Service Manual

Tektronix

1780R-Series
Video Measurement Set
SN B030000 & Up

070-8030-01

This document supports firmware version 1.16 and above.

Warning
The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

CE

Printed in the U.S.A.

Tektronix, Inc., P.O. Box 1000, Wilsonville, OR 97070–1000

Service Assurance

If you have not already purchased Service Assurance for this product, you may do so at any time during the product's warranty period. Service Assurance provides Repair Protection and Calibration Services to meet your needs.

Repair Protection extends priority repair services beyond the product's warranty period; you may purchase up to three years of Repair Protection.

Calibration Services provide annual calibration of your product, standards compliance and required audit documentation, recall assurance, and reminder notification of scheduled calibration. Coverage begins upon registration; you may purchase up to five years of Calibration Services.

Service Assurance Advantages

- Priced well below the cost of a single repair or calibration
- Avoid delays for service by eliminating the need for separate purchase authorizations from your company
- Eliminates unexpected service expenses

For Information and Ordering

For more information or to order Service Assurance, contact your Tektronix representative and provide the information below. Service Assurance may not be available in locations outside the United States of America.

Name	VISA or Master Card number and expiration
Company	date or purchase order number
Address	Repair Protection (1,2, or 3 years)
City, State, Postal code	Calibration Services (1,2,3,4, or 5 years)
Country	Instrument model and serial number
Phone	Instrument purchase date

WARRANTY

Tektronix warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of three (3) years from the date of shipment. If a product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

THIS WARRANTY IS GIVEN BY TEKTRONIX IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TEKTRONIX' RESPONSIBILITY TO REPAIR OR REPLACE DEFECTIVE PRODUCTS IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

Table of Contents

Theory of Operation

Performance Verification

Adjustment Procedures

Maintenance

Options

Electrical Parts List

Diagrams

Mechanical Parts List

List of Figures

List of Tables

General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Connect and Disconnect Properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Recharge Batteries Properly. Recharge batteries for the recommended charge cycle only.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Wear Eye Protection. Wear eye protection if exposure to high-intensity rays or laser radiation exists.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

Symbols and Terms

Terms in this Manual. These terms may appear in this manual:

WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*

CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product. These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product. The following symbols may appear on the product:


CAUTION
Refer to Manual


WARNING
High Voltage


Double
Insulated


Protective Ground
(Earth) Terminal


Not suitable for
connection to
the public telecom-
munications network

Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power. To avoid electric shock, disconnect the mains power by means of the power cord or, if provided, the power switch.

Use Caution When Servicing the CRT. To avoid electric shock or injury, use extreme caution when handling the CRT. Only qualified personnel familiar with CRT servicing procedures and precautions should remove or install the CRT.

CRTs retain hazardous voltages for long periods of time after power is turned off. Before attempting any servicing, discharge the CRT by shorting the anode to chassis ground. When discharging the CRT, connect the discharge path to ground and then the anode. Rough handling may cause the CRT to implode. Do not nick or scratch the glass or subject it to undue pressure when removing or installing it. When handling the CRT, wear safety goggles and heavy gloves for protection.

Use Care When Servicing With Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

X-Radiation. To avoid x-radiation exposure, do not modify or otherwise alter the high-voltage circuitry or the CRT enclosure. X-ray emissions generated within this product have been sufficiently shielded.

Preface

This Service Manual is part of a 2-volume set. Its companion manual is the Operator's Manual, which is aimed primarily at operating personnel. Information in this volume is intended for those who are required to maintain the 1780R-Series Video Measurement Set.

Specific instructional procedures can be found in the *Performance Check*, *Adjustment Procedures*, *Maintenance* and *Installation* sections. In addition, the lists of Replaceable and Mechanical Parts along with circuit board component locating dollies and schematic diagrams are at the back of this manual.

Operating Information is a very simple explanation of the controls and connectors. If there is a question involving one of the specific measurement applications, it may be necessary to consult the Operator's Manual to determine if there is an instrument malfunction or simply an operator error.

Special techniques are required to service the 1780R-Series Low Voltage Power Supply. Consult *Troubleshooting* before attempting to work on the Low Voltage Power Supply.

To assist in locating information in this volume there is a complete Table of Contents, augmented by a List of Illustrations and a List of Tables.

Product Description

The Tektronix 1780R-Series Video Measurement Set is a 19-inch wide, 5 1/4-inch high, 18-inch deep dual-CRT Waveform Monitor/Vectorscope. It weighs approximately 28 pounds and is intended for rack-mount applications, but can also be configured as a full (rack) width cabinet model for bench and portable applications. See Figure 1–1. The remainder of the front-panel area contains controls and switches that manually configure the instrument for measurements. Both CRTs have alphanumeric readout and touch-screen control to simplify measurement tasks and operating menus.

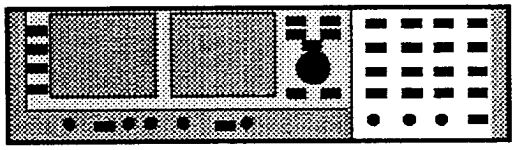


Figure 1–1: Simplified representation of the 1780R-Series Video Measurement Set

The left CRT is selectively used for vectorscope, picture monitor, SCH phase, and XY displays, while the right one is used for the waveform monitor displays. The picture monitor display has a bright-up strobe; when the instrument is in a line select mode, that makes its display identical to that of a picture monitor driven from the rear-panel Pix Mon Out.

The right CRT is used for the normal filtered waveform monitor displays. Waveform monitor measurements can have voltage and time cursors added to the display to improve measurement accuracy. The elapsed time or amplitude difference between cursors is displayed as alphanumeric CRT readout. Besides the typical waveform monitor displays the right CRT is used for high-resolution, high-accuracy differential gain and phase measurements.

Signal and reference input is through 75 Ω bridging loop-through inputs. There are four composite video inputs, making it possible to use the 1780R-Series to measure analog component signals, if desired. In addition to the normal 1- or 2-line, and 1- or 2-field displays, both component and composite signals can be displayed in parade or overlay mode. The external reference can be either composite sync or black burst. The 1780R-Series can also be operated with an external subcarrier reference input, similar to the Tektronix 520-Series.

All instruments in the series have a front-panel, high impedance (1 MΩ) probe input. Signals input through the probe can be displayed as single or multiple lines or fields and can also be overlayed or paraded with the rear-panel input

signals. The probe input has gain and input compensation for both X1 and X10 probes.

The instrument control system is based on a National Semiconductor 32CG16 Microprocessor, with an additional line rate processor that makes line-by-line measurement decisions. Front-panel switching and CRT touch-screen selections are acted upon by the processors. The front-panel switches are momentary touch-type, which toggle through a short list of functions and provide additional selections when held in. Each switch has a back-lighted functional indicator or built-in indicator to relay switch status to the operator. In addition to sensing and acting on switch and touch panel changes, the Microprocessor controls the alphanumeric CRT readout for menu selections and measurement results.

The current front-panel configuration (switch and touch screen) is always stored in non-volatile memory allowing the instrument to power back up in its previous measurement configuration. In addition, front-panel configurations can be stored and recalled (one-button measurement), like the Tektronix 1730-Series.

The use of touch screens and an assignable, multi-function control greatly simplifies the operator interface. The control is an optical encoder that is used for line selection, voltage measurements, timing measurements, and subcarrier phase measurements, along with other menu/touch screen assigned tasks. A pair of push buttons, adjacent to the control, can be used to duplicate the function of the control when individual steps are desired.

The waveform monitor has reduced spot size and provides a bright display for showing an individual line. The left CRT provides the vectorscope, picture monitor, SCH phase and XY displays. Both CRTs have internal measurement graticules, and can accommodate external graticules that are used for specialized measurements and some photographic applications. Variable graticule scale illumination provides uniform lighting over the usable area for both the internal and external graticules.

CRT Options

Option 74 provides a P4 (white) phosphor tube.

Power Cord Options

Any of the power cord options described in *Maintenance* can be ordered for the 1780R-Series. If no power cord option is ordered, instruments are shipped with a North American 125 V power cord and one replacement fuse.

Specifications

This section of the manual contains the specifications for the 1780R-Series. Tabular information is divided into two categories. First there are the Performance Requirements which is assured by Tektronix Inc. Second are the items in the Supplemental Information column, which due to a number of reasons may be only typical numbers or could vary slightly from one instrument to the next.

The *Performance Verification* is provided to verify listed Performance Requirements. If a step for a specific requirement is not included in this procedure, it is because the performance has been built into the instrument and is therefore assured by either the fact that the instrument is operational or is proven correct by other performance check steps. In a few instances, the procedure to verify a specification can be extremely difficult or require extremely expensive equipment to verify, which might also cause them to be omitted from the procedure. In these cases the factory has a procedure, that can be provided if necessary.

The step numbers, that can be used to verify the Performance Requirements and some critical Supplemental items, are in a column following the Supplemental Information.

Performance Qualification

The Performance Requirements listed in the Electrical Specification apply over an ambient temperature range of 0° C to +50° C. The rated accuracies are valid when the instrument is calibrated at an ambient temperature range of +20° C to +30° C, after a warm-up time of 20 minutes. Test equipment used to verify Performance Requirements must be calibrated and working within the limits specified under the Equipment Required list.

Heat Dissipation

Maximum heat dissipation is 120 Watts (410 BTU/ Hour).

Table 1–1: Input/Output

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Vertical Ranges			
Volts Full Scale	Accuracy		
1.0	1.0 V ±0.007 V.	Peak-to-peak Amplitude for Full Graticule 1.0 volt/140 IRE.	4
Var		≤0.5:1 to ≥1.5:1 (0.67 V to 2.0 V input signal can be made full scale).	5
Input Gain Ratios			
A to B	1 to 1 ±0.002 (0.998 – 1.002).		10
Auxiliary Video Input to A Input	1.5 dB ±0.3 dB.		10
Input A to Auxiliary Video Output	1 to 1 ±0.005 (0.995 – 1.005).		10
Input A to Picture Monitor Output	1 to 1 ±0.02 (0.98 – 1.02).		10
Vertical Magnifier			
X5 Accuracy		0.2 V ±0.007 V.	
Peak-to-peak Amplitude for Full Graticule		0.2 V/28 IRE.	
Maximum Input Signal			
AC Coupled All Inputs	2.0 V, peak-to-peak, 10%–90% APL.	Aux Video Out and Pix Mon (terminated), 1.0 V peak-to-peak, 10%–90% APL.	
DC Coupled All Inputs	±1.5 V (DC + peak AC).		
Max volts from Loop-Thru common terminal to chassis	2 V_{RMS} at mains frequency.	Rejection ratio of common-to-chassis in floating ground mode, ≥34 dB at mains frequency.	
Max DC Output Voltage			
Aux Video Out		±0.5 V into 75 Ω.	
Pix Mon Out		±0.5 V into 75 Ω. Line strobe but no input signal.	7
Remote Control			
Interface Standard		RS422, RS232 (subset of all controls).	
Control Enable		Ground closures and presets.	

Table 1–2: Waveform Monitor Vertical System

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Return Loss			
CH A, B1, B2, or B3	>40 dB DC to 5 MHz.	(Terminated in 75 Ω.)	58
Aux Video In, Aux Video Out, & Pix Mon Out	>34 dB DC to 5 MHz.	Instrument On only.	58
Ext. Sync Input	>46 dB to 5 MHz.		58
Loop-Through Isolation		>80 dB at F_{SC}, between channels and each channel and EXT REF. Measured externally.	
Crosstalk		Typically 70 dB isolation between channels. Measured at F_{SC} between channels and each channel and EXT REF .	
Frequency Response			
Flat (X1)			
50 kHz – 5 MHz	±1%.	All inputs, 1 V Full Scale, Var. Gain off. Adjusted for min. lum/chroma gain error. Typically <0.5%.	11–15
	±2%.	Aux In, and Aux Out.	15–16
5 MHz – 10 MHz	±1%.	CH A, 1 V Full Scale, Var. Gain off.	11
	±2%.	Ch B1, Ch B2, Ch B3, Aux In, and Aux Out.	12–16
10 MHz – 15 MHz	+2% –5%.	All Inputs, 1 V Full Scale, Var. Gain off.	11–15
15 MHz – 20 MHz	+2% –15%.	All Inputs, 1 V Full Scale, Var. Gain off. –3 dB at >20 MHz.	11–15
Lum/Chroma Gain	±0.5%.	X5 Gain with Modulated Sin^2 Pulse (12.5T NTSC, 10T PAL).	19
Voltage Cursor			
Accuracy	±0.2%.		6
Resolution	1 mV.		
Cal Amplitude			
Accuracy	1.00 V ±0.2%.	NTSC = 0.714 V ±0.5%. PAL = 0.700 V ±0.5%.	3
Resolution	1 mV at 1.00 V.		

Table 1–2: Waveform Monitor Vertical System (Cont.)

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
DC Restorer			
Clamp Point		Backporch or Sync Tip. (All clamps controlled together.)	21
Mains Hum Atten.			
Slow Clamp	≤0.9 dB.	Attenuation ≤10%.	22
Fast Clamp	≥26 dB.		
Shift caused by presence or absence of burst		NTSC = 1 IRE. PAL = ≤7 mV.	24
Lum/Chroma Gain Ratio			
NTSC (50 kHz – 3.58 MHz)	1:1 ±1%.	Adjusted to minimize luminance to chrominance gain error at 1 V Full Scale, typically ≤0.5%.	19
PAL (50 kHz – 4.43 MHz)	1:1 ±1%.		
DC Channel Matching		Typically within 30 mV.	8
Common Mode Rejection	*AB1* *B1B2 / B1B3*	1 V peak-to-peak common mode signal.	26
60 Hz	≥46 dB ≥46 dB		
15 kHz (Lum)	≥46 dB ≥46 dB		
1 MHz	≥40 dB ≥34 dB		
3.58 or 4.43 MHz (Chroma)	≥34 dB ≥34 dB	A – B1 typically >46 dB to 6.0 MHz and >40 dB to 10.0 MHz.	
Filters			
Luminance	<3 dB down at 1 MHz. ≥40 dB down at 3.58 or 4.43 MHz.		
Low Pass	≥14 dB down at 500 kHz.	Typically –3 dB at 300 kHz.	
Chrominance			
3.58 MHz		±1% of flat at 3.58 MHz. 3 dB points: Lower: 2.83 ±0.15 MHz. Upper: 4.33 ±0.15 MHz.	20
4.43 MHz		±1% of flat at 4.43 MHz. 3 dB points: Lower: 3.68 ±0.15 MHz. Upper: 5.18 ±0.15 MHz.	

Table 1–2: Waveform Monitor Vertical System (Cont.)

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Diff Steps			
(Differentiated Steps Attenuation)	>40 dB at 3.58 MHz (4.43 MHz PAL).	5 step, 20 IRE staircase within 2% of flat display. Vertical Gain increase approx. 5X to compare staircase risers.	27
Noise Measurements			
Accuracy	To 56 dB within 1 dB; 60 dB within 2 dB.	Relative to 700 mV_{RMS}, Var Gain set to maximum.	9
Offset Accuracy	To 56 dB within 0.5 dB; 60 dB within 1 dB.		
Non-Linear Waveform Distortion			
Differential Gain			
Aux Video Out	≤0.25%, 10% – 90% APL.	Waveform modes.	
Pix Mon Out	≤0.25%, 10% – 90% APL.		
Differential Phase			
Aux Video Out	≤0.25°, 10% – 90% APL.		
Pix Mon Out	≤0.25°, 10% – 90% APL.		
Linear Waveform Distortion			
Pulse Overshoot & Ringing	≤1% of applied pulse amplitude.	Typically <0.5% on T Pulse, and <1.0% on T/2 Pulse.	29
Pulse and Bar	≤1% of applied pulse amplitude.	Typically <0.5% on T Pulse, and <1.0% on T/2 Pulse.	
25 µs Bar Tilt	≤1% of applied bar amplitude.		
Field Square Wave Tilt	≤1% of applied square wave amplitude.	Typically <0.5%.	
2T Sin^2 Pulse-to-Bar Ratio	1:1 ±1%.		
Vertical Overscan			
Baseline Distortion	<7 mV variation in baseline of chroma when positioned anywhere between sync tip and 100% white.	1 V p-p PAL or NTSC Modulated Sin^2 composite video signal (12.5T NTSC, 10T PAL). X1 or X5, Variable Gain off. Typically <0.5%.	23

Table 1–3: Waveform Monitor Probe Input

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Input Resistance		1 MΩ.	
Input RC Product		20 µs (20 pF).	
Gain	Unity ±3%.	With gain adjusted for equivalent 1 V peak-to-peak display.	30
Frequency Response			
25 Hz to 10 MHz	±3%.	Referenced to 50 kHz.	17, 18
Tilt	Less than 5% on 50 Hz square wave.	Fast DC Restorer eliminates low frequency tilt on a comp video signal.	32
Probe Calibrator			
Waveform		50% Duty Cycle square wave.	31
Period		4 horizontal lines.	
Output Voltage	1.0 V ±0.5%.	0.995 to 1.005 V.	
Impedance Out		≈950 Ω.	

Table 1–4: Waveform Monitor Horizontal Deflection System

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Sweep Rates & Timing Accuracy		1 MΩ.	
1 Line (5 µs/Div.)	±2%.	Center 10 divisions.	34
2 Line (10 µs/Div.)	±2%.	Center 10 divisions.	
3 Line (15 µs/Div.)	±2%.	Center 10 divisions.	
1-Field Sweep		Displays 1 full field including field rate sync.	
2-Field Sweep		Displays 2 full fields, and the field rate sync between them. First sweep is selectable between the even or odd field.	
3-Field Sweep		Displays 3 full fields, and the 2-field rate sync intervals between them (3/4 of the color frame). First sweep is selectable between the even or odd field, third field polarity is the same as the first field's.	

Table 1–4: Waveform Monitor Horizontal Deflection System (Cont.)

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Sweep Linearity			
1 Line (5 µs/Div.)	±1%.		34
2 Line (10 µs/Div.)	±1%.		
3 Line (15 µs/Div.)	±1%.		
1-Field Sweep	±0.5 division.		
2-Field Sweep	±0.5 division.		
3-Field Sweep	±0.5 division.		
Slow Sweep	±5% of full screen over the length of the sweep.		
Magnified Sweep Accuracy			
X5 (1 µs/Div.)	±1%.	Applies to the center 10 divisions of unmagnified sweep. Excludes the first 2 divisions of the magnified display.	34
X10 (0.5 µs/Div.)	±2%.		
X20 (0.25 µs/Div.)	±3%.		
X25 (0.2 µs/Div.)	±3%.		
X50 (0.1 µs/Div.)	±3%.		
X100 (50 ns/Div.)	±5%.		
Magnified Sweep Linearity			
X5 (1 µs/Div.)	±1 minor division (2%).	Applies to the center 10 divisions of unmagnified sweep. Excludes the first 2 divisions of the magnified display.	34
X10 (0.5 µs/Div.)	±1 minor division (2%).		
X20 (0.25 µs/Div.)	±1 minor division (2%).		
X25 (0.2 µs/Div.)	±1 minor division (2%).		
X50 (0.1 µs/Div.)	±1 minor division (2%).		
X100 (50 ns/Div.)	±1 minor division (2%).		
Variable Sweep Range	>±20%.	Expands sweep around center of sweep.	35
Slow Sweep Duration		4 to 12 seconds. Front panel variable control.	45
Timing Cursor Accuracy	Within 5 ns, any delay within 1 line (64 µs).		33
Line Select			
Range	Full Field.	Waveform monitor and vectorscope may select different lines. CRT alphanumeric identification.	36
Field Selection	1 of 4 for NTSC or 1 of 8 for PAL. Even or Odd and All Fields.		

Table 1–4: Waveform Monitor Horizontal Deflection System (Cont.)

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
RGB/YRGB			
Staircase Input Amplitude	A +10 V input will result in a horizontal display of 9 divisions ±1.4 major divisions.	Ground to +10 V. +10 V corresponds to left side of CRT.	37
Staircase Operating Signal	DC Signal levels plus peak AC, not to exceed _–12 to +12 V.		
Max AC Signal Volts	12 V peak-to-peak.	Field or line rate sweeps.	
Sweep Length			
RGB		2 Fld = 27 – 33% of normal. 1 Line = 27 – 33% of normal. 2 Line = 27 – 33% of normal.	
YRGB		2 Fld = 20 25% of normal. 1 Line = 20 – 25% of normal. 2 Line = 20 – 25% of normal.	
Sweep Repetition Rate	Field or line rate of displayed video or external sync signal as selected by front-panel HORIZONTAL controls.	Requires 1H or 1Fld sweep selection.	
External Horiz. Input		Used for ICPM measurements.	
Sensitivity		Direct coupled 0 – 5 V. Sawtooth input of up to 5 V is nominally a 10 division horizontal sweep.	38
Input Impedance		≈10 kΩ.	

Table 1–5: Waveform Monitor dG and dP Display

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Differential Gain			
Deflection Factor	5% dG deflects the trace 50 IRE (NTSC) or 500 mV (PAL) ±5%.	Waveform gain X1, Var. Gain off. Vector gain adjusted to place chroma at compass rose.	39
Residual dG (10 – 90% APL)	≤0.2%, last 90% of trace.		39
Calibrated dG		CRT readout.	39
Resolution	0.1%.		
Accuracy	0.1% ±10% of reading.		
Range	±5%.		
Differential Phase			
Deflection Factor	5° dP deflects the trace 50 IRE (NTSC) or 500 mV (PAL) ±5%.	Waveform gain X1, Var. Gain off. Vector gain adjusted to place chroma at compass rose.	40
Residual dP (10 – 90% APL)	≤0.1°, last 90% of trace.		40
Calibrated dP		CRT readout.	40
Resolution	0.05°.		
Accuracy	±0.1° over any 10° increment. ±0.1° over full 360°, Ext. Ref. ±0.2° burst lock.		
Range	360°.		
Recursive Filter			
Noise Reduction		≈15 dB signal-to-noise reduction with filter selected. Assumes white noise source.	41
Cross-Luminance Rejection		≈30 dB with filter selected. 0 dB in dual dP/dG mode.	
Unit Sample Response		Settles to within 1 dB in <50 lines with a step in APL. Settles to within 1 dB in <50 frames in line select.	
Chrominance Bandwidth		500 kHz ±100 kHz baseband.	

Table 1–6: Synchronization

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Sync Input			
Internal			
Ref. Sync Separator	0.2 to 2.0 V peak-to-peak composite video.	Composite video applied to Inputs A, B1, B2, or B3 or probe.	42
Int. Sync Separator	0.5 to 2.0 V peak-to-peak composite video.		42
External			
Black Burst	–14 dB to +6 dB.	Black Burst signal of 0.2 to 5 times amplitude applied to EXT SYNC input.	43
Composite Sync	0.2 to 8.0 V peak-to-peak.	Composite sync applied to EXT SYNC input locks waveform monitor; vectorscope also requires CW signal.	43
SCH Modes	286 mV (300 mV PAL) Sync and Burst ±3 dB.	Composite Video or Black Burst.	56
Direct Sync			
Horiz. Freq. Range	15.75 kHz ±1 kHz.	Frequencies much below 15.75 kHz will not permit a normal TV display.	
Sync Jitter			
Comp sync or video		≤12 ns with respect to input sync.	44
Variable APL (10–90%)		≤20 ns; with the addition of 36 dB white noise ≤90 ns.	
Noise Immunity		<250 ns jitter, 1 V composite video with _–26 dB white noise.	
AFC Sync			
Horiz. Freq. Range	15.75 kHz ±200 Hz.		44
Lock-In Time	<1 second.		
Sync Jitter			
Comp sync or video Variable APL (10–90%)		≤10 ns; with the addition of 36 dB white noise ≤12 ns.	
Jitter with respect to white noise	≤30 ns.	Doubles with each 6 dB increase in white noise.	
Noise Immunity		<90 ns jitter, 1 V composite video with _–26 dB white noise.	

Table 1–6: Synchronization (Cont.)

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Jitter from missing line sync pulses		<15 ns per missing sync pulse. Maximum of 10 consecutive line sync pulses.	
Slow Sweep Triggering			
Signal	APL change from 10% to ≤90%.	Front panel selectable for either + or _– level change.	45
Sensitivity	0.4 V to 2.0 V peak-to-peak composite video with APL change.		
Rate	0.2 Hz.	Free runs at rates less than 0.2 Hz or with no triggering signal.	
Remote Sync			
Amplitude	2.0 to 5.0 V square wave, or 4.0 V composite sync.	Input enabled through rear-panel REMOTE connector.	46
Input Impedance		1 MΩ.	
Frequency		30/60 Hz (NTSC), 25/50 Hz (PAL) square wave will synchronize a 2-field sweep. Remote sync bypasses the sync stripper and field ID circuits.	

Table 1–7: Vectorscope Vector Display

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Phase Control			
Digital Phase Shifter			
Phase Accuracy	±0.1°.	(External CW signal.) 0.25° Burst Lock.	47
Resolution		0.05°.	
Chrominance Bandwidth			
Upper –3 dB Point	F_{SC} +500 kHz, ±100 kHz.	F_{SC} (Subcarrier Frequency) NTSC – 3.579545 MHz. PAL – 4.43361875 MHz.	48
Lower –3 dB Point	F_{SC} _–500 kHz, ±100 kHz.		
Chrominance Transient Response		Modulated Sin^2 pulse in R-Y mode.	

Table 1–7: Vectorscope Vector Display (Cont.)

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Display			
Vector Phase Accuracy	±1.25°.	Measured with color bar signal.	49
Vector Gain Accuracy		±2.5% (1.25 IRE).	
Quadrature Phasing	±0.5°.		
Subcarrier Regenerator			
Pull-In Range			
(NTSC)	±50 Hz of F_{SC}.	PAL instruments are tested to 10 Hz, but typically lock to within 50 Hz.	50
(PAL)	±10 Hz of F_{SC}.		
Pull-In Time		Within 1 second, with subcarrier frequency within 50 Hz (10 Hz for PAL instruments) of F_{SC}.	
Phase Shift with Subcarrier Frequency Change			
(NTSC)		±0.5° from F_{SC} to (F_{SC} +50 Hz), or F_{SC} to (F_{SC} –50 Hz).	
(PAL)		±0.5° from F_{SC} to (F_{SC} + 10 Hz), or F_{SC} to (F_{SC} –10 Hz).	
Phase Shift with Burst Amplitude Change	±2° from nominal burst amplitude to ±3 dB.	Internal or External burst reference.	50
Phase Shift with Input Channel Change	±2°.	CH A to CH B1 or CH B1, CH B2, and CH B3 to each other. With EXT REF selected.	50
Phase Control Range		360° continuous rotation.	50
Vector Display			
Differential Phase		≤1.	
Differential Gain		≤1%. Measured with 140 IRE (1 V) linearity signal with 40 IRE (300 mV) of subcarrier.	
Position Control Range			
Horizontal		≥1/4 inch (6 mm) from center.	51
Vertical		≥1/4 inch (6 mm) from center.	
Clamp Stability	1/64 inch (0.4 mm) or less.	Center Spot movement with rotation of PHASE control.	51

Table 1–7: Vectorscope Vector Display (Cont.)

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Variable GAIN Range	+14 dB to –6 dB of 75% color bar preset gain.	Unterminated color bar signal can be brought to appropriate targets. Burst from a triple terminated signal can be moved to the compass rose.	52
Max Gain		>X5.	
Variable GAIN Phase Shift	±1° as gain is varied from +3 dB to – 6 dB.		53

Table 1–8: Vectorscope X-Y Display

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Input		DC coupled differential inputs through rear-panel connector.	
Input Amplitude	2 to 9 V peak-to-peak.	Adjustable full scale deflection 0 dBm to +12 dBm for 600 Ω system. Factory set to 0 dBm.	
Maximum Input Voltage	±15 V combined peak signal and DC.		
Frequency Response	DC to >500 kHz.	3 dB point.	55
X and Y Input Phase Matching	< a trace width of separation at 20 kHz.	Single-ended. Phase matching above 20 kHz may be improved by adjusting Vertical Deflection Amplifier VHF Compensation.	54

Table 1–9: Vectorscope SCH Phase Display

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Accuracy			
Absolute	±5° phase at 25° C.		56
Relative		±2°.	
Acquisition Time	≤1 sec.		56
Display Phase Error caused by CRT Geometry Variations		±1.25° calibrated for zero display phase error at zero SCH phase.	

Table 1–9: Vectorscope SCH Phase Display (Cont.)

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Input Timing		Correct relative SCH operation with displayed video delayed up to 2 µs or advanced up to 1.5 µs relative to external reference.	
Display Range			
Ext Reference	360°.		
Int Reference	±70°.	Typically >80°.	56

Table 1–10: CRTs and High Voltage Supplies

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Waveform Monitor			
Viewing Area		80 × 100 mm. Horizontal Scale 12.5 Divisions. Vertical Scale 170 IRE (NTSC), 1.19 V (PAL).	
Accelerating Potential		Nominally 20 kV.	
Orthogonality		±1°.	57
Trace Rotation Range	≥±1° from horizontal.	Typical adjustment range is ≈8°.	57
Vectorscope			
Viewing Area		80 × 100 mm.	
Accelerating Potential		Nominally 13.75 kV.	
Orthogonality		±1°.	57

Table 1–11: Power Requirements

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Mains Voltage Ranges			
110 VAC	90 – 132 V.	Selected by rear-panel switch.	1
220 VAC	200 – 250 V.		
Mains Frequency Range	48 – 66 Hz.		

Table 1–11: Power Requirements (Cont.)

Characteristic	Performance Requirement	Supplemental Information	Performance Check Step
Crest Factor		≥1.3.	
Power Consumption	120 Watts maximum.		

Table 1–12: Environmental Summary

Characteristic	Performance Requirement
Temperature	
Operating	0° C to +50° C.
Non-Operating	55° C to +75° C.
Altitude	
Operating	To 15,000 feet (4.5 km) maximum.
Non-Operating	To 50,000 feet (15 km) maximum.
Vibration	
Operating	0.015 inch (0.38 mm) peak-to-peak 10–55 Hz, 75 minutes total.
Shock	
Non-Operating	30 g acceleration 3 times each major axis. 11 ms halfsine.
Bench Handling	4 inch drop to table top on each of the four bottom corners.
Transportation	
Vibration	Qualified under National Safe Transit Association (NSTA) Test Procedure 1A-B-1.
Drop Test	Qualified under NSTA Test Procedure 1A-B-2.
Humidity	90 to 95% Noncondensing

Table 1–13: Physical Characteristics

Characteristic	Supplemental Information
Dimensions	
Height	5 1/4 inches (133.4 mm).
Width	19 inches (483 mm).
Length	18 inches (460 mm).
Net Weight	Approximately 28 lbs (approximately 12.7 kg). Add 7 lbs (3.2 kg) for accessories and manuals.
Shipping Weight	Approximately 45 lbs (approximately 20.3 kg).

Table 1–14: Certifications and Compliances

EC Declaration of Conformity – EMC	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities: EN 50081-1 Emissions: EN 55022 Class B Radiated and Conducted Emissions EN 50082-1 Immunity: IEC 801-2 Electrostatic Discharge Immunity IEC 801-3 RF Electromagnetic Field Immunity IEC 801-4 Electrical Fast Transient/Burst Immunity High-quality shielded cables must be used to ensure compliance to the above listed standards.This product complies when installed into any of the following Tektronix instrument enclosures: 1700F00 Standard Cabinet 1700F02 Portable Cabinet 1700F05 Rack Adapter
FCC Compliance	Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits
EC Declaration of Conformity – Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 73/23/EEC HD401 S1 Safety requirements for electronic measuring apparatus
U.S. Nationally Recognized Laboratory Listing	UL1244 Standard for Electrical and Electronic Measuring and Testing Equipment.
Canadian Certification	CAN/CSA C22.2 No. 231 CSA Safety Requirements for Electrical and Electronic Measuring and Test Equipment.
Installation Category Descriptions	Terminals on this product may have different installation category designations. The installation categories are: CAT III Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location CAT II Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected CAT I Secondary (signal level) or battery operated circuits of electronic equipment

Installation

Overview

This section provides information on both mechanical and electrical installation of the 1780R-Series Video Measurement Set. Be sure to read this material prior to physically mounting the instrument in either a rack mount or portable configuration.

Packaging

The shipping carton and pads provide protection for the instrument during transit, and should be retained in case subsequent shipment becomes necessary. Repackaging instructions, including an illustration, can be found at the end of this section.

Accessories

The 1780R-Series comes with a set of standard accessories, which includes items such as manuals, rack-mounting hardware, external graticules, power cord, spare fuse, etc. Table 2–1 is a list of these standard accessories. Not all of the items in the table (especially power cables and graticules) are appropriate for all instruments. Part numbers for these accessories are located at the back of the manual in the *Replaceable Mechanical Parts List*.

Table 2–1: 1780R-Series Standard Accessories

Item	Description	
1 Manual	1 – Operator Manual	
3 External Graticules per Standard	1– IEEE STD 511 Visual (1780) 1– IEEE STD. 511 Photo (1780) 1– PAL K-Factor Visual (1781) 1– PAL K-Factor Photo (1781)	
Power Cable Assembly (1 of 5 options)	*Option*	*Country of Use*
	——	North Amer. (115 V)
	A1	European (220 V)
	A2	U K (240 V)
	A3	Australian (240 V)
1 Spare Fuse	250 V 2A T-type Cartridge fuse	
3 Incandescent Bulbs	Spare Graticule Lights	
1 Air Filter	For rear-panel fan	
2 Mounting Brackets	For rear rack-mounting	

In addition to the standard accessories in Table 2–1 there are a number of optional accessories that can be purchased, such as a portable case, maintenance kits, etc., to complement the 1780R-Series Video Measurement Set. For more information contact a Tektronix Inc. field office or distributor.

Table 2–2 is a partial list of optional accessories that are available for the 1780R-Series instruments.

Table 2–2: Partial List of Optional Accessories Available for the 1780R-Series

Item	Description
Cabinet	1780F02 Portable Carrying Case with front and rear panel covers
Circuit Bd. Extender Kit	Used to service Oscillator and Z-Axis etched circuit boards
Viewing Hood	Tektronix Catalog Accessory
Manual	Service Manual

Rear Panel Connectors

Figure 2–1 shows the rear panel of the 1780R-Series. The following connectors are on the rear panel.

CH A. High impedance bridging loop-through input for composite video signal. Shield can be grounded or floating depending on the position of the grounding screw (located between the BNC connectors).

CH B1. High impedance bridging loop-through input for composite video signal. Shield can be grounded or floating depending on the position of the grounding screw (located between the BNC connectors).

CH B2. High impedance bridging loop-through input for composite video signal. Shield can be grounded or floating depending on the position of the grounding screw (located between the BNC connectors).

CH B3. High impedance bridging loop-through input for composite video signal. Shield can be grounded or floating depending on the position of the grounding screw (located between the BNC connectors).

EXT HORIZ. High impedance input through BNC connector. Positive-going signal deflects the sweep from left to right. Requires a 0 to +5 V signal for full scale deflection.

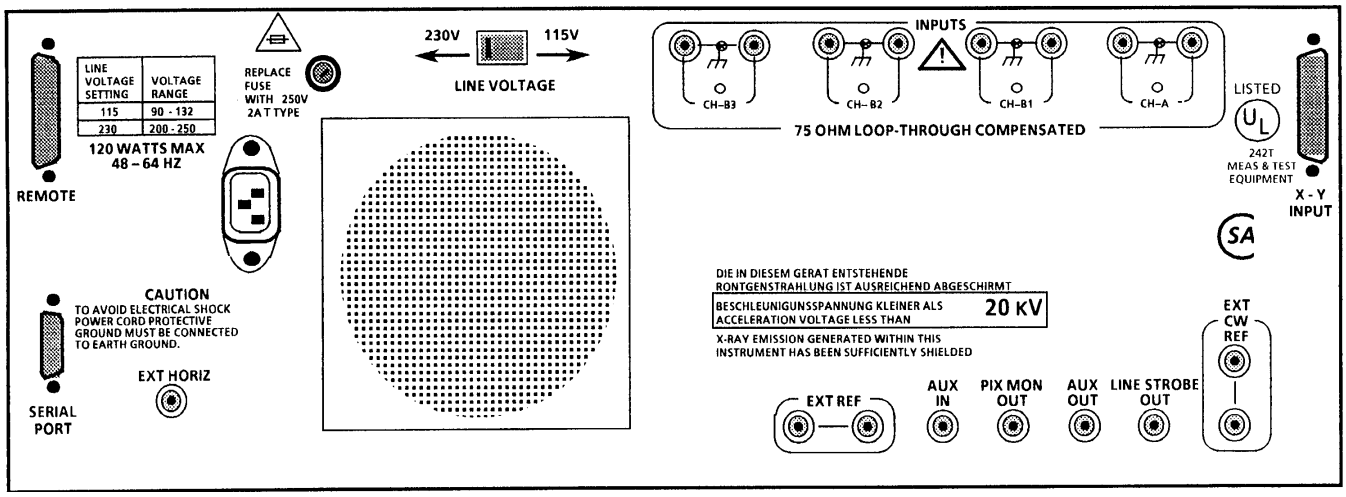


Figure 2–1: Rear panel for the Tektronix 1780R-Series Measurement Set

EXT REF. High impedance bridging loop through connector for either composite sync or black burst.

AUX IN. 75 Ω input for video signals. Insertion point follows the internal filters.

AUX OUT. 75 Ω video signal output just prior to the filters. Can be used with the AUX IN to design custom filters.

PIX MON. 75 Ω output to drive a picture monitor, signal is output prior to filters and has a bright-up pulse added when line select is used.

LINE STROBE. A 75 Ω output that provides a pulse for the selected line(s) when line select is used. Can also be configured to output the Field 1 pulse, see Table 2–3 (J1103).

CW. High impedance bridging loop-through input for continuous subcarrier signal. Provides an external phase reference signal.

REMOTE. 15-pin D-type connector used as a ground closure interface for remote control of key functions. See Figure 2–4.

SERIAL PORT. 9-pin D-type connector that provides a serial interface, using RS422A or RS232D control, for remote control of Microprocessor-controlled functions. See Figure 2–5.

X – Y. A 15-pin D-type connector used as a high impedance input for the 600 Ω balanced audio. See Figure 2–6.

Installation Requirements

The 1780R-Series is designed for efficient use of rack space. It can be mounted flush with other equipment, eliminating the need for air circulation above and below the cabinet. It should not be mounted flush with equipment that is a significant heat source, because heat conducted through the cabinet can raise the internal temperature of the instrument beyond its ability to cool itself.

Cooling air for the 1780R-Series is pulled into the instrument through a rear-panel fan and exhausted through the cabinet sides. Most equipment racks provide enough space, along side the instruments, to allow heated air to escape from this instrument.

Before installing the instrument in the rack, be sure that the cooling fan blades are un-obstructed and turn freely.

A minimum rear panel clearance of 1-1/2 inches is required to connect BNC cables.

Front-panel clearance of at least 20 inches is required to remove the instrument from its rack mounting cabinet.

Electrical Installation

Power Source

This instrument is designed to operate from a single-phase power source having one of its current-carrying conductors at or near earth-ground (the neutral conductor). Only the Line conductor is fused for over-current protection. Systems that have both current-carrying conductors live with respect to ground (such as phase-to-phase in multiphase systems) are not recommended as power sources.

Mains Frequency and Voltage Ranges

The 1780R-Series operates over a frequency range of 48 to 64 Hz, and at a nominal mains voltage of 115 VAC or 230 VAC. The factory setting, 115 V or 230 V, is marked on the rear-panel mains switch. See Figure 2–2. Be sure the instrument is operated with the selected mains voltage.

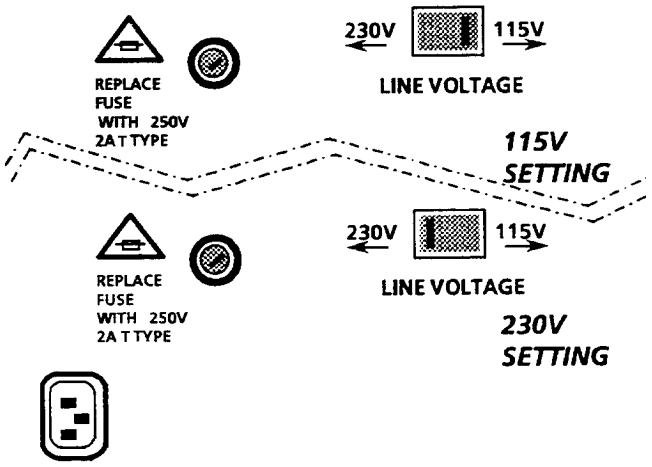


Figure 2–2: Settings for the rear-panel mains selector switch

Operating Options

In addition to being able to configure the 1780R-Series through user interaction with a series of CRT-presented menus, there are some specific operating situations that can be selected by changing internal plug jumpers or Dual-Inline-Package (DIP) switches. These provide for some specific conditions that are not anticipated to change on a regular basis. For most applications, the factory-installed plug jumper and DIP switch settings will be adequate. Tables 2–3 through 2–5 list the internal plug jumpers and DIP switches, by name, and detail their operation.

Some of the plug jumpers are for maintenance use only. They are designated in the following tables with a ‡ symbol. When setting up the instrument for operation they should be left set as they are. Installing jumpers on open pins or removing already installed maintenance jumpers can disable the instrument.

The plug and the jumper portions of the plug jumpers, in most cases, have pin one designated by a small triangle.

CAUTION. *Be sure that you move only the operation selecting plug jumpers or DIP switches. Installing or removing Maintenance jumpers or changing the setting of Maintenance DIP switches will disable normal operation.*

Table 2–3: Plug Jumpers for Waveform Board (Assembly A2) (Schematic Diagrams 3 through 15)

Jumper Number	Name	Plug Position	Purpose
J192 <9>	Remote Sync Polarity	1-2 † 2-3	Positive Negative
J585 <10>	RGB YRGB	1-2 2-3 †	3-Step RGB Parade 4-Step YRGB Parade
J858 <9>	Sound-in-Syncs	1-2 † 2-3	Normal Sound-in-Syncs
J694 <10>	NTSC PAL	1-2 2-3	NTSC (1780R) PAL (1781R)
J865 <9>	Sync for Vector Clamps	1-2 † 2-3	Reference as source Input Signal as source
J866 & J867 <9>	Sync for Waveform Clamps	1-2 † & 1-2 † 2-3 & 2-3	Reference as source Input Signal as source
J986 <15>	SCH Course Adjust	Varies with the circuits.	4-position jumper set up during calibration
J1081 <14>	Frame Pulse Select	1-2 † 2-3	Internal Ext. Video
J1085 (Active in NTSC only) <14>	SCH Display Mode	1-2 † 2-3	Double Single
J1103 <7>	Line Strobe	1-2 2-3 †	Line Select Field 1 Pulse
J1483 <8>	Sound-in-Syncs	1-2 † 2-3	Normal Sound-in-Syncs

† **Factory installed position.**

Table 2–4: Plug Jumpers and DIP Switch on the Microprocessor Board (Assembly A5) (Schematic Diagrams 16 through 19)

Jumper Number	Name	Plug Position	Purpose
J342 <16>	µProcessor Restart	Removed †	Normal operation
	Maintenance ‡	Installed	Non-maskable interrupt to processor
J344 <16>	µProcessor Reset	Removed †	Normal operation
	Maintenance ‡	Momentary Closure	Resets processor (Used with a factory startup DEBUG program)
J453 <17>	RAM Part Selection	Removed †	128 K RAM installed
		Installed	512 K RAM installed
S385 <19>	Special purpose 4-position DIP switch	1	Open = NTSC Closed = PAL
		2	Open = Password Closed = No password
		3	‡ Open = Norm. Oper. Closed = DEBUG
		4	Not used.

† **Factory installed position.**

‡ **Special maintenance use only.**

Table 2–5: Plug Jumpers for Vectorscope Board (Assembly A6) and Oscillator Board (Assembly A7)

Jumper Number	Name	Plug Position	Purpose
J108 (A6) <29>	X Input Gain	Removed †	X gain is normal
		Installed	X gain is in High Gain position
J205 (A6) <29>	Y Input Gain	Removed †	Y gain is normal
		Installed	Y gain is in High Gain position
J321 (A6) <27>	Center Dot Blanking	1-2	Center dot unblanked
		2-3_ †	Center dot blanked

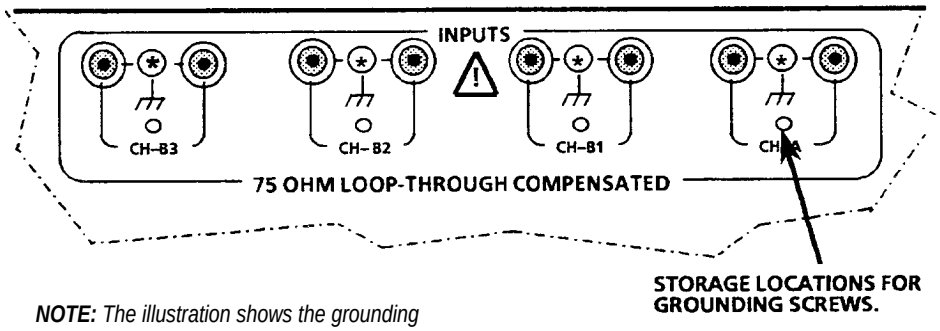
Table 2–5: Plug Jumpers for Vectorscope Board (Assembly A6) and Oscillator Board (Assembly A7) (Cont.)

Jumper Number	Name	Plug Position	Purpose
J320 (A7) <34>	Diff Phase Display	1-2 †	Double (H)/4
		2-3	Single (V)/2

† **Factory installed position.**

Floating Video Input Connectors

The video input connectors can be isolated from ground to increase hum rejection. When grounding screws are removed (and stored in the blank holes) the input amplifiers have a common mode input for ac hum that is introduced from an external source. See Figure 2–3. See *Theory of Operation* for more information.



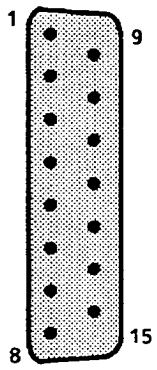
NOTE: *The illustration shows the grounding screws in the ground positions.*

Figure 2–3: Upper right portion of the 1780R-Series rear panel, showing the location of the four loop-through signal inputs

REMOTE Connector

The rear-panel REMOTE connector is a subminiature 15-pin D-type receptacle with female contacts. All the active remote control lines can be forced low by remote ground closures or TTL levels.

Pin assignments for the REMOTE connector are shown in Figure 2–4.



Pin Number	Function
1	RGB Staircase Input
2	/RGB Staircase Enable
3	No Connection
4	/Remote Sync Enable
5	/Preset 2
6	/Preset 3
7	/Preset 1
8	/Preset 4
9	Ground
10	Remote Sync Input
11	/Store
12	/Preset 8
13	/Preset 5
14	/Preset 6
15	/Preset 7

Figure 2–4: Remote connector and the function of each pin. A / before a function indicates a low to activate

Remote Operation

The 1780R-Series REMOTE connector provides access to several operating modes plus the first eight Preset front panels which can also be accessed through the front-panel PRESET selection and touch screen menus.

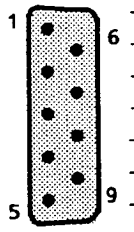
Table 2–2 describes the remote functions that may be selected. A logic NOT, or low, means that the specified REMOTE pin must be low (0 V to +0.8 V) to achieve that function. A high means that the pin is left open (with no signal), or accepts a 2 V to 5 V signal, to achieve the desired function.

Remote Sync input (pin 10) works with TTL level square waves, and requires an input signal of approximately 30–60 Hz (NTSC) or 25–50 Hz (PAL) to synchronize the 1780R-Series. Polarity is internal jumper selected as shown in Table 2–3.

Forcing pin 2 of the REMOTE connector low disables normal sweep and connects the RGB staircase signal (input on pin 1) to the horizontal Mag Amplifier. A +10 V staircase input will deflect the trace approximately 9 graticule divisions. Sweep length, per line or field, is approximately 33% of normal for an RGB parade display and 25% of normal for a YRGB parade display. See Table 2–3 (J585) for display selection information.

SERIAL Interface Connector

The rear-panel SERIAL interface connector is a 9-pin, sub-miniature, D-type connector. It is used as an RS422A or RS232D interface to the 1780R-Series microcontroller, drivers for both interfaces are resident. RS422A is a balanced voltage digital interface, while RS232D is a serial binary data interchange. Figure 2–5 shows the rear-panel SERIAL connector pin assignments.



Pin Number	Data Connection
1	Ground
2	RS232D Receive
3	RS232D Transmit
4	/RS422A Receive
5	RS232D Signal Ground
6	No Connection
7	/RS422A Transmit
8	RS422A Transmit
9	RS422A Receive

Figure 2–5: Serial interface connector showing the function of each pin

Serial Remote Information

1780R-Series instrument configurations can be stored at (and retrieved from) a remote location by connecting a host computer to the rear-panel SERIAL port that supports RS-232 or RS-422 standards. Because RS232D calls for a 25-pin connector, a special 9-pin to 25-pin adapter cable will be required to access this operating mode, unless some form of 9-pin to 9-pin interface is being used.

All front-panel controls are operative in their usual manner when serial remote operation is employed, which allows local modification when desired. Front-panel LED indicators show current switch settings, even when serial remote control is used.

Serial Data Format. 8 data bits, 1 stop bit, no parity.

Baud Rates. 300, 1200, 9600, 19200. The baud rate selection is made through page 3 of the touch screen Configure menu.

The data stream transmitted to and from the host (representing the current 1780R-Series settings) consists of 512 bytes, followed by a one-byte checksum. All data bytes are in the range of Hex 20 to Hex 7F, so that they are printable ASCII characters.

25-Pin to 9-Pin RS232D Adapter

In order to use the SERIAL interface with an RS232D compatible host computer that has a standard RS232D 25-pin connector, an adapter will be required. Both connectors are the sub-miniature D-type and should be readily available from most local electronic supply outlets. The adapter connects pin 2 to 2 and pin 3 to 3 of the connectors along with providing a common signal ground between pin 5

(of the 9-pin male connector) and pin 7 (of the 25-pin female connector). In addition, pins 4 and 5 and pins 6, 8, and 20 of the 25-pin connector will need to be wired together. See Figure 2–6.

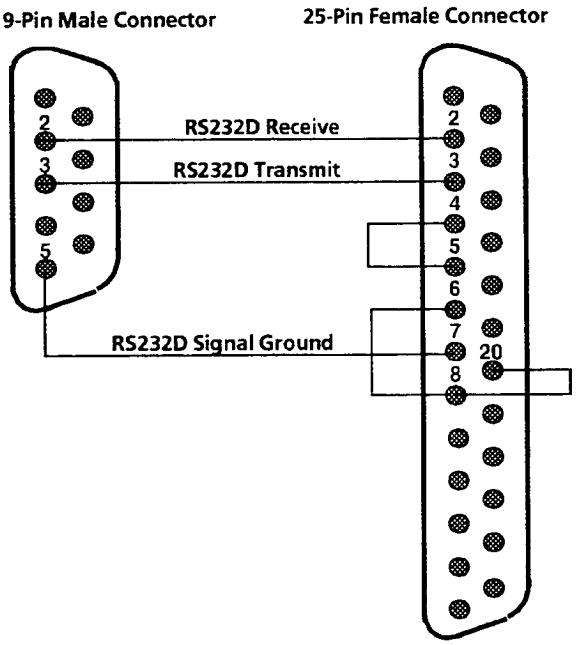


Figure 2–6: RS232D serial interface adapter diagram

Command Set

The command set for the the 1780R-Series SERIAL interface is shown in Table 2–6.

Table 2–6: Serial Remote Commands

Command*	Function	Results
#U or #u	UPLOAD	1780R-Series sends a stream of data, representing the current instrument configuration, to the host computer.
#D or #d	DOWNLOAD	1780R-Series expects a stream of data representing an instrument configuration of the same form that was uploaded.
#P or #p	PARTIAL DOWNLOAD	1780R-Series expects a stream of data representing an instrument configuration, with the knob settings (focus, intensity, etc.) not affected.

*** The # character indicates a remote control command. All transmissions are ignored until this character is received.**

Responses from the 1780R-Series SERIAL interface are shown in Table 2–7.

Table 2–7: Serial Remote Responses

Command	Description
A	The transmission was successful (ACK)
C	Command not known. (The # character was received, but was not followed by a U, u, D, d, P, or p.)
D	Bad data received (all expected data consists of ASCII printable characters).
H	Bad internal checksum.
N	Bad transmission checksum (NACK)
T	Timed out (the process took too long to complete).
V	Software version number mismatch.

XY INPUT Connector

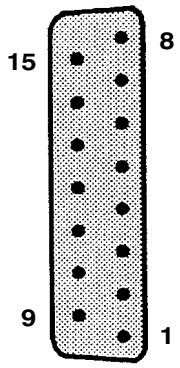
The rear-panel XY INPUT connector is a 15-pin, sub-miniature, D-type connector that provides input to the Horizontal and Vertical (X and Y) Amplifiers. They are balanced (differential), DC-coupled, high impedance (>20 kΩ), un-terminated inputs provided for audio applications. If AC coupling is desired, external capacitors are required. These inputs are factory calibrated for 0 dBm in 600 Ω but can be adjusted for any 600 Ω system between 0 and 12 dBm. See Figure. 2–7.

0 dBm is equal to 1 mW or 2.19 V peak-to-peak in 600 Ω.
12 dBm is equal to 15.8 mW or 8.72 V peak-to-peak in 600 Ω.

To calibrate the 1780R-Series for a system other than 0 dBm, perform step 38 of the Adjustment Procedure (Section 6) using a 1 kHz sine wave of the appropriate amplitude.

Inputs can be driven single-ended by driving either the + or – X and Y inputs with the opposite polarity inputs grounded.

In addition, a single-ended, high-gain mode can be used for other, primarily non-audio, applications. It can be accessed by installing plug jumpers on J108 and J205 (on the Vectorscope board, see Table 2–5) and inputting the signal on the +X and +Y inputs with the –X and –Y inputs grounded.



Pin Number	Function
1	– X Input
2	No Connection
3	+ X Input
4	No Connection
5	– Y Input
6	No Connection
7	+ Y Input
8	No Connection
9	– X Input
10	Ground
11	+ X High Gain Input
12	Ground
13	– Y Input
14	No Connection
15	+ Y High Gain Input

Figure 2–7: Rear-panel XY connector diagram showing the function of each pin

Mechanical Installation

All qualification testing for the 1780R-Series was performed with the rack-mount cabinet installed. To guarantee compliance with specifications, the instrument should be operated in a cabinet, either the rack-mount cabinet or the portable case (1780F02). The 1780F02 case has a handle and front and back covers. The front and back covers provide protection for the instrument during transportation and storage.

NOTE. *Cabinet drawings are provided for installation information only, and are not to scale. All dimensions are in inches.*

The rack-mounting cabinet is a standard accessory; all instruments are factory shipped in this cabinet. The portable case (1780F02) is available from Tektronix as an Optional Accessory. It, as does the rack-mounting cabinet, provides the proper electrical environment for the instrument, supplies adequate shielding, minimizes handling damage, and reduces dust collection within the instrument.

Rack Mounting The 1780R-Series

The 1780R-Series rack-mounting cabinet is designed for permanent mounting. The instrument slides in and out of the cabinet with relative ease. The instrument is secured in the cabinet with four 6–32 TORX® drive screws. See Figure 2–8.

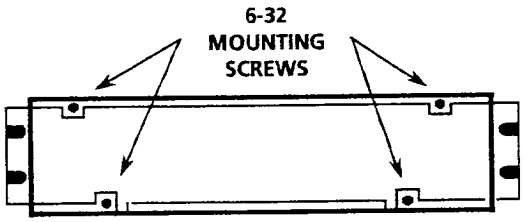


Figure 2–8: Location of the four screws that secure the instrument to rack mounting cabinet or portable case

WARNING. *Do not attempt to carry a cabinetized instrument without installing the rear-panel mounting screws. There is nothing to hold the instrument in the cabinet if it is tipped forward.*

Rack Installation

The 1780R-Series is a three rack-unit (5.25 inch) high, 19 inch wide unit. It requires no vertical rack space above or below the unit. A front clearance, for removal from the rack, of at least 18 inches is required. BNC connectors, on the rear panel, extend approximately 0.6 inches, making it necessary to have 1 inch or more of rear clearance to have enough room to cable the instrument. See Figure 2–9 for rack mounting dimensions.

NOTE. *For ease of installation, place the nut bars to the outside of the adjustable brackets and drive the screws from the center into the nut bars.*

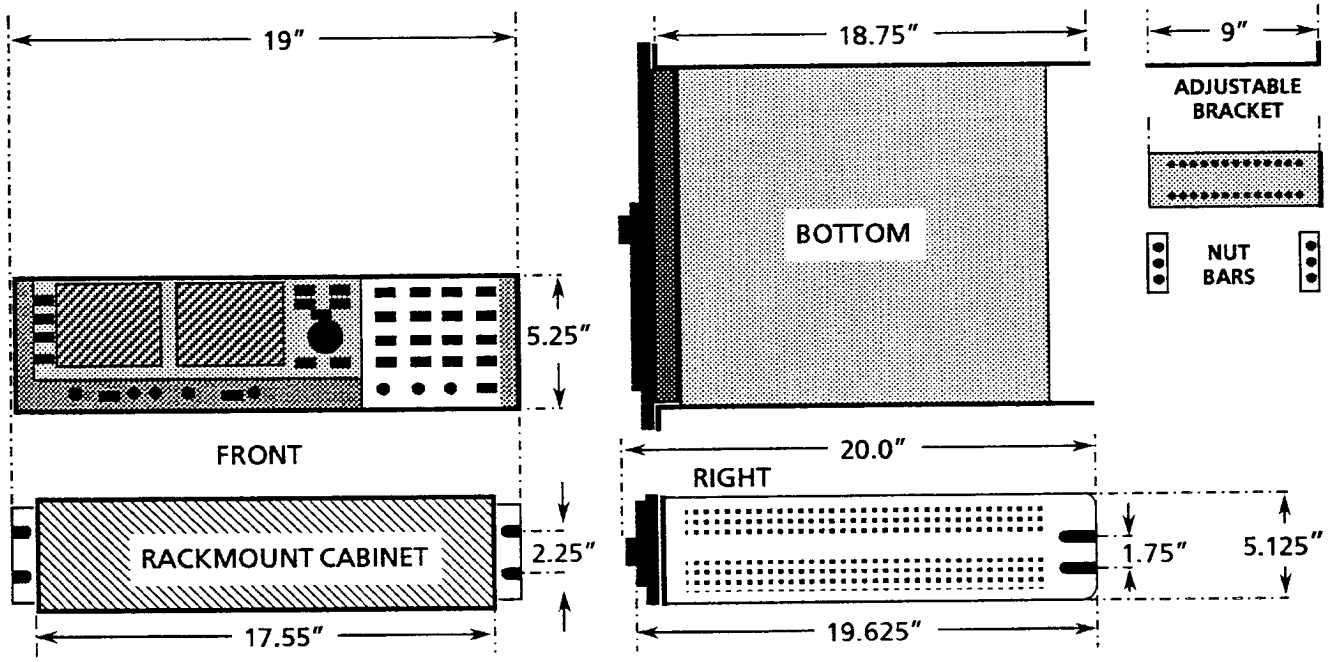


Figure 2–9: Dimensions used for rack mounting the 1780R-Series Video Measurement Set

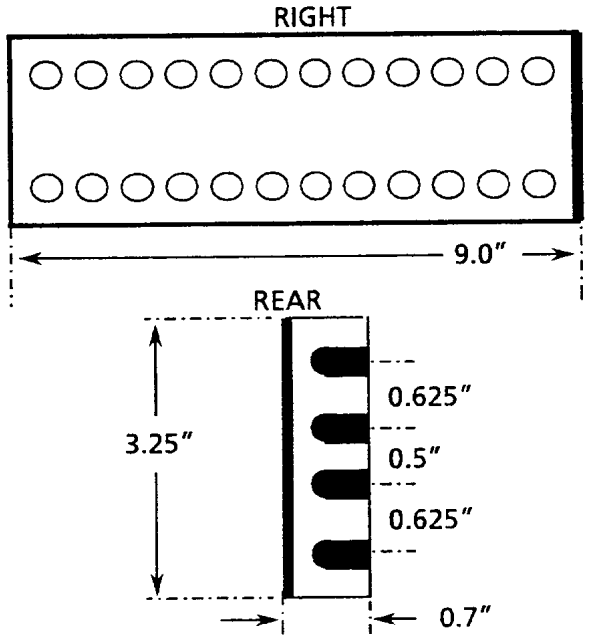


Figure 2–10: Dimensions of the adjustable rear rackmounting bracket

To install the instrument in the rack: First remove the four securing screws and take the instrument out of the rack-mounting cabinet. (All 1780R-Series instruments are shipped in the rack-mounting cabinet to provide extra shipping protection.) Once the instrument is out of the cabinet, mount the front of the cabinet in the rack, using four 10–32 TORX® screws. Cabinet front slots are spaced, and wide enough, to accommodate standard racks. Next, mount the adjustable brackets to the rear rack section. See Figure 2–10 for bracket dimensions. Then mount the adjustable brackets to the rack-mount cabinet using four 10–32 TORX® screws, four number 10 flat washers, and the nut bars. See Figure 2–11 for more assembly detail. Finally, re-install the four 6–32 screws that secure the instrument to the rack-mounting cabinet. See Figure 2–8.

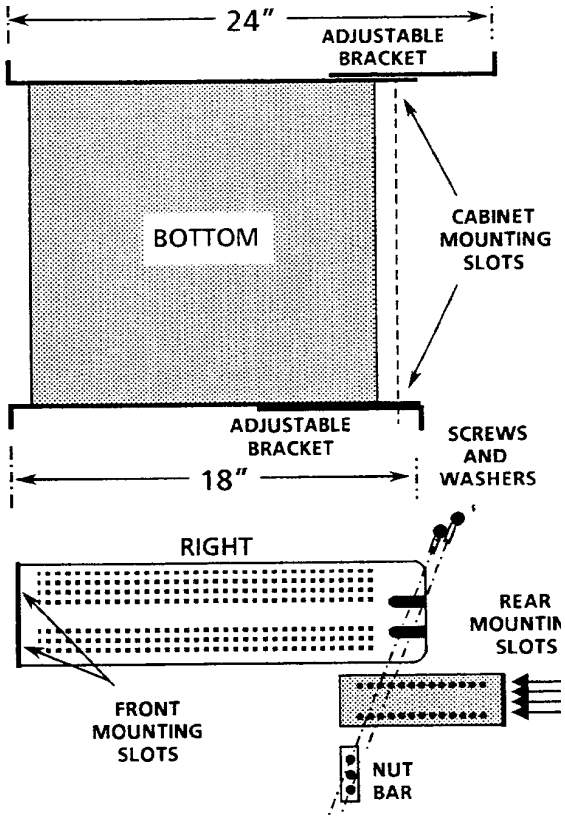


Figure 2–11: Installing rear rack-mounting brackets for rack applications of depths from 18 to 24 inches

Portable Case Installation

The 1780R-Series can be mounted in a portable case. This case is an optional accessory, and is nomenclated 1780F02. The portable case consists of a metal cabinet with feet, front elevating bail, carrying handle (all installed), and front and back protective covers. See Figure 2–12. Instrument mounting in the portable case is identical to that of the rack-mount cabinet. See Figure 2–8 for location of the mounting screws.

The 1780F02 portable case has sufficient length (SN B010500 for this portable case; not the instrument) to protect the rear-mounted fan, connectors, cable connections, and power cord when the instrument is placed on its rear during operation.

The feet located on the bottom and left sides of the case allow the instrument to be placed in either of these positions for operation, transportation, or storage.

The front and rear covers are identical so they are interchangeable.

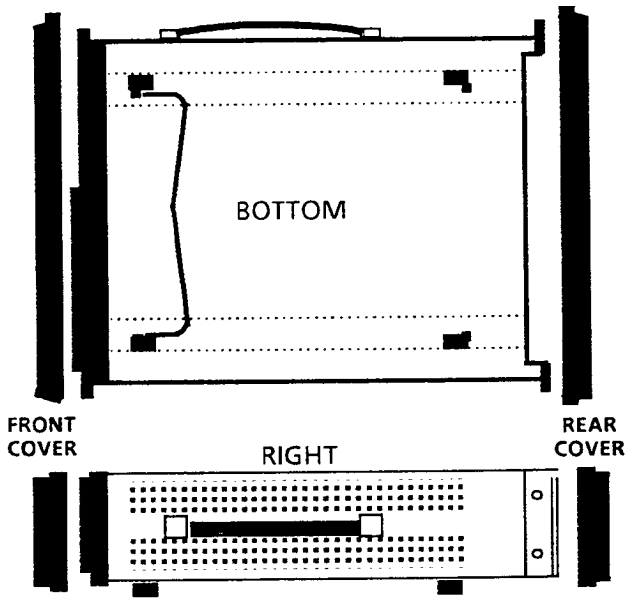


Figure 2–12: Portable case for the 1780R-Series Video Measurement Set. Case has handle, feet, and an elevating bail along with two panel covers

Initial Calibration

Once the 1780R-Series has been installed in the rack or portable case, some simple calibration steps will need to be performed. An accurate Color Bar signal and a 1 V square wave are the only external signals required to perform the steps in the procedure that follows. The procedure used here is similar to the one provided to operating personnel in the Operator's Manual.

In the procedures that follow the 1780R-Series front-panel control names are in ALL CAPITALS and menu items are enclosed in <>.

Calibration Menu Information

The Calibration menu is available for both vector and waveform, and uses both CRTs.

Pushing the front-panel CALIBRATE button provides access to the menu. Several calibration features can be selected using the touch screen. Refer to the following Waveform and Vector calibration procedures.

To toggle the display between vectorscope and waveform calibration, push the buttons under the CRTs. When waveform is selected, the waveform calibrator is displayed on the right CRT, with waveform menu selections on the left CRT (vectorscope display blanked). When vectorscope is selected, the arrangement is reversed.

Waveform Calibration Information

The internal calibrator signal is selected by touching the <CAL SIGNAL> area of the screen until <ON> is outlined. It automatically reverts to <OFF> when the Calibration menu is exited and must be reselected (if desired) when the menu is reentered. (CAL signal is not available in <CAL AMPL ZERO SET>.)

An external 1.0 Volt reference signal is required to adjust the External Horizontal Input gain.

VOLT CURSORS ZERO SET, CAL AMPL ZERO SET, and HORIZ POSITION KNOB CAL provide menu displays on the Waveform CRT. The selection is indicated by a box on the Vectorscope CRT, and the large knob function is circled on the Waveform CRT.

HORIZ CAL, EXT HORIZ CAL, VERT CAL, READOUT INTENSITY, and TRACE ROTATION will be circled, when selected, to indicate large knob assignment.

Changes in calibration will be stored when the Calibrate menu is exited. Exit by pushing the CALIBRATE menu button or by pushing another menu button.

Waveform Calibration Procedure

***NOTE**. Preparation is usually not required before performing this procedure. However, if something occurs to cause calibration data to be reset or invalid (such as loss of Non-volatile memory or installation of new software), then Step 3 of the ADJUSTMENT PROCEDURE must be performed prior to the Initial Calibration Procedure.*

1. Apply a video signal to a 1780R-Series input channel and select that channel for display. Check that the input channel is terminated into 75 Ω.

2. Push the front-panel CONFIGURE button and touch <FIXED CAL AMPL> until 1000 (1.0 Volt) is outlined.

3. Push the front-panel CALIBRATE button. Push the button below the Waveform CRT.

4. <READOUT INTENSITY> will be circled on the Vectorscope CRT. Use the large knob to adjust intensity. (The front-panel INTENSITY control adjusts signal intensity only. Readout intensity must be adjusted through the Calibration menu.)

***NOTE**. Step 5 is to be performed for instruments SN B020244 and below only.*

5. Touch <HORIZ POS KNOB CAL> to calibrate the HORIZ POS knob. A menu will be displayed on the Waveform CRT. Center the HORIZ POS control by turning the control and then releasing it, allowing the spring (not necessarily the signal display) to return to midpoint of its range. Then touch the area labeled: <CENTER HORIZONTAL POSITION KNOB, THEN PRESS HERE>. This tells the microprocessor that the knob is now at the midpoint, or zero point, of its range. This zero point is referred to as the Dead Zone, and its tolerance can be varied by touching <INCREASE> or <DECREASE>. The value changes in single step increments from the smallest possible setting of 1 unit up to 16 units, and current value is shown on the readout. A beep sounds when the Dead Zone has been increased or decreased as much as possible. If the Dead Zone is increased, the control must be turned slightly before it will respond, but will also return to center more readily after it is turned.

6. Touch <TRACE ROTATION> to obtain a test axis, then use the large knob to adjust trace rotation. Align the horizontal lines of the electronic graticule with the Waveform CRT graticule horizontal lines.

7. Touch <CAL AMPL ZERO SET> to obtain a menu on the Waveform CRT for adjusting the calibrator zero level. Adjust the large knob to overlay the two waveforms. Press the front-panel REFERENCE SET button to record this zero setting.

8. Touch <VOLT CURSORS ZERO SET> to obtain a voltage cursor menu on the Waveform CRT. Use the large knob to move the cursors, touching the <CURSOR 1 / CURSOR 2> area to toggle between Cursors One and Two. When cursors are aligned, press REFERENCE SET to reset the displayed voltage difference to zero.

9. Touch <CAL SIGNAL ON / OFF> until <ON> is outlined. (Calibration signal is not available in <CAL AMP ZERO SET>.) Check that the WFM HORIZONTAL–TWO–LINE sweep is selected and VAR sweep is off.

10. Select <VERT CAL> as shown in Figure 2–13. The large knob will now adjust signal amplitude with respect to the graticule. Adjust for a 1 Volt display on the Waveform CRT. Leave the CALIBRATE button set to On.

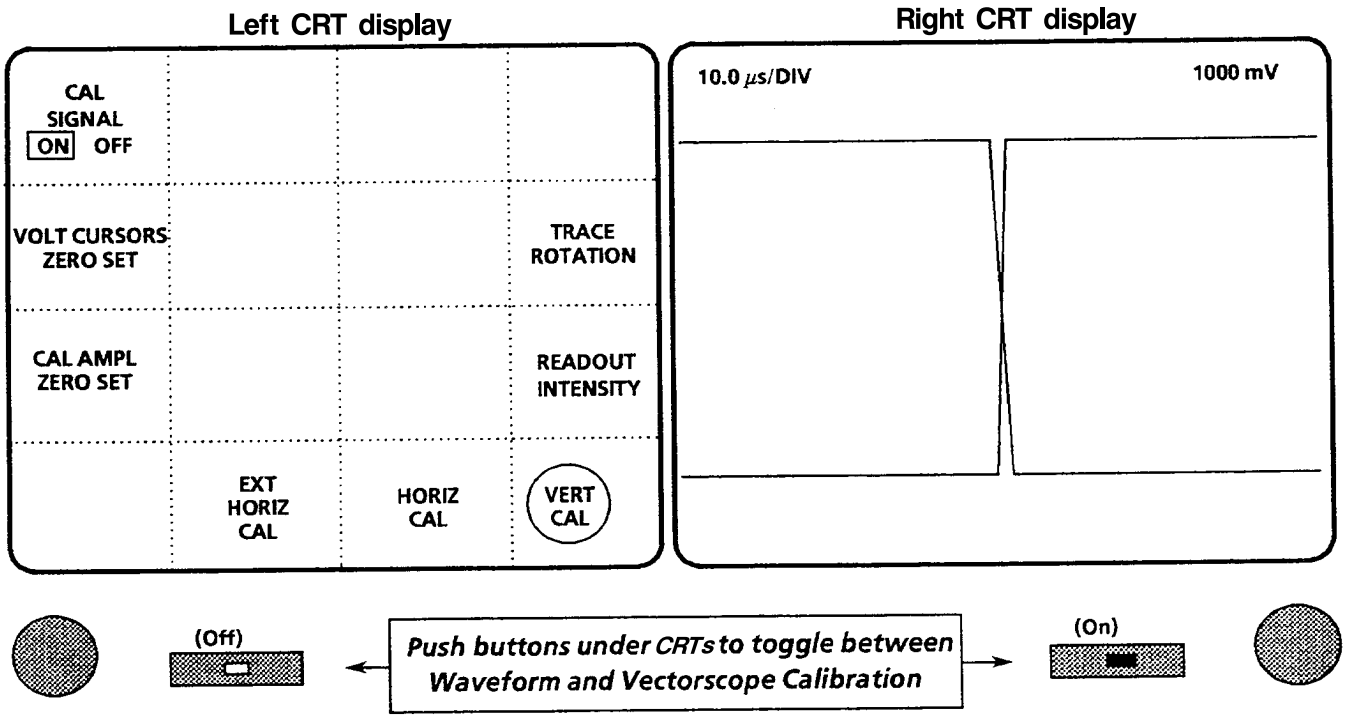


Figure 2–13: Waveform Calibration menu display

11. Select an input channel that has no signal applied. Check that TWO LINE sweep is selected.

a. Push the front-panel TIME button to turn on the timing cursors. Reduce the trace (display) intensity if necessary to view the timing cursor dots.

b. Touch the timing cursors area of the screen until <CURSOR 1> is outlined. Use the large knob to move Cursor 1 approximately 1 division in from the left edge of the graticule.

c. Select <CURSOR 2> and use the large knob to move it 100 μsec to the right of Cursor 1, as indicated on the CRT readout.

d. Push the CALIBRATE button. Touch <HORIZ CAL>. The large knob will now adjust sweep length (time) with respect to the graticule. Adjust for 10 divisions between cursor dots.

e. Push the front-panel TIME button to turn off the timing cursors. Readjust the trace (display) intensity if necessary.

12. Apply a 1.0 volt signal to the EXT HORIZ input. Touch <EXT HORIZ CAL>. The large knob will now adjust sweep length (time) with respect to the graticule. Do not change the MAG setting (automatically set to 100 mV/div). Adjust the large knob for a horizontal display of 10 divisions.

13. Press the CALIBRATE button to exit the menu.

Vectorscope Calibration Information

READOUT INTENSITY, TRACE ROTATION, and GAIN CAL (GAIN 1 CAL / GAIN 2 CAL for NTSC) will be circled when selected, to indicate large knob assignment.

The oscillator signal is selected by touching the <CAL OSC> area of the screen until <ON> is outlined. It automatically reverts to <OFF> when the Calibration menu is exited and must be reselected (if desired) when the menu is reentered.

Changes in calibration will be stored when the Calibrate menu is exited. Exit by pushing the CALIBRATE menu button or by pushing another menu button.

Vectorscope Calibration Procedure

NOTE*. Preparation is usually not required before performing this procedure. However, if something occurs to cause calibration data to be reset or invalid (such as loss of Non-volatile memory or installation of new software), then Step 3 of the ADJUSTMENT PROCEDURE (SECTION 6) must be performed prior to the Initial Calibration Procedure.*

1. Apply a 75% color bar signal to the 1780R-Series CH A INPUT connector. For NTSC only: Use a signal with 7.5% setup. Check that CH A INPUT loop-through is terminated into 75 Ω.

2. Select INPUT–CH A on the 1780R-Series front panel.

3. Push the front-panel CONFIGURE button to enter the Configure menu. Touch the <PAGE> area of the screen until <2> is outlined. Check that <BARS> <75%> is outlined.

4. Push the front-panel CALIBRATE button to enter the Calibration menu.

5. Push the button under the left CRT (LED will light) to select Vectorscope calibration.

6. <READOUT INTENSITY> will be circled on the Waveform CRT. Use the large knob to adjust intensity. (The front-panel INTENSITY control adjusts signal intensity only. Readout intensity must be adjusted through the Calibration menu.)

7. Touch <TRACE ROTATION> to obtain a test axis, then use the large knob to adjust trace rotation on the Vectorscope CRT. Align the horizontal lines of the electronic graticule parallel with the Vectorscope CRT graticule.

8. Touch <CAL OSC> until <ON> is outlined. While the cal oscillator is on, the V axis switcher is enabled and 75% bars are selected (with 7.5% setup for NTSC).

   a. For 1780R (NTSC) only: Touch <GAIN 1 CAL (SETUP)> on the Waveform CRT. See Figure 2–14. The large knob will now adjust vectorscope gain. Use the large knob to match the circle to the compass rose. Touch <GAIN 2 CAL (NO SETUP)>. Use the large knob to match the circle to the compass rose. Touch <GAIN 1 CAL (SETUP)> to return to this mode.

   b. For 1781R (PAL) only: Touch <GAIN CAL> on the Waveform CRT. See Figure 2–15. The large knob will now adjust vectorscope gain. Use the large knob to match the circle to the compass rose.

9. Touch <CAL OSC> until <OFF> is outlined.

10. Push the front-panel PHASE SHIFT button to On. Turn the large knob to properly position the burst and color vectors to their graticule marks on the Vectorscope CRT. Press the PHASE SHIFT button to exit this mode.

    a. For 1780R (NTSC) only: Check that <GAIN 1 CAL (SETUP)> is selected. Verify that the color vector dots are in their boxes. Then, set the NTSC generator Setup button to 0%. Select <GAIN 2 CAL (NO SETUP)> and verify that the color vector dots are in their boxes. Set the NTSC generator Setup button to 7.5%.

    b. For 1781R (PAL) only: Check that <GAIN CAL> is selected. Verify that the color vector dots are in their boxes.

11. Push the front-panel CALIBRATE button to exit the menu.

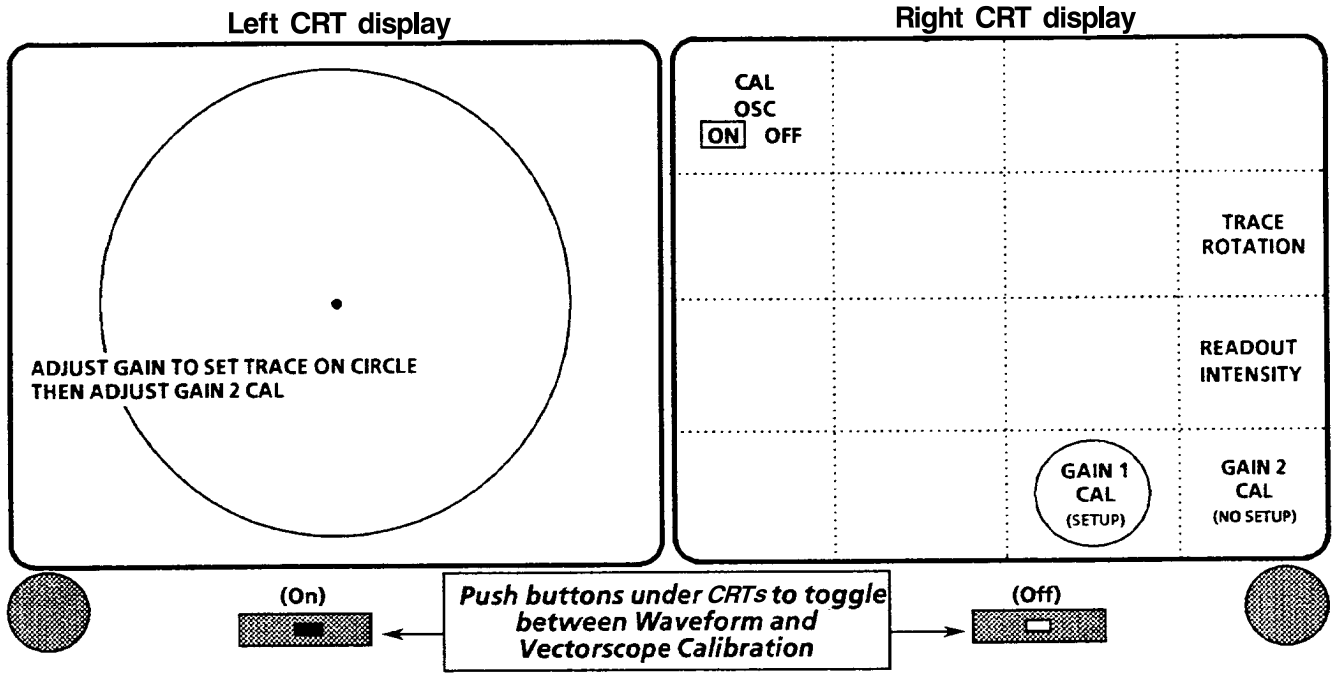


Figure 2–14: 1780R (NTSC) Vectorscope Calibration menu display with CAL OSC on

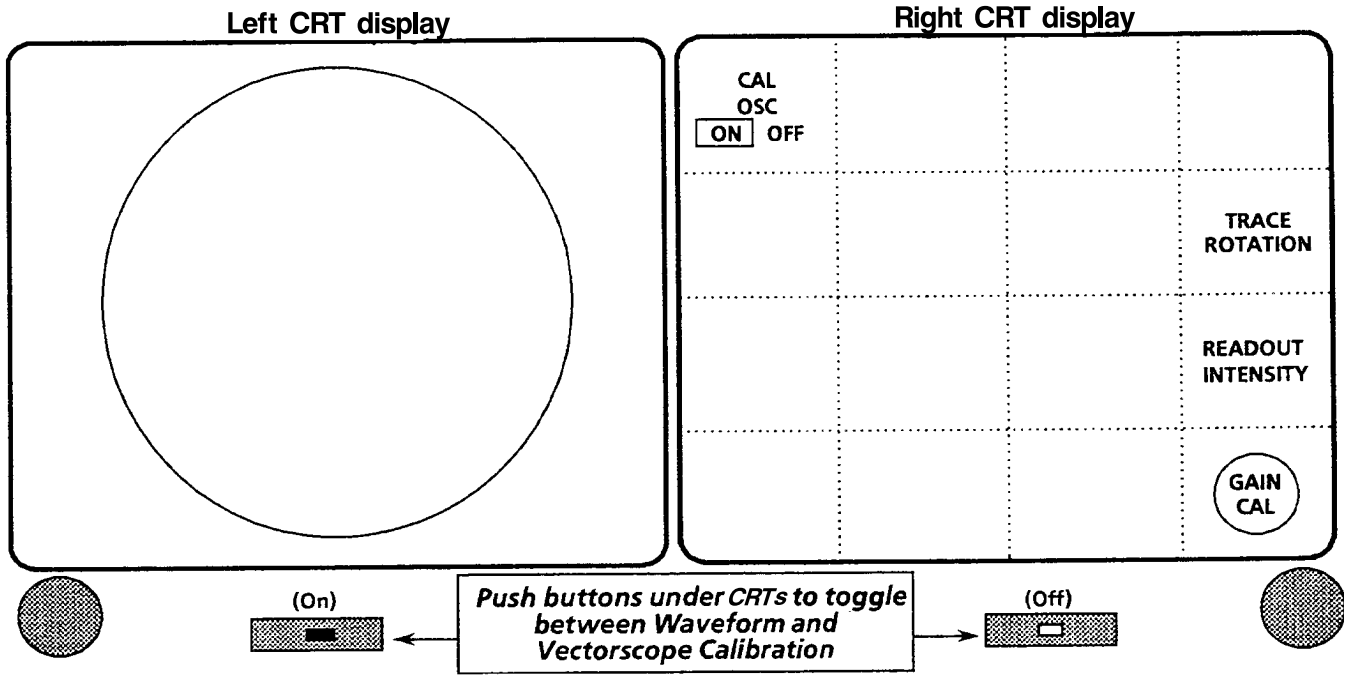


Figure 2–15: 1781R (PAL) Vectorscope Calibration menu display

Repackaging

Identification Tag

If the instrument is to be shipped to a Tektronix Service Center, attach a tag to the instrument showing:

1. Owner (with complete address) and the name of the person at your firm that can be contacted.
2. Instrument serial number and a description of the service required.

Repackaging for Shipment

Repackaging the instrument in the original manner provides adequate shipping protection (See Figure 2–16). If the original packaging is not available or is unfit for use, repackage the instrument as follows:

1. Obtain a corrugated cardboard carton whose inside dimensions are at least six inches greater than the dimensions of the instrument, for cushioning. The shipping carton should have a test strength of at least 275 pounds.
2. Surround the instrument with polyethylene sheeting to protect the finish.
3. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the instrument.
4. Seal the carton with shipping tape or an industrial stapler.

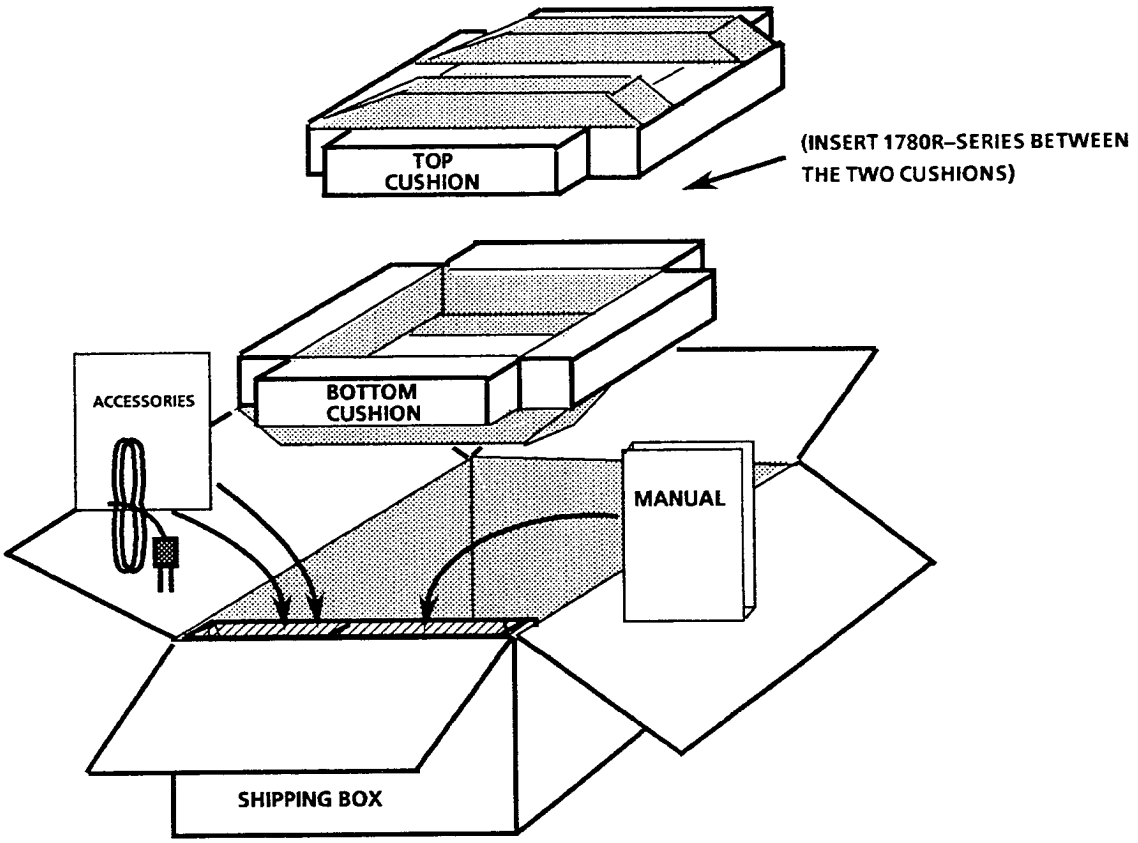


Figure 2–16: 1780R-Series repackaging

Operating Information

In order to effectively service the 1780R-Series it is essential to understand how the controls work. Controls and switches fall into one of four groups; Display (Scale, Focus, Intensity and Positioning), Special Purpose (Preset, Measure, Configure, and Calibrate), Precision Measurement (Cursors, Phase, Line Select, etc., which support the assignable measurement control), and the Functional Measurement controls and switches (Input and Reference switching, etc., from the right front panel). See Figure 2–17.

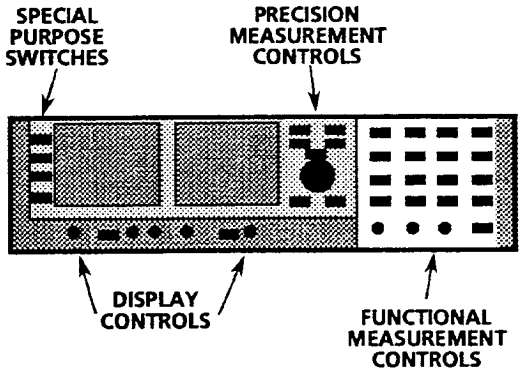


Figure 2–17: Simplified representation of the 1780R Series showing the location of the control groups

When servicing this instrument, all of the front-panel controls will be used at one time or another. In most cases the function of a control is obvious from the front-panel nomenclature; however, there are cases where some extra explanation is required. For example, the display controls (FOCUS, SCALE, INTENSITY, VERT POS, HORIZ POS), located beneath the CRTs, are functionally switched between the CRTs.

Figures 2–18 and 2–19 are used in conjunction with the following explanations of the control functions.

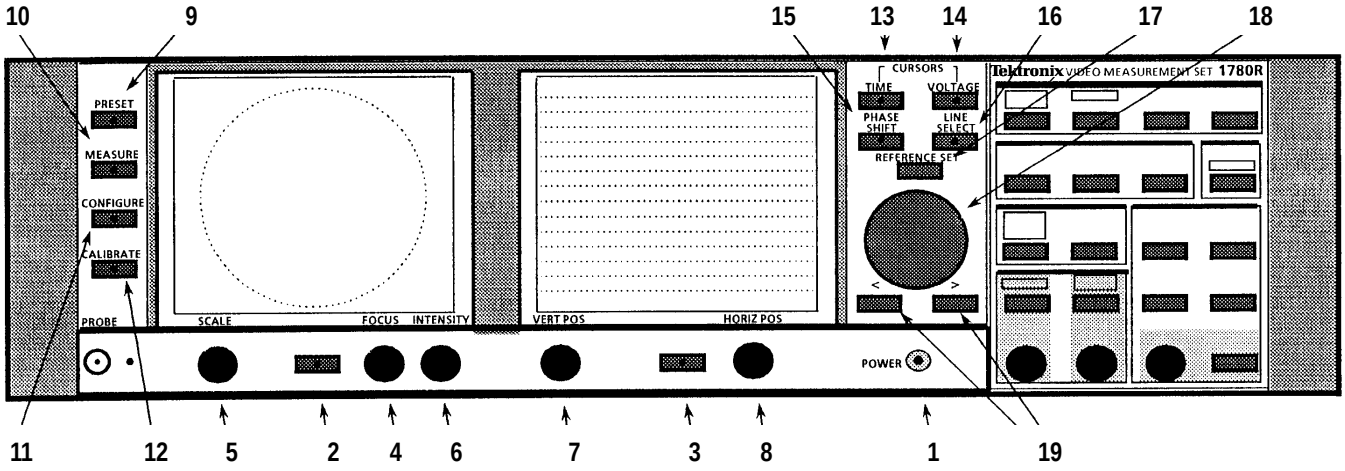


Figure 2–18: Front panel of the 1780R-Series Video Measurement Set

Front-panel Controls

With the exception of the POWER switch, all of the switches and controls on the 1780R-Series front panel fall into the general groupings of Special Purpose, Precision Measurement, Display, or Functional Measurement. Numerals by each control name are supplied to assist in locating the control in the two associated figures.

1. POWER. Self indicating positive push and release switch that changes the 1780R-Series from standby to operate. When power cord is connected to the instrument, it is automatically in standby state.

Display Controls

2. Left (button). Illuminated switch that assigns the common FOCUS, SCALE, INTENSITY, and POSITION controls to operate with the left-hand CRT. Previous setting of these controls is stored and returned when the button is first pushed. (In the factory-shipped configuration this button causes only a temporary shift in control, timing out and returning control to the right CRT after selection.)

3. Right (button). Illuminated switch that assigns the common FOCUS, SCALE, INTENSITY, and POSITION controls to operate with the right-hand CRT. Previous setting of these controls is stored and returned when the button is first pushed. (As factory-shipped, control reverts to this button after a timeout for the left CRT display.)

4. FOCUS. Adjusts beam for the selected CRT to provide optimum definition.

5. SCALE. Controls the level of graticule illumination for the selected CRT.

6. INTENSITY. Controls display brightness for the selected CRT.

7. VERT POS. Positions the selected display up and down. Positioning range depends on the display selected; range is much greater for the waveform monitor displays than it is for the vectorscope displays.

8. HORIZ POS. Positions the selected display left and right. Positioning range depends on the display selected; range is much greater for the waveform monitor displays than it is for the vectorscope displays.

Special Purpose Switches

9. PRESET. Lighted momentary contact switch that turns on or off a list of preset front-panel setups that the operator can program and select for repeated measurements.

10. MEASURE. Lighted momentary contact switch that brings up menu selections for factory pre-programmed measurement setups.

11. CONFIGURE. Lighted momentary contact switch that calls up menus to guide the configuring of the measurement criteria, such as clamping, coupling, etc.

12. CALIBRATE. Lighted momentary contact switch that brings up a menu to provide calibration adjustments and signal choices for instrument calibration.

Precision Measurement Controls

13. TIME CURSORS. A single momentary contact on/off switch enabling the timing cursors, which use the Precision Measurement knob, or the <> buttons. Time Cursors switch has a built-in indicator.

14. VOLTAGE CURSORS. A single momentary contact on/off switch enabling the voltage cursors, which use the Precision Measurement knob, or the <> buttons. Voltage Cursors switch has a built-in indicator.

15. PHASE SHIFT. A single momentary contact on/off switch enabling the precision phase shift measurements, which use the Precision Measurement knob, or the <> buttons. Phase Shift switch has a built-in indicator.

16. LINE SELECT. A single momentary contact on/off switch enabling the line select function, which displays the selected line (first in a multiple line display, or brightened in a field display). Alpha-numeric readout indicates the selected line and field on the waveform monitor CRT. Line Select switch has a built-in indicator. Selection of the exact line and field is accomplished through the Precision Measurement knob, or the <> buttons.

17. REFERENCE SET. Used with the Phase Shift mode to store a reference phase. REFERENCE SET is used in the VOLTAGE CURSORS mode when RELATIVE is selected. It is also used in the LINE SELECT mode to access line 19 in the vertical interval.

18. Knob. The Precision Measurement control operates with the four functions selected by the preceding switches. Provides continuously adjustable range to the selected measurement.

19. < >. A pair of momentary contact switches that provide stepped levels that duplicate the function of the Precision Measurement control.

Functional Measurement Controls

Functional Measurement Controls are shown in Figure 2–19. Note that the numerical entries are enclosed in rectangles instead of the circles that were used in Figure 2–18.

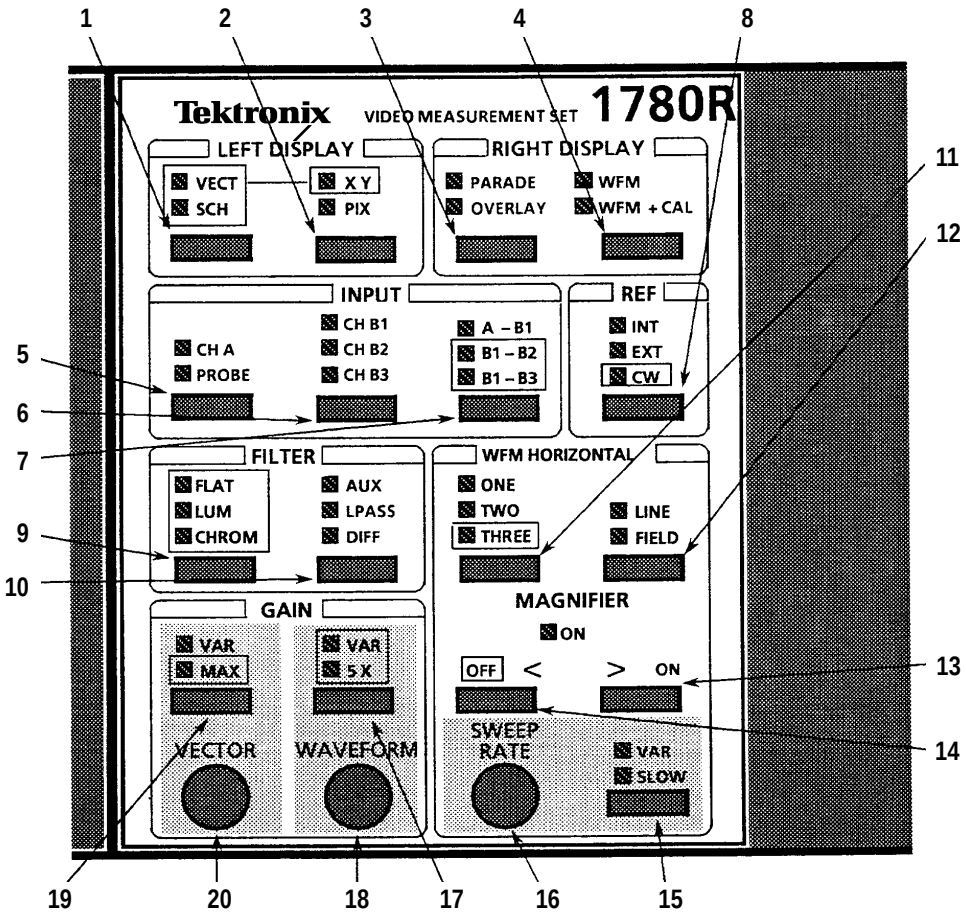


Figure 2–19: The right front panel for the Tektronix 1780R-Series, showing the Functional Measurement Controls

Left Display

1. VECT / SCH. Momentary contact switch that cycles through selections of the Vector, SCH phase or a combination of both for display on the vectorscope CRT. Small front-panel light-emitting diodes indicate the selected display.

2. XY / PIX. Momentary contact switch that selects the XY or picture monitor display for the vectorscope CRT. Can be selected when SCH phase or Vector display is operating. Small front-panel light-emitting diodes indicate the selected display.

Right Display

3. PARADE / OVERLAY. Momentary contact switch that cycles through selections of sequential displays that can be up to 3 lines or 3 fields on a single display, depending on the selected waveform sweep.

4. WFM / WFM + CAL. Momentary contact switch that cycles through selections of standard waveform or waveform plus calibrator signal for display on the waveform monitor CRT. Small front-panel light-emitting diodes indicate the selected display.

Input

5. CH A / PROBE. Momentary contact switch that selects the signal from the rear-panel Channel A loop-through input or the front-panel Probe input for display on both CRTs. Small front-panel light-emitting diodes indicate the selected display.

6. CH B1 / CH B2 / CH B3. Momentary contact switch that cycles through selections of the signal from the rear-panel Channel B1, Channel B2, or Channel B3 loop-through input for display on both CRTs. Small front-panel light-emitting diodes indicate the selected display.

7. A-B1 / B1-B2 / B1-B3. Momentary contact switch that cycles through the differential input selections for display. Small front-panel light-emitting diodes indicate the selected display. Pushing and holding this switch in provides menu instructions for setting up new differential combinations for this display.

REF

8. INT / EXT / CW. Momentary contact switch that toggles between internal (from incoming video), external (from rear-panel loop-through input) signals for sync and subcarrier reference. Pushing and holding this switch selects the rear-panel CW loop-through as a subcarrier reference. Small front-panel light-emitting diodes indicate the selected reference.

Filter

9. FLAT / LUM / CHROM. Momentary contact switch that toggles through Flat (unfiltered video signal), Luminance (chrominance filtered out), and Chrominance (luminance filtered out) video signal for display. Small front-panel light-emitting diodes indicate the selected filter.

   Pushing and holding this button selects a multiple filter display. In 2-line or 2-field sweeps the first half of the waveform monitor display will be flat and the second half will be the luminance filter. In 3-line or 3-field sweep the order is flat, luminance filter, and chrominance filter. If the button is held in during 1-line or 1-field sweep the filter reverts to flat.

10. AUX / LPASS / DIFF. Momentary contact switch that toggles through Aux Video Input (signal is input following the video filters), low-pass filter (300 kHz bandwidth) and the Differentiated step (rising and falling

transitions) display. Small front-panel light-emitting diodes indicate the selected filter.

WFM Horizontal

11. ONE / TWO / THREE. Momentary contact switch that toggles through two sweep positions (1-line or 1-field and 2-line or 2-field; 3-line or 3-field is activated by holding the button in). Small front-panel light-emitting diodes indicate the selected number of lines or fields per sweep.

12. LINE / FIELD. Momentary contact switch that toggles between line and field rate sweeps. Small front-panel light-emitting diodes indicate the selected sweep range.

Magnifier

13. ON >. Momentary contact switch that turns on the magnifier, and once the magnifier is on toggles upward through the magnifier ranges.

14. < OFF. Momentary contact switch that toggles downward through the magnifier ranges. Turns off the magnifier when held in.

A small front-panel light-emitting diode is on whenever the magnifier is turned on.

15. VAR / SLOW. Momentary contact switch that toggles between Variable Sweep, Slow Sweep, and Off. Small front-panel light-emitting diodes indicate if either Slow Sweep or Variable Sweep is turned on.

16. SWEEP RATE. Variable and Slow Sweep both use the associated knob to provide the control for sweep rate (variable sweep) or sweep duration (slow sweep).

Gain: Waveform

17. VAR / X5. Momentary contact switch that toggles through variable gain, X5 gain, and off for the waveform monitor Vertical Amplifier. Holding this switch in enables both X5 and Variable Gain. The knob controls the amount of variable gain.

Small front-panel light-emitting diodes indicate the selected gain.

18. VARIABLE CONTROL. 360° potentiometer controlling variable gain.

Gain: Vector

19. VAR / MAX. Momentary contact switch that turns on the Variable Gain, which is controlled by the knob. Holding in this switch disables the variable and sets the vectorscope gain to maximum.

20. VARIABLE CONTROL. 360° potentiometer controlling variable gain.

Theory of Operation

Contents of this section are designed to work with the block and schematic diagrams in Section 9, at the back of this manual. Each schematic diagram description begins with a small block diagram of the circuits on that page and a short overview relating the illustration to the circuit theory that follows.

Block Diagrams

The 1780R-Series contains a large amount of circuitry; in order to simplify the block diagram, it has been split into 5 pages. Each page covers a specific area of operation. Symbols used on these diagrams are those that have typical use in instruction manuals for other Tektronix television instruments. In particular:

A number in brackets (< >) denotes the schematic diagram (in Section 9) where that individual circuit can be found.

Names within the dashed line rectangles are switching functions that are either activated by front-panel switches or touch-panel menu selections.

Input and output signals that go to another block diagram are identified both by signal name and the name and number of the block diagram they are going to or coming from.

For example, –REF H SYNC MPU 4 is the reference horizontal sync and is shown going to the Microprocessor, which is shown on Block Diagram number 4.

Block Diagram 1 Input And Waveform Vertical

This diagram contains all of the signal input circuitry, DC restorers, signal filters, and the vertical amplifiers and output for the waveform monitor.

Block Diagram 2 SCH And Waveform Horizontal

This diagram contains the sync separators (input and reference), ramp generators (including slow sweep), output amplifiers for the horizontal sweeps, clamp pulse generator, and SCH identification and output circuits.

Block Diagram 3 Vectorscope

This diagram has the vectorscope amplifiers, timing circuits, demodulators, and output circuits. In addition, the subcarrier regenerator, precision phase shifter, dP and dG demodulators, digital recursive filter, X-Y, and picture monitor sweeps also appear here.

Block Diagram 4 Microprocessor

This diagram contains the interface to the front-panel switches, indicators, and touch panels along with the rear-panel serial and remote connectors. In addition, it contains circuitry that controls internal switching functions and generates readout for both CRTs.

Block Diagram 5 Z-axis

This diagram contains the blanking and unblanking functions of the CRTs, their power supplies and display control circuits, cursor implementations, and the low voltage power supply circuitry.

Schematic Diagrams

Schematic diagrams for this instrument are grouped both functionally and by etched circuit board. One major exception occurs with Schematic 3, which contains probe circuitry. Probe input is on the Vectorscope circuit board (Assembly A6) while the probe output amplifier and DC restorer circuits are on the Waveform circuit board (Assembly A2).

The individual circuit description write ups are separated by schematic diagram number. In some cases more than one diagram is represented by a circuit description. In those cases the description title indicates which diagrams are included.

Each description is preceded by a block diagram which serves to introduce each new group of circuits, showing their interconnections. In addition to the interconnection of circuit blocks these illustrations also give the key circuit numbers associated with each represented circuit. Having these numbers on the block diagram makes it easy to locate the key components on the diagram.

A short overview of the block is provided to help provide an overall insight into each schematic diagram. The overview does not get too specific, it is only intended to functionally introduce the schematic diagram.

The circuit theory which follows the overview is more detailed and contains circuit numbers to locate specific components. (In the event a circuit number can not be found, there is a component location chart associated with each diagram that gives grid locations similar to those used on a road map.)

Most of the diagrams in Section 9 have circuit block titles printed on them. These titles serve as both paragraph headings in the circuit theory and as block names on the introductory block illustrations.

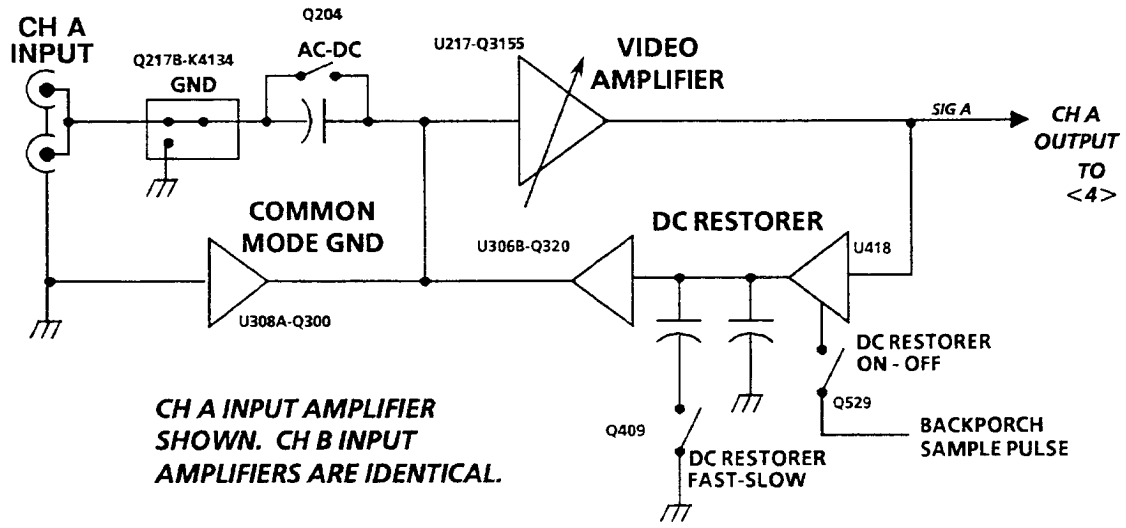
Table 3–1: Schematics and Circuit Board Assemblies

Diagram Number	Schematic Name	Assembly Name	Assembly Number
1	Input Amplifiers A and B1	Input	A1
2	Input Amplifiers B2 and B3	Input	A1
3	Probe Input & DC Restorer	Vectorscope & Waveform	A6 & A2
4	Input & Reference Selection	Waveform	A2
5	Diff Amp & Video Filters	Waveform	A2
6	Vertical Deflection	Waveform	A2
7	Vertical Control Logic, Calibrator, & Cursors	Waveform	A2
8	Ref Sync Generation	Waveform	A2
9	Horiz & Vertical Sync Generators	Waveform	A2
10	Ramp Generator	Waveform	A2
11	Horizontal Mag & Output Amps	Waveform	A2
12	Horizontal Latches & DAC	Waveform	A2
13	Slow Sweep & Ext Horiz Input	Waveform	A2
14	SCH Phase Timing	Waveform	A2
15	SCH Sync Locked Oscillator	Waveform	A2
16	Master MPU	Waveform	A2
17	Dynamic RAM, ROM, & NOVRAM	Waveform	A2
18	Line Rate Controller	MPU	A5
19	UART & A/D	MPU	A5
20	Readout Eng & Read Output	MPU	A5
21	Interconnect	MPU	A5
22	MPU Annex	Annex	A10
23	Front Switch Panel	Front Panel (Switch)	A12
24	Touch Panel	Touch Panel	A9
25	Vector Input & Gain	Vectorscope	A6
26	Diff Phase/ Gain	Vectorscope	A6
27	Vector Timing & Blanking	Vectorscope	A6
28	Demodulators	Vectorscope	A6
29	XY Inputs & Pix Monitor	Vectorscope	A6
30	Vector Deflection Amps	Vectorscope	A6
31	Subcarrier Regenerator	Oscillator	A7

Table 3–1: Schematics and Circuit Board Assemblies (Cont.)

Diagram Number	Schematic Name	Assembly Name	Assembly Number
32	Digital Shifter	Oscillator	A7
33	Horiz AFC & Post Regulators	Oscillator	A7
34	Diff Gain/Phase Alt Mode Switch	Oscillator	A7
35	Digital Recursive Filter	Filter	A15
36	Z-Axis	Z-Axis	A4
37	Timing Cursors	Z-Axis	A4
38	Timing Cursor Counters	Z-Axis	A4
39	CRT Display DAC	Z-Axis	A4
40	Scale Illumination & Trace Rotation	Z-Axis	A4
41	Vector High Volts	Vector High Volts	A3
42	Waveform High Volts	WFM Hi Volts	A16
43	Low Voltage Power Supply	Low Volts	A1
44	Vectorscope, Waveform, & Oscillator	Interconnect	A11
45	Z-Axis, Graticules, Vector HV, & Power Supply	Interconnect, Waveform, & Vector Grat Lights	A11 A13 A14
46	MPU, & Front Panel Controls	Interconnect	A11

Diagrams 1 & 2 Input Amplifiers



Overview

The Input board contains four amplifiers that give the input signal gain, DC restore it, and send it to the + and – Amplifiers. Since they are identical circuits, only the operation of Channel A will be described.

Circuit Theory

Channel A Input. The input signal is connected to the loop-through BNC connectors on the rear of the instrument. Inductors L116 and L115 provide good return loss characteristics over the video bandwidth. Capacitor C206 AC couples the signal to U217D, the amplifier input. FET Q204 shorts C206 for DC-coupled operation. Relay K213 switches between the applied signal and the internal ground reference, through R114.

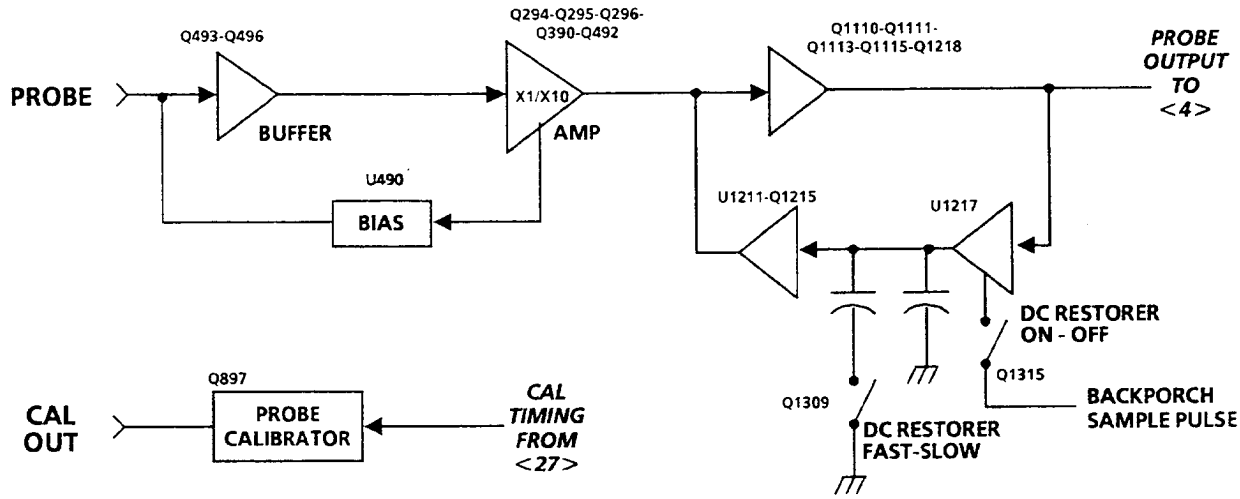
Video Amplifier. Emitter coupled pair U217D and transistors Q315 and U217A are connected as an operational amplifier with resistors R343 and the parallel combination of R341 and R340 forming a noninverting gain of two topology. U308A feeds any hum on the ground lead of the input BNC connectors to the inverting input of the Video Amplifier. Because of this, hum that is common to both the signal and ground connections is eliminated from the signal at the output of the amplifier. This common mode feature is enabled when the screw between the two BNCs, on the rear panel, is removed.

DC Restorer. Either the backporch or sync tip level of the applied video can be clamped to 0 volts by the DC Restorer circuit, which consists of U418 and U306B. U418 is a gated transconductance amplifier that samples the filtered output of the Video Amplifier during either sync tip or backporch (depending on the timing of the sample pulse at pin 5). R422, C541, L541, and C542 (at the

inverting input, pin 2 of U418) form a low-pass filter, with a notch at the subcarrier frequency. U418 drives C543, which holds charge during the active portion of the video line. When Q408 is on, C512 is in parallel with C521, and the DC Restorer response is slowed so that 60 Hz (50 Hz for 1481) hum is not attenuated. The DC Restorer is turned off by the absence of the sample pulses at the sample input (pin 5) of U418. Hold capacitors C521 and C512 discharge to 0 volts through R410, and the emitter of Q320 stays at 0 volts.

Operational amplifier U306B (along with C412, C411, R411, and R415) is an active low-pass filter that stabilizes the characteristics of the DC Restorer loop. Q320 provides a low output impedance for the filter at higher frequencies.

Diagram 3 Probe Input and DC Restorer



Overview

The 1780R-Series is equipped with a front-panel Probe Input, which allows it to be used to make some measurements not normally possible with a waveform monitor or vectorscope. The Probe Input is a high impedance input that can also be used as another video input, when terminated with an in-line termination. The Probe Input is configured to take either a X1 or X10 probe (Configure menu selection) by switching in an internal 10X Amplifier when X10 is selected.

The Probe Output Amplifier has a DC Restorer identical to those used for the video inputs. Clamping can be on the backporch or sync tip. The Probe DC Restorer is controlled with the restorers on the four (CH A – CH B3) video inputs; all restorers on, fast or slow, or sync tip or backporch clamp.

A front-panel Probe Calibrator Output is provided to set the probe gain and compensation. Timing of the Probe Calibrator square wave is controlled by the Microprocessor through the Vertical Calibrator and Filter Control in the vertical control logic.

Circuit Theory

Probe Input Amp. The Probe Input Amplifier is a high input impedance non-inverting amplifier with a gain of 1.1 or 11, depending on instrument configuration. Bias for the AC-coupled amplifier is provided by a low-frequency feedback loop.

Q493 and Q496 form a high impedance, unity gain voltage follower. C495 is the AC input coupling capacitor. CR493 and R494 provide input overvoltage protection. C494 bypasses R494 to improve frequency response. C493 adjusts the probe input capacitance to 20 pF. R495 and R492 set the input resistance to 1 MΩ.

The voltage follower drives a current-mode feedback amplifier consisting of Q492, Q390, and Q294. The gain is set by the feedback network consisting of R393, R396, R394, R295, and Q295. When the instrument is configured for X1 probe gain, Q295 is off and R393 and R396 set the amplifier gain to 1.1. In the X10 gain setting, Q295 is saturated and the feedback signal from R393 is shunted to ground through R394 and R295. This causes the gain of the amplifier to increase to X11 when R295 is properly adjusted. Gain switching allows the 1780R-Series to work with either X1 or X10 probes.

The operating point of the Probe Input Amplifier is established by a feedback loop consisting of U490, R491, C490, and R492. The loop tries to keep the emitter of Q492 at 0 V. U490, R491, and C490 form a inverting integrator which compares the voltage on Q492's emitter to 0 V. If the emitter is not at 0 V, then the charge on C490 will change, and the voltage on U490 pin 6 will move in a direction opposite to the error at Q492's emitter. This voltage is applied to the amplifier input through R492, forcing Q492's emitter back to 0 V. The feedback loop compensates for offset variations in Q493 and Q492 and prevents output DC level shifts when the gain is changed from X1 to X10.

Probe Calibrator. The Calibrator provides a 1 volt square wave at the front-panel CAL OUT pin jack. The Cal Timing signal, that originates from the Calibrator and Filter Control (Diagram 7), alternately saturates and turns off Q897. The Calibrator Amplitude (R795) sets the cathode potential on VR796 (collector voltage for Q897) to 5 volts. When Q897 is turned off, a voltage divider (R897, R898, and R899) sets the Probe Cal Out to 1 volt. When Q897 is saturated, the Probe Cal Out is at ground.

Probe Output Amp. The Probe Output Amplifier consists of a variable attenuator and a X2 gain non-inverting amplifier, together providing a gain of 0.9. When combined with the X1.1/X11.1 gain of the Probe Input Amplifier, an overall probe system gain of X1/X10 results.

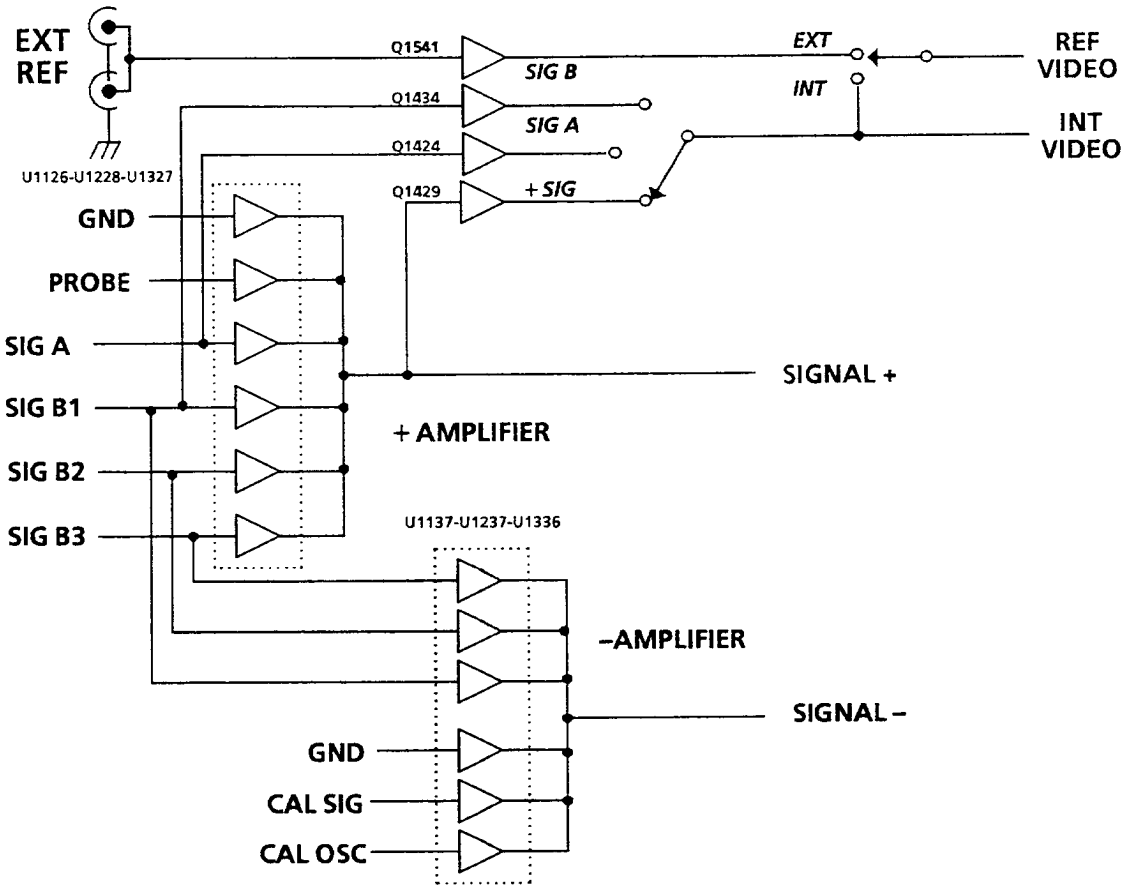
R1106, R1107, and R1108 form the attenuator. R1107 adjusts the overall probe system gain. Q1111, Q1218, Q1113, and Q1115 form the amplifier. Feedback resistors R1116 and R1218 set the gain of 2. C1222 varies the amplifier frequency response and is used to adjust the overall probe system response.

DC Restorer. Either the backporch or sync tip level of the applied video can be clamped to 0 volts by the DC Restorer circuit, which consists of U1217 and U1211. U1217 is a gated transconductance amplifier that samples the filtered output of the Probe Amplifier during either sync tip or backporch (depending on the timing of the sample pulse at pin 5). R1122, C1221, L1220, and C1220 (at the inverting input, pin 2 input of U1217) form a low-pass filter, with a notch at the subcarrier frequency. U1217 drives C1216, which holds charge during the active portion of the video line. When Q1309 is on, C1313 is in parallel with C1216, and the DC Restorer response is slowed so that 60 Hz (50 Hz for 1781)

hum is not attenuated. The DC Restorer is turned off by the absence of the sample pulses at the sample input (pin 5) of U1217. Hold capacitors C1216 and C1313 discharge to 0 volts through R1314, and the emitter of Q1215 stays at 0 volts.

Operational amplifier U1211 (along with C1212, C1211, R1112, and R1216) is an active low-pass filter that stabilizes the characteristics of the DC Restorer loop. Q1215 provides a low output impedance for the filter at higher frequencies.

Diagram 4 Input & Reference Selection



Overview

The + and – Amplifiers select the appropriate input signal for display. The + Amplifier output goes to the + input of the Difference Amplifier, while the – Amplifier output goes to the – input. The four video signals from the Input Amplifiers are connected to 6-to-1 video switches, which consist of multiple sections of transistor arrays. Resistive networks at the inputs attenuate the signal and provide a means for channel frequency response matching. The B channel input signals are connected to both + and – switches for differential display of the A-B input signals. Probe video and the Waveform (CAL SIG) and Vector (CAL OSC) Calibrators are also switched into the signal path here. Inserting the calibrators this early in the Vertical circuit enables calibration of more circuitry.

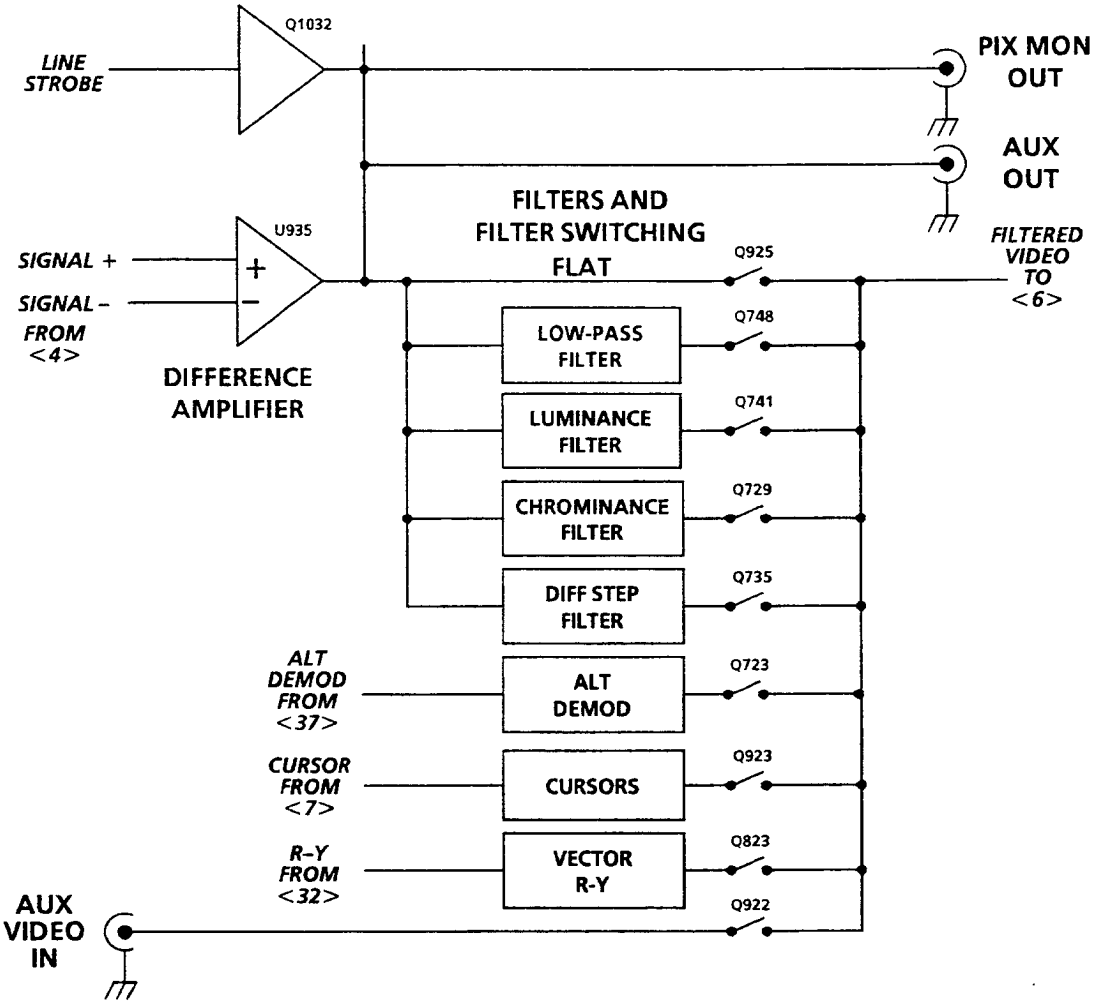
Signals from Channel A, Channel B, + Amplifier, and External Reference are selected through transistor follower switches for horizontal and vectorscope references.

Circuit Theory

Video Input Selection. Each video switch is an operational amplifier connected for unity gain, and consists of six differential amplifier inputs. An input is selected by biasing the appropriate differential pair with current from current sources Q1427 and Q1438. This biasing current is steered to the appropriate differential pair by applying a TTL high level to the resistor network at the differential input current source transistor. Only one + Amplifier and one – Amplifier input can be selected at a time.

Reference Switch. Input A, Input B, or the +Signal output can be selected for Internal Reference or Reference Video by forward biasing the diodes at the switching transistor (Q1524, Q1534, Q1529, or Q1341) collectors. Pulling the cathode junction of the diodes up to +5 volts turns off the particular signal.

Diagram 5 Difference Amplifier & Video Filters



Overview

The signal at the output of the Difference Amplifier is distributed to many internal circuits. Seventy-five-ohm video is provided to the Auxiliary Output and Picture Monitor BNC connectors. There is an additional current source to provide bright-up for the selected line(s) on the Picture Monitor Output.

There are four filters that act on the applied video signal (luminance, low-pass, chrominance, and differentiated step). Their outputs are selected by a saturated transistor switch. Unfiltered video passes to the switch unaltered for full bandwidth frequency response. Several other signals can be switched in for display at this point. They are Alt Demod and Vector R-Y from the vectorscope, cursor voltages from the Vertical Control Schematic, and the Auxiliary Video Input.

Only one signal is switched through the saturating transistor at a time, although Flat, Luminance, and Chroma may be time multiplexed.

The luminance filter has a 1 MHz bandwidth and a transmission zero at the subcarrier frequency. It has been optimized for best transient response. This filter has performance identical to the luminance filter used in the Tektronix 1480 and 1485 Waveform Monitors.

The chrominance filter is a bandpass filter centered on the chrominance subcarrier. It is a Lerner-type filter, exhibiting arithmetic symmetry and linear phase across its bandwidth for excellent phase transient response.

The low-pass filter is an eighth order Bessel-type filter consisting of four second order active sections.

The differentiated step filter is a high-pass filter that acts on the output of the luminance filter. It is a differentiator, or slope detector. The signal from the luminance filter has uniform luminance rise times, so that the differentiated step filter can generate pulses mostly dependent on step amplitude.

The Auxiliary Input, when combined with the Auxiliary Output, provides a means for connecting an external filter to the 1780R-Series. This is a 75 Ω input with 1.5 dB gain to compensate for loss in the applied filter. Of course, AUX IN can also be used as another input to the 1780R-Series.

Circuit Theory

Difference Amplifier. U935 is a high bandwidth operational amplifier connected as a difference amplifier with a gain of 2. This is where the subtraction occurs for the front-panel A-B1, B1-B2, or B2-B3 selections. U935 drives all of the internal filter circuits. Q1032 is a current source that inserts an offset into the Pix Mon video for an intensified display during line select operation. Q937 performs the same function for the picture monitor display on the Vectorscope CRT.

Filters and Filter Switching. The emitters of all the switches are at 0 volts DC. All of the switching transistors, except the selected filter switch, have –1.7 volts on the base to keep them off. When a switch is off, the diode connected to the switching transistor collector is biased on to provide a low impedance signal path to ground. A TTL high at the base resistor network turns on the transistor to provide a low impedance signal path from collector to emitter.

Luminance Filter. The filtered signal is picked off by transistors Q847 and Q939 for C/Y measurements and picture monitor display. The picture monitor display also has the line select strobe added to it through Q937.

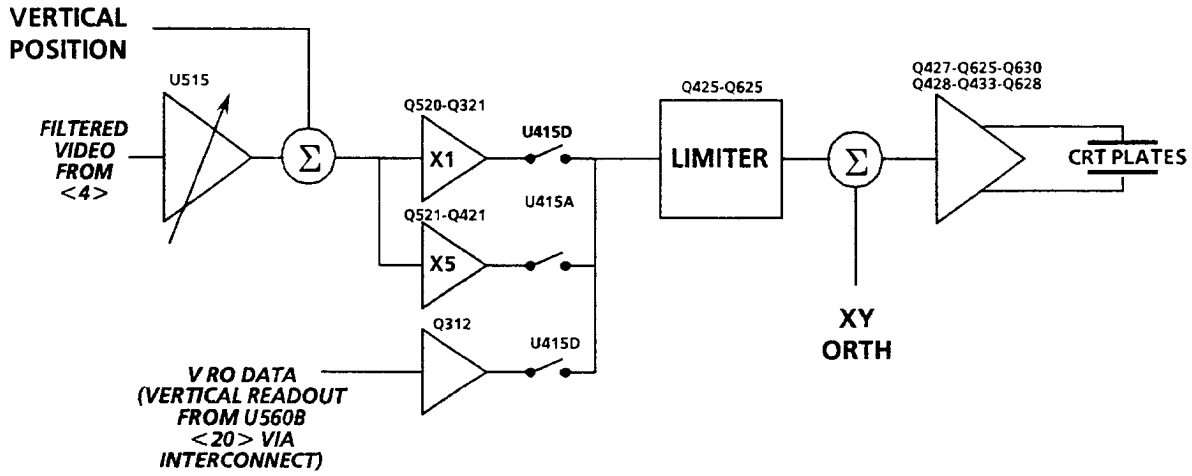
Low-Pass Filter. This filter is an eighth order Bessel-type filter with four second order active sections using operational amplifiers in U1046. Bandwidth is about 300 kHz, and transient response is optimized by adjusting C951.

Chrominance Filter. The chrominance filter is a Lerner-type filter, exhibiting arithmetic symmetry and linear phase across its bandwidth. U827 amplifies the filtered chrominance signal to drive both the Waveform Monitor and Vectorscope circuits.

Differentiated Step Filter. U840A and B with associated circuitry form an active low-pass filter. U840C, D, and E form an operational amplifier. C838 and R837 are connected as a differentiator or highpass filter.

Auxiliary Input. AUX IN is switched into the signal path by saturating Q922. When not selected, Q1022 is on to maintain the 75 Ω input impedance.

Diagram 6 Vertical Deflection



Overview

The current output of the filters passes through a common base amplifier which drives a Gilbert multiplier (Variable Gain Amplifier). Output current from the Variable Gain Amplifier drives inputs to two separate differential amplifiers (X1 and X5). The other side of the differential amplifiers is driven by the Vertical Position voltage.

Vertical readout information from the Microprocessor is input through a third differential amplifier. Only one of the three differential amplifiers (X1, X5, or Readout) is operational at a given time. The output drives a Limiter and the Deflection Amplifier to drive the CRT deflection plates. Limiting is required to prevent the Deflection Amplifier from going into saturation or cut off.

Circuit Theory

Variable Gain. Q619 is a common base amplifier whose voltage output drives U515 whose gain is controlled by the voltage between pins 8 and 10. U411B is a –5 volt voltage source, and R513 is a longtailed current source. The voltage between pins 8 and 10 of U515 is determined by manipulating the current balance in Q514 through the voltage across R509. The Variable Gain Centering, R514, is adjusted for a 450 mV calibrator signal amplitude in WFM+CAL mode of operation. The Variable Gain Registration, R510, is adjusted so that there is no output DC movement of a composite video signal when the variable WAVEFORM GAIN control is varied.

The output current of the Gain Cell (U515) passes through cascode transistors Q518 and Q519 to drive the X1/X5 Amplifier.

X1/X5 Amplifier. The X1/X5 Amplifier consists of two separate differential pairs (Q520-Q321 and Q521-Q421), only one of which is on at any given time. The emitter impedance of Q521-Q421 is 1/5 of the impedance of Q520-Q321, which

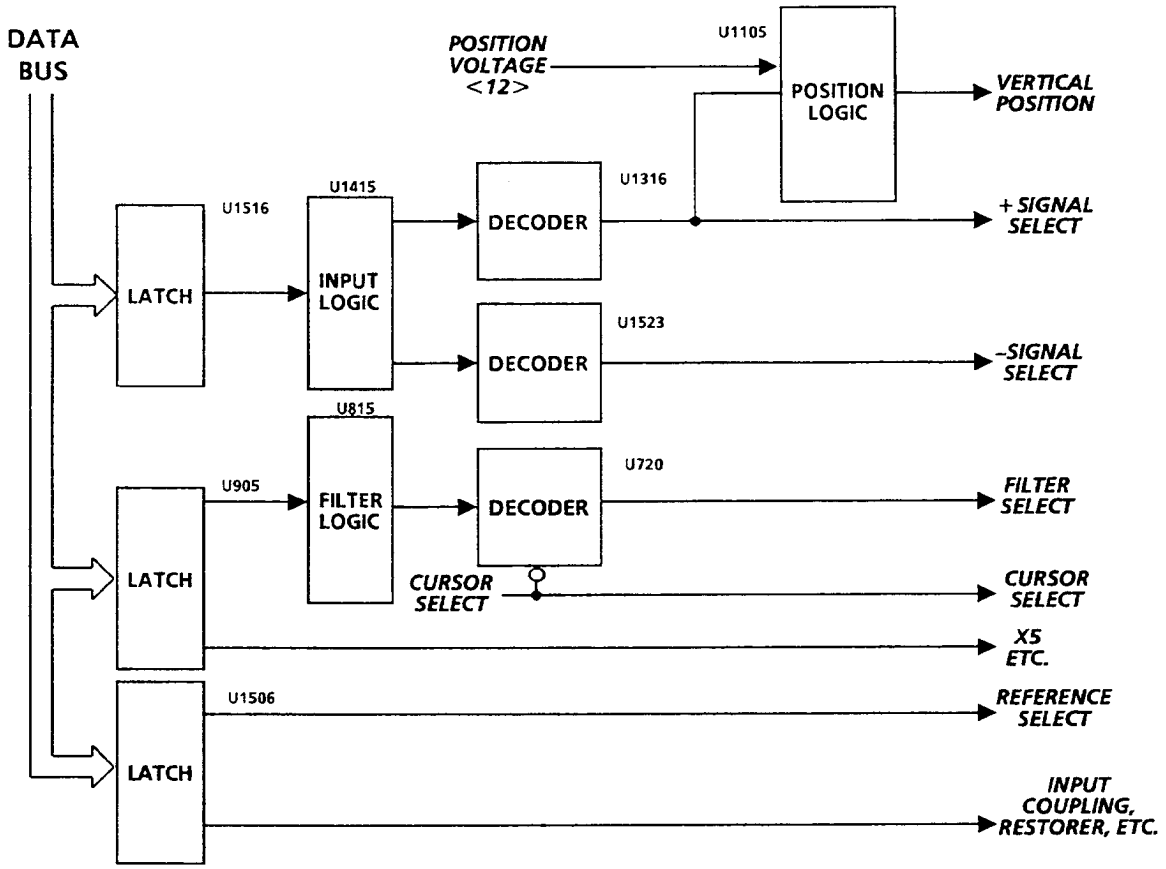
gives them five times greater transconductance. Current from U415B is switched to the appropriate differential pair by U415A and U415D. The differential pair that is off has a high impedance so that it does not affect the other pair. The second input to the differential pairs is connected to the vertical position voltage. R526 sets the balance between the output currents to center the X5 gain at the 0 IRE (300 mV for PAL) graticule line.

Readout. A differential amplifier made up of Q310 and Q312 switches in the vertical component of the waveform display readout. During readout time, bias current from U415B is steered by U415D to this differential pair. Readout Size (R215) and Readout Position (R309) adjustments are provided.

Limiter. The signal current from the X1, X5, or Readout Amplifier drives the Deflection Amplifier, Q628 and Q427, through cascode transistors Q625 and Q425. The voltage excursion at the base of these transistors is limited by transistors Q423 and Q626. If the voltage at either emitter falls low enough to turn on the transistor, the additional current for this node is shunted to the opposite side. The limiter threshold level is adjusted so that the Deflection Amplifier will not saturate or cut off.

Deflection Amplifier. Q628 and Q427 are a differential pair that generate the current for controlling the deflection voltage. Q630 and Q428 convert the Differential Amplifier input transistors into Unity Gain Amplifiers. Most of the signal current flows through Q630 and Q428 so that the little power in the input Q628 and Q427 does not change their base emitter voltage and distort the signal at its extremes. The signal current flowing through Q635 and Q433 drives the CRT deflection plates. R540 supplies a current from the horizontal sweep for active correction of CRT orthogonality errors (misalignment of the vertical and horizontal deflection plates).

Diagram 7 Vertical Control Logic, Calibrator, & Cursors



Overview

The Microprocessor controls the vertical functions through three 8-bit latches. These are all static logic levels. Dynamic switching, such as the Ch-A/Ch-B Parade display, is achieved by state machines in logic arrays, and is timed by sync from the Horizontal Timing circuit. Analog voltages, such as position and gain, come from the Sample-and-Hold circuits on Schematic 12.

Circuit Theory

Input Selection. Input selection data (encoded into 8 bits) is latched in from the data bus by U1516. Selection of inputs to the Differential Amplifier occurs in U1415, a logic array, and the two latches at its output. Bits I1 through I4 contain the + Amplifier switch information, while bits I5 through I7 contain the – Amplifier information. The PAR MODE bit provides additional information to U1415 (I8) when Parade mode is selected. Table 3–2 shows the coding of the inputs. The table also shows the signal that is currently being used as the internal reference source.

Table 3–2: Input Channel Selection Logic

Operating Mode	Input(s)	(U1415)				(U1415)			Par Mode	Internal Reference
		I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	
SINGLE INPUT	A	0	0	0	0	0	0	0	0	CH A
SINGLE INPUT	B1	0	0	0	1	0	0	0	0	CH B1
SINGLE INPUT	B2	0	0	1	0	0	0	0	0	CH B2
SINGLE INPUT	B3	0	0	1	1	0	0	0	0	CH B3
SINGLE INPUT	PROBE	0	1	1	1	0	0	0	0	PROBE
DIFFERENTIAL	A B1	0	0	0	0	1	0	0	0	CH A
DIFFERENTIAL	B1 B2	0	0	0	1	1	0	1	0	CH B1
DIFFERENTIAL	B1 B3	0	0	0	1	1	1	0	0	CH B1
PARADE	A + B1	1	0	0	0	0	0	0	1	CH A
PARADE	A + PROBE	1	0	0	1	0	0	0	1	CH A
PARADE	B1 + PROBE	1	0	1	0	0	0	0	1	CH B1
PARADE	B1 + B2 + B3	1	1	1	1	0	0	0	1	CH B1
PARADE	B1 B2 + B2 B3	0	0	0	1	1	1	1	1	CH B1
OVERLAY	A + B1	1	0	0	0	0	0	0	0	CH A
OVERLAY	A + PROBE	1	0	0	1	0	0	0	0	CH A
OVERLAY	B1 + PROBE	1	0	1	0	0	0	0	0	CH B1
OVERLAY	B1 + B2 + B3	1	1	1	1	0	0	0	0	CH B1
OVERLAY	B1 + B2	1	1	0	0	0	0	0	0	CH B1
OVERLAY	B1 + B3	1	1	0	1	0	0	0	0	CH B1
OVERLAY	B2 + B3	1	1	1	0	0	0	0	0	CH B1
WFM + CAL	A + CAL	0	0	0	0	0	0	1	0	CH A
WFM + CAL	B1 + CAL	0	0	0	1	0	0	1	0	CH B1
WFM + CAL	B2 + CAL	0	0	1	0	0	0	1	0	CH B2
WFM + CAL	B3 + CAL	0	0	1	1	0	0	1	0	CH B3
WFM + CAL	PROBE + CAL	0	1	1	1	0	0	1	0	PROBE
CALIBRATOR	CAL SIG	0	1	0	1	0	0	1	0	GROUND
CALIBRATOR OSC	CAL OSC	0	1	0	1	0	1	0	0	GROUND

Decoders U1316 and U1523 convert the 3-bit logic array outputs to single active high signals. When an input mode requires dynamic switching of inputs, such as A/B Parade or B1-B2/B1-B3, the U1415 state machines cycle their outputs through the appropriate sequence, timed by sync and the horizontal retrace pulse.

DC Restorer and Reference Selection. Data for the reference and DC Restorer is latched in by U1506. This latch controls input coupling and DC Restorer operation along with the internal/external reference selection.

Filter Selection. The encoded 4 bits of filter selection data is latched in by U905. U815 is a logic array, controlling filter selection and calibrator timing. U720 is a 3:8 decoder outputting the filter selection signals for Diagram 5. Four data bits on Latch U905, F0 through F3, have all the filter selection data encoded in them. See Table 3–3. Logic for multiple filter displays, such as Flat/Lum, is in a state machine in U815.

Table 3–3: Filter Selection Logic

Filter(s)	F_0	F_1	F_2	F_3
FLAT	0	0	0	0
LUMINANCE	0	0	1	0
CHROMINANCE	0	1	0	0
LOW-PASS	1	0	0	0
DIFF STEP	1	0	1	0
AUX VIDEO IN	1	1	0	0
ALT DEMOD	1	1	1	0
VECTOR R-Y	0	0	0	1

*** The length of the horizontal sweep determines whether two or three filters are displayed.**

U815 has a divider circuit that generates the calibrator square wave, whose frequency is 1/8th of the applied horizontal or vertical sync rate. The differential output signal from pins 17 and 18 drives the Calibrator, U1019A.

Calibrator. The Calibrator signal is output from U1019A. It has R1119 for the feedback resistance, with R1007 and R1008 forming the input resistance. Calibrator upper and lower level voltages, from the Sample-and-Hold circuits on Diagram 12, determine input currents thorough the input resistors (R1007 and R1008). They are alternately switched (U1011C and D) by the Differential Calibrator square wave timing signal from U815.

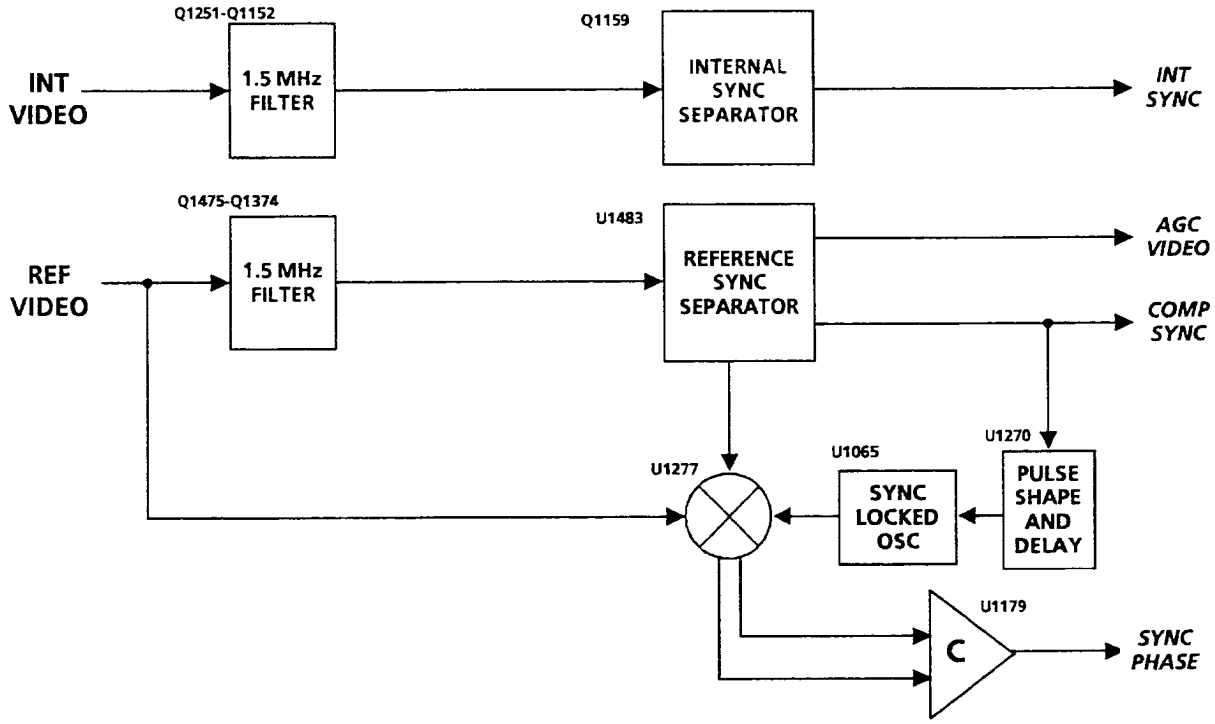
Vertical Position. Vertical position voltages, from the Sample-and-Hold circuits on Diagram 12, are connected to a three-to-one switch, U505. U1105 selects W VERT POS 1 as the main vertical position control voltage. The other two voltages are used for the B2 and B3 position offsets in the B1/B2/B3 multiple display modes.

U1105 is a logic array that selects the timing rate (pin 16) for the logic on this schematic. HSYNC or VSYNC is selected depending on whether the horizontal sweep rate is at a line rate or field rate.

Voltage Cursors. U1019B is the Voltage Cursor Amplifier. Upper and lower voltage levels are determined by the Microprocessor, and are stored by the Sample-and-Hold circuits on Diagram 12. The Cursor Select control line from the Readout Engine (Diagram 21) is converted to a bipolar signal in U1105.

Line Strobe Out. In line select operation, a TTL high pulse appears at the Line Strobe Out rear-panel BNC connector during the selected line time. Jumper J1103 can be moved to its other position to send the Field 1 pulse from the SCH circuit instead of the line bright-up pulse.

Diagram 8 Reference Sync Generation



Overview

Both Internal and Reference sync inputs are filtered by active low-pass filters. The Internal Sync Separator is a descrete clamped operational amplifier circuit that is clamped just above sync tip level to clip off active video.

The Reference Sync Separator is monolithic providing both composite sync and AGC video outputs. Its AGC output is used to trigger the slow sweep circuits. The Reference Sync Separator accommodates sound-in-syncs by replacing the H sync pulses with a fixed 5 μs pulse.

A Sync Locked Oscillator outputs a burst of subcarrier rate sine wave that can be adjusted to start between 70 and 400 ns after the leading edge of sync. A Mixer compares this signal to the color burst, outputting a pulse when the 50% point of sync corresponds to a negative zero crossing of subcarrier. The sync phase output pulse is used to drive color framing logic.

Circuit Theory

Internal Sync Separator. The internal video is input through a 1.5 MHz active low-pass filter made up of Q1251, R1248, R1249, C1247, and C1251. The filtered video drives the Internal Sync Separator, which is a high gain inverting operational amplifier and a feedback clamp. The clamp adjusts the DC level of the operational amplifier so that video just above sync tip causes it to saturate and clip off the video. Q1152 and U1159D form the operational amplifier with

R1156 and R1253 setting the AC gain. CR1155, CR1254, U1159A, and C1254 form the feedback clamp. The clamp sets sync tip to +3 V at the operational amplifier output (U1159 pin 1). U1159B and R1260 provide a constant current discharge path for C1254 during sync time. The clamp voltage is varied by adjusting the current flow through CR1254. U1159C amplifies and inverts the separated sync producing a 5 volt, negative-going sync pulse at its collector (pin 14).

Reference Sync Separator. The selected reference video is input through a 1.5 MHz active low-pass filter made up of Q1475, Q1374, and associated components. The filtered video drives U1483, a monolithic Sync Separator. Negative-going composite sync is output on pin 5, which is an open collector output allowing R1378 and CR1273 to pull-up and clamp the signal for a 0 to +5.3 V output swing. When J1483 is set to the sound-in-sync (SIS) position, U1483 replaces the sync time with a fixed, 5 s pulse. This provides proper synchronization even if digital data such as sound-in-sync is present during horizontal sync time.

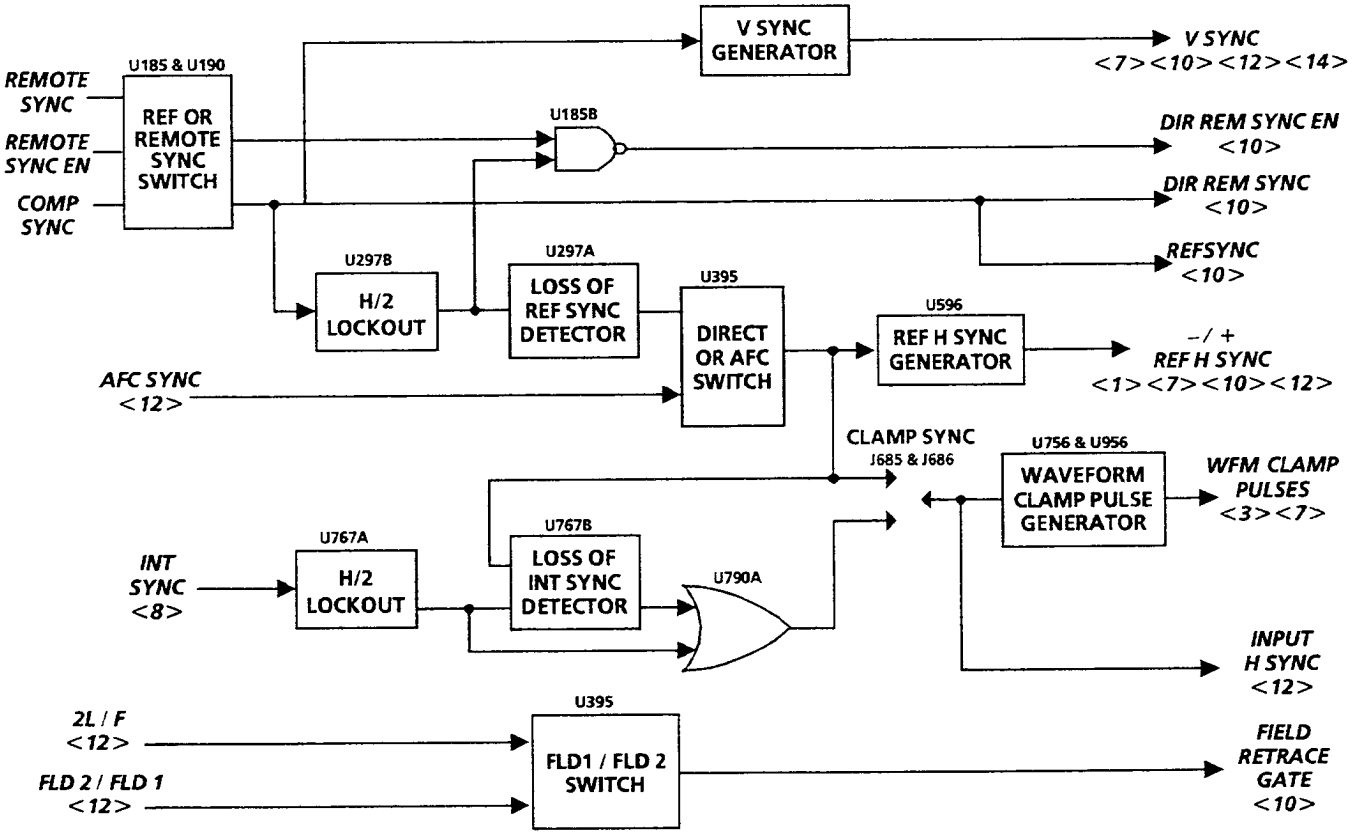
Filtered Reference Video is inverted and scaled so that sync-to-blanking is 800 mV, and then is output as AGC video on pin 13. Q1380 buffers the signal and outputs it to the Slow Sweep Triggering (Diagram 13). Q1483, R1480, and R1481 limit the Sync Separator AGC range so that it does not output noise bursts with no input video.

Sync Locked Oscillator. The Sync Locked Oscillator is locked to sync by a PLL (Phase Locked Loop). U1060 is the phase detector/error amplifier which compares the phase of the VCXO, U1065C, to one-shot U1270A's output. The 140 ns pulse (100 ns for PAL) at the output of U1270A is box-car delayed. by U1270B to provide a calibration adjustment, R1263, for the external reference sync phase. (Box-car delay is accomplished by using two one-shots; one is triggered and the other provides delay.) C1072 is adjusted to center the VCXO (Voltage-Controlled Crystal Oscillator) operating point.

Reference Sync Phase. The Sync Locked Oscillator output is input to one port of a Mixer, U1277. The Reference Video is multiplied by 2 by an inverting amplifier (Q1471 and Q1472), filtered by a chroma bandpass filter (C1370 and L1374), and input to the second port of the Mixer. The Mixer, U1277, is turned on at burst time by saturated switch Q1389 that is keyed by the Burst Gate output of the Sync Separator (U1483 pin 4). A differential current is output, during burst time, from U1277 (pins 6 and 12). Its magnitude is determined by the phase difference between the Reference Video burst and the output of the Sync Locked Oscillator. This differential current flows in R1176, R1177, and C1179 where it is filtered and converted to a voltage to drive a comparator, U1179. The REF SCH ADJ (R1263 in the Sync Locked Oscillator) adjusts the start time of the Sync Locked Oscillator so that the comparator outputs a positive

pulse when the 50% sync point corresponds with a negative subcarrier zero crossing ±80°. This positive-going output pulse drives the SCH color framing logic on Diagram 14.

Diagram 9 H & V Sync Generators



Overview

The Horizontal and Vertical (line and field) Sync Generators extract the synchronizing signals from the output of the Reference Sync Separator (Diagram 8) or the Remote Sync Input to supply the required sync signals for the rest of the instrument. In the absence of input video or remote sync, free-running H and V sync signals are output to control sweep, clamps, and CRT readouts.

In addition to the synchronizing signals the Waveform Display Clamp Pulse Generator is on this diagram. It provides correctly-timed clamp pulses to the four signal inputs along with the Probe Input, during the active part of the video field when the clamps are turned on.

Circuit Theory

Ref or Remote Sync Switch. U185A-C-D form a logic switch that selects between the Remote Sync Input (from the rear-panel REMOTE connector) and Comp Sync from the Reference Sync Separator (Diagram 8). If Remote Sync Enable is high, U185A cannot AND, but U185D ANDs on Comp Sync. When the Remote Sync Enable line is low, U185D cannot AND, but U185A ANDs on Remote Sync. In either case one input of U185C will be high with the output of either

U185D or U185A being gated through. The output of U185C is Reference Sync and Direct Remote Sync.

V Sync Detector. Q385 and Q391 form an integrating Sync Detector that has an output when the vertical broad pulse occurs. Q385 is saturated for all of the field, except during the vertical sync pulse when it is turned off. When Q385 turns off, C285 charges, causing the collector to ramp up in a nearly linear waveform. When Q385 again saturates, a peak detector, CR385, catches the peak and holds it. When Q385 is on, during the active field, the charge on C390 slowly decays. When Q385 again turns off C285 ramps back up just enough to replace the amount of charge that has decayed off. Q391 then turns on during the time that C390 is charging (while the decayed charge is being replaced) to output a vertical sync pulse.

V Sync Free Run Generator. U291 is a timer circuit that follows the output of the V Sync Detector, when there is vertical sync. If sync is missing, U291 free runs at about a 30 Hz rate (V/2) to keep the instrument operating until there is incoming video or remote sync. U190C provides a complement vertical sync.

Loss of Ref Sync Detector. U297B is a non re-triggerable one-shot that outputs a 36 μs pulse. It is triggered by the negative-going pulses output from the Ref or Remote Sync switch. The timing of this one-shot is long enough to keep it from triggering on vertical equalizing pulses, but well short of the horizontal sync pulse rate.

Q282, which is driven by the Q output of U297B, has a long time constant circuit in its base circuit; when Remote Sync is enabled it provides one input to U185B, which generates the /Dir Sync Enable. Having a long charging time prevents noise or the field or field/2 square wave repetition rate from disabling the /Dir Sync Enable.

U297A is a re-triggerable one-shot with a period of 320 μs. As long as there is a direct sync output from U297B it remains triggered and Q will be high and /Q low. If the direct sync output from U297B is not present, U297A reverses outputs (Q low and /Q high) causing the Direct or AFC switch to switch to AFC. When AFC Sync is selected on the Waveform CRT menu the DIR/AFC line goes low, which clears the one-shot and forces Q low and /Q high to force the switch to the AFC mode.

Direct or AFC Switch. U395 is an inverting data switch that is controlled by the outputs from U297A. When Q is high and /Q low the switch connects the direct sync from U297B Q to the Ref H Sync Generator. When Q goes low and /Q high the switch inverts and connects the AFC Sync, from Diagram 37, to the Ref H Sync Generator.

Ref H Sync Generator. The Reference Horizontal Sync Generator is made up of two one-shot multivibrators. U596B is triggered by the direct or AFC sync from the Direct or AFC switch. Its Q output is a 0.5 μs pulse whose trailing edge triggers the second one-shot. Using the trailing edge of the first one-shot output provides a 0.5 μs delay to the leading edge of Ref H Sync. The Ref H Sync has a period of 1.2 μs and is output as –Ref H Sync from the /Q output and + Ref H Sync from the Q output.

Internal Sync Detector. U767A is a non-retriggerable one-shot multivibrator, triggered by the negative-going internal sync. It has a period of 51 μs, which prevents it from being triggered by vertical equalizing pulses, but enough short of the H sync rate to allow for normal H-rate trigger. When internal sync is present the Q output is high most of the time, which charges C771 and keeps U767B from being triggered. U790A is an OR gate that is driven by the Q outputs of either U767A or B. When Q767A is being triggered, U767B is disabled and U790A outputs the Q output from U767A.

If there is loss of internal sync, U767A is not triggered and the charge on C771 decays and allows U767B to be triggered by the output of the Direct or AFC Sync switch. When this condition occurs the output of U790A is the Q output from U767B.

The outputs from U790A and U395 (Direct or AFC switch), through J865 and J866, are used to drive the Waveform and Vector Clamp Generators. Driving U790A with either the internal sync triggered output of U767A or the reference sync output of the Direct or AFC switch output of U767B ensures a clamp timing pulse at all times.

FLD 1/FLD 2 Switch. The switch output, Fld Retrace Gate, controls when the vertical sweep starts in the 2-field sweep mode. In 2-field sweep mode, the Configure menu provides a choice of triggering on monochrome field 1 (color field 1 or 3) or field 2 (color field 2 or 4). In 1-field or 3-field sweep the Field Sweep Gate (Diagram 10) outputs a triggering signal for each V sync pulse.

U395 controlled by the Fld2/Fld1 and 2L/F control lines selects either the Q or /Q output of U297B and inverts it for input to the Field Sweep Gate. Because the output of U297B is about a half line long, selecting one or the other of its outputs provides a high on the Fld Retrace Gate for either the first or last half of the line.

When the Fld2/Fld1 line is high, for NTSC signals (monochrome field 2 selected), U395 selects the Q output of U297B, inverts it and outputs a high Fld Retrace Gate during the first half line. When the Fld Retrace Gate is high on the first half of the line it corresponds to the V sync for color fields 2 or 4 and the field rate sweep is triggered on field 2. When Fld2/Fld1 goes low, U395 selects the Q output of U297B, which is inverted to provide a high for the second half of the field to correspond with field 1. Because the period of the /Q or Q output is

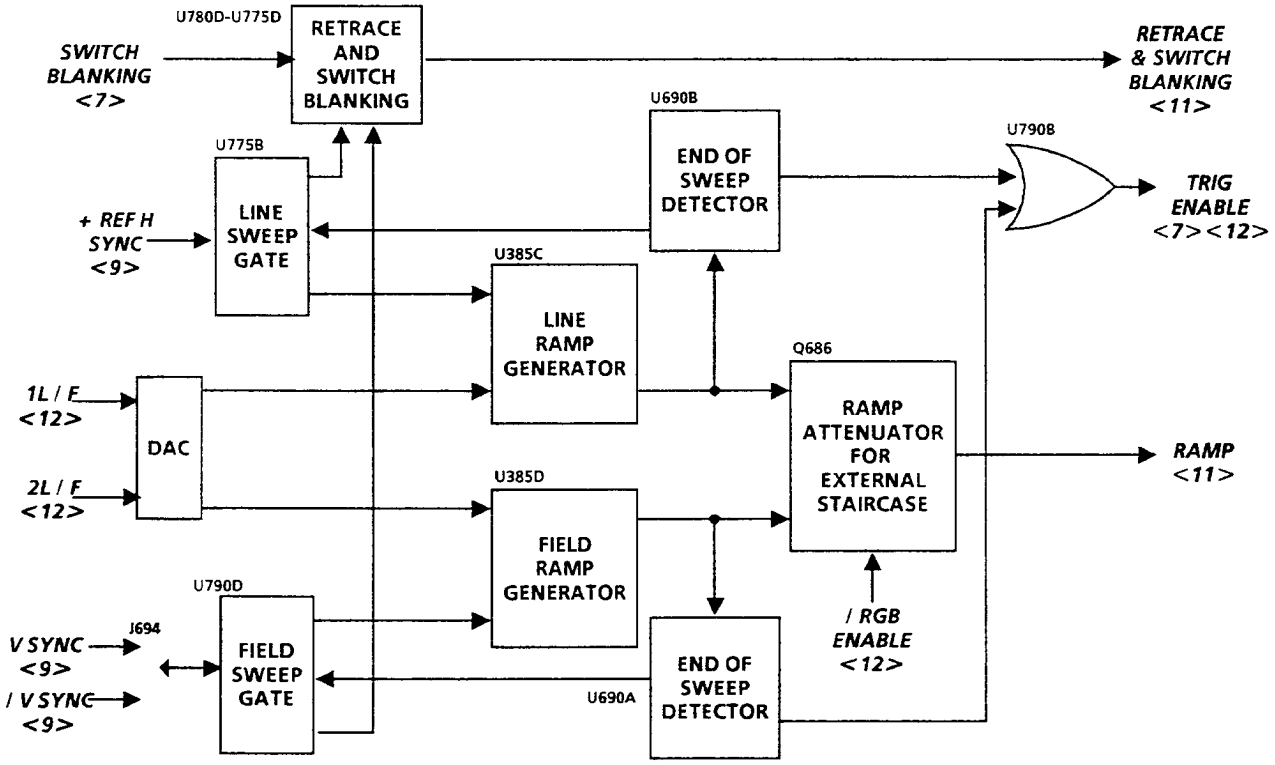
too long for PAL signals, a jumper (on Diagram 10) is provided to realign the Fld Retrace Gate with V sync. See *Field Sweep Gate* description, on Diagram 10, for details.

Clamp Pulse Generator for Waveform Display. U858B is a retriggerable one-shot multivibrator that generates a 2 s clamp pulse at either sync tip or backporch as dictated by U958. Both + and – clamp pulses are generated when the B input is high, which occurs when the DC Restorer is enabled, Clear is high, and the 1Y input of U958 goes low.

U958 is a dual AND-OR-INVERT gate performing the timing logic for the output one-shot (U858B). It makes the timing determination on a combination of sync, backporch or sync tip selection and status of vertical lockout. Vertical Lockout goes low during the vertical sync pulse to prevent the sync tip clamp pulses from moving to backporch timing when the narrow serrations in the vertical sync pulse occur.

U858A generates a pulse 5 μs after the leading edge of H sync. This delayed pulse is used to time the start of the clamp pulse when backporch clamping is selected. J866 can be set for clamp pulse timing reference from either the AFC Sync or the Internal Sync Separator output.

Diagram 10 Ramp Generator



Overview

The Ramp Generators produce the line and field sweep ramps for the waveform displays. The slope of the ramp, for 1- 2- or 3-line or field sweep, is controlled by a Digital-to-Analog Converter (DAC). Initiation of retrace and sweep start is controlled, through sweep gates, by the +Ref H sync (line rate sweep) and V sync (field rate sweep). The H and V pulses are gated in by the Line and Field Sweep Gates to ensure that retrace does not occur during the active part of 2- or 3-line or field sweeps. In addition, the Field Sweep Gate implements the field 1, field 2 triggering in the 2-field sweep rate.

The ramps are attenuated for Parade display of RGB (3-step) and YRGB (4-step) external staircase signals. Both the staircase signal (to the horizontal) and the /RGB Enable signal are input to the 1780R-Series through the rear-panel REMOTE connector.

Circuit Theory

Line Sweep Gate. In the line sweep modes the LINE control line is high, U880B inverts it and inputs it to U775B (an OR gate). The other input to the gate is from U780A, which is also low (except at sync and retrace time). With no high during active line sweep time, U775B output is low, which turns off Q589 in the Line Ramp Generator to start the sweep ramp.

When the sweep ramp has reached approximately 3/4 of its final amplitude the End of Sweep Detector outputs a high on the pin 1 input of U775A (OR gate) to provide a high on one input of U780A (an AND gate). The next +Ref H sync will AND U780A causing Q589 to turn on and force the Line Ramp Generator to retrace and hold low for the remainder of the +Ref H sync pulse. In 2- and 3-line sweeps the End of Sweep Detector output will be low during the first 3/4 of the sweep and +Ref H sync will not AND U780A to turn on Q589 until the final 1/4 of sweep.

Line Ramp Generator. The Ramp Generator consists of an integrator-connected operational amplifier, U385C. Its output is coupled back to the negative input through the integrating capacitor, C587. The current source for the integrator is through R489 from the voltage output of the DAC. Current always flows through R489. When the ramp is to be terminated (for retrace), Q589 is turned on and C587 is discharged. When Q589 is on, the output of the integrator is held near ground by shorting the output to the input.

DAC. The DAC controls the slope of both the line and field ramps by controlling the amount of charging current to the ramp timing capacitors. Pin 4 of U490 is a current source for R487, R488, and R489, which are the timing resistors for the ramp timing capacitors. The amount of current available to the resistors depends on the 1L/F and 2L/F control line status.

In the 1-line or field sweep mode both the 1L/F and 2L/F control lines are high and the maximum current is present at the output of U490, which produces about –3 volts. In the 2-line or field sweep mode only the 2L/F line is high and the output voltage drops to approximately –1.5 volts. In 3-line or field sweep mode both 1L/F and 2L/F control lines are low and the voltage output at pin 4 of U490 is about –1 volt.

Field Sweep Gate. When the 1780R-Series Waveform Monitor is in a sweep mode other than 1-, 2-, or 3-field, the FIELD control line is low. When FIELD is low U795B, a D-type flip-flop, is preset with a high on the Q output. The high output is ORed through U790D to turn on Q386 and hold the Field Ramp Generator integrator near ground (no sweep).

In the field rate sweep modes the A input of U789B has to go low to enable the retriggerable one-shot. In the 1-field mode, U790C ORs through a high from the 1L/F control line. When the End of Sweep Detector (U690A) output is high (signifying the ramp is near maximum amplitude) U760B ANDs and goes high. U880D inverts the output of U760B to provide the low on the A input of U789B. Once the A input is low, the first rising edge of V sync, on the B input, triggers the one-shot. The Q output goes high for approximately 148 μs after the one-shot is triggered by V sync. The high from the Q output sets the D input of U795A high so that the next two +Ref H sync pulses clock through a 2-line high to U790D, which ORs to turn on Q386 for retrace.

In 3-field sweep modes the FLD Retrace Gate is always high. The Field Ramp Generator End of Sweep Detector outputs a high in the last third of the ramp. ANDing through U760B does not occur until significantly after the second V sync to ensure that the next V sync will again retrace and start the Field Ramp Generator.

In 2-field sweep mode it is possible to trigger the field sweep on a selected monochrome field. The FLD Retrace Gate line is high for only half a line and V sync goes high during the last half of the line for field 1 and during the first half for field 2. By changing which half of the line the FLD Retrace Gate is high, it is possible to start the one-shot only for the selected field.

Because the line count scheme is different for PAL instruments the one-shot is triggered on the trailing edge of V sync. J694 is moved to select /V Sync in the PAL instruments to accommodate the difference.

When the instrument is in the Remote Sync mode and there is no horizontal sync information in the remote sync signal, the /DIR REMSYNC EN line will be low. This disables U789B (one-shot) and the sweep is controlled by U795B, a D-type flip-flop. The DIR REMSYNC clocks a low to begin a sweep and then goes high to begin retrace.

Field Ramp Generator. The Ramp Generator consists of an integrator-connected operational amplifier, U386D. Its output is coupled back to the negative input through the integrating capacitor, C485. The current source for the integrator is through R487 from the voltage output of the DAC. Current always flows through R487. When the ramp is to be terminated (for retrace) or is undesirable, Q386 is turned on and C485 is discharged. When Q386 is on, the output of the integrator is held near ground by shorting the output to the input.

Ramp Attenuator for External Staircase. When the /RGB EN control line is pulled low the output of U880F goes high to turn on Q686 and ground one end of R587. When Q686 is on, the output of the Ramp Generator is attenuated to either 20% for the 4-step staircase (YRGB) or 33% for the 3-step staircase (RGB) as dictated by the position of the plug jumper on J585.

End of Sweep Detector. U690A and U690B are connected as voltage comparators. The negative inputs are set to approximately 5 volts by a voltage divider made up of R591 and R592. Until the Ramp Generator output (applied to the positive input) reaches 5 volts, the End of Sweep Detector output is low. The 5 volt level corresponds to approximately 3/4 of the sweep length, which ensures that a 2-, 3-line, field sweep will be past the middle one or two syncs before the sweep gate is enabled again.

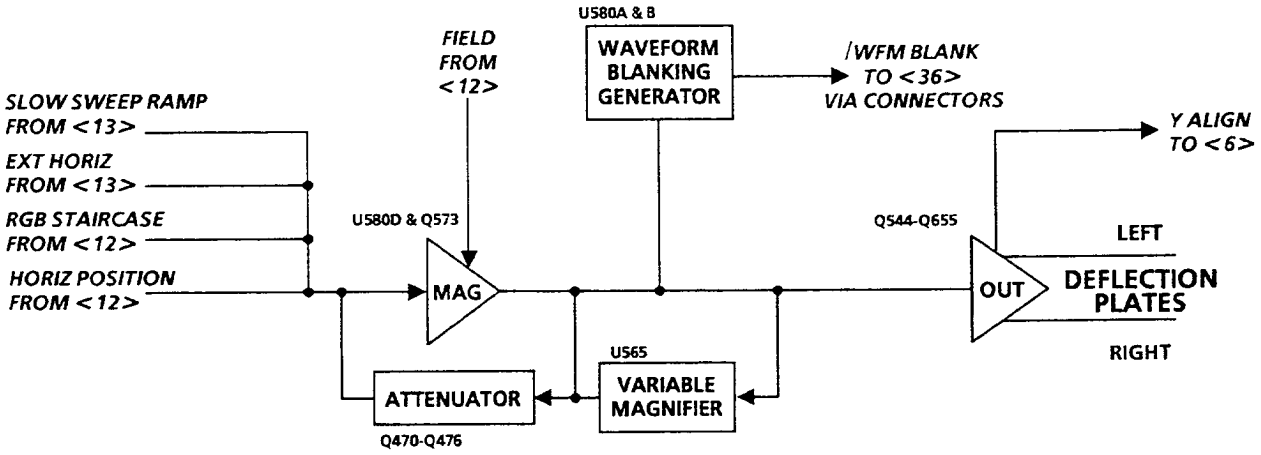
Whenever either End of Sweep Detector goes high U790B outputs a corresponding high (Trig En) to synchronize cursor display, calibrator display, and differential gain and phase displays.

Retrace Switch Blanking. Sweep blanking occurs whenever the output of U775D (an OR gate) goes high. In field rate sweep modes, blanking is directly related to the sweep retrace start and end. The blanking pulse is generated by U780C (FIELD high) and U790D output high (duration of ramp retrace).

Blanking for line rate sweeps is about 0.1 μs longer than ramp retrace time. U789A is a retriggerable one-shot multivibrator that stretches the retrace pulse. U789A is triggered by the output of U775B going high to start retrace.

U780D provides blanking during switching between inputs for parade displays. If either input of U775C is high (line select on or RGB enabled) U880A inverts it and un-ANDs U780D. When neither of these conditions occurs, the output of U880A will be high and a high on the SWITCH BLNK line generates a blanking pulse.

Diagram 11 Horizontal Magnifier & Output Amplifiers



Overview

The Magnifier Amplifier provides selection of fixed voltage gains for the Line and Field Ramp Generator sweep ramps. This provides the time per division variation on the horizontal axis of the CRT display. In addition, the Magnifier Amplifier provides variable amplification for the sweep ramps, external horizontal input (ICPM mode), and external RGB staircase. The Magnifier Amplifier drives the Horizontal Output Amplifier which drives the CRT deflection plates. The input to the Horizontal Output Amplifier is switched between the sweep ramp and the Microprocessor-generated readout signal to provide display messages and menus.

In the magnified sweep modes, only a small portion of the line or field is displayed on the CRT. The remainder of the time the beam is off to the left or right of the screen. Without blanking during this off-screen time the CRT would appear to be backlit.

Circuit Theory

Magnifier Amp. The Magnifier Amplifier is an inverting, feedback amplifier with its summing junction at its input (pin 2 of U580D). The amplifier voltage output is at the collector of Q573. Amplifier gain is controlled by the combination of the feedback resistors (R569 and R478), the attenuator resistors (R472-477), and the input resistance. The input resistance for the sweep ramps is on Diagram 10 (R581). The other input resistances are R378 and R576 for the horizontal positioning voltage, R683 for the external horizontal input, R682 and R765 for the RGB staircase input, and R678 for the slow sweep ramp. CR579, CR581, and CR582 are back biased when the sweep ramp is selected and individually turned on when their input is selected for display.

The attenuator resistors (R472, R572, R477, R470 and R471, R473 and R474), along with R476, when switched on alter the feedback resistance. When one or more of the transistors, in series with the attenuator resistors, is saturated the

gain of the amplifier is increased. When a gain greater than X5 is selected, the lower gain transistors are also saturated, turning on up to all six attenuator transistors for X100 magnification.

The capacitors C572 and C575 provide compensation for the amplifier at gains less than X50. At gains of X50 and X100 in the line sweep modes, transistor Q477 is saturated, shorting out the compensation, and the amplifier has the faster response needed in these high gains for magnifying the line rate sweeps. In field sweep modes, transistor Q477 is off in all the gain settings, causing the amplifier to be heavily compensated in all the gain settings and making it less sensitive to high frequency noise.

When field rate sweep is selected, Q478 is turned on to parallel C478 across C477 to reduce loop bandwidth. Reducing loop bandwidth increases the noise immunity of the amplifier during the slower ramps of the field rate sweeps.

The output of the Magnifier Amplifier is voltage limited. The collector of Q573 can go no higher than +12 volts when it saturates, and no lower than one diode drop below ground when CR469 turns on. This voltage limit prevents the Output Amplifier from being overdriven or saturating, with the accompanying non-linearities.

Variable Mag. U565, a 1496 Modulator/Demodulator, and CR566, a diode pair, comprise a Gain Cell. A voltage-divided portion of the Magnifier Amplifier output is the input to the Gain Cell through pin 1. The output of the Gain Cell (pin 6) is the signal current plus a quiescent current. The signal current can be positive, negative, or nulled depending on the DC bias voltage between pins 8 and 10 of U565. Q669 is a current mirror, putting the combined signal and quiescent current back into the Magnifier Amplifier at a point between the feedback resistors (R569 and R478). Q668 is a current sink that subtracts the quiescent current from this point. Adding or subtracting the signal current at this point varies the gain of the Magnifier Amplifier.

The ability to vary the amplifier gain with a DC bias voltage is the way the horizontal timing calibration is accomplished from the 1780R-Series Calibration menu. There are no other adjustments in the horizontal chain to accommodate the tolerances of the Ramp Generators, Output Amplifier, and CRT sensitivity.

Waveform Blanking. Voltage levels in the Magnifier Amplifier (U580B) are sensed to detect when the beam is being driven off screen and a blanking signal is produced. When the output of the Magnifier Amplifier moves toward its lower voltage limit of one diode drop below ground (CR469), U580B turns off and turns on U580A. A low at the collector of U580A blanks the Waveform CRT. When the output of the Magnifier Amplifier is at its other voltage limit (Q573 saturated) the input side of the differential pair, U580D, is off and its collector is pulled up toward +12 volts. When pin 1 of U580D goes high, VR578 conducts to turn on U580A and produce a blanking signal.

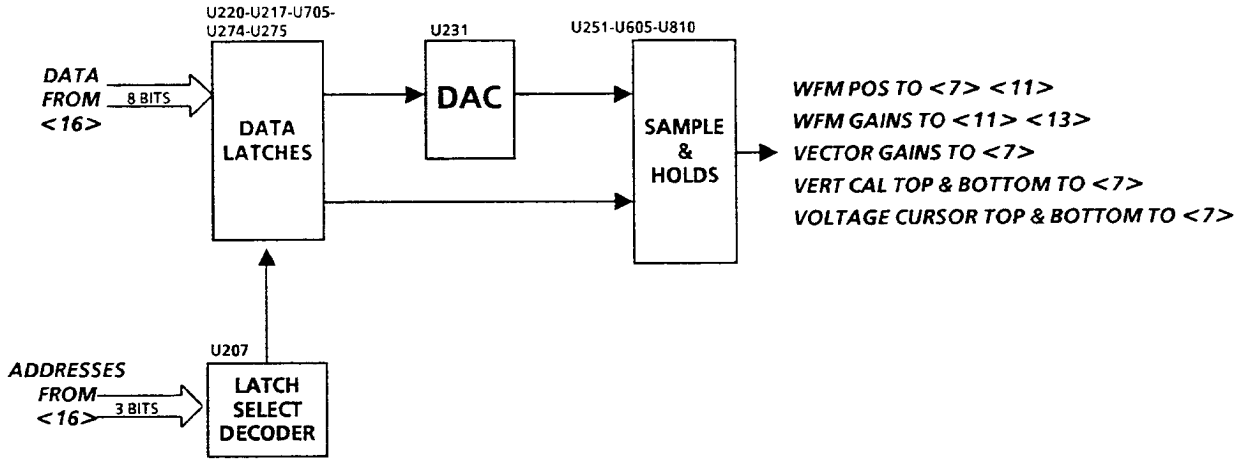
Readout Switching. When /WFM READOUT EN is high, the H RO DATA WFM signal is disconnected from the Output Amplifier by turning on Q267 to short the readout signal to the –2.2 volt supply. When Q267 is on, CR251 is reverse biased and the horizontal readout data is disconnected from the Output Amplifier. When Q267 is on, Q354 is open and allows the output signal from the Magnifier Amplifier to flow through R354 and CR252.

When /WFM READOUT EN goes low, Q267 is open and the H RO DATA WFM signal is coupled to the Output Amplifier through CR251. Q354 is turned on by the output of U260F going high, which shorts the Magnifier Amplifier output signal to the –2.2 volt supply and reverse biases CR252. R167 (WFM Readout H Gain) determines the width of the readout display, while R170 (WFM Readout H Center) controls the DC level to horizontally position the readout display.

Output Amplifier. The Horizontal Output Amplifier has a paraphase output to differentially drive the CRT deflection plates. The input is the base of Q547, which is a summing junction near ground. R451 is a compensated (C352) feedback resistor returning a differential current from the collector of Q555. Common mode feedback from both outputs is returned to the emitters of Q547 and Q550. Bias current for Q544 and Q555 flows through Q643 and Q655.

A sample of the left deflection plate driving signal is taken from a voltage divider in the base of Q550. It is coupled back to the Vertical Output Amplifier, Diagram 6, to provide an orthogonality adjustment for the CRT.

Diagram 12 Horizontal Latches & DAC



Overview

Eight-bit digital data from the Microprocessor, used to control horizontal as well as some vertical functions, is latched onto the circuit board. A Latch Select Decoder, using three address bits, controls the Data Latch operation. Data bits from the latches are input to a 16-bit Digital-to-Analog-Converter (DAC) that converts the data bits to the analog voltage levels used for gain setting and positioning.

Circuit Theory

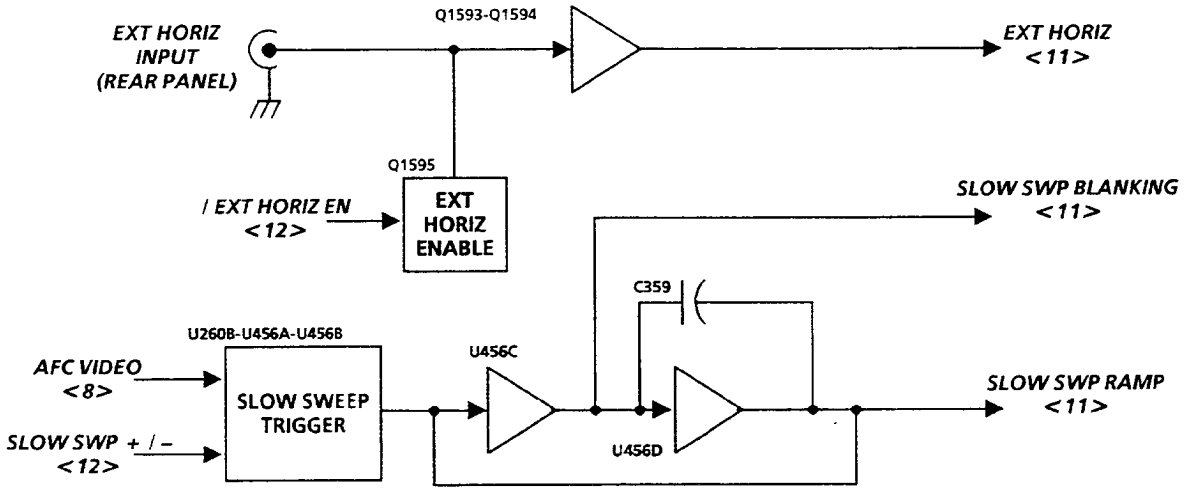
Latches. The five identical latches (U220, U217, U705, U274, and U275) write data from the data bus to their outputs on the rising edge of their clock pulses. The data is held on their outputs until new data is written on the next clock pulse. U220 and U217 write data into the DAC. U705 controls sequencing of the DAC output to the 11 Sample-and-Hold circuits. U274 and U275 directly output a number of control signals, most of which are used by the horizontal and sweep circuits.

Latch Select Decoder. The Latch Select Decoder generates the clock for the eight latches to receive data from the data bus. When the /VH HRDW CTRL input is pulsed low, one of the outputs (Y0 through Y7) goes low for the duration of the pulse. When the /VH HRDW CTRL returns high, the output goes high to generate a positive-going transition that is the clock edge for the selected latch.

DAC. The DAC, U231, has an output voltage range of ±3 volts and 16 bits of resolution. The DAC has no internal latches and its analog output continuously follows its digital input. R231 is the gain control for the DAC output. The DAC output is utilized only when one of the analog switches is closed, to connect its analog output to one of the Sample-and-Hold circuits.

Sample-and-Holds. The sample-and-holds sample the output of the DAC when its analog switch is closed. U708 is an analog multiplexer employed as a single-pole, 8-throw switch. U245 is a dual-in-line switch package using three sections. The Sampling Amplifiers are in U251, U605, and U810, which are Quad-Differential Amplifiers. The combination of the amplifier and its hold capacitor (C245 for WFM Horiz Position, U251B) hold the voltage while the DAC continues the cycle of refreshing the rest of the sample-and-holds. Refresh occurs approximately every 10 milliseconds.

Diagram 13 Slow Sweep & Ext Horiz Input



Overview

The External Horizontal Input Amplifier is a non-inverting amplifier that inputs a ramp voltage of ≈5 volts to produce a 10-division sweep ramp.

The Slow Sweep Ramp Generator produces a ramp that is triggered by an APL change through 50%, or free-runs after about 10 seconds when no trigger has occurred. AGC video is sent from the Reference Sync Separator to detect APL changes. The internal reference is required to have the Sync Separator receive the same signal displayed on the CRT.

Circuit Theory

Ext. Horizontal Input Amplifier. Whenever the /EXT HORZ EN is high (not enabled) Q1595 is turned on and all signal current is returned to the –2.2 volt supply. In addition, when the line is low the Output Amplifier is pulled down enough to back bias the switching diode at the input to the Mag Amplifier on Diagram 11.

The amplifier itself is a non-inverting amplifier with a gain of ≈4.5. Gain is determined by the current flowing in the emitter of Q1594. CR1593 and CR1597 are input protection, setting the maximum input amplitude to ±12.5 volts.

Slow Sweep Trigger. The AGC video, from the Reference Sync Separator, is inverted video with the chroma filtered off. R761 (Slow Sweep Trig Level) is adjusted so that video with a 50% APL produces approximately 0 volts on C661. C661 maintains this APL through the vertical interval.

If the Slow Sweep Trigger is set to + an increasing APL change, through 50%, passes through a 0 volt threshold set on U458B by the SLOW SWP +/– control line producing a low on the – input of U458B. As the APL changes from below

50% to above, the output of the amplifier changes from being limited at the positive supply to being limited at the negative supply. This negative transition is coupled through C557, turning on Q658 to begin the ramp.

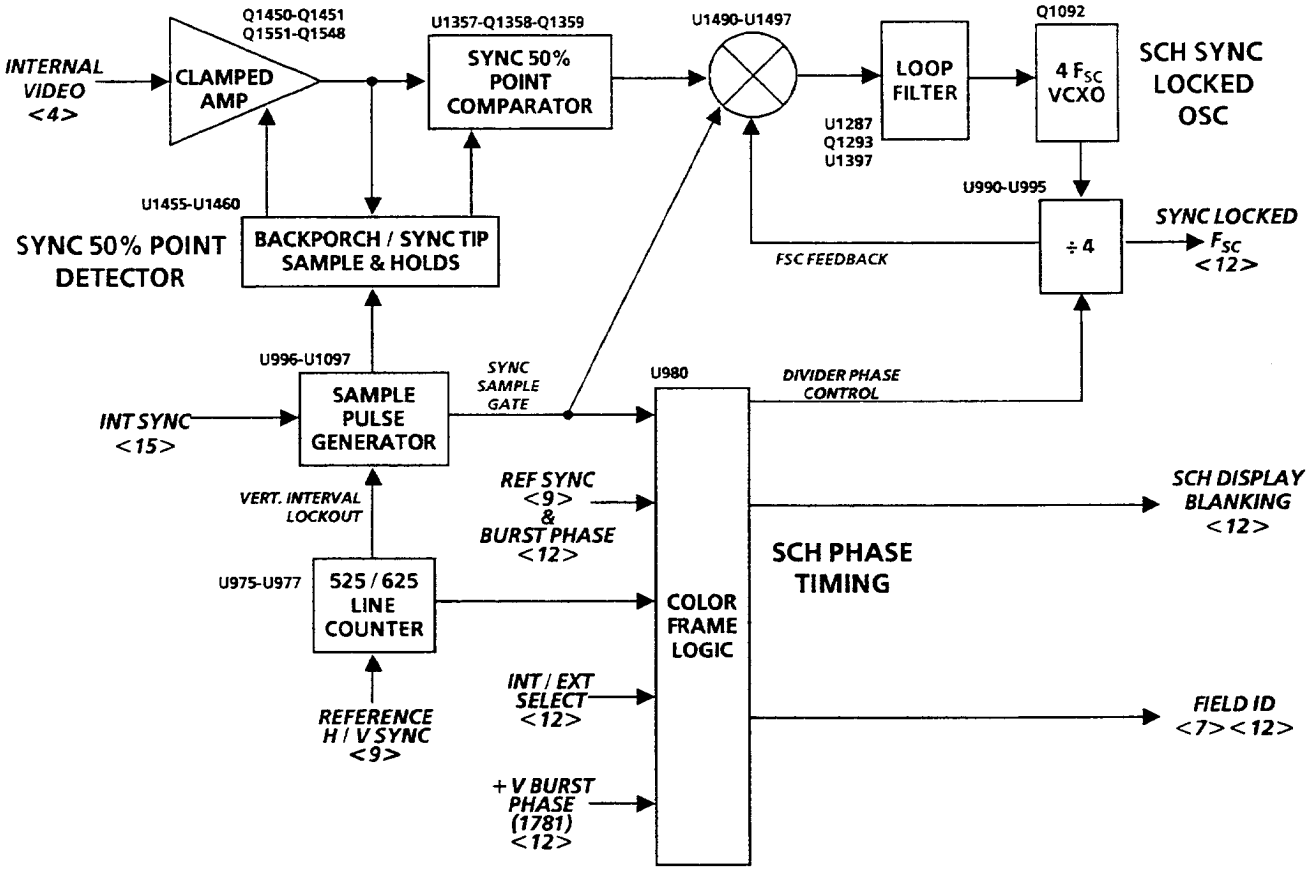
When Slow Sweep Trigger is set to – a decreasing APL change, through 50%, passes through a 0 volt threshold set on U458A by the SLOW SWP +/– control line being low on the + input of U458A. As the APL changes from above 50% to below, the output of the amplifier changes from being limited at the positive supply to being limited at the negative supply. This negative transition is coupled through C457, turning on Q658 to begin the ramp.

Slow Sweep Ramp Generator. The ramp is produced by an integrator that consists of an amplifier, U458D, and an integrating capacitor, C359. Integrator current source is through R360 and R361. Charging current is varied by the W HORZ GAIN level, which can be set between ±3 volts. Changing the charging current for C359 affects the slope of the Slow Sweep Ramp, and therefore the time required per trace.

Sweep retrace occurs when the ramp voltage turns on VR462 (≈6.2 volts), which causes the output of U458C to limit near its positive supply voltage and turns on CR358 and CR359 to discharge the integrator. When U485C limits, the SLOW SWP BLNK line goes high to start the CRT blanking pulse. The negative transition of the ramp resetting conducts through C660 to move the input, of 458C, to –6 volts. This holds the output of the amplifier high and the integrator off until C660 is charged up to approximately ground from the current through R656 and R659, or through Q658 when it is turned on by an APL change trigger. When C660 charges up to 0 volts, the amplifier output goes to approximately ground to start the ramp and bring the SLOW SWP BLNK line low again to end the CRT blanking pulse.

The SLOW SWP EN line is high when slow sweep is occurring. When slow sweep is not selected (CRT menu selection), the SLOW SWP EN line is low which pulls the SLOW SWP BLNK line to approximately 0.5 volts, which is ignored. In addition, when SLOW SWP EN line is low the output of the integrator is held to approximately –3 volts, which will back bias the switching diode at the input to the Mag Amplifier on Diagram 11.

Diagrams 14 & 15 SCH Phase Timing & Sync Locked Oscillator



Overview

The 1780R-Series displays the horizontal sync to subcarrier phase relationship as a polar plot on its Vectorscope CRT. It generates a subcarrier rate signal, phase locked to the 50% point of sync that is demodulated against burst-locked subcarrier to produce a dot on the vectorscope. By comparing this sync dot to the burst vector, the SCH phase of the signal can determined.

The SCH circuit consists of four major blocks. The Sync 50% Detector amplifies and clamps the displayed (internal) video signal. The backporch and sync tip levels of this signal are sampled and the voltage half way between, which corresponds to the 50% sync point, is applied to one input of a comparator. The amplified video is applied to the remaining input so that the comparator outputs an edge when the 50% sync point occurs.

The Sync Locked Oscillator consists of a $4 \times F_{SC}$ oscillator that is divided by four and harmonically locked to the edge output by the 50% Sync Detector.

Logic and Timing to control the oscillator is generated, based upon the burst-sync relationship of reference video. Also, field identification information is provided to the MPU for line select.

Finally, the burst-sync relationship of the reference video is determined. The Burst Phase Detector is part of the Reference Sync circuitry on Diagram 8.

Circuit Theory (Diagram 15)

Sync 50% Detector. Q1451, Q1548, and Q1450 form an inverting amplifier with a gain of 8. R1451 and R1448 determine the AC gain. U1455 and U1460 (sample-and-holds) sample the amplifier output at backporch and sync tip time. A resistive divider (R1552-R1558) derives a voltage halfway between the backporch and sync tip. This 50% level is stored on C1550. Q1551 (an emitter follower) buffers the voltage and feeds it to the amplifier input through R1450. This sets the 50% sync point at the amplifier output, which is approximately +3 volts.

Q1548, in the operational amplifier, saturates when the amplifier output drops below 0 volts. This saturated condition, coupled with the clamp feedback, is used to strip off large amplitude video that would otherwise break down the comparator.

U1357, Q1358, and Q1359 form a high-gain, low-offset comparator. Inverted video from the Clamped Amplifier is input through pin 2 of U1357D. A precision resistive divider consisting of R1556 and R1557 sets a DC level on the other comparator input that is a voltage corresponding to a point halfway between backporch and sync tip. R1455 nulls the input offset so that the comparator switches at the 50% sync point regardless of small sync height variations. R1458 and C1364 provide AC hysteresis. The comparator output is a positive-going, 5 volts transition at U1357B (pin 11) when the 50% point on the leading edge sync is reached.

Timing for the backporch and sync tip sample-and-holds (U1455 and U1460) is provided by a Sync Separator driving a Pulse Generator state machine, U1097. The Pulse Generator is a 9-bit subcarrier rate counter that is triggered by internal sync. It counts up until it reaches a terminal count, and then resets to wait for the next internal sync. U996 outputs 7 bits of the counter. U1097 outputs bits 8 and 9, the counter reset, and the decoding to make the sample pulses. All three sample pulses are nominally 3 s wide; the SYNC GATE pulse (pin 16) straddles the leading sync edge, /BP SAMP (pin 14) and /ST SAMP (pin 15) occur during backporch and sync tip time. A /VERT LOCKOUT pulse, from the SCH Phase and Timing (Diagram 14), is input to pin 19 of U1097 to inhibit backporch and sync tip sampling during the vertical interval.

SCH Sync Locked Oscillator. Q1092, C1091, and C1094 form a Colpitts oscillator that is series tuned by crystal Y1190 and varactor CR1288. C1194 is adjusted so that the oscillator runs at $4 \times F_{SC}$ when there is 5.5 volts on the varactor.

The oscillator output is divided by 4 with a Johnson counter internal to U990. The counter has four outputs that are 90° apart. These four signals drive a 4:1 multiplexer, also internal to U990, which is controlled by a flip-flop, U985 on Diagram 14, through pins 8 and 9. By controlling the multiplexer the F_{SC} signal output on pin 16 of U990 can be phase shifted in 90° increments.

In NTSC, there are 227.5 cycles of F_{SC} per horizontal line. Thus when the F_{SC} signal is sampled each line, the samples will differ by 180° from one line to the next. However phase shifting the F_{SC} signal by 180° from line to line provides successive samples that will be in phase. The counter and multiplexer in U990 provide the line rate phase shifting. In PAL a similar phase shift operation occurs, except that the shift is 90° per line.

The phase-shifted F_{SC} (F_{SC} feedback), output by U990, is latched (U995) and fed to a Phase Detector, U1287. U1287 and Q1293 form a Charge-Pump Phase Detector. The Phase Detector is gated on with a sample pulse from U1490A. The sample pulse begins with the trigger from the 50% Sync Detector and ends from 140 to 280 ns later when the F_{SC} feedback signal transitions positive. During the time the Phase Detector is gated on, current flows in and out of integrating capacitors C1287 and C1291. The direction of the current flow is controlled by the F_{SC} feedback signal driving U1287D pin 2. When pin 2 is low, 2 mA of current from the current source (U1287C) flows out of the integrating capacitors through the collector of U1287D (pin 5). When pin 2 is high, the current from U1287 is routed into a current mirror (Q1293) where it is multiplied by 3 and then added to the integrating capacitors. An equilibrium condition exists when the net charge transfer is zero; therefore, pin 2 will be low 3 times as long as it is high when the loop is locked. R1185 and the integrating capacitors, C1287 and C1291, form the loop filter that controls the phase-lock loop response. The net current flow into the loop filter produces the VCO control voltage, which controls the varactor (CR1288) through R1290.

In order to provide a fine phase adjustment for the Sync Locked Oscillator, U1397 provides a separate discharge path for the loop filter capacitors (C1287 and C1291). When the Sample Gate goes low, U1287B turns off and U1287A turns on. At the same time U1497B pin 8 goes low, turning on U1397D for one subcarrier cycle. This allows the current source (U1287C) to discharge the loop filter while U1397D is on. The amount of current flowing is dependent on the setting of the Fine SCH Adjust, R1281. When R1281 is adjusted to have its wiper near ground little or no current flows through this path; however, when the wiper is near the other end of the control, up to 2 mA of current flows from the loop filter capacitors back to the –12 volt supply. When charge is taken off the loop filter capacitors the duty factor on the charge pump will change; pin 2 will be high longer to restore the no net charge transfer condition. This retards the oscillator phase relative to the Sample Gate. Range of the Fine SCH Adjust is approximately 110°.

U1497B is a D-type flip-flop that generates a negative pulse ($\overline{Q}$) to turn on U1397 immediately after the Sample Gate again goes low. This flip-flop-generated TSC pulse is approximately 1 subcarrier cycle in duration.

Lock detection is done by U1497A, a flip-flop. When the loop is locked, the F_{SC} feedback signal (pin 2) will always be high when the Sample Gate (pin 3) transitions positive. Thus the output from U1497A (pin 5) will also be high. If, however, the loop is unlocked, the F_{SC} feedback signal will sometimes be low when the Sample Gate clocks U1497A. In fact it will be a 50% duty cycle square wave equal to the oscillator frequency error that will appear at pin 5. Q1396, which is normally off, now gets switched at this rate and charges C1394 through R1396 causing the emitter of Q1395 to rise toward 0 volts. This causes current to flow through R1397 and increase the charge pump constant current source, U1287C, by a factor of up to 4 ($4 \times$ loop gain). When the emitter of Q1395 reaches –4 volts, Q1397D is turned off, taking the Fine SCH correction out of the circuit. This aids lockup by removing any bias in the Phase Detector.

The time constant of R1396, R1494, and C1394 causes a gradual attack, very slow release on Q1395. If the Sync Locked Oscillator is near locking up, it may not be necessary to shut off the Fine SCH Adjust; a slight increase in gain (more current flowing in U1297) might be all that is required for lockup (no apparent shift in displayed SCH dots). If there is an apparent lock (lock detector true for a few lines), the loop does not revert to lower gain and bandwidth only to have to go back and search for true lockup.

Circuit Theory (Diagram 14)

Flywheel Counter. U975 and U977 form a 525 line (625 for PAL) flywheel counter. It is clocked by Ref H sync and is phased up in the frame by the V sync pulse. It automatically counts either to 525 (NTSC) or 625 (PAL) lines and then resets. U975A and B form a ripple counter that generates 8 bits. The two MSBs are generated by U977, which also contains the logic needed to output the Vertical Lockout that inhibits the DC Restorer for the video input circuits (Diagrams 1 and 2) and shuts off the backporch and sync tip sample-and-holds (Diagram 15) during the vertical sync time.

The other control signal output from the Flywheel Counter is the Field Chroma switch, which is used by the Vectorscope circuitry to multiplex the SCH and vector display when Vector + SCH mode is selected. The SCH display in this mode is turned on only during the vertical interval when no color information is present on the signal.

Color Frame Logic. U980 is a programmed logic array that makes signal generation decisions based on line count, from the Flywheel Counter, and sync and timing signals from other diagrams. U980 looks for the sync phase pulse (pin 17) going high on a particular line of the monochrome field to identify color field 1. (The 1781 also examines the +V burst phase to help with identification.) An NTSC frame pulse is output at pin 15 on field 4, line 261 (the PAL frame pulse is output on field 8, line 620) to phase up the flip-flops, U985. The

flip-flops drive U980 where a color field 1 pulse is output on pin 20 during line 11 (NTSC) or line 7 (PAL). The 1781 also outputs a Bruch frame pulse, on pin 21, during line 7 of fields 1 and 5. Both the field 1 and Bruch pulses are required by the MPU for line selection.

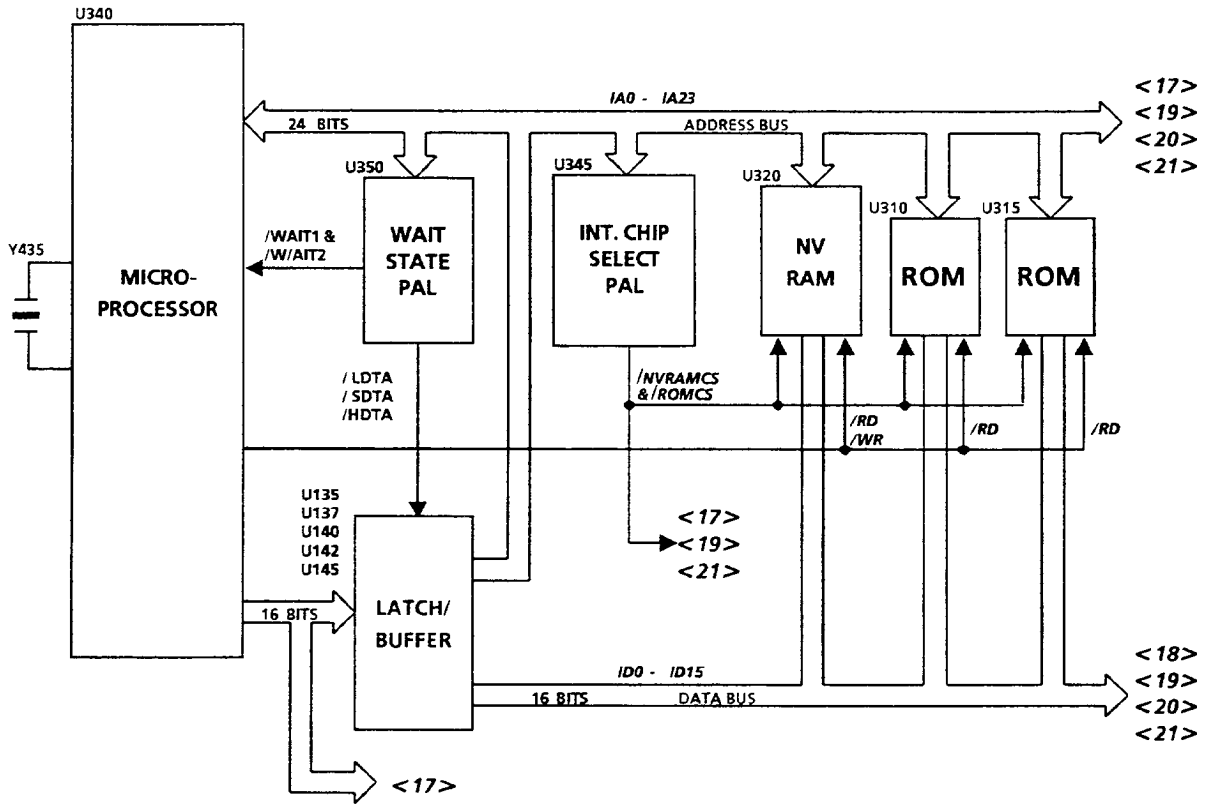
An internally-referenced NTSC SCH display can be set to display one (single) or two (double mode) by setting J1085. The double mode (two dots 180° apart) is more convenient for examining such things as color frame switching angle in processing equipment. Regardless of the jumper setting the display reverts to single dot display when an external reference is selected (Relative SCH mode). The single dot display is generated by blanking the Z-Axis at a line alternate rate. The switching is controlled by the FLD SCH BLK pulse on pin 22.

The 1781 FLD SCH BLK pulse (pin 22) blanks the SCH compass rose circle for 14 lines either side of the SCH dot.

Oscillator Phase Generator U985A and B generate pulses that are input to U990, on Diagram 15, to ensure that the Sync Locked Oscillator phase is correct. U980 outputs a color framing pulse that clears U985A and B just prior to vertical sync. Clearing these D-type flip-flops early allows the 1780R-Series to operate with VTRs that may be experiencing head dropout around the start of vertical sync.

Output of these flip-flops is also fed back to U980 to provide a true starting point for the field 1 pulse. U985A and B can be driven with an external field 1 pulse that is input through J870. Q970 and Q969 are a 7 μs half-shot to ensure that no matter what the external pulse duration the flip-flops will be cleared with a 7 μs duration pulse. J1081 controls whether an external pulse is required to clear U985A and B.

Diagrams 16 & 17 Master MPU, ROM & NVRAM



Overview

The Master MPU kernel consists of the NS32CG16 processor, running at 10 MHz, and its associated clock, memory, and buffering circuitry. Also included here are the Internal Chip Select and Wait State Generator PALs. The Master MPU is supported with 128K of Read-Only Memory (ROM), a Non-Volatile Random Access Memory (NVRAM), and 128K of Dynamic Random Access Memory (DRAM), shown on Diagram 17.

Circuit Theory

Microprocessor. The heart of the Master MPU system is the Microprocessor, U340, running at 10 MHz after the 20 MHz output of the crystal oscillator, Y435, is divided down. FCLK, which is derived from the crystal oscillator, is output to U361 (the Dynamic RAM control PAL) on Diagram 17. The Master MPU is reset at power up by U344 and a segment of R360 to allow the instrument power supplies to stabilize. It can be reset at any time by momentarily shorting J344. U535A and B is a 74LS74 flip-flop that provides metastable protection for the processor /INT and /HOLD signals.

The Master MPU normally does not use the Non-Maskable Interrupt (NMI) signal and it is held high by a pull-up voltage from one segment of R360. It can, however, be asserted for troubleshooting by placing a jumper across J342.

Latches. The Master MPU uses a multiplexed data bus and the lower 16 address bits are latched by external latches U135 and U137. The latches are actuated by an inverted /ADS signal which latches data during processor cycle T1. These two latches are normally active, but are tri-stated during Dynamic Memory Access (DMA) cycles by HOLDA. A series of pull-ups force address bits IA0 through IA3, IA13 through IA18, and IA23 to a high state during DMA transfers in order to retrieve readout engine data from the highest part of DRAM.

The Master MPU data also goes to a data buffer consisting of U140, U142, and U145, as well as to the DRAM data bits. This minimizes access time to the DRAM while maintaining strong bus drive for other peripherals. The three data buffers automatically swap data as necessary to provide a true 8-bit bus for the 8-bit devices and a 16-bit bus for the Read-Only Memory (ROM) and DRAM. A ROM or DRAM access will use both halves of the bus through U142 and U145. An 8-bit device such as the UART will use only data bits 0 through 8 from U140.

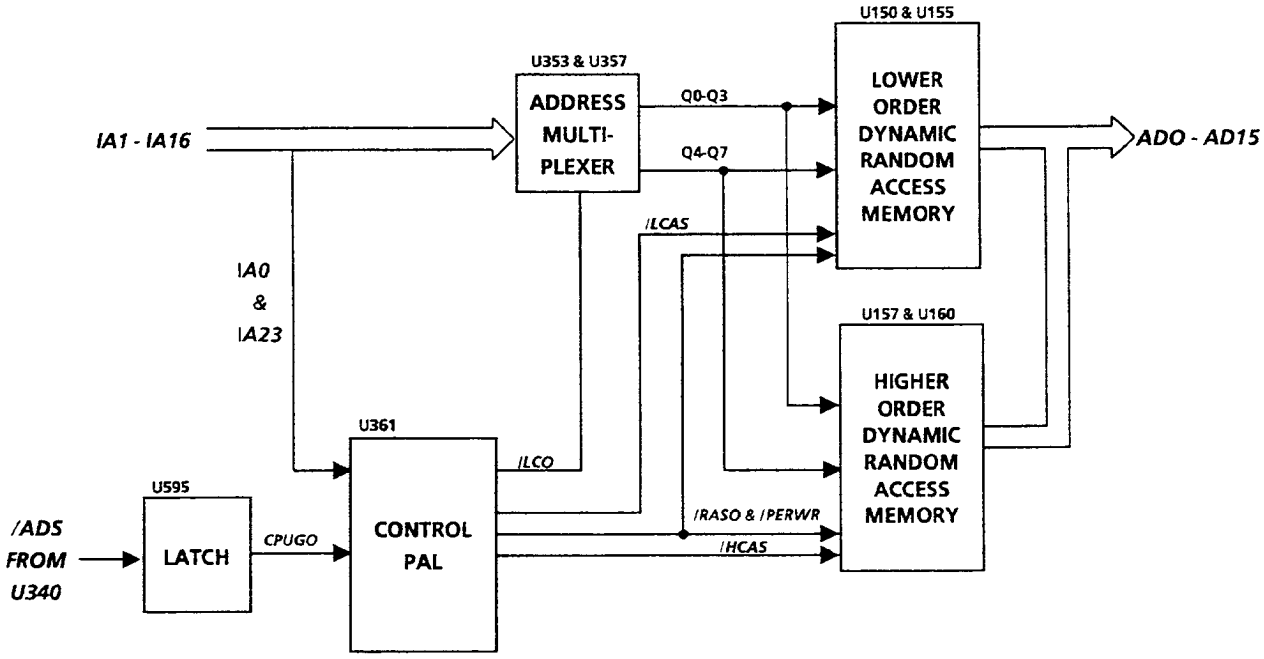
Wait State Generator. The data bus buffers and wait states are controlled by U350, a PAL automatically adding the proper amount of wait states for each type of device as well as controlling the three data bus buffers. This PAL also generates the unqualified chip select /LRC that is used by the Line Rate Controller (Diagram 18).

Internal Chip Select. The internal chip select PAL U345 creates the bulk of the chip select enables used by the internal peripherals. U345 also outputs an inverted /RSTO for the DRAM (Diagram 17).

ROM. The ROM consists of two 28-pin chips, U310 and U315. They are activated whenever a read to the ROM address space is made. A read to ROM causes /ROMCS to go low along with /RD.

NVRAM. The Non-Volatile RAM, U320, is selected whenever the NVRAM chip select is addressed for reads or writes. When chip select /NVRAMCS along with either /WR or /RD is activated, the chip can be written to or read from. Data in the NVRAM is safe even if instrument mains power is lost.

Diagram 17 Dynamic RAM



Overview

The Dynamic Random Access Memory (DRAM) is a 16-bit wide memory used by the readout engine for its instructions. The system consists of three major components; the memory array, an address multiplexer, and a control PAL. The memory array consists of four 4-bit architecture DRAM chips residing on a 16-bit bus.

The Master MPU accesses each address from IA1 through IA8 (256 values) once every 4 ms; the least significant bit (IA0) is not used as an address.

Circuit Theory

Address Multiplexer. The Address Multiplexer consists of two 74ALS158 (Quad 2-to-1 Multiplexers U353 & U357) that produce a combined set of RAS/ CAS enables for the memory chips. Quad NAND gate U450 is mounted on the circuit board but is not used in the current memory configuration. The order of addresses multiplexed is chosen so that the lower order addresses (IA1 etc.) are used as RAS addresses to allow for DRAM refresh by accessing a 512-word address space.

DRAM Control PAL. The heart of the DRAM control circuit is a PAL, U361. It provides all the timing signals for Master MPU and DMA accesses, along with reshaping the write enable (/PERWR) used by the external interface and the DRAM chips.

The Master MPU memory access sequence starts when /ADS goes low, forcing Master MPUGO to be latched high by U595A&B and start the PAL sequence. /RASO, which is in-line terminated by R361 and becomes /RAS, goes low to enable the memory chip RAS input. The row addresses must be stable at this time. 50 ns after /RASO goes low, /COL goes low and switches the address multiplexers, U353 and U357, from the row to the column addresses. In addition to switching the address, /COL going low resets the Master MPUGO latch.

If the cycle that is starting is destined for the DRAM, one of the two CAS lines goes low. /LCASO goes low if IA23 is high and IA0 is low and directs the cycle to the lower DRAM bank. /HCASO goes low when IA23 is high and /HBE goes low. /RPERW is used to write enable both of the DRAM arrays when it is low; however, only the bank with its CAS enabled can be written to.

At the start of the next Master MPU cycle, the /RASO line is raised, to allow for RAS precharge time, and the Master MPU latches data. /LCASO and /HCASO go high 50 ns after the Master MPU reads the data, to allow hold time while removing the data before the Master MPU again drives the data bus.

A Direct Memory Access (DMA) cycle is similar to a Master MPU cycle, except that two extra wait states are added to allow setup time for the D/A Converters. The Control PAL also does two complete cycles and sends two words to the readout engine. When control switches from Master MPU to DMA control, the Master MPU pulls /HOLDA down.

The PAL begins the cycle when /HOLDA and CTTL are both low. CTTL prevents metastable problems and keeps the PAL aligned with the T states of the Master MPU. When /HOLDA goes low ROEN/also goes low and signals the readout engine to place its address on the internal bus lines IA2..IA12. /CYC2 is also high at this time, signifying that the first of two cycles is beginning.

When the cycle begins, /RASO goes low and starts the DRAM cycle. The address lines must be stable prior to this point. The /COL line is dropped to switch from row to column addresses. Both /LCASO and /HCASO go low, completing the DRAM address sequence and activating the DRAM output buffers. /PERWR is forced high to ensure a read cycle. The Control PAL LATCH output goes low and is multiplexed (U457) to output Latch 1.

At this time the first of two wait states is inserted. No other outputs change during this period. When the second wait state occurs, /RASO is raised to start the RAS precharge period. When the first DRAM cycle begins to end, the LATCH signal goes high, latching data into the first D/A.

/LCASO and /HCASO go high to finish the first cycle. The next cycle begins when /CYC2 goes low and switches address IA1 from 0 to 1, and LATCH1 to LATCH2.

From this point on, the second cycle is identical to the first cycle. During the second cycle, the Control PAL enters a special idle state, where /ROEN goes

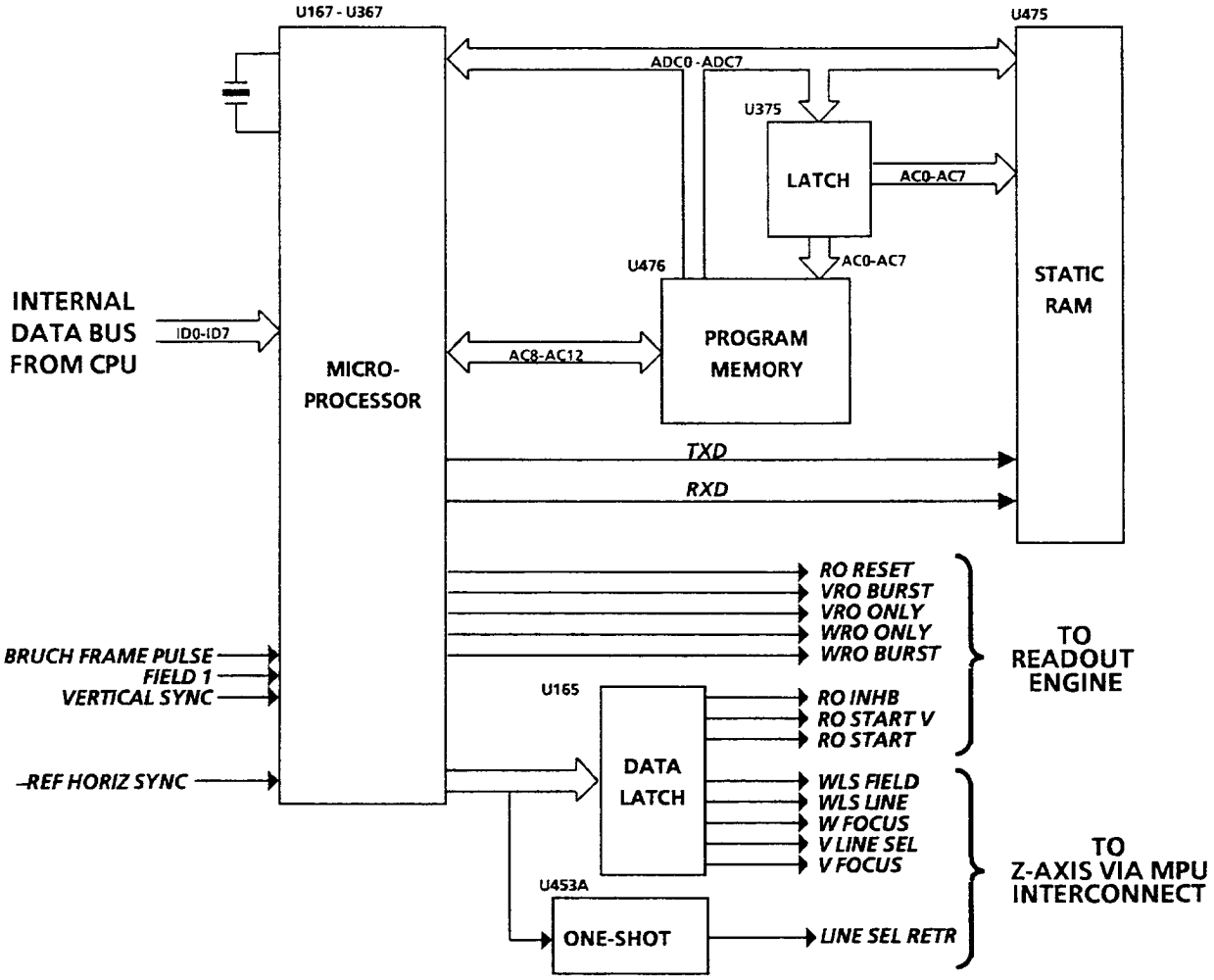
high to remove the readout engine's address from the bus. The Control PAL then waits until the Master MPU raises /HOLDA, signifying its return to bus control. At this point the PAL enters the normal idle state to wait for the first Master MPU cycle.

DRAM Memory. The DRAM consists of four identical 64K × 4 addressable memory chips. Each chip outputs 4 bits of the 16-bit memory word to the data bus AD. Each chip has row and column enable inputs along with a write enable.

As configured, U150 and U155 are the lower bank of the memory and are controlled by either the /RAS (which also controls the higher bank) or the /LCAS which is lower bank specific. U150 and U155 output data bits AD0 through AD7. U157 and U160 are the higher bank of memory and it also is controlled by the /RAS, but relies on the /HCAS to switch to column addresses and output data bits AD8 through AD15.

The circuit board contains mountings for 1M × 4 memory chips (U151, U156, U158, and U161) to support potential custom modifications, should more memory be required.

Diagram 18 Line Rate Controller



Overview

The Line Rate Controller provides real time control of the readout and line select functions for both the waveform monitor and vectorscope CRTs. It issues instructions to start, stop, hold, or skip readout. It determines if only readout is to be displayed, readout is to be sent in block or burst form with a return to video display, or if a sequence of two lines of video followed by two lines of readout will be executed.

The Line Rate Controller sequentially executes a stack just as a state machine does. The stack consists of 4-byte blocks of TaskData. TaskData consists of two bytes representing the video line number and two bytes to be sent to the Readout Engine and Z-Axis. The Line Rate Controller receives TaskData information from the Master MPU over the Internal Data (ID) Bus. The data is stored in the static RAM. There are two stacks in RAM, one that contains the TaskData that is

currently being used and a TaskData stack that is being built for a new line number selection, or a different line rate, etc. The two bytes that are actually TaskData consist of data bits that go to control lines (WLS LINE, WRO START, etc.) for the Readout Engine and Z-Axis at specific video line numbers. The Line Rate Controller keeps track of the actual video line number through the synchronization signals (V SYNC, –REF H SYNC, etc.).

Circuit Theory

Processor (U167, U367). The Line Rate Controller receives its information (TaskData) from the Master MPU Diagram 16 on the Internal Data Bus (ID0-ID7) and control lines /RD, /WR, /LRC, and data bit IA0. It has a protocol that consists of instructions for starting a TaskData list, loading the TaskData list, and ending a TaskData list.

Starting the TaskData list consists of Start TaskData ID byte followed by a Port 1 (P1.0 through P1.7) configuration byte, and Ports 4 and 5 (P4.0 through P4.7 and P5.0 through P5.7) initial state bytes.

The TaskData is sent in packets of 5 bytes each. The first byte is the TaskData ID byte. The next two bytes specify the video line number where the task is to be delivered. The last two bytes are data bits for the Readout and Z-Axis control (Ports 4 and 5). If the instruction is TaskData, the 4 bytes consisting of the TaskData and video line number are sent to the Static RAM, U475. If the instruction is a Start List instruction, the RAM pointer is reset to zero. If the instruction is an EndList, the loading of TaskData is complete. When TaskData is complete, a bit is set so that at the start of a new video frame the TaskData stack becomes the new operational stack.

Input Signals. The following signals are applied to the Line Rate Controller (Processor U167 and U367):

–REF H SYNC (T0, INT 0) are video timing pulses that are synchronous with incoming video. The negative edge occurs 1.5 μs after the edge of video and is 1.2 μs wide.

–REF H SYNC is used to count and synchronize the TaskData bits. It is applied to U367 through T0, which increments an internal counter. The counter keeps track of the actual video line number. The –REF H SYNC also drives the INT 0 input to interrupt the Line Rate Controller every line. When interrupted, the Controller checks the counter number against the current line number in the Static RAM, U475. If the counter and line number agree, the TaskData bits are sent to the Data Latch, U165. The next –REF H SYNC then latches the data to the output. When the data is latched out, the RAM pointer is incremented by four to point to the next TaskData item.

–REF H SYNC (pin 3 of U167), BRUCH Frame Pulse (pin 4), FIELD 1 (pin 5), and V SYNC (pin 6) are all used to synchronize the Line Rate Controller. In the All Fields, 2 of 4, or 4 of 8 field modes, V SYNC and –REF H SYNC

are ANDed together in U167 to produce a frame sync pulse. The frame sync pulse interrupts the Line Rate Controller and causes the line counter to be reset to zero, and resets the Static RAM stack pointer. In the 1781R 2 of 8 mode the BRUCH frame pulse provides the interrupt through U167. This is a negative edge signal that occurs on line 7 of field 1 and field 5. In the 1 of 4 and 1 of 8 modes, the FIELD 1 pulse is also a negative edge signal that occurs on line 7 of field 1 in PAL or line 11 of field 1 in NTSC.

The BRUCH Frame Pulse and FIELD 1 signals are enabled by P1.1 and P1.0 as part of the start TaskData that is sent to the Line Rate Controller over the Internal Data Bus. ID0-ID7, /RD, /WR, /LRC, and IA0 communicate bi-directionally with the Master MPU.

Output Signals. The following control signals are generated by the Line Rate Controller (Processor U367):

FIELD 1 ENABLE (P1.0), when set to high, enables the field 1 pulse for triggering (interrupting) the Line Rate Controller. For NTSC this occurs on line 7 of field 1 every four fields. For PAL this occurs on line 316 (third line of field 2) every eight fields.

BRUCH PUL ENABLE (P1.1), when set high, enables the BRUCH Pulse for triggering (interrupting) the Line Rate Controller. This triggering mode is only used for PAL and occurs on line 316 every four fields.

RO RESET (P1.6) resets the Readout Engine on Diagram 20. The Clear line goes high when RO RESET is active high to cause the Readout Control & Skip Instruction state machine to go to a known state (State A). RO RESET is normally executed on power up only.

VRO BURST (P4.0) informs the Readout Engine that the vectorscope is operating in line select mode. During readout, VRO BURST tells the Readout Engine to display all readout in the burst mode instead of 2 of 4 line mode.

VRO ONLY (P4.1) is used when the Vectorscope CRT is used to display readout only. This control line tells the Readout Engine to display all readout in the burst mode and not return the display control back to vectors.

VRO INHB (P4.2) is ANDed with WRO INHB (P5.4) to generate the RO INHB shutdown signal for the Readout Engine. When not in line select mode, VRO INHB is set to high. In line select mode, this signal line goes low and disables the Readout Engine one or more lines before the selected line. VRO INHB is held low until after the last selected line is displayed in the field. This control line then goes high so that the Readout Engine can start up.

VRO START (P4.3) is used to start the Readout Engine. If a Wait For Start (WFS at pin 17 of U385 on Diagram 20) is used, the VRO START signal

line allows execution of the instruction set to continue. By inserting one WFS per instruction set, the VRO START signal will control the refresh rate of the readout.

V UNBLANK (P4.4) controls the blanking of the Z-Axis for the vectorscope CRT. This signal control line is one of four signals applied to the 4-input NAND gate, U289A, on the Z-Axis Diagram 35. The NAND gate controls whether the vectorscope trace is displayed or blanked. Other signals fed to the NAND gate include /VECT READOUT EN and PHASE BLANK from the Readout Engine (Diagram 20) and /VECTOR BLNK (Vector Center Dot Blanking) from Diagram 27.

V UNBLANK enables the vectorscope trace when vector line select mode is enabled. When in line select mode, V UNBLANK is set low to blank the vectorscope trace. When set high, the selected lines are displayed.

When the vectorscope is not in line select mode, V UNBLANK is set high and the vectorscope trace display is controlled by other signals in the instrument.

V FOCUS (P4.5) and W FOCUS (P5.2) control the focus to the vectorscope CRT and waveform CRT, respectively. These signals are active low for the line select mode during 1-, 2-, or 3-line sweeps, but are not activated during 15-line or field rate sweeps. During field rate sweeps and when not in the line select mode, these lines are set high.

V SKIP WRO (P4.6) is used to skip the waveform CRT readout instruction set and execute the vectorscope instruction list. This control line is used in field sweep modes to allow the vectorscope display to be refreshed at a 60 Hz rate while the waveform display is updated at a 30 Hz rate.

WLS LINE (P5.0) controls the blanking of the Z-Axis for the waveform display. This signal control line is one of four signals applied to a 4-input NAND gate, U289B, on the Z-Axis Diagram 35. The NAND gate controls whether the waveform trace is displayed or blanked. The other three signals fed to the NAND gate are: /WFM READOUT EN and WFM BLANK EN from the Readout Engine; /RY SCH BLNK from pin 19 of U226 on Diagram 42.

WLS FIELD (P5.1) controls the intensification of the selected lines in line select mode when the field sweep mode is selected for the waveform display. This control signal line is set low for the selected lines in field rate sweeps. When not in line select mode or not during field rate sweeps, WLS FIELD goes to the high state.

WRO START (P5.3) is used to start the Readout Engine. If a Wait For Start (WFS) is used in the readout instruction list, this signal control line allows execution of the readout instruction list to continue. Normally this control line is held high and then pulsed low to signal the Readout Engine.

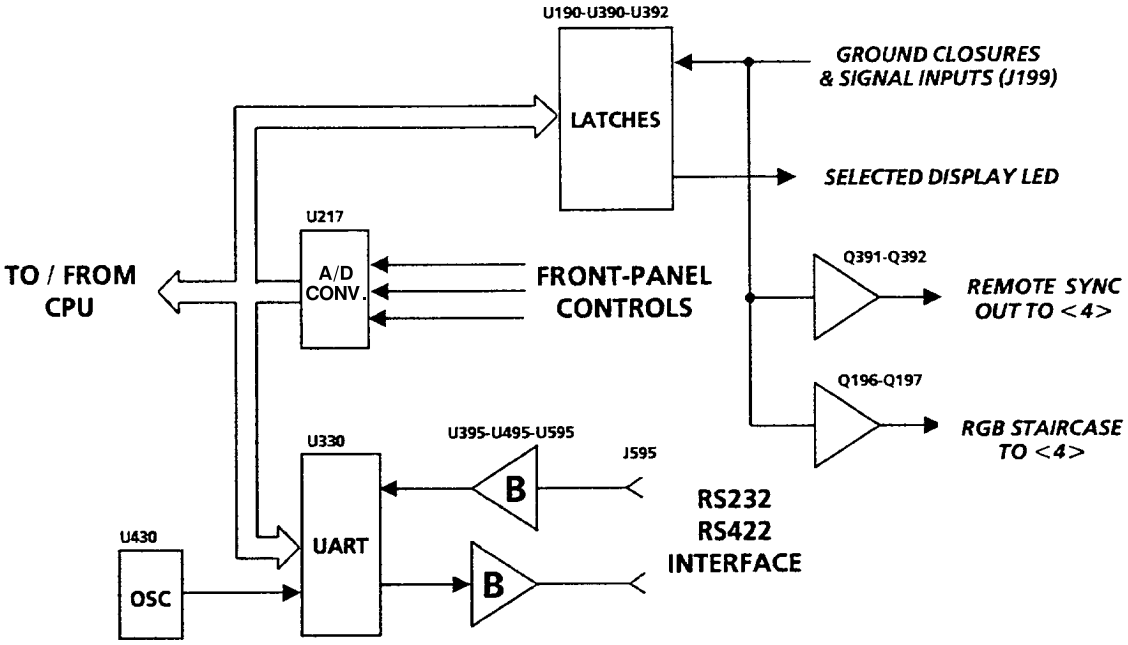
The output of the WRO START LINE is wire ANDed with the VRO START to provide an RO START control line at pin 12 of U165.

WRO INHB (P5.4) is wire ANDed with the control line from pin 7 of U167 and fed to the one-shot, U453A. the LINE SEL RETRACE at the output of U453A rephases the Sweep Generator to the video in 2-line and 3-line sweep modes. U453A sets this control line high a number of lines prior to the selected line for line displays.

WRO ONLY (P5.5) is used when the waveform screen displays readout only. WRO ONLY tells the Readout Engine to display all readout during the burst mode and not to return the display control back to the waveform display.

WRO BURST (P5.6) informs the Readout Engine that the waveform monitor is operating in the line select mode. Readout occurs during burst mode (instead of 2 of 4 line mode).

Diagram 19 UART & A/D



Overview

The Universal Asynchronous Receiver/Transmitter (UART) has both RS-232 and RS-422 buffers for communication between the Master MPU (Diagram 16) and external peripherals. By using two buffers and internal terminations it is possible to use a single rear-panel 9-pin, D-type connector for both interface standards.

The A/D Converter changes the 16 analog potentiometer signals into 8-bit digital bytes for use by the Master MPU.

Also included on this diagram are the Remote Sync and RGB Input Amplifiers.

Circuit Theory

UART. U330 is a dual UART that runs at a clock frequency of 3.6864 MHz. It is configured as an 8-bit peripheral activated whenever the Master MPU addresses the UART address space. The chip select /UARTCS (from the Master MPU) is the chip enable (CEN) for the UART. The /RD and /WR determine the type of communication between the Master MPU and the connected external peripheral. The clock signal is generated by U430, a CMOS oscillator.

The remainder of the circuit consists of U495, an RS-232 buffer, and U395, an RS-422 buffer. The receive outputs from these parts are NANDed (by U595C) and input to the UART RXDA (Read External Data). This allows either an RS-232 or RS-422 device to be connected to rear-panel J595, without having to reconfigure the UART input. R393, R391, and R392 are a 120 Ω termination for the RS-422 line which bias it to the inactive state when there is no connection to

J595. Pins 7 and 8 of U495 go to connector J495. This connector is used by the factory to connect to peripheral equipment when developing software.

A to D Converter. The A/D Converter, U217, combines a 16-bit analog multiplexer with an 8-bit A/D Converter. The multiplexer is set by accessing the ADMUX address region to activate the /ADMUX strobe. The least significant 4 bits of the address (IA0..IA3) are used to set the multiplexer to 1 of 16 values. Using the address lines instead of the data lines provides adequate setup and hold times. Once the multiplexer is set, it requires 2.5 μs for the output to stabilize on the MUX OUT line. MUX OUT is low-pass filtered (R315 and C315) to remove high frequency noise and then input to the converter COMP IN.

The converter is started by the MPU writing to the ADCS address, which activates the /ADCS chip select. U120C ANDs /ADCS with /WR and inverts the result to produce an active high START pulse. 10 μs after the START pulse, the End Of Convert (EOC) line goes low and stays low until the conversion is completed. When the conversion is complete, EOC returns to high. EOC can be read by the Master MPU as one of the miscellaneous input bits.

I/O. In order to provide an external ground closure interface, miscellaneous input bits are connected to one of two multiplexers, U190 and U390, which allows for a maximum of 16 input bits from J199, S385, or U217. When the bits are read, the Master MPU does a read to the MISC address region, which activates the /MISCS chip select. For reads, U130 (a PAL) qualifies this with /RD to produce the active low /MRDCS. When /MRDCS is low, the multiplexers place their data on the Internal Data (ID) Bus. The least significant address bit (IA0) is used to select the A or B side of the multiplexers.

S385 controls three of the B inputs to U390, allowing ID1, ID2, and ID3 to be set for specific functions when IA0 goes high to select the B inputs of U390.

Output bits, to control front-panel indicators, are set by writing to output register U392. It is cleared at power-up by the Master MPU-generated /RSTO signal. Bits are set in the register when the MPU writes to the MISC address region. U130 qualifies the /MISCS signal with /WR to produce /MWRCS. The rising edge of /MWRCS latches the least significant 6 bits of the data bus (ID0..ID5) into the register.

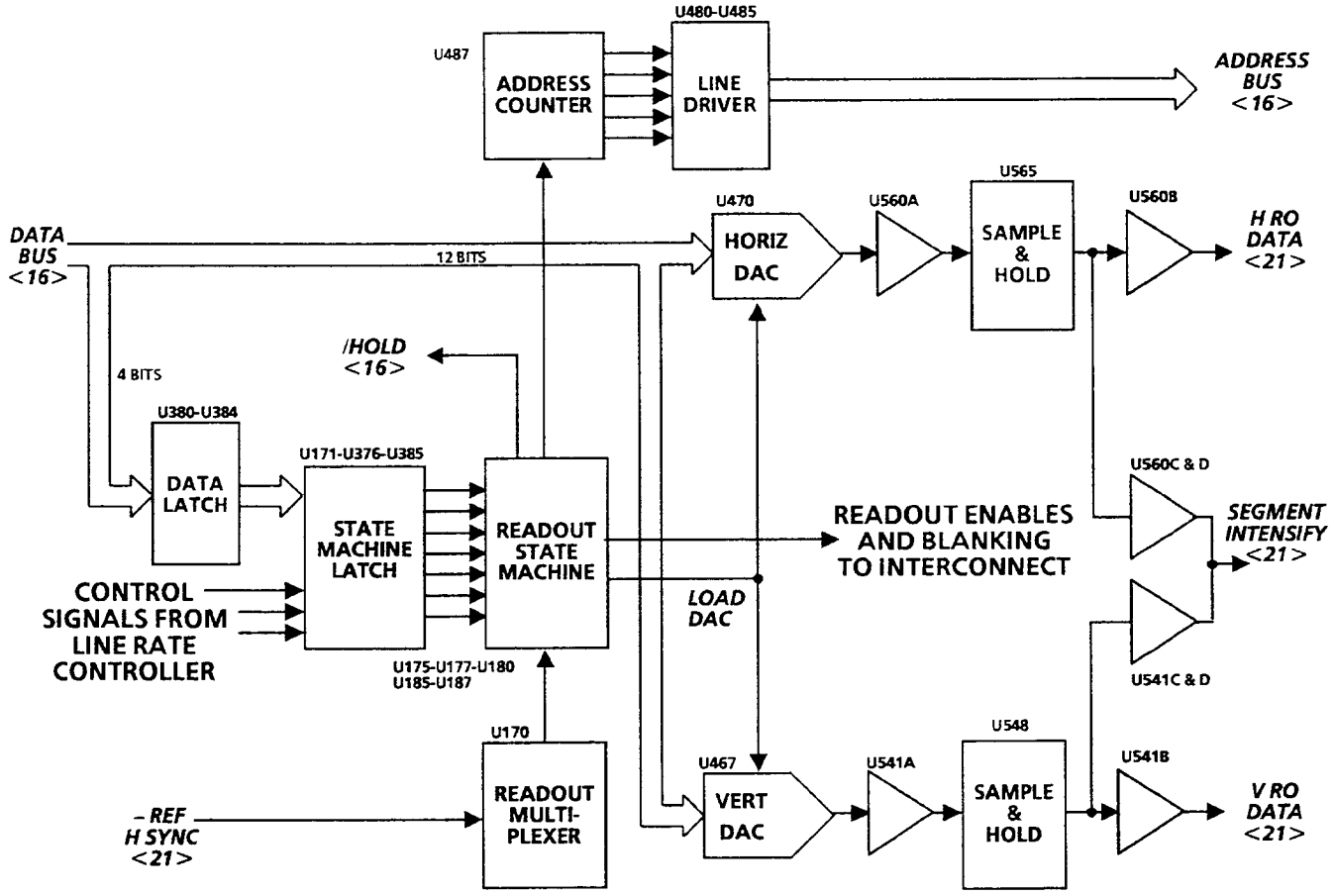
The least significant output of U392 is connected through a dropping resistor, R390, to the diagnostic LED, DS491. A low on this bit turns on the LED. Bits 1 and 2 are connected through R491 and R492 to front-panel LEDs R0 and R1. A low on these bits turns on the LED. The upper three bits of the register are not used.

Remote Sync. A 2 to 5 volt, 25 or 50 Hz (PAL) or 30 or 60 Hz (NTSC) square wave input to Q391 will synchronize the Field Sweep Gate (Diagram 10) to

provide a 2-field sweep. Remote sync is AC-coupled with an input impedance of approximately 1 MΩ. Q392 is a switching transistor that is turned off when Remote Sync Enable is present and saturates when there is no enable present. Remote sync polarity is selected by changing a plug-jumper on Diagram 9.

RGB Amplifier. The RGB staircase signal from the rear-panel REMOTE connector drives an operational amplifier composed of Q197 and Q195. The amplifier is compensated for optimum step definition by C195 (RGB Comp). A DC level can be adjusted out by R194, the RGB Offset adjustment.

Diagram 20 Readout Engine & Read Output



Overview

The asynchronous Readout Engine outputs the readout characters that are displayed on the vectorscope and waveform monitor CRTs. Digital data from the Dynamic RAM is converted to an analog output for display. The D/A Converters are loaded from the Internal Data (ID) Bus and output the analog signal to sample-and-hold circuits for display on the CRTs. The heart of the Readout Engine is a state machine made up of five PALs. State machine operation is controlled by the 4 most significant bits (MSBs) from the Internal Data (ID) Bus, and control signals generated by the Line Rate Controller, Diagram 18.

Circuit Theory

Data Latch. The 4 MSBs of data from the Dynamic Random Access Memory (DRAM) are input to a Data Latch consisting of U380 and U384 (positive edge triggered D-type flip-flops). U380 and U384 are individually triggered by the /Latch 1 and /Latch 2 outputs from the DRAM (Diagram 17). /Latch 1 is used for vertical readout; /Latch 2 for horizontal readout.

State Machine Latch. The 4-bit output of the Data Latch is input to the State Machine Latch (U171, U376, and U385). In addition to the outputs from the Data Latch, control signals from the Line Rate Controller are latched by the State Machine Latch at a 500 kHz rate to control the Readout State Machine.

Readout Multiplexer. U170 is an up/down counter that is load enabled by its own BO (Borrow Out) output forming a divide-by-7 counter that is clocked by the -H Ref sync pulse. Pin 6 (QC output) selects readout for four horizontal lines and waveform for three horizontal lines.

Readout State Machine. The Readout State Machine consists of five PALs (U175, U177, U180, U185, and U187). The first portion of the state machine cycle pulls HOLD/ low to force the Master MPU to relinquish control of the Internal Data (ID) Bus (within 2 μs). When the Master MPU relinquishes control, the DRAM Controller (Diagram 17) asserts /ROEN in order to output a readout address on internal address lines IA2..IA12. The address must be active and stable no later than 75 ns after the falling edge of /ROEN or an error will result. The four highest address (IA14 through 17) are set high at the input of Line Driver U485.

Once the addresses are received the DRAM Controller enables two read cycles with suitable timing for the DACs, U470 and U487. The first word of data is latched on the rising edge of LATCH1, with the second word latched on the rising edge of LATCH2. /ROEN is removed at this time and no further addresses are put on the Internal Address Bus.

The Readout State Machine ends the cycle by setting /HOLD high immediately after the rising edge of LATCH2.

DACs. U470 and U487 are 12-bit Digital-to-Analog Converters that are loaded from the Internal Data (ID) Bus; the 4 MSBs are not used. The Load (/LDC) is from the state machine. Write enables (WR) are provided by the /LATCH signals from the Line Rate Controller. /LATCH1 write enables the horizontal DAC, U470, and /LATCH2 enables the vertical DAC, U480. The analog outputs drive sample-and-hold circuits, U560A and U565.

Address Counter – Line Driver. The Address Counter (U487) starts when the increment from U185 goes low. It is reset when the clear from U185 goes high. The count is input to the Line Driver (U480 and U485) to output an address on the Internal Address Bus when the DRAM Controller sets /ROEN low.

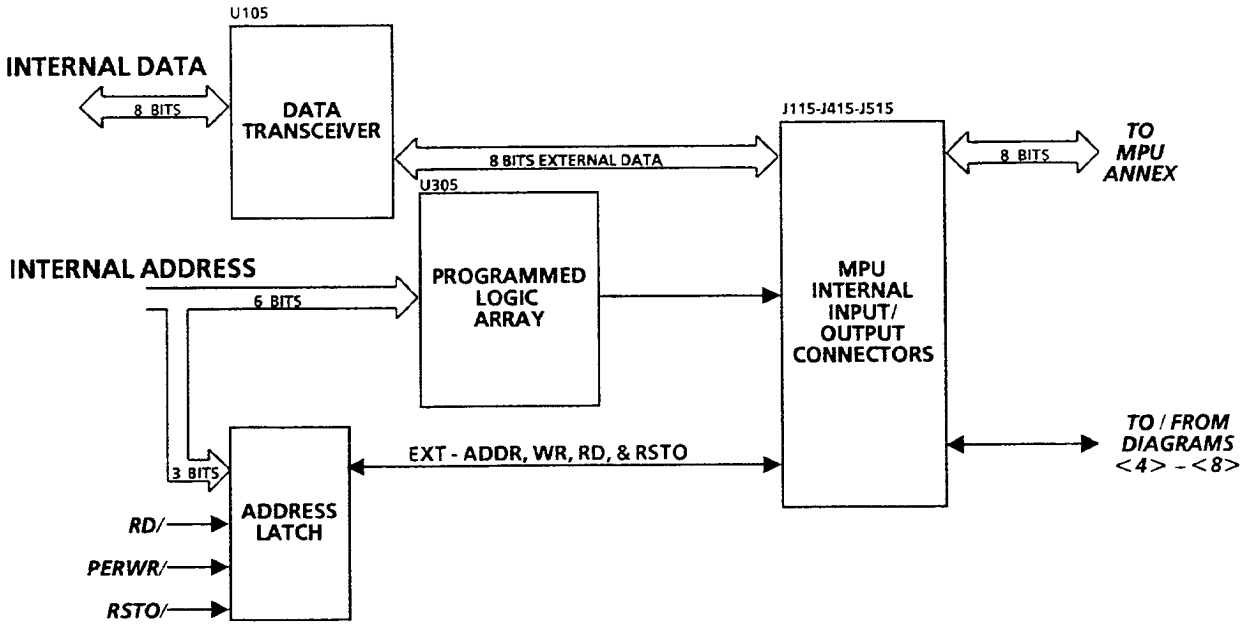
Sample-and-Holds. U560A and U565 form the Vertical Sample-and-Hold circuit. U560A is connected to compare the output signal to the DAC output. Its gain is unity, with the output driving the sample-and-hold (U565) input. The input signal is sampled and the level stored on the Hold capacitor (C465) on the rising

edge of the /Sample RO from the Readout State Machine. U560B drives the Vertical Output Amplifiers of the CRTs; R555 (V Shape) is a gain control.

U560C and D, which are also driven by the sample-and-hold output, provide an increase in drive to the Z-Axis Amplifier when readout segments or cursors are being displayed.

Horizontal Sample-and-Hold operates in the same manner, except that the gain is 2 (instead of unity) in the comparator circuit.

Diagram 21 Interconnect



Overview

All inputs to and outputs from the MPU circuit board are through the Interconnect. There are two connectors on the MPU Interconnect, one that ties into the 1780R-Series main Interconnect circuit board, and one that serves as the I/O for the MPU Annex board.

A transceiver is the bridge between the Internal Data (ID) Bus and External Data (ED) Bus used by circuits not on the MPU circuit board (including the MPU Annex board).

Three Internal Addresses (IA) are latched off the board and become External Addresses (EA) used as control signals on four other circuit boards.

Circuit Theory

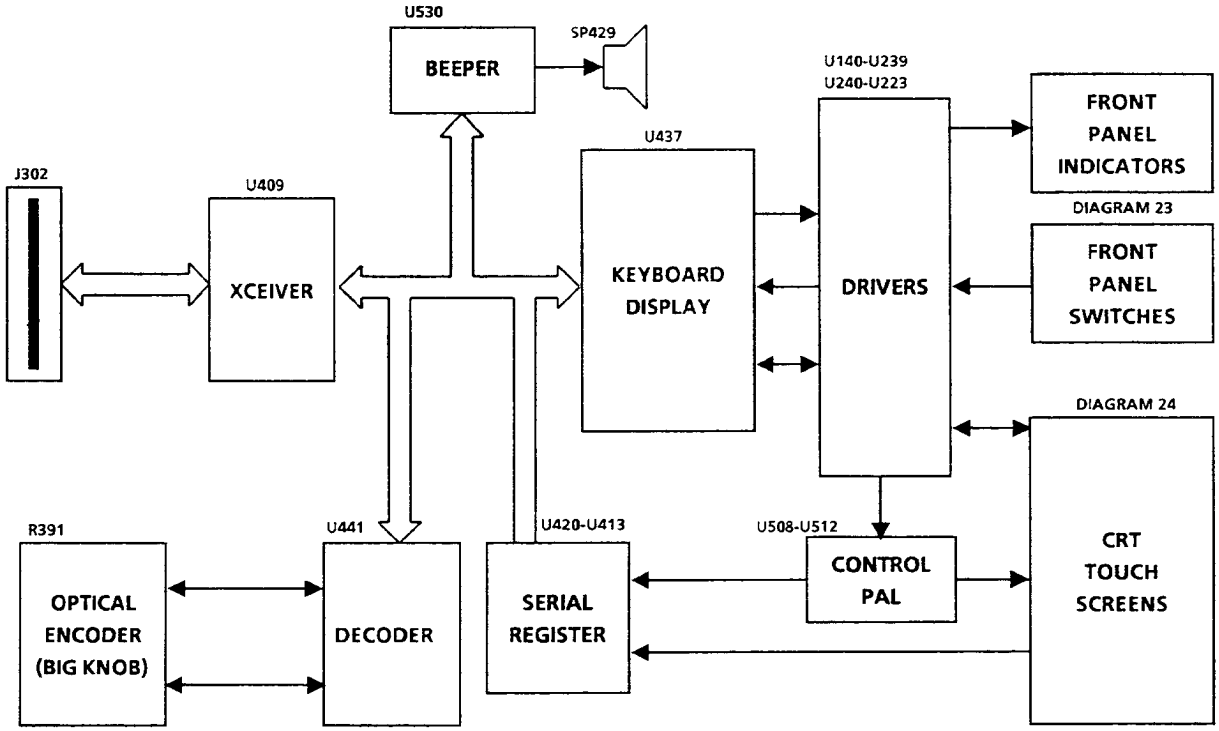
Data Transceiver. U105 is the I/O to the External Data Bus. It is a tri-state device conducting A-to-B, B-to-A, or nonconducting depending on the /G and DIR inputs. /G must be low for the transceiver to conduct in either direction. When DIR is low it conducts from B-to-A and when high it conducts from A-to-B. Direction of communication is controlled directly by the Master MPU (Diagram 16) /DDIN. It is enabled by the /EXTDBE from U305, the Interconnect Control PAL.

Programmed Logic Array. U305 outputs clock signals, enables, and control signals that augment the Internal Data (ID) Bus. Input signals to the array are read (/RD) and write (/PERWR), Data Bus Enable (/DBE), and the six least significant bits from the 24-bit Internal Address (IA) Bus. The Annex Data Bus

Enable (/ANDBE) controls communication with the circuitry on the Annex circuit board.

Address Latch. U101 is a tri-state device conducting A-to-B only because G is tied low and the DIR tied high. It outputs three External Addresses (EA0-EA1-EA2) used as controls on the Waveform, Oscillator, Z-Axis, and Filter circuit boards. In addition, it outputs the External Read (/ERD), Write (/EWR), and Restore (/ERST0) used to time the Keyboard/Display circuits on the Annex circuit board.

Diagrams 22, 23, & 24 MPU Annex, Front Switch Panel, & Touch Panel



Overview

Circuits on the Annex circuit board (Diagram 22) tie the 1780R-Series data bus to the front-panel switches, touch screens, indicators, and the Optical Encoder. Data transactions to and from the Master MPU are through a bi-directional transceiver. Two-way communication with the front-panel switches and indicators along with the CRT touch panels is through the Keyboard Display driver and non-latched interface.

Optical Encoder output is decoded into a digital data stream and put on the bus. Audio feedback, when the Optical Encoder is turned or when some of the switch functions are activated, is provided by a speaker on the Annex circuit board.

Circuit Theory

Data Transceiver. U409 is the I/O to the External Data (ED) Bus (MD0MD7). It is a tri-state device conducting A-to-B, B-to-A, or nonconducting depending on the /G and DIR inputs. /G (/ANDBE from U305 on the Interconnect, Diagram 21) is low for the transceiver to conduct in either direction. When DIR (DDIN/ from the Master MPU, Diagram 16) is low it conducts from B-to-A, and when high it conducts from A-to-B.

Keyboard Display. U437 is a Programmable Keyboard/Display Interface tying the data bus, from the MPU, to the front-panel drivers. Chip Select (CS) from the

MPU enables U437, Read (RD) enables the buffers to read from the bus, and Write (WR) enables the buffers to write to the bus. RL0-RL7 are data inputs from the Front Switch Panel (Diagram 23) and Touch Panel (Diagram 24). SL0-SL3, OA0-OA3, and OB0-OB3 are outputs to the Front Switch Panel (Diagram 23) and Touch Panel (Diagram 24).

Drivers. U338 is a 3-line to 8-line decoder used to decode SL0-SL2 in order to provide 1 of 8 mutually exclusive column select signals for the front-panel drivers. Row information to complete the switching matrix of the Keyboard/Display is returned to R0-R4. CR106 through CR113 in the SCANL lines from U338 prevent false imaging when multiple switches are pushed.

U140, U239, and U240 are high power cathode drivers for the front-panel indicators (LEDs) and the touch panel LEDs. Anode voltage for the LEDs is provided by U223. U210 regulates the 12 volt supply to account for the changing current requirements of the front-panel LEDs; without an external regulator the LEDs would dim and brighten according to the number lit. Up to eight LEDs can be lit by one select line. R208 through R215 provide current limiting. Resistor values for the front panel and the touch panel are different, because the touch panel LEDs are lit in pairs, not singly.

Control PAL. U508 outputs the TP0 and TP1 (TANOD1 and 2 enables for U223) and a LATCH signal to clock the Serial/Parallel register. The cycle starts with BDL from U437 going high. BDL is inverted (U520C) and input to U508 and at the same time resets counter U512. U512 counts up to 256. When both count 64 and count 256 are high TP0 goes high and U223 outputs TANOD1 to the Waveform Monitor touch panel. The delay of 256 clock cycles is required to ensure that each LED is read at 50% duty cycle which increases the touch panel noise margin. BDL cycles a total of eight times in order to read all eight LEDs on the CRT touch panel. Each time a touch panel LED is read its state is output (TP OUT), inverted (U520A), and input to serial input of the Shift Register (U420).

After eight cycles the LATCH output of U508 goes low in preparation to scan the Vectorscope touch panel. When LATCH goes high the cycle starts over again with TP1 alternately going high and low for eight cycles to read the Vectorscope touch panel LEDs and input the data into its Shift Register (U413). After two complete cycles the LATCH data from both touch screens is contained in the serial register of the Shift Registers.

On the second LATCH transition, data from the serial registers is transferred into the parallel registers of U413 and U420. The Master MPU reads the touch panel information from U413 when a read instruction is sent to the CSTPL address and A0 is low. U420 is read when A0L (from U508) goes low along with the read to CSTPL.

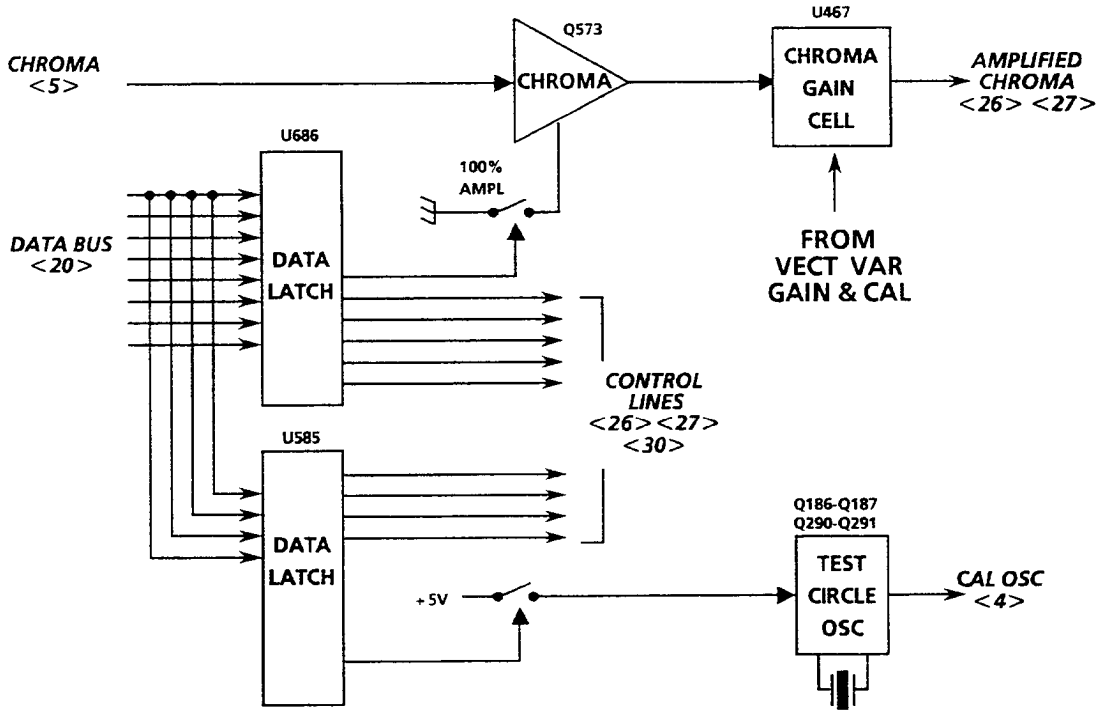
Rotary Encoder / Decoder. U441 is the decoder for the optical rotary encoder on the touch panel. U441 compares the current inputs to CHA and CHB to the previous reading and, if there is a difference, starts an up/down binary counter. The counter output is transferred to an output register for the Master MPU to read. The SEL input is held high to set the register to 8 bits.

Beeper. U530 is a timer connected in a multivibrator configuration. Its output, pin 3, drives a piezoelectric transducer. When Q2 of latch U531 is low, U530 is held off. The frequency of the multivibrator is controlled by Q3 and Q5 from the latch. The latch is clocked when both WRL and CSREL inputs to U310C are low.

Front Switch Panel. (Diagram 23) Switch closures couple SCANL0 through SCANL7 to RL0 through RL2, which is read by the Keyboard Driver on the Annex, Diagram 24. LEDs on the front touch panel are matrixed with the +voltage on the FANODE (0-4) lines and the cathodes connected to the FCATH (0-7) lines.

Touch Panel Output (Diagram 24). U288 is a 1 of 8 binary converter. Switching is controlled by the SL0, SL1, and SL2 lines from the Annex circuits. The X output of U288 is a serial output that drives the Touch Panel Output Amplifier. The output of U297 is the TP Out signal to the Serial Parallel Shift Register on Diagram 22.

Diagram 25 Vectorscope Input & Gain



Overview

The Data Latches decode the Vectorscope operating instructions from the Master MPU. Two of the circuits controlled by these instructions, Chroma Amp and Test Circle Oscillator, appear on this schematic. The Test Circle Oscillator is a crystal-controlled oscillator running at F_{SC}.

When the Chroma Amplifier is switched in, gain in the Chroma Gain Cell is reduced by 25% to allow 100% amplitude color bar excursions to fall within the graticule targets.

The Vectorscope Gain Cell controls chroma amplitude in response to the setting of the Vector Gain Cal and Vector Variable Gain.

Circuit Theory

Data Latches. U585 and U686 are rising edge triggered, multiple D-type flip-flops, with negative clear, operating as data latches. Data, from the Microprocessor, is applied to the D inputs of both flip-flops and clocked through on a rising clock transition to be held until either a new Clock or a Clear (from the Master MPU) occurs. U585 has complementary outputs making it possible to generate high or low asserting control signals for the associated Vectorscope circuitry.

Chroma Amp. U486D is one section of a dual-in-line package (DIP) of switches that closes on a low control input (pin 16) and opens on a high. When the switch is open, Q573 turns on and parallels R566 with a network made up of C570, R571, and R568 to lower the Gain Cell gain by 25%. Lowering the gain scales the signal to the Vectorscope graticule, which allows the targets normally associated with 75% amplitude color bars to be used for 100% amplitude color bars. C570 compensates for difference in phase response between the two gain settings. R568 is a gain set for 100% color bar amplitude.

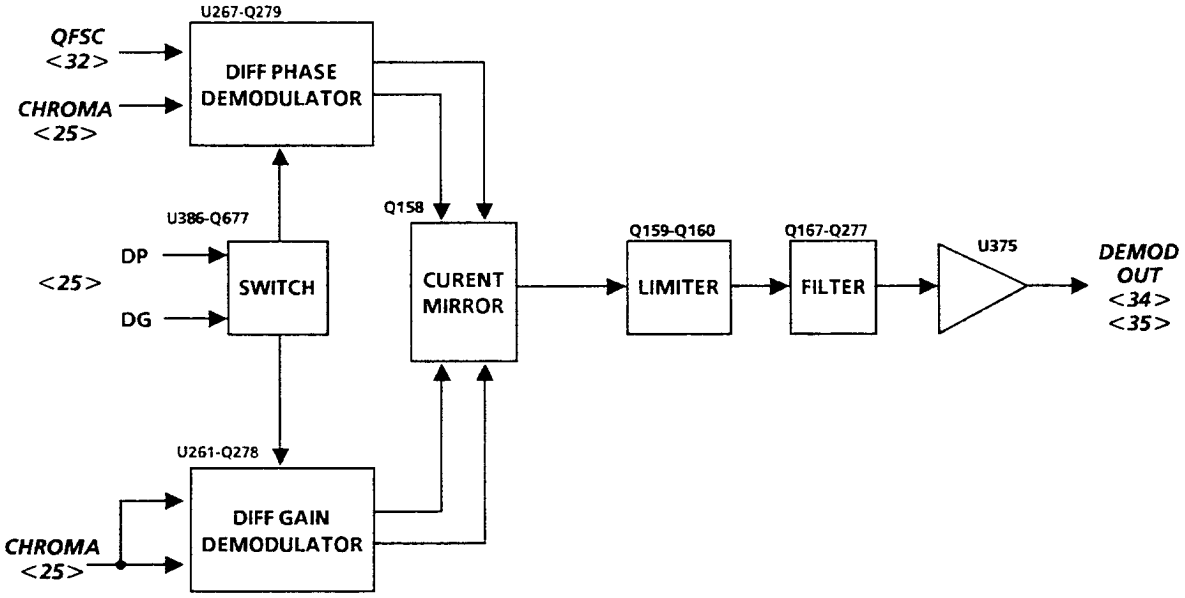
Vectorscope Gain Cell. U473 is an operational amplifier whose positive input is voltage driven from the Vector Gain voltage, which is the sum of the Vector Gain Calibration and the Variable Vector Gain. The voltage at the output of U473, in conjunction with R469, R470, and constant current source Q467, determine the current split in the two halves of dual-transistor Q468. The difference in current between the two transistor halves determines the voltage difference between pins 8 and 10 of U467. Chroma Gain Range, R572, is adjusted to set the minimum gain of the front-panel variable VECTOR GAIN control.

Chrominance input (J574) to the Gain Cell is AC-coupled chroma (C573) from the chrominance filter (in the Waveform Monitor) that inputs to pin 4 of U467. Q459 and Q462 form a level setting transconductance amplifier that turns the Gain Cell double-ended current output into a single-ended chrominance voltage output.

Test Circle Oscillator. U486B is another section of the DIP switch. When the CAL OSC EN from the Data Latch goes high, the switch opens and allows Q291 to conduct and draw current through Y195. Y195 dictates the frequency of the oscillator and is selected for the color standard that is being decoded. Q186 and Q187 form a high gain amplifier stage. Q290 is the output clamp and provides the feedback to control the bias of Q291 to close the loop.

Cal Osc signal processing and switching occurs on Diagram 4 (Input & Reference Selection), with the Cal Osc signal routed back through the chroma filter (Diagram 5 – Difference Amp and Video Filters) and input to the Gain Cell when Test Circle is selected.

Diagram 26 Diff Phase/Gain



Overview

The Differential Gain and Phase Demodulators change a subcarrier rate signal into DC currents proportional to chroma amplitude (gain) and phase. The resultant current is limited (to prevent driving down-stream amplifiers into limit), filtered (to get rid of high frequencies), and amplified to produce the DEMOD out signal for the dP/dG Alternate Mode switch (Diagram 34) and the Recursive Filter (Diagram 35).

Circuit Theory

Differential Phase Demodulator. U267 is a balanced demodulator used to recover the differential phase product. Its signal inputs are driven by chroma whose amplitude is set by the Gain Cell on Diagram 25. The demodulator gain is set by the value of R367, which is physically located between pins 2 and 3.

When Differential Phase Measurement is selected Q279 saturates. R273, along with a resistor and diode internal to U267, sets the current into pin 5 at approximately 5 mA. This causes 5 mA of DC current to flow into both pins 6 and 12.

The cross-coupled, emitter-coupled output stage of the demodulator is turned on and off by the quadrature phase signals (QFSC1 and QFSC2) from the Digital Phase Shifter (Diagram 32). Output signal current will be alternately inverted from the input chroma signal, at a subcarrier rate, which produces the desired multiplication. The output currents from pins 6 and 12 drive into a current mirror that is shared with the Differential Gain Demodulator.

The DP Zero adjustment, C172, provides a small amount of delay to the switching signal in order to have the demodulator timed to the R-Y Demodulator (Diagram 28).

Differential Gain Demodulator. U261 is a balanced demodulator used as an envelope detector that multiplies the input chroma by itself to come up with a DC current proportional to the input chroma amplitude. The signal and switching inputs are driven by chroma, whose amplitude is set by the Gain Cell on Diagram 25. The demodulator input gain is set by the value of R359, which is physically located between pins 2 and 3.

The demodulator is enabled when Q278 saturates, causing 5 mA of current to flow into pin 5. The DC voltage on pin 5 is approximately –8.7 volts when Q278 is on. The output of the demodulator is an amplified, full-wave-rectified version of the input chroma. The DC component of this signal is proportional to the chroma amplitude.

The Differential Gain Demodulator produces a large DC component at the output of the current mirror. Q265, a current sink, is turned on when Q278 is turned on to remove this component and place the trace at center screen when the chroma amplitude is correctly set (chroma vector at the vectorscope compass rose). The amount of current drawn off is nominally 2.2 mA, and is set by R167 (DC Offset).

Current Mirror, Limiter, Filter, and Output Amplifier. Q158 is the current mirror providing a single-ended output of a differential current input. Pin 12 of both demodulators is directly connected to the output of the current mirror, while pin 6 of both demodulators is connected to an inverting input. This inverting and adding of one input current gives the stage an effective gain of 2. When the output currents are balanced, R163 and R164 set the voltage level out for Q158 at approximately 6 volts.

Q159 and Q160 are emitter followers configured as a diode limiter. The base of Q159 is set to 5.6 volts and the base of Q160 at 6.4 volts. When the demodulator output currents are unbalanced the voltage level on the limiter emitters changes. For example, when the demodulator pin 6 current is higher than that on pin 12 (output in the direction of R-Y) the emitter voltage rises. When the emitter voltage reaches approximately 7 volts, Q160 clamps the signal so that it can not drive the following stages into limit. Conversely, if pin 6 current is lower than the demodulator pin 12 current, the emitter level drops and Q159 will clamp when the signal reaches +5 volts.

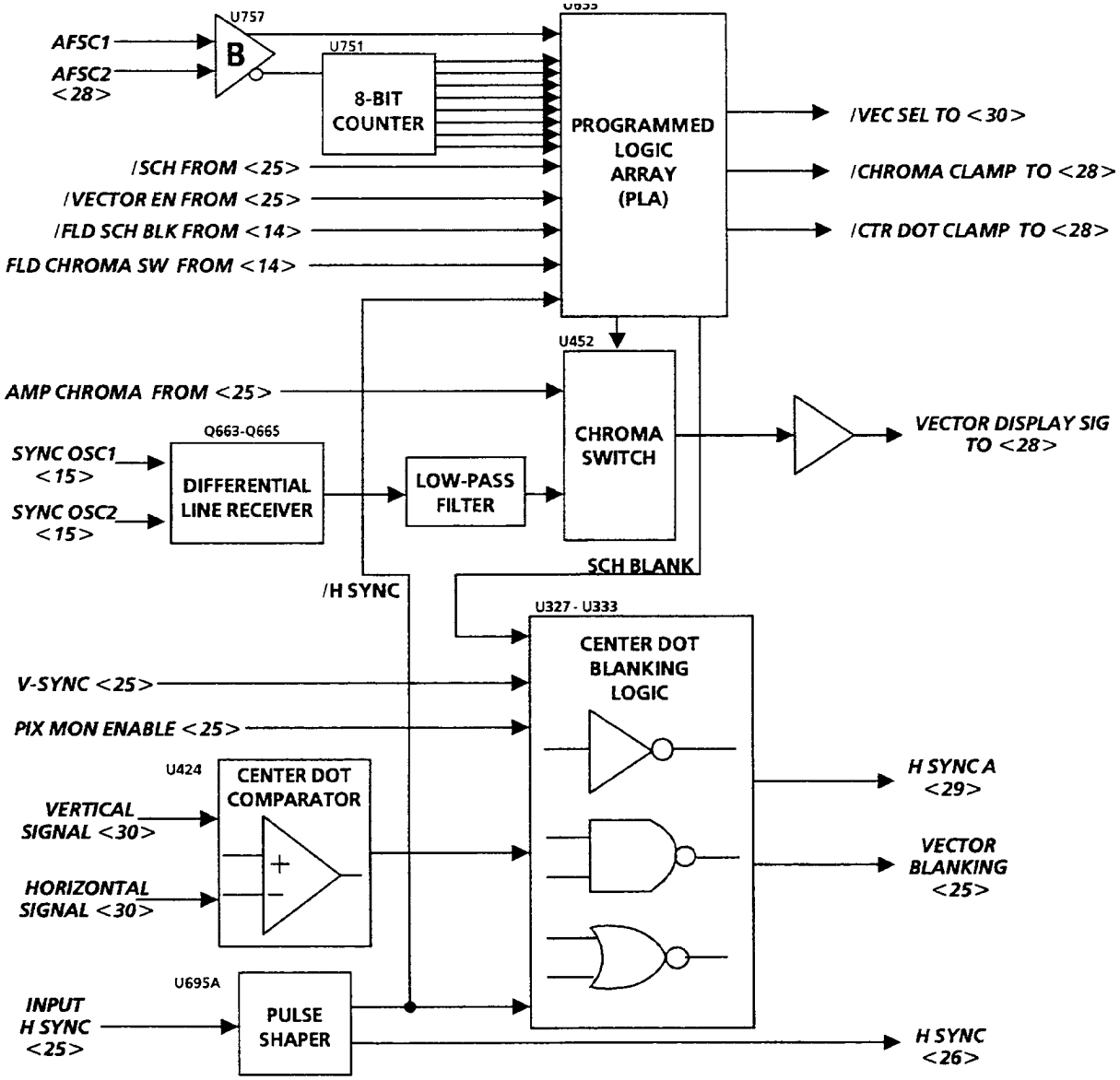
Q167 and Q277 are the active elements of a 750-kHz-wide low-pass filter. The low-pass filtered signal drives the inverting input of the operational amplifier employed as the Output Amplifier. Gain is set by adjusting R370 so that an output of 750 mV is equal to 7° (NTSC) or 5° (PAL). The same 750 mV in the Diff Gain mode equates to 7% (NTSC) or 5% (PAL). The Demod Offset is set

for a DC level of 1 volt, with no chroma, to accommodate the Recursive Filter (Diagram 35).

Demodulator Switching. U386A and B control the selection of the demodulators. For either dG or dP the Preset and Clear for U386B controls the selection of the demodulators. When dP is selected it is high and dG is low, which presets U386B and sets /Q low and turns on the Differential Phase Demodulator (U267). When dG is selected dP goes low and clears U386B which sets Q low and turns on the Differential Gain Demodulator.

When alternate dP and dG is selected, both the dP and dG lines are pulled high, and U386A controls the selection of which demodulator is on and dictates the correct sequence (dP on the first half of sweep and dG on the second half). The default sweep for alternate dP and dG is a 2-line ramp. Near the end of ramp time the Ramp Generator (Diagram 10) outputs a TRIG EN pulse. The positive-going pulse is shortened by a half-shot, Q677, and presets the Q output of U386A high. On the next 2-line sweep, the high is clocked into U386B, setting /Q low and turning on the Differential Phase Demodulator. At the same time U386A has toggled so that its Q output is low. Thus the following H sync, occurring in the middle of the 2-line sweep, clocks this low into U386B, causing the outputs to reverse state and turn on the Differential Gain Demodulator.

Diagram 27 Vector Timing & Blanking



Overview

The Vectorscope display selection, chroma clamp, center dot clamp, and SCH blanking signals for the Vectorscope are generated by the Vector Timing circuits. In addition, the switching of the SCH and Vectorscope chrominance signals occurs on this schematic.

Input signals to the Deflection Amplifiers drive the Center Dot Comparator. If the amplifiers are not deflecting the CRT beam away from CRT center, the comparator generates a pulse, input to the Center Dot Blanking Logic, that generates a vectorscope blanking signal to the Z-Axis Amplifier.

The input H sync pulse width, which is regenerated, is approximately a half line in duration. In order to provide a uniform duration, usable H sync is shaped by a monostable pulse shaper. Its output is supplied to the Differential Gain and Phase circuits as well as to the Blanking Logic.

The Center Dot Blanking Logic, which consists of NOR and NAND gates, outputs the Vectorscope blanking pulse and the horizontal sync used by the Pix Mon H-Sweep Generator.

Circuit Theory

SCH/Chroma Switching. U452 is used as a chroma switch. The Vectorscope chroma signal is input to one emitter, while the SCH signal is input to the other. The chroma signal, through pin 3, originates from the Vectorscope Chroma Gain Cell on Diagram 25. There is a peaking circuit that consists of C554, R550, and R554 which sets the gain in this input.

The SCH signal from the Sync Locked OSC (Diagram 15) is differential. The combination of Q663 and Q665 is a differential receiver that outputs a single-ended sine-wave signal to a low-pass filter. The amplitude of the sine wave is controlled by the SCH Gain (R667) adjustment. The low-pass filter is made up of C661, L659, and C660. The filtered sine-wave output signal is AC-coupled to pin 2 of U452.

Switching is controlled by the VEC line from U653, pin 12. When VEC is low, Vectorscope chroma signal current flows out U452 pin 12 into the emitter follower stage (Q447); SCH signal current is switched into the power supply from pin 6. When VEC is high the opposite condition occurs and SCH signal current flows into the emitter follower stage.

Control Signal Generator. Signals to control timing and blanking of the Vectorscope display are generated in a Programmed Logic Array (PLA), U653. It combines the levels of static control lines /SCH and /VECTOR EN, with the dynamic control line states of /FLD SCH BLK and FLD CHROMA SW, along with a counter output correctly timed to these control signals.

U757 is used as a buffer for the chroma signal from the Demodulator (Diagram 28). Its Subcarrier output is a direct input to U653. The /Subcarrier output is the A input to U751A, which is the lower order half of an 8-bit ripple through the counter; U751B is the higher order half of the counter. All eight outputs from the counter are input to U653 providing the PLA with up to 256 possible decisions for one complete cycle of the counter. The line rate timing signal for U653 is the INPUT H SYNC from the H & V Sync Generators (Diagram 9). INPUT H SYNC from Diagram 9 goes through the MPU Interconnects on Diagrams 12, 44, and 25 to Diagram 27.

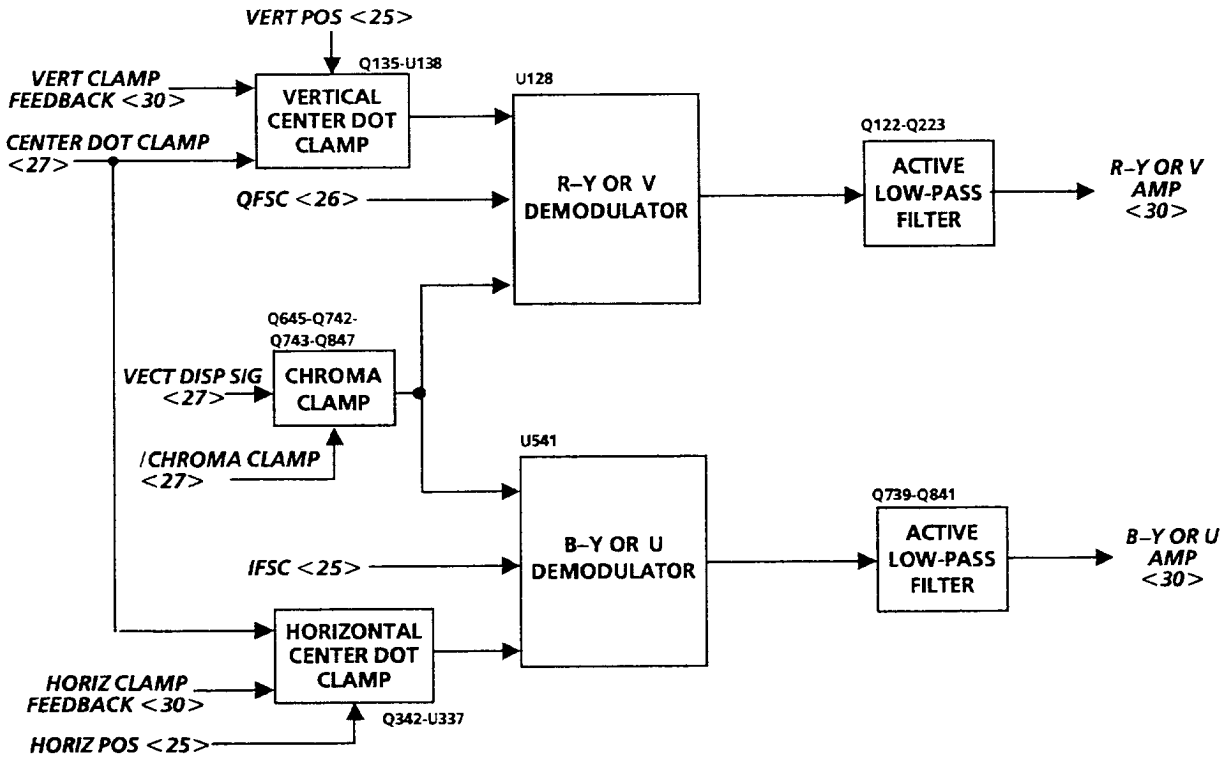
Center Dot Comparator. The Vertical and Horizontal Deflection Amplifier input signals drive the + and – comparators (U424). If the CRT-displayed signal is

deflected away from the center, one or two of the comparators will drive a summing point, at the emitter of Q323 (a common base amplifier) and turn it on. When Q323 turns on, its collector goes low to disable U327C. Whenever there is no deflection and the display is centered, Q323 is turned off and a high is applied to one input of U327C. If no center dot blanking is desired, P321 (Center Dot Blanking Disable) can be moved to pins 2 and 3 of J321.

Horizontal Sync Pulse Shaper. U695A is a monostable one-shot that regenerates a horizontal sync pulse from the approximate 1/2 line input H sync. C695 and R693 are the timing elements for the one-shot, which is triggered at the leading edge of input H sync.

Center Dot Blanking Logic. The gates in U327 and U333 make the blanking decision. When the output of U333C is low, which occurs when either input goes high, the CRT is blanked. U333D is used as an inverter for the Horizontal Sync Pulse Shaper-regenerated sync pulse.

Diagram 28 Demodulators



Overview

Chrominance from the Gain Cell is clamped to 0 volts. The Vertical and Horizontal Center Dot Clamps provide a fixed bias level to the demodulators when the Chroma Clamp forces the signal input to 0 volts.

The Vertical Demodulator (R-Y or U) uses the QFSC signal from the Subcarrier Regenerator as the carrier or reference for demodulation. The Horizontal Demodulator (B-Y or V) uses the IF_{SC} from the Subcarrier Regenerator as its reference.

Demodulator outputs are low-pass filtered by active, 500-kHz, low-pass filters.

Circuit Theory

Chroma Clamp. Chrominance from the input Gain Cell (Diagram 25) is clamped at 0 V when center dot blanking occurs. Q645 is turned off at Chroma Clamp pulse time. When Q645 turns off Q742 turns on and clamps both demodulator + signal inputs to ground.

Center Dot Position Clamps. The R-Y Amplifier output is fed back to the Vertical Center Dot Clamp through R235. The clamp circuit consists of U138 and Q135. The B-Y Amplifier output is fed back to the Horizontal Center Dot Clamp, which consists of U337 and Q342, through R436. U138 and U337 are operation-

al transconductance amplifiers used in sample-and-hold circuits. The demodulated chrominance that is fed back drives the negative input; the positive input is driven by a Position control DC reference voltage (from the Master MPU).

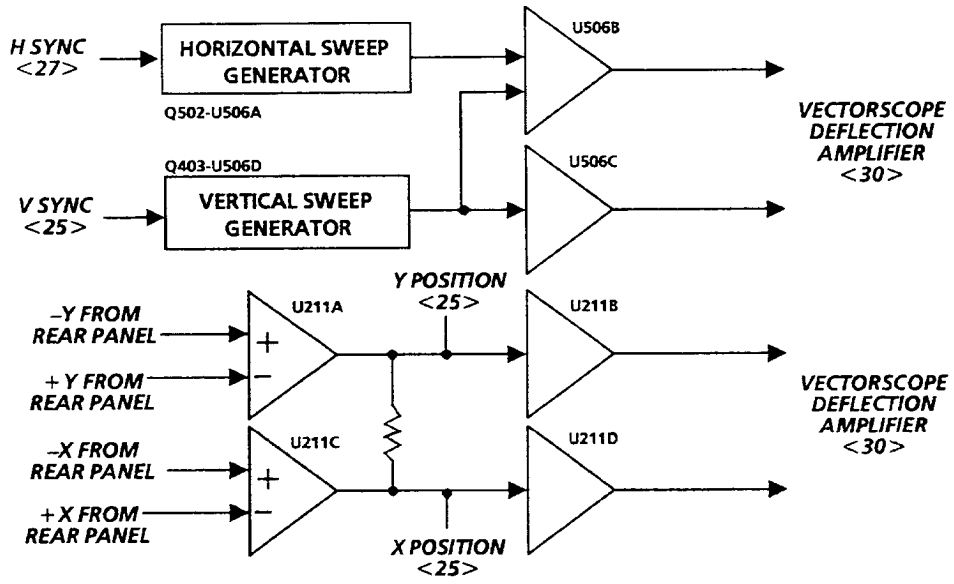
At the middle of horizontal sync a PAL (located on Diagram 27) generates the Center Dot Clamp pulse, which is the bias input to the operational amplifiers (U138 and U337). The bias inputs turn on the amplifiers to transfer the voltage level from the negative input to the hold capacitors (C136 and C341). The charge stored in the hold capacitors, output through source followers Q135 and Q342, is the bias input to the Demodulators (U128 and U541).

Demodulators. U128 and U541 are double balanced demodulators, whose outputs are voltages proportional to the phase difference between the signal input (pins 1 and 4) and the carrier input (pins 8 and 10). The signal inputs are driven by chrominance from the Gain Cell (Diagram 27). The carrier inputs are driven by continuous sine-wave signals from the Subcarrier Regenerator (Diagram 31). The carrier input for the R-Y Demodulator (U128) is the IF_{SC} output; the B-Y Demodulator (U541) carrier input is the QF_{SC}, which is quadrature delayed in the Subcarrier Regenerator. Fine adjustment of Quad Phase (C850) changes the phase relationship between the + and – carrier inputs to the B-Y Demodulator.

Demodulator gains are set by adjusting a variable resistance (R227 for the vertical and R542 for the horizontal) between emitters of the signal input differential amplifier.

Low-Pass Filters. The Demodulator outputs are filtered by identical four-pole low-pass filters with Q122 and Q223 as the active elements for the vertical filter and Q739 and Q841 as the active elements in the horizontal filter. The low-pass filters remove the high-frequency components of the demodulation process, and determine the bandwidth of the vector mode signal path to control the rise time and delay of the demodulated signal.

Diagram 29 XY Inputs & PIX Monitor



Overview

Picture monitor sweeps and XY input signals drive the Deflection Amplifiers through switching circuits on the Deflection Amplifier schematic diagram. The Sweep Generators have sufficient gain range to accommodate either 525/60 or 625/50 scanning rates. The XY Amplifiers are designed for 0 to +12 dBm audio signals, but can be internal jumper switched to provide approximately X10 Amplifiers for non-audio applications.

Circuit Theory

Picture Monitor Horizontal Sweep. Q602 is turned on by H rate sync to start U506A, which is a J-FET input operational amplifier configured as a Ramp Generator. Ramp slope is dictated by C503; ramp amplitude is adjusted by R604 (Horizontal Gain). U506B is connected as an inverting operational amplifier, with a gain of approximately 2. A small amount of vertical signal is input to the non-inverting input of the operational amplifier for orthogonality adjustment purposes. R606 (Pix Horiz Pos) provides a limited amount DC offset adjustment that is used for horizontal positioning.

Picture Monitor Vertical Sweep. Q403 is turned on by V rate sync to start U506D, which is a J-FET input operational amplifier configured as a Ramp Generator. Ramp slope is dictated by C401; ramp amplitude is adjusted by R404 (Vertical Gain). U506C is connected as a non-inverting operational amplifier, with a gain of approximately 1.5. R407 (Pix Vert Pos) provides a limited amount DC offset adjustment for vertical positioning.

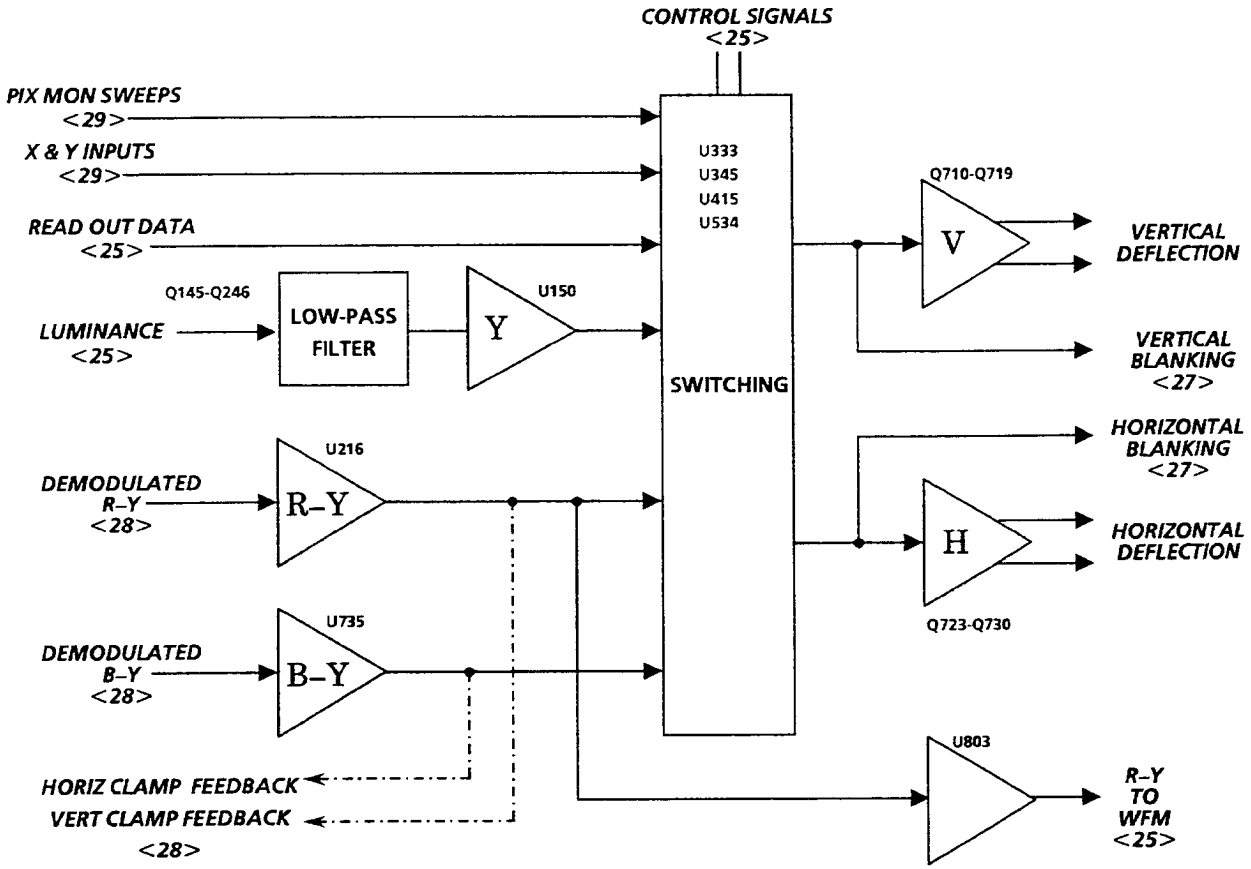
XY Input Amplifiers. U211 is a quad, J-FET input operational amplifier. U211A and C are balanced Differential Input Amplifiers intended for audio use. In a 600 Ω system, R113 and R308 can be adjusted to normalize signals from 0 dBm to +12 dBm (2 -9 volts p-to-p). The input impedance is greater than 20 kΩ to ground.

P108 and P205 (on J108 & J205) can be installed to connect the inverting inputs of U211A and U211C for high gain (X10) inputs. These inputs are provided for special non-audio applications where a higher gain may be needed.

U211B and D drive the X and Y Deflection Amplifiers through a Master MPU-controlled input switch. Position offset voltage for both the X and Y Amplifiers is supplied from the Z-Axis Digital-to-Analog Converter (DAC) on Diagram 39. R312 feeds a small amount of Y signal into the X Amplifier for orthogonality adjustment.

Post Regulators. U764 and U864 are ground referenced post regulators. They convert the 1780R-Series + and – 15 volts to the + and – 12 volts required to power the Vectorscope circuitry.

Diagram 30 Vector Deflection Amps



Overview

Demodulated R-Y (V) and B-Y (U) is amplified and input to a switching circuit controlled by the Master MPU acting on front-panel switch selections. When Vector or SCH display is selected, the Demodulated R-Y (V) is input to the Vertical Deflection Amplifier, and the Demodulated B-Y (U) is input to the Horizontal Deflection Amplifier. R-Y (V) and B-Y (U) Amplifier output signals are fed back to the Demodulator circuits as chrominance level references for Center Dot Clamping. The output signal from the R-Y (V) Amplifier is the source of the waveform monitor R-Y for the R-Y sweep display.

In addition to amplifying the demodulated signals to match the CRT deflection needs, the Deflection Amplifiers convert the single-ended input to a differential output and matches the deflection plate capacitance to improve display linearity.

Luminance from the waveform monitor is low-pass filtered and amplified to provide the delay required to match the Chroma processing delay. Delayed and amplified luminance is input to the Horizontal Deflection Amplifier to produce the Chrominance/Luminance display.

Horizontal and vertical readout (from the MPU), X and Y output, and picture monitor sweeps are input directly to the switching circuit for display on the Vectorscope CRT.

Input signal switching to the Deflection Amplifiers is Master MPU controlled in response to front-panel switching and touch screen menu selections.

Circuit Theory

R-Y and B-Y Amplifiers. The low-pass filtered outputs of the Demodulators drive identical inverting operational amplifiers, U216 (R-Y or V) and U735 (B-Y or U). Amplifier gain is approximately 11.

A small amount of R-Y (V) is fed into the B-Y (U) Amplifier input through R736 to provide + and – range for the Orthogonality adjustment, R511.

RY Buffer. U803 is an inverting operational amplifier used as a buffer. When R-Y sweep is selected for the waveform monitor, the R-Y (V) Buffer drives the Vertical Amplifier with demodulated chrominance. Stage gain is approximately 0.3.

Low-Pass Filter and Luminance Amplifier. Luminance signal from the waveform monitor is filtered by a four-pole low-pass filter employing Q145 and Q246 as its active elements.

Filtered luminance drives an externally-compensated inverting operational amplifier, U150. Vector horizontal positioning voltage is applied to its + input as an offset. C153 is a delay adjustment that matches the luminance signal delay to the chrominance signal processing delay.

Switching. In addition to the R-Y (V), B-Y (U), and Y that are displayed in Vectorscope modes, alpha numeric readout, XY, and picture monitor deflection sweeps need to be input to the Deflection Amplifiers. Signals are switched to their prospective amplifiers through DIP switches U415, U432, and U534. U415 makes one of four possible selections: R-Y (V), vertical readout elements, picture monitor vertical (field) sweep, and the X-axis voltage.

The Horizontal Deflection Amplifier has five possible inputs through U432 and U534. In addition to BY (U), there are horizontal readout elements, picture monitor horizontal (line) sweep, Y-axis voltage, and luminance.

Readout Gain adjustments (R833 for the vertical and R836 for the horizontal) are located in the compensations at the switch inputs.

U333 and U345 are multiple OR gate packages driven by Master MPU control lines that provide the switch control logic.

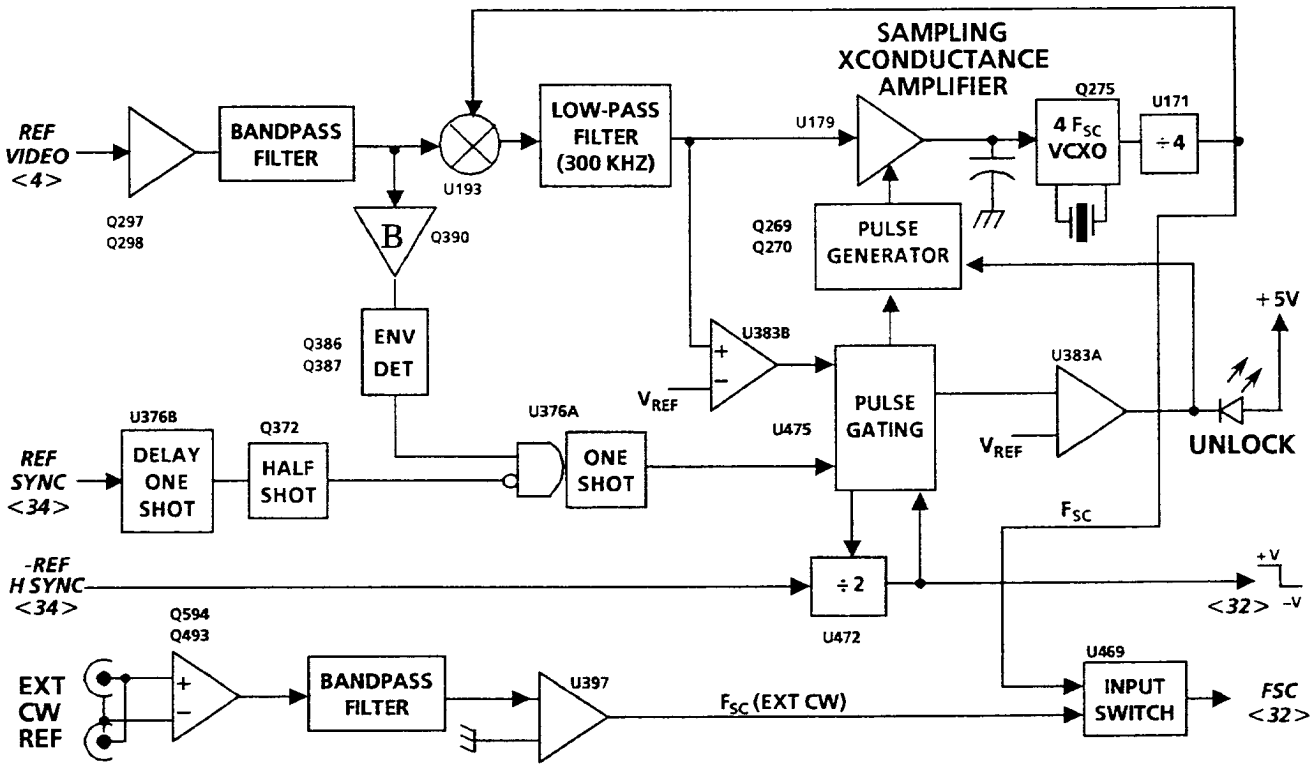
Deflection Amplifiers. The amplifiers are nearly identical. The Vertical Amplifier, which has VHF Compensation (C614), consists of Q611 and Q617 (a differential pair) and Q710 and Q719 (grounded base amplifiers) that speed up the amplifier by minimizing the Miller capacitance of Q611 and Q617. Q515 and Q516 are the current source for the differential pair.

The Horizontal Amplifier consists of Q623 and Q628 (a differential pair) with Q723 and Q730 (grounded base amplifiers) that speed up the amplifier. Q526 and Q527 are the current source for the differential pair.

The Othogonality adjustment (R511) feeds a vertical (X) signal into the - input of the Horizontal Deflection Amplifier. About +2% of the Y signal is fed into the X signal for orthogonality compensation. Adjusting the orthogonality control cancels out some or all of the Y signal in the X Amplifier to change the deflection angle between the X- and Y-axis and compensate for CRT geometry.

The input signals for the Deflection Amplifiers are also routed to the Vectorscope Z-Axis Amplifiers for blanking/unblanking the CRT.

Diagram 31 Subcarrier Regenerator



Overview

The Reference Video signal from the Waveform Monitor Reference switch (Diagram 4) is buffered and bandpass filtered before being mixed with the Voltage-Controlled Crystal Oscillator (VCXO) output to produce a control signal for the VCXO. In addition, the bandpass filtered Ref Video is buffered and envelope detected to provide a chrominance sample to one input of a coincidence detecting one-shot; the other input is from a one-shot delayed Reference Sync that produces a half-shot conditioned transition at backporch time.

The output of the coincidence detecting one-shot provides one input to the Pulse Gating circuit. The second input to the Pulse Gating circuit is from a lock-detecting comparator at the output of the low-pass filter. The third input is either a resistor pulled up level (NTSC) or the +V output of the PAL burst flip-flop.

The Pulse Gating circuit drives a Pulse Generator to provide a gain controlling pulse to the sampling transconductance amplifier. Loop bandwidth is switched between narrow for phase lock (to integrate out noise and chrominance phase errors on a line-by-line basis) and wide for lock acquisition when the loop is unlocked by increasing and decreasing amplifier gain.

The output of the sampling transconductance amplifier is the control voltage for the VCXO, which runs at $4 \times F_{SC}$. The VCXO output is divided down by 4 to

provide a TTL pulse at F_{SC} to the Digital Phase Shifter and the comparison input of the Mixer stage.

The External CW loop-through input is buffered, to common mode out ground currents, and bandpass filtered. The filtered output is converted to TTL pulses, for the Digital Phase Shifter, by a strobe-controlled complementary comparator.

Circuit Theory

Buffer and Bandpass Filter, and Mixer and Low-Pass Filter. Q297 and Q298 form a non-inverting buffer amplifier. W198 makes the input to the buffer single ended, but in extreme conditions can be removed for common mode input, to reduce hum current on the Ref Video coaxial cable run. The output of the buffer is bandpass filtered (value of C392 depends on the frequency of F_{SC}, NTSC, or PAL color standard).

The Mixer, U193, is an MC1496P balanced demodulator with the bandpass filtered Ref Video input to the + and – signal inputs. TTL pulses from the VCXO, ÷4 flip-flop, are input to the + Carrier Input; – Carrier is tied to digital ground through R293 to set a comparison point. Stage gain is set by R189 and the balance adjustment is R286. The output of U193 drives a 300-kHz, low-pass, pi-filter consisting of C187, L186, and C285. R184 is the filter's load resistor.

Sampling Transconductance Amplifier and VCXO. U179 is a transconductance operational amplifier, with a sampling input at pin 5. It is connected as an integrating Error Amplifier. Pulses from the Pulse Generator change the loop characteristics, by altering amplifier gain, from wide bandwidth for the unlocked or capture mode to narrow band for phase lock. The narrow bandwidth integrates out noise and burst phase errors on a line-by-line basis.

Q275 is a Voltage-Controlled Crystal Oscillator, running at $4 \times F_{SC}$. Y182 is a 14.318 MHz crystal for NTSC color standard, or 17.73448 MHz for the PAL color standard. C182 is a trimmer capacitor adjusted for a signal amplitude of 2 volts. Q169 turns off the VCXO for NTSC External CW operation; it is inoperative for PAL External CW operation.

U171 is a 2-stage 4 counter made up of D-type flip-flops that is clocked at $4F_{SC}$ by the collector of Q275. The counter provides TTL output pulses ($+F_{SC}$ and $-F_{SC}$) to the Input Switch, U469. In addition, a clock-cycle delayed$+F_{SC}$ output is fed back to the Mixer to complete the phase-lock loop.

Envelope Detector and Pulse Gating. Q390, which is driven by bandpass filtered Ref Video, is an emitter follower buffer stage driving an envelope detector to provide a high to U376A when chrominance is present on the Ref Video input.

U376B is a delay one-shot that delays Reference Sync (Ref Sync) for proper phasing. Q372 is a half-shot circuit that provides a window during backporch of the Ref Sync. U376A is wired to use its AND gate input (pins 1 and 2) as a coincidence detector that will start the one-shot only if chrominance (burst) is

present on the sync backporch. This effectively locks out black and white signals or the vertical interval, where there is backporch but no burst.

U383B is one half of a dual comparator that samples the output of the Mixer stage low-pass filter. Its output is low for phase lock and pulses high for an unlocked condition.

U475 is a triple, three-input NAND gate used as a pulse gating circuit. U475A generates the lock/unlock levels, that after peak detection control the Pulse Generator. U475B provides an output that phases up the PAL signal+V/–V flip-flop (U472). U475C generates an enable signal that allows the Pulse Generator to operate only on +V bursts for PAL operation and is inoperative for NTSC.

In PAL operation the Pulse Generator provides the controlling current pulse to the Sampling Transconductance Error Amplifier, and is only enabled during the lines containing +V. To accomplish this, and to provide proper phase + and –V pulses to the field selection circuits (for PAL operation), jumper W480 connects the /Q output from U472A to inputs for U475A and C in order to provide a high for +V lines. When W480 is not in place (NTSC operation) the same inputs are held high by pull-up resistor R480. U475B generates a clear signal for U472A, to ensure the correct phase of the + and –V pulses.

When an unlocked condition occurs, U383B output goes high, which ANDs U475A to pull its output low. A low on the output of U475A discharges C483, which is normally pulled high by R379. When the level on the + input of U383A goes below the comparator threshold level set by the – input, the output goes low turning off Q370. DS184 will come on only if there is a condition where lock should occur, but does not.

For PAL instruments the Pulse Generator does not sample on the lines with –V burst. On a +V line U475C is ANDed to pull CR273 low and turn on Q270. On –V lines U475C is not ANDed holding its output high to turn off Q270, which turns off the Pulse Generator, making the phase-lock loop sample only on +V lines.

Pulse Generator. The Pulse Generator is made up of Q269 and Q270. Current amplitude to the Sampling Transconductance Sampling Input is controlled by Q370. When Q370 is off the current in the collector circuit of Q269 will be high and the Sampling Transconductance Amplifier gain will also be high which increases the loop gain (bandwidth). When lock occurs, Q370 saturates and collector current in Q269 is reduced, which lowers the current to the sampling input of U179 and reduces loop gain.

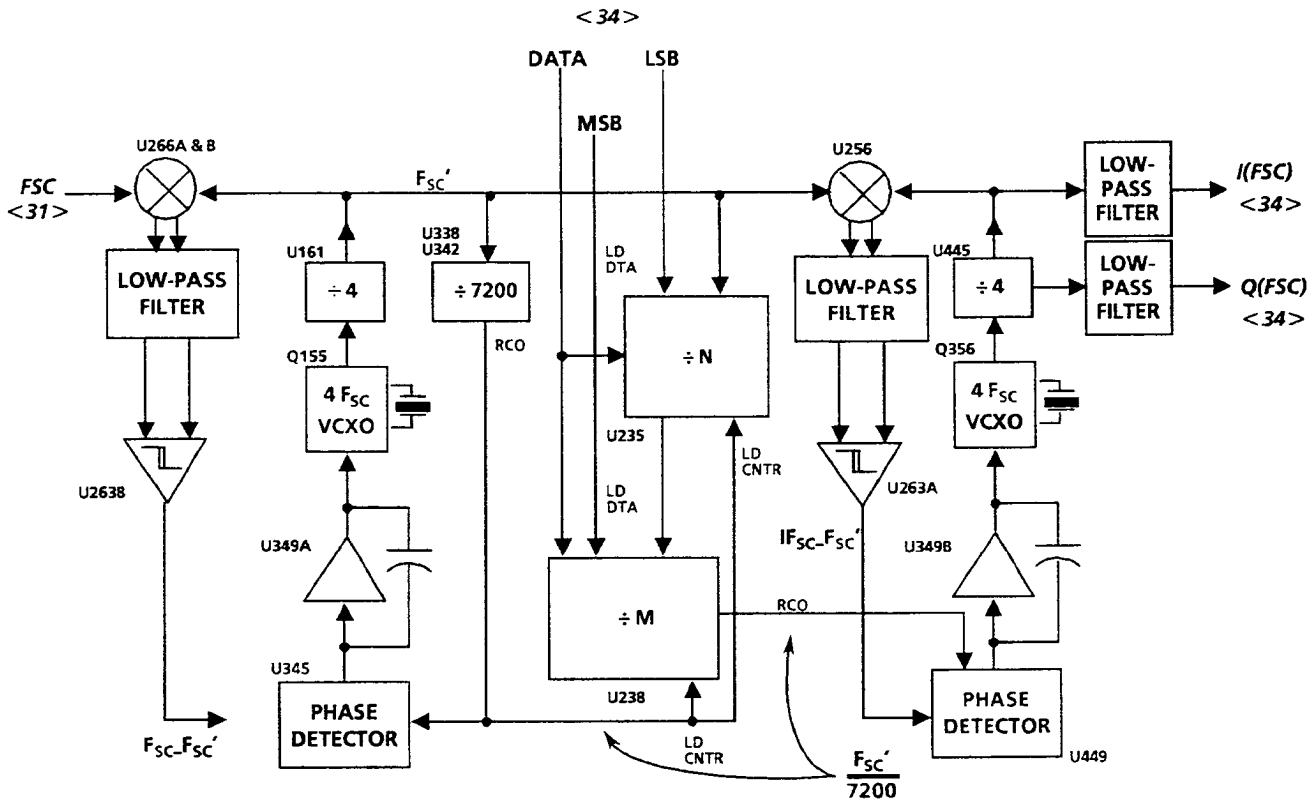
EXT CW Input. Q594 and Q493 form a Difference Input Amplifier. It can common mode out ground currents from the rear-panel EXT CW INPUT bridging loop-through. C596, L592, L491, and C394 are a bandpass filter. The value of

C394 is lowered ≈1/3 for PAL instruments. U397 is a strobe-controlled complementary output comparator. U397 provides TTL outputs, at External CW frequency, to the Input Switch, U469, from the bandpass filtered EXT CW signal.

The strobe signal is disabled in EXT CW. It is also used to turn off the VCXO in NTSC instruments; U169 is disabled in PAL instruments.

Input Switch. U469 is a quad 2-input multiplexer used to select the F_{SC} reference for the input phase-lock loop. It is switched by the EXT CW control line to select either buffered EXT CW or F_{SC} as the reference source. U266C is an Exclusive OR gate that inverts the Microprocessor-generated control signal.

Diagram 32 Digital Phase Shifter



Overview

The Digital Phase Shifter uses the input subcarrier frequency to generate an intermediate and somewhat lower subcarrier frequency. The intermediate subcarrier, which is divided into 7200 parts, is used to load a Microprocessor-generated count into a programmable counter. The ripple output from the programmable counter then provides a reference for a regenerated subcarrier, which reflects the difference between the front-panel phase offset and the incoming reference. The resultant output subcarrier is then used by the Vectorscope to demodulate the color signal.

The subcarrier source is either the F_{SC} or EXT CW from the Subcarrier Regenerator schematic. Incoming F_{SC} is mixed with the VCXO-generated F_{SC}', which derives a difference frequency that is low-pass filtered at approximately 500 Hz. The low-pass filtered difference signal is converted to TTL levels by a balanced comparator and used as one input to a Phase Detector, where it is compared to the output of a divide by 7200 counter. Resultant signal drives an Integrating Error Amplifier that controls the frequency of the approximately $4F_{SC}$ VCXO. VCXO output frequency is divided down by four to produce F_{SC}' that is input to one side of the input Mixer to close the input phase-lock loop.

In addition, the divided by 7200 F_{SC}' produces the counter load pulse for a Programmable Divide by 7200 Counter that outputs the reference phase to the Phase Detector in the output phase-lock loop.

The output phase-lock loop mixes the F_{SC}' signal with the output of a second VCXO to produce a difference signal that is low-pass filtered and converted to TTL levels by a balanced comparator. The TTL output of the balanced comparator is one input to the Phase Detector. The reference input to the Phase Detector is the output of the programmable counter. Phase Detector output drives an Integrating Error Amplifier, whose output is the control voltage for the $4F_{SC}$ VCXO. The output of the VCXO is divided down to produce the IF_{SC} and QF_{SC} signals for the Vectorscope Demodulators. The IF_{SC} signal is also fed back to the Mixer to close the output phase-lock loop.

Circuit Theory

Mixer, Low-pass Filter, Error Amplifier, and Phase Detector. U266A and B are Exclusive OR gates configured as a balanced mixer, where the input subcarrier reference and the intermediate subcarrier reference (F_{SC}') are mixed to derive a difference signal (about 500 Hz below F_{SC}). Mixer output is low-pass filtered and drives a comparator stage (U263B) configured as a Hysteresis Amplifier that outputs a TTL error signal, of approximately 500 Hz, to drive the reference input of the Phase Detector, U345A, a TTL frequency/phase detector.

The remaining input to the Phase Detector is the Voltage-Controlled Crystal Oscillator (VCXO) generated intermediate subcarrier (F_{SC}'). Phase difference between the reference (R) and feedback (V) inputs of the Phase Detector directly control the output voltage.

Error Amplifier, $4F_{SC}$ VCXO and ÷4 Counter. The output voltage of the Phase Detector drives U349A, an Integrating Error Amplifier, whose output is the control voltage to the Varactor-controlled $4F_{SC}$ VCXO.

Q155 is an oscillator stage running at approximately $4F_{SC}$ – 2 kHz. L153 in the tank circuit of the oscillator allows it to be tuned approximately 2 kHz low, when the crystal frequency is $4F_{SC}$. U161 is a dual D-type, edge-triggered, TTL flip-flop clocked by the output of the crystal oscillator. The /Q output of U161A drives one input of the balanced mixer to close the phase-lock loop. In addition, this F_{SC}' signal clocks both the ÷7200 and programmable counters, and provides one input to the output F_{SC} Mixer (U256A and B).

÷7200 and Programmable Counters. Both counters are made up of two 8-bit, binary counters (with input registers) in cascade configuration. Both counters are clocked by the intermediate subcarrier (F_{SC}'). The ÷7200 counter register is loaded to a fixed starting count by hard wiring inputs either high or low. The starting count is loaded into the counter by the falling edge of the U161B Q output. Clock enable for the second counter is the ripple carry out (RCO) of

U338. RCO from U342 is the counter load for the programmable counter (÷M and ÷N).

The input register for the programmable counter (U235 and U238) is loaded with a count from the Microprocessor Data Bus. This count is in the form of two 8-bit words. The word consisting of the 8 least significant bits (LSBs) is loaded into the input register of U235 followed by the 8 most significant bits (MSBs) word being loaded into the register for U238. Registers are loaded on the rising edge of the RCLK, which is supplied from the Microprocessor. The two 8-bit words are the Microprocessor-decoded setting of the front-panel PHASE SHIFT. The contents of the input registers are loaded into the counter when the 7200 Counter ripple carries out (RCO), and the counter starts on the next F_{SC}' clock. Clock Enable for U238 is the ripple carry out from U235.

Ripple carry out from U238 is one input to a coincidence input for a one-shot (U335B). The other input to this pulse stuffer one-shot is from U230B, which is clocked by U230A. U230 is a dual, edge-triggered, D-type, TTL flip-flop. The pulse stuffer is required to compensate for a possible missing count in the programmable counter. The one-shot output is the reference input for the output Phase Detector, U449.

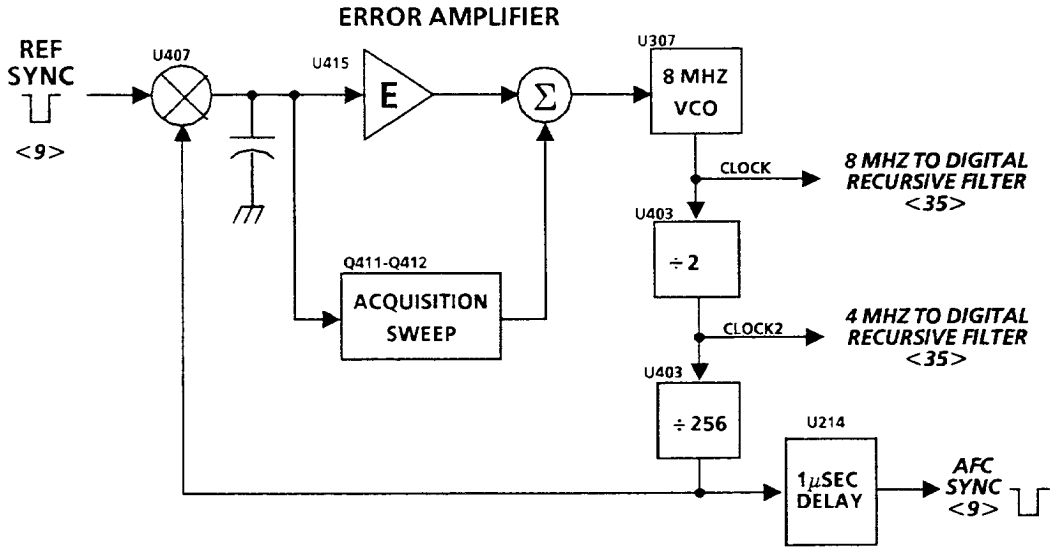
Phase Detector, Error Amplifier, ÷4F_{SC} VCXO and 4 Counter. The remaining input to the Phase Detector is the Voltage-Controlled Crystal Oscillator (VCXO) generated subcarrier (IF_{SC}). Phase difference between the reference (R) and feedback (V) inputs of the Phase Detector directly control the output voltage.

The output voltage of the Phase Detector drives U349B, an Integrating Error Amplifier, whose output is the control voltage to the Varactor-controlled $4F_{SC}$ VCXO.

Q356 is the oscillator running at $4F_{SC}$. U445 is an edge-triggered quad D-type, flip-flop with complementary outputs. It divides down the $4F_{SC}$ output of the VCXO to F_{SC}. The Q2 output of U445 drives one input of the balanced mixer to close the phase-lock loop. U445 also serves as an output latch, which provides 0 180° phase shift to output the IF_{SC} and QF_{SC} references that are used by the Vectorscope to demodulate the color signal. In addition, outputs from U445 drive the Test Circle Oscillator and PAL +V/–V switching.

Low-pass Filter, Error Amplifier, and Phase Detector. U256A and B are Exclusive OR gates that are configured as a balanced mixer where the output subcarrier reference and the intermediate subcarrier reference (F_{SC}') are mixed to derive a difference signal. Mixer output is low-pass filtered and drives a comparator stage (U263A) that is configured as a Hysteresis Amplifier to output a TTL error signal that drives the feedback input of the Phase Detector, U449.

Diagram 33 Horizontal AFC & Post Regulators



Overview

REF SYNC, originating from the H Sync Generator on Diagram <9>, is compared to the H rate sync divided down from the VCO by a Phase Detector. If they are not phase locked, the Error Amplifier output will be high and cause the Acquisition Sweep to run and sweep the VCO frequency control circuits. VCO output, which is at 8 MHz, is divided by 2 and again by 256 to return to H rate.

Eight MHz and 4 MHz signals are buffered and supplied to the Noise Filter as clock signals. Divided down H rate sync is applied to the Input Phase Detector to complete the phase-locked loop. When lock occurs, the output of the Error Amplifier goes low and the Acquisition Sweep does not run, which allows the Error Amplifier output to control VCO frequency.

AFC Sync Out is delayed for correct phasing with direct sync, thus preventing a jump when switching between Direct and AFC.

Circuit Theory

Phase Detector. The Ref Sync input, from the H Sync Generator, is AC-coupled (C303) and clamped (CR303) into one input of U407, which is connected as a current output, Integrating Phase Detector. Ref Sync phase is compared to the phase of VCO-generated AFC sync. A difference in the phase of the two signals causes the output of the detector to go high, to indicate that the loop is unlocked, and the Error Amplifier turns on the Acquisition Sweep.

Error Amplifier and Acquisition Sweep. The Error Amplifier (U415) is a dual bi-FET operational amplifier. U415B is the AC path and U415A is the DC path for the Acquisition Sweep Ramp. The Error Amplifier output is the sum of both signals. The Acquisition Sweep occurs once for each line. When the loop locks

up, the output of the Phase Detector falls below the trigger threshold of the unijunction-wired Acquisition Sweep (Q411 and Q412), to turn off the ramp. If the loop unlocks, the output of the Phase Detector (through the Error Amplifier) goes above the Acquisition Sweep threshold and the ramp is again generated, line by line, until lock re-occurs.

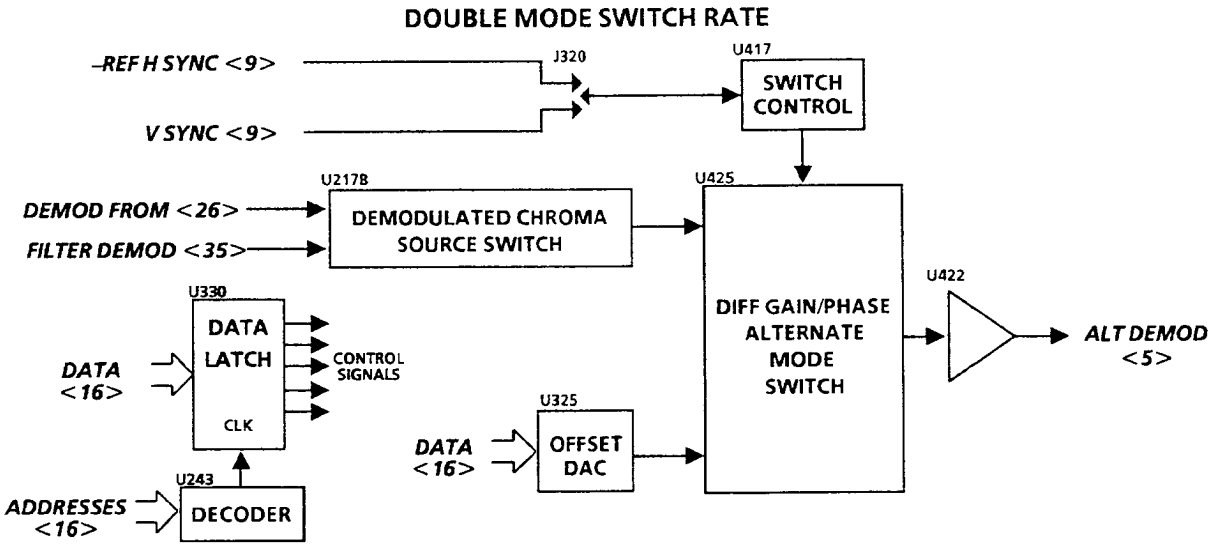
VCO and Frequency Divider. The active components of the VCO are high-speed buffer inverters. Its output is approximately 8 MHz (512 × H rate). Frequency for 625/50 is a little higher than that for 525/60 operation, but both are within the operating range of the VCO. Frequency control for the VCO is through Q309 and CR310, a Schottky diode, that duty cycle modulates C210 to vary the frequency of the VCO. The VCO output, in addition to being the input to the divide-by-512 array, is also buffered, filtered, and sent off the Oscillator circuit board (through the Interconnect) to the Filter circuit board, see Diagram <35>.

The VCO output clocks U403, a 20-input Programmable Logic Array. A divide-by-2 output (4 MHz) is buffered, filtered, and sent off the Oscillator circuit board (through the Interconnect) to the Filter circuit board as the Clock/2 signal. U403 performs an additional divide by 256 (for a total of 512) to generate the AFC H rate sync. U214 is a serial-input, parallel-output register used to delay the AFC sync for correct phase match with direct sync. The signal can be delayed up to 8 Clock/2 cycles; however, 4 cycles provides optimum phase match to eliminate a shift in sweep starting point when switching between Direct and AFC Sync.

The divide-by-512 output from U403 is the AFC H rate sync signal to the Phase Detector that completes the phase-locked loop.

Post Regulators. U135, U136, and U147 are solid state voltage regulators for the Oscillator circuit board. They provide +12 V (U147), –12 V (U135), and +5 V decoupled (U136) for the circuits on this board.

Diagram 34 Diff Gain/Phase Alt Mode Switch



Overview

The 1780R-Series offers a choice of either single display mode or a double display mode that can be nulled. The Alternate, or double mode, is switched about itself to display a mirror image. Sources of chroma for the mode switch are either directly from the Demodulators or a Recursive Filtered Demodulator output when noise needs to be reduced.

In addition, this diagram contains the Data Latch and Address Decoder used to write data from the Master MPU to the Oscillator circuit board.

Circuit Theory

Switch Control. Output switching is controlled by U417, a dual D-type flip-flop. Switching rate is selectable between Field/2 or Line/4, depending on the location of the plug on J320. The Line/4, which is used with a PAL-modulated ramp signal, divides the –Ref H sync by 2 in U417A to clock U417B for an additional divide by 2. The Field/2 uses V sync to clock U417B only for the divide by 2. Factory-programmed position is Line/4.

When dP measurements are made, the phase of the subcarrier signal is varied and measured. But when dG is measured, the fixed chroma level from the demodulators is compared to a DC offset level and the offset level measured.

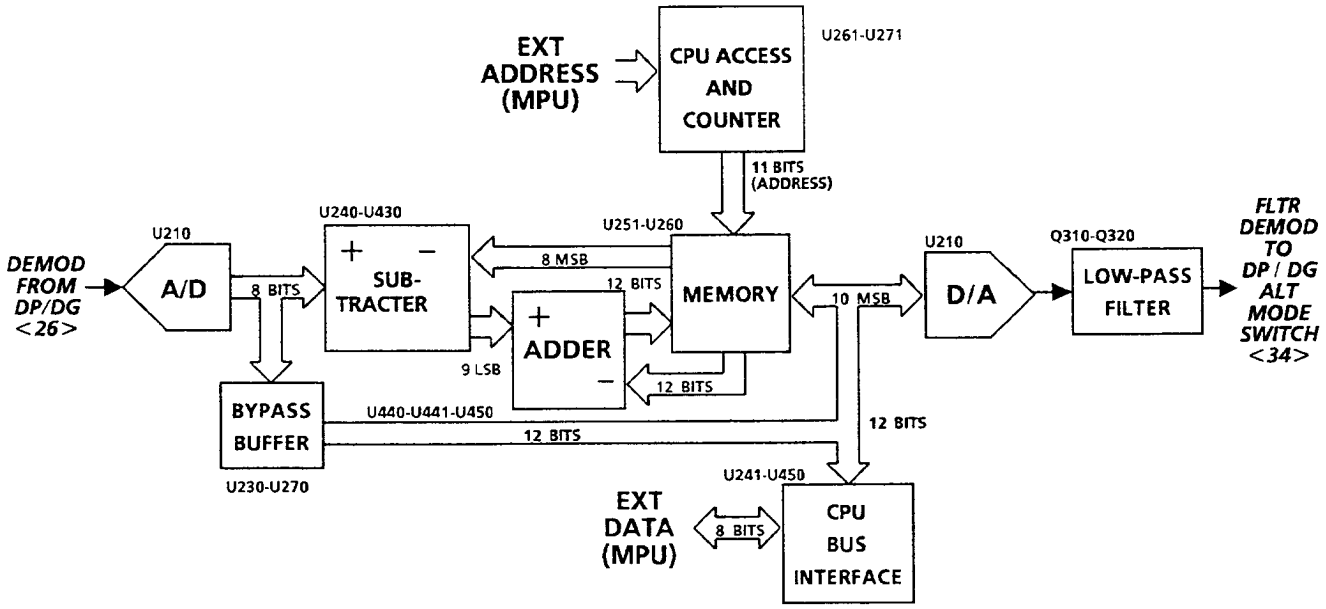
Demodulated Chroma Source Switch. U217 is a set of analog switches, controlled by the Microprocessor, used to select a filtered or unfiltered demod output signal for the Alternate Mode switch, U425. Q322 is a common emitter amplifier, whose gain is approximately 1, serving as an inverting buffer that sets the input DC level for the Alternate Mode switch.

Diff Gain/Phase Alternate Mode Switch. U425 implements a Switchable Polarity Amplifier, which outputs a differential current. Pin 4 is the signal input; transconductance gain is set by R422. The pin 6 output drives the + input of a Differential Operational Amplifier and pin 12 drives the – input. Levels at pin 8 and pin 10 dictate the polarity of the output from the Differential Amplifier. When pin 10 is high, there is no inversion between the pin 4 input and the Alt Demod signal. If pin 8 is high, the Alt Demod output is inverted. The gain is unity between pin 4 and the Alt Demod signal, which goes back to the Waveform Monitor Diff Amp and Video Filters (Diagram 5).

DAC. An Offset DAC, U325, provides a variable level for dG measurements (from measurements knob setting, through the Microprocessor). For dP measurements the DAC outputs a fixed level, corresponding to center range. DAC current output is converted to a voltage by U221A and B (operational amplifiers). R322 calibrates the gain to ensure that 750 mV is equal to 7% or 7° (5% or 5° PAL). R315 sets the DC level to center the DAC in its range and compensate for the DC level out of the demodulator.

Data Latch. U330 is an octal, D-type flip-flop that latches data from the Microprocessor Data Bus. All communication from the Processor to the Oscillator and Recursive Filter circuit boards is through this latch. U243 is a TTL 3- to 8-line decoder/de-multiplexer used to decode the memory mapped Oscillator circuit board addresses. Clock signal for the Data Latch is from the Y3 output of U243.

Diagram 35 Digital Recursive Filter



Overview

The Digital Recursive Filter reduces the noise content of differential phase and differential gain signals without impacting the spectral response below 500 kHz by reinforcing the harmonic frequencies that are multiples of line rate. The video line is broken into 256 points, and each point is associated with a memory location. A point is sampled and the difference taken between it and a previous result stored in memory. The new value of the point is then added to the memory output and stored in the same memory location. The circuit output is always the data in memory before processing on the sampled point begins.

The demodulated chrominance signal (Demod) from the Differential Phase and Gain Demodulator is the analog input of the A/D Converter. The analog input is sampled and the data is output on the C Data Bus. The C Data Bus inputs to the Subtracter and the Bypass Buffers. The upper 8 bits of stored data from the M (Memory) Data Bus is subtracted (inverted and added) from the input data.

The Subtracter output is the S Data Bus, which is input to the lower 8 bits of the Adder as an error signal. The borrow output from the Subtracter is inverted and used as an error signal for the upper 4 bits of the Adder. The 12 bits of Adder output data are latched into Memory. The data stored in the Memory is from the conversion of the previously-sampled video line and is at the same point that the A/D Converter is sampling on the current line. During the read operation, the 12-bit memory data is on the M Data Bus and input to the Adder, with the lower 8 bits input to the Subtracter. During a write operation, data from either the Bypass Buffers or the Filter Latch is stored in the Memory, as dictated by the Data switch.

The D/A Converter latches data off the M Data Bus at the same time that the Adder data is loaded into the Filter Latch. The analog signal is output to a low-pass output filter to remove sampling artifacts above approximately 750 kHz.

The Address Counter output A6 is the clock for the Memory Write Control. The CPU Access provides addressing for the upper pages of Memory. It also controls the one-bit state machine that increments the memory addresses during data transfer to the Microprocessor.

The Microprocessor accesses the Recursive Filter Storage through the CPU Bus Interface. For full field operation, a state machine is used as a half-line counter to inhibit Write Enable during the vertical interval and prevent writing to Memory.

Circuit Theory

A/D Converter. The demodulated chrominance signal (Demod) from the Differential Phase and Gain Demodulator (Diagram 26) is the analog input to the A/D Converter section of U210. R210 is a protection resistor. The analog input is sampled on the falling edge of a 4 MHz clock (/Clock2), and data is output on the C Data Bus at the falling edge of the next clock pulse. The C Data Bus is the 8-bit input to the Subtracter (U240 and U430) and the Bypass Buffer (U230 and U270).

Subtracter. The upper 8 bits of data, from Storage, that are on the M Data Bus are inverted (U461 and U470) and added to the input data (a logical subtraction).

Adder. The Subtracter output (S Data Bus) is input, as an error signal, to the Adder lower 8 bits (U450 and U441). The Subtracter borrow output (C4) is inverted (U470A) and input as an error signal for the upper 4 bits of the 12-bit Adder (U440 plus U441 and U450). The U450 Carry (C4) increments U440 and adds a hexadecimal F to decrement. The 12 bits of Adder output data are latched into memory, from the P Data Bus, on the falling edge of /Clock2 by U250 and U451 (octal, tri-state, flip-flops) that are the Filter Latch.

Data Switch. U410B is the Data Switch that controls the source of data to the M Data Bus during filtering. It activates the tri-state output of either the Filter Latch (U250 and U451) or the Bypass Buffer (U230 and U270) as selected by the R/W pulse. When /BYPASS and /MA are both high, data is output from the Filter Latch to Storage. When /BYPASS is low and /MA is high, data output is from the Bypass Buffer.

D/A Converter. The D/A Converter, contained in U210, latches data off the M Data Bus on the falling edge of Clock2, at the same time as the Adder output data is loaded into the Filter Latch. On the rising edge of Clock2, the analog signal is output to a 4-pole Sallen and Keyes low-pass output filter (Q310 and Q320) which removes sampling artifacts above approximately 750 kHz.

Storage. The data stored in Static Random Access Memory (U251 and U260) is from the conversion of the previously-sampled video line and is at the same point that the A/D Converter is outputting from the current line. During the read operation, the 12-bit Memory data is on the M Data Bus and is being input to the Adder (U440, U441, and U450). The lower 8 bits, on the M Data Bus, are inverted and input to the Subtracter (U461A, B, C, D and U470B, C, E, F). During a write operation, data from either the Bypass Buffer or the Filter Latch is stored in Memory. U330 is a quad, dual-input multiplexer used as a memory switch, whose output is controlled by the level of the Memory Access pulse (/MA). See Table 3–4.

Table 3–4: Memory Switch Outputs

	/MA	
U330 Output	**High**	**Low**
/OE (PIN 4)	/CLOCK2	/RD
/WE (PIN 7)	R/W	/WR
/CSL (PIN 9)	Ground	A8
/CSH (PIN 12)	Ground	/A8

The R/W pulse is derived from the rising edge of inverted Clock2 (U470D) and clocks U400A (high for a write operation) and outputs the /W from the inverted output of U400A (pin 6). Clock (8 MHz) switches the inverted output of U400A to a high state after a quarter of a Clock2 cycle, and enables the Memory to store data before the next address change.

Address Counter and CPU Access. The Address Counter (U271) is a multi-mode, 9-bit synchronous counter, built from a Programmable Logic Array. During filtering, it operates as an 8-bit counter phase-locked by the 2 μs AFC sync pulse, from the AFC Counter. The ninth bit is used to pass the /DG Filter pulse during DP/DG display modes. Output A6, inverted by U461F, is the clock for the Memory Write Control. When /MA is low, /BYPASS is used to clear the counter and the INC input is used to increment the counter for Memory access by the Microprocessor.

CPU Access, made up of a 16-input Programmable Logic Array (U261) and a D-type flip-flop (U400B), provides addressing for the upper pages of Storage and generates the INC pulse for the Address Counter. When /PAL is low, the +V Out becomes address bit A9. AB1 is latched with the /WR signal when /Fltr Brd is low to become address bit A10. When /PAL is high, AB0 is latched and used for address bit A9.

The CPU Access (U261 and U400B) also operates as a one-bit state machine that increments the Memory addresses during data transfer to the Microprocessor.

U400B is clocked by U261 when either /RD or /WR goes low while /Fltr Brd is low. An Exclusive OR gate internal to U261 outputs the INC pulse and increments the Address Counter. Incrementing the Address Counter toggles the A0 (U271-14) output, which is the other input to the U261 Exclusive OR gate, that resets the INC pulse after one address count. The /BYPASS clears U400B and U271 to reset the initial starting conditions.

CPU Bus Interface. When /Fltr Brd and /MA inputs to U410A are low, A8 determines whether the 8-bit MPU Address Bus has access to the lower 8 bits (U241 [M0 – M7]) of Storage data (A8 low) or the upper 4 bits (U260 [M8 – M11]) of data (A8 high). /RD, from the CPU Access, determines the direction of data exchange.

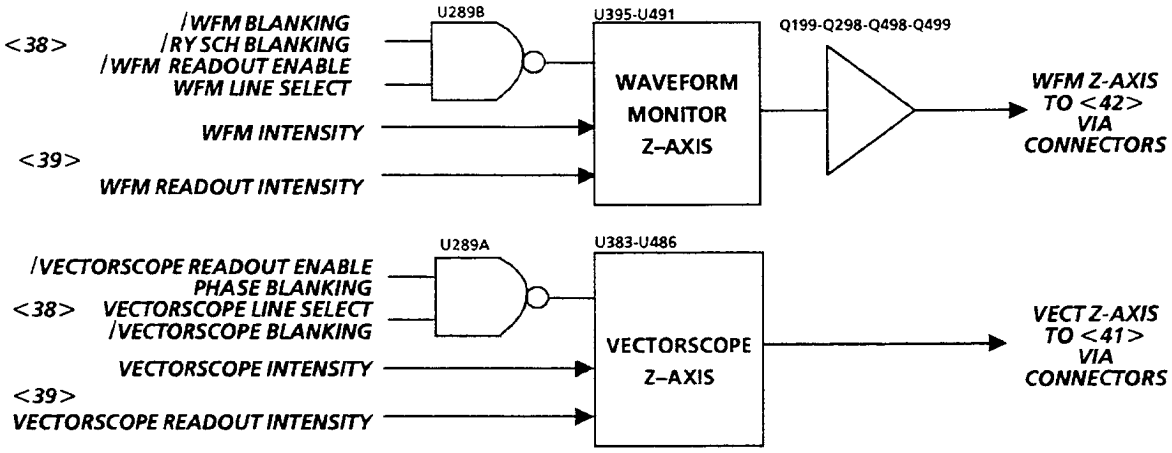
Memory Write Control. The Memory Write Control uses the R/W pulse to control storage of data for full field, VITS, and freeze line modes in 525/60 or 625/50 systems. In full field operation, a state machine, built from a Programmable Logic Array (U280) and a 12-bit Binary Counter (U281), is used as a half-line counter to assert the WE output during the vertical interval and halt generation of the R/W pulse, which prevents writing to Storage. The counter is synchronized to a vertical rate pulse, V Sel. The /PAL input sets the video standard (high for 525/60 or low for 625/50).

When /LSE counter input is low, WE is generated only when U280 accepts a line select pulse, W Linesel F. If the line select pulse is not present, the Memory data is echoed to give a bright display of the selected line.

A low on the counter /FL input sets a low on WE to disable writing to Storage and the data in Storage is output as a frozen signal.

Power Supply. U200 is a post regulator for the –5 volt supply. L421 and C411 decouple the digital +5 volt supply from the +5 volt supply. L210 and C100 provide decoupling for the analog –5 volts. L420 and C420 are the decoupling for the analog+5 volts.

Diagram 36 Z-Axis



Overview

The Waveform and Vectorscope Z-Axis circuits act on blanking/unblanking signals from several sources to control the intensity of the CRT displays. Intensity control signals for both active display and readout are independently input to the Z-Axis circuits. The Waveform Z-Axis Amplifier is shown on this diagram, while the Vectorscope Z-Axis Amplifier is shown on the Vector High Volts diagram.

Both Z-Axis circuits provide current outputs to the Z-Axis Amplifiers. Inputs from the Intensity controls, both waveform and readout, control the current in separate current sources. Logic signals steer the currents into the Z-Axis Amplifiers as needed.

Circuit Theory

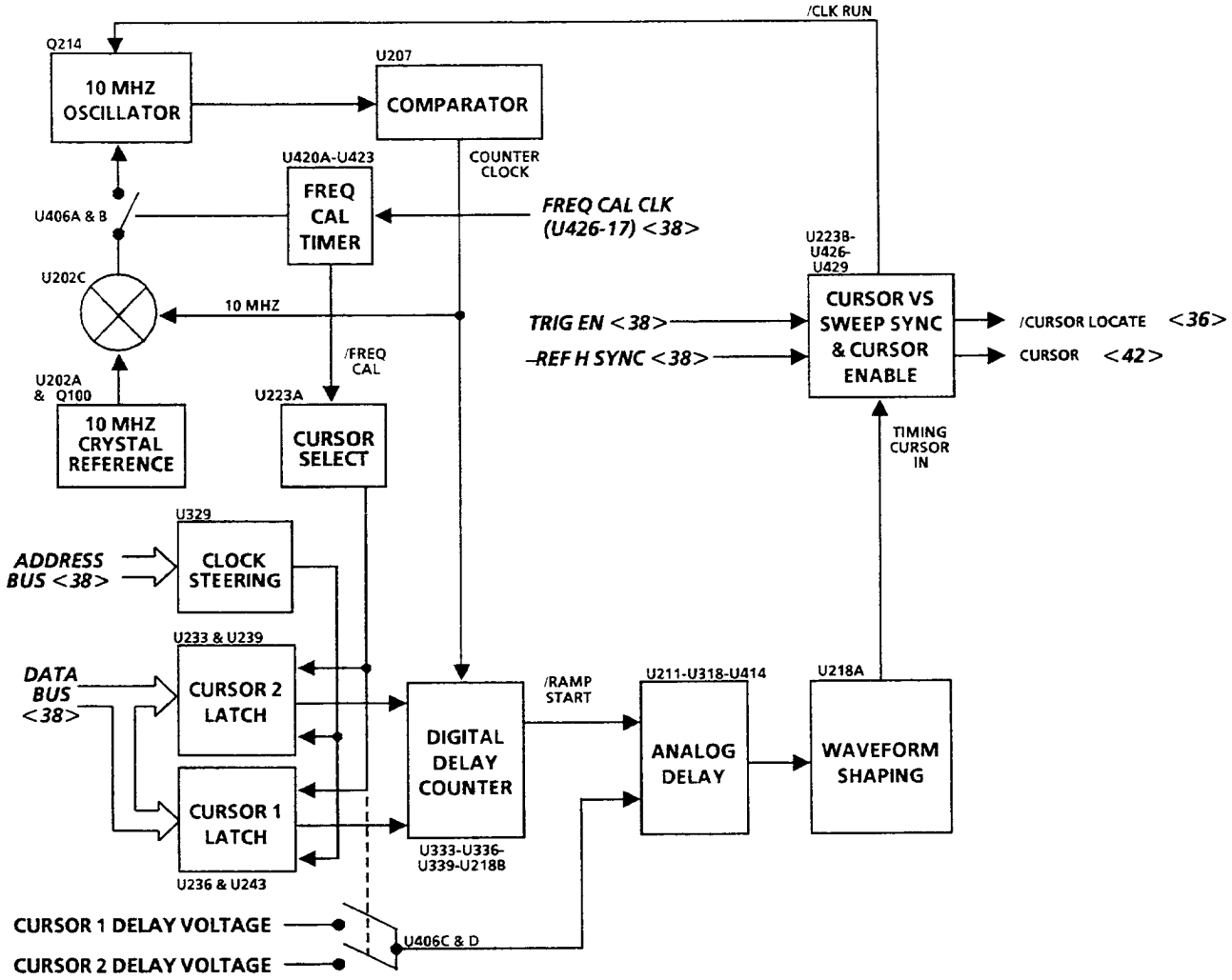
Waveform Z-Axis. The Waveform Z-Axis consists of three differential transistor pairs and two current sources. The differential pairs and their current sources steer current into the input of the Z-Axis Amplifier. U491C sets the intensity of the waveform and U395C sets the intensity of the readout display. The display is blanked when the differential pairs do not steer current into the Z-Axis Amplifier. By controlling the differential pairs, waveform blanking, readout blanking, and field rate line select intensification can be effected. U491D normally steers current into the 5 volt supply. When line select is on and the instrument is displaying field rate sweeps, U491D steers current into the Z-Axis Amplifier to make the display brighter for the selected line. U289B is a four-input NAND gate controlling U395D. If any of the inputs of U289B go low, the waveform blanking is enabled and the active display is blanked. Differential pair U395A and B steer current from the readout current source into the Z-Axis Amplifier.

Vectorscope Z-Axis. The Vectorscope Z-Axis consists of two current sources and two current steering differential pairs, U383D and U486D. U383D steers current

from the vector intensity current source, U383C. Vector intensity is blanked if any one of the inputs to U289A is low. U486D steers current from the readout intensity current source, U486C. The display is blanked when no current is diverted into the output, which drives the Vectorscope Z-Axis Amplifier. Q380 is saturated to shunt the video signal to ground, unless a video signal is summed into the vector brightness circuit in the picture monitor mode of operation.

Waveform Z-Axis Amp. The junction of R396 and R296 is the summing junction for this amplifier. It is at +5 volts DC. R397 and R498 are a voltage level shifter to bias the base of Q499 at 0 volts, when the summing junction is at +5 volts. R296 is the feedback resistor, which sets the overall amplifier gain at 36 volts/mA of input current. Q499 is an emitter follower that drives Q498, a common emitter amplifier. Q298 is a common base stage driven from Q498. The collector of Q298 is the output of the amplifier. Q199 is a constant current source that is the collector load for Q298. C299 is a speed-up capacitor that modulates the constant current source to increase amplifier rise time.

Diagrams 37 & 38 Timing Cursors & Counters



Overview

The timing cursors for the 1780R-Series are narrow bright-up pulses applied to the CRT cathode. They can be moved independently in 5-nanosecond intervals. The Microprocessor keeps track of the time difference between the two timing cursors and displays the difference on the screen. The timing cursors are implemented by starting an accurate oscillator at sync pulse time and digitally counting cycles until the selected time delay is reached. The oscillator frequency (10 MHz) gives 100-nanosecond time intervals when cycles are counted. A fine Analog Delay is added after the final digital count providing delay increments of 5 nanoseconds. The digital delay, however, must remain accurate over a two-line interval of 128 microseconds. To produce an accurate delay over a two-line interval requires that the oscillator be accurate in frequency. The frequency accuracy needed dictates that a crystal oscillator be used, but a crystal oscillator

will not start quickly at sync pulse time to be synchronous with the sweep. An LC Oscillator is used and calibrated to a crystal frequency reference during the vertical interval.

At Reference calibration time the Freq Cal Timer circuit generates a Frequency Cal pulse that connects the Error Amplifier (U302A) output to the LC Oscillator frequency determining Varactor diode. The change in capacitance caused by the increase/decrease in voltage across the Varactor diode changes the LC Oscillator frequency. The Error Amplifier voltage is stored away on a sample-and-hold cap until the next calibration interval. In this way, the quick starting LC Oscillator is always adjusted to the correct frequency.

The output of the LC Oscillator is 10-MHz TTL pulses that clock a counter, loaded to a predetermined starting count by data latched in from the Microprocessor Data Bus. One of the two sets of latches is enabled (depending whether Cursor 1 or Cursor 2 is selected) by the output of an enabling flip-flop. Ripple out from the counter triggers a one-shot that generates the Ramp Start pulse used by the analog delay to provide a ramp, which is compared to a DC level (from the Master MPU) to output a timing cursor.

Cursor versus sweep synchronization determines when to draw the timing cursors with respect to the horizontal sweep. A cursor shaper produces a very narrow pulse from the leading edge of the timing cursor, and is located on the waveform high voltage power supply.

Circuit Theory

OSC. Q214 is a Colpitts LC Oscillator, with L115, C115, and C116 forming a resonant tank circuit. CR214 is the Varactor diode, that changes capacitance to provide frequency control for the oscillator. Q407 is the on-off switch for the oscillator, which must be started and stopped with each delay count and each time it is compared to the Reference Oscillator, Q100.

CR307, R307, and C214 form a quick start circuit, that causes the oscillator to immediately begin oscillations when a falling edge is applied to the cathode of CR307.

U207 is a voltage comparator that converts the sine-wave output of the LC Oscillator to a TTL signal of the same frequency.

10 MHz Ref. Y105 is the resonant element in a Voltage-Controlled Crystal Oscillator (VCXO), Q100, circuit. C109 is adjusted for 10 MHz at TP108. Exclusive OR gate U202A is a buffer stage.

Phase Det. U202C (an Exclusive OR gate) and Q204 form a Phase Detector. The voltage on the collector of Q204 is directly proportional to the phase difference of the signals from the LC Oscillator and the 10 MHz Reference. This phase difference signal is amplified in U302A, a frequency-dependent Error Amplifier.

Sample-and-Hold. During the time that the LC Oscillator is being checked against the 10 MHz Reference, U406A is closed and U406B is open; during the time that timing cursor information is being output, the switches are in the opposite configuration. With C403 paralleling C404, and the loop filter disconnected, C403 (after a few seconds) reaches the same voltage that C404 has in the oscillator calibration mode. This makes the control voltage and the frequency the same for both calibration and timing cursor output. L115 in the LC Oscillator should be adjusted so that the Varactor drive voltage (TP100) is +8 volts, at room temperature.

Analog Delay. Q411 is normally off, and CR310 and CR311 are forward conducting to allow U211 to hold (TP315) just a few millivolts from ground, which gives the ramp a consistent 0-volt reference starting point. When the Digital Counter reaches the end of its count, it triggers the one-shot, U218B, and generates the Ramp Start signal. The Ramp Start signal turns on Q411 to back bias CR310 and CR311. A constant current source, Q311, charges C313 in a linear fashion, to generate a ramp signal. The ramp drives one input to a comparator, U318, where it is compared to a DC voltage from the Microprocessor. The comparator outputs a TTL pulse, proportionally delayed in time by the DC voltage level from the Microprocessor.

The two cursors are output time shared at a 30 Hz rate. U406D and U406C are switches that steer Cursor 1 and Cursor 2 voltages to the comparator, U318, depending on which cursor is being driven.

The comparator (U318) output ANDs with a permanent low to trigger a pulse shaping one-shot (U218A) that outputs a 1 μs pulse that drives the cursor shaper driving the Waveform CRT cathode. The timing cursor locate mode uses the 1 μs pulse to bright-up the display; the entire pulse width is used during locate, not just the leading edge, to drive the Z-Axis Amplifier.

Cursor Versus Sweep Synchronization and Cursor Enable. The timing cursors must be synchronous with the sweep signal. For instance, in a two-line sweep the timing cursors must always start at the first displayed line, and not the second. A TRIG EN signal originating from the sweep circuitry on Diagram 10 tells the timing cursor circuitry of an impending sweep start. When TRIG EN is true, the timing cursors can start counting on the leading edge of –REF H SYNC.

It is possible for the timing cursors to delay greater than two lines. Due to this, timing cursors may be displayed only on every other sweep sequence of a two-line sweep. U429A does this function by passing only half of the TRIG EN pulses to the control IC, U426. The signal out of U429A is called HALF TRIG EN. When TRIG EN and HALF TRIG EN are both true, and other control line conditions are met, COUNTER ENABLE DATA becomes true.

The –REF H SYNC signal from U596 on Diagram 9 and the COUNTER ENABLE DATA signal from the control IC U426 are both applied to U429B.

The output from U429B drives U223B, which enables the Digital Delay Counters. U429B and U223B are both cleared with the /RAMP START signal, which becomes true at the end of the digital count from the delay counters.

The remaining outputs from U426 are described as follows:

LINE SEL PHASE: Presets flip-flip U429A during the selected line in line select mode so that one of the timing dots is present each time a line is displayed. Note that since there are two timing dots, and since only one timing dot can be displayed during one line, that each dot is displayed only half of the time on that line, causing the displayed timing dots to flicker at half the rate of the selected line.

FREQ CAL CLK: During line select, FREQ CAL CLK occurs just after the selected line is displayed. During non-line select, it occurs during the vertical interval. This logic selects V SYNC or W LINESEL L as the FREQ CAL CLK source, depending on line select or not.

/CLK RUN: /CLK RUN is true low, and runs the timing cursor clock (Oscillator Q214). If either COUNTER ENABLE or FREQ CAL is low, /CLK RUN becomes low.

CURSOR: This signal is true high. SUBCARRIER DOTS EN, TIME DOTS EN, LINE SEL, and WFM READOUT EN are input control signals for selecting T CURSOR IN or SUBCURSE. These control signals determine whether T CURSOR IN or SUBCURSE is steered into CURSOR. In non-line select mode, no timing cursors are displayed when the readout is being displayed. In line select mode, timing cursors are displayed during the readout time so that they will be visible on the voltage cursors. This also causes the timing cursors to be displayed on the readout text when in line select mode. When subcarrier dots are being displayed, SUBCURSE is selected as the input for CURSOR.

/CURSOR LOCATE: This signal is true low. /CURSOR LOCATE is a 1 μs pulse which coincides with the timing cursor pulse, CURSOR. The difference in the two is their destination. Only the leading edge of CURSOR is used to make the Z-Axis bright-up dot, where the whole of /CURSOR LOCATE is used to brighten the Z-Axis. /CURSOR LOCATE is low when /T C LOCATE is low, WFM READOUT EN is high, T CURSOR IN is high, TIME DOTS EN is high, and LINESEL is low. /CURSOR LOCATE is also low when LINESEL is high, /T C LOCATE is low, T CURSOR IN is high, and TIME DOTS EN is high.

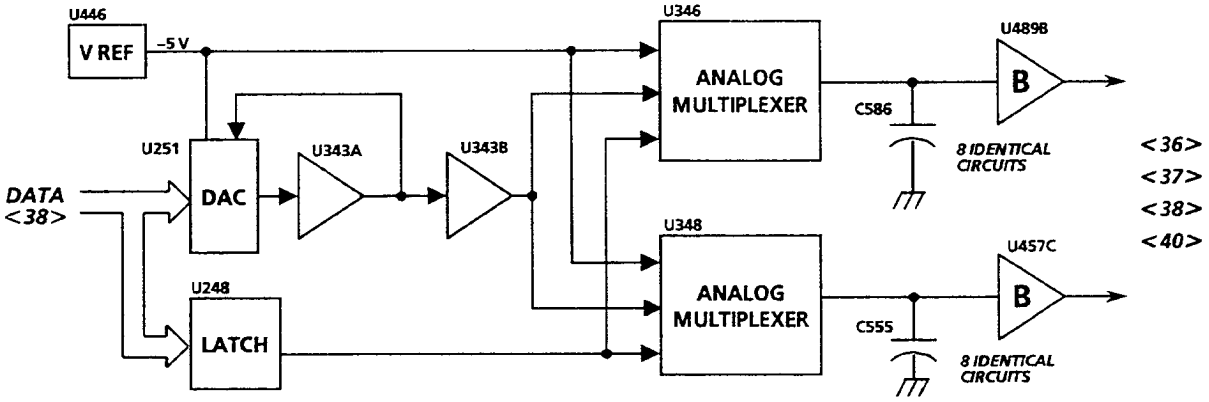
Freq Cal Timer. U420A outputs the FREQ CAL pulse. The duration of this pulse is eight lines, set by U423, which counts H pulses.

Digital Delay and Counters. U233, U239, U236, and U243 are latches that input delay information from the Microprocessor Data Bus to output counter delay

information. This delay information is loaded into the three counters, U333, U336, and U339. At any given time, only one cursor delay can be active; Cursor 1 and Cursor 2 time share at a 30 Hz rate. Cursor 1 and Cursor 2 delays are selected by a clock steering decoder, U329, which latches data in from the Microprocessor Data Bus. U239 and U233 latch the data for Timing Cursor 2, while U236 and U243 latch the data for Timing Cursor 1. The correct latch pair is selected by the outputs from U223A, a D-type flip-flop, that is clocked from the Freq Cal Timer.

The discrete counters are wired in series to form a single 12-bit counter. Each counter element is driven by 4 bits that preset its delay. The counter clock is a 10-MHz TTL pulse from the synchronized LC Oscillator comparator output. The ripple carry out of U339 drives U218B, to generate the Ramp Start pulse. The Ramp Start pulse from U218B also clears U223B. The Q output of U223B loads the latch count into the counters. U223B is preset by a /COUNTER ENABLE pulse that starts the LC Oscillator and restarts the cycle.

Diagram 39 CRT Display DAC



Overview

The CRT Display DAC decodes digital information from the Microprocessor Data Bus to drive 16 analog control voltage outputs. This digital information is the current setting of front-panel controls, such as Focus and Intensity levels, and some menu driven (Measurements control set) functions, such as Read Out Intensity and Trace Rotation levels.

The Digital-to-Analog Converter (DAC) provides a single analog output for each digital word it receives. The output from the DAC is input to Analog Multiplexers whose output is controlled by instructions latched from the data bus. Because of the relatively low sampling rate, the DC levels output from the Multiplexers are stored on sampling capacitors. Each of the 16 outputs is buffered before it is applied to its control circuit.

Circuit Theory

DAC. When the DAC (U251) Write input (pin 13) is driven low, data from the Microprocessor Data Bus is loaded into an internal latch. When the Chip Select input (pin 12) is driven low, the DAC is activated and outputs an analog signal.

VREF (pin 15) is driven from the DAC Ref Voltage Supply, and is at –5 volts. An internal resistor (10K) between RFB and OUT1 provides feedback resistance around U343A. The gain of U343A is equal to 10 volts per milliampere of current from the DAC.

The minus input of U343A is a summing junction, with no measurable signal voltage. U343B level shifts the signal from U343A. With the DAC input data (from the Microprocessor Data Bus) all zeros, U343B output is at –4.5 volts. The output is at +4.5 volts when the DAC input data is all ones.

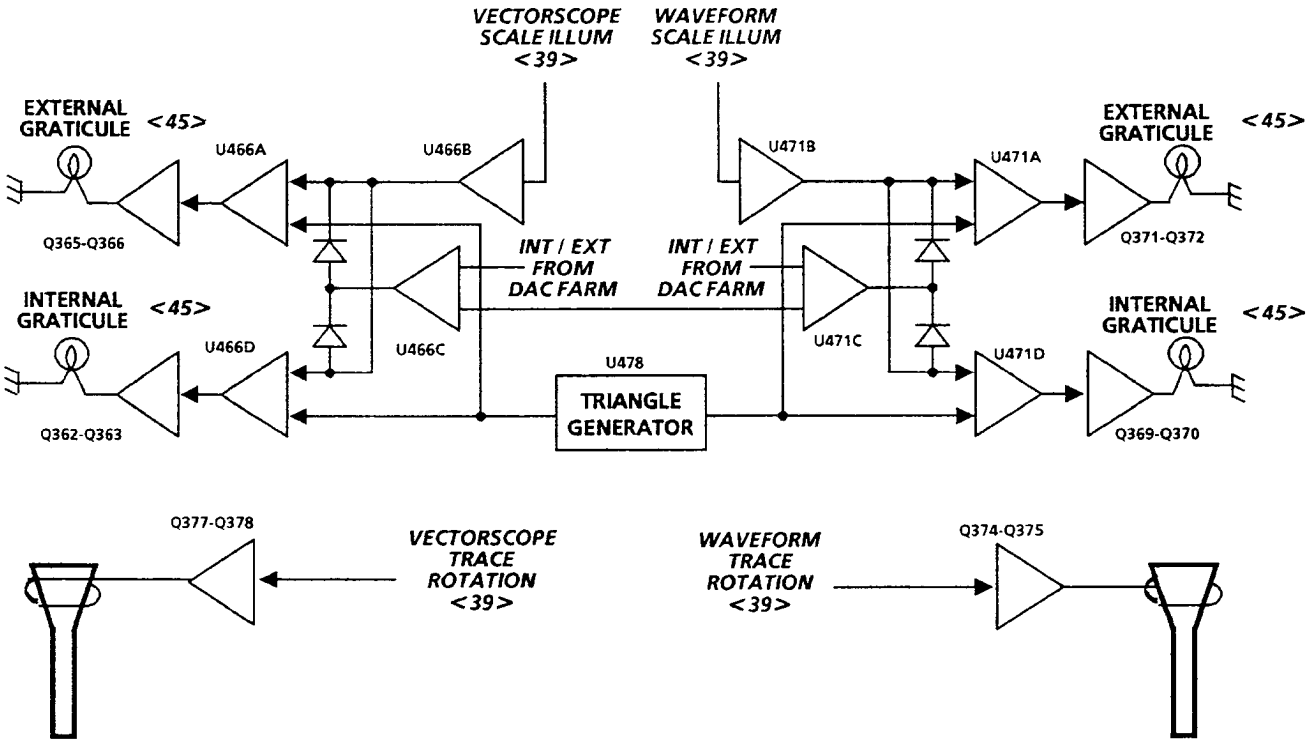
DAC Ref. U446 is a shunt voltage regulator, whose reference-to-anode voltage is internally set to 2.5 volts. Because R443 and R444 are equal, the reference-to-anode voltage sets the voltage between cathode and anode to 5 volts.

Analog Multiplexers. U346 and U348 are Analog Multiplexers. Each has one input and eight outputs; the input is the analog signal level from the DAC. The outputs are normally high impedance disconnects, except when one is selected by the digital word at inputs A, B, and C.

U248 is a latch that takes a “snapshot in time” of the information on the data bus, and uses it as steering information to the Analog Multiplexers. By properly timing the steering information, the voltage from the DAC is routed to the desired output. Only one Analog Multiplexer is enabled at one time by bringing the INH pin low.

The Analog Multiplexers time share the DAC signal. In addition, the DAC input from the Microprocessor Data Bus is time shared with the rest of the instrument. Because of the input and output time sharing, the outputs rarely are connected to the DAC. To compensate for this, each output of the Analog Multiplexers drives a sample-and-hold capacitor. The capacitors hold the DAC value between samples; their output drives a Buffer Output Amplifier.

Diagrams 40 & 45 Scale Illum & Trace Rotation – Graticule Lights



Overview

A Triangle Generator is employed to provide a triangular waveform to drive one input of the Pulse Width Modulators. Pulse Width Modulators are voltage comparators that compare the triangle-shaped waveform to DC voltages and produce a pulse width modulated square wave. The pulse width is changed by varying the DC voltage. The brightness of the graticule illumination light bulbs are varied by driving them with a variable duty cycle AC-coupled square wave to provide longer bulb life. 50% duty cycle is maximum brightness. Anything above or below 50% duty cycle reduces the value of illumination. There are four sets of graticule lights, internal and external for both tubes. Each set of lights has its own voltage comparator to produce a duty cycle modulated square wave. Independent comparators make it possible for each set of graticule lights to have a different intensity. The graticule lights are independently selected by enabling or disabling their comparators.

The duty cycled square waves are AC-coupled to the Scale Drivers, which are in turn AC-coupled to the graticule lights.

The Rotation Drivers buffer the trace rotation signals from the DAC and drive the Trace Rotation coils around the CRTs.

Circuit Theory

Rotation Drivers. The Rotation Drivers are simple push-pull, discrete transistor, emitter followers. Each driver consists of a pnp and npn transistor pair (Q377 & Q378, Q374 & Q375) between –15 volts and +15 volts. Their outputs drive the Trace Rotation coils around the Vectorscope and Waveform Monitor CRTs.

Data Latch. 226 latches data from the Microprocessor Data Bus. Data values are transferred to the Q outputs on the rising edge of the Grat Clock signal (pin 11). The Q outputs are static lines that only occasionally change.

Triangle Generator. U478 is a voltage comparator whose output is a square wave. The gain from the output (pin 5) to the negative input (pin 2) is time delayed and greater than the gain to the positive input (pin 3), which causes it to oscillate. C476 and R479 provide the time delay to the negative input and set the frequency of oscillation. The negative input has a symmetrical exponential waveform resembling a triangle waveform, which drives the Pulse Width Modulators.

Pulse Width Modulators. U466C and U471C along with the diodes in their outputs are the enabling/disabling circuits for the Pulse Width Modulators. They select either internal or external graticule lights. U466A and D along with U471A and D, when enabled, are the duty cycle comparators. They compare the DC level output by Control Buffer Amplifiers, U466B and U471B, to the triangle waveform. Comparator square-wave output is AC-coupled to the Scale Drivers.

Scale Drivers. The Scale Drivers are simple push-pull, discrete transistor, emitter followers, similar to those in the Rotation Drivers. Each driver consists of a pnp and npn transistor pair between ground and +15 volts. Their output is AC-coupled directly to the graticule lights.

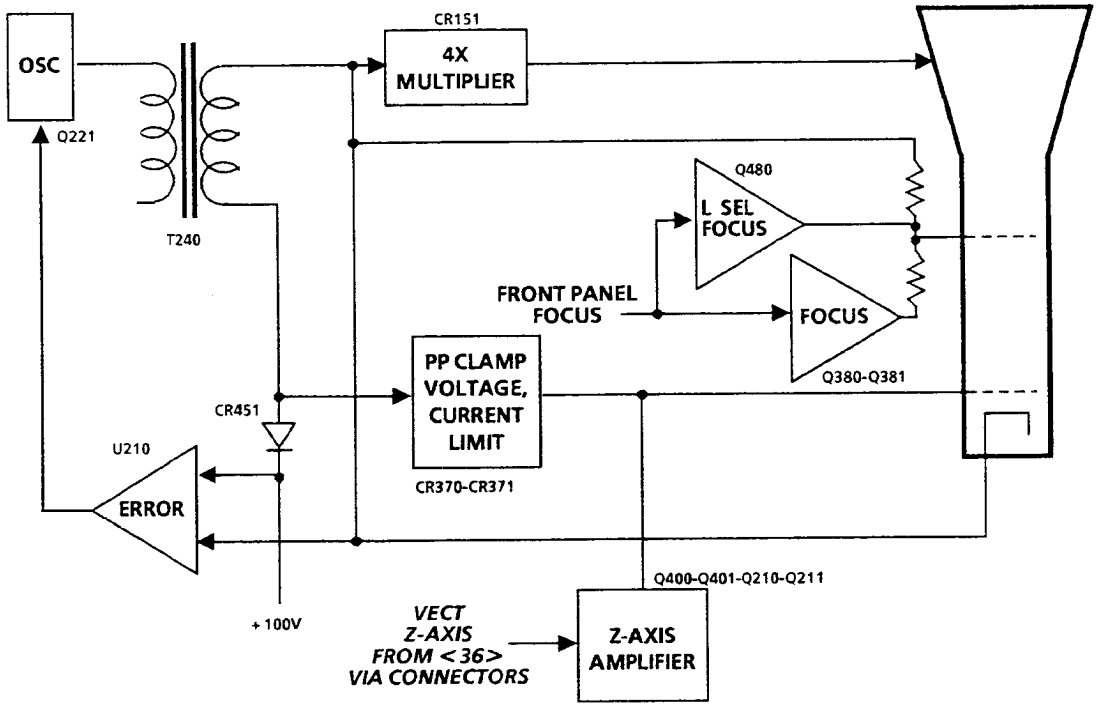
Vector Grat Light. (Diagram <45>) Internal graticule is illuminated with three bulbs, in parallel, between the output of the Vectorscope Internal Graticule Scale Driver and ground. External graticule is illuminated with two bulbs, in parallel, between the output of the Vectorscope External Scale Driver and ground.

S131 is a push-button switch with an LED that is directly beneath the Vectorscope CRT. It assigns Focus, Intensity, Scale Illum, and Position controls to the Vectorscope.

Waveform Grat Light. (Diagram <45>) Internal graticule is illuminated with three bulbs, in parallel, between the output of the Waveform Internal Graticule Scale Driver and ground. External graticule is illuminated with two bulbs, in parallel, between the output of the Waveform External Scale Driver and ground.

S130 is a push-button switch with an LED that is directly beneath the Waveform CRT. It assigns Focus, Intensity, Scale Illum, and Position controls to the Waveform Monitor.

Diagram 41 Vector High Volts



Overview

The Waveform Monitor high voltage supply generates all of the potentials required to power the CRT, except for the deflection voltages. The high voltage is derived from an Armstrong Oscillator-generated 33-kHz signal. The Error Amplifier, which controls oscillator base current, samples the voltage on the 100-volt supply, which is also generated by the High Voltage Oscillator.

The PP Clamp provides the proper amplitude RF signal to the Grid Drive Rectifier, which outputs a DC voltage proportional to the driving Z-axis signal. The Focus Amplifier sets the voltage on the bottom of the focus divider. By varying the Focus Amplifier output, the focus voltage higher up the divider string can be varied a small amount. In line select, the CRT is driven very hard and the Line Select Focus circuit causes the focus voltage to change during the selected line, and then return to normal the rest of the time. Changing focus for the selected line and then changing back keeps the readout signal, which does not drive the CRT as hard, in focus.

The Z-Axis Amplifier provides the fast rise time signal, to the CRT control grid, that unblanks the Vectorscope CRT.

Circuit Theory

Osc. Q221 is the active element of an Armstrong Oscillator, with C230 and the primary of T240 resonating at 30 kHz. L110 and C120 filter the 30-kHz signal out of the +60 volt supply.

C130 provides a low impedance current path for the base drive winding of T240. R222 limits Q221 base current.

Power Supplies. CR151 is a potted assembly of diodes and capacitors which provides a DC output equal to four times the peak input voltage. The output provides +11K volts DC post acceleration to the CRT anode.

CR150 rectifies the minus peaks from the transformer secondary to provide the –2.75K volts CRT cathode potential.

CR451 rectifies the positive peaks from a T240 (pin 6 & 7) winding to provide the +100 V that powers the Z-Axis Amplifiers.

Error Amp. U210 senses the +100 volts and the current in the high voltage winding through R250 and C110. This feedback sensing holds the high voltage constant over varying intensity levels, at the expense of +100 volts regulation.

The Error Amp output controls the current through R111 and R120 to adjust base current for the High Volts Oscillator, Q221.

The Error Amp is stabilized through several frequency compensation elements: C111, C321, and R112. If one or more of these elements is defective, the Error Amplifier may oscillate, or have a poor response time.

Q220 provides a slow start on power-up. C320 pulls the base of Q220 low. When the base of Q220 goes low, the emitter pulls down on CR120 to prevent the Error Amp from providing base current to the oscillator. Eventually, R121 charges C320 and the oscillator is allowed to start.

Grid Drive Rectifier. Z-axis high frequency information is fed to the CRT control grid through C263. Low frequency information is through C264. The Grid Drive Rectifier, consisting of CR170 and CR171, is a voltage doubler that converts peak-to-peak voltage from the PP Clamp to DC. When the Z-axis signal voltage changes, the peak-to-peak amplitude of the signal from the PP Clamp changes the same amount, causing the Grid Drive Rectifier to reflect this change by proportionally changing its DC output voltage. The PP Clamp signal is coupled across a 2.75 kV boundary through C264.

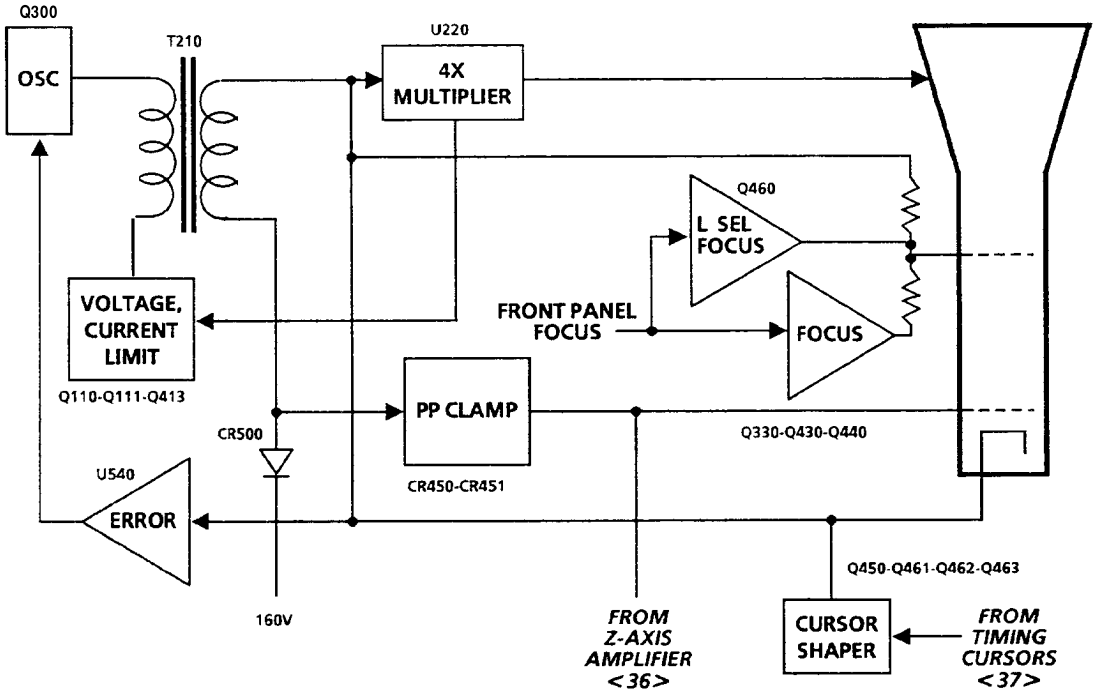
PP Clamp. The signal from a winding (pins 6 & 7) of T240 is coupled into the PP Clamp through C460 and R370. Diodes CR370 and CR371 clip the signal. The amplitude of the clipped signal is set by the voltages on the diodes. The voltage on the cathode of CR371 is set by the CRT bias control (R373) and the anode voltage on CR370 is the same as the output of the Z-Axis Amplifier, which is a dynamic signal.

Focus Amp. The Focus Amp consists of Q380 and Q381 with R379 as the input resistor and R382 as the feedback resistor. Coarse focus is adjusted with R182, which is located at the Focus divider resistor string. The amplifier output varies between 0 and –250 volts.

Line Select Focus. When the instrument is in line select, Q480 is turned on during the selected line in a periodic manner. This causes a negative-going pulse to appear on the collector, which is coupled to the CRT focus grid through capacitors C480 and C280. The amplitude of the pulse, and thus the amount of focus change, is determined by the setting of the Line Select Focus adjustment, R384. DS480 and DS361 are spark arrestors, in case there is a high voltage arc.

Z-Axis Amp. The junction of R202 and R312 is a summing junction at +5 volts DC. R301 and R300 provide a voltage level shift so that the base of Q401 will be at 0 volts, when the summing junction is at +5 volts. R312 is the feedback resistor, and sets the overall amplifier gain at 36 volts per milliampere of input current. Q401 is an emitter follower driving a common emitter amplifier (Q400) that drives Q210, a common base stage. The collector of Q210 is the output of the amplifier. Q211 is a constant current source collector load for Q210. C410 is a speedup capacitor to modulate the constant current source and increase amplifier rise time.

Diagram 42 Waveform High Volts



Overview

The Waveform Monitor high voltage supply generates all of the potentials required to power the CRT, except for the deflection voltages (however, +160 volts for the Horizontal Deflection Amplifier is generated by these circuits). The high voltage is derived from an Armstrong Oscillator-generated 25-kHz signal. The Error Amplifier, which controls oscillator base current, samples the cathode supply DC voltage. The voltage current limit circuit is a fail safe, designed to prevent X-rays if the Error Amplifier should fail.

The PP Clamp provides the proper amplitude RF signal to the Grid Drive Rectifier, which outputs a DC voltage proportional to the driving Z-axis signal. The Focus Amplifier sets the voltage on the bottom of the focus divider. By varying the Focus Amplifier output, the focus voltage higher up the divider string can be varied a small amount. In line select the CRT is driven very hard. The Line Select Focus circuit causes the focus voltage to change during the selected line, and then return to normal the rest of the time so that the readout signal, which does not drive the CRT as hard, will also be in focus.

The Cursor Shaper takes a positive-going TTL edge and turns it into a very narrow negative pulse. This pulse is applied to the cathode of the CRT to provide a short duration bright-up of the trace. The Cursor Shaper is used for timing cursors and subcarrier dots mode.

Circuit Theory

Osc. Q300 is the active element of an Armstrong Oscillator, with C410 and the primary of T210 resonating at 25 kHz. L200 and C100 filter the 25-kHz signal out of the +60 volt supply.

C500 provides a low impedance current path for the base drive winding of T250. C300 prevents parasitic oscillations and R300 limits Q300 base current.

Power Supplies. U220 is a potted assembly of diodes and capacitors which provides a DC output equal to four times the peak input voltage. The output provides +15.6 kV DC post acceleration to the CRT anode. CR220 rectifies the minus peaks from the transformer secondary to provide the –3.9 kV CRT cathode potential.

CR500 rectifies the positive peaks from a T250 (pin 6 & 7) winding to provide the+160 volts that powers the Waveform Monitor Horizontal Deflection Amplifier.

Error Amp. U540 senses the –3.9 kV supply voltage through a resistor assembly contained in R330. R330 is a four-section, thick-film resistor. Two closely matched resistors form a voltage divider off of the –3.9 kV supply. The other two resistors form the Focus voltage divider. The +5 volts supply provides current into the resistive divider to bias pin 2 of R330 at 0 volts when the –3.9 kV supply is at the proper operating voltage.

The Error Amp output varies to keep pin 2 of R330 at 0 volts, by controlling the current through R501 and R500 to adjust base current for the High Volts Oscillator, Q300.

The Error Amplifier is stabilized through several frequency compensation elements: C243, C430, R531, C534, C533, R540, and R441. If one or more of these elements is defective, the Error Amplifier may oscillate, or have a poor response time.

Q530 provides a slow start on power-up. C530 pulls the base of Q530 low. When the base of Q530 goes low, the emitter pulls down on CR520 to prevent the Error Amp from providing base current to the oscillator. Eventually, R530 charges C530 and the oscillator is allowed to start.

Voltage, Current Limit. If the 160 volt supply gets too high, the reference pin on VR210 rises above 2.5 volts, which causes current to flow in the cathode circuit of VR210 and turns on Q111. Q111 turns on Q110, which shuts the oscillator off by shunting its base signal to ground.

The anode current in the CRT is equal to the current flowing in the ground pin of the 4X Multiplier, U220. R320 is a current sense that turns on Q413 when the anode current reaches 60 uA. When Q413 is turned on, the voltage reference for VR210 rises above 2.5 volts and the oscillator is shut down.

Grid Drive Rectifier. Z-axis high frequency information is fed to the CRT control grid through C240. Low frequency information is through C241. The Grid Drive Rectifier, consisting of CR140 and CR141, is a voltage doubler that converts peak-to-peak voltage from the PP Clamp to DC. When the Z-axis signal voltage changes, the peak-to-peak amplitude of the signal from the PP Clamp changes the same amount, causing the Grid Drive Rectifier to reflect this change by proportionally changing its DC output voltage. The PP Clamp signal is coupled across a 4 kilovolt boundary through C241.

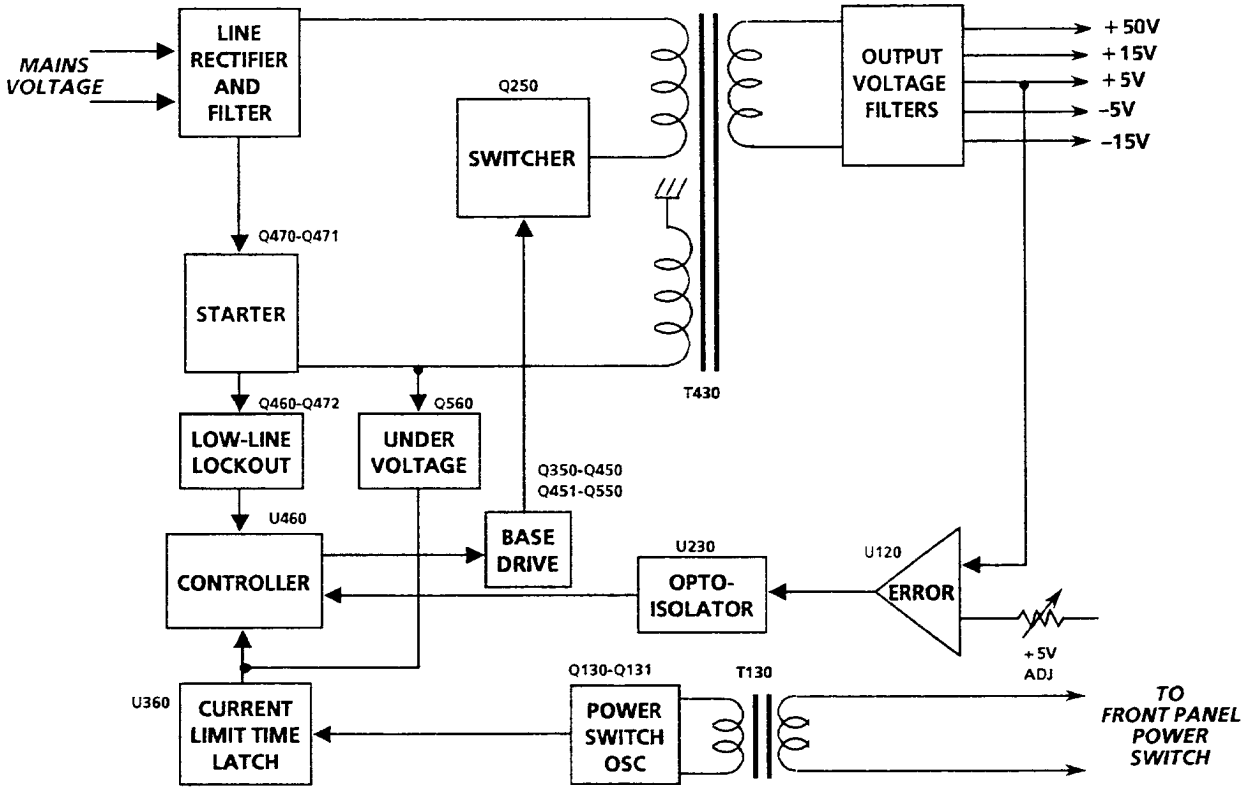
PP Clamp. The signal from a winding (pins 6 & 7) of T250 is coupled into the PP Clamp through C512 and R510. Diodes CR450 and CR451 clip the signal. The amplitude of the clipped signal is set by the voltages on the diodes. The voltage on the cathode of CR450 is set by the CRT bias control (R420) and the anode voltage on CR451 is the same as the output of the Z-Axis Amplifier, which is a dynamic signal.

Focus Amp. The Focus Amp consists of Q440, Q430, Q330 with R550 as the input resistor, and R440 and R443 forming the feedback resistor. Coarse focus is adjusted with R130, which is located between two sections of R330, the Focus divider. Q430 and Q330 are connected in series to allow for a high voltage output from the amplifier, which can reach about –500 volts, and would overstress a single transistor.

Line Select Focus. When the instrument is in line select, Q460 is turned on during the selected line in a periodic manner. This causes a negative-going pulse to appear on the collector, which is coupled to the CRT focus grid through capacitors C365 and C251. The amplitude of the pulse, and thus the amount of focus change, is determined by the setting of the Line Select Focus adjustment, R350. DS362 and DS361 are spark arrestors, in case there is a high voltage arc.

Cursor Shaper. Q450 drives Q462 through a delay element consisting of L560 and C562. Initially, the collectors of Q450 and Q462 are at the positive supply potential. When a positive TTL edge drives the base of Q450 positive, its collector goes negative and because Q462 is off, its collector also goes negative. A few nanoseconds later, Q462 is turned on through L560 and C562, and its collector goes back positive. Q461 and Q463 are emitter followers that drive signal current into the cathode of the CRT.

Diagram 43 Low Voltage Power Supply



Overview

The low voltage power supply is a line operated switcher, of the discontinuous flyback type, running at 40 kHz. The switching transistor saturates, placing the primary voltage across the primary winding. Due to the inductance of the primary winding, current rises in the switching transistor in a linear fashion. When this current reaches a preset amount (fixed by the control circuitry and the load power) the transistor turns off. When the transistor turns off, the energy stored as flux in the transformer is released when all of the voltages change polarity (flyback) and the secondary diodes conduct current.

By performing this operation many times per second, energy is transferred to the secondary circuits of the transformer to charge the filter capacitors. If the frequency remains constant, the amount of energy flowing into the secondary can be controlled by adjusting the duty cycle of the switch. A short duty cycle transfers less energy than a long duty cycle.

The power supply regulates the +5 volt output. Because the outputs are electrically isolated from the primary, information about the secondaries is transferred by a light beam in a device called an Opto-Isolator. The control circuits, using the fed back +5 volt reference, change the duty cycle as the load changes, to keep the +5 volt output constant.

The primary side of the circuit is not referenced to chassis ground and typically, the line common rides at – 150 volts, unless an isolation transformer is used. An isolation transformer between the instrument and the mains power will let the line side common float, which will allow the line side common to be connected to ground.

WARNING. *Troubleshooting or signal measurement should not be attempted without an isolation transformer.*

The power switch in this supply does not disconnect the mains power. Whenever the instrument is plugged in, power line potential is available, and a neon indicator, located on the fuse board, warns of this danger. The power switch is electrically isolated from the line side circuitry for safety reasons. The coupling medium in this case is the magnetic field in a transformer, enabling or disabling a "Flea Power Oscillator."

Circuit Theory

Line Rectifier and Filter. The rectifier diodes (CR100, CR101, CR102, and CR103) are connected as a full-wave bridge when 220 volts mains is selected. When 110 volts mains is selected, CR103 and CR101 are connected as a full-wave doubler (CR102 and CR100 do not conduct). If 220 volts is applied when S110 is in the 110 volt position, R210 and E210 cause the fuse to blow. R210 is a fast acting varistor that keeps high voltage transients from triggering the spark gap, E210. E210 can handle large currents to prevent an over-voltage condition in the rest of the supply.

Filtering is accomplished with C160 and C170. High frequency energy is prevented from entering the power line by a circuit consisting of C270, C271, L370, C576, and C340, as well as the line filter located on the rear panel.

S250 is a thermal switch on the switching transistor heat sink. If the fan stops, the switching transistor gets hot enough to trip the thermal switch (approximately 80° C).

Switcher. Q250 is a high voltage transistor capable of withstanding 1000 volts from collector to base. CR350, and CR351 and CR353 in the base circuit, are wired as a Baker clamp, to keep Q250 from being driven into saturation and enhancing the switching characteristics of the transistor. R150, in the emitter of Q250, is a current sense resistor. Maximum peak voltage on the emitter is 2.2 volts, which corresponds to 4.3 amperes, including base drive current (which is about 600 mA). Collector current is 3.7 amperes maximum (4.3 A minus 600 mA). Normally, the current levels are less, depending on power supply loading.

Snubber. There are two snubber circuits, the voltage peak snubber and the rising edge snubber. The voltage peak snubber consists of CR141, CR140, L140, L240,

R140, and C240, which protects Q250 from over-voltage. C240 and CR141 arrest the voltage spike on the flyback pulse at a safe level (approximately 650 to 700 volts). L240 and R140 limit the rise time of the current pulse in C240, quieting the noise spike. C240 discharges each cycle, through CR140 and L140, when Q250 turns on.

The rising edge snubber, consisting of C141, CR149, and R149, slows down the rising edge of the flyback pulse to diminish noise. When the flyback pulse occurs, C141 is charged through CR149 and discharges through R149 when Q250 is turned on.

Base Drive. Base drive current must be sufficient to keep the transistor saturated, yet not be great enough to cause the transistor to dissipate excessive power during switching transients. When the transistor is turned off, reverse current is pulled out of the base, due to charge storage in the device. The reverse base current is a short duration spike of greater than 1 ampere. The base drive circuit must be capable of providing this current to ensure the transistor turns off properly and does not run too hot.

Q450 and VR350 are wired together in a 5 volt zener circuit. They are able to dissipate more power than a typical zener diode. The circuit is placed across C350 to keep it charged to 5 volts, which allows the base of Q250 to be driven negative, even though the preceding base drive circuitry can go no lower than 0 volts. This provides the negative base drive voltage to Q250, needed for proper switching action.

Q451 and Q350 are emitter followers that amplify the base drive signal from pin 6 of the Current Mode Controller, U460. Q550 is a current limit transistor that sets the drive current from Q451 (about 600 mA) to limit the turn-on base current in Q250. R460 limits the current available to Q550 and keeps its power dissipation at a safe level. CR460 bypasses the resistor for negative excursions to provide drive current for Q350. The turn-off base current for Q250 is provided by Q350.

Controller. U460 is a Current Mode Controller, using the current in the switching transistor and the output voltage of the 5 volt supply as references. By monitoring the 5 volt output, the Current Mode Controller can set the peak current (in the switching transistor) by varying its duty cycle.

The current in the switching transistor is a ramp signal. Its emitter resistor changes the ramp current to a ramp voltage. A comparator inside the controller compares the emitter voltage ramp (pin 3) to a level-shifted DC voltage from an internal Error Amplifier. The duty cycle is controlled by the voltage on this Error Amplifier output. As the Error Amplifier voltage goes more positive, the time it takes for the ramp voltage to get to that positive level increases and causes the controller comparator to output a longer duty cycle.

Pin 1 of U460 is the Error Amplifier output. Pin 2 is the minus input to the Error Amplifier, the positive terminal is internally connected to +2.5 volts. Pin 3 is the current sense input, and pin 6 is the controller output, driving the base drive circuit. The Current Mode Controller has an internal oscillator and the frequency of operation is determined by a resistor/capacitor (RC) circuit (R560 and C461) connected to pin 4. Pin 8 is the +5 volt reference output.

The signal from the Opto-Isolator drives R462; R461 is the feedback resistor. Because R461 and R462 are equal, the gain of the signal (at the output of the Error Amplifier) is equal to one.

Starter. Q471 and Q470 form the starter circuit. Because CR540 cannot supply base drive power when the instrument is first turned on, an alternative start is needed. Prior to power supply start, Q470 is off because U460 cannot power its base. Q471 is on, with R574 supplying its base current.

The collector resistor for Q471 (R575) limits current to a small value, which is just large enough to charge C540 in a fraction of a second. Once C540 charges to 16 volts, U460 turns on and provides base drive. Once the supply is operating, the power for the base drive circuit is supplied by CR540.

When the supply starts, Q470 turns on, lights DS470, and turns off Q471. If for some reason the power supply does not start (e.g., the power switch is off), C540 is quickly depleted and when its charge reaches 10 volts, U460 shuts down. This cycle repeats at a periodic rate of a few cycles per second.

Under Voltage Disabler. Q560 turns on when the base drive power supply drops below about 13 volts. When it turns on, it pulls up the current sense line to U460 to shut down the supply and ensure that the base drive signal is shut off before it gets too weak.

Low Line Lockout. Q472 is normally held in the off condition by the voltage divider on its base (R570, R571, and R572). If the line voltage drops below about 80 volts AC, Q472 turns on and pulls the base of Q460 high to pull pin 2 of U460 high and turn it off.

Current Limit Time Latch. The Comp input of U460 rises above 4 volts when it is in current limit. If U360 senses this condition, its output goes low and charges C360. After about 40 milliseconds, C360 charges enough to turn on Q360. Once it is turned on, it will not turn off again until the power source decays. Q360 pulls pin 3 of U460 high to shut down base drive power.

When the power supply load is too great, and it is in current limit, it typically runs in short bursts of 40 milliseconds or so, followed by a half second of rest time.

Output Filters. The filters are all the standard pi configuration except the –8 volt filter. There are three powdered iron beads (L420, L421, and L422) on the +5 volt secondary wires to help raise the other output voltages to the proper values.

Error Amp. U131 is a shunt regulator supplying a +5 volt reference. The reference pin is the negative input to an internal amplifier and the cathode is the output. The reference input is set internally to operate 2.5 volts above the anode, which is grounded.

Jumper J122 is to test the over-voltage protection circuit by increasing the +5 volt reference to +6.5 volts.

U120 is the Error Amp, which compares the +5 volt reference to the +5 volt output, and drives the Opto-Isolator, U230, with the difference signal.

Over-voltage Protection. Q220 is a silicon-controlled rectifier (SCR). If the gate is pulled a diode drop higher than the cathode, the device fires and shorts the +5 volt supply to ground. VR220 causes Q220 to fire if the +5 volt supply rises above about 6 volts.

Power Switch Oscillator. The primary winding of T130 is the resonant element in the Power Switch Oscillator. When the power switch is closed (power on), a 100Ω resistive load is placed across the secondary of the transformer, disabling the oscillator.

When the Power Switch Oscillator is running (power off), it provides pulses of base current to Q130. Q130 supplies current through CR370 that pulls pin 3 of U460 high and prevents operation of the power supply.

The Power Switch Oscillator operates in short bursts, as dictated by U460, which powers the oscillator. C132 prevents the supply from starting on the transitions that occur when U460 becomes active before the oscillator has started.

Performance Verification

This section consists of the Performance Check, used to determine compliance with the Performance Requirements listed in the *Specifications* section.

Controls and connectors on the 1780R-Series front panel and rear panel are fully capitalized (e.g., RIGHT DISPLAY-WFM). Control and connector names on test equipment, as well as internal controls and adjustments for the instrument under test, are initial capitalized (e.g., Time/Div).

Recommended Equipment List

The following equipment and accessory items are required to do the Performance Check Procedure. Broad specifications are followed by an example of equipment that meets these specifications. In most cases, the following procedure was prepared using the recommended equipment.

Table 4–1: Recommended Equipment

Electrical Instrument	Performance Requirements	Example
1. Test Oscilloscope		
Vertical Amplifier	Differential Comparator with 30 MHz bandwidth and 1 mV sensitivity. Dual-Trace Amplifier with 30 MHz bandwidth and 5 mV sensitivity.	TEKTRONIX 7603 Oscilloscope, a 7B53A Dual Time Base, a 7A13 Differential Comparator, a 7A18A Dual-Trace Amplifier, a 1X probe (Tektronix P6101A), and a 10X probe (Tektronix P6102A).
Time Base	10 ns/div to 5 ms/div sweep speeds; triggering to 5 MHz.	
2. Television Test Signal Generator	Provides color test signals for the television standard that the 1780R-Series will use. Required signals: Black Burst. Color Bars. Linearity Staircase and Variable APL. Field Rate Square Wave. 2T Pulse & 2T Bar. Multiburst. Field 1 Reference.	TEKTRONIX NTSC 1410 with Option AA and Option AB (modified SPG2 and TSG7), TSP1 Switcher (optional), TSG3, TSG5, and TSG6. TEKTRONIX PAL 1411 with Option AA and Option AB (modified SPG12 and TSG11), TSP11 Switcher (optional), TSG13, TSG15, and TSG16. The 1410 and 1411 Option AA are mainframes with modified SPG2 and SPG12 Sync Generators with the added features of: Variable Subcarrier Frequency; (±20 Hz, ±50 Hz for the 1410), (±5 Hz, ±10 Hz for the 1411), Variable Burst amplitude, Variable Sync amplitude, and SCH unlock.

Table 4–1: Recommended Equipment (Cont.)

Electrical Instrument	Performance Requirements	Example
NOTE: *The 1410 Series generators with standard SPG and TSG modules can be used, but this will not allow all checks and adjustments to be made.* *The 1410 and 1411 Option AB are mainframes with modified TSG7 and TSG11 Color Bar Generators that more accurately control output amplitudes of the standard 75% amplitude bars.* *When preparing this procedure, the modules were configured to provide the following signals at the mainframe J1 to J6 rear-panel connectors:* *J1 Black Burst* *J2 Color Bars* *J3 Switcher* *J4 Linearity* *J5 Pulse & Bar* *J6 Multiburst* *When performing linear waveform distortion, differential phase, and gain checks, the signal from the module was connected directly to the instrument instead of going through the Switcher.*		
3. Television Generator	Provides accurate test signals for checking SCH Phase accuracy. Required signals: Color Bar, Black Burst, and Field 1 Reference.	TEKTRONIX TSG-170A NTSC Television Generator or TEKTRONIX TSG-271 PAL Television Generator.
4. Leveled Sine Wave Generator	Flatness 1%, 250 kHz to 50 MHz. The flatness can be characterized (a chart made of variations) with the TEKTRONIX Peak-to-Peak Detector (015-0408-00).	TEKTRONIX SG503 Leveled Sine Wave Generator installed in a TEKTRONIX TM500 Series Power Module. When using the TEKTRONIX SG503 the following additional accessories are needed: Two 50 Ω coaxial cables, Tektronix Part No. 012-0482-00. A 50-to-75 Ω minimum loss attenuator, Tektronix Part No. 011-0057-00.
5. Digital (Frequency) Counter	Range: 10 kHz to 20 MHz; accuracy, ±0.001%.	TEKTRONIX DC 503A used in a TM500 Series Power Module.
6. Peak-to-Peak Detector Amplifier		Tektronix Part No. 015-0408-00 (includes one 015-0413-00 Peak-to-Peak Detector Head). Installed in a TEKTRONIX TM500 Series Power Module.
7. Detector Head		Two each, Tektronix Part No. 015-0413-00 for use with TEKTRONIX Peak-to-Peak Detector Amplifier (item 6). One Detector Head is supplied with the Peak-to-Peak Detector.
8. Voltmeter (DMM)	Range: 0 to 100 VDC; accuracy, ±0.1 %.	TEKTRONIX DM501A used in a TEKTRONIX TM500 Series Power Module.

Table 4–1: Recommended Equipment (Cont.)

Electrical Instrument	Performance Requirements	Example
9. Video Amplitude Calibration Fixture	Signal; adjustable square wave 0.0 to 999.9 mV p-p with a resolution of 0.1 mV and an accuracy of 0.05%, frequency approximately 270 Hz.	TEKTRONIX 067-0916-00 used in a TEKTRONIX TM500 Series Power Module.
10. Sine Wave Generator	Signal: 10 Hz to 100 kHz sine waves; – and + balanced outputs.	A TEKTRONIX SG505 Option 02 Oscillator installed in a TEKTRONIX TM500 Series Power Module.
11. Function Generator	Signal: 1 kHz, +10 V, square waves for checking YRGB mode of operation.	TEKTRONIX FG501A Function Generator installed in a TEKTRONIX TM500 Series Power Module.
12. Power Module Mainframe (required for Items 4, 5, 6, 8, 9, 10, and 11)	For powering and housing TEKTRONIX DC503A, DM503A, DM501A, FG501A, SG503, SG505, 067-0916-00, and 015-0408-00.	For example: TEKTRONIX TM506 Power Module Mainframe.
13. Variable Autotransformer		General Radio Metered Autotransformer W10MT3W. If 220 V operation must be checked, a conversion transformer or appropriate 220 V autotransformer is needed.
14. Vectorscope	Required to check differential gain and phase of the 1780R-Series AUX OUT and PIX MON OUT connectors. See Step 28.	Use another TEKTRONIX 1780R-Series instrument or use a TEKTRONIX 520A-Series Vectorscope.
Auxiliary Equipment		
15. Return Loss Bridge	Range: At least 46 dB return loss sensitivity, 50 kHz to 6 MHz. (Supplied with two precision [0.2%] 75 Ω feed-through terminators; Tektronix Part No. 011-0103-00 and 011-0103-01.)	TEKTRONIX 015-0149-00.
16. 75 Ω Terminators	Seven required, at least five must be a feed-through type.	75 Ω End-line Terminator (Tektronix Part No. 011-0102-00). Precision (0.2%) 75 Ω Feed-through Terminator (Tektronix Part No. 011-0103-02).
17. 75 Ω Coaxial Cables	Three 42 inch cables, with BNC connectors are required.	RG 59U (Tektronix Part No. 012-0159-00)
18. Dual Input Coupler	Matched BNC cable-T for checking common-mode rejection. Length of arms matched to within ±0.1 in.	Tektronix Part No. 067-0525-02.
19. 75 Ω 10X Attenuator		Tektronix Part No. 011-0061-00.
20. 5% Signal Attenuator	For checking differential gain. Attenuator accuracy: 5%, 1% of 5% (4.95% to 5.05%). Construct as shown in Figure 4–1.	Accessory housing, equipped with BNC connectors but without internal electrical components, is available by ordering as follows: Accessory Housing, Tektronix Part No. 011-0081-00.

Table 4–1: Recommended Equipment (Cont.)

Electrical Instrument	Performance Requirements	Example
21. X Y Input Connector	Fifteen-pin, subminiature D-type connector modified to input the audio signal for X Y checks and adjustments. See Figure 4–2.	Tektronix Part No. 131-0459-00.
22. Remote Sync Input Connector	15-pin, sub-miniature, D-type connector modified to enable and to apply remote sync. See Figure 4–3.	
23. 20 pF Input Normalizer		Tektronix Part No. 067-0538-00.
24. BNC T Connector		Tektronix Part No. 103-0030-00.
25. Alligator Clip to BNC Adapter	Female BNC connector to Alligator clip leads. Used with Parade Display Test Connector. (See item 26.)	Tektronix Part No. 013-0076-00.
26. Parade Display Test Connector	Remote connector modified to enable and test the RGB parade input. See Figure 4–4.	

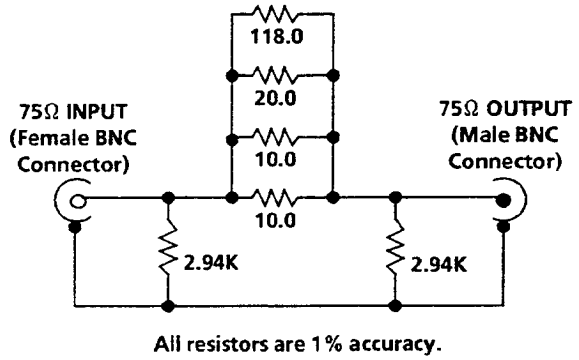


Figure 4–1: 5% signal Attenuator for checking differential gain

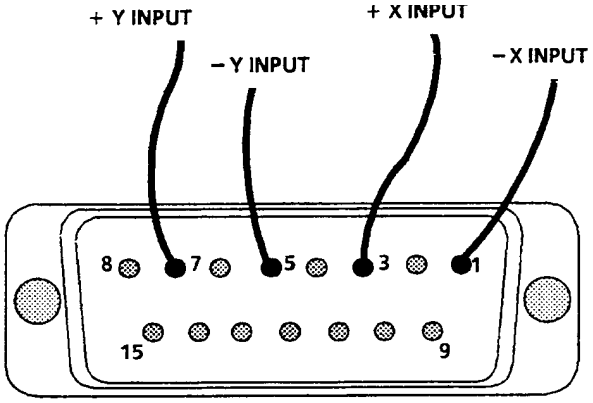


Figure 4–2: Rear view of the X Y plug connections. (Pins 2, 4, 6, 10, 12, and 14 can be used to make ground connections.)

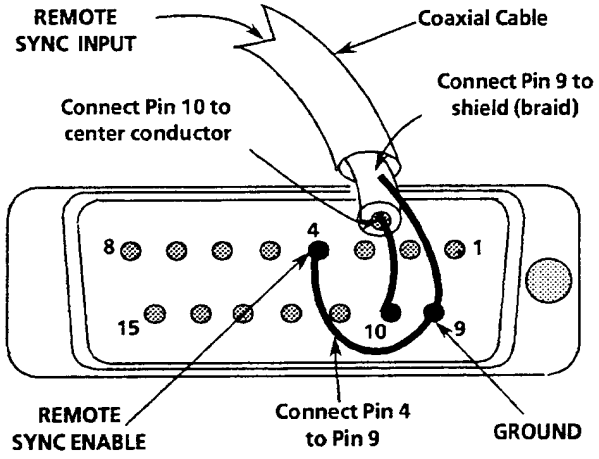


Figure 4–3: REMOTE connector modified for Remote Sync input

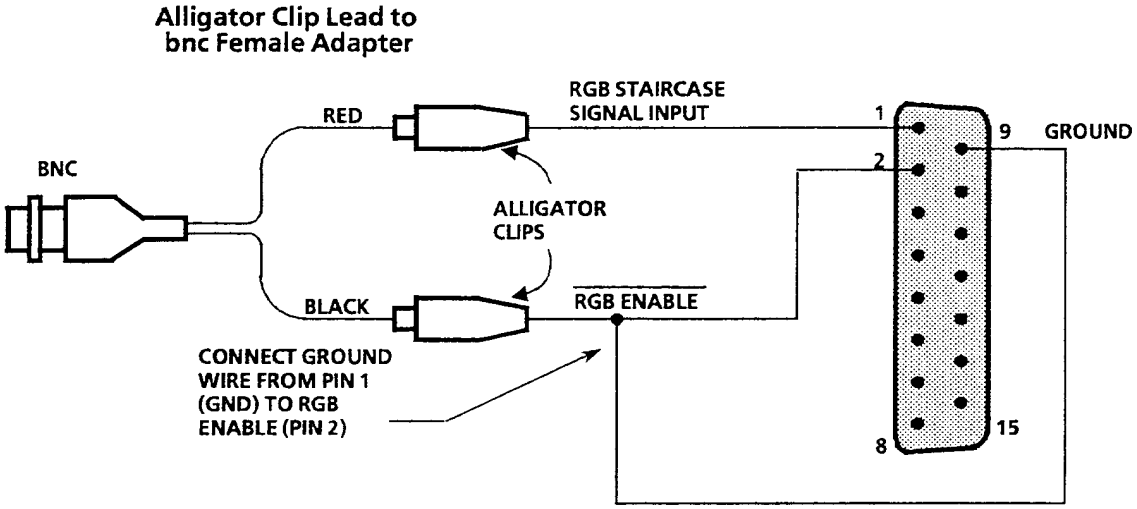


Figure 4–4: RGB Parade Display Test Connector

Short Form Procedure

The Short Form Performance Check is provided for those familiar with the complete check procedure, and the Standard Performance Check Procedure is provided for those who need more detailed instructions.

Both forms of the performance check procedure use the same step numbers so the short form can be used as an index to the standard form.

1. Check Power Supplies

2. Check Software Options (not required unless calibration data becomes lost or invalid)

3. Check Calibrator Amplitude Accuracy

4. Check Volts Full Scale Accuracy

5. Check Variable Volts Full Scale Range

6. Check Voltage Cursor Accuracy

7. Check DC Output Voltage

8. Check DC Channel Matching

9. Check Noise Measurements

10. Check Input Gain Ratios

11. Check X1 Gain CH A Frequency Response

12. Check X1 Gain CH B1 Frequency Response

13. Check X1 Gain CH B2 Frequency Response

14. Check X1 Gain CH B3 Frequency Response

15. Check Auxiliary Input Frequency Response

16. Check Auxiliary Output Frequency Response

17. Check X1 Probe Frequency Response

18. Check X10 Probe Frequency Response

19. Check Lum/Chroma Gain Ratio

20. Check Filter Response and Gain

21. Check DC Restorer Operation

22. Check DC Restorer Hum Attenuation

23. Check Vertical Overscan

24. Check DC Restorer Shift Versus Burst

25. Check Filter DC Matching

26. Check Common Mode Rejection

27. Check Differentiated Steps

28. Check Non-Linear Waveform Distortion

29. Check Linear Waveform Distortion

30. Check Probe Input Gain

31. Check Calibrator Output Voltage for Probe

32. Check Probe Tilt and Non-Linear Distortion

33. Check Timing Cursor Accuracy

34. Check Sweep Rates and Timing Accuracy

35. Check Variable Sweep Range

36. Check Line Selection

37. Check RGB/YRGB Operation

38. Check External Horizontal Sensitivity

39. Check Differential Gain

40. Check Differential Phase

41. Check Recursive Filter

42. Check Internal Sync Input

43. Check External Sync Input

44. Check AFC and Direct Sync

45. Check Slow Sweep Duration and Triggering

46. Check Remote Sync Input

47. Check Digital Phase Shifter

48. Check Chroma Bandwidth

49. Check Vector Display Phase and Gain Accuracy

50. Check Subcarrier Regenerator

51. Check Vector Display Clamp Stability and Position Range

52. Check Vector Display Variable Gain Range

53. Check Variable Gain Phase Shift

54. Check X and Y Input Phase Matching

55. Check X Y Frequency Response

56. Check SCH Phase Accuracy

57. Check WFM Trace Rotation and Orthogonality

58. Check Return Loss

Performance Check Procedure

This Performance Check Procedure is a continuous sequential procedure. If a step is performed out of sequence, pertinent control settings are given within the step. Remaining control settings can be determined by referring to Table 4–2; however, sometimes it may be necessary to go back one or more steps to check for possible changes.

***NOTE**. Leave the metal cover installed on the instrument during the procedure.*

Table 4–2: 1780R-Series Initial Control Settings

Front-Panel Control	Setting	CONFIGURE Menu Selection*	Setting
POWER	ON	SYNC	DIR
LEFT DISPLAY	VECT	COUPLING	DC
RIGHT DISPLAY	WFM	FIELD TRIG	F1
INPUT	CH A	PAL/+V (for PAL only)	PAL
REF	EXT	FIXED CAL AMPL	1000 (mV)
FILTER	FLAT	CLAMP	BP
WFM HORIZONTAL	TWO-LINE	DC RESTORER	OFF
VECTOR GAIN	Off	SYSTEM (for PAL only) * *	as desired
WAVEFORM GAIN	Off	VECT GRAT	INT
MAGNIFIER	OFF	PHASE DISPLAY	360
VAR/SLOW	Off	BARS	75%
Buttons below CRT	as desired	SETUP (for NTSC only)	YES
SCALE	as desired	WFM GRAT	INT
FOCUS	as desired	PROBE	X1
INTENSITY	as desired	ABS UNITS (for NTSC only)	mV
VERT POS	as desired	CW SYNC	EXT
HORIZ POS	as desired	SLOW SWP TRIG	+
Precision Measurement	Off	BAUD RATE	as desired
Menu Selection Switches	Off	KNOB ASSIGN TIMEOUT	OFF
		VECT READOUT	ON
		WFM READOUT	ON
		BEEP	ON

*** Applies to VERSION 1.11 instruments (VERSION is displayed on page 3 of the CONFIGURE menu.)**

**** SYSTEM (for PAL only): Select B/G or 1, whichever applies to your PAL system.**

NOTE. *Leave the 1780R-Series internal jumpers in their factory-set positions unless directed otherwise. The factory-set positions are listed in Section 2, Installation, Electrical.*

Install the metal cover on the instrument and leave it installed when following this procedure to check performance requirements.

Preliminary Setup

- Verify that the 1780R-Series instrument is set to the desired nominal line voltage as indicated on the rear panel. If the line voltage must be changed, set the rear-panel mains switch to the other setting.
- Connect the 1780R-Series AC power cord to the variable autotransformer. Set the mains Power switch for the autotransformer to On. Set the autotransformer to the voltage indicated on the 1780R-Series rear-panel.
- Connect a Television Test Signal Generator Color Bar signal through a 75 Ω feed-through termination to the 1780R-Series CH A INPUT connector.
- Connect the Television Test Signal Generator Black Burst signal to the 1780R-Series EXT REF connector. Connect a 75 Ω end-line termination to the remaining side of the EXT REF loop-through connector. See Figure 4–5.

NOTE. *Leave the Black Burst signal connected to the EXT REF connector throughout the entire Performance Check Procedure except when directed otherwise.*

Once the instrument is powered up, allow at least 20 minutes of warm-up time before continuing.

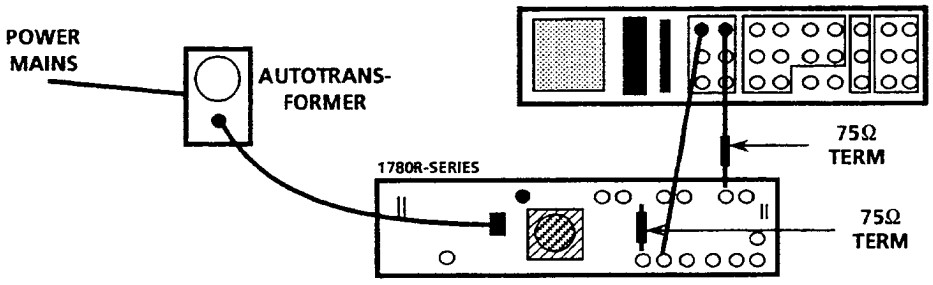


Figure 4–5: Initial equipment hook-up for the Performance Check Procedure

- Set the 1780R-Series instrument POWER switch to ON.

- Set the 1780R-Series front-panel controls and Configure menu selection to the settings given in Table 4–2. Adjust the controls for best viewing of the display.

1. Check Power Supply Operation

Requirement:. Check AC input range, 90–132 V or 200–250 V, as determined by the line voltage indication.

a. Vary the autotransformer from low-line to high-line voltage (as dictated by the rear-panel line voltage indication).

b. Check for stable operation over the prescribed voltage range.

c. Set the autotransformer to the nominal mains voltage.

d. Disconnect the Color Bar signal from the CH A INPUT connector.

2. Check Software Options

NOTE*. This step is not required unless calibration data becomes lost or invalid. Some examples of this are: Non-volatile memory is reset, or the MPU board is replaced.*

a. Enter the CONFIGURE menu mode and go to page 3 of the menu.

b. Touch <VERSION> on the screen, then immediately press the front-panel REFERENCE SET button. The menu screen now provides two settings: HORIZ POS POT and TC ON VC IN LS (Time Cursors on Voltage Cursors in Line Select).

c. Check that the menu settings are appropriate for the instrument:

<HORIZ POS POT>

<CONTINUOUS> should be selected.

<TC ON VC IN LS>

<ENABLE> should be selected.

3. Check Calibrator Amplitude Accuracy

Requirement: Calibrator Amplitude Accuracy: 1.00 V ±0.2%; Resolution: 1 mV.

a. Connect the VAC output to the 1780R-Series CH B1 INPUT connector. Do not terminate.

b. Set the VAC output amplitude to 999.9 mV. Check that the +Lum button is pressed in and the Lum/Sync button is out. Check that the correct television standard (NTSC, PAL, or PALM) is selected.

NOTE. *Leave the VAC +Lum and Lum/Sync buttons and television standard set as described in part b. whenever the VAC is used for this Performance Check Procedure.*

c. Check that the Television Test Signal Generator Black Burst signal is connected to the 1780R-Series EXT REF connector. Check that the remaining side of the loop-through connector is terminated into 75 Ω. See Figure 4–6.

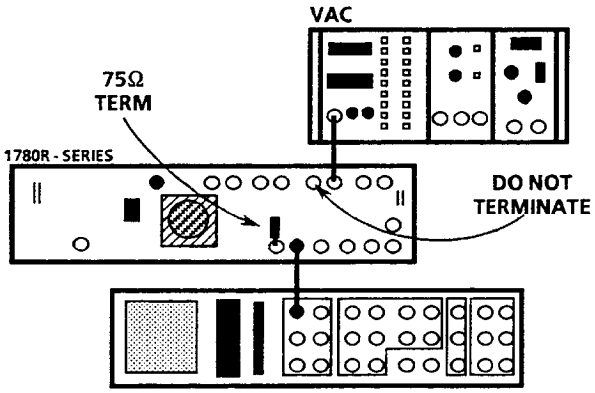


Figure 4–6: Test equipment connections for checking calibrator amplitude accuracy

d. Set the 1780R-Series controls as follows: RIGHT DISPLAY–WFM+CAL, INPUT–CH B1, REF–EXT, and WAVEFORM GAIN–X5. (For the NTSC instrument: Check that ABS UNITS-mV is selected on Page 2 of the Configure menu).

e. Use the VERT POS control to move the center traces of the upper and lower calibrator signals to the 50 IRE graticule line for NTSC (0.65 V for PAL) on the Waveform CRT.

f. Press and hold the VAR/X5 button so that both X5 and VAR lights are On. Turn the variable WAVEFORM GAIN control to obtain maximum gain (“beep” sound).

g. Select VAR on the Waveform CRT menu. Check that ABS on the menu is selected.

h. Rotate the Precision Measurement control so the center traces are overlaid.

i. Check that the CAL readout on the Waveform CRT is 1000 mV ±2 mV.

j. Set the WAVEFORM GAIN–VAR–X5 to Off. Set the INPUT to CH A. Leave the RIGHT DISPLAY set to WFM+CAL, the CONFIGURE button set to On, and the VAR/FIX selection set to VAR on the Waveform CRT menu when starting the next step.

k. Disconnect the VAC signal from the instrument.

4. Check Volts Full Scale Accuracy

Requirement: Volts Full Scale Accuracy: 1.0 V ±0.007 V.

a. Check that no signal is applied to the CH A INPUT connector.

b. Check that the CONFIGURE button is set to On. Select COUPLING–GND on Page 1 of the menu. Check that the button below the Waveform CRT is On, the RIGHT DISPLAY is set to WFM+CAL, and VAR/FIX (on the Waveform CRT menu) is set to VAR. Check that ABS is selected on the Waveform CRT menu.

c. Use the Precision Measurement control to obtain a 1 volt amplitude display. Use the VERT POS control and appropriate graticule lines as aids while obtaining the correct display height.

d. Check that the CAL readout is 1000 mV ±7 mV on the Waveform CRT.

e. Turn the Precision Measurement control to obtain a 200 mV CAL readout.

f. Set the WAVEFORM GAIN to X5.

g. Rotate the VERT POS and Precision Measurement controls so the display height appears to be 1 volt full scale (actually 200 mV) using the appropriate graticule lines.

h. Check that the CAL readout is 200 mV ±7 mV.

i. Set the WAVEFORM GAIN–X5 to Off. Turn the Precision Measurement control so the CAL readout is 1000 mV. Select COUPLING–DC on the Configure menu.

j. Select FIX on the Waveform CRT menu and set the RIGHT DISPLAY to WFM.

5. Check Variable Volts Full Scale Range

Supplemental: Variable Volts Full Scale Range: 0.5:1 to 1.5:1 (0.67 V to 2.0 V input signal can be made full scale).

a. Apply a modulated Pulse & Bar signal, through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT connector.

b. Select WAVEFORM GAIN–VAR. Check that RIGHT DISPLAY–WFM and INPUT–CH A are selected.

c. Use the VERT POS control to position the waveform backporch or blanking level to the graticule 0 IRE graticule line for NTSC (0.3 V for PAL) on the Waveform CRT.

d. Turn the variable WAVEFORM GAIN control to obtain a minimum (“beep” sound) amplitude display.

e. Check that the amplitude of the white bar is approximately 50 IRE for NTSC (350 mV for PAL). See Figure 4–7.

f. Turn the variable WAVEFORM GAIN control to obtain a maximum (“beep” sound) amplitude display.

g. Check that the burst amplitude is approximately 60 IRE peak-to-peak (450 mV for PAL).

h. Set the WAVEFORM GAIN–VAR to Off.

i. Disconnect the Pulse & Bar signal from the instrument.

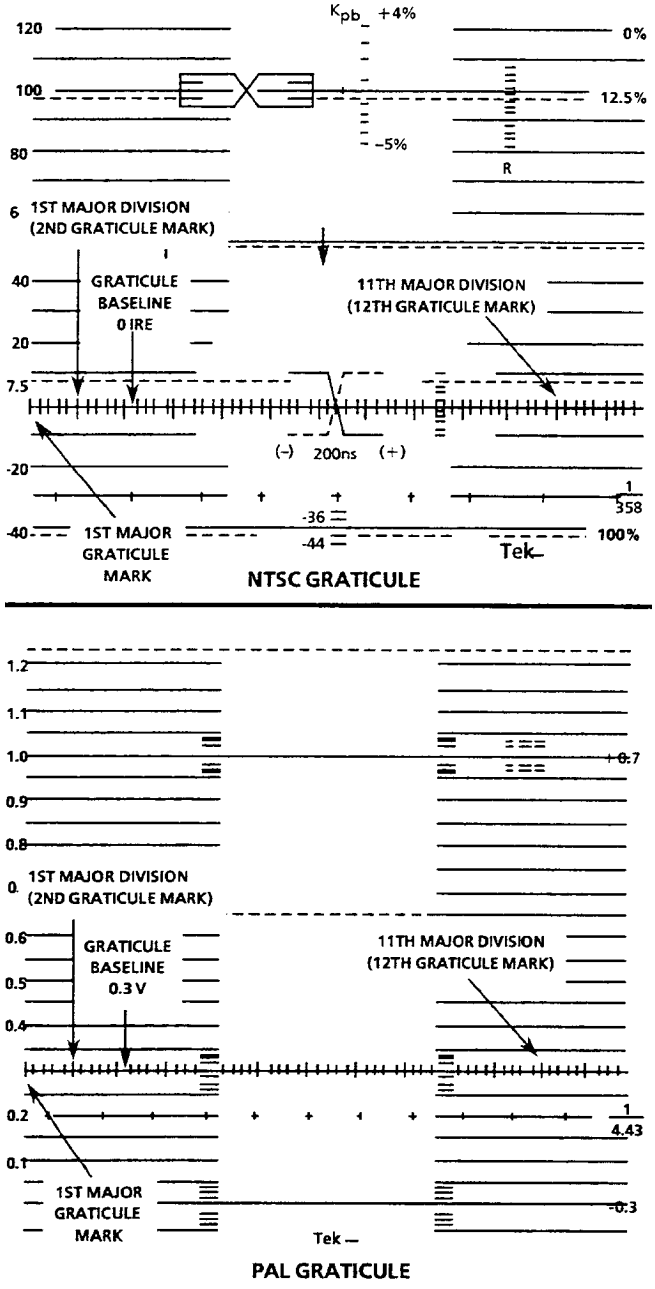


Figure 4–7: Identification of marks and divisions on the graticule baseline

6. Check Voltage Cursor Accuracy

Requirement: Accuracy: ±0.2%. Resolution: 1 mV.

a. With no signal applied to CH A INPUT, set the front-panel controls and menu selection as follows: RIGHT DISPLAY–WFM+CAL, WFM HORIZONTAL–ONE–LINE, VOLTAGE CURSORS–On (ABSOLUTE, SEPARATE), CURSOR 1, CONFIGURE–On, PAGE 1, COUPLING–GND, ABS UNITS–IRE (for NTSC only).

b. Use the VERT POS control to position the top trace of the Calibrator signal to the 0 IRE (0.3 V for PAL) graticule line.

c. Rotate the Precision Measurement control so that the CURSOR 1 trace overlays the top trace of the calibrator signal.

d. Set the WAVEFORM GAIN to X5.

e. Readjust the Precision Measurement control, if necessary, so the trace overlays as described in part c. of this step.

f. Set the WAVEFORM GAIN–X5 to Off and select the CURSOR 2 pad on the Waveform CRT.

g. Use parts b. through e. of this step as a guide for overlaying the CURSOR 2 trace on the Calibrator signal bottom trace.

h. Check that the ΔV readout on the Waveform CRT is between 139.7 IRE and 140.3 IRE (998 mV and 1002 mV for PAL).

i. Set the 1780R-Series front-panel controls as follows: RIGHT DISPLAY–WFM, WAVEFORM GAIN–X5–Off, CURSOR 1, and VOLTAGE CURSORS–Off. With the CONFIGURE button set to On, select COUPLING–DC. Press the CONFIGURE button to exit the menu.

7. Check Maximum DC Output Voltage

Supplemental: AUX OUT and PIX MON OUT connectors: ±0.5 V into 75 Ω.

a. Check that no signal is applied to the 1780R-Series CH A INPUT connector. Check that CH A INPUT is selected.

b. Establish a ground reference for Ch 1 on the test oscilloscope dual-trace vertical amplifier.

c. Set the test oscilloscope vertical amplifier controls as follows: Ch 1 Volts/Div switch to 0.2, Ch 1 Input Coupling switch to DC, and the Display Mode to Ch 1.

d. Connect a coaxial cable from the 1780R-Series AUX OUT connector, through a precision (0.2%) 75 Ω feed-through terminator, to Ch 1 Input on the test oscilloscope.

NOTE*. The precision terminator is listed under Auxiliary Equipment. It is also supplied with the Return Loss Bridge.*

e. Check that the DC level, displayed on the test oscilloscope CRT, is between –0.5 V and +0.5 V.

f. Move the coaxial cable from the AUX OUT connector to the PIX MON OUT connector.

g. Check that the DC level, displayed on the test oscilloscope CRT, is between –0.5 V and +0.5 V.

h. Disconnect the coaxial cable from the PIX MON OUT connector and the test oscilloscope.

8. Check DC Channel Matching

Supplemental: Typically within 30 mV.

a. Check that no signal is applied to the 1780R-Series CH A INPUT connector. Check that CH A INPUT is selected.

b. Connect a 75 Ω terminator to each of the following 1780R-Series channel inputs: CH A, CH B1, CH B2, and CH B3.

c. Connect a coaxial cable from the 1780R-Series AUX OUT connector, through a precision (0.2%) 75 Ω feed-through terminator, to the +Input connector on the test oscilloscope differential comparator.

d. Set the test oscilloscope differential amplifier controls as follows: +Input to DC, –Input to Vc, Volts/Div to 10 mV, and BW to 5 MHz.

e. Use the test oscilloscope differential comparator Comparison Voltage control to set the trace on the center graticule line. This is the DC reference level.

f. Select INPUT–CH B1 on the 1780R-Series front panel.

g. Check that the trace is located within 30 mV of the DC reference level.

h. Select INPUT–CH B2.

i. Check that the trace is located within 30 mV of the DC reference level.

j. Select INPUT–CH B3.

k. Check that the trace is located within 30 mV of the DC reference level.

l. Remove the four terminators used in part b. of this step and the coaxial cable from the AUX OUT connector to the test oscilloscope.

9. Check Noise Measurements

Requirement: Accuracy: To 56 dB within 1 dB; 60 dB within 2 dB.

a. Connect the VAC to the 1780R-Series CH B1 INPUT connector. Set the VAC output amplitude to 45.2 mV.

b. Check that DC RESTORER–OFF is selected.

c. Select INPUT–CH B1 on the 1780R-Series front panel. Press the MEASURE button to On. Select the NOISE (measurement) pad on the Vectorscope CRT menu. Set the front-panel WAVEFORM GAIN to VAR–X5.

d. Turn the Precision Measurement control to obtain a S/N 30 dB readout on the Waveform CRT.

e. Adjust the VAC output amplitude so that the center traces are nulled on the Waveform CRT display.

f. Check that the VAC readout is between 42.2 mV and 46.5 mV.

g. Turn the Precision Measurement control to obtain a S/N 50 dB readout on the Waveform CRT.

h. Set the VAC amplitude to 4.5 mV.

i. Adjust the VAC output amplitude so that the center traces are nulled on the Waveform CRT display.

NOTE. *Due to the low amplitude of the display, exact null is difficult to determine. Use the Precision Measurement increment buttons to check for equal null deviation above and below 50 dB. Return to 50 dB.*

---

j. Check that the VAC readout is between 4.0 mV and 5.0 mV.

k. Press the MEASURE button to exit the menu. Check that the WAVEFORM GAIN–VAR–X5 mode goes to Off.

l. Reset the VAC amplitude to 999.9 mV.

m. Disconnect the VAC from the CH B1 INPUT.

10. Check Input Gain Ratios

Requirement: Ch A Input to Ch B1 Input: 1 to 1 ±0.002 (0.998 to 1.002). CH B1 to CH B2 or CH B3: 1 to 1 0.±002 (0.998 to 1.002). Auxiliary Video Input to Ch A Input: 1.5 dB ±0.3 dB. Ch A Input to Auxiliary Video Output:

1 to 1 ±0.005 (0.995 to 1.005). Ch A Input to Picture Monitor Output: 1 to 1 ±0.02 (0.98 to 1.02).

a. Connect the VAC output to the 1780R-Series CH A INPUT connector. Do not terminate. Check that the Black Burst signal is applied to the EXT REF connector.

b. Check that the VAC output amplitude is set for 999.9 mV, the +Lum button is pressed in, the Lum/Sync button is out, and the correct television standard is selected.

c. Select INPUT–CH A. Check that the 1780R-Series front-panel controls are set as follows: RIGHT DISPLAY–WFM+CAL, WFM HORIZONTAL–TWO–LINE, CONFIGURE–On, PAGE 1, DC RESTORER–OFF, and CONFIGURE–Off.

d. Set the WAVEFORM GAIN to X5.

e. Select VAR and REL on the Waveform CRT menu.

f. Use the VERT POS control to position the center traces to the center of the Waveform CRT graticule.

g. Turn the Precision Measurement control so the center traces are overlayed and they appear as one trace.

h. Press the REFERENCE SET button so that the relative CAL readout is 100.0% on the Waveform CRT.

i. Move the VAC signal from the 1780R-Series CH A INPUT to the CH B1 INPUT connector.

j. Select the 1780R-Series CH B1 INPUT and repeat part g. of this step.

k. Check that the relative CAL readout is 99.8% to 100.2%.

l. Move the VAC signal from the 1780R-Series CH B1 INPUT to the CH B2 INPUT connector.

m. Select the 1780R-Series CH B2 INPUT and repeat part g.

n. Check that the relative CAL readout is 99.8% to 100.2%.

o. Move the VAC signal from the CH B2 INPUT to the CH B3 INPUT connector.

p. Select the CH B3 INPUT and repeat part g.

q. Check that the relative CAL readout is 99.8% to 100.2%. After completing this check, select FIX on the Waveform CRT menu.

r. Move the VAC output signal from the CH B3 INPUT to the CH A INPUT. Connect a coaxial cable from the CH A INPUT loop-through connector to the +Input of the test oscilloscope Differential Comparator.

s. Connect another coaxial cable from the PIX MON OUT connector, through a precision (0.2%) 75 Ω terminator, to the Differential Comparator –Input.

NOTE*. The precision terminator is listed under Auxiliary Equipment. It is also supplied with the Return Loss Bridge.*

---

t. Set the 1780R-Series RIGHT DISPLAY to WFM, INPUT button to select CH A, and WAVEFORM GAIN–X5 to Off.

u. Set the test oscilloscope Differential Comparator controls as follows: Volts/Div to 10 mV, Input Coupling (both) to DC, and BW to 5 MHz. Set the Time Base Time/Div to 1 ms.

v. Check that the signals displayed on the test oscilloscope are nulled within ±20 mV.

w. Move the coaxial cable from the PIX MON OUT connector to the AUX OUT connector. (Check that the AUX OUT signal is applied through the precision terminator to the test oscilloscope.)

x. Set the test oscilloscope Volts/Div to 2 mV.

y. Check that the signals, displayed on the test oscilloscope, are nulled within ±5 mV.

z. Disconnect the VAC signal from the CH A INPUT connector. Disconnect the coaxial cable from the other CH A INPUT connector and the test oscilloscope.

aa. Disconnect the coaxial cable and precision terminator from the AUX OUT connector and the test oscilloscope.

ab. Apply a 50-kHz signal from the leveled sine wave generator, through a 50-to-75 Ω minimum loss attenuator, to the CH A INPUT connector. Connect a 75 Ω terminator to the remaining CH A INPUT loop-through connector.

ac. Check that RIGHT DISPLAY–WFM, INPUT–CH A, REF–EXT, and WFM HORIZONTAL–TWO–LINE are selected.

ad. Set the generator output amplitude to display a 700 mV peak-to-peak display on the Waveform CRT. Use the VOLTAGE CURSORS, ABSOLUTE, SEPARATE, CURSORS 1, and CURSORS 2 measurement mode to be sure that the amplitude is 700 mV.

ae. Select RELATIVE on the Vectorscope CRT menu. Press the REFERENCE SET button. Note that the ΔV readout is 100.0% on the Waveform CRT.

af. Move the coaxial cable with the 50 Ω-to-75 Ω minimum loss attenuator from the CH A INPUT connector to the AUX IN connector. (Check that the 700 mV sine wave signal is applied to the AUX IN connector.)

ag. Select the FILTER–AUX input mode.

ah. Use the Precision Measurement control to set CURSORS 1 and CURSORS 2 traces to measure the relative value of the AUX IN signal.

ai. Check that the ΔV readout is between 115.0% and 123.0% on the Waveform CRT.

aj. Set the FILTER to FLAT and the VOLTAGE CURSORS button to Off.

ak. Disconnect the sinewave signal and minimum loss attenuator from the AUX IN connector. Disconnect the terminator from the CH A INPUT connector.

11. Check X1 Gain CH A Frequency Response

Requirement: Flat frequency response from 50 kHz to 10 MHz within ±1%. 50 kHz is used as a reference. Frequency response from 10 MHz to 15 MHz is within +2% and –5% of the reference amplitude. Frequency response from 15 MHz to 20 MHz is within +2% and –15% of the reference amplitude.

a. Connect the leveled sine wave generator output, through a 50 Ω-to-75 Ω minimum loss attenuator, to the CH A INPUT connector. Do not terminate the loop-through connector.

b. Connect a Peak-to-Peak Detector Head (Tektronix Part No. 015-0413-00) to the other CH A INPUT connector. Connect a coaxial cable from the Detector Head to the +Input on the Peak-to-Peak Detector Amplifier. See Figure 4–8.

c. Connect the Peak-to-Peak Detector Amplifier output to the input of a DMM.

d. Connect a 75 Ω termination to the 1780R-Series PIX MON OUT connector.

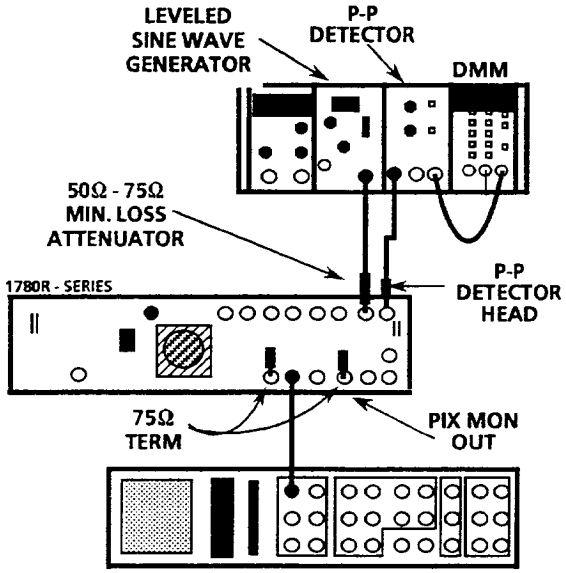


Figure 4–8: Test equipment connections for checking CH A frequency response

NOTE. *Leave the termination connected to the PIX MON OUT connector for steps 11 through 15 unless directed otherwise.*

e. Check that the controls are set as follows: RIGHT DISPLAY–WFM, INPUT–CH A, REF–EXT, FILTER–FLAT, WFM HORIZONTAL–TWO–LINE, and WAVEFORM GAIN–Off.

f. Set the generator output frequency to 50 kHz (reference). Set the generator output amplitude so the waveform CRT display is exactly 714 mV or 100 IRE in amplitude for NTSC (700 mV for PAL).

g. Check that the Peak-to-Peak Detector Amplifier +Input Enable button is pressed in and the –Input Enable button is set to the Out position (disabled). Adjust the +Level control to turn on the green light. Note the DMM reading.

h. Set the generator frequency to 1 MHz.

i. Set the generator output amplitude to obtain the same DMM reading as noted in part g. of this step.

j. Check that the signal amplitude displayed on the Waveform CRT is 714 mV or 100 IRE in amplitude within ±7.1 mV for NTSC (700 mV within ±7.0 mV for PAL).

k. Check set the generator to each of the following frequencies: 3.58 MHz (4.43 MHz for PAL), 5 MHz, 8 MHz, and 10 MHz. Use parts i. and j. as a guide for checking the frequency response at each given frequency.

l. Set the generator frequency to 15 MHz. Set the generator output amplitude to obtain the same DMM reading as noted in part g. of this step.

m. Check that the signal amplitude displayed on the Waveform CRT is 714 mV or 100 IRE in amplitude within +14.3 mV and –35.5 mV for NTSC (700 mV within +14.0 mV and –35.0 mV for PAL).

n. Set the generator frequency to 20 MHz. Set the generator output amplitude to obtain the same DMM reading as noted in part g. of this step.

o. Check that the signal amplitude displayed on the Waveform CRT is 714 mV or 100 IRE in amplitude within +14.3 mV and –107.5 mV for NTSC (700 mV within 14.0 mV and –105 mV for PAL).

p. Disconnect the sine wave signal and Peak-to-Peak Detector Head from the CH A INPUT connector.

12. Check X1 Gain CH B1 Frequency Response

Requirement: Flat frequency response from 50 kHz to 5 MHz within 1%. 50 kHz is used as a reference. Flat frequency response from 5 MHz to 10 MHz within ±2% of the reference amplitude. 10 MHz to 15 MHz should be within +2% and –5% of the reference amplitude. 15 MHz to 20 MHz should be within +2% and –15% of the reference amplitude.

a. Connect the leveled sine wave generator output, through a 50 Ω-to-75 Ω minimum loss attenuator, to the CH B1 INPUT connector. Do not terminate the loop-through connector.

b. Select INPUT–CH B1.

c. Check repeat step 11b. through 11p. to check the frequency response of the 1780R-Series CH B1 INPUT. Parts b., e., and p. should read “CH B1 INPUT” when using the step 11 procedure as a guide. Also, part j. should read ±14.3 mV for NTSC (±14.0 mV for PAL) when checking these frequencies: 8 MHz and 10 MHz.

13. Check X1 Gain CH B2 Frequency Response

Requirement: Flat frequency response from 50 kHz to 5 MHz within 1%. 50 kHz is used as a reference. Flat frequency response from 5 MHz to 10 MHz within ±2% of the reference amplitude. 10 MHz to 15 MHz should be within +2% and –5% of the reference amplitude. 15 MHz to 20 MHz should be within +2% and –15% of the reference amplitude.

a. Connect the leveled sine wave generator output, through a 50 Ω-to-75 Ω minimum loss attenuator, to the CH B2 INPUT connector. Do not terminate the loop-through connector.

b. Select INPUT–CH B2.

c. Check repeat step 11b. through 11p. to check the frequency response of the 1780R-Series CH B2 INPUT. Parts b., e., and p. should read "CH B2 INPUT" when using the step 11 procedure as a guide. Also, part j. should read ±14.3 mV for NTSC (±14.0 mV for PAL) when checking these frequencies: 8 MHz and 10 MHz.

14. Check X1 Gain CH B3 Frequency Response

Requirement: Flat frequency response from 50 kHz to 5 MHz within 1%. 50 kHz is used as a reference. Flat frequency response from 5 MHz to 10 MHz within ±2% of the reference amplitude. 10 MHz to 15 MHz should be within +2% and –5% of the reference amplitude. 15 MHz to 20 MHz should be within +2% and –15% of the reference amplitude.

a. Connect the leveled sine wave generator output, through a 50 Ω-to-75 Ω minimum loss attenuator, to the CH B3 INPUT connector. Do not terminate the loop-through connector.

b. Select INPUT–CH B3.

c. Check repeat step 11b. through 11p. to check the frequency response of the 1780R-Series CH B3 INPUT. Parts b., e., and p. should read "CH B3 INPUT" when using the step 11 procedure as a guide. Also, part j. should read ±14.3 mV for NTSC (±14.0 mV for PAL) when checking these frequencies: 8 MHz and 10 MHz.

d. Disconnect the termination from the PIX MON OUT connector and the Peak-to-Peak Detector Head from CH B3 INPUT.

15. Check Auxiliary Input Frequency Response

Requirement: Flat frequency response from 50 kHz to 10 MHz within ±2%. 50 kHz is used as a reference.

a. Connect the leveled sine wave generator output, through a 50 Ω-to-75 Ω minimum loss attenuator, to the AUX IN connector.

b. Check that the 1780R-Series front-panel controls are set for normal 1-volt peak-to-peak waveform monitoring except as follows: Select the FILTER–AUX mode. Check that the 1780R-Series INPUT selection is set to CH A. Check that the WAVEFORM GAIN button is set to Off (X1 Gain).

c. Set the generator output frequency to 50 kHz (reference). Set the generator output amplitude so the Waveform CRT display is exactly 714 mV or 100 IRE for NTSC (or 700 mV for PAL) in amplitude.

d. Set the generator output frequency to 1 MHz.

e. Check that the Waveform CRT display amplitude is 714 mV for NTSC (700 mV for PAL) in amplitude within ±2% or ±14.3 mV or 2 IRE for NTSC (14.0 mV for PAL).

f. Set the generator frequency to each of these frequencies: 3.58 MHz (4.43 MHz for PAL), 5 MHz, 8 MHz, and 10 MHz.

g. Check that the Waveform CRT display amplitude is 714 mV for NTSC (700 mV for PAL) in amplitude within ±2% or ±14.3 mV or±2 IRE for NTSC (±14.0 mV for PAL) for each frequency given in part f. of this step.

h. Set the FILTER selection to FLAT.

i. Disconnect the sine wave signal from the AUX IN connector.

16. Check Auxiliary Output Frequency Response

Requirement: Flat frequency response from 50 kHz to 10 MHz within ±2%. 50 kHz is used as a reference.

a. Connect the leveled sine wave generator output, through a 50 Ω-to-75 Ω minimum loss attenuator, to the CH A INPUT connector. Connect a 75 Ω terminator to this loop-through connector.

b. Connect a coaxial cable from the AUX OUT connector through a 75 Ω feed-through terminator to the test oscilloscope Dual-Trace Amplifier Ch 1 input. See Figure 4–9.

c. Set the test oscilloscope Dual-Trace Amplifier controls as follows: Ch 1 Volts/Div to 0.1 V, Input Coupling to DC, Display Mode to Ch 1, Trigger Source to Ch1, and BW to Full. Set the Time Base controls as follows: Mode to Auto, Coupling to DC, Source to Int, and Time/Div to 1 ms.

d. Adjust the generator output frequency to 50 kHz (reference) and the amplitude to display exactly 714 mV in amplitude for NTSC (700 mV for PAL) on the test oscilloscope CRT. Note this exact amplitude for use as a reference.

e. Set the generator output frequency to 1 MHz.

f. Check that the test oscilloscope displayed amplitude is within ±2% or ±14.3 mV for NTSC (±14.0 mV for PAL) of the amplitude noted in part d. of this step. Take into account the generator flatness error.

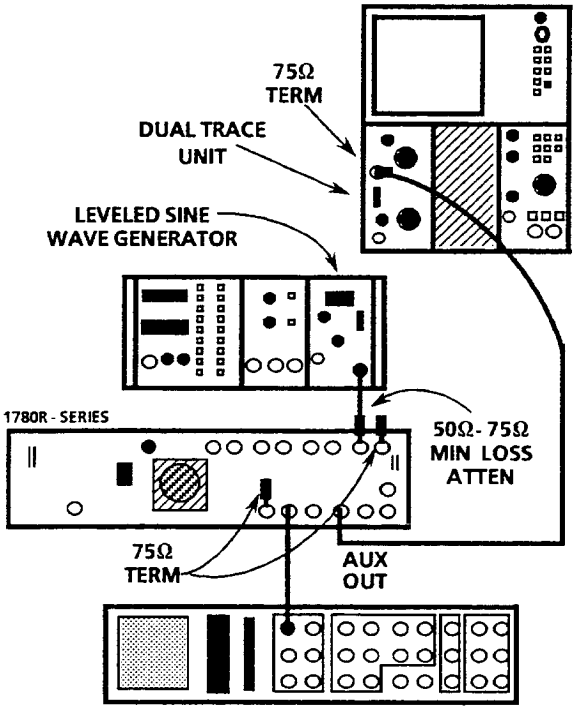


Figure 4–9: Connections for checking AUX OUT frequency response. (Only Ch 1 of the test oscilloscope dual-trace unit is used.)

g. Set the generator to each of these frequencies: 3.58 MHz (4.43 MHz for PAL), 5 MHz, 8 MHz, and 10 MHz.

h. Check the response for each frequency given in part g. of this step. The amplitude displayed on the test oscilloscope CRT should be within ±2% or ±14.3 mV for NTSC (±14.0 mV for PAL) of the amplitude noted in part d. of this step. Take into account generator flatness error.

i. Disconnect the sine wave signal from the CH A INPUT connector. Disconnect the test oscilloscope from the AUX OUT connector.

17. Check X1 Probe Frequency Response

Requirement: Flat frequency response from 50 kHz to 10 MHz within ±3%. 50 kHz is used as a reference.

a. Connect the leveled sine wave generator output, through a 50 Ω-to-75 Ω minimum loss attenuator and a 75 Ω feed-through terminator, to the 1780R-Series front-panel PROBE input connector. Connect a 75 Ω end-line termination to the rear-panel PIX MON OUT connector.

b. Select INPUT–PROBE and WFM HORIZONTAL ONE–FIELD mode of operation. Check that PROBE–X1 is selected on PAGE 2 of the Configure menu.

c. Set the generator output frequency to 50 kHz (reference). Set the generator output amplitude so the display on the Waveform CRT is exactly 714 mV or 100 IRE for NTSC (700 mV for PAL) in amplitude. This is the reference amplitude.

d. Set the generator frequency to 1 MHz.

e. Check that the displayed amplitude on the Waveform CRT is within ±3% or ±21.4 mV for NTSC (±21.0 mV for PAL) of the amplitude noted in part c. of this step.

f. Set the generator frequency to 3.58 MHz (4.43 MHz for PAL), 5 MHz, 8 MHz, and then 10 MHz.

g. Check that the displayed amplitude on the Waveform CRT is within ±3% or ±21.4 mV for NTSC (±21.0 mV for PAL) of the amplitude noted in part c. of this step for each frequency given in part f.

***NOTE**. To check X1 and X10 frequency response from 25 Hz to 100 kHz, use the sine wave generator (Item 10) described in the Recommended Equipment List. Use 50 kHz as the reference.*

---

h. Leave the equipment connected as is to perform the next step.

18. Check X10 Probe Frequency Response

Requirement: Flat frequency response from 25 Hz to 10 MHz within ±3%. 50 kHz is used as a reference.

a. Check that the equipment is connected as described in Step 17.

b. Insert a 10X 75 Ω attenuator between the minimum loss attenuator and the 75 Ω feed-through terminator.

c. Set the 1780R-Series controls as follows: CONFIGURE–On, PAGE 2, PROBE–X10. Check that INPUT–PROBE, REF–EXT, WFM HORIZONTAL–ONE–FIELD, and DC RESTORER–Off are selected.

d. Check Repeat parts c. through g. of Step 17 to check X10 probe frequency response.

e. Disconnect the equipment from the PROBE input connector.

f. Disconnect the 75 Ω termination from the PIX MON OUT connector.

19. Check Lum/Chroma Gain Ratio

Requirement: X1 Gain Ratio: 1:1 ±1%; X5 Gain Ratio:±0.5%.

a. Connect a modulated 2T Pulse & Bar signal (12.5T NTSC, 10T PAL) from a Television Test Signal Generator through a 75 Ω feed-through terminator to the 1780R-Series CH A INPUT connector.

b. Set the 1780R-Series controls as follows: INPUT–CH A, WFM HORIZONTAL ONE–LINE, and CONFIGURE–Off. Check that REF–EXT is selected.

c. Use the VERT and HORIZ POS controls to position the waveform blanking level to the graticule baseline (0 IRE for NTSC; 0.3 V for PAL).

d. Check that the bottom of the modulated bar is equal to or less than 7.1 mV or 1.0 IRE for NTSC (7.0 mV for PAL) from the graticule baseline.

e. Set the front-panel WAVEFORM GAIN to X5.

f. Repeat part c. of this step.

g. Check that the bottom of the modulated bar is equal to or less than 17.9 mV or 2.5 IRE for NTSC (17.5 mV for PAL) from the graticule baseline.

h. Move the modulated Pulse & Bar signal to each of these INPUT connectors: CH B1, CH B2, and then to CH B3. Use the appropriate INPUT button to select each of these inputs.

i. Check Repeat parts c. through g. when checking the channels selected in part h. of this step.

j. Set the WAVEFORM GAIN–X5 to Off.

k. Disconnect the Pulse & Bar signal from the CH B3 connector.

20. Check Filter Response and Gain

REQUIREMENT Luminance: Less than 3 dB down at 1 MHz. Equal to or greater than 40 dB down at 3.58 (1780R) or 4.43 (1781R) MHz. Low Pass: ≤14 dB down at 500 kHz.

a. Connect the leveled sine wave generator output, through a 50 Ω-to-75 Ω minimum loss attenuator, to the CH A INPUT connector. Connect a 75 Ω terminator to this loop-through connector.

b. Select INPUT–CH A and WFM HORIZONTAL–ONE–FIELD mode of operation.

c. Set the generator frequency to 50 kHz (reference). Set the generator output amplitude so the waveform CRT display is exactly 714 mV or 100 IRE in amplitude for NTSC (700 mV for PAL).

d. Select FILTER–LUM mode.

e. Check that the displayed amplitude is between 707 mV and 721 mV or 99 IRE and 101 IRE for NTSC (693 mV and 707 mV for PAL).

f. Use the VERT POS control to position the bottom of the display to the graticule baseline (0 IRE for NTSC; 0.3 V for PAL).

g. Set the generator frequency to 1 MHz.

h. Check that the displayed amplitude is equal to or greater than 500 mV or 70 IRE for NTSC (490 mV for PAL).

i. Set the generator frequency to 3.58 MHz (4.43 MHz for PAL).

j. Set the WAVEFORM GAIN to X5.

k. Check that the displayed amplitude is equal to or less than 36 mV or 5 IRE for NTSC (35 mV for PAL).

l. Set the WAVEFORM GAIN–X5 to Off and select the FILTER–LPASS mode.

m. Set the generator frequency to 300 kHz.

n. Check that the displayed amplitude is equal to or less than 500 mV or 70 IRE for NTSC (490 mV for PAL).

o. Set the generator frequency to 500 kHz.

p. Check that the displayed amplitude is equal to or less than 143 mV or 20 IRE for NTSC (140 mV for PAL).

q. Set the generator frequency to 3.58 MHz (4.43 MHz for PAL).

r. Check that the displayed amplitude is equal to or less than 14.3 mV or 2 IRE for NTSC (14 mV for PAL).

s. Select FILTER–FLAT mode.

t. Set the generator output amplitude so the Waveform CRT display is exactly 714 mV or 100 IRE in amplitude for NTSC (700 mV for PAL).

u. Select FILTER–CHROM mode.

v. Check that the displayed amplitude is between 707 mV and 721 mV or 99 IRE and 101 IRE for NTSC (693 mV and 707 mV for PAL).

w. Set the generator frequency to 2.98 MHz (3.83 MHz for PAL).

x. Check that the displayed amplitude is equal to or greater than 500 mV or 70 IRE for NTSC (490 mV for PAL).

y. Set the generator frequency to 2.68 MHz (3.53 MHz for PAL).

z. Check that the displayed amplitude is equal to or less than 500 mV or 70 IRE for NTSC (490 mV for PAL).

aa. Set the generator frequency to 4.18 MHz (5.03 MHz for PAL).

ab. Check that the displayed amplitude is equal to or greater than 500 mV or 70 IRE for NTSC (490 mV for PAL).

ac. Set the generator frequency to 4.48 MHz (5.33 MHz for PAL).

ad. Check that the displayed amplitude is equal to or less than 500 mV or 70 IRE for NTSC (490 mV for PAL).

ae. Select FILTER–FLAT mode.

af. Disconnect the sine wave signal from the instrument.

21. Check DC Restorer Operation

a. Connect a full field AC Bounce signal from the Television Test Signal Generator Linearity module, through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT connector.

b. Set the 1780R-Series controls as follows: WFM HORIZONTAL–TWO–LINE.

c. Press the CONFIGURE button to On. Check that COUPLING–DC and DC RESTORER–OFF are selected on PAGE 1 of the Configure menu. For NTSC: Select ABS UNITS–IRE on PAGE 2

d. Use the VERT POS control to position the signal blanking level to the baseline (0 IRE for NTSC; 0.3 V for PAL) on the Waveform CRT graticule.

e. Check that the signal blanking level does not bounce up and down. Check that the white bar bounces up and down.

f. Select COUPLING–AC on the Configure menu.

g. Check that the signal blanking level bounces up and down.

h. Select DC RESTORER–SLOW on the menu.

i. Check that the signal blanking level moves less than 3 IRE for NTSC (21 mV for PAL).

j. Select DC RESTORER–FAST on the menu.

k. Check that the signal blanking level moves less than 3 IRE for NTSC (21 mV for PAL).

l. Move the coaxial cable with its terminator from the CH A INPUT connector to the CH B1 INPUT connector. Select INPUT–CH B1 on the right front panel.

m. Check Repeat parts c. through k. of this step to check CH B1.

n. Move the coaxial cable with its terminator from the CH B1 INPUT connector to the CH B2 INPUT connector. Select INPUT–CH B2 on the right front panel.

o. Check Repeat parts c. through k. of this step to check CH B2.

p. Move the coaxial cable with its terminator from the CH B2 INPUT connector to the CH B3 INPUT connector. Select INPUT–CH B3 on the right front panel.

q. Check Repeat parts c. through k. of this step to check CH B3.

r. Remove the coaxial cable with its terminator from the CH B3 INPUT connector. Connect the AC Bounce signal, through a 75 Ω 10X attenuator and a 75 Ω feed-through terminator, to the left front panel PROBE input connector.

s. Select INPUT–PROBE on the 1780R-Series right front panel. Check that the CONFIGURE button is On, COUPLING–AC, and PROBE–X10 are selected. Select DC RESTORER–OFF on the menu.

t. Check Repeat parts g. through k. of this step to check the PROBE input.

u. Select COUPLING–DC and DC RESTORER–OFF on the menu. Press the CONFIGURE button to exit the menu. Select INPUT–CH A on the right front panel.

v. Set the television test signal generator Linearity Level control to 50%.

w. Disconnect the Linearity signal from the 1780R-Series PROBE input.

22. Check DC Restorer Hum Attenuation

Requirement: Slow Clamp Mains Hum Attenuation: Equal to or less than 0.9 dB. Fast Clamp Mains Hum Attenuation: Equal to or greater than 26 dB.

a. Connect a 60-Hz (50 Hz for PAL) hum signal from a sine wave oscillator to the 1780R-Series CH A INPUT connector. Do not terminate.

b. Check that a Black Burst signal is applied to the 1780R-Series EXT REF connector and REF–EXT is selected on the front panel. Check that the internal jumpers for A2J865, A2J866, and A2J867 are all set to their factory-set positions.

c. Set the 1780R-Series WFM HORIZONTAL buttons to TWO–LINE.

d. Press the CONFIGURE button to On. Check that COUPLING–DC and DC RESTORER–OFF are selected on the Configure menu.

e. Set the sine wave oscillator amplitude control so that the display on the Waveform CRT is 100 IRE for NTSC (700 mV for PAL).

f. Select WFM HORIZONTAL–TWO–FIELD mode.

g. Select DC RESTORER–SLOW on the CONFIGURE menu.

h. Check that the hum signal is greater than 90 IRE for NTSC (643 mV for NTSC or PAL) as displayed on the Waveform CRT.

i. Select DC RESTORER–FAST.

j. Check that the hum signal is less than 5 IRE in amplitude for NTSC (36 mV for NTSC or PAL).

k. Move the hum signal to each of these 1780R-Series INPUT connectors: CH B1, CH B2, and CH B3. Use the appropriate INPUT button to select each of these inputs.

l. Check Use parts g. through j. of this step as a guide to check hum attenuation for the CH B1, CH B2, and CH B3 INPUTs.

m. Move the sine wave hum signal from the 1780R-Series CH B3 INPUT connector to the left front-panel PROBE input connector.

n. Use the appropriate 1780R-Series INPUT button to select PROBE. Select PROBE–X1 on PAGE 2 of the Configure menu.

o. Check Use parts e. and g. through j. of this step to check hum attenuation for the PROBE input.

p. Set the 1780R-Series control and menu as follows: INPUT–CH A and DC RESTORER–OFF.

q. Disconnect the hum signal from the PROBE connector.

23. Check Vertical Overscan

Requirement: With 1 V p-to-p NTSC or PAL Modulated Sin^2 composite video signal applied to the 1780R-Series CH A INPUT, there should be less than 7 mV variation in the chroma baseline when the signal baseline is positioned anywhere within the 1 V vertical scan area.

a. Connect the television test signal generator Modulated 2T Pulse & Bar signal (12.5T NTSC, 10T PAL), through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT. Check that the Black Burst signal is applied to the EXT REF connector.

b. Set the generator Luminance button to On (pressed in).

c. Set the 1780R-Series controls as follows: INPUT to CH A, WFM HORIZONTAL to ONE–LINE, MAGNIFIER to 1.0 µs/DIV, and WAVEFORM GAIN to X5.

d. Use the VERT POS control to move the signal baseline between the –40 IRE and +100 IRE graticule lines for NTSC (0 V and 1.0 V for PAL).

e. Check that the bottom of the modulated pulse does not change more than 5 IRE for NTSC (36 mV for NTSC or PAL) as measured using the graticule. Equivalent to 7 mV when WAVEFORM GAIN – X5 is set to Off.

f. Set the MAGNIFIER and WAVEFORM GAIN–X5 to Off.

g. Leave the Pulse & Bar signal connected to the CH A INPUT connector.

24. Check DC Restorer Shift Versus Burst

Supplemental: Equal to or less than 1 IRE (NTSC) or 7 mV (PAL).

a. Check that a Pulse & Bar signal is applied to the 1780R-Series CH A INPUT connector.

b. Set the 1780R-Series WFM HORIZONTAL buttons to TWO–FIELD. Check that the CONFIGURE button is On and DC RESTORER–FAST is selected on the Configure menu.

c. Use the VERT POS control to move the signal blanking level to the Waveform CRT graticule baseline (0 IRE for NTSC; 0.3 V for PAL).

d. Check by setting the generator Burst switch to Off and then to On, that the signal blanking level moves less than 1 IRE for NTSC (7 mV for PAL).

e. Select CLAMP–ST on PAGE 1 of the Configure menu.

f. Verify that the sync tip goes to the graticule baseline. The graticule baseline is 0 IRE for NTSC; 0.3 V for PAL.

g. Check that by setting the generator Burst switch to Off and On, the sync tip moves less than 1 IRE for NTSC (7 mV for PAL).

h. Select CLAMP–BP on the Configure menu. Set the generator Burst switch to On.

i. Leave the Pulse & Bar signal connected to the instrument.

25. Check Filter DC Matching

Supplemental: (not listed in Section 2); Matching: Within 10 IRE for NTSC (70 mV for PAL).

a. Check that a Pulse & Bar signal is applied to the 1780R-Series CH A INPUT connector.

b. Set the 1780R-Series controls as follows: Select WFM HORIZONTAL–THREE–LINE. Hold the left FILTER button in until the FLAT, LUM, and CHROM lights are On. Set the WAVEFORM GAIN to X5. Select COUPLING–GND on the Configure menu.

c. Check that the three filter lines are within 10 IRE of each other for NTSC (or within 70 mV of each other for PAL).

d. Select FILTER–FLAT mode, WFM HORIZONTAL–ONE–LINE, and WAVEFORM GAIN–X5 to Off. Select COUPLING–DC and DC RESTORER–OFF on the Configure menu.

e. Disconnect the Pulse & Bar signal from the instrument.

26. Check Common Mode Rejection

Requirement: See Table 4–3.

Table 4–3: Common Mode Rejection

Frequency	A–B	B–B2/B–B3
60 Hz	46 dB	34 dB
15 kHz (Luminance)	46 dB	34 dB
1 MHz	40 dB	34 dB
3.58 or 4.43 MHz (Chroma)	34 d B	34 dB

a. Connect a 60 Hz sine wave signal from a sine wave oscillator to a dual-input coupler.

b. Connect one side of the dual-input coupler to the 1780R-Series CH A INPUT connector; connect the other side of the coupler to CH B1 INPUT. Do not terminate.

c. Check that INPUT–CH A and WFM HORIZONTAL–ONE–LINE are selected.

d. Set the sine wave oscillator output amplitude control so that the display on the Waveform CRT is 140 IRE for NTSC (1 V for NTSC or PAL).

e. Set the 1780R-Series controls as follows: INPUT to AB1 and WAVEFORM GAIN to X5.

f. Check that the amplitude is 3.5 IRE or less for NTSC (25 mV for NTSC or PAL) as displayed on the Waveform CRT.

g. Set the sine wave oscillator frequency to 15 kHz. Select INPUT–CH A and set the WAVEFORM GAIN–X5 to Off. Repeat parts d. and e.

h. Check that the amplitude is 3.5 IRE or less for NTSC (25 mV for NTSC or PAL) as displayed on the Waveform CRT.

i. Disconnect the sine wave oscillator from the instrument. In its place, connect a leveled sine wave generator signal through a 50 Ω-to-75 Ω minimum loss attenuator and a 75 Ω feed-through terminator to the dual-input coupler.

j. Select INPUT–CH A and set the WAVEFORM GAIN–X5 to Off.

k. Set the generator output frequency to 1 MHz.

l. Set the leveled sine wave generator output amplitude control so that the display on the Waveform CRT is 140 IRE for NTSC (1 V for NTSC or PAL).

m. Set the the INPUT selection to AB1. Set the WAVEFORM GAIN to X5.

n. Check that the amplitude is 7 IRE or less for NTSC (50 mV for NTSC or PAL) as displayed on the Waveform CRT.

o. Set the generator output frequency to 3.58 MHz for NTSC (4.43 MHz for PAL). Repeat parts l. and m.

p. Check that the amplitude is 14 IRE or less for NTSC (100 mV for NTSC or PAL) as displayed on the Waveform CRT.

q. Move the dual-input coupler from CH A INPUT to CH B2 INPUT.

r. Check common mode rejection. Use parts a. through p. in reverse order as a guide for checking common mode rejection. The amplitudes for 3.58 or 4.43 MHz, 1 MHz, 15 kHz, and 60 Hz are 14 IRE or less for NTSC; 100 mV or less for PAL. (Set the appropriate INPUT button to CH B1 when setting the display reference amplitude and then select INPUT B1B2 to check common mode rejection).

s. Move the dual-input coupler from CH B2 INPUT to CH B3 INPUT.

t. Check common mode rejection. Use parts a. through p. in the normal order as a guide for checking common mode rejection. The amplitudes for 60 Hz, 15 kHz, 1 MHz, and 3.58 or 4.43 MHz are as follows: 14 IRE or less for NTSC; 100 mV or less for PAL. (Set the appropriate INPUT

button to CH B1 when setting the display reference amplitude and then select INPUT B1B3 to check common mode rejection).

u. Disconnect the dual-input coupler and the sine wave signal from the instrument.

27. Check Differentiated Steps

Requirement: Step Attenuation: ≥40 dB, 3.58 MHz, or 4.43 MHz. Step Amplitude: Within 2% of flat display.

a. Connect a 5-Step, 40 IRE Modulated Staircase signal from the television test signal generator, through a 75 feed-through terminator, to the 1780R-Series CH A INPUT connector. For PAL, use 280 mV modulation.

b. Set the 1780R-Series controls as follows: Select INPUT–CH A and FILTER–DIFF mode. Press the WAVEFORM GAIN button to select the VAR mode.

c. Adjust the variable WAVEFORM GAIN control so that the differentiated steps are 100 IRE or 714 mV in amplitude for NTSC (set to 1 V for PAL).

d. Use the VERT POS control to position the tips of the differentiated steps to the graticule centerline on the Waveform CRT.

e. Check that the differentiated steps are within 2% or 14.3 mV (for NTSC) of each other when comparing the lowest amplitude step with the highest amplitude step. For PAL, 2% is equal to 20 mV.

f. Use the VERT POS control to position the waveform blanking level to the graticule baseline (0 IRE for NTSC; 0.3 V for PAL).

g. Press the WAVEFORM GAIN button to select X5 (not VAR–X5).

h. Check that the subcarrier attenuation is 40 dB or 2 IRE for NTSC (≥20 mV for PAL).

i. Set the FILTER selection to FLAT and the WAVEFORM GAIN–X5 to Off.

j. Leave the Modulated Staircase signal connected to CH A INPUT.

28. Check Non-Linear Waveform Distortion

Requirement: Differential Gain at Aux Video Output and Pix Mon Output: ≤0.25%, 10% to 90% APL. Differential Phase at Aux Video Output and Pix Mon Output: ≤0.25°, 10% to 90% APL.

a. Check that a 5-Step, 40 IRE Modulated Staircase signal is applied to the 1780R-Series CH A INPUT connector. For PAL, use a 280 mV Modulated Linearity signal.

b. Connect a coaxial cable from the AUX OUT connector of the 1780R-Series instrument under test to the Ch A Input of a test vectorscope. Connect an end-line termination to the Ch A Input loop-through connector on the test vectorscope. (The test vectorscope is another vectorscope used to check the 1780R-Series instrument being checked. See the Recommended Equipment List.)

c. Set the controls of the test vectorscope to measure differential phase in the double-trace mode. Null the first step and record the dial reading. Null the last step and record the dial reading. Subtract the smaller reading from the larger reading to obtain the measurement.

d. Check that differential phase is ≤0.25°.

e. Set the controls of the test vectorscope to measure differential gain between the first and last steps of the staircase.

f. Check that differential gain is ≤0.25%.

g. Move the coaxial cable from the AUX OUT connector to the PIX MON OUT connector on the 1780R-Series being checked.

h. Check Repeat parts c. through f.

i. Disconnect the test vectorscope from the PIX MON OUT connector of the 1780R-Series instrument being checked. Disconnect the 5-Step Staircase signal from the CH A INPUT connector of the instrument being checked.

29. Check Linear Waveform Distortion

Requirement: Pulse Overshoot & Ringing: ≤1% of applied pulse amplitude. Pulse & Bar: ≤1% of applied pulse amplitude. 25 μs Bar Tilt: ≤1% of applied bar amplitude. Field Square Wave Tilt: ≤1% of applied square wave amplitude. 2T Sin^2 Pulse-to-Bar Ratio: 1:1 ±1%.

a. Apply a modulated 2T Pulse & Bar signal, through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT. Do not go through the Switcher module.

b. Check that the 1780R-Series controls are set as follows: INPUT–CH A, REF–EXT, and WFM HORIZONTAL–ONE–LINE.

c. Check that there is 1 IRE or less for NTSC (7 mV for PAL) of overshoot and ringing on the 2T bar.

d. Check that the 2T pulse amplitude is 1 IRE or less for NTSC (7 mV for PAL) than the 2T bar amplitude.

e. Check that the 2T bar tilts 1 IRE or less for NTSC (7 mV for PAL).

f. Change the generator output signal to Field Square Wave. Select WFM HORIZONTAL–ONE–FIELD mode on the 1780R-Series front panel.

g. Check that the Field Square Wave signal tilts 1 IRE or less for NTSC (7 mV for PAL).

h. Select WFM HORIZONTAL–TWO–LINE mode.

i. Disconnect the Square Wave signal from the instrument.

30. Check Probe Input Gain

Requirement: Gain: Unity ±3%.

a. Connect the VAC output to the 1780R-Series front-panel PROBE input connector. Do not terminate.

b. Select the following settings: RIGHT DISPLAY WFM+CAL, INPUT–PROBE, CONFIGURE–On, PAGE 1, DC RESTORER–OFF, PAGE 2, and PROBE–X1. (For NTSC: Select ABS UNITS–mV.) Select VAR on the Waveform CRT menu; check that ABS is selected on this menu.

c. Set the VAC to 999.9 mV. Check that the +Lum button is pressed in and the Lum/Sync button is out. Check that the correct television standard (NTSC, PAL, or PAL M) is selected.

d. Use the VERT POS control to move the center two traces (bottom of the upper signal and top of the lower signal) to the graticule baseline (0 IRE for NTSC; 0.3 V for PAL).

e. Set the WAVEFORM GAIN to X5 and turn the Precision Measurement control to adjust for a null.

f. Check that the CAL readout is between 970 mV and 1030 mV.

g. Check that the CONFIGURE button is On and PAGE 2 menu is selected. Touch the PROBE X10 pad.

h. Set the VAC to 99.9 mV.

i. Repeat part d. of this step. Then, slightly readjust the Precision Measurement control to obtain a null.

j. Check that the CAL readout is between 970 mV and 1030 mV.

k. Set the WAVEFORM GAIN X5 to Off. Leave VAR and ABS selected on the Waveform CRT to perform the next step.

l. Disconnect the VAC signal from the PROBE input connector.

31. Check Calibrator Output Voltage for Probe

Requirement: CAL OUT Voltage: 1.0 V ±0.5%.

a. Connect the BNC connector end of a 1X probe to the 1780R-Series PROBE input connector.

b. Connect the probe tip through a BNC to Probe Adapter to the VAC Output connector.

c. Set the VAC readout to 999.9 mV.

d. Check and/or set the 1780R-Series controls and menu as follows: RIGHT DISPLAY–WFM+CAL, INPUT–PROBE, CONFIGURE–On, PAGE 1, DC RESTORER–OFF, and PAGE 2, PROBE–X1.

e. Use the 1780R-Series VERT POS control to position the center two traces near the graticule baseline (0 IRE for NTSC; 0.3 V for PAL).

f. Set the WAVEFORM GAIN to X5. Check that VAR and ABS are selected on the Waveform CRT.

g. Rotate the Precision Measurement control to overlay the center two traces.

h. Check that the CAL readout on the Waveform CRT is between 970 mV and 1030 mV. Note this CAL readout in mV.

i. Remove the BNC to Probe Adapter from the probe tip. Connect the 1X probe tip to the 1780R-Series CAL OUT connector.

j. Adjust the Precision Measurement control to overlay the center two traces.

k. Check that the CAL readout on the Waveform CRT is the same as noted in part h. of this step within ±5 mV.

l. Readjust the Precision Measurement control so that the readout is 1000 mV. Select FIX on the Waveform CRT.

m. Set the 1780R-Series controls and menu as follows: RIGHT DISPLAY–WFM and WAVEFORM GAIN–X5–Off. Leave the INPUT selection set to PROBE and the CONFIGURE button set to On to prepare for performing Step 32.

n. Disconnect the 1X probe from the PROBE and CAL OUT connectors.

32. Check Probe Tilt and Non-Linear Distortion

Requirement: Tilt: Less than 5% on a 50 Hz square wave (less than 4% when using a 60 Hz square wave).

a. Apply a Field Square Wave from the Pulse & Bar module of the television test signal generator, through a 75 Ω feed-through terminator, to the 1780R-Series PROBE input connector.

b. Check and/or set the 1780R-Series controls as follows: RIGHT DISPLAY–WFM, INPUT–PROBE, WFM HORIZONTAL–ONE–FIELD, CONFIGURE–On, PAGE 1, COUPLING–DC, DC RESTORER–OFF, and PAGE 2, PROBE–X1.

c. Check that tilt is less than 5% on a 50 Hz flat field signal or less than 4% on a 60 Hz flat field signal. (This is equivalent to less than 35 mV for a 50 Hz signal; less than 28 mV [4 IRE] for a 60 Hz signal.)

d. Set the CONFIGURE button to Off. Select INPUT–CH A.

e. Disconnect the signal and terminator from the PROBE input connector.

33. Check Timing Cursor Accuracy

Requirement: Accuracy: Within 5 ns, any delay within one line (64 μs).

a. Connect the television test signal generator Color Bar signal through a 75 Ω feed-through terminator to the 1780R-Series CH A INPUT connector.

b. Press the TIME CURSORS button to On. Check that MEASURE and SEPARATE (on the Vectorscope CRT Timing Cursors menu) are selected. Check that WFM HORIZONTAL–ONE–LINE is selected on the right front panel.

c. Use the 1780R-Series VERT POS and HORIZ POS controls to position the leading edge of the white bar to the center of the graticule area.

d. Check that CURSOR 1 is selected. Turn the Precision Measurement control knob counterclockwise until the ΔT readout stops changing.

e. Select CURSOR 2 and turn the Precision Measurement control knob counterclockwise until ΔT readout stops changing.

f. Select CURSOR 1 and turn the Precision Measurement control knob clockwise to place CURSOR 1 bright-up spot at the 50% point on the leading edge of the white bar.

g. Select CURSOR 2 and turn the Precision Measurement knob clockwise to obtain a ΔT readout of 63.555 μs on the Waveform CRT. (The readout for PAL should be 64.000 μs.)

h. Select CURSOR 1 on the Waveform CRT.

i. Turn the Precision Measurement knob so that CURSOR 1 bright-up spot overlays CURSOR 2 bright-up spot.

j. Check that the ΔT readout on the Waveform CRT is between 63.550 µs and 63.560 µs. (The readout for PAL should be between 63.995 µs and 64.005 µs.)

k. Set the TIME CURSORS button to Off.

l. Disconnect the Color Bar signal from the instrument.

34. Check Sweep Rates and Timing Accuracy

Requirement: See Table 4–4.

Table 4–4: Sweep Timing and Linearity

Line	Magnifier	Sweep Rate Readout	Time Cursors ΔT Readout	Check Timing* Accuracy	Check Linearity*
ONE–LINE	OFF (X1)	5.0 µs/DIV	50.0 µs	±1 µs	±0.5 µs
TWO–LINE	OFF (X1)	10 µs/DIV	100.0 µs	±2 µs	±1.0 µs
THREE–LINE	OFF (X1)	15.0 µs/DIV	135.0 µs**	±2.7 µs	±1.35 µs
ONE–LINE	ON (X5)	1.0 µs/DIV	10.000 µs	±0.2 µs	±1 minor div.
ONE–LINE	ON (X10)	.50 µs/DIV	5.000 µs	±0.1 µs	±1 minor div.
ONE–LINE	ON (X20)	.25 µs/DIV	2. 500 µs	±0.075 µs	±1 minor div.
ONE–LINE	ON (X25)	.20 µs/DIV	2.00 0 µs	±0.06 µs	±1 minor div.
ONE–LINE	ON (X50)	.10 µs/DIV	1.000 µs	±0.03 µs	±1 minor div.
ONE–LINE	ON (X100)	.05 µs/DIV	0.500 µs	±0.025 µs	±1 minor div.

*** Applies to the center 10 divisions of the sweep. Exceptions: Applies to center 9 divisions for THREE–LINE sweep when using TIME CURSORS for measurement. For magnified sweep measurement, exclude the first 2 divisions.**

**** When going from THREE–LINE back to ONE–LINE, turn the Precision Measurement knob counterclockwise until the TIME CURSORS 2 ΔT readout is 50.0 µs. By doing this, the correct CURSOR 2 bright-up dot will appear in the viewing area. Continue checking the remaining sweep rates by using the information provided in Table 4–4 and the detailed procedure as a guide.**

a. Check that no signal is applied to the CH A INPUT. Check that Black Burst is applied to the EXT REF connector and this loop-through is terminated into 75 Ω.

b. Check and/or set the 1780R-Series controls as follows: RIGHT DISPLAY–WFM, INPUT–CH A, REF–EXT, WFM HORIZONTAL–ONE–LINE and MAGNIFIER–OFF.

c. Use the 1780R-Series VERT POS and HORIZ POS controls to position the trace on the graticule baseline so that it starts at the first major graticule mark (located at the start or left end of the baseline) on the Waveform CRT. The graticule baseline is 0 IRE for NTSC; 0.3 V for PAL.

d. Press the TIME CURSORS button to On and select LOCATE (on the Vectorscope CRT Timing Cursors menu). Check that CURSOR 1 is selected.

e. Turn the Precision Measurement control knob counterclockwise until the ΔT readout stops changing. Select CURSOR 2 and turn the control knob counterclockwise until the ΔT readout stops changing. Select CURSOR 1.

f. Use the Precision Measurement control knob to place CURSOR 1 bright-up area on the 2nd major graticule mark. Select CURSOR 2 and use the control knob to move the CURSOR 2 bright-up area to the 12th major graticule mark. (The cursor dots should be exactly or very close to 10 divisions apart.)

g. Select MEASURE on the Vectorscope CRT and CURSOR 1 on the Waveform CRT. Repeat part f. of this step to place the CURSOR 1 and CURSOR 2 bright-up dots on the 2nd and 12th major graticule marks, respectively.

h. Check ONE–LINE sweep rate accuracy. The ΔT readout should be 50.0 μs 1 μs.

i. Turn the Precision Measurement control so the ΔT readout is exactly 50.000 μs.

j. Press the VAR/SLOW button and select VAR. Adjust the variable SWEEP RATE control, in conjunction with the HORIZ POS control, to place CURSOR 1 and CURSOR 2 bright-up dots directly on the 2nd and 12th major graticule marks, respectively.

k. Check that CURSOR 2 is selected. Use the Precision Measurement control to position the CURSOR 2 bright-up dot to each of the major graticule marks (11th, 10th, 9th, etc.). Note the readout at each of these marks.

l. Check ONE–LINE sweep linearity. The ΔT readout at each major graticule mark should be within 0.5 μs of the correct sweep time. For example, the ΔT readout at the 10th graticule mark should be 40.0 μs 0.5 μs. (At the 10th graticule mark, the cursor dots are 8 divisions apart.)

m. Check sweep rate accuracy and linearity for the remaining sweep rates listed in Table 4–4. Use the technique described in parts c. through k. as a guide.

n. Set the TIME CURSORS button to Off and the MAGNIFIER to OFF.

35. Check Variable Sweep Range

Requirement: Range: >±20%.

a. Connect the television test signal generator Color Bar signal through a 75 Ω feed-through terminator to the 1780R-Series CH A INPUT connector.

b. Set the Select WFM HORIZONTAL THREE–LINE mode.

c. Note the number of divisions that the three-line waveform display occupies.

d. Set the VAR/SLOW button to VAR.

e. Rotate the variable SWEEP RATE control counterclockwise to shorten the variable sweep length. Use the HORIZ POS control to position the display horizontally so the graticule baseline can be used to measure the width of the three-line waveform display.

f. Check that the three-line waveform display occupies a width that is 20% or less than the number of divisions noted in part c. of this step.

g. Set the VAR/SLOW button to Off.

h. Note the number of divisions that a one-line waveform occupies.

i. Set the VAR/SLOW button to VAR.

j. Rotate the variable SWEEP RATE control clockwise to the longest variable sweep length.

k. Check that one line of the three-line waveform display occupies a width that is 20% or more greater than the number of divisions noted in part h. of this step.

l. Select WFM HORIZONTAL TWO–LINE sweep and set the VAR/SLOW button to Off.

m. Leave the Color Bar signal connected to CH A INPUT.

36. Check Line Selection

Requirement: Range: Full Field. Field Selection: 1 of 4 for NTSC or 1 of 8 for PAL. Even or Odd and All Fields.

a. Check that a Color Bar signal is applied to the CH A INPUT.

b. Press the LINE SELECT button and check that WFM HORIZONTAL TWO–LINE is selected. Check that FIELD 1,3 pad (for NTSC) is selected on the Waveform CRT menu. (For PAL, select FIELD 1,5,3,7.)

c. Rotate the Precision Measurement control to select Line 263 for the 1780R NTSC instrument. For PAL, go to parts e. and f.

d. Check that there is a one-half color display line located on the left side of the Waveform CRT screen. Check that there is no Color Bar signal displayed on the right side of the screen.

e. For the 1781R PAL instrument, select LINE SEL MENU–ON, FIELD 4 OF 8, and FIELD 1, 5, 3, 7 on the Waveform CRT. Turn the Precision Measurement control to select Line 310.

f. Check that one color display line is located on the left side of the Waveform CRT screen.

g. Press the LINE SELECT button to the Off position.

h. Leave the Color Bar and Black Burst signals connected to the instrument.

37. Check RGB/YRGB Operation

Requirement: Square Wave or Staircase Input Amplitude: +10 V input will result in a horizontal display of 6.7 divisions ±0.7 major division. Sweep Repetition Rate: Field or line rate of displayed video as selected by the WFM HORIZONTAL buttons.

a. Check that a Color Bar signal from the television test signal generator is connected through a 75 Ω feed-through terminator to the 1780R-Series CH A INPUT.

b. Check that a Black Burst signal is applied to the 1780R-Series EXT REF connector and this connector is terminated into 75 Ω.

c. Select 1780R-Series WFM HORIZONTAL–ONE–LINE mode. Check that RIGHT DISPLAY–WFM, INPUT–CH A, and REF EXT are selected.

d. Use the 1780R-Series HORIZ POS and VERT POS controls to center the display on the Waveform CRT.

e. Connect the RGB Parade Display Test Connector fixture (see Figure 4–4) to the 1780R-Series rear-panel REMOTE connector.

f. Check that the color bar display (or sweep) has shortened to 3.2 to 3.7 divisions when jumper A2J585 is set to its factory-set 4-step YRGB Parade position (pins 2 & 3 are jumpered).

g. Use the 1780R-Series HORIZ POS control so that the color bar display ends at the last major division mark on the right side of the Waveform CRT graticule baseline. Note the waveform end location.

h. Connect the output of the function generator to the test oscilloscope vertical amplifier input. Set the generator controls for 0 V to +10 V square waves as displayed on the test oscilloscope CRT.

i. Disconnect the function generator output signal from the test oscilloscope. Connect the generator output square wave signal to the RGB Parade Display Test Connector input BNC connector.

j. Check that the first or left-hand waveform ends 6.7 major divisions ±0.7 major division to the left of the location noted in part g. of this step.

k. Disconnect the generator square wave signal and RGB Parade Display Test Connector from the REMOTE connector. Disconnect the Color Bar signal from the CH A INPUT connector.

38. Check External Horizontal Input Sensitivity

Supplemental: Sawtooth input of up to 5 V is nominally a 10-division horizontal sweep.

a. Connect the VAC output to the 1780R-Series EXT HORIZ input connector.

b. Set the VAC to 999.9 mV.

c. Press the MEASURE button to On and select the ICPM mode on the menu. (The instrument will automatically select X25 sweep magnification.) Set the MAGNIFIER to X5.

d. Use the HORIZ POS control to center the trace (two dots) on the Waveform CRT.

e. Check that the horizontal sweep length is 9 to 11 major divisions.

f. Set the MEASURE button to Off to exit the ICPM mode of operation.

g. Disconnect the VAC signal from the EXT HORIZ input connector.

39. Check Differential Gain

Requirement: Deflection Factor: 5% dG deflects the trace 50 IRE (NTSC) or 500 mV (PAL) within a tolerance of ±5%. Residual dG: ≤0.2%, last 90% of trace. Calibrated dG Resolution: 0.1%; Accuracy: 0.1% ±10% of reading; Range: ±5%.

a. Connect a 40 IRE (280 mV for PAL) Modulated 5-Step Staircase signal from the television test signal generator to the 1780R-Series CH A INPUT connector. Terminate this loop-through connector into 75 Ω.

b. Set the generator 5-Steps button to Off. (Leave the subcarrier modulation On.)

c. Check and/or set the 1780R-Series controls as follows: LEFT DISPLAY–VECT, RIGHT DISPLAY–WFM, REF–EXT, and WFM HORIZONTAL ONE–LINE.

d. Press the MEASURE button to On. Select DIFF GAIN, SINGLE, and NOISE REDUCTION–OFF on the Vectorscope CRT menu.

e. Check that the VECTOR GAIN–VAR is On. Turn the variable VECTOR GAIN control so that the modulation vector dot is located on the compass rose as displayed on the Vectorscope CRT.

f. Use the VERT POS control to position the Waveform CRT trace to the 50 IRE graticule line for NTSC (0.8 graticule line for PAL).

g. Insert the 5% Signal Attenuator between the coaxial cable and the CH A INPUT connector.

h. Check that the trace on the Waveform CRT moved downward 50 IRE to the 0 IRE graticule line within a tolerance of ±2.5 IRE for NTSC. (For PAL, the trace should move downward 50 mV from the 0.8 graticule line to the 0.3 graticule line within a tolerance of ±2.5 mV.)

i. Remove the 5% Signal Attenuator. Leave the Staircase signal applied to the CH A INPUT connector.

j. Press the REFERENCE SET button so that the D GAIN readout is 0.0% on the Waveform CRT.

k. Turn the Precision Measurement control in a direction that moves the trace downward five divisions to the 0 IRE graticule line for NTSC (0.3 line for PAL).

l. Check that the D GAIN readout on the Vectorscope CRT is between 4.8% and 5.2%.

m. Turn the Precision Measurement control so that the D GAIN readout is 0.0%.

n. Set the generator 5-Steps button to On.

o. Select DOUBLE and, if desired, NOISE REDUCTION–ON.

p. Turn the Precision Measurement control so that the first step location for the traces are overlayed.

q. Press the REFERENCE SET button.

r. Turn the Precision Measurement control so that the fifth step location on the trace overlays.

s. Check that the D GAIN readout on the Vectorscope CRT is equal to or less than 0.2%.

t. Select SINGLE and NOISE REDUCTION–OFF on the Vectorscope CRT menu. Press the MEASURE button to exit the menu.

u. Leave the 5-Step Staircase signal connected to CH A INPUT.

40. Check Differential Phase

Requirement: Deflection Factor: 5° dP deflects the trace 50 IRE (NTSC) or 500 mV (PAL) within a tolerance of ±5%. Residual dP: ≤0.1°, last 90% of trace. Calibrated dP Resolution: 0.05°; Accuracy: ±0.1° over full 360°, External Reference ±0.2 burst lock. Range: 360°.

a. Check that a 40 IRE (280 mV for PAL) Modulated 5-Step Staircase test signal is applied to the CH A INPUT connector.

b. Check that the 1780R-Series controls are set the same as given in part c. in Step 39 except as follows: Press the MEASURE button to display the menu and select DIFF PHASE. Check that SINGLE and NOISE REDUCTION–OFF are selected.

c. Check that VECTOR GAIN–VAR is On. Adjust the variable VECTOR GAIN control to place the subcarrier vector dot on the compass rose.

d. Use the VERT POS control to position the waveform blanking level to the graticule baseline (0 IRE for NTSC; 0.3 V for PAL).

e. Turn the Precision Measurement control so that the chroma overlays the vertical interval.

f. Use the VERT POS control to place the chroma on the graticule baseline.

g. Press the REFERENCE SET button.

h. Turn the Precision Measurement control so that the chroma line is positioned to the 50 IRE graticule line for NTSC (0.8 graticule line for PAL).

i. Check that the PHASE readout on the Vectorscope CRT is between –4.75° and –5.25°.

j. Select DOUBLE on the Vectorscope CRT menu.

k. Turn the Precision Measurement control so that the first step location on the trace overlays.

l. Press the REFERENCE SET button.

m. Adjust the Precision Measurement control so that the fifth step location on the trace overlays.

n. Check that the PHASE readout on the Vectorscope CRT is 0.10° or less.

o. Leave the MEASURE button set to On.

p. Leave the 5-Step Staircase test signal from the CH A INPUT connector.

41. Check Recursive Filter

SUPPLEMENT Approximately 15 dB signal-to-noise reduction with filter selected.

a. Check that a Modulated 5-Step Staircase signal from the television test signal generator is applied to the 1780R-Series CH A INPUT connector. Check that CH A INPUT is terminated.

b. Check that the 1780R-Series MEASURE button is set to On. Check that DIFF PHASE and DOUBLE are selected on the menu.

c. Check that the VECTOR GAIN–VAR is set to On. If necessary, turn the variable VECTOR GAIN control to place the vector dot on the compass rose.

d. Check the noise reduction circuitry by toggling between NOISE REDUCTION–ON and OFF. Noise on the Waveform CRT display should noticeably decrease when NOISE REDUCTION–ON is selected.

e. Select the NOISE REDUCTION–ON setting. Set FREEZE to On.

f. Check that the Waveform CRT display does not move as the Precision Measurement control is rotated.

g. Select the NOISE REDUCTION–OFF setting. Press MEASURE button exit the menu.

h. Disconnect the 5-Step Staircase signal from the instrument.

42. Check Internal Sync Input

Requirement: Internal Reference Sync Separator: 0.2 V to 2.0 V peak-to-peak composite video. Internal Sync Separator: 0.5 V to 2.0 V peak-to-peak composite video.

a. Connect the television test signal generator Black Burst signal to the 1780R-Series CH A INPUT connector. Do not terminate.

b. Set the 1780R-Series control as follows: REF–INT.

c. Check that the Waveform CRT display is locked.

d. Connect five 75 Ω feed-through terminators to the 1780R-Series CH A INPUT loop-through connector.

e. Set the television test signal generator Variable Sync to On. Adjust the Variable Sync control to obtain minimum output amplitude (14 dB reduction; i.e., <8 IRE amplitude for NTSC; <57 mV for PAL).

f. Check that the Waveform CRT display is locked.

g. Set the test signal generator Variable Sync to Off.

h. Disconnect the Black Burst signal and the five feed-through terminators from the CH A INPUT connector.

43. Check External Sync Input

Requirement: Black Burst: –14 dB to +6 dB. Composite Sync: 0.2 V to 8.0 V peak-to-peak.

a. Connect the television test signal generator Color Bar signal, through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT connector. Check that the generator Black Burst signal is connected to the EXT REF connector and terminated into 75 Ω.

b. Set the 1780R-Series control as follows: REF–EXT.

c. Unterminate the 1780R-Series EXT REF input.

d. Check that the Vectorscope and Waveform CRT displays are locked.

e. Connect five 75 Ω feed-through terminators to the 1780R-Series EXT REF connector loop-through connector.

f. Set the television test signal generator Variable Sync to On. Adjust the Variable Sync control to obtain minimum output amplitude (14 dB reduction; i.e. <8 IRE amplitude for NTSC; <57 mV for PAL).

g. Check that only the Waveform CRT display is locked. (Ignore the Vectorscope display.)

h. Set the test signal generator Variable Sync to Off.

i. Disconnect the five feed-through terminators from the EXT REF connector. Connect a 75 Ω end-line termination to this loop-through connector.

j. Leave the Color Bar and Black Burst signals connected to the instrument.

44. Check AFC and Direct Sync

Requirement: AFC Sync Lock-In Time: <1 second. Jitter With Respect to White Noise: ≤30 ns.

Supplemental: Direct Sync Jitter: ≤12 ns.

a. Check that the television test signal generator Color Bar signal is applied to the 1780R-Series CH A INPUT connector. Check that the generator Black Burst signal is applied to the EXT REF connector and this connector is terminated into 75 Ω.

b. Check and/or set the 1780R-Series controls as follows: REF–EXT, WFM HORIZONTAL–TWO–LINE, CONFIGURE button–On, SYNC–AFC, COUPLING–DC, and DC RESTORER–OFF.

c. Check by switching between SYNC–AFC and SYNC–DIR on the Vectorscope CRT menu that the Waveform CRT display remains locked.

d. Select SYNC–AFC and COUPLING–GND on the menu.

e. Check by switching COUPLING from GND to AC, that the display freeruns then locks up within one second. (The display may lock up immediately.)

f. Select SYNC–DIR and COUPLING–GND.

g. Check by switching COUPLING from GND to AC, that the display locks up immediately.

h. Select COUPLING–DC. Check that SYNC–DIR is selected.

i. Use the HORIZ POS control to position the leading edge of the horizontal sync pulse to graticule center.

j. Set the MAGNIFIER to 0.10 µs/DIV. Reposition the leading edge of sync to graticule center.

k. Check that sync jitter is equal to or less than 12 ns (0.5 minor division).

l. Select SYNC–AFC.

m. Check that sync jitter is equal to or less than 30 ns (1.5 minor division).

n. Select SYNC–DIR and check that COUPLING–DC is selected. Press the CONFIGURE button to exit the menu. Set the MAGNIFIER to OFF.

o. Disconnect the Color Bar signal from the instrument.

45. Slow Sweep Duration and Triggering

Requirement: Signal: APL change from 10% to 90%. Sensitivity: ≤0.4 V to 2.0 V peak-to-peak composite video with APL change. Front panel selectable for either + or – (minus) triggering level change. Slow Sweep Duration: 4 to 12 seconds.

a. Connect a 0% to 100% APL AC Bounce signal from the television test signal generator, through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT connector.

b. Select REF–INT on the 1780R-Series front panel. Adjust the generator Linearity Rate control so the signal bounce rate is approximately two seconds.

c. Set the 1780R-Series VAR/SLOW button to SLOW. Press the CONFIGURE button to On and select the PAGE 3 menu. Check that SLOW SWEEP TRIG + is selected.

d. Check that the Waveform CRT display begins at maximum APL. (The bright APL dot should be at the maximum APL level when the sweep starts and then drop to the blanking level as the sweep moves across the screen.)

e. Select SLOW SWEEP TRIG (minus) on the menu.

f. Check that the Waveform CRT display begins at the blanking level. (The bright APL dot should be at the blanking level when the sweep starts and then rise to the maximum APL level as the sweep moves across the screen.)

g. Select SLOW SWEEP TRIG + on the menu. Turn the variable SWEEP RATE control to obtain the slowest sweep.

h. Check that the sweep takes 12 seconds or more to move across the Waveform CRT.

i. Turn the variable SWEEP RATE control to obtain the fastest sweep.

j. Check that the sweep moves across the screen in 4 seconds or less.

k. Set the VAR/SLOW button to Off. Press the CONFIGURE button to exit the menu.

l. Disconnect the AC Bounce signal from the instrument.

46. Check Remote Sync Input

Requirement: Amplitude: 2.0 V to 5.0 V 100 kHz square wave or 4.0 V composite sync.

a. Connect the Remote Sync Input Connector (see Figure 4–3) to the 1780R-Series REMOTE connector.

b. Connect a 4 V composite sync signal from the television test signal generator to the Remote Sync Input Connector.

c. Connect a Color Bar signal, through a 75 Ω feed-through terminator, to the CH A INPUT connector.

d. Check that the signal displayed on the Waveform CRT is locked.

e. Disconnect the Remote Sync Input Connector from the instrument. Leave the Color Bar signal connected to CH A INPUT.

47. Check Digital Phase Shifter

Requirement: Phase Accuracy: 0.1°.

a. Check that a television test signal generator Color Bar signal is applied through a 75 Ω feed-through terminator to the 1780R-Series CH A INPUT connector.

b. Connect the television test signal generator front-panel Subcarrier signal to the EXT CW REF connector. Connect a 75 Ω end-line termination to the remaining EXT CW REF loop-through connector. Check that Black Burst is applied to the EXT REF connector.

c. Set the 1780R-Series controls as follows: REF–EXT–CW.

d. Set the television test signal generator Subcarrier Phase dial to 0.

e. Check that the vector display is locked.

f. Press the CONFIGURE button; select PAGE 3. Check that CW SYNC–EXT is selected. Push the CONFIGURE button to exit the menu.

g. Press the MEASURE button to On; select DIFF PHASE, DOUBLE, and NOISE REDUCTION–ON. Set the front-panel WAVEFORM GAIN to X5.

h. Adjust the variable VECTOR GAIN control so that the red vector dot is located on the compass rose.

i. Use the Precision Measurement control to position the red vector dot on the 180° graticule line. (For PAL, use the +V component red dot.)

j. Turn the Precision Measurement control so that the red bars overlay on the Waveform CRT.

k. Press the REFERENCE SET button. The PHASE readout on the Waveform CRT should be 0.00°.

l. Turn the Precision Measurement control counterclockwise to overlay the magenta bars on the Waveform CRT. Check that the magenta vector dot is located on the 180° graticule line.

m. The PHASE readout on the Waveform CRT should be between 42° and 43°. Note your own exact reading.

n. Turn the Precision Measurement control clockwise to reposition the red vector dot on the 180° graticule line. (For PAL, use the +V component red dot.)

o. Turn the Subcarrier dial on the television test signal generator to place the red vector dot on the 210° graticule line on the 1780R-Series Vectorscope CRT. Turn the 1780R-Series Precision Measurement control to reposition the red vector dot back to the 180° graticule line.

p. Check Repeat parts j. through o. eleven more times to check the complete compass rose (in 30° increments). Check that the PHASE readout for each 30° increment is the same, within 0.10°, as the readout noted in part m. of this step.

q. Push the MEASURE button to exit the menu. Select REF–EXT on the front panel.

r. Disconnect the subcarrier signal and termination from the EXT CW REF connectors. Disconnect the Color Bar signal from the CH A INPUT connector.

48. Check Chroma Bandwidth

Requirement: Upper –3 dB Point: F_{SC} +500 kHz, ±100 kHz. Lower –3 dB Point: F_{SC} –500 kHz, ±100 kHz.

a. Connect a BNC T connector to the output of the leveled sine wave generator. Connect the generator output from the T connector through a 50 Ω-to-75 Ω minimum loss attenuator to the 1780R-Series CH A INPUT connector. Connect a 75 Ω terminator to this loop-through connector. Also, connect the generator output from the T connector to a digital counter to verify the frequencies within ±1 kHz.

b. Check and/or select the following 1780R-Series front-panel control settings: LEFT DISPLAY–VECT, RIGHT DISPLAY–WFM, INPUT–CHA, REF–EXT, FILTER–FLAT, and WFM HORIZONTAL ONE–LINE.

c. Set the generator output frequency to 3.579545 MHz for NTSC (4.43361875 MHz for PAL). Adjust the generator output amplitude control until the vector coincides with the compass rose. Leave the generator amplitude control at this setting when performing parts d. through i. of this step.

d. Set the generator output frequency to 3.179545 MHz for NTSC (4.033619 MHz for PAL).

e. Check that the circle displayed on the Vectorscope CRT is larger than the 3 dB marks. See Fig. 4–10.

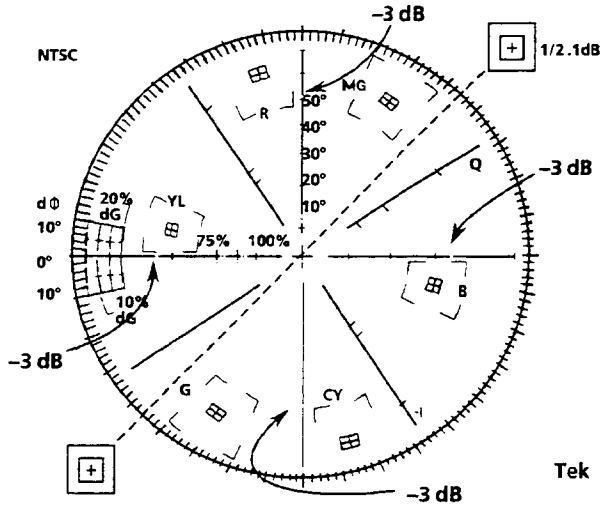


Figure 4–10: Vector graticule showing the –3 dB points for checking frequency response

f. Set the generator output frequency to 2.979545 MHz for NTSC (3.833619 MHz for PAL).

g. Check that the circle displayed on the Vectorscope CRT is smaller than the 3 dB marks.

h. Set the generator output frequency to 3.979545 MHz and then to 4.179545 MHz. (Use 4.833619 MHz and 5.033619 MHz for PAL.)

i. Check that, at 3.979545 MHz, the circle is larger than the 3 dB marks; at 4.179545 MHz, the circle should be smaller than the 3 dB marks. (Use 4.833619 MHz and 5.033619 MHz for PAL.)

j. Disconnect the sine wave signal from the instrument.

49. Check Vector Display Phase and Gain Accuracy

Requirement: Vector Phase Accuracy: ±1.25. Vector Gain Accuracy: ±2.5% (1.25 IRE). Quadrature Phasing: ±0.5°.

a. Connect the television test signal generator 75% Amplitude Color Bar signal to the 1780R-Series CH A INPUT connector. Check that this loop-through connector is terminated.

b. Press the PHASE SHIFT button to On.

c. Turn the Precision Measurement control so that burst is located on the 180° graticule line as displayed on the Vectorscope CRT. (For PAL, position the burst vector dots to their reference marks on the graticule.)

d. Check that the color vector dots are located within 50% of the distance between the center of the boxes and edges of the boxes.

e. Check that the button under the Vectorscope CRT is On. Press the CALIBRATE button and select the CAL OSC–ON pad on the Waveform CRT.

f. Check that the test circles are overlayed within 0.36 mm (typically one trace width) and located on the compass rose as displayed on the Vectorscope CRT.

g. Press the CONFIGURE button and select PAGE 2 menu. Select BARS–100% on the Vectorscope CRT. Press the CONFIGURE button to exit the menu.

h. Set the generator Color Bar Ampl button to 100%.

i. Check that the color vector dots are located within their boxes.

j. Set the generator Color Bar Ampl button to 75%.

k. Set the 1780R-Series controls as follows: PHASE SHIFT button–Off. Select CONFIGURE–On, PAGE 2, BARS–75%, and CONFIGURE–Off.

l. Leave the color Bar signal connected to the CH A INPUT connector.

50. Check Subcarrier Regenerator

Requirement: Pull-In Range: ±50 Hz of F_{SC} for NTSC; ±10 Hz of F_{SC} for PAL. Phase Shift with Burst Amplitude Change: ±2° from nominal burst amplitude to ±3 dB. Phase Shift with Input Channel Change: ±2°.

a. Check that a Color Bar signal is applied to the CH A INPUT connector and Black Burst is applied to EXT REF.

b. Set the television test signal generator SPG2, Option AA, Variable Subcarrier Frequency Offset push-button switch to On. Set the Frequency button to offset the frequency 50 Hz for NTSC. (For PAL, use the SPG12, Option AA, button to offset the frequency 10 Hz.)

c. Check that the vector display locks in when the generator Frequency Offset button is set to + and then to – (minus).

d. Set the generator Subcarrier Frequency Offset buttons to + and Off.

e. Remove the end-line termination from the 1780R-Series EXT REF connector. Connect a coaxial cable from the EXT REF connector through a feed-through terminator to Ch 1 input of the test oscilloscope dual-trace amplifier.

f. Set the test oscilloscope dual trace amplifier controls as follows: Ch 1 Volts/Div to 0.1 V, Input Coupling to DC, Display Mode to Ch 1, and the Trigger Source to Ch 1. Set the Time Base controls as follows: Mode to Auto, Coupling to DC, Source to Int, and the Time/ Div to 1 µs.

g. Set the 1780R-Series front-panel controls as follows: Select the VECTOR GAIN–VAR mode. Press the PHASE SHIFT button to On.

h. Turn the variable VECTOR GAIN control to place the burst vector dot on the compass rose. (For PAL, use the 135° burst vector dot as the reference and the equivalent to the NTSC burst vector dot when performing parts i. through w.)

i. Use the Precision Measurement control to align the burst vector dot with the 180° graticule line.

j. Adjust the generator Variable Burst Amplitude control to display 200 mV burst amplitude on the test oscilloscope (210 mV for PAL).

k. Check that the burst vector dot remains between 178° and 182°.

l. Set the generator Variable Burst Amplitude control to obtain 404 mV burst amplitude on the test oscilloscope CRT (424 mV for PAL).

m. Check that the burst vector dot remains between 178° and 182°.

n. Set the generator Variable Burst Amplitude control to the detent position. Disconnect the coaxial cable from the test oscilloscope Ch 1 input and 1780R-Series EXT REF connectors. Reconnect a 75 Ω end-line termination to the EXT REF connector to terminate the Black Burst signal.

o. Move the Color Bar signal to the 1780R-Series CH B1 INPUT connector and terminate into 75 Ω. Select INPUT–CH B1.

p. Use the Precision Measurement control to align the vector with the 180° graticule line. Press the REFERENCE SET button so that the PHASE readout on the Vectorscope CRT is 0.00°.

q. Move the Color Bar signal back to the 1780R-Series CH A INPUT connector and terminate into 75 Ω.

r. Select INPUT–CH A. Turn the Precision Measurement control to align the burst vector dot with the 180° graticule line.

s. Check that the PHASE readout remains between 358.0° and 2.00°.

t. Move the Color Bar signal to the CH B2 INPUT connector and terminate into 75 Ω. Select INPUT–CH B2.

u. Check Use parts p. through s. as a guide for checking CH B2.

v. Move the Color Bar signal to the CH B3 INPUT connector and terminate into 75 Ω. Select INPUT–CH B3.

w. Check Use parts p. through s. as a guide for checking CH B3.

x. Set the VECTOR GAIN–VAR to Off.

y. Leave the Color Bar signal connected to the CH A INPUT connector.

51. Check Vector Display Clamp Stability and Position Range

Requirement: Clamp Stability: 1/64-inch (0.4 mm) or less. Vertical and Horizontal Position Control Range: 1/4-inch (6 mm) from center.

a. Check that 75%-Amplitude Color Bars are applied to the 1780R-Series CH A INPUT connector and Black Burst is applied to EXT REF.

b. Check that LEFT DISPLAY–VECT is selected and the PHASE SHIFT button is set to On.

c. Check that the vector center dot does not shift more than 1/64-inch from its original position as the burst vector(s) is rotated 360°. (Use the Precision Measurement control to rotate the burst vector(s) the full 360° range.)

d. Set the PHASE SHIFT button to Off.

e. Check that the vector center dot can be positioned 1/4-inch (6 mm) or more from its centered position. Use the VERT and HORIZ POS controls to move the vector center dot.

f. Use the VERT and HORIZ POS controls to reposition the vector center dot to its original centered position on the vector graticule.

g. Disconnect the Color Bar signal and feed-through termination from the instrument.

52. Check Vector Display Variable Gain Range

Requirement: Range: +14 dB to –6 dB of 75% color bar preset gain.

a. Connect the output of the leveled sine wave generator, through a 50 Ω to 75 Ω minimum loss attenuator, to the 1780R-Series CH A INPUT connector. Terminate this loop-through connector into 75 Ω.

b. Check that LEFT DISPLAY–VECT is selected.

c. Set the generator output frequency to 3.579645 MHz for NTSC (4.43361875 MHz for PAL). Adjust the generator output amplitude control until the circle coincides with the compass rose on the Vectorscope CRT.

d. Set the 1780R-Series VECTOR GAIN to VAR. Turn the variable VECTOR GAIN control counterclockwise until the circle is its smallest size.

e. Note the amplitude of the display on the Waveform CRT.

f. Set the generator output amplitude so that it is twice the amplitude noted in part e. of this step. Note this amplitude on the Waveform CRT.

g. Check that the circle is located inside the compass rose.

h. Adjust the generator output amplitude so that it is 1/10 the amplitude noted in part f. of this step.

i. Turn the variable VECTOR GAIN control clockwise until the circle is its largest size.

j. Check that the circle is located outside the compass rose.

k. Select VECTOR GAIN–MAX on the 1780R-Series front panel.

l. Check that the circle is located outside the compass rose.

m. Set VECTOR GAIN–MAX to Off.

n. Disconnect the sine wave signal and minimum loss attenuator from the instrument.

53. Check Variable Gain Phase Shift

Requirement: Phase Shift: ±1° as gain is varied from +3 dB to –6 dB.

a. Connect the television test signal generator Color Bar signal to the 1780R-Series CH A INPUT connector. Check that a 75 Ω feed-through terminator is connected to this loop-through connector.

b. Set the 1780R-Series controls as follows: Press the MEASURE button to On. Select DIFF PHASE and SINGLE on the menu.

c. Turn the Precision Measurement control to null the burst displayed on the Waveform CRT. Check that the burst vector is located on the 180° graticule line as displayed on the Vectorscope CRT. (For PAL, use the 135° burst vector when performing parts c. through h.)

d. Press the REFERENCE SET button.

e. Select VECTOR GAIN–VAR mode. Adjust the variable VECTOR GAIN control so that the burst vector is one-half its original length.

f. Turn the Precision Measurement control to null the burst.

g. Check that the PHASE readout on the Vectorscope CRT is between +1.00° and –1.00°.

h. Adjust the variable VECTOR GAIN control so that the burst vector length reaches the 20% DG mark on the 180° graticule line.

i. Turn the Precision Measurement control to null the burst.

j. Check that the PHASE readout on the Vectorscope CRT is between +1.00° and –1.00°.

k. Set the VECTOR GAIN–VAR mode to Off. Press the MEASURE button to exit the menu.

l. Disconnect the Color Bar signal and 75 Ω terminator from the instrument.

54. Check X and Y Input Phase Matching

Requirement: Input Phase Matching: Less than a trace width of separation at 20 kHz.

a. Connect the – Output from the sine wave oscillator to pin 1 (–X Input) and pin 5 (–Y Input) of the X–Y Input Connector listed in the Auxiliary Equipment. Connect the oscillator + Output to pin 3 (+X Input) and pin 7 (+Y Input) of the X–Y Input Connector.

b. Connect the X Y Input Connector to the 1780R-Series rear panel X Y INPUT connector.

c. Select LEFT DISPLAY–XY on the 1780R-Series front panel.

d. Set the sine wave oscillator frequency to 1 kHz. Adjust the oscillator output amplitude so the trace extends between the targets (+) on the diagonal line as displayed on the Vectorscope CRT.

e. Set the sine wave oscillator output frequency to 20 kHz.

f. Check that there is less than a trace width separation along the diagonal line. See Figure 4–11.

g. Disconnect the sine wave oscillator from the X Y Input Connector.

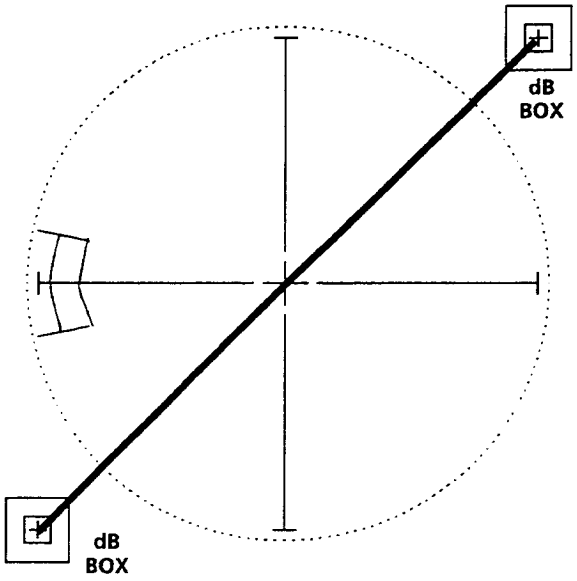


Figure 4–11: Properly adjusted xy input gains

55. Check X Y Frequency Response

Requirement: Frequency Response: DC to >500 kHz.

a. Connect the leveled sine wave generator output signal to pin 3 of the 1780R-Series rear panel X Y INPUT connector. Use the X Y INPUT connector listed in the Auxiliary Equipment to make the connections. Connect pin 1 to ground. Connect the generator ground to pin 1.

b. Check that LEFT DISPLAY–XY is selected.

c. Set the generator output frequency to 50 kHz and the output amplitude for a display equal to the diameter of the compass rose on the 1780R-Series Vectorscope CRT.

d. Set the generator output frequency to 500 kHz.

e. Check that the display reaches the –3 dB gaps in the horizontal axis or beyond. See Figure 4–10.

f. Move the generator output signal to pin 7 of the X Y INPUT connector. Connect pin 5 to ground.

g. Check that the display reaches the –3 dB gaps in the vertical axis or beyond.

h. Disconnect the leveled sine wave generator from the instrument.

***NOTE**. Perform parts i. through o. of this step only if the internal jumpers for A6J108 and A6J205 are installed to operate the instrument in the High Gain mode.*

i. Connect the sine wave oscillator to pin 11 and ground pin 9 of the X Y INPUT connector.

j. Set the sine wave oscillator output frequency to approximately 10 kHz and adjust its amplitude for a display equal to the diameter of the graticule compass rose.

k. Set the oscillator frequency to 100 kHz.

l. Check that the display reaches the –3 dB gaps in the horizontal axis or beyond.

m. Move the sine wave oscillator signal so that it is applied to pin 15. Connect pin 13 to ground.

n. Repeat parts j. and k. of this step.

o. Check that the display reaches the –3 dB gaps in the horizontal axis or beyond.

p. Disconnect the sine wave oscillator from the instrument.

q. Disconnect the X Y INPUT connector and Color Bar signal.

56. Check SCH Phase Accuracy

Requirement: Absolute Phase Accuracy: ±5° phase at 25°C. Acquisition Time: ≤1 sec. External Reference: 360°. Internal Reference: ±70°. Synchronization: 286 mV for NTSC (300 mV for PAL) sync and burst ±3 dB. Line Strobe Out occurs on Line 11 (NTSC) or line 7 (PAL).

a. Connect a Color Bar signal from a TEKTRONIX TSG–170A NTSC Television Generator to the 1780R CH A INPUT connector. Connect a 75 Ω end-line termination to the remaining CH A INPUT connector. Connect the generator Black Burst signal to the EXT REF connector. Check that the EXT REF loop-through connector is terminated into 75 Ω. (Use a TEKTRONIX TSG-271 PAL Generator for the 1781R.)

b. Select the 1780R-Series LEFT DISPLAY–SCH mode of operation. Check that REF–EXT is selected.

c. Use the VERT and HORIZ POS controls to position the vector center dot to the exact center of the vector graticule.

d. Press the PHASE SHIFT button to On. Rotate the Precision Measurement control to place the burst vector(s) to their reference target(s). Press the PHASE SHIFT button to Off.

e. Check that the SCH dot is located near the compass rose and that it is within 5° of the 180° axis for NTSC or PAL.

f. Connect the Frame/Black (NTSC) or Frame Ref (PAL) signal from the television generator to the CH 1 Input to the test scope dual trace amplifier. Connect the 1780R-Series LINE STROBE OUT to the CH 2 Input of the dual trace amplifier. See Figure 4–12.

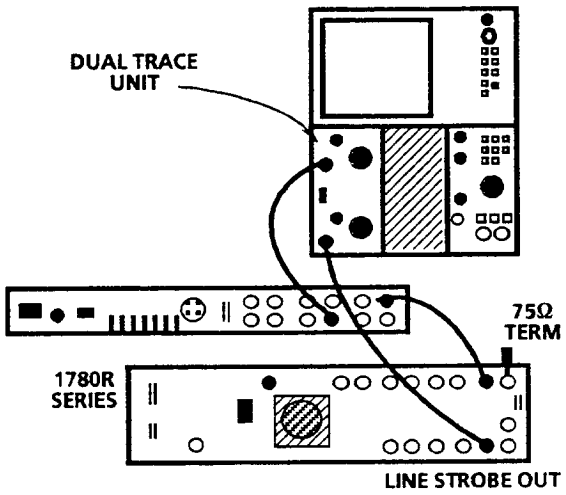


Figure 4–12: Connections for checking line strobe pulse timing

NOTE. *The television generator is factory set to output a frame pulse on the Frame/Black or Frame Ref. If the pulse is internally disabled by a jumper change, restore the jumper to the factory-set position.*

g. Trigger the test scope from CH 1 and set the Display Mode to Chop. Set test scope time base to 10 ms/Div, vertical Volts/Div to 5.

h. Push the 1780R-Series LINE SELECT button. Turn on the touch screen Line Select menu and select 1–IN–4 (NTSC) or 1–IN–8 (PAL).

i. Rotate the 1780R-Series Precision Measurement knob to display line 7 (NTSC) or line 11 (PAL).

j. Check that the line strobe pulse displayed on the test scope is within 1 division of the strobe output by the television generator.

k. Disconnect the TSG-170A (or TSG-271) signal from the 1780R-Series instrument. In its place, connect the television test signal generator (1410 or 1411) Color Bar signal to the CH A INPUT connector. Connect a coaxial cable from the other CH A INPUT connector to the EXT REF connector. Check that the EXT REF connector is terminated into 75 Ω.

Check that the generator is internally connected so that the SCH can be varied. (Refer to P339 on the generator A21 Sync Lock board.)

l. Check that by turning the generator Subcarrier Phase control clockwise, the SCH dot "flips" between 80° and 115° (typical range). SCH phase can be varied ±70° from 0° without changing fields. If this performance requirement and the one described in part e. of this step are met, the 360° requirement will also be met.

m. Leave the Color Bar signal connected to the CH A INPUT. Disconnect the coaxial cable from the other CH A INPUT connector; terminate this loop-through connector into 75 Ω. Connect Black Burst from the generator to the EXT REF connector; check that this loop-through connector is terminated into 75 Ω.

n. Press the generator Horiz Unlock button.

o. Check that the SCH dot locks into a stable position within ≥1 second when the generator Horiz Unlock button is released.

p. Remove the 75 Ω termination from the EXT REF connector.

q. Check that the SCH dot locks.

r. Connect two 75 Ω terminations to the EXT REF connector.

s. Check that the SCH dot locks.

t. Remove one of the terminators from the EXT REF connector.

u. Leave the Color Bar signal connected to the instrument.

57. Check WFM Trace Rotation and Orthogonality

Requirement: Trace Rotation Range: ≥±1° from horizontal. Orthogonality: ±1°.

a. Check that a 75% Amplitude Color Bar signal is applied from the television test signal generator to the CH A INPUT connector.

b. Adjust the VER POS control so that the waveform blanking level is positioned to the graticule baseline (0 IRE for NTSC; 0.3 V for PAL) as displayed on the Waveform CRT.

c. Press the CALIBRATE button and select TRACE ROTATION on the Vectorscope CRT menu.

d. Check that the electronic graticule horizontal lines, displayed on the Waveform CRT, are parallel to the nearest graticule lines within ±1°. Check that the electronic graticule vertical lines are perpendicular to the electronic graticule horizontal lines within ±1°.

e. Turn the Precision Measurement control so that the waveform blanking level is aligned parallel with the CRT graticule baseline (0 IRE for NTSC; 0.3 V for PAL). The electronic graticule horizontal line will also be parallel with its nearest CRT graticule line.

f. Turn the Precision Measurement control each direction.

g. Check that the horizontal line, vertical line, and waveform will rotate equal to or greater than ±1° from their original position.

h. Turn the Precision Measurement control so that the waveform blanking level is aligned parallel with the CRT graticule baseline.

i. Check that the electronic graticule lines on the Vectorscope CRT are straight within ±1°. The electronic graticule lines should be parallel with the X and Y axis within ±1°.

j. Press the CALIBRATE button to exit the menu and TRACE ROTATION mode.

k. Disconnect the Color Bar and Black Burst signals from the instrument.

58. Check Return Loss

Requirement: CH A, B1, B2, or B3: >40 dB to 5 MHz. AUX IN, AUX OUT, or PIX MON OUT (Instrument On only): >34 dB to 5 MHz. EXT REF: >46 dB to 5 MHz.

a. Connect the output signal from the leveled sine wave generator, through a 50 Ω-το 75 Ω minimum loss attenuator, to the input connector of the Return Loss Bridge.

b. Connect the output of the Bridge to the test oscilloscope Differential Comparator (7A13) inputs. Check that the Red terminator is removed from the Unknown arm of the Bridge and the Green terminator is connected to the Reference arm. See Figure 4–13a. Set the test oscilloscope for differential mode of operation. Check that the Differential Comparator + and –Input Coupling switches are set to AC.

c. Set the generator output frequency to 50 kHz and the amplitude to 500 mV p-p as displayed on the test oscilloscope CRT.

d. Change the generator output frequency to 5 MHz. Connect the Red terminator to the Unknown arm, set the 7A13 for 1 mV/Div, and balance the bridge. See Figure 4–13b.

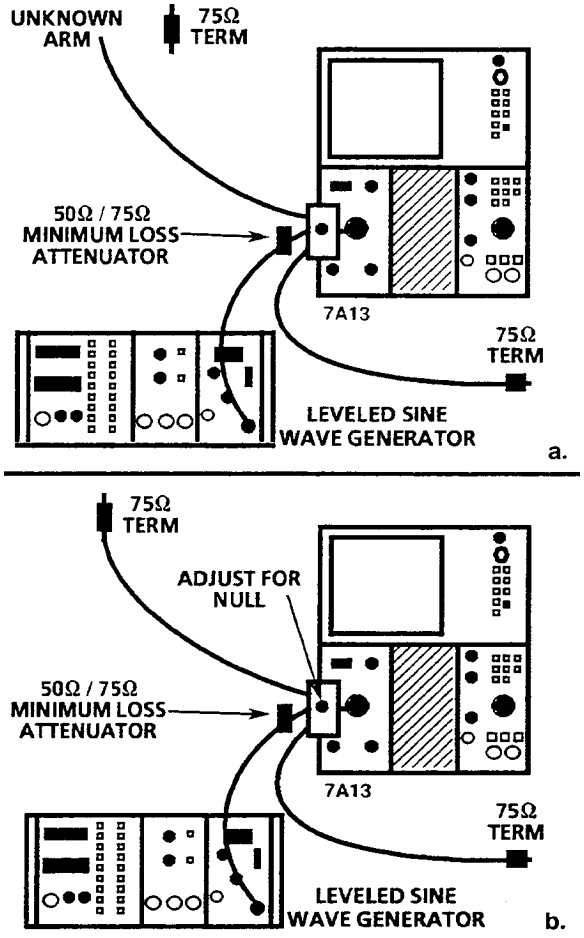


Figure 4–13: Setting up the Return Loss Bridge: a) setup 500 mV amplitude; b) Nulling the bridge

***NOTE**. The Return Loss Bridge must null within 0.5 mV. If the Bridge does not null within this amplitude, the Bridge must be recalibrated before checking the 1780R-Series instrument return loss.*

e. Remove the Red terminator from the Unknown arm. Connect the Unknown arm to the 1780R-Series CH A INPUT. Connect the Red terminator to the opposite side of the CH A INPUT loop-through connector. See Figure 4–14.

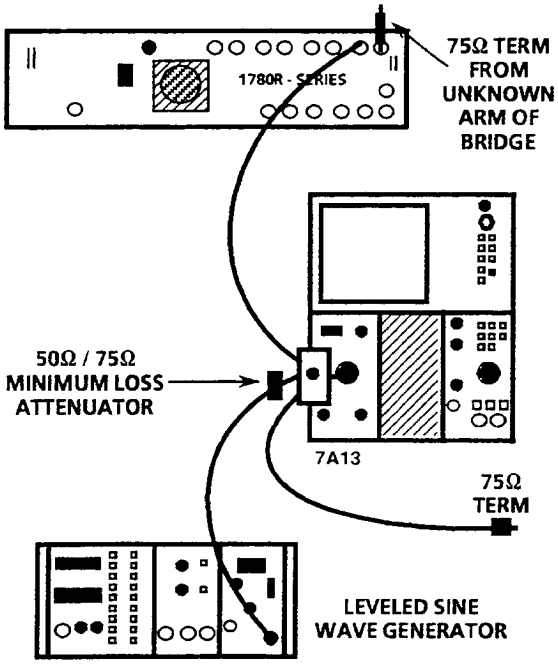


Figure 4–14: Measuring return loss of 1780R-Series CH A INPUT

f. Check that the return loss of the CH A INPUT is better than 40 dB for a frequency range from 50 kHz (reference) to 5 MHz. Make this check, within this frequency range, with instrument power on and off. (40 dB converts to 5 mV on the test oscilloscope CRT display.) Check return loss of CH B1, CH B2, and CH B3 using the same technique as checking the CH A INPUT.

g. Check return loss of the AUX IN, AUX OUT, and PIX MON OUT connectors in that sequence. Do not terminate. Leave the instrument power On. 34 dB converts to 10 mV on the test oscilloscope CRT display.

h. Check return loss of the EXT REF connector with the terminator connected. The instrument can be On or Off. 46 dB converts to 2.5 mV as displayed on the test oscilloscope CRT.

i. Disconnect the Return Loss Bridge from the instrument and the test oscilloscope.

This completes the Performance Check Procedure.

Adjustment Procedures

This section of the 1780R-Series Service Manual consists of an Adjustment Procedure. The *Performance Verification* is used to evaluate operation of the instrument as specified in the Performance Requirements in *Specifications*. The Adjustment Procedure is used to return the instrument to operate within its Performance Requirements.

Prior to attempting recalibration, use the Performance Check Procedure to check the instrument. Special note should be taken of steps where Performance Requirements are not met. Only partial re-adjustment may be required to return the instrument to operate within its Performance Requirements. If any adjustments are made, the Performance Check Procedure should be followed once again to ensure that all Performance Requirements are met.

In this procedure, names of 1780R-Series front- and rear-panel controls and connectors are fully capitalized (e.g., VERT POS). Control and connector names on test equipment and internal 1780R-Series adjustments are initial capitalized (e.g., Time/Div. Geometry, etc.).

Limits, tolerances, and waveforms in this section are guides to adjustments and checks. They are not instrument specifications unless listed in the Performance Requirements column of the *Specifications* in Section 1.

General Information

The 1780R-Series front-panel controls fall into four groups:

1. Display controls, which are located beneath the CRTs and are assigned to their respective CRT by the lighted push-button switch directly below the CRT.
2. Menu selection switches located on left side of the CRT bezel assembly. Where the menus selected by these switches are displayed is also a function of the lighted push-button switches in the Display control group.
3. Precision Measurement switches and control (large knob) on the right side of the CRT bezel assembly.
4. Functional Measurement controls, on the right front panel. Figure 5–1 shows the location of these control groups.

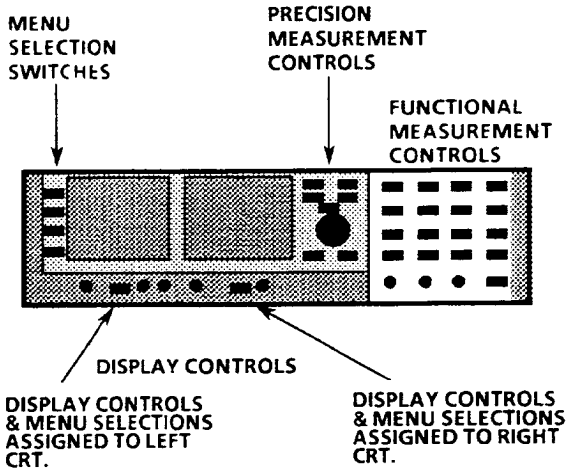
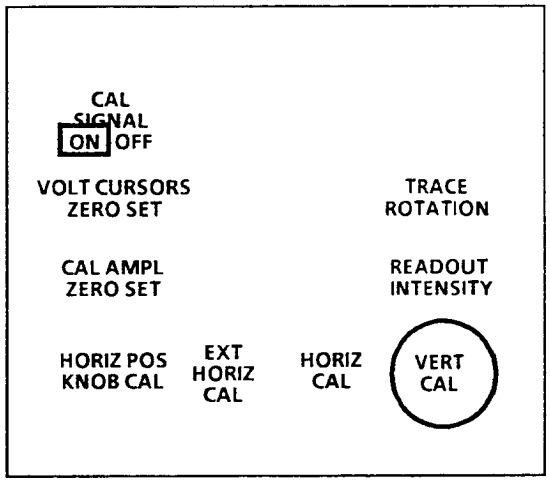


Figure 5–1: Simplified representation of the 1780R-Series Video Measurement Set, showing the location of the four control groups

The Precision Measurement Control is multifunctional. Its function is assigned either by the accompanying switches or through one of the CRT displayed menus. The current function for the control is always denoted on the appropriate CRT by a circle surrounding the related readout. See Figure 5–2 for a sample menu. When touch-screen menus are present, simply touching a readout transfers the Precision Measurement Control to that function.



CALIBRATE button and the button below the Waveform CRT are On. The menu shows that CAL SIGNAL-ON and VERT CAL are selected. The Precision Measurement control is used to set output gain as described in Step 18k.

Figure 5–2: Calibrate menu as displayed on the Vectorscope CRT

The <> switches below the Precision Measurement Control knob duplicate its function, allowing a single increment of change per push.

The instrument is made up of a number of etched circuit boards. Adjustments are present on most of the boards, making it necessary to first find the circuit board and then find the adjustment. This procedure contains a number of small illustrations that can be used to locate the adjustments. In addition, Figure 5–3 shows where in the instrument each of the circuit boards is located.

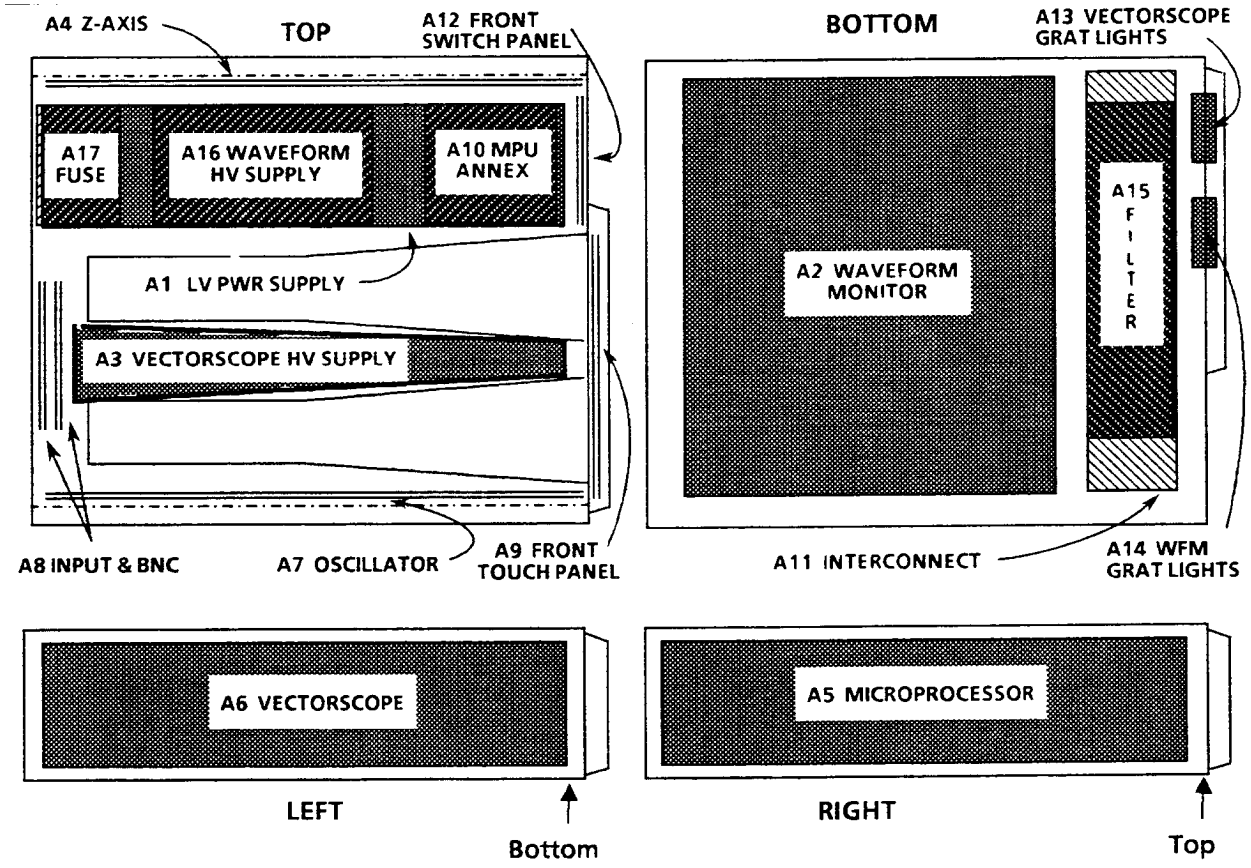


Figure 5–3: 1780R-Series circuit board assembly locations

CAUTION. *Use non-conducting tools to make the adjustments. If troubleshooting is necessary, be sure to read the information given in the Troubleshooting portion of Maintenance. This section includes a procedure for troubleshooting the Power Supply.*

Recommended Equipment List

Table 5–1: Recommended Equipment

Electrical Instrument	Performance Requirements	Example
Electrical Instruments		
1. Test Oscilloscope		
Vertical Amplifier	Differential Comparator with 30 MHz bandwidth and 1 mV sensitivity. Dual-Trace Amplifier with 30 MHz bandwidth and 5 mV sensitivity.	TEKTRONIX 7603 Oscilloscope, a 7B53A Dual Time Base, a 7A13 Differential Comparator, a 7A18A Dual-Trace Amplifier, a 1X probe (Tektronix P6101A), and a 10X probe (Tektronix P6102A).
Time Base	10 ns/div to 5 ms/div sweep speeds; triggering to 5 MHz.	
2. Television Test Signal Generator	Provides color test signals for the television standard that the 1780R-Series will use. Required signals: Color Bars. Linearity Staircase Pulse & Bar, with 2T Pulse, 2T Bar, and Modulated Pulse. Multiburst. Black Burst.	TEKTRONIX NTSC 1410 with Option AA and Option AB (modified SPG2 and TSG7), TSG3, TSG5, and TSG6. TEKTRONIX PAL 1411 with Option AA and Option AB (modified SPG12 and TSG11), TSG13, TSG15, and TSG16. The 1410 and 1411 Option AA are mainframes with modified SPG2 and SPG12 Sync Generators with the added features of: Variable Subcarrier Frequency; (±20 Hz, ±50 Hz for the 1410), (±5 Hz, ±10 Hz for the 1411), Variable Burst amplitude, Variable Sync amplitude, and SCH unlock.
NOTE: *The 1410 Series generators with standard SPG and TSG modules can be used, but this will not allow all checks and adjustments to be made.* *The 1410 and 1411 Option AB are mainframes with modified TSG7 and TSG11 Color Bar Generators that more accurately control output amplitudes of the standard 75% amplitude bars.*		
3. Television Generator	Provides accurate test signals for checking and adjusting 1780R-Series SCH phase and luminance compensation. Required signals: Color Bar. Black Burst. Frame Reference (Field 1 Reference).	TEKTRONIX TSG-170A NTSC Television Generator or TEKTRONIX TSG-271 PAL Television Generator.
4. Voltmeter (DMM)	Range: 0 to 100 VDC; accuracy, ±0.1 %.	TEKTRONIX DM501A used in a TEKTRONIX TM500 Series Power Module.

Table 5–1: Recommended Equipment (Cont.)

Electrical Instrument	Performance Requirements	Example
5. Leveled Sine Wave Generator	Flatness 1%, 250 kHz to 50 MHz. The flatness can be characterized (a chart made of variations) with the TEKTRONIX Peak-to-Peak Detector (015-0408-00).	TEKTRONIX SG503 Leveled Sine Wave Generator installed in a TEKTRONIX TM500 Series Power Module. When using the TEKTRONIX SG503 the following additional accessories are needed: Two 50 Ω coaxial cables, Tektronix Part No. 012-0482-00. A 50-to-75 Ω minimum loss attenuator, Tektronix Part No. 011-0057-00.
6. Digital (Frequency) Counter	Range: 10 kHz to 20 MHz; accuracy, ±0.001%.	TEKTRONIX DC 503A used in a TM500 Series Power Module.
7. Peak-to-Peak Detector Amplifier		Tektronix Part No. 015-0408-00 (includes one 015-0413-00 Peak-to-Peak Detector Head). Installed in a TEKTRONIX TM500 Series Power Module.
8. Detector Head		Two each, Tektronix Part No. 015-0413-00 for use with TEKTRONIX Peak-to-Peak Detector Amplifier (item 7). One Detector Head is supplied with the Peak-to-Peak Detector.
9. Video Amplitude Calibration Fixture (VAC)	Signal; adjustable square wave 0.0 to 999.9 mV p-p with a resolution of 0.1 mV and an accuracy of 0.05%, frequency approximately 270 Hz.	TEKTRONIX 067-0916-00 used in a TEKTRONIX TM500 Series Power Module.
10. Sine Wave Oscillator	Signal: 10 Hz to 100 kHz sine waves; + and – (minus) balanced outputs.	A TEKTRONIX SG505 Option 02 Oscillator installed in a TEKTRONIX TM500 Series Power Module.
11. Function Generator	Signal: 1 kHz, +10 V, square waves for adjusting YRGB compensation.	TEKTRONIX FG501A Function Generator installed in a TEKTRONIX TM500 Series Power Module.
12. Power Module Mainframe (required for Items 4, 5, 6, 7, 9, 10, and 11)	For powering and housing TEKTRONIX DC503A, DM501A, FG501A, SG503, SG505, 067-0916-00, and 015-0408-00.	For example: TEKTRONIX TM506 Power Module Mainframe.
13. Variable Autotransformer		General Radio Metered Autotransformer W10MT3W. If 220 V operation must be checked, a conversion transformer or appropriate 220 V autotransformer is needed.

Table 5–1: Recommended Equipment (Cont.)

Electrical Instrument	Performance Requirements	Example
Auxiliary Equipment		
14. 75 Ω Terminators	Five required, three must be a feed-through type.	Two 75 Ω End-line Terminators (Tektronix Part No. 011-0102-00). Three Precision (0.2%) 75 Ω Feed-through Terminators (Tektronix Part No. 011-0103-02).
15. 75 Ω Coaxial Cables	Three 42 inch cables, with BNC connectors are required.	RG 59U (Tektronix Part No. 012-0159-00)
16. Dual Input Coupler	Matched BNC cable-T for matching input gains. Length of arms matched to within ±0.1 in.	Tektronix Part No. 067-0525-02.
17. 75 Ω 10X Attenuator		Tektronix Part No. 011-0061-00.
18. X Y Input Connector	Fifteen-pin, subminiature D-type connector modified to input the audio signal for X Y checks and adjustments. See Figure 5–4.	Tektronix Part No. 131-0459-00.
19. Board Extender Bracket	Bracket includes cable extenders to allow access to the Oscillator circuit board (A7) adjustments.	Tektronix Part No. 016-1011-00.
20. 20 pF Input Normalizer		Tektronix Part No. 067-0538-00.
21. BNC T Connector		Tektronix Part No. 103-0030-00.
22. BNC Elbow Connector		Tektronix Part No. 103-0031-00.
23. Alligator Clip to BNC Adapter	Female BNC connector to Alligator clip leads. Used with Parade Display Test Connector. (See item 24.)	Tektronix Part No. 013-0076-00.
24. Parade Display Test Connector	Remote connector modified to enable and test the RGB parade input. See Figure 5–5.	

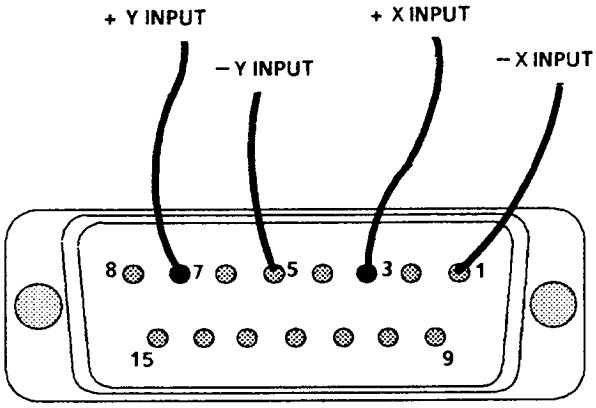


Figure 5–4: Rear view of the X Y plug connections. (Pins 2, 4, 6, 10, 12, and 14 can be used to make ground connections.)

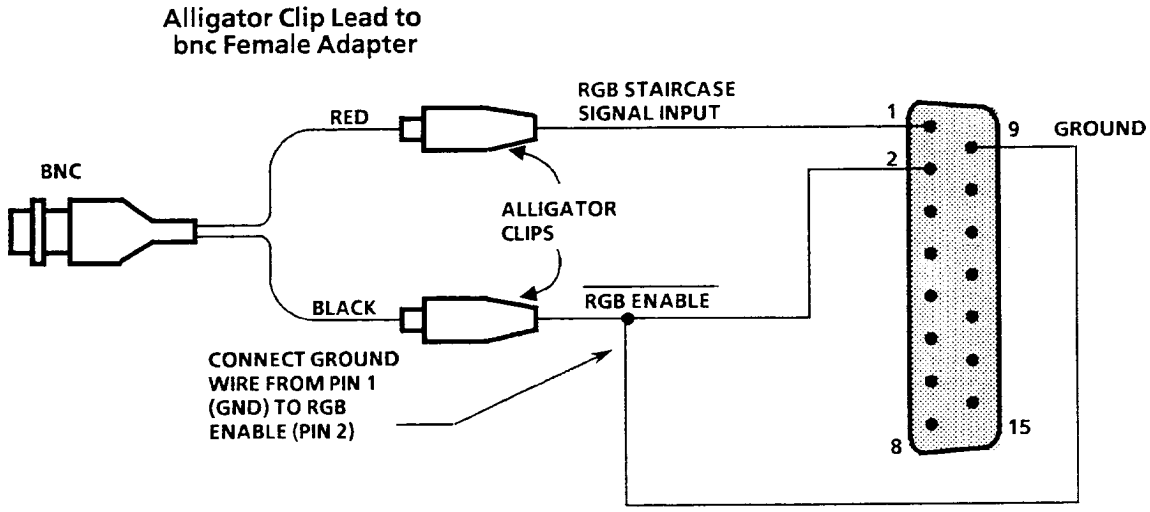


Figure 5–5: RGB Parade Display Test Connector

Adjustment List

Table 5–2 lists all of the adjustments by step number sequence. This table can be used as a short form adjustment procedure for those who are familiar with the adjustment procedure for the 1780R-Series.

Table 5–2: 1780R-Series Adjustments for Calibration Procedure

Step #	Adjustment Name	A #	Circuit Number	Diag #
2	+5 V Adj	A1	R219	43
2	Ripple Null	A16	R135	42
3	Set Software Options (not required unless calibration data becomes lost or invalid)	N/A	N/A	N/A
4	(WFM) CRT Bias	A16	R420	42
5	(WFM) Astigmatism	A16	R122	42
5	(WFM) Focus	A16	R130	42
6	(Vector) CRT Bias	A3	R373	41
7	(Vector) Focus	A3	R182	41
7	(Vector) Astigmatism	A3	R200	41
8	DAC Gain	A2	R231	12
8	H Shape	A5	R536	20
8	V Shape	A5	R555	20
9	(WFM) Geometry	A16	R112	42
9	(WFM) Orthogonality	A2	R536	6
10, 33	WFM Readout H Gain	A2	R167	11
10, 33	WFM Readout H Center	A2	R170	11
10	Vert Readout Size	A2	R215	6
10, 18	Vert Readout Pos	A2	R309	6
11	(Vector) Geometry	A3	R101	41
11	(Vector) Orthogonality	A6	R511	30
12	Readout Horiz Pos	A6	R523	30
12	Readout Vert Pos	A6	R620	30
12	Readout Vert Gain	A6	R833	30
12	Readout Horiz Gain	A6	R836	30
13	Pix Vert Gain	A6	R404	29
13	Pix Vert Pos	A6	R407	29
13	Pix Horiz Gain	A6	R604	29
13	Pix Horiz Pos	A6	R606	29

Table 5–2: 1780R-Series Adjustments for Calibration Procedure (Cont.)

Step #	Adjustment Name	A #	Circuit Number	Diag #
14	Cal Gain	A2	R1137	5
15	(Diff Amp Accuracy) LF CMR	A2	R1033	5
16	Gain B1	A8	R347	1
17	Gain B3	A8	R394	2
17	Gain B2	A8	R370	2
17	Gain A	A8	R323	1
18	Var Gain Regis	A2	R510	6
18	X5 Gain Regis	A2	R526	6
19	X5 Gain	A2	R422	6
19	Var Gain Centering	A2	R514	6
19	LP Filter Gain	A2	R754	5
20	Cursor Gain	A2	R1017	5
21	X1 Flat Resp	A2	C418, R418	6
21, 22	X5 Flat Resp	A2	C422, R421	6
21	Output HF Resp Comp	A2	C527, R534	6
21	Gain Cell Freq Resp	A2	C611, R612	6
21	Limiter	A2	R628	6
23–26	B3 CMR	A2	C1131	4
23–25	B2 CMR	A2	C1232	4
23, 24	B1 CMR	A2	C1329	4
23	B3 CMR	A2	R1135	4
23	B2 CMR	A2	R1221	4
23	B1 CMR	A2	R1333	4
27	Lum Trans Resp	A2	L947, L951	5
28	Lum Offset	A2	R743	5
28	Lum Gain	A2	R747	5
29	LP Trans Resp	A2	R1050	5
30	BP 1	A2	C831	5
30	BP 2	A2	C930	5
30–31	Chroma Gain	A2	R828	5
31	Chroma Off set	A2	R732	5
32	X25 Mag	A2	R471	11
32	X50 Mag	A2	R474	11
32	X100 Mag	A2	R476	11

Table 5–2: 1780R-Series Adjustments for Calibration Procedure (Cont.)

Step #	Adjustment Name	A #	Circuit Number	Diag #
33	H Mag Reg	A2	R344	11
34	Slow Sweep Trig Level	A2	R761	13
35	Burst Lock Center Freq	A7	C182	31
35	+Delta F Center Freq	A7	C252	32
35	Output Center Freq	A7	C452	32
35	DC Balance	A7	R286	31
36	100% Phase	A6	C570	25
36	Quad Phase	A6	C850	28
36	Vert R–Y Gain	A6	R227	28
36	Test Circle Ampl	A6	R286	25
36	100% Gain Set	A6	R56 8	25
36	Chrom Gain Range	A6	R572	25
36	Horiz B–Y Gain	A6	R643	28
36	SCH Gain	A6	R667	27
37	DP Zero	A6	C172	26
37	DG Offset	A6	R167	26
37	Demod Offset	A7	R314	34
37	DAC Offset	A7	R315	34
37	DAC Gain	A7	R322	34
37	Demod Offset	A6	R369	26
37	Demod Gain	A6	R370	26
38	VCO Adj	A2	C1072	8
38	VCO Adj	A2	C1194	15
38	Coarse SCH Adj	A2	J986	15
38	Ref SCH Adj	A2	R1263	8
38	Fine SCH Adj	A2	R1281	15
38	SCH Offset	A2	R1455	15
39	10 MHz Ref	A4	C109	37
39	Cursor Clock Centering	A4	L115	37
39	Analog Delay	A4	R110	37
40	Lum Comp	A6	C153	30
41	X Gain	A6	R113	29
41	Y Gain	A6	R308	29
42	RGB/YRGB Staircase Comp	A5	C195	19

Table 5–2: 1780R-Series Adjustments for Calibration Procedure (Cont.)

Step #	Adjustment Name	A #	Circuit Number	Diag #
42	RGB/YRGB Staircase Offset	A5	R194	19
43	(WFM) Line Select Focus	A16	R350	42
43	(Vector) Line Select Focus	A3	R384	41
44	Probe Comp	A6	C493	3
45	(Probe) Calibrator Amplitude	A6	R795	3
46	Probe Gain	A2	R1107	3
46	(Probe) 10X Gain	A6	R295	3
47	Probe Resp	A2	C1222	3
47	X10 Probe Resp	A6	C394	3
——	Pix Monitor Contrast	A4	R380*	36
——	Current Limit Adj	A1	R466**	43
——	Touch Panel Sensitivity	A9	R292**	24

***** **Leave these adjustments centered.**

****** **See *Maintenance* section.**

Procedure

This Adjustment Procedure is a continuous sequential procedure. If a step is performed out of sequence, pertinent control settings are given within the step. Remaining control settings can be determined by referring to Table 5–3; however, sometimes it may be necessary to go back one or more steps to check for possible changes.

Table 5–3: 1780R-Series Initial Control Settings

Front-Panel Control	Setting	CONFIGURE Menu Selection*	Setting
POWER	ON	SYNC	DIR
LEFT DISPLAY	VECT	COUPLING	DC
RIGHT DISPLAY	WFM	FIELD TRIG	F1
INPUT	CH A	PAL/+V (for PAL only)	PAL
REF	EXT	FIXED CAL AMPL	1000 (mV)
FILTER	FLAT	CLAMP	BP
WFM HORIZONTAL	TWO–LINE	DC RESTORER	OFF
VECTOR GAIN	Off	SYSTEM (for PAL only)**	as desired
WAVEFORM GAIN	Off	VECT GRAT	INT
MAGNIFIER	OFF	PHASE DISPLAY	360
VAR/SLOW	Off	BARS	75%
Buttons below CRT	as desired	SETUP (for NTSC only)	YES
SCALE	as desired	WFM GRAT	INT
FOCUS	as desired	PROBE	X1
INTENSITY	as desired	ABS UNITS (for NTSC only)	mV
VERT POS	as desired	CW SYNC	EXT
HORIZ POS	as desired	SLOW SWP TRIG	+
Precision Measurement	Off	BAUD RATE	as desired
Menu Selection Switches	Off	KNOB ASSIGN TIMEOUT	OFF
		VECT READOUT	ON
		WFM READOUT	ON
		BEEP	ON

*** Applies to VERSION 1.11 instruments (VERSION is displayed on page 3 of the CONFIGURE menu.)**

**** SYSTEM (for PAL only): Select B/G or 1, whichever applies to your PAL system.**

1. Equipment Connections

a. Connect the television test signal generator Color Bar signal, through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT connector. See Figure 5–6.

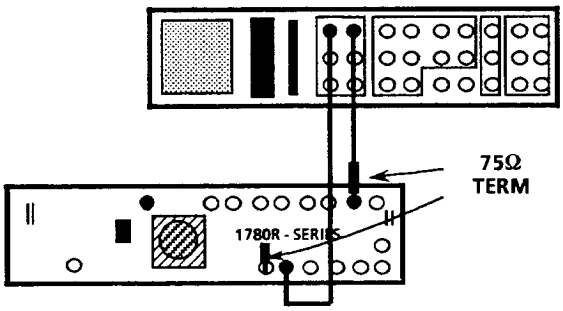


Figure 5–6: Initial signal connections for re-adjustment of the 1780R-Series

b. Connect the television test signal generator Black Burst signal to the 1780R-Series EXT REF. Terminate the remaining side of the loop-through connector with a 75 Ω terminator.

NOTE. *Leave the Black Burst signal connected to the EXT REF connector throughout the entire Calibration Procedure except when stated otherwise. Leave Color Bar signal connected to CH A INPUT for Steps 1 through 12.*

Leave the internal jumpers in their factory-set positions unless directed otherwise in this Adjustment Procedure. The factory-set jumper positions are listed in Section 2, Installation Electrical.

Once the instrument is powered up, allow at least 20 minutes of warm-up time before continuing.

---

c. Connect the power cord to the designated mains voltage. See rear panel LINE VOLTAGE switch setting. Set the POWER switch to ON.

d. Press the CONFIGURE button to On. Set the front-panel controls and Configure menu selection to the initial settings given in Table 5–3. Press the CONFIGURE button to exit the menu.

e. Use the buttons and controls below each CRT to center the displays and set their intensity for best viewing. Press the PHASE SHIFT button to On. Use the Precision Measurement control to place the burst vector dot on the 180° reference line for NTSC (for PAL, position the burst vector dots to their reference marks on the graticule).

f. Set the PHASE SHIFT button to Off, the CALIBRATE button to On, and the button below the Vectorscope CRT to On.

g. Use the Precision Measurement control to adjust for desired Vectorscope CRT readout intensity.

h. Press the button below the Waveform CRT to On.

i. Turn the Precision Measurement control to obtain the desired Waveform CRT readout intensity.

j. Press the CALIBRATE button to exit the menu.

2. Adjust Power Supplies

a. Connect the DM501A common lead to chassis ground and measurement lead to the test points in Table 5–4. Adjust and/or check for the listed voltages. (The circuit boards are as follows: A1 is the LV Power Supply; A16 is the Waveform HV Supply. See Fig. 5–7.)

Table 5–4: Low Voltage Power Supply Tolerance

Supply	Test Point	Adjust	Tolerance
+5 V	A16TP402	A1R219* (+5 V Adj.)	+4.7 to +5.3 V
–15 V	A16TP501	Check for	–14.5 to –15.5 V
+15 V	A16TP401	Check for	+14.5 to +15.5 V

*** A1R219 is accessible through the opening for the ribbon cable that connects to J200 on the Waveform HV Supply board.**

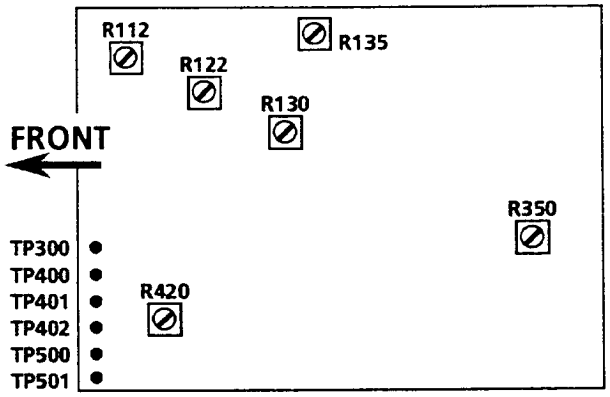


Figure 5–7: Adjustment and test point locations on the Waveform HV Supply circuit board (Assembly 16.)

NOTE*. The +5 V supply is the reference supply for the instrument. If it is adjusted, the entire instrument will need to be recalibrated. Do not adjust the +5 V supply if it is within listed tolerance.*

The +5 V supply affects both the + and –15 V supplies. The +5 V supply can be set anywhere within its tolerance to ensure that the other supplies are within specification.

b. Disconnect the DMM (DM501A) leads from the instrument.

c. Select WFM HORIZONTAL-TWO-LINE on the 1780R-Series right front panel.

d. Adjust Ripple Null (A16R135) for minimum Z-Axis intensity modulation of the color bar display on the Waveform CRT.

3. Set Software Options (see Note)

NOTE*. This step is not required unless calibration data becomes lost or invalid. Some examples of this are: Non-volatile memory is reset, or the MPU board is replaced.*

a. Enter the CONFIGURE menu and go to page 3 of the menu.

b. Touch <VERSION> on the screen, then immediately press the front-panel REFERENCE SET button. The menu screen now provides two settings: HORIZ POS POT and TC ON VC IN LS (Time Cursors on Voltage Cursors in Line Select).

c. Select the menu settings that are appropriate for the instrument:

<HORIZ POS POT>

Select <CONTINUOUS>. This indicates that the instrument has a continuous Horizontal Position control (dual wiper potentiometer).

<TC ON VC IN LS>

Select <ENABLE>. Timing cursor dots are placed on the Voltage Cursors when in Line Select for ease in viewing. Voltage Cursors are automatically enabled when entering Line Select.

4. Adjust Waveform CRT Intensity

a. Set the 1780R-Series INPUT selection to CH B1 for no signal input. Select WFM HORIZONTAL-TWO-LINE mode. Check that the button below the Waveform CRT is On.

b. Set the trace to the center of the right CRT using the 1780R-Series VERT POS control.

c. Rotate the SCALE and INTENSITY controls fully counterclockwise (“beep” sound).

d. Adjust CRT Bias (A16R420) until the waveform trace just disappears. (A16 is the Waveform High Voltage supply circuit board. See Figure 5–7.)

e. Set the front-panel SCALE and INTENSITY controls for normal intensity.

5. Adjust Waveform CRT Internal Astigmatism and Focus

a. Set the 1780R-Series INPUT selection to CH A. Check that the button below the Waveform CRT is On.

b. Set the 1780R-Series front-panel FOCUS control to midrange between “beeps.”

c. Adjust Focus (A16R130) and Astigmatism (A16R122) for well-defined color bar display.

6. Adjust Vector Intensity

a. Press the button below the Vectorscope CRT.

b. Rotate the 1780R-Series SCALE and INTENSITY controls fully counterclockwise (“beep” sound).

c. Adjust CRT Bias (A3R373) until the vector dot just disappears. (A3 is the Vectorscope High Voltage Supply board. See Figure 5–8.)

d. Set the 1780R-Series front-panel SCALE and INTENSITY controls for normal brightness.

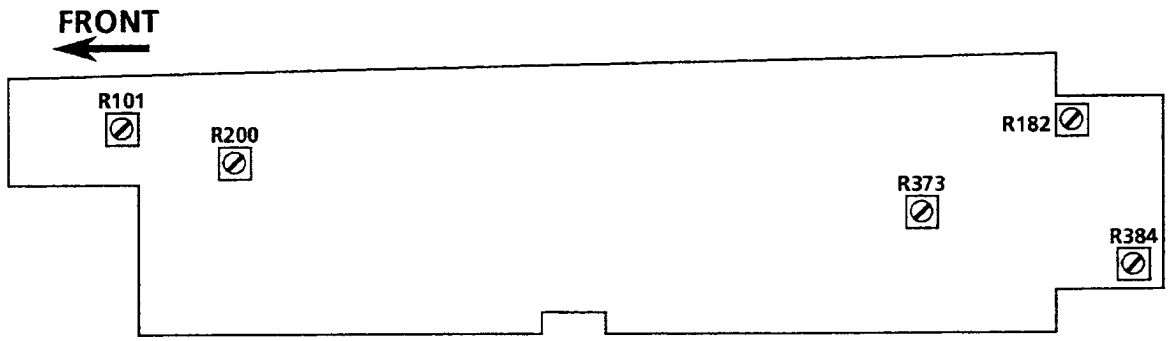


Figure 5–8: Adjustment locations on the Vectorscope HV Supply circuit board (Assembly A3)

7. Adjust Vector Astigmatism and Focus

a. Set the front-panel FOCUS control to midrange between “beeps.”

b. Adjust Focus (A3R182) and Astigmatism (A3R200) for a well-defined vector display. See Figure 5–8.

8. Adjust Readout Character Symmetry and DAC Gain

a. Set the 1780R-Series INPUT selection to CH B1 for no-signal input.

b. Press the CONFIGURE button to On. Select COUPLING-GND on PAGE 1 of the menu displayed on the Vectorscope CRT.

c. Adjust Horiz Shape (A5R536) and Vert Shape (A5R555) for best readout character symmetry as displayed on the Vectorscope CRT. (A5 is the Microprocessor circuit board. See Figure 5–9.)

d. Press the button below the Waveform CRT.

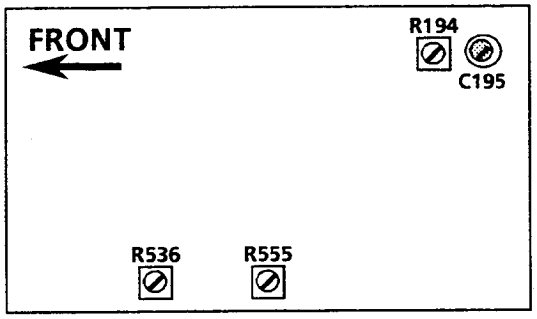


Figure 5–9: Adjustment locations on the Microprocessor circuit board (Assembly A5)

e. Press the CALIBRATE button. Select VOLTAGE CURSORS ZERO SET on the Vectorscope CRT menu.

f. Use the VERT POS control to center the nulled cursors on the Waveform CRT. If the cursors are not overlayed, use the Precision Measurement control to null the cursors so they appear as one trace.

g. Press the REFERENCE SET button. Check that the ΔV readout is 0 mV on the Waveform CRT.

h. Select CAL AMPL ZERO SET on the Vectorscope CRT.

i. Use the VERT POS control to position the (overlayed) traces to the center of the Waveform CRT. If the traces are not overlayed, use the Precision Measurement control to overlay the traces.

j. Press the REFERENCE SET button. Check that the readout on the Waveform CRT indicates CAL 0 mV.

k. Press the CALIBRATE button to exit the menu.

l. Select the RIGHT DISPLAY–WFM+CAL mode. Select VAR on the Waveform CRT menu. Check that ABS is selected on the Waveform CRT.

m. Turn the Precision Measurement control so the CAL readout is 1000 mV.

n. Select FIX on the Waveform CRT menu.

o. Connect the DMM (DM501A) to A2U810: Connect the DMM Volts test lead to pin 7 and the common (Low) test lead to pin 1.

p. Adjust DAC Gain (A2R231) for a 2.00 V, ±1%, readout on the DMM. (A2 is the Waveform board. See Figure 5–10.)

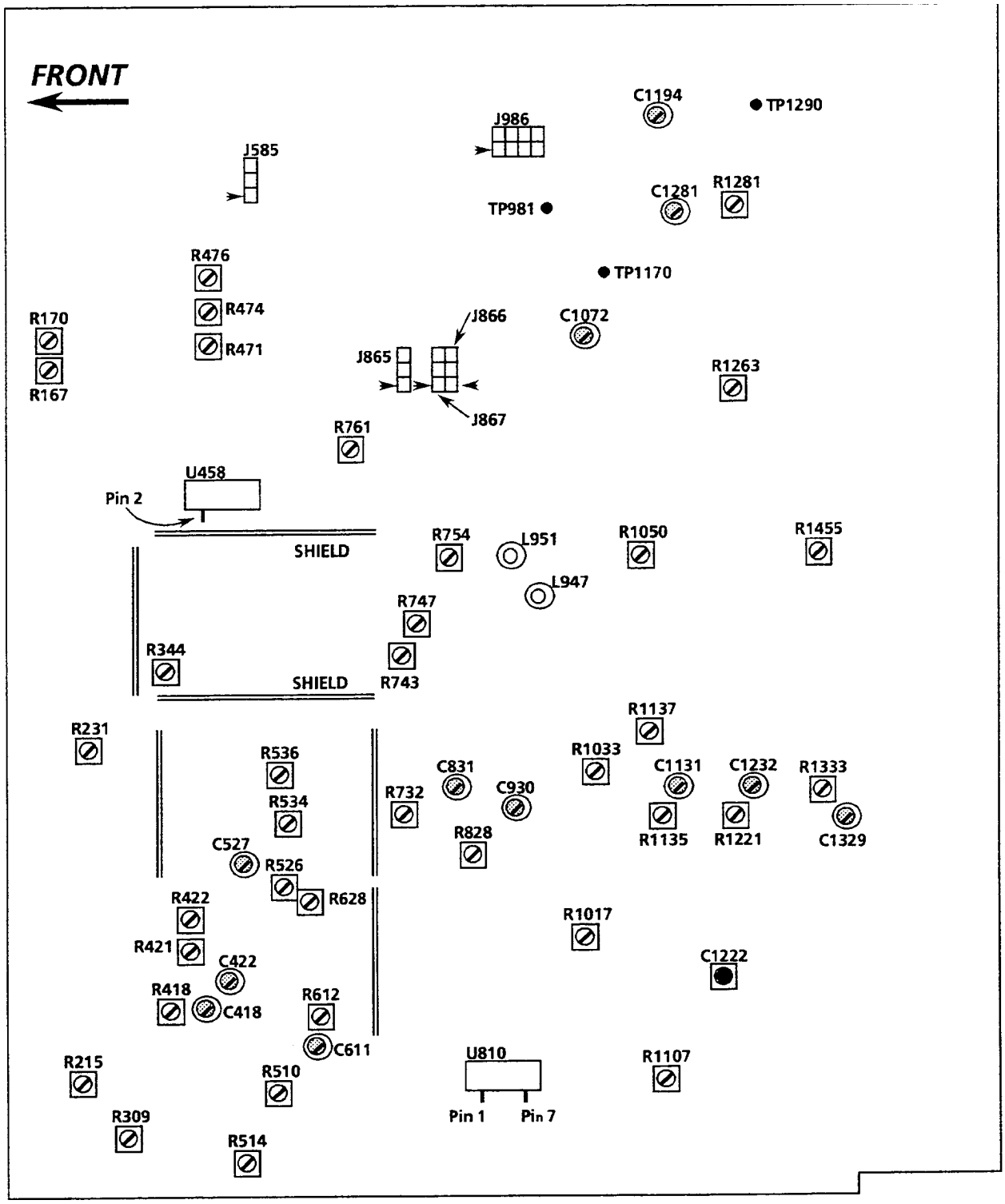


Figure 5–10: Waveform circuit board (Assembly A2) adjustment, test point, and jumper locations.

q. Select RIGHT DISPLAY-WFM mode. Press the CONFIGURE button to On and select COUPLING-DC on PAGE 1. Press the CONFIGURE button to exit the menu.

r. Disconnect the DMM test leads from A2U810.

NOTE*. Leave the 1780R-Series INPUT selection set to CH B1 so that no input signal is displayed when performing Steps 8 through 11.*

9. Adjust Waveform CRT Trace Rotation, Orthogonality, and Geometry

a. Push the 1780R-Series CALIBRATE button.

b. Check that the button under the Waveform CRT is On.

c. Touch the TRACE ROTATION pad on the left hand (Vectorscope) CRT. Be sure that the circle surrounds the words TRACE ROTATION.

d. Adjust the Precision Measurement control to align the horizontal lines of the electronic graticule with the Waveform CRT graticule.

e. Adjust WFM Orthogonality (A2R536) so that the vertical lines of the electronic graticule are perpendicular to the Waveform CRT graticule horizontal lines.

f. Adjust WFM Geometry (A16R112) for straight electronic graticule lines on the Waveform CRT. See Figure 5–7.

10. Align Waveform Electronic Graticule

a. Check that the button below the Waveform CRT is On. Check that the CALIBRATE button is On and TRACE ROTATION is selected on the Vectorscope CRT.

b. Adjust Vertical Readout Pos (A2R309) and Vertical Readout Size (A2R215) so that the bottom and top horizontal electronic graticule lines are aligned with the –40 and 100 IRE graticule lines (0 and 1.0 volt lines for PAL), respectively. Align the + marks of the Waveform CRT electronic graticule with the 0 IRE (0.3 for PAL) graticule baseline. Readjust, as necessary, to obtain the correct alignment.

c. Adjust WFM Readout H Center (A2R170) and WFM Readout H Gain (A2R167) so the left-hand + mark of the electronic graticule aligns with the first major division mark on the graticule baseline. Align the right-hand + mark of the electronic graticule with the 11th major division graticule mark on the baseline. (Figure 4–7 in *Performance Verification* identifies the major division marks on the Waveform CRT graticule baseline.)

11. Adjust Vector CRT Trace Rotation, Orthogonality, and Geometry

a. Press the button under the Vectorscope CRT to On.

b. Touch the TRACE ROTATION pad on the Waveform CRT. Be sure that the circle surrounds the words TRACE ROTATION.

c. Turn the Precision Measurement Control to align the horizontal lines of the electronic graticule parallel with the Vectorscope CRT graticule.

d. Adjust Vector Orthogonality (A6R511) so that the vertical lines of the electronic graticule are perpendicular to the horizontal lines. (A6 is the Vectorscope board.) See Figure 5–11.

e. Adjust Vector Geometry (A3R101) for straight electronic graticule lines on the Vectorscope CRT. (A3 is the Vectorscope HV Supply board. See Figure 5–8.)

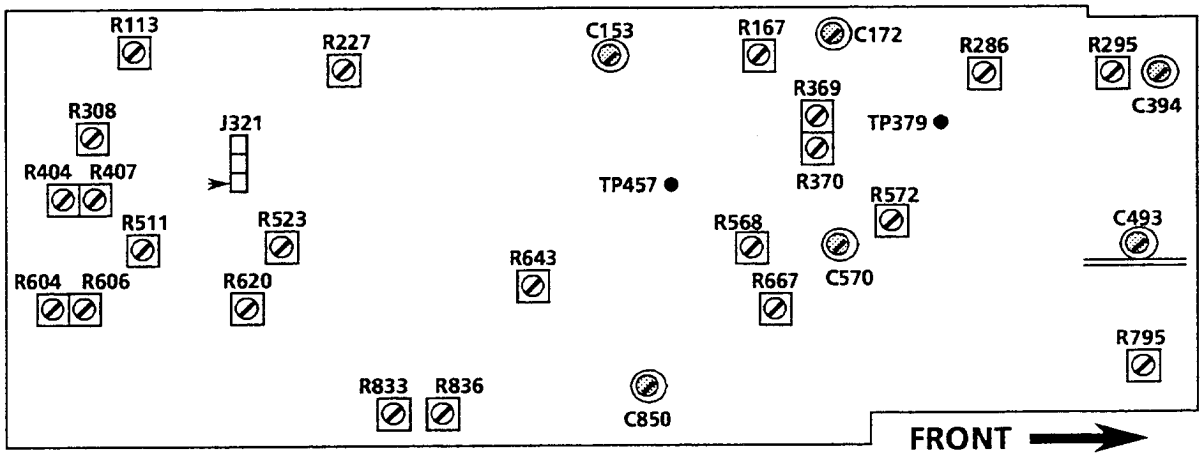


Figure 5–11: Adjustment locations on the Vectorscope circuit board (Assembly A6)

12. Align Vector Electronic Graticule

a. Check that the button below the Vectorscope CRT is On. Check that the CALIBRATE button is On.

b. Adjust Readout Horiz Pos (A6R523) and Readout Vert Pos (A6R620) so that the center of the electronic graticule coincides with the exact center of the Vectorscope CRT graticule. (A6 is the Vectorscope board. See Figure 5–11.)

c. Adjust Readout Horiz Gain (A6R836) and Vert Readout Gain (A6R833) so that the outer vertical and horizontal lines of the electronic graticule coincide with the compass rose (Vectorscope CRT graticule circle).

d. Press the CALIBRATE button to exit the menu.

13. Adjust Picture Monitor

a. Set 1780R-Series INPUT selection to CH A.

b. Select the LEFT DISPLAY-PIX mode.

c. Adjust Pix Vert Position (A6R407), Pix Vert Gain (A6R404), Pix Horiz Gain (A6R604), and Pix Horiz Pos (A6R606) for a slightly under-scanned picture monitor display. (There should be a narrow black border about 1/16-inch to 1/8-inch or 1.5 mm to 3 mm at the edges of the display.)

d. Select the LEFT DISPLAY-VECT mode.

e. Disconnect the Color Bar signal from the CH A INPUT connector.

14. Adjust Calibrator Amplitude

a. Check that no signal is applied to the 1780R-Series CH A INPUT. Check that Black Burst is applied to the EXT REF.

b. Connect the output of the Video Amplitude Calibrator (VAC) to the +Input of the test oscilloscope Differential Comparator.

c. Connect a 75 Ω coaxial cable to the 1780R-Series AUX OUT. Connect the other end of the cable, through a precision (0.2%) 75 Ω feed-through termination, to the –Input of the test oscilloscope Differential Comparator. See Fig. 5–12.

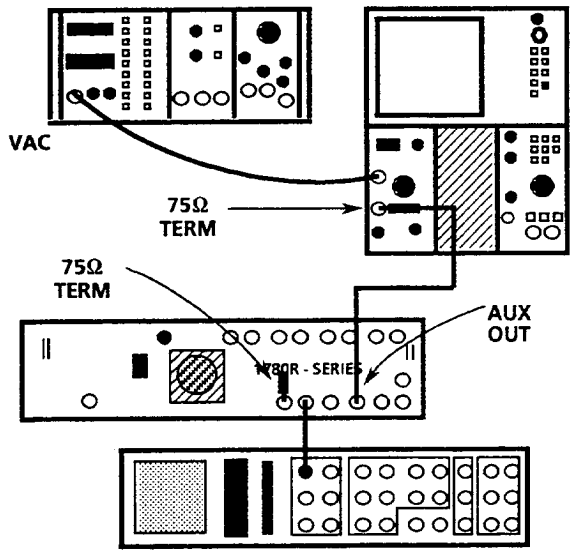


Figure 5–12: Connections for adjusting the calibrator amplitude

d. Set the VAC for a 999.9 mV output amplitude. Check that the +Lum button is pressed in and the Lum/Sync button is out. Check that the correct television standard (NTSC, PAL, or PAL-M) is selected.

NOTE. *Leave VAC +Lum and Lum/Sync buttons and television standard set as described in part d of Step 13 whenever the VAC is used in this Adjustment Procedure.*

e. Select the RIGHT DISPLAY–WFM+CAL mode. Change FIX to VAR on the Waveform CRT menu. Check that ABS is selected on the Waveform CRT. Rotate the Precision Measurement control to obtain this readout: CAL 1000 mV.

f. Set the test oscilloscope Differential Comparator to A-B (null) the two signal amplitudes. Use DC coupling for both inputs, 0.1 V/Div vertical deflection factor, and 5 ms/Div sweep rate.

g. Adjust Cal Gain (A2R1137) to null the signals displayed on the test oscilloscope.

h. Change VAR to FIX on the Waveform CRT menu. Select the RIGHT DISPLAY-WFM mode.

i. Disconnect the VAC; disconnect the test oscilloscope from the AUX OUT connector.

15. Adjust Low Frequency Common Mode Rejection (Differential Amplifier Accuracy)

a. Connect the television test signal generator Color Bar signal to the 1780R-Series CH B1 INPUT and terminate the remaining side of the input connector with a 75 Ω termination. Check that a Black Burst signal is applied to the 1780R-Series EXT REF connector.

b. Select CH B1 INPUT and set the WAVEFORM GAIN-X5 to On. Check that the RIGHT DISPLAY-WFM mode is selected.

c. Press the button below the Waveform CRT to On.

d. Use the VERT POS control to position the back porch of the waveform to the graticule baseline (0 IRE for NTSC; 0.3 V for PAL).

e. Push the CONFIGURE button to enter the menu.

f. Select PAGE 3 of the Configure menu. Touch the VERSION pad on the Vectorscope CRT. Quickly select the A-B1 INPUT on the right front panel. This turns on the B1-B1 function. (The CH B1 selection will

remain lit but not the A-B1 selection.) The display should become a nearly flat trace and the left CRT should display the messages:

"COMMON MODE B1"

"TOUCH HERE TO EXIT"

g. If these messages are not displayed, repeat part f. of this step. Move quickly from touching the screen to selecting the A-B1 INPUT; otherwise, the messages may not appear.

h. Adjust LF CMR (A2R1033) for minimum amplitude.

i. Touch the message “TOUCH HERE TO EXIT.” Press the CONFIGURE button to exit the menu. Set the WAVEFORM GAIN-X5 to Off.

j. Disconnect the Color Bar signal and terminator from the CH B1 INPUT connectors.

16. Adjust CH B1 Input Gain

a. Connect the VAC output to one side of the 1780R-Series CH B1 INPUT. Do not terminate. Check that a Black Burst signal is applied to the EXT REF Connector.

b. Check that the VAC is set for 999.9 mV output amplitude. Check that the +Lum button is pressed in and the Lum/Sync button is out. Check that the correct television standard (NTSC, PAL, or PAL-M) is selected.

c. Check that CH B1 INPUT is selected.

d. Select 1780R-Series RIGHT DISPLAY–WFM+CAL mode. Press the CONFIGURE button to On. Check that COUPLING-DC and DC RESTORER-OFF are selected.

e. Position the meeting point of the upper and lower (stacked) calibrator signals to the graticule baseline (0 IRE for NTSC; 0.3 V for PAL) on the Waveform CRT.

f. Set the WAVEFORM GAIN-X5 to On.

g. Adjust Gain B1 (A8R347) so that the bottom trace of the upper level calibrator signal overlays the top trace of the lower level calibrator signal as displayed on the Waveform CRT. (A8 is the Input & BNC board. See Figure 5–13.)

h. Select the RIGHT DISPLAY-WFM mode and set the CONFIGURE button to Off.

i. Leave the DC RESTORER set to OFF.

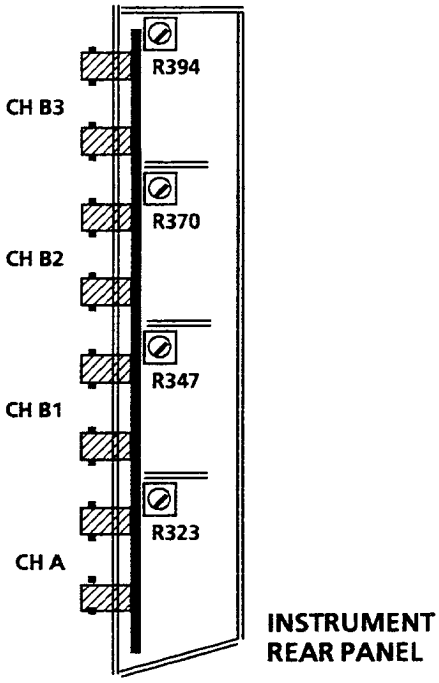


Figure 5–13: Input & BNC circuit board (A8) adjustments, shown as they would appear with the instrument on its left side

17. Match Input Gains

- **a.** Connect the VAC output cable to a dual input coupler.
- **b.** Connect one side of the coupler to the CH B1 INPUT and the other side to the CH A INPUT of the 1780R-Series instrument. Check that the Black Burst signal is applied to the EXT REF connector. See Figure 5–14.
- **c.** Select A-B1 INPUT.
- **d.** Check that the VAC is set to 999.9 mV.
- **e.** Check that the WAVEFORM GAIN-X5 is On.
- **f.** Adjust Gain A (A8R323) for a null display.
- **g.** Move the side of the dual input coupler from the 1780R-Series CH A INPUT to the CH B2 INPUT.
- **h.** Select 1780R-Series B1B2 INPUT.
- **i.** Adjust Gain B2 (A8R370) for a null display.

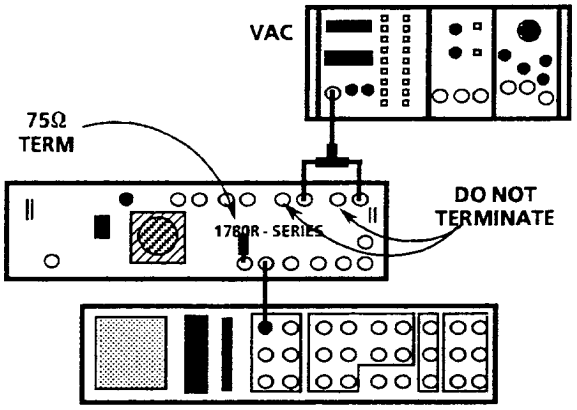


Figure 5–14: Test equipment connections for matching CH A and CH B1 input gains.

j. Move the side of the dual input coupler from the 1780R-Series CH B2 INPUT to the CH B3 INPUT.

k. Select 1780R-Series B1-B3 INPUT.

l. Adjust Gain B3 (A8R394) for minimum amplitude or null display.

m. Select INPUT-CH A and set the WAVEFORM GAIN-X5 to Off.

n. Disconnect the dual input coupler and the VAC signal from the CH A INPUT.

18. Adjust Waveform Variable Gain Registration

a. Connect the television test signal generator Color Bar signal through a 75 Ω feed-through terminator to the 1780R-Series CH A INPUT. Check that the Black Burst signal is connected to the EXT REF input.

b. Press the CONFIGURE button to On. Select DC-RESTORER-SLOW and COUPLING-AC. Set the CONFIGURE button to Off. Select INPUT-CH A and WFM HORIZONTAL-ONE-LINE.

c. Set the WAVEFORM GAIN to VAR.

d. Use the 1780R-Series VERT POS control to position the back porch to the graticule baseline (0 IRE for NTSC; 0.3 V for PAL).

e. Adjust Var Gain Regis (A2R510) for no backporch or blanking level DC position movement while the variable WAVEFORM GAIN control is rotated full range. Once that no movement is achieved, turn the VERT POS control to reposition the back porch to the graticule baseline.

***NOTE**. To eliminate generator signal DC level error, if present, when performing parts e. through h. of this step, select COUPLING-GND on PAGE 1 of the Configure menu. Use the VERT POS control to position the trace to the Waveform CRT graticule baseline. Perform parts e. through h. and j. through m.*

f. Set the WAVEFORM GAIN-X5 to On.

g. Use the VERT POS control to position the backporch to the graticule baseline.

h. Adjust X5 Gain Regis (A2R526) for minimum back porch or blanking level DC shift between the X5-On and X5-Off WAVEFORM GAIN selections. This is accomplished by using the VERT POS control to move the blanking level to the graticule baseline in the X5-On mode. Then go to X5-Off and adjust A2R526 so that the blanking level is repositioned back to the graticule baseline. Alternate WAVEFORM GAIN between X5-Off and X5-On and repeat the procedure until the movement is minimum.

i. Press the CONFIGURE button and select COUPLING-GND for no signal input.

j. Check that the button below the Waveform CRT is On. Press the CALIBRATE button and select TRACE ROTATION on the Vectorscope CRT.

k. Readjust Vertical Readout Pos (A2R309) to position the + marks of the Waveform CRT electronic graticule with the 0 IRE (0.3 for PAL) graticule baseline.

l. Press the CALIBRATE button to exit the menu. (Leave COUPLING-GND selected on the Configure menu.)

m. Disconnect the Color Bar signal from the CH A INPUT.

19. Adjust Output Gain

a. Reconnect the VAC output to one of the 1780R-Series CH A INPUT connectors. Check that the Black Burst signal is applied to the EXT REF connector.

b. Press the CONFIGURE button and select DC RESTORER-OFF. Check that COUPLING-GND is selected.

c. Select RIGHT DISPLAY-WFM+CAL mode. Check that the VAC is set for 999.9 mV.

d. Set the WAVEFORM GAIN to VAR and adjust the variable WAVEFORM GAIN control fully counterclockwise for minimum gain as displayed on the Waveform CRT.

e. Adjust Var Gain Centering (A2R514) for a Calibrator signal amplitude of 65 IRE for NTSC (or 450 mV for either NTSC or PAL).

f. Press the CONFIGURE button and select COUPLING-DC.

g. For NTSC only: Check that ABS UNITS-mV is selected on PAGE 2.

h. Set the VAR WAVEFORM GAIN to Off.

i. Press the CALIBRATE button. Select CAL SIGNAL-ON and VERT CAL.

j. Check that REF-EXT and WFM HORIZONTAL-ONE-LINE are selected on the right front panel.

k. Adjust the 1780R-Series Precision Measurement knob until the traces are exactly 1 V apart as displayed on the Waveform CRT. Use the VERT POS control to align the traces with the graticule lines.

l. Select 1780R-Series FILTER-LPASS.

m. Adjust Low Pass Filter Gain (A2R754) so the traces are exactly 1 V apart to match the amplitude obtained in part k. of this step.

n. Select 1780R-Series FILTER-FLAT.

o. Press the CALIBRATE button to exit the menu and the CALIBRATE mode.

p. Set the VAC for 199.9 mV output.

q. Set the front panel RIGHT DISPLAY to WFM and WAVEFORM GAIN-X5 to On. Use the VERT POS control to position the traces into view.

r. Adjust X5 Gain (A2R422) for 1 V amplitude indication as displayed by the traces on the Waveform CRT. (Signal amplitude is 199.9 mV.)

s. Set the WAVEFORM GAIN-X5 to Off.

t. Disconnect the VAC from the CH A INPUT.

20. Adjust Voltage Cursors

a. Check that no signal is applied to the CH A INPUT.

b. Select RIGHT DISPLAY-WFM+CAL. Press the CONFIGURE button to On. Select COUPLING-GND. (For NTSC: Check that ABS UNITS-mV is selected on PAGE 2.) Press the CONFIGURE button to Off.

c. Check that the CAL readout is 1000 mV on the Waveform CRT.

d. Press the VOLTAGE CURSORS button to On.

e. Check that the Voltage Cursors menu on the Vectorscope CRT indicates that ABSOLUTE and SEPARATE are selected. If not, make this selection.

f. Use the Precision Measurement control to overlay CURSOR 1 trace on the calibrator upper trace. Touch CURSOR 2 pad and overlay the CURSOR 2 trace over the calibrator lower trace. The ΔV readout should be 1000 mV within a tolerance of ±2 mV. If it is not, turn the Precision Measurement control so that the ΔV readout is exactly 1000 mV.

g. Adjust Cursor Gain (A2R1017) so that CURSOR 1 and CURSOR 2 traces overlay the internal calibrator signal.

h. Set the WAVEFORM GAIN to X5.

i. Repeat the technique used in parts f. and g. of this step to obtain optimum accuracy.

j. Select RIGHT DISPLAY-WFM. Set the VOLTAGE CURSORS and WAVEFORM GAIN-X5 to Off. Press CONFIGURE button to On. Select COUPLING-DC on PAGE 1 and then press the CONFIGURE button to exit the menu.

21. Adjust CH A Input Frequency Response

a. Connect the television test signal generator Multiburst signal to the 1780R-Series CH A INPUT connector. Connect an end-line 75 Ω termination to the CH A INPUT loop-through connector.

b. Connect a 75 Ω termination to the 1780R-Series PIX MON OUT connector.

NOTE. *Parts c. through e. of this step provide a method for roughly presetting the adjustments. If the frequency response of the display is flat to 12 MHz and rolls off approximately 7% at 20 MHz, do not turn the adjustments given in part e. of this step.*

---

c. Set the generator multiburst controls to obtain a Full Amplitude, Composite, High Frequency Range Sweep with Markers.

d. Select WFM HORIZONTAL-TWO-FIELD.

e. Adjust Gain Cell Freq Resp (A2C611, A2R612), X1 Flat Resp (A2C418, A2R418), Output HF Resp Comp (A2C527, A2R534) for a flat multiburst display to 12 MHz on the 1780R-Series Waveform CRT. Rolloff should be approximately 4% to 7% at 20 MHz.

***NOTE**. Typically, A2R612 is set fully counterclockwise and A2R418 is set fully clockwise. A2R534 is set nearly fully clockwise.*

f. Set the WAVEFORM GAIN to X5.

g. Set the generator multiburst frequency range to Low.

h. Adjust Limiter (A2R628) until the off-screen recovery is good; that is, the display is not distorted. If the waveform display is distorted, turn A2R628 fully counterclockwise. Then, turn the adjustment clockwise until the display is undistorted.

i. Adjust X5 Flat Resp (A2C422, A2R421) for optimum flat response.

j. Set the WAVEFORM GAIN-X5 to Off.

k. Disconnect the multiburst sweep signal and termination from the CH A INPUT.

l. Connect the leveled sine wave generator output through a 50 Ω-to-75 Ω minimum loss attenuator to the CH A INPUT connector.

m. Connect the peak-to-peak detector head to the other CH A INPUT connector. Connect a coaxial cable from the detector head to the +Input on the peak-to-peak detector amplifier.

n. Connect the peak-to-peak detector amplifier Output to the input of a DMM. See Figure 5–15.

o. Set the 1780R-Series WFM HORIZONTAL to TWO-LINE. Set the generator frequency to 50 kHz (reference) and the output amplitude to obtain 100 IRE (700 mV for PAL) amplitude display on the Waveform CRT.

p. Check that the peak-to-peak detector amplifier +Input Enable button is pressed in and the –Input Enable button is set to the Out position (disabled). Adjust the +Level control until the green light turns On. (Leave the +Level control at this setting for the rest of this step.) Note the DMM reading.

q. Set the generator frequency to 3.58 MHz (4.43 MHz for PAL). Set the amplitude to obtain the same DMM reading as noted in part p. of this step.

r. Adjust A2C611 to obtain 100 IRE (700 mV for PAL) signal amplitude as displayed on the Waveform CRT.

s. Set the generator frequency to 5 MHz. Set the generator amplitude to the DMM reference reading noted in part p. of this step.

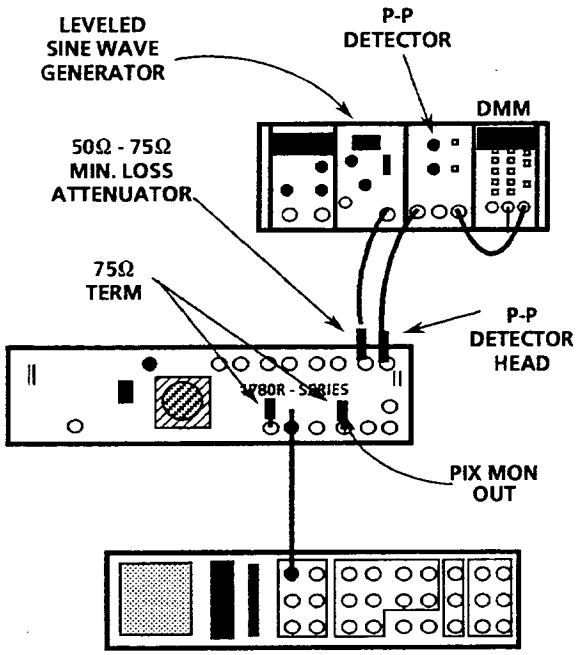


Figure 5–15: Test equipment connections for adjusting CH A frequency response

t. Adjust A2C527 for 100 IRE (700 mV for PAL) signal amplitude on the Waveform CRT.

u. Recheck the amplitudes at 3.58 MHz (4.43 MHz for PAL) and 5 MHz. Readjust A2C611 and A2C527 if necessary.

v. Set the generator frequency to 10 MHz and the proper amplitude as noted in part p. of this step.

w. Adjust A2C418 for a 101 IRE (707 mV for PAL) signal amplitude as displayed on the Waveform CRT.

***NOTE**. A2C418 is set for slightly higher amplitude to allow for thermal variations in frequency response when the instrument cover is installed.*

x. Set the generator frequency to 3.58 MHz (4.43 MHz for PAL). Set the amplitude to obtain the same DMM reading as noted in part p. of this step.

y. Readjust A2C611, if necessary, for 100 IRE (700 mV for PAL).

***NOTE**. Repeat parts v. through y. of this step, as necessary, to obtain the frequency response described.*

z. Adjust the generator frequency and check for a decreased amplitude of 1% to 3% at 15 MHz, and 4%to 7% at 20 MHz. If the amplitudes at these frequencies are incorrect, then adjust A2R534 slightly counter-clockwise to increase the rolloff, or clockwise to decrease the rolloff.

aa. Repeat parts k. through y., if necessary, to obtain proper frequency response.

ab. Disconnect the equipment from the 1780R-Series CH A INPUT. Leave the PIX MON OUT connector terminated for Steps 21 through 25.

22. Adjust X5 Frequency Response

a. Apply a modulated 2T Pulse & Bar signal from the television test signal generator, through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT.

b. Select the following 1780R-Series settings: INPUT-CH A and WFM HORIZONTAL-ONE-LINE.

c. Use the VERT POS control to move the waveform back porch or blanking level to the graticule baseline (0 IRE for NTSC; 0.3 V for PAL).

d. Set the WAVEFORM GAIN to X5 and the WFM HORIZONTAL MAGNIFIER to 1 μs/DIV.

e. Adjust X5 Flat Resp (A2C422) slightly, if necessary, to obtain a flat bottom on the modulated bar.

***NOTE**. A2C422 was previously adjusted in Step 20i.*

f. Set the WAVEFORM GAIN-X5 to Off.

g. Disconnect the Pulse & Bar signal from the instrument.

23. Adjust Input Channel Common Mode Rejection

a. Connect the television test signal generator Multiburst signal, through a 75 Ω feed-through termination and dual-input coupler, to the 1780R-Series CH A and CH B1 INPUT connectors.

b. Check that the generator multiburst controls are set to obtain a Full Amplitude, Composite, High Frequency Range, Markers-On, Sweep mode output.

c. Select the following 1780R-Series settings: INPUT A-B1, WAVEFORM HORIZONTAL-ONE-FIELD, and WAVEFORM GAIN-X5-On.

***NOTE**. Do not turn the CMR adjustments given in parts d., g., and j. of this step if chrominance nulls within 14 IRE for NTSC (100 mV for PAL).*

d. Adjust B1 CMR (A2C1329, A2R1333) for best nulled display. Chrominance should be nulled within 14 IRE for NTSC (100 mV for PAL).

e. Move the dual-input coupler from CH A INPUT to CH B2 INPUT.

f. Select the B1-B2 INPUT mode.

g. Adjust B2 CMR (A2C1232, A2R1221) to obtain a nulled display. Chrominance should be nulled within 14 IRE for NTSC (100 mV for PAL).

h. Move the dual-input coupler from CH B2 to CH B3 INPUT.

i. Select the B1-B3 INPUT mode.

j. Adjust B3 CMR (A2C1131, A2R1135) for a nulled display. Chrominance should be nulled within 14 IRE for NTSC (100 mV for PAL).

k. Select the following mode: INPUT-CH B1 and WAVEFORM GAIN-X5-Off.

l. Disconnect the Multiburst signal and dual input coupler.

24. Adjust CH B1 Input Frequency Response

a. Connect the leveled sine wave generator output, through a 50 Ω-to-75 Ω minimum loss attenuator, to the CH B1 INPUT connector. Do not terminate the loop-through connector.

b. Connect a peak-to-peak detector head to the other CH B1 INPUT connector. Connect a coaxial cable from the detector head to the +Input on the peak-to-peak detector amplifier.

c. Connect the peak-to-peak detector amplifier output to the input of a DMM.

d. Check that a 75 Ω termination is connected to the 1780R-Series PIX MON OUT connector. Set the WFM HORIZONTAL to TWO-LINE and check that INPUT-CH B1 is selected.

e. Set the generator frequency to 50 kHz (reference). Check that the 1780R-Series INPUT selection is set to CH B1. Set the generator output

amplitude so the Waveform CRT display is 100 IRE (700 mV for PAL) in amplitude.

f. Adjust the peak-to-peak detector amplifier +Level control to turn on the green light. Note the DMM reading.

g. Set the generator frequency to 10 MHz and adjust the output amplitude to obtain the same DMM reading as noted in part f. of this step.

h. Check that the Waveform CRT display amplitude is 100 IRE (700 mV for PAL).

i. Readjust B1 CMR (A2C1329) for 100 IRE (700 mV for PAL) signal amplitude on the Waveform CRT.

NOTE*. For Steps 23 through 25: If any of the CMR adjustments are readjusted for frequency response, recheck common-mode rejection to assure performance requirements are met.*

---

j. Leave the equipment connected as is.

25. Adjust CH B2 Input Frequency Response

a. Continuing from the previous step, move the generator signal and peak-to-peak detector head from CH B1 INPUT to the CH B2 INPUT connectors.

b. Select INPUT-CH B2.

c. Using the procedure given in step 23 (parts e. through g.) as a guide, check that the display on the 1780R-Series Waveform CRT is 100 IRE (700 mV for PAL) in amplitude at 10 MHz.

d. Readjust B2 CMR (A2C1232) for 100 IRE (700 mV for PAL) signal amplitude on the Waveform CRT.

e. Leave the equipment connected as is.

26. Adjust CH B3 Input Frequency Response

a. Move the generator signal and peak-to-peak detector head from CH B2 INPUT to the CH B3 INPUT connectors.

b. Select INPUT-CH B3.

c. Use Step 23 (parts e. through g.) as a guide to check that the Waveform CRT display is 100 IRE (700 mV for PAL) in amplitude at 10 MHz.

d. Readjust B3 CMR (A2C1131) for 100 IRE (700 mV for PAL) signal amplitude on the Waveform CRT.

e. Disconnect the equipment from CH B3 INPUT.

f. Disconnect the termination from the PIX MON OUT connector.

27. Adjust Luminance Filter Transient Response (Chroma Rejection)

a. Connect a Color Bar signal to the 1780R-Series CH A INPUT. Terminate the opposite side of the loop-through into 75 Ω.

b. Select INPUT-CH A, FILTER-LUM, and WFM HORIZONTAL-TWO-LINE mode of operation.

c. Adjust Lum Trans Resp (A2L947, A2L951) for squarest leading corner on the white bar.

d. Select FILTER-FLAT mode.

e. Leave the Color Bar signal connected to the instrument.

28. Adjust Luminance Filter Gain

a. Check that the television test signal generator Color Bar signal is applied to the 1780R-Series CH A INPUT. Check that this input is terminated into 75 Ω.

b. Select FILTER-FLAT/LUM overlay. (To obtain the FLAT/LUM overlay mode, press the FILTER button and hold in until the FLAT and LUM buttons are lit.) Select WFM HORIZONTAL-ONE-LINE mode of operation.

c. Adjust Lum Gain (A2R747) and Lum Offset (A2R743) to overlay the blanking levels and white bars of the one line display.

d. Leave the Color Bar signal connected to the 1780R-Series CH A INPUT.

29. Adjust Low Pass Filter

a. Select 1780R-Series FILTER-LPASS.

b. Adjust LP Trans Resp (A2R1050) for best square corner on the curved leading edge of the white bar.

c. Select FILTER-FLAT.

d. Disconnect the Color Bar signal from the CH A INPUT.

30. Adjust Chrominance Filter

a. Connect the output of the leveled sine wave generator, through the 50 Ω-to-75 Ω minimum loss attenuator, to the 1780R-Series CH A INPUT connector. Check that this input is terminated into 75 Ω.

b. Check that FILTER-FLAT mod is selected.

c. Set the leveled sine wave generator output frequency to 3.58 MHz (4.43 MHz for PAL) and its output amplitude to 100 IRE for NTSC (700 mV for PAL).

d. Select FILTER-CHROM mode. Check that WFM HORIZONTAL-ONE-LINE is selected.

NOTE. *In most cases, only the Chrom Gain (A2R828) may need to be adjusted to obtain proper gain (100 IRE for NTSC; 700 mV for PAL). BP 1 and BP 2 can remain at their factory-adjusted settings.*

---

e. Adjust BP 1 (A2C831) and BP 2 (A2C930) for maximum signal amplitude on the Waveform monitor CRT. Adjust Chroma Gain (A2R828) for a signal amplitude of 100 IRE (700 mV for PAL).

f. Set the leveled sine wave generator output frequency to 4.33 MHz for 1780R NTSC (5.18 MHz for 1781R PAL).

g. Readjust BP 2 (A2C930) for a signal amplitude of 70 IRE (490 mV for PAL).

h. Set the leveled sine wave generator frequency to 3.58 MHz (4.43 MHz for PAL).

i. Readjust Chroma Gain (A2R828) for a signal amplitude of 100 IRE (700 mV for PAL).

j. Set the leveled sine wave generator output frequency to 2.83 MHz (3.68 MHz for PAL).

k. Readjust BP 1 (A2C831) for a signal amplitude of 70 IRE (490 mV for PAL).

l. Set the leveled sine wave generator frequency to 3.58 MHz (4.43 MHz for PAL).

m. Readjust Chroma Gain (A2R828) for a signal amplitude of 100 IRE (700 mV for PAL).

n. Repeat parts f. through m. three or four times for optimum adjustment accuracy.

NOTE. *Parts o. through w. apply to NTSC (1780R) only.*

---

o. Disconnect the leveled sine wave generator signal, and connect in its place (to CH A INPUT) the Color Bar signal from the television test signal generator.

p. Check that FILTER-CHROM and ONE-LINE are still selected.

q. Set the television test signal generator for Horizontal Unlock.

r. Use the 1780R VERT POS and HORIZ POS to center the green-magenta transition on the Waveform CRT.

s. Set the WFM HORIZONTAL MAGNIFIER to 0.25 μs/DIV.

t. Check for minimum green-magenta transition amplitude on the Waveform CRT display. Typical amplitude is between one and two trace widths.

u. Set the television test signal generator for Horizontal Lock. Disconnect the Color Bar signal from the 1780R instrument.

v. Set the 1780R MAGNIFIER to OFF.

w. Disconnect the Color Bar signal from the instrument.

31. Adjust Chroma Filter Position and Gain

a. Connect the output of the leveled sine wave generator, through a 50 Ω-to-75 Ω minimum loss attenuator, to the 1780R-Series CH A INPUT. Check that the remaining side of the loop-through input is terminated into 75 Ω. Check that a Black Burst signal is applied to EXT REF.

b. Set the leveled sine wave generator output frequency to 3.58 MHz (4.43 MHz for PAL).

c. Check and/or select INPUT-CH A, REF-EXT, WFM HORIZONTAL-ONE-LINE, and FILTER-FLAT on the 1780R-Series instrument. Check that COUPLING-DC is selected on the Configure menu.

d. Adjust the leveled sine wave generator Amplitude Multiplier and Output Amplitude control for a display of 100 IRE (700 mV for PAL).

e. Select the 1780R-Series FILTER-CHROM mode.

f. Readjust Chroma Gain (A2R828) to obtain the same signal amplitude for both the CHROM and FLAT positions of the FILTER. Switch several times to check for optimum adjustment setting.

g. Disconnect the sine wave signal from the 1780R-Series CH A INPUT but leave the terminator connected to this input.

h. Select COUPLING-GND on the Configure menu.

i. Adjust Chroma Offset (A2R732) to obtain the same DC level when switching the FILTER between FLAT and CHROM. Switch several times to check for optimum adjustment setting.

j. Select the FILTER-FLAT mode. Select COUPLING-DC on the Configure menu. Press the CONFIGURE button to exit the menu.

32. Adjust Horizontal Timing

NOTE*. Perform Step 39, Adjust Timing Cursors, before checking and adjusting horizontal timing.*

a. Check that no signal is applied to the CH A INPUT.

b. Check that the television test signal generator Black Burst signal is connected to the 1780R-Series EXT REF connector. Check that this loop-through connector is terminated into 75 Ω.

c. Check that the 1780R-Series controls are set as follows: RIGHT DISPLAY-WFM, REF-EXT, WFM HORIZONTAL-TWO-LINE, and MAGNIFIER-OFF. Check that the Waveform CRT readout indicates 10 μs/DIV.

d. Use the 1780R-Series VERT POS and HORIZ POS controls to position the trace on the graticule baseline and so that it starts at the first major graticule mark (located at the start or left end of the graticule baseline) on the Waveform CRT. The baseline is the 0 IRE graticule line for NTSC; 0.3 V for PAL.

e. Press the TIME CURSORS button to On. Select LOCATE and SEPARATE on the Vectorscope CRT. Check that CURSOR 1 is selected on the Waveform CRT.

f. Turn the Precision Measurement control knob counterclockwise until the ΔT readout stops changing, Select CURSOR 2 and turn the control knob counterclockwise until the ΔT readout stops changing, select CURSOR 1.

g. Use the Precision Measurement control to place CURSOR 1 bright-up area on the 2nd major graticule mark (first division mark). Select CURSOR 2 and use the control to move the CURSOR 2 bright-up area to the 12th major graticule mark. (The cursor dots should be 10 divisions apart.)

h. Select MEASURE and CURSOR 1 on the Waveform CRT. Repeat part g. of this step to place the CURSOR 1 and CURSOR 2 bright-up dots on the 2nd and 12th major graticule marks, respectively.

i. Check that CURSOR 2 is selected. Slowly turn the Comparison Voltage control until the ΔT readout is exactly 100.000 μs.

j. Press the 1780R-Series CALIBRATE menu button and touch HORIZ CAL. Press the TIME CURSORS button to On.

k. Adjust the Precision Measurement control so that the CURSOR 1 and CURSOR 2 dots are exactly 10 divisions apart (The bright-up dots should coincide with the 2nd and 12th major graticule marks when the ΔT readout is exactly 100.000 μs.)

NOTE*. The dots may have to be set slightly short (1/8 to 1/4 of a minor division so that the X5, X10, and X20 sweep timing will meet their performance requirements.*

l. Push the CALIBRATE button to exit the HORIZ CAL mode.

m. Set 1780R-Series MAGNIFIER for a readout of 0.40 μs/DIV.

n. Use the technique described in parts e. through i. to position CURSOR 1 and CURSOR 2 bright-up dots on the 2nd and 12th major graticule marks. Then, slowly turn the Comparison Voltage control until the ΔT readout is exactly 4.000 μs.

o. Adjust X25 Mag (A2R471) so that the CURSOR 1 and CURSOR 2 dots are exactly 10 divisions apart while the ΔT readout is 4.000 μs.

p. Set 1780R-Series MAGNIFIER for a readout of 0.20 μs/DIV.

q. Use the technique described in parts e. through i. to position the dots while maintaining a ΔT readout of exactly 2.000 μs.

r. Adjust X50 Mag (A2R474) so that the CURSOR 1 and CURSOR 2 dots are exactly 10 divisions apart while the ΔT readout is 2.000 μs.

s. Set 1780R-Series MAGNIFIER for a readout of 0.10 μs/DIV.

t. Use the technique described in parts e. through i. to position the dots while maintaining a ΔT readout of exactly 1.000 μs.

u. Adjust X100 Mag (A2R476) so that the CURSOR 1 and CURSOR 2 dots are exactly 10 divisions apart while the ΔT readout is 1.000 μs.

v. Set the TIME CURSORS and MAGNIFIER to OFF.

33. Adjust Horizontal Magnifier Registration

a. Connect the television test signal generator Color Bar signal through a 75 Ω feed-through terminator to the CH A INPUT. Check that the generator Black Burst signal is connected to the EXT REF connector and terminated into 75 Ω.

b. Set the 1780R-Series button selection to WFM HORIZONTAL-TWO-FIELD sweep. Check that INPUT-CH A is selected.

c. Set the WFM HORIZONTAL-MAGNIFIER to ON and to X100.

d. Use the HORIZ POS control to position the center of the vertical sync to the mid-screen graticule mark.

e. Set the WFM HORIZONTAL-MAGNIFIER to OFF.

f. Adjust H Mag Reg (A2R344) to center the vertical sync on the screen.

g. Disconnect the Color Bar signal from the CH A INPUT.

***NOTE**. If A2R344 was adjusted, go to step 9. Readjust WFM Readout H Center (A2R170) and WFM Readout Gain (A2R167).*

---

34. Adjust Slow Sweep Trigger Level

a. Connect a 50% APL signal from the television test signal generator, through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT.

b. Select REF-INT and WFM HORIZONTAL-TWO-LINE sweep. Check that INPUT-CH A is selected.

c. Connect a test oscilloscope 10X probe to pin 2 of A2U458.

d. Set the test oscilloscope controls to establish a ground reference.

e. Set the test oscilloscope controls to 20 mV/ Div, DC-coupled, and 10 ms/Div. Monitor the voltage level at pin 2 of A2U458.

f. Adjust Slow Sweep Trig Level (A2R761) for 0 V average on the test oscilloscope CRT.

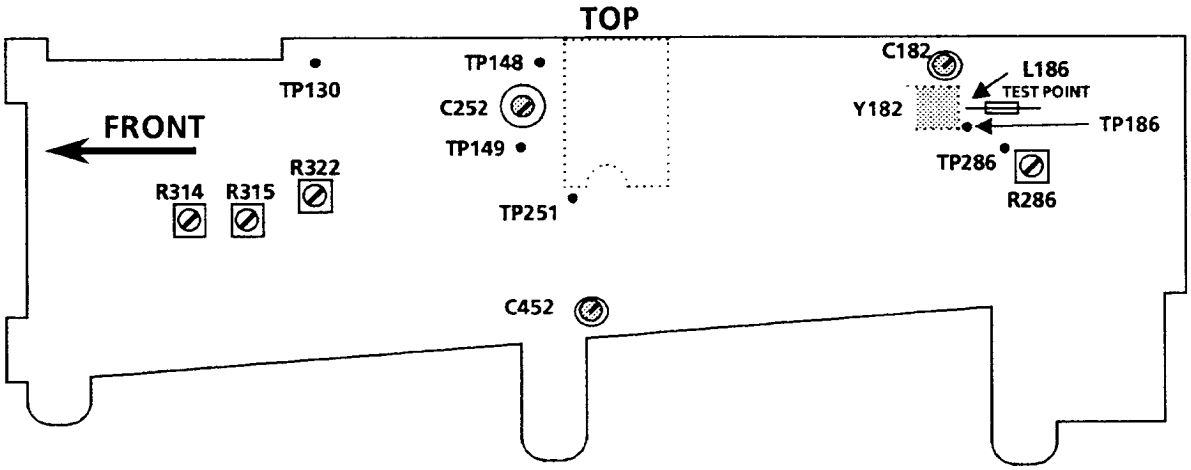
g. Remove the 10X probe from the test point. Disconnect the 50% APL signal from the CH A INPUT.

35. Adjust VCO Lockup

a. Connect the television test signal generator Color Bar signal through a 75 Ω feed-through terminator to the CH A INPUT. Check that the generator Black Burst signal is connected to the EXT REF connector and terminated into 75 Ω.

b. Select REF-EXT. Check that INPUT-CH A and WFM HORIZONTAL-TWO-LINE sweep are selected.

c. Connect the Digital Multimeter (DMM) Volts lead to A7TP286 and the common (or Low) lead to chassis ground. A7 is the Oscillator board. See Fig. 5–16.



Variable resistors are shown rotated 90° from the way they are mounted on the assembly; variable resistors are adjustable from the top of the circuit board.

Figure 5–16: Adjustment and test point (TP) locations for the Oscillator circuit board (Assembly A7).

NOTE. *The adjustments given in parts d., f., and h. should not be adjusted if the voltages at the test points are within tolerance.*

d. Adjust Burst Lock Center Freq (A7C182) for 2.0 V ±2.0 V.

e. Connect the DMM Volts lead to A7TP149.

f. Adjust +Delta F Center Freq (A7C252) for 3 V to 8 V (5 V nominal).

NOTE. *For access to adjustments A7C252 and A7C452, the Oscillator board (A7) must be mounted on the Board Extender Bracket.*

g. Connect the DMM Volts lead to A7TP251.

h. Adjust Output Center Freq (A7C452) for +3 V to +8 V (+5 V nominal).

i. Disconnect the Digital Multimeter and the Color Bar signal from the instrument. Leave the Black Burst signal connected to the 1780R-Series EXT REF input.

j. Connect a second Black Burst signal from the television test signal generator to the 1780R-Series CH A INPUT and terminate in 75 Ω.

k. Connect a test oscilloscope 10X probe to A7TP186.

l. Set the test oscilloscope vertical amplifier controls to 50 mV/Div, AC-coupled; set the Time/ Div control to 20 µs.

m. Adjust DC Balance (A7R286) so that the NTSC demodulated burst pulse overlays the demodulated baseline as displayed on the test oscilloscope. (For PAL, there are two bursts. Adjust the burst that will null.)

n. Disconnect the test oscilloscope probe from the test point. Disconnect the Black Burst signal from the 1780R-Series CH A INPUT.

36. Adjust Vector Gains

a. Connect the television test signal generator 5-Step, 40 IRE Modulated Staircase signal to the 1780R-Series CH A INPUT. Check that the CH A INPUT is terminated in 75 Ω and a Black Burst signal is applied to the EXT REF connector. (For PAL, use 280 mV modulation.)

b. Push the button beneath the Vectorscope CRT.

c. Select LEFT DISPLAY-VECT, REF-EXT-CW and VECTOR GAIN-VAR on the right front panel. (The vector display will be unlocked.)

d. PRESET Chroma Gain Range (A6R572) to the center of its range.

e. Connect the test oscilloscope 10X probe to TP457 on the Vectorscope circuit board (A6). Set the test oscilloscope vertical deflection factor to 0.2 V/Div, Input Coupling to AC, BW switch to Full, and sweep rate to 20 μs/Div.

f. Set the 1780R-Series variable VECTOR GAIN control for 800 mV peak-to-peak display on the test oscilloscope CRT. (Be sure that the test oscilloscope vertical amplifier BW switch is set to Full.)

g. Remove the 10X probe.

h. Set the HORIZ and VERT POS controls to center the vector center dot on the Vectorscope CRT.

i. Adjust Vert R-Y Gain (A6R227) and Horiz B-Y Gain (A6R643) so that the circle is on the compass rose.

NOTE. *A6C850 (Quad Phase) may need adjusting to keep the circle symmetrical.*

j. Remove the Staircase signal from the CH A INPUT. Connect a 75% amplitude Color Bar signal to the CH A INPUT. For NTSC only: Check that the Color Bar generator Setup button is set to 7.5%.

k. Select the 1780R-Series REF-EXT mode and press the PHASE SHIFT button. Use the Precision Measurement control to place the burst vector(s) on the graticule reference line(s). 180° line for NTSC; 135° and 225° lines for PAL.

l. Use the variable VECTOR GAIN control to place the burst vector dot(s) to the graticule reference 75% mark(s). If necessary, use the VERT and HORIZ POS controls to center the vector display center dot.

m. Remove the 75 Ω termination from CH A INPUT.

n. Turn the variable VECTOR GAIN control fully counterclockwise to its minimum gain position. Check that the vector display center dot is centered.

o. Adjust Chroma Gain Range (A6R572) to place the burst vector dot(s) halfway between the 75% and 100% graticule reference mark(s). The color vectors will be decreased by approximately 10%.

p. Connect three 75 Ω feed-through terminators in series between the television test signal generator Color Bar cable and the 1780R-Series CH A INPUT.

q. Check that the burst vector(s) can be moved to the compass rose by adjusting the variable VECTOR GAIN control.

r. Set the VECTOR GAIN-VAR mode to Off.

s. Remove two of the feed-through terminators from the television test signal generator Color Bar cable.

t. Check that the button under the Vectorscope CRT is On. Press the CALIBRATE button to On. Check that the Waveform CRT readout indicates that the CAL OSC is set to OFF. For NTSC (1780R) only: Select GAIN 1 CAL (SETUP) on the Waveform CRT. For PAL (1781R): Select GAIN CAL.

u. Turn the Precision Measurement control to place the color vectors in their boxes.

v. For NTSC (1780R) only: Set the NTSC generator Setup button to 0%. Select GAIN 2 CAL (NO SETUP) on the Waveform CRT and repeat part u. of this step. Set the NTSC generator Setup button to 7.5%.

w. Set the television test signal generator Color Bar Ampl button to 100%.

x. Push the CONFIGURE button. Select PAGE 2 and touch the BARS-100% pad. Press the CONFIGURE button to exit the menu.

y. Adjust 100% Gain Set (A6R568) so that the color vector dots are in their boxes.

z. Set the television test signal generator Color Bar Ampl button to 75%.

aa. Push the CONFIGURE button. Select PAGE 2 and touch the BARS-75% pad. Press the CONFIGURE button to exit the menu.

ab. Note the exact phase position of the burst vector(s) for use as a reference.

NOTE*. The front-panel variable VECTOR GAIN control can be used to move the burst vector to the compass rose while performing parts bb. through ee.*

ac. Set the television test signal generator Color Bar Ampl button to 100%.

ad. Push the CONFIGURE button. Select PAGE 2 and touch the BARS-100% pad. Press the CONFIGURE button to exit the menu.

ae. Adjust 100% Phase (A6C570) so that the burst vector dot(s) is at the same phase location as noted in part ab. of this procedure.

af. Select the 1780R-Series LEFT DISPLAY-SCH mode.

ag. Adjust SCH Gain (A6R667) so that the SCH dot is on the compass rose.

ah. Set the television test signal generator Color Bar Ampl button to 75%.

ai. Push the CONFIGURE button. Select PAGE 2 and touch the BARS-75% pad. Press the CONFIGURE button to exit the menu

aj. Push the CALIBRATE button.

ak. Touch CAL OSC on the Waveform CRT and set it to ON.

al. Adjust Test Circle Amplitude (A6R286) and Quad Phase (A6C850) to overlay the (two) circles on the compass rose.

am. For NTSC (1780R) only: Select GAIN 1 CAL (SETUP). Check that the overlayed circles are on the compass rose. Select GAIN 2 CAL (NO SETUP). Check that the circles are on the compass rose. If not, slightly adjust the Precision Measurement control to place the overlayed circles on the compass rose.

an. Press the CALIBRATE button to exit this mode. Set the PHASE SHIFT button to Off and select LEFT DISPLAY-VECT mode.

ao. Disconnect the Color Bar signal from the instrument.

37. Adjust Differential Phase and Gain

a. Connect a 5-Step 40-IRE Modulated Staircase signal from the television test signal generator to the 1780R-Series CH A INPUT. Check that the remaining side of the loop-through is terminated into 75 Ω. (For PAL, use 280 mV modulation.)

b. Check that LEFT DISPLAY-VECT and REF-EXT mode are selected.

c. Press the MEASURE button to On. Touch the DIFF PHASE, SINGLE, and NOISE REDUCTION-OFF pads on the Vectorscope CRT menu.

d. Set the VECTOR GAIN to VAR.

e. Move the subcarrier vector to the Vectorscope CRT compass rose using the variable VECTOR GAIN control.

f. Connect the 10X probe from the test oscilloscope to A6TP379 on the Vectorscope board. Set the test oscilloscope vertical deflection factor to 0.5 V/Div, Input Coupling to DC, and sweep rate to 10 µs/Div. Check that the generator 180° Subcarrier is set to On. (For PAL, check that the U Subcarrier is On.)

g. Adjust Demod Offset (A6R369) for 1 volt of DC at the non-subcarrier time.

h. Touch the GO TO DIFF GAIN pad on the Vectorscope CRT.

i. Check that SINGLE is selected.

j. If necessary, move the vector to the CRT compass rose using the variable VECTOR GAIN control.

k. Check that the test oscilloscope 10X probe is connected to A6TP379.

l. Adjust DG Offset (A6R167) for 1 VDC at chroma time.

m. Check that the LEFT DISPLAY-VECT mode light is on. Touch the GO TO DIFF PHASE pad and check that SINGLE is selected.

n. Remove the 10X probe from the test point.

o. Use the VERT POS control to move the vertical interval line of the display trace to the graticule baseline (0 IRE for NTSC; 0.3 V for PAL).

p. Rotate the Precision Measurement control until the chroma overlays the vertical interval line on the waveform display.

q. Press the 1780R-Series REFERENCE SET button.

r. Check that the D PHASE readout on the Waveform CRT is 0.00°.

***NOTE**. Do not press the REFERENCE SET button during the remaining portion of this step.*

s. Rotate the Precision Measurement control for a PHASE readout of –5.00°.

t. Adjust Demod Gain (A6R370) for 5 major divisions of deflection between the chroma and the vertical interval lines.

***NOTE**. Repeat parts p. through t. of this step, if necessary, for proper deflection.*

u. Touch the GO TO DIFF GAIN pad on the Vectorscope CRT. Check that SINGLE is selected. Use the variable VECTOR GAIN control to position the burst vector to the CRT compass rose.

v. Use the Precision Measurement control to move the chroma of the differential gain display to the graticule baseline.

w. Press the REFERENCE SET button.

x. Rotate the Precision Measurement control for a D GAIN readout of 5.0%.

***NOTE**. Rotate the control so that the chroma line is moving upward until a D GAIN readout of 5.0% is obtained.*

y. Adjust DAC Gain (A7R322) for 5 major divisions of deflection between the chroma line and the graticule baseline.

***NOTE**. Turn the Precision Measurement control back to obtain the 0.0% D GAIN readout. Reposition the chroma lines to the graticule baseline. Repeat parts x. and y. of this step to obtain a deflection of 5 divisions when the D Gain readout is 5.0%. Repeat, if necessary, to check that A7R322 has been properly adjusted.*

z. Touch the GO TO DIFF PHASE, DOUBLE and NOISE REDUCTION-ON pads.

aa. Rotate the Precision Measurement control so the chroma separation is about 8 divisions.

ab. Adjust DAC Offset (A7R315) for no separation of the vertical interval lines of the display traces (see Figure 5–17).

ac. Touch NOISE REDUCTION-OFF pad.

ad. Adjust Demod Offset (A7R314) for no separation of the vertical interval lines of the display traces (see Figure 5–18).

ae. Touch the GO TO DIFF GAIN pad on the Vectorscope CRT. Check that DOUBLE is selected.

af. Adjust the Precision Measurement control to overlay the chroma lines. Press the REFERENCE SET button.

ag. Readjust DG Offset (A6R167) to overlay the chroma lines, using the first packet.

ah. Touch the GO TO DIFF PHASE pad on the Vectorscope CRT. Check that DOUBLE is selected.

ai. Press the button located below the left CRT. Use the VERT and HORIZ POS controls to position the vector center dot to the center of the Vectorscope CRT. Rotate the Precision Measurement control to position the vector dot to the 180° reference line.

aj. Adjust DP Zero (A6C172) to overlay the chroma lines using the first packet.

ak. Push the MEASURE button to exit this mode.

al. Disconnect the Linearity test signal and the Black Burst signal from the 1780R-Series instrument.

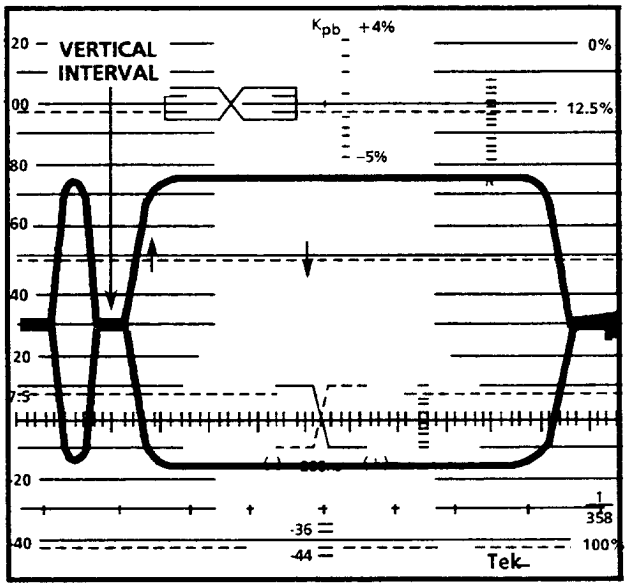


Figure 5–17: Noise Reduction-ON. DAC offset properly adjusted

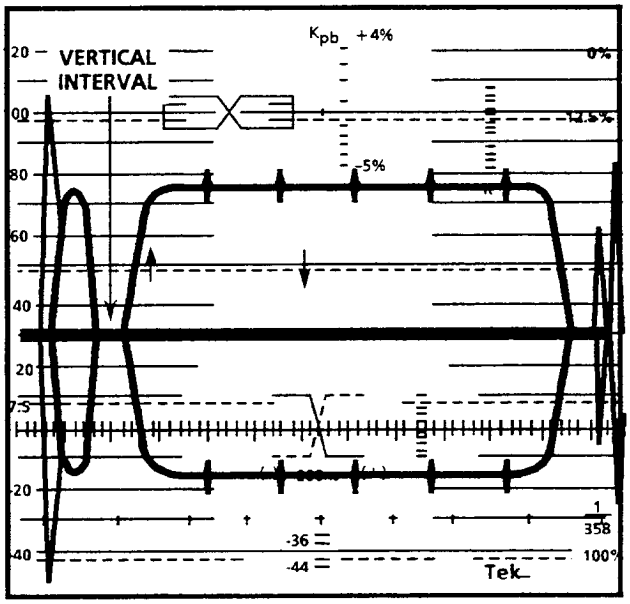


Figure 5–18: Noise Reduction-OFF. Demod offset properly adjusted

38. Adjust SCH Phase

a. Connect a Color Bar signal from a TEKTRONIX TSG-170A NTSC Television Generator to the 1780R CH A INPUT connector. Connect a 75 Ω end-line termination to the remaining CH A INPUT connector. Connect the generator Black Burst signal to the EXT REF connector. Check that the EXT REF loop-through connector is terminated into 75 Ω. (Use a TSG-271 PAL Generator for the 1781R.)

b. Select the 1780R-Series LEFT DISPLAY-SCH mode of operation. Check that REF-EXT is selected.

c. Connect a 10X probe from the test oscilloscope vertical input to A2TP1170. Set the test oscilloscope vertical deflection factor to 2 V/Div, Input Coupling to DC, and the sweep rate to 2 ms/Div.

d. Adjust VCO Adj (A2C1072) for a DC level between 6 V and 8 V (7 V nominal) on the test oscilloscope CRT.

e. Disconnect the 10X probe from A2TP1170.

f. Connect a coaxial cable from the generator Frame/Ref connector to Ch 1 of the test oscilloscope dual trace amplifier. Connect a 10X probe from Ch 2 of the dual-trace amplifier to A2TP981. Set test oscilloscope vertical deflection factors to 5 V and mode to Chopped. Set the time base to 10 µs/Div and trigger on the Field 1 Reference (Ch 1) signal. Use

–Slope and Normal mode triggering. (For PAL, set the time base to 20 μs/Div.)

g. Check that the 1780R-Series WFM HORIZONTAL-ONE-LINE (or TWO-LINE) is selected. Press the LINE SELECT button to On. Select LINE SEL MENU-ON, WFM= VECT-YES, and FIELD 1 OF 4 for NTSC (FIELD 2 OF 8 for PAL). These selections are made on the Vectorscope CRT menu.

h. Adjust Ref SCH Adj (A2R1263) so the timing of the Ch 2 pulses coincide with the Ch 1 pulses as displayed on the test oscilloscope CRT. Leave the adjustment in the center of the range where proper timing is obtained.

NOTE. *The time base can be set to 10 ms/Div for NTSC (20 ms/Div for PAL) to check timing coincident.*

---

i. Move the 10X probe from A2TP981 to A2TP1290. Set the test oscilloscope controls for Ch 2 only operation and the deflection factor to 1 V/Div.

j. Adjust VCO Adj (A2C1194) for a DC level between 5 V and 6 V on the test oscilloscope CRT.

k. Disconnect the 10X probe from A2TP1290. Disconnect the generator Frame/Ref pulse from the test oscilloscope.

l. Select FIELD 2 OF 4 for NTSC (FIELD 4 OF 8 for PAL). Select MENU-OFF and set the LINE SELECT button to Off.

m. Connect two more 75 Ω terminators in series with the one that is connected to the CH A INPUT.

n. Adjust SCH Offset (A2R1455) for minimum shift of the SCH display on the Vectorscope CRT by alternately removing and reconnecting the three 75 Ω feed-through terminators at the CH-A INPUT. (Leave the signal applied to the other CH-A INPUT.)

o. Disconnect the three terminators used in part n. of this step. Reconnect one 75 Ω feed-through terminator between the Television Generator Color Bar output and the CH-A INPUT.

p. Use the VERT and HORIZ POS controls to position the vector center dot to the exact center of the vector graticule.

q. Press the PHASE SHIFT button. Rotate the Precision Measurement control to place the burst vector(s) to the reference target(s).

r. If necessary, move the jumper on A2J986 so the SCH dot is closest to the burst vector reference line as displayed on the Vectorscope CRT. (That is, close to the 0° mark on the graticule dΘ scale.)

NOTE. *The jumper on A2J986 should be left at the position set by the factory.*

s. Adjust Fine SCH Adj. (A2R1281) for 0 SCH (using the 0° mark on the graticule dΘ scale.)

t. Disconnect the TSG-170A (or TSG-271) and the feed-through terminator from the 1780R-Series instrument. In their place, connect the television test signal generator (1410 or 1411) Color Bar signal to the CH A INPUT connector. Connect a coaxial cable from the other CH A INPUT connector to the EXT REF connector. Check that the EXT REF connector is terminated into 75 Ω. Check that the generator is internally connected so that the SCH can be varied. (Refer to P339 on the 1410/1411 generator A21 Sync Lock board.)

u. Check, by turning the generator Subcarrier Phase control (clockwise), that the SCH dot "flips" (changes fields) between 80° and 100° away from 0° SCH. If this condition is met, go to part w. of this step. If this condition is not met, perform part v. of this step before going to part w.

v. Readjust-Note the setting of the Ref SCH Adj (A2R1263). Readjust A2R1263 very slightly so that the dot "flips" between 80° and 100°. Leave A2R1263 at this readjusted setting.

w. Leave the Color Bar signal connected to the CH A INPUT. Disconnect the coaxial cable from the other CH A INPUT connector; terminate this loop-through connector into 75 Ω. Connect Black Burst from the generator to the EXT REF connector; check that this loop-through connector is terminated into 75 Ω.

39. Adjust Timing Cursors

a. Check that the television test signal generator Color Bar signal is connected to the CH A INPUT.

b. Select the 1780R-Series LEFT DISPLAY-VECT mode of operation. Check that WFM HORIZONTAL-ONE-LINE mode is selected.

c. Connect the probe from a digital counter to A4TP108. Be sure to ground the probe to the chassis.

d. Adjust 10 MHz Ref (A4C109) for 10 MHz on the digital counter. A4 is the Z-Axis board. See Figure 5–19.

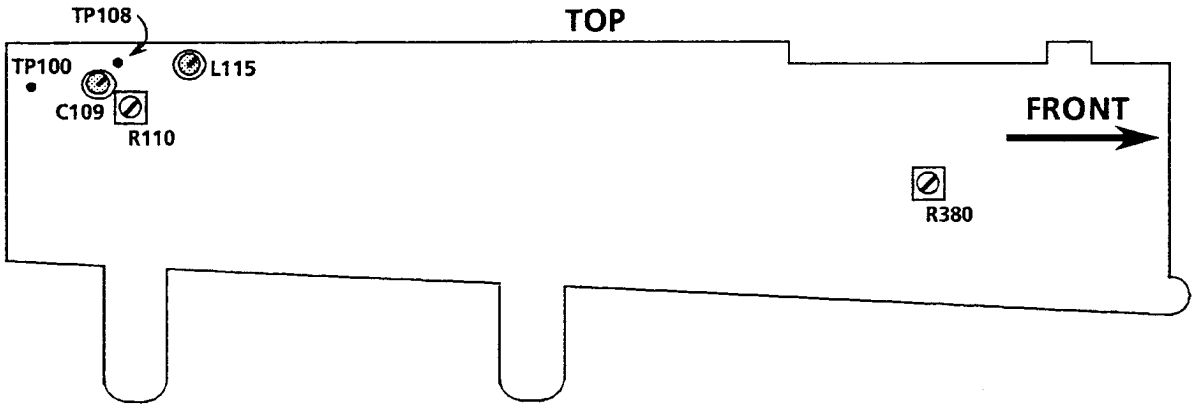


Figure 5–19: Z-Axis circuit board (A4) adjustment and test point locations

e. Disconnect the probe from A4TP108.

f. Connect a 10X probe from the test oscilloscope vertical input to A4TP100. Set the test oscilloscope vertical deflection factor to 2 V/ Div and the sweep rate to 2 ms/Div.

g. Adjust Cursor Clock Centering (A4L115) for a DC level of +8 V at ambient room temperature.

h. Disconnect the 10X probe from the test point.

i. Select CONFIGURE-On and PAGE 3. Touch the VERSION pad on the Vectorscope CRT menu and then quickly press the TIME CURSORS button. The Vectorscope CRT should display the following messages:

`"INTERNAL TIMING CURSORS CAL"`

`"TOUCH HERE TO EXIT"`

j. Turn the Precision Measurement control to place the cursors on the rising edge of the white bar as displayed on the Waveform CRT.

k. Adjust Analog Delay (A4R110) so the timing cursors overlay each other on the rising edge of the white bar.

l. Touch the indicated location on the Vectorscope CRT menu to exit this mode. Press the CONFIGURE button to Off.

m. Disconnect the Color Bar signal.

40. Adjust Chrominance/Luminance

a. Connect a Pulse & Bar signal from a TEKTRONIX TSG170A NTSC Television Generator to the 1780R CH A INPUT connector. (For the 1781R, use the TSG271 PAL Generator.)

b. Select REF-INT on the 1780R-Series front panel.

c. Press the button below the Vectorscope CRT to On. Press the PHASE SHIFT button and use the Precision Measurement control to place the burst vector dot(s) on the reference line(s).

d. Press the MEASURE button. Touch the CHROMA/LUM pad on the Vectorscope CRT. Select the C/Y mode on the menu.

e. Adjust Lum Comp (A6C153) for minimum loop located at about 45° as displayed on the Vectorscope CRT. (For PAL, there will be two loops located at about 45° and 315°.

f. Press the MEASURE button to exit the menu. Press the PHASE SHIFT button to Off.

g. Disconnect the Pulse & Bar signal.

41. Adjust X Y Input Gains

a. Connect the sine wave oscillator –Output to pin 1 (–X) and the +Output to pin 3 (+X) on the XY Input connector fixture. Connect the XY Input connector fixture to the 1780R-Series rear-panel X Y INPUT connector. (Be sure that the fixture is connected to the correct input on the 1780R-Series rear panel.)

b. Set the generator output frequency to 1 kHz and the voltage to 2.4 V.

c. Select LEFT DISPLAY–XY mode of operation.

d. Use the VERT POS and HORIZ POS controls to center the trace and position it to the horizontal axis.

e. Adjust X Gain (A6R113) so the horizontal trace is as long as the horizontal axis graticule line located inside the compass rose on the Vectorscope CRT. See Figure 5–20.

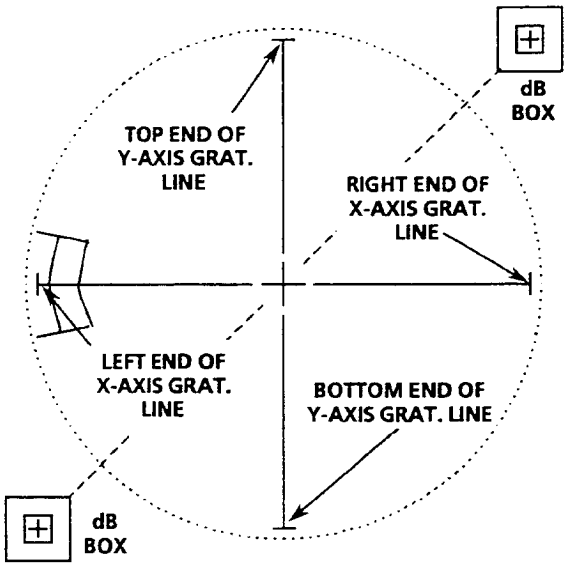


Figure 5–20: Vector graticule x- and y-axis markings for adjusting xy input gains

f. Move the generator output connections to pin 5 (–Y) and pin 7 (+Y) on the XY Input connector.

g. Adjust Y Gain (A6R308) so the vertical trace is as long as the vertical axis graticule line located inside the compass rose on the Vectorscope CRT. See Figure 5–20.

h. Connect the generator –Output to pins 1 and 5 of the XY Input connector. Connect the generator +Output to pins 3 and 7 of the XY Input connector.

i. Readjust A6R113 and A6R308 so the line ends are centered in the dB boxes. See Figure 5–21.

j. Disconnect the sine wave oscillator signal from the XY Input connector fixture. Disconnect the fixture from the 1780R-Series XY INPUT connector.

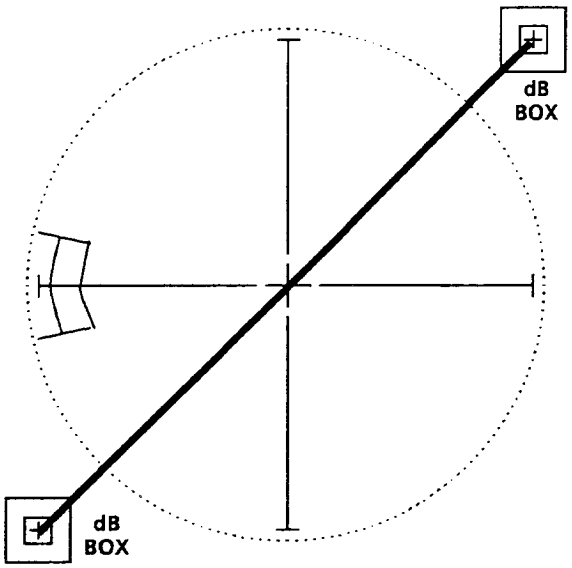


Figure 5–21: Properly adjusted xy input gains

42. Adjust RGB/YRGB

a. Connect a Color Bar signal from the television test signal generator, through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT.

b. Check that a Black Burst signal is applied to the 1780R-Series EXT REF connector and this connector is terminated into 75 Ω.

c. Select 1780R-Series RIGHT DISPLAY-WFM and REF-EXT. Check that INPUT-CH A and WFM HORIZONTAL-ONE-LINE are selected.

d. Press the button below the Waveform CRT. Use the 1780R-Series HORIZ POS and VERT POS controls to center the display on the Waveform CRT.

e. Connect the RGB Parade Display Test Connector fixture (see Figure 5–5) to the 1780R-Series rear-panel REMOTE connector.

f. Note that the color bar display (or sweep) has shortened to 3.2 to 3.7 divisions when jumper A2J585 is set to its factory-set 4-Step YRGB Parade position (pins 2 & 3 are jumpered).

g. Adjust RGB/YRGB Staircase Offset (A5R194) to horizontally position the color bar waveform so that it ends at the last major division mark on the right side of the Waveform CRT graticule baseline.

h. Connect the output of the function generator to the test oscilloscope vertical amplifier input. Set the generator controls for 1 kHz, 0 V to +10 V, square waves as displayed on the test oscilloscope CRT.

i. Disconnect the function generator output signal from the test oscilloscope. Connect the generator output square wave signal to the RGB Parade Display Test Connector input BNC connector.

j. Adjust RGB/YRGB Staircase Comp (A5C195) for no smearing.

k. Disconnect the generator square wave signal and RGB Parade Display Test Connector from the instrument. Leave the Color Bar and Black Burst signals connected to the instrument.

43. Adjust Dynamic Focus

a. Check that a Color Bar signal from the television test signal generator is connected, through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT.

b. Check that a Black Burst signal is applied to the 1780R-Series EXT REF connector.

c. Select LEFT DISPLAY-VECT and REF-EXT. Press the LINE SELECT button to turn on this function. Touch the LINE SEL MENU-ON pad to display the menu on the Vectorscope CRT. Select VERT-1H, WFM=VECT-YES, FIELD 2 OF 4 for NTSC (4 OF 8 for PAL), WFM-1H, VECT LSEL-ON, and WFM LSEL-ON.

d. Select WFM HORIZONTAL-TWO-LINE. Check that RIGHT DISPLAY-WFM is selected.

e. Use the Precision Measurement control to select an active video line that displays the Color Bar signal.

f. Select LINE SEL MENU-OFF. Adjust FOCUS control for best trace definition.

g. Adjust the INTENSITY control along with the WFM Line Select Focus (A16R350) for best trace definition on the Waveform CRT display.

h. Press the button below the Vectorscope CRT.

i. Adjust the INTENSITY control along with the Vector Line Select Focus (A3R384) for best trace definition on the Vectorscope CRT.

NOTE. *A3R384 adjustment range is limited. Adjust for roundest dots on the Vectorscope CRT display.*

j. Press the LINE SELECT button to turn it off. If necessary, readjust the INTENSITY and FOCUS controls for best readout and trace definition.

k. Disconnect the Color Bar signal from the CH A INPUT.

44. Adjust Probe Compensation

a. Set the VAC amplitude to 199.9 mV. Connect the VAC output signal through the 20 pF Input Normalizer to the 1780R-Series front-panel PROBE input connector.

b. Check that the VAC +Lum button is pressed in, the Lum/Sync button is out, and the correct television standard is selected.

c. Check that a Black Burst signal is applied to the 1780R-Series EXT REF connector.

d. Press the button below the Waveform CRT.

e. Select 1780R-Series WFM HORIZONTAL-TWO-FIELD and INPUT-PROBE mode of operation. Check that the CONFIGURE button is On. Select PAGE 2 and PROBE-X10. Select PAGE 1 and check that DC RESTORER-OFF is selected.

f. Use the VERT POS control to center the display on the Waveform CRT. (The display will be unlocked or free running.)

g. Adjust Probe Comp (A6C493) for the squarest leading front corner. If desired, set the WFM HORIZONTAL MAGNIFIER to X5 to check the waveform.

h. Set the MAGNIFIER to OFF and press the CONFIGURE button to exit the menu.

i. Disconnect the VAC and 20 pF Input Normalizer from the PROBE input connector.

45. Adjust Probe Calibrator Gain

a. Check that no signal is applied to the CH A INPUT connector.

b. Connect a 1X probe from the test oscilloscope Differential Comparator +Input to the 1780R-Series front-panel CAL OUT connector.

c. Connect the VAC output signal to the test oscilloscope Differential Comparator -Input. Set the VAC output to 999.9. Check that the VAC +Lum button is pressed in, the Lum/ Sync button is out, and the correct television standard is selected.

d. Set the test oscilloscope controls as follows: Inputs DC coupled, 500 mV/Div vertical deflection factor, and 1 ms/Div sweep rate.

e. Adjust Probe Calibrator Amplitude (A6R795) to obtain a null on the test oscilloscope CRT display.

f. Disconnect the test oscilloscope from the VAC and the 1X probe from the 1780R-Series CAL OUT connector.

g. Connect a Pulse & Bar signal from a television test signal generator, through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT connector.

h. Select RIGHT DISPLAY WFM+CAL, INPUT-CH A, and WFM HORIZONTAL-TWO-LINE mode of operation. Touch the VAR pad on the Waveform CRT.

i. Rotate the Precision Measurement control to overlay the sync tip (bottom) of the upper waveform on the white bar (top) of the lower waveform.

j. Select FIX on the Waveform CRT menu to ensure that the amplitude set in part i. of this step remains fixed when probe X1 and X10 gains are set in Step 45.

k. Disconnect the Pulse & Bar signal from the CH A INPUT connector.

46. Adjust Probe Gain

a. Connect a Pulse & Bar signal from a television test signal generator, through a 75 Ω feed-through terminator, to the 1780R-Series front-panel PROBE input connector.

b. Select the following 1780R-Series front-panel and menu settings: INPUT-PROBE and CONFIGURE-On. Select PAGE 2 and PROBE-X1 on the menu. Check that RIGHT DISPLAY-WFM+CAL and WFM HORIZONTAL-TWO-LINE modes are selected on the front panel.

c. Adjust Probe Gain (A2R1107) so that the sync tip of the upper waveform and the white bar of the lower waveform are overlayed.

d. Attenuate the Pulse & Bar signal by inserting a 75 Ω 10X attenuator between the coaxial cable from the signal generator and the 75 Ω feed-through terminator used in part a. of this step.

e. Check that the CONFIGURE button is On. Select PROBE-X10 on PAGE 2.

f. Adjust Probe X10 Gain (A6R295) so that the sync tip of the upper waveform and white bar of the lower waveform are overlayed.

g. Select RIGHT DISPLAY-WFM. Leave INPUT-PROBE selected for the next step.

h. Disconnect the Pulse & Bar signal from the front-panel PROBE input connector.

47. Adjust Probe Frequency Response

a. Connect the television test signal generator Multiburst signal, through a 75 Ω feed-through terminator, to the 1780R-Series front-panel PROBE input connector.

b. Connect a 75 Ω end-line termination to the rear-panel PIX MON OUT connector.

c. Select PROBE-X1 on PAGE 2 of the Configure menu. Check that DC RESTORER-OFF is selected on PAGE 1. Select RIGHT DISPLAY-WFM mode. Check that INPUT-PROBE and WFM HORIZONTAL-ONE-FIELD are selected on the front panel.

d. Set the generator multiburst controls to obtain a Full Amplitude, Composite, High Frequency Range Sweep with markers output signal.

e. Adjust Probe Resp (A2C1222) for flat frequency response, within ±3%, to 10 MHz.

f. Attenuate the Multiburst signal by inserting a 75 Ω 10X attenuator between the coaxial cable from the signal generator and the 75 Ω feed-through terminator.

g. Check that the CONFIGURE button is On. Select PROBE-X10 on PAGE 2.

h. Adjust Probe X10 Resp (A6C394) for flat frequency response, within ±3%, to 10 MHz.

i. Disconnect the Multiburst signal from the PROBE input connector.

j. Connect the output of a leveled sine wave generator through a 50 Ω-to-75 Ω minimum loss attenuator, a 75 Ω 10X attenuator, and 75 Ω feed-through terminator to the 1780R-Series front-panel PROBE input connector.

k. Select WFM HORIZONTAL-TWO-LINE mode.

l. Set the leveled sine wave generator output frequency to 50 kHz and the output amplitude to display a 100 IRE (700 mV for PAL) peak-to-peak signal on the 1780R-Series Waveform CRT. This is the reference amplitude.

m. Set the generator output frequency to 1 MHz.

n. CHECK that the displayed amplitude on the Waveform CRT is within ±3% or ±21.4 mV for NTSC (±21.0 mV for PAL) of the amplitude noted in part l. of this step.

o. Set the generator output frequency to 3.58 MHz (4.43 MHz for PAL), 5 MHz, 8 MHz, and then to 10 MHz.

p. Check that the displayed amplitude on the Waveform CRT is within ±3% or ±21.4 mV for NTSC (±21.0 mV for PAL) of the amplitude noted in part l. of this step for each frequency given in part o.

q. Remove the 10X attenuator so that the signal is applied through the 50 Ω-to-75 Ω minimum loss attenuator and 75 Ω feed-through terminator to the PROBE input.

r. Check that the CONFIGURE button is On. Select PROBE-X1 on PAGE 2 of the menu.

s. Repeat parts l. through p. to check the probe X1 frequency response.

NOTE*. If the probe frequency response does not meet the performance requirements, repeat the procedure for adjusting A2C1222 and A6C394. Recheck the probe frequency response.*

t. Disconnect the equipment from the PROBE input connector.

u. Disconnect the 75 Ω termination from the PIX MON OUT connector.

This completes the Adjustment Procedure.

Preventive Maintenance

Preventive maintenance consists of cleaning, visual inspection, performance checks, and (if needed) readjustment. The preventive maintenance schedule established for the instrument should be based on the amount of use it receives and the environment in which it is operated. Under average conditions, scheduled preventive maintenance should be performed every 2000 hours of operation.

Cleaning or Changing the Fan Filter

In order to provide adequate flow of clean air it is essential to regularly clean or replace the rear-panel fan filter. Interval between filter cleaning or replacement is dictated by the operating environment; the cleaner the source of cooling air the longer the filter will remain clean.

The filter material is designed to be washed in a solution of mild detergent and water.

To remove the filter, take out the two screws holding its housing. The inner part of the housing has four dimples, that mate with slots in the outer portion, to hold the filter securely in place. Separate the two halves of the housing by applying a small amount of pressure to one side of the inner housing and pulling the dimples free of the slots. When reassembling the filter housing be sure that the dimples align with the slots before attempting to remount over the fan.

Performance Checks and Readjustments

Instrument performance should be checked after each 2000 hours of operation, or every 12 months if used intermittently. This will help ensure maximum performance and assist in locating defects that may not be apparent during regular operation. The Performance Verification and the Adjustment Procedure are in Sections 4 and 5.

Cleaning

CAUTION. *A 2% RMA flux content solder is recommended for making repairs in this instrument. Cleaning of rosin residue is not recommended. Most cleaning solvents tend to reactivate the rosin and spread it under components where it may cause corrosion under humid conditions. The rosin residue, if left alone, does not exhibit these corrosive properties.*

The instrument should be cleaned often enough to prevent dust and dirt from accumulating. Dirt acts as a thermal insulator, preventing effective heat dissipation, and can also provide high-resistance electrical leakage paths between conductors or components in a humid environment.

CAUTION. *Do not allow water to get inside any enclosed assembly or component. Do not clean any plastic materials with benzene, toluene, xylene, acetone, or similar compounds, because they may damage the plastic.*

Exterior Clean the dust from the outside of the instrument with a soft cloth or small brush. A brush is especially useful for removing dust from around the selector buttons, knobs, and connectors. Hardened dirt may be removed using a cloth dampened with a mild detergent and water solution. Abrasive cleaners should not be used.

CRT Clean the CRT faces with a soft, lint-free cloth dampened in isopropyl alcohol or glass cleaner solution. Abrasive cleaners should not be used.

Interior Loosen dust with a soft, dry brush and remove it with low-pressure air (high-velocity air can damage some parts). Hardened dirt or grease can be removed with a cotton-tipped applicator dampened with a mild detergent and water solution. Abrasive cleaners should not be used.

If the circuit board assemblies must be removed for cleaning, follow the instructions for removal/replacement under the heading of Corrective Maintenance.

After cleaning, allow the interior to dry thoroughly before applying power to the instrument.

Visual Inspection

After cleaning, check the instrument carefully for improperly seated transistors or integrated circuits, defective connections, and damaged parts. To prevent additional damage, in the case of heat-damaged parts, determine the cause of overheating before replacing the damaged part.

Periodic checks of the transistors and integrated circuits are not recommended. The best measure of performance is the actual operation of the component in the circuit.

Static-Sensitive Components

This instrument contains electrical components that are susceptible to damage from static discharge. Static voltages from 1 kV to 30 kV are common in unprotected environments. Table 6–1 shows the relative static discharge susceptibility of various semiconductor classes.

Table 6–1: Static Susceptibility

Relative Susceptibility Levels		Voltage*
1	MOS and CMOS	100 to 500 V
2	ECL	200 to 500 V
3	SCHOTTKY SIGNAL DIODES	250 V
4	SCHOTTKY TTL	500 V
5	HF BIPOLAR TRANSISTORS	400 to 600 V
6	JFETS	600 to 800 V
7	LINEAR µCIRCUITS	400 to 1000 V est.
8	LOW POWER SCHOTTKY TTL	900 V
9	TTL	1200 V

*** Voltage equivalent for levels (voltage discharged from a 100-pF capacitor through a resistance of 100Ω).**

Observe the following precautions to avoid damage:

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive components or assemblies.
3. Discharge the static voltage from your body by wearing a grounding wrist strap while handling these components. Static-sensitive assemblies or components should be serviced only at a static-free work station by qualified personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep component leads shorted together whenever possible.
6. Handle components by the body, never by the leads.

7. Do not slide components over any surface.
8. Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge.
9. Use a soldering iron that is connected to earth ground.
10. Use only wick-type or special anti-static suction desoldering tools.

Corrective Maintenance

CAUTION. *A 2% RMA flux content solder is recommended for making repairs in this instrument. Cleaning of rosin residue is not recommended. Most cleaning solvents tend to reactivate the rosin and spread it under components where it may cause corrosion under humid conditions. The rosin residue, if left alone, does not exhibit these corrosive properties.*

NOTE*. No repair should be attempted during the warranty period.*

Obtaining Replacement Parts

Replacement parts are available through the local Tektronix, Inc., field office or representative. However, many common electronic parts are available through local sources. Using a local source, where possible, will eliminate shipping delays.

Changes to Tektronix instruments are sometimes made to accommodate improved components, as they become available, and to improve circuit performance. Therefore, it is important to include the following information when ordering parts:

1. Part Number
2. Instrument Type or Number
3. Serial Number
4. Modification or Option Number (if applicable)

If a part has been replaced with a new or improved part, the new part will be shipped (if it is a direct replacement). If not directly replaceable the local Tektronix field office or representative will contact the customer concerning any changes. After any repair, circuit readjustment may be required.

Mechanical Disassembly/Assembly

Use these instructions for disassembly and then reverse them for reassembly, unless noted otherwise. The Inner Bezel Frame Removal and Graticule Light Removal procedures can be performed with the instrument installed in the rack mounting cabinet or portable case.

Before attempting any disassembly/assembly of the instrument, be sure to disconnect the power cord.

NOTE. *All screws, unless otherwise noted, are TORX® screws and can be removed with a T15 screwdriver tip (Tektronix Part No. 003-0966-00). The exception is #2 Pozidrive® screws which can be removed with a #1 Pozidrive® tip (003-0443-00).*

Inner Bezel Frame Removal

Use the following procedure to remove the Inner Bezel Frame.

1. For either CRT, insert a wedge-shaped plastic tool in the slot at the top center of the bezel. See Figure 6–1 to identify the front-panel parts.

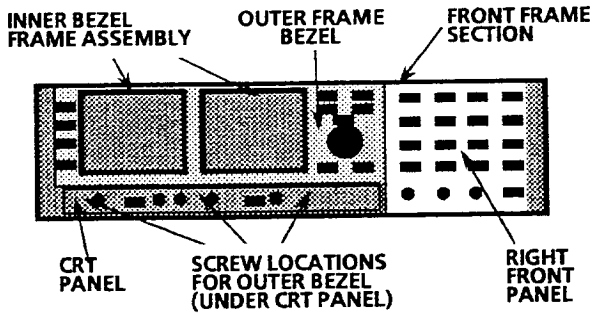


Figure 6–1: Front panel parts

2. Apply slight downward and outward pressure on the tool to unclip the bezel from the CRT Frame Outer Bezel.
3. To install the bezel, place the bottom edge of the bezel in the CRT Frame Outer Bezel. Push on the top of the bezel to snap it into place.

Graticule Light Removal

Use the following procedure to replace the graticule lights.

1. Remove the SCALE, FOCUS, INTENSITY, VERT POS, and HORIZ POS knobs by loosening their set screws.
2. Use pliers to grip the CRT Panel protrusion where the SCALE control shaft is located. Carefully pull the panel outward until it pops out. (This panel is a strip measuring 1-1/16-inch wide and 12-1/4 inches long. It is located below the CRTs; see Figure 6–1.)
3. For graticule lights outside of the plastic light guide: Put some masking tape on the inside surface of the long-nose plier jaws. Use the pliers to gently grasp the bulb without crushing it; pull the bulb straight out of its socket. Plug the new bulb into the socket.
4. After replacing the bulb, install the parts that were removed.

NOTE. *For graticule lights located behind the plastic light guide, continue with Step 5 and on.*

5. Remove the three screws that hold the plastic CRT Frame Outer Bezel to the chassis. These screws are located below the CRTs. See Figure 6–1.
6. Gently pull outward on the bottom edge of the CRT Frame Outer Bezel. Be careful that the wire to the PROBE BNC connector stays connected. (The top edge of the outer bezel will remain attached because it has three curved protrusions or tabs that serve as a hinge.)

NOTE. *If the CRT Frame Outer Bezel is swung out too far, the wire for the PROBE BNC connector may pull out of the connector. If this occurs, the instrument has to be removed from the rack mounting cabinet or portable case to obtain access to the wire. Then, the wire can be pushed back into its original position.*

7. Remove the light guide that covers the defective light bulb. Use long-nose pliers to replace the plug-in bulb as described in step 3.
8. After replacing the graticule light, reverse the removal procedure to reinstall all the parts.

Instrument Removal from Rack Mounting Cabinet or Portable Case

Use the following procedure to remove the instrument from the cabinet or case.

1. Check that the power cord is disconnected. Disconnect all the coaxial cables from the rear-panel BNC connectors.
2. Remove the instrument from the rack mounting cabinet or from its portable case. (Four 10–32 screws secure the instrument to the cabinet or portable case. See Figure 2–8.)

CRT Removal

Use the following procedure to remove the CRT.

WARNING. *The CRT is a high vacuum device and must be handled with care. Safety glasses, gloves, and protective clothing should always be worn when handling CRTs.*

1. To remove either CRT, use the Graticule Light Removal procedure to remove the CRT Panel (located below the CRTs) and to loosen the bottom edge of the CRT Frame Outer Bezel.
2. Disconnect the coaxial cable connector from J498 on the Vectorscope board (A6). This cable comes from the front-panel PROBE BNC connector. Disconnect the ribbon cable connector at J138 on the MPU Annex board (A10).
3. Swing the bottom edge of the CRT Frame Outer Bezel outward until it becomes unhinged at the top.
4. Remove the graticule light guides.
5. WAVEFORM CRT ONLY: Note the deflection lead colors (blue, brown, green, red) and their connections to the CRT so they can be reconnected properly later on. Disconnect the four deflection leads from the CRT. See Figure 6–2.

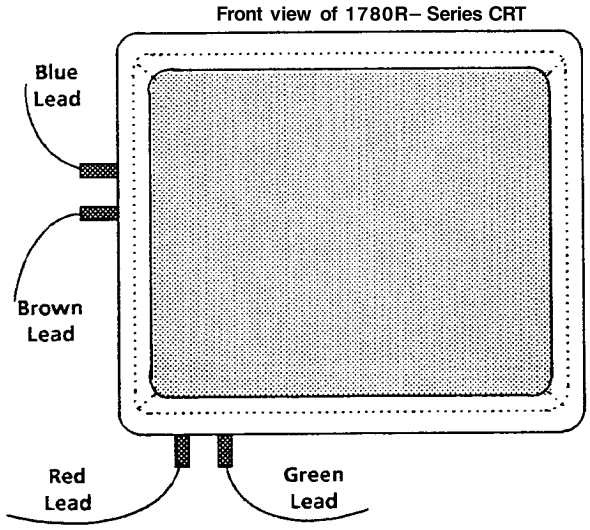


Figure 6–2: Positions of the waveform CRT deflection leads

6. For the CRT being removed: Disconnect the appropriate Trace Rotation connector from the Interconnect board (A11). For the waveform CRT, the connector is J165; for the vectorscope CRT, the connector is J143 on A11.

WARNING. *The CRT may retain a dangerous charge. Ground the conductor of the anode to discharge the CRT. Do not allow the conductor to touch your body or any circuitry.*

7. Disconnect the CRT anode lead by separating the connector for the CRT involved. This connector is located in line with the lead that goes to the High Voltage Supply for the CRT being replaced. A strong pull is required to separate the connector. Do not touch the exposed tip of the connector. Discharge the CRT by touching the connector tip to the chassis several times.

8. Remove the metal shield for the Input & BNC board (A8) to provide space for disconnecting and reconnecting the CRT socket. There are two screws that hold this shield in position. See Figure 6–3.

9. Loosen the nuts for the grey CRT base mount.

10. Note the position of the CRT faceplate relative to the chassis opening. Push the CRT forward by pressing on the back of the CRT base mount.

Disconnect the CRT from the socket and slide the CRT forward through the front of the instrument. Catch the four cushions that may fall away from the bezel opening; save them for the CRT to be installed.

CRT Replacement

Use the following procedure to replace the CRT.

1. Slide the CRT partially into position so the CRT base pins will align with the socket. Push the socket into position onto the CRT pins.

CAUTION. *Avoid bending the CRT base pins when pushing the CRT into the socket. Do not pinch wires between the CRT and the socket.*

2. Check that the four cushions are properly positioned in the corners of the bezel opening. Push the CRT into position so that the faceplate is flush with the original CRT's location. Check that the CRT shield is seated firmly in the base mount.
3. Tighten the CRT base mount nuts.
4. WAVEFORM CRT ONLY Reconnect all the deflection leads to the CRT.

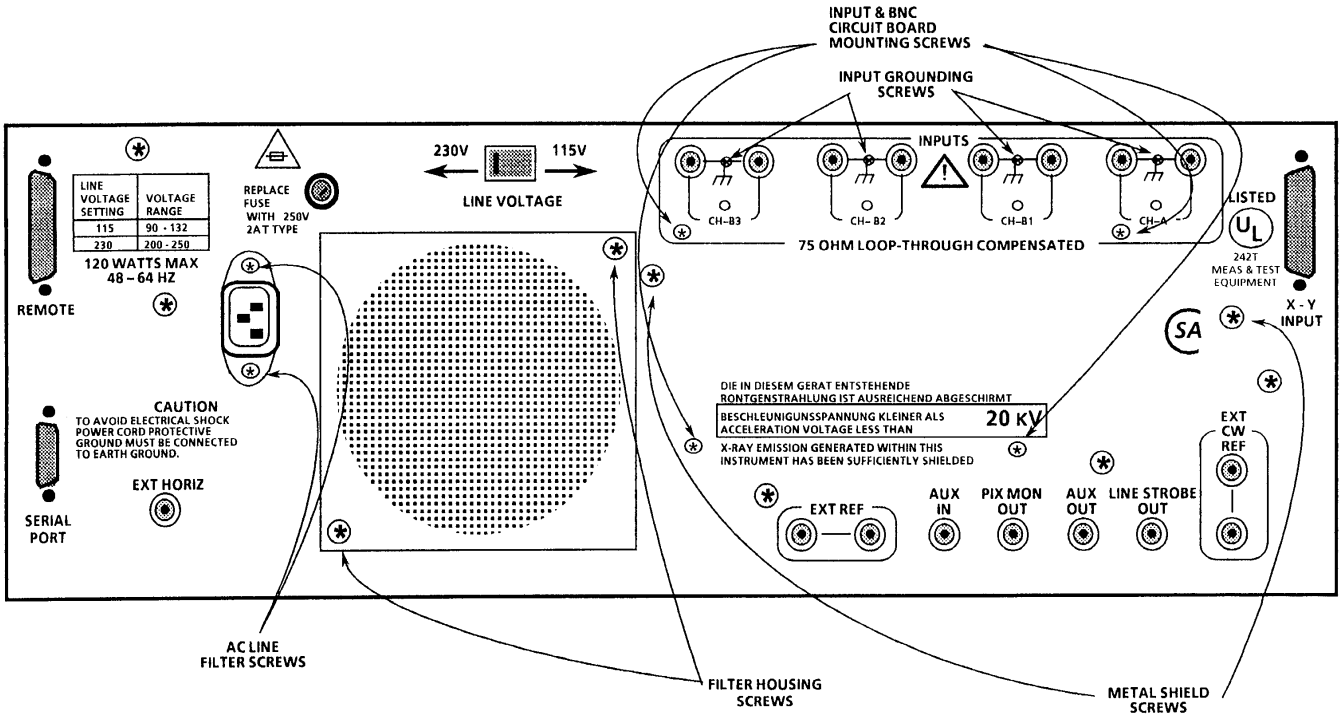


Figure 6–3: Rear panel for the Tektronix 1780R-Series Video Measurement Set showing the location of sub-assembly mounting screws

5. Reconnect the Trace Rotation connector to the Interconnect board (A11). Reconnect the anode lead to the in-line connector.

6. Clean the face of the CRT to remove fingerprints.

7. Reconnect the PROBE connector to J498 on the Vectorscope board (A6). Install the parts removed in steps 1 through 4 of the CRT Removal procedure. Reconnect the ribbon cable connector to J138 on the MPU Annex board (A10).

Removing the Input & BNC Board

Use the following procedure to remove the Input & BNC board.

1. Remove the two screws that hold the metal shield to the chassis (see Figure 6–3).

2. Remove eight screws that hold the circuit board to the chassis. (Four of the screws are ground screws located between the channel INPUT BNC connectors.) See Figure 6–3.

3. Unplug four connectors from the Waveform Monitor board (A2). These connectors are J1322, J1331, J1231, and J1133 on A2.

4. Lift the circuit board with attached cables out of the instrument.

5. When reinstalling the Input and BNC board, CH-A connects to J1322, CH-B1 connects to J1331, CH-B2 connects to J1231, and CH-B3 connects to J1133 on the Waveform Monitor board.

Removing the Fuse Board

Use the following procedure to remove the Fuse board.

WARNING. *Before attempting any disassembly/assembly of the instrument, be sure to disconnect the power cord.*

1. Remove the two screws that hold the clear plastic cover in place.

2. Remove two 1/4-inch hex-shaped posts.

3. Note the color (brown, blue, blk-gry to minus, gry to center, red-gry to plus) and connection locations of the five wires soldered to the board. Unsolder these wires.

4. Remove the two screws that hold the board in place.

5. Remove the board.

6. To re-assemble, reverse the procedure.

Removing the Waveform HV Supply Board

Use the following procedure to remove the Waveform HV Supply board.

1. Remove the two screws that hold the clear plastic cover in position.
2. Remove the two 1/4-inch hex-shaped posts.

WARNING. *The CRT may retain a dangerous charge. Ground the anode lead conductor to discharge the CRT. Do not allow the conductor to touch your body or any circuitry.*

3. Unplug the connectors from J110, J140, J200, J300, and J550 on the Waveform HV Supply board (A16). Disconnect the high voltage anode lead at the in-line connector. Refer to step 7 in the CRT Removal procedure for more information.
4. Remove the six screws to remove the board.
5. To re-assemble, reverse the procedure.

Removing the Microprocessor (MPU) Board

Use the following procedure to remove the Microprocessor board.

1. Unplug the three ribbon cable connectors from J115, J415, and J515 on the Microprocessor board (A5).
2. Remove the four nuts that hold the REMOTE and SERIAL PORT connectors to the rear panel.
3. Remove the eight screws from the circuit board.
4. Remove the board by moving the front end of the board outward and then forward.
5. To re-assemble, reverse the procedure.
6. Perform Step 3 of the *Adjustment Procedure*.

Removing the MPU Annex Board

Use the following procedure to remove the

1. Unplug the three ribbon cable connectors from J112, J138, and J302 on the MPU Annex board (A10). Use the pull tabs to disengage the connectors from J112 and J138 on the board.
2. Remove the four screws to release the board for removal.
3. To re-assemble, reverse the procedure.

Removing the LV Power Supply Board

Use the following procedure to remove the LV Power Supply board.

1. Remove the MPU Annex (A10), Waveform HV Supply (A16), and the Fuse (A17) boards using the procedures given previously.
2. Remove the screws and one nut that hold the large and small metal shields in place. The nut is located on the small shield. These shields cover the LV Power Supply board and are used to hold the boards listed in step 1.
3. Remove the two screws that hold the AC line filter to the rear panel. See Figure 6–3. Leave the AC line filter green/yellow ground wire connected to the chassis ground stud. Slide the AC line filter out toward the rear of the instrument as far as it will go.
4. Disconnect the cable connector from J600 on the LV Power Supply board. Leave J120 connected to its cable.
5. Remove the four screws that hold the LV Power Supply air tunnel shield to the chassis. Two screws are accessible by the rear cutout corners of the board; the remaining two screws are accessible through the large holes provided in the front portion of the board.
6. Lift the air tunnel shield with the attached LV Power Supply board out of the instrument.
7. Remove the 13 screws to release the LV Power Supply board from the air tunnel shield.
8. Slide the LV Power Supply board out toward the rear end of the tunnel shield.
9. To re-assemble, reverse the procedure.

Removing the Vectorscope Board

Use the following procedure to remove the Vectorscope board.

1. Disconnect three small connectors from J389, J498, and J574 on the Vectorscope board (A6). Note the orientation of these connectors so they can be reconnected properly when the board is ready to be installed.
2. Unplug the ribbon cable connector from J885 on the board.
3. Unsolder the blue, brown, green, and red wires from the board. Also, unsolder (from the board) the wire that goes to the front-panel CAL OUT connector.
4. Remove two nuts from the XY INPUT connector.
5. Remove the eight screws from the board.
6. Remove the board by moving the front end of the board outward and forward.

7. To re-assemble, reverse the procedure.

Removing the Oscillator Board

Use the following procedure to remove the Oscillator board.

1. Unsolder the ground and center conductor wires from the EXT CW REF rear-panel BNC connector.
2. Unplug the coaxial cable connector from J499 on the Oscillator board (A7).
3. Remove two screws that hold the lower (tabs) edges of the board to the chassis.
4. Disconnect the ribbon cable connector from J115 on the board.
5. Remove the four screws that hold the upper edge of the board to the chassis.
6. Lift the board out of the instrument.
7. To re-assemble, reverse the procedure.

Removing the Z-Axis Board

Use the following procedure to remove the Z-Axis board.

1. Remove the two screws from the lower (tabs) edges of the board.
2. Disconnect the ribbon cable from J302 on the Interconnect board (A11).
3. Disconnect the ribbon cable from J180 on the Z-Axis board (A4); also disconnect the three-wire connector from J156 on this same board.
4. Remove the four screws that hold the upper edge of the board to the chassis.
5. Lift the board out of the instrument.
6. To re-assemble, reverse the procedure.

Troubleshooting

Since this manual is a troubleshooting aid, its organization is described here. This material is general, and does not cover specific cases.

Troubleshooting Aids

Foldout Pages

The foldout pages at the back of the manual contain block and schematic diagrams, circuit board illustrations, and look-up charts. See Figure 6–4.

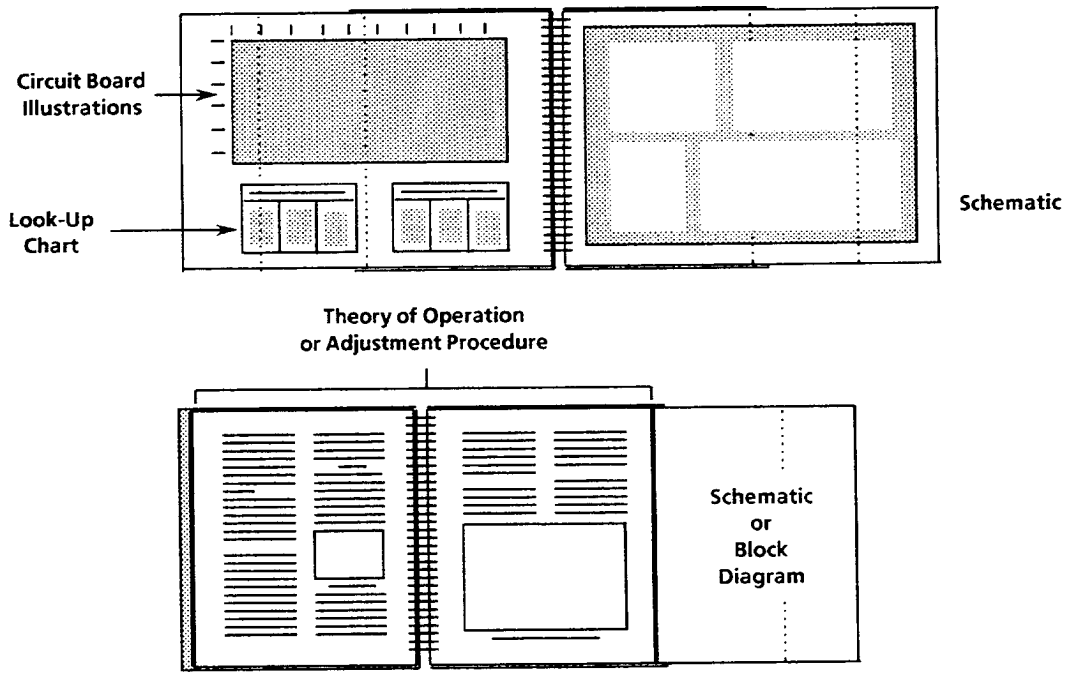


Figure 6–4: Using foldout pages

Diagrams. Schematic diagrams show the circuit number and electrical value of each component. Symbols used on these diagrams are defined on the first page of Section 9. Circuit boards are indicated by a heavy border.

Refer to the *Replaceable Electrical Parts List* for a complete description of each component.

Look Up Charts. Each schematic diagram is assigned an alpha-numeric grid and a look-up chart which lists the grid location of components on that schematic.

Circuit Board Illustrations. Electrical components, connectors, and test points are identified on circuit board illustrations, which are located on the back of the schematic diagrams. Circuit boards are grid numbered, with the lowest number in the upper left corner and the highest number in the lower right.

Parts Lists

There are two separate parts lists in this manual. The *Replaceable Electrical Parts List* precedes the schematic diagrams, and the *Replaceable Mechanical Parts List* follows them.

Replaceable Electrical Parts. This list is arranged by assembly (as designated in ANSI Standard Y32.16–1975), beginning with the etched circuit board assemblies. These are followed by the individual components, which combine the assembly number with the individual circuit number.

Example: R570 on the Power Supply board (A1) would be shown in the Replaceable Electrical Parts List as A1R570.

Selected Components

Test selectable components and their values are shown in Table 6–2.

Table 6–2: Test Selectable Components

Circuit Number	Nominal Value	Range of Values	Selection Criteria
A2C918	Not Installed	2.2 pF	Increase bandwidth of AUX IN
A6C171 A6C848 A6C851	Not Installed	0 – 20 pF	Insufficient adjustment range
A16C300	.47 µF	.22 µF .1 µF	To set +160V supply between 157V and 180V at +160V test point.

Replaceable Mechanical Parts List and Exploded View Drawing. Parts listed in the Replaceable Mechanical Parts List are assigned index numbers which correspond to circled numbers on the exploded view drawing(s).

Accessories List. Standard accessories are illustrated in the exploded view drawing. Part numbers of standard and optional accessories are given at the end of the *Replaceable Mechanical Parts List*.

Assembly and Circuit Numbering. All circuit board assemblies are assigned assembly or "A" numbers. Table 6–3 and Figure 6–5 show the assembly numbers and their locations for this instrument.

NOTE. *Always check the parts list for part numbers and descriptions when ordering replacement parts. Some parts may have been replaced or have a different value in an individual instrument.*

Table 6–3: Circuit Board Assemblies

Assembly Number	Board Name
A1	Low Voltage Power Supply and Waveform Monitor High Voltage Supply
A2	Waveform Monitor
A3	Vectorscope High Voltage Supply
A4	Z-Axis
A5	Microprocessor
A6	Vectorscope
A7	Oscillator
A8	Input including BNC
A9	Front Touch Panel
A10	Microprocessor Annex
A11	Interconnect
A12	Front Switch Panel
A13	Vectorscope Graticule Lights
A14	Waveform Monitor Graticule Lights
A15	Filter
A16	Waveform High Voltage Supply
A17	Fuse

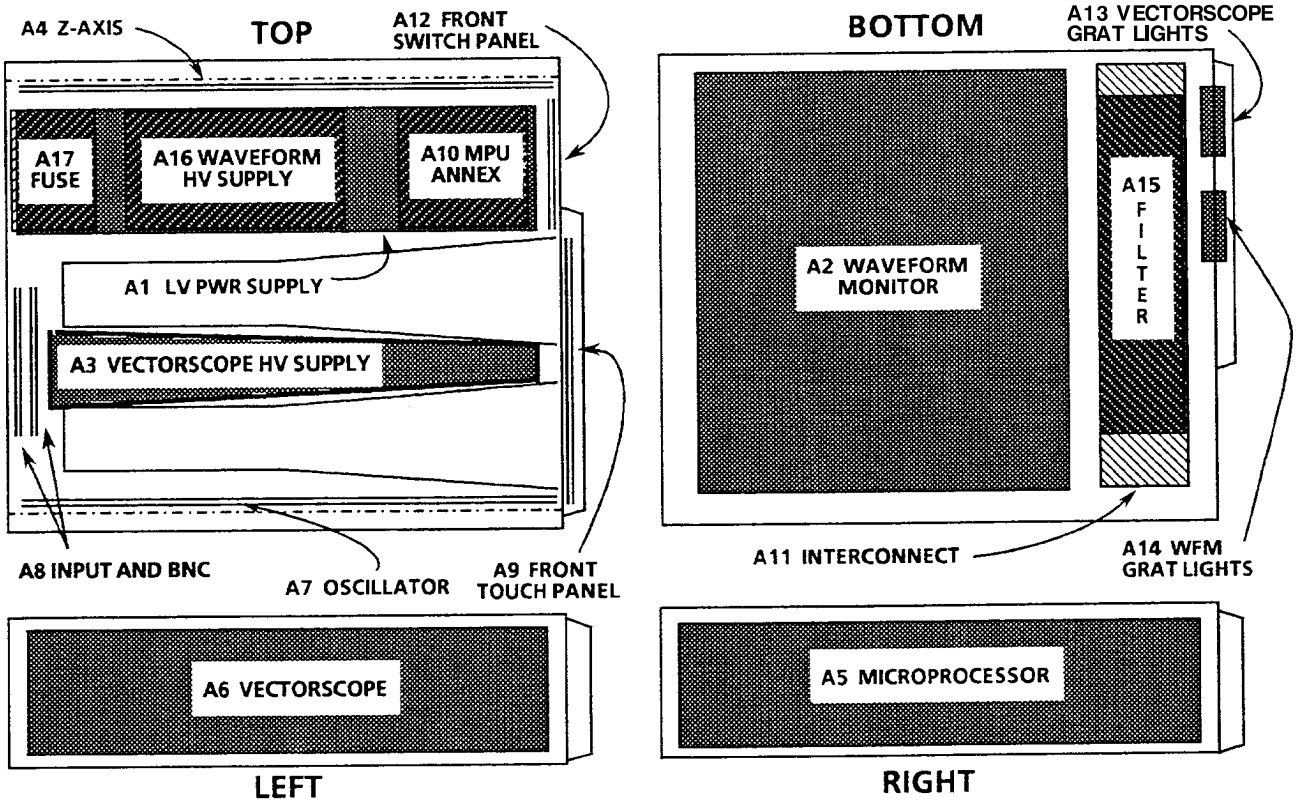


Figure 6–5: 1780R-Series circuit board assembly locations

General Troubleshooting Techniques

1. Be sure the instrument is malfunctioning. See Section 2 to determine whether the instrument is operating properly. Check the operation of front-panel controls, associated equipment, and input signal connections.

CAUTION. *Use extreme care when probing with meter leads or probes, because of the high component density and limited access within the instrument. The inadvertent movement of leads or a probe could cause a short circuit or transient voltages capable of destroying components.*

2. Determine the nature of the problem. Determine whether the instrument is out of calibration or there has been a component failure. Once the type of failure has been determined, identify the functional area most likely at fault.

3. Isolate the problem to a circuit or assembly. Use the block diagram as an aid to signal tracing and circuit isolation.

CAUTION. *Always remove the assembly from the instrument prior to attempting to replace a soldered-in component. See Corrective Maintenance for the correct procedure.*

4. Visually inspect the suspect assembly for obvious defects. Look for chafed insulation, components that are broken, loose, improperly seated, overheated or burned, etc. Repair or replace all obvious defects. In the case of overheated components, determine and correct the cause of overheating before re-applying power.

5. Use successive electrical checks to locate the source of the problem. The primary tool for problem isolation is the oscilloscope. Use the *Performance Check Procedure* to determine if a circuit is operating within specifications. It may be necessary to change a calibration adjustment to determine if a circuit is operational. Use caution, since this can destroy instrument calibration. Note the adjustment position before making changes, so that it can be returned to the same position.

6. Determine the extent of the repair. If the necessary repair is complex, it may be advisable to contact your local Tektronix field office or representative before continuing. If the repair is minor, such as replacing a component, see the parts list for replacement information. Removal and replacement procedures for the assemblies can be found under *Corrective Maintenance*.

Troubleshooting Procedures

Board Accessibility

Servicing some circuit assemblies in this instrument requires removal of other components (shields, cables, circuit boards, etc.). Some procedures call out special equipment such as cable extenders or external power supplies. The following information details the procedures for accessing/troubleshooting these circuit assemblies.

Z Axis and Oscillator Boards

To troubleshoot these hard-to-reach boards, an optional extender bracket with cable extenders is available by ordering Tektronix Part No. 016-1011-00. To use the extender, proceed as follows:

1. Remove the board by following the appropriate removal procedure given previously in this section of the manual.
2. Flip the board upside down and use the screws that were removed to fasten the board to the post spacers on the extender bracket.

NOTE. *The post spacers on the extender bracket must face to the left when viewing the board/extender assembly from the front; that is, after completing step 3 of this procedure.*

---

3. Using two screws, fasten the bracket/board assembly so that it is located above the former location of the board. Mounting the board in this manner allows some of the cables to be reconnected and permits the board to be serviced from either side. Use the appropriate cable extenders provided in the kit to complete all the connections necessary for operating the instrument and troubleshooting the board.

LV Power Supply Board

Use the following procedures to troubleshoot the LV Power Supply Board.

1. This board is accessible for troubleshooting by removing two boards and a shield. Follow these removal procedures: Removing the Waveform HV Supply Board and Removing the MPU Annex Board. After these boards have been taken out of the instrument, remove the large shield that is located above the LV Power Supply board.
2. Check that the cable connectors that were unplugged are not shorting to any metal conductors. The instrument can be turned on without applying an external load as a substitute for the removed boards. Be careful when troubleshooting the LV Power Supply board.

WARNING. *Dangerous potentials exist on the LV Power Supply board. Use care when troubleshooting to prevent personal injury. Read the instructions given in the Troubleshooting portion of this section.*

Power Supply

The 1780R-Series power supply presents special troubleshooting problems, if a fault occurs. Besides having a sizeable area where dangerous potentials can be contacted, the type of circuitry employed can not be troubleshot by conventional means.

WARNING. *Do not attempt to troubleshoot the 1780R-Series power supply without reading these instructions.*

Circuitry in this power supply, for troubleshooting purposes, can be divided into two categories: Control and Primary. The first area to troubleshoot is the control circuits, which requires an external DC supply. Once the control circuitry has been eliminated as the source of the problem, then move on to the primary. Carefully follow instructions regarding placement of ground leads and disconnecting of loads to avoid personal hazards and potential circuit damage.

WARNING. *Do not attempt to work on the power supply primary circuitry without using an isolation transformer.*

Troubleshooting Equipment

Several pieces of equipment, that may not be found on a typical service bench, are required to service this instrument's low voltage power supply. These are items that are in addition to the equipment called out in the *Performance Verification* and *Adjustment Procedures* in this manual. A DC power supply is required to power up the low voltage control circuits (Base Drive, Controller, Starter, etc.). An isolation transformer is required to work on the power supply primary circuits, which are located on both the Low Voltage Power Supply circuit board (Assembly A1) and the Fuse circuit board (Assembly A17).

Equipment Required List

DC Power Supply:	Variable voltage supply, 0–20 V DC at 1A. For example: A TEKTRONIX PS 503A Power Supply. (Requires a TM500-Series mainframe.)
Isolation Transformer:	For example: Stancor GIS 1000.
Test Oscilloscope:	See Equipment Required List for the *Performance Verification* or *Adjustment Procedures.*
5 V Supply Load Resistor:	47 Ω, 1W resistor.
A Resistive Dummy Load:	See Step 18 for resistance values.

Procedure

1. Unplug the 1780R-Series from the AC mains.

WARNING. *Turning off the 1780R-Series Power switch does not remove mains potential from the power supply circuits. Unplug the 1780R-Series power cord.*

2. Connect a shorting strap from U360 pin 3 to ground. Connect the external DC power supply leads between TP560 (+) and TP460 (–). See Figure 6–6.

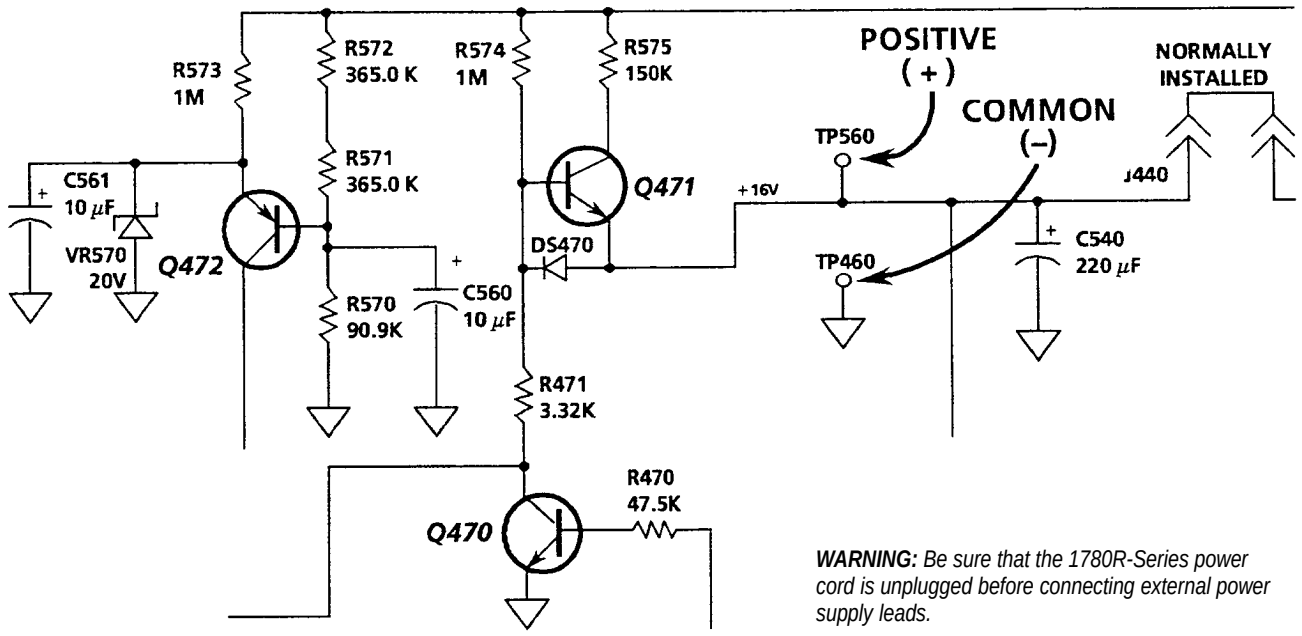


Figure 6–6: Connections for the external power supply leads

3. Turn on instrument front-panel POWER switch.

4. Connect the test oscilloscope probe to the base of Q250, ground to TP460 along with the external power supply common lead.

5. Slowly increase DC power supply voltage. At about 16 V U460 turns on and the base of the Switcher (Q250) has a waveform with a 90% duty cycle, 5 V peak-to-peak amplitude (+1 V to –4 V), and a 20 μs period.

6. Slowly decrease the DC power supply voltage. At approximately 12 to 13 V the Switcher base drive waveform is disabled.

7. Turn POWER switch on and then off. Check to see if switcher waveform enables then disables.

8. Remove P600 from J600 (main power distribution plug).

9. Install the plug jumper on J121 (Power Off Defeat).

10. Apply the +5 V supply load resistor (47 Ω) between the +5 V supply and the +5 V ground. The best way to install this load is to obtain a blank power connector (P600) and solder the resistor between the +5 V (pins 41 through 50) and the +5 V Ground (pins 31 through 40).

    If this is not possible the load resistor can be installed between W401 and TP400.

11. Connect the 1780R-Series power cord to the isolation transformer. Use a Variac between the mains power and the isolation transformer. See Figure 6–7.

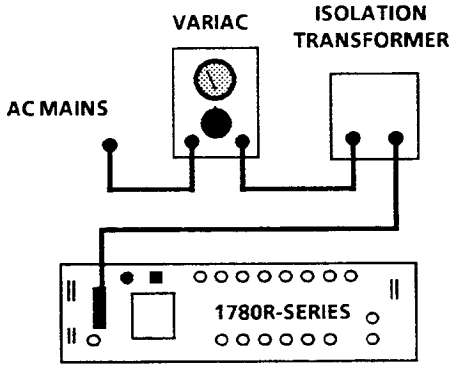


Figure 6–7: Connecting the AC mains to the 1780-R Series for troubleshooting

WARNING. *Mains potential is accessible on both the Low Voltage Power Supply and Fuse circuit boards.*

Do not attempt to apply mains power, and troubleshoot the 1780R-Series instrument without using an isolation transformer.

12. Short across VR570 to disable the Low Line Lockout circuit.

13. Set the Variac to 40 V. Adjust the external DC supply for 18 V.

14. Use the test oscilloscope to check the waveform on the base of Q460 has approximately 20% duty cycle and a period of about 4 μs.

15. Connect the test oscilloscope probe to the anode of CR140 and check for an approximate 150 V signal; voltage snubber working.

16. Move the probe to the collector of Q250 and check for a waveform.

17. Remove the short across VR570, the shorting strap from U360 pin 3, and the external power supply leads.

At this point the power plug J600 can be reconnected or all supplies can be externally loaded. However, if the power supply fails to operate the instrument, it will be necessary to attempt to operate with an external load to determine if the problem is with the power supply or in the load (instrument circuits).

18. Connect either the external load or reconnect J600. Table 6–4 has the resistance values for the loads. Do not remove the isolation transformer.

Table 6–4: Power Supply External Load Resistances

Supply	Resistance for 13 W Load (for troubleshooting)	Resistance for 80 W Load (simulated instrument load)	J600 pin connections for power supply loads
Gnd.			31 – 39
+5 V	5 Ω 5W	1.7 Ω 15W	41 – 50
+15 V	100 Ω 3W	11 Ω 20W	17 – 22
–15 V	100 Ω 3W	11 Ω 20W	11 – 16
+60 V	1 kΩ 4W	144 Ω 25W	5 – 8

19. Set the variac for 110 V. Connect the test oscilloscope probe to W401 and check for ≈+5 VDC, adjustable with R219.

20. Adjust the variac for mains potential of 90 V and then 130 V and check that the test oscilloscope still reads the same as it did in step 19 (≈+5 VDC).

21. Adjust the voltage down with the variac, while watching the test oscilloscope. At 80 V the power supply should cease to operate (under voltage lockout).

22. Set the variac to 110 V. Check the following waveforms (see Figure 6–8):

A. Q250 collector requires X100 probe (≈750 V)
B. Q250 base
C. Q350 Q451 emitter

D. U460 pin 3
E. U460 pin 4

23. Connect the test oscilloscope probe to the emitter of Q250. With the variac set to 110 V, temporarily short the +5 V supply to ground, and check that the voltage on Q250 does not rise above 1.7 V. Power supply should operate in short bursts and then shut down.

CAUTION. *Power supply must be connected to the external resistive load. Integrated circuits powered from the +5 V supply will be damaged by this test.*

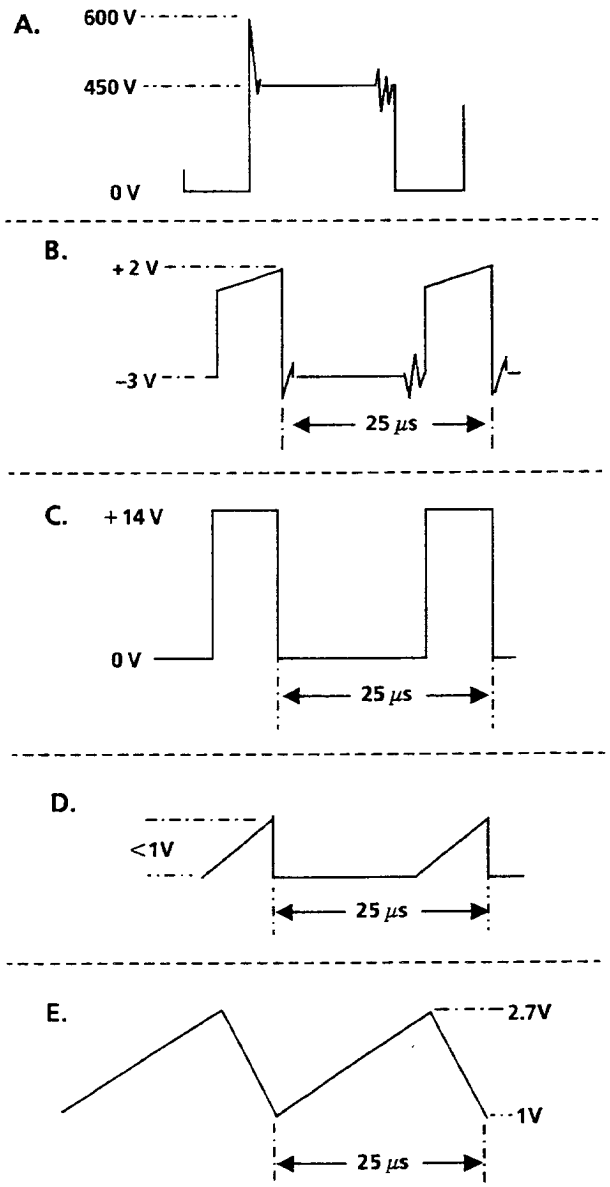


Figure 6–8: A. Q250 collector waveform. B. Q250 base waveform. C. Q350–Q451 emitter waveform. D. U460 pin 3 waveform. E. U460 pin 4 waveform

24. Install a plug jumper on J122. Connect the test oscilloscope probe to the +5 V supply. Supply should turn on in short bursts and not increase beyond +6.5 V. See Figure 6–9.

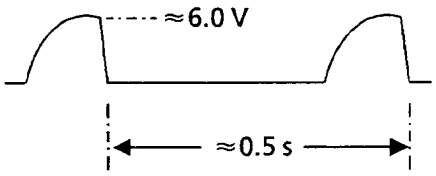


Figure 6–9: +5 V supply output waveform when over voltage protection is operating

Current Limit Adjustment (A1R466)

Equipment Required List

Variable Auto Transformer:	See Equipment Required List in the *Adjustment Procedures* section.
Television Test Signal Generator (Optional):	Color Bars. See *Adjustment Procedures.*
75 Ω Feed-Through Terminator.	See *Adjustment Procedures.*
75 Ω Coaxial Cable.	See *Adjustment Procedures.*
180 Ω 10W Resistive Load:	Use four 180 Ω, 5W wirewound resistors connected in series parallel as shown in Figure 6–10.

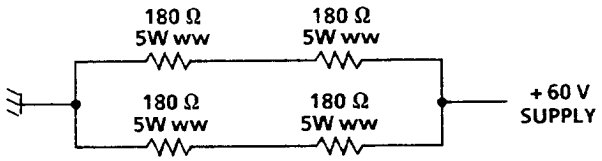


Figure 6–10: Power supply load used when adjusting current limit (A1R466). Load can be connected between the top end of A2L638 and ground

Procedure

1. Verify that the 1780R-Series instrument is set to the desired nominal line voltage. If the line voltage must be changed, set the rear-panel mains switch to the correct setting.
2. Connect the 1780R-Series AC power cord to the variable autotransformer. Set the mains Power switch for the autotransformer to On. Set the autotransformer to the voltage indicated on the 1780R-Series rear panel.
3. Optional: Connect a Color Bar signal from a Television Test Signal Generator, through a 75 Ω feed-through terminator, to the 1780R-Series CH A INPUT connector. (The instrument can be checked and/or adjusted without the test signal applied.)

4. Set the 1780R-Series instrument POWER switch to ON.

5. Set the 1780R-Series front-panel controls for best viewing of the color bar vectors on the Vectorscope CRT and of the waveform displayed on the Waveform CRT. Turn the SCALE control to obtain the highest level of illumination for both CRT graticules.

6. Set the autotransformer to low line (90 V for 115 VAC operation; 180 V for 230 VAC operation).

7. Set the 1780R-Series POWER switch to OFF (STANDBY). Connect the 180 Ω, 10W, resistive load between the top end of A2L638 and chassis ground. Miniature alligator clips may be used for connecting the load between A2L638 and ground. (The +60 V supply is applied through A2L339 to the top end of A2L638; see Diagram <6>.)

8. Turn A1R466 fully clockwise (maximum resistance). Then, turn this adjustment counterclockwise about one-third of its rotation range. Set the POWER switch to ON.

9. ADJUST Current Limit Adj (A1R466) slowly counterclockwise until stable operation is obtained. Typically, stable operation occurs near the center of the adjustment range.

CAUTION. *Avoid turning the adjustment fully counterclockwise (minimum resistance); otherwise, the switching transistor, A1Q250, may become damaged.*

10. Set the instrument POWER switch to OFF (STANDBY). Disconnect the resistive load. Set the POWER switch to ON and check for stable operation at low line. The instrument should operate normally.

Touch Panel Sensitivity Adjustment (A9R292)

Equipment Required List

Test Oscilloscope:	See Equipment Required List for the *Performance Verification* or *Adjustment Procedures.*

Procedure

1. Check that the 1780R-Series instrument POWER switch is set to OFF (STANDBY).
2. Remove the CRT Panel and CRT Frame Outer Bezel by using the Graticule Light Removal procedure as a guide. Disconnect the PROBE wire where it pugs into the PROBE BNC connector.
3. Connect a 10X probe from the test oscilloscope to pin 1 on A10–U520 on the MPU Annex board.
4. Set the test oscilloscope controls to 2 V/Div and 5 ms/Div.
5. Set the 1780R-Series POWER switch and CONFIGURE button to ON.
6. ADJUST Touch Panel Sensitivity (A9R292) in a direction that minimizes the amplitude of the touch panel pulses displayed on the test oscilloscope CRT. Turn A9R292 in the opposite direction until all the touch panel pulses are at maximum amplitude. Then, continue to turn the adjustment two notches past the maximum amplitude point for optimum sensitivity.

***NOTE**. When adjusting A9R292, keep the ambient light level as low as possible by shading the back of the front touch panel. (Too much light will adversely affect the adjustment sensitivity setting.)*

7. Set the POWER switch to STANDBY.
8. Disconnect the 10X probe from the MPU Annex board.
9. Reconnect the wire to the PROBE BNC connector when reassembling the CRT Frame Outer Bezel to the Front Frame Section.
10. Install the CRT panel and control knobs.

Options

CRT Options

The standard instrument is shipped with a P31 (green) phosphor CRTs installed. If Option 74 is ordered, the instrument is shipped with P4 (white) phosphor CRTs installed. The Option 74 CRT part numbers are given at the end of the Replaceable Electrical Parts List.

Power Cord Options

Any of the following power cord options can be ordered for the 1780R-Series. If no power cord option is ordered, instruments are shipped with a North American 125 V power cord and one replacement fuse.

- Option A1. Universal Europe 220V/16A Locking Power Plug (Power cord and one replacement fuse)
- Option A2. United Kingdom 240V/15A Power Plug (Power cord and one replacement fuse)
- Option A3. Australian 240V/10A Power Plug (Power cord and one replacement fuse)

Unless otherwise specified, power cords for use in North America are UL listed and CSA certified. Cords for use in areas other than North America are approved by at least one test house acceptable in the country to which the product is shipped. Power cord part numbers are shown in Section 10.

Replaceable Electrical Parts

This section contains a list of the electrical components for the <instrument>. Use this list to identify and order replacement parts.

Parts Ordering Information

Replacement parts are available through your local Tektronix field office or representative.

Changes to Tektronix products are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest improvements. Therefore, when ordering parts, it is important to include the following information in your order:

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If you order a part that has been replaced with a different or improved part, your local Tektronix field office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

Using the Replaceable Electrical Parts List

The tabular information in the Replaceable Electrical Parts List is arranged for quick retrieval. Understanding the structure and features of the list will help you find all of the information you need for ordering replacement parts. The following table describes each column of the electrical parts list.

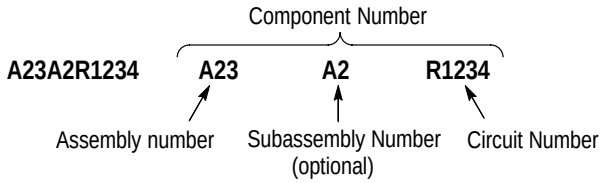
Parts list column descriptions

Column	Column name	Description
1	Component number	The component number appears on diagrams and circuit board illustrations, located in the diagrams section. Assembly numbers are clearly marked on each diagram and circuit board illustration in the *Diagrams* section, and on the mechanical exploded views in the *Replaceable Mechanical Parts* list section. The component number is obtained by adding the assembly number prefix to the circuit number (see Component Number illustration following this table). The electrical parts list is arranged by assemblies in numerical sequence (A1, with its subassemblies and parts, precedes A2, with its subassemblies and parts). Chassis-mounted parts have no assembly number prefix, and they are located at the end of the electrical parts list.
2	Tektronix part number	Use this part number when ordering replacement parts from Tektronix.
3 and 4	Serial number	Column three indicates the serial number at which the part was first effective. Column four indicates the serial number at which the part was discontinued. No entry indicates the part is good for all serial numbers.
5	Name & description	An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.
6	Mfr. code	This indicates the code number of the actual manufacturer of the part.
7	Mfr. part number	This indicates the actual manufacturer's or vendor's part number.

Abbreviations

Abbreviations conform to American National Standard ANSI Y1.1–1972.

Component Number



Read: Resistor 1234 (of Subassembly 2) of Assembly 23

List of Assemblies

A list of assemblies is located at the beginning of the electrical parts list. The assemblies are listed in numerical order. When a part's complete component number is known, this list will identify the assembly in which the part is located.

Chassis Parts

Chassis-mounted parts and cable assemblies are located at the end of the Replaceable Electrical Parts List.

Mfr. Code to Manufacturer Cross Index

The table titled Manufacturers Cross Index shows codes, names, and addresses of manufacturers or vendors of components listed in the parts list.

Manufacturers cross index

Mfr. code	Manufacturer	Address	City, state, zip code
00779	AMP INC.	CUSTOMER SERVICE DEPT PO BOX 3608	HARRISBURG, PA 17105–3608
01295	TEXAS INSTRUMENTS INC	SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY PO BOX 655303	DALLAS, TX 75272–5303
01884	DEARBORN ELECTRONICS INC	1221 NORTH HIGHWAY 17/92	LONGWOOD, FL 32750
02111	SPECTROL ELECTRONICS CORP	4051 GREYSTONE DRIVE	ONTARIO, CA 91761
02113	COILCRAFT, INC.	1102 SILVER LAKE RD.	CARY, IL 60013
04222	AVX/KYOCERA	PO BOX 867	MYRTLE BEACH, SC 29577
04426	ITW SWITCHES	AN ILLINOIS TOOL WORKS CO. 6615 W. IRVING PARK RD.	CHICAGO, IL 60634
04713	MOTOROLA INC	SEMICONDUCTOR PRODUCTS SECTOR 5005 E MCDOWELL ROAD	PHOENIX, AZ 85008–4229
05292	ITT COMPONENTS		CLIFTON, NJ
05347	ULTRONIX INC	461 N 22ND P O BOX 1090	GRAND JUNCTION, CO 81502
05820	EG & G WAKEFIELD	60 AUDUBON ROAD	WAKEFIELD, MA 01880
060D9	UNITREK CORPORATION	3000 COLUMBIA HOUSE BLVD, SUITE 1 20	VANCOUVER, WA 98661
07263	FAIRCHILD SEMICONDUCTOR CORPORATION	333 WESTERN AVE S.	SOUTH PORTLAND, ME 04106–1705
08111	MF ELECTRONICS CORP	10 COMMERCE DRIVE	NEW ROCHELLE, NY 10801
09023	CORNELL–DUBILIER CORPORATION	C/O EARL & BROWN CO INC 7185 SW SANDBURG RD	TIGARD, OR 97223
09969	DALE ELECTRONIC COMPONENTS	EAST HWY 50 P.O. BOX 180	YANKTON, SD 57078
0B0A9	DALLAS SEMICONDUCTOR	4350 BELTWOOD PKWY S	DALLAS, TX 75244
0C8T6	CITEL AMERICA INC	1111 PARK CENTRE BLVD, SUITE 340	MIAMI, FL 33169
0CVK3	ALLEGRO MICROSYSTEMS INC	115 NE CUTOFF PO BOX 2036	WORCHESTER, MA 01613–2036
0J260	COMTEK MANUFACTURING OF OREGON	P O BOX 4200 M/S 16–207	BEAVERTON, OR 970764200
0J9R2	HARISON ELECTRIC CO LTD	2–1 ASAHIMACHI 5–CHOME IMARARI	EMINE, JAPAN 527R
0JR03	ZMAN MAGNETICS INC	7633 S 180TH	KENT, WA 98032
0JR04	TOSHIBA AMERICA INC.	ELECTRONICS COMPONENTS DIV 9775 TOLEDO WAY	IRVINE, CA 92718
0JR05	TRIQUEST PRECISION PLASTICS	3000 LEWIS & CLARK HWY PO BOX 66008	VANCOUVER, WA 98666–6008
0KB01	STAUFFER SUPPLY CO	810 SE SHERMAN	PORTLAND, OR 97214–4657
0LUA3	PHILIPS COMPONENTS	100 PROVIDENCE PIKE	SLATERSVILLE, RI 02876
11236	CTS CORPORATION	406 PARR ROAD	BERNE, IN 46711–9506
12697	CLAROSTAT SENSORS & CONTROLS INC	12055 ROJAS DR SUITE K	EL PASO, TX 79936

Manufacturers cross index (cont.)

Mfr. code	Manufacturer	Address	City, state, zip code
12954	MICROSEMI CORP – SCOTTSDALE	8700 E THOMAS ROAD PO BOX 1390	SCOTTSDALE, AZ 85252–5252
12969	MICROSEMI CORP	WATERTOWN DIVISION 530 PLEASANT STREET	WATERTWON, MA 02172
13103	THERMALLOY INC	2021 W. VALLEY VIEW LN PO BOX 810839	DALLAS, TX 75381–5381
13919	BURR–BROWN CORPORATION	CORP OFFICE 6730 S TUCSON BLVD PO BOX 11400	TUCSON, AZ 85706
14301	ANDERSON ELECTRONICS INC	PO BOX 89	HOLLIDAYSBURG, PA 16648–0089
14604	ELMWOOD SENSORS INC.	500 NARRAGANSETT PARK DR PO BOX 2325	PAWTUCKET, RI 02861
14752	ELECTROCUBE INC	1307 S MYRTLE AVE PO BOX 889	MONROVIA, CA 91016
15454	KETEMA INC	RODAN DIVISION 2900 BLUE STAR ST	ANAHEIM, CA 92806–2591
15513	DATA DISPLAY PRODUCTS	445 S DOUGLAS ST	EL SEGUNDO, CA 90245
17856	TEMIC NORTH AMERICA	(SILICONIX & MATRA MHS) 2201 LAURELWOOD RD	SANTA CLARA, CA 95954–1516
18796	MURATA ELECTRONICS N AMERICA	1900 WEST COLLEGE AVE.	STATE COLLEGE, PA 16801–2723
19396	ILLINOIS TOOL WORKS INC	PAKTRON DIV 1205 MCCONVILLE RD P O BOX 4539	LYNCHBURG, VA 24502
19701	PHILIPS COMPONENTS	AIRPORT RD P.O.BOX 760	MINERAL WELLS, TX 76067
1CH66	PHILIPS SEMICONDUCTORS	811 E ARQUES AVE PO BOX 3409	SUNNYVALE, CA 94086–3409
21847	FEI MICROWAVE	825 STEWART DRIVE	SUNNYVALE, CA 94086
22526	BERG ELECTRONICS INC	825 OLD TRAIL ROAD	ETTERS, PA 17319
23633	RICHEY ELECTRONICS INC	7441 LINCOLN WAY	GARDEN GROVE, CA 92641
24165	SPRAGUE ELECTRIC CO	267 LOWELL ROAD	HUDSON, NH 03051
24226	GOWANDA ELECTRONICS CORP	1 INDUSTRIAL PLACE	GOWANDA, NY 14070–1409
24355	ANALOG DEVICES	1 TECHNOLOGY DRIVE	NORWOOD, MA 02062
24546	DALE ELECTRONICS INC	550 HIGH ST	BRADFORD, PA 16701
24931	BERG ELECTRONICS INC	RF/COAXIAL DIV 2100 EARLYWOOD DR PO BOX 547	FRANKLIN, IN 46131
26364	COMPONENTS CORPORATION	6 KINSEY PLACE	DENVILLE, NJ 07834
27014	NATIONAL SEMICONDUCTOR CORP	2900 SEMICONDUCTOR DR PO BOX 58090 MS 30–115	SANTA CLARA, CA 95051–0606
2N936	VISHAY ELECTRONIC COMPONENTS	1122 23RD STREET	COLUMBUS, NE 68601
30983	PHILIPS COMPONENTS	1440 W INDIANTOWN ROAD PO BOX 689605	JUPITER, FL 33468–9605
31918	ITT SWITCH PRODUCTS	8081 WALLACE RD	EDEN PRAIRIE, MN 55344–8798

Manufacturers cross index (cont.)

Mfr. code	Manufacturer	Address	City, state, zip code
33095	SPECTRUM CONTROL INC	8061 AVONIA RD	FAIRVIEW, PA 16415
34335	ADVANCED MICRO DEVICES INC	901 THOMPSON PLACE PO BOX 3453	SUNNYVALE, CA 94088–3453
34371	HARRIS SEMICONDUCTORS	SEMICONDUCTOR SECTOR MS 58–71 PO BOX 883	MELBOURNE, FL 32902–0883
37942	NORTH AMERICAN CAPACITOR CO	INDIANAPOLIS ROAD, HWY 240 PO BOX 240	GREEN CASTLE, IN 46135
44648	SAMSUNG SEMICONDUCTORS INC	3725 N FIRST STREET	SAN JOSE, CA 95134–1708
48726	UNITRODE INTEGRATED CIRCUITS	7 CONTINENTAL BLVD	MERRIMACK, MN 03054
4T165	NEC ELECTRONICS, INC.	2880 SCOTT BLVD PO BOX 58062	SANTA CLARA, CA 95052–8062
50139	ALLEN–BRADLEY COMPANY INC	ELECTRONIC COMPONENTS DIVISION 1414 ALLEN BRADLEY DRIVE	EL PASO, TX 79936
50434	HEWLETT PACKARD	370 W TRIMBLE ROAD	SAN JOSE, CA 95131–1008
50444	HEWLETT PACKARD	1501 PAGE MILL ROAD	PALO ALTO, CA 94304
50891	SEMICONDUCTOR TECHNOLOGY INC	C/O CARUSO & CAMELLERI ASSOCIATES 11818 SE MILL PLAIN BLVD #408 PO BOX 84600	VANCOUVER, WA 98684
51406	MURATA ELECTRONICS N AMERICA	2200 LAKE PARK DR	SMYRNA, GA 30080
52769	SPRAGUE–GOODMAN ELECT INC	1700 SHAMES DRIVE	WESTBURY, NY 11590
53387	3M COMPANY	ELECTRONICS PRODUCTS DIV 3M AUSTIN CENTER	AUSTIN, TX 78769–2963
54294	SHALLCROSS INC	US 70 EAST	SMITHFIELD, NC 27577
55285	BERGQUIST COMPANY INC., THE	5300 EDINA INDUSTRIAL BLVD	MINNEAPOLIS, MN 55435–3707
55680	NICHICON (AMERICA) CORP	927 E STATE PARKWAY	SCHAUMBURG, IL 60195–4526
56845	DALE ELECTRONIC COMPONENTS	2300 RIVERSIDE BLVD PO BOX 74	NORFOLK, NE 68701
57668	ROHM CORPORATION	15375 BARRANCA PARKWAY SUITE B207	IRVINE, CA 92718
58050	TEKA INTERCONNECTION SYSTEMS	45 SALEM ST	PROVIDENCE, RI 02907
59660	TUSONIX INC	7741 N BUSINESS PARK DR PO BOX 37144	TUCSON, AZ 85740–7144
61058	MATSUSHITA ELECTRIC CORP OF AMERICA	PANASONIC INDUSTRIAL CO DIV TWO PANASONIC WAY	SECAUCUS, NJ 07094
61429	FOX ELECTRONICS	DIV OF FOX ENTERPRIXED INC 5842 CORPORATION CIRCLE	FORT MEYERS, FL 33905
61529	AROMAT CORPORATION (NAIS)	629 CENTRAL AVENUE	NEW PROVIDENCE, NJ 07974
61935	SCHURTER INC	1016 CLEGG CT PO BOX 750158	PETALUMA, CA 94975–0158
61964	OMRON ELECTRONICS	CUSTOMEER SERVICE DEPT. 1 EAST COMMERCE DRIVE	SCHAUMBURG, IL 60173
62643	UNITED CHEMI–CON INC	9801 W HIGGINS RD	ROSEMONT, IL 60018–4771

Manufacturers cross index (cont.)

Mfr. code	Manufacturer	Address	City, state, zip code
62703	MICRO QUALITY SEMICONDUCTOR	1000 N SHILOH RD PO BOX 6676	GARLAND, TX 75040
62786	HITACHI AMERICA LTD	HITACHI PLAZA 2000 SIERRA POINT PKWY	BRISBAINE, CA 94005
64537	KDI/TRIANGLE ELECTRONICS INC	60 S JEFFERSON RD	WHIPPANY, NJ 07981
64762	ELANTEC INC	1996 TAROB COURT	MILPITAS, CA 95035–6824
71400	BUSSMANN	DIVISION COOPER INDUSTRIES INC PO BOX 14460	ST LOUIS, MO 63178
73743	FISCHER SPECIAL MFG CO	111 INDUSTRIAL RD PO BOX 76500	COLD SPRINGS, KY 41076
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077–0001
80023	SCHOTT CORP	1000 PARKERS LAKE RD	WAYZATA, MN 55391
85480	BRADY USA	NAMEPLATE DIVISION P O BOX 571 346 ELIZABETH BRADY RD	HILLSBOROUGH, NC 27278
86928	SEASTROM MFG CO INC	456 SEASTROM STREET	TWIN FALLS, ID 83301
8X345	NORTHWEST SPRING	5858 WILLOW LANE	LAKE OSWEGO, OR 9703
91637	DALE ELECTRONIC COMPONENTS	1122 23RD ST	COLUMBUS, NE 68601
93907	CAMCAR DIV OF TEXTRON INC	ATTN: ALICIA SANFORD 516 18TH AVE	ROCKFORD, IL 611045181
98159	RUBBER TECK INC	15627 S BROADWAY	GARDENA, CA 90248
98291	ITT CANNON RF PRODUCTS	585 EAST MAIN STREET	NEW BRITAIN, CT 06051
S3774	OSHINO ELECTRIC LAMP WORKS LTD	5 2 MINAMI SHINAGAWA 2 CHORE SHINAGAWA KU	TOKYO, 55
TK0196	ALMAC/ARROW ELECTRONICS	9500 SW NIMBUS AVE BUILDING E	BEAVERTON, OR 97005
TK0198	HAMILTON HALLMARK	9750 SW NIMBUS AVE	BEAVERTON, OR 97005
TK0515	EVOX/RIFA INC	300 TRI–STATE INTERNATIONAL SUITE 375	LINCOLNSHIRE, IL 60069
TK0891	MICONICS	1 FAIRCHILD AVE	PLAINVIEW, NY 11803
TK1163	POLYCAST INC	9898 SW TIGARD ST	TIGARD, OR 97223
TK1727	PHILIPS NEDERLAND BV	POSTBUS 90050	5600 PB EINDHOVEN, HOLLAND
TK1913	WIMA	DIV OF INTER–TECHNICAL GROUP INC 175 CLEARBROOK RD PO BOX 535	ELMSFORD, NY 10523–0535
TK1947	NORTHWEST ETCH TECHNOLOGY	2601 S HOOD ST PO BOX 110610	TACOMA, WA 98411–0610
TK2058	TDK CORPORATION OF AMERICA	1600 FEEHANVILLE DRIVE	MOUNT PROSPECT, IL 60056
TK2073	TOKYO COSMOS AMERICA INC	1177 E TOWER ROAD	SCHAUMBURG, IL 60173

Manufacturers cross index (cont.)

Mfr. code	Manufacturer	Address	City, state, zip code
TK2601	MAXTEK COMPONENTS CORPORATION	13335 SW TERMAN RD PO BOX 428	BEAVERTON, OR 97075–0428
TK6168	L–3 COMMUNICATIONS CORP	NARDA MICROWAVE–EAST SEMICONDUCTOR DIVISION 75 TECHNOLOGY DRIVE	LOWELL, MA 01851

Replaceable electrical parts list

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A1	671–0460–12			CIRCUIT BD ASSY:LOW VOLTAGE	80009	671–0460–12
A2	671–0467–18		B030472	CIRCUIT BD ASSY:WAVEFORM MONITOR,NTSC	80009	671–0467–18
A2	671–0467–19	B030473		CIRCUIT BD ASSY:WAVEFORM MONITOR,NTSC (1780R ONLY)	80009	671–0467–19
A2	671–0988–18		B030472	CIRCUIT BD ASSY:WAVEFORM MONITOR,PAL	80009	671–0988–18
A2	671–0988–19	B030473		CIRCUIT BD ASSY:WAVEFORM MONITOR,PAL (1781R ONLY)	80009	671–0988–19
A3	671–0459–05			CIRCUIT BD ASSY:VECTOR HV	80009	671–0459–05
A4	671–0461–02		B030399	CIRCUIT BD ASSY:ZAXIS	80009	671–0461–02
A4	671–0461–03	B030400		CIRCUIT BD ASSY:ZAXIS	80009	671–0461–03
A5	671–0466–12		B030488	CIRCUIT BD ASSY:MICROPROCESSOR	80009	671–0466–12
A5	671–0466–13	B030489		CIRCUIT BD ASSY:MICROPROCESSOR	80009	671–0466–13
A6	671–0465–13			CIRCUIT BD ASSY:VECTORSCOPE (1780R ONLY)	80009	671–0465–13
A6	671–0987–14			CIRCUIT BD ASSY:VECTORSCOPE (1781R ONLY)	80009	671–0987–14
A7	671–0468–10			CIRCUIT BD ASSY:OSCILLATOR,NTSC (1780R ONLY)	80009	671–0468–10
A7	671–0989–10			CIRCUIT BD ASSY:OSCILLATOR,PAL (1781R ONLY)	80009	671–0989–10
A8	672–1283–02			CIRCUIT BD ASSY:INPUT & BNC,NTSC (1780R ONLY)	80009	672–1283–02
A8	672–1305–02			CIRCUIT BD ASSY:INPUT & BNC,PAL (1781R ONLY)	80009	672–1305–02
A9	671–0463–02		B030488	CIRCUIT BD ASSY:FRONT TOUCH PNL	80009	671–0463–02
A9	671–0463–03	B030489		CIRCUIT BD ASSY:FRONT TOUCH PNL	80009	671–0463–03
A10	671–0925–01		B030488	CIRCUIT BD ASSY:MPU ANNEX	80009	671–0925–01
A10	671–0925–02	B030489		CIRCUIT BD ASSY:MPU ANNEX	80009	671–0925–02
A11	671–0469–03			CIRCUIT BD ASSY:INTERCONNECT	80009	671–0469–03
A12	671–0462–01		B030488	CIRCUIT BD ASSY:FRONT SW PNL	80009	671–0462–01
A12	671–0462–02	B030489		CIRCUIT BD ASSY:FRONT SW PNL	80009	671–0462–02
A13	671–0548–01		B030488	CIRCUIT BD ASSY:VECTORSCOPE GRATICULE LIGHTS	80009	671–0548–01
A13	671–0548–02	B030489		CIRCUIT BD ASSY:VECTORSCOPE GRATICULE LIGHTS	80009	671–0548–02
A14	671–0549–01		B030488	CIRCUIT BD ASSY:WAVEFORM MONITOR GRATICULE LIGHTS	80009	671–0549–01
A14	671–0549–02	B030489		CIRCUIT BD ASSY:WAVEFORM MONITOR GRATICULE LIGHTS	80009	671–0549–02
A15	671–0547–04			CIRCUIT BD ASSY:FILTER	80009	671–0547–04
A16	671–0882–04			CIRCUIT BD ASSY:WAVEFORM HV	80009	671–0882–04
A17	671–0883–04			CIRCUIT BD ASSY:FUSE	80009	671–0883–04

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A1	671–0460–12			CIRCUIT BD ASSY:LOW VOLTAGE	80009	671–0460–12
A1C100	290–1302–00			CAP,FXD,ALUM:1000UF,20%,35V,12.5 X 30MM (0.492 X 1.180),RADIAL,LOWIMP,1.95A RIPPLE	62643	CEEFM1V102M7
A1C120	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A1C121	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A1C130	283–0249–00			CAP,FXD,CER DI:0.068UF,10%,50V SQUARE	04222	SR215C683KAA
A1C132	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A1C134	285–1420–00			CAP,FXD,PLASTIC:FILM&FOIL,4700PF,63V,5%,POLY	TK1913	FKP2 4700/63/5
A1C135	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A1C140	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A1C141	285–1470–00			CAP,FXD,PLASTIC:330PF,1600VDC/500VAC	TK1913	FKP1 330/1600/5
A1C160	290–1215–00			CAP,FXD,ELCTLT:680UF,20%,200V SNAP IN MT	62643	CEAUF2D681M40
A1C170	290–1215–00			CAP,FXD,ELCTLT:680UF,20%,200V SNAP IN MT	62643	CEAUF2D681M40
A1C234	285–0901–00			CAP,FXD,PLASTIC:0.047UF,5%,50V	01884	LP66A1A473J
A1C240	285–1329–00			CAP,FXD,PLASTIC:680PF,10%,1600V,POLY	TK1913	FKP1 680/1600/10
A1C260	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A1C270	285–1246–00			CAP,FXD,PPR DI:0.022UF,20%,250VAC	TK0515	PME 265 MB 522
A1C271	285–1246–00			CAP,FXD,PPR DI:0.022UF,20%,250VAC	TK0515	PME 265 MB 522
A1C300	290–1302–00			CAP,FXD,ALUM:1000UF,20%,35V,12.5 X 30MM	62643	CEEFM1V102M7
A1C301	290–1267–00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	62643	CEEFM1H561M7
A1C320	290–1221–00			CAP,FXD,ELCTLT:100UF,20%,100V,AL,LOW IMP	62643	KMF100VB101M12X2
A1C321	290–1267–00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	62643	CEEFM1H561M7
A1C340	285–1380–00			CAP,FXD,PLASTIC:2.2UF,400V,4A @ 100KHZ	TK1913	MKC4 2.2/400/20
A1C350	285–1187–00			CAP,FXD,MTLZD:0.47 UF,10%,100 V	05292	PMT 3R .47K 100
A1C360	290–1319–00			CAP,FXD,ALUM:4.7UF,20%,50V,ESR=2.2 OHM (100KHZ,20C),5X11MM,105C,LOW IMP,RADIAL	55680	UPL1H4R7MDH1TD
A1C361	290–1311–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=1.4 OHM (100KHZ,20C),5X11MM,105C,5000HRS,RADIAL	55680	UPL1H100MDH1TD
A1C400	290–1302–00			CAP,FXD,ALUM:1000UF,20%,35V,12.5 X 30MM (0.492 X 1.180),RADIAL,LOWIMP,1.95A RIPPLE	62643	CEEFM1V102M7
A1C410	290–1309–00			CAP,FXD,AL:100UF,20%,63V,10 X 20MM, RADIAL,105 DEG,L0W Z,T&A	55680	UPL1J101MPH1TD
A1C411	290–1309–00			CAP,FXD,AL:100UF,20%,63V,10 X 20MM, RADIAL,105 DEG,L0W Z,T&A	55680	UPL1J101MPH1TD
A1C412	290–1221–00			CAP,FXD,ELCTLT:100UF,20%100V,AL,LOW IMP	62643	KMF100VB101M12X2
A1C420	290–1267–00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	62643	CEEFM1H561M7
A1C421	290–1267–00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	62643	CEEFM1H561M7
A1C461	285–1420–00			CAP,FXD,PLASTIC:FILM&FOIL,4700PF,63V,5%,POLY	TK1913	FKP2 4700/63/5

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A1C462	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A1C463	281–0823–00			CAP,FXD,CER DI:470PF,10%,50V TUBULAR,MI	04222	SA101A471KAA
A1C540	290–1314–00			CAP,FXD,ALUM:330UF,20%,63V,ESR=0.049 OHM(100KHZ,20C),12.5X25MM,105C,LOW IMP	55680	UPL1J331MHH
A1C560	290–1311–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=1.4 OHM(100KHZ,20C),5X11MM,105C,5000HRS,RADIAL	55680	UPL1H100MDH1TD
A1C561	290–1311–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=1.4 OHM(100KHZ,20C),5X11MM,105C,5000HRS,RADIAL	55680	UPL1H100MDH1TD
A1C576	283–0189–00			CAP,FXD,CER DI:0.1UF,20%,400V SQUARE	04222	SR508C104MAA
A1CR140	152–0897–00			DIODE,RECT:FAST RCVRY,1000V,1.5A,300NS,SOFT RCVRY,BYV96E,T&R	0LUA3	BYV96E
A1CR141	152–0897–00			DIODE,RECT:FAST RCVRY,1000V,1.5A,300NS,SOFT RCVRY,BYV96E,T&R	0LUA3	BYV96E
A1CR149	152–0897–00			DIODE,RECT:FAST RCVRY,1000V,1.5A,300NS,SOFT RCVRY,BYV96E,T&R	0LUA3	BYV96E
A1CR230	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35,T&R	01295	1N4152R
A1CR310	152–0720–00			DIODE,RECT:ULTRA FAST,200V,8A,25NS,100A IFSM,BYW29E–200,TO–220	0LUA3	BYW29–200
				MOUNTING PARTS		
	211–0008–00			SCREW,MACHINE:4–40 X 0.25,PNH,STL CD PL,POZ	93907	ORDER BY DESCRIPTION
	214–4197–00			HEAT SINK,SEMIC:TRANSISTOR,TO–218,VERTICAL MOUNT,(2)SOLDERABLE PINS,1.375" H CUT EXTRUSION,ALUMI	13103	6298B MODIFIED
	210–0406–00			NUT,PLAIN,HEX:4–40 X 0.188,BRS CD PL	73743	12161–50
				END MOUNTING PARTS		
A1CR320	152–0720–00			DIODE,RECT:ULTRA FAST,200V,8A,25NS,100A IFSM,BYW29E–200,TO–220	0LUA3	BYW29–200
				MOUNTING PARTS		
	211–0008–00			SCREW,MACHINE:4–40 X 0.25,PNH,STL CD PL,POZ	93907	ORDER BY DESCRIPTION
	214–4075–00			HEAT SINK,SEMIC:TRANSISTOR,TO–220,VERTICAL MOUNT,(2)SOLDERABLE TABS,ALUMINUM,BLACK ANODIZE,6022P	13103	6022PB
	210–0406–00			NUT,PLAIN,HEX:4–40 X 0.188,BRS CD PL	73743	12161–50
				END MOUNTING PARTS		
A1CR321	152–0863–00			DIODE,RECT:ULTRA FAST,600V,1A,30NS,SOFT RECOVERY,BYV26V	0LUA3	BYV26C
A1CR350	152–1085–00			DIODE,RECT:ULTRA FAST,1000V,1A,30A IFSM,75NS SOFT RECOVERY,BYV26E,SOD–57	0LUA3	BYV26E
A1CR351	152–0400–00			DIODE,RECT:FAST RCVRY,400V,1A,200NS,1N4936,DO–41	04713	1N4936RL
A1CR352	152–0400–00			DIODE,RECT:FAST RCVRY,400V,1A,200NS,1N4936,DO–41	04713	1N4936RL

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A1CR353	152–0400–00			DIODE,RECT:FAST RCVRY,400V,1A,200NS,1N4936,DO–41	04713	1N4936RL
A1CR354	152–0400–00			DIODE,RECT:FAST RCVRY,400V,1A,200NS,1N4936,DO–41	04713	1N4936RL
A1CR362	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A1CR364	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A1CR370	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A1CR460	152–0400–00			DIODE,RECT:FAST RCVRY,400V,1A,200NS,1N4936,DO–41	04713	1N4936RL
A1CR520	152–0400–00			DIODE,RECT:FAST RCVRY,400V,1A,200NS,1N4936,DO–41	04713	1N4936RL
A1CR521	152–0720–00			DIODE,RECT:ULTRA FAST,200V,8A,25NS,100A IFSM,BYW29E–200,TO–220	0LUA3	BYW29–200
A1CR540	152–0400–00			DIODE,RECT:FAST RCVRY,400V,1A,200NS,1N4936,DO–41	04713	1N4936RL
A1CR550	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35,	01295	1N4152R
A1DS470	150–1036–00			DIODE,OPTO:LED,RED,640NM,2.5MCD AT 20MA,MV5074C.L1617,T–1	01295	TIL 209A
A1J120	174–1168–00			CA ASSY,SP:RIBBON,IDC,10,28AWG,4.25L,2X10,0.1 PCB,X 2X10,0.1,CTRPLZ,RCPT,SAME SIDE	23633	174–1168–00
A1J121	131–4794–00			CONN,HDR:PCB,MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB,W/BD RET	53387	2402–6112 UB
A1J122	131–4794–00			CONN,HDR:PCB,MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB,W/BD RET	53387	2402–6112 UB
A1J440	131–4794–00			CONN,HDR:PCB,MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB,W/BD RET	53387	2402–6112 UB
A1J600	131–3277–00			CONN,HDR:PCB,MALE,STR,2 X 30,0.1 CTR,0.365 H X 0.105 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD,	22526	66506–057
A1L110	108–1412–00			INDUCTOR,FXD:POWER,4.7UH,20%,I<3.7A,RDC<0.017 OHM,Q>10,SRF>30MHZ,BOBBIN,TSL0809RA–4R7,LS 0.30	TK2058	TSL0807–4R7M3R0
A1L140	108–1267–00			COIL,RF:FXD 1 MH, +/– 10%, DCR 4 OHM MAX, POT CORE, POTTED, PCMOUNT, CORE 84–99	24226	108–1267–00
A1L240	108–1459–00			INDUCTOR,FXD:POWER,10UH,10%,IDC<2A, RDC<0.0073 OHM,TOROID CORE,VERTMOUNT W/HOLDER	0JR03	108–1459–00
A1L320	108–1411–00			INDUCTOR,FXD:POWER,47UH,10%,IDC<0.96 A,RDC<0.17 OHM,Q>20,SRF>7.6 MHZ,BOBBIN,TSL0707–470K,RADI	TK2058	TSL0707–470KR94
A1L370	108–0422–00			INDUCTOR,FXD:CUSTOM,POWER,80UH,20%,IDC<2 A,RDC<0.15 OHM,Q>30@40KHZ,AXIAL	0JR03	108–0422–00

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A1L420	108–1520–00			INDUCTOR,FXD:POWER,47UH,10%,I<1.5A,RDC<0.056 OHM,Q>20,SRF>5.8MHZ,FERRITE BOBBIN,TSL112RA–470K	TK2058	TSL1110–470K1R5
A1L420	108–1520–00			INDUCTOR,FXD:POWER,47UH,10%,I<1.5A,RDC<0.056 OHM,Q>20,SRF>5.8MHZ,FERRITE BOBBIN,TSL112RA–470K	TK2058	TSL1110–470K1R5
				ATTACHED PARTS		
	276–0603–00			CORE,EM:TOROID,POWDERED IRON,U0=160 (NOM),OD=0.515,ID0.275,WID=0.202	0JR03	276–0603–00
				END ATTACHED PARTS		
A1L421	108–1411–00			INDUCTOR,FXD:POWER,47UH,10%,IDC<0.96 A,RDC<0.17 OHM,Q>20,SRF>7.6 MHZ,BOBBIN,TSL0707–470K,RADI	TK2058	TSL0707–470KR94
A1L421	108–1411–00			INDUCTOR,FXD:POWER,47UH,10%,IDC<0.96 A,RDC<0.17 OHM,Q>20,SRF>7.6 MHZ,BOBBIN,TSL0707–470K,RADI	TK2058	TSL0707–470KR94
				ATTACHED PARTS		
	276–0603–00			CORE,EM:TOROID,POWDERED IRON,U0=160 (NOM),OD=0.515,ID0.275,WID=0.202	0JR03	276–0603–00
				END ATTACHED PARTS		
A1L510	108–1411–00			INDUCTOR,FXD:POWER,47UH,10%,IDC<0.96 A,RDC<0.17 OHM,Q>20,SRF>7.6 MHZ,BOBBIN,TSL0707–470K,RADI	TK2058	TSL0707–470KR94
A1L520	108–1520–00			INDUCTOR,FXD:POWER,47UH,10%,I<1.5A,RDC<0.056 OHM,Q>20,SRF>5.8MHZ,FERRITE BOBBIN,TSL112RA–470K	TK2058	TSL1110–470K1R5
A1P440	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER	00779	530153–2
A1Q130	151–0216–04			TRANSISTOR,SIG:BIPOLAR,PNP,25V,100MA,170MHZ, AMPLIFIER,MPS6523,TO–92 EBC	04713	MPS6523RLRA
A1Q131	151–0195–00			TRANSISTOR,SIG:BIPOLAR,NPN,20V,100MA,150MHZ, AMPLIFIER,2N5223/MPS6521,TO–92 EBC	04713	2N5223
A1Q220	151–0528–00			THYRISTOR,PWR:BIPOLAR,SCR,50V,16A RMS, PHASE CONTROL,2N6400,TO–220	04713	2N6400
A1Q250	151–0870–00			TRANSISTOR,PWR:BIPOLAR,NPN,450V VCEO,850V VCBO,15A,SWITCHING,BUF410/BUF410A,TO–218	04713	MJF16010A
				MOUNTING PARTS		
	211–0008–00			SCREW,MACHINE:4–40 X 0.25,PNH,STL CD PL,POZ	93907	ORDER BY DESCRIPTION
	214–4197–00			HEAT SINK,SEMIC:TRANS,TO–218,VERT MOUNT,1.375" H CUT EXTRUSION,ALUM	13103	6298B MODIFIED
	210–0478–00			SPACER,POST:0.66 L W/6–32 THD THRU,AL, HEX ONE END,ROUND OTHER	0J260	ORDER BY DESCRIPTION
				END MOUNTING PARTS		
A1Q350	151–0482–00			TRANSISTOR,PWR:BIPOLAR,PNP,100V,3.0A,3.0MHZ, AMPLIFIER,TIP32C,TO–220	04713	TIP32C

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A1Q360	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A1Q450	151–0476–00			TRANSISTOR,PWR:BIPOLAR,NPN,100V,3.0A,3.0MHZ, AMPLIFIER,TIP31C,TO–220	04713	TIP31C
				MOUNTING PARTS		
	211–0097–00			SCREW,MACHINE:4–40 X 0.312,PNH,STL CD PL,POZ (MUST BE DECORATIVE)	93907	ORDER BY DESCRIPTION
	210–1178–00			WASHER,SHLDR:TRANSISTOR,TO–220,0.2"ODX0.116	13103	7721–7PPS
	214–4197–00			HEAT SINK,SEMIC:TRANS,TO–218,VERT MNT,1.375" H CUT EXTRUSION,ALUM	13103	6298B MODIFIED
	342–0355–00			INSULATOR,PLATE:TRANSISTOR,SILICONE RUBBER	55285	7403–09FR–51
	210–0406–00			NUT,PLAIN,HEX:4–40 X 0.188,BRS CD PL	73743	12161–50
				END MOUNTING PARTS		
A1Q451	151–0476–00			TRANSISTOR,PWR:BIPOLAR,NPN,100V,3.0A,3.0MHZ, AMPLIFIER,TIP31C,TO–220	04713	TIP31C
A1Q460	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A1Q470	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A1Q471	151–0750–00			TRANSISTOR,SIG:BIPOLAR,NPN,400V,300MA,20MHZ, AMPLIFIER,MPSA44,TO–92 EBC	50891	TO BE ASSIGNED
A1Q472	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A1Q550	151–0710–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,1.0A,50MHZ, AMPLIFIER,2N6715/MPSW01A,TO–237/TO–226AE	04713	MPS6715
A1Q560	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A1R129	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A1R130	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A1R131	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A1R132	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A1R133	322–3322–00			RES,FXD:METAL FILM,22.1K OHM,1%,0.2W	57668	CRB20 FXE 22K1
A1R134	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A1R135	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A1R140	308–0218–00			RES,FXD,WW:150 OHM,5%,3W AXIAL LEADS	91637	CW–2B–60–1500JTR
A1R149	308–0077–00			RES,FXD,WW:1K OHM,5%,3W	05347	CS4–1001J
A1R150	308–0679–00			RES,FXD:0.51 OHM,5%,2W AXIAL LEAD	91637	CPF–2–0R51JT1
A1R151	322–3228–00			RES,FXD,FILM:2.32K OHM,1%,0.2W	57668	CRB20 FXE 2K32
A1R219	311–2238–00			RES,VAR,TRMR:CERMET,50K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST,T&R	TK2073	GF06UT2 503 M L20
A1R220	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A1R221	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A1R223	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A1R224	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A1R230	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W	91637	CCF50–6191F–R36
A1R232	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A1R233	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A1R260	322–3350–00			RES,FXD,FILM:43.2K OHM,1%,0.2W	91637	CCF50–4322F–R36
A1R270	315–0474–00			RES,FXD,FILM:470K OHM,5%,0.25W	50139	CB4745
A1R271	315–0474–00			RES,FXD,FILM:470K OHM,5%,0.25W	50139	CB4745
A1R350	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A1R355	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A1R360	322–3314–00			RES,FXD:METAL FILM,18.2K OHM,1%,0.2W	57668	CRB20 FXE 18K2
A1R361	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W	57668	CRB20T68EFX1502
A1R362	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W	57668	CRB20 FXE 30K1
A1R363	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A1R364	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W	57668	CRB20 FXE 30K1
A1R365	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A1R450	308–0677–00			RES,FXD,WW:1 OHM,5%,2W AXIAL LEAD	91637	CPF–2–1R0JT1
A1R452	322–3379–00			RES,FXD,FILM:86.6K OHM,1%,0.2W	91637	CCF50–8662F–R36
A1R460	301–0101–00			RES,FXD,FILM:100 OHM,5%,0.5W	19701	5053CX100RDJ
A1R461	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A1R462	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A1R463	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A1R464	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A1R465	322–3198–00			RES,FXD,FILM:1.13K OHM,1%,0.2W	57668	CRB20 FXE 1K13
A1R466	311–2232–00			RES,VAR,TRMR:CERMET,2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	30983	ORDER BY DESCRIPTION
A1R470	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A1R471	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A1R550	322–3130–00			RES,FXD,FILM:221 OHM,1%,0.2W	57668	CRB20T68EFX2210
A1R551	322–3350–00			RES,FXD,FILM:43.2K OHM,1%,0.2W	91637	CCF50–4322F–R36
A1R560	322–3284–00			RES,FXD,FILM:8.87K OHM,1%,0.2W	57668	CRB20 FXE 8K87
A1R561	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W	91637	CCF50–4321F–R36
A1R570	322–3381–00			RES,FXD,FILM:90.9K OHM,1%,0.2W	91637	CCF50–9092F–R36
A1R571	322–3439–00			RES,FXD,FILM:365K OHM,1%,0.2W	91637	CCF50–3653F–R36
A1R572	322–3439–00			RES,FXD,FILM:365K OHM,1%,0.2W	91637	CCF50–3653F–R36
A1R573	301–0105–01			RES,FXD,CMPSN:1M OHM,5%,0.5W	50139	EB1055
A1R574	301–0105–01			RES,FXD,CMPSN:1M OHM,5%,0.5W	50139	EB1055
A1R575	303–0154–00			RES,FXD,CMPSN:150K OHM,5%,1W	24546	FP1 150 K OHM 5 PERCENT

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A1S250	260–2485–00			SWITCH,THRMSTC:SPST,NC,OPEN 80.0 DEGREES C,CL 69.4 DEGREES C,15A,120VAC	14604	2450–400–8
A1T130	120–1532–00			TRANSFORMER,RF:TOROID,ISOLATION,RATIO 1:1,IND 100–300 UH, DCR 1.5 OHM POTTED, PKG 0.8 X 0.65,0.	24226	51–446
A1T430	120–1764–00			TRANSFORMER,PWR:SWITCHING, 40.0KHZ,PRI 200V, SEC 5V 5A,+/–15V 3A,8V 2A 60V .5A,HSEKEEPING 17V	0JR03	128–8020–00
A1TP150	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A1TP239	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A1TP400	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A1TP410	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A1TP460	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A1TP470	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A1TP560	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A1U120	156–0067–00			IC,LINEAR:BIPOLAR,OP–AMP,741C,DIP08.3	01295	UA741CP
A1U131	156–1631–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, SHUNT,ADJUSTABLE,100MA,TL431CLP,TO–92	01295	TL431CLP
A1U230	156–0885–00			IC, OPTOCOUPLER:7.5KV ISOL, VCEO 70V, I COLL 100MA, HFE 400, 6 PIN DIP	04713	SOC 123A
A1U360	156–1126–00			IC,LINEAR:BIPOLAR,COMPARATOR,OPEN COLLECTOR,200NS,LM311N,DIP08.3	01295	LM311P
A1U460	156–2524–00			IC,LINEAR:BIPOLAR,SW–REGULATOR CONTROLLER, PWM, CURRENT MODE,SINGLE TOTEM POLE OUTPUT,UC3842	48726	UC3842N
A1VR220	152–0195–00			DIODE,ZENER:5.1V,5%,0.5W,5.0MA IZT,1N5993B/BZX55C5V1,DO–35,T&R	04713	SZ11755RL
A1VR230	152–0688–00			DIODE,ZENER:2.4V,5%,0.4W,1N4370A,DO–7 OR DO–35	04713	1N4370A
A1VR350	152–0395–00			DIODE,ZENER:4.3V,5%,0.4W,1N749A,DO–7 OR DO–35	04713	1N749ARL
A1VR570	152–0304–00			DIODE,ZENER:20V,5%,0.4W,1N968B,DO–7 OR DO–35	04713	1N968BRL
A1W400	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A1W401	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A1W510	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A1W511	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A1W512	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A1W520	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A1W540	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2	671–0467–18		B030472	CIRCUIT BD ASSY:WAVEFORM MONITOR,NTSC	80009	671–0467–18
A2	671–0467–19	B030473		CIRCUIT BD ASSY:WAVEFORM MONITOR,NTSC (1780R ONLY)	80009	671–0467–19
A2	671–0988–18		B030472	CIRCUIT BD ASSY:WAVEFORM MONITOR,PAL	80009	671–0988–18
A2	671–0988–19	B030473		CIRCUIT BD ASSY:WAVEFORM MONITOR,PAL (1781R ONLY)	80009	671–0988–19
				ATTACHED PARTS		
	337–0607–00			PLATE,ELEC SHLD:CIRCUIT BOARD 661 (QUANTITY 3)	0J260	337–0607–00
	337–0896–00			PLATE,ELEC SHLD:B SWEEP CKT BD 454 (QUANTITY 4)	0J260	ORDER BY DESCRIPTION
	337–1197–00			SHIELD,ELEC:ATTEN CKT BD 3A9 (QUANTITY 2)	80009	337–1197–00
	337–2804–00			SHIELD,ELEC:CIRCUIT BOARD (QUANTITY 2)	TK1947	337–2804–00
				END ATTACHED PARTS		
A2C160	290–0944–00			CAP,FXD,ALUM:220UF,+50–20%,10V,RADIAL	62643	CEUSM1A221
A2C196	281–0910–00			CAP,FXD,CER DI:1800PF,1%,50V	04222	MA205A182FAA
A2C198	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A2C212	281–0820–00			CAP,FXD,CERAMIC:MLC,680 PF,10%,50V	04222	SA101C681KAA
A2C248	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A2C250	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C252	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C267	281–0788–00			CAP,FXD,CERAMIC:MLC,470PF,10%,100V	04222	SA102C471KAA
A2C285	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA
A2C287	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C290	281–0272–01			CAP,FXD,CERAMIS:MLC,0.1UF,10%,50V	04222	SA115C104KAA
A2C303	281–0861–00			CAP,FXD,CER DI:270PF,5%,50V TUBULAR	04222	SA101A271JAA
A2C318	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA
A2C320	283–0051–00			CAP,FXD,CER DI:0.0033UF,5%,100V SQUARE	04222	SR211A332JAA
A2C352	281–0538–00			CAP,FXD,CERAMIC:MLC,1PF,20%,500V,O.170 X 0.220	04222	MA107A1ROCAA
A2C359	283–0194–00			CAP,FXD,CER DI:4.7UF,20%,50V SQUARE	04222	SR505E475MAA
A2C368	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C380	281–0925–01			CAP,FXD,CERAMIC:MLC,0.22UF,20%,50V	04222	SA115E224MAA
A2C381	290–0530–00			CAP,FXD,TANT:68UF,20%,6V,RADIAL	2N936	199D686X06R3DA1
A2C390	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A2C394	281–0861–00			CAP,FXD,CER DI:270PF,5%,50V TUBULAR	04222	SA101A271JAA
A2C410	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C411	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C412	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2C414	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C415	281–0786–00			CAP,FXD,CERAMIC:MLC,150PF,10%,100V	04222	SA101A151KAA
A2C418	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A2C422	281–0253–00			CAP,VAR,PLASTIC:10–180PF,100V	52769	GZC 18100
A2C423	281–0788–00			CAP,FXD,CERAMIC:MLC,470PF,10%,100V	04222	SA102C471KAA
A2C429	281–0761–00			CAP,FXD,CERAMIC:MLC,27PF,5%,100V	04222	SA102A270JAA
A2C435	281–0783–00			CAP,FXD,CERAMIC:MLC,0.1 UF 20%,100V	12969	CGD104MEZ
A2C457	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C469	281–0764–00			CAP,FXD,CER DI:82PF,5%,100V TUBULAR	04222	SA102A820JAA
A2C474	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C477	281–0757–00			CAP,FXD,CERAMIC:MLC,10PF,10%,200V	04222	SA102A100KAA
A2C478	281–0910–00			CAP,FXD,CER DI:1800PF,1%,50V	04222	MA205A182FAA
A2C482	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C485	285–1067–00			CAP,FXD,PLASTIC:0.5UF,1%,200V	14752	230B1C504F
A2C495	281–0861–00			CAP,FXD,CER DI:270PF,5%,50V TUBULAR	04222	SA101A271JAA
A2C496	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA
A2C522	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C523	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C527	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A2C533	281–0777–00			CAP,FXD,CERAMIC:MLC,51PF,5%,200V	04222	SA102A510JAA
A2C549	281–0756–00			CAP,FXD,CERAMIC:MLC,2.2PF,+/–0.5PF,200V	04222	SA102A2R2DAA
A2C557	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C571	281–0756–00			CAP,FXD,CERAMIC:MLC,2.2PF,+/–0.5PF,200V	04222	SA102A2R2DAA
A2C572	281–0777–00			CAP,FXD,CERAMIC:MLC,51PF,5%,200V	04222	SA102A510JAA
A2C575	281–0777–00			CAP,FXD,CERAMIC:MLC,51PF,5%,200V	04222	SA102A510JAA
A2C576	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A2C580	281–0772–00			CAP,FXD,CERAMIC:MLC,4700PF,10%,100V	04222	SA101C472KAA
A2C586	290–0808–00			CAP,FXD,TANT:DRY,2.7UF,10%,20V,TANT OXIDE	2N936	173D275X9020V
A2C587	285–1224–00			CAP,FXD,PLASTIC:0.0033UF,1%,200V	14752	A910D1C332F
A2C593	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA
A2C609	281–0767–00			CAP,FXD,CERAMIC:MLC,330PF,20%,100V	04222	SA102C331MAA
A2C610	281–0895–00			CAP,FXD,CER DI:6.8PF,100VDC TUBULAR	04222	SA102A6R8DAA
A2C611	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A2C614	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C620	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C630	281–0761–00			CAP,FXD,CERAMIC:MLC,27PF,5%,100V	04222	SA102A270JAA
A2C634	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C649	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2C651	283–0189–00			CAP,FXD,CER DI:0.1UF,20%,400V SQUARE	04222	SR508C104MAA
A2C660	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A2C661	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C670	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C675	281–0777–00			CAP,FXD,CERAMIC:MLC,51PF,5%,200V	04222	SA102A510JAA
A2C690	281–0777–00			CAP,FXD,CERAMIC:MLC,51PF,5%,200V	04222	SA102A510JAA
A2C693	281–0909–00			CAP,FXD,CERAMIC:MLC,0.022UF,20%,50V	04222	SA105C223MAA
A2C707	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C708	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C710	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C711	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C713	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C725	281–0537–00			CAP,FXD,CERAMIC:MLC,0.68PF,20%,500	04222	TBA
A2C758	290–0808–00			CAP,FXD,TANT:DRY,2.7UF,10%,20V,TANT OXIDE	2N936	173D275X9020V
A2C765	281–0767–00			CAP,FXD,CERAMIC:MLC,330PF,20%,100V	04222	SA102C331MAA
A2C767	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA
A2C771	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C786	281–0861–00			CAP,FXD,CER DI:270PF,5%,50V TUBULAR	04222	SA101A271JAA
A2C793	281–0910–00			CAP,FXD,CER DI:1800PF,1%,50V	04222	MA205A182FAA
A2C795	281–0861–00			CAP,FXD,CER DI:270PF,5%,50V TUBULAR	04222	SA101A271JAA
A2C808	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C810	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C812	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C817	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C825	281–0809–00			CAP,FXD,CERAMIC:MLC,200 PF,5%,100V	04222	SA101A201JAA
A2C826	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C829	281–0819–00			CAP,FXD,CERAMIC:MLC,33 PF,5%,50V (1780R ONLY)	04222	SA102A330JAA
A2C829	281–0797–00			CAP,FXD,CERAMIC:MLC,15PF,5%,100V,SAFETY (1781R ONLY)	12969	CGB150KFN
A2C830	281–0797–00			CAP,FXD,CERAMIC:MLC,15PF,5%,100V,SAFETY (1780R ONLY)	12969	CGB150KFN
A2C830	281–0757–00			CAP,FXD,CERAMIC:MLC,10PF,10%,200V (1781R ONLY)	04222	SA102A100KAA
A2C831	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A2C832	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C835	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A2C836	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C837	281–0757–00			CAP,FXD,CERAMIC:MLC,10PF,10%,200V	04222	SA102A100KAA
A2C838	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2C842	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C844	281–0791–00			CAP,FXD,CERAMIC:MLC,270PF,10%,100V	04222	SA102C271KAA
A2C845	281–0777–00			CAP,FXD,CERAMIC:MLC,51PF,5%,200V	04222	SA102A510JAA
A2C848	283–0636–01			CAP,FXDCA DI:36PF,1.%,500V (1780R ONLY)	09023	CDA15ED360G03
A2C848	283–0779–00			CAP,FXDCA DI:27 PF,2%,500V (1781R ONLY)	09023	CD15ED270G03
A2C852	283–0629–01			CAP,FXDCA DI:62PF,1%,500V	09023	CDA10ED620F03
A2C855	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA
A2C858	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C861	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA
A2C865	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C870	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA
A2C875	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C906	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C907	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C908	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C913	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C918	281–0756–00			CAP,FXD,CERAMIC:MLC,2.2PF,+/–0.5PF,200V	04222	SA102A2R2DAA
A2C922	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C929	290–0183–00			CAP,FXD,TANT:DRY,1UF,10%,35V,TANT OXIDE	12954	AT513A105K035N
A2C930	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A2C931	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A2C932	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C934	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C936	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C941	283–0672–00			CAP,FXDCA DI:200PF,1%,500V	09023	CD15FD201F03
A2C945	281–0864–00			CAP,FXD,CERAMIC:MLC,430PF,5%,100V	04222	SA101A431JAA
A2C946	281–0863–00			CAP,FXD,CERAMIC:MLC,240PF,5%,100V	04222	SA101A241JAA
A2C947	283–0672–00			CAP,FXDCA DI:200PF,1%,500V	09023	CD15FD201F03
A2C948	283–0766–00			CAP,FXDCA DI:47 PF,1%,500V	09023	CD15ED470D03
A2C950	281–0809–00			CAP,FXD,CERAMIC:MLC,200 PF,5%,100V	04222	SA101A201JAA
A2C951	283–0770–00			CAP,FXDCA DI:300 PF,1%,500V	09023	CD15FD301F03
A2C966	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C967	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA
A2C969	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A2C991	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A2C1003	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1010	281–0864–00			CAP,FXD,CERAMIC:MLC,430PF,5%,100V	04222	SA101A431JAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2C1011	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V TUBULAR	04222	SA102A101JAA
A2C1016	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1019	281–0823–00			CAP,FXD,CER DI:470PF,10%,50V TUBULAR	04222	SA101A471KAA
A2C1024	281–0763–00			CAP,FXD,CERAMIC:MLC,47PF,10%,100V	04222	SA102A470KAA
A2C1028	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA
A2C1029	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1036	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1040	281–0763–00			CAP,FXD,CERAMIC:MLC,47PF,10%,100V	04222	SA102A470KAA
A2C1041	283–0646–00			CAP,FXDCA DI:170PF,1%,500V,.380H X .460L,RADIAL	09023	CD15FD171F03
A2C1042	283–0725–00			CAP,FXDCA DI:214PF,1%,500V	09023	CD15FD(214)F03
A2C1046	283–0780–00			CAP,FXDCA DI:125PF,1%,500V	09023	CD15FD(125)F03
A2C1047	283–0598–00			CAP,FXDCA DI:253PF,5%,500V	09023	CD15FD(253)J03
A2C1058	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A2C1060	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1066	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1067	283–0625–01			CAP,FXDCA DI:220PF,1%,500V (1780R ONLY)	09023	CDA10FD221F03
A2C1067	283–0644–01			CAP,FXDCA DI:150PF,1%,500V (1781R ONLY)	TK0891	ADVISE
A2C1070	283–0100–00			CAP,FXD,CER DI:0.0047UF,10%,200V SQUARE	04222	SR302A472KAA
A2C1071	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A2C1072	281–0302–00			CAP,VAR,PLASTIC:1.2–4PF,100V	52769	GXL4R000
A2C1075	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1079	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1086	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A2C1090	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A2C1091	283–0788–00			CAP,FXDCA DI:267PF,1%,500V	09023	CD15FD(267)F03
A2C1093	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1094	283–0597–00			CAP,FXDCA DI:470PF,10%,300V	09023	CD15FD471K03
A2C1113	281–0759–00			CAP,FXD,CERAMIC:MLC,22PF,10%,100V	04222	SA102A220KAA
A2C1116	281–0757–00			CAP,FXD,CERAMIC:MLC,10PF,10%,200V	04222	SA102A100KAA
A2C1117	281–0809–00			CAP,FXD,CERAMIC:MLC,200 PF,5%,100V	04222	SA101A201JAA
A2C1118	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1131	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A2C1134	281–0772–00			CAP,FXD,CERAMIC:MLC,4700PF,10%,100V	04222	SA101C472KAA
A2C1141	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1145	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A2C1146	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A2C1150	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2C1160	281–0759–00			CAP,FXD,CERAMIC:MLC,22PF,10%,100V	04222	SA102A220KAA
A2C1171	281–0767–00			CAP,FXD,CERAMIC:MLC,330PF,20%,100V	04222	SA102C331MAA
A2C1179	281–0863–00			CAP,FXD,CERAMIC:MLC,240PF,5%,100V	04222	SA101A241JAA
A2C1194	281–0302–00			CAP,VAR,PLASTIC:1.2–4PF,100V	52769	GXL4R000
A2C1195	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1211	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V TUBULAR	04222	SA102A101JAA
A2C1212	281–0823–00			CAP,FXD,CER DI:470PF,10%,50V TUBULAR	04222	SA101A471KAA
A2C1213	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1216	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A2C1220	283–0622–00			CAP,FXDCA DI:450PF,1%,300V	09023	CD15FD451F03
A2C1221	283–0636–01			CAP,FXDCA DI:36PF,1.%,500V (1780R ONLY)	09023	CDA15ED360G03
A2C1221	281–0643–00			CAP,FXD,CER DI:30PF,10%,500V (1781R ONLY)	80009	281–0643–00
A2C1222	281–0182–00			CAP,VAR,PLASTIC:1.8–10PF,300V TOP/BOT ADJ	52769	GXE10001
A2C1232	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A2C1247	283–0647–00			CAP,FXDCA DI:70PF,1%,100V	09023	CD15ED700F03
A2C1251	283–0631–00			CAP,FXDCA DI:95PF,1%,500V	09023	CD15FD950F03
A2C1252	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A2C1254	281–0815–00			CAP,FXD,CERAMIC:MLC,0.027UF,20%,50V	04222	SA205C273MAA
A2C1267	283–0642–01			CAP,FXDCA DI:33PF,2%,500V	09023	CDA10ED330G03
A2C1272	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A2C1276	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1281	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A2C1284	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1287	281–0772–00			CAP,FXD,CERAMIC:MLC,4700PF,10%,100V	04222	SA101C472KAA
A2C1288	281–0861–00			CAP,FXD,CER DI:270PF,5%,50V TUBULAR	04222	SA101A271JAA
A2C1291	281–0813–00			CAP,FXD,CERAMIC:MLC,0.047UF,20%,50V	04222	SA105E473MAA
A2C1312	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1313	281–0563–00			CAP,FXD,CERAMIC:MLC,0.47UF,20%,50V,0.150 X 0.290	04222	SA305E474MAA
A2C1329	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A2C1347	290–0848–00			CAP,FXD,ALUM:47UF,20%,16V	62643	CEBPM1E470M
A2C1351	283–0638–00			CAP,FXDCA DI:130PF,1%,500V (1780R ONLY)	09023	CD15FD131F03
A2C1351	283–0674–00			CAP,FXDCA DI:85PF,1%,500V (1781R ONLY)	09023	CD15FD850F03
A2C1364	281–0756–00			CAP,FXD,CERAMIC:MLC,2.2PF,+/–0.5PF,200V	04222	SA102A2R2DAA
A2C1365	283–0642–01			CAP,FXDCA DI:33PF,2%,500V	09023	CDA10ED330G03
A2C1366	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2C1370	283–0625–01			CAP,FXDCA DI:220PF,1%,500V (1780R ONLY)	09023	CDA10FD221F03
A2C1370	283–0644–01			CAP,FXDCA DI:150PF,1%,500V (1781R ONLY)	TK0891	ADVISE
A2C1374	283–0638–00			CAP,FXDCA DI:130PF,1%,500V	09023	CD15FD131F03
A2C1379	290–0848–00			CAP,FXD,ALUM:47UF,20%,16V	62643	CEBPM1E470M
A2C1380	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A2C1381	281–0925–01			CAP,FXD,CERAMIC:MLC,0.22UF,20%,50V	04222	SA115E224MAA
A2C1383	283–0785–00			CAP,FXDCA DI:250PF,1%,500V	09023	CD15FD251F03
A2C1386	283–0643–00			CAP,FXDCA DI:22PF,0.5%,500V	09023	CD10ED220D03
A2C1390	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A2C1391	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A2C1394	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A2C1395	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A2C1397	281–0909–00			CAP,FXD,CERAMIC:MLC,0.022UF,20%,50V	04222	SA105C223MAA
A2C1414	281–0797–00			CAP,FXD,CERAMIC:MLC,15PF,5%,100V,SAFETY	12969	CGB150KFN
A2C1415	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V TUBULAR	04222	SA102A101JAA
A2C1426	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1440	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1441	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1443	290–0183–00			CAP,FXD,TANT:DRY,1UF,10%,35V,TANT OXIDE	12954	AT513A105K035N
A2C1465	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A2C1467	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1473	283–0766–00			CAP,FXDCA DI:47 PF,1%,500V	09023	CD15ED470D03
A2C1477	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1480	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A2C1489	283–0203–00			CAP,FXD,CER DI:0.47UF,20%,50V SQUARE	04222	SR305C474MAA
A2C1490	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1497	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1517	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1536	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1550	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1553	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1554	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1555	285–1062–00			CAP,FXD,PLASTIC:0.005UF,1%,200V	19396	502F02PP460R–AE
A2C1560	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1561	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A2C1563	285–1062–00			CAP,FXD,PLASTIC:0.005UF,1%,200V	19396	502F02PP460R–AE
A2C1570	281–0777–00			CAP,FXD,CERAMIC:MLC,51PF,5%,200V	04222	SA102A510JAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2C1571	283–0633–00			CAP,FXDCA DI:77PF,1%,100V	09023	CD15ED770F03
A2C1575	283–0632–00			CAP,FXDCA DI:87PF,1%,500V	09023	CD15FD870F03
A2C1578	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A2C1582	290–0973–00			CAP,FXD,ALUM:100UF,20%,25VDC	55680	UVX1V101MPA
A2C1584	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A2C1591	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A2CR251	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR252	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR302	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR358	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR359	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR377	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR385	152–0246–00			DIODE,SIG:ULTRA FAST,40V,200MA,FDH300A,DO–7	12969	NDP0533
A2CR386	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR392	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR403	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR407	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR408	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR409	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR410	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR458	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR459	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR462	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR463	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR469	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR485	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR488	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR521	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR522	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR559	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR566	152–0307–00			DIODE,SIG:ULTRA FAST,DUAL,100V,4.0NS, 1.5PF,COM–CATHODE,MSD6100,TO–92	04713	MSD6100
A2CR573	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR577	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR579	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR581	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR582	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR590	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR592	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2CR625	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR651	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR658	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR659	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR667	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR672	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR673	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR675	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR721	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR722	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR735	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR736	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR738	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR743	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR751	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR775	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR777	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR778	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR795	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR824	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR828	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR840	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR912	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR913	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR914	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR915	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR928	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1010	152–1187–00			DIODE,SIG:VVC,30V,11PF AT 3V,2.1PF AT 25V,C3/C25=5.2,Q=300,IR=50NA,KV3201,DO–34	TK6168	KV3201
A2CR1011	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1022	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1031	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1040	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1060	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF, 2US,GP10G/1N5060	0LUA3	1N5060
A2CR1061	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF, 2US,GP10G/1N5060	0LUA3	1N5060
A2CR1111	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1141	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF, 2US,GP10G/1N5060	0LUA3	1N5060

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2CR1142	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF, 2US,GP10G/1N5060	0LUA3	1N5060
A2CR1150	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF, 2US,GP10G/1N5060	0LUA3	1N5060
A2CR1151	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF, 2US,GP10G/1N5060	0LUA3	1N5060
A2CR1154	152–0322–00			DIODE,SIG:SCHOTTKY,15V,0.41V VF AT 1.0MA,1.2P,5082–2811,HP "15"	21847	A2X600
A2CR1155	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1254	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1259	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1273	152–0322–00			DIODE,SIG:SCHOTTKY,15V,0.41V VF AT 1.0MA,1.2P,5082–2811,HP "15"	21847	A2X600
A2CR1288	152–0269–00			SEMICOND DVC,DI:VVC,SI,35V,33PF AT 4V,DO–7 1N5450 FAMILY	04713	PG1151
A2CR1304	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1312	152–0322–00			DIODE,SIG:SCHOTTKY,15V,0.41V VF AT 1.0MA,1.2P,5082–2811,HP "15"	21847	A2X600
A2CR1313	152–0322–00			DIODE,SIG:SCHOTTKY,15V,0.41V VF AT 1.0MA,1.2P,5082–2811,HP "15"	21847	A2X600
A2CR1357	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1358	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1360	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1365	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF, 2US,GP10G/1N5060	0LUA3	1N5060
A2CR1366	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF, 2US,GP10G/1N5060	0LUA3	1N5060
A2CR1405	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1430	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1433	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1435	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1444	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1445	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1525	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1526	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1530	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1534	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1540	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1544	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1545	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1588	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2CR1593	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2CR1597	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A2J1	131–0106–00			CONN,RF JACK:BNC,FEMALE,STR,SLDR CUP/FRONT PNL,0.472 MLG X 0.590 TAIL,0.328 L 0.375–32 THD,D	24931	28JR158–1
A2J2	131–0106–00			CONN,RF JACK:BNC,FEMALE,STR,SLDR CUP/FRONT PNL,0.472 MLG X 0.590 TAIL,0.328 L 0.375–32 THD,D	24931	28JR158–1
A2J9	131–0106–00			CONN,RF JACK:BNC,FEMALE,STR,SLDR CUP/FRONT PNL,0.472 MLG X 0.590 TAIL,0.328 L 0.375–32 THD,D	24931	28JR158–1
A2J130	174–1173–00			CA ASSY,SP:RIBBON,IDC,34,28AWG,2.0L,2X17,0.1,CTR PLZ,RCPT W/PULLTAB X 2X17,0.1 CTR,PCB	23633	174–1173–00
A2J147	174–1173–00			CA ASSY,SP:RIBBON,IDC,34,28AWG,2.0L,2X17,0.1,CTR PLZ,RCPT W/PULLTAB X 2X17,0.1 CTR,PCB	23633	174–1173–00
A2J192	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A2J585	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A2J694	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A2J828	131–4752–00			CONN,HDR::PCB,MALE,45 DEG,1 X 2,0.1 CTR,0.240 MLG X 0.110 TAIL,30 GOLD,	58050	082–0243–AS10
A2J858	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A2J865	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A2J866	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A2J867	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A2J870	131–4794–00			CONN,HDR:PCB,MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB,W/BD RET	53387	2402–6112 UB
A2J920	131–4752–00			CONN,HDR::PCB,MALE,45 DEG,1 X 2,0.1 CTR,0.240 MLG X 0.110 TAIL,30 GOLD,	58050	082–0243–AS10
A2J931	131–4752–00			CONN,HDR::PCB,MALE,45 DEG,1 X 2,0.1 CTR,0.240 MLG X 0.110 TAIL,30 GOLD,	58050	082–0243–AS10
A2J932	131–4752–00			CONN,HDR::PCB,MALE,45 DEG,1 X 2,0.1 CTR,0.240 MLG X 0.110 TAIL,30 GOLD,	58050	082–0243–AS10
A2J986	131–2970–00			CONN,HDR:PCB,MALE,STR,1 X 4,0.1 CTR,0.330 MLG X 0.120 TAIL,30 GOLD,0.040 DIA PTH,	22526	65516–104
A2J1081	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A2J1085	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A2J1103	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A2J1133	131–4752–00			CONN,HDR::PCB,MALE,45 DEG,1 X 2,0.1 CTR,0.240 MLG X 0.110 TAIL,30 GOLD,	58050	082–0243–AS10

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2J1203	131–4752–00			CONN,HDR::PCB,MALE,45 DEG,1 X 2,0.1 CTR,0.240 MLG X 0.110 TAIL,30 GOLD,	58050	082–0243–AS10
A2J1231	131–4752–00			CONN,HDR::PCB,MALE,45 DEG,1 X 2,0.1 CTR,0.240 MLG X 0.110 TAIL,30 GOLD,	58050	082–0243–AS10
A2J1322	131–4752–00			CONN,HDR::PCB,MALE,45 DEG,1 X 2,0.1 CTR,0.240 MLG X 0.110 TAIL,30 GOLD,	58050	082–0243–AS10
A2J1331	131–4794–00			CONN,HDR:PCB,MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB,W/BD RET	53387	2402–6112 UB
A2J1406	131–3718–00			CONN,HDR:PCB,MALE,STR,2 X 5,0.1 CTR,0.385 H X 0.120 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD,0.	53387	2510–6002UB
A2J1446	131–4752–00			CONN,HDR::PCB,MALE,45 DEG,1 X 2,0.1 CTR,0.240 MLG X 0.110 TAIL,30 GOLD,	58050	082–0243–AS10
A2J1483	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A2L157	108–0245–00			INDUCTOR,FXD:CUSTOM,POWER,3.9UH,10%,IDC<800 MA,RDC<0.264 OHM,Q>35@7.9MHZ,SRF>61MHZ	0JR03	108–0245–00
A2L339	108–0395–00			INDUCTOR,FXD:SIGNAL,64UH,TOROID FORM 276–0557–00,	0JR03	108–0395–00
A2L427	108–0538–00			INDUCTOR,FXD:CUSTOM,POWER,2.7UH,10%,IDC<1 A,RDC<0.168 OHM,Q>34@7.9MHZ,SRF>74MHZ	0JR03	108–0538–00
A2L437	108–0538–00			INDUCTOR,FXD:CUSTOM,POWER,2.7UH,10%,IDC<1 A,RDC<0.168 OHM,Q>34@7.9MHZ,SRF>74MHZ	0JR03	108–0538–00
A2L519	108–0538–00			INDUCTOR,FXD:CUSTOM,POWER,2.7UH,10%,IDC<1 A,RDC<0.168 OHM,Q>34@7.9MHZ,SRF>74MHZ	0JR03	108–0538–00
A2L615	108–0683–00			INDUCTOR,FXD:CUSTOM,SIGNAL,900NH,2%Q>52@25 MHZ,ON FORM 276–0153–00,29T W/37 AWG	0JR03	108–0683–00
A2L626	108–0538–00			INDUCTOR,FXD:CUSTOM,POWER,2.7UH,10%,IDC<1 A,RDC<0.168 OHM,Q>34@7.9MHZ,SRF>74MHZ	0JR03	108–0538–00
A2L638	108–0538–00			INDUCTOR,FXD:CUSTOM,POWER,2.7UH,10%,IDC<1 A,RDC<0.168 OHM,Q>34@7.9MHZ,SRF>74MHZ	0JR03	108–0538–00
A2L731	108–1268–00			INDUCTOR,FXD:SIGNAL,56UH,10%,IDC<100 MA,RDC<5.7 OHM,Q>45@2.5MHZ,SRF>18 MHZ	24226	10M562K
A2L758	108–0245–00			INDUCTOR,FXD:CUSTOM,POWER,3.9UH,10%,IDC<800 MA,RDC<0.264 OHM,Q>35@7.9MHZ,SRF>61MHZ	0JR03	108–0245–00
A2L831	108–1268–00			INDUCTOR,FXD:SIGNAL,56UH,10%,IDC<100 MA,RDC<5.7 OHM,Q>45@2.5MHZ,SRF>18 MHZ	24226	10M562K
A2L947	114–0310–00			INDUCTOR,VAR:CUSTOM,26–82UH,ON FORM 276–0231–00,68.5T W/43 AWG,VERT MOUNT	0JR03	114–0310–00
A2L951	114–0310–00			INDUCTOR,VAR:CUSTOM,26–82UH,ON FORM 276–0231–00,68.5T W/43 AWG,VERT MOUNT	0JR03	114–0310–00
A2L1066	108–1212–00			INDUCTOR,FXD:CUSTOM,SIGNAL,9UH,2%,IDC<300 MA,RDC<1.6 OHM,Q>60@4MHZ,SRF>50 MHZ	0JR03	108–1212–00
A2L1220	108–1268–00			INDUCTOR,FXD:SIGNAL,56UH,10%,IDC<100 MA,RDC<5.7 OHM,Q>45@2.5MHZ,SRF>18 MHZ	24226	10M562K

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2L1350	108–0317–00			INDUCTOR,FXD:CUSTOM,POWER,15UH,10%,IDC<460 MA,RDC<1.2 OHM,Q>55@2.5MHZ,SRF>30 MHZ,POWDERED IRO	0JR03	108–0317–00
A2L1374	108–1212–00			INDUCTOR,FXD:CUSTOM,SIGNAL,9UH,2%,IDC<300 MA,RDC<1.6 OHM,Q>60@4MHZ,SRF>50 MHZ	0JR03	108–1212–00
A2P192	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER,	00779	530153–2
A2P585	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER,	00779	530153–2
A2P694	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER,	00779	530153–2
A2P858	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER,	00779	530153–2
A2P865	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER,	00779	530153–2
A2P866	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER,	00779	530153–2
A2P867	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER,	00779	530153–2
A2P920	174–1498–00			CABLE ASSY,RF:50 OHM COAX,12.75 L	53387	ORDER BY DESCRIPTION
A2P931	174–1498–00			CABLE ASSY,RF:50 OHM COAX,12.75 L	53387	ORDER BY DESCRIPTION
A2P932	174–1498–00			CABLE ASSY,RF:50 OHM COAX,12.75 L	53387	ORDER BY DESCRIPTION
A2P986	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER,	00779	530153–2
A2P1081	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER,	00779	530153–2
A2P1085	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER,	00779	530153–2
A2P1103	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER,	00779	530153–2
A2P1483	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER,	00779	530153–2
A2Q267	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q282	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q310	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A2Q312	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A2Q321	151–0711–00			TRANSISTOR,SIG:BIPOLAR,NPN,25V,50MA, 650MHZ,AMPLIFIER,MPSH10,TO–92 BEC	04713	MPSH10

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2Q354	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q361	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q365	151–0207–00			TRANSISTOR,SIG:BIPOLAR,NPN,45V,300MA, 250MHZ,AMPLIFIER,PN100A,TO–92 EBC	07263	PN100A
A2Q385	151–0195–00			TRANSISTOR,SIG:BIPOLAR,NPN,20V,100MA, 150MHZ,AMPLIFIER,2N5223/MPS6521,TO–92 EBC	04713	2N5223
A2Q386	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q391	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q421	151–0711–00			TRANSISTOR,SIG:BIPOLAR,NPN,25V,50MA, 650MHZ,AMPLIFIER,MPSH10,TO–92 BEC	04713	MPSH10
A2Q423	151–0711–00			TRANSISTOR,SIG:BIPOLAR,NPN,25V,50MA, 650MHZ,AMPLIFIER,MPSH10,TO–92 BEC	04713	MPSH10
A2Q425	151–0719–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA, 600MHZ,AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A2Q427	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A2Q428	151–0719–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA, 600MHZ,AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A2Q433	151–0211–00			TRANSISTOR,SIG:BIPOLAR,NPN,30V VCEO,55V VCBO,400MA,500MHZ,AMPLIFIER,2N3866,TO–39	04713	2N3866
				ATTACHED PARTS		
	214–1291–00			HEAT SINK,SEMIC:TRANSISTOR/IC,TO–5/TO–39, RADIAL,PRESS–ON,0.72" DIA,SILVER–BEARING COPPER W/BLACK	05820	207SB
				END ATTACHED PARTS		
A2Q470	151–0207–00			TRANSISTOR,SIG:BIPOLAR,NPN,45V,300MA, 250MHZ,AMPLIFIER,PN100A,TO–92 EBC	07263	PN100A
A2Q472	151–0207–00			TRANSISTOR,SIG:BIPOLAR,NPN,45V,300MA, 250MHZ,AMPLIFIER,PN100A,TO–92 EBC	07263	PN100A
A2Q473	151–0207–00			TRANSISTOR,SIG:BIPOLAR,NPN,45V,300MA, 250MHZ,AMPLIFIER,PN100A,TO–92 EBC	07263	PN100A
A2Q474	151–0207–00			TRANSISTOR,SIG:BIPOLAR,NPN,45V,300MA, 250MHZ,AMPLIFIER,PN100A,TO–92 EBC	07263	PN100A
A2Q475	151–0207–00			TRANSISTOR,SIG:BIPOLAR,NPN,45V,300MA, 250MHZ,AMPLIFIER,PN100A,TO–92 EBC	07263	PN100A
A2Q476	151–0207–00			TRANSISTOR,SIG:BIPOLAR,NPN,45V,300MA, 250MHZ,AMPLIFIER,PN100A,TO–92 EBC	07263	PN100A
A2Q477	151–0207–00			TRANSISTOR,SIG:BIPOLAR,NPN,45V,300MA, 250MHZ,AMPLIFIER,PN100A,TO–92 EBC	07263	PN100A
A2Q478	151–1005–00			TRANSISTOR,SIG:JFET,N–CH,5V,6MA,2MS, 500 OHM,J231/PN4303 SPECIAL,TO–92,SDG	04713	SPF685

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2Q514	151–0619–00			TRANSISTOR,SIG:BIPOLAR,NPN,35V,20MA, SUPERMATCHED DUAL,LM394H/MAT02FH,TO–78	27014	LM394BH
A2Q518	151–0711–00			TRANSISTOR,SIG:BIPOLAR,NPN,25V,50MA, 650MHZ,AMPLIFIER,MPSH10,TO–92 BEC	04713	MPSH10
A2Q519	151–0711–00			TRANSISTOR,SIG:BIPOLAR,NPN,25V,50MA, 650MHZ,AMPLIFIER,MPSH10,TO–92 BEC	04713	MPSH10
A2Q520	151–0711–00			TRANSISTOR,SIG:BIPOLAR,NPN,25V,50MA, 650MHZ,AMPLIFIER,MPSH10,TO–92 BEC	04713	MPSH10
A2Q521	151–0711–00			TRANSISTOR,SIG:BIPOLAR,NPN,25V,50MA, 650MHZ,AMPLIFIER,MPSH10,TO–92 BEC	04713	MPSH10
A2Q544	151–0915–00			TRANSISTOR,PWR:BIPOLAR,NPN,300V,100MA, 60MHZ,AMPLIFIER,BF471,TO–126	0LUA3	BF471
A2Q547	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q550	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q555	151–0915–00			TRANSISTOR,PWR:BIPOLAR,NPN,300V,100MA, 60MHZ,AMPLIFIER,BF471,TO–126	0LUA3	BF471
A2Q573	151–0221–00		B030472	TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A2Q573	151–0199–05	B030473		TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS3640,TO–92 EBC	04713	MPS3640
A2Q583	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q584	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q589	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q611	151–0719–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA, 600MHZ,AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A2Q619	151–0719–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA, 600MHZ,AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A2Q625	151–0719–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA, 600MHZ,AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A2Q626	151–0711–00			TRANSISTOR,SIG:BIPOLAR,NPN,25V,50MA, 650MHZ,AMPLIFIER,MPSH10,TO–92 BEC	04713	MPSH10
A2Q628	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A2Q630	151–0719–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA, 600MHZ,AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A2Q635	151–0211–00			TRANSISTOR,SIG:BIPOLAR,NPN,30V VCEO,55V VCBO,400MA,500MHZ,AMPLIFIER,2N3866,TO–39	04713	2N3866
				ATTACHED PARTS		
	214–1291–00			HEAT SINK,SEMIC:TRANSISTOR/IC,TO–5/TO–39, RADIAL,PRESS–ON,0.72" DIA,SILVER–BEARING COPPER W/BLACK	05820	207SB

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
				END ATTACHED PARTS		
A2Q643	151–0916–00			TRANSISTOR,PWR:BIPOLAR,PNP,300V,100MA, 60MHZ,AMPLIFIER,BF472,TO–126	0LUA3	BF472
A2Q655	151–0916–00			TRANSISTOR,PWR:BIPOLAR,PNP,300V,100MA, 60MHZ,AMPLIFIER,BF472,TO–126	0LUA3	BF472
A2Q658	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q668	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q669	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q674	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q686	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q723	151–0223–06			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC,T&A	04713	MPS2369ARLRP
A2Q729	151–0223–06			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC,T&A	04713	MPS2369ARLRP
A2Q735	151–0223–06			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC,T&A	04713	MPS2369ARLRP
A2Q741	151–0223–06			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC,T&A	04713	MPS2369ARLRP
A2Q748	151–0223–06			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC,T&A	04713	MPS2369ARLRP
A2Q823	151–0223–06			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC,T&A	04713	MPS2369ARLRP
A2Q847	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A2Q861	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q922	151–0223–06			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC,T&A	04713	MPS2369ARLRP
A2Q923	151–0223–06			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC,T&A	04713	MPS2369ARLRP
A2Q925	151–0223–06			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC,T&A	04713	MPS2369ARLRP
A2Q926	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q937	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q939	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q969	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2Q970	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1010	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A2Q1012	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A2Q1022	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1025	151–0719–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA, 600MHZ,AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A2Q1028	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER;PS918,TO–92 EBC	01295	MPS918
A2Q1032	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1034	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER;PS918,TO–92 EBC	01295	MPS918
A2Q1036	151–0719–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA, 600MHZ,AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A2Q1092	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A2Q1110	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1111	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A2Q1113	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1115	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1152	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1215	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A2Q1218	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A2Q1251	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1293	151–0261–00			TRANSISTOR,SIG:BIPOLAR,PNP,60V,50MA, 100MHZ,AMPLIFIER,DUAL,2N3810,TO–77	04713	2N3810
A2Q1304	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1309	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1315	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1341	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2Q1346	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1358	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1359	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1374	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1380	151–0195–00			TRANSISTOR,SIG:BIPOLAR,NPN,20V,100MA, 150MHZ,AMPLIFIER,2N5223/MPS6521,TO–92 EBC	04713	2N5223
A2Q1389	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A2Q1395	151–0195–00			TRANSISTOR,SIG:BIPOLAR,NPN,20V,100MA, 150MHZ,AMPLIFIER,2N5223/MPS6521,TO–92 EBC	04713	2N5223
A2Q1396	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1415	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A2Q1424	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A2Q1427	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1429	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A2Q1434	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A2Q1438	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1443	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1445	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1450	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1451	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1471	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1472	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1475	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A2Q1483	151–0195–00			TRANSISTOR,SIG:BIPOLAR,NPN,20V,100MA, 150MHZ,AMPLIFIER,2N5223/MPS6521,TO–92 EBC	04713	2N5223
A2Q1524	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2Q1529	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1534	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1537	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1541	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A2Q1545	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2Q1548	151–0223–06			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC,T&A	04713	MPS2369ARLRP
A2Q1551	151–0195–00			TRANSISTOR,SIG:BIPOLAR,NPN,20V,100MA, 150MHZ,AMPLIFIER,2N5223/MPS6521,TO–92 EBC	04713	2N5223
A2Q1579	151–0736–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,600MA, 250MHZ,AMPLIFIER,2N4401,TO–92 EBC	01295	TIS111
A2Q1586	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A2R162	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R167	311–2232–00			RES,VAR,TRMR:CERMET,2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	30983	ORDER BY DESCRIPTION
A2R170	311–2232–00			RES,VAR,TRMR:CERMET,2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	30983	ORDER BY DESCRIPTION
A2R180	322–3487–00			RES,FXD,FILM:500 OHM,1%,0.2W,TC=TO	57668	RB20 FXE 499E
A2R187	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0,	91637	CCF50–2000F–R36
A2R196	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R197	322–3373–00			RES,FXD,FILM:75K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 75K0
A2R213	322–3189–00			RES,FXD,FILM:909 OHM,1%,0.2W,TC=T0	57668	CRB 20 FXE 909E
A2R214	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R215	311–2231–00			RES,VAR,TRMR:CERMET,1K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 102 M L20
A2R231	311–2231–00			RES,VAR,TRMR:CERMET,1K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 102 M L20
A2R232	322–3320–00			RES,FXD,FILM:21K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 21K0
A2R251	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A2R252	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R255	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W	57668	CRB20T68EFX1502
A2R256	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R268	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R269	322–3295–00			RES,FXD:METAL FILM,11.5K OHM,1%,0.2W	57668	CRB20 FXE 11K5
A2R270	322–3248–00			RES,FXD,FILM:3.74K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 3K74
A2R271	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R272	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R281	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A2R282	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A2R283	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A2R285	315–0136–01			RES,FXD,FILM:13M OHM,5%,0.25W	50139	CB1365 ALLEN BRADLEY ONLY
A2R286	322–3360–00			RES,FXD,FILM:54.9K OHM,1%,0.2W,TC=T0	91637	CCF50–5492F–R36
A2R287	322–3469–00			RES,FXD,FILM:750K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 750K
A2R288	322–3450–00			RES,FXD,FILM:475K OHM,1%,0.2W,TC=T0	91637	CCF50–4753F–R36
A2R290	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A2R302	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 806E
A2R306	322–3314–00			RES,FXD:METAL FILM,18.2K OHM,1%,0.2W	57668	CRB20 FXE 18K2
A2R307	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4021
A2R308	322–3179–00			RES,FXD,FILM:715 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 715E
A2R309	311–2234–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 502 M L20
A2R310	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0	91637	CCF50–7500F–R36
A2R311	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0	91637	CCF50–7500F–R36
A2R313	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 301E
A2R317	322–3141–00			RES,FXD,FILM:287 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 287E
A2R318	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 301E
A2R319	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 301E
A2R320	322–3275–00			RES,FXD,FILM:7.15K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K15
A2R344	311–2232–00			RES,VAR,TRMR:CERMET,2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	30983	ORDER BY DESCRIPTION
A2R345	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A2R346	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K50
A2R354	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R357	322–3363–00			RES,FXD,FILM:59K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 59K0
A2R358	322–3371–00			RES,FXD,FILM:71.5K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX7152
A2R359	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 1M00
A2R360	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 1M00
A2R361	322–3443–00			RES,FXD,FILM:402K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4023
A2R363	322–3300–00			RES,FXD,FILM:13K OHM,1%,0.2W,TC=T0	80009	322–3300–00
A2R365	322–3250–00			RES,FXD:METAL FILM,3.92K OHM,1%,0.2W	91637	CCF50–3921F–R36
A2R366	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A2R370	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R371	322–3487–00			RES,FXD,FILM:500 OHM,1%,0.2W,TC=TO	57668	RB20 FXE 499E
A2R372	322–3487–00			RES,FXD,FILM:500 OHM,1%,0.2W,TC=TO	57668	RB20 FXE 499E
A2R373	322–3487–00			RES,FXD,FILM:500 OHM,1%,0.2W,TC=TO	57668	RB20 FXE 499E

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R374	322–3487–00			RES,FXD,FILM:500 OHM,1%,0.2W,TC=TO	57668	RB20 FXE 499E
A2R375	322–3487–00			RES,FXD,FILM:500 OHM,1%,0.2W,TC=TO	57668	RB20 FXE 499E
A2R376	322–3487–00			RES,FXD,FILM:500 OHM,1%,0.2W,TC=TO	57668	RB20 FXE 499E
A2R377	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R378	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0	91637	CCF50–7500F–R36
A2R380	322–3295–00			RES,FXD:METAL FILM,11.5K OHM,1%,0.2W	57668	CRB20 FXE 11K5
A2R381	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A2R382	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A2R385	322–3330–00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 26K7
A2R387	322–3330–00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 26K7
A2R388	322–3235–00			RES,FXD:METAL FILM,2.74K OHM,1%,0.2W	57668	CRB20 FXE 2K74
A2R390	322–3357–00			RES,FXD,FILM:51.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 51K1
A2R392	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 249E
A2R393	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R394	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R403	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A2R404	322–3246–00			RES,FXD,FILM:3.57K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 3K57
A2R405	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R406	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R407	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R408	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W	57668	CRB20 FXE 11K0
A2R409	322–3325–00			RES,FXD,FILM:23.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 23K7
A2R410	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R412	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R413	322–3300–00			RES,FXD,FILM:13K OHM,1%,0.2W,TC=T0	80009	322–3300–00
A2R414	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A2R415	322–3385–00			RES,FXD:METAL FILM,100K OHM,1%,0.2W	57668	CRB20T29EFX1003
A2R416	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 249E
A2R417	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 249E
A2R418	311–2234–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 502 M L20
A2R419	322–3072–00			RES,FXD,FILM:54.9 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 54E9
A2R420	322–3072–00			RES,FXD,FILM:54.9 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 54E9
A2R421	311–2229–00			RES,VAR,TRMR:CERMET,250 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 251 M L20
A2R422	311–2232–00			RES,VAR,TRMR:CERMET,2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	30983	ORDER BY DESCRIPTION
A2R423	322–3275–00			RES,FXD,FILM:7.15K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K15
A2R424	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R425	322–3114–00			RES,FXD,FILM:150 OHM,1%,0.2W	57668	CRB20–FX–150E
A2R428	322–3252–00			RES,FXD,FILM:4.12K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K12
A2R431	322–3077–00			RES,FXD,FILM:61.9 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 61E9
A2R433	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R437	308–0783–00			RES,FXD,WW:1K OHM,1%,3W,TC=30PPM	54294	LA461ND9–1000OHM ±1PERCENT
A2R445	322–3320–00			RES,FXD,FILM:21K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 21K0
A2R446	323–0356–00			RES,FXD,FILM:49.9K OHM,1%,0.5W,TC=T0	64537	PME70
A2R447	322–3320–00			RES,FXD,FILM:21K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 21K0
A2R451	323–0356–00			RES,FXD,FILM:49.9K OHM,1%,0.5W,TC=T0	64537	PME70
A2R452	323–0356–00			RES,FXD,FILM:49.9K OHM,1%,0.5W,TC=T0	64537	PME70
A2R458	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R460	322–3300–00			RES,FXD,FILM:13K OHM,1%,0.2W,TC=T0	80009	322–3300–00
A2R461	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R462	322–3237–00			RES,FXD,FILM:2.87K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K87
A2R463	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R464	322–3235–00			RES,FXD:METAL FILM,2.74K OHM,1%,0.2W	57668	CRB20 FXE 2K74
A2R465	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K50
A2R466	322–3202–00			RES,FXD,FILM:1.24K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K24
A2R468	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R469	322–3300–00			RES,FXD,FILM:13K OHM,1%,0.2W,TC=T0	80009	322–3300–00
A2R470	322–3106–00			RES,FXD,FILM:124 OHM,1%,0.2W,TC=100PPM	91637	CCF50–1240F–R36
A2R471	311–2227–00			RES,VAR,TRMR:CERMET,100 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	30983	ORDER BY DESCRIPTION
A2R472	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 249E
A2R473	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R474	311–2224–00			RES,VAR,TRMR:CERMET,20 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 200 M L20
A2R475	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R476	311–2224–00			RES,VAR,TRMR:CERMET,20 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 200 M L20
A2R477	322–3095–00			RES,FXD,FILM:95.3 OHM,1%,0.2W,TC=T0	91637	CCF50–2–G95R30FT
A2R478	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	91637	CCF501C20000B
A2R480	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W,TC=100	57668	CRB20T68EFX2002
A2R481	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 1M00
A2R483	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R484	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A2R485	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX3011
A2R486	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX3011

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R487	322–3300–00			RES,FXD,FILM:13K OHM,1%,0.2W,TC=T0 (1780R ONLY)	80009	322–3300–00
A2R487	322–3310–00			RES,FXD,FILM:16.5K OHM,1%,0.2W,TC=T0 (1781R ONLY)	57668	CRB20 FXE 16K5
A2R488	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R489	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0 (1780R ONLY)	57668	CRB20 FXE 7K50
A2R489	322–3279–00			RES,FXD,FILM:7.87K OHM,1%,0.2W,TC=T0 (1781R ONLY)	57668	CRB20 FXE 7K87
A2R490	322–3469–00			RES,FXD,FILM:750K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 750K
A2R492	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX3011
A2R493	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R495	322–3252–00			RES,FXD,FILM:4.12K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K12
A2R496	322–3236–00			RES,FXD,FILM:2.8K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K80
A2R508	322–3252–00			RES,FXD,FILM:4.12K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K12
A2R509	322–3342–00			RES,FXD,FILM:35.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 35K7
A2R510	311–2231–00			RES,VAR,TRMR:CERMET,1K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 102 M L20
A2R513	322–3294–00			RES,FXD,FILM:11.3K OHM,1%,0.2W,TC=T0	91637	CCF50–1132F–R36
A2R514	311–2233–00			RES,VAR,TRMR:CERMET,3K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 302 M L20
A2R515	322–3363–00			RES,FXD,FILM:59K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 59K0
A2R517	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX3011
A2R518	322–3205–00			RES,FXD,FILM:1.33K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K33
A2R521	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R522	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R523	322–3163–00			RES,FXD,FILM:487 OHM,1%,0.2W,TC=T0	91637	CCF50–4870F–R36
A2R524	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4021
A2R525	322–3310–00			RES,FXD,FILM:16.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 16K5
A2R526	311–2231–00			RES,VAR,TRMR:CERMET,1K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 102 M L20
A2R527	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R528	322–3141–00			RES,FXD,FILM:287 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 287E
A2R529	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R530	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 249E
A2R531	322–3141–00			RES,FXD,FILM:287 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 287E
A2R532	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 249E
A2R533	322–3150–00			RES,FXD,FILM:357 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 357E
A2R534	311–2227–00			RES,VAR,TRMR:CERMET,100 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	30983	ORDER BY DESCRIPTION
A2R535	322–3077–00			RES,FXD,FILM:61.9 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 61E9

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R536	311–2239–00			RES,VAR,TRMR:CERMET,100K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 104 M L20
A2R540	322–3328–00			RES,FXD,FILM:25.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 25K5
A2R543	303–0203–00			RES,FXD,CMPSN:20K OHM,5%,1W	24546	FP32 OR FP1 20 K OHM 5 PERCEN
A2R547	322–3130–00			RES,FXD,FILM:221 OHM,1%,0.2W	57668	CRB20T68EFX2210
A2R548	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4021
A2R549	322–3154–00			RES,FXD:METAL FILM,392 OHM,1%,0.2W	57668	RB20FX392E
A2R550	322–3130–00			RES,FXD,FILM:221 OHM,1%,0.2W	57668	CRB20T68EFX2210
A2R551	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R552	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4021
A2R557	303–0203–00			RES,FXD,CMPSN:20K OHM,5%,1W	24546	FP32 OR FP1 20 K OHM 5 PERCEN
A2R558	322–3339–00			RES,FXD:METAL FILM,33.2K OHM,1%,0.2W	91637	CCF50–3322F–R36
A2R559	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R560	322–3281–00			RES,FXD:METAL FILM,8.25K OHM,1%,0.2W	57668	CRB20 FXE 8K25
A2R561	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R562	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A2R566	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A2R569	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	91637	CCF501C20000B
A2R572	322–3125–00			RES,FXD,FILM:196 OHM,1%,0.2W,TC=T0	91637	CCF50–2–G196ROF
A2R573	322–3114–00			RES,FXD,FILM:150 OHM,1%,0.2W	57668	CRB20–FX–150E
A2R575	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R576	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A2R577	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0,	91637	CCF50–2000F–R36
A2R578	322–3169–00			RES,FXD:METAL FILM,562 OHM,1%,0.2W	91637	CCF50–5620F–R36
A2R581	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A2R583	322–3075–00			RES,FXD,FILM:59 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 59E
A2R584	322–3262–00			RES,FXD,FILM:5.23K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 5K23
A2R585	322–3256–00			RES,FXD,FILM:4.53K OHM,1%,0.2W,TC=T0	91637	CCF50–4531F–R36
A2R586	322–3339–00			RES,FXD:METAL FILM,33.2K OHM,1%,0.2W	91637	CCF50–3322F–R36
A2R587	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R588	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R589	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K50
A2R590	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R591	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R592	322–3300–00			RES,FXD,FILM:13K OHM,1%,0.2W,TC=T0	80009	322–3300–00
A2R593	322–3326–00			RES,FXD,FILM:24.3K OHM,1%,0.2W,TC–T0	91637	CCF50–2432F–R36
A2R609	322–3360–00			RES,FXD,FILM:54.9K OHM,1%,0.2W,TC=T0	91637	CCF50–5492F–R36

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R610	322–3310–00			RES,FXD,FILM:16.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 16K5
A2R611	322–3150–00			RES,FXD,FILM:357 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 357E
A2R612	311–2234–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 502 M L20
A2R613	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R615	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R616	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R617	322–3228–00			RES,FXD,FILM:2.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K32
A2R618	322–3203–00			RES,FXD,FILM:1.27K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K27
A2R619	322–3270–00			RES,FXD,FILM:6.34K OHM,1%,0.2W,TC=T0	91637	CCF501G63400FT
A2R620	322–3056–00			RES,FXD,FILM:37.4 OHM,1%,0.2W,TC=T0,	91637	CCF50–37R4F–R36
A2R621	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W,TC=T0	91637	CCF50–6191F–R36
A2R622	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R623	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R624	322–3255–00			RES,FXD,FILM:4.42K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K42
A2R625	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R626	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R627	322–3171–00			RES,FXD,FILM:590 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 590E
A2R628	311–2235–00			RES,VAR,TRMR:CERMET,10K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 103 M L20
A2R629	322–3114–00			RES,FXD,FILM:150 OHM,1%,0.2W	57668	CRB20–FX–150E
A2R630	322–3252–00			RES,FXD,FILM:4.12K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K12
A2R631	322–3077–00			RES,FXD,FILM:61.9 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 61E9
A2R636	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R637	308–0783–00			RES,FXD,WW:1K OHM,1%,3W,TC=30PPM	54294	LA461ND9–1000OHM ±1PERCENT
A2R645	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R646	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R647	322–3178–00			RES,FXD,FILM:698 OHM,1%,0.2W,TC=T0	91637	CCF50–6980F–R36
A2R648	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R651	322–3178–00			RES,FXD,FILM:698 OHM,1%,0.2W,TC=T0	91637	CCF50–6980F–R36
A2R656	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 1M00
A2R657	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R658	322–3385–00			RES,FXD:METAL FILM,100K OHM,1%,0.2W	57668	CRB20T29EFX1003
A2R659	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 1M00
A2R661	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A2R662	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R663	322–3393–00			RES,FXD:METAL FILM,121K OHM,1%,0.2W	57668	CRB20 FXE 121K
A2R664	322–3270–00			RES,FXD,FILM:6.34K OHM,1%,0.2W,TC=T0	91637	CCF501G63400FT

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R665	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R666	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A2R667	322–3300–00			RES,FXD,FILM:13K OHM,1%,0.2W,TC=T0	80009	322–3300–00
A2R668	322–3204–00			RES,FXD,FILM:1.3K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX1301
A2R670	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R671	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A2R674	322–3154–00			RES,FXD:METAL FILM,392 OHM,1%,0.2W	57668	RB20FX392E
A2R675	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R676	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R677	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R678	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K49
A2R679	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R680	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A2R681	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R682	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0	91637	CCF50–7500F–R36
A2R683	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R684	322–3326–00			RES,FXD,FILM:24.3K OHM,1%,0.2W,TC–T0	91637	CCF50–2432F–R36
A2R685	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R686	322–3330–00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 26K7
A2R687	322–3235–00			RES,FXD:METAL FILM,2.74K OHM,1%,0.2W	57668	CRB20 FXE 2K74
A2R688	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R689	322–3330–00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 26K7
A2R690	322–3235–00			RES,FXD:METAL FILM,2.74K OHM,1%,0.2W	57668	CRB20 FXE 2K74
A2R691	322–3330–00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 26K7
A2R692	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R695	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301E
A2R696	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R697	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R698	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R710	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R712	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0,	91637	CCF50–2000F–R36
A2R717	322–3385–00			RES,FXD:METAL FILM,100K OHM,1%,0.2W	57668	CRB20T29EFX1003
A2R718	322–3385–00			RES,FXD:METAL FILM,100K OHM,1%,0.2W	57668	CRB20T29EFX1003
A2R719	322–3085–00			RES,FXD,FILM:75 OHM,1%,0.2W	57668	CRB20T68EFX75R0
A2R721	322–3178–00			RES,FXD,FILM:698 OHM,1%,0.2W,TC=T0	91637	CCF50–6980F–R36
A2R722	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R723	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A2R726	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R727	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R728	322–3411–00			RES,FXD,FILM:187K OHM,1%,0.2W,TC=T0	91637	CCF50–1873F–R36
A2R729	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	91637	CCF501C20000B
A2R730	322–3259–00			RES,FXD,FILM:4.87K OHM,1%,0.2W,TC=T0	09969	CCF50–4871F–R36
A2R732	311–2230–00			RES,VAR,TRMR:CERMET,500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 501 M L20
A2R734	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R735	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R736	322–3411–00			RES,FXD,FILM:187K OHM,1%,0.2W,TC=T0	91637	CCF50–1873F–R36
A2R738	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A2R739	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R740	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R741	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R742	322–3252–00			RES,FXD,FILM:4.12K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K12
A2R743	311–2231–00			RES,VAR,TRMR:CERMET,1K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 102 M L20
A2R744	322–3256–00			RES,FXD,FILM:4.53K OHM,1%,0.2W,TC=T0	91637	CCF50–4531F–R36
A2R745	322–3411–00			RES,FXD,FILM:187K OHM,1%,0.2W,TC=T0	91637	CCF50–1873F–R36
A2R746	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R747	311–2227–00			RES,VAR,TRMR:CERMET,100 OHM,20%,0.5W,0.197 SQ,TOP ADJUST	30983	ORDER BY DESCRIPTION
A2R748	322–3189–00			RES,FXD,FILM:909 OHM,1%,0.2W,TC=T0	57668	CRB 20 FXE 909E
A2R749	322–3411–00			RES,FXD,FILM:187K OHM,1%,0.2W,TC=T0	91637	CCF50–1873F–R36
A2R750	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R751	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R752	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A2R753	322–3219–00			RES,FXD,FILM:1.87K,OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K87
A2R754	311–2229–00			RES,VAR,TRMR:CERMET,250 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 251 M L20
A2R761	311–2265–00			RES,VAR,NONWW:TRMR,200K OHM,20%,0.5W LINEAR	TK2073	GF06VT2 204 M L20
A2R765	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0	91637	CCF50–7500F–R36
A2R767	322–3339–00			RES,FXD:METAL FILM,33.2K OHM,1%,0.2W	91637	CCF50–3322F–R36
A2R770	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W,TC=100	57668	CRB20T68EFX2002
A2R775	322–3214–00			RES,FXD,FILM:1.65K OHM,1%,0.2W,TC=T0	57668	CRB 20 FXE 1K65
A2R781	322–3342–00			RES,FXD,FILM:35.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 35K7
A2R786	322–3246–00			RES,FXD,FILM:3.57K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 3K57
A2R793	322–3369–00			RES,FXD:METAL FILM,68.1K OHM,1%,0.2W	57668	CRB20 FXE 6812
A2R795	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R808	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A2R812	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K49

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R818	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R819	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R820	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R821	322–3411–00			RES,FXD,FILM:187K OHM,1%,0.2W,TC=T0	91637	CCF50–1873F–R36
A2R822	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R823	322–3411–00			RES,FXD,FILM:187K OHM,1%,0.2W,TC=T0	91637	CCF50–1873F–R36
A2R824	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R825	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R826	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R827	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R828	311–2234–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 502 M L20
A2R829	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R830	322–3138–00			RES,FXD,FILM:267 OHM,1%,0.2W,TC=T0,	57668	CRB20 FXE 267E
A2R831	322–3393–00			RES,FXD:METAL FILM,121K OHM,1%,0.2W	57668	CRB20 FXE 121K
A2R832	322–3138–00			RES,FXD,FILM:267 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 267E
A2R835	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A2R836	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R837	322–3271–00			RES,FXD,FILM:6.49K OHM,1%,0.2W,TC=T0	91637	CCF50–6491F–R36
A2R838	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W	57668	CRB20T68EFX1502
A2R839	322–3248–00			RES,FXD,FILM:3.74K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 3K74
A2R841	322–3130–00			RES,FXD,FILM:221 OHM,1%,0.2W	57668	CRB20T68EFX2210
A2R842	322–3285–00			RES,FXD,FILM:9.09K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 9K09
A2R843	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A2R845	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W,TC=T0	91637	CCF50–6191F–R36
A2R846	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R847	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R848	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R849	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R852	322–3185–00			RES,FXD:METAL FILM,825 OHM,1%,0.2W	57668	CRB20 FXE 825E
A2R855	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A2R860	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R865	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A2R870	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A2R872	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R887	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A2R888	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0	91637	CCF50–7500F–R36
A2R890	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A2R891	322–3487–00			RES,FXD,FILM:500 OHM,1%,0.2W,TC=TO	57668	RB20 FXE 499E

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R912	322–3485–07			RES,FXD,FILM:5K OHM,0.1%,0.2W,TC=T9	91637	CCF501C50000B
A2R913	322–3485–07			RES,FXD,FILM:5K OHM,0.1%,0.2W,TC=T9	91637	CCF501C50000B
A2R915	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R916	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R917	322–3257–00			RES,FXD,FILM:4.64K OHM,1%,0.2W,TC=T0	91637	CCF50–4641F–R36
A2R918	322–3185–00			RES,FXD:METAL FILM,825 OHM,1%,0.2W	57668	CRB20 FXE 825E
A2R919	322–3089–00			RES,FXD,FILM:82.5 OHM,1%.0.2W	57668	CRB20 FXE 82E5
A2R920	322–3411–00			RES,FXD,FILM:187K OHM,1%,0.2W,TC=T0	91637	CCF50–1873F–R36
A2R921	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A2R922	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R924	322–3411–00			RES,FXD,FILM:187K OHM,1%,0.2W,TC=T0	91637	CCF50–1873F–R36
A2R925	322–3411–00			RES,FXD,FILM:187K OHM,1%,0.2W,TC=T0	91637	CCF50–1873F–R36
A2R926	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W,TC=100	57668	CRB20T68EFX2002
A2R927	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W,TC=100	57668	CRB20T68EFX2002
A2R928	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A2R929	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	91637	CCF501C20000B
A2R930	322–3085–07			RES,FXD,FILM:METAL FILM,75 OHM,0.1%,0.2W,TC=25	91637	CCF502–C75R00BT
A2R931	322–3085–07			RES,FXD,FILM:METAL FILM,75 OHM,0.1%,0.2W,TC=25	91637	CCF502–C75R00BT
A2R932	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A2R933	322–3172–00			RES,FXD,FILM:604 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 604E
A2R934	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A2R935	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R936	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R937	322–3085–00			RES,FXD,FILM:75 OHM,1%,0.2W	57668	CRB20T68EFX75R0
A2R938	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K49
A2R939	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R940	322–3105–00			RES,FXD,FILM:121 OHM,1%,0.2W	57668	CRB20 FXE 121E
A2R941	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4021
A2R942	322–3160–00			RES,FXD,FILM:453 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 453E
A2R943	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R958	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R959	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W,TC=100	57668	CRB20T68EFX2002
A2R965	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A2R966	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K49
A2R967	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A2R968	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R969	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R970	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R985	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R987	307–0730–00			RES NTWK,FXD,FI:7,47K OHM,2%,0.18W EA,BULK	11236	750–81–R47K
A2R991	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R992	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R994	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A2R996	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A2R1005	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	91637	CCF501C20000B
A2R1006	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	91637	CCF501C20000B
A2R1007	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	91637	CCF501C20000B
A2R1008	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	91637	CCF501C20000B
A2R1009	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	91637	CCF501C20000B
A2R1010	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	91637	CCF501C20000B
A2R1012	322–3294–00			RES,FXD,FILM:11.3K OHM,1%,0.2W,TC=T0	91637	CCF50–1132F–R36
A2R1013	322–3216–00			RES,FXD,FILM:1.74K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K74
A2R1014	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R1015	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R1016	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A2R1017	311–2229–00			RES,VAR,TRMR:CERMET,250 OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 251 M L20
A2R1018	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX3011
A2R1019	322–3222–07			RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9	91637	CCF501C20000B
A2R1020	322–3360–00			RES,FXD,FILM:54.9K OHM,1%,0.2W,TC=T0	91637	CCF50–5492F–R36
A2R1021	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A2R1022	322–3188–00			RES,FXD,FILM:887 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 887E
A2R1023	322–3034–00			RES,FXD,FILM:22.1 OHM,1%,0.2W	91637	CCF50–22R1F–R36
A2R1024	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1025	322–3367–00			RES,FXD,FILM:64.9K OHM,1%,0.2W,TC=T0	91637	CCF50–6492F–R36
A2R1026	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A2R1027	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1028	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A2R1029	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1030	322–3322–00			RES,FXD:METAL FILM,22.1K OHM,1%,0.2W	57668	CRB20 FXE 22K1
A2R1031	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K49
A2R1032	322–3188–00			RES,FXD,FILM:887 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 887E
A2R1033	311–2229–00			RES,VAR,TRMR:CERMET,250 OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 251 M L20
A2R1034	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A2R1035	322–3106–00			RES,FXD,FILM:124 OHM,1%,0.2W,TC=100PPM	91637	CCF50–1240F–R36
A2R1036	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0	91637	CCF50–7500F–R36

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R1037	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A2R1038	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A2R1039	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1040	322–3034–00			RES,FXD,FILM:22.1 OHM,1%,0.2W	91637	CCF50–22R1F–R36
A2R1041	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R1042	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R1043	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R1044	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A2R1046	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R1048	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A2R1050	311–2234–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 502 M L20
A2R1052	322–3132–00			RES,FXD,FILM:232 OHM,1%,0.2W,TC=150 PPM,,T&R	91637	CCF50–2320F–R36
A2R1053	322–3393–00			RES,FXD:METAL FILM,121K OHM,1%,0.2W	57668	CRB20 FXE 121K
A2R1054	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	91637	CCF50–2000F–R36
A2R1055	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1056	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1066	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R1070	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1076	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A2R1079	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1085	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1086	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A2R1090	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	91637	CCF50–2000F–R36
A2R1091	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A2R1103	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A2R1105	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1106	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1107	311–2229–00			RES,VAR,TRMR:CERMET,250 OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 251 M L20
A2R1108	322–3177–00			RES,FXD:METAL FILM,681 OHM,1%,0.2W	91637	CCF50–6810F–R36
A2R1109	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A2R1110	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R1111	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A2R1112	322–3431–00			RES,FXD,FILM:301K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301K
A2R1113	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A2R1114	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R1115	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R1116	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R1117	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R1119	322–3193–07			RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9	91637	CCF501C10000B
A2R1122	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W,TC=T0	91637	CCF50–6650F–R36
A2R1124	322–3172–00			RES,FXD,FILM:604 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 604E
A2R1125	322–3276–00			RES,FXD,FILM:7.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K32
A2R1126	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R1127	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1128	322–3106–00			RES,FXD,FILM:124 OHM,1%,0.2W,TC=100PPM	91637	CCF50–1240F–R36
A2R1129	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1130	322–3191–00			RES,FXD,FILM:953 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 953E
A2R1131	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1132	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1133	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R1134	322–3163–00			RES,FXD,FILM:487 OHM,1%,0.2W,TC=T0	91637	CCF50–4870F–R36
A2R1135	311–2234–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 502 M L20
A2R1136	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1137	311–2226–00			RES,VAR,TRMR:CERMET,50 OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 500 M L20
A2R1138	322–3276–00			RES,FXD,FILM:7.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K32
A2R1139	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R1140	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1151	322–3322–00			RES,FXD:METAL FILM,22.1K OHM,1%,0.2W	57668	CRB20 FXE 22K1
A2R1152	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0,	91637	CCF50–2000F–R36
A2R1153	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 806E
A2R1154	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 806E
A2R1155	322–3250–00			RES,FXD:METAL FILM,3.92K OHM,1%,0.2W	91637	CCF50–3921F–R36
A2R1156	322–3473–00			RES,FXD,FILM:825K OHM,1%,0.2W,TC=100PPM	91637	CCF50–8253F–R36
A2R1160	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1161	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A2R1165	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0,	91637	CCF50–2000F–R36
A2R1167	322–3155–00			RES,FXD,FILM:402 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 402E
A2R1168	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A2R1169	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A2R1171	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A2R1172	322–3431–00			RES,FXD,FILM:301K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 301K
A2R1175	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1176	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1177	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R1178	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W	57668	CRB20T68EFX1502
A2R1179	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1185	322–3414–00			RES,FXD:METAL FILM,200K OHM,1%,0.2W	57668	CRB 20 FXE 200 K
A2R1190	322–3154–00			RES,FXD:METAL FILM,392 OHM,1%,0.2W	57668	RB20FX392E
A2R1194	322–3285–00			RES,FXD,FILM:9.09K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 9K09
A2R1196	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A2R1197	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX3011
A2R1213	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A2R1214	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A2R1215	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A2R1216	315–0226–01			RES,FXD,FILM:22 M OHM,5%,0.25W , MI	50139	CB2265
A2R1217	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A2R1218	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1219	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W,TC=T0	91637	CCF50–6650F–R36
A2R1221	311–2234–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 502 M L20
A2R1222	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R1223	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1224	322–3276–00			RES,FXD,FILM:7.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K32
A2R1225	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R1226	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1227	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1228	322–3276–00			RES,FXD,FILM:7.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K32
A2R1229	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R1230	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1231	322–3191–00			RES,FXD,FILM:953 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 953E
A2R1232	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1233	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1234	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R1235	322–3276–00			RES,FXD,FILM:7.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K32
A2R1236	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R1237	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1238	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1239	322–3276–00			RES,FXD,FILM:7.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K32
A2R1240	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R1241	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1247	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1248	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1249	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R1252	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1253	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1254	322–3281–00			RES,FXD:METAL FILM,8.25K OHM,1%,0.2W	57668	CRB20 FXE 8K25
A2R1255	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1256	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A2R1257	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX3011
A2R1258	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R1259	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A2R1260	322–3281–00			RES,FXD:METAL FILM,8.25K OHM,1%,0.2W	57668	CRB20 FXE 8K25
A2R1261	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1263	311–2237–00			RES,VAR,TRMR:CERMET,25K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST,T&R	TK2073	GF06UT2 253 M L20
A2R1264	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A2R1265	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A2R1272	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1274	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A2R1275	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A2R1276	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1278	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1280	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A2R1281	311–2232–00			RES,VAR,TRMR:CERMET,2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	30983	ORDER BY DESCRIPTION
A2R1282	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A2R1283	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A2R1284	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A2R1285	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A2R1286	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1287	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1290	322–3392–00			RES,FXD,FILM:118K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 118K
A2R1292	322–3172–00			RES,FXD,FILM:604 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 604E
A2R1293	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0,	91637	CCF50–2000F–R36
A2R1296	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1297	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1298	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1304	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A2R1305	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 30K1
A2R1309	322–3330–00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 26K7
A2R1310	322–3392–00			RES,FXD,FILM:118K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 118K

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R1312	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A2R1314	315–0755–00			RES,FXD,FILM:7.5M OHM,5%,0.25W MI	50139	CB7555
A2R1315	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K50
A2R1316	322–3314–00			RES,FXD:METAL FILM,18.2K OHM,1%,0.2W	57668	CRB20 FXE 18K2
A2R1317	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A2R1318	322–3276–00			RES,FXD,FILM:7.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K32
A2R1319	322–3276–00			RES,FXD,FILM:7.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K32
A2R1320	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R1321	322–3191–00			RES,FXD,FILM:953 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 953E
A2R1322	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1323	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A2R1324	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1325	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1326	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1327	322–3276–00			RES,FXD,FILM:7.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K32
A2R1328	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R1329	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1330	322–3191–00			RES,FXD,FILM:953 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 953E
A2R1331	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1332	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1333	311–2234–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 502 M L20
A2R1334	322–3276–00			RES,FXD,FILM:7.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K32
A2R1335	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R1336	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1337	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1338	322–3276–00			RES,FXD,FILM:7.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K32
A2R1339	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R1340	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1341	322–3438–00			RES,FXD,FILM:357K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 357K
A2R1342	322–3350–00			RES,FXD,FILM:43.2K OHM,1%,0.2W,TC=T0	91637	CCF50–4322F–R36
A2R1344	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R1345	322–3350–00			RES,FXD,FILM:43.2K OHM,1%,0.2W,TC=T0	91637	CCF50–4322F–R36
A2R1346	322–3342–00			RES,FXD,FILM:35.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 35K7
A2R1352	322–3250–00			RES,FXD:METAL FILM,3.92K OHM,1%,0.2W	91637	CCF50–3921F–R36
A2R1353	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R1354	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R1355	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A2R1356	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R1357	322–3385–00			RES,FXD:METAL FILM,100K OHM,1%,0.2W	57668	CRB20T29EFX1003
A2R1359	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	91637	CCF50–2000F–R36
A2R1360	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A2R1361	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	91637	CCF50–2000F–R36
A2R1362	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A2R1363	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A2R1370	322–3272–00			RES,FXD,FILM:6.65K OHM,1%,0.2W,TC=T0 (1780R ONLY)	91637	CCF50–6651F–R36
A2R1370	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0 (1781R ONLY)	57668	CRB20T68EFX4991
A2R1371	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1372	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R1373	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1374	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R1376	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1377	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1378	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A2R1379	322–3322–00			RES,FXD:METAL FILM,22.1K OHM,1%,0.2W	57668	CRB20 FXE 22K1
A2R1380	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1381	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K50
A2R1382	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1383	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A2R1384	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	91637	CCF50–2000F–R36
A2R1385	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1386	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1387	322–3329–00			RES,FXD,FILM:26.1K OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 26K1
A2R1388	322–3469–00			RES,FXD,FILM:750K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 750K
A2R1389	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1390	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1391	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1392	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1395	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1396	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1397	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1398	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W,TC=100	57668	CRB20T68EFX2002
A2R1399	322–3346–00			RES,FXD:METAL FILM,39.2K OHM,1%,0.2W	57668	CRB20FXE39K2
A2R1414	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W,TC=T0	91637	CCF50–6191F–R36
A2R1415	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1416	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4021

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R1417	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1420	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1421	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1422	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A2R1423	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1429	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A2R1430	322–3286–00			RES,FXD,FILM:9.31K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 9K31
A2R1431	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A2R1432	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1433	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1434	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX3011
A2R1435	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	91637	CCF50–4321F–R36
A2R1436	322–3276–00			RES,FXD,FILM:7.32K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K32
A2R1437	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A2R1438	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1439	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A2R1440	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A2R1441	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R1444	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A2R1445	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A2R1447	322–3047–00			RES,FXD,FILM:30.1 OHM,1%,0.2W,TC=T0	57668	CRB20FXE30E1
A2R1448	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A2R1449	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1450	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1451	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1452	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1453	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A2R1455	311–2235–00			RES,VAR,TRMR:CERMET,10K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 103 M L20
A2R1457	322–3185–00			RES,FXD:METAL FILM,825 OHM,1%,0.2W	57668	CRB20 FXE 825E
A2R1458	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1467	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1468	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1469	322–3300–00			RES,FXD,FILM:13K OHM,1%,0.2W,TC=T0	80009	322–3300–00
A2R1470	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R1472	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1473	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 806E
A2R1474	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R1475	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 806E

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R1476	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1477	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A2R1480	322–3339–00			RES,FXD:METAL FILM,33.2K OHM,1%,0.2W	91637	CCF50–3322F–R36
A2R1481	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A2R1486	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1487	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R1488	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1489	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A2R1494	322–3450–00			RES,FXD,FILM:475K OHM,1%,0.2W,TC=T0	91637	CCF50–4753F–R36
A2R1495	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A2R1496	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A2R1525	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A2R1528	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A2R1529	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R1530	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R1533	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A2R1534	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 49K9
A2R1535	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A2R1537	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4021
A2R1538	322–3105–00			RES,FXD,FILM:121 OHM,1%,0.2W	57668	CRB20 FXE 121E
A2R1539	322–3297–00			RES,FXD:METAL FILM,12.1K OHM,1%,0.2W	57668	CRB20 FXE 12K1
A2R1540	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W,TC=100	57668	CRB20T68EFX2002
A2R1541	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A2R1544	322–3105–00			RES,FXD,FILM:121 OHM,1%,0.2W	57668	CRB20 FXE 121E
A2R1545	322–3295–00			RES,FXD:METAL FILM,11.5K OHM,1%,0.2W	57668	CRB20 FXE 11K5
A2R1546	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A2R1547	322–3047–00			RES,FXD,FILM:30.1 OHM,1%,0.2W,TC=T0	57668	CRB20FXE30E1
A2R1548	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1549	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R1550	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1552	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A2R1556	322–3193–07			RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9	91637	CCF501C10000B
A2R1557	322–3193–07			RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9	91637	CCF501C10000B
A2R1558	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A2R1570	322–3188–00			RES,FXD,FILM:887 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 887E
A2R1575	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1576	322–3188–00			RES,FXD,FILM:887 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 887E
A2R1577	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2R1578	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1579	322–3285–00			RES,FXD,FILM:9.09K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 9K09
A2R1580	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1581	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1583	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A2R1584	322–3285–00			RES,FXD,FILM:9.09K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 9K09
A2R1585	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A2R1586	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX3011
A2R1589	322–3235–00			RES,FXD:METAL FILM,2.74K OHM,1%,0.2W	57668	CRB20 FXE 2K74
A2R1590	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A2R1591	322–3270–00			RES,FXD,FILM:6.34K OHM,1%,0.2W,TC=T0	91637	CCF501G63400FT
A2R1593	322–3357–00			RES,FXD,FILM:51.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 51K1
A2R1597	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A2R1598	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A2R1599	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W,TC=100	57668	CRB20T68EFX2002
A2T835	120–1057–00			TRANSFORMER,SIG:CUSTOM,TRIFILAR,450–675UH, TOROID CORE 276–0614–00,8 TURNS WITH 31 AWG WIRE 176–0	0JR03	120–1057–00
A2TP304	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP740	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP936	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP981	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP1079	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP1120	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP1128	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP1130	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP1138	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP1141	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP1170	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP1241	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2TP1273	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP1290	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2TP1345	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A2U185	156–2256–00			IC,DIGITAL:HCMOS,GATE,QUAD 2–INPUT NAND,74HC00,DIP14.3,TUBE	01295	SN74HC00N
A2U190	156–2027–00			IC,DIGITAL:HCMOS,GATE,HEX INVERTER,74HC04,DIP14.3,TUBE	01295	SN74HC04N
A2U207	156–2583–00			IC,DIGITAL:HCMOS,DECODER,1–OF–8,ACTIVE LOW,74HC138,DIP16.3,TUBE	01295	SN74HC138N
A2U217	156–2584–00			IC,DIGITAL:HCMOS,FLIP FLOP,OCTAL D–TYPE,CLEAR,74HC273,DIP20.3,TUBE	01295	SN74HC273N
A2U220	156–2584–00			IC,DIGITAL:HCMOS,FLIP FLOP,OCTAL D–TYPE,CLEAR,74HC273,DIP20.3,TUBE	01295	SN74HC273N
A2U231	156–3583–00			IC,CONVERTER:BIPOLAR,D/A,16 BIT,VOLTAGE OUT,DIGITAL AUDIO,PCM54HP,DIP28.6	13919	PCM54HP
A2U245	156–1850–00			ICSC:CMOS,ANALOG SWITCH,QUAD,DG211,DIP16.3	17856	DG211CJ
A2U251	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD, TL074CN/LF347N/MC34004P,DIP14.3	01295	TL074CN
A2U260	156–2027–00			IC,DIGITAL:HCMOS,GATE,HEX INVERTER,74HC04,DIP14.3,TUBE	01295	SN74HC04N
A2U274	156–2584–00			IC,DIGITAL:HCMOS,FLIP FLOP,OCTAL D–TYPE,CLEAR,74HC273,DIP20.3,TUBE	01295	SN74HC273N
A2U275	156–2584–00			IC,DIGITAL:HCMOS,FLIP FLOP,OCTAL D–TYPE,CLEAR,74HC273,DIP20.3,TUBE	01295	SN74HC273N
A2U291	156–0402–00			ICSC:BIPOLAR,TIMER,LM555CN,DIP08.3	27014	LM555CN
A2U297	156–1335–00			IC,DIGITAL:LSTTL,MULTIVIBRATOR,DUAL RETRIG MONOSTABLE,96LS02,DIP16.3	07263	DM96LS02N
A2U385	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD, TL074CN/LF347N/MC34004P,DIP14.3	01295	TL074CN
A2U395	156–0875–00			IC,DIGITAL:LSTTL,GATE,DUAL 2–WIDE,2–INPUT AND–OR–INVERT,74LS51,DIP14.3,TUBE	01295	SN74LS51N
A2U411	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A2U415	156–0048–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN,(1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPLIFIER,C	04713	MC3346P
A2U458	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD, TL074CN/LF347N/MC34004P,DIP14.3	01295	TL074CN
A2U490	156–0509–00			IC,CONVERTER:BIPOLAR,D/A,8 BIT,400NS, MULTIPLYING,CURRENT OUTPUT,MC1408,DIP16.3	04713	MC1408P8
A2U505	156–1850–00			ICSC:CMOS,ANALOG SWITCH,QUAD,DG211,DIP16.3	17856	DG211CJ
A2U515	156–2460–00			ICSC:BIPOLAR,MODULATOR/DEMODULATOR, BALANCED,MC1496P,DIP14.3	04713	MC1496P

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2U565	156–2460–00			ICSC:BIPOLAR,MODULATOR/DEMODULATOR, BALANCED,MC1496P,DIP14.3	04713	MC1496P
A2U580	156–0048–05			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY, (5),NPN,(1)DIFF PAIR,(3)IND,15V,50MA, 300MHZ,AMPLIFIER,MOT/NATL	04713	MC3346P
A2U596	156–1335–00			IC,DIGITAL:LSTTL,MULTIVIBRATOR,DUAL RETRIG MONOSTABLE,96LS02,DIP16.3	07263	DM96LS02N
A2U605	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD, TL074CN/LF347N/MC34004P,DIP14.3	01295	TL074CN
A2U690	156–1225–00			IC,LINEAR:BIPOLAR,COMPARATOR,DUAL,OPEN COLLECTOR,300NS,LM393N,DIP08.3	01295	LM393P
A2U705	156–2584–00			IC,DIGITAL:HCMOS,FLIP FLOP,OCTAL D–TYPE,CLEAR,74HC273,DIP20.3,TUBE	01295	SN74HC273N
A2U708	156–0513–03			ICSC:CMOS,ANALOG MUX,8 CHANNEL,4051B, DIP16.3,TUBE	04713	MC14051BCP
A2U720	156–3592–00			IC,DIGITAL:HCTCMOS,DECODER,1–OF–8,ACTIVE HIGH,74HCT238,DIP16.3,TUBE	01295	SN74HCT238N
A2U767	156–2761–01			IC,DIGITAL:HCMOS,MULTIVIBRATOR,DUPLICATE OF 156–2761–00,74HC221A,DIP16.3,TUBE	0JR04	TC74HC221AP
A2U775	156–2463–00			IC,DIGITAL:HCMOS,GATE,QUAD 2–INPUT OR,74HC32,DIP14.3,TUBE	01295	SN74HC32N
A2U780	156–0577–00			IC,DIGITAL:CMOS,GATE,QUAD 2–INPUT AND,74C08,DIP14.3,TUBE	07263	MM74C08N
A2U789	156–2761–01			IC,DIGITAL:HCMOS,MULTIVIBRATOR,DUPLICATE OF 156–2761–00,74HC221A,DIP16.3,TUBE	0JR04	TC74HC221AP
A2U790	156–2463–00			IC,DIGITAL:HCMOS,GATE,QUAD 2–INPUT OR,74HC32,DIP14.3,TUBE	01295	SN74HC32N
A2U795	156–2009–01			IC,DIGITAL:HCMOS,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74HC74,DIP14.3,TUBE	04713	MC74HC74AN
A2U810	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD, TL074CN/LF347N/MC34004P,DIP14.3	01295	TL074CN
A2U815	160–6018–00			IC,DIGITAL:CMOS,PLD,EEPLD,20V8,25NS,90MA,PRGM 156–3012–00,20V8–25,DIP24.3	TK0198	160601800
				MOUNTING PARTS		
	136–0925–00			SOCKET,DIP::PCB,24 POS,2 X 12,0.1 X 0.3 CTR,0.196 H X 0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015	00779	2–641932–3
				END MOUNTING PARTS		
A2U827	156–3226–00			IC,LINEAR:BIPOLAR,OP–AMP,35 MHZ,UNITY GAIN STABLE,LM6361N,DIP08.3	27014	LM6361N
A2U840	156–0259–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5)NPN,INDEPENDENT,15V,100MA,300MHZ,AM PLIFIER,CA3083,DI	0CVK3	ULN2083A
A2U858	156–0750–00			IC,DIGITAL:CMOS,MULTIVIBRATOR,DUAL MONOSTABLE,74C221,DIP16.3	07263	MM74C221J
A2U880	156–2027–00			IC,DIGITAL:HCMOS,GATE,HEX INVERTER,74HC04,DIP14.3,TUBE	01295	SN74HC04N

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2U905	156–2584–00			IC,DIGITAL:HCMOS,FLIP FLOP,OCTAL D–TYPE,CLEAR,74HC273,DIP20.3,TUBE	01295	SN74HC273N
A2U935	165–2243–00			MICROCKT,LINEAR:OP–AMP	TK2601	165–2243–00
A2U958	156–0875–00			IC,DIGITAL:LSTTL,GATE,DUAL 2–WIDE,2–INPUT AND–OR–INVERT,74LS51,DIP14.3,TUBE	01295	SN74LS51N
A2U961	156–2559–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, NEGATIVE,–12V,1.5A,2%,MC7912ACT,TO–220	04713	MC7912ACT
A2U975	156–2906–00			IC,DIGITAL:HCMOS,COUNTER,DUAL 4–BIT BINARY RIPPLE,74HC393,DIP14.3,TUBE	04713	MC74HC393N
A2U977	160–6030–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS,90MA,PRGM 156–2983–00,16V8–25,DIP20.3 (1780R ONLY)	TK0198	160603000
A2U977	160–6028–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS,90MA,PRGM 156–2983–00,16V8–25,DIP20.3 (1781R ONLY)	TK0198	160602800
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE,	98291	DIPS20PIT
				END MOUNTING PARTS		
A2U980	160–6020–00			IC,DIGITAL:CMOS,PLD,EEPLD,20V8,25NS,90MA,PRGM 156–3012–00,20V8–25,DIP24.3 (1780R ONLY)	TK0198	160602000
A2U980	160–6029–00			IC,DIGITAL:CMOS,PLD,EEPLD,20V8,25NS,90MA,PRGM 156–3012–00,20V8–25,DIP24.3 (1781R ONLY)	TK0198	160602900
				MOUNTING PARTS		
	136–0925–00			SOCKET,DIP::PCB,24 POS,2 X 12,0.1 X 0.3 CTR,0.196 H X 0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015	00779	2–641932–3
				END MOUNTING PARTS		
A2U985	156–2009–01			IC,DIGITAL:HCMOS,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74HC74,DIP14.3,TUBE	04713	MC74HC74AN
A2U990	160–6022–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS,90MA,PRGM 156–2983–00,16V8–25,DIP20.3 (1780R ONLY)	TK0198	160602200
A2U990	160–6026–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS,90MA,PRGM 156–2983–00,16V8–25,DIP20.3 (1781R ONLY)	TK0198	160602600
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE,	98291	DIPS20PIT
				END MOUNTING PARTS		
A2U995	156–1973–00			IC,DIGITAL:FTTL,FLIP FLOP,QUAD D–TYPE,CLEAR, COMPLEMENTARY OUTPUTS,74F175,DIP16.3,TUBE	01295	SN74F175N
A2U996	156–2906–00			IC,DIGITAL:HCMOS,COUNTER,DUAL 4–BIT BINARY RIPPLE,74HC393,DIP14.3,TUBE	04713	MC74HC393N

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2U1011	156–0259–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5)NPN,INDEPENDENT,15V,100MA, 300MHZ,AMPLIFIER,CA3083,DI	0CVK3	ULN2083A
A2U1019	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A2U1046	156–2817–00			IC,LINEAR:BIFET,OP–AMP,QUAD,MC34084P,DIP14.3	04713	MC34084AP
A2U1060	156–0048–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPLIFIER,C	04713	MC3346P
A2U1065	156–0295–02			IC,DIGITAL:ECL,GATE,DUPLICATE OF 156–0295–00,10107,DIP16.3,TUBE	04713	MC10107P
A2U1097	160–6023–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS,90MA,PRGM 156–2983–00,16V8–25,DIP20.3 (1780R ONLY)	TK0198	160602300
A2U1097	160–6027–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS,90MA,PRGM 156–2983–00,16V8–25,DIP20.3 (1781R ONLY)	TK0198	160602700
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE,	98291	DIPS20PIT
				END MOUNTING PARTS		
A2U1105	160–6024–00			IC,DIGITAL:CMOS,PLD,EEPLD,20V8,25NS,90MA,PRGM 156–3012–00,20V8–25,DIP24.3	TK0198	160602400
				MOUNTING PARTS		
	136–0925–00			SOCKET,DIP::PCB,24 POS,2 X 12,0.1 X 0.3 CTR,0.196 H X 0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015	00779	2–641932–3
				END MOUNTING PARTS		
A2U1126	156–0534–00			IC,LINEAR:BIPOLAR,AMPLIFIER,DUAL,DIFFERENTIAL, W/CURRENT SOURCE TRANS,1.0GHZ FT,CA3102E,DIP	34371	CA3102E
A2U1137	156–0534–00			IC,LINEAR:BIPOLAR,AMPLIFIER,DUAL,DIFFERENTIAL, W/CURRENT SOURCE TRANS,1.0GHZ FT,CA3102E,DIP	34371	CA3102E
A2U1150	156–2558–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, POSITIVE,12V,1.5A,2%,MC7812ACT,TO–220	01295	TL780–12CKC
A2U1159	156–0048–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPLIFIER,C	04713	MC3346P
A2U1179	156–1126–00			IC,LINEAR:BIPOLAR,COMPARATOR,OPEN COLLECTOR,200NS,LM311N,DIP08.3	01295	LM311P
A2U1211	156–1149–00			IC,LINEAR:BIFET,OP–AMP,LF351N,DIP08.3	04713	MC34001P/LF351N
A2U1217	156–0912–00			IC,LINEAR:BIPOLAR,OP–AMP,TRANSCONDUCTANCE, CA3080E,DIP08.3	27014	LM3080N
A2U1228	156–0534–00			IC,LINEAR:BIPOLAR,AMPLIFIER,DUAL,DIFFERENTIAL, W/CURRENT SOURCE TRANS,1.0GHZ FT,CA3102E,DIP	34371	CA3102E
A2U1237	156–0534–00			IC,LINEAR:BIPOLAR,AMPLIFIER,DUAL,DIFFERENTIAL, W/CURRENT SOURCE TRANS,1.0GHZ FT,CA3102E,DIP	34371	CA3102E
A2U1243	156–2559–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, NEGATIVE,–12V,1.5A,2%,MC7912ACT,TO–220	04713	MC7912ACT

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2U1270	156–1335–00			IC,DIGITAL:LSTTL,MULTIVIBRATOR,DUAL RETRIG MONOSTABLE,96LS02,DIP16.3	07263	DM96LS02N
A2U1277	156–2460–00			ICSC:BIPOLAR,MODULATOR/DEMODULATOR,BALANCED,MC1496P,DIP14.3	04713	MC1496P
A2U1287	156–0048–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPLIFIER,C	04713	MC3346P
A2U1316	156–3592–00			IC,DIGITAL:HCTCMOS,DECODER,1–OF–8,ACTIVE HIGH,74HCT238,DIP16.3,TUBE	01295	SN74HCT238N
A2U1327	156–0534–00			IC,LINEAR:BIPOLAR,AMPLIFIER,DUAL,DIFFERENTIAL, W/CURRENT SOURCE TRANS,1.0GHZ FT,CA3102E,DIP	34371	CA3102E
A2U1336	156–0534–00			IC,LINEAR:BIPOLAR,AMPLIFIER,DUAL,DIFFERENTIAL, W/CURRENT SOURCE TRANS,1.0GHZ FT,CA3102E,DIP	34371	CA3102E
A2U1357	156–0048–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPLIFIER,C	04713	MC3346P
A2U1397	156–0048–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPLIFIER,C	04713	MC3346P
A2U1415	160–6019–00			IC,DIGITAL:CMOS,PLD,EEPLD,20V8,25NS,90MA,PRGM 156–3012–00,20V8–25,DIP24.3	TK0198	160601900
				MOUNTING PARTS		
	136–0925–00			SOCKET,DIP::PCB,24 POS,2 X 12,0.1 X 0.3 CTR,0.196 H X 0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015	00779	2–641932–3
				END MOUNTING PARTS		
A2U1455	156–1312–00			ICSC:BIPOLAR,SAMPLE/HOLD,LOW DROOP RATE,SMP–11,DIP14.3	24355	SMP11FY
A2U1460	156–1312–00			ICSC:BIPOLAR,SAMPLE/HOLD,LOW DROOP RATE,SMP–11,DIP14.3	24355	SMP11FY
A2U1483	155–0144–00			MICROCKT,LINEAR:SYN STRIPPER 16 DIP	80009	155–0144–00
A2U1490	156–1611–00			IC,DIGITAL:FTTL,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74F74,DIP14.3,TUBE	04713	MC74F74N
A2U1497	156–1611–00			IC,DIGITAL:FTTL,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74F74,DIP14.3,TUBE	04713	MC74F74N
A2U1506	156–2584–00			IC,DIGITAL:HCMOS,FLIP FLOP,OCTAL D–TYPE,CLEAR,74HC273,DIP20.3,TUBE	01295	SN74HC273N
A2U1516	156–2584–00			IC,DIGITAL:HCMOS,FLIP FLOP,OCTAL D–TYPE,CLEAR,74HC273,DIP20.3,TUBE	01295	SN74HC273N
A2U1523	156–3592–00			IC,DIGITAL:HCTCMOS,DECODER,1–OF–8,ACTIVE HIGH,74HCT238,DIP16.3,TUBE	01295	SN74HCT238N
A2U1565	156–2558–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, POSITIVE,12V,1.5A,2%,MC7812ACT,TO–220	01295	TL780–12CKC
A2U1595	156–2880–00			IC,LINEAR:BIFET,OP–AMP,DUAL,DECOMPENSATED,MC34083P/MC34083BP,DIP08.3	04713	MC34083P
A2VR308	152–0195–00			DIODE,ZENER:5.1V,5%,0.5W,5.0MA IZT,1N5993B/BZX55C5V1	04713	SZ11755RL
A2VR309	152–0217–00			DIODE,ZENER:8.2V,5%,0.4W,1N959B FMLY,DO–35 OR DO–7	04713	SZG20RL

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A2VR462	152–0760–00			DIODE,ZENER:6.2V,2%,0.4W,1N753C FMLY/1N5995C,DO–7 OR DO–35	04713	1N5995C
A2VR483	152–0241–00			DIODE,ZENER:33V,5%,0.4W,1N973B,DO–7 OR DO–35	04713	1N973BRL
A2VR492	152–0461–00			DIODE,SIG:6.2V,5%,0.4W,1N821,DO–7	04713	1N821
A2VR578	152–0217–00			DIODE,ZENER:8.2V,5%,0.4W,1N959B FMLY,DO–35 OR DO–7	04713	SZG20RL
A2VR650	152–0461–00			DIODE,SIG:6.2V,5%,0.4W,1N821,DO–7	04713	1N821
A2VR905	152–0195–00			DIODE,ZENER:5.1V,5%,0.5W,5.0MA IZT,1N5993B/BZX55C5V1	04713	SZ11755RL
A2VR931	152–0280–00			DIODE,ZENER:6.2V,5%,0.4W,1N753A,DO–35 OR DO–7	04713	1N753ARL
A2VR936	152–0280–00			DIODE,ZENER:6.2V,5%,0.4W,1N753A,DO–35 OR DO–7	04713	1N753ARL
A2VR1117	152–0166–00			DIODE,ZENER:6.2V,5%,0.4W,1N5995B, DO–35/DO–204AH	04713	1N5995BRL
A2VR1524	152–0217–00			DIODE,ZENER:8.2V,5%,0.4W,1N959B FMLY,DO–35 OR DO–7	04713	SZG20RL
A2W162	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A2W858	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A2W1043	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A2W1061	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A2W1251	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A2W1365	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A2X5	337–0890–00			SHIELD,ELEC:ATTENUATOR 10A2A	80009	337–0890–00
A2X6	337–0890–00			SHIELD,ELEC:ATTENUATOR 10A2A	80009	337–0890–00
A2X7	337–0890–00			SHIELD,ELEC:ATTENUATOR 10A2A	80009	337–0890–00
A2X8	337–0890–00			SHIELD,ELEC:ATTENUATOR 10A2A	80009	337–0890–00
A2Y1010	158–0396–00			XTAL,UNIT QTZ:3.587412MHZ,+/–0.005%,SERIES,CL 16PF,4 PIN MINI DIP PKG (1780R ONLY)	14301	016–210–00071
A2Y1010	158–0395–00			XTAL,UNIT QTZ:4.4375MHZ,+/–0.005%,SERIES,CL 16PF,4 PIN MINI DIP PKG (1781R ONLY)	14301	016–210–00072
A2Y1190	158–0352–00			XTAL UNIT,QTZ:14.318180MHZ,0.002%,PARALLEL,CL 30 PF,4 PIN MINI DIP PKG (1780R ONLY)	14301	016–210–00040
A2Y1190	158–0353–00			XTAL UNIT,QTZ:17.734480MHZ,0.002%,PARALLEL,CL 30 PF, 4 PIN MINI DIP PKG (1781R ONLY)	14301	016–210–00041

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A3	671–0459–05			CIRCUIT BD ASSY:VECTOR HV	80009	671–0459–05
A3C100	290–1310–00			CAP,FXD,ALUM:10UF,20%,160V,ESR=24.9 OHM (120HZ,20C),LS=0.200 INCH,13X20MM,105C,5000HRS	62643	CEJSM2C100M
A3C101	285–1341–00			CAP,FXD,PLASTIC:METALIZED FILM,0.1UF,20%,100V,POLY	TK1913	MKS2 0.1/100/20
A3C102	285–1341–00			CAP,FXD,PLASTIC:METALIZED FILM,0.1UF,20%,100V,POLY	TK1913	MKS2 0.1/100/20
A3C110	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A3C111	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY, 0.100 X 0.170,AXIAL	04222	SA101C103KAA
A3C112	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A3C120	290–1310–00			CAP,FXD,ALUM:10UF,20%,160V,ESR=24.9 OHM (120HZ,20C),LS=0.200 INCH,13X20MM,105C,5000HRS	62643	CEJSM2C100M
A3C130	285–1189–00			CAP,FXD,MTLZD:0.1 UF,5%,100 V	05292	PMT 3R .1J 100
A3C200	285–1341–00			CAP,FXD,PLASTIC:METALIZED FILM,0.1UF,20%,100V,POLY	TK1913	MKS2 0.1/100/20
A3C210	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A3C211	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A3C230	285–1328–00			CAP,FXD,PLASTIC:METALIZED FILM,0.01UF,5%,2000V,POLYPROPYLENE,1.25X.95	TK1913	FKP1 .01/2000/5
A3C260	283–0021–00			CAP,FXD,CER DI:0.001UF,20%,5000V	59660	848–556–Y5S–102M
A3C261	283–0261–00			CAP,FXD,CER DI:0.01UF,20%,4000V	04222	5742–0001
A3C262	283–0261–00			CAP,FXD,CER DI:0.01UF,20%,4000V	04222	5742–0001
A3C263	283–0261–00			CAP,FXD,CER DI:0.01UF,20%,4000V	04222	5742–0001
A3C264	283–0021–00			CAP,FXD,CER DI:0.001UF,20%,5000V	59660	848–556–Y5S–102M
A3C280	283–0021–00			CAP,FXD,CER DI:0.001UF,20%,5000V	59660	848–556–Y5S–102M
A3C300	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A3C311	283–0057–00			CAP,FXD,CER DI:0.1UF,+80–20%,200V SQUARE	04222	SR302E104ZAA
A3C320	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A3C321	290–0778–00			CAP,FXD,ALUM:1UF,20%,50V,5 X 11 MM,NONPOLAR,RADIAL	62643	CEBPM1H010M(Q)
A3C350	283–0189–00			CAP,FXD,CER DI:0.1UF,20%,400V SQUARE	04222	SR508C104MAA
A3C351	283–0189–00			CAP,FXD,CER DI:0.1UF,20%,400V SQUARE	04222	SR508C104MAA
A3C352	290–1310–00			CAP,FXD,ALUM:10UF,20%,160V,ESR=24.9 OHM (120HZ,20C),LS=0.200 INCH,13X20MM,105C,5000HRS	62643	CEJSM2C100M
A3C370	283–0189–00			CAP,FXD,CER DI:0.1UF,20%,400V SQUARE	04222	SR508C104MAA
A3C380	283–0008–00			CAP,FXD,CER DI:0.1UF,20%,500V SQUARE	04222	SR507C104MAA
A3C410	283–0003–00			CAP,FXD,CER DI:0.01UF,+80–20%,150V DISC	24165	20C205A1
A3C411	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A3C460	283–0084–00			CAP,FXD,CER DI:270PF,5%,1000V DISC	59660	838 533 X5FO 2715
A3C480	283–0057–00			CAP,FXD,CER DI:0.1UF,+80–20%,200V SQUARE	04222	SR302E104ZAA
A3CR120	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A3CR150	152–0409–00			DIODE,RECT:FAST RCVRY,12KV,10MA,250NS,CRVT150,AXIAL LEAD	62703	VG12X–1
A3CR151	152–0900–00			MODULE,HV:7.5KVAC IN,15KVDC OUT,POTTED MODULE,MSL2556	51406	MSL2556
A3CR170	152–0061–00			DIODE,SIG:200V,0.1A,700NS,4.0PF,1N3070/FDH2161	01295	PV120 FAMILY
A3CR171	152–0061–00			DIODE,SIG:200V,0.1A,700NS,4.0PF,1N3070/FDH2161	01295	PV120 FAMILY
A3CR310	152–0061–00			DIODE,SIG:200V,0.1A,700NS,4.0PF,1N3070/FDH2161	01295	PV120 FAMILY
A3CR320	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A3CR350	152–0400–00			DIODE,RECT:FAST RCVRY,400V,1A,200NS,1N4936,DO–41	04713	1N4936RL
A3CR370	152–0061–00			DIODE,SIG:200V,0.1A,700NS,4.0PF,1N3070/FDH2161	01295	PV120 FAMILY
A3CR371	152–0061–00			DIODE,SIG:200V,0.1A,700NS,4.0PF,1N3070/FDH2161	01295	PV120 FAMILY
A3CR450	152–0400–00			DIODE,RECT:FAST RCVRY,400V,1A,200NS,1N4936,DO–41	04713	1N4936RL
A3CR451	152–0400–00			DIODE,RECT:FAST RCVRY,400V,1A,200NS,1N4936,DO–41	04713	1N4936RL
A3CR480	152–0061–00			DIODE,SIG:200V,0.1A,700NS,4.0PF,1N3070/FDH2161	01295	PV120 FAMILY
A3DS160	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A3DS161	150–0050–00			LAMP,GLOW:135V MAX,1.9MA,C2A–T,WIRE LEAD	0J9R2	NE–2Q–11R–T
A3DS170	150–0050–00			LAMP,GLOW:135V MAX,1.9MA,C2A–T,WIRE LEAD	0J9R2	NE–2Q–11R–T
A3DS340	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A3DS460	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A3DS461	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A3DS480	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A3J100	131–3718–00			CONN,HDR:PCB,MALE,STR,2 X 5,0.1 CTR,0.385 H X 0.120 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD,0.	53387	2510–6002UB
A3J110	131–5337–00			CONN,HDR:PCB/WIREWRAP,MALE,STR,1 X 4,0.150 CTR,0.230 MLG X 0.285 TAIL,30 GOLD,SIDE BY SI	22526	65561–104
A3J160	131–5337–00			CONN,HDR:PCB/WIREWRAP,MALE,STR,1 X 4,0.150 CTR,0.230 MLG X 0.285 TAIL,30 GOLD,SIDE BY SI	22526	65561–104
A3L110	108–1262–00			INDUCTOR,FXD:POWER,100UH,10%,I<0.75A,RDC<0.23 OHM,Q>15,SRF>5.4MHZ,BOBBIN CORE,TSL0807–101K,RA	TK2058	TSL0807–101KR75

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A3L111	108–1262–00			INDUCTOR,FXD:POWER,100UH,10%,I<0.75A,RDC<0.23 OHM,Q>15,SRF>5.4MHZ,BOBBIN CORE,TSL0807–101K	TK2058	TSL0807–101KR75
A3Q210	151–0347–00			TRANSISTOR,SIG:BIPOLAR,NPN,160V,600MA,100MHZ, AMPLIFIER,2N5551,TO–92 EBC	04713	2N5551
A3Q211	151–0350–00			TRANSISTOR,SIG:BIPOLAR,PNP,150V,600MA,100MHZ, AMPLIFIER,2N5401,TO–92 EBC	01295	SKA8001
A3Q220	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A3Q221	151–0678–00			TRANSISTOR,PWR:BIPOLAR,NPN,400V,4.0A, SWITCHING,MJE13005,TO–220	04713	MJE13005
				ATTACHED PARTS		
	214–3841–00			HTSNK,XSTR:TO–220 W/SLDR TABS,AL	80009	214–3841–00
				END ATTACHED PARTS		
A3Q380	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A3Q381	151–0749–00			TRANSISTOR,SIG:BIPOLAR,PNP,400V,500MA,50MHZ, AMPLIFIER,MPSA94,TO–92 EBC	04713	MPSA94
A3Q400	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A3Q401	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A3Q480	151–0750–00			TRANSISTOR,SIG:BIPOLAR,NPN,400V,300MA,20MHZ, AMPLIFIER,MPSA44,TO–92 EBC	50891	TO BE ASSIGNED
A3R100	315–0562–00			RES,FXD,FILM:5.6K OHM,5%,0.25W	50139	CB5625
A3R101	311–2239–00			RES,VAR,TRMR:CERMET,100K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 104 M L20
A3R102	307–0106–00			RES,FXD,CMPSN:4.7 OHM,5%,0.25W	50139	CB47G5
A3R103	315–0682–00			RES,FXD,FILM:6.8K OHM,5%,0.25W	50139	CB6825
A3R104	315–0183–00			RES,FXD,FILM:18K OHM,5%,0.25W	50139	CM1835
A3R105	315–0473–00			RES,FXD,FILM:47K OHM,5%,0.25W	50139	CB4735
A3R110	315–0104–00			RES,FXD,FILM:100K OHM,5%,0.25W	50139	CB1045
A3R111	315–0331–00			RES,FXD,FILM:330 OHM,5%,0.25W	50139	CB3315
A3R112	315–0474–00			RES,FXD,FILM:470K OHM,5%,0.25W	50139	CB4745
A3R120	315–0331–00			RES,FXD,FILM:330 OHM,5%,0.25W	50139	CB3315
A3R121	315–0105–00			RES,FXD,FILM:1M OHM,5%,0.25W	50139	CB1055
A3R122	322–3385–00			RES,FXD:METAL FILM,100K OHM,1%,0.2W	57668	CRB20T29EFX1003
A3R160	315–0223–00			RES,FXD,FILM:22K OHM,5%,0.25W	50139	CB2235
A3R161	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	50139	CB1505
A3R162	315–0473–00			RES,FXD,FILM:47K OHM,5%,0.25W	50139	CB4735
A3R170	315–0226–00			RES,FXD,FILM:22M OHM,5%,0.25W	50139	CB2265
A3R171	303–0155–00			RES,FXD,FILM:1.5M OHM,5%,1W	50139	GB1555

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A3R180	315–0511–02			RES,FXD,FILM:510 OHM,.25W,5%	50139	CB5115 ALLEN BRADLEY ONLY
A3R181	301–0225–02			RES,FXD,FILM:2.2M OHM,5%,0.5W	50139	EB2255
A3R182	311–1256–00			RES,VAR,TRMR:CERMET,2.5M OHM,10%,0.5W,0.375 SQ,TOP ADJUST,BULK	02111	63M–255–T604
A3R183	303–0155–00			RES,FXD,FILM:1.5M OHM,5%,1W	50139	GB1555
A3R200	311–2239–00			RES,VAR,TRMR:CERMET,100K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 104 M L20
A3R201	315–0182–00			RES,FXD,FILM:1.8K OHM,5%,0.25W	50139	CB1825
A3R202	315–0331–00			RES,FXD,FILM:330 OHM,5%,0.25W	50139	CB3315
A3R220	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W	91637	CCF50–5111F–R36
A3R221	315–0512–00			RES,FXD,FILM:5.1K OHM,5%,0.25W	50139	CB5125
A3R222	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	50139	CB1505
A3R250	315–0302–00			RES,FXD,FILM:3K OHM,5%,0.25W	50139	CB3025
A3R280	303–0155–00			RES,FXD,FILM:1.5M OHM,5%,1W	50139	GB1555
A3R281	303–0155–00			RES,FXD,FILM:1.5M OHM,5%,1W	50139	GB1555
A3R300	315–0622–00			RES,FXD,FILM:6.2K OHM,5%,0.25W	50139	CB6225
A3R301	315–0512–00			RES,FXD,FILM:5.1K OHM,5%,0.25W	50139	CB5125
A3R310	315–0471–00			RES,FXD,FILM:470 OHM,5%,0.25W	50139	CB4715
A3R311	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	50139	CB2025
A3R312	315–0363–00			RES,FXD,FILM:36K OHM,5%,0.25W	50139	CB3635
A3R313	315–0471–00			RES,FXD,FILM:470 OHM,5%,0.25W	50139	CB4715
A3R314	315–0202–00			RES,FXD,FILM:2K OHM,5%,0.25W	50139	CB2025
A3R360	315–0511–02			RES,FXD,FILM:510 OHM,.25W,5%	50139	CB5115 ALLEN BRADLEY ONLY
A3R370	315–0104–00			RES,FXD,FILM:100K OHM,5%,0.25W	50139	CB1045
A3R371	315–0223–00			RES,FXD,FILM:22K OHM,5%,0.25W	50139	CB2235
A3R372	315–0223–00			RES,FXD,FILM:22K OHM,5%,0.25W	50139	CB2235
A3R373	311–2239–00			RES,VAR,TRMR:CERMET,100K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 104 M L20
A3R379	315–0243–00			RES,FXD,FILM:24K OHM,5%,0.25W	50139	CB2435
A3R380	315–0153–00			RES,FXD,FILM:15K OHM,5%,0.25W	50139	CB1535
A3R381	315–0511–02			RES,FXD,FILM:510 OHM,.25W,5%	50139	CB5115 ALLEN BRADLEY ONLY
A3R382	315–0914–00			RES,FXD,FILM:910K OHM,5%,0.25W	50139	CB9145
A3R383	315–0223–00			RES,FXD,FILM:22K OHM,5%,0.25W	50139	CB2235
A3R384	311–2238–00			RES,VAR,TRMR:CERMET,50K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06UT2 503 M L20
A3R410	315–0104–00			RES,FXD,FILM:100K OHM,5%,0.25W	50139	CB1045
A3R411	315–0100–00			RES,FXD,FILM:10 OHM,5%,0.25W	50139	CB1005
A3R450	315–0101–03			RES,FXD,CMPSN:100 OHM,5%,0.25W	50139	CB1015

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A3R460	315–0102–03			RES,FXD,FILM:1K OHM,5%,0.25W	50139	CB1025 (CARD PACK ONLY)
A3R461	315–0470–03			RES,FXD,FILM:47 OHM,5%,0.25W	50139	CB4705
A3R462	315–0511–02			RES,FXD,FILM:510 OHM,.25W,5%	50139	CB5115 ALLEN BRADLEY ONLY
A3R470	315–0103–00			RES,FXD,FILM:10K OHM,5%,0.25W	50139	CB1035
A3R471	315–0473–00			RES,FXD,FILM:47K OHM,5%,0.25W	50139	CB4735
A3R472	315–0333–00			RES,FXD,FILM:33K OHM,5%,0.25W	50139	CB3335
A3R480	315–0473–00			RES,FXD,FILM:47K OHM,5%,0.25W	50139	CB4735
A3R481	315–0683–00			RES,FXD,FILM:68K OHM,5%,0.25W	50139	CB6835
A3T240	120–1766–00			TRANSFORMER,HV:PRI 95V, FEEDBACK WINDING, SEC 10.5V,100V,2750V	0JR03	128–7111–00
A3TP210	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A3TP470	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A3U210	156–0067–00			IC,LINEAR:BIPOLAR,OP–AMP,741C,DIP08.3	01295	UA741CP
A3VR200	152–0461–00			DIODE,SIG:6.2V,5%,0.4W,1N821,DO–7	04713	1N821

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A4	671–0461–02		B030399	CIRCUIT BD ASSY:ZAXIS	80009	671–0461–02
A4	671–0461–03	B030400		CIRCUIT BD ASSY:ZAXIS	80009	671–0461–03
A4C100	283–0770–01			CAP,FXDCA DI:300PF,1%,500V	09023	CDA15FD301F03
A4C101	283–0789–00			CAP,FXDCA DI:600PF,1%,300V,0.41 X 0.48,RADIAL	09023	CD15FC601F03
A4C102	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C104	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C108	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C109	281–0281–00			CAP,VAR,PLASTIC:2–22PF,100V GYB22000	52769	GYB22000
A4C110	281–0758–00			CAP,FXD,CERAMIC:MLC,15PF,20%,100V,NPO	04222	SA102A150MAA
A4C112	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C113	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A4C115	283–0770–01			CAP,FXDCA DI:300PF,1%,500V	09023	CDA15FD301F03
A4C116	283–0594–02			CAP,FXDCA DI:1000PF,1%,100V	09023	CDA15FA102F03
A4C118	281–0819–00			CAP,FXD,CERAMIC:MLC,33 PF,5%,50	04222	SA102A330JAA
A4C120	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C133	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C136	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C139	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C143	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C148	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C151	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C164	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A4C165	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A4C197	283–0057–03			CAP,FXD,CER DI:0.1UF,+80–20%,200V SQUARE	04222	SR302E104ZAAAP1
A4C206	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C207	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C211	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C214	281–0814–00			CAP,FXD,CERAMIC:MLC,100 PF,10%,100V	04222	SA102A101KAA
A4C215	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C217	281–0809–00			CAP,FXD,CERAMIC:MLC,200 PF,5%,100V	04222	SA101A201JAA
A4C218	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C219	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C220	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C223	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C226	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C250	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C251	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C263	290–0973–03			CAP,FXD,ALUM:100UF,20%,35V,ESR=1.99 OHM (120HZ,20C),8 X 11.5MM,LS=3.5MM	55680	UVX1V101MPA1TD

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A4C264	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A4C265	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A4C267	290–0973–03			CAP,FXD,ALUM:100UF,20%,35V	55680	UVX1V101MPA1TD
A4C269	290–0973–03			CAP,FXD,ALUM:100UF,20%,35V	55680	UVX1V101MPA1TD
A4C272	290–0973–03			CAP,FXD,ALUM:100UF,20%,35V	55680	UVX1V101MPA1TD
A4C289	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C291	281–0767–00		B030399	CAP,FXD,CERAMIC:MLC,330PF,10%,100V	04222	SA102C331KAA
A4C291	281–0791–00	B030400		CAP,FXD,CERAMIC:MLC,270PF,10%,100V	04222	SA102C271KAA
A4C293	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A4C299	283–0003–00			CAP,FXD,CER DI:0.01UF,+80–20%,150V DISC	24165	20C205A1
A4C302	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C303	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C305	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V TUBULAR	04222	SA102A101JAA
A4C306	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C307	281–0911–00			CAP,FXD,CER DI:12PF,10%,50V	04222	SA102A12OKAA
A4C311	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V TUBULAR	04222	SA102A101JAA
A4C312	281–0819–00			CAP,FXD,CERAMIC:MLC,33 PF,5%,50V	04222	SA102A330JAA
A4C313	283–0636–01			CAP,FXDCA DI:36PF,1.%,500V	09023	CDA15ED360G03
A4C314	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C320	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C323	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C327	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C329	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C333	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C336	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C339	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C343	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C346	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C348	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C350	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C351	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C352	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C353	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C354	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C355	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C357	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C361	290–0966–00			CAP,FXD,ALUM:220UF,20%,25V	61058	ECEB1EV221S
A4C364	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A4C366	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A4C369	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A4C372	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A4C384	281–0767–00			CAP,FXD,CERAMIC:MLC,330PF,20%,100V	04222	SA102C331MAA
A4C385	281–0763–00			CAP,FXD,CERAMIC:MLC,47PF,10%,100V	04222	SA102A470KAA
A4C390	281–0763–00			CAP,FXD,CERAMIC:MLC,47PF,10%,100V	04222	SA102A470KAA
A4C391	281–0763–00			CAP,FXD,CERAMIC:MLC,47PF,10%,100V	04222	SA102A470KAA
A4C397	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C399	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C402	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A4C403	283–0059–02			CAP,FXD,CER DI:1UF,20%,50V,X7R	04222	SR305C105MAAAP1
A4C404	285–1340–00			CAP,FXD,PLASTIC:MTLZD FILM,0.01UF,10%,63V,POLY	37942	185/0.01/K/63/AA/A
A4C412	281–0759–00			CAP,FXD,CERAMIC:MLC,22PF,10%,100V	04222	SA102A220KAA
A4C414	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C416	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C440	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C444	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A4C452	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A4C453	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A4C454	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C455	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C456	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C463	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C469	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C476	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A4C478	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C489	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C551	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C555	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C557	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C566	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C571	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C578	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C586	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C587	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C588	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C591	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4C592	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A4C598	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A4CR204	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR214	152–0269–01			DIODE,SIG:VVC,C4=33PF,5%,C4/C20=2, SMV1263–1,DO–7	04713	SMV1263–1
A4CR296	152–0061–00			DIODE,SIG:200V,0.1A,700NS,4.0PF,1N3070/FDH2161	01295	PV120 FAMILY
A4CR306	152–0322–00			DIODE,SIG:SCHOTTKY,15V,0.41V VF AT 1.0MA,1.2PF,5082–2811,HP "15"	21847	A2X600
A4CR307	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR310	152–0322–00			DIODE,SIG:SCHOTTKY,15V,0.41V VF AT 1.0MA,1.2PF,5082–2811,HP "15"	21847	A2X600
A4CR311	152–0322–00			DIODE,SIG:SCHOTTKY,15V,0.41V VF AT 1.0MA,1.2PF,5082–2811,HP "15"	21847	A2X600
A4CR312	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR394	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR395	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR402	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR403	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR466	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR467	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR472	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR473	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR481	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR498	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4CR597	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A4DS195	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T, WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A4DS196	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T, WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A4J156	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A4J180	131–4339–00			CONN,HDR::PCB,MALE,RTANG,2 X 30,0.1 CTR,0.340 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD	53387	3372–5202

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A4L115	114–0438–00			INDUCTOR,VAR:SHIELDED,0.70–0.94UH,Q>65@L=65 (2.5MHZ),SLOT TEN–3–01,VERT MOUNT	02113	SLOT TEN–3–01
A4L261	108–1262–00			INDUCTOR,FXD:POWER,100UH,10%,I<0.75A,RDC<0.23 OHM,Q>15,SRF>5.4MHZ,BOBBIN CORE,TSL0807–101K	TK2058	TSL0807–101KR75
A4M10	337–3551–00			SHIELD,ELEC:OSCILLATOR,ECB,BRASS	TK1947	337–3551–00
A4Q100	151–0221–08			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258RLRA (EL8345)
A4Q199	151–0350–00			TRANSISTOR,SIG:BIPOLAR,PNP,150V,600MA,100MHZ, AMPLIFIER,2N5401,TO–92 EBC	01295	SKA8001
A4Q204	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A4Q214	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A4Q298	151–0347–00			TRANSISTOR,SIG:BIPOLAR,NPN,160V,600MA,100MHZ, AMPLIFIER,2N5551,TO–92 EBC	04713	2N5551
A4Q311	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A4Q362	151–0622–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,1.0A,50MHZ, AMPLIFIER,2N6727/MPS6727/MPSW51A, TO–237/TO–226 AE EBC	04713	MPS6727
A4Q363	151–0710–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,1.0A,50MHZ, AMPLIFIER,2N6715/MPSW01A,TO–237/TO–226AE	04713	MPS6715
A4Q365	151–0622–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,1.0A,50MHZ, AMPLIFIER,2N6727/MPS6727/MPSW51A,TO–237/TO–226AE EBC	04713	MPS6727
A4Q366	151–0710–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,1.0A,50MHZ, AMPLIFIER,2N6715/MPSW01A,TO–237/TO–226AE	04713	MPS6715
A4Q369	151–0622–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,1.0A,50MHZ, AMPLIFIER,2N6727/MPS6727/MPSW51A,TO–237/TO–226AE EBC	04713	MPS6727
A4Q370	151–0710–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,1.0A,50MHZ, AMPLIFIER,2N6715/MPSW01A,TO–237/TO–226AE	04713	MPS6715
A4Q371	151–0622–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,1.0A,50MHZ, AMPLIFIER,2N6727/MPS6727/MPSW51A,TO–237/TO–226AE EBC	04713	MPS6727
A4Q372	151–0710–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,1.0A,50MHZ, AMPLIFIER,2N6715/MPSW01A,TO–237/TO–226AE	04713	MPS6715
A4Q374	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A4Q375	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A4Q377	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A4Q378	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A4Q380	151–0207–00			TRANSISTOR,SIG:BIPOLAR,NPN,45V,300MA,250MHZ, AMPLIFIER,PN100A,TO–92 EBC	07263	PN100A

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A4Q381	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A4Q407	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A4Q408	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A4Q411	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A4Q498	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A4Q499	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A4R100	322–3165–00			RES,FXD,FILM:511 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 511E
A4R103	322–3485–00			RES,FXD,FILM:5.0K OHM,1%,0.2W,TC=T0	57668	RB20 FXE 5K11
A4R104	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	91637	CCF50–G200R0DR36
A4R105	322–3485–00			RES,FXD,FILM:5.0K OHM,1%,0.2W,TC=T0	57668	RB20 FXE 5K11
A4R106	322–3154–00			RES,FXD:METAL FILM,392 OHM,1%,0.2W,TC=100 PPM	57668	RB20FX392E
A4R110	311–2271–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06VT2 502 M L20
A4R111	322–3281–00			RES,FXD:METAL FILM,8.25K OHM,1%,0.2W	57668	CRB20 FXE 8K25
A4R112	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A4R113	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	91637	CCF50–G200R0DR36
A4R117	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A4R194	315–0101–00			RES,FXD,FILM:100 OHM,5%,0.25W	50139	CB1015
A4R195	322–3385–00			RES,FXD:METAL FILM,100K OHM,1%,0.2W	57668	CRB20T29EFX1003
A4R196	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX4750
A4R197	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX2001
A4R204	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A4R205	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R206	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX2001
A4R207	322–3322–00			RES,FXD:METAL FILM,22.1K OHM,1%,0.2W	57668	CRB20 FXE 22K1
A4R211	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX1001
A4R214	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0	91637	CCF50–G200R0DR36
A4R217	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R264	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A4R270	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A4R276	301–0181–00			RES,FXD,FILM:180 OHM,5%,0.5W	19701	5053CX180R0J
A4R277	301–0181–00			RES,FXD,FILM:180 OHM,5%,0.5W	19701	5053CX180R0J
A4R280	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R291	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R292	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A4R293	322–3308–00			RES,FXD,FILM:15.8K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX1582
A4R294	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R296	315–0363–00			RES,FXD,FILM:36K OHM,5%,0.25W	50139	CB3635
A4R298	322–3069–00			RES,FXD,FILM:51.1 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 51E1
A4R303	322–3269–02			RES,FXD,FILM:6.19K OHM,0.2W,5%	57668	CRB DYE 6K19
A4R305	322–3297–00			RES,FXD:METAL FILM,12.1K OHM,1%,0.2W	57668	CRB20 FXE 12K1
A4R307	322–3385–00			RES,FXD:METAL FILM,100K OHM,1%,0.2W	57668	CRB20T29EFX1003
A4R308	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R309	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX2001
A4R310	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX3011
A4R311	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R313	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A4R314	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX1502
A4R346	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K49
A4R364	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W,TC=100 PPM	57668	CRB20 FXE 332E
A4R367	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W,TC=100 PPM	57668	CRB20 FXE 332E
A4R370	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W,TC=100 PPM	57668	CRB20 FXE 332E
A4R373	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W,TC=100 PPM	57668	CRB20 FXE 332E
A4R374	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R375	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R377	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R378	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R380	311–2258–00			RES,VAR,TRMR:CERMET,1K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06VT2 102 M L20
A4R381	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R382	322–3268–00			RES,FXD,FILM:6.04K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 6K04
A4R383	322–3280–00			RES,FXD,FILM:8.06K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX8061
A4R384	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A4R385	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A4R386	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A4R387	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R388	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R390	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A4R391	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A4R392	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX2001
A4R393	322–3250–00			RES,FXD:METAL FILM,3.92K OHM,1%,0.2W	91637	CCF50–3921F–R36
A4R394	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W	57668	CRB20 FXE 2K49
A4R395	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A4R396	322–3280–00			RES,FXD,FILM:8.06K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX8061

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A4R397	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A4R398	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX2001
A4R399	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX4750
A4R407	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R408	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R409	322–3418–00			RES,FXD:METAL FILM,221K OHM,1%,0.2W	57668	CRB20 FXE 221K
A4R410	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R411	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX2001
A4R412	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R414	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX3011
A4R416	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R417	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A4R418	322–3299–00			RES,FXD,FILM:12.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 12K7
A4R419	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX1001
A4R440	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4991
A4R441	322–3315–00			RES,FXD,FILM:18.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 18K7
A4R442	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W,TC=100 PPM	57668	CRB20 FXE 11K0
A4R443	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K49
A4R444	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K49
A4R446	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX1001
A4R456	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A4R457	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R458	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R463	322–3314–00			RES,FXD:METAL FILM,18.2K OHM,1%,0.2W	57668	CRB20 FXE 18K2
A4R464	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A4R465	322–3304–00			RES,FXD,FILM:14.3K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX1432
A4R466	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R467	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R468	322–3314–00			RES,FXD:METAL FILM,18.2K OHM,1%,0.2W	57668	CRB20 FXE 18K2
A4R469	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A4R470	322–3304–00			RES,FXD,FILM:14.3K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX1432
A4R474	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R477	322–3281–00			RES,FXD:METAL FILM,8.25K OHM,1%,0.2W	57668	CRB20 FXE 8K25
A4R478	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W,TC=100 PPM	57668	CRB20 FXE 11K0
A4R479	322–3322–00			RES,FXD:METAL FILM,22.1K OHM,1%,0.2W	57668	CRB20 FXE 22K1
A4R480	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A4R481	322–3339–00			RES,FXD:METAL FILM,33.2K OHM,1%,0.2W	91637	CCF50–3322F–R36
A4R482	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A4R483	322–3308–00			RES,FXD,FILM:15.8K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX1582
A4R484	322–3238–00			RES,FXD,FILM:2.94K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K94
A4R485	322–3269–02			RES,FXD,FILM:6.19K OHM,0.2W,5%	57668	CRB DYE 6K19
A4R487	322–3308–00			RES,FXD,FILM:15.8K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX1582
A4R488	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K49
A4R492	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R493	322–3269–02			RES,FXD,FILM:6.19K OHM,0.2W,5%	57668	CRB DYE 6K19
A4R494	322–3299–00			RES,FXD,FILM:12.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 12K7
A4R495	322–3238–00			RES,FXD,FILM:2.94K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K94
A4R496	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R497	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R498	322–3297–00			RES,FXD:METAL FILM,12.1K OHM,1%,0.2W	57668	CRB20 FXE 12K1
A4R558	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0	91637	CCF50–5111F–R36
A4R572	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R573	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R574	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T29EFX1002
A4R579	322–3281–00			RES,FXD:METAL FILM,8.25K OHM,1%,0.2W	57668	CRB20 FXE 8K25
A4R580	322–3385–00			RES,FXD:METAL FILM,100K OHM,1%,0.2W	57668	CRB20T29EFX1003
A4R581	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R582	322–3299–00			RES,FXD,FILM:12.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 12K7
A4R583	322–3211–00			RES,FXD,FILM:1.54K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K54
A4R584	322–3268–00			RES,FXD,FILM:6.04K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 6K04
A4R585	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX2001
A4R592	322–3308–00			RES,FXD,FILM:15.8K OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX1582
A4R593	322–3185–00			RES,FXD:METAL FILM,825 OHM,1%,0.2W,TC=100 PPM	57668	CRB20 FXE 825E
A4R594	322–3255–00			RES,FXD,FILM:4.42K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K42
A4R595	322–3299–00			RES,FXD,FILM:12.7K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 12K7
A4R596	322–3269–02			RES,FXD,FILM:6.19K OHM,0.2W,5%	57668	CRB DYE 6K19
A4R597	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20T68EFX4990
A4R599	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W,TC=100 PPM	57668	CRB20T68EFX1502
A4TP100	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A4TP108	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A4TP315	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A4TP403	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A4U120	156–1324–00			IC,LINEAR:BIPOLAR,COMPARATOR,TTL,20NS,COMPLEMENTARY OUTPUT,W/STROBES,LM361N,DIP14.3	1CH66	NE529N SUPR II–B

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A4U167	156–2558–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, POSITIVE,12V,1.5A,2%,MC7812ACT,TO–220	01295	TL780–12CKC
A4U202	156–0381–00			IC,DIGITAL:LSTTL,GATE,QUAD 2–INPUT XOR,74LS86,DIP14.3,TUBE	01295	SN74LS86AN
A4U207	156–1324–00			IC,LINEAR:BIPOLAR,COMPARATOR,TTL,20NS,COMPL EMENTARY OUTPUT,W/STROBES,LM361N,DIP14.3	1CH66	NE529N SUPR II–B
A4U211	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A4U218	156–1600–00			IC,DIGITAL:LSTTLSC,DUAL RETRIG MONOSTABLE MULTIVIBRATOR,74LS123,DIP16.3,TUBE	01295	SN74LS123N
A4U223	156–0388–00			IC,DIGITAL:LSTTL,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74LS74,DIP14.3,TUBE	01295	SN74LS74AN
A4U226	156–0982–00			IC,DIGITAL:LSTTL,FLIP FLOP,OCTAL D–TYPE,3–STATE,74LS374,DIP20.3,TUBE	01295	SN74LS374N
A4U233	156–0982–00			IC,DIGITAL:LSTTL,FLIP FLOP,OCTAL D–TYPE,3–STATE,74LS374,DIP20.3,TUBE	01295	SN74LS374N
A4U236	156–0982–00			IC,DIGITAL:LSTTL,FLIP FLOP,OCTAL D–TYPE,3–STATE,74LS374,DIP20.3,TUBE	01295	SN74LS374N
A4U239	156–0982–00			IC,DIGITAL:LSTTL,FLIP FLOP,OCTAL D–TYPE,3–STATE,74LS374,DIP20.3,TUBE	01295	SN74LS374N
A4U243	156–0982–00			IC,DIGITAL:LSTTL,FLIP FLOP,OCTAL D–TYPE,3–STATE,74LS374,DIP20.3,TUBE	01295	SN74LS374N
A4U248	156–3107–00			IC,DIGITAL:HCMOS,FLIP FLOP,OCTAL D–TYPE,3–STATE,74HC374,DIP20.3	01295	SN74HC374N
A4U251	156–1367–00			IC,CONVERTER:CMOS,D/A,8BIT,400NS,CURRENT OUT,MPU COMPATIBLE,MULTIPLYING,AD7524JN,DIP16.3	24355	AD7524JN
A4U262	156–2559–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, NEGATIVE,–12V,1.5A,2%,MC7912ACT,TO–220	04713	MC7912ACT
A4U289	156–2101–00			IC,DIGITAL:ALSTTL,GATE,DUAL 4–INPUT NAND,74ALS20,DIP14.3,TUBE	01295	SN74ALS20AN
A4U302	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A4U318	156–1324–00			IC,LINEAR:BIPOLAR,COMPARATOR,TTL,20NS,COMPL EMENTARY OUTPUT,W/STROBES,LM361N,DIP14.3	1CH66	NE529N SUPR II–B
A4U329	156–0469–00			IC,DIGITAL:LSTTL,DECODER,1–OF–8,ACTIVE LOW,74LS138,DIP16.3,TUBE	01295	SN74LS138N
A4U333	156–0784–00			IC,DIGITAL:LSTTL,COUNTER,SYNCH 4–BIT BINARY,74LS163,DIP16.3,TUBE	01295	SN74LS163AN
A4U336	156–0784–00			IC,DIGITAL:LSTTL,COUNTER,SYNCH 4–BIT BINARY,74LS163,DIP16.3,TUBE	01295	SN74LS163AN
A4U339	156–0784–00			IC,DIGITAL:LSTTL,COUNTER,SYNCH 4–BIT BINARY,74LS163,DIP16.3,TUBE	01295	SN74LS163AN
A4U343	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A4U346	156–0513–03			ICSC:CMOS,ANALOG MUX,8 CHANNEL,4051B,DIP16.3,TUBE	04713	MC14051BCP
A4U348	156–0513–03			ICSC:CMOS,ANALOG MUX,8 CHANNEL,4051B,DIP16.3,TUBE	04713	MC14051BCP
A4U355	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD, TL074CN/LF347N/MC34004P,DIP14.3	01295	TL074CN
A4U357	156–2463–00			IC,DIGITAL:HCMOS,GATE,QUAD 2–INPUT OR,74HC32,DIP14.3,TUBE	01295	SN74HC32N
A4U383	156–0048–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFF PAIR, (3)IND,15V,50MA,300MHZ,AMPLIFIER,C	04713	MC3346P
A4U395	156–0048–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFF PAIR, (3)IND,15V,50MA,300MHZ,AMPLIFIER,C	04713	MC3346P
A4U406	156–1850–00			ICSC:CMOS,ANALOG SWITCH,QUAD,DG211,DIP16.3	17856	DG211CJ
A4U414	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A4U420	156–0388–00			IC,DIGITAL:LSTTL,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74LS74,DIP14.3,TUBE	01295	SN74LS74AN
A4U423	156–0784–00			IC,DIGITAL:LSTTL,COUNTER,SYNCH 4–BIT BINARY,74LS163,DIP16.3,TUBE	01295	SN74LS163AN
A4U426	160–8232–00			IC,DIGITAL:CMOS,PLD,EEPLD,20V8,15NS,115MA, PRGM 156–3212–01,20V8–15,DIP24.3	TK0198	160823200
				MOUNTING PARTS		
	136–0925–00			SOCKET,DIP::PCB,24 POS,2 X 12,0.1 X 0.3 CTR,0.196 H X 0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015	00779	2–641932–3
				END MOUNTING PARTS		
A4U429	156–0388–00			IC,DIGITAL:LSTTL,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74LS74,DIP14.3	01295	SN74LS74AN
A4U446	156–1631–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, SHUNT,ADJUSTABLE,100MA,TL431CLP,TO–92	01295	TL431CLP
A4U451	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD,TL074CN/LF347N/MC 34004P,DIP14.3	01295	TL074CN
A4U457	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD,TL074CN/LF347N/MC 34004P,DIP14.3	01295	TL074CN
A4U466	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD,TL074CN/LF347N/MC 34004P,DIP14.3	01295	TL074CN
A4U471	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD,TL074CN/LF347N/MC 34004P,DIP14.3	01295	TL074CN
A4U478	156–0067–00			IC,LINEAR:BIPOLAR,OP–AMP,741C,DIP08.3	01295	UA741CP
A4U486	156–0048–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPLIFIER,C	04713	MC3346P
A4U489	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD,TL074CN/LF347N/MC 34004P,DIP14.3	01295	TL074CN
A4U491	156–0048–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPLIFIER,C	04713	MC3346P
A4Y105	158–0362–00			XTAL UNIT,QTZ:10MHZ	14301	016–210–00051

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A5	671–0466–12		B030488	CIRCUIT BD ASSY:MICROPROCESSOR	80009	671–0466–12
A5	671–0466–13	B030489		CIRCUIT BD ASSY:MICROPROCESSOR	80009	671–0466–13
A5C105	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C117	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C130	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C135	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C137	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C140	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C142	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C145	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C150	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C155	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C170	281–0767–00			CAP,FXD,CERAMIC:MLC,330PF,20%,100V	04222	SA102C331MAA
A5C171	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C175	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C177	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C180	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C185	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50	04222	SA105E104MAA
A5C187	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C190	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C195	281–0302–00			CAP,VAR,PLASTIC:1.2–4PF,100V	52769	GXL4R000
A5C205	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C210	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C215	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C220	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C240	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50	04222	SA105E104MAA
A5C255	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C257	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C261	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C264	281–0819–00			CAP,FXD,CERAMIC:MLC,33 PF,5%,50V	04222	SA102A330JAA
A5C265	281–0819–00			CAP,FXD,CERAMIC:MLC,33 PF,5%,50V	04222	SA102A330JAA
A5C276	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C284	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C285	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C290	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C294	290–0848–00			CAP,FXD,ALUM:47UF,20%,16V,ESR=7.05 OHM(120HZ,25C),10X12MM,RADIAL.	62643	CEBPM1E470M
A5C295	281–0757–00			CAP,FXD,CERAMIC:MLC,10PF,10%,200V	04222	SA102A100KAA
A5C315	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V TUBULARI	04222	SA102A101JAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A5C335	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C336	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C342	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C344	290–0778–00			CAP,FXD,ALUM:1UF,20%,50V,5 X 11 MM,NONPOLAR,RADIAL	62643	CEBPM1H010M(Q)
A5C390	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C433	281–0819–00			CAP,FXD,CERAMIC:MLC,33 PF,5%,50V	04222	SA102A330JAA
A5C434	281–0759–00			CAP,FXD,CERAMIC:MLC,22PF,10%,100V	04222	SA102A220KAA
A5C440	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C445	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C448	283–0934–00			CAP,FXD,PLASTIC:0.0022UF,5%,100WVDC	TK1913	FKP2 2200/100/5
A5C450	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C455	281–0771–00			CAP,FXD,CER DI:2200PF,20%,200V TUBULAR	04222	SA102C222MAA
A5C457	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C465	283–0934–00			CAP,FXD,PLASTIC:0.0022UF,5%,100WVDC	TK1913	FKP2 2200/100/5
A5C476	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C480	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C485	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C487	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C492	290–0776–00			CAP,FXD,ALUM:22UF,20%,10V,ESR=15.07 OHM (120HZ,20C),RADIAL	62643	CEUSM1A220
A5C493	290–0776–00			CAP,FXD,ALUM:22UF,20%,10V,ESR=15.07 OHM (120HZ,20C),RADIAL	62643	CEUSM1A220
A5C495	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C496	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C534	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C539	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA
A5C540	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C541	290–0782–02			CAP,FXD,ELCTLT:4.7UF,+75–10%,35VDC	55680	UVX1V4R7MDA1TD
A5C550	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C551	281–0925–01			CAP,FXD,CERAMIC:MLC,0.22UF,20%,50V	04222	SA115E224MAA
A5C553	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C554	281–0925–01			CAP,FXD,CERAMIC:MLC,0.22UF,20%,50V	04222	SA115E224MAA
A5C558	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V	04222	SA105A102JAA
A5C567	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C568	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C569	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C570	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C571	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A5C572	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A5C592	290–0776–00			CAP,FXD,ALUM:22UF,20%,10V,ESR=15.07 OHM (120HZ,20C),RADIAL	62643	CEUSM1A220
A5C593	290–0776–00			CAP,FXD,ALUM:22UF,20%,10V,ESR=15.07 OHM (120HZ,20C),RADIAL	62643	CEUSM1A220
A5CR295	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA, 4NS,2PF,1N4152,DO–35	01295	1N4152R
A5CR394	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA, 4NS,2PF,1N4152,DO–35	01295	1N4152R
A5CR395	152–0322–00			DIODE,SIG:SCHOTTKY,15V,0.41V VF AT 1.0MA,1.2PF,5082–2811,HP "15"	21847	A2X600
A5CR545	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA, 4NS,2PF,1N4152,DO–35	01295	1N4152R
A5CR546	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA, 4NS,2PF,1N4152,DO–35	01295	1N4152R
A5CR550	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A, 1.2VF,2US,GP10G/1N5060	0LUA3	1N5060
A5CR553	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A, 1.2VF,2US,GP10G/1N5060	0LUA3	1N5060
A5CR564	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA, 4NS,2PF,1N4152,DO–35	01295	1N4152R
A5CR565	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA, 4NS,2PF,1N4152,DO–35	01295	1N4152R
A5DS491	150–1152–00			DIODE,OPTO:LED,HIGH EFFIC. RED,635NM,INTEGRAL RESISTOR,HLMP–1600–002,T1	50434	HLMP–1600–002
A5DS492	150–1152–00			DIODE,OPTO:LED,HIGH EFFIC. RED,635NM,INTEGRAL RESISTOR,HLMP–1600–002,T1	50434	HLMP–1600–002
A5DS493	150–1152–00			DIODE,OPTO:LED,HIGH EFFIC. RED,635NM,INTEGRAL RESISTOR,HLMP–1600–002,T1	50434	HLMP–1600–002
A5DS494	150–1152–00			DIODE,OPTO:LED,HIGH EFFIC. RED,635NM,INTEGRAL RESISTOR,HLMP–1600–002,T1,	50434	HLMP–1600–002
A5J115	131–3364–00			CONN,HDR:PCB,MALE,STR,2 X 17,0.1 CTR,0.365 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD,	53387	N2534–6002UB
A5J199	131–4046–00			CONN,DSUB:PCB/PNL,FEMALE,RTANG,15 POS,0.318 MLG X 0.125 TAIL,4–40 THD INSERTS,BD RETENTIO	00779	747845–4
A5J342	131–4794–00			CONN,HDR:PCB,MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB,W/BD RET	53387	2402–6112 UB
A5J344	131–4794–00			CONN,HDR:PCB,MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB,W/BD RET	53387	2402–6112 UB
A5J415	131–3277–00			CONN,HDR:PCB,MALE,STR,2 X 30,0.1 CTR,0.365 H X 0.105 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD	22526	66506–057
A5J453	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION	00779	104344–1
A5J495	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION	00779	104344–1

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A5J515	131–3277–00			CONN,HDR:PCB,MALE,STR,2 X 30,0.1 CTR,0.365 H X 0.105 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD	22526	66506–057
A5J595	131–6028–00			CONN,DSUB:PCB,FEMALE,RTANG,9 POS,0.112 CTR, 0.375 MLG X 0.125 TAIL,4–40 THD INSERT,BD RETE	00779	869522-5
A5P453	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER	00779	530153–2
A5Q196	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A5Q197	151–0410–00			TRANSISTOR,SIG:BIPOLAR,PNP,50V,50MA,40MHZ, AMPLIFIER,2N5087,TO–92 EBC	04713	2N5087
A5Q391	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A5Q392	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A5R105	307–0445–00			RES,NTWK:THICK FILM,(9) 4.7K OHM,2%,0.2W EACH,TC=100 PPM,SIP10,PIN 1 COMMON,BULK	11236	750–101–R4.7 K TUBE PACKED
A5R111	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R112	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R113	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R114	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R115	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R116	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R117	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R118	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R170	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A5R171	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A5R188	307–0446–00			RES NTWK,FXD,FI:(9) RES10K OHM,20%	11236	750–101–R10K
A5R194	311–2239–00			RES,VAR,TRMR:CERMET,100K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 104 M L20
A5R195	322–3414–00			RES,FXD:METAL FILM,200K OHM,1%,0.2W	57668	CRB 20 FXE 200 K OHM
A5R196	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W	57668	CRB20 FXE 1M00
A5R197	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A5R198	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A5R199	322–3431–00			RES,FXD,FILM:301K OHM,1%,0.2W	57668	CRB20 FXE 301K
A5R230	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A5R293	322–3335–00			RES,FXD,FILM:30.1K OHM,1%,0.2W	57668	CRB20 FXE 30K1
A5R294	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A5R297	322–3405–00			RES,FXD,FILM:162K OHM,1%,0.2W	91637	CCF50–1623F–R36
A5R299	307–0446–00			RES NTWK,FXD,FI:(9) RES,10K OHM,20%	11236	750–101–R10K
A5R305	307–0445–00			RES,NTWK:THICK FILM,(9) 4.7K OHM,2%,0.2W EACH,TC=100 PPM,SIP10,PIN 1 COMMON,BULK	11236	750–101–R4.7 K TUBE PACKED

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A5R315	322–3385–00			RES,FXD:METAL FILM,100K OHM,1%,0.2W	57668	CRB20T29EFX1003
A5R355	307–0446–00			RES NTWK,FXD,FI:(9) RES,10K OHM,20%	11236	750–101–R10K
A5R360	307–0446–00			RES NTWK,FXD,FI:(9) RES,10K OHM,20%	11236	750–101–R10K
A5R361	322–3051–00			RES,FXD,METAL:33.2 OHM,1%,0.2W	57668	CRB20FXE33E2
A5R362	322–3051–00			RES,FXD,METAL:33.2 OHM,1%,0.2W	57668	CRB20FXE33E2
A5R363	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A5R364	322–3051–00			RES,FXD,METAL:33.2 OHM,1%,0.2W	57668	CRB20FXE33E2
A5R370	307–0446–00			RES NTWK,FXD,FI:(9) RES,10K OHM,20%	11236	750–101–R10K
A5R391	322–3108–00			RES,FXD,FILM:130 OHM,1%,0.2W	57668	CRB20T68EFX1300
A5R392	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A5R393	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A5R394	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W	57668	CRB20T68EFX4991
A5R395	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A5R396	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A5R397	322–3431–00			RES,FXD,FILM:301K OHM,1%,0.2W	57668	CRB20 FXE 301K
A5R398	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A5R399	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A5R402	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R403	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R404	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R405	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R406	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R407	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R408	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R430	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A5R431	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A5R435	315–0305–00			RES,FXD,FILM:3M OHM,5%,0.25W	50139	CB3055
A5R436	322–3426–00			RES,FXD,FILM:267K OHM,1%,0.2W	91637	CCF50–2673F–R36
A5R437	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W	57668	CRB20T68EFX4990
A5R438	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A5R445	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A5R450	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A5R455	322–3320–00			RES,FXD,FILM:21K OHM,1%,0.2W	57668	CRB20 FXE 21K0
A5R456	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A5R460	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A5R461	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A5R491	322–3130–00		B030488	RES,FXD,FILM:221 OHM,1%,0.2W	57668	CRB20T68EFX2210
A5R491	322–3101–00	B030489		RES,FXD,FILM:110 OHM,1%,0.2W	57668	CRB20T68EFX1100

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A5R492	322–3130–00		B030488	RES,FXD,FILM:221 OHM,1%,0.2W	57668	CRB20T68EFX2210
A5R492	322–3101–00	B030489		RES,FXD,FILM:110 OHM,1%,0.2W	57668	CRB20T68 EFX1100
A5R502	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R503	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R504	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R505	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R506	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R507	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R508	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R509	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A5R536	311–2234–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 502 M L20
A5R537	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A5R538	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W	57668	CRB20T68EFX4990
A5R539	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A5R541	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A5R545	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W	57668	CRB20 FXE 7K50
A5R546	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A5R547	322–3350–00			RES,FXD,FILM:43.2K OHM,1%,0.2W	91637	CCF50–4322F–R36
A5R555	311–2234–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 502 M L20
A5R556	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A5R557	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A5R558	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A5R559	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W	57668	CRB20T68EFX4991
A5R563	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A5R564	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A5R565	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A5R566	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A5R567	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A5R572	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A5S385	260–1965–00			SWITCH,ROCKER:DIP,RAISED ROCKER,4 POSITION,TOP SEALED,150MA 30VDC,76SBO4S	00779	435166–2
A5U101	156–1748–00			IC,DIGITAL:ALSTTL,TRANSCEIVER,OCTAL, 3–STATE,74ALS1245,DIP20.3,TUBE	01295	SN74ALS1245AN
A5U105	156–1748–00			IC,DIGITAL:ALSTTL,TRANSCEIVER,OCTAL, 3–STATE,74ALS1245,DIP20.3,TUBE	01295	SN74ALS1245AN
A5U120	156–2092–00			IC,DIGITAL:ALSTTL,GATE,QUAD 2–INPUT NOR,74ALS02,DIP14.3,TUBE	01295	SN74ALS02AN
A5U130	160–6016–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS, 90MA,PRGM 156–2983–00,16V8–25,DIP20.3	80009	160–6016–00

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE	98291	DIPS20PIT
				END MOUNTING PARTS		
A5U135	156–2111–00			IC,DIGITAL:ALSTTL,LATCH,OCTAL D–TYPE,3–STATE,74ALS373A,DIP20.3,TUBE	01295	SN74ALS373AN
A5U137	156–2111–00			IC,DIGITAL:ALSTTL,LATCH,OCTAL D–TYPE,3–STATE,74ALS373A,DIP20.3,TUBE	01295	SN74ALS373AN
A5U140	156–1748–00			IC,DIGITAL:ALSTTL,TRANSCEIVER,OCTAL, 3–STATE,74ALS1245,DIP20.3,TUBE	01295	SN74ALS1245AN
A5U142	156–1748–00			IC,DIGITAL:ALSTTL,TRANSCEIVER,OCTAL, 3–STATE,74ALS1245,DIP20.3,TUBE	01295	SN74ALS1245AN
A5U145	156–1748–00			IC,DIGITAL:ALSTTL,TRANSCEIVER,OCTAL, 3–STATE,74ALS1245,DIP20.3,TUBE	01295	SN74ALS1245AN
A5U150	156–2372–00			IC,MEMORY:NMOS 65536 X 4 DRAM41464–12,18 DIP	4T165	UPD41464C–10
A5U155	156–2372–00			IC,MEMORY:NMOS 65536 X 4 DRAM41464–12,18 DIP	4T165	UPD41464C–10
A5U157	156–2372–00			IC,MEMORY:NMOS 65536 X 4 DRAM41464–12,18 DIP	4T165	UPD41464C–10
A5U160	156–2372–00			IC,MEMORY:NMOS 65536 X 4 DRAM41464–12,18 DIP	4T165	UPD41464C–10
A5U165	156–2357–00			IC,DIGITAL:HCTCMOS,FLIP FLOP,OCTAL D–TYPE, FLOW THRU,3–STATE,74HCT574,DIP20.3,TUBE	01295	SN74HCT574N
A5U167	160–8065–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,15NS,90MA,PRGM 156–3211–00,16V8–15,DIP20.3	TK0198	160806500
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE	98291	DIPS20PIT
				END MOUNTING PARTS		
A5U170	156–3638–00			IC,DIGITAL:HCTCMOS,COUNTER,SYNCH 4–BIT UP/DOWN BINARY,74HCT193,DIP16.3,TUBE	1CH66	74HCT193N
A5U171	156–2357–00			IC,DIGITAL:HCTCMOS,FLIP FLOP,OCTAL D–TYPE, FLOW THRU,3–STATE,74HCT574,DIP20.3,TUBE	01295	SN74HCT574N
A5U175	160–6016–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS, 90MA,PRGM 156–2983–00,16V8–25,DIP20.3	80009	160–6016–00
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE	98291	DIPS20PIT
				END MOUNTING PARTS		
A5U177	160–6016–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS, 90MA,PRGM 156–2983–00,16V8–25,DIP20.3	80009	160–6016–00
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE	98291	DIPS20PIT
				END MOUNTING PARTS		
A5U180	160–6016–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS, 90MA,PRGM 156–2983–00,16V8–25,DIP20.3	80009	160–6016–00

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE	98291	DIPS20PIT
				END MOUNTING PARTS		
A5U185	160–6016–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS, 90MA,PRGM 156–2983–00,16V8–25,DIP20.3	80009	160–6016–00
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE	98291	DIPS20PIT
				END MOUNTING PARTS		
A5U187	160–6016–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS, 90MA,PRGM 156–2983–00,16V8–25,DIP20.3	80009	160–6016–00
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE	98291	DIPS20PIT
				END MOUNTING PARTS		
A5U190	156–2210–00			IC,DIGITAL:ALSTTL,MUX,QUAD 2–TO–1,3–STATE,74ALS257,DIP16.3,TUBE	01295	SN74ALS257N
A5U217	156–3452–00			IC,CONVERTER:CMOS,A/D,8–BIT,100US,SAR, 16 CHANNEL MUX,ADC0817,DIP40.6	27014	ADC0817CCN
A5U305	160–6012–00			MICROCKT,DGTL:CMOS,PLD,PRGM 22V10–25 DIP24.3	TK0198	160601200
				MOUNTING PARTS		
	136–0925–00			SOCKET,DIP:PCB,24 POS,2 X 12,0.1 X 0.3 CTR,0.196 H X 0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015	00779	2–641932–3
				END MOUNTING PARTS		
A5U310	160–6014–07			IC,DIGITAL:CMOS,EPROM,131072 X 8,PRGM 156–3621–00,27C010,DIP32.6	TK0198	160601407
				MOUNTING PARTS		
	136–0963–00			SOCKET,DIP:PCB,32,2 X 16,0.1 X 0.6 CTR,0.210 H X 0.12 TAIL,PHOS BRZ,ACCOM 0.008–0.014 THI	00779	2–644018–3
				END MOUNTING PARTS		
A5U315	160–6015–07			IC,DIGITAL:CMOS,EPROM,131072 X 8,PRGM 156–3621–00,27C010,DIP32.6	TK0198	160601507
				MOUNTING PARTS		
	136–0963–00			SOCKET,DIP:PCB,32,2 X 16,0.1 X 0.6 CTR,0.210 H X 0.12 TAIL,PHOS BRZ,ACCOM 0.008–0.014 THI	00779	2–644018–3
				END MOUNTING PARTS		
A5U320	156–2991–00			IC,MEMORY:CMOS,NVRAM,8K X 8,200NS, SRAM,INTEGRAL BATTERY,1225,DIP28.6	0B0A9	DS1225Y–200
				MOUNTING PARTS		
	136–0755–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 14,28 POS,0.1 X 0.6 CTR,0.175 H X 0.130 TAIL,BECU,TIN,ACCOM	98291	DIPS28PIT

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
				END MOUNTING PARTS		
A5U330	156–3669–00			IC,PROCESSOR:NMOS,PERIPHL,DUART,2681,DIP24.4	1CH66	SCN2681AC1N24
A5U340	156–5701–00			IC,PROCESSOR:CMOS,MICROPROCESSOR,16–BIT,10 MHZ,32CG16,PLCC68,TUBE	27014	NS32CG16V–10E
				MOUNTING PARTS		
	136–0871–00			SOCKET,PLCC::PCB,68 POS,0.05 CTR,0.360 H X 0.125 TAIL,TIN,0.1 CTR PCB,0.060 SHOULDER HEIGHT	00779	3–821574–1
				END MOUNTING PARTS		
A5U344	156–2396–00			IC,MISC:BIPOLAR,PWR SUPPLY SUPERVISOR,MPU RESET GENERATOR,5V SUPPLY SENSING,TL7705ACP	01295	TL7705ACP
A5U345	160–6012–00			MICROCKT,DGTL:CMOS,PLD,PRGM 22V10–25 DIP24.3	TK0198	160601200
				MOUNTING PARTS		
	136–0925–00			SOCKET,DIP:PCB,24 POS,2 X 12,0.1 X 0.3 CTR,0.196 H X 0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015	00779	2–641932–3
				END MOUNTING PARTS		
A5U350	160–6016–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS,90MA,PRGM 156–2983–00,16V8–25,DIP20.3	80009	160–6016–00
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE	98291	DIPS20PIT
				END MOUNTING PARTS		
A5U353	156–2161–00			IC,DIGITAL:ALSTTL,MUX,QUAD INVERT 2–TO–1,ENABLE,74ALS158,DIP16.3,TUBE	01295	SN74ALS158N
A5U357	156–2161–00			IC,DIGITAL:ALSTTL,MUX,QUAD INVERT 2–TO–1,ENABLE,74ALS158,DIP16.3,TUBE	01295	SN74ALS158N
A5U361	160–6012–00			MICROCKT,DGTL:CMOS,PLD,PRGM 22V10–25 DIP24.3	TK0198	160601200
				MOUNTING PARTS		
	136–0925–00			SOCKET,DIP:PCB,24 POS,2 X 12,0.1 X 0.3 CTR,0.196 H X 0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015	00779	2–641932–3
				END MOUNTING PARTS		
A5U367	156–5526–00			IC,PROCESSOR:CMOS,MICROCOMPUTER,8–BIT, 12MHZ,ROMLESS,128X8 RAM,(7)8–BIT I/O PORTS,SERIAL I/O,8	1CH66	SC80C451CCA68
				MOUNTING PARTS		
	136–0871–00			SOCKET,PLCC:PCB,68 POS,0.05 CTR,0.360 H X 0.125 TAIL,TIN,0.1 CTR PCB,0.060 SHOULDER HEIGHT	00779	3–821574–1
				END MOUNTING PARTS		
A5U375	156–2356–00			IC,DIGITAL:HCTCMOS,LATCH,OCTAL D–TYPE,FLOW THRU,3–STATE,74HCT573,DIP20.3,TUBE	01295	SN74HCT573N
A5U376	156–2357–00			IC,DIGITAL:HCTCMOS,FLIP FLOP,OCTAL D–TYPE,FLOW THRU,3–STATE,74HCT574,DIP20.3,TUBE	01295	SN74HCT574N
A5U380	156–2096–00			IC,DIGITAL:ALSTTL,FLIP FLOP,QUAD D–TYPE,CLEAR,74ALS175,DIP16.3,TUBE	01295	SN74ALS175N

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A5U384	156–2096–00			IC,DIGITAL:ALSTTL,FLIP FLOP,QUAD D–TYPE,CLEAR,74ALS175,DIP16.3,TUBE	01295	SN74ALS175N
A5U385	156–2357–00			IC,DIGITAL:HCTCMOS,FLIP FLOP,OCTAL D–TYPE, FLOW THRU,3–STATE,74HCT574,DIP20.3,TUBE	01295	SN74HCT574N
A5U390	156–2210–00			IC,DIGITAL:ALSTTL,MUX,QUAD 2–TO–1,3–STATE,74ALS257,DIP16.3,TUBE	01295	SN74ALS257N
A5U392	156–3637–00			IC,DIGITAL:ACTCMOS,FLIP FLOP,HEX D–TYPE,CLEAR,74ACT174,DIP16.3,TUBE	04713	MC74ACT174N
A5U395	156–3453–00			IC,MISC:TTL,INTERFACE,DIFFERENTIAL LINE DRIVER /RECEIVER PAIR,MEETS RS–422A & RS–485 STAND	01295	SN75179BP
				MOUNTING PARTS		
	136–0727–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 4,0.3 CTR,0.175 H X 0.130 TAIL,TIN,BECU	98291	DIPS08PIT
				END MOUNTING PARTS		
A5U430	119–1916–00			OSCILLATOR:CRYSTAL CONTROLLED,3.6864 MHZ,100PPM	08111	M1200–3.6864 MHZ
A5U450	156–2091–00			IC,DIGITAL:ALSTTL,GATE,QUAD 2–INPUT NAND,74ALS00,DIP14.3,TUBE	01295	SN74ALS00AN
A5U453	156–2761–01			IC,DIGITAL:HCMOS,MULTIVIBRATOR,DUPLICATE OF 156–2761–00,74HC221A,DIP16.3,TUBE	0JR04	TC74HC221AP
A5U457	156–2210–00			IC,DIGITAL:ALSTTL,MUX,QUAD 2–TO–1,3–STATE,74ALS257,DIP16.3,TUBE	01295	SN74ALS257N
A5U467	156–3639–00			IC,CONVERTER:CMOS,D/A,12 BIT,VOLTAGE OUT, W/REF,MPU COMP,PARALLEL LOAD,AD7245JN,DIP24.3	24355	AD7245JN
A5U470	156–3639–00			IC,CONVERTER:CMOS,D/A,12 BIT,VOLTAGE OUT, W/REF,MPU COMP,PARALLEL LOAD,AD7245JN,DIP24.3	24355	AD7245JN
A5U475	156–2146–00			IC,MEMORY:CMOS,SRAM,2K X 8,150NS,OE,DIP24.3	62786	HM6116ASP–15
A5U476	160–6000–02			IC,DIGITAL:CMOS,EPROM,8192 X 8,27C64,PRGM 156–2858–00,DIP28.6	TK0198	160600002
				MOUNTING PARTS		
	136–0755–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 14,28 POS,0.1 X 0.6 CTR,0.175 H X 0.130 TAIL,BECU,TIN,ACCOM	98291	DIPS28PIT
				END MOUNTING PARTS		
A5U480	156–1920–00			IC,DIGITAL:HCTCMOS,BUFFER,OCTAL,3–STATE,74HC T244,DIP20.3,TUBE	04713	MC74HCT244AN
A5U485	156–1920–00			IC,DIGITAL:HCTCMOS,BUFFER,OCTAL,3–STATE,74HC T244,DIP20.3,TUBE	04713	MC74HCT244AN
A5U487	156–0545–00			IC,DIGITAL:CMOS,COUNTER,12–BIT BINARY,4040B,DIP16.3,TUBE	04713	MC14040BCP
A5U495	156–2724–00			IC,MISC:CMOS,INTERFACE,DUAL RS–232 LINE DRIVER/RECEIVER,+5V VCC,EXTERNAL CAPS REQD	24355	AD232JN
A5U535	156–1756–00			IC,DIGITAL:ALSTTL,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74ALS74,DIP14.3,TUBE	01295	SN74ALS74AN
A5U541	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD,TL074CN/LF347N/MC 34004P,DIP14.3	01295	TL074CN

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A5U548	156–1312–00			IC,MISC:BIPOLAR,SAMPLE/HOLD,LOW DROOP RATE,SMP–11,DIP14.3	24355	SMP11FY
A5U550	156–2263–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, NEGATIVE,–12V,100MA,4%,MC79L12ACP,TO–92	04713	MC79L12ACP
A5U553	156–2735–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, POSITIVE,12V,100MA,5%,MC78L12ACP,TO–92	01295	UA78L12ACLP
A5U560	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD,TL074CN/LF347N/MC 34004P,DIP14.3	01295	TL074CN
A5U565	156–1312–00			IC,MISC:BIPOLAR,SAMPLE/HOLD,LOW DROOP RATE,SMP–11,DIP14.3	24355	SMP11FY
A5U595	156–2091–00			IC,DIGITAL:ALSTTL,GATE,QUAD 2–INPUT NAND,74ALS00,DIP14.3,TUBE	01295	SN74ALS00AN
A5W475	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A5W548	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A5Y264	158–0300–00			XTAL UNIT,QTZ:12.0 MHZ,50 PPM,SERIES HC–49U W/3RD LEAD	61429	FOX120X
A5Y435	158–0360–00			XTAL UNIT,QTZ:20MHZ,0.005%,SERIES,HC49 W/3RD LEAD 20 OHM	14301	011–661–03390

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6	671–0465–13			CIRCUIT BDASSY:VECTORSCOPE,NTSC, (1780R ONLY)	80009	671–0465–13
A6	671–0987–14			CIRCUIT BD ASSY:VECTORSCOPE,PAL, (1781R ONLY)	80009	671–0987–14
				ATTACHED PARTS		
	337–3551–00			SHIELD,ELEC:OSCILLATOR,ECB,BRASS	TK1947	337–3551–00
	337–0607–00			PLATE,ELEC SHLD:CIRCUIT BOARD 661	0J260	337–0607–00
				END ATTACHED PARTS		
A6C105	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V	04222	SA102A101JAA
A6C110	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V	04222	SA102A101JAA
A6C116	290–0776–01			CAP,FXD,ALUM:22UF,20%,10V	55680	UVX1A220MDA1TD
A6C118	283–0768–01			CAP,FXD,MICA DI:132PF,1%,500V	09023	CDA15FD(132)F03
A6C120	283–0630–01			CAP,FXD,MICA DI:110PF,1%,500V	09023	CDA15FD111F03
A6C126	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C131	281–0797–00			CAP,FXD,CERAMIC:MLC,15PF,5%,100V,SAFETY	12969	CGB150KFN
A6C136	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C137	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C140	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C146	283–0665–00			CAP,FXD,MICA DI:190PF,1%,100V	09023	CD15FD191F03
A6C148	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C150	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C153	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A6C156	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C157	281–0777–00			CAP,FXD,CERAMIC:MLC,51PF,5%,200V	04222	SA102A510JAA
A6C162	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A6C165	283–0784–01			CAP,FXD,MICA DI:40PF,2%,500V	09023	CDA15ED400G03
A6C166	283–0633–01			CAP,FXD,MICA DI:77PF,1%,500V,RADIAL	09023	CDA15ED770F03
A6C171	281–0000–00			TEST SELECTABLE COMPONENT	80009	281–0000–00
A6C172	281–0320–00			CAP,VAR,CER DI:3.9–27PF,100V,8MM TOP ADJ	52769	GXA27000
A6C183	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C184	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C185	283–0638–01			CAP,FXD,MICA DI:130PF,1%,500V	09023	CDA15FD131F03
A6C188	283–0631–01			CAP,FXD,MICA DI:95PF,1%,500V	TK0891	RDM15FD950F03
A6C190	283–0645–01			CAP,FXD,MICA DI:790PF,1%,300V	09023	CDA15FC791F03
A6C205	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V	04222	SA102A101JAA
A6C208	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C213	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C216	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6C218	281–0000–00			TEST SELECTABLE COMPONENT	80009	281–0000–00
A6C221	283–0665–00			CAP,FXD,MICA DI:190PF,1%,100V	09023	CD15FD191F03
A6C225	283–0634–01			CAP,FXD,MICA DI:65PF,1%,500V	09023	CDA15ED650F03
A6C238	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C243	283–0634–01			CAP,FXD,MICA DI:65PF,1%,500V	09023	CDA15ED650F03
A6C248	283–0630–01			CAP,FXD,MICA DI:110PF,1%,500V	09023	CDA15FD111F03
A6C249	283–0768–01			CAP,FXD,MICA DI:132PF,1%,500V	09023	CDA15FD(132)F03
A6C251	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C257	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C264	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C273	283–0677–01			CAP,FXD,MICA DI:82PF,1%,500V	09023	CDA15ED820F03
A6C277	283–0725–01			CAP,FXD,MICA DI:214PF,1%,500V	09023	CDA15FD(214)F03
A6C288	283–0638–01			CAP,FXD,MICA DI:130PF,1%,500V	09023	CDA15FD131F03
A6C290	283–0620–01			CAP,FXD,MICA DI:470PF,1%,500V	09023	CDA15FD471F03
A6C292	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C294	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C297	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A6C305	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V	04222	SA102A101JAA
A6C318	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C319	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C324	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C330	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C336	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C339	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C341	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C343	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C344	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C346	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C350	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C351	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C357	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C358	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C360	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C365	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C369	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A6C373	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C377	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6C383	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C391	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C392	281–0893–00			CAP,FXD,CERAMIC:MLC,4.7PF,+/–0.5PF,100V	04222	SA102A4R7DAA
A6C394	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A6C395	281–0819–00			CAP,FXD,CERAMIC:MLC,33 PF,5%,50V	04222	SA102A330JAA
A6C401	281–0783–00			CAP,FXD,CERAMIC:MLC,0.1 UF 20%,100V	12969	CGD104MEZ
A6C404	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C411	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C412	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C417	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C420	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A6C421	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C438	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C443	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C450	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C454	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C456	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A6C457	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C464	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C471	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C474	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C481	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C482	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C483	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C484	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C486	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C490	281–0925–01			CAP,FXD,CERAMIC:MLC,0.22UF,20%,50V,Z5U	04222	SA115E224MAA
A6C491	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C492	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C493	281–0182–00			CAP,VAR,PLASTIC:1.8–10PF,300V TOP/BOT ADJ	52769	GXE10001
A6C494	281–0772–00			CAP,FXD,CERAMIC:MLC,4700PF,10%,100V	04222	SA101C472KAA
A6C495	281–0813–00			CAP,FXD,CERAMIC:MLC,0.047UF,20%,50V	04222	SA105E473MAA
A6C503	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C521	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C529	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C530	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C537	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C538	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6C554	281–0797–00			CAP,FXD,CERAMIC:MLC,15PF,5%,100V,SAFETY	12969	CGB150KFN
A6C555	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C562	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C570	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A6C571	281–0893–00			CAP,FXD,CERAMIC:MLC,4.7PF,+/–0.5PF,100V	04222	SA102A4R7DAA
A6C573	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C576	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A6C582	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C605	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C614	281–0893–00			CAP,FXD,CERAMIC:MLC,4.7PF,+/–0.5PF,100V	04222	SA102A4R7DAA
A6C627	281–0757–00			CAP,FXD,CERAMIC:MLC,10PF,10%,200V,NPO,AXIAL	04222	SA102A100KAA
A6C632	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A6C634	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A6C641	290–0776–01			CAP,FXD,ALUM:22UF,20%,10V	55680	UVX1A220MDA1TD
A6C645	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C648	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C659	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C660	283–0672–01			CAP,FXD,MICA DI:200PF,1%,500V (1780R ONLY)	09023	CDA15FD201F03
A6C660	283–0671–00			CAP,FXD,MICA DI:164PF,1%,500V (1781R ONLY)	09023	CD15FD(164)F03
A6C661	283–0647–01			CAP,FXD,MICA DI:70PF,1%,500V (1780R ONLY)	09023	CDA15ED700F03
A6C661	283–0639–01			CAP,FXD,MICA DI:56PF,1%,500V (1781R ONLY)	09023	CDA15ED560F03
A6C664	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C672	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C673	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A6C676	283–0785–01			CAP,FXD,MICA DI:250PF,1%,500V	09023	CDA15FD251F03
A6C682	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C693	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C695	281–0920–00			CAP,FXD:CERAMIC,MLC,1000PF,5%,50V,0.170 X 0.1,NPO,AXIAL,TAPE &REEL	04222	SA105A102JAA
A6C703	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C733	281–0000–00			TEST SELECTED COMPONENT	80009	281–0000–00
A6C735	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C738	283–0630–01			CAP,FXD,MICA DI:110PF,1%,500V	09023	CDA15FD111F03
A6C742	283–0768–01			CAP,FXD,MICA DI:132PF,1%,500V	09023	CDA15FD(132)F03
A6C744	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6C747	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C753	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C756	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C758	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C761	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A6C803	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C805	281–0759–00			CAP,FXD,CERAMIC:MLC,22PF,10%,100V	04222	SA102A220KAA
A6C818	281–0756–00			CAP,FXD,CERAMIC:MLC,2.2PF,+/–0.5PF,200V,NPO	04222	SA102A2R2DAA
A6C819	281–0811–00			CAP,FXD,CERAMIC:MLC,10PF,10%,200V	04222	SA102A100KAA
A6C832	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C835	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6C839	283–0665–00			CAP,FXD,MICA DI:190PF,1%,100V	09023	CD15FD191F03
A6C843	283–0634–01			CAP,FXD,MICA DI:65PF,1%,500V	09023	CDA15ED650F03
A6C848	281–0000–00			TEST SELECTED COMPONENT	80009	281–0000–00
A6C849	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C850	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A6C851	281–0000–00			TEST SELECTED COMPONENT	80009	281–0000–00
A6C852	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A6C861	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A6CR236	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A6CR237	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A6CR294	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A6CR436	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A6CR437	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A6CR443	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A6CR444	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A6CR467	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A6CR468	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A6CR493	152–0246–00			DIODE,SIG:ULTRA FAST,40V,200MA,FDH300A,DO–7,T&R	12969	NDP0533
A6CR671	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF,2US,GP10G/1N5060	0LUA3	1N5060

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6CR672	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF,2US,GP10G/1N5 060	0LUA3	1N5060
A6CR860	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF,2US,GP10G/1N5 060,T&R,	0LUA3	1N5060
A6CR861	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF,2US,GP10G/1N5 060,T&R,	0LUA3	1N5060
A6J100	131–4046–00			CONN,DSUB:PCB/PNL,FEMALE,RTANG,15 POS,0.318 MLG X 0.125 TAIL,4–40 THD INSERTS,BD RETENTIO	00779	747845–4
A6J108	131–4794–00			CONN,HDR:PCB,MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB,W/BD RET	53387	2402–6112 UB
A6J205	131–4794–00			CONN,HDR:PCB,MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB,W/BD RET	53387	2402–6112 UB
A6J321	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A6J389	131–1425–00			CONN,HDR:PCB,MALE,RTANG,1 X 36,0.1 CTR,0.230 MLG X 0.090 TAIL,30 GOLD,STACKABLE,	22526	65521–136
A6J498	131–1425–00			CONN,HDR:PCB,MALE,RTANG,1 X 36,0.1 CTR,0.230 MLG X 0.090 TAIL,30 GOLD,STACKABLE,	22526	65521–136
A6J574	131–1425–00			CONN,HDR:PCB,MALE,RTANG,1 X 36,0.1 CTR,0.230 MLG X 0.090 TAIL,30 GOLD,STACKABLE,	22526	65521–136
A6J885	131–4339–00			CONN,HDR::PCB,MALE,RTANG,2 X 30,0.1 CTR,0.340 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD	53387	3372–5202
A6J1203	131–1425–00			CONN,HDR:PCB,MALE,RTANG,1 X 36,0.1 CTR,0.230 MLG X 0.090 TAIL,30 GOLD,STACKABLE,	22526	65521–136
A6L287	108–0317–00			INDUCTOR,FXD:CUSTOM,POWER,15UH,10%,IDC<460 MA,RDC<1.2 OHM,Q>55@2.5MHZ,SRF>30 MHZ,POWDERED IRO (1780R ONLY)	0JR03	108–0317–00
A6L287	108–0368–00			INDUCTOR,FXD:CUSTOM,POWER,9.7UH,IMAX<240MA @2.5MHZ,ON FORM 302–0102–00,82T W/41 AWG, (1781R ONLY)	80023	ADVISE
A6L659	108–0317–00			INDUCTOR,FXD:CUSTOM,POWER,15UH,10%,IDC<460 MA,RDC<1.2 OHM,Q>55@2.5MHZ,SRF>30 MHZ,POWDERED IRO	0JR03	108–0317–00
A6P321	131–0993–00			CONN,BOX SHUNT,;FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER;	80009	131–0993–00
A6Q122	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q135	151–1025–00			TRANSISTOR,SIG:JFET,N–CH,6V,15MA,4.5MS, AMPLIFIER,J304/PN4416,TO–92 SDG	04713	SPF3036
A6Q145	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q158	151–0261–01			TRANSISTOR,SIG:BIPOLAR,PNP,60V,50MA,100MHZ, AMPLIFIER,DUAL,2N3810,TO–78	04713	2N3810
A6Q159	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6Q160	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A6Q167	151–0216–00			TRANSISTOR,SIG:BIPOLAR,PNP,25V,100MA,170MHZ, AMPLIFIER,MPS6523,TO–92 EBC	01295	SKA3312
A6Q186	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A6Q187	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q223	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q239	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A6Q246	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q265	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q277	151–0195–00			TRANSISTOR,SIG:BIPOLAR,NPN,20V,100MA,150MHZ, AMPLIFIER,2N5223/MPS6521,TO–92 EBC	04713	2N5223
A6Q278	151–0164–00			TRANSISTOR,SIG:BIPOLAR,PNP,60V,600MA,200MHZ, AMPLIFIER,MPS2907A,TO–92EBC	01295	A8T3702
A6Q279	151–0164–00			TRANSISTOR,SIG:BIPOLAR,PNP,60V,600MA,200MHZ, AMPLIFIER,MPS2907A,TO–92EBC	01295	A8T3702
A6Q290	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A6Q291	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A6Q294	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q295	151–0711–00			TRANSISTOR,SIG:BIPOLAR,NPN,25V,50MA,650MHZ, AMPLIFIER,MPSH10,TO–92 BEC	04713	MPSH10
A6Q296	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A6Q323	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q342	151–1025–00			TRANSISTOR,SIG:JFET,N–CH,6V,15MA,4.5MS, AMPLIFIER,J304/PN4416,TO–92 SDG	04713	SPF3036
A6Q390	151–0712–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA,600MHZ, AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A6Q403	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q447	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q459	151–0195–00			TRANSISTOR,SIG:BIPOLAR,NPN,20V,100MA,150MHZ, AMPLIFIER,2N5223/MPS6521,TO–92 EBC	04713	2N5223
A6Q462	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6Q467	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q468	151–0619–00			TRANSISTOR,SIG:BIPOLAR,NPN,35V,20MA, SUPERMATCHED DUAL,LM394H/MAT02FH,TO–78	27014	LM394BH
A6Q492	151–0711–00			TRANSISTOR,SIG:BIPOLAR,NPN,25V,50MA,650MHZ, AMPLIFIER,MPSH10,TO–92 BEC	04713	MPSH10
A6Q493	151–1025–00			TRANSISTOR,SIG:JFET,N–CH,6V,15MA,4.5MS, AMPLIFIER,J304/PN4416,TO–92 SDG	04713	SPF3036
A6Q496	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A6Q515	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q516	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q526	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q527	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q560	151–0195–00			TRANSISTOR,SIG:BIPOLAR,NPN,20V,100MA,150MHZ, AMPLIFIER,2N5223/MPS6521,TO–92 EBC	04713	2N5223
A6Q573	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q602	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q611	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q617	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q623	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q628	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q645	151–1059–00			TRANSISTOR,SIG:JFET,N–CH,10V,30MA(MIN),30OHM, 300MW,MPF4391,TO–92 DSG	04713	MPF4391
A6Q663	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q665	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q677	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A6Q710	151–0407–00			TRANSISTOR:NPN,SI,TO–39 TCS0147	04713	2N3501
A6Q719	151–0407–00			TRANSISTOR:NPN,SI,TO–39 TCS0147	04713	2N3501
A6Q723	151–0407–00			TRANSISTOR:NPN,SI,TO–39 TCS0147	04713	2N3501
A6Q730	151–0407–00			TRANSISTOR:NPN,SI,TO–39 TCS0147	04713	2N3501

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6Q739	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q742	151–1059–00			TRANSISTOR,SIG:JFET,N–CH,10V,30MA(MIN),30OHM, 300MW,MPF4391,TO–92 DSG	04713	MPF4391
A6Q743	151–0223–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC	04713	MPS2369A
A6Q841	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6Q847	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A6Q897	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A6R104	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R106	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R107	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R109	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R110	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A6R111	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R112	322–3314–00			RES,FXD:METAL FILM,18.2K OHM,1%,0.2W	57668	CRB20 FXE 18K2
A6R113	311–2235–00			RES,VAR,TRMR:CERMET,10K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 103 M L20
A6R114	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R117	322–3202–00			RES,FXD,FILM:1.24K OHM,1%,0.2W	57668	CRB20 FXE 1K24
A6R118	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A6R121	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R122	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R123	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R124	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R125	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R130	322–3173–00			RES,FXD,FILM:619 OHM,1%,0.2W	91637	CCF50–6190F–R36
A6R131	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R132	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R133	322–3173–00			RES,FXD,FILM:619 OHM,1%,0.2W	91637	CCF50–6190F–R36
A6R134	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A6R141	322–3322–00			RES,FXD:METAL FILM,22.1K OHM,1%,0.2W	57668	CRB20 FXE 22K1
A6R144	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R147	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W	91637	CCF50–5111F–R36
A6R148	322–3216–00			RES,FXD,FILM:1.74K OHM,1%,0.2W	57668	CRB20 FXE 1K74
A6R154	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W	91637	CCF50–6191F–R36
A6R155	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R156	322–3402–00			RES,FXD:METAL FILM,150K OHM,1%,0.2W	57668	CRB20T68EFX1503

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6R157	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W	57668	CRB20T68EFX4990
A6R158	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W	57668	CRB20T68EFX4990
A6R159	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W	57668	CRB20T68EFX4991
A6R160	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W	91637	CCF50–7500F–R36
A6R161	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W	57668	CRB20T68EFX4991
A6R162	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A6R163	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W	57668	CRB20T68EFX4021
A6R164	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W	57668	CRB20T68EFX4021
A6R165	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R166	322–3189–00			RES,FXD,FILM:909 OHM,1%,0.2W	57668	CRB 20 FXE 909E
A6R167	311–2230–00			RES,VAR,TRMR:CERMET,500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 501 M L20
A6R170	322–3154–00			RES,FXD:METAL FILM,392 OHM,1%,0.2W	57668	RB20FX392E
A6R173	322–3154–00			RES,FXD:METAL FILM,392 OHM,1%,0.2W	57668	RB20FX392E
A6R183	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A6R184	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A6R185	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R187	322–3248–00			RES,FXD,FILM:3.74K OHM,1%,0.2W	57668	CRB20 FXE 3K74
A6R189	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A6R191	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R192	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R204	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R205	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R206	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A6R207	322–3314–00			RES,FXD:METAL FILM,18.2K OHM,1%,0.2W	57668	CRB20 FXE 18K2
A6R212	322–3283–00			RES,FXD,FILM:8.66K OHM,1%,0.2W	57668	CRR20 FXE 8K66
A6R213	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W	91637	CCF50–G200R0DR36
A6R214	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A6R215	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W	91637	CCF50–4321F–R36
A6R218	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A6R219	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W	57668	CRB20T68EFX4990
A6R222	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R223	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R224	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R226	322–3177–00			RES,FXD:METAL FILM,681 OHM,1%,0.2W	91637	CCF50–6810F–R36
A6R227	311–2230–00			RES,VAR,TRMR:CERMET,500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 501 M L20
A6R229	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A6R230	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6R234	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W	57668	CRB20T68EFX4990
A6R235	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R237	322–3172–00			RES,FXD,FILM:604 OHM,1%,0.2W	57668	CRB20 FXE 604E
A6R238	322–3281–00			RES,FXD:METAL FILM,8.25K OHM,1%,0.2W	57668	CRB20 FXE 8K25
A6R240	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A6R241	322–3273–00			RES,FXD:METAL FILM,6.81K OHM,1%,0.2W	57668	CRB20T68EFX6811
A6R243	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R244	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R245	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W	91637	CCF50–5111F–R36
A6R247	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R248	322–3196–00			RES,FXD,FILM:1.07K OHM,1%,0.2W	91637	CCF50–1071F–R36
A6R250	322–3196–00			RES,FXD,FILM:1.07K OHM,1%,0.2W	91637	CCF50–1071F–R36
A6R251	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W	57668	CRB20 FXE 806E
A6R257	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R258	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R263	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R264	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R270	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R271	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R272	322–3214–00			RES,FXD,FILM:1.65K OHM,1%,0.2W	57668	CRB 20 FXE 1K65
A6R273	322–3214–00			RES,FXD,FILM:1.65K OHM,1%,0.2W	57668	CRB 20 FXE 1K65
A6R274	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R275	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R276	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R277	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R278	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A6R280	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A6R281	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R282	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R285	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A6R286	311–2230–00			RES,VAR,TRMR:CERMET,500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 501 M L20
A6R287	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A6R289	322–3114–00			RES,FXD,FILM:150 OHM,1%,0.2W	57668	CRB20–FX–150E
A6R292	322–3322–00			RES,FXD:METAL FILM,22.1K OHM,1%,0.2W	57668	CRB20 FXE 22K1
A6R293	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W	57668	CRB20 FXE 1M00
A6R294	322–3130–00			RES,FXD,FILM:221 OHM,1%,0.2W	57668	CRB20T68EFX2210
A6R295	311–2224–00			RES,VAR,TRMR:CERMET,20 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 200 M L20

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6R296	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A6R297	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A6R298	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A6R304	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R306	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R307	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R308	311–2235–00			RES,VAR,TRMR:CERMET,10K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 103 M L20
A6R309	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W	91637	CCF50–4321F–R36
A6R310	322–3346–00			RES,FXD:METAL FILM,39.2K OHM,1%,0.2W	57668	CRB20FXE39K2
A6R311	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R312	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A6R313	322–3346–00			RES,FXD:METAL FILM,39.2K OHM,1%,0.2W	57668	CRB20FXE39K2
A6R314	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R315	322–3197–00			RES,FXD,FILM:1.1K OHM,1%,0.2W	57668	CRB20 FXE 1K10
A6R316	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R317	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A6R322	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R323	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R324	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R340	322–3322–00			RES,FXD:METAL FILM,22.1K OHM,1%,0.2W	57668	CRB20 FXE 22K1
A6R346	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R349	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A6R350	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R351	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A6R352	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R353	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R354	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W	57668	CRB20T68EFX4991
A6R357	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R358	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R359	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W	91637	CCF50–G200R0DR36
A6R360	322–3172–00			RES,FXD,FILM:604 OHM,1%,0.2W	57668	CRB20 FXE 604E
A6R361	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R362	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W	57668	CRB20T68EFX4990
A6R363	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R364	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R365	322–3172–00			RES,FXD,FILM:604 OHM,1%,0.2W	57668	CRB20 FXE 604E
A6R366	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R367	322–3151–00			RES,FXD,FILM:365 OHM,1%,0.2W	57668	CRB20 FXE 365E

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6R368	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R369	311–2230–00			RES,VAR,TRMR:CERMET,500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 501 M L20
A6R370	311–2232–00			RES,VAR,TRMR:CERMET,2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	30983	ORDER BY DESCRIPTION
A6R371	322–3227–00			RES,FXD,FILM:2.26K OHM,1%,0.2W	91637	CCF50–2261F–R36
A6R372	322–3214–00			RES,FXD,FILM:1.65K OHM,1%,0.2W	57668	CRB 20 FXE 1K65
A6R373	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R377	322–3273–00			RES,FXD:METAL FILM,6.81K OHM,1%,0.2W	57668	CRB20T68EFX6811
A6R378	322–3173–00			RES,FXD,FILM:619 OHM,1%,0.2W	91637	CCF50–6190F–R36
A6R381	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R382	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R389	322–3442–00			RES,FXD,FILM:392K OHM,1%,0.2W	91637	CCF50–3923F–R36
A6R390	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A6R391	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R392	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A6R393	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R394	322–3089–00			RES,FXD,FILM:82.5 OHM,1%.0.2W	57668	CRB20 FXE 82E5
A6R395	————————			SELECTED PART	80009	————————
A6R396	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A6R397	322–3030–00			RES,FXD,FILM:20 OHM,1%,0.2W	57668	CRB 20 FXE 20E0
A6R398	322–3377–00			RES,FXD:METAL FILM,82.5K OHM,1%,0.2W	91637	CCF50–8252F–R36
A6R399	322–3346–00			RES,FXD:METAL FILM,39.2K OHM,1%,0.2W	57668	CRB20FXE39K2
A6R402	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R403	322–3442–00			RES,FXD,FILM:392K OHM,1%,0.2W	91637	CCF50–3923F–R36
A6R404	311–2242–00			RES,VAR,NONWW:TRMR,500K OHM,20%,0.5W LINEAR	TK2073	GF06UT2 504 M L20
A6R405	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W	57668	CRB20 FXE 49K9
A6R406	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A6R407	311–2239–00			RES,VAR,TRMR:CERMET,100K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 104 M L20
A6R425	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W	57668	CRB20 FXE 11K0
A6R426	322–3130–00			RES,FXD,FILM:221 OHM,1%,0.2W	57668	CRB20T68EFX2210
A6R427	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W	57668	CRB20 FXE 11K0
A6R428	322–3130–00			RES,FXD,FILM:221 OHM,1%,0.2W	57668	CRB20T68EFX2210
A6R436	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R437	322–3172–00			RES,FXD,FILM:604 OHM,1%,0.2W	57668	CRB20 FXE 604E
A6R438	322–3281–00			RES,FXD:METAL FILM,8.25K OHM,1%,0.2W	57668	CRB20 FXE 8K25
A6R439	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A6R440	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6R441	322–3273–00			RES,FXD:METAL FILM,6.81K OHM,1%,0.2W	57668	CRB20T68EFX6811
A6R442	322–3281–00			RES,FXD:METAL FILM,8.25K OHM,1%,0.2W	57668	CRB20 FXE 8K25
A6R443	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W	57668	CRB20T68EFX4990
A6R444	322–3385–00			RES,FXD:METAL FILM,100K OHM,1%,0.2W	57668	CRB20T29EFX1003
A6R446	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A6R447	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R448	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R453	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A6R455	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R456	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R458	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W	57668	CRB20 FXE 11K0
A6R460	322–3214–00			RES,FXD,FILM:1.65K OHM,1%,0.2W	57668	CRB 20 FXE 1K65
A6R461	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A6R462	322–3270–00			RES,FXD,FILM:6.34K OHM,1%,0.2W	91637	CCF501G63400FT
A6R463	322–3248–00			RES,FXD,FILM:3.74K OHM,1%,0.2W	57668	CRB20 FXE 3K74
A6R465	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W	57668	CRB20T68EFX4991
A6R468	322–3260–00			RES,FXD,FILM:4.99K OHM,1%,0.2W	57668	CRB20T68EFX4991
A6R469	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W	91637	CCF50–4321F–R36
A6R470	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W	91637	CCF50–4321F–R36
A6R471	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A6R472	322–3238–00			RES,FXD,FILM:2.94K OHM,1%,0.2W	57668	CRB20 FXE 2K94
A6R475	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A6R477	322–3173–00			RES,FXD,FILM:619 OHM,1%,0.2W	91637	CCF50–6190F–R36
A6R490	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A6R491	315–0106–00			RES,FXD,FILM:10M OHM,5%,0.25W	50139	CB1065
A6R492	315–0915–00			RES,FXD,FILM:9.1M OHM,5%,0.25W	50139	CB9155
A6R493	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R494	322–3450–00			RES,FXD,FILM:475K OHM,1%,0.2W	91637	CCF50–4753F–R36
A6R495	321–0486–00			RES,FXD,FILM:1.13 MEG OHM,1%,0.125W	07716	CEAD11303F
A6R496	322–3218–00			RES,FXD:METAL FILM,1.82K OHM,1%,0.2W	57668	CRB20 FXE 1K82
A6R497	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A6R498	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R499	322–3135–00			RES,FXD,FILM:249 OHM,1%,0.2W	57668	CRB20 FXE 249E
A6R501	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R502	322–3469–00			RES,FXD,FILM:750K OHM,1%,0.2W	57668	CRB20 FXE 750K
A6R506	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A6R511	311–2236–00			RES,VAR,TRMR:CERMET,20K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST,T&R	TK2073	GF06UT2 203 M L20
A6R512	322–3326–00			RES,FXD,FILM:24.3K OHM,1%,0.2W	91637	CCF50–2432F–R36

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6R513	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R514	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R517	322–3204–00			RES,FXD,FILM:1.3K OHM,1%,0.2W	57668	CRB20T68EFX1301
A6R518	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R523	311–2236–00			RES,VAR,TRMR:CERMET,20K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST,T&R	TK2073	GF06UT2 203 M L20
A6R524	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W	57668	CRB20T68EFX1502
A6R525	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R527	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R528	322–3177–00			RES,FXD:METAL FILM,681 OHM,1%,0.2W	91637	CCF50–6810F–R36
A6R539	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R542	322–3177–00			RES,FXD:METAL FILM,681 OHM,1%,0.2W	91637	CCF50–6810F–R36
A6R543	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A6R544	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R545	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R547	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A6R548	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A6R549	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R550	322–3114–00			RES,FXD,FILM:150 OHM,1%,0.2W	57668	CRB20–FX–150E
A6R551	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R552	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A6R553	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A6R554	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W	57668	CRB20 FXE 806E
A6R561	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A6R562	322–3189–00			RES,FXD,FILM:909 OHM,1%,0.2W	57668	CRB 20 FXE 909E
A6R563	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R564	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R565	322–3183–00			RES,FXD,FILM:787 OHM,1%,0.2W	57668	CRB20 FXE 787E
A6R566	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A6R567	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W	57668	CRB20 FXE 11K0
A6R568	311–2230–00			RES,VAR,TRMR:CERMET,500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 501 M L20
A6R569	322–3156–00			RES,FXD,FILM:412 OHM,1%,0.2W	57668	CRB20 FXE 412E
A6R571	322–3150–00			RES,FXD,FILM:357 OHM,1%,0.2W	57668	CRB20 FXE 357E
A6R572	311–2232–00			RES,VAR,TRMR:CERMET,2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	30983	ORDER BY DESCRIPTION
A6R575	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R578	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R601	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6R602	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R603	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R604	311–2236–00			RES,VAR,TRMR:CERMET,20K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST,T&R	TK2073	GF06UT2 203 M L20
A6R605	322–3356–00			RES,FXD,FILM:49.9K OHM,1%,0.2W	57668	CRB20 FXE 49K9
A6R606	311–2239–00			RES,VAR,TRMR:CERMET,100K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 104 M L20
A6R612	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R613	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W	91637	CCF50–7500F–R36
A6R616	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W	91637	CCF50–7500F–R36
A6R617	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R618	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W	57668	CRB20T68EFX1502
A6R620	311–2236–00			RES,VAR,TRMR:CERMET,20K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST,T&R	TK2073	GF06UT2 203 M L20
A6R623	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R624	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A6R625	322–3150–00			RES,FXD,FILM:357 OHM,1%,0.2W	57668	CRB20 FXE 357E
A6R627	322–3150–00			RES,FXD,FILM:357 OHM,1%,0.2W	57668	CRB20 FXE 357E
A6R637	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R638	322–3202–00			RES,FXD,FILM:1.24K OHM,1%,0.2W	57668	CRB20 FXE 1K24
A6R639	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A6R640	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R643	311–2230–00			RES,VAR,TRMR:CERMET,500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 501 M L20
A6R645	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A6R646	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R647	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R663	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A6R664	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A6R666	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A6R667	311–2232–00			RES,VAR,TRMR:CERMET,2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	30983	ORDER BY DESCRIPTION
A6R675	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W	57668	CRB20T68EFX1502
A6R677	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A6R678	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R693	322–3244–00			RES,FXD,FILM:3.4K OHM,1%,0.2W	57668	CRB20 FXE 3K40
A6R708	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R714	308–0549–00			RES,FXD,WW:6.3K OHM,1%,3W	54294	LA461–6.3 KOHM +–1PERCENT
A6R716	308–0549–00			RES,FXD,WW:6.3K OHM,1%,3W	54294	LA461–6.3 KOHM +–1PERCENT

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6R726	308–0549–00			RES,FXD,WW:6.3K OHM,1%,3W	54294	LA461–6.3 KOHM +–1PERCENT
A6R728	308–0549–00			RES,FXD,WW:6.3K OHM,1%,3W	54294	LA461–6.3 KOHM +–1PERCENT
A6R729	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R734	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A6R735	322–3197–00			RES,FXD,FILM:1.1K OHM,1%,0.2W	57668	CRB20 FXE 1K10
A6R736	322–3322–00			RES,FXD:METAL FILM,22.1K OHM,1%,0.2W	57668	CRB20 FXE 22K1
A6R741	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R742	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R743	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R744	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R748	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R753	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R763	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A6R765	322–3162–00			RES,FXD:METAL FILM,475 OHM,1%,0.2W	57668	CRB20T68EFX4750
A6R790	307–0445–00			RES,NTWK:THICK FILM,(9) 4.7K OHM,2%,0.2W EACH,TC=100 PPM,SIP10,PIN 1 COMMON,BULK	11236	750–101–R4.7 K TUBE PACKED
A6R795	311–2236–00			RES,VAR,TRMR:CERMET,20K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST,T&R	TK2073	GF06UT2 203 M L20
A6R797	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R798	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R802	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A6R803	322–3189–00			RES,FXD,FILM:909 OHM,1%,0.2W	57668	CRB 20 FXE 909E
A6R804	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R806	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R818	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R822	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R831	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R832	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R833	311–2231–00			RES,VAR,TRMR:CERMET,1K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 102 M L20
A6R834	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A6R835	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R836	311–2231–00			RES,VAR,TRMR:CERMET,1K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK2073	GF06UT2 102 M L20
A6R837	322–3164–00			RES,FXD,FILM:499 OHM,1%,0.2W	57668	CRB20T68EFX4990
A6R838	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W	57668	CRB20 FXE 806E
A6R839	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W	57668	CRB20 FXE 806E
A6R840	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6R841	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R842	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R843	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R844	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A6R845	322–3339–00			RES,FXD:METAL FILM,33.2K OHM,1%,0.2W	91637	CCF50–3322F–R36
A6R846	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A6R847	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A6R848	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A6R849	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A6R850	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R851	322–3173–00			RES,FXD,FILM:619 OHM,1%,0.2W	91637	CCF50–6190F–R36
A6R852	322–3173–00			RES,FXD,FILM:619 OHM,1%,0.2W	91637	CCF50–6190F–R36
A6R853	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R856	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R857	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A6R892	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R893	322–3344–00			RES,FXD,FILM:37.4K OHM,1%,0.2W	57668	CRB20 FXE 37K4
A6R894	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R895	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R896	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W	57668	CRB20T68EFX1502
A6R897	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6R898	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A6R899	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A6TP223	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A6TP355	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A6TP379	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A6TP389	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A6TP457	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A6TP841	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A6U128	156–2460–00			IC,MISC:BIPOLAR,MODULATOR/DEMODULATOR,BALANCED,MC1496P,DIP14.3	04713	MC1496P
A6U138	156–0912–00			IC,LINEAR:BIPOLAR,OP–AMP,TRANSCONDUCTANCE,CA3080E,DIP08.3	27014	LM3080N
A6U150	156–3226–00			IC,LINEAR:BIPOLAR,OP–AMP,35 MHZ,UNITY GAIN STABLE,LM6361N,DIP08.3	27014	LM6361N

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A6U211	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD,TL074CN/LF347N/MC 34004P,DIP14.3	01295	TL074CN
A6U216	156–3599–00			IC,LINEAR:BIPOLAR,OP–AMP,CURRENT FEEDBACK,50MHZ,EL2020CN,DIP08.3	64762	EL2020CN
A6U261	156–2460–00			IC,MISC:BIPOLAR,MODULATOR/DEMODULATOR, BALANCED,MC1496P,DIP14.3	04713	MC1496P
A6U267	156–2460–00			IC,MISC:BIPOLAR,MODULATOR/DEMODULATOR, BALANCED,MC1496P,DIP14.3	04713	MC1496P
A6U327	156–2256–00			IC,DIGITAL:HCMOS,GATE,QUAD 2–INPUT NAND,74HC00,DIP14.3,TUBE	01295	SN74HC00N
A6U333	156–2026–00			IC,DIGITAL:HCMOS,GATE,QUAD 2–INPUT NOR,74HC02,DIP14.3,TUBE	04713	MC74HC02AN
A6U337	156–0912–00			IC,LINEAR:BIPOLAR,OP–AMP,TRANSCONDUCTANCE, CA3080E,DIP08.3	27014	LM3080N
A6U345	156–0479–00			IC,DIGITAL:LSTTL,GATE,QUAD 2–INPUT OR,74LS32,DIP14.3,TUBE	01295	SN74LS32N
A6U375	156–1338–00			IC,LINEAR:BIPOLAR,OP–AMP,HIGH OUTPUT DRIVE,NE5534N,DIP08.3	01295	NE5534P
A6U386	156–2009–00			IC,DIGITAL:HCMOS,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74HC74,DIP14.3,TUBE	01295	SN74HC74N
A6U415	156–1850–00			IC,MISC:CMOS,ANALOG SWITCH,QUAD,DG211,DIP16.3	17856	DG211CJ
A6U424	156–0411–00			IC,LINEAR:BIPOLAR,COMPARATOR,QUAD,SINGLE SUPPLY,300NS,LM339N,DIP14.3	01295	LM339N
A6U432	156–1850–00			IC,MISC:CMOS,ANALOG SWITCH,QUAD,DG211,DIP16.3	17856	DG211CJ
A6U452	156–2460–00			IC,MISC:BIPOLAR,MODULATOR/DEMODULATOR, BALANCED,MC1496P,DIP14.3	04713	MC1496P
A6U467	156–2460–00			IC,MISC:BIPOLAR,MODULATOR/DEMODULATOR, BALANCED,MC1496P,DIP14.3	04713	MC1496P
A6U473	156–0067–00			IC,LINEAR:BIPOLAR,OP–AMP,741C,DIP08.3	01295	UA741CP
A6U486	156–1850–00			IC,MISC:CMOS,ANALOG SWITCH,QUAD,DG211,DIP16.3	17856	DG211CJ
A6U490	156–1149–00			IC,LINEAR:BIFET,OP–AMP,LF351N,DIP08.3	04713	MC34001P/LF351N
A6U506	156–1200–00			IC,LINEAR:BIFET,OP–AMP,QUAD,TL074CN/LF347N/MC 34004P,DIP14.3	01295	TL074CN
A6U534	156–1850–00			IC,MISC:CMOS,ANALOG SWITCH,QUAD,DG211,DIP16.3	17856	DG211CJ
A6U541	156–2460–00			IC,MISC:BIPOLAR,MODULATOR/DEMODULATOR, BALANCED,MC1496P,DIP14.3	04713	MC1496P
A6U585	156–2421–00			IC,DIGITAL:HCMOS,FLIP FLOP,QUAD D–TYPE,CLEAR,74HC175,DIP16.3,TUBE	04713	MC74HC175N
A6U653	160–6001–00			IC,DIGITAL:CMOS,PLD,EEPLD,20V8,25NS,90MA,PRGM 156–3012–00,20V8–25,DIP24.3	TK0198	160600100
				MOUNTING PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
	136–0925–00			SOCKET,DIP::PCB,24 POS,2 X 12,0.1 X 0.3 CTR,0.196 H X 0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015	00779	2–641932–3
				END MOUNTING PARTS		
A6U686	156–2584–00			IC,DIGITAL:HCMOS,FLIP FLOP,OCTAL D–TYPE,CLEAR,74HC273,DIP20.3,TUBE	01295	SN74HC273N
A6U695	156–2761–01			IC,DIGITAL:HCMOS,MULTIVIBRATOR,DUPLICATE OF 156–2761–00,74HC221A,DIP16.3	0JR04	TC74HC221AP
A6U735	156–3599–00			IC,LINEAR:BIPOLAR,OP–AMP,CURRENT FEEDBACK,50MHZ,EL2020CN,DIP08.3	64762	EL2020CN
A6U751	156–2906–00			IC,DIGITAL:HCMOS,COUNTER,DUAL 4–BIT BINARY RIPPLE,74HC393,DIP14.3	04713	MC74HC393N
A6U757	156–1324–00			IC,LINEAR:BIPOLAR,COMPARATOR,TTL,20NS,COMPL EMENTARY OUTPUT,W/STROBES,LM361N,DIP14.3	1CH66	NE529N SUPR II–B
A6U764	156–2558–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, POSITIVE,12V,1.5A,2%,MC7812ACT,TO–220	01295	TL780–12CKC
A6U803	156–3226–00			IC,LINEAR:BIPOLAR,OP–AMP,35 MHZ,UNITY GAIN STABLE,LM6361N,DIP08.3	27014	LM6361N
A6U864	156–2559–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, NEGATIVE,–12V,1.5A,2%,MC7912ACT,TO–220	04713	MC7912ACT
A6VR390	152–0166–00			DIODE,ZENER:6.2V,5%,0.4W,1N5995B,DO–35/DO–204A H,T&R	04713	1N5995BRL
A6VR418	152–0486–00			DIODE,ZENER:6.2V,2%,0.4W,1N825 FMLY,DO–7 OR DO–35,T&R	04713	1N825CRL
A6VR577	152–0461–00			DIODE,SIG:6.2V,5%,0.4W,1N821,DO–7	04713	1N821
A6VR796	156–1631–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, SHUNT,ADJUSTABLE,100MA,TL431CLP,TO–92	01295	TL431CLP
A6W669	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A6W858	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A6Y195	158–0368–00			XTAL UNIT,QTZ:3.589MHZ,0.002%,PAR,32PF,MINI DIP (1780R ONLY)	14301	016–210–00053
A6Y195	158–0367–00			XTAL UNIT,QTZ:4.421303MHZ,+/–0.002%,PRL 30PF,MINI DIP PKG,8 PIN DIPCOMPATIBLE (1781R ONLY)	14301	016–210–00054
				ATTACHED PARTS		
	346–0032–00			STRAP,RETAINING:0.075 DIA X 4.0 L,MLD RBR	98159	2829–75–4
				END ATTACHED PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7	671–0468–10			CIRCUIT BD ASSY:OSCILLATOR,NTSC (1780R ONLY)	80009	671–0468–10
A7	671–0989–10			CIRCUIT BD ASSY:OSCILLATOR,PAL (1781R ONLY)	80009	671–0989–10
A7C131	290–0920–00			CAP,FXD,ALUM:33UF,20%,50V,6 X 11MM,0.1SP,RADIAL	62643	SME50VB33RM6X11L
A7C133	290–0920–00			CAP,FXD,ALUM:33UF,20%,50V,6 X 11MM,0.1SP,RADIAL	62643	SME50VB33RM6X11L
A7C139	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C142	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A7C143	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C144	290–0920–00			CAP,FXD,ALUM:33UF,20%,50V,6 X 11MM,0.1SP,RADIAL	62643	SME50VB33RM6X11L
A7C149	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A7C151	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C153	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V TUBULAR	04222	SA102A101JAA
A7C155	283–0788–00			CAP,FXD,MICA DI:267PF,1%,500V	09023	CD15FD(267)F03
A7C156	283–0788–00			CAP,FXD,MICA DI:267PF,1%,500V	09023	CD15FD(267)F03
A7C161	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C165	290–0798–00			CAP,FXD,ALUM:180UF,20%,40V	62643	672D708A
A7C167	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C173	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C174	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C175	281–0758–00			CAP,FXD,CERAMIC:MLC,15PF,20%,100V,NPO	04222	SA102A150MAA
A7C176	281–0123–00			CAP,VAR,CER DI:5–25PF,100V SUBMIN CER,TOP ADJ	33095	53–709–001 A5–25
A7C177	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C178	283–0698–00			CAP,FXD,MICA DI:390PF,1%,500V	09023	CD15FD391F03
A7C180	283–0649–01			CAP,FXD,MICA DI:105PF,1%,500V	09023	CDA15FD(105)F03
A7C186	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C187	283–0645–00			CAP,FXD,MICA DI:790PF,1%,300V	09023	CD15FC791F03
A7C190	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C191	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A7C193	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C196	290–0973–00			CAP,FXD,ALUM:100UF,20%,25VDC	55680	UVX1V101MPA
A7C202	283–0639–00			CAP,FXD,MICA DI:56PF,1%,500V	09023	CD15ED560F03
A7C203	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A7C206	281–0925–00			CAP,FXD,CERAMIC:MLC,0.22UF,20%,50V	04222	SA305E224MAA
A7C207	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C209	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C210	283–0642–00			CAP,FXD,MICA DI:33PF,2%,500V,0.370 X 0.340,RADIAL	09023	CD10ED330G03
A7C212	290–0920–00			CAP,FXD,ALUM:33UF,20%,50V	62643	SME50VB33RM6X11L
A7C219	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7C225	281–0758–00			CAP,FXD,CERAMIC:MLC,15PF,20%,100V	04222	SA102A150MAA
A7C226	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C227	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C228	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C246	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C248	285–1341–00			CAP,FXD,PLASTIC:METALIZED FILM,0.1UF,20%,100V	TK1913	MKS2 0.1/100/20
A7C249	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V,SAFETY	04222	SA101C103KAA
A7C250	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,	04222	SA105E104MAA
A7C252	281–0184–00			CAP,VAR,PLASTIC:2–18PF,500VDC TOP/BOT ADJ	TK1727	2222–809–05003
A7C253	285–1341–00			CAP,FXD,PLASTIC:METALIZED FILM,0.1UF,20%,100V	TK1913	MKS2 0.1/100/20
A7C256	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C259	290–0973–00			CAP,FXD,ALUM:100UF,20%,25VDC	55680	UVX1V101MPA
A7C260	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A7C261	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C273	281–0819–00			CAP,FXD,CERAMIC:MLC,33 PF,5%,50V	04222	SA102A330JAA
A7C276	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C279	283–0625–00			CAP,FXD,MICA DI:220PF,1%,500V	09023	CD10FD221F03
A7C280	283–0644–00			CAP,FXD,MICA DI:150PF,1%,500V	09023	CD15FD151F03
A7C281	283–0212–00			CAP,FXD,CER DI:2UF,20%,50V SQUARE	18796	RPE114 Z5U 205M50V
A7C282	283–0111–00			CAP,FXD,CER DI:0.1UF,20%,50V SQUARE	04222	SR215C104MAA
A7C283	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C285	283–0646–00			CAP,FXD,MICA DI:170PF,1%,500V	09023	CD15FD171F03
A7C286	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C287	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C288	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,	04222	SA105E104MAA
A7C289	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A7C290	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C291	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C292	281–0814–00			CAP,FXD,CERAMIC:MLC,100 PF,10%,100V	04222	SA102A101KAA
A7C293	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C294	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C297	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C298	290–0747–00			CAP,FXD,ELCTLT:100UF,+50–20%,25WVDC AL	62643	CE02W1E101F
A7C302	283–0643–00			CAP,FXD,MICA DI:22PF,0.5%,500V	09023	CD10ED220D03
A7C303	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A7C304	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A7C306	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C307	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7C308	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V	04222	SA101C103KAA
A7C311	290–0943–00			CAP,FXD,ALUM:47UF,+50–20%,25V,6 X 11MM,RADIAL	62643	CEUSM1E470–Q
A7C320	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C327	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C334	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A7C338	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C340	281–0823–00			CAP,FXD,CER DI:470PF,10%,50V TUBULAR	04222	SA101A471KAA
A7C343	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C344	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C348	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C349	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C350	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C352	281–0773–00			CAP,FXD,CERAMIC:MLC,0.01UF,10%,100V	04222	SA101C103KAA
A7C354	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C356	283–0788–00			CAP,FXD,MICA DI:267PF,1%,500V	09023	CD15FD(267)F03
A7C357	283–0788–00			CAP,FXD,MICA DI:267PF,1%,500V	09023	CD15FD(267)F03
A7C358	281–0909–00			CAP,FXD,CERAMIC:MLC,0.022UF,20%,50V	04222	SA105C223MAA
A7C359	281–0909–00			CAP,FXD,CERAMIC:MLC,0.022UF,20%,50V	04222	SA105C223MAA
A7C360	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C361	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C362	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C363	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C364	281–0767–00			CAP,FXD,CERAMIC:MLC,330PF,20%,100V	04222	SA102C331MAA
A7C365	281–0767–00			CAP,FXD,CERAMIC:MLC,330PF,20%,100V	04222	SA102C331MAA
A7C366	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A7C367	281–0909–00			CAP,FXD,CERAMIC:MLC,0.022UF,20%,50V	04222	SA105C223MAA
A7C368	281–0909–00			CAP,FXD,CERAMIC:MLC,0.022UF,20%,50V	04222	SA105C223MAA
A7C369	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C372	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C374	283–0625–00			CAP,FXD,MICA DI:220PF,1%,500V	09023	CD10FD221F03
A7C382	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C383	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C387	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A7C392	283–0625–00			CAP,FXD,MICA DI:220PF,1%,500V	09023	CD10FD221F03
A7C393	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C394	283–0796–00			CAP,FXD,MICA DI:100PF,5%,500V (1780R ONLY)	09023	CD10FD101J03
A7C394	283–0633–00			CAP,FXD,MICA DI:77PF,1%,100V (1781R ONLY)	09023	CD15ED770F03

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7C395	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C396	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C408	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C412	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A7C413	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C414	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C415	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C416	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C417	281–0757–00			CAP,FXD,CERAMIC:MLC,10PF,10,%,200V	04222	SA102A100KAA
A7C418	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C419	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C433	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A7C434	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C435	281–0776–00			CAP,FXD,CERAMIC:MLC,120PF,5%,100V	04222	SA102A121JAA
A7C436	281–0776–00			CAP,FXD,CERAMIC:MLC,120PF,5%,100V	04222	SA102A121JAA
A7C437	281–0819–00			CAP,FXD,CERAMIC:MLC,33 PF,5%,50V	04222	SA102A330JAA
A7C438	281–0776–00			CAP,FXD,CERAMIC:MLC,120PF,5%,100V	04222	SA102A121JAA
A7C439	281–0776–00			CAP,FXD,CERAMIC:MLC,120PF,5%,100V	04222	SA102A121JAA
A7C440	281–0819–00			CAP,FXD,CERAMIC:MLC,33 PF,5%,50V	04222	SA102A330JAA
A7C441	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C452	281–0280–00			CAP,VAR,PLASTIC:2–10PF,100V,SIDE ADJ	52769	GYB10000
A7C453	281–0764–00			CAP,FXD,CER DI:82PF,5%,100V TUBULAR	04222	SA102A820JAA
A7C461	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C477	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C483	283–0198–00			CAP,FXD,CERAMIC:MLC,0.22UF,20%,50V	04222	SR305C224MAA
A7C487	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A7C495	281–0903–00			CAP,FXD,CER DI:3.9PF,100V TUBULAR	04222	SA102A3R9DAA
A7C496	281–0756–00			CAP,FXD,CERAMIC:MLC,2.2PF,+/–0.5PF,200V	04222	SA102A2R2DAA
A7C513	281–0909–00			CAP,FXD,CERAMIC:MLC,0.022UF,20%,50V	04222	SA105C223MAA
A7C593	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C594	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A7C595	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7C596	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A7CR130	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A7CR139	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A7CR145	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7CR152	152–0269–00			SEMICOND DVC,DI:VVC,SI,35V,33PF AT 4V,DO–7 1N5450 FAMILY	04713	PG1151
A7CR174	152–0269–00			SEMICOND DVC,DI:VVC,SI,35V,33PF AT 4V,DO–7 1N5450 FAMILY	04713	PG1151
A7CR182	152–0246–00			DIODE,SIG:ULTRA FAST,40V,200MA,FDH300A,DO–7	12969	NDP0533
A7CR183	152–0246–00			DIODE,SIG:ULTRA FAST,40V,200MA,FDH300A,DO–7	12969	NDP0533
A7CR266	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A7CR267	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A7CR273	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A7CR274	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A7CR280	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A7CR283	152–0246–00			DIODE,SIG:ULTRA FAST,40V,200MA,FDH300A,DO–7	12969	NDP0533
A7CR303	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A7CR310	152–0322–00			DIODE,SIG:SCHOTTKY,15V,0.41V VF AT 1.0MA,1.2PF,5082–2811,HP "15"	21847	A2X600
A7CR379	152–0246–00			DIODE,SIG:ULTRA FAST,40V,200MA,FDH300A,DO–7	12969	NDP0533
A7CR386	152–0322–00			DIODE,SIG:SCHOTTKY,15V,0.41V VF AT 1.0MA,1.2PF,5082–2811,HP "15"	21847	A2X600
A7CR453	152–0269–00			SEMICOND DVC,DI:VVC,SI,35V,33PF AT 4V,DO–7 1N5450 FAMILY	04713	PG1151
A7DS184	150–1020–00			DIODE,OPTO:LED,RED,635NM,1.0MCD AT 5V,90 DEG VIEW,INTEGRAL RESISTOR,SUBMINIATURE RT ANG	15513	SP830719
A7J5	131–0955–00			CONN,RF JACK:BNC,50 OHM,FEMALE,STR,SLDR CUP/ FRONT PNL,GOLD,0.520 MLG X 0.490 TAIL,0.092 L SL	00779	87–3334–017
A7J6	131–0955–00			CONN,RF JACK:BNC,50 OHM,FEMALE,STR,SLDR CUP/ FRONT PNL,GOLD,0.520 MLG X 0.490 TAIL,0.092 L SL	00779	87–3334–017
A7J115	131–4339–00			CONN,HDR::PCB,MALE,RTANG,2 X 30,0.1 CTR,0.340 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD	53387	3372–5202
A7J320	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A7J499	131–1425–00			CONN,HDR:PCB,MALE,RTANG,1 X 36,0.1 CTR,0.230 MLG X 0.090 TAIL,30 GOLD,STACKABLE,	22526	65521–136
A7L158	108–0245–00			INDUCTOR,FXD:CUSTOM,POWER,3.9UH,10%,IDC<800 MA,RDC<0.264 OHM,Q>35@7.9MHZ,SRF>61MHZ	0JR03	108–0245–00
A7L179	108–0245–00			INDUCTOR,FXD:CUSTOM,POWER,3.9UH,10%,IDC<800 MA,RDC<0.264 OHM,Q>35@7.9MHZ,SRF>61MHZ	0JR03	108–0245–00
A7L186	108–1343–00			INDUCTOR,FXD:POWER,100UH,10%,I<0.165A,RDC<3.5 OHM,Q>60,SRF>5.5MHZ,FERRITE CORE	TK2058	SP0305–101K

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7L202	108–1212–00			INDUCTOR,FXD:CUSTOM,SIGNAL,9UH,2%,IDC<300 MA,RDC<1.6 OHM,Q>60@4MHZ,SRF>50 MHZ,AXIAL	0JR03	108–1212–00
A7L203	108–1212–00			INDUCTOR,FXD:CUSTOM,SIGNAL,9UH,2%,IDC<300 MA,RDC<1.6 OHM,Q>60@4MHZ,SRF>50 MHZ,AXIAL	0JR03	108–1212–00
A7L225	108–0422–00			INDUCTOR,FXD:CUSTOM,POWER,80UH,20%,IDC<2 A,RDC<0.15 OHM,Q>30@40KHZ,AXIAL	0JR03	108–0422–00
A7L291	108–1212–00			INDUCTOR,FXD:CUSTOM,SIGNAL,9UH,2%,IDC<300 MA,RDC<1.6 OHM,Q>60@4MHZ,SRF>50 MHZ,AXIAL	0JR03	108–1212–00
A7L401	108–0245–00			INDUCTOR,FXD:CUSTOM,POWER,3.9UH,10%,IDC<800 MA,RDC<0.264 OHM,Q>35@7.9MHZ,SRF>61MHZ	0JR03	108–0245–00
A7L491	108–1212–00			INDUCTOR,FXD:CUSTOM,SIGNAL,9UH,2%,IDC<300 MA,RDC<1.6 OHM,Q>60@4MHZ,SRF>50 MHZ,AXIAL	0JR03	108–1212–00
A7L592	108–1212–00			INDUCTOR,FXD:CUSTOM,SIGNAL,9UH,2%,IDC<300 MA,RDC<1.6 OHM,Q>60@4MHZ,SRF>50 MHZ,AXIAL	0JR03	108–1212–00
A7P320	131–0993–00			CONN,BOX:SHUNT,FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER	00779	530153–2
A7Q155	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A7Q169	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A7Q209	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A7Q269	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A7Q270	151–0223–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC	04713	MPS2369A
A7Q275	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A7Q297	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA,600MHZ, AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A7Q298	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A7Q307	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A7Q309	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A7Q322	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A7Q356	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A7Q370	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A7Q372	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A7Q386	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7Q387	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A7Q390	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A7Q408	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A7Q409	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A7Q411	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A7Q412	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A7Q493	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A7Q594	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A7R130	307–0103–00			RES,FXD,CMPSN:2.7 OHM,5%,0.25W	50139	CB27G5
A7R134	307–0103–00			RES,FXD,CMPSN:2.7 OHM,5%,0.25W	50139	CB27G5
A7R151	322–3139–00			RES,FXD,FILM:274 OHM,1%,0.2W	57668	CRB20T68EFX2740
A7R152	322–3392–00			RES,FXD,FILM:118K OHM,1%,0.2W	57668	CRB20 FXE 118K
A7R156	322–3154–00			RES,FXD:METAL FILM,392 OHM,1%,0.2W	57668	RB20FX392E
A7R166	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W	91637	CCF50–4321F–R36
A7R167	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W	91637	CCF50–6191F–R36
A7R168	322–3339–00			RES,FXD:METAL FILM,33.2K OHM,1%,0.2W	91637	CCF50–3322F–R36
A7R169	322–3281–00			RES,FXD:METAL FILM,8.25K OHM,1%,0.2W	57668	CRB20 FXE 8K25
A7R174	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A7R175	322–3154–00			RES,FXD:METAL FILM,392 OHM,1%,0.2W	57668	RB20FX392E
A7R176	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W	91637	CCF50–5111F–R36
A7R179	322–3392–00			RES,FXD,FILM:118K OHM,1%,0.2W	57668	CRB20 FXE 118K
A7R183	322–3414–00			RES,FXD:METAL FILM,200K OHM,1%,0.2W	57668	CRB 20 FXE 200 K
A7R184	322–3166–00			RES,FXD,FILM:523 OHM,1%,0.2W	57668	CRB20 FXE 523E
A7R185	322–3235–00			RES,FXD:METAL FILM,2.74K OHM,1%,0.2W	57668	CRB20 FXE 2K74
A7R186	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A7R187	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A7R188	322–3158–00			RES,FXD,FILM:432 OHM,1%,0.2W	57668	CRB20T68EFX4320
A7R189	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W	91637	CCF50–2000F–R36
A7R190	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A7R191	322–3234–00			RES,FXD,FILM:2.67K OHM,1%,0.2W	91637	CCF50–2671F–R36
A7R197	322–3170–00			RES,FXD,FILM:576 OHM,1%,0.2W	57668	CRB20 FXE 576E
A7R200	322–3154–00			RES,FXD:METAL FILM,392 OHM,1%,0.2W	57668	RB20FX392E
A7R203	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7R209	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A7R210	322–3034–00			RES,FXD,FILM:22.1 OHM,1%,0.2W	91637	CCF50–22R1F–R36
A7R211	322–3034–00			RES,FXD,FILM:22.1 OHM,1%,0.2W	91637	CCF50–22R1F–R36
A7R212	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A7R213	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W	57668	CRB20 FXE 2K49
A7R214	322–3385–00			RES,FXD:METAL FILM,100K OHM,1%,0.2W	57668	CRB20T29EFX1003
A7R225	322–3012–00			RES,FXD,FILM:13 OHM,1%,0.2W	91637	CCF50–13R0F–R36
A7R248	322–3367–00			RES,FXD,FILM:64.9K OHM,1%,0.2W	91637	CCF50–6492F–R36
A7R249	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W	91637	CCF50–6191F–R36
A7R250	315–0396–00			RES,FXD,FILM:39M OHM,5%,0.25W	50139	CB3965
A7R254	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W	91637	CCF50–6191F–R36
A7R255	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W	91637	CCF50–5111F–R36
A7R256	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A7R257	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A7R258	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A7R259	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A7R260	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A7R263	322–3185–00			RES,FXD:METAL FILM,825 OHM,1%,0.2W	57668	CRB20 FXE 825E
A7R265	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A7R266	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A7R267	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A7R268	322–3235–00			RES,FXD:METAL FILM,2.74K OHM,1%,0.2W	57668	CRB20 FXE 2K74
A7R269	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W	57668	CRB20 FXE 11K0
A7R270	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A7R271	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W	91637	CCF50–2000F–R36
A7R272	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A7R273	322–3158–00			RES,FXD,FILM:432 OHM,1%,0.2W	57668	CRB20T68EFX4320
A7R274	322–3327–00			RES,FXD,FILM:24.9K OHM,1%,0.2W	57668	CRB20FXE24K9
A7R275	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W	91637	CCF50–5111F–R36
A7R278	322–3327–00			RES,FXD,FILM:24.9K OHM,1%,0.2W	57668	CRB20FXE24K9
A7R279	322–3184–00			RES,FXD,FILM:806 OHM,1%,0.2W	57668	CRB20 FXE 806E
A7R280	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A7R281	322–3255–00			RES,FXD,FILM:4.42K OHM,1%,0.2W	57668	CRB20 FXE 4K42
A7R282	322–3126–00			RES,FXD,FILM:200 OHM,1%,0.2W	91637	CCF50–2000F–R36
A7R283	322–3273–00			RES,FXD:METAL FILM,6.81K OHM,1%,0.2W	57668	CRB20T68EFX6811
A7R286	311–2257–00			RES,VAR,TRMR:CERMET,500 OHM,20%,0.5W,0.197 SQ,SIDE ADJUST,T&A	TK2073	GF06VT2 501 M L20
A7R287	322–3211–00			RES,FXD,FILM:1.54K OHM,1%,0.2W	57668	CRB20 FXE 1K54
A7R288	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W	91637	CCF50–4321F–R36

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7R289	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W	91637	CCF50–6191F–R36
A7R290	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W	91637	CCF50–6191F–R36
A7R292	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A7R293	322–3158–00			RES,FXD,FILM:432 OHM,1%,0.2W	57668	CRB20T68EFX4320
A7R295	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W	91637	CCF50–5111F–R36
A7R296	322–3213–00			RES,FXD,FILM:1.62K OHM,1%,0.2W	57668	CRB20 FXE 1K62
A7R297	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A7R298	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W	91637	CCF50–4321F–R36
A7R303	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W	57668	CRB20 FXE 1M00
A7R304	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A7R305	322–3185–00			RES,FXD:METAL FILM,825 OHM,1%,0.2W	57668	CRB20 FXE 825E
A7R307	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A7R308	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W	57668	CRB20 FXE 7K50
A7R309	322–3034–00			RES,FXD,FILM:22.1 OHM,1%,0.2W	91637	CCF50–22R1F–R36
A7R310	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W	57668	CRB20T68EFX3011
A7R311	322–3034–00			RES,FXD,FILM:22.1 OHM,1%,0.2W	91637	CCF50–22R1F–R36
A7R313	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A7R314	311–2271–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06VT2 502 M L20
A7R315	311–2271–00			RES,VAR,TRMR:CERMET,5K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06VT2 502 M L20
A7R317	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A7R318	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A7R319	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W (1780R ONLY)	91637	CCF50–3321F–R36
A7R319	322–3273–00			RES,FXD:METAL FILM,6.81K OHM,1%,0.2W (1781R ONLY)	57668	CRB20T68EFX6811
A7R320	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W (1780R ONLY)	57668	CRB20T68EFX2001
A7R320	322–3236–00			RES,FXD,FILM:2.8K OHM,1%,0.2W (1781R ONLY)	57668	CRB20 FXE 2K80
A7R321	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W	57668	CRB20T68EFX4021
A7R322	311–2258–00			RES,VAR,TRMR:CERMET,1K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06VT2 102 M L20
A7R323	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A7R324	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W	91637	CCF50–7500F–R36
A7R333	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W	57668	CRB20T68EFX1502
A7R340	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A7R352	322–3367–00			RES,FXD,FILM:64.9K OHM,1%,0.2W	91637	CCF50–6492F–R36
A7R353	322–3235–00			RES,FXD:METAL FILM,2.74K OHM,1%,0.2W	57668	CRB20 FXE 2K74
A7R354	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W	57668	CRB20 FXE 7K50

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7R355	315–0396–00			RES,FXD,FILM:39M OHM,5%,0.25W	50139	CB3965
A7R361	322–3139–00			RES,FXD,FILM:274 OHM,1%,0.2W	57668	CRB20T68EFX2740
A7R362	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W	91637	CCF50–6191F–R36
A7R366	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A7R367	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A7R370	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W	57668	CRB20 FXE 11K0
A7R373	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W	57668	CRB20 FXE 11K0
A7R374	322–3297–00			RES,FXD:METAL FILM,12.1K OHM,1%,0.2W	57668	CRB20 FXE 12K1
A7R377	322–3373–00			RES,FXD,FILM:75K OHM,1%,0.2W	57668	CRB20 FXE 75K0
A7R378	322–3235–00			RES,FXD:METAL FILM,2.74K OHM,1%,0.2W	57668	CRB20 FXE 2K74
A7R379	315–0106–00			RES,FXD,FILM:10M OHM,5%,0.25W	50139	CB1065
A7R380	322–3138–00			RES,FXD,FILM:267 OHM,1%,0.2W	57668	CRB20 FXE 267E
A7R382	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001
A7R383	322–3248–00			RES,FXD,FILM:3.74K OHM,1%,0.2W	57668	CRB20 FXE 3K74
A7R386	322–3123–00			RES,FXD,FILM:187 OHM,1%,0.2W	57668	CRB20 FXE 187E
A7R387	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W	57668	CRB20 FXE 11K0
A7R388	322–3254–00			RES,FXD,FILM:4.32K OHM,1%,0.2W	91637	CCF50–4321F–R36
A7R390	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A7R391	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A7R394	322–3205–00			RES,FXD,FILM:1.33K OHM,1%,0.2W	57668	CRB20 FXE 1K33
A7R397	322–3189–00			RES,FXD,FILM:909 OHM,1%,0.2W	57668	CRB 20 FXE 909E
A7R405	322–3250–00			RES,FXD:METAL FILM,3.92K OHM,1%,0.2W	91637	CCF50–3921F–R36
A7R406	322–3239–00			RES,FXD,FILM:3.01K OHM,1%,0.2W	57668	CRB20T68EFX3011
A7R407	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A7R408	322–3250–00			RES,FXD:METAL FILM,3.92K OHM,1%,0.2W	91637	CCF50–3921F–R36
A7R409	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A7R410	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A7R411	322–3402–00			RES,FXD:METAL FILM,150K OHM,1%,0.2W	57668	CRB20T68EFX1503
A7R412	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W	91637	CCF50–6191F–R36
A7R413	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W	57668	CRB20T68EFX4021
A7R414	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A7R415	322–3218–00			RES,FXD:METAL FILM,1.82K OHM,1%,0.2W	57668	CRB20 FXE 1K82
A7R416	322–3402–00			RES,FXD:METAL FILM,150K OHM,1%,0.2W	57668	CRB20T68EFX1503
A7R417	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A7R418	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W	91637	CCF50–7500F–R36
A7R420	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A7R421	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A7R422	322–3222–00			RES,FXD:METAL FILM,2K OHM,1%,0.2W	57668	CRB20T68EFX2001

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7R423	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A7R424	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A7R426	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A7R427	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A7R428	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A7R429	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A7R430	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W	91637	CCF50–7500F–R36
A7R433	322–3339–00			RES,FXD:METAL FILM,33.2K OHM,1%,0.2W	91637	CCF50–3322F–R36
A7R440	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W	57668	CRB20 FXE 301E
A7R441	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W	57668	CRB20 FXE 301E
A7R442	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W	57668	CRB20 FXE 301E
A7R443	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W	57668	CRB20 FXE 301E
A7R452	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W	91637	CCF50–6191F–R36
A7R453	322–3392–00			RES,FXD,FILM:118K OHM,1%,0.2W	57668	CRB20 FXE 118K
A7R459	322–3261–00			RES,FXD,FILM:5.11K OHM,1%,0.2W	91637	CCF50–5111F–R36
A7R460	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A7R461	322–3154–00			RES,FXD:METAL FILM,392 OHM,1%,0.2W	57668	RB20FX392E
A7R462	322–3185–00			RES,FXD:METAL FILM,825 OHM,1%,0.2W	57668	CRB20 FXE 825E
A7R478	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W	57668	CRB20T68EFX1502
A7R479	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W	91637	CCF50–6191F–R36
A7R480	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W	57668	CRB20 FXE 11K0
A7R483	322–3235–00			RES,FXD:METAL FILM,2.74K OHM,1%,0.2W	57668	CRB20 FXE 2K74
A7R487	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A7R492	322–3269–00			RES,FXD,FILM:6.19K OHM,1%,0.2W	91637	CCF50–6191F–R36
A7R493	322–3158–00			RES,FXD,FILM:432 OHM,1%,0.2W	57668	CRB20T68EFX4320
A7R494	322–3128–00			RES,FXD,FILM:210 OHM,1%,0.2W	57668	CRB20FXE210E
A7R495	322–3183–00			RES,FXD,FILM:787 OHM,1%,0.2W	57668	CRB20 FXE 787E
A7R496	322–3268–00			RES,FXD,FILM:6.04K OHM,1%,0.2W	57668	CRB20 FXE 6K04
A7R497	322–3293–00			RES,FXD,FILM:11K OHM,1%,0.2W	57668	CRB20 FXE 11K0
A7R507	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A7R509	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A7R593	322–3039–00			RES,FXD,FILM:24.9 OHM,1%,0.2W	57668	CRB20T68EFX24R9
A7R594	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W	57668	CRB20T68EFX1502
A7R595	322–3234–00			RES,FXD,FILM:2.67K OHM,1%,0.2W	91637	CCF50–2671F–R36
A7R596	322–3039–00			RES,FXD,FILM:24.9 OHM,1%,0.2W	57668	CRB20T68EFX24R9
A7TP130	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A7TP145	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7TP148	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A7TP149	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A7TP186	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A7TP251	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A7TP286	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A7U135	156–2559–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, NEGATIVE,–12V,1.5A,2%,MC7912ACT,TO–220	04713	MC7912ACT
A7U136	156–0991–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, POSITIVE,5.0V,100MA,5%,MC78L05ACP,TO–92	01295	UA78L05ACLP
A7U147	156–2558–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, POSITIVE,12V,1.5A,2%,MC7812ACT,TO–220	01295	TL780–12CKC
A7U161	156–1611–00			IC,DIGITAL:FTTL,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74F74,DIP14.3,TUBE	04713	MC74F74N
A7U171	156–1611–00			IC,DIGITAL:FTTL,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74F74,DIP14.3,TUBE	04713	MC74F74N
A7U179	156–0912–01			IC,LINEAR:BIPOLAR,OP–AMP,TRANSCONDUCTANCE, DUPLICATE OF 156–0912–00,CA3080E/LM30	27014	LM3080N
A7U193	156–2460–00			IC,MISC:BIPOLAR,MODULATOR/DEMODULATOR, BALANCED,MC1496P,DIP14.3	04713	MC1496P
A7U214	156–3064–00			IC,DIGITAL:HCMOS,REGISTER,8–BIT SIPO SHIFT,74HC164,DIP14.3,TUBE	01295	SN74HC164N
A7U217	156–1850–00			IC,MISC:CMOS,ANALOG SWITCH,QUAD,DG211,DIP16.3	17856	DG211CJ
A7U221	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A7U230	156–1611–00			IC,DIGITAL:FTTL,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74F74,DIP14.3,TUBE	04713	MC74F74N
A7U235	156–2456–00			IC,DIGITAL:LSTTL,COUNTER,8–BIT BINARY, WITH INPUT REGISTERS,74LS592,DIP16.3,TUBE	01295	SN74LS592N
A7U238	156–2456–00			IC,DIGITAL:LSTTL,COUNTER,8–BIT BINARY, WITH INPUT REGISTERS,74LS592,DIP16.3,TUBE	01295	SN74LS592N
A7U243	156–0469–00			IC,DIGITAL:LSTTL,DECODER,1–OF–8,ACTIVE LOW,74LS138,DIP16.3,TUBE	01295	SN74LS138N
A7U246	156–0382–00			IC,DIGITAL:LSTTL,GATE,QUAD 2–INPUT NAND,74LS00,DIP14.3,TUBE	01295	SN74LS00N
A7U256	156–1800–00			IC,DIGITAL:FTTL,GATE,QUAD 2–INPUT XOR,74F86,DIP14.3,TUBE	04713	MC74F86N
A7U263	156–1226–00			IC,LINEAR:BIPOLAR,COMPARATOR,DUAL,OPEN COLLECTOR,80NS,LM319N,DIP14.3	1CH66	LM319N
A7U266	156–1800–00			IC,DIGITAL:FTTL,GATE,QUAD 2–INPUT XOR,74F86,DIP14.3,TUBE	04713	MC74F86N

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7U307	156–1852–00			IC,DIGITAL:HCMOS,GATE,HEX INVERTER,UNBUFFERED,74HCU04,DIP14.3,TUBE	04713	MC74HCU04N
A7U325	156–1367–00			IC,CONVERTER:CMOS,D/A,8BIT,400NS,CURRENTOUT, MPU COMPATIBLE,MULTIPLYING,AD7524JN,DIP16.3	24355	AD7524JN
A7U330	156–0865–00			IC,DIGITAL:LSTTL,FLIP FLOP,OCTAL D–TYPE,CLEAR,74LS273,DIP20.3,TUBE	01295	SN74LS273N
A7U335	156–0733–00			IC,DIGITAL:LSTTL,MULTIVIBRATOR,DUAL NON–RETRIG MONOSTABLE, RESET, SCHMIT TRIG INPUT,74LS221	01295	SN74LS221N
A7U338	156–2456–00			IC,DIGITAL:LSTTL,COUNTER,8–BIT BINARY, WITH INPUT REGISTERS,74LS592,DIP16.3,TUBE	01295	SN74LS592N
A7U342	156–2456–00			IC,DIGITAL:LSTTL,COUNTER,8–BIT BINARY, WITH INPUT REGISTERS,74LS592,DIP16.3,TUBE	01295	SN74LS592N
A7U345	156–0124–00			IC,LINEAR:TTL,MISC,PHASE–FREQ DETECTOR,DUAL,MC4044P,DIP14.3	04713	MC4044P
A7U349	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A7U376	156–2761–01			IC,DIGITAL:HCMOS,MULTIVIBRATOR,DUPLICATE OF 156–2761–00,74HC221A,DIP16.3,TUBE	0JR04	TC74HC221AP
A7U383	156–1225–00			IC,LINEAR:BIPOLAR,COMPARATOR,DUAL,OPEN COLLECTOR,300NS,LM393N,DIP08.3	01295	LM393P
A7U397	156–1324–00			IC,LINEAR:BIPOLAR,COMPARATOR,TTL,20NS,COMPL EMENTARY OUTPUT,W/STROBES,LM361N,DIP14.3	1CH66	NE529N SUPR II–B
A7U403	160–6002–01			IC,DIGITAL:CMOS,PLD,OPT,22V10,25NS,33.3MHZ,90MA ,PRGM 156–3243–00,22V10–25,DIP24.3	TK0198	160600201
A7U407	156–0048–00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPLIFIER,C	04713	MC3346P
A7U415	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A7U417	156–0388–00			IC,DIGITAL:LSTTL,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74LS74,DIP14.3,TUBE	01295	SN74LS74AN
A7U422	156–1338–00			IC,LINEAR:BIPOLAR,OP–AMP,HIGH OUTPUT DRIVE,NE5534N,DIP08.3	01295	NE5534P
A7U425	156–2460–00			IC,MISC:BIPOLAR,MODULATOR/DEMODULATOR, BALANCED,MC1496P,DIP14.3	04713	MC1496P
A7U445	156–1973–00			IC,DIGITAL:FTTL,FLIP FLOP,QUAD D–TYPE,CLEAR, COMPLEMENTARY OUTPUTS,74F175,DIP16.3,TUBE	01295	SN74F175N
A7U449	156–0124–00			IC,LINEAR:TTL,MISC,PHASE–FREQ DETECTOR,DUAL,MC4044P,DIP14.3	04713	MC4044P
A7U469	156–1997–00			IC,DIGITAL:FTTL,MUX,QUAD INVERT 2–TO–1,ENABLE,74F158,DIP16.3,TUBE	07263	74F158PC
A7U472	156–0680–02			IC,DIGITAL:CMOS,FLIP FLOP,DUAL J–K,CLEAR,74C107,DIP14.3,SCRN	07263	MM74C107N/A+
A7U475	156–3140–00			IC,DIGITAL:HCTCMOS,GATE,TRIPLE 3–INPUT NAND,74HCT10,DIP14.3,TUBE	1CH66	74HCT10N

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A7VR196	152–0195–00			DIODE,ZENER:5.1V,5%,0.5W,5.0MA IZT,1N5993B/BZX55C5V1,DO–35	04713	SZ11755RL
A7VR209	152–0279–00			DIODE,ZENER:5.1V,5%,0.4W,1N751A,DO–7 OR DO–35	04713	1N751ARL
A7VR324	152–0461–00			DIODE,SIG:6.2V,5%,0.4W,1N821,DO–7	04713	1N821
A7VR492	152–0195–00			DIODE,ZENER:5.1V,5%,0.5W,5.0MA IZT,1N5993B/BZX55C5V1,DO–35	04713	SZ11755RL
A7W143	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A7W169	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A7W198	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A7W480	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A7Y182	158–0352–00			XTAL UNIT,QTZ:14.318180MHZ,0.002%,PARALLEL,CL 30 PF,4 PIN MINI DIP PKG (1780R ONLY)	14301	016–210–00040
A7Y182	158–0353–00			XTAL UNIT,QTZ:17.734480MHZ,0.002%,PARALLEL,CL 30 PF, 4 PIN MINI DIP PKG (1781R ONLY)	14301	016–210–00041
A7Y253	158–0380–00			XTAL,UNIT QTZ:14.316190MHZ,+/–0.002%, PARALLEL,30PF,MINI DIP PKG,8 PIN TYPE (1780R ONLY)	14301	016–210–00067
A7Y253	158–0381–00			XTAL,UNIT QTZ:17.732010MHZ,+/–0.002%,PARALLEL, 30PF,MINI DIP PKG,8 PIN TYPE (1781R ONLY)	14301	016–210–00068
A7Y457	158–0352–00			XTAL UNIT,QTZ:14.318180MHZ,0.002%,PARALLEL,CL 30 PF,4 PIN MINI DIP PKG (1780R ONLY)	14301	016–210–00040
A7Y456	158–0353–00			XTAL UNIT,QTZ:17.734480MHZ,0.002%,PARALLEL,CL 30 PF, 4 PIN MINI DIP PKG (1781R ONLY)	14301	016–210–00041

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A8	672–1283–02			CIRCUIT BD ASSY:INPUT & BNC,NTSC (1780R ONLY)	80009	672–1283–02
A8	672–1305–02			CIRCUIT BD ASSY:INPUT & BNC,PAL (1781R ONLY)	80009	672–1305–02
				ATTACHED PARTS		
	129–0339–00			SPACER,POST:0.28 L,4–40 TAP/STUD,BRS,CU SN ZN PL,0.25 HEX	0KB01	129–0339–00
				(QUANTITY 2)		
	174–1447–00			CABLE ASSY:COAX,RFD,50 OHM,7.0L,1X2,0.1,RCPT X 0.5 CUT & STRIP	53387	ORDER BY DESCR
	174–1449–00			CABLE ASSY,RF:50 OHM COAX,5.0 L	53387	ORDER BY DESCR
				(QUANTITY 3)		
	337–1197–00			SHIELD,ELEC:ATTEN CKT BD 3A9	80009	337–1197–00
				(QUANTITY 3)		
				END ATTACHED PARTS		
A8C103	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C126	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C150	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C173	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C208	290–0848–00			CAP,FXD,ALUM:47UF,20%,16V,ESR=7.05 OHM(120HZ,25C),10X12MM,RADIAL.	62643	CEBPM1E470M
A8C218	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C221	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A8C222	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C223	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C230	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A8C231	290–0848–00			CAP,FXD,ALUM:47UF,20%,16V,ESR=7.05 OHM(120HZ,25C),10X12MM,RADIAL.	62643	CEBPM1E470M
A8C242	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C245	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A8C246	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C247	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C255	290–0848–00			CAP,FXD,ALUM:47UF,20%,16V,ESR=7.05 OHM(120HZ,25C),10X12MM,RADIAL.	62643	CEBPM1E470M
A8C266	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C268	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A8C269	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C270	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A8C278	290–0848–00			CAP,FXD,ALUM:47UF,20%,16V,ESR=7.05 OHM(120HZ,25C),10X12MM,RADIAL.	62643	CEBPM1E470M
A8C289	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C291	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C292	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A8C293	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A8C307	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A8C313	283–0639–01			CAP,FXD,CER DI:56PF,1%,100V TUBULAR	09023	CDA15ED560F03
A8C319	281–0898–00			CAP,FXD,CERAMIC:MLC,7.5PF,+/–0.5PF,100V	04222	MA107A7R5DAA
A8C336	283–0639–01			CAP,FXD,CER DI:56PF,1%,100V TUBULAR	09023	CDA15ED560F03
A8C343	281–0898–00			CAP,FXD,CERAMIC:MLC,7.5PF,+/–0.5PF,100V	04222	MA107A7R5DAA
A8C354	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A8C360	283–0639–01			CAP,FXD,CER DI:56PF,1%,100V TUBULAR	09023	CDA15ED560F03
A8C367	281–0898–00			CAP,FXD,CERAMIC:MLC,7.5PF,+/–0.5PF,100V	04222	MA107A7R5DAA
A8C379	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A8C383	283–0639–01			CAP,FXD,CER DI:56PF,1%,100V TUBULAR	09023	CDA15ED560F03
A8C390	281–0898–00			CAP,FXD,CERAMIC:MLC,7.5PF,+/–0.5PF,100V	04222	MA107A7R5DAA
A8C411	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V TUBULAR	04222	SA102A101JAA
A8C412	281–0788–00			CAP,FXD,CERAMIC:MLC,470PF,10%,100V	04222	SA102C471KAA
A8C424	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A8C435	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V TUBULAR	04222	SA102A101JAA
A8C436	281–0788–00			CAP,FXD,CERAMIC:MLC,470PF,10%,100V	04222	SA102C471KAA
A8C448	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A8C459	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V TUBULAR	04222	SA102A101JAA
A8C460	281–0788–00			CAP,FXD,CERAMIC:MLC,470PF,10%,100V	04222	SA102C471KAA
A8C472	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A8C482	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V TUBULAR	04222	SA102A101JAA
A8C483	281–0788–00			CAP,FXD,CERAMIC:MLC,470PF,10%,100V	04222	SA102C471KAA
A8C495	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A8C504	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A8C505	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A8C512	281–0563–00			CAP,FXD,CERAMIC:MLC,0.47UF,20%,50V	04222	SA305E474MAA
A8C519	283–0636–00			CAP,FXD,MICA DI:36PF,2%,500V,0.370 X 0.460,RADIAL (1780R ONLY)	09023	CDA15ED360G03
A8C519	283–0643–00			CAP,FXD,MICA DI:22PF,0.5%,500V (1781R ONLY)	09023	CD10ED220D03
A8C520	283–0622–00			CAP,FXD,MICA DI:450PF,1%,300V	09023	CD15FD451F03

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A8C521	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A8C525	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A8C535	281–0563–00			CAP,FXD,CERAMIC:MLC,0.47UF,20%,50V	04222	SA305E474MAA
A8C541	283–0636–00			CAP,FXD,MICA DI:36PF,2%,500V,0.370 X 0.460,RADIAL (1780R ONLY)	09023	CDA15ED360G03
A8C541	283–0643–00			CAP,FXD,MICA DI:22PF,0.5%,500V (1781R ONLY)	09023	CD10ED220D03
A8C542	283–0622–00			CAP,FXD,MICA DI:450PF,1%,300V	09023	CD15FD451F03
A8C543	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A8C548	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A8C559	281–0563–00			CAP,FXD,CERAMIC:MLC,0.47UF,20%,50V	04222	SA305E474MAA
A8C564	283–0636–00			CAP,FXD,MICA DI:36PF,2%,500V,0.370 X 0.460,RADIAL (1780R ONLY)	09023	CDA15ED360G03
A8C564	283–0643–00			CAP,FXD,MICA DI:22PF,0.5%,500V (1781R ONLY)	09023	CD10ED220D03
A8C565	283–0622–00			CAP,FXD,MICA DI:450PF,1%,300V	09023	CD15FD451F03
A8C566	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100	04222	SA101C102KAA
A8C571	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A8C583	281–0563–00			CAP,FXD,CERAMIC:MLC,0.47UF,20%,50V	04222	SA305E474MAA
A8C588	283–0636–00			CAP,FXD,MICA DI:36PF,2%,500V,0.370 X 0.460,RADIAL (1780R ONLY)	09023	CDA15ED360G03
A8C588	283–0643–00			CAP,FXD,MICA DI:22PF,0.5%,500V (1781R ONLY)	09023	CD10ED220D03
A8C589	283–0622–00			CAP,FXD,MICA DI:450PF,1%,300V	09023	CD15FD451F03
A8C590	281–0812–00			CAP,FXD,CERAMIC:MLC,1000PF,10%,100V	04222	SA101C102KAA
A8C595	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A8CR212	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A8CR224	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A8CR235	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A8CR248	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A8CR268	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A8CR271	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A8CR283	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A8CR295	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A8CR307	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A8CR331	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A8CR355	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A8CR379	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A8J512	174–1168–00			CA ASSY,SP:RIBBON,IDC,10,28AWG,4.25L,2X10, 0.1,PCB,X 2X10,0.1,CTRPLZ,RCPT,SAME SIDE	23633	174–1168–00
A8K213	148–0185–00			RELAY,ARM:1 FORM C,COIL 12VDC 515 OHM,CONT 60VDC 1A 30W,PKG 0.472 X 0.291,0.326 HIGH	61529	HDIE–M–DC12V
A8K238	148–0185–00			RELAY,ARM:1 FORM C,COIL 12VDC 515 OHM,CONT 60VDC 1A 30W,PKG 0.472 X 0.291,0.326 HIGH	61529	HDIE–M–DC12V
A8K261	148–0185–00			RELAY,ARM:1 FORM C,COIL 12VDC 515 OHM,CONT 60VDC 1A 30W,PKG 0.472 X 0.291,0.326 HIGH	61529	HDIE–M–DC12V
A8K284	148–0185–00			RELAY,ARM:1 FORM C,COIL 12VDC 515 OHM,CONT 60VDC 1A 30W,PKG 0.472 X 0.291,0.326 HIGH	61529	HDIE–M–DC12V
A8L115	108–0327–00			INDUCTOR,FXD:CUSTOM,SIGNAL,48NH	0JR03	108–0327–00
A8L116	108–0327–00			INDUCTOR,FXD:CUSTOM,SIGNAL,48NH	0JR03	108–0327–00
A8L138	108–0327–00			INDUCTOR,FXD:CUSTOM,SIGNAL,48NH	0JR03	108–0327–00
A8L139	108–0327–00			INDUCTOR,FXD:CUSTOM,SIGNAL,48NH	0JR03	108–0327–00
A8L162	108–0327–00			INDUCTOR,FXD:CUSTOM,SIGNAL,48NH	0JR03	108–0327–00
A8L163	108–0327–00			INDUCTOR,FXD:CUSTOM,SIGNAL,48NH	0JR03	108–0327–00
A8L186	108–0327–00			INDUCTOR,FXD:CUSTOM,SIGNAL,48NH	0JR03	108–0327–00
A8L187	108–0327–00			INDUCTOR,FXD:CUSTOM,SIGNAL,48NH	0JR03	108–0327–00
A8L519	108–1268–00			INDUCTOR,FXD:SIGNAL,56UH,10%	24226	10M562K
A8L541	108–1268–00			INDUCTOR,FXD:SIGNAL,56UH,10%	24226	10M562K
A8L564	108–1268–00			INDUCTOR,FXD:SIGNAL,56UH,10%	24226	10M562K
A8L588	108–1268–00			INDUCTOR,FXD:SIGNAL,56UH,10%	24226	10M562K
A8P1133	174–1449–00			CABLE ASSY,RF:50 OHM COAX,5.0 L	53387	ORDER BY DESCRIPTION
A8P1231	174–1449–00			CABLE ASSY,RF:50 OHM COAX,5.0 L	53387	ORDER BY DESCRIPTION
A8P1322	174–1449–00			CABLE ASSY,RF:50 OHM COAX,5.0 L	53387	ORDER BY DESCRIPTION
A8P1331	174–1449–00			CABLE ASSY,RF:50 OHM COAX,5.0 L	53387	ORDER BY DESCRIPTION
A8Q204	151–1059–00			TRANSISTOR,SIG:JFET,N–CH,10V,30MA(MIN), 30OHM,300MW,MPF4391,TO–92 DSG	04713	MPF4391
A8Q227	151–1059–00			TRANSISTOR,SIG:JFET,N–CH,10V,30MA(MIN), 30OHM,300MW,MPF4391,TO–92 DSG	04713	MPF4391

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A8Q251	151–1059–00			TRANSISTOR,SIG:JFET,N–CH,10V,30MA(MIN), 30OHM,300MW,MPF4391,TO–92 DSG	04713	MPF4391
A8Q275	151–1059–00			TRANSISTOR,SIG:JFET,N–CH,10V,30MA(MIN), 30OHM,300MW,MPF4391,TO–92 DSG	04713	MPF4391
A8Q300	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA,600 MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A8Q315	151–0719–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA, 600MHZ,AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A8Q320	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A8Q325	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A8Q338	151–0719–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA, 600MHZ,AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A8Q350	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A8Q362	151–0719–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA, 600MHZ,AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A8Q363	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A8Q375	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A8Q385	151–0719–00			TRANSISTOR,SIG:BIPOLAR,PNP,20V,50MA, 600MHZ,AMPLIFIER,MPSH81,TO–92 BEC	04713	MPSH81
A8Q408	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A8Q431	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A8Q440	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A8Q456	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A8Q479	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A8Q485	151–0198–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,50MA, 600MHZ,AMPLIFIER,MPS918,TO–92 EBC	04713	MPS918
A8Q529	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A8R104	322–3109–00			RES,FXD,FILM:133 OHM,1%,0.2W	91637	CCF50–1330F–R36
A8R114	322–3056–00			RES,FXD,FILM:37.4 OHM,1%,0.2W	91637	CCF50–37R4F–R36
A8R115	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W	57668	CRB20 FXE 1M00
A8R123	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A8R124	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W	91637	CCF50–6650F–R36
A8R127	322–3109–00			RES,FXD,FILM:133 OHM,1%,0.2W	91637	CCF50–1330F–R36
A8R131	322–3056–00			RES,FXD,FILM:37.4 OHM,1%,0.2W	91637	CCF50–37R4F–R36

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A8R132	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W	57668	CRB20 FXE 1M00
A8R147	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A8R148	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W	91637	CCF50–6650F–R36
A8R151	322–3109–00			RES,FXD,FILM:133 OHM,1%,0.2W	91637	CCF50–1330F–R36
A8R165	322–3056–00			RES,FXD,FILM:37.4 OHM,1%,0.2W	91637	CCF50–37R4F–R36
A8R166	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W	57668	CRB20 FXE 1M00
A8R170	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A8R171	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W	91637	CCF50–6650F–R36
A8R174	322–3109–00			RES,FXD,FILM:133 OHM,1%,0.2W	91637	CCF50–1330F–R36
A8R184	322–3056–00			RES,FXD,FILM:37.4 OHM,1%,0.2W	91637	CCF50–37R4F–R36
A8R185	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W	57668	CRB20 FXE 1M00
A8R194	322–3265–00			RES,FXD:METAL FILM,5.62K OHM,1%,0.2W	57668	CRB20 FXE 5K62
A8R195	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W	91637	CCF50–6650F–R36
A8R203	315–0625–00			RES,FXD,FILM:6.2M OHM,5%,0.25W	50139	CB6255
A8R207	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A8R209	322–3105–00			RES,FXD,FILM:121 OHM,1%,0.2W	57668	CRB20 FXE 121E
A8R210	322–3457–00			RES,FXD,FILM:562K OHM,1%,0.2W	91637	CCF50–5623F–R36
A8R211	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A8R219	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A8R223	322–3269–02			RES,FXD,FILM:6.19K OHM,0.2W,5%	57668	CRB DYE 6K19
A8R224	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A8R226	315–0625–00			RES,FXD,FILM:6.2M OHM,5%,0.25W	50139	CB6255
A8R230	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A8R232	322–3105–00			RES,FXD,FILM:121 OHM,1%,0.2W	57668	CRB20 FXE 121E
A8R233	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A8R234	322–3457–00			RES,FXD,FILM:562K OHM,1%,0.2W	91637	CCF50–5623F–R36
A8R243	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A8R247	322–3269–02			RES,FXD,FILM:6.19K OHM,0.2W,5%	57668	CRB DYE 6K19
A8R248	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A8R250	315–0625–00			RES,FXD,FILM:6.2M OHM,5%,0.25W	50139	CB6255
A8R255	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A8R256	322–3105–00			RES,FXD,FILM:121 OHM,1%,0.2W	57668	CRB20 FXE 121E
A8R257	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A8R258	322–3457–00			RES,FXD,FILM:562K OHM,1%,0.2W	91637	CCF50–5623F–R36
A8R267	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A8R270	322–3269–02			RES,FXD,FILM:6.19K OHM,0.2W,5%	57668	CRB DYE 6K19
A8R271	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A8R273	315–0625–00			RES,FXD,FILM:6.2M OHM,5%,0.25W	50139	CB6255

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description		Mfr. code	Mfr. part number
A8R278	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W		56845	CCF50–4751F–R36
A8R279	322–3105–00			RES,FXD,FILM:121 OHM,1%,0.2W		57668	CRB20 FXE 121E
A8R281	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W		57668	CRB20T68EFX2002
A8R282	322–3457–00			RES,FXD,FILM:562K OHM,1%,0.2W		91637	CCF50–5623F–R36
A8R290	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W		57668	CRB20T68EFX10R0
A8R294	322–3269–02			RES,FXD,FILM:6.19K OHM,0.2W,5%		57668	CRB DYE 6K19
A8R295	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W		57668	CRB20T68EFX1001
A8R302	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W		57668	CRB20 FXE 1K50
A8R303	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W		57668	CRB20 FXE 332E
A8R307	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W		57668	CRB20 FXE 301E
A8R308	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W		57668	CRB20T68EFX1211
A8R309	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W		57668	CRB20T68EFX4021
A8R311	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W		57668	CRB20 FXE 301E
A8R312	322–3130–00			RES,FXD,FILM:221 OHM,1%,0.2W		57668	CRB20T68EFX2210
A8R315	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W		57668	CRB20T68EFX1000
A8R316	322–3172–00			RES,FXD,FILM:604 OHM,1%,0.2W		57668	CRB20 FXE 604E
A8R317	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W		91637	CCF50–7500F–R36
A8R319	322–3145–00			RES,FXD,FILM:316 OHM,1%,0.2W		57668	CRB20 FXE 316E
A8R320	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W		57668	CRB20T68EFX1000
A8R322	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W		09969	CCF50–47R5F–R36
A8R323	311–2277–00			RES,VAR,NONWW:TRMR,50OHM,20%,0.5W	LINEAR	TK2073	GF06VT2 500 M L20
A8R325	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W		57668	CRB20 FXE 1K50
A8R326	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W		57668	CRB20 FXE 332E
A8R327	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W		57668	CRB20T68EFX4021
A8R328	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W		57668	CRB20T68EFX1211
A8R330	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W		57668	CRB20 FXE 301E
A8R334	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W		57668	CRB20 FXE 301E
A8R335	322–3130–00			RES,FXD,FILM:221 OHM,1%,0.2W		57668	CRB20T68EFX2210
A8R337	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W		57668	CRB20T68EFX1000
A8R340	322–3172–00			RES,FXD,FILM:604 OHM,1%,0.2W		57668	CRB20 FXE 604E
A8R341	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W		91637	CCF50–7500F–R36
A8R343	322–3145–00			RES,FXD,FILM:316 OHM,1%,0.2W		57668	CRB20 FXE 316E
A8R344	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W		57668	CRB20T68EFX1000
A8R345	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W		09969	CCF50–47R5F–R36
A8R347	311–2277–00			RES,VAR,NONWW:TRMR,50 OHM,20%,0.5W	LINEAR	TK2073	GF06VT2 500 M L20
A8R350	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W		57668	CRB20 FXE 1K50
A8R351	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W		57668	CRB20 FXE 332E
A8R354	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W		57668	CRB20 FXE 301E

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A8R356	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A8R357	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W	57668	CRB20T68EFX4021
A8R358	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W	57668	CRB20 FXE 301E
A8R359	322–3130–00			RES,FXD,FILM:221 OHM,1%,0.2W	57668	CRB20T68EFX2210
A8R361	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A8R364	322–3172–00			RES,FXD,FILM:604 OHM,1%,0.2W	57668	CRB20 FXE 604E
A8R365	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W	91637	CCF50–7500F–R36
A8R367	322–3145–00			RES,FXD,FILM:316 OHM,1%,0.2W	57668	CRB20 FXE 316E
A8R368	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A8R369	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A8R370	311–2277–00			RES,VAR,NONWW:TRMR,50 OHM,20%,0.5W LINEAR	TK2073	GF06VT2 500 M L20
A8R372	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A8R373	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A8R375	322–3201–00			RES,FXD:METAL FILM,1.21K OHM,1%,0.2W	57668	CRB20T68EFX1211
A8R376	322–3251–00			RES,FXD,FILM:4.02K OHM,1%,0.2W	57668	CRB20T68EFX4021
A8R379	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W	57668	CRB20 FXE 301E
A8R381	322–3143–00			RES,FXD,FILM:301 OHM,1%,0.2W	57668	CRB20 FXE 301E
A8R382	322–3130–00			RES,FXD,FILM:221 OHM,1%,0.2W	57668	CRB20T68EFX2210
A8R384	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A8R385	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A8R387	322–3172–00			RES,FXD,FILM:604 OHM,1%,0.2W	57668	CRB20 FXE 604E
A8R388	322–3181–00			RES,FXD,FILM:750 OHM,1%,0.2W	91637	CCF50–7500F–R36
A8R390	322–3145–00			RES,FXD,FILM:316 OHM,1%,0.2W	57668	CRB20 FXE 316E
A8R391	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A8R393	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A8R394	311–2277–00			RES,VAR,NONWW:TRMR,50 OHM,20%,0.5W LINEAR	TK2073	GF06VT2 500 M L20
A8R404	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A8R405	322–3392–00			RES,FXD,FILM:118K OHM,1%,0.2W	57668	CRB20 FXE 118K
A8R406	322–3330–00			RES,FXD,FILM:26.7K OHM,1%,0.2W	57668	CRB20 FXE 26K7
A8R410	315–0755–00			RES,FXD,FILM:7.5M OHM,5%,0.25W	50139	CB7555
A8R411	322–3431–00			RES,FXD,FILM:301K OHM,1%,0.2W	57668	CRB20 FXE 301K
A8R412	315–0226–01			RES,FXD,FILM:22 M OHM,5%,0.25W	50139	CB2265
A8R415	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A8R418	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W	91637	CCF50–6650F–R36
A8R421	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A8R422	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W	91637	CCF50–6650F–R36
A8R428	322–3392–00			RES,FXD,FILM:118K OHM,1%,0.2W	57668	CRB20 FXE 118K
A8R429	322–3330–00			RES,FXD,FILM:26.7K OHM,1%,0.2W	57668	CRB20 FXE 26K7

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A8R433	315–0755–00			RES,FXD,FILM:7.5M OHM,5%,0.25W	50139	CB7555
A8R434	322–3431–00			RES,FXD,FILM:301K OHM,1%,0.2W	57668	CRB20 FXE 301K
A8R435	315–0226–01			RES,FXD,FILM:22 M OHM,5%,0.25W	50139	CB2265
A8R438	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A8R439	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A8R441	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W	91637	CCF50–6650F–R36
A8R444	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A8R446	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W	91637	CCF50–6650F–R36
A8R453	322–3392–00			RES,FXD,FILM:118K OHM,1%,0.2W	57668	CRB20 FXE 118K
A8R454	322–3330–00			RES,FXD,FILM:26.7K OHM,1%,0.2W	57668	CRB20 FXE 26K7
A8R458	315–0755–00			RES,FXD,FILM:7.5M OHM,5%,0.25W	50139	CB7555
A8R459	322–3431–00			RES,FXD,FILM:301K OHM,1%,0.2W	57668	CRB20 FXE 301K
A8R460	315–0226–01			RES,FXD,FILM:22 M OHM,5%,0.25W	50139	CB2265
A8R463	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W	91637	CCF50–6650F–R36
A8R464	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A8R465	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A8R468	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A8R470	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W	91637	CCF50–6650F–R36
A8R477	322–3392–00			RES,FXD,FILM:118K OHM,1%,0.2W	57668	CRB20 FXE 118K
A8R478	322–3330–00			RES,FXD,FILM:26.7K OHM,1%,0.2W	57668	CRB20 FXE 26K7
A8R481	315–0755–00			RES,FXD,FILM:7.5M OHM,5%,0.25W	50139	CB7555
A8R482	322–3431–00			RES,FXD,FILM:301K OHM,1%,0.2W	57668	CRB20 FXE 301K
A8R483	315–0226–01			RES,FXD,FILM:22 M OHM,5%,0.25W	50139	CB2265
A8R485	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W	57668	CRB20 FXE 332E
A8R489	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W	91637	CCF50–6650F–R36
A8R491	322–3210–00			RES,FXD:METAL FILM,1.5K OHM,1%,0.2W	57668	CRB20 FXE 1K50
A8R493	322–3176–00			RES,FXD,FILM:665 OHM,1%,0.2W	91637	CCF50–6650F–R36
A8R523	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W	57668	CRB20 FXE 7K50
A8R524	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A8R530	322–3243–00			RES,FXD:METAL FILM,3.32K OHM,1%,0.2W	91637	CCF50–3321F–R36
A8R531	322–3314–00			RES,FXD:METAL FILM,18.2K OHM,1%,0.2W	57668	CRB20 FXE 18K2
A8R532	322–3236–00			RES,FXD,FILM:2.8K OHM,1%,0.2W	57668	CRB20 FXE 2K80
A8R545	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W	57668	CRB20 FXE 7K50
A8R546	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A8R569	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W	57668	CRB20 FXE 7K50
A8R570	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0
A8R592	322–3277–00			RES,FXD,FILM:7.5K OHM,1%,0.2W	57668	CRB20 FXE 7K50
A8R593	322–3001–00			RES,FXD,FILM:10 OHM,1%,0.2W	57668	CRB20T68EFX10R0

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A8U217	156–0048–05			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFFPAIR,(3)IND,15V,50MA,300MHZ, AMPLIFIER,C, MOTOROLA/NATIONAL ONLY	04713	MC3346P
A8U240	156–0048–05			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFFPAIR,(3)IND,15V,50MA,300MHZ, AMPLIFIER,C, MOTOROLA/NATIONAL ONLY	04713	MC3346P
A8U264	156–0048–05			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFFPAIR,(3)IND,15V,50MA,300MHZ, AMPLIFIER,C, MOTOROLA/NATIONAL ONLY	04713	MC3346P
A8U288	156–0048–05			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY,(5),NPN, (1)DIFFPAIR,(3)IND,15V,50MA,300MHZ, AMPLIFIER,C, MOTOROLA/NATIONAL ONLY	04713	MC3346P
A8U308	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A8U331	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A8U354	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A8U378	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A8U418	156–0912–01			IC,LINEAR:BIPOLAR,OP–AMP,TRANSCONDUCTANCE, CA3080E/LM30	27014	LM3080N
A8U441	156–0912–01			IC,LINEAR:BIPOLAR,OP–AMP,TRANSCONDUCTANCE, CA3080E/LM30	27014	LM3080N
A8U464	156–0912–01			IC,LINEAR:BIPOLAR,OP–AMP,TRANSCONDUCTANCE, CA3080E/LM30	27014	LM3080N
A8U489	156–0912–01			IC,LINEAR:BIPOLAR,OP–AMP,TRANSCONDUCTANCE, CA3080E/LM30	27014	LM3080N
A8VR223	152–0226–00			DIODE,ZENER:5.1V,5%,0.4W,1N751A FMLY,DO–7 OR DO–35	04713	SZ12262RL
A8VR247	152–0226–00			DIODE,ZENER:5.1V,5%,0.4W,1N751A FMLY,DO–7 OR DO–35	04713	SZ12262RL
A8VR270	152–0226–00			DIODE,ZENER:5.1V,5%,0.4W,1N751A FMLY,DO–7 OR DO–35	04713	SZ12262RL
A8VR294	152–0226–00			DIODE,ZENER:5.1V,5%,0.4W,1N751A FMLY,DO–7 OR DO–35	04713	SZ12262RL
A8A1	——— ———			CIRCUIT BD ASSY:BNC (REPLACEABLE AT A8 ONLY)		
A8A1J1	131–0955–00			CONN,RF JACK:BNC,50 OHM,FEMALE	00779	87–3334–017
				ATTACHED PARTS		
	210–0013–00			WASHER,LOCK:0.391 ID INTL,0.035 THK,STL CD PL	78189	1220–00–00–0541C
				END ATTACHED PARTS		
A8A1J2	131–0955–00			CONN,RF JACK:BNC,50 OHM,FEMALE	00779	87–3334–017
				ATTACHED PARTS		
	210–0013–00			WASHER,LOCK:0.391 ID INTL,0.035 THK,STL CD PL	78189	1220–00–00–0541C
				END ATTACHED PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A8A1J3	131–0955–00			CONN,RF JACK:BNC,50 OHM,FEMALE	00779	87–3334–017
				ATTACHED PARTS		
	210–0013–00			WASHER,LOCK:0.391 ID INTL,0.035 THK,STL CD PL	78189	1220–00–00–0541C
				END ATTACHED PARTS		
A8A1J4	131–0955–00			CONN,RF JACK:BNC,50 OHM,FEMALE	00779	87–3334–017
				ATTACHED PARTS		
	210–0013–00			WASHER,LOCK:0.391 ID INTL,0.035 THK,STL CD PL	78189	1220–00–00–0541C
				END ATTACHED PARTS		
A8A1J5	131–0955–00			CONN,RF JACK:BNC,50 OHM,FEMALE	00779	87–3334–017
				ATTACHED PARTS		
	210–0013–00			WASHER,LOCK:0.391 ID INTL,0.035 THK,STL CD PL	78189	1220–00–00–0541C
				END ATTACHED PARTS		
A8A1J6	131–0955–00			CONN,RF JACK:BNC,50 OHM,FEMALE	00779	87–3334–017
				ATTACHED PARTS		
	210–0013–00			WASHER,LOCK:0.391 ID INTL,0.035 THK,STL CD PL	78189	1220–00–00–0541C
				END ATTACHED PARTS		
A8A1J7	131–0955–00			CONN,RF JACK:BNC,50 OHM,FEMALE	00779	87–3334–017
				ATTACHED PARTS		
	210–0013–00			WASHER,LOCK:0.391 ID INTL,0.035 THK,STL CD PL	78189	1220–00–00–0541C
				END ATTACHED PARTS		
A8A1J8	131–0955–00			CONN,RF JACK:BNC,50 OHM,FEMALE	00779	87–3334–017
				ATTACHED PARTS		
	210–0013–00			WASHER,LOCK:0.391 ID INTL,0.035 THK,STL CD PL	78189	1220–00–00–0541C
				END ATTACHED PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A9	671–0463–02		B030488	CIRCUIT BD ASSY:FRONT TOUCH PNL	80009	671–0463–02
A9	671–0463–03	B030489		CIRCUIT BD ASSY:FRONT TOUCH PNL	80009	671–0463–03
				ATTACHED PARTS		
	211–0022–00			SCR,MACH:2–56 X 0.188,PNH,STL (QTY 5)	8009	ORDER BY DESCR
	426–2266–01			FRAME,CRT:OUTER BEZEL	8009	426–2266–00
				END ATTACHED PARTS		
A9C105	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A9C288	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A9C292	281–0820–00			CAP,FXD,CERAMIC:MLC,680 PF,10%,50V	04222	SA101C681KAA
A9C296	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A9C297	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A9C298	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A9C396	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A9C397	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A9C398	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A9C399	290–0167–00			CAP,FXD,ELCTLT:10UF,20%,15V TANTALUM	12954	ST513B106M015N
A9C443	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A9C483	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A9C490	290–0167–00			CAP,FXD,ELCTLT:10UF,20%,15V TANTALUM	12954	ST513B106M015N
A9C498	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A9CR291	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152,DO–35	01295	1N4152R
A9CR297	152–0246–00			DIODE,SIG:ULTRA FAST,40V,200MA,FDH300A,DO–7	12969	NDP0533
A9DS106	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS146	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS206	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS246	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS306	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS346	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS406	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS413	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS420	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A9DS428	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS436	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS446	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS453	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS460	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS468	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9DS476	150–1168–00			DIODE,OPTO:LED,940NM,100MW,50MA IF,5V REVERSE,1.4VF AT 20MA,100PF,SE308T	4T165	SE308T
A9J492	174–3364–00			91100–14062:RIBBON,91100–14062,IDC,25,28 AWG,6 IN,DB255,25 POS,DSUB,FEMALE,W/STRAIN RELIEF X	80009	174–3364–00
A9Q113	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q120	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q128	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q136	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q143	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q153	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q160	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q168	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q176	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q183	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q243	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A9Q283	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q343	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q383	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q443	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9Q483	151–0848–00			TRANSISTOR,OPTO:DETECTOR,940NM,VISIBLE LIGHT FILTER,30VVCEO,100MW,100NA DARK CURRENT,PH108A–T	4T165	PH108A–T
A9R292	311–2258–00			RES,VAR,TRMR:CERMET,1K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST,T&A	TK2073	GF06VT2 102 M L20
A9R295	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	57668	CRB20T29EFX1002
A9R297	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	57668	CRB20T29EFX1002
A9R299	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	57668	CRB20T29EFX1002
A9R391	311–2403–00			ENCODER,OPTICAL:100 CYCLES PER REVOLUTION, 10 WEIGHT OIL FILLED,1.180 WIDE X 1.620 HIGH,0.375–32	50434	QEDS–5915
				ATTACHED PARTS		
	366–2159–02			KNOB ASSEMBLY:MEDIUM GRAY,SCROLL,1.243 ID X .4 OD X 0.42 H	TK1163	ORDER BY DESCRIPTION
	210–0978–00			WASHER,FLAT:0.375 ID X 0.5 OD X 0.024,STL CD PL	86928	ORDER BY DESCRIPTION
	214-4727-00			SPRING;COMPRESSION SPRING, 0.031, 302 STAINLESS STEEL, 0.385, ±0.008	8X345	214-4727-00
				END ATTACHED PARTS		
A9S102	260–2402–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	61964	B3E–1300
A9S102	260–2675–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,TL1240G	OUAU4	TL1240G
				ATTACHED PARTS		
	366–0682–00			PUSH BUTTON:LIGHTED CAP,INSERT ASSY	0JR05	366–0682–00
				END ATTACHED PARTS		
A9S188	260–2402–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	61964	B3E–1300

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A9S188	260–2675–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,TL1240G	OUAU4	TL1240G
				ATTACHED PARTS		
	366–0682–00			PUSH BUTTON:LIGHTED CAP,INSERT ASSY	0JR05	366–0682–00
				END ATTACHED PARTS		
A9S189	260–2402–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	61964	B3E–1300
A9S189	260–2675–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,TL1240G	OUAU4	TL1240G
				ATTACHED PARTS		
	366–0682–00			PUSH BUTTON:LIGHTED CAP,INSERT ASSY	0JR05	366–0682–00
				END ATTACHED PARTS		
A9S196	260–2402–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	61964	B3E–1300
A9S196	260–2675–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,TL1240G	OUAU4	TL1240G
				ATTACHED PARTS		
	366–0682–00			PUSH BUTTON:LIGHTED CAP,INSERT ASSY	0JR05	366–0682–00
				END ATTACHED PARTS		
A9S197	260–2402–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	61964	B3E–1300
A9S197	260–2675–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,TL1240G	OUAU4	TL1240G
				ATTACHED PARTS		
	366–0682–00			PUSH BUTTON:LIGHTED CAP,INSERT ASSY	0JR05	366–0682–00
				END ATTACHED PARTS		
A9S202	260–2402–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	61964	B3E–1300
A9S202	260–2675–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,TL1240G	OUAU4	TL1240G
				ATTACHED PARTS		
	366–0682–00			PUSH BUTTON:LIGHTED CAP,INSERT ASSY	0JR05	366–0682–00
				END ATTACHED PARTS		
A9S291	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A9S291	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A9S302	260–2402–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	61964	B3E–1300
A9S302	260–2675–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,TL1240G	OUAU4	TL1240G
				ATTACHED PARTS		
	366–0682–00			PUSH BUTTON:LIGHTED CAP,INSERT ASSY	0JR05	366–0682–00
				END ATTACHED PARTS		
A9S402	260–2402–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	61964	B3E–1300
A9S402	260–2675–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,TL1240G	OUAU4	TL1240G
				ATTACHED PARTS		
	366–0682–00			PUSH BUTTON:LIGHTED CAP,INSERT ASSY	0JR05	366–0682–00
				END ATTACHED PARTS		
A9S488	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A9S488	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A9S497	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A9S497	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A9U288	156–0513–00			IC,MISC:CMOS,ANALOG MUX,8 CHANNEL,1.2KOHM,CD4051,DIP16.3	04713	MC14051BCP
A9U296	156–2263–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, NEGATIVE,–12V,100MA,4%,MC79L12ACP,TO–92	04713	MC79L12ACP

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A9U297	156–1191–00			IC,LINEAR:BIFET,OP–AMP,DUAL, TL072CN/LF353N,DIP08.3	01295	TL072CP
A9U495	156–1150–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, NEGATIVE,–5.0V,100MA,4%,MC79L05ACP,TO–92	04713	MC79L05ACP
A9U498	156–0991–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, POSITIVE,5.0V,100MA,5%,MC78L05ACP,TO–92	01295	UA78L05ACLP

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A10	671–0925–01		B030488	CIRCUIT BD ASSY:MPU ANNEX	80009	671–0925–01
A10	671–0925–02	B030489		CIRCUIT BD ASSY:MPU ANNEX	80009	671–0925–02
A10C207	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V,ESR=16.58 OHM (120HZ,20C),RADIAL	55680	UVX1H100MDA
A10C211	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C230	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C312	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C313	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C320	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C327	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C329	290–1034–00			CAP,FXD,ALUM:330UF,20%,25V,13 X 25MM,RADIAL	62643	CEUFM1E331
A10C343	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C403	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C407	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C413	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C420	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C439	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C525	281–0909–00			CAP,FXD,CERAMIC:MLC,0.022UF,20%,50V	04222	SA105C223MAA
A10C534	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10C539	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A10CR106	152–0333–00			DIODE,SIG:ULTRA FAST,80V,4NS,1VF AT 200MA,2.0PF,DO–35	12969	NDP261
A10CR107	152–0333–00			DIODE,SIG:ULTRA FAST,80V,4NS,1VF AT 200MA,2.0PF,DO–35	12969	NDP261
A10CR108	152–0333–00			DIODE,SIG:ULTRA FAST,80V,4NS,1VF AT 200MA,2.0PF,DO–35	12969	NDP261
A10CR109	152–0333–00			DIODE,SIG:ULTRA FAST,80V,4NS,1VF AT 200MA,2.0PF,DO–35	12969	NDP261
A10CR110	152–0333–00			DIODE,SIG:ULTRA FAST,80V,4NS,1VF AT 200MA,2.0PF,DO–35	12969	NDP261
A10CR111	152–0333–00			DIODE,SIG:ULTRA FAST,80V,4NS,1VF AT 200MA,2.0PF,DO–35	12969	NDP261
A10CR112	152–0333–00			DIODE,SIG:ULTRA FAST,80V,4NS,1VF AT 200MA,2.0PF,DO–35	12969	NDP261
A10CR113	152–0333–00			DIODE,SIG:ULTRA FAST,80V,4NS,1VF AT 200MA,2.0PF,DO–35	12969	NDP261
A10J112	131–3364–00			CONN,HDR:PCB,MALE,STR,2 X 17,0.1 CTR,0.365 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD,	53387	N2534–6002UB
A10J138	131–3364–00			CONN,HDR:PCB,MALE,STR,2 X 17,0.1 CTR,0.365 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD,	53387	N2534–6002UB
A10J302	131–3364–00			CONN,HDR:PCB,MALE,STR,2 X 17,0.1 CTR,0.365 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD,	53387	N2534–6002UB

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A10R208	322–3093–00			RES,FXD,FILM:90.9 OHM,1%,0.2W,MI,SMALL BODY	91637	CCF50–90R9F–R36
A10R209	322–3093–00			RES,FXD,FILM:90.9 OHM,1%,0.2W,MI,SMALL BODY	91637	CCF50–90R9F–R36
A10R210	322–3093–00			RES,FXD,FILM:90.9 OHM,1%,0.2W,MI,SMALL BODY	91637	CCF50–90R9F–R36
A10R211	322–3093–00			RES,FXD,FILM:90.9 OHM,1%,0.2W,MI,SMALL BODY	91637	CCF50–90R9F–R36
A10R212	322–3093–00			RES,FXD,FILM:90.9 OHM,1%,0.2W,MI,SMALL BODY	91637	CCF50–90R9F–R36
A10R213	322–3117–00		B030488	RES,FXD,FILM:162 OHM,1%,0.2W,MI,SMALL BODY	57668	CRB20 FXE 162E
A10R213	322–3089–00	B030489		RES,FXD,FILM:82.5 OHM,1%,0.2W,MI,SMALL BODY	57668	CRB20 FXE 82E5
A10R214	322–3073–00			RES,FXD,FILM:56.2 OHM,1%,0.2W,SMALL BODY	57668	CRB20 FXE 56E2
A10R215	322–3073–00			RES,FXD,FILM:56.2 OHM,1%,0.2W,T&R,SMALL BODY	57668	CRB20 FXE 56E2
A10R221	307–0103–00			RES,FXD,CMPSN:2.7 OHM,5%,0.25W MI	50139	CB27G5
A10R305	307–0446–00			RES NTWK,FXD,FI:(9) RES,10K OHM,20%,100PPM	11236	750–101–R10K
A10R411	307–0446–00			RES NTWK,FXD,FI:(9) RES,10K OHM,20%,100PPM	11236	750–101–R10K
A10R420	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,SMALL BODY	57668	CRB20T29EFX1002
A10R447	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,SMALL BODY	57668	CRB20T29EFX1002
A10R448	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,SMALL BODY	57668	CRB20T29EFX1002
A10R524	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W,SMALL BODY	57668	CRB20T29EFX1002
A10R526	322–3357–00			RES,FXD,FILM:51.1K OHM,1%,0.2W,SMALL BODY	57668	CRB20 FXE 51K1
A10R535	322–3334–00			RES,FXD,FILM:29.4K OHM,1%,0.2W,SMALL BODY	57668	CRB20 FXE 29K4
A10R538	322–3305–00			RES,FXD,FILM:14.7K OHM,1%,0.2W,SMALL BODY	91637	CCF50–1472F–R36
A10R539	322–3363–00			RES,FXD,FILM:59K OHM,1%,0.2W,SMALL BODY	57668	CRB20 FXE 59K0
A10SP429	119–1388–00			XDCR,AUDIO:0–150V P–P	61058	EFB–RD24C411
A10U140	156–3653–00			IC,LINEAR:BIPOLAR,POWER DRIVER,8 CHANNEL SATURATED SINK DRIVER,20V,100MA/DRIVER,UDN2595A,D	0CVK3	UDN–2595A
A10U210	156–2558–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, POSITIVE,12V,1.5A,2%,MC7812ACT,TO–220	01295	TL780–12CKC
A10U223	156–3653–00			IC,LINEAR:BIPOLAR,POWER DRIVER,8 CHANNEL SATURATED SINK DRIVER,20V,100MA/DRIVER,UDN2595A,D	0CVK3	UDN–2595A
A10U239	156–3653–00			IC,LINEAR:BIPOLAR,POWER DRIVER,8 CHANNEL SATURATED SINK DRIVER,20V,100MA/DRIVER,UDN2595A,D	0CVK3	UDN–2595A
A10U240	156–3653–00			IC,LINEAR:BIPOLAR,POWER DRIVER,8 CHANNEL SATURATED SINK DRIVER,20V,100MA/DRIVER,UDN2595A,D	0CVK3	UDN–2595A
A10U310	156–2436–00			IC,DIGITAL:HCTCMOS,GATE,QUAD 2–INPUT OR,74HCT32,DIP14.3,TUBE	01295	SN74HCT32N
A10U338	156–1956–00			IC,DIGITAL:HCTCMOS,DECODER,1–OF–8,ACTIVE LOW,74HCT138,DIP16.3,TUBE	01295	SN74HCT138N
A10U409	156–1748–00			IC,DIGITAL:ALSTTL,TRANSCEIVER,OCTAL,3–STATE,74 ALS1245,DIP20.3,TUBE	01295	SN74ALS1245AN
A10U413	156–1917–00			IC,DIGITAL:LSTTL,REGISTER,8–BIT SHIFT,OUTPUT LATCH,74LS595,DIP16.3,TUBE	01295	SN74LS595N

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A10U420	156–1917–00			IC,DIGITAL:LSTTL,REGISTER,8–BIT SHIFT,OUTPUT LATCH,74LS595,DIP16.3,TUBE	01295	SN74LS595N
A10U437	156–1535–00			IC,PROCESSOR:NMOS,PERIPHERAL,PROGRAMMABLE KEYBOARD INTERFACE,8279–5,DIP40.6	34335	AM8279–5(N OR J)
A10U441	156–2980–00			IC,DIGITAL:HCMOS,QUADRATURE DECODER/COUNTER INTERFACE,8–BIT TRI STAR,12–BIT UP/DOWN,12–BIT	50444	HCTL–2000
A10U508	160–6004–00			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS,90MA,PRGM 156–2983–00,16V8–25,DIP20.3	TK0198	160600400
A10U512	156–1172–00			IC,DIGITAL:LSTTL,COUNTER,DUAL 4–BIT BINARY,74LS393,DIP14.3,TUBE	01295	SN74LS393N
A10U520	156–0721–00			IC,DIGITAL:LSTTL,SCHMITT TRIG,QUAD 2–INPUT NAND,74LS132,DIP14.3,TUBE	07263	DM74LS132N
A10U530	156–0402–00			IC,MISC:BIPOLAR,TIMER,LM555CN,DIP08.3	27014	LM555CN
A10U541	156–3192–00			IC,DIGITAL:HCMOS,FLIP FLOP,HEX D–TYPE,CLEAR,74HCT174,DIP16.3,TUBE	04713	MC74HCT174N

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A11	671–0469–03			CIRCUIT BD ASSY:INTERCONNECT	80009	671–0469–03
A11J116	131–5531–00			CONN,HDR:PCB,MALE,RTANG,1 X 7,0.1 CTR,0.235 MLG X 0.115 TAIL,GOLD,	53387	2407–5112TB
A11J133	174–1168–00			CA ASSY,SP:RIBBON,IDC,10,28AWG,4.25L,2X10,0.1, PCB,X 2X10,0.1,CTRPLZ,RCPT,SAME SIDE	23633	174–1168–00
A11J143	131–5531–00			CONN,HDR:PCB,MALE,RTANG,1 X 7,0.1 CTR,0.235 MLG X 0.115 TAIL,GOLD,	53387	2407–5112TB
A11J150	131–5531–00			CONN,HDR:PCB,MALE,RTANG,1 X 7,0.1 CTR,0.235 MLG X 0.115 TAIL,GOLD,	53387	2407–5112TB
A11J165	131–5531–00			CONN,HDR:PCB,MALE,RTANG,1 X 7,0.1 CTR,0.235 MLG X 0.115 TAIL,GOLD,	53387	2407–5112TB
A11J303	174–1172–00			CA ASSY,SP:RIBBON,IDC,60,28AWG,2.1L,2X30,0.1,CTR PLZ,RCPT,X 2X30,0.1 CTR,PCB	23633	174–1172–00
A11J308	174–1172–00			CA ASSY,SP:RIBBON,IDC,60,28AWG,2.1L,2X30,0.1,CTR PLZ,RCPT,X 2X30,0.1 CTR,PCB	23633	174–1172–00
A11J375	174–1170–00			CA ASSY,SP:RIBBON,IDC,60,28AWG,6.3L,2X30,0.1,CTR PLZ,RCPT W/PULLTAB X2X30,0.1 CTR,PCB	23633	174–1170–00
A11J380	174–1171–00			CA ASSY,SP:RIBBON,IDC,60,28AWG,4.9L,2X30,0.1,CTR PLZ,RCPT W/PULLTAB X 2X30,0.1 CTR,PCB	23633	174–1171–00
A11J492	174–1167–00			CA ASSY,SP:RIBBON,IDC,60,28AWG,6.2L W/TAPE,2X30,0.1,CTR PLZ,RCPTX 2X30,0.1 CTR,PCB	23633	174–1167–00
A11J497	174–1171–00			CA ASSY,SP:RIBBON,IDC,60,28AWG,4.9L,2X30,0.1,CTR PLZ,RCPT W/PULLTAB X 2X30,0.1 CTR,PCB	23633	174–1171–00
A11J516	174–1173–00			CA ASSY,SP:RIBBON,IDC,34,28AWG,2.0L,2X17,0.1,CTR PLZ,RCPT W/PULLTAB X 2X17,0.1 CTR,PCB	23633	174–1173–00
A11J531	174–1173–00			CA ASSY,SP:RIBBON,IDC,34,28AWG,2.0L,2X17,0.1,CTR PLZ,RCPT W/PULLTAB X 2X17,0.1 CTR,PCB	23633	174–1173–00
A11J547	131–3364–00			CONN,HDR:PCB,MALE,STR,2 X 17,0.1 CTR,0.365 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD,	53387	N2534–6002UB
A11J565	131–3364–00			CONN,HDR:PCB,MALE,STR,2 X 17,0.1 CTR,0.365 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD,	53387	N2534–6002UB
A11R109	311–2442–02			RES,VAR,PNL:CP,10K OHM,10%,0.5W,LINEAR,CONTIN-UOUS ROTATION,0.5 SQ,2.0 LONG SHAFT	12697	S–1–20629
				ATTACHED PARTS		
	366–0649–00			KNOB:GY,0.127 ID X 0.392 OD X 0.5 H	80009	366–0649–00
	214–4726–00			SPRING;CONICAL SPRING, 0.026, 302 STAINLESS STEEL, 0.313, ± 0.040	8X345	214–4726–00
				END ATTACHED PARTS		
A11R123	311–2442–02			RES,VAR,PNL:CP,10K OHM,10%,0.5W,LINEAR,CONTIN-UOUS ROTATION,0.5 SQ,2.0 LONG SHAFT	12697	S–1–20629
				ATTACHED PARTS		
	366–0649–00			KNOB:GY,0.127 ID X 0.392 OD X 0.5 H	80009	366–0649–00
	214–4726–00			SPRING;CONICAL SPRING, 0.026, 302 STAINLESS STEEL, 0.313, ± 0.040	8X345	214–4726–00
				END ATTACHED PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A11R127	311–2442–02			RES,VAR,PNL:CP,10K OHM,10%,0.5W,LINEAR,CONTINUOUS ROTATION,0.5 SQ,2.0 LONG SHAFT	12697	S–1–20629
				ATTACHED PARTS		
	366–0649–00			KNOB:GY,0.127 ID X 0.392 OD X 0.5 H	80009	366–0649–00
	214–4726–00			SPRING;CONICAL SPRING, 0.026, 302 STAINLESS STEEL, 0.313, ± 0.040	8X345	214–4726–00
				END ATTACHED PARTS		
A11R138	311–2442–02			RES,VAR,PNL:CP,10K OHM,10%,0.5W,LINEAR,CONTINUOUS ROTATION,0.5 SQ,2.0 LONG SHAFT	12697	S–1–20629
				ATTACHED PARTS		
	366–0649–00			KNOB:GY,0.127 ID X 0.392 OD X 0.5 H	80009	366–0649–00
	214–4726–00			SPRING;CONICAL SPRING, 0.026, 302 STAINLESS STEEL, 0.313, ± 0.040	8X345	214–4726–00
				END ATTACHED PARTS		
A11R158	311–2442–02			RES,VAR,PNL:CP,10K OHM,10%,0.5W,LINEAR,CONTINUOUS ROTATION,0.5 SQ,2.0 LONG SHAFT	12697	S–1–20629
				ATTACHED PARTS		
	366–0649–00			KNOB:GY,0.127 ID X 0.392 OD X 0.5 H	80009	366–0649–00
	214–4726–00			SPRING;CONICAL SPRING, 0.026, 302 STAINLESS STEEL, 0.313, ± 0.040	8X345	214–4726–00
				END ATTACHED PARTS		
A11R185	311–2442–02			RES,VAR,PNL:CP,10K OHM,10%,0.5W,LINEAR,CONTINUOUS ROTATION,0.5 SQ,2.0 LONG SHAFT	12697	S–1–20629
				ATTACHED PARTS		
	366–0649–00			KNOB:GY,0.127 ID X 0.392 OD X 0.5 H	80009	366–0649–00
	214–4726–00			SPRING;CONICAL SPRING, 0.026, 302 STAINLESS STEEL, 0.313, ± 0.040	8X345	214–4726–00
				END ATTACHED PARTS		
A11R191	311–2442–02			RES,VAR,PNL:CP,10K OHM,10%,0.5W,LINEAR,CONTINUOUS ROTATION,0.5 SQ,2.0 LONG SHAFT	12697	S–1–20629
				ATTACHED PARTS		
	366–0649–00			KNOB:GY,0.127 ID X 0.392 OD X 0.5 H	80009	366–0649–00
	214–4726–00			SPRING;CONICAL SPRING, 0.026, 302 STAINLESS STEEL, 0.313, ± 0.040	8X345	214–4726–00
				END ATTACHED PARTS		
A11R198	311–2442–02			RES,VAR,PNL:CP,10K OHM,10%,0.5W,LINEAR,CONTINUOUS ROTATION,0.5 SQ,2.0 LONG SHAFT	12697	S–1–20629
				ATTACHED PARTS		
	366–0649–00			KNOB:GY,0.127 ID X 0.392 OD X 0.5 H	80009	366–0649–00
	214–4726–00			SPRING;CONICAL SPRING, 0.026, 302 STAINLESS STEEL, 0.313, ± 0.040	8X345	214–4726–00
				END ATTACHED PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A12	671–0462–01		B030488	CIRCUIT BD ASSY:FRONT SW PNL	80009	671–0462–01
A12	671–0462–02	B030489		CIRCUIT BD ASSY:FRONT SW PNL	80009	671–0462–02
A12DS104	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS106	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS114	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS116	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS124	150–1212–00			LT EMITTING DIO:GREEN,2.2V	50434	HLMP2566
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS126	150–1212–00			LT EMITTING DIO:GREEN,2.2V	50434	HLMP2566
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS134	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS136	150–1212–00			LT EMITTING DIO:GREEN,2.2V	50434	HLMP2566
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS204	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A12DS206	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS214	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS215	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS216	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS224	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS225	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS226	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS234	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS235	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS236	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS304	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS305	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS306	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS314	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS315	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS316	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS324	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS325	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS326	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A12DS334	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS336	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS404	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS406	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS414	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS416	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS430	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS534	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12DS536	150–1211–00			LT EMITTING DIO:GREEN,2.0V	50434	HLMP–2516
				ATTACHED PARTS		
	361–1484–00			SPACER,LED:NYLON	0JR05	361–1484–00
				END ATTACHED PARTS		
A12J410	174–1169–00			CA ASSY,SP:RIBBON,IDC,34,28AWG,6.25L,2X17,0.1 CTR PLZ,RCPT W/PULL TAB X 2X17,0.1 CTR,PCB,O	53387	174–1169–00

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A12S105	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S105	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S115	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S115	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S125	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S125	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S135	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S135	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S205	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S205	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S215	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S215	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A12S225	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S225	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S235	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S235	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S305	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S305	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S315	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S315	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S325	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S325	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S335	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S335	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A12S405	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S405	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S415	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S415	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S425	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S425	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S435	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S435	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		
A12S535	260–2401–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	61964	B3E–1000
A12S535	260–2673–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,B3E–1000	OUAU4	TL1240N
				ATTACHED PARTS		
	366–0683–00			PUSH BUTTON:SWITCH CAP	0JR05	366–0683–00
				END ATTACHED PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A13	671–0548–01		B030488	CIRCUIT BD ASSY:VECTORSCOPE GRATICULE LIGHTS	80009	671–0548–01
A13	671–0548–02	B030489		CIRCUIT BD ASSY:VECTORSCOPE GRATICULE LIGHTS	80009	671–0548–02
A13DS111	150–1136–00			LAMP,INCAND:OL–381BPR	S3774	OL–381 BPR–022
				MOUNTING PARTS		
	136–0987–00			SOCKET,ELEC:BULB	S3774	BPR–058
				MOUNTING PARTS		
A13DS121	150–1136–00			LAMP,INCAND:OL–381BPR	S3774	OL–381 BPR–022
				MOUNTING PARTS		
	136–0987–00			SOCKET,ELEC:BULB	S3774	BPR–058
				MOUNTING PARTS		
A13DS131	150–1136–00			LAMP,INCAND:OL–381BPR	S3774	OL–381 BPR–022
				MOUNTING PARTS		
	136–0987–00			SOCKET,ELEC:BULB	S3774	BPR–058
				MOUNTING PARTS		
A13DS141	150–1136–00			LAMP,INCAND:OL–381BPR	S3774	OL–381 BPR–022
				MOUNTING PARTS		
	136–0987–00			SOCKET,ELEC:BULB	S3774	BPR–058
				MOUNTING PARTS		
A13DS151	150–1136–00			LAMP,INCAND:OL–381BPR	S3774	OL–381 BPR–022
				MOUNTING PARTS		
	136–0987–00			SOCKET,ELEC:BULB	S3774	BPR–058
				MOUNTING PARTS		
A13P116	174–1297–00			CA ASSY,SP:RIBBON,LDI,7,26AWG,2.8L,1X7,0.1 CTR,RCPT X 0.2 CUT & STRIP	060D9	174–1297–00
A13S131	260–2402–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	61964	B3E–1300
A13S131	260–2675–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E1300	OUAU4	TL1240G
				MOUNTING PARTS		
	366–0682–00			PUSH BUTTON:LIGHTED CAP,INSERT ASSY	0JR05	366–0682–00
				END MOUNTING PARTS		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A14	671–0549–01		B030488	CIRCUIT BD ASSY:WAVEFORM MONITOR GRATICULE LIGHTS	80009	671–0549–01
A14	671–0549–02	B030489		CIRCUIT BD ASSY:WAVEFORM MONITOR GRATICULE LIGHTS	80009	671–0549–02
A14DS110	150–1136–00			LAMP,INCAND:OL–381BPR	S3774	OL–381 BPR–022
				**MOUNTING PARTS*		
	136–0987–00			SOCKET,ELEC:BULB	S3774	BPR–058
				**END MOUNTING PARTS*		
A14DS120	150–1136–00			LAMP,INCAND:OL–381BPR	S3774	OL–381 BPR–022
				**MOUNTING PARTS*		
	136–0987–00			SOCKET,ELEC:BULB	S3774	BPR–058
				**END MOUNTING PARTS*		
A14DS130	150–1136–00			LAMP,INCAND:OL–381BPR	S3774	OL–381 BPR–022
				**MOUNTING PARTS*		
	136–0987–00			SOCKET,ELEC:BULB	S3774	BPR–058
				**END MOUNTING PARTS*		
A14DS140	150–1136–00			LAMP,INCAND:OL–381BPR	S3774	OL–381 BPR–022
				**MOUNTING PARTS*		
	136–0987–00			SOCKET,ELEC:BULB	S3774	BPR–058
				**END MOUNTING PARTS*		
A14DS150	150–1136–00			LAMP,INCAND:OL–381BPR	S3774	OL–381 BPR–022
				**MOUNTING PARTS*		
	136–0987–00			SOCKET,ELEC:BULB	S3774	BPR–058
				**END MOUNTING PARTS*		
A14P150	174–1297–00			CA ASSY,SP:RIBBON,LDI,7,26AWG,2.8L,1X7,0.1 CTR,RCPT X 0.2 CUT & STRIP	060D9	174–1297–00
A14S130	260–2402–00		B030488	SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,B3E–1300	61964	B3E–1300
A14S130	260–2675–00	B030489		SWITCH,PUSH:SPST,MOM,NO,150 GRM FRC,SEALED,50MA,24VDC,100M OHM,W/GRN LED 20 MA MAX,TL1240G	OUAU4	TL1240G
				**ATTACHED PARTS*		
	366–0682–00			PUSH BUTTON:LIGHTED CAP,INSERT ASSY	0JR05	366–0682–00
				**END ATTACHED PARTS*		

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A15	671–0547–04			CIRCUIT BD ASSY:FILTER	80009	671–0547–04
A15C100	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A15C110	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C111	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C130	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C140	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C141	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C150	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C151	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C160	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C161	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C170	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C171	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C180	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C181	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C210	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C211	290–0920–00			CAP,FXD,ALUM:33UF,20%,50V,6 X 11MM,0.1SP,RADIAL	62643	SME50VB33RM6X11L
A15C212	283–0725–00			CAP,FXD,MICA DI:214PF,1%,500V	09023	CD15FD(214)F03
A15C220	283–0677–00			CAP,FXD,MICA DI:82PF,1%,500V	09023	CD15ED820F03
A15C300	290–0920–00			CAP,FXD,ALUM:33UF,20%,50V,6 X 11MM,0.1SP,RADIAL	62643	SME50VB33RM6X11L
A15C310	290–0920–00			CAP,FXD,ALUM:33UF,20%,50V,6 X 11MM,0.1SP,RADIAL	62643	SME50VB33RM6X11L
A15C311	283–0644–00			CAP,FXD,MICA DI:150PF,1%,500V	09023	CD15FD151F03
A15C312	283–0644–00			CAP,FXD,MICA DI:150PF,1%,500V	09023	CD15FD151F03
A15C320	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A15C321	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A15C322	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C350	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C400	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C410	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C411	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A15C420	283–0177–00			CAP,FXD,CER DI:1UF,+80–20%,25V	04222	SR303E105ZAA
A15C430	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C440	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C441	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C450	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C460	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C461	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA
A15C470	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V,Z5U	04222	SA105E104MAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A15CR300	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A, 1.2VF,2US,GP10G/1N5060	0LUA3	1N5060
A15CR310	152–0066–00			DIODE,RECT:400V,1A,IFSM=30A, 1.2VF,2US,GP10G/1N5060	0LUA3	1N5060
A15J310	174–1173–00			CA ASSY,SP:RIBBON,IDC,34,28AWG,2.0L,2X17,0.1,CTR PLZ,RCPT W/PULLTAB X 2X17,0.1 CTR,PCB	23633	174–1173–00
A15J380	174–1173–00			CA ASSY,SP:RIBBON,IDC,34,28AWG,2.0L,2X17,0.1,CTR PLZ,RCPT W/PULLTAB X 2X17,0.1 CTR,PCB	23633	174–1173–00
A15L210	108–0317–00			INDUCTOR,FXD:CUSTOM,POWER,15UH,10%,IDC<460 MA,RDC<1.2 OHM,Q>55@2.5MHZ,SRF>30 MHZ,POWDERED IRO	0JR03	108–0317–00
A15L420	108–0317–00			INDUCTOR,FXD:CUSTOM,POWER,15UH,10%,IDC<460 MA,RDC<1.2 OHM,Q>55@2.5MHZ,SRF>30 MHZ,POWDERED IRO	0JR03	108–0317–00
A15L421	108–0422–00			INDUCTOR,FXD:CUSTOM,POWER,80UH,20%,IDC<2 A,RDC<0.15 OHM,Q>30@40KHZ,AXIAL	0JR03	108–0422–00
A15Q310	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA,250MHZ, AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A15Q320	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA,300MHZ, AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A15R210	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W,TC=100 PPM,AXIAL,T&R,SMALL BODY	57668	CRB20T68EFX1001
A15R220	322–3188–00			RES,FXD,FILM:887 OHM,1%,0.2W,TC=T0, SMALL BODY	57668	CRB20 FXE 887E
A15R221	322–3188–00			RES,FXD,FILM:887 OHM,1%,0.2W,TC=T0, SMALL BODY	57668	CRB20 FXE 887E
A15R222	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W,	56845	CCF50–4751F–R36
A15R223	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W,	57668	CRB20T68EFX1000
A15R310	322–3066–00			RES,FXD,FILM:47.5 OHM,1%,0.2W	09969	CCF50–47R5F–R36
A15R320	322–3188–00			RES,FXD,FILM:887 OHM,1%,0.2W	57668	CRB20 FXE 887E
A15R321	322–3188–00			RES,FXD,FILM:887 OHM,1%,0.2W	57668	CRB20 FXE 887E
A15R322	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A15R344	322–3258–00			RES,FXD:METAL FILM,4.75K OHM,1%,0.2W	56845	CCF50–4751F–R36
A15R380	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A15R410	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A15U200	156–0846–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULA-TOR,NEGATIVE,–5.0V,1.0A,4.0%,MC7905CT,TO–220	01295	UA7905CKC
A15U210	156–4627–00			IC,CONVERTER:BIPOLAR,A/D & D/A,8–BIT FLASH A/D,10–BIT D/A,PARALLEL,W/REF,UVC3130–8,DIP40.6	14433	UVC3130–8
A15U230	156–1754–02			IC,DIGITAL:ALSTTL,BUFFER,OCTAL,HIGH DRIVE,3–STATE,74ALS244–1,DIP20.3	07263	DM74ALS244AN
A15U240	156–1705–00			IC,DIGITAL:FTTL,ARITHMETIC FUNCTIONS,4–BIT BINARY FULL ADDER,FAST CARRY,74F283,DIP16.3	04713	MC74F283N
A15U241	156–1748–00			IC,DIGITAL:ALSTTL,TRANSCEIVER,OCTAL,3–STATE,74 ALS1245,DIP20.3	01295	SN74ALS1245AN
A15U250	156–2063–00			IC,DIGITAL:ALSTTL,FLIP FLOP,OCTAL D–TYPE,3–STATE,74ALS374,DIP20.3	01295	SN74ALS374AN

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A15U251	156–2992–00			IC,MEMORY:CMOS,SRAM,2K X 8,35NS,OE,DIP24.3	62786	HM6716P–35
A15U260	156–2992–00			IC,MEMORY:CMOS,SRAM,2K X 8,35NS,OE,DIP24.3	62786	HM6716P–35
A15U261	160–6005–01			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS,90MA,PRGM 156–2983–00,16V8–25,DIP20.3	TK0198	160600501
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE,	98291	DIPS20PIT
				END MOUNTING PARTS		
A15U270	156–1754–02			IC,DIGITAL:ALSTTL,BUFFER,OCTAL,HIGH DRIVE,3–STATE,74ALS244–1,DIP20.3,TUBE	07263	DM74ALS244AN
A15U271	160–6003–01			IC,DIGITAL:CMOS,PLD,OPT,22V10,25NS,33.3MHZ,90MA ,PRGM 156–3243–00,22V10–25,DIP24.3	TK0198	160600301
				MOUNTING PARTS		
	136–0925–00			SOCKET,DIP::PCB,24 POS,2 X 12,0.1 X 0.3 CTR,0.196 H X 0.130 TAIL,BECU,TIN,ACCOM 0.008–0.015	00779	2–641932–3
				END MOUNTING PARTS		
A15U280	160–6005–01			IC,DIGITAL:CMOS,PLD,EEPLD,16V8,25NS,90MA,PRGM 156–2983–00,16V8–25,DIP20.3	TK0198	160600501
				MOUNTING PARTS		
	136–0752–00			SOCKET,DIP:PCB,FEMALE,STR,2 X 10,0.3 CTR,0.210 H X 0.128 TAIL,TIN,PHOS BRONZE,	98291	DIPS20PIT
				END MOUNTING PARTS		
A15U281	156–0545–00			IC,DIGITAL:CMOS,COUNTER,12–BIT BINARY,4040B,DIP16.3	04713	MC14040BCP
A15U330	156–2377–00			IC,DIGITAL:ASTTL,MUX,QUAD 2–TO–1,3–STATE,74AS257,DIP16.3	01295	SN74AS257N
A15U400	156–1611–00			IC,DIGITAL:FTTL,FLIP FLOP,DUAL D–TYPE,SET,CLEAR,74F74,DIP14.3	04713	MC74F74N
A15U410	156–0541–00			IC,DIGITAL:LSTTL,DECODER,DUAL 1–OF–4,ACTIVE LOW,74LS139,DIP16.3	01295	SN74LS139AN
A15U430	156–1705–00			IC,DIGITAL:FTTL,ARITHMETIC FUNCTIONS,4–BIT BINARY FULL ADDER,FAST CARRY,74F283,DIP16.3	04713	MC74F283N
A15U440	156–1705–00			IC,DIGITAL:FTTL,ARITHMETIC FUNCTIONS,4–BIT BINARY FULL ADDER,FAST CARRY,74F283,DIP16.3	04713	MC74F283N
A15U441	156–1705–00			IC,DIGITAL:FTTL,ARITHMETIC FUNCTIONS,4–BIT BINARY FULL ADDER,FAST CARRY,74F283,DIP16.3	04713	MC74F283N
A15U450	156–1705–00			IC,DIGITAL:FTTL,ARITHMETIC FUNCTIONS,4–BIT BINARY FULL ADDER,FAST CARRY,74F283,DIP16.3	04713	MC74F283N
A15U451	156–2063–00			IC,DIGITAL:ALSTTL,FLIP FLOP,OCTAL D–TYPE,3–STATE,74ALS374,DIP20.3	01295	SN74ALS374AN
A15U460	156–1748–00			IC,DIGITAL:ALSTTL,TRANSCEIVER,OCTAL, 3–STATE,74ALS1245,DIP20.3	01295	SN74ALS1245AN
A15U461	156–1722–00			IC,DIGITAL:FTTL,GATE,HEX INVERTER,74F04,DIP14.3	04713	MC74F04N

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A15U470	156–1722–00			IC,DIGITAL:FTTL,GATE,HEX INVERTER,74F04,DIP14.3,TUBE	04713	MC74F04N
A15W121	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A15W123	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A15W381	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000
A15W400	131–0566–00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L W/WIRE LEADS	57668	TPW 02–000

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A16	671–0882–04			CIRCUIT BD ASSY:WAVEFORM HV	80009	671–0882–04
A16C100	290–0939–00			CAP,FXD,ELCTLT:10UF,+100–10%,100V AL	62643	672D106H100CG2C
A16C101	283–0057–00			CAP,FXD,CER DI:0.1UF,+80–20%,200V SQUARE	04222	SR302E104ZAA
A16C102	283–0057–00			CAP,FXD,CER DI:0.1UF,+80–20%,200V SQUARE	04222	SR302E104ZAA
A16C110	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A16C111	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A16C113	283–0057–00			CAP,FXD,CER DI:0.1UF,+80–20%,200V SQUARE	04222	SR302E104ZAA
A16C120	283–0057–00			CAP,FXD,CER DI:0.1UF,+80–20%,200V SQUARE	04222	SR302E104ZAA
A16C121	283–0057–00			CAP,FXD,CER DI:0.1UF,+80–20%,200V SQUARE	04222	SR302E104ZAA
A16C210	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A16C230	285–0509–01			CAP,FXD,PPR DI:0.0068UF,20%,5000V	01884	430P507
A16C231	285–0509–01			CAP,FXD,PPR DI:0.0068UF,20%,5000V	01884	430P507
A16C240	285–0509–01			CAP,FXD,PPR DI:0.0068UF,20%,5000V	01884	430P507
A16C241	283–0021–00			CAP,FXD,CER DI:0.001UF,20%,5000V	59660	848–556–Y5S–102M
A16C243	283–0021–00			CAP,FXD,CER DI:0.001UF,20%,5000V	59660	848–556–Y5S–102M
A16C250	283–0021–00			CAP,FXD,CER DI:0.001UF,20%,5000V	59660	848–556–Y5S–102M
A16C251	283–0021–00			CAP,FXD,CER DI:0.001UF,20%,5000V	59660	848–556–Y5S–102M
A16C300	283–0190–00			CAP,FXD,CER DI:0.47UF,5%,50V SQUARE	04222	SR305C474JAA
A16C365	283–0057–00			CAP,FXD,CER DI:0.1UF,+80–20%,200V SQUARE	04222	SR302E104ZAA
A16C410	285–1328–00			CAP,FXD,PLASTIC:METALIZED FILM,0.01UF,5%,2000V,POLYPROPYLENE,1.25X.95	TK1913	FKP1 .01/2000/5
A16C411	285–1329–00			CAP,FXD,PLASTIC:METALIZED FILM,680PF,10%,1600V,POLYPROPYLENE	TK1913	FKP1 680/1600/10
A16C419	290–0778–00			CAP,FXD,ALUM:1UF,20%,50V,5 X 11 MM,NONPOLAR	62643	CEBPM1H010M(Q)
A16C420	283–0008–00			CAP,FXD,CER DI:0.1UF,20%,500V SQUARE	04222	SR507C104MAA
A16C430	285–1349–00			CAP,FXD,MTLZD:0.1UF,5%,63VDC	TK1913	MKS2 .1/63/5
A16C500	285–1187–00			CAP,FXD,MTLZD:0.47 UF,10%,100 V	05292	PMT 3R .47K 100
A16C510	290–0758–00			CAP,FXD,ELCTLT:2.2UF,+50–10%,200V AL	62643	CEUSM2F2R2
A16C511	290–0758–00			CAP,FXD,ELCTLT:2.2UF,+50–10%,200V AL	62643	CEUSM2F2R2
A16C512	283–0084–00			CAP,FXD,CER DI:270PF,5%,1000V DISC	59660	838 533 X5FO 2715
A16C513	283–0057–00			CAP,FXD,CER DI:0.1UF,+80–20%,200V SQUARE	04222	SR302E104ZAA
A16C530	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A16C531	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A16C532	281–0775–01			CAP,FXD,CERAMIC:MCL,0.1UF,20%,50V	04222	SA105E104MAA
A16C533	283–0026–00			CAP,FXD,CER DI:0.2UF,+80–20%,25V SQUARE	04222	SR305C204MAA
A16C534	281–0768–00			CAP,FXD,CER DI:470PF,20%,100V TUBULAR	04222	SA101A471KAA
A16C540	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A16C560	290–0974–00			CAP,FXD,ALUM:10UF,20%,50V	55680	UVX1H100MDA
A16C561	281–0765–00			CAP,FXD,CER DI:100PF,5%,100V TUBULAR	04222	SA102A101JAA

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A16C562	281–0819–00			CAP,FXD,CERAMIC:MLC,33 PF,5%,50V	04222	SA102A330JAA
A16CR140	152–0061–00			DIODE,SIG:200V,0.1A,700NS,4.0PF,1N3070/FDH2161	01295	PV120 FAMILY
A16CR141	152–0061–00			DIODE,SIG:200V,0.1A,700NS,4.0PF,1N3070/FDH2161	01295	PV120 FAMILY
A16CR220	152–0409–00			DIODE,RECT:FAST RCVRY,12KV,10MA,250NS	62703	VG12X–1
A16CR360	152–0061–00			DIODE,SIG:200V,0.1A,700NS,4.0PF,1N3070/FDH2161	01295	PV120 FAMILY
A16CR440	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A16CR450	152–0061–00			DIODE,SIG:200V,0.1A,700NS,4.0PF,1N3070/FDH2161	01295	PV120 FAMILY
A16CR451	152–0061–00			DIODE,SIG:200V,0.1A,700NS,4.0PF,1N3070/FDH2161	01295	PV120 FAMILY
A16CR460	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A16CR461	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A16CR500	152–0400–00			DIODE,RECT:FAST RCVRY,400V,1A,200NS,1N4936	04713	1N4936RL
A16CR520	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A16CR530	152–0141–02			DIODE,SIG:ULTRA FAST,40V,150MA,4NS,2PF,1N4152	01295	1N4152R
A16DS140	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A16DS141	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A16DS300	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A16DS360	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A16DS361	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A16DS362	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A16DS440	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A16DS441	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A16J110	131–5337–00			CONN,HDR:PCB/WIREWRAP,MALE,STR,1 X 4,0.150 CTR,0.230 MLG X 0.285 TAIL,30 GOLD,SIDE BY SI	22526	65561–104
A16J140	131–5337–00			CONN,HDR:PCB/WIREWRAP,MALE,STR,1 X 4,0.150 CTR,0.230 MLG X 0.285 TAIL,30 GOLD,SIDE BY SI	22526	65561–104
A16J200	131–3718–00			CONN,HDR:PCB,MALE,STR,2 X 5,0.1 CTR,0.385 H X 0.120 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD,0.	53387	2510–6002UB
A16J300	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A16J550	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A16L200	108–1262–00			INDUCTOR,FXD:POWER,100UH,10%,I<0.75A,RDC<0.23 OHM,Q>15,SRF>5.4MHZ,BOBBIN CORE,	TK2058	TSL0807–101KR75
A16L500	108–1262–00			INDUCTOR,FXD:POWER,100UH,10%,I<0.75A,RDC<0.23 OHM,Q>15,SRF>5.4MHZ,BOBBIN CORE	TK2058	TSL0807–101KR75

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A16L560	108–1450–00			INDUCTOR,FXD:SIGNAL,5.6UH,10%,IDC<0.5 A,RDC<0.4 OHM,Q>45@7.96MHZ,SRF>40 MHZ,AXIAL	24226	ML10–561K
A16Q100	151–0750–00			TRANSISTOR,SIG:BIPOLAR,NPN,400V,300MA, 20MHZ,AMPLIFIER,MPSA44,TO–92 EBC	50891	MPSA44
A16Q110	151–0710–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,1.0A,50MHZ, AMPLIFIER,2N6715/MPSW01A,TO–237/TO–226AE	04713	MPS6715
A16Q111	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A16Q300	151–0678–00			TRANSISTOR,PWR:BIPOLAR,NPN,400V,4.0A, SWITCHING,MJE13005,TO–220	04713	MJE13005
A16Q330	151–0749–00			TRANSISTOR,SIG:BIPOLAR,PNP,400V,500MA, 50MHZ,AMPLIFIER,MPSA94,TO–92 EBC	04713	MPSA94
A16Q413	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A16Q430	151–0749–00			TRANSISTOR,SIG:BIPOLAR,PNP,400V,500MA, 50MHZ,AMPLIFIER,MPSA94,TO–92 EBC	04713	MPSA94
A16Q440	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A16Q450	151–0223–00			TRANSISTOR,SIG:BIPOLAR,NPN,15V,500MA, SWITCHING,MPS2369A,TO–92 EBC	04713	MPS2369A
A16Q460	151–0750–00			TRANSISTOR,SIG:BIPOLAR,NPN,400V,300MA, 20MHZ,AMPLIFIER,MPSA44,TO–92 EBC	50891	MPSA44
A16Q461	151–0190–00			TRANSISTOR,SIG:BIPOLAR,NPN,40V,200MA, 300MHZ,AMPLIFIER,2N3904,TO–92 EBC	04713	2N3904
A16Q462	151–0221–00			TRANSISTOR,SIG:BIPOLAR,PNP,12V,80MA, SWITCHING,MPS4258,TO–92 EBC	04713	MPS4258(EL8345)
A16Q463	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A16Q530	151–0188–00			TRANSISTOR,SIG:BIPOLAR,PNP,40V,200MA, 250MHZ,AMPLIFIER,2N3906,TO–92 EBC	04713	2N3906
A16R100	315–0101–03			RES,FXD,CMPSN:100 OHM,5%,0.25W	50139	CB1015
A16R101	315–0183–00			RES,FXD,FILM:18K OHM,5%,0.25W	50139	CM1835
A16R102	315–0243–00			RES,FXD,FILM:24K OHM,5%,0.25W	50139	CB2435
A16R103	315–0473–00			RES,FXD,FILM:47K OHM,5%,0.25W	50139	CB4735
A16R110	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A16R111	315–0333–00			RES,FXD,FILM:33K OHM,5%,0.25W	50139	CB3335
A16R112	311–2239–00			RES,VAR,TRMR:CERMET,100K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 104 M L20
A16R113	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W,	57668	CRB20T68EFX1001
A16R114	322–3231–00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K49
A16R115	322–3412–00			RES,FXD,FILM:191K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 191K
A16R120	315–0154–00			RES,FXD,FILM:150K OHM,5%,0.25W	50139	CB1545
A16R121	315–0333–00			RES,FXD,FILM:33K OHM,5%,0.25W	50139	CB3335

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A16R122	311–2239–00			RES,VAR,TRMR:CERMET,100K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 104 M L20
A16R123	315–0333–00			RES,FXD,FILM:33K OHM,5%,0.25W	50139	CB3335
A16R130	311–1256–00			RES,VAR,TRMR:CERMET,2.5M OHM,10%,0.5W,0.375 SQ,TOP ADJUST,BULK	02111	63M–255–T604
A16R131	315–0223–03			RES,FXD,FILM:22K OHM,5%,0.25 W	50139	CB2235 ALLEN BRADLEY ONLY
A16R135	311–2240–00			RES,VAR,NONWW:TRMR,200K OHM,20%,0.5W LINEAR	TK2073	GF06UT2 204 M L20
A16R140	307–0109–00			RES,FXD,CMPSN:8.2 OHM,5%,0.25W	50139	CB82G5
A16R141	315–0822–03			RES,FXD,FILM:8.2K OHM,5%,0.25W	50139	CB8225 ALLEN BRADLEY ONLY
A16R142	315–0226–01			RES,FXD,FILM:22 M OHM,5%,0.25W	50139	CB2265
A16R143	315–0471–00			RES,FXD,FILM:470 OHM,5%,0.25W	50139	CB4715
A16R144	315–0100–00			RES,FXD,FILM:10 OHM,5%,0.25W	50139	CB1005
A16R200	307–0106–00			RES,FXD,CMPSN:4.7 OHM,5%,0.25W	50139	CB47G5
A16R300	315–0150–00			RES,FXD,FILM:15 OHM,5%,0.25W	50139	CB1505
A16R311	322–3226–00			RES,FXD:METAL FILM,2.21K OHM,1%,0.2W	57668	CRB20T68EFX2211
A16R320	322–3289–00			RES,FXD:METAL FILM,10K OHM,1%,0.2W	57668	CRB20T29EFX1002
A16R321	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A16R330	307–2251–00			RES NTWK,FXD,FI:HIGH VOLTAGE THICK FILM	TK2601	307–2251–00
A16R331	315–0102–03			RES,FXD,FILM:1K OHM,5%,0.25W	50139	CB1025 (CARD PACK ONLY)
A16R332	315–0470–03			RES,FXD,FILM:47 OHM,5%,0.25W	50139	CB4705
A16R340	315–0511–02			RES,FXD,FILM:510 OHM,.25W,5%	50139	CB5115 ALLEN BRADLEY ONLY
A16R341	315–0511–02			RES,FXD,FILM:510 OHM,.25W,5%	50139	CB5115 ALLEN BRADLEY ONLY
A16R350	311–2240–00			RES,VAR,NONWW:TRMR,200K OHM,20%,0.5W LINEAR	TK2073	GF06UT2 204 M L20
A16R360	315–0101–03			RES,FXD,CMPSN:100 OHM,5%,0.25W	50139	CB1015
A16R361	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A16R362	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A16R363	322–3402–00			RES,FXD:METAL FILM,150K OHM,1%,0.2W	57668	CRB20T68EFX1503
A16R364	322–3273–00			RES,FXD:METAL FILM,6.81K OHM,1%,0.2W	57668	CRB20T68EFX6811
A16R365	322–3428–00			RES,FXD,FILM:280K 0HM,1%,0.2W,TC=T0	57668	CRB20 FXE 280K
A16R420	311–2239–00			RES,VAR,TRMR:CERMET,100K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 104 M L20
A16R421	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W,	57668	CRB20T68EFX1000
A16R422	315–0155–00			RES,FXD,FILM:1.5M OHM,5%,0.25W	TK1727	SFR25 2322–181–63106
A16R430	322–3306–00			RES,FXD:METAL FILM,15K OHM,1%,0.2W	57668	CRB20T68EFX1502

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A16R440	315–0155–00			RES,FXD,FILM:1.5M OHM,5%,0.25W	TK1727	SFR25 2322–181–63106
A16R441	322–3165–00			RES,FXD,FILM:511 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 511E
A16R442	322–3363–00			RES,FXD,FILM:59K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 59K0
A16R450	322–3193–00			RES,FXD:METAL FILM,1K OHM,1%,0.2W	57668	CRB20T68EFX1001
A16R460	322–3051–00			RES,FXD,METAL:33.2 OHM,1%,0.2W,TC=100 PPM	57668	CRB20FXE33E2
A16R461	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A16R500	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W,TC=100 PPM	57668	CRB20 FXE 332E
A16R501	322–3147–00			RES,FXD,FILM:332 OHM,1%,0.2W,TC=100 PPM	57668	CRB20 FXE 332E
A16R510	322–3402–00			RES,FXD:METAL FILM,150K OHM,1%,0.2W	57668	CRB20T68EFX1503
A16R511	322–3322–00			RES,FXD:METAL FILM,22.1K OHM,1%,0.2W	57668	CRB20 FXE 22K1
A16R530	322–3481–00			RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 1M00
A16R531	322–3354–00			RES,FXD:METAL FILM,47.5K OHM,1%,0.2W	57668	CRB20T68EFX4752
A16R540	322–3318–00			RES,FXD,FILM:METAL FILM,20K OHM,1%,0.2W	57668	CRB20T68EFX2002
A16R550	322–3357–00			RES,FXD,FILM:51.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 51K1
A16R560	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A16R561	322–3097–00			RES,FXD,FILM:100 OHM,1%,0.2W	57668	CRB20T68EFX1000
A16T210	120–1765–00			TRANSFORMER,HV:PRI 123V,FEEDBACK WINDING,SEC 10.5V,160V,4000V,27.6KHZ	0JR03	128–7112–01
A16TP300	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A16TP400	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A16TP401	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A16TP402	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A16TP500	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A16TP501	214–4085–00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRASS,W/ RED NYLON COLLAR	26364	TP104–01–02
A16U220	152–0865–00			MODULE,HV:7.5KVAC IN,15KVDC OUT,POTTED MODULE,MSL2554	51406	MSL2554
A16U540	156–1149–00			IC,LINEAR:BIFET,OP–AMP,LF351N,DIP08.3	04713	MC34001P/LF351N
A16VR210	156–1631–00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR, SHUNT,ADJUSTABLE,100MA,TL431CLP,TO–92	01295	TL431CLP

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A17	671–0883–04			CIRCUIT BD ASSY:FUSE	80009	671–0883–04
A17C310	285–1222–00			CAP,FXD,PLASTIC:0.068UF,20%,250V	37942	158/.068/M/250/H
A17CR100	152–1165–00			DIODE,RECT:ULTRA FAST,600V,4A,50NS,MUR460	04713	MUR460RL
A17CR101	152–1165–00			DIODE,RECT:ULTRA FAST,600V,4A,50NS,MUR460	04713	MUR460RL
A17CR102	152–1165–00			DIODE,RECT:ULTRA FAST,600V,4A,50NS,MUR460	04713	MUR460RL
A17CR103	152–1165–00			DIODE,RECT:ULTRA FAST,600V,4A,50NS,MUR460	04713	MUR460RL
A17DS200	150–0035–00			LAMP,GLOW:NEON,90V,0.3MA,AID–T,WIRE LD,NE–2B TYPE	0J9R2	NE–2B(13)R–T
A17E210	119–0181–00			ARSR,ELEC SURGE:230V, +/–15%, GAS DISCHARGE	0C8T6	BBS–230V +/–15%
A17F210	159–0023–00			FUSE,CARTRIDGE:3AG,2A,250V,SLOW BLOW	71400	MDX2
				ATTACHED PARTS		
	200–2264–00			CAP,FUSEHOLDER:3AG FUSES	61935	FEK 031 1666
	204–0906–00			BODY,FUSEHOLDER:3AG & 5 X 20MM FUSES CKT BD MOUNT	61935	TYPE FAU 031.3577
				END ATTACHED PARTS		
A17R200	307–0353–00			RES,THERMAL:5 OHM,10% DISC	15454	5DA5–K–270SS–SIL
A17R201	315–0684–00			RES,FXD,FILM:680K OHM,5%,0.25W	50139	CB6845
A17R300	307–0353–00			RES,THERMAL:5 OHM,10% DISC	15454	5DA5–K–270SS–SIL
A17S110	260–2225–00			SWITCH,SLIDE:DPDT,10A,125V,LINE SELECTOR	04426	18–100–0009

Replaceable electrical parts list (cont.)

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
				CHASSIS PARTS		
B1	119–1545–03			FAN,TUBE AXIAL:12V, 1.56W,37CFM,80 MM, W/SOLID MOUNTING FLANGES	80009	119–1545–03
P300	174–1500–00			CA ASSY,SP:RIBBON,CPR,3,26AWG,3.0L, 1X3,0.1 CTR,RCPT X 0.25 CUT &STRIP	23633	ORDER BY DESCRIPTION
Q300	151–0678–00			TRANSISTOR,PWR:BIPOLAR,NPN,400V, 4.0A,SWITCHING,MJE13005,TO–220	04713	MJE13005
				MOUNTING PARTS		
	210–1178–00			WASHER,SHLDR:TRANSISTOR,TO–220,0.2"ODX0.116	13103	7721–7PPS
	211–0008–00			SCREW,MACHINE:4–40 X 0.25,PNH,STL CD PL,POZ	93907	ORDER BY DESCRIPTION
	342–0355–00			INSULATOR,PLATE:TRANSISTOR,SILICONE RUBBER	55285	7403–09FR–51
				END MOUNTING PARTS		
S100	260–2465–00			SWITCH,PUSH:0.4A,125VAC,W/SOLDER LUG, BUTTON W/YELLOW INDICATOR	31918	(602844)
				MOUNTING PARTS		
	196–3146–00			CA ASSY,SP:FLAT FLEX,FLX,27 AWG, 1.0 L,PCB,TERM,STR BOTH ENDS,	TK0196	FSN–1A,P OR K
	210–0405–00			NUT,PLAIN,HEX:2–56 X 0.188,BRS CD PL	73743	12157–50
	211–0100–00			SCREW,MACHINE:2–56 X 0.750,PNH,STL CD PL,POZ	0KB01	ORDER BY DESCRIPTION
				END MOUNTING PARTS		
V1	154–0901–16			ELECTRON TUBE:CRT,T1710–4–3.20 (1780R ONLY)	80009	154–0901–16
V1	154–0902–16			ELECTRON TUBE:CRT,T1710–4–3.21 (1781R ONLY)	80009	154–0902–16
V2	154–0940–16			ELECTRON TUBE:CRT,T1780–4–3.80 (1780R ONLY)	80009	154–0940–16
V2	154–0941–16			ELECTRON TUBE:CRT,T1781–4–3.81 (1781R ONLY)	80009	154–0941–16
				ATTACHED PARTS		
	198–5748–00			WIRE SET,ELEC:1780R	80009	198–5748–00
				END ATTACHED PARTS		

Diagrams and Circuit Board Illustrations

This section contains the troubleshooting procedures, block diagrams, circuit board illustrations, component locator tables, waveform illustrations, and schematic diagrams.

Symbols

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975. Abbreviations are based on ANSI Y1.1-1972.

Logic symbology is based on ANSI/IEEE Standard 91-1984 in terms of positive logic. Logic symbols depict the logic function performed and can differ from the manufacturer's data.

The tilde (~) preceding a signal name indicates that the signal performs its intended function when in the low state.

Other standards used in the preparation of diagrams by Tektronix, Inc., include the following:

- Tektronix Standard 062-2476 Symbols and Practices for Schematic Drafting
- ANSI Y14.159-1971 Interconnection Diagrams
- ANSI Y32.16-1975 Reference Designations for Electronic Equipment
- MIL-HDBK-63038-1A Military Standard Technical Manual Writing Handbook

Component Values

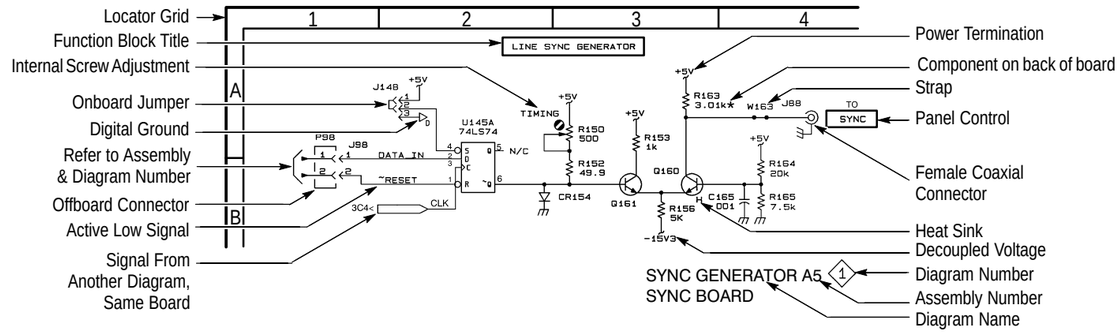
Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors: Values one or greater are in picofarads (pF).
Values less than one are in microfarads (μF).

Resistors: Values are in Ohms (Ω).

Graphic Items and Special Symbols Used in This Manual

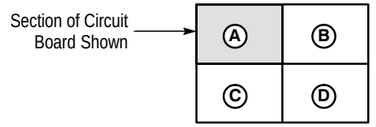
Each assembly in the instrument is assigned an assembly number (for example A5). The assembly number appears in the title on the diagram, in the lookup table for the schematic diagram, and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assembly in numerical sequence; the components are listed by component number.



Component Locator Diagrams

The schematic diagram and circuit board component location illustrations have grids marked on them. The component lookup tables refer to these grids to help you locate a component. The circuit board illustration appears only once; its lookup table lists the diagram number of all diagrams on which the circuitry appears.

Some of the circuit board component location illustrations are expanded and divided into several parts to make it easier for you to locate small components. To determine which part of the whole locator diagram you are looking at, refer to the small locator key shown below. The gray block, within the larger circuit board outline, shows where that part fits in the whole locator diagram. Each part in the key is labeled with an identifying letter that appears in the figure titles under component locator diagrams.



WAVEFORM CONDITIONS

The 1780R–Series has a set preset front-panel conditions. They are accessed by pushing the PRESET button on the left (vectorscope) graticule bezel. Most of the waveforms shown for the diagrams in this section were taken using PRESET 1 and a Color Bar signal input through the A INPUT. Table 11-1 is the control settings for PRESET 1, in case that particular preset front panel has been changed. Some of the waveforms were obtained by changing a front-panel control setting and Configure menu selection. Waveform conditions. if changed, are noted near the waveform.

Table 11-1
1780R–Series Front-Panel Settings for PRESET 1

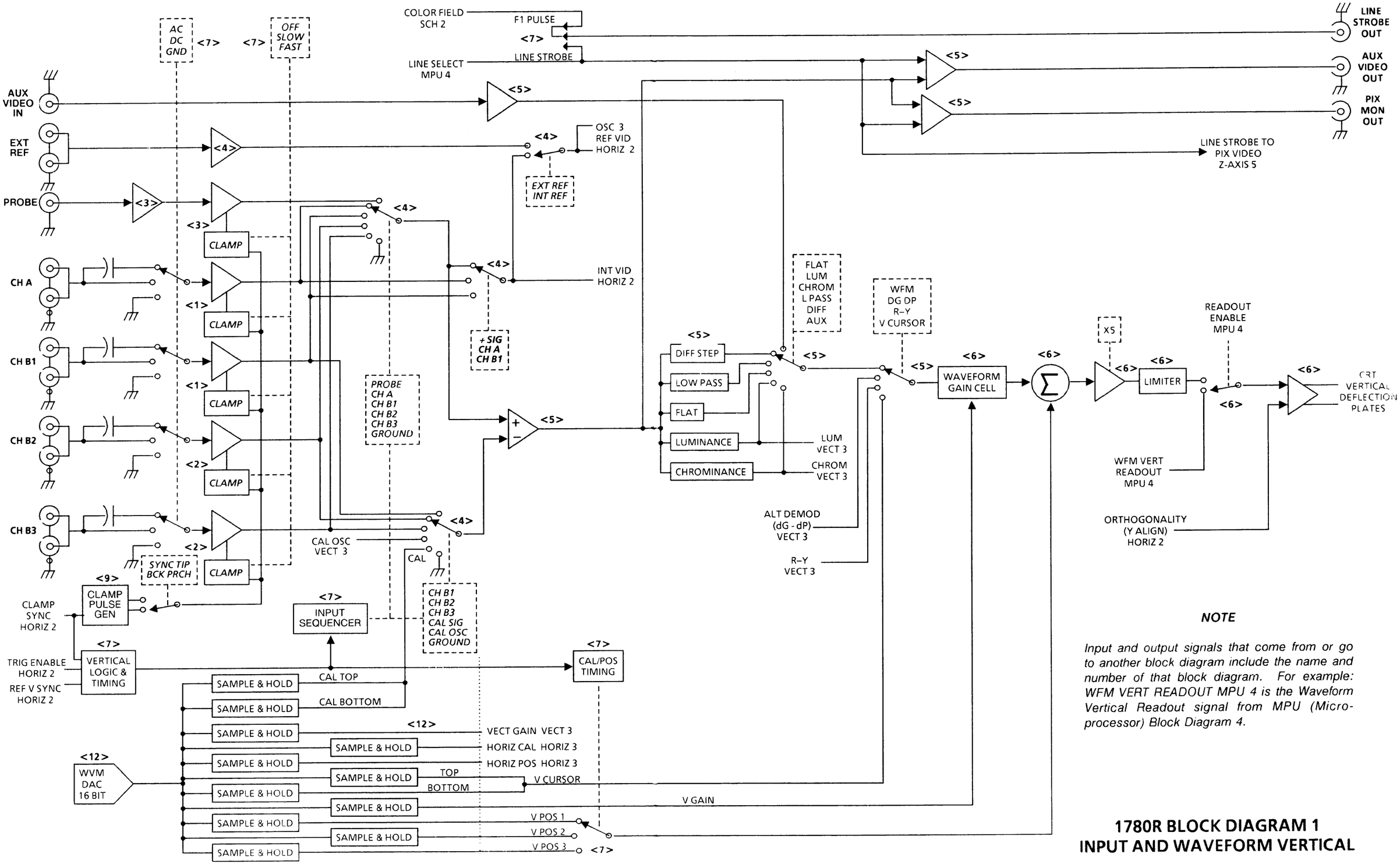
FRONT PANEL CONTROL	SETTING	FRONT PANEL CONTROL	SETTING	FRONT PANEL CONTROL	SETTING
LEFT DISPLAY	VECT	RIGHT DISPLAY	WFM	INPUT	CH A
REF	INT	FILTER	FLAT	WFM HORIZONTAL	TWO LINE
GAIN (VECTOR)	OFF	GAIN (WFM)	OFF	MAGNIFIER	OFF

Signal source used for these waveform photos was a Tektronix 1910 Digital Generator full field Color Bar signal.

Table 11-2 has the settings for the 1780R–Series CONFIGURE menu used as part of PRESET 1.

Table 11-2
1780R–Series CONFIGURE Menu for PRESET 1

MENU SELECTION	SETTING	MENU SELECTION	SETTING	MENU SELECTION	SETTING
SYNC	DIR	COUPLING	DC	FIELD TRIGGER	F1
PAL/ + V (1781 ONLY)	PAL	FIXED CAL AMPL	1000	CLAMP	BP
DC RESTORER	OFF	SYSTEM (1781 ONLY)	as desired	VECT GRAT	INT
PHASE DISPLAY	360	BARS	75%	SETUP (1780 ONLY)	YES
WFM GRAT	INT	PROBE	X1	ABS UNITS (1780 ONLY)	IRE
CW SYNC	EXT	SLOW SWP TRIG	+	BAUD RATE	9600
KNOB ASIGN TIMEOUT	ON	VECT READOUT	ON	WFM READOUT	ON
BEEP	ON				



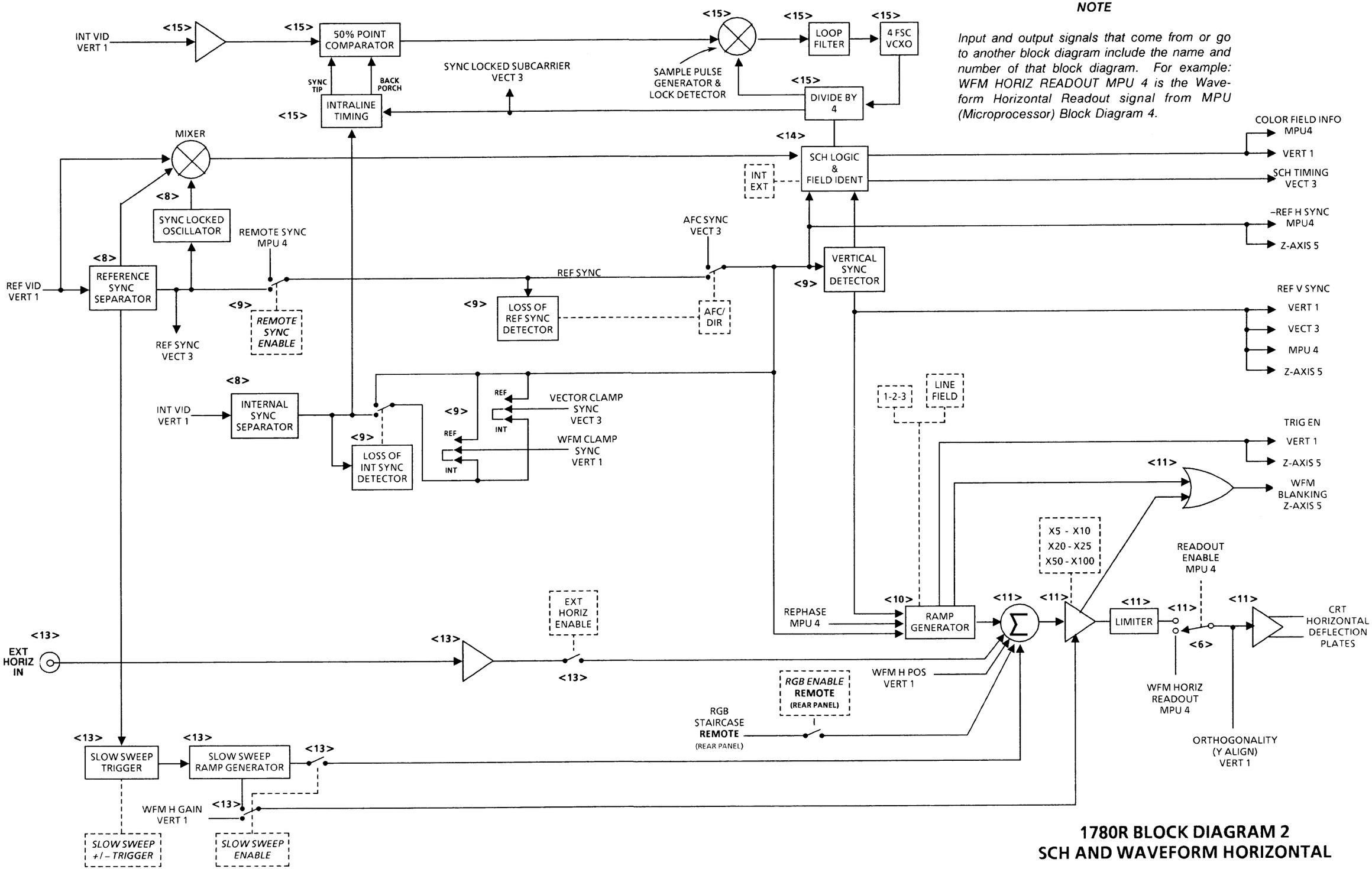
NOTE

Input and output signals that come from or go to another block diagram include the name and number of that block diagram. For example: WFM VERT READOUT MPU 4 is the Waveform Vertical Readout signal from MPU (Microprocessor) Block Diagram 4.

1780R BLOCK DIAGRAM 1
INPUT AND WAVEFORM VERTICAL

NOTE

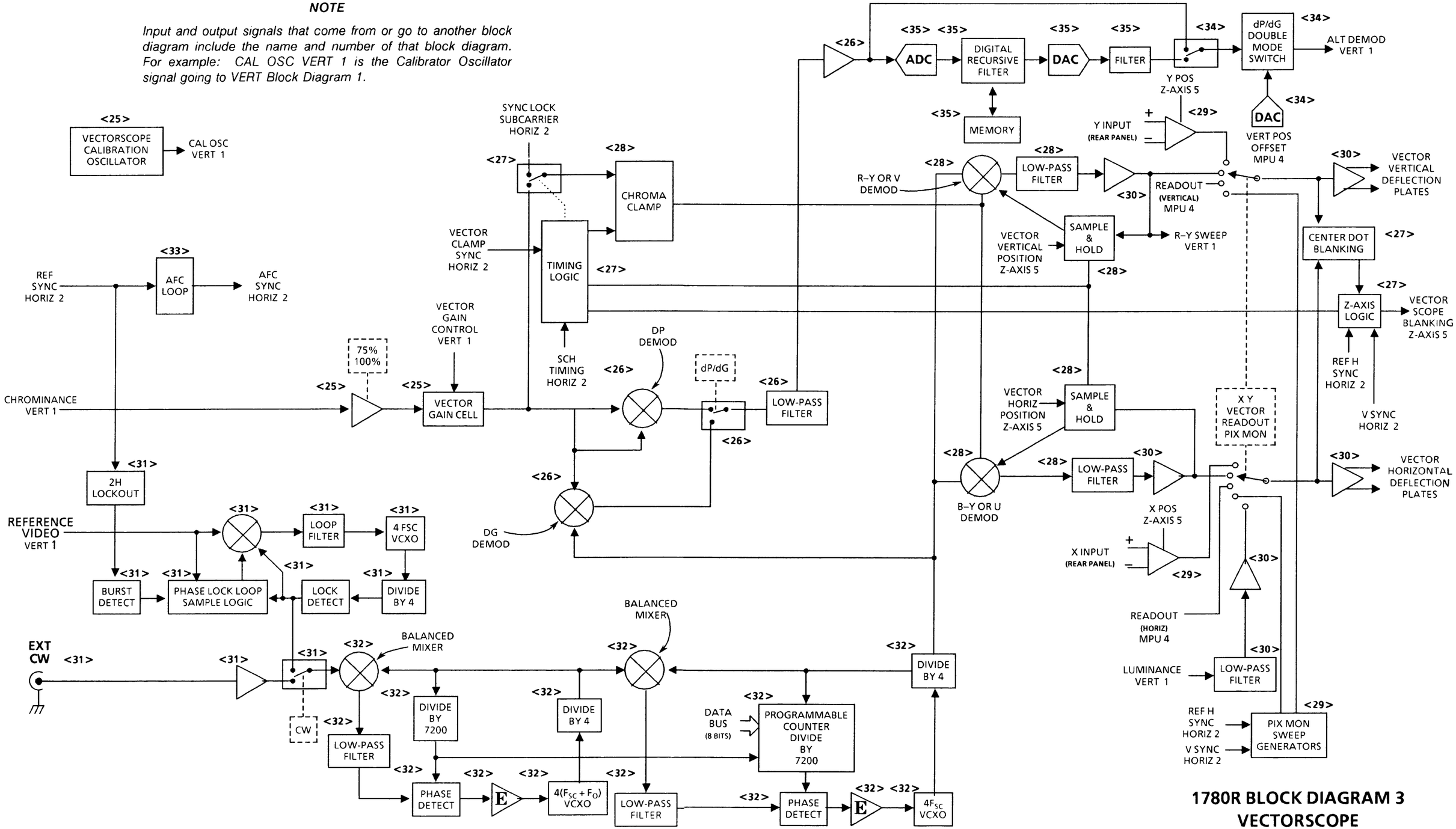
Input and output signals that come from or go to another block diagram include the name and number of that block diagram. For example: WFM HORIZ READOUT MPU 4 is the Waveform Horizontal Readout signal from MPU (Microprocessor) Block Diagram 4.



1780R BLOCK DIAGRAM 2
SCH AND WAVEFORM HORIZONTAL

NOTE

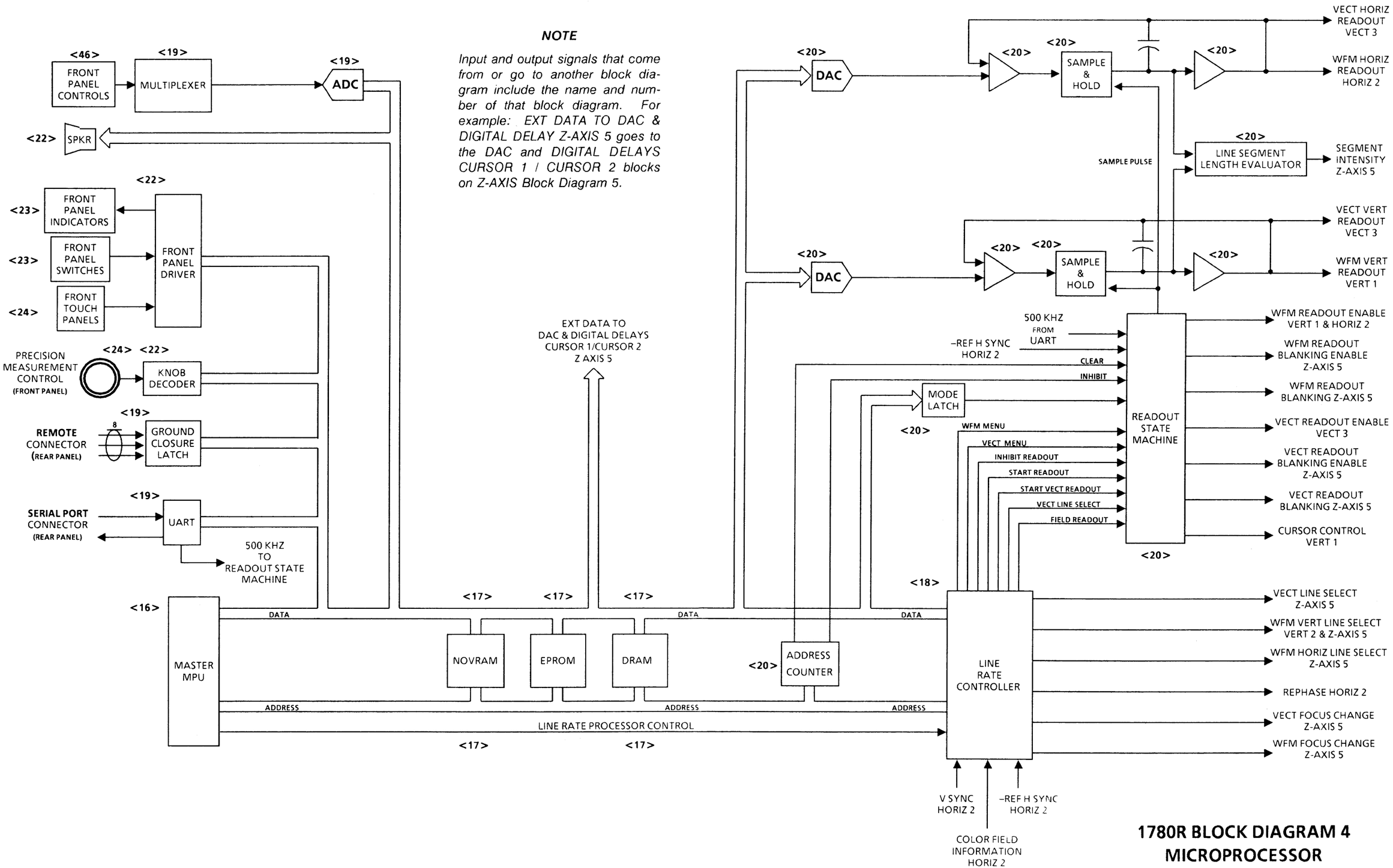
Input and output signals that come from or go to another block diagram include the name and number of that block diagram. For example: CAL OSC VERT 1 is the Calibrator Oscillator signal going to VERT Block Diagram 1.



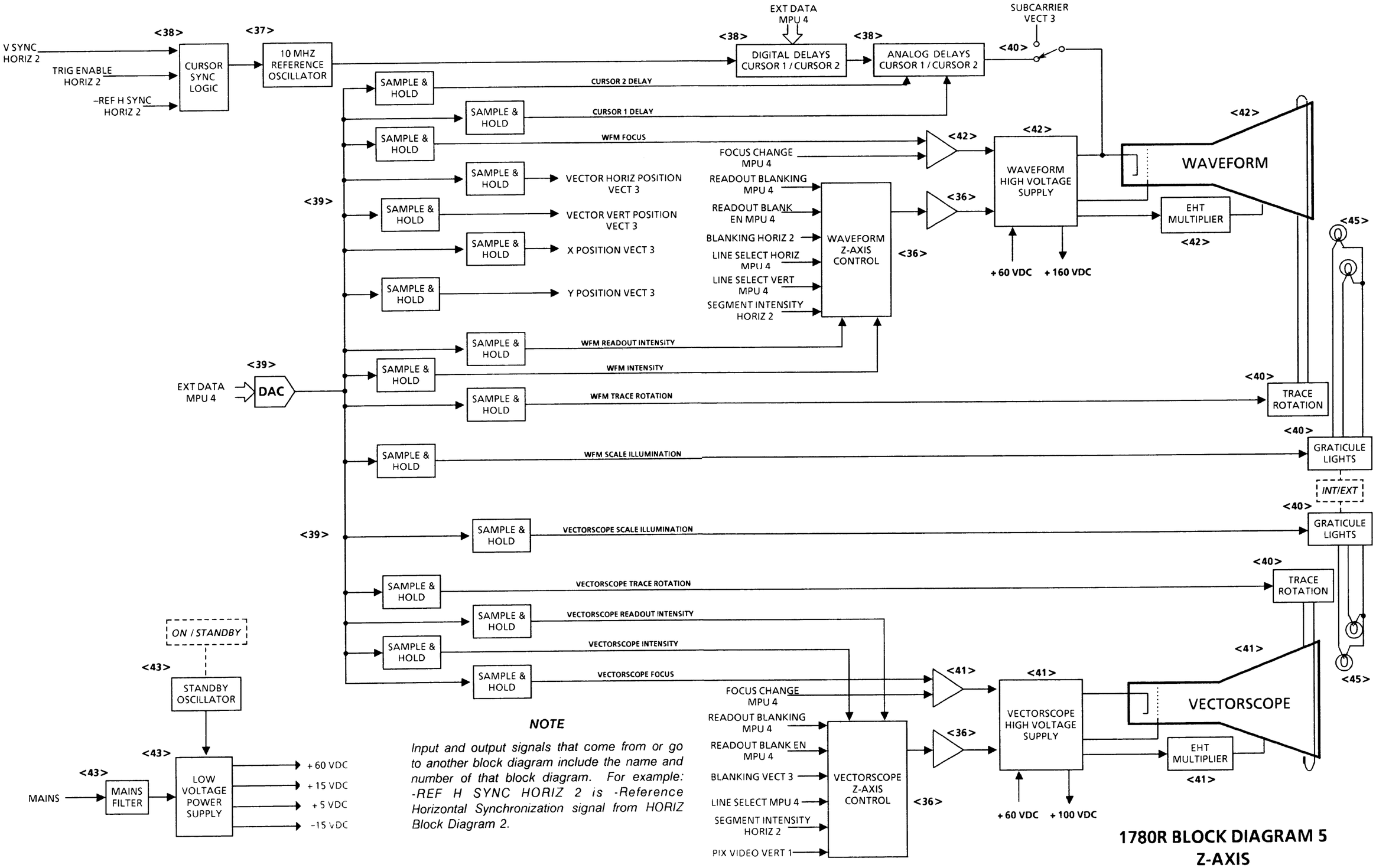
1780R BLOCK DIAGRAM 3
VECTORSCOPE

NOTE

Input and output signals that come from or go to another block diagram include the name and number of that block diagram. For example: EXT DATA TO DAC & DIGITAL DELAY Z-AXIS 5 goes to the DAC and DIGITAL DELAYS CURSOR 1 / CURSOR 2 blocks on Z-AXIS Block Diagram 5.



1780R BLOCK DIAGRAM 4
MICROPROCESSOR



NOTE

Input and output signals that come from or go to another block diagram include the name and number of that block diagram. For example: -REF H SYNC HORIZ 2 is -Reference Horizontal Synchronization signal from HORIZ Block Diagram 2.

1780R BLOCK DIAGRAM 5
Z-AXIS

CIRCUIT BOARD AND SCHEMATIC DIAGRAM INDEX

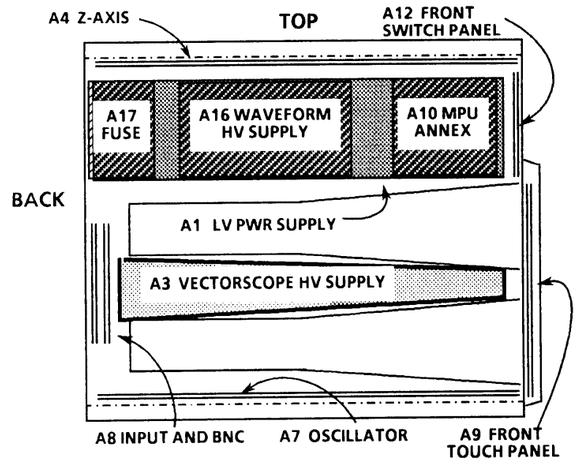


DIAGRAM NUMBER	DIAGRAM NAME	ASSEMBLY NUMBER
1	INPUT AMPLIFIERS A & B1	A8
2	INPUT AMPLIFIERS B2 & B3	A8
3	PROBE INPUT & DC RESTORER	A6, A2
4	INPUT & REFERENCE SELECTION	A2
5	DIFFERENCE AMP & VIDEO FILTERS	A2
6	VERTICAL DEFLECTION	A2
7	VERT CONTROL LOGIC, CALIB, & CURSORS	A2
8	REF SYNC GENERATION	A2
9	HORIZ & VERT SYNC GENERATORS	A2
10	RAMP GENERATOR	A2
11	HORIZ MAG & OUTPUT AMPS	A2
12	HORIZ LATCHES & DAC	A2
13	SLOW SWEEP & EXT HORIZ INPUT	A2
14	SCH PHASE TIMING	A2
15	SCH SYNC-LOCKED OSCILLATOR	A2

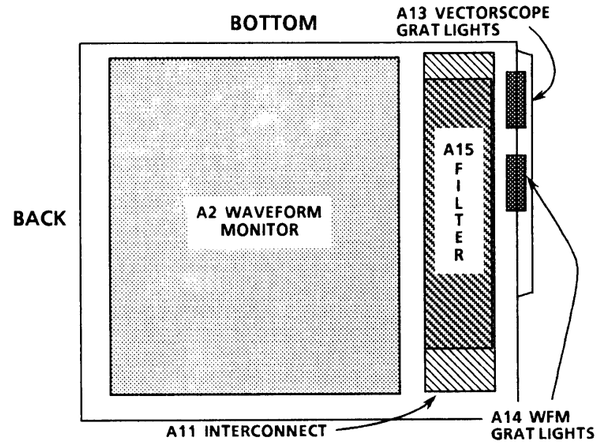


DIAGRAM NUMBER	DIAGRAM NAME	ASSEMBLY NUMBER
16	MASTER MPU	A5
17	DYNAMIC RAM, ROM, & NOVRAM	A5
18	LINE RATE CONTROLLER	A5

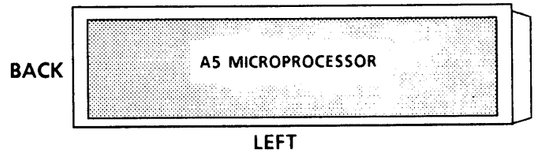


DIAGRAM NUMBER	DIAGRAM NAME	ASSEMBLY NUMBER
19	UART & A/D	A5
20	READOUT ENGINE & READ OUTPUT	A5
21	INTERCONNECT	A5
22	MPU ANNEX	A10
23	FRONT SWITCH PANEL	A12
24	TOUCH PANEL	A9

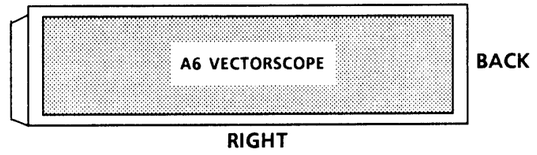
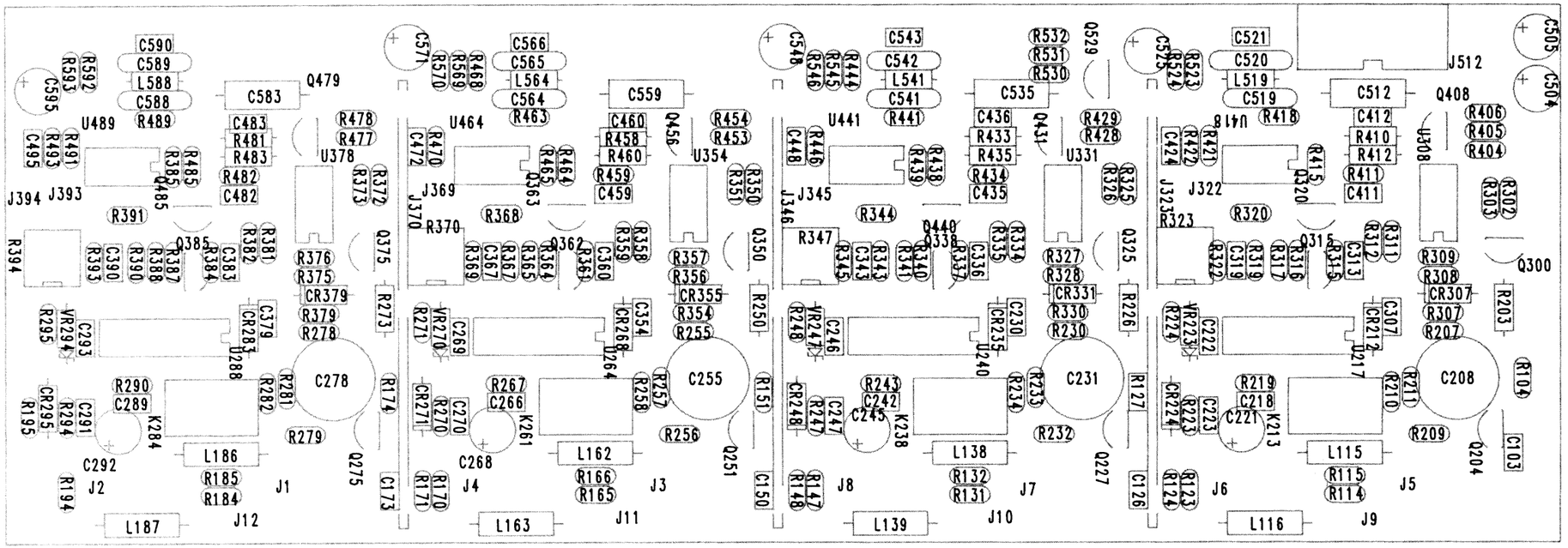


DIAGRAM NUMBER	DIAGRAM NAME	ASSEMBLY NUMBER
25	VECTOR INPUT & GAIN	A6
26	DIFF PHASE / GAIN	A6
27	VECTOR TIMING & BLANKING	A6
28	DEMODULATORS	A6
29	XY INPUTS & PIX MONITOR	A6
30	VECTOR DEFLECTION AMPS	A6
31	SUBCARRIER REGENERATOR	A7
32	DIGITAL SHIFTER	A7
33	HORIZ AFC & POST REGULATORS	A7
34	DIFF GAIN/PHASE ALT MODE SWITCH	A7
35	DIGITAL RECURSIVE FILTER	A15
36	Z AXIS	A4
37	TIMING CURSORS	A4
38	TIMING CURSOR COUNTERS	A4
39	CRT DISPLAY DAC	A4
40	SCALE ILLUMINATION & TRACE ROTATION	A4
41	VECTOR HIGH VOLTS	A3
42	WAVEFORM HIGH VOLTS	A16
43	LOW VOLTAGE POWER SUPPLY	A1
44	VECTORSCOPE, WAVEFORM, & OSCILLATOR	A11
45	Z-AXIS, GRATICULES, VECT HV, & POWER SUPPLY	A11, A13, A14
46	MICROPROCESSOR & FRONT PANEL CONTROLS	A11



INPUT CIRCUIT BOARD (A8)

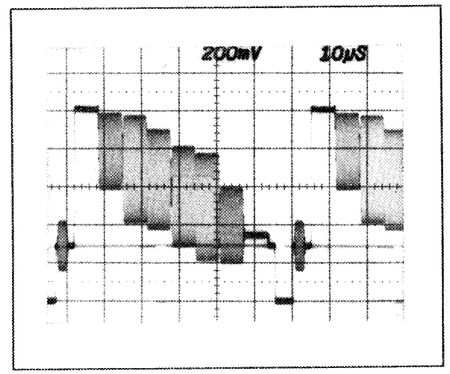
Static Sensitive Devices
See Maintenance Section

A8 Input & BNC Board <1> Component Locator

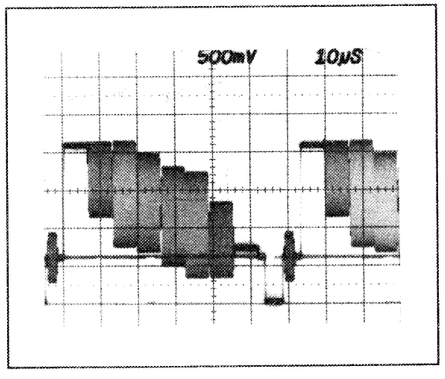
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C103	B2			Q440	E4	R315	D1	R435	E4
C126	B4	CR212	C2	Q529	B5	R316	E2	R438	E4
C208	D1	CR224	D2			R317	D2	R439	E4
C218	B2	CR235	C4	R104	C2	R319	F1	R441	F4
C221	B2	CR248	D4	R114	B1	R320	G1	R444	F5
C222	G1	CR307	D1	R115	B1	R322	G2	R446	G4
C223	B2	CR331	D3	R123	D2	R323	F1	R523	F3
C230	D3			R124	D2	R325	D5	R524	A3
C231	D3	J5	A4	R127	C4	R326	C4	R530	B5
C242	B4	J512	A4	R131	B4	R327	C4	R531	B5
C245	B3	J6	A3	R132	B4	R328	C5	R532	B5
C246	G3	J7	A2	R147	D4	R330	D3	R545	F5
C247	B3	J8	A1	R148	D4	R334	E3	R546	A3
C307	D1			R203	C1	R335	D3		
C313	D1	K213	C1	R207	C2	R337	D3	U217A	G1
C319	F1	K238	C3	R209	C1	R340	E4	U217B	C2
C336	D3			R210	D1	R341	D4	U217C	D2
C343	F3	L115	A2	R211	D1	R343	F3	U217D	D1
C411	E2	L116	A1	R219	A2	R344	G3	U240A	G3
C412	F2	L138	A4	R223	D2	R345	G4	U240B	C4
C424	B3	L139	A3	R224	G2	R347	F3	U240C	D4
C435	E4	L519	G2	R226	C3	R404	E2	U240D	D3
C436	F4	L541	G4	R230	C4	R405	F2	U308A	C2
C448	B3			R232	C3	R406	F2	U308B	E2
C504	A5	P1322	H2	R233	D4	R410	F2	U331A	C4
C505	B5	P1331	H4	R234	D3	R411	E2	U331B	E4
C512	F2			R243	A3	R412	E2	U418	F2
C519	G2	Q204	D1	R247	D4	R415	E2	U441	F4
C520	G2	Q227	D3	R248	G4	R418	F2		
C521	F2	Q300	D2	R302	D2	R421	F3	VR223	G1
C525	B3	Q315	D1	R303	C2	R422	G2	VR247	G3
C535	F4	Q320	E2	R307	D1	R428	F4		
C541	G4	Q325	D4	R308	C2	R429	F4		
C542	G4	Q338	D3	R309	C2	R433	F4		
C543	F4	Q408	F2	R311	E1	R434	E4		
C548	B3	Q431	F4	R312	D1				

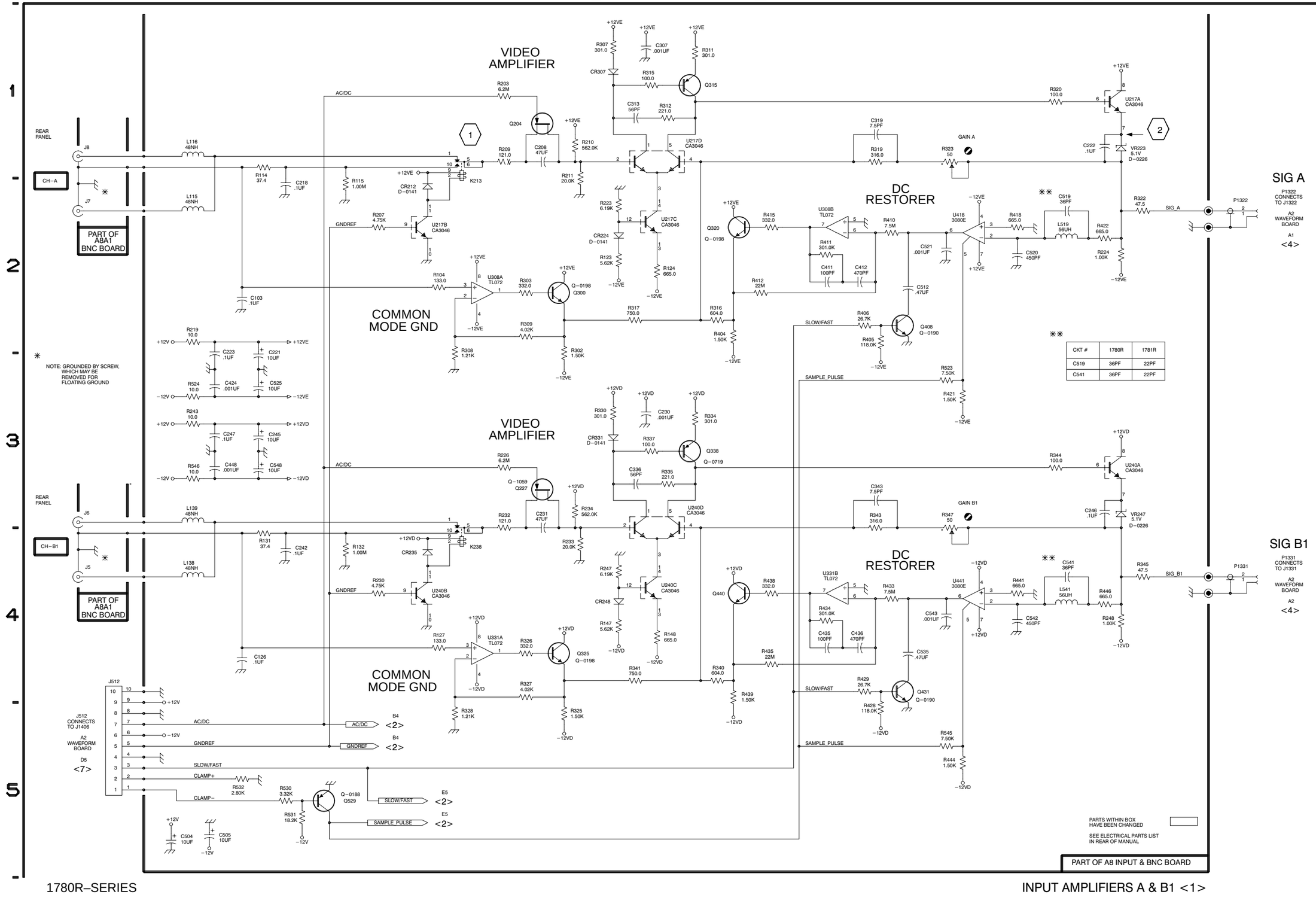
1

1



2




VIDEO AMPLIFIER
COMMON MODE GND
DC RESTORER
VIDEO AMPLIFIER
COMMON MODE GND
DC RESTORER
REAR PANEL
J8
CH–A
J7
PART OF A8A1 BNC BOARD
L116 48NH
L115 48NH
AC/DC
GNDREF
SLOW/FAST
SAMPLE_PULSE
CLAMP+
CLAMP–
GAIN A
GAIN B1
SIG A
SIG_A
P1322
P1331
SIG B1
A2 WAVEFORM BOARD
A1
<4>
REAR PANEL
J6
CH–B1
J5
PART OF A8A1 BNC BOARD
L139 48NH
L138 48NH
J512
J512 CONNECTS TO J1406
A2 WAVEFORM BOARD
D5
<7>
B4
<2>
E5
<2>
NOTE: GROUNDED BY SCREW, WHICH MAY BE REMOVED FOR FLOATING GROUND
**
CKT # 1780R 1781R
C519 36PF 22PF
C541 36PF 22PF
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A8 INPUT & BNC BOARD

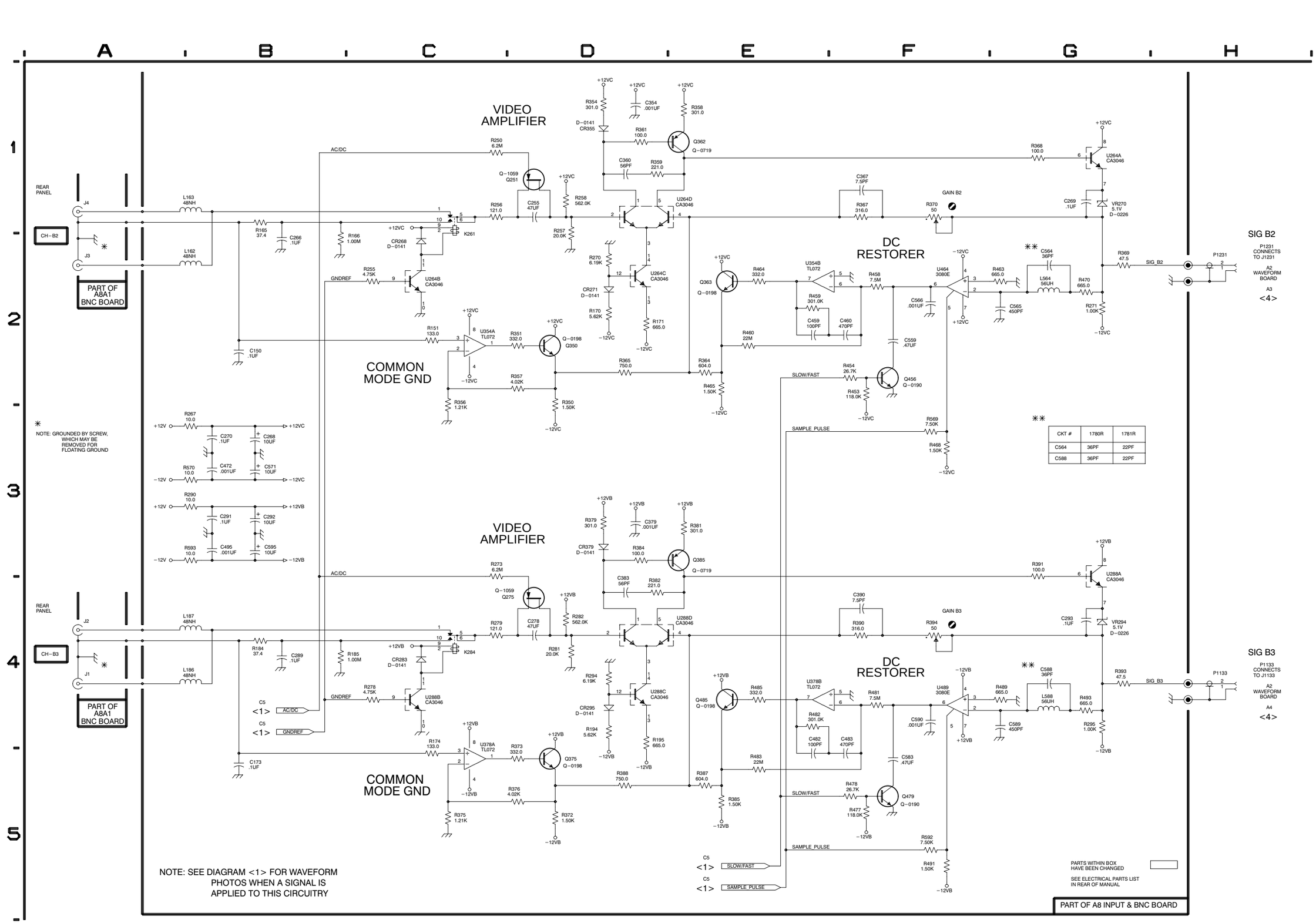
2

Waveforms for Diagram 2 are the same as those for diagram 1, when a specific channel is selected and the video signal is present.

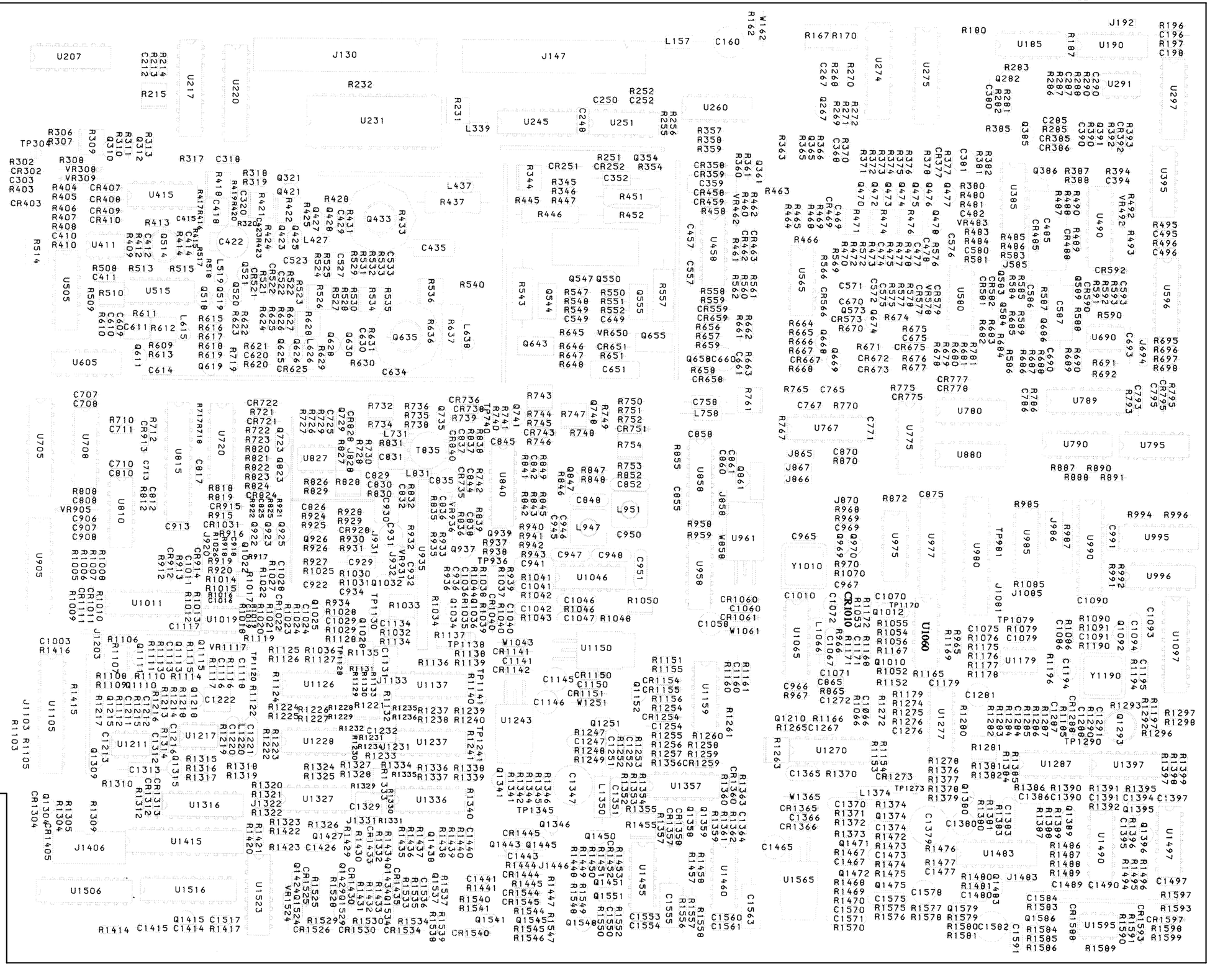
A8 Input & BNC Board <2> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C150	B2	CR268	C2			R364	E2	R483	E5
C173	B5	CR271	D2	R151	C2	R365	D2	R485	E4
C255	D1	CR283	C4	R165	B1	R367	F1	R489	F4
C266	B2	CR295	D4	R166	B1	R368	G1	R491	F5
C268	B3	CR355	D1	R170	D2	R369	G2	R493	G4
C269	G1	CR379	D3	R171	D2	R370	F1	R569	F3
C270	B3			R174	C5	R372	D5	R570	A3
C278	D4	J1	A4	R184	B4	R373	C5	R592	F5
C289	B4	J2	A4	R185	B4	R375	C5	R593	A3
C291	B3	J3	A2	R194	D4	R376	C5		
C292	B3	J4	A1	R195	D4	R379	D3	U264A	G1
C293	G4			R250	C1	R381	E3	U264B	C2
C354	D1	K261	C1	R255	C2	R382	D4	U264C	D2
C360	D1	K284	C4	R256	C1	R384	D3	U264D	D1
C367	F1			R257	D1	R385	E5	U288A	G3
C379	D3	L162	A2	R258	D1	R387	E5	U288B	C4
C383	D4	L163	A1	R267	A3	R388	D5	U288C	D4
C390	F4	L186	A4	R270	D2	R390	F4	U288D	D4
C459	E2	L187	A4	R271	G2	R391	G4	U354A	C2
C460	F2	L564	G2	R273	C3	R393	G4	U354B	E2
C472	B3	L588	G4	R278	C4	R394	F4	U378A	C5
C482	E5			R279	C4	R453	F2	U378B	E4
C483	F5	P1133	H4	R281	D4	R454	F2	U464	F2
C495	B3	P1231	H2	R282	D4	R458	F2	U489	F4
C559	F2			R290	A3	R459	E2		
C564	G2	Q251	D1	R294	D4	R460	E2	VR270	G1
C565	G2	Q275	D4	R295	G4	R463	F2	VR294	G4
C566	F2	Q350	D2	R350	D2	R464	E2		
C571	B3	Q362	D1	R351	C2	R465	E2		
C583	F5	Q363	E2	R354	D1	R468	F3		
C588	G4	Q375	D5	R356	C2	R470	G2		
C589	G4	Q385	D3	R357	C2	R477	F5		
C590	F4	Q456	F2	R358	E1	R478	F5		
C595	B3	Q479	F5	R359	D1	R481	F4		
		Q485	E4	R361	D1	R482	E4		

A8 Input and BNC Board <2> Component Locator


VIDEO AMPLIFIER
DC RESTORER
COMMON MODE GND
REAR PANEL
CH–B2
PART OF A8A1 BNC BOARD
J4
J3
L163 48NH
L162 48NH
AC/DC
R250 6.2M
Q–1059 Q251
C255 47UF
R256 121.0
R258 562.0K
R257 20.0K
C360 56PF
R359 221.0
R354 301.0
D–0141 CR355
C354 .001UF
R358 301.0
R361 100.0
Q362 Q–0719
U264D CA3046
R368 100.0
U264A CA3046
C367 7.5PF
R367 316.0
GAIN B2
R370 50
C269 .1UF
VR270 5.1V D–0226
R369 47.5
SIG_B2
P1231
SIG B2
P1231 CONNECTS TO J1231
A2 WAVEFORM BOARD
A3
<4>
R165 37.4
C266 .1UF
R166 1.00M
CR268 D–0141
K261
R255 4.75K
GNDREF
U264B CA3046
C150 .1UF
R151 133.0
U354A TL072
R351 332.0
Q–0198 Q350
R357 4.02K
R356 1.21K
R350 1.50K
R365 750.0
R364 604.0
R465 1.50K
R270 6.19K
U264C CA3046
CR271 D–0141
R170 5.62K
R171 665.0
Q363 Q–0198
R464 332.0
U354B TL072
R459 301.0K
C459 100PF
C460 470PF
R458 7.5M
C559 .47UF
R460 22M
SLOW/FAST
R454 26.7K
R453 118.0K
Q456 Q–0190
SAMPLE_PULSE
R569 7.50K
R468 1.50K
U464 3080E
C566 .001UF
R463 665.0
C565 450PF
C564 36PF
L564 56UH
R470 665.0
R271 1.00K
R267 10.0
C270 .1UF
C268 10UF
R570 10.0
C472 .001UF
C571 10UF
R290 10.0
C291 .1UF
C292 10UF
R593 10.0
C495 .001UF
C595 10UF
NOTE: GROUNDED BY SCREW, WHICH MAY BE REMOVED FOR FLOATING GROUND
CKT # | 1780R | 1781R
C564 | 36PF | 22PF
C588 | 36PF | 22PF
J2
J1
L187 48NH
L186 48NH
R184 37.4
C289 .1UF
R185 1.00M
CR283 D–0141
K284
R278 4.75K
U288B CA3046
C173 .1UF
R174 133.0
U378A TL072
R373 332.0
Q375 Q–0198
R376 4.02K
R375 1.21K
R372 1.50K
R388 750.0
R387 604.0
R385 1.50K
R379 301.0
CR379 D–0141
C379 .001UF
R381 301.0
R384 100.0
Q385 Q–0719
C383 56PF
R382 221.0
U288D CA3046
R391 100.0
U288A CA3046
C390 7.5PF
R390 316.0
GAIN B3
R394 50
C293 .1UF
VR294 5.1V D–0226
R393 47.5
SIG_B3
P1133
SIG B3
P1133 CONNECTS TO J1133
A2 WAVEFORM BOARD
A4
<4>
R281 20.0K
R282 562.0K
R279 121.0
C278 47UF
R294 6.19K
U288C CA3046
CR295 D–0141
R194 5.62K
R195 665.0
Q485 Q–0198
R485 332.0
U378B TL072
R482 301.0K
C482 100PF
C483 470PF
R481 7.5M
R483 22M
C583 .47UF
SLOW/FAST
R478 26.7K
R477 118.0K
Q479 Q–0190
SAMPLE_PULSE
R592 7.50K
R491 1.50K
U489 3080E
C590 .001UF
R489 665.0
C589 450PF
C588 36PF
L588 56UH
R493 665.0
R295 1.00K
C5 <1> AC/DC
C5 <1> GNDREF
C5 <1> SLOW/FAST
C5 <1> SAMPLE_PULSE
NOTE: SEE DIAGRAM <1> FOR WAVEFORM PHOTOS WHEN A SIGNAL IS APPLIED TO THIS CIRCUITRY
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A8 INPUT & BNC BOARD

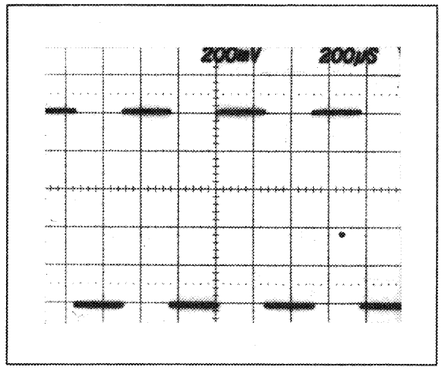
WAVEFORM CIRCUIT BOARD (A2)



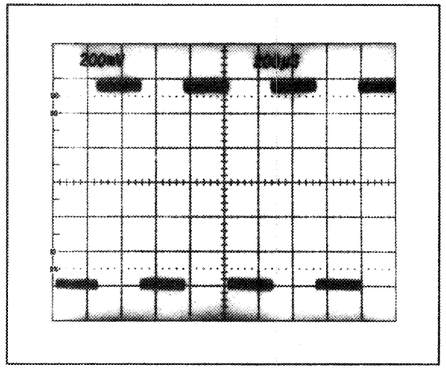
Static Sensitive Devices
See Maintenance Section

3

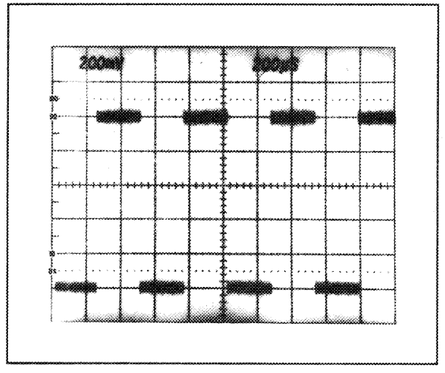
1



2



3



Waveform Conditions

For Waveforms 2 and 3: Connect a 10X probe from the 1780R-Series front panel PROBE input connector to the CAL OUT connector. Select PROBE-X10 on Page 2 of the Configure menu and INPUT-PROBE on the front panel. Use a test oscilloscope 10X probe to connect to test points A6TP389 for Waveform 2 and A2TP1120 for Waveform 3. Apply comp sync or black burst to the EXT REF connector. Select REF-EXT to obtain a stable display.

A6 Vectorscope & A2 Waveform Board <3> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION
A6	
C297	A1
C391	D1
C392	C2
C394	D3
C395	D3
C490	B3
C491	B3
C492	B3
C493	A2
C494	B2
C495	A2
CR294	C3
CR493	B2
J389	E2
J498	A2
J899	E5
P1203	A2
P1203	E2
P389	E2
Q294	D2
Q295	D3
Q296	C3
Q390	D2
Q492	C2
Q493	B2
Q496	C2
Q897	D5
R295	D3
R296	C3
R297	C3
R298	D2
R390	D2
R391	C2
R392	D2
R393	D2
R394	D2
R395	D2
R396	C2
R397	A2
R398	C4
R399	D4
R490	C1
R491	C2
R492	B2
R493	C2
R494	B2
R495	A2
R496	B2
R497	B2
R498	C3
R795	C5
R797	C4
R798	C4
R893	C5
R894	C5
R895	D5
R896	D5
R897	D4
R898	D5
R899	D5
TP389	D2
U490	B3
VR390	D1
VR796	C5

CIRCUIT NUMBER	SCHEM LOCATION
A2	
C1113	F2
C1116	G2
C1118	F1
C1211	F3
C1212	F3
C1213	F4
C1216	G4
C1220	G4
C1221	H4
C1222	G2
C1312	F4
C1313	G4
J1203	E2
L1220	H4
Q1110	F3
Q1111	F2
Q1113	F2
Q1115	G2
Q1215	F4
Q1218	F2
Q1309	G4
Q1315	G5
R1106	E2
R1107	F2
R1108	F2
R1109	F3
R1110	F2
R1111	F1
R1112	F3
R1113	F2
R1114	F2
R1115	F2
R1116	G2
R1117	G2
R1122	H4
R1213	F3
R1214	F3
R1215	F4
R1216	F4
R1217	F4
R1218	F2
R1219	G4
R1309	F4
R1310	F5
R1312	F5
R1314	F4
R1315	G5
R1316	G5
R1317	G5
TP1120	H2
U1211	F4
U1217	G4
VR1117	F1

A6 Vectorscope & A2 Waveform Board <3> Component Locator

PROBE INPUT AMPLIFIER

SHIELD BOX

FRONT PANEL

PROBE

P1203

J498

C297 10UF

−12VDCPL

R397 20.0

−12V

C495 .047UF

R495 1.13M

C493 1.8−10PF

PROBE COMP

C494 4700PF

R499 249.0

R494 475.0K

R492 9.1M

CR493 D−0246

−12VDCPL

Q493

S D G

+12V

R497 332.0

Q493 Q−1025

Q−0188 Q496

R496 1.82K

−12VDCPL

R493 100.0

Q−0711 Q492

R490 3.32K

R396 5.62K

−12VDCPL

R491 10M

R395 *SEL

R394 82.5

R393 1.00K

R392 2.21K

−12V

C391 .1UF

D−0166 VR390 6.2V

Q295 Q390 Q492

B E C

R391 100.0

Q−0712 Q390

C392 4.7PF

R298 2.21K

−12V

Q−0190 Q294

GAIN TO TP389 APPROX. 1.15 (X1) AND 11.5 (X10)

2

TP389

R390 47.5

J389

P389

J1203

C490 .22UF

C492 .1UF

U490 LF351

C491 .1UF

−12V

LOW − X1
HIGH − X10

D3

<25>

/PROBE_X1

D−0141 CR294

R296 2.21K

R295 20

X10 GAIN

C395 33PF

C394 2−18PF

X10 RESP

R498 10.0K

Q−0188 Q296

R297 1.50K

Q−0711 Q295

R398 82.5K

R399 39.2K

−12V

✳ NOTE: R395 IS USED FOR CUSTOMER SERVICE APPLICATIONS. WHEN THIS BOARD VERSION IS INSTALLED IN INSTRUMENTS BEFORE S/N B020000, REMOVE Q295 AND INSTALL A 357.0 OHM RESISTOR FOR R395.

PROBE CALIBRATOR

VR796

VR796 431C

R A C

+12V

R798 1.00K

+5V

R797 1.00K

R893 37.4K

R795 20K

CALIBRATOR AMPLITUDE

R894 1.00K

−12V

+2.5V

R897 2.00K

R899 2.00K

PROBE_CAL_OUT

1V P−P

1

J899

FRONT PANEL

CAL OUT

A3

<25>

J885−33

CAL_TIMING

R895 2.00K

Q897 Q−0190

R896 15.0K

R898 1.00K

−12V

PART OF A6 VECTORSCOPE BOARD

PROBE OUTPUT AMPLIFIER

+12V1

R1111 3.32K

C1118 .1UF

D−0166 VR1117 6.2V

Q−0188 Q1113

R1113 10.0

C1113 22PF

R1115 2.21K

−12V1

Q1115 Q−0190

1V VIDEO

3

TP1120

A4

<4>

PROBE VIDEO

C1116 10PF

R1116 1.00K

R1106 1.00K

R1107 250

PROBE GAIN

R1108 681.0

Q−0198 Q1111

Q1218 Q−0198

R1110 20.0

R1114 20.0

R1218 1.00K

C1222 1.8−10PF

PROBE RESP

R1117 2.21K

R1213 5.62K

R1214 5.62K

Q1110 Q−0190

R1109 1.21K

DC RESTORER

**	REF	1780	1781
	C1221	36PF	22PF

C1211 100PF

R1112 301.0K

C1212 470PF

R1216 22M

C1213 .1UF

U1211 LF351

R1215 332.0

Q1215 Q−0198

R1217 1.50K

C1312 .1UF

R1314 7.5M

C1313 .47UF

C1216 .001UF

U1217 3080E

C1221 36PF

L1220 56UH

R1122 665.0

C1220 450PF

R1219 665.0

C5

<7>

SLOW/FAST

R1309 26.7K

Q1309 Q−0190

R1310 118.0K

G5

<9>

CLAMP −

R1312 3.32K

Q1315 Q−0188

R1316 18.2K

R1315 7.50K

R1317 1.50K

PARTS WITHIN BOX HAVE BEEN CHANGED

SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL

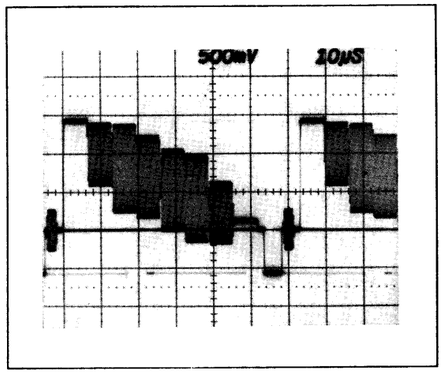
PART OF A2 WAVEFORM BOARD

A2 Waveform Board <4> Component Locator

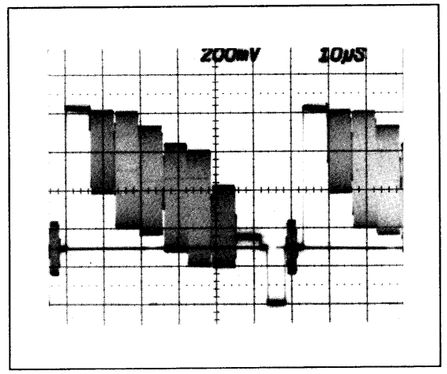
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C1024	C1	Q1034	E1	R1136	E4	R1332	B2	R1534	E3
C1029	C1	Q1036	D1	R1138	D4	R1333	A2	R1535	G3
C1036	D1	Q1341	F4	R1139	D4	R1334	D2	R1537	G2
C1040	D1	Q1346	G3	R1140	D4	R1335	D2	R1538	F2
C1131	A3	Q1424	E2	R1221	A3	R1336	E2	R1539	F2
C1232	A3	Q1427	D5	R1222	B5	R1337	E4	R1540	F5
C1329	A2	Q1429	E4	R1223	B5	R1338	D5	R1541	F5
C1426	C5	Q1434	E3	R1224	B4	R1339	D5	R1544	G4
C1440	E5	Q1438	D5	R1225	B5	R1340	D4	R1545	G4
C1441	H5	Q1443	G4	R1226	C4	R1341	F4	R1546	H3
C1443	F4	Q1445	G4	R1227	C3	R1342	F4	R1547	H4
C1536	F3	Q1524	F2	R1228	B3	R1344	F4	R934	B1
C934	B1	Q1529	F4	R1229	B3	R1345	G4	R936	E1
C936	E1	Q1534	F3	R1230	B3	R1346	F4		
		Q1537	G2	R1231	A3	R1420	A1	TP1128	C1
CR1022	B1	Q1541	F5	R1232	B3	R1421	E2	TP1130	C1
CR1040	D1	Q1545	H4	R1233	D2	R1422	C5	TP1138	E1
CR1430	E4			R1234	A3	R1423	E2	TP1141	C4
CR1433	D5	R1021	B1	R1235	D3	R1429	D5	TP1241	C3
CR1435	E3	R1023	C1	R1236	D3	R1430	D5	TP1345	G2
CR1444	G4	R1024	B1	R1237	E3	R1431	E4		
CR1445	G3	R1028	B1	R1238	E3	R1432	E3	U1126A	B4
CR1525	E2	R1029	C1	R1239	D3	R1433	E3	U1126B	B4
CR1526	F2	R1035	E1	R1240	D4	R1434	D5	U1137A	D3
CR1530	F4	R1037	D1	R1241	D3	R1435	D2	U1137B	D4
CR1534	F3	R1038	D1	R1318	B5	R1436	D2	U1228A	B5
CR1540	G5	R1039	D1	R1319	B1	R1437	D5	U1228B	B3
CR1544	G5	R1040	D1	R1320	B1	R1438	E1	U1237A	D2
CR1545	G5	R1044	D1	R1321	A1	R1439	E5	U1237B	D3
		R1124	B4	R1322	A1	R1440	E5	U1327A	B1
J1	F5	R1125	B4	R1323	C5	R1441	H4	U1327B	B2
J1133	A3	R1126	B4	R1324	C5	R1444	G4	U1336A	D1
J1231	A3	R1127	C4	R1325	C2	R1445	G5	U1336B	D4
J1322	A1	R1128	C1	R1326	C1	R1447	H3		
J1331	A2	R1129	B4	R1327	B2	R1525	E3	VR1524	F2
J1446	H3	R1130	A3	R1328	B3	R1528	E4		
J2	F5	R1131	B4	R1329	B2	R1529	E2		
		R1132	D3	R1330	A2	R1530	E4		
Q1025	B1	R1133	A4	R1331	D1	R1533	E3		
Q1028	C1	R1135	A3						

4

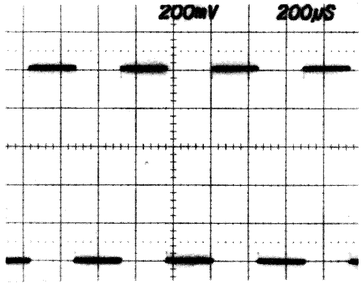
1



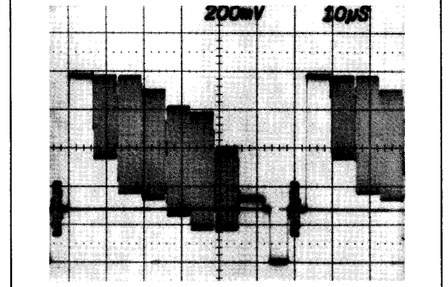
2



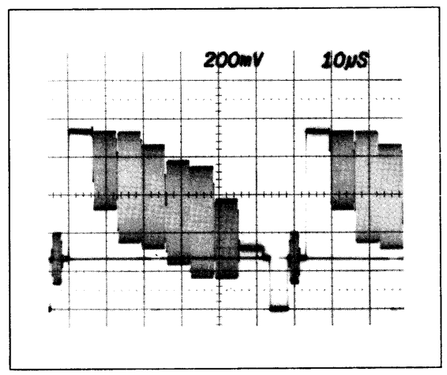
3

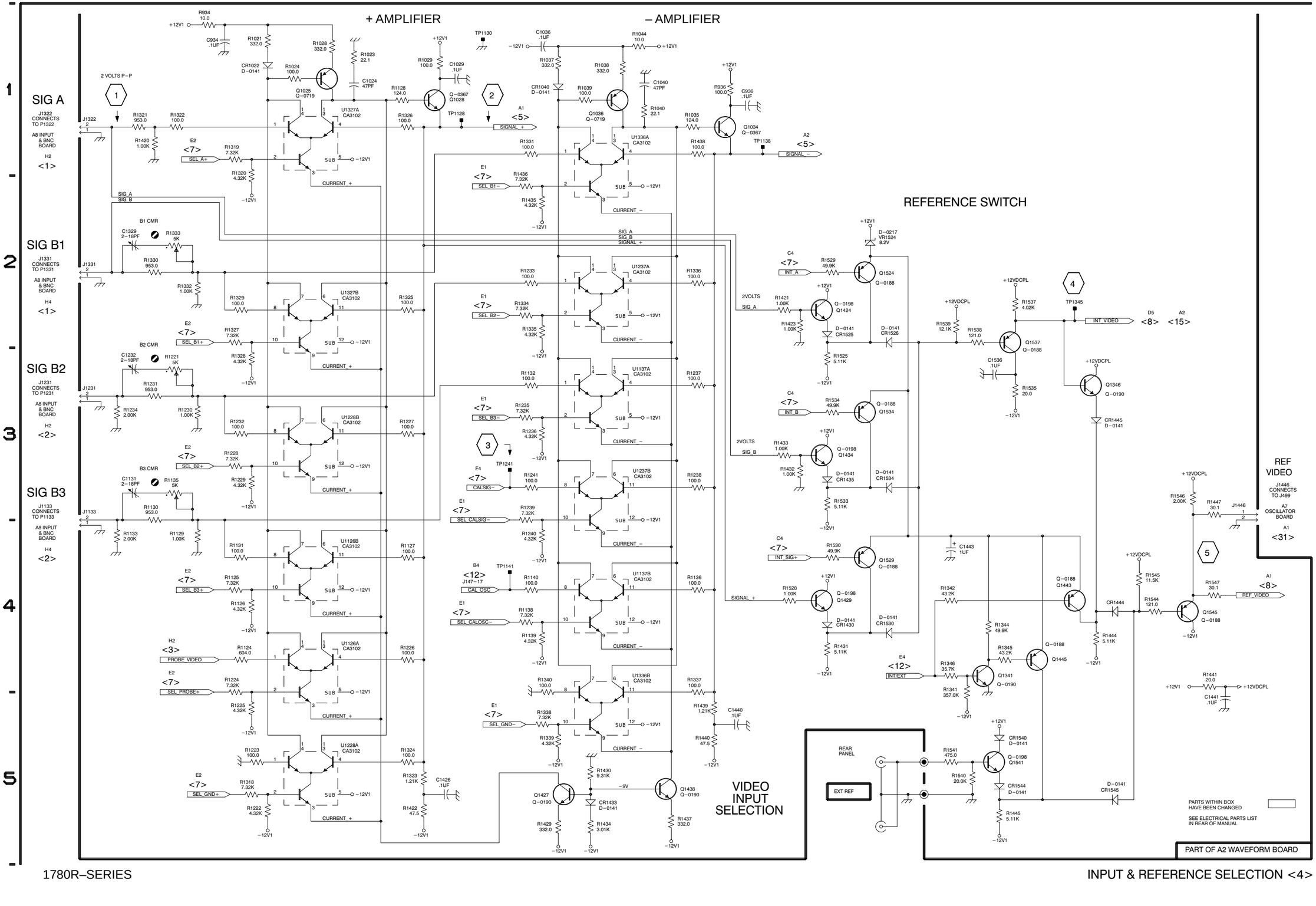


4



5



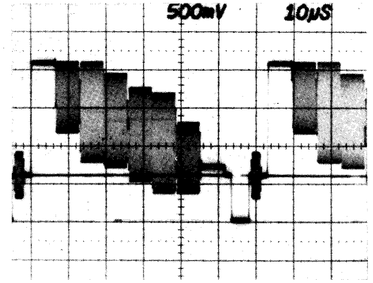

+ AMPLIFIER
– AMPLIFIER
REFERENCE SWITCH
SIG A
SIG B1
SIG B2
SIG B3
VIDEO INPUT SELECTION
REF VIDEO
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A2 WAVEFORM BOARD

A2 Waveform Board <5> Component Locator

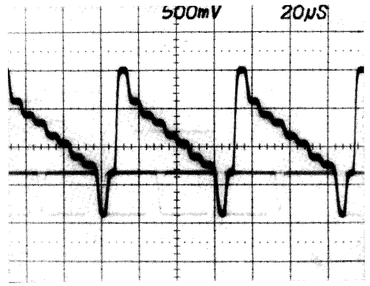
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
		CR743	H3	R1025	B5	R750	G2	R924	H1
C1028	E5	CR751	H2	R1026	E5	R751	G2	R925	B5
C1041	D1	CR824	D5	R1027	E5	R752	H1	R926	B5
C1042	D1	CR828	G2	R1030	A2	R753	G1	R927	B5
C1046	E2	CR840	F4	R1031	B2	R754	G1	R928	H1
C1047	E2	CR914	E5	R1032	A1	R818	B4	R929	H1
C1134	B1	CR915	G1	R1033	A1	R819	G1	R930	B2
C303	G5	CR928	H1	R1034	A2	R820	F5	R931	B2
C825	D5			R1036	A1	R821	G5	R932	B1
C826	E2	J828	F2	R1041	D1	R822	C5	R933	C1
C829	D2	J920	A4	R1042	D1	R823	D5	R935	B2
C830	D3	J931	B2	R1043	E1	R824	C5	R937	B4
C831	D2	J932	B3	R1046	E1	R825	D5	R938	B3
C832	C2			R1048	F1	R826	E3	R939	C1
C835	B1	L731	D2	R1050	F1	R827	E2	R940	B4
C836	B1	L831	D3	R1134	A1	R828	E3	R941	B4
C837	F4	L947	D3	R1137	A2	R829	E3	R942	C3
C838	E4	L951	D3	R302	F5	R830	D3	R943	C1
C842	G4			R403	G5	R831	D2		
C844	D4	P920	A4	R721	G5	R832	C2	T835	D2
C845	D4	P931	B2	R722	F5	R835	B1		
C848	D3	P932	B3	R723	G5	R836	E4	TP304	F5
C852	D3			R726	F2	R837	F4	TP740	G4
C918	A4	Q1022	B5	R727	F3	R838	E3	TP936	C1
C922	B4	Q1032	B3	R728	G3	R839	E4		
C929	A3	Q723	G5	R729	G2	R841	F4	U1046A	E1
C930	D2	Q729	G2	R730	G2	R842	E3	U1046B	F1
C931	B1	Q735	H4	R732	G2	R843	F4	U1046C	F1
C932	B1	Q741	H3	R734	G4	R845	F4	U1046D	D1
C941	C1	Q748	H2	R735	G4	R846	D4	U827	E2
C945	C3	Q823	D5	R736	H4	R847	D4	U840A	E4
C946	C3	Q847	D3	R738	H4	R848	D3	U840B	E4
C947	D1	Q922	B5	R739	H4	R849	D4	U840C	E4
C948	F2	Q923	E5	R740	G3	R852	D3	U840D	F4
C950	D3	Q925	H1	R741	G3	R915	G1	U840E	F3
C951	F2	Q926	B5	R742	D4	R916	B4	U935	B1
		Q937	B3	R743	H3	R917	C4		
CR1031	E5	Q939	B4	R744	H3	R918	A4	VR931	B1
CR302	F5			R745	H3	R919	A5	VR936	B1
CR721	G5	R1014	E5	R746	F4	R920	E5		
CR722	F3	R1015	E5	R747	G3	R921	D5		
CR735	F4	R1017	E5	R748	G3	R922	C5		
CR736	G3	R1022	E5	R749	H2				
CR738	H4								

5

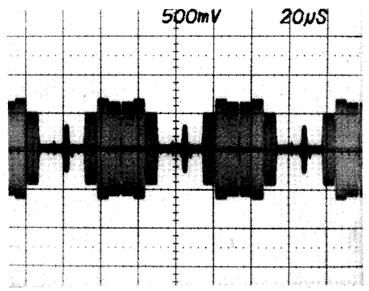
1



2



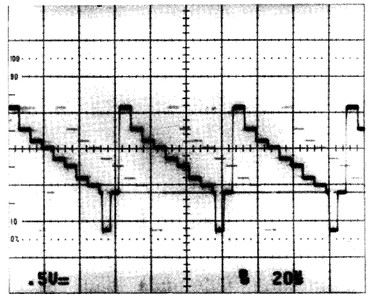
3



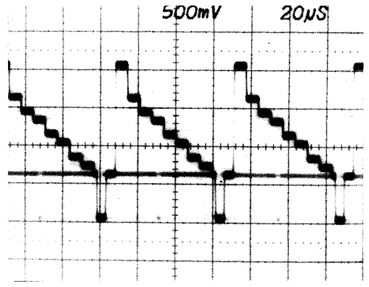
CHROMA FILTER ON

4

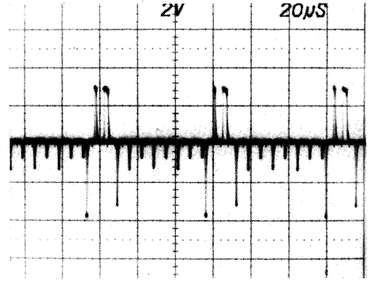
PIX MODE
OSCILLOSCOPE BW: 20 MHz



5

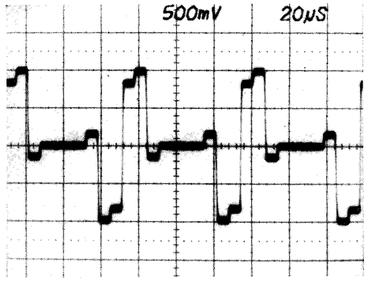


6

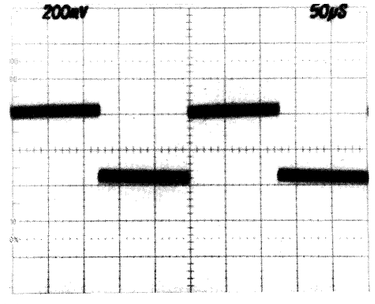


DIFF FILTER ON

7



8



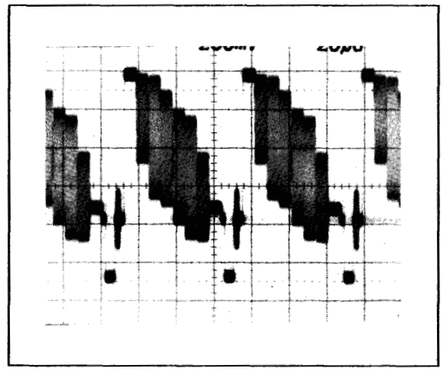
REF	1780	1781
C829	33PF	15PF
C830	15PF	10PF
C848	36PF	27PF

A2 Waveform Board <6> Component Locator

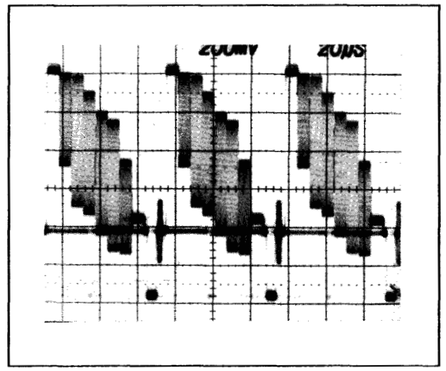
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C212	G4			R306	F4	R433	F1	R617	C4
C318	G4	L339	E1	R307	F4	R437	F1	R618	B5
C320	E3	L427	F2	R308	E5	R508	B4	R619	B5
C410	B3	L437	E1	R309	F4	R509	A4	R620	B5
C411	B4	L519	C3	R310	F4	R510	B4	R621	B5
C412	B3	L615	B5	R311	F4	R513	B4	R622	D3
C414	C3	L626	D2	R313	F4	R514	B4	R623	D4
C415	E4	L638	E1	R317	G4	R515	A4	R624	E3
C418	F4			R318	F4	R517	C3	R625	F2
C422	F3	Q310	F4	R319	G3	R518	C3	R626	E2
C423	F3	Q312	F4	R320	E3	R521	F2	R627	D3
C429	F1	Q321	F4	R404	F5	R522	F2	R628	E3
C435	E1	Q421	F3	R405	D5	R523	F3	R629	D2
C522	E2	Q423	E2	R406	F5	R524	E3	R630	E1
C523	F3	Q425	F2	R407	D5	R525	E3	R631	D1
C527	F1	Q427	F2	R408	D5	R526	E3	R636	E1
C533	F2	Q428	F1	R409	A3	R527	D2	R637	E1
C609	D4	Q433	F1	R410	B3	R528	E2	R719	B5
C610	D4	Q514	B4	R412	B3	R529	G2		
C611	D4	Q518	C3	R413	E5	R530	E2	U411B	B3
C614	C4	Q519	C3	R414	C3	R531	F2	U415A	E5
C620	B5	Q520	D4	R415	E4	R532	F2	U415B	E5
C630	E1	Q521	D3	R416	E4	R533	E2	U415C	D5
C634	E2	Q611	D4	R417	F4	R534	E2	U415D	E5
C725	B5	Q619	B5	R418	F4	R535	E2	U515	C4
		Q625	D2	R419	F3	R536	F1	U515	C4
CR403	F5	Q626	F2	R420	E3	R540	F1		
CR407	E5	Q628	E2	R421	F3	R609	C4	VR308	D5
CR408	F5	Q630	E1	R422	E3	R610	D4	VR309	F5
CR409	F5	Q635	E1	R423	F3	R611	C4		
CR410	E5			R424	E3	R612	C4		
CR521	D3	R213	G4	R425	F2	R613	C4		
CR522	F2	R214	G4	R428	F1	R615	B4		
CR625	B5	R215	G4	R431	F1	R616	B3		

6

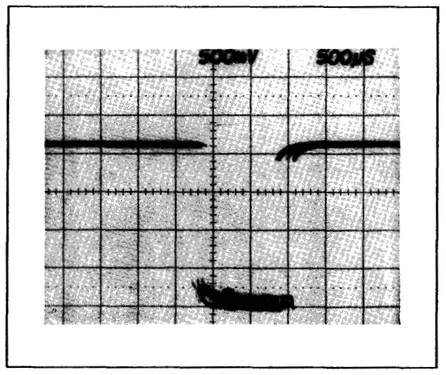
1



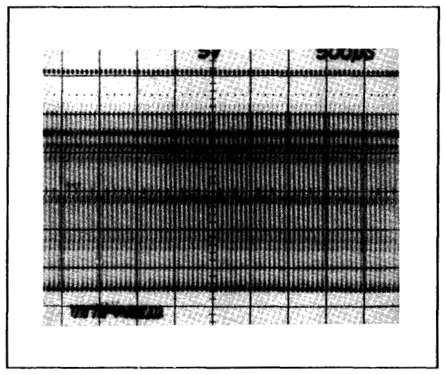
2



3



4



A2 Waveform Board <6> Component Locator

DEFLECTION AMP

LIMITER

X1/X5 AMPLIFIER

VARIABLE GAIN

VERTICAL READOUT

PARTS WITHIN BOX HAVE BEEN CHANGED

SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL

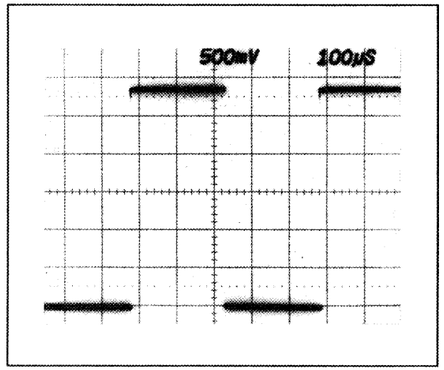
PART OF A2 WAVEFORM BOARD

A2 Waveform Board <7> Component Locator

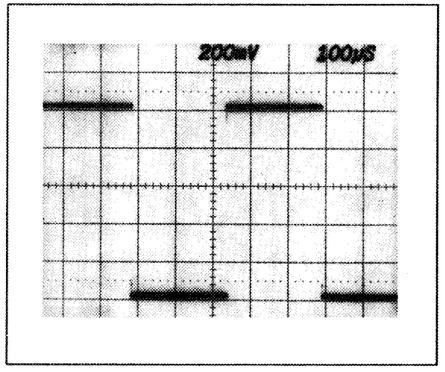
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C1003	B1	Q1304	B5	R718	E3
C1011	E4	Q1415	C1	R812	F2
C1016	F4			R912	D4
C1019	H4	R1005	G4	R913	D4
C1117	E4	R1006	G4		
C1414	C1	R1007	D4	U1011A	E5
C1415	C2	R1008	D4	U1011B	G4
C1517	B5	R1009	G4	U1011C	E4
C713	C4	R1010	G4	U1011D	E4
C812	C4	R1012	E5	U1011E	G4
C817	C4	R1013	G4	U1019A	E4
C913	F5	R1016	E4	U1019B	H4
		R1018	E4	U1105	F2
CR1011	G4	R1019	H4	U1316	D1
CR1111	G4	R1020	E4	U1415	D1
CR1304	B5	R1103	H1	U1506	B4
CR1312	C1	R1105	C1	U1516	B1
CR1313	C1	R1119	E4	U1523	D1
CR1405	B5	R1304	C5	U505A	H2
CR912	E4	R1305	B5	U505B	H2
CR913	D4	R1414	C1	U505D	H2
		R1415	C2	U720	F3
J1103	H1	R1416	C3	U815	D3
J1406	D5	R1417	C1	U905	B3
J9	H1	R712	D3		
		R717	E3		
P1103	H1				

7

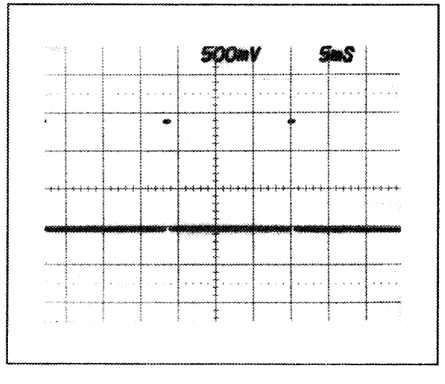
1



2



3

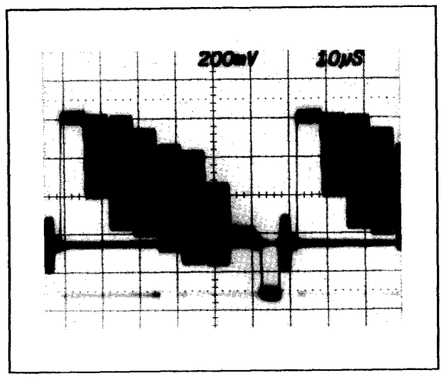


INPUT SELECTION
FILTER SELECTION
DC RESTORER SELECTION
CALIBRATOR
VOLTAGE
VERTICAL POSITION
U1516 74HCT273
U1415 20V8
U1523 74HCT238
U1316 74HCT238
U905 74HCT273
U815 20V8
U1506 74HCT273
U1105 20V8
U720 74HCT238
U505D DG211
U505A DG211
U505B DG211
U1019B TL072
U1019A TL072
U1011C CA3083
U1011D CA3083
U1011E CA3083
U1011B CA3083
U1011A CA3083
J1406
J1103 LINE STROBE
REAR PANEL
LINE STROBE OUT
1–2 LINE SELECT
2–3 FIELD 1 PULSE
J1406 CONNECTS TO J512 A8 INPUT & BNC BOARD A5 <1>
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A2 WAVEFORM BOARD

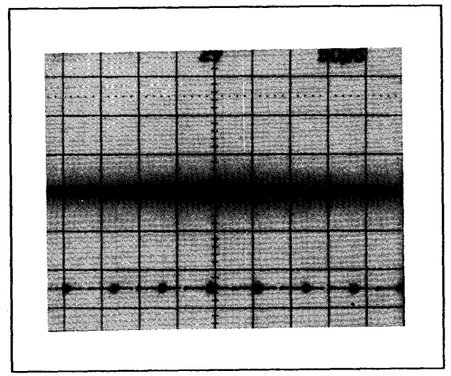
A2 Waveform Board <8> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C1010	B3			R1175	E2	R1475	C1
C1066	D4	J1483	E2	R1176	E3	R1476	D1
C1067	B3			R1177	E3	R1477	F2
C1070	B4	L1066	B3	R1178	E3	R1480	D1
C1071	B3	L1374	C2	R1179	D3	R1481	D1
C1072	B3			R1247	E5	R1486	E2
C1075	F3	P1483	E2	R1248	E5	R1487	F2
C1079	F3			R1249	D5	R1488	F1
C1160	G5	Q1010	C4	R1252	E5	R1489	E1
C1171	D3	Q1012	B4	R1253	E5	R1570	B1
C1179	E3	Q1152	F5	R1254	F4	R1575	B1
C1247	E5	Q1210	B4	R1255	E4	R1576	B1
C1251	D5	Q1251	E5	R1256	E5	R1579	G1
C1252	E5	Q1374	C1	R1260	F4	R1580	H1
C1254	F4	Q1380	F1	R1261	G4	R1581	G1
C1267	B5	Q1389	E2	R1263	B5	R865	A4
C1272	A5	Q1471	C2	R1265	B4	R965	B5
C1276	D3	Q1472	B2	R1272	D3	R966	B3
C1281	E3	Q1475	B1	R1274	D3	R967	B3
C1365	C5	Q1483	D1	R1275	D3		
C1370	C2	Q1579	H1	R1276	D3	TP1079	G3
C1374	C1			R1278	D3	TP1170	B3
C1379	D1	R1052	C3	R1280	E3	TP1273	F2
C1380	D1	R1053	B3	R1370	C5		
C1381	D1	R1054	B3	R1371	C2	U1060A	B4
C1383	E1	R1055	B4	R1372	C2	U1060B	C4
C1467	C2	R1056	C4	R1373	B2	U1060C	C5
C1473	C1	R1066	D4	R1374	C1	U1060D	B4
C1477	D1	R1076	E3	R1376	D3	U1065A	A3
C1480	D2	R1079	F3	R1377	E2	U1065B	A3
C1489	F1	R1151	F5	R1378	F2	U1065C	B3
C1570	B2	R1152	B4	R1379	F1	U1159A	E4
C1571	B1	R1153	B4	R1380	H1	U1159B	F4
C1575	B1	R1154	C4	R1383	F1	U1159C	G5
C1582	G1	R1155	F4	R1387	D2	U1159D	F5
C865	A4	R1156	F5	R1388	D2	U1179	F3
C965	A4	R1160	G5	R1389	E2	U1270A	C5
C966	A3	R1161	G5	R1467	C2	U1270B	B5
C967	B4	R1165	C4	R1468	C2	U1277	D3
		R1166	A4	R1469	B2	U1483	D1
CR1010	B3	R1167	C4	R1470	B2		
CR1154	F5	R1168	C3	R1472	C1	Y1010	C3
CR1155	F4	R1169	B5	R1473	C1		
CR1254	F4	R1171	C3	R1474	B1		
CR1273	F2	R1172	B4				

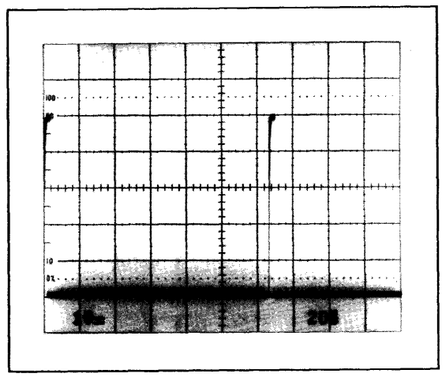
1



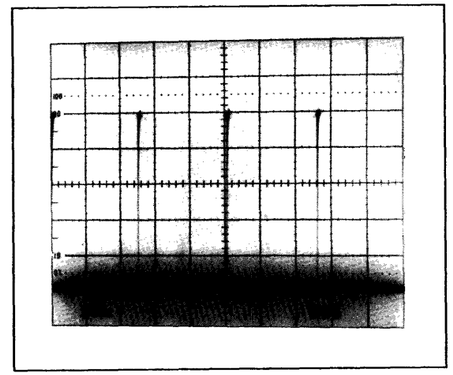
2



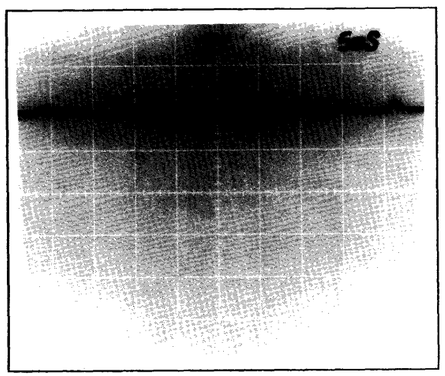
3



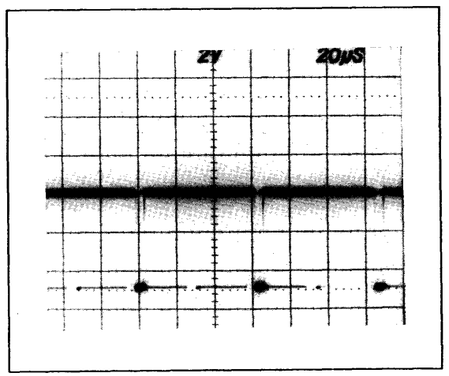
3

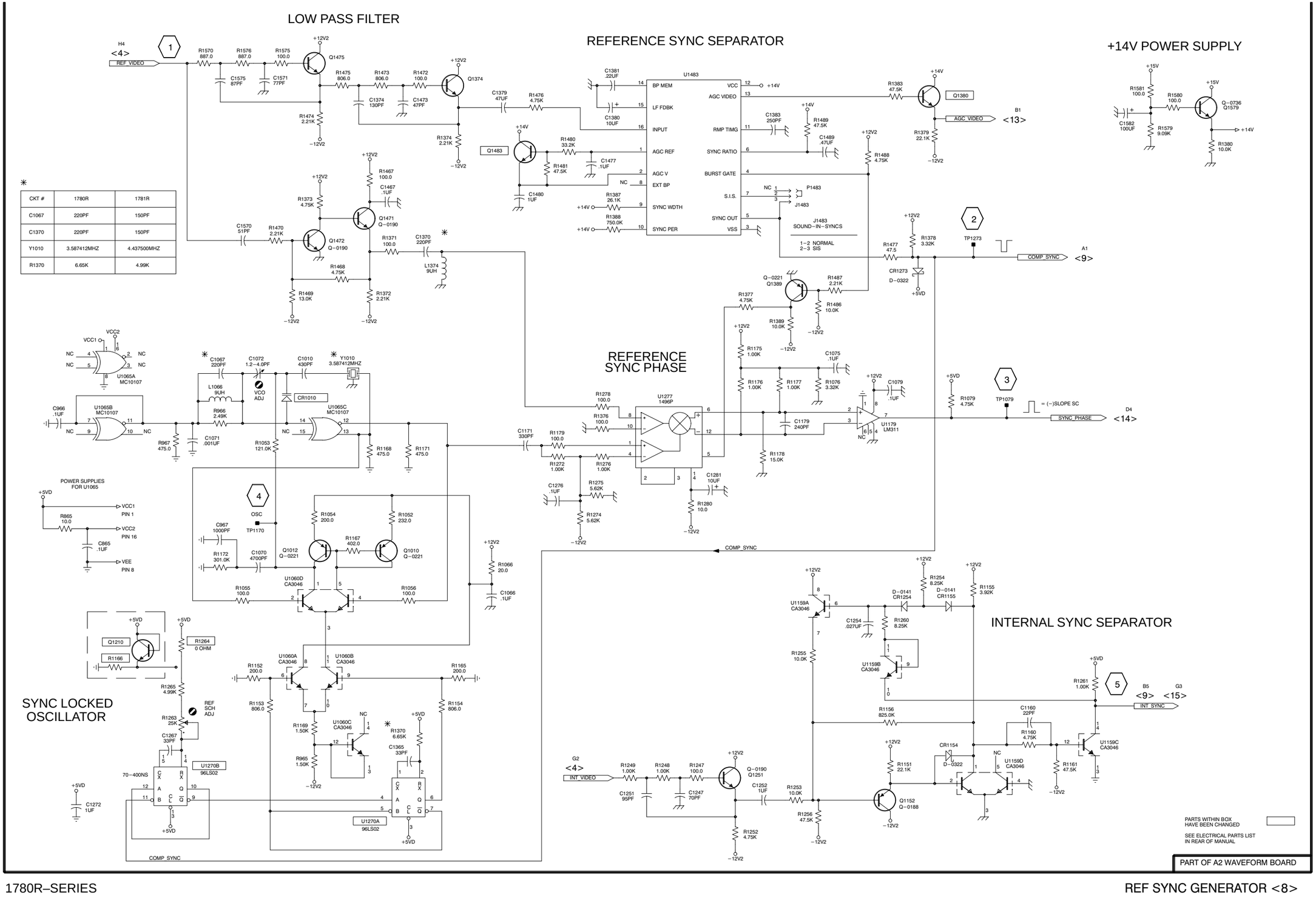


4



5





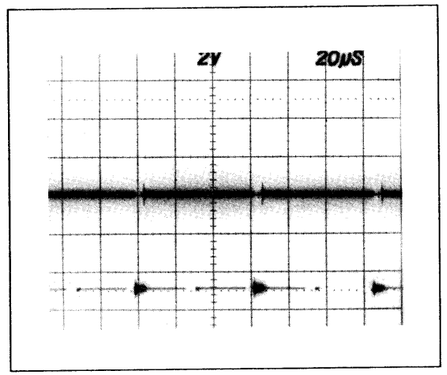
CKT #	1780R	1781R
C1067	220PF	150PF
C1370	220PF	150PF
Y1010	3.587412MHZ	4.437500MHZ
R1370	6.65K	4.99K

A2 Waveform Board <9> Component Locator

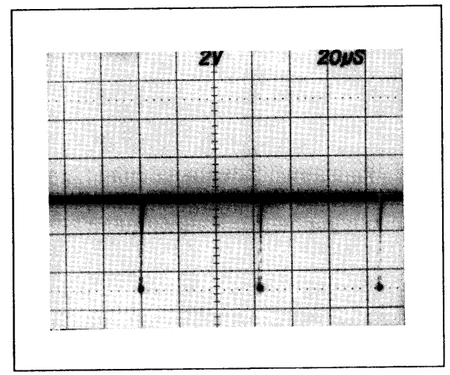
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C196	B3			R860	E4
C198	C3	Q282	C2	R870	C4
C285	D2	Q385	D2	R888	E4
C287	C2	Q391	E2	R958	F5
C290	E2	Q861	F5	R959	F5
C380	B2				
C390	D2	R180	C1	U185A	B1
C495	E3	R187	C1	U185B	C1
C496	F3	R196	B3	U185C	C1
C767	B5	R197	C3	U185D	B1
C771	C5	R281	B2	U190A	B1
C855	G4	R282	B2	U190B	A2
C858	G4	R283	C1	U190C	F2
C861	E5	R285	D2	U190D	D3
C870	C5	R286	C2	U190E	B1
		R287	C2	U291	E2
CR385	D2	R288	F2	U297A	C3
CR386	D2	R290	F2	U297B	B3
CR392	E2	R385	D2	U395	D3
		R390	D2	U596A	F3
J192	B1	R392	E2	U596B	E3
J858	G5	R393	E2	U767A	B5
J865	D4	R495	E3	U767B	C5
J866	D4	R496	F3	U790A	D5
J867	D4	R695	F3	U858A	E5
		R696	F3	U858B	G4
P192	B1	R697	F3	U880E	E4
P858	G5	R698	F3	U958	F4
P865	D4	R767	C5		
P866	D4	R770	C5	W858	F5
P867	D4	R855	G4		

9

1



2



A2 Waveform Board <9> Component Locator

REF OR REMOTE SYNC SWITCH

G2 <8> COMP_SYNC
B4 <12> /REM_SYNC_EN J147–6
B3 <12> REM_SYNC J147–4
P192 J192 1 2 3
U185D 74HC00
U185C 74HC00
U185A 74HC00
U185B 74HC00
U190E 74HC04
U190A 74HC04
R187 200.0
R180 500.0
DIR_REMSYNC → B5 <10>
REF_SYNC → B4 <12> J147–20
/DIR_REMSYNC_EN → B5 <10>
J192 REMOTE SYNC POLARITY
1–2 POSITIVE
2–3 NEGATIVE
+5VD
R283 20.0K
U190B 74HC04
R282 20.0K
R281 20.0K
Q282
C380 .22UF

V SYNC DETECTOR

+12V2
C285 1000PF
R385 26.7K
CR385
C390 .01UF
CR386
R285 13M 1/4W
R390 51.1K
−12VDCPL
C287 .1UF
R286 54.9K
R287 750.0K
Q385
Q391
R393 10.0K

V SYNC FREERUN GENERATOR

CR392
R392 249.0
R290 1.50K
R288 475.0K
+5VD
U291 LM555
RST GND VCC TRIG CV THR DIS Q
C290 .1UF
/V_SYNC → B5 <10>
U190C 74HC04
V_SYNC → F2 <7> B5 <10> B4 <12> J147–18 C3 <14>

H/2 LOCKOUT

38uS
R196 49.9K
C196 1800PF
U297B 96LS02
+5VD

DIRECT/AFC & FLD1/FLD2 SWITCH

U190D 74HC04
U395 74LS51
E5 <12> FLD2/FLD1
E5 <12> 2L/F
FLD_RETRACE_GATE → A4 <10>
320uS
R197 75.0K
C198 .01UF
U297A 96LS02
B4 <12> J147–14 AFC_SYNC
E5 <12> DIR/AFC

LOSS OF REF SYNC DETECTOR

REF H SYNC GENERATOR

0.5uS
R495 4.12K
C495 270PF
U596B 96LS02
1.2uS
C496 1000PF
R496 2.80K
U596A 96LS02
R696 2.00K
R695 301.0
+REF_H_SYNC → F2 <7> B2 <10>
REF_H → B3 <14>
R698 2.00K
R697 100.0
−REF_H_SYNC → B4 <12> J147–16

J865 SYNC FOR VECTOR CLAMPS
1–2 REF
2–3 INPUT
P865 J865
U880E 74HC04
R888 750.0
INPUT_H_SYNC → B4 <12> J147–12

J866/J867 SYNC FOR WAVEFORM CLAMPS
1–2 REF
2–3 INPUT
P866 J866
P867 J867

INTERNAL SYNC DETECTOR

51uS
R767 33.2K
C767 1000PF
U767A 74HC221
H4 <8> INT_SYNC
5uS
R870 4.99K
C870 1000PF
C771 .1UF
R770 20.0K
U767B 74HC221
U790A 74HC32

LOSS OF INT SYNC DETECTOR

5uS
R860 4.32K
C861 1000PF
U858A 74C221
D4 <14> /VERT_LOCKOUT
C5 <7> BP/ST
W858 0 OHM
R959 20.0K
Q861 Q–0190
U958 74LS51
2uS
C855 1000PF
R855 1.50K
C858 .1UF
U858B 74C221
C4 <7> ON/OFF
CLAMP + → C5 <7> J1406–2
CLAMP − → F5 <3> <7> C5 J1406–1
R958 10.0K
J858 SOUND–IN–SYNCS
1–2 NORMAL
2–3 SIS
P858

CLAMP PULSE GENERATOR FOR WAVEFORM DISPLAY

PARTS WITHIN BOX HAVE BEEN CHANGED

SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL

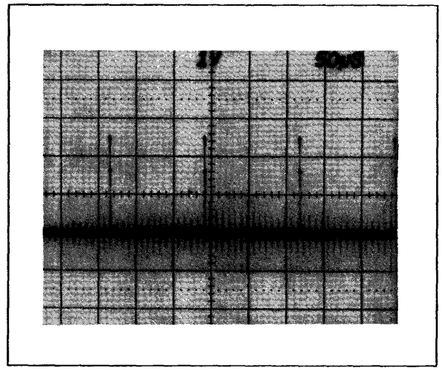
PART OF A2 WAVEFORM BOARD

A2 Waveform Board <10> Component Locator

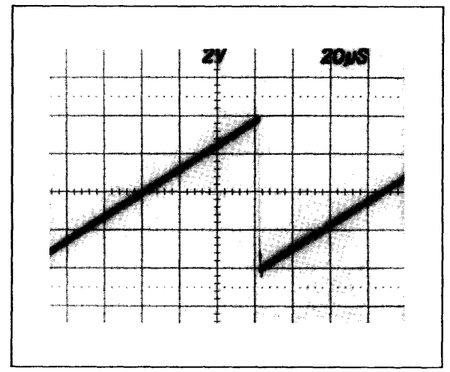
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C394	E3	R387	E4	R887	G2
C485	E4	R388	D4	R890	G4
C587	E2	R394	D4	R891	H3
C593	F2	R463	C3		
C690	E2	R485	F3	U385C	E2
C693	F4	R486	F3	U385D	E4
C786	D1	R487	E3	U490	D3
C793	C4	R488	E3	U690A	G4
C795	B5	R489	E3	U690B	G2
		R490	E3	U775A	B1
CR485	E2	R492	D3	U775B	C2
CR488	E2	R493	D3	U775D	D1
CR590	F2	R581	G3	U780A	C2
CR592	F4	R583	G3	U780B	B4
CR775	D1	R587	G3	U780C	D4
CR777	D2	R588	E2	U789A	C1
CR778	D1	R590	F2	U789B	B4
CR795	B4	R591	G3	U790B	G3
		R592	G3	U790C	A4
J585	G3	R593	G2	U790D	D4
J694	B4	R686	F4	U795A	C4
		R687	F4	U795B	C5
P585	G3	R688	F3	U880B	C2
P694	B4	R689	E2	U880C	C5
		R690	D2	U880D	B4
Q361	C3	R691	G4	U880F	F4
Q386	E4	R692	D2		
Q589	E2	R786	D1	VR492	D3
Q686	F4	R793	C4		
		R795	B5		
R363	D3				

10

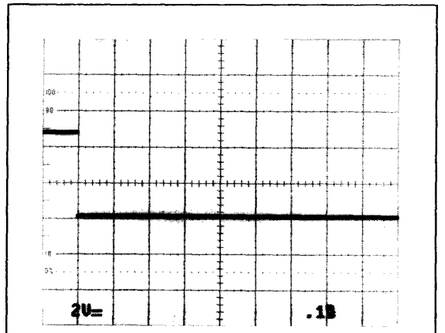
1



2

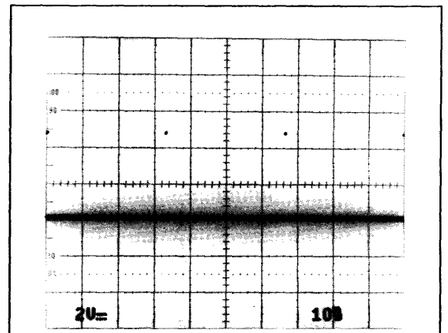


3



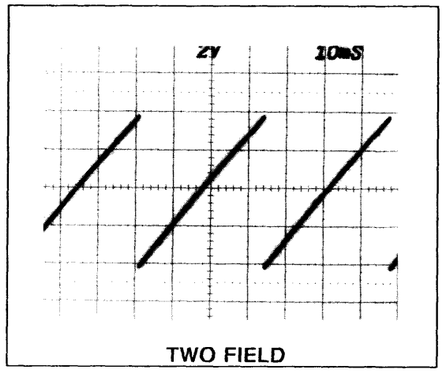
TWO FIELD

3

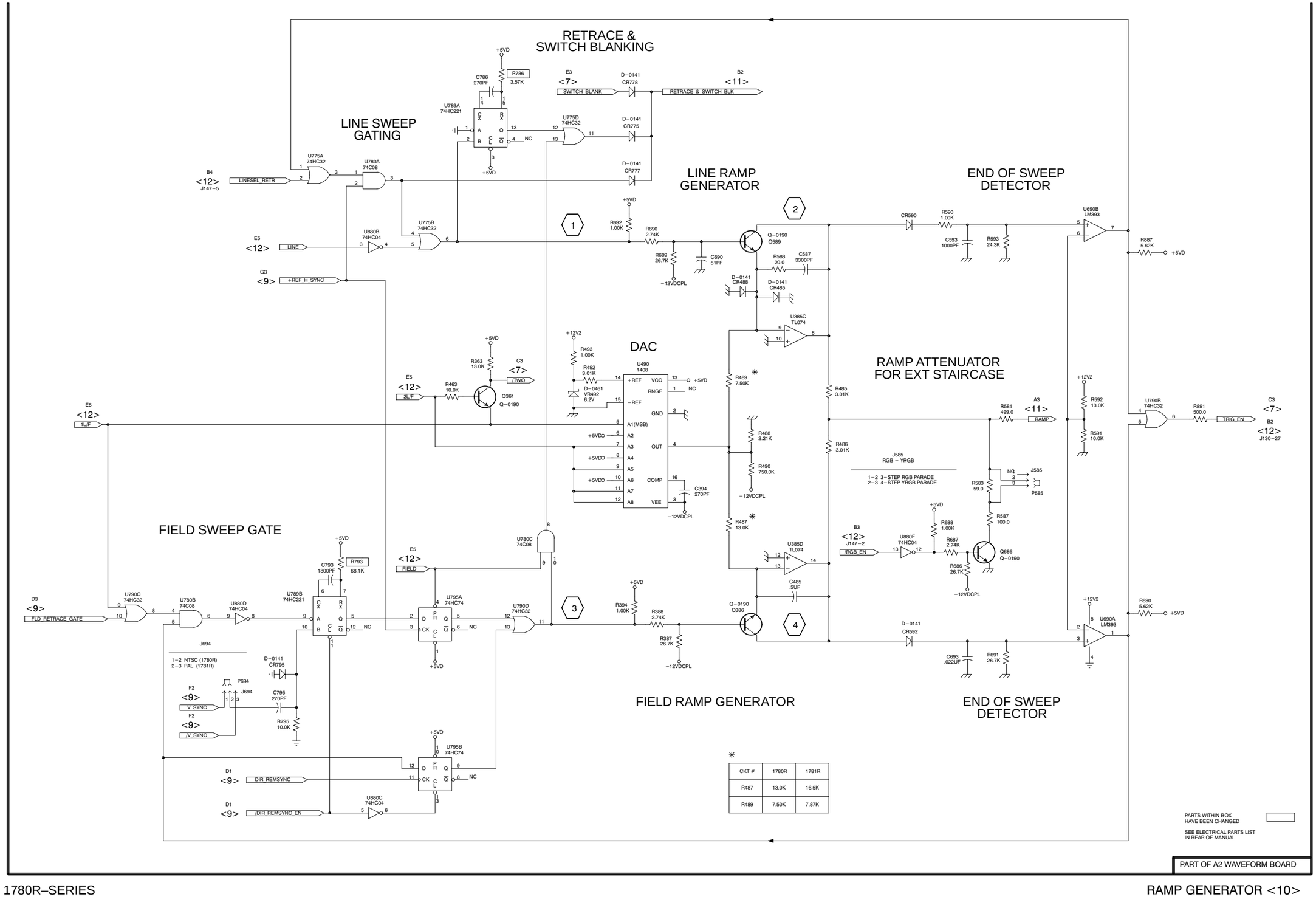


TWO FIELD

4



TWO FIELD

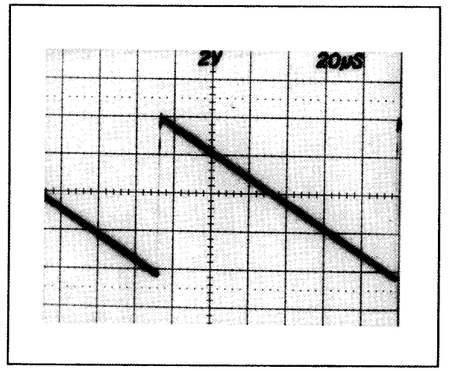

RETRACE &
SWITCH BLANKING
LINE SWEEP
GATING
LINE RAMP
GENERATOR
END OF SWEEP
DETECTOR
DAC
RAMP ATTENUATOR
FOR EXT STAIRCASE
FIELD SWEEP GATE
FIELD RAMP GENERATOR
END OF SWEEP
DETECTOR
+5VD
R786
3.57K
C786
270PF
U789A
74HC221
E3
<7>
SWITCH_BLANK
D-0141
CR778
B2
<11>
RETRACE_&_SWITCH_BLK
U775D
74HC32
D-0141
CR775
D-0141
CR777
B4
<12>
J147-5
LINESEL_RETR
U775A
74HC32
U780A
74C08
E5
<12>
LINE
U880B
74HC04
U775B
74HC32
G3
<9>
+REF_H_SYNC
1
2
+5VD
R692
1.00K
R690
2.74K
Q-0190
Q589
C690
51PF
R689
26.7K
-12VDCPL
R588
20.0
C587
3300PF
D-0141
CR488
D-0141
CR485
U385C
TL074
CR590
R590
1.00K
C593
1000PF
R593
24.3K
U690B
LM393
R887
5.62K
+5VD
+12V2
R493
1.00K
R492
3.01K
D-0461
VR492
6.2V
U490
1408
+REF
-REF
A1(MSB)
A2
A3
A4
A5
A6
A7
A8
VCC
RNGE
GND
OUT
COMP
VEE
NC
+5VD
-12VDCPL
C394
270PF
R489
7.50K
R488
2.21K
R490
750.0K
R487
13.0K
R485
3.01K
R486
3.01K
R363
13.0K
C3
<7>
/TWO
E5
<12>
2L/F
R463
10.0K
Q361
Q-0190
E5
<12>
1L/F
J585
RGB - YRGB
1-2 3-STEP RGB PARADE
2-3 4-STEP YRGB PARADE
A3
<11>
RAMP
R581
499.0
NO
J585
R583
59.0
P585
R587
100.0
+12V2
R592
13.0K
R591
10.0K
U790B
74HC32
R891
500.0
TRIG_EN
C3
<7>
B2
<12>
J130-27
B3
<12>
J147-2
/RGB_EN
U880F
74HC04
+5VD
R688
1.00K
R687
2.74K
Q686
Q-0190
R686
26.7K
-12VDCPL
U385D
TL074
C485
.5UF
U780C
74C08
E5
<12>
FIELD
+5VD
R793
68.1K
C793
1800PF
U789B
74HC221
U790C
74HC32
U780B
74C08
U880D
74HC04
D3
<9>
FLD_RETRACE_GATE
J694
1-2 NTSC (1780R)
2-3 PAL (1781R)
D-0141
CR795
P694
J694
F2
<9>
V_SYNC
F2
<9>
/V_SYNC
C795
270PF
R795
10.0K
U795A
74HC74
U790D
74HC32
3
+5VD
R394
1.00K
R388
2.74K
R387
26.7K
-12VDCPL
Q-0190
Q386
4
D-0141
CR592
C693
.022UF
R691
26.7K
U690A
LM393
R890
5.62K
+5VD
U795B
74HC74
D1
<9>
DIR_REMSYNC
D1
<9>
/DIR_REMSYNC_EN
U880C
74HC04
CKT #
1780R
1781R
R487
13.0K
16.5K
R489
7.50K
7.87K
PARTS WITHIN BOX
HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST
IN REAR OF MANUAL
PART OF A2 WAVEFORM BOARD

A2 Waveform Board <11> Component Locator

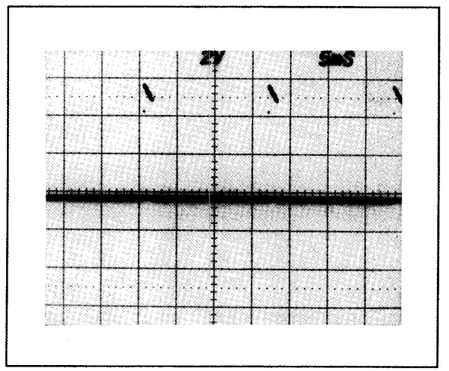
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C267	F2	CR675	C1	R344	G3	R478	C3	R671	F3
C352	G2			R345	G3	R480	B3	R674	E4
C368	F2	Q267	F2	R346	H3	R481	C3	R675	C2
C381	B5	Q354	E3	R354	E3	R483	C2	R676	D2
C469	D3	Q365	F4	R365	E4	R484	C2	R677	A3
C474	C3	Q470	C4	R366	F4	R543	G2	R678	B2
C477	C3	Q472	C4	R370	F2	R547	G3	R679	B2
C478	C3	Q473	C4	R371	C4	R548	G3	R680	C1
C482	A1	Q474	D5	R372	C4	R549	G4	R681	B1
C549	G3	Q475	C4	R373	C4	R550	H3	R682	B2
C571	D3	Q476	D5	R374	C5	R551	G4	R683	A2
C572	D3	Q477	D3	R375	C4	R552	G3	R684	A3
C575	D3	Q478	C3	R376	C5	R557	H2	R685	B4
C576	A2	Q544	G3	R377	D3	R566	E4	R765	B2
C580	C2	Q547	G3	R378	A2	R569	D3	R775	A3
C586	B4	Q550	G3	R380	B3	R572	C3	R781	B2
C649	G4	Q555	G3	R381	A5	R575	C3		
C651	G2	Q573	D2	R382	A5	R576	A2	U190F	D3
C670	D2	Q583	B3	R445	H3	R577	D2	U260F	E1
C675	C1	Q584	A3	R446	G3	R578	C2	U385A	A5
C765	B2	Q643	G2	R447	H3	R584	B3	U565	F4
		Q655	G2	R451	G3	R585	B3	U580A	B1
CR251	F2	Q668	D4	R452	G3	R586	B3	U580B	C2
CR252	F3	Q669	F3	R464	E5	R589	B3	U580C	A1
CR377	D3	Q674	E4	R465	E3	R645	G2	U580D	C3
CR469	E3			R466	F5	R646	G2	U775C	E1
CR566	E4	R162	E2	R468	F4	R647	G2	U780D	D1
CR573	D2	R167	F2	R469	E4	R648	G2		
CR577	C2	R170	F1	R470	D3	R651	H2	VR483	D2
CR579	B2	R251	F2	R471	D4	R664	F5	VR578	C2
CR581	B2	R252	E3	R472	C3	R665	F5	VR650	G2
CR582	A2	R268	F2	R473	D3	R666	D4		
CR651	G2	R269	F2	R474	D4	R667	F5	W162	E1
CR667	F3	R270	F1	R475	C3	R668	F3		
CR672	A3	R271	F2	R476	D4	R670	D2		
CR673	A3	R272	F2	R477	C3				

11

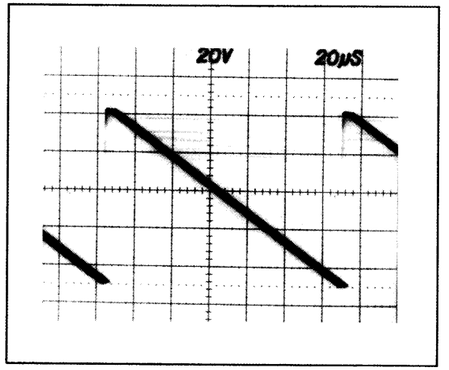
1



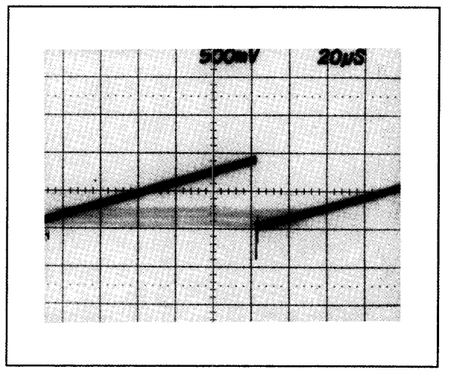
2



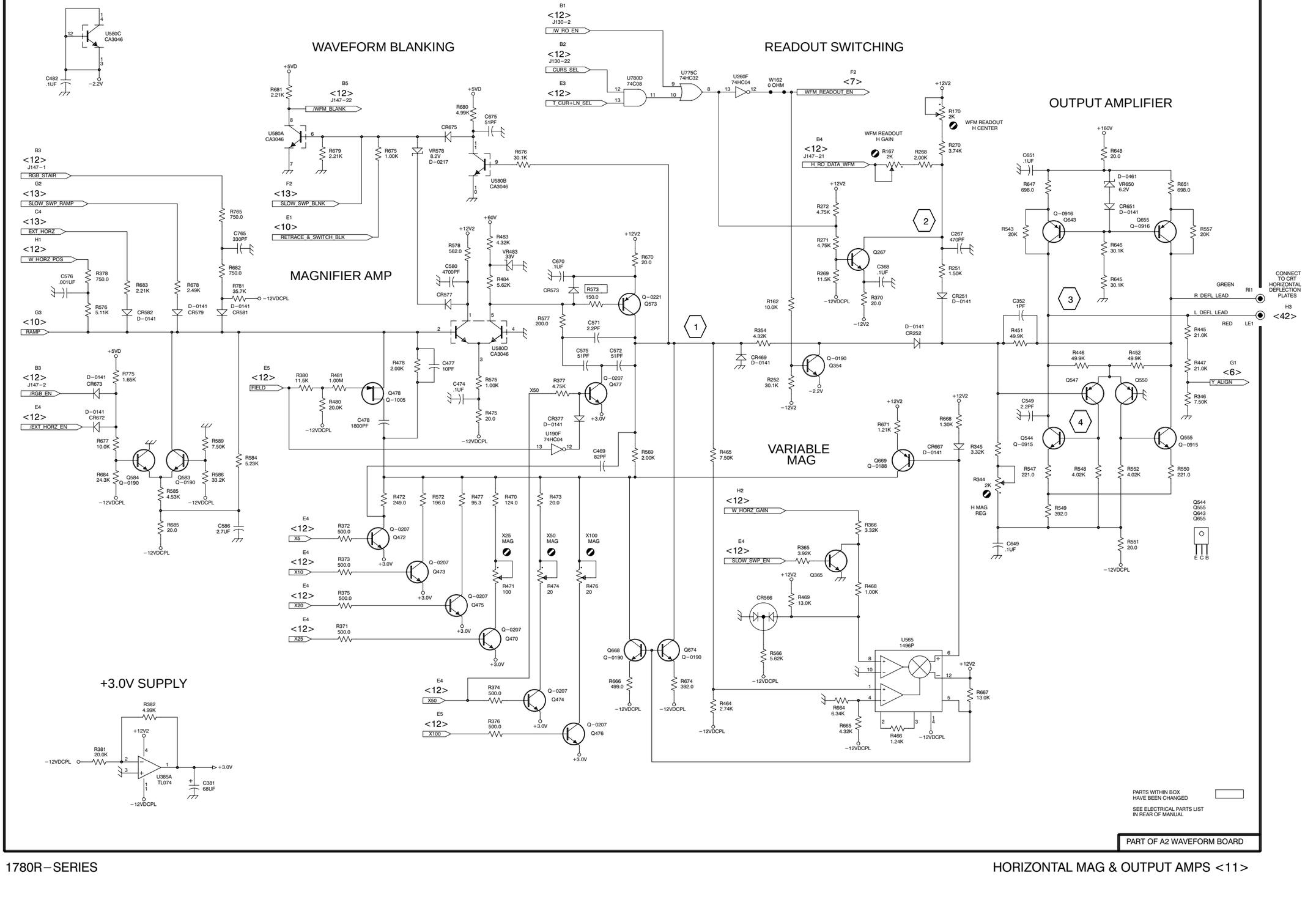
3



4



A2 Waveform Board <11> Component Locator


WAVEFORM BLANKING
READOUT SWITCHING
OUTPUT AMPLIFIER
MAGNIFIER AMP
VARIABLE MAG
+3.0V SUPPLY
U580C CA3046
C482 .1UF
−2.2V
+5VD
R681 2.21K
B5 <12> J147−22 /WFM_BLANK
U580A CA3046
R679 2.21K
R675 1.00K
CR675
R680 4.99K
C675 51PF
VR578 8.2V D−0217
R676 30.1K
U580B CA3046
F2 <13> SLOW_SWP_BLNK
E1 <10> RETRACE_&_SWITCH_BLK
B1 <12> J130−2 /W_RO_EN
B2 <12> J130−22 CURS_SEL
E3 <12> T_CUR+LN_SEL
U780D 74C08
U775C 74HC32
U260F 74HC04
W162 0 OHM
F2 <7> WFM_READOUT_EN
+12V2
R170 2K
WFM READOUT H CENTER
WFM READOUT H GAIN
R167 2K
B4 <12> J147−21 H_RO_DATA_WFM
R268 2.00K
R270 3.74K
+160V
R648 20.0
C651 .1UF
R647 698.0
D−0461 VR650 6.2V
R651 698.0
CR651 D−0141
Q−0916 Q643
Q655 Q−0916
R543 20K
R557 20K
R646 30.1K
R645 30.1K
B3 <12> J147−1 RGB_STAIR
G2 <13> SLOW_SWP_RAMP
C4 <13> EXT_HORZ
H1 <12> W_HORZ_POS
R765 750.0
C765 330PF
R682 750.0
R781 35.7K
−12VDCPL
C576 .001UF
R378 750.0
R683 2.21K
R678 2.49K
R576 5.11K
CR582 D−0141
D−0141 CR579
D−0141 CR581
G3 <10> RAMP
+60V
R483 4.32K
VR483 33V
R484 5.62K
R578 562.0
C580 4700PF
CR577
U580D CA3046
C670 .1UF
CR573
R573 150.0
Q−0221 Q573
R670 20.0
R577 200.0
C571 2.2PF
C575 51PF
C572 51PF
Q−0207 Q477
R377 4.75K
X50
CR377 D−0141
+3.0V
U190F 74HC04
C469 82PF
R569 2.00K
R465 7.50K
R162 10.0K
R354 4.32K
CR469 D−0141
Q−0190 Q354
R252 30.1K
−12V2
D−0141 CR252
C267 470PF
R251 1.50K
CR251 D−0141
Q267
R272 4.75K
R271 4.75K
R269 11.5K
C368 .1UF
R370 20.0
−12VDCPL
−12V2
C352 1PF
R451 49.9K
R446 49.9K
R452 49.9K
Q547
Q550
C549 2.2PF
Q544 Q−0915
Q555 Q−0915
R345 3.32K
R547 221.0
R548 4.02K
R552 4.02K
R550 221.0
R344 2K
H MAG REG
R549 392.0
C649 .1UF
R551 20.0
Q544 Q555 Q643 Q655
E C B
GREEN
R_DEFL_LEAD
RED
L_DEFL_LEAD
RI1
LE1
H3 <42>
CONNECT TO CRT HORIZONTAL DEFLECTION PLATES
R445 21.0K
R447 21.0K
R346 7.50K
G1 <6> Y_ALIGN
B3 <12> J147−2 /RGB_EN
D−0141 CR673
R775 1.65K
E4 <12> /EXT_HORZ_EN
D−0141 CR672
R677 10.0K
R589 7.50K
R584 5.23K
R684 24.3K
Q584 Q−0190
Q583 Q−0190
R586 33.2K
R585 4.53K
R685 20.0
C586 2.7UF
E5 <12> FIELD
R380 11.5K
R481 1.00M
R480 20.0K
Q478 Q−1005
C478 1800PF
R478 2.00K
C477 10PF
C474 .1UF
R575 1.00K
R475 20.0
R589 7.50K
R472 249.0
R572 196.0
R477 95.3
R470 124.0
R473 20.0
E4 <12> X5
R372 500.0
Q−0207 Q472
E4 <12> X10
R373 500.0
Q−0207 Q473
E4 <12> X20
R375 500.0
Q−0207 Q475
E4 <12> X25
R371 500.0
Q−0207 Q470
X25 MAG
X50 MAG
X100 MAG
R471 100
R474 20
R476 20
E4 <12> X50
R374 500.0
Q−0207 Q474
E5 <12> X100
R376 500.0
Q−0207 Q476
Q668 Q−0190
Q674 Q−0190
R666 499.0
R674 392.0
R464 2.74K
H2 <12> W_HORZ_GAIN
E4 <12> SLOW_SWP_EN
R366 3.32K
R365 3.92K
Q365
R468 1.00K
CR566
R469 13.0K
R566 5.62K
U565 1496P
R667 13.0K
R664 6.34K
R665 4.32K
R466 1.24K
R671 1.21K
Q669 Q−0188
CR667 D−0141
R668 1.30K
R382 4.99K
R381 20.0K
U385A TL074
C381 68UF
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A2 WAVEFORM BOARD

A2 Waveform Board <12> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C248	G1	U274	D4
C250	G1	U275	D5
C252	G2	U605A	H4
C707	H4	U605B	H3
C708	H4	U605C	H3
C710	H3	U605D	H4
C711	G3	U705	D3
C808	H3	U708	F2
C810	H3	U810A	H3
C906	H2	U810B	H5
C907	H5	U810C	H4
C908	H4	U810D	H2
J130	A1	VR905	G3
J147	A3		
		C1058	F4
R231	E2	C1060	E4
R232	E2	C1141	D4
R255	G2	C1145	D4
R256	G2	C1146	D4
R710	G3	C1150	D4
R808	G3	C1366	E4
		C1465	F4
U207	C3	C1578	G4
U217	D2	C1584	H4
U220	D1	C1591	G4
U231	E1	C160	E5
U245A	G2	C359	G2
U245B	G1	C457	C1
U245C	G1	C557	C1
U251B	G1	C660	D1
U251C	G2	C661	C1
U251D	G1		

12

Diagram 12 is made up of a DAC, sample and hold circuits (that output dc levels), and connectors. There are no waveform photos associated with this diagram. See Section 4 for more circuit information.

Table 12

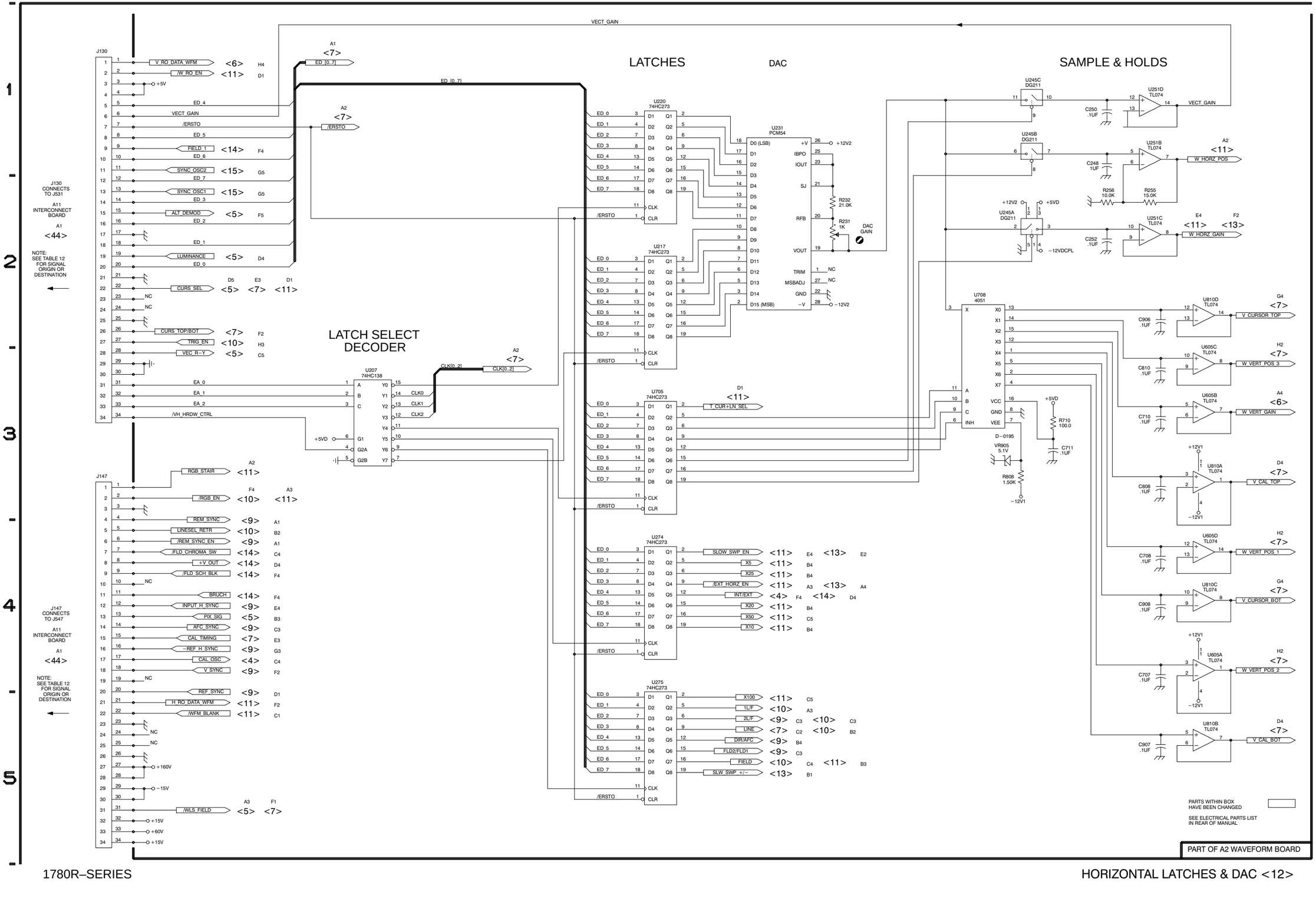
J130 Connects with these pins via the Interconnect Board.

J130 Pin#	To / From	Destination / Origin
1	→	J415-7 <21>
2	→	J415-58 <21>
5	→	J515-34 <21>
6	←	J885-37 <25>
7	→	J415-9 <21>
8	→	J515-35 <21>
9	←	J515-17 <21>
10	→	J515-37 <21>
11	←	J885-48 <25>
12	→	J515-38 <21>
13	←	J885-47 <25>
14	→	J515-33 <21>
15	→	J115-33 <34>
16	→	J415-29 <21>
18	→	J415-27 <21>
19	←	J885-39 <25>
20	→	J415-26 <21>
22	→	J515-57 <21>
26	→	J415-60 <21>
27	←	J885-21 <25> J180-7 <38>
28	→	J885-17 <25>
31	→	J515-15 <21>
32	→	J515-14 <21>
33	→	J515-13 <21>
34	→	J515-25 <21>

J147 Connects with these pins via the Interconnect Board.

J147 Pin#	To / From	Destination / Origin
1	→	J515-31 <21>
2	→	J515-30 <21>
4	→	J515-29 <21>
5	→	J415-55 <21>
6	→	J515-27 <21>
7	←	J885-31 <25>
8	→	J115-51 <34>
9	←	J885-25 <25>
11	←	J415-45 <21>
12	←	J885-22 <25>
13	←	J180-36 <38>
14	→	J115-29 <34>
15	←	J885-33 <25>
16	←	J415-57 <21> J115-18 <34> J180-5 <38>
17	→	J885-29 <25>
18	←	J515-26 <21> J885-30 <25> J115-31 <34> J380-1 <35> J180-9 <38>
20	←	J115-46 <34>
21	→	J415-5 <21>
22	←	J515-6 <21> J180-23 <38>
31	→	J515-39 <21>

A2 Waveform Board <12> Component Locator

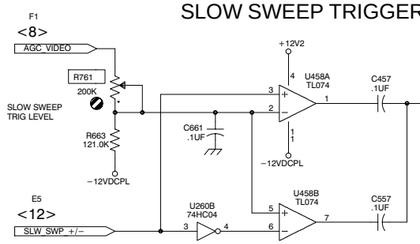

LATCHES
DAC
SAMPLE & HOLDS
LATCH SELECT DECODER
VECT_GAIN
ED_[0..7]
J130
J130 CONNECTS TO J531
A11 INTERCONNECT BOARD
A1 <44>
NOTE: SEE TABLE 12 FOR SIGNAL ORIGIN OR DESTINATION
V_RO_DATA_WFM
/W_RO_EN
+5V
ED_4
VECT_GAIN
/ERSTO
ED_5
FIELD_1
ED_6
SYNC_OSC2
ED_7
SYNC_OSC1
ED_3
ALT_DEMOD
ED_2
ED_1
LUMINANCE
ED_0
CURS_SEL
NC
CURS_TOP/BOT
TRIG_EN
VEC_R-Y
EA_0
EA_1
EA_2
/VH_HRDW_CTRL
U207 74HC138
CLK[0..2]
J147
J147 CONNECTS TO J547
RGB_STAIR
/RGB_EN
REM_SYNC
LINESEL_RETR
/REM_SYNC_EN
/FLD_CHROMA_SW
+V_OUT
/FLD_SCH_BLK
BRUCH
INPUT_H_SYNC
PIX_SIG
AFC_SYNC
CAL_TIMING
-REF_H_SYNC
CAL_OSC
V_SYNC
REF_SYNC
H_RO_DATA_WFM
/WFM_BLANK
+160V
-15V
/WLS_FIELD
+15V
+60V
U220 74HC273
U217 74HC273
U705 74HC273
U274 74HC273
U275 74HC273
ED_0
ED_1
ED_2
ED_3
ED_4
ED_5
ED_6
ED_7
CLK
CLR
U231 PCM54
D0 (LSB)
D15 (MSB)
+V
-V
IBPO
IOUT
SJ
RFB
VOUT
TRIM
MSBADJ
GND
+12V2
-12V2
R232 21.0K
R231 1K
DAC GAIN
T_CUR+LN_SEL
SLOW_SWP_EN
X5
X25
/EXT_HORZ_EN
INT/EXT
X20
X50
X10
X100
1L/F
2L/F
LINE
DIR/AFC
FLD2/FLD1
FIELD
SLW_SWP_+/-
U245C DG211
U245B DG211
U245A DG211
U251D TL074
U251B TL074
U251C TL074
C250 .1UF
C248 1UF
C252 .1UF
R256 10.0K
R255 15.0K
-12VDCPL
W_HORZ_POS
W_HORZ_GAIN
U708 4051
U810D TL074
U605C TL074
U605B TL074
U810A TL074
U605D TL074
U810C TL074
U605A TL074
U810B TL074
C906 .1UF
C810 .1UF
C710 .1UF
C808 .1UF
C708 .1UF
C908 .1UF
C707 .1UF
C907 .1UF
V_CURSOR_TOP
W_VERT_POS_3
W_VERT_GAIN
V_CAL_TOP
W_VERT_POS_1
V_CURSOR_BOT
W_VERT_POS_2
V_CAL_BOT
R710 100.0
C711 1UF
VR905 5.1V
R808 1.50K
D-0195
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A2 WAVEFORM BOARD

A2 Waveform Board <13> Component Locator

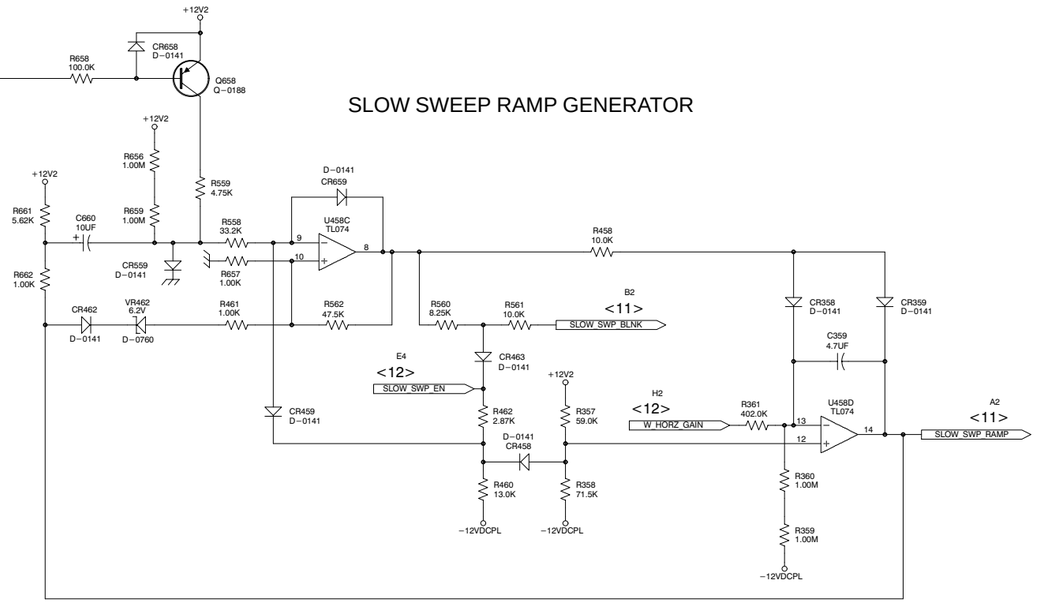
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C758	E5	R1578	G5	R659	D1
		R1583	G3	R661	D1
CR1060	F4	R1584	G4	R662	D2
CR1061	F4	R1585	G4	R663	B1
CR1141	E4	R1586	G3	R761	B1
CR1142	D4	R1589	C4	U1150	D3
CR1150	D3	R1590	B4	U1243	D4
CR1151	E3	R1591	C4	U1565	E3
CR1365	F3	R1593	B4	U1595A	C3
CR1366	F3	R1597	B4	U1595B	B4
CR1588	B4	R1598	B4	U260A	B2
CR1593	B4	R1599	A3	U260B	C1
CR1597	B3	R357	F2	U260C	B2
CR358	F2	R358	F2	U260D	B2
CR359	G2	R359	F2	U260E	B2
CR458	E2	R360	F2	U458A	C1
CR459	E2	R361	F2	U458B	C1
CR462	D2	R458	F2	U458C	E1
CR463	E2	R460	E2	U458D	G2
CR559	D2	R461	D2	U961	E4
CR658	D1	R462	E2		
CR659	E1	R558	D1	VR462	D2
		R559	D1		
L157	E5	R560	E2	W1043	E4
L758	E5	R561	E2	W1061	F4
		R562	E2	W1251	E3
Q1586	G4	R656	D1	W1365	F3
Q658	D1	R657	D2		
		R658	D1		
R1577	G5				

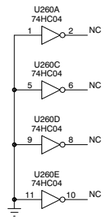
A2 Waveform Board <13> Component Locator

SLOW SWEEP TRIGGER

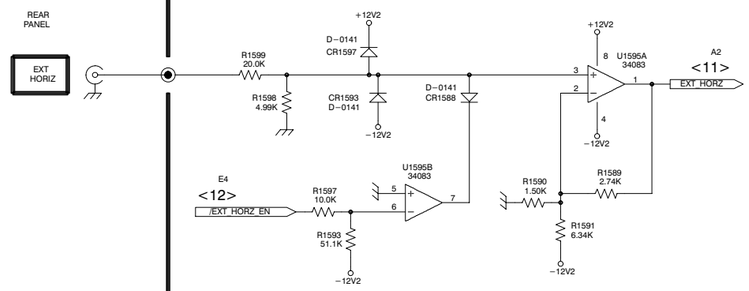


SLOW SWEEP RAMP GENERATOR

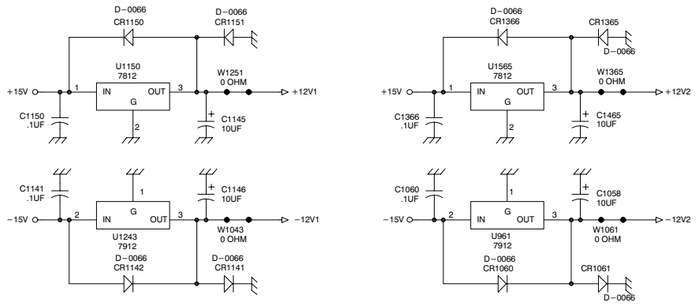




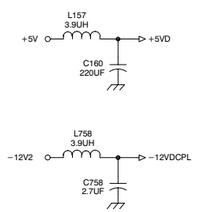
EXT HORIZONTAL INPUT AMPLIFIER



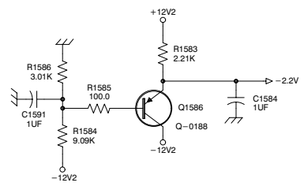
POST REGULATORS



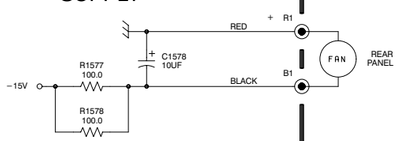
DECOUPLED SUPPLIES



–2.2V SUPPLY



FAN POWER SUPPLY



PARTS WITHIN BOX
HAVE BEEN CHANGED

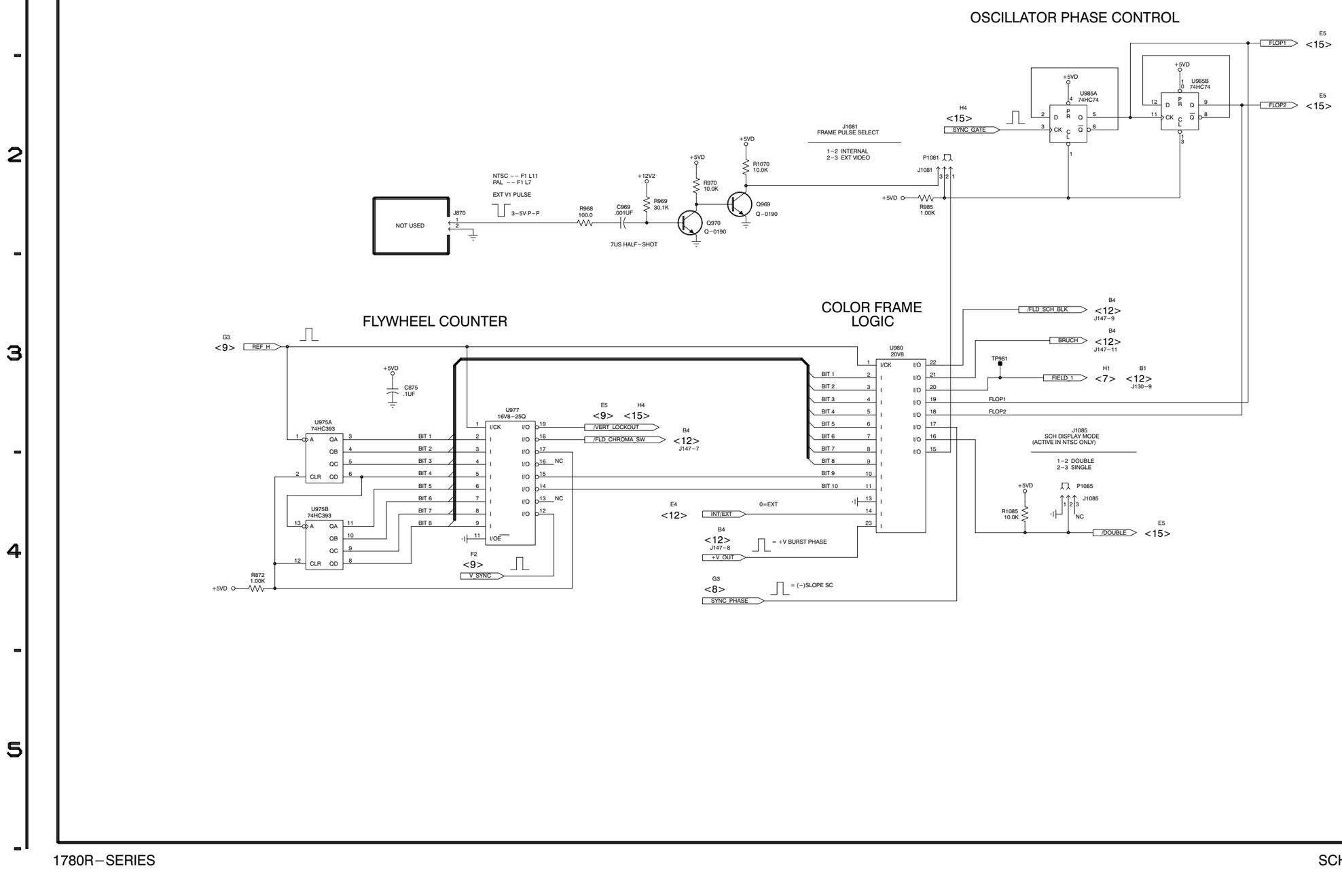
SEE ELECTRICAL PARTS LIST
IN REAR OF MANUAL

PART OF A2 WAVEFORM BOARD

A2 Waveform Board <14> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION
C875	B3
C969	D2
J1081	E2
J1085	F3
J870	C2
P1081	E2
P1085	F3
Q969	D2
Q970	D2
R1070	D2
R1085	F3
R872	B4
R968	C2
R969	D2
R970	D2
R985	E2
TP981	F3
U975A	B3
U975B	B4
U977	C3
U980	E3
U985A	F2
U985B	G2

A2 Waveform Board <14> Component Locator

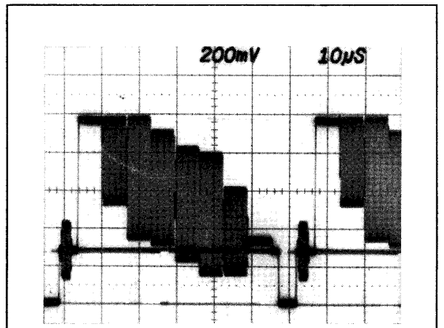

OSCILLATOR PHASE CONTROL
FLYWHEEL COUNTER
COLOR FRAME LOGIC
NOT USED
J870
NTSC -- F1 L11
PAL - - F1 L7
EXT V1 PULSE
3-5V P-P
R968 100.0
C969 .001UF
7US HALF-SHOT
+12V2
R969 30.1K
+5VD
R970 10.0K
Q970 Q-0190
Q969 Q-0190
R1070 10.0K
J1081
FRAME PULSE SELECT
1-2 INTERNAL
2-3 EXT VIDEO
P1081
R985 1.00K
H4
<15>
SYNC_GATE
U985A 74HC74
U985B 74HC74
FLOP1
FLOP2
E5
<15>
G3
<9>
REF_H
C875 .1UF
U975A 74HC393
U975B 74HC393
BIT 1
BIT 2
BIT 3
BIT 4
BIT 5
BIT 6
BIT 7
BIT 8
R872 1.00K
U977 16V8-25Q
I/CK
I/OE
NC
F2
V_SYNC
E5 H4
<9> <15>
/VERT_LOCKOUT
/FLD_CHROMA_SW
B4
<12>
J147-7
U980 20V8
BIT 9
BIT 10
E4
<12>
INT/EXT
0=EXT
B4
<12>
J147-8
+V_OUT
= +V BURST PHASE
G3
<8>
SYNC_PHASE
= (-)SLOPE SC
/FLD_SCH_BLK
B4
<12>
J147-9
BRUCH
B4
<12>
J147-11
TP981
FIELD_1
H1
<7>
B1
<12>
J130-9
J1085
SCH DISPLAY MODE
(ACTIVE IN NTSC ONLY)
1-2 DOUBLE
2-3 SINGLE
P1085
J1085
R1085 10.0K
/DOUBLE
E5
<15>
PARTS WITHIN BOX
HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST
IN REAR OF MANUAL
PART OF A2 WAVEFORM BOARD

A2 Waveform Board <15> Component Locator

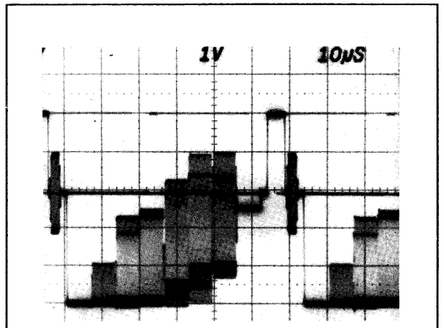
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C991	G1	CR1288	D3	R1257	F3	R1386	B3	R994	G5
C1086	E3	CR1357	F3	R1258	F3	R1390	C3	R996	G5
C1090	G1	CR1358	F2	R1259	F2	R1391	E3		
C1091	E3	CR1360	G3	R1281	C3	R1392	E3	TP1290	C3
C1093	H1			R1282	C3	R1395	D3		
C1094	E3	J986	E4	R1283	C4	R1396	D5	U1097	H4
C1194	E3			R1284	B4	R1397	D4	U1287A	C4
C1195	C3	L1350	E2	R1285	C4	R1398	D4	U1287B	B4
C1284	C4			R1286	B4	R1399	D4	U1287C	B4
C1287	D3	P986	E5	R1287	B3	R1448	B2	U1287D	B3
C1288	D3			R1290	D3	R1449	B2	U1357A	F1
C1291	D3	Q1092	E3	R1292	B3	R1450	B1	U1357B	F1
C1347	B2	Q1293A	B3	R1293	B3	R1451	B2	U1357C	F3
C1351	E2	Q1293B	B3	R1296	C3	R1452	C2	U1357D	F2
C1364	G3	Q1358	F1	R1297	H2	R1453	E2	U1397A	D4
C1386	B3	Q1359	F1	R1298	H2	R1455	C1	U1397B	C3
C1390	B3	Q1395	D5	R1352	F1	R1457	F1	U1397C	C4
C1391	B4	Q1396	D5	R1353	F1	R1458	F3	U1397D	D3
C1394	D5	Q1450	C2	R1354	F1	R1494	D5	U1455	D1
C1395	E4	Q1451	B2	R1355	E2	R1495	C5	U1460	D1
C1397	C5	Q1548	B2	R1356	F3	R1496	C5	U1490A	A4
C1490	H1	Q1551	B1	R1357	C1	R1548	C2	U1490B	A4
C1497	H1			R1359	F2	R1549	B2	U1497A	B5
C1550	B1	R1086	E2	R1360	F1	R1550	B2	U1497B	B5
C1553	D2	R1090	E3	R1361	F2	R1552	C1	U990	F4
C1554	D1	R1091	E3	R1362	F2	R1556	C1	U995	F4
C1555	D2	R1185	D3	R1363	F1	R1557	C1	U996A	G4
C1560	D1	R1190	E3	R1381	C4	R1558	C1	U996B	G4
C1561	D1	R1194	B3	R1382	C4	R987	E4		
C1563	D1	R1196	E3	R1384	C4	R991	G3	Y1190	E3
		R1197	B2	R1385	B3	R992	G4		
CR1259	G1								

15

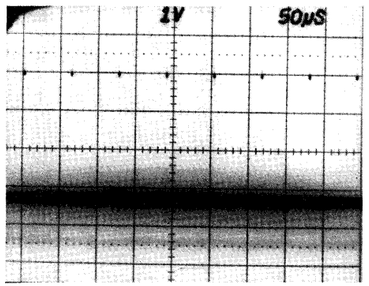
1



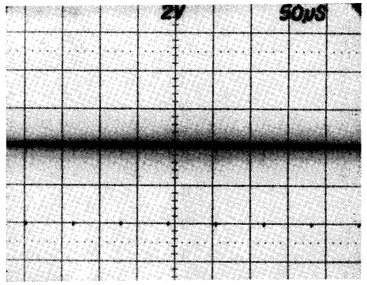
2



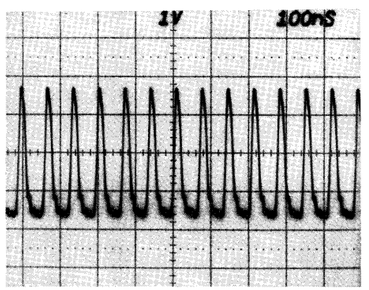
3



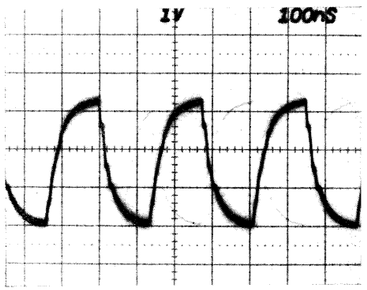
4



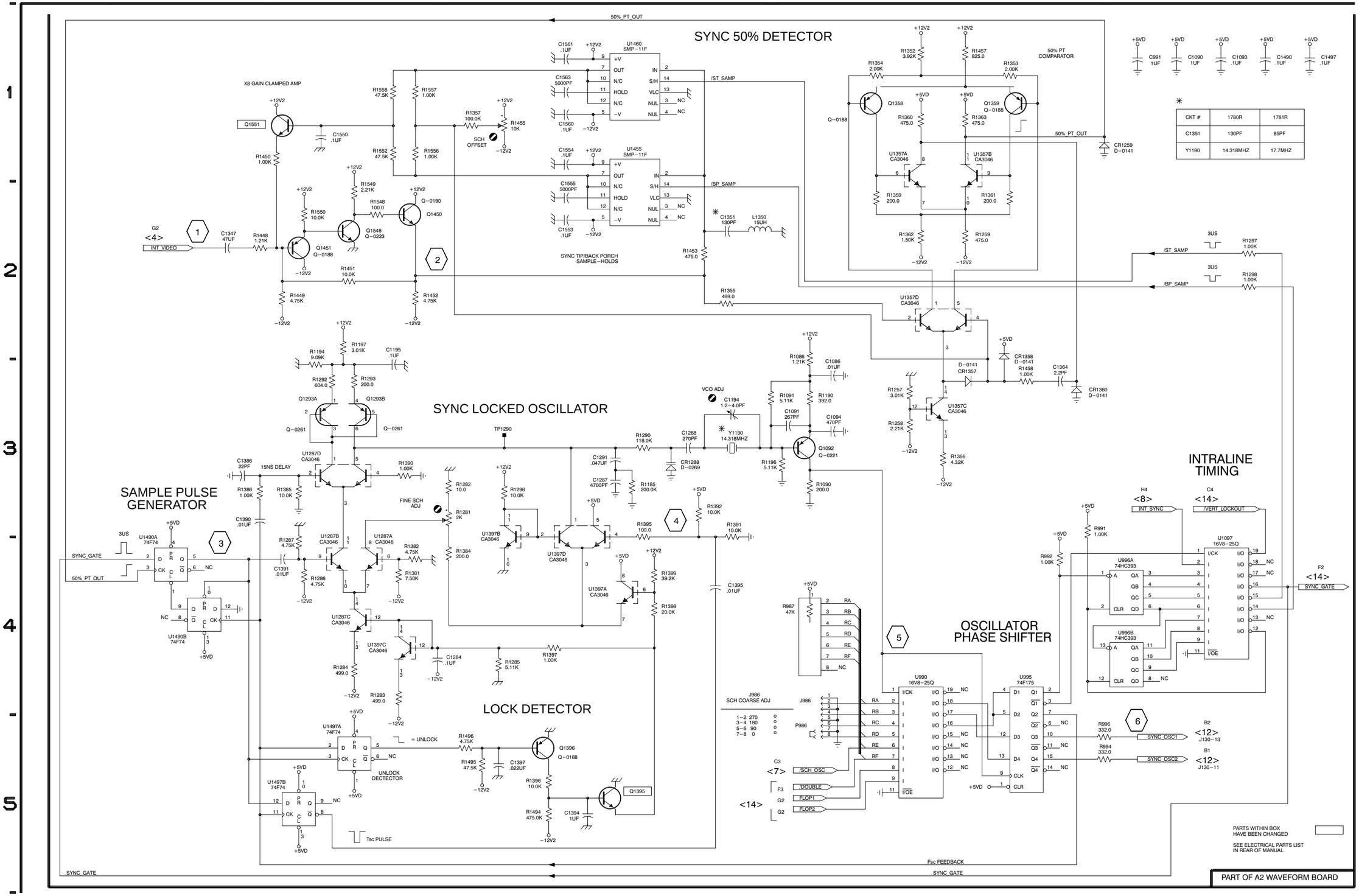
5

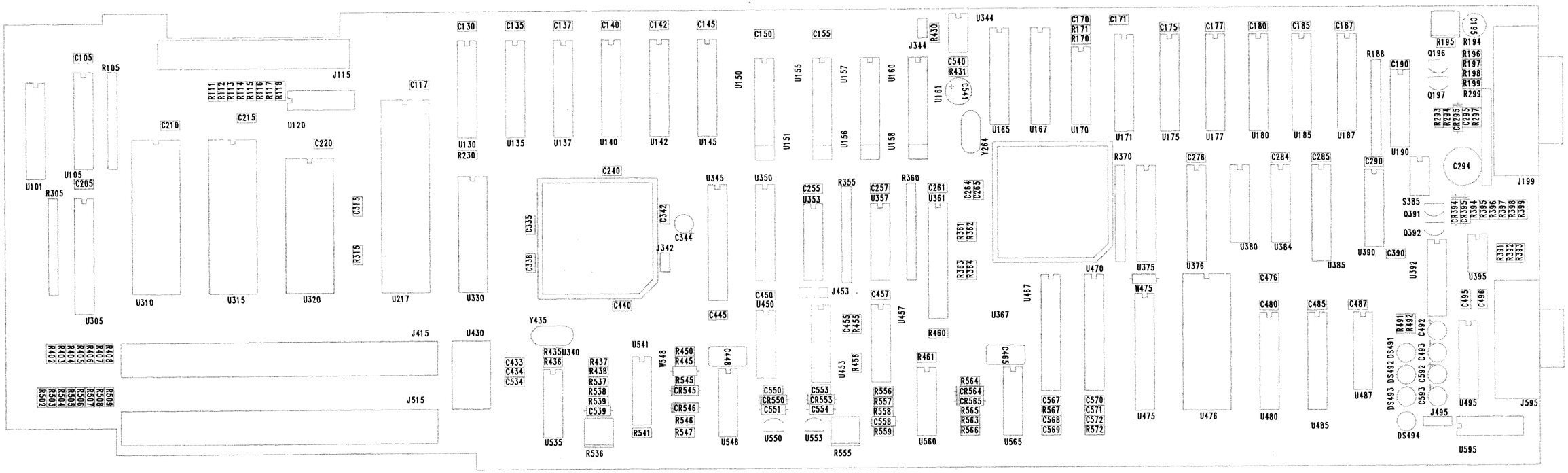


6



SCH display on.


SYNC 50% DETECTOR
50% PT_OUT
X8 GAIN CLAMPED AMP
Q1551
C1550 .1UF
R1450 1.00K
R1558 47.5K
R1557 1.00K
R1552 47.5K
R1556 1.00K
R1357 100.0K
R1455 10K
SCH OFFSET
+12V2
−12V2
U1460 SMP−11F
U1455 SMP−11F
C1561 .1UF
C1563 5000PF
C1560 .1UF
C1554 .1UF
C1555 5000PF
C1553 .1UF
/ST_SAMP
/BP_SAMP
SYNC TIP/BACK PORCH SAMPLE−HOLDS
50% PT COMPARATOR
Q1358
Q1359 Q−0188
Q−0188
R1352 3.92K
R1457 825.0
R1354 2.00K
R1353 2.00K
R1360 475.0
R1363 475.0
U1357A CA3046
U1357B CA3046
R1359 200.0
R1361 200.0
R1362 1.50K
R1259 475.0
CR1259 D−0141
+5VD
C991 1UF
C1090 1UF
C1093 .1UF
C1490 .1UF
C1497 .1UF
CKT #
1780R
1781R
C1351
130PF
85PF
Y1190
14.318MHZ
17.7MHZ
G2 <4>
INT_VIDEO
C1347 47UF
R1448 1.21K
R1550 10.0K
R1549 2.21K
R1548 100.0
Q−0190 Q1450
Q1548 Q−0223
Q1451 Q−0188
R1451 10.0K
R1449 4.75K
R1452 4.75K
C1351 130PF
L1350 15UH
R1453 475.0
R1355 499.0
U1357D CA3046
3US
R1297 1.00K
R1298 1.00K
SYNC LOCKED OSCILLATOR
R1194 9.09K
R1197 3.01K
C1195 .1UF
R1292 604.0
R1293 200.0
Q1293A
Q1293B
Q−0261
U1287D CA3046
C1386 22PF
15NS DELAY
R1386 1.00K
R1385 10.0K
R1390 1.00K
C1390 .01UF
TP1290
R1290 118.0K
C1288 270PF
CR1288 D−0269
VCO ADJ
C1194 1.2−4.0PF
Y1190 14.318MHZ
C1291 .047UF
C1287 4700PF
R1185 200.0K
R1196 5.11K
R1091 5.11K
C1091 267PF
R1190 392.0
C1094 470PF
Q1092 Q−0221
R1090 200.0
R1086 1.21K
C1086 .01UF
D−0141 CR1357
CR1358 D−0141
R1458 1.00K
C1364 2.2PF
CR1360 D−0141
R1257 3.01K
U1357C CA3046
R1258 2.21K
R1356 4.32K
SAMPLE PULSE GENERATOR
FINE SCH ADJ
R1282 10.0
R1281 2K
R1384 200.0
R1296 10.0K
U1397B CA3046
U1397D CA3046
R1395 100.0
R1392 10.0K
R1391 10.0K
U1397A CA3046
R1399 39.2K
R1398 20.0K
C1395 .01UF
U1490A 74F74
U1490B 74F74
SYNC_GATE
50% PT_OUT
NC
R1287 4.75K
R1286 4.75K
C1391 .01UF
U1287B CA3046
U1287A CA3046
R1382 4.75K
R1381 7.50K
U1287C CA3046
U1397C CA3046
C1284 .1UF
R1285 5.11K
R1397 1.00K
R1284 499.0
R1283 499.0
LOCK DETECTOR
U1497A 74F74
= UNLOCK
R1496 4.75K
R1495 47.5K
C1397 .022UF
Q1396 Q−0188
R1396 10.0K
R1494 475.0K
C1394 1UF
Q1395
U1497B 74F74
UNLOCK DECTECTOR
Tsc PULSE
J986 SCH COARSE ADJ
1−2 270
3−4 180
5−6 90
7−8 0
P986
C3 <7>
<14>
/SCH_OSC
/DOUBLE
FLOP1
FLOP2
F3
G2
U990 16V8−25Q
U995 74F175
OSCILLATOR PHASE SHIFTER
R996 332.0
R994 332.0
SYNC_OSC1
SYNC_OSC2
B2 <12> J130−13
B1 <12> J130−11
INTRALINE TIMING
H4 <8>
INT_SYNC
C4 <14>
/VERT_LOCKOUT
R991 1.00K
R992 1.00K
U1097 16V8−25Q
U996A 74HC393
U996B 74HC393
F2 <14>
SYNC_GATE
Fsc FEEDBACK
SYNC_GATE
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A2 WAVEFORM BOARD

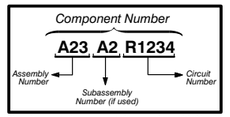


MPU CIRCUIT BOARD (A5)

A5 Microprocessor Board <16> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C135	G3	C440	H4	R430	A5	U340	B1
C137	H3	C445	H4	R431	B5	U344	A5
C140	H3	C450	G4	R435	B3	U345	E5
C142	G4	C534	H4	R436	B2	U350	E4
C145	H4	C540	A5			U535A	A3
C240	H4	C541	A5	U120A	E2	U535B	A3
C335	G4			U120B	E2		
C336	H4	J342	B4	U135	G2	Y435	B3
C342	H4	J344	A5	U137	G1		
C344	G4			U140	G3		
C433	B3	R355	E1	U142	G4		
C434	B2	R360	E3	U145	G3		

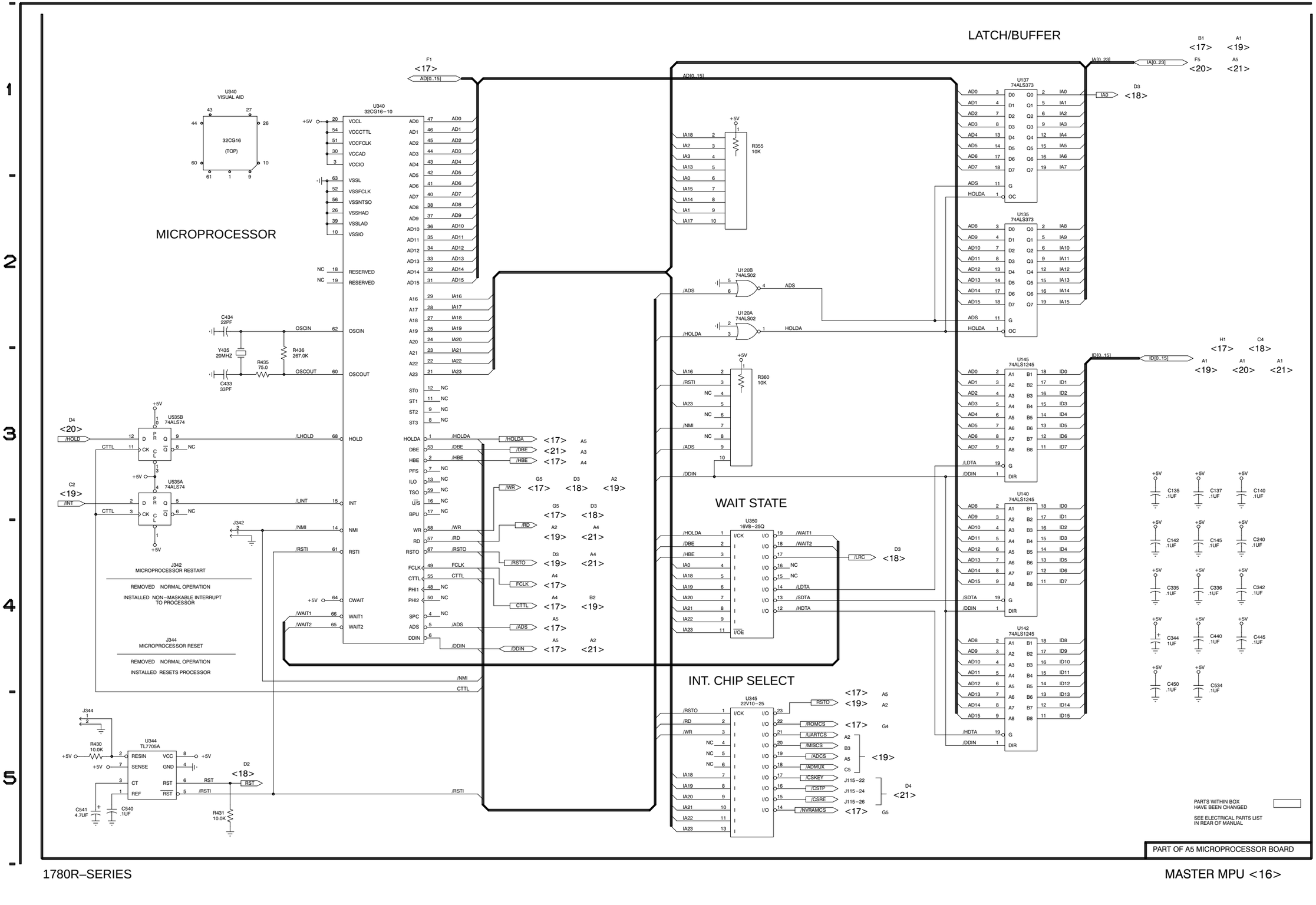
COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

STATIC SENSITIVE DEVICES

A5 Microprocessor Board <16> Component Locator



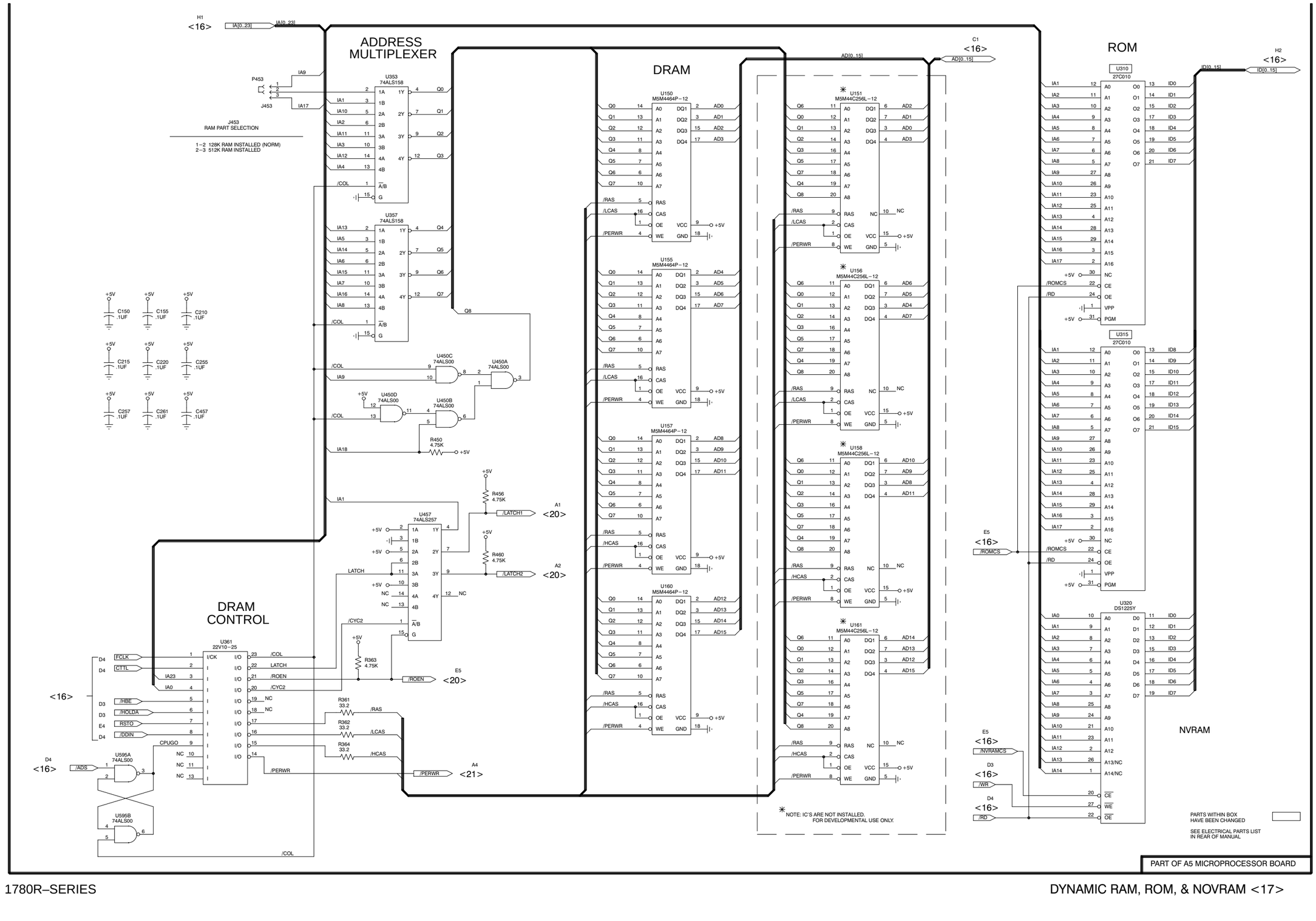
1780R–SERIES

MASTER MPU <16>

A5 Microprocessor Board <17> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C150	A2	U150	E1
C155	A2	U151	F1
C210	B2	U155	E2
C215	A3	U156	F2
C220	A3	U157	E3
C255	B3	U158	F3
C257	A3	U160	E4
C261	A3	U161	F4
C457	B3	U310	G1
		U315	G2
J453	B1	U320	G4
		U353	C1
P453	B1	U357	C2
		U361	B4
R361	C5	U450A	D3
R362	C5	U450B	C3
R363	C4	U450C	C3
R364	C5	U450D	C3
R450	C3	U457	C4
R456	C3	U595A	A5
R460	C4	U595B	A5

A5 Microprocessor Board <17> Component Locator


ADDRESS MULTIPLEXER
DRAM
ROM
DRAM CONTROL
NVRAM
J453
RAM PART SELECTION
1–2 128K RAM INSTALLED (NORM)
2–3 512K RAM INSTALLED
U353 74ALS158
U357 74ALS158
U361 22V10–25
U450A 74ALS00
U450B 74ALS00
U450C 74ALS00
U450D 74ALS00
U595A 74ALS00
U595B 74ALS00
U457 74ALS257
U150 M5M4464P–12
U155 M5M4464P–12
U157 M5M4464P–12
U160 M5M4464P–12
U151 M5M44C256L–12
U156 M5M44C256L–12
U158 M5M44C256L–12
U161 M5M44C256L–12
U310 27C010
U315 27C010
U320 DS1225Y
R450 4.75K
R456 4.75K
R460 4.75K
R363 4.75K
R361 33.2
R362 33.2
R364 33.2
C150 .1UF
C155 .1UF
C210 .1UF
C215 .1UF
C220 .1UF
C255 .1UF
C257 .1UF
C261 .1UF
C457 .1UF
NOTE: IC'S ARE NOT INSTALLED. FOR DEVELOPMENTAL USE ONLY.
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A5 MICROPROCESSOR BOARD

A5 Microprocessor Board <18> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION
C177	H4
C185	H4
C187	H4
C264	C2
C265	C2
C285	H4
C455	E5
C476	H4
C480	H4
R370	G1
R455	E4
U165	F3
U167	B3
U367	D1
U375	E1
U453A	E5
U453B	D5
U475	G1
U476	F1
W475	D1
Y264	D2

A5 Microprocessor Board <18> Component Locator

PROCESSOR

LATCH

PROGRAM MEMORY

STATIC RAM

80C451 ONLY

W475 0 OHM

ADC8

ADC[0..8]

AC[0..7]

U367 80C451

U375 74HCT573

U476 27C64

U475 6116

+5V

R370 10K

80C451 (top)

(PLCC BOTTOM)

C265 33PF

Y264 12MHZ

C264 33PF

B5 <16>

RST

RESET

EA/VP

X1

X2

INT0

INT1

T0

T1

P1.0

P1.1

P1.2

P1.3

P1.4

P1.5

P1.6

P1.7

VCC

GND

P0.0 P0.1 P0.2 P0.3 P0.4 P0.5 P0.6 P0.7

P2.0 P2.1 P2.2 P2.3 P2.4 P2.5 P2.6 P2.7

RD

WR

PSEN

ALE/P

TXD

RXD

P4.0 P4.1 P4.2 P4.3 P4.4 P4.5 P4.6 P4.7

P5.0 P5.1 P5.2 P5.3 P5.4 P5.5 P5.6 P5.7

P6.0 P6.1 P6.2 P6.3 P6.4 P6.5 P6.6 P6.7

U167 16V8-15

<21>

J415-57 J415-45 J515-17 J515-26

-REF_H_SYNC

BRUCH

FIELD_1

V_SYNC

WRO_INHB

VRO_INHB

A5 <20>

RO_RESET

VRO_BURST

VRO_ONLY

VRO_INHB

VRO_START

V_UNBLANK

V_FOCUS

V_SKIP_WRO

WRO_START

WRO_INHB

WRO_ONLY

WRO_BURST

<16>

/RD /WR /LRC IA0

ODS IDS BFLAG AFLAG

H2 <16>

ID[0..7]

DATA LATCH

U165 74HCT574

WLS_LINE

WLS_FIELD

W_FOCUS

V_UNBLANK

V_FOCUS

INHIBIT_RO

V_SKIP_WRO

/WLS_FIELD

/W_FOCUS

V_LINESEL

/V_FOCUS

RO_INHB

RO_STARTV

RO_START

A4 <20>

<21>

J515-18 J515-39 J415-23 J415-19 J415-21

ONE-SHOT

U453B 74HCT221

U453A 74HCT221

C455 2200PF

R455 21.0K

LINESEL_RETR

F4 <21> J415-55

C177 .1UF

C185 .1UF

C187 .1UF

C285 .1UF

C476 .1UF

C480 .1UF

PARTS WITHIN BOX HAVE BEEN CHANGED

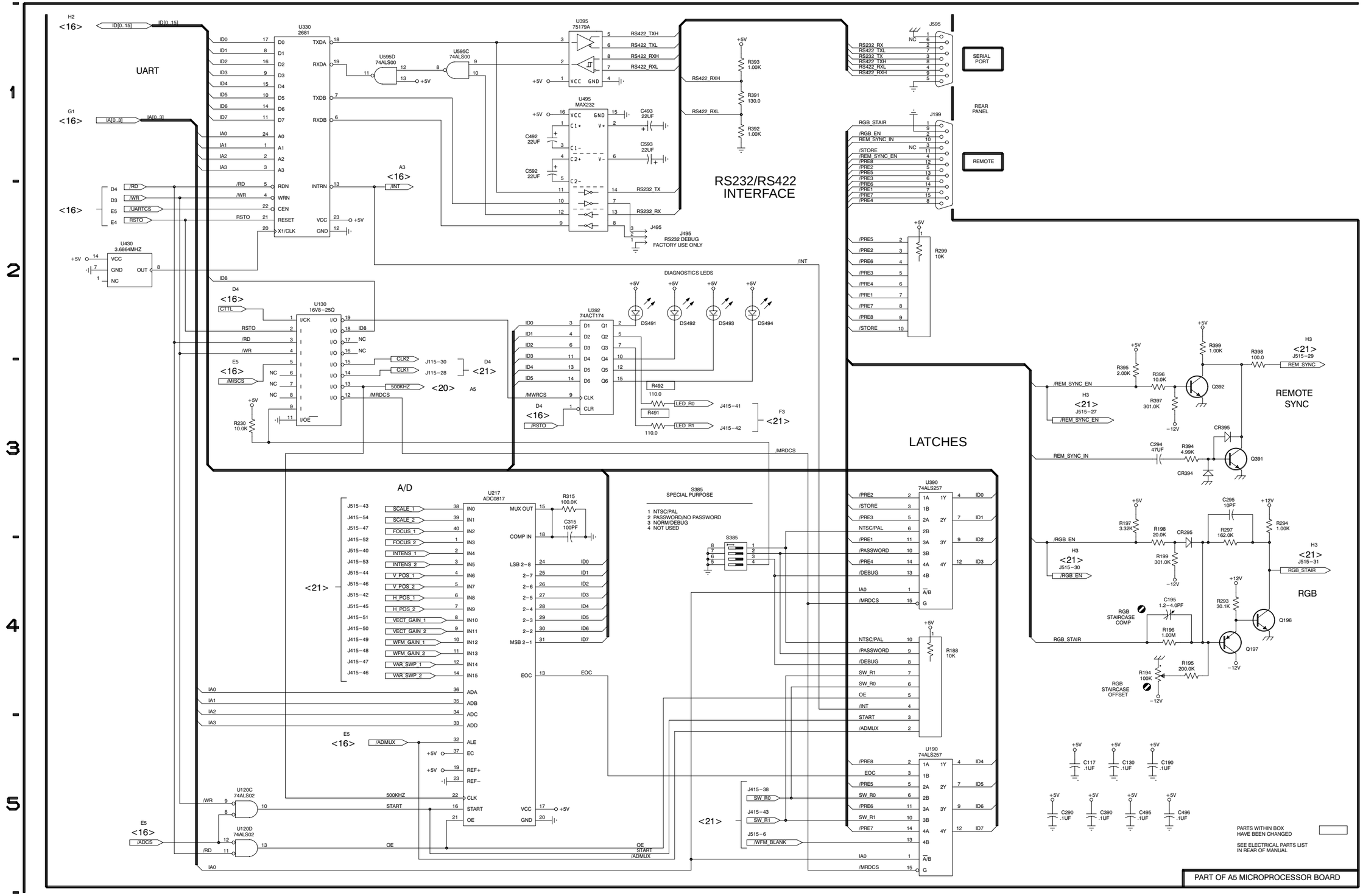
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL

PART OF A5 MICROPROCESSOR BOARD

A5 Microprocessor Board <19> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C117	G5	J495	D2	R395	G3
C130	G5	J595	F1	R396	G3
C190	G5			R397	G3
C195	G4	Q196	H4	R398	H3
C290	G5	Q197	H4	R399	H2
C294	G3	Q391	H3	R491	D3
C295	H3	Q392	G3	R492	D3
C315	D3				
C390	G5	R188	F4	S385	E4
C492	D1	R194	G4		
C493	D1	R195	G4	U120C	B5
C495	G5	R196	G4	U120D	B5
C496	G5	R197	G3	U130	B2
C592	D1	R198	G4	U190	F5
C593	D1	R199	G4	U217	C3
		R230	B3	U330	B1
CR295	G4	R293	H4	U390	F3
CR394	H3	R294	H3	U392	D2
CR395	H3	R297	H4	U395	D1
		R299	F2	U430	A2
DS491	D2	R315	D3	U495	D1
DS492	D2	R391	E1	U595C	C1
DS493	E2	R392	E1	U595D	C1
DS494	E2	R393	E1		
		R394	G3		
J199	F1				

A5 Microprocessor Board <19> Component Locator

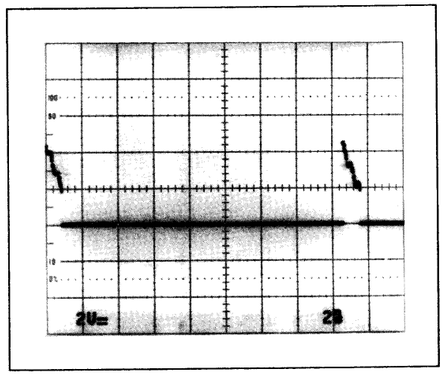

UART
RS232/RS422 INTERFACE
LATCHES
A/D
REMOTE SYNC
RGB
DIAGNOSTICS LEDS
S385 SPECIAL PURPOSE
1 NTSC/PAL
2 PASSWORD/NO PASSWORD
3 NORM/DEBUG
4 NOT USED
J495 RS232 DEBUG FACTORY USE ONLY
SERIAL PORT
REAR PANEL
REMOTE
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A5 MICROPROCESSOR BOARD

A5 Microprocessor Board <20> Component Locator

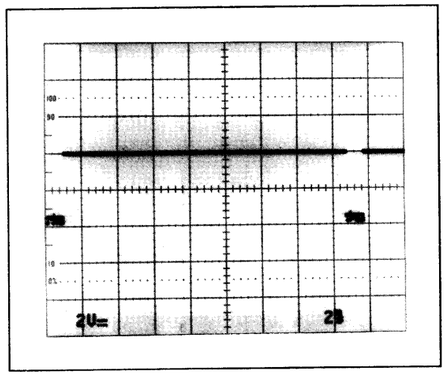
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C170	B4	R170	A4	U177	C1
C171	G4	R171	A4	U180	C3
C175	G4	R437	F1	U185	C4
C180	G4	R438	F1	U187	C5
C276	G4	R445	H2	U376	B5
C284	G4	R461	F3	U380	A2
C448	G1	R536	G1	U384	A1
C465	G3	R537	F1	U385	A2
C485	G4	R538	F1	U467	E2
C487	G4	R539	H1	U470	E1
C539	H1	R541	G2	U480	E4
C550	G4	R545	H1	U485	E3
C551	G4	R546	G2	U487	E4
C553	G4	R547	G2	U541A	F1
C554	G4	R555	G3	U541B	H1
C558	H3	R556	F2	U541C	G2
C567	F2	R557	F3	U541D	H2
C568	E2	R558	F3	U548	G1
C569	E3	R559	H3	U550	G4
C570	E3	R563	G2	U553	G3
C571	E2	R564	H2	U560A	F3
C572	F1	R565	G2	U560B	H3
		R566	G2	U560C	G2
CR545	H2	R567	E2	U560D	H2
CR546	H2	R572	E1	U565	G3
CR550	G4				
CR553	G4	U170	B3	W548	F1
CR564	H2	U171	B4		
CR565	H2	U175	C2		

20

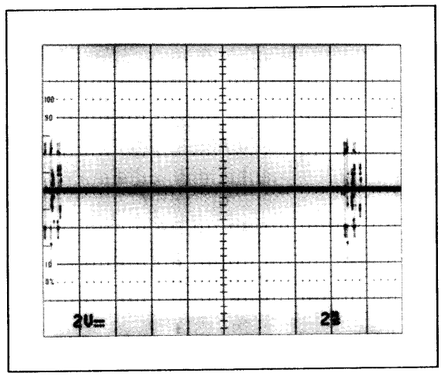
1

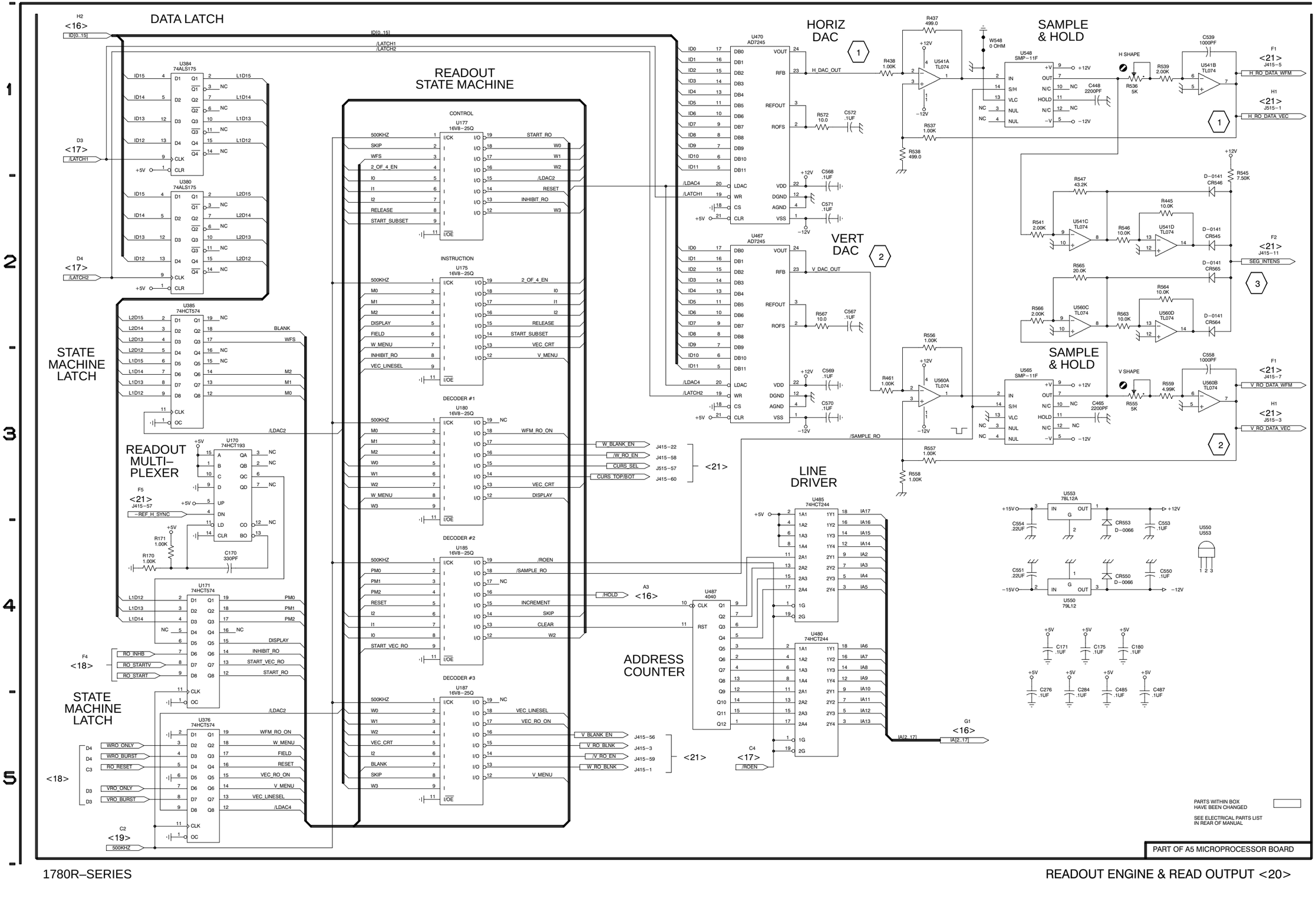


2



3




DATA LATCH
READOUT STATE MACHINE
HORIZ DAC
VERT DAC
SAMPLE & HOLD
SAMPLE & HOLD
STATE MACHINE LATCH
READOUT MULTI–PLEXER
STATE MACHINE LATCH
ADDRESS COUNTER
LINE DRIVER
CONTROL
INSTRUCTION
DECODER #1
DECODER #2
DECODER #3
ID[0..15]
/LATCH1
/LATCH2
/LDAC2
/SAMPLE_RO
H_DAC_OUT
V_DAC_OUT
W_BLANK_EN
/W_RO_EN
CURS_SEL
CURS_TOP/BOT
V_BLANK_EN
/V_RO_EN
/HOLD
/ROEN
IA[2..17]
H SHAPE
V SHAPE
H_RO_DATA_WFM
H_RO_DATA_VEC
SEG_INTENS
V_RO_DATA_WFM
V_RO_DATA_VEC
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A5 MICROPROCESSOR BOARD

A5 Microprocessor Board <21> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION
C105	A3
C205	A3
J115	D2
J415	F1
J515	H1
R105	B1
R111	C1
R112	C1
R113	C1
R114	C1
R115	C2
R116	C2
R117	C2
R118	C2
R305	B2
R402	C4
R403	C5
R404	C4
R405	C3
R406	C3
R407	C3
R408	C4
R502	C5
R503	C4
R504	C4
R505	C3
R506	C4
R507	C3
R508	C3
R509	C3
U101	B4
U105	B1
U305	B3

Table 21

J415 Connects with these pins via the Interconnect Board.

J415 Pin#	To / From	Destination / Origin
1	←	J180-16 <38>
3	←	J180-45 <38>
5	←	J147-21 <12>
7	←	J130-1 <12>
9	←	J130-7 <12> J885-11 <25> J115-35 <34>
11	←	J180-38 <38>
19	←	J180-31 <38>
21	←	J100-5 <41>
22	←	J180-28 <38>
23	←	J200-2 <42>
25	←	J180-56 <38>
26	↔	J130-20 <12> J885-8 <25> J115-10 <34> J380-21 <35> J180-55 <38>
27	↔	J130-18 <12> J885-7 <25> J115-9 <34> J380-22 <35> J180-54 <38>
29	↔	J130-16 <12> J885-6 <25> J115-7 <34> J380-19 <35> J180-53 <38>
37	←	J380-5 <35>
38	→	J150-1 <45>
39	←	J116-1 <45> J150-4 <45>
41	←	J150-2 <45>
42	←	J116-2 <45>
43	→	J116-3 <45>
45	→	J147-11 <12>
55	←	J147-5 <12>
56	←	J180-27 <38>
57	→	J147-16 <12>
58	←	J130-2 <12>
59	←	J885-38 <25>
60	←	J130-26 <12>

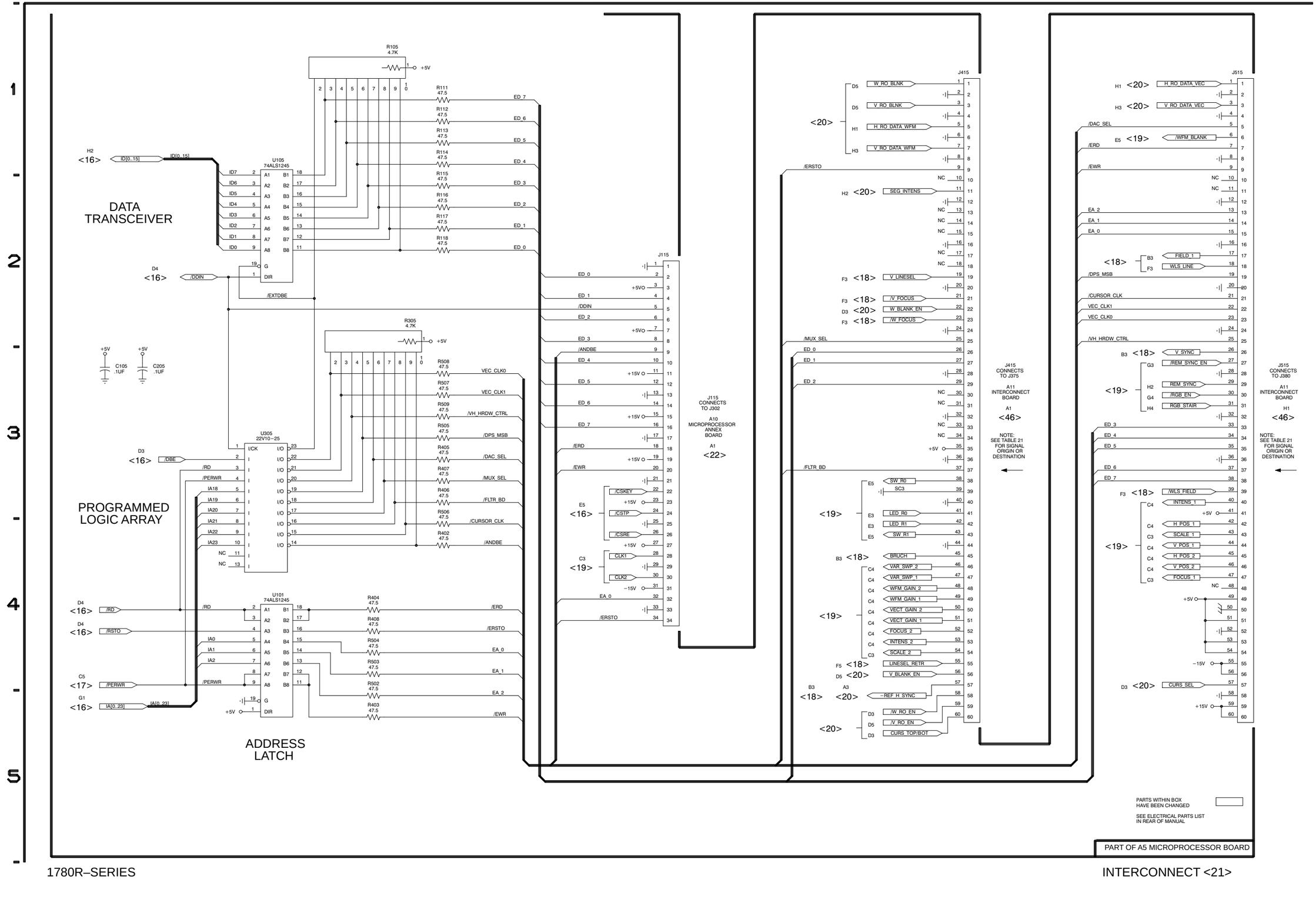
J515 Connects with these pins via the Interconnect Board.

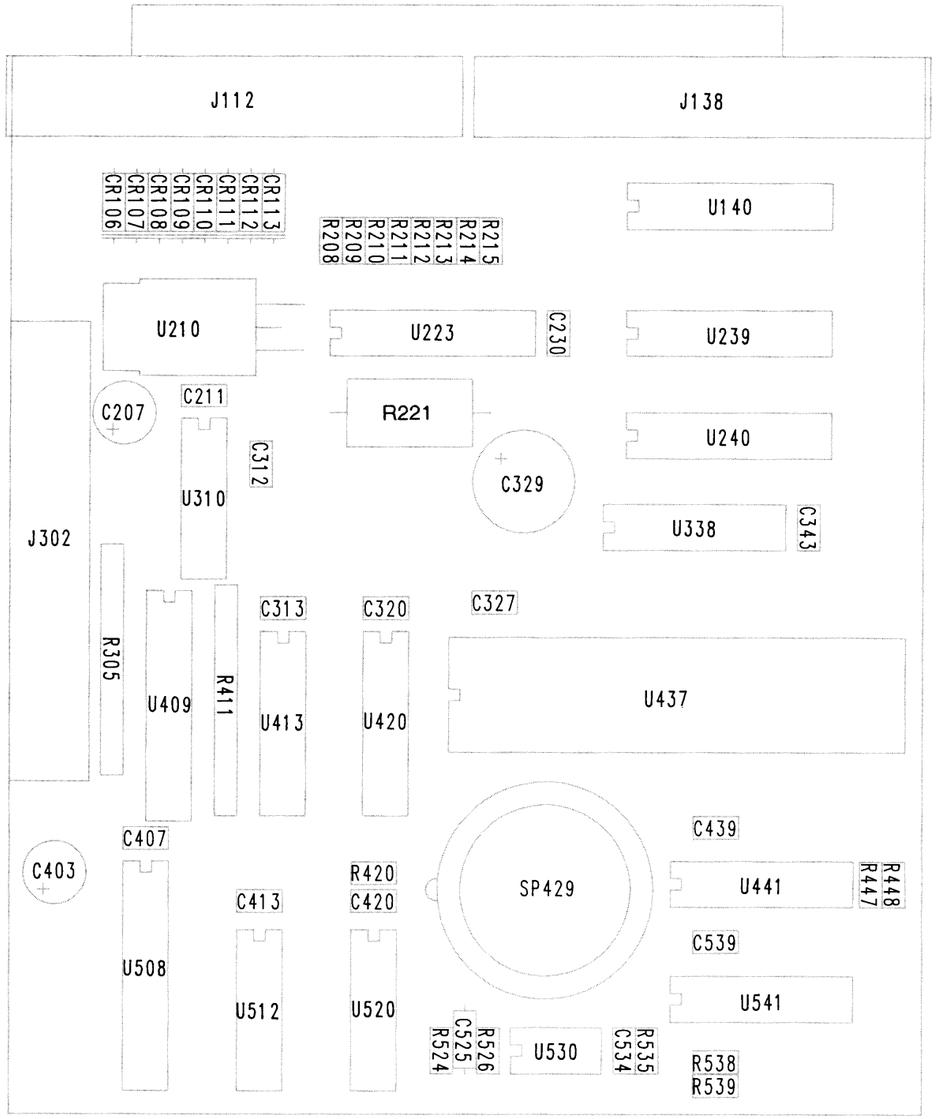
J515 Pin#	To / From	Destination / Origin
1	←	J885-34 <25>
3	←	J885-36 <25>
5	←	J180-57 <38>
6	→	J147-22 <12>
7	←	J380-3 <35>
9	←	J115-54 <34> J380-4 <35> J180-58 <38>
13	←	J115-58 <34> J130-33 <12> J380-31 <35> J180-15 <38>
14	←	J115-55 <34> J130-32 <12> J380-34 <35> J180-17 <38>
15	←	J115-56 <34> J130-31 <12> J380-33 <35> J180-25 <38>
17	→	J130-9 <12>
18	←	J180-30 <38>
19	←	J115-53 <34>
21	←	J180-34 <38>
22	←	J885-12 <25>
23	←	J885-13 <25>
25	←	J130-34 <12>
26	→	J147-18 <12>
27	←	J147-6 <12>
29	←	J147-4 <12>
30	←	J147-2 <12>
31	←	J147-1 <12>
33	↔	J115-6 <34> J885-5 <25> J130-14 <12> J380-20 <35> J180-52 <38>
34	↔	J115-4 <34> J885-4 <25> J130-5 <12> J380-17 <35> J180-51 <38>

J515 Con't next column.

J515 Con't from previous column.

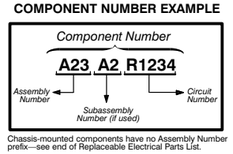
J515 Pin#	To / From	Destination / Origin
35	↔	J115-3 <34> J885-3 <25> J130-8 <12> J380-18 <35> J180-50 <38>
37	↔	J115-2 <34> J885-2 <25> J130-10 <12> J380-15 <35> J180-49 <38>
38	↔	J115-1 <34> J885-1 <25> J130-12 <12> J380-16 <35> J180-48 <38>
39	←	J147-31 <12> J380-2 <35> J180-12 <38>
57	←	J130-22 <12>


DATA TRANSCEIVER
PROGRAMMED LOGIC ARRAY
ADDRESS LATCH
U105 74ALS1245
U305 22V10-25
U101 74ALS1245
R105 4.7K
R305 4.7K
R111 47.5
R112 47.5
R113 47.5
R114 47.5
R115 47.5
R116 47.5
R117 47.5
R118 47.5
R508 47.5
R507 47.5
R509 47.5
R505 47.5
R405 47.5
R407 47.5
R406 47.5
R506 47.5
R402 47.5
R404 47.5
R408 47.5
R504 47.5
R503 47.5
R502 47.5
R403 47.5
C105 .1UF
C205 .1UF
H2 <16>
D4 <16>
D3 <16>
C5 <17>
G1 <16>
D4 <16>
D4 <16>
C5 <17>
G1 <16>
ID[0..15]
IA[0..23]
/DDIN
/EXTDBE
/DBE
/RD
/PERWR
/RSTO
/ERSTO
/ANDBE
/ERD
/EWR
/DPS_MSB
/DAC_SEL
/MUX_SEL
/FLTR_BD
/CURSOR_CLK
VEC_CLK0
VEC_CLK1
/VH_HRDW_CTRL
EA_0
EA_1
EA_2
ED_0
ED_1
ED_2
ED_3
ED_4
ED_5
ED_6
ED_7
J115
J115 CONNECTS TO J302
A10 MICROPROCESSOR ANNEX BOARD
A1 <22>
J415
J415 CONNECTS TO J375
A11 INTERCONNECT BOARD
A1 <46>
NOTE: SEE TABLE 21 FOR SIGNAL ORIGIN OR DESTINATION
J515
J515 CONNECTS TO J380
A11 INTERCONNECT BOARD
H1 <46>
NOTE: SEE TABLE 21 FOR SIGNAL ORIGIN OR DESTINATION
W_RO_BLNK
V_RO_BLNK
H_RO_DATA_WFM
V_RO_DATA_WFM
SEG_INTENS
V_LINESEL
/V_FOCUS
W_BLANK_EN
/W_FOCUS
SW_R0
SW_R1
LED_R0
LED_R1
BRUCH
VAR_SWP_2
VAR_SWP_1
WFM_GAIN_2
WFM_GAIN_1
VECT_GAIN_2
VECT_GAIN_1
FOCUS_2
INTENS_2
SCALE_2
LINESEL_RETR
V_BLANK_EN
-REF_H_SYNC
/W_RO_EN
/V_RO_EN
CURS_TOP/BOT
H_RO_DATA_VEC
V_RO_DATA_VEC
/WFM_BLANK
FIELD_1
WLS_LINE
V_SYNC
/REM_SYNC_EN
REM_SYNC
/RGB_EN
RGB_STAIR
/WLS_FIELD
INTENS_1
H_POS_1
SCALE_1
V_POS_1
H_POS_2
V_POS_2
FOCUS_1
CURS_SEL
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A5 MICROPROCESSOR BOARD



ANNEX CIRCUIT BOARD (A10)

COMPONENT NUMBER EXAMPLE



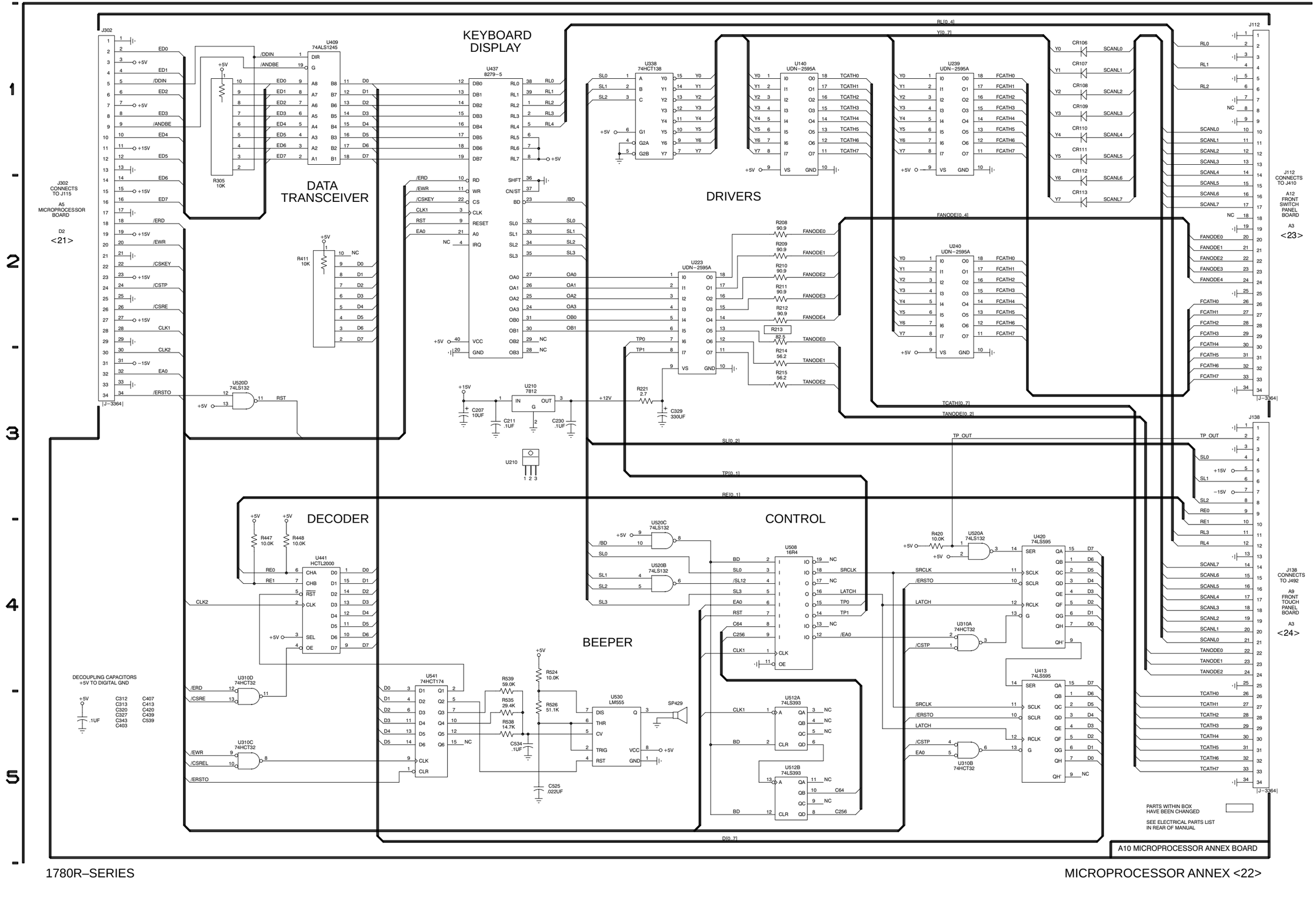
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

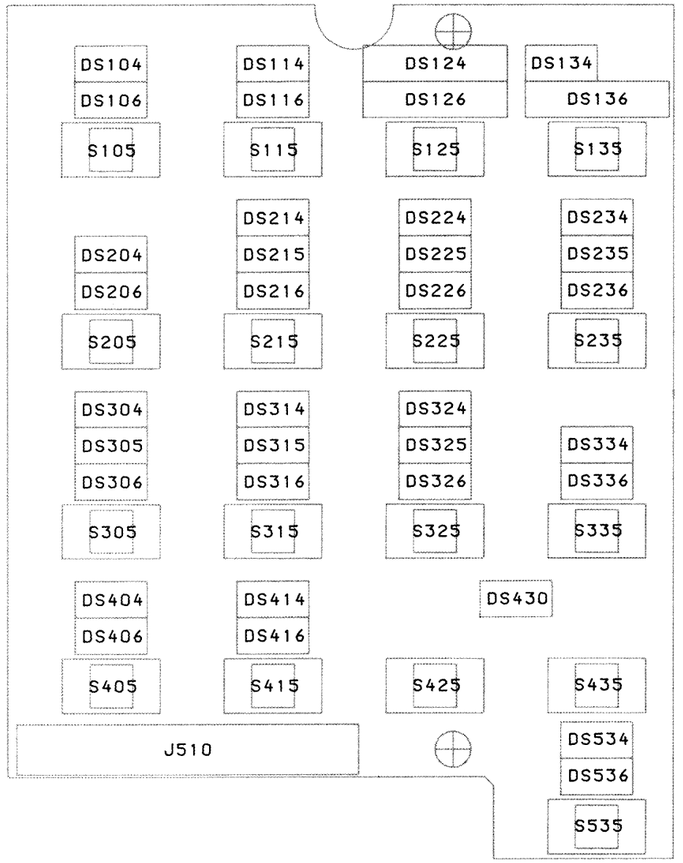
STATIC SENSITIVE DEVICES

A10 Microprocessor Annex Board <22> Component Locator

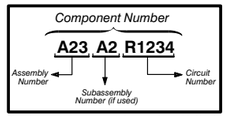
A10 Microprocessor Annex Board <22> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C207	C3	R524	D4
C211	C3	R526	D5
C230	D3	R535	C5
C329	D3	R538	C5
C525	D5	R539	C4
C534	D5		
		SP429	D5
CR106	G1		
CR107	G1	U140	E1
CR108	G1	U210	D3
CR109	G1	U223	E2
CR110	G1	U239	F1
CR111	G1	U240	F2
CR112	G2	U310A	F4
CR113	G2	U310B	F5
		U310C	B5
J112	H1	U310D	B4
J138	H3	U338	D1
J302	A1	U409	B1
		U413	G4
R208	E2	U420	G4
R209	E2	U437	C1
R210	E2	U441	B4
R211	E2	U508	E4
R212	E2	U512A	E5
R213	E2	U512B	E5
R214	E3	U520A	F4
R215	E3	U520B	D4
R221	D3	U520C	D4
R305	B1	U520D	B3
R411	B2	U530	D5
R420	F4	U541	C4
R447	B4		
R448	B4		


KEYBOARD DISPLAY
DATA TRANSCEIVER
DRIVERS
DECODER
CONTROL
BEEPER
J302
J302 CONNECTS TO J115
A5 MICROPROCESSOR BOARD
D2
<21>
J112
J112 CONNECTS TO J410
A12 FRONT SWITCH PANEL BOARD
A3
<23>
J138
J138 CONNECTS TO J492
A9 FRONT TOUCH PANEL BOARD
A3
<24>
U409 74ALS1245
U437 8279-5
U338 74HCT138
U140 UDN-2595A
U239 UDN-2595A
U240 UDN-2595A
U223 UDN-2595A
U441 HCTL2000
U541 74HCT174
U530 LM555
U508 16R4
U420 74LS595
U413 74LS595
U520A 74LS132
U520B 74LS132
U520C 74LS132
U520D 74LS132
U310A 74HCT32
U310B 74HCT32
U310C 74HCT32
U310D 74HCT32
U512A 74LS393
U512B 74LS393
U210 7812
R305 10K
R411 10K
R447 10.0K
R448 10.0K
R420 10.0K
R206 90.9
R209 90.9
R210 90.9
R211 90.9
R212 90.9
R213 82.5
R214 56.2
R215 56.2
R221 2.7
R524 10.0K
R526 51.1K
R539 59.0K
R535 29.4K
R538 14.7K
C207 10UF
C211 .1UF
C230 .1UF
C329 330UF
C534 .1UF
C525 .022UF
SP429
DECOUPLING CAPACITORS +5V TO DIGITAL GND
C312 C313 C320 C327 C343 C403
C407 C413 C420 C439 C539
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
A10 MICROPROCESSOR ANNEX BOARD



COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

STATIC SENSITIVE DEVICES

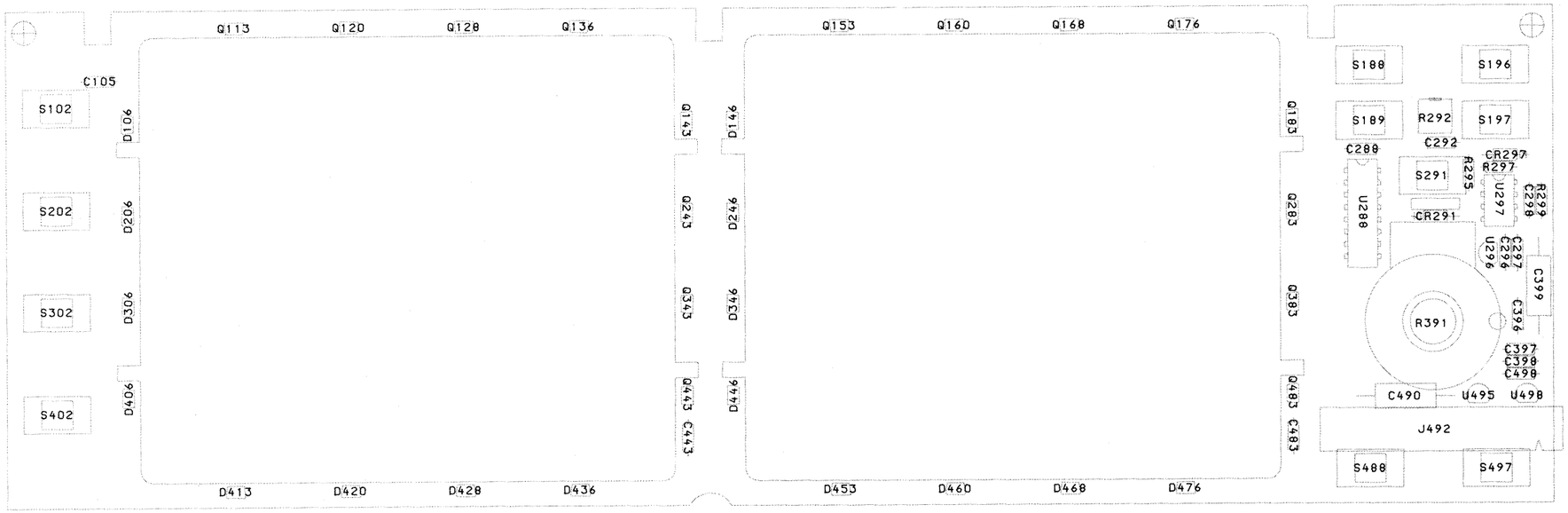
FRONT PANEL CIRCUIT BOARD (A12)

A12 Front Switch Panel Board <23> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
DS104	E1	DS216	F3	DS316	F4	DS536	H5	S235	D2
DS106	E2	DS224	G2	DS324	G3			S305	B2
DS114	F1	DS225	G3	DS325	G4	J410	A3	S315	B2
DS116	F2	DS226	G3	DS326	G4			S325	C2
DS124	G1	DS234	H2	DS334	H4	S105	B1	S335	D2
DS126	G1	DS235	H3	DS336	H4	S115	B1	S405	B3
DS134	H1	DS236	H3	DS404	E4	S125	C1	S415	B3
DS136	H1	DS304	E3	DS406	E5	S135	D1	S425	C3
DS204	E3	DS305	E4	DS414	F4	S205	B2	S435	D3
DS206	E3	DS306	E4	DS416	F5	S215	B2	S535	D4
DS214	F2	DS314	F3	DS430	G4	S225	C2		
DS215	F3	DS315	F4	DS534	H4				

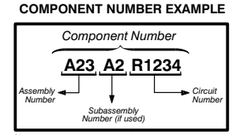
A12 Front Switch Panel Board <23> Component Locator

LEFT DISPLAY
RIGHT DISPLAY
LEFT DISPLAY
RIGHT DISPLAY
RL1
VECT/ SCH
S105
X Y/ PIX
S115
PARADE/ OVERLAY
S125
WFM/ WFM + CAL
S135
SCANL5
SCANL4
SCANL6
SCANL7
INPUT
REF
RL0
CH A/ PROBE
S205
CH B1/ CH B2/ CH B3
S215
A – B1/ B1 – B2/ B1 – B3
S225
INT/ EXT/ CW
S235
SCANL4
SCANL5
SCANL6
SCANL7
FILTER
WAVEFORM SWEEPS
RL1
FLAT/ LUM/ CHROM
S305
AUX/ LPASS/ DIFF
S315
ONE/ TWO/ THREE
S325
LINE/ FIELD
S335
SCANL0
SCANL1
SCANL2
SCANL3
GAIN
MAGNIFIER
RL0
VAR/ MAX
S405
VAR/ X5
S415
OFF <
S425
> ON
S435
SCANL0
SCANL1
SCANL2
SCANL3
SWEEP RATE
RL2
VAR/ SLOW
S535
SCANL0
J410
1 RL0
2 RL1
3 RL2
4 NC
5 SCANL0
6 SCANL1
7 SCANL2
8 SCANL3
9 SCANL4
10 SCANL5
11 SCANL6
12 SCANL7
13 NC
14 FANODE0
15 FANODE1
16 FANODE2
17 FANODE3
18 FANODE4
19 FCATH0
20 FCATH1
21 FCATH2
22 FCATH3
23 FCATH4
24 FCATH5
25 FCATH6
26 FCATH7
27 NC
174–1169
J410 CONNECTS TO J112
A10 MICROPROCESSOR ANNEX BOARD
H1
<22>
DS104
VECT
DS106
SCH
DS204
CH A
DS206
PROBE
DS304
FLAT
DS305
LUM
DS306
CHROM
DS404
VAR
DS406
MAX
VECTOR
DS114
X Y
DS116
PIX
DS214
CH B1
DS215
CH B2
DS216
CH B3
DS314
AUX
DS315
LPASS
DS316
DIFF
DS414
VAR
DS416
X5
WAVEFORM
DS124
PARADE
DS126
OVERLAY
DS224
A – B1
DS225
B1 – B2
DS226
B1 – B3
DS324
ONE
DS325
TWO
DS326
THREE
DS430
ON
DS134
WFM
DS136
WFM + CAL
DS234
INT
DS235
EXT
DS236
CW
DS334
LINE
DS336
FIELD
DS534
VAR
DS536
SLOW
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
A12 FRONT SWITCH PANEL BOARD



TOUCH PANEL CIRCUIT BOARD (A9)

COMPONENT NUMBER EXAMPLE



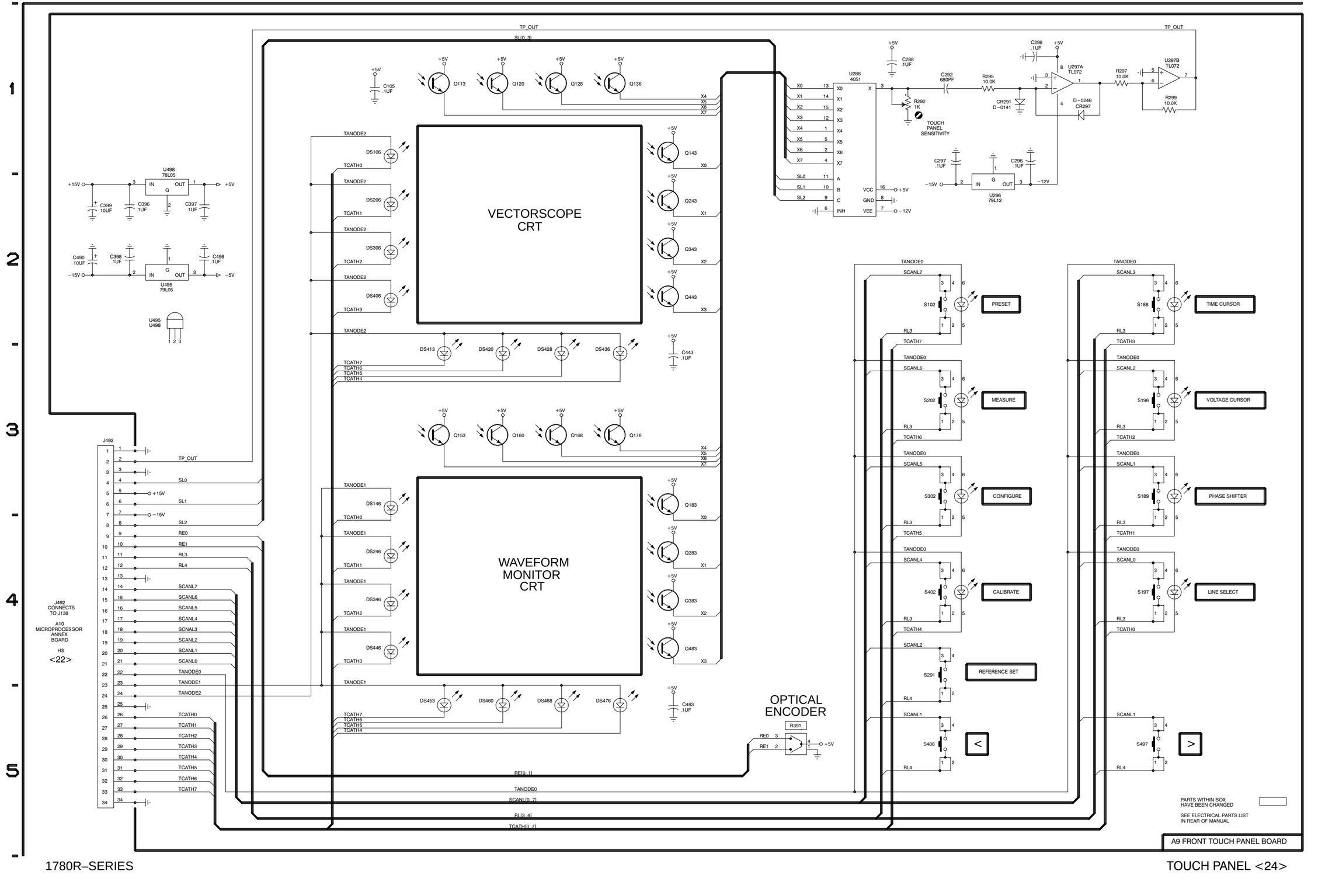
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

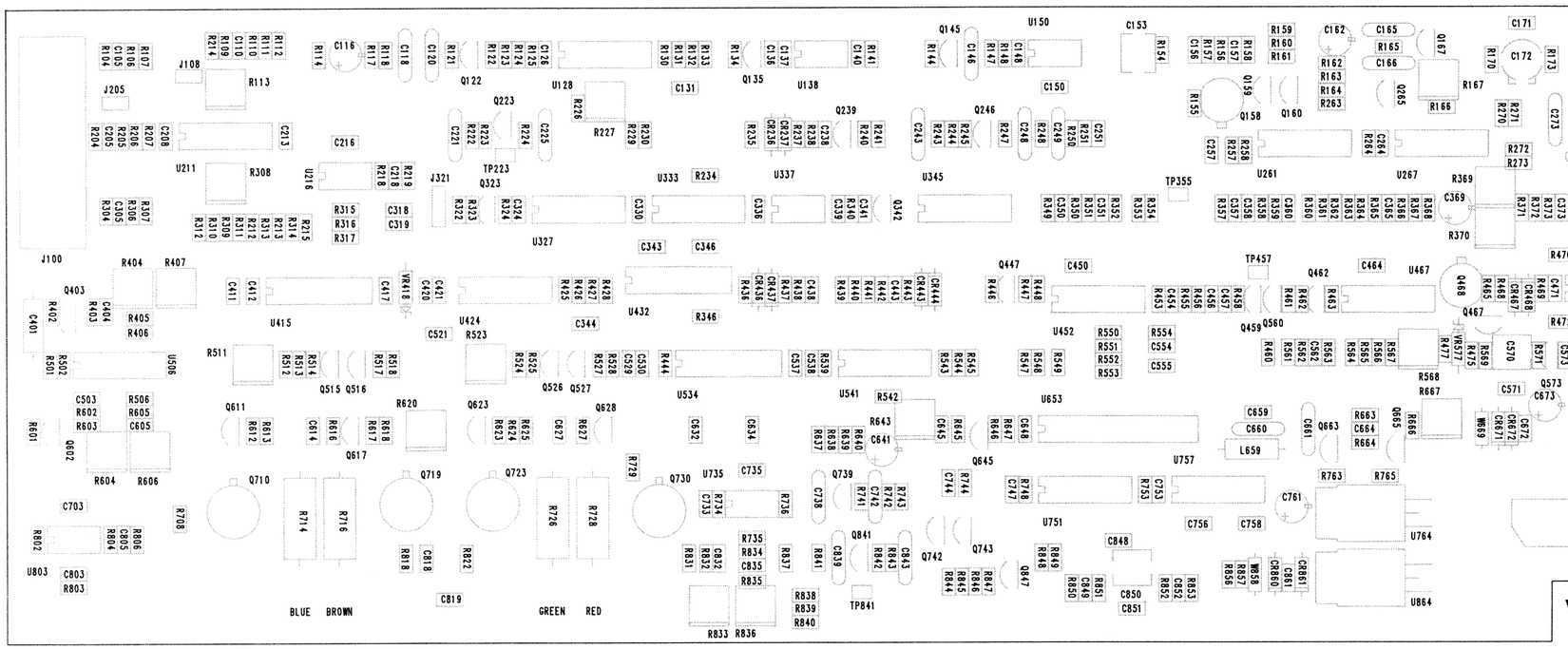
STATIC SENSITIVE DEVICES

A3 Touch Front Panel Board <24> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C105	C1	DS206	C2	Q136	D1	S102	F2
C288	F1	DS246	C4	Q143	D1	S188	H2
C292	F1	DS306	C2	Q153	C3	S189	H3
C296	G1	DS346	C4	Q160	C3	S196	H3
C297	F1	DS406	C2	Q168	D3	S197	H4
C298	G1	DS413	C2	Q176	D3	S202	F3
C396	A2	DS420	C2	Q183	D3	S291	F4
C397	B2	DS428	D2	Q243	D2	S302	F3
C398	A2	DS436	D2	Q283	D4	S402	F4
C399	A2	DS446	C4	Q343	D2	S488	F5
C443	E3	DS453	C5	Q383	D4	S497	H5
C483	E5	DS460	C5	Q443	D2		
C490	A2	DS468	D5	Q483	D4	U288	F1
C498	B2	DS476	D5			U296	F2
				R292	F1	U297A	G1
CR291	G1	J492	A3	R295	F1	U297B	H1
CR297	G1			R297	G1	U495	A2
		Q113	C1	R299	H1	U498	A2
DS106	C1	Q120	C1	R391	E5		
DS146	C3	Q128	D1				

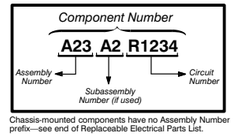
A3 Touch Front Panel Board <24> Component Locator


TP_OUT
SL[0..3]
VECTORSCOPE CRT
WAVEFORM MONITOR CRT
OPTICAL ENCODER
U498 78L05
U495 79L05
U288 4051
U296 79L12
U297A TL072
U297B TL072
TOUCH PANEL SENSITIVITY
PRESET
MEASURE
CONFIGURE
CALIBRATE
REFERENCE SET
TIME CURSOR
VOLTAGE CURSOR
PHASE SHIFTER
LINE SELECT
J492
TP_OUT
SL0
SL1
SL2
RE0
RE1
RL3
RL4
SCANL7
SCANL6
SCANL5
SCANL4
SCNAL3
SCANL2
SCANL1
SCANL0
TANODE0
TANODE1
TANODE2
TCATH0
TCATH1
TCATH2
TCATH3
TCATH4
TCATH5
TCATH6
TCATH7
J492 CONNECTS TO J138
A10 MICROPROCESSOR ANNEX BOARD
H3
<22>
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
A9 FRONT TOUCH PANEL BOARD



VECTORSCOPE CIRCUIT BOARD (A6)

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

STATIC SENSITIVE DEVICES

A6 Vectorscope Board

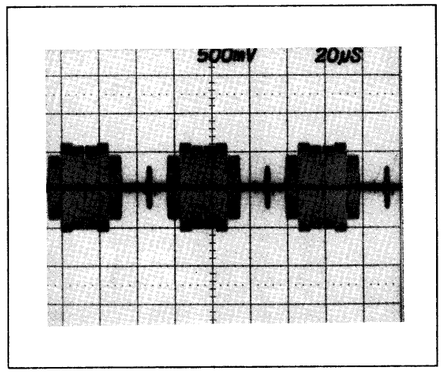
A6 Vectorsope Board <25> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C183	F4	R287	G4
C184	G4	R289	F4
C185	G4	R292	E5
C188	F5	R293	E5
C190	F5	R294	F5
C288	G4	R389	E4
C290	E4	R458	G2
C292	E5	R460	G2
C294	F5	R461	G1
C464	F2	R462	G1
C471	E2	R463	G1
C474	E2	R465	E1
C483	H3	R468	E1
C484	H3	R469	E1
C486	H3	R470	E2
C562	F1	R471	E2
C570	E3	R472	D2
C571	E3	R475	F1
C573	E3	R477	F1
C576	D2	R561	F1
C582	B5	R562	G1
C682	B5	R563	F1
		R564	F2
CR467	E1	R565	G2
CR468	E1	R566	F3
		R567	F2
J574	D3	R568	F3
J885	A1	R569	E3
		R571	E3
L287	G4	R572	E2
		R575	E3
Q186	F4	R578	D2
Q187	F4	R790	C2
Q290	E4		
Q291	E4	TP457	H1
Q459	G2		
Q462	G1	U467	F2
Q467	E1	U467	F2
Q468	E1	U473	E2
Q560	G1	U486A	H3
Q573	E3	U486B	E4
		U486D	E3
R183	F4	U585	C4
R184	F4	U686	C3
R185	F4		
R187	F5	VR577	F1
R189	F5		
R191	E4	Y195	F5
R192	F4		
R285	G5		
R286	G5		

A5 Vectorscope Board <25> Component Locator

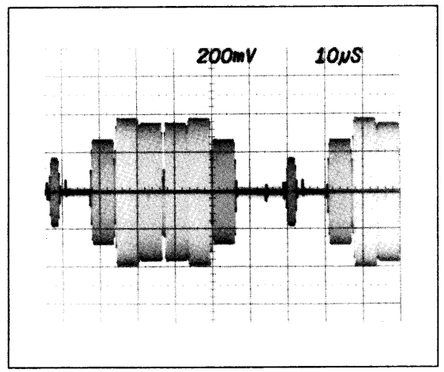
25

1



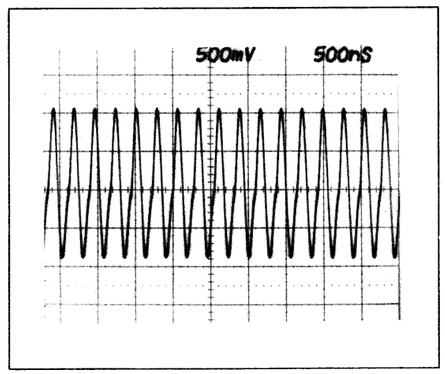
External Trigger.

2



External Trigger.

3

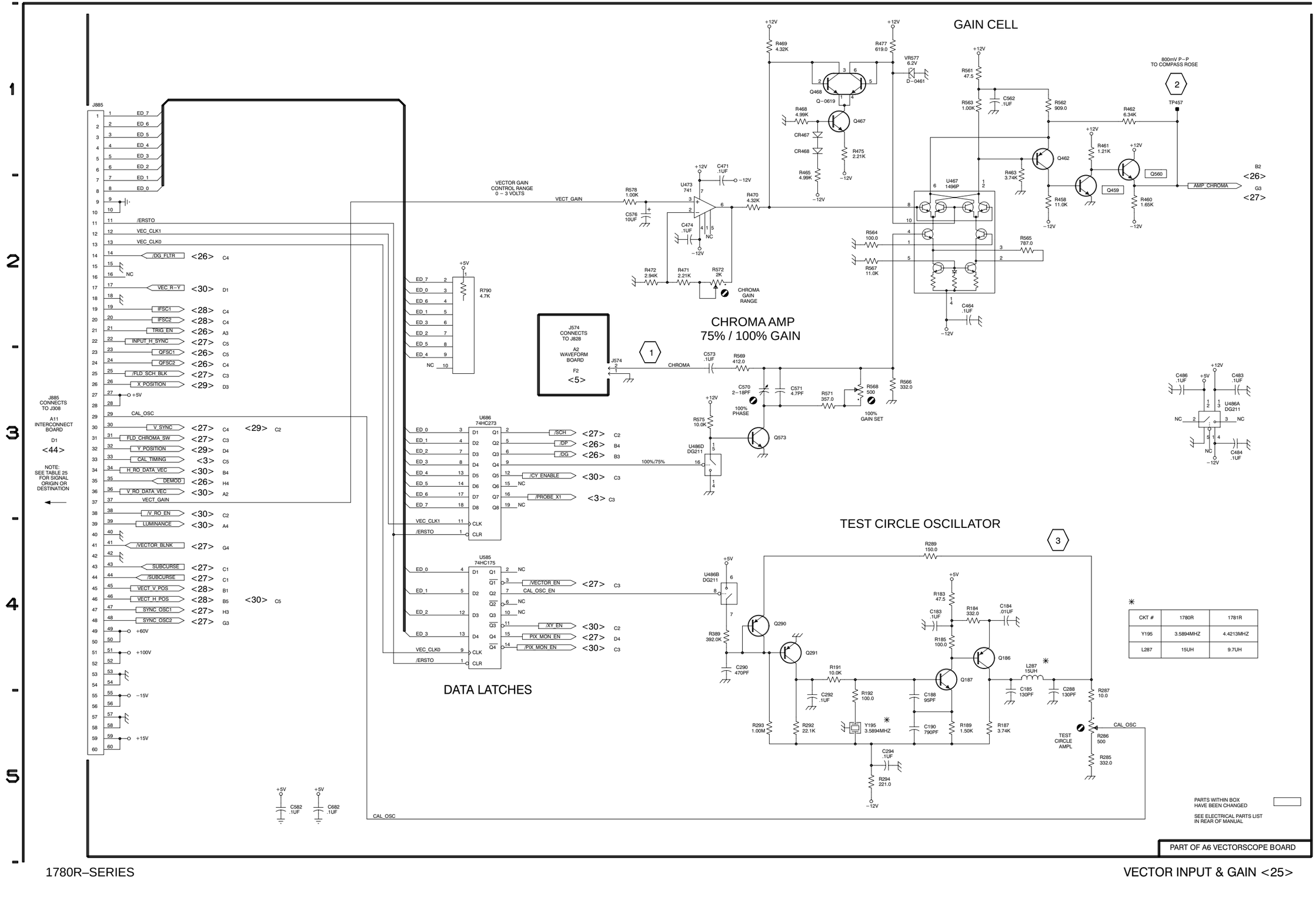


Vector Calibrator on.

Table 25

J885 Connects with these pins via the Interconnect Board.

J885 Pin#	To / From	Destination / Origin
1	→	J515-38 <21>
2	→	J515-37 <21>
3	→	J515-35 <21>
4	→	J515-34 <21>
5	→	J515-33 <21>
6	→	J415-29 <21>
7	→	J415-27 <21>
8	→	J415-26 <21>
11	→	J415-9 <21>
12	→	J515-22 <21>
13	→	J515-23 <21>
14	←	J310-30 <35>
17	←	J130-28 <12>
19	→	J115-44 <34>
20	→	J115-43 <34>
21	→	J130-27 <12>
22	→	J147-12 <12>
23	→	J115-40 <34>
24	→	J115-39 <34>
25	→	J147-9 <12>
26	→	J180-46 <38>
29	←	J147-17 <12>
30	→	J147-18 <12>
31	→	J147-7 <12>
32	→	J180-47 <38>
33	→	J147-15 <12>
34	→	J515-1 <21>
35	←	J115-57 <34> J310-1 <35>
36	→	J515-3 <21>
37	→	J130-6 <12>
38	→	J415-59 <21>
39	→	J130-19 <12>
41	←	J180-32 <38>
43	←	J180-3 <38>
44	←	J180-4 <38>
45	→	J180-60 <38>
46	→	J180-59 <38>
47	→	J130-13 <12>
48	→	J130-11 <12>

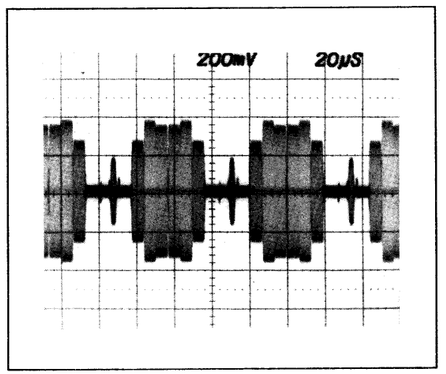

GAIN CELL
CHROMA AMP
75% / 100% GAIN
TEST CIRCLE OSCILLATOR
DATA LATCHES
J885
J885 CONNECTS TO J308
A11 INTERCONNECT BOARD
D1
<44>
NOTE: SEE TABLE 25 FOR SIGNAL ORIGIN OR DESTINATION
J574 CONNECTS TO J828
A2 WAVEFORM BOARD
F2
<5>
VECTOR GAIN CONTROL RANGE 0 ~ 3 VOLTS
VECT_GAIN
CHROMA
CHROMA GAIN RANGE
100% PHASE
100% GAIN SET
800mV P-P TO COMPASS ROSE
TP457
AMP_CHROMA
TEST CIRCLE AMPL
CAL_OSC
U473 741
U686 74HC273
U585 74HC175
U486A DG211
U486B DG211
U486C DG211
U486D DG211
U467 1496P
Q468
Q-0619
Q467
Q462
Q459
Q560
Q573
Q290
Q291
Q186
Q187
VR577 6.2V
D-0461
Y195 3.5894MHZ
ED_7
ED_6
ED_5
ED_4
ED_3
ED_2
ED_1
ED_0
/ERSTO
VEC_CLK1
VEC_CLK0
/DG_FLTR
VEC_R-Y
IFSC1
IFSC2
TRIG_EN
INPUT_H_SYNC
QFSC1
QFSC2
/FLD_SCH_BLK
X_POSITION
CAL_OSC
V_SYNC
FLD_CHROMA_SW
Y_POSITION
CAL_TIMING
H_RO_DATA_VEC
DEMOD
V_RO_DATA_VEC
/V_RO_EN
LUMINANCE
/VECTOR_BLNK
SUBCURSE
/SUBCURSE
VECT_V_POS
VECT_H_POS
SYNC_OSC1
SYNC_OSC2
/SCH
/DP
/DG
/CY_ENABLE
/PROBE_X1
/VECTOR_EN
CAL_OSC_EN
/XY_EN
PIX_MON_EN
/PIX_MON_EN
CKT # | 1780R | 1781R
Y195 | 3.5894MHZ | 4.4213MHZ
L287 | 15UH | 9.7UH
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A6 VECTORSCOPE BOARD

A6 Vectorscope Board <26> Component Locator

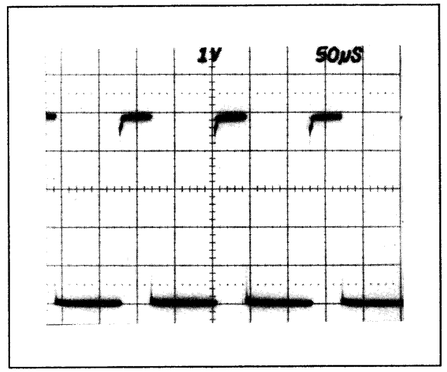
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C131	D5	R133	C5	R359	D2
C156	E1	R155	E1	R360	D3
C157	E1	R156	E1	R361	C3
C162	F2	R157	E1	R362	C3
C165	F3	R158	E1	R363	D3
C166	F3	R159	E3	R364	D3
C171	D4	R160	E2	R365	D3
C172	D4	R161	E2	R366	C3
C257	D2	R162	F2	R367	E5
C264	E5	R163	F3	R368	G4
C273	G3	R164	F2	R369	G4
C277	G3	R165	F3	R370	H3
C357	C2	R166	D3	R371	G4
C358	C2	R167	D3	R372	G3
C360	C3	R170	D5	R373	G3
C365	D3	R173	D4	R377	G3
C369	G4	R257	C2	R378	G4
C373	H3	R258	C2	R381	C4
C377	H4	R263	F3	R382	C5
C383	G5	R264	D3	R675	A3
C481	C4	R270	D5	R677	A3
C482	C5	R271	D4	R678	B3
C676	A3	R272	C3		
		R273	C5	TP379	H3
Q158	E1	R274	F2		
Q159	E2	R275	F3	U261	D2
Q160	F2	R276	G3	U261	D2
Q167	F3	R277	G3	U267	E4
Q265	D3	R278	C3	U267	E5
Q277	G3	R280	C5	U375	H4
Q278	C2	R281	B2	U386A	A4
Q279	C5	R282	B5	U386B	B4
Q677	B3	R357	C2		
		R358	C2		
R130	C5				

26

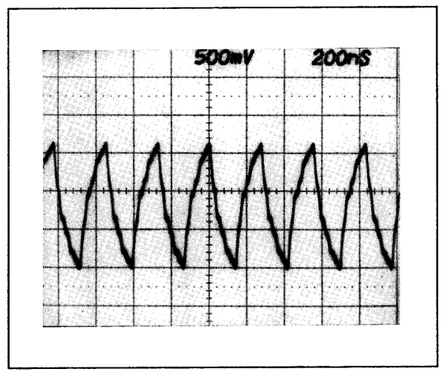
1



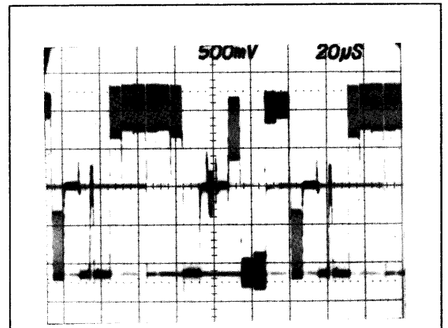
2



3

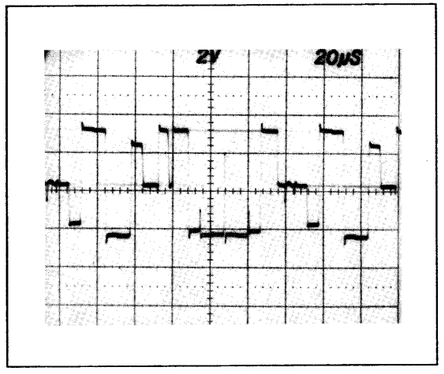


4

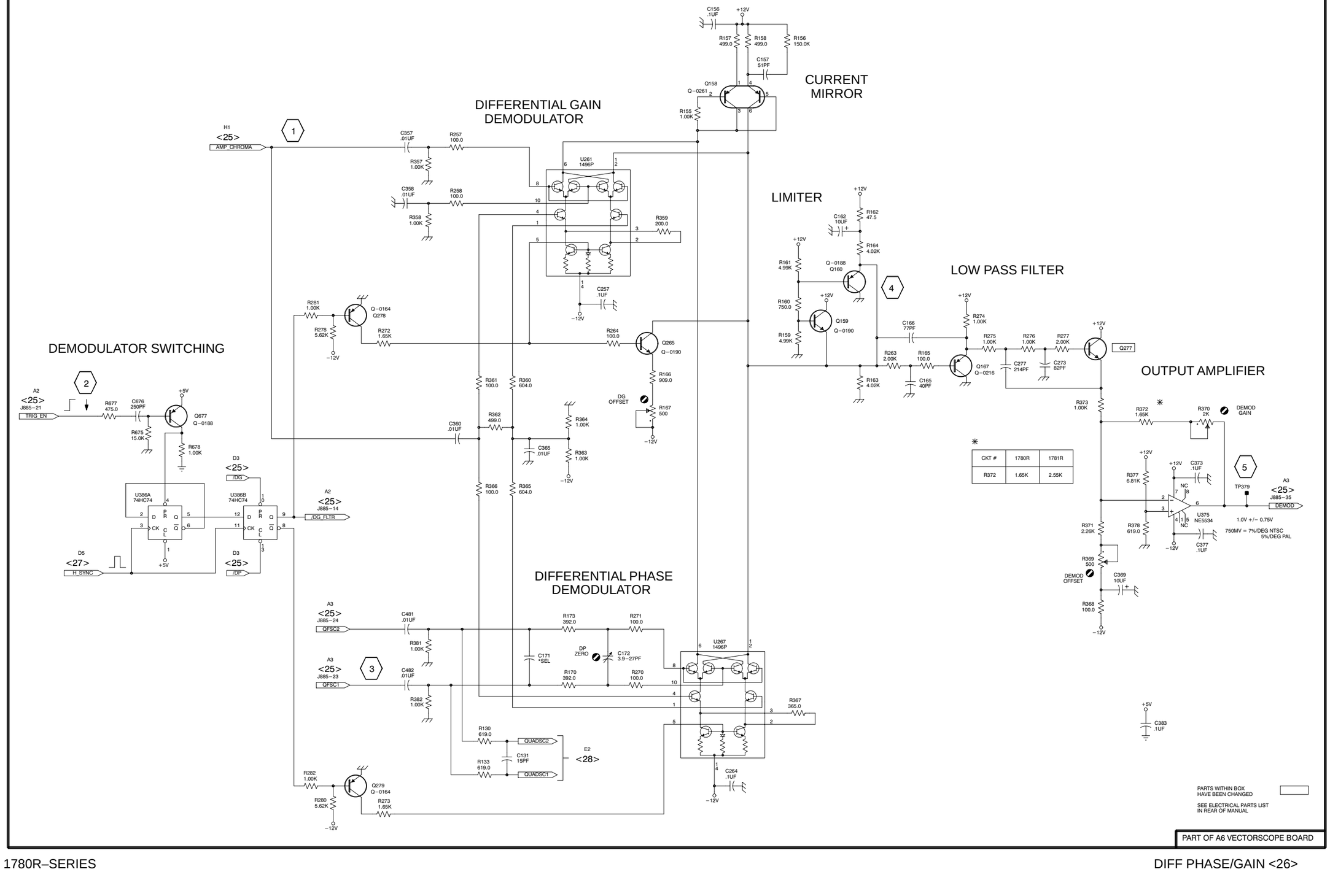


dP & dG measurement turned on.

5



dP & dG measurement turned on.

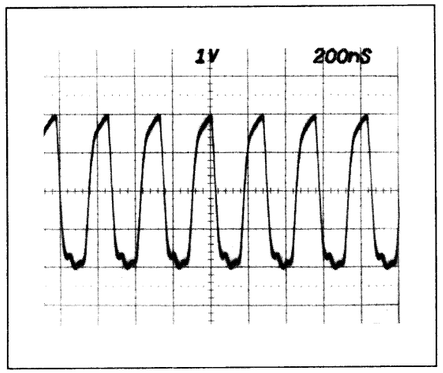

DIFFERENTIAL GAIN DEMODULATOR
CURRENT MIRROR
LIMITER
LOW PASS FILTER
DEMODULATOR SWITCHING
OUTPUT AMPLIFIER
DIFFERENTIAL PHASE DEMODULATOR
H1 <25> AMP_CHROMA
A2 <25> J885-21 TRIG_EN
D3 <25> /DG
A2 <25> J885-14 /DG_FLTR
D5 <27> H_SYNC
D3 <25> /DP
A3 <25> J885-24 QFSC2
A3 <25> J885-23 QFSC1
E2 <28>
QUADSC2
QUADSC1
DG OFFSET
DP ZERO
DEMOD GAIN
DEMOD OFFSET
A3 <25> J885-35 DEMOD
TP379
1.0V +/- 0.75V
750MV = 7%/DEG NTSC
5%/DEG PAL
U261 1496P
U267 1496P
U386A 74HC74
U386B 74HC74
U375 NE5534
Q158 Q-0261
Q-0188 Q160
Q159 Q-0190
Q167 Q-0216
Q277
Q265 Q-0190
Q-0164 Q278
Q279 Q-0164
CKT # | 1780R | 1781R
R372 | 1.65K | 2.55K
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A6 VECTORSCOPE BOARD

A6 Vectorscope Board <27> Component Locator

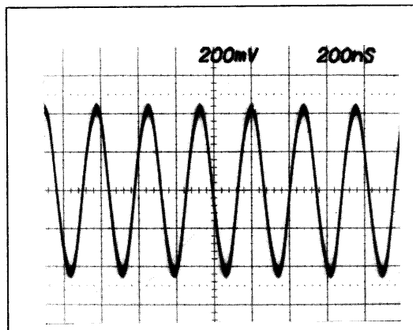
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C324	F5	Q663	G3	R667	G4
C330	F5	Q665	H3	R693	C5
C350	F2			R748	B1
C351	E2	R234	F4	R753	B1
C420	B4	R322	B4	R763	G3
C421	B4	R323	B4	R765	H3
C450	F3	R324	B4	R856	C1
C454	E2	R349	F2	R857	C1
C456	E2	R350	E2	R892	D5
C457	G2	R351	D2		
C521	B4	R352	E2	U327A	D4
C554	F2	R425	A5	U327B	E4
C555	E2	R426	A5	U327C	D4
C648	F5	R427	A5	U327D	E4
C659	F3	R428	A5	U333A	D4
C660	G3	R446	F2	U333C	F4
C661	G3	R447	F2	U333D	D5
C664	H3	R448	F2	U424A	B4
C693	F5	R453	E3	U424B	B5
C695	C5	R455	E2	U424C	B5
C747	F5	R456	E2	U424D	B5
C753	F5	R547	E3	U452	F2
C756	A1	R548	E2	U452	F2
C758	A1	R549	F3	U653	C1
		R550	F2	U695A	C5
J321	C4	R551	E2	U751A	C1
		R552	E3	U751B	C2
L659	G3	R553	D2	U757	B1
		R554	F2		
P321	C4	R647	B2	VR418	B4
		R663	G3		
Q323	B4	R664	G3		
Q447	F2	R666	G3		

27

1

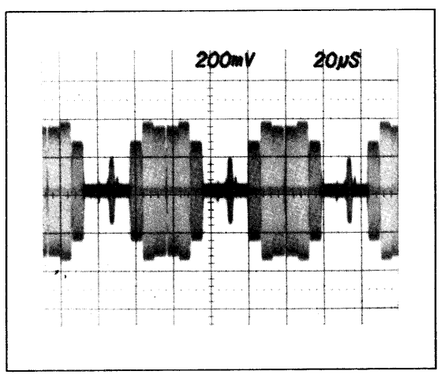


2

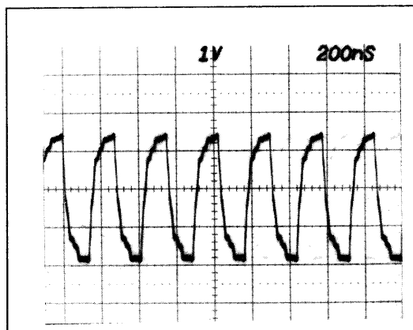


SCH display turned on.

3

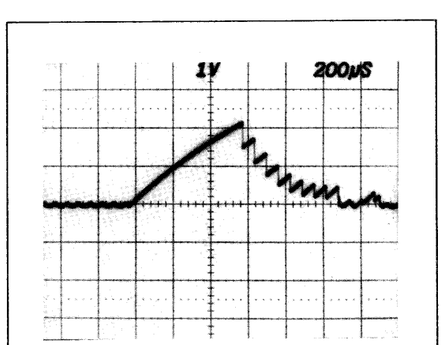


4

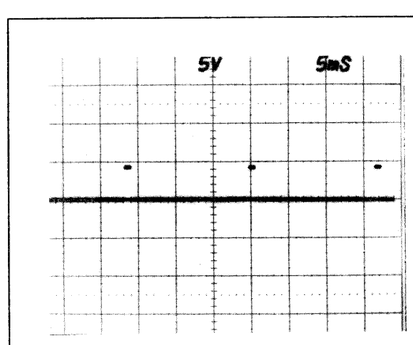


SCH display turned on.

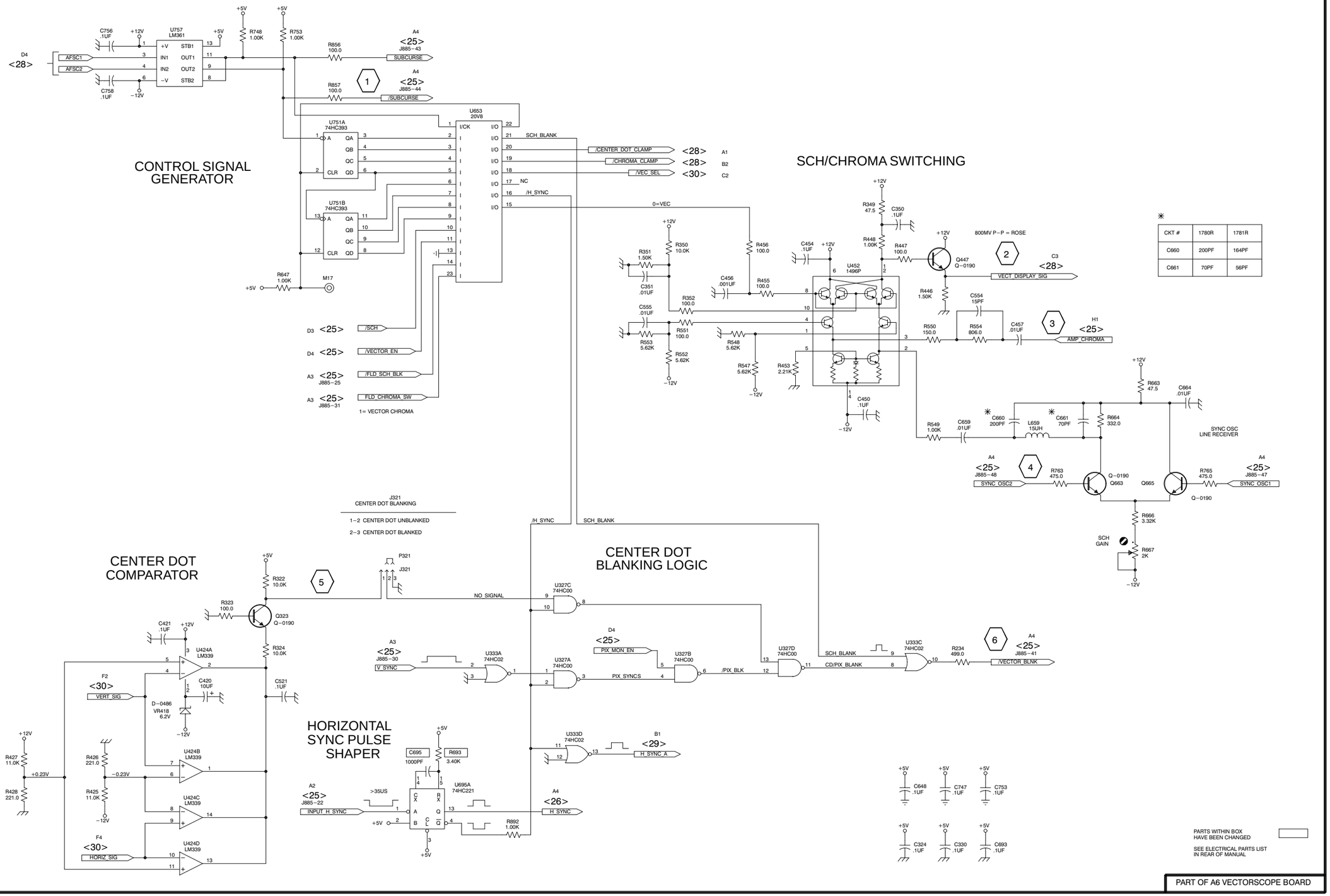
5



6



SCH + Vector display turned on.



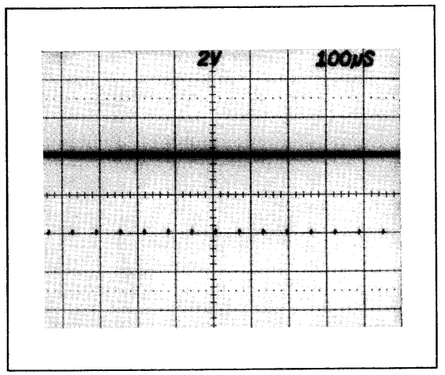
CKT #	1780R	1781R
C660	200PF	164PF
C661	70PF	56PF

A6 Vectorscope Board <28> Component Locator

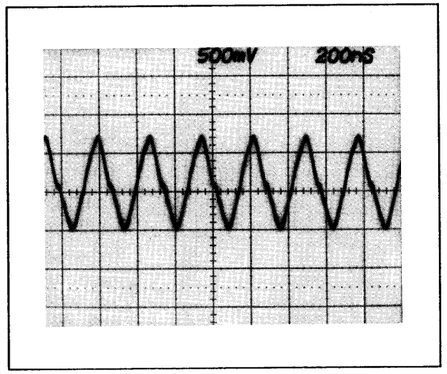
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C116	E1	Q739	G3	R543	E3
C118	G2	Q742	D3	R544	D4
C120	G2	Q743	C2	R545	D4
C126	F3	Q841	H4	R637	F3
C136	D2	Q847	C2	R638	E3
C137	C1			R639	F4
C140	C2	R114	E1	R640	E3
C221	G2	R117	E1	R643	F4
C225	G2	R118	F2	R645	C2
C238	B1	R121	G2	R646	C2
C336	C5	R122	G2	R741	G3
C339	C5	R123	F2	R742	G4
C341	D5	R124	G2	R743	G4
C438	B5	R125	F2	R744	C2
C443	D3	R131	E2	R841	H4
C538	F5	R132	E2	R842	G4
C641	E3	R134	D2	R843	G4
C645	D2	R141	B1	R844	C3
C738	G4	R222	H2	R845	C2
C742	G4	R223	G2	R846	C3
C744	D3	R224	G2	R847	C3
C839	G4	R226	F2	R848	C2
C843	G4	R227	F2	R849	B2
C848	D4	R229	E2	R850	D4
C849	C4	R230	E3	R851	D4
C850	D4	R235	B2	R852	D4
C851	C4	R237	C1	R853	D4
C852	C4	R238	B1		
		R240	B1	TP223	H2
CR236	C2	R241	A1	TP355	H4
CR237	C2	R340	C4	TP841	H4
CR436	C5	R436	B5		
CR437	C5	R437	C5	U128	E2
CR443	E3	R438	C5	U128	E2
CR444	E3	R439	D5	U138	C1
		R440	F4	U337	C5
Q122	G1	R441	E3	U541	E4
Q135	D1	R442	E3	U541	E4
Q223	H2	R443	E3		
Q239	B1	R539	E3		
Q342	D5	R542	F4		
Q645	C2				

28

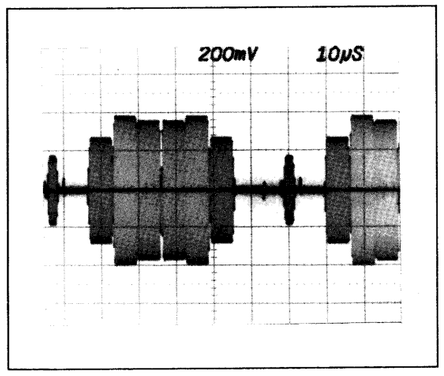
1



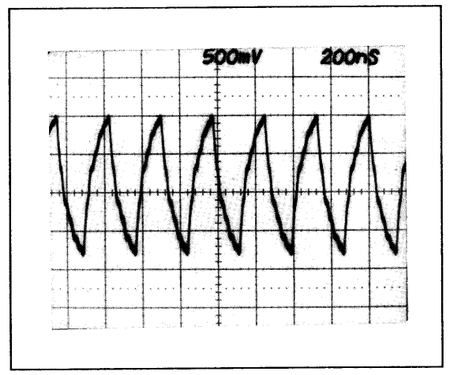
2



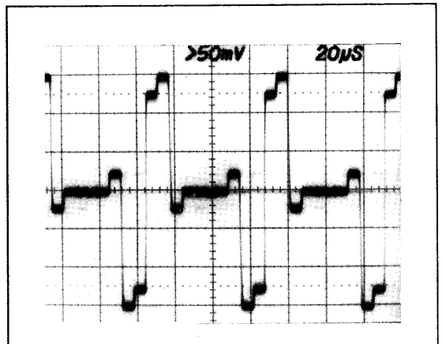
3



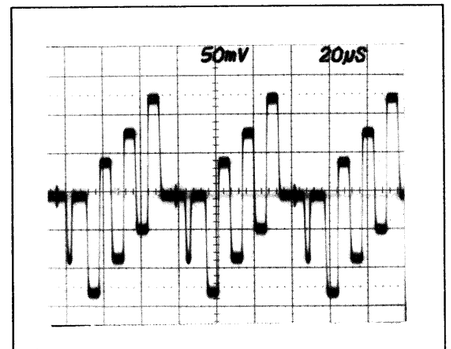
4

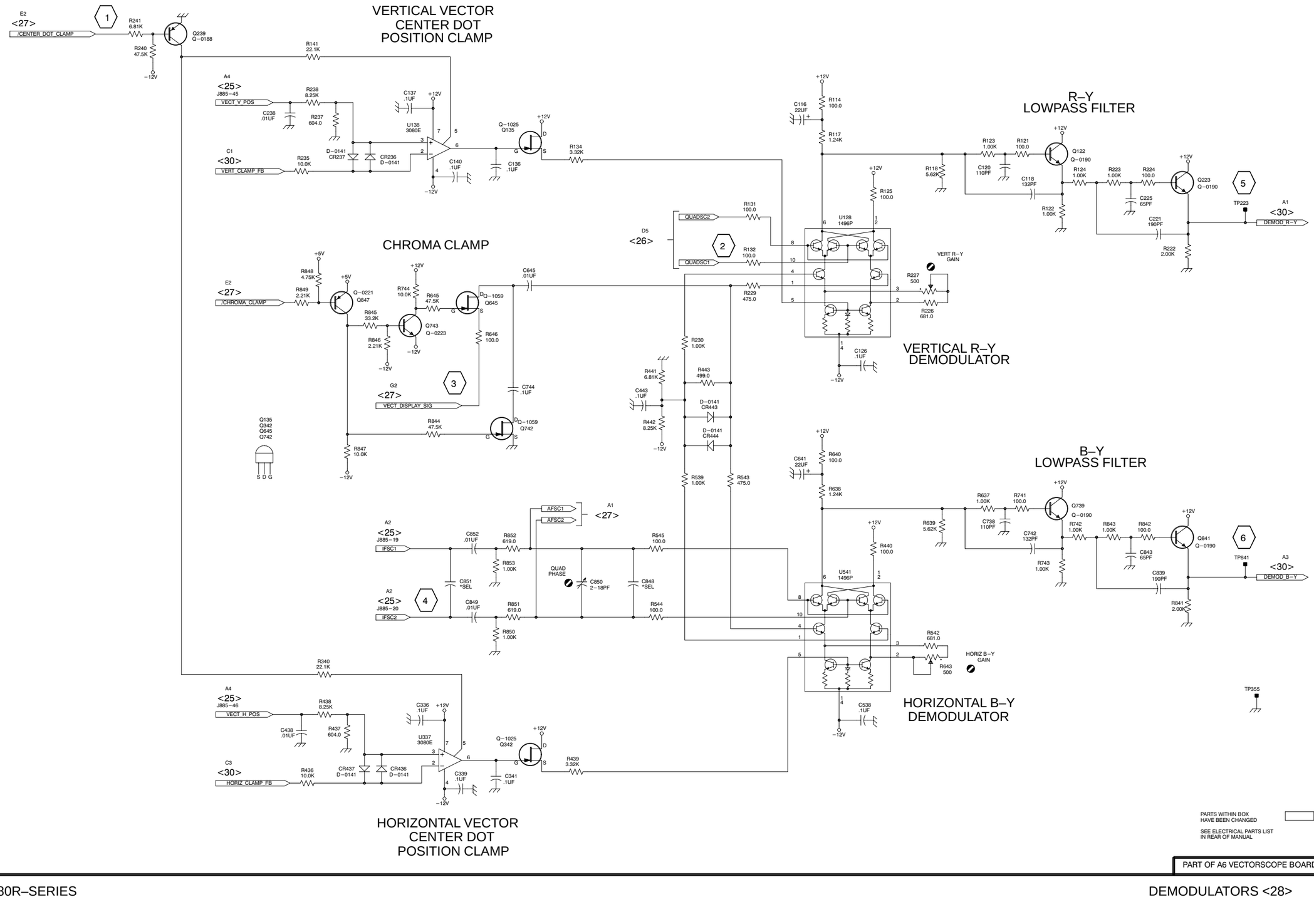


5



6



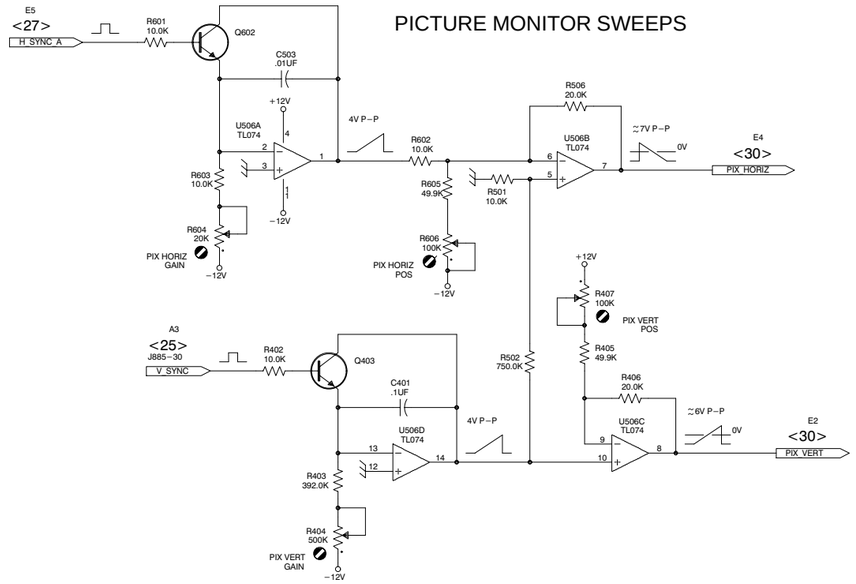

VERTICAL VECTOR CENTER DOT POSITION CLAMP
E2 <27> /CENTER_DOT_CLAMP
R241 6.81K
R240 47.5K
Q239 Q-0188
R141 22.1K
A4 <25> J885-45
VECT_V_POS
R238 8.25K
C238 .01UF
R237 604.0
C137 .1UF
U138 3080E
C1 <30>
VERT_CLAMP_FB
R235 10.0K
D-0141 CR237
CR236 D-0141
C140 .1UF
Q-1025 Q135
C136 .1UF
R134 3.32K
CHROMA CLAMP
E2 <27> /CHROMA_CLAMP
R848 4.75K
R849 2.21K
Q-0221 Q847
R845 33.2K
R846 2.21K
Q743 Q-0223
R744 10.0K
R645 47.5K
Q-1059 Q645
C645 .01UF
R646 100.0
G2 <27> VECT_DISPLAY_SIG
C744 .1UF
R844 47.5K
Q-1059 Q742
R847 10.0K
Q135 Q342 Q645 Q742
S D G
D5 <26>
QUADSC2
QUADSC1
R131 100.0
R132 100.0
R229 475.0
R230 1.00K
U128 1496P
R114 100.0
C116 22UF
R117 1.24K
R125 100.0
C126 .1UF
VERT R-Y GAIN
R227 500
R226 681.0
VERTICAL R-Y DEMODULATOR
R-Y LOWPASS FILTER
R118 5.62K
R123 1.00K
R121 100.0
C120 110PF
C118 132PF
Q122 Q-0190
R124 1.00K
R223 1.00K
R224 100.0
C225 65PF
Q223 Q-0190
R122 1.00K
C221 190PF
R222 2.00K
TP223
A1 <30> DEMOD_R-Y
R441 6.81K
C443 .1UF
R442 8.25K
R443 499.0
D-0141 CR443
D-0141 CR444
R539 1.00K
R543 475.0
A1 <27>
AFSC1
AFSC2
A2 <25> J885-19
IFSC1
A2 <25> J885-20
IFSC2
C852 .01UF
R852 619.0
R853 1.00K
C851 *SEL
C849 .01UF
R851 619.0
R850 1.00K
QUAD PHASE
C850 2-18PF
C848 *SEL
R545 100.0
R544 100.0
C641 22UF
R640 100.0
R638 1.24K
R440 100.0
U541 1496P
C538 .1UF
R542 681.0
R643 500
HORIZ B-Y GAIN
HORIZONTAL B-Y DEMODULATOR
B-Y LOWPASS FILTER
R639 5.62K
R637 1.00K
R741 100.0
C738 110PF
C742 132PF
Q739 Q-0190
R742 1.00K
R843 1.00K
R842 100.0
C843 65PF
Q841 Q-0190
R743 1.00K
C839 190PF
TP841
A3 <30> DEMOD_B-Y
R841 2.00K
TP355
R340 22.1K
A4 <25> J885-46
VECT_H_POS
R438 8.25K
C438 .01UF
R437 604.0
C336 .1UF
U337 3080E
C3 <30>
HORIZ_CLAMP_FB
R436 10.0K
CR437 D-0141
CR436 D-0141
C339 .1UF
Q-1025 Q342
C341 .1UF
R439 3.32K
HORIZONTAL VECTOR CENTER DOT POSITION CLAMP
+12V
-12V
+5V
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A6 VECTORSCOPE BOARD

A6 Vectorscope Board <29> Component Locator

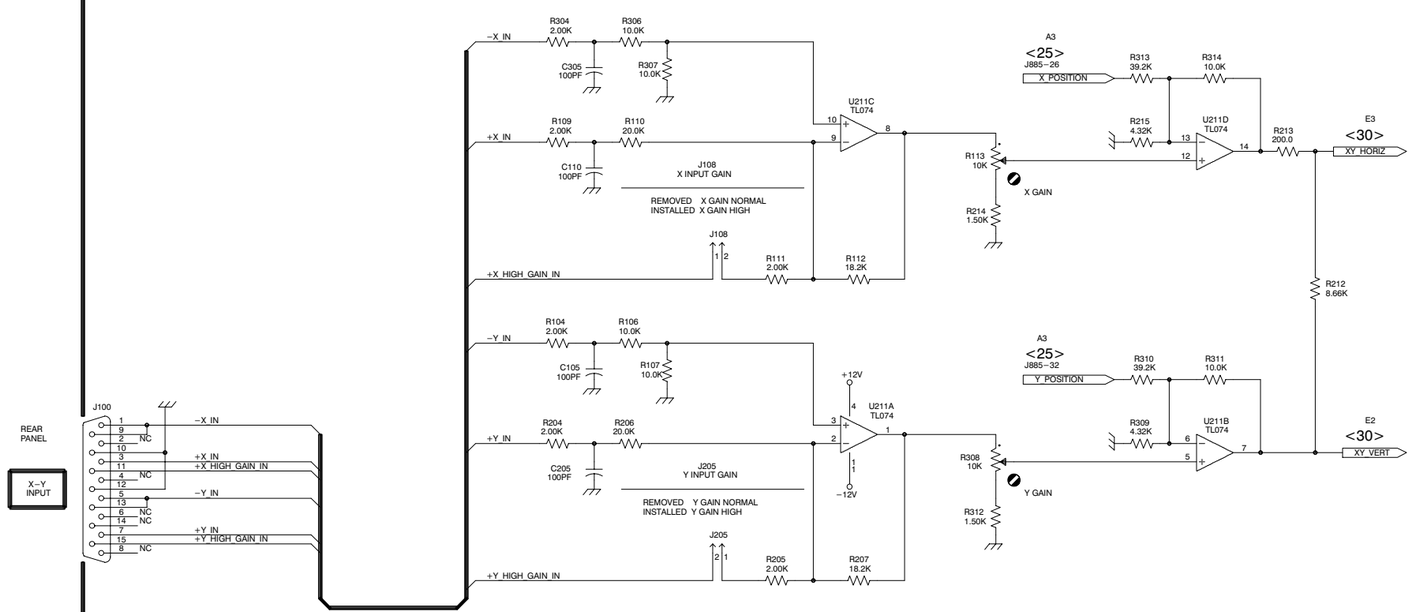
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C105	C4	R215	E4
C110	C4	R304	C3
C205	C5	R306	C3
C208	G4	R307	C3
C213	G4	R308	D5
C305	C3	R309	E5
C401	D2	R310	E4
C404	G4	R311	E4
C503	C1	R312	D5
C605	G4	R313	E3
C672	G3	R314	E3
C673	G3	R402	C2
C761	G3	R403	C2
C861	G3	R404	C3
		R405	D2
CR671	H3	R406	D2
CR672	G3	R407	D2
CR860	G3	R501	D1
CR861	H3	R502	D2
		R506	D1
J100	A5	R601	C1
J108	C4	R602	D1
J205	C5	R603	C1
		R604	C2
Q403	C2	R605	D1
Q602	C1	R606	D2
R104	C4	U211A	D5
R106	C4	U211B	E5
R107	C4	U211C	D3
R109	C4	U211D	E4
R110	C4	U506A	C1
R111	C4	U506B	D1
R112	D4	U506C	D2
R113	D4	U506D	D2
R204	C5	U764	G3
R205	C5	U864	G3
R206	C5		
R207	D5	W669	H3
R212	E4	W858	H3
R213	E4		
R214	D4		

A6 Vectorscope Board <29> Component Locator

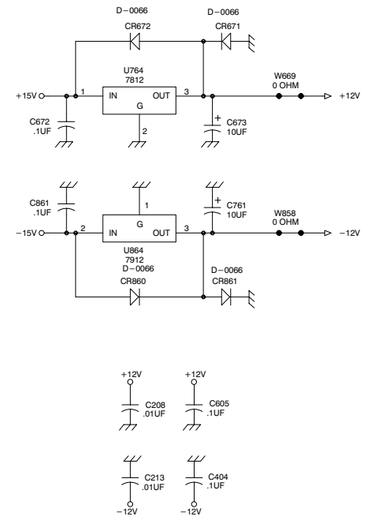
PICTURE MONITOR SWEEPS



X–Y INPUT AMPLIFIER



POST REGULATORS



PARTS WITHIN BOX
HAVE BEEN CHANGED

SEE ELECTRICAL PARTS LIST
IN REAR OF MANUAL

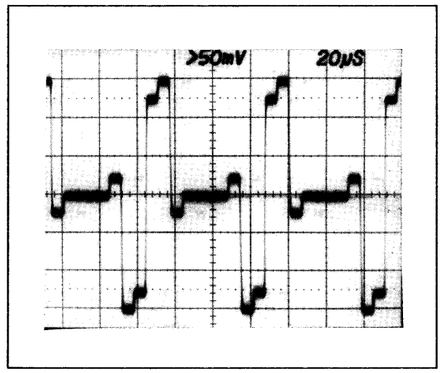
PART OF A6 VECTORSCOPE BOARD

A6 Vectorscope Board <30> Component Locator

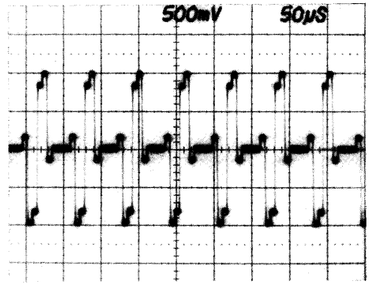
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C146	C5	Q628	G4	R623	F4
C148	D5	Q710	F2	R624	F4
C150	D5	Q719	G2	R625	G4
C153	C4	Q723	F4	R627	G4
C216	B1	Q730	G4	R708	F2
C218	B1			R714	G1
C243	B5	R144	B5	R716	G1
C248	B5	R147	C5	R726	G3
C249	B5	R148	C5	R728	G3
C251	C5	R154	C4	R729	G4
C318	B1	R218	B1	R734	B3
C319	B1	R219	B1	R735	B3
C343	E5	R243	B5	R736	A3
C344	E5	R244	B5	R802	C1
C346	F5	R245	B5	R803	C1
C411	E2	R247	B4	R804	C1
C412	E2	R248	A4	R806	C1
C417	F2	R250	A4	R818	G2
C529	E4	R251	D5	R822	F4
C530	E4	R315	B1	R831	B2
C537	F4	R316	B1	R832	B3
C614	G2	R317	B1	R833	B2
C627	G4	R346	E5	R834	B3
C632	B2	R353	C5	R835	B4
C634	B4	R354	C5	R836	B4
C703	C1	R444	F3	R837	A3
C733	B3	R511	F3	R838	B2
C735	C3	R512	F3	R839	B4
C803	D1	R513	G4	R840	B4
C805	C1	R514	G3		
C818	H2	R517	F2	U150	D5
C819	H3	R518	G3	U216	B1
C832	B3	R523	H4	U333B	D2
C835	C3	R524	H4	U345A	D2
		R525	G5	U345B	D2
Q145	C5	R527	G5	U345C	D3
Q246	B4	R528	F4	U345D	D3
Q515	G2	R612	F2	U415	E1
Q516	F3	R613	G2	U432	E4
Q526	G4	R616	G2	U534	E3
Q527	F4	R617	G2	U735	B3
Q611	F2	R618	G2	U803	C1
Q617	G2	R620	G2		
Q623	F4				

30

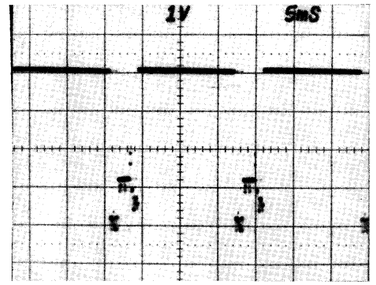
1



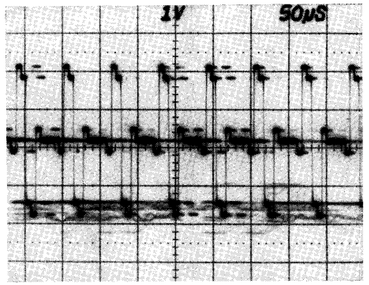
2



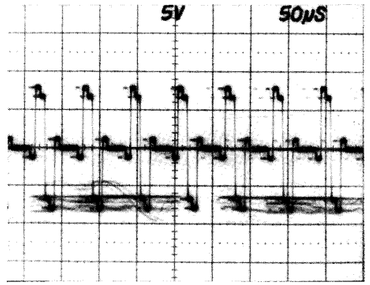
3



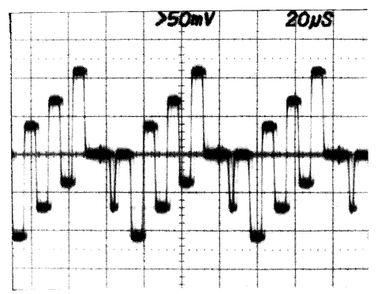
4



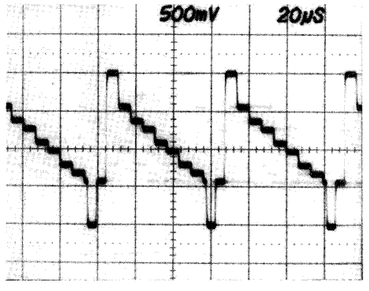
5



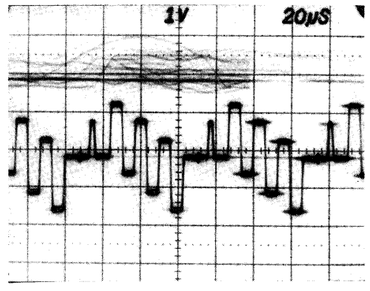
6



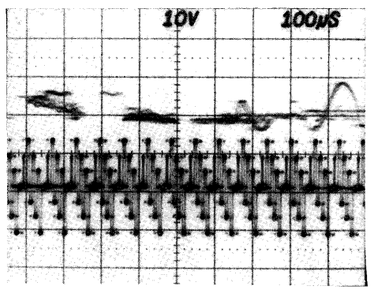
7

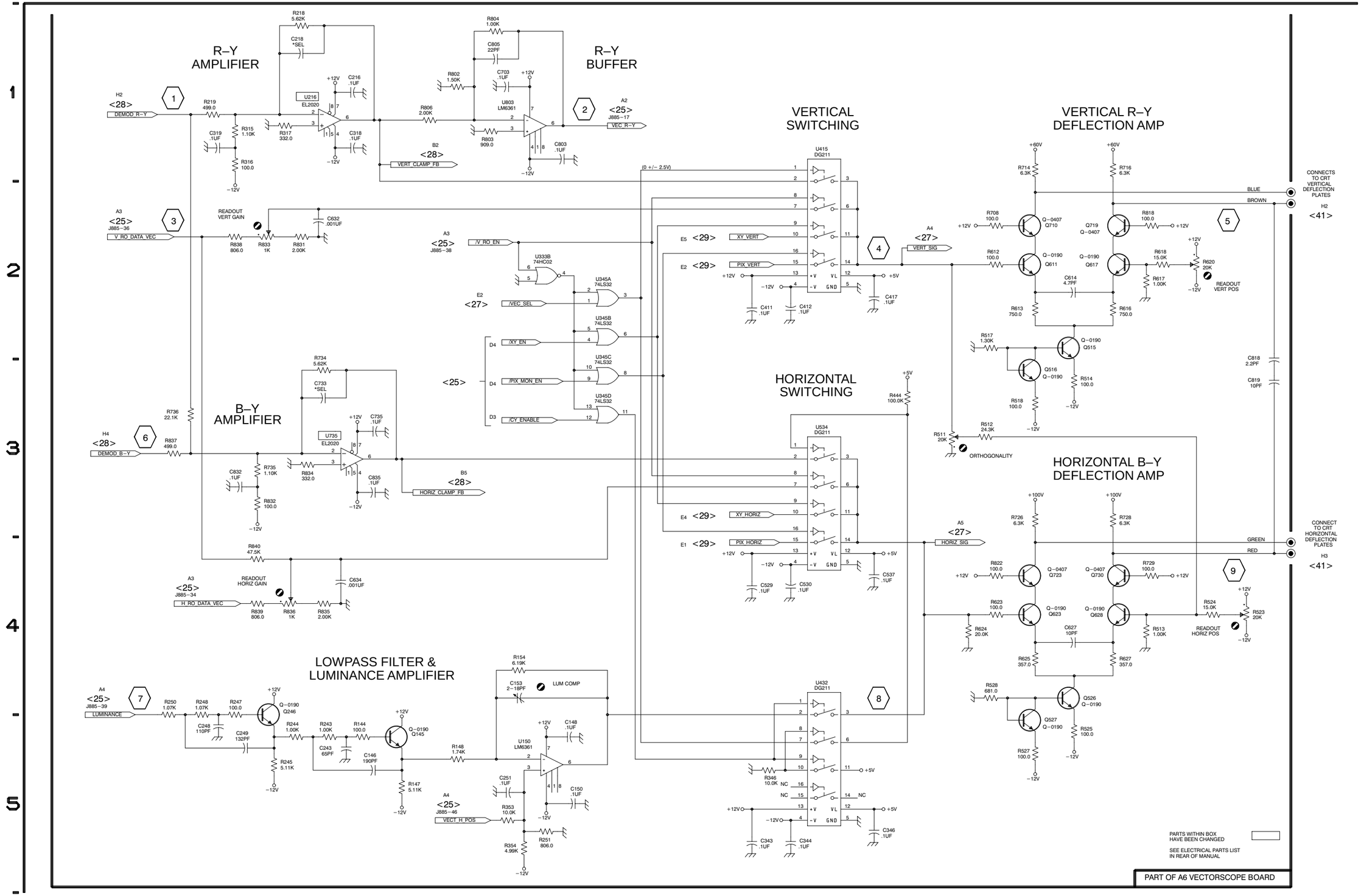


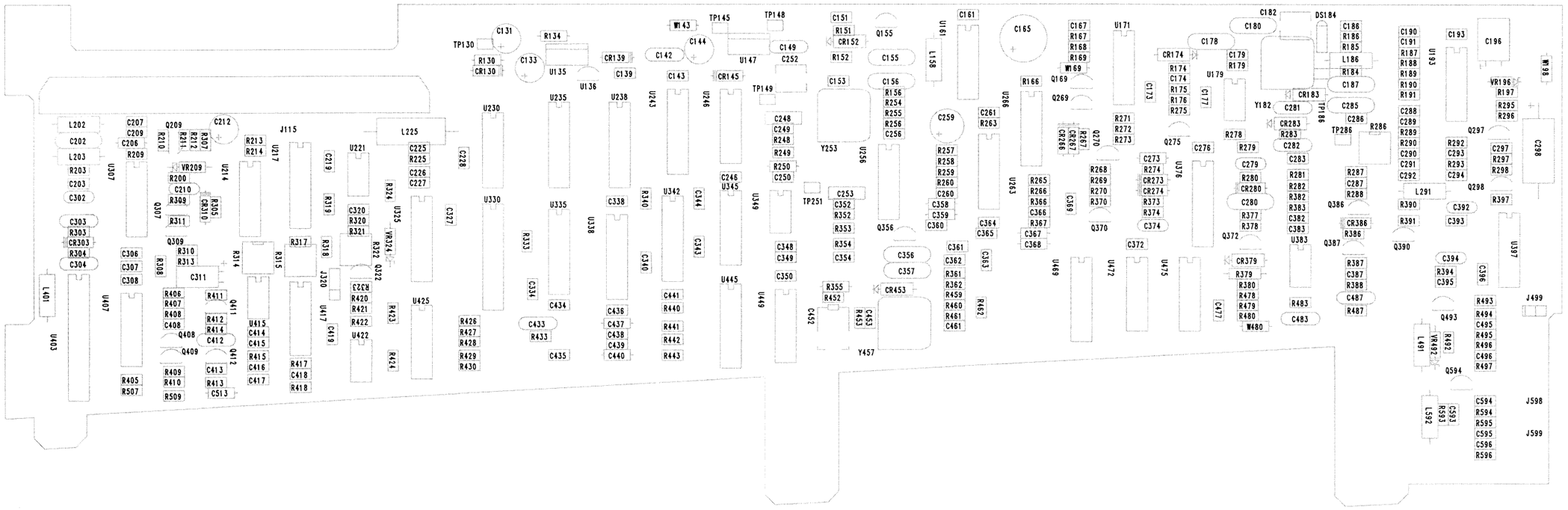
8



9

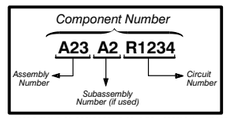



R–Y AMPLIFIER
R–Y BUFFER
VERTICAL SWITCHING
VERTICAL R–Y DEFLECTION AMP
B–Y AMPLIFIER
HORIZONTAL SWITCHING
HORIZONTAL B–Y DEFLECTION AMP
LOWPASS FILTER & LUMINANCE AMPLIFIER
DEMOD_R–Y
VERT_CLAMP_FB
VEC_R–Y
READOUT VERT GAIN
V_RO_DATA_VEC
/V_RO_EN
/VEC_SEL
/XY_EN
/PIX_MON_EN
/CY_ENABLE
XY_VERT
PIX_VERT
VERT_SIG
CONNECTS TO CRT VERTICAL DEFLECTION PLATES
BLUE
BROWN
READOUT VERT POS
ORTHOGONALITY
DEMOD_B–Y
HORIZ_CLAMP_FB
READOUT HORIZ GAIN
H_RO_DATA_VEC
XY_HORIZ
PIX_HORIZ
HORIZ_SIG
CONNECT TO CRT HORIZONTAL DEFLECTION PLATES
GREEN
RED
READOUT HORIZ POS
LUMINANCE
LUM COMP
VECT_H_POS
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A6 VECTORSCOPE BOARD



OSCILLATOR CIRCUIT BOARD (A7)

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

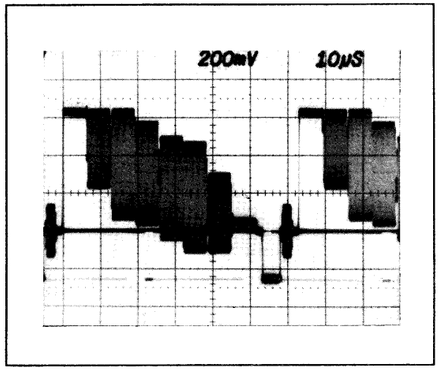
STATIC SENSITIVE DEVICES

A7 Oscillator Board

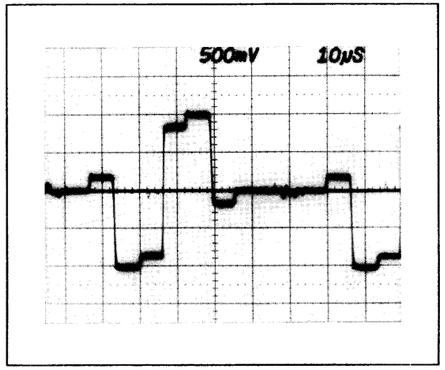
A7 Oscillator Board <31> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C167	F1	C594	A5	R184	D1	R397	B2
C173	A3	C595	B5	R185	G4	R478	F3
C174	F1	C596	B5	R186	G3	R479	F3
C177	E1			R187	C2	R480	E3
C178	G1	CR174	F1	R188	C1	R483	E3
C179	F1	CR183	E1	R189	D2	R487	C3
C180	F1	CR266	E2	R190	C2	R492	A4
C182	F1	CR267	F2	R191	C2	R493	C5
C186	A3	CR273	F3	R197	A1	R494	A5
C187	C1	CR274	F3	R267	F2	R495	A5
C190	C3	CR280	D4	R268	F2	R496	B5
C191	E1	CR283	E1	R269	E2	R497	A5
C193	C1	CR379	F3	R270	F2	R593	A4
C196	C1	CR386	C4	R271	G1	R594	A5
C273	F2			R272	E2	R595	B5
C276	B3	DS184	G3	R273	E2	R596	A5
C279	E3			R274	F3		
C280	D3	J5	A5	R275	F1	TP186	D1
C281	E1	J6	A5	R278	E2	TP286	E1
C282	E1	J499	A1	R279	F1		
C283	A3	J598	A5	R280	D3	U171A	G2
C285	D1	J599	A5	R281	E3	U171B	H2
C286	A3			R282	D2	U179	D1
C287	A4	L186	C1	R283	E1	U193	C1
C288	A4	L291	B2	R286	C2	U193	C2
C289	C2	L491	B5	R287	D1	U266C	C5
C290	C2	L592	B5	R288	C4	U376A	D3
C291	B4			R289	B2	U376B	C3
C292	C4	Q169	G1	R290	C2	U383A	F3
C293	B3	Q269	E2	R292	C1	U383B	D3
C294	B3	Q270	F2	R293	C2	U397	C5
C297	A3	Q275	G1	R295	A2	U469	G4
C298	A1	Q297	B1	R296	B2	U472A	E4
C369	A3	Q298	B1	R297	B2	U472B	F4
C372	E4	Q370	F3	R298	B1	U475A	E3
C374	C3	Q372	D3	R370	G3	U475B	E4
C382	D3	Q386	C4	R373	F2	U475C	E3
C383	G3	Q387	C4	R374	C3		
C387	C4	Q390	B4	R377	D3	VR196	C1
C392	B2	Q493	B4	R378	D3	VR492	B4
C393	B3	Q594	A5	R379	F3		
C394	B5			R380	F3	W169	G1
C395	B4	R166	H1	R382	C3	W198	B2
C396	C5	R167	E1	R383	D3	W480	E4
C477	B3	R168	E2	R386	C4		
C483	F3	R169	H1	R387	C4	Y182	F1
C487	C4	R174	G1	R388	B3		
C495	A4	R175	G1	R390	B2		
C496	B5	R176	F1	R391	B2		
C593	B4	R179	E1	R394	C5		

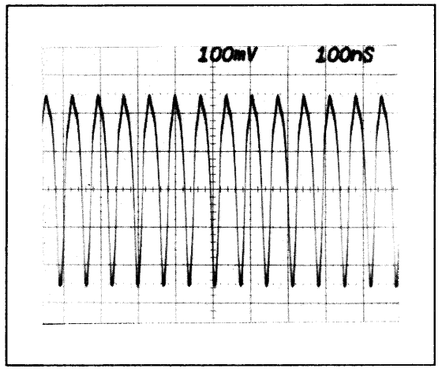
1



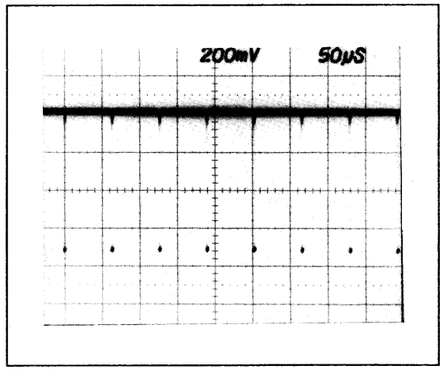
2



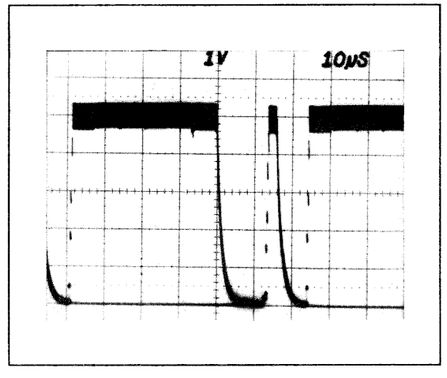
3



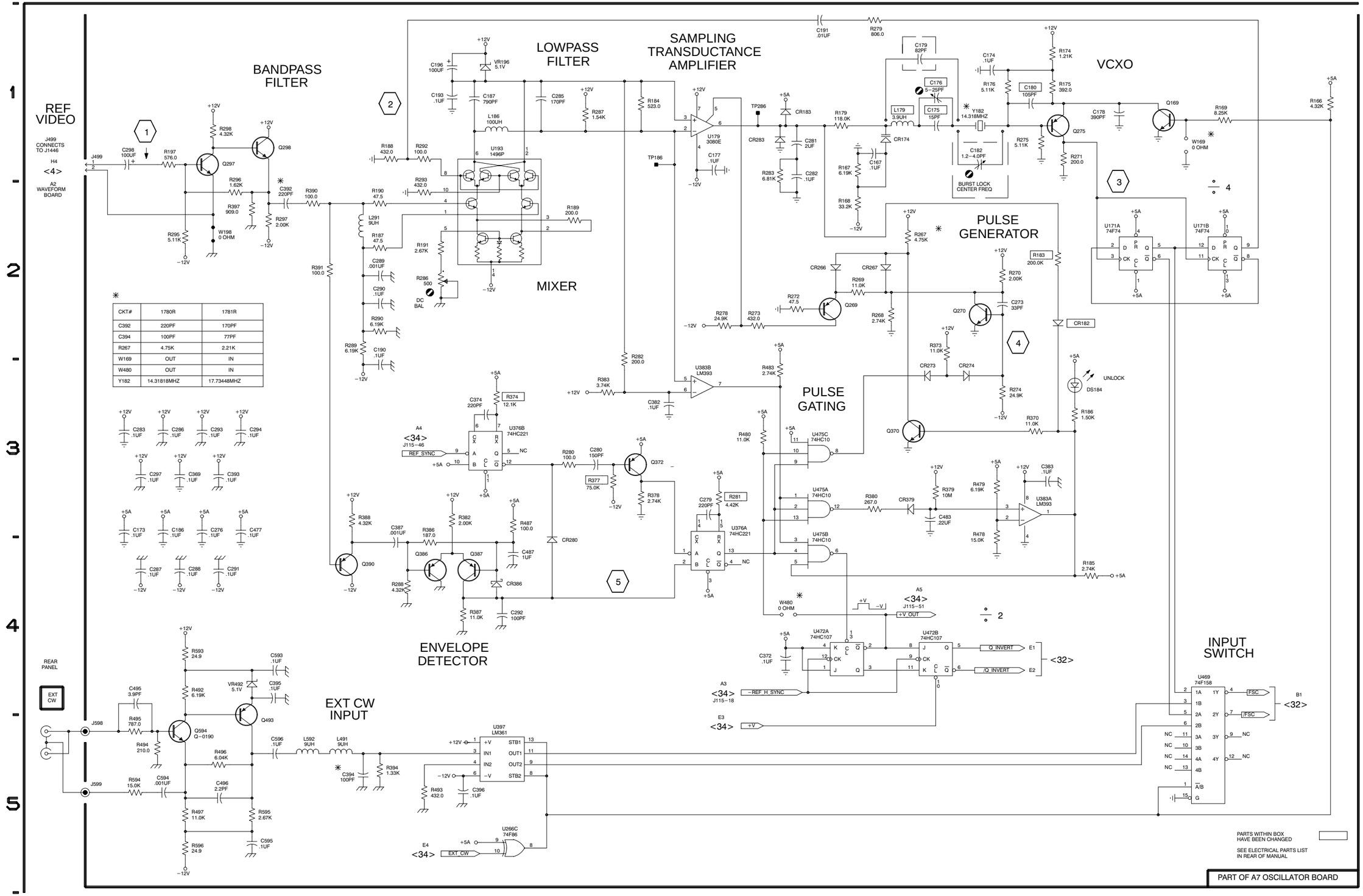
4



5



A7 Oscillator Board Waveforms

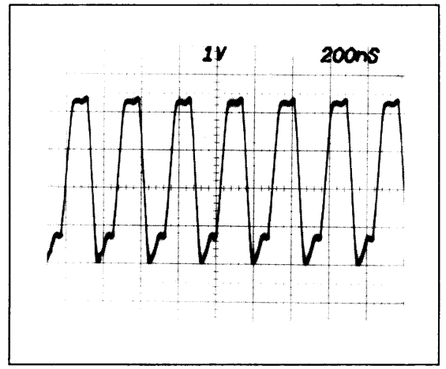


CKT#	1780R	1781R
C392	220PF	170PF
C394	100PF	77PF
R267	4.75K	2.21K
W169	OUT	IN
W480	OUT	IN
Y182	14.31818MHZ	17.73448MHZ

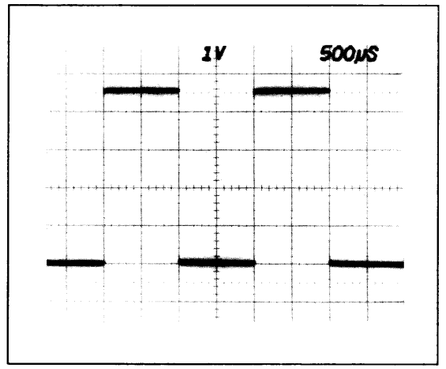
A7 Oscillator Board <32> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C151	G4	C439	F2	R442	F1
C153	B2	C440	G2	R443	F2
C155	A2	C441	H4	R452	G3
C156	A2	C452	F3	R453	G3
C161	A1	C453	F3	R459	F2
C228	G4	C461	E2	R460	F2
C246	G4			R461	F2
C248	C2	CR152	B2	R462	D1
C249	C2	CR453	F3		
C250	C2			TP149	C2
C252	B2	Q155	A2	TP251	G2
C253	G2	Q356	F3		
C256	A2			U161A	A1
C260	G1	R151	A2	U161B	A1
C327	H4	R152	B2	U230A	E5
C334	G5	R156	A2	U230B	F5
C338	H4	R248	C2	U235	E3
C340	F4	R249	C2	U238	E4
C343	G4	R250	C2	U246A	A5
C344	G4	R254	A2	U246D	A5
C348	H3	R255	A2	U256A	F1
C349	C2	R256	A2	U256B	F1
C352	G2	R257	F1	U256C	E2
C354	G3	R258	F1	U256D	E1
C356	E2	R259	G1	U263A	G1
C357	F3	R260	G1	U263B	C1
C358	G1	R263	H1	U266A	B1
C359	G1	R265	C1	U266B	B1
C360	G1	R266	C1	U335B	F5
C361	G1	R333	G5	U338	B3
C362	H4	R340	F4	U342	B4
C363	H4	R352	G2	U345	D2
C364	C1	R353	G3	U349A	C2
C365	G1	R354	G3	U349B	G3
C366	C1	R355	G2	U445	F1
C367	C1	R361	F3	U449	H2
C368	C1	R362	F3		
C434	G5	R366	C1	Y253	B2
C435	F2	R367	C1	Y457	F3
C436	F2	R440	F2		
C437	G2	R441	F2		
C438	F1				

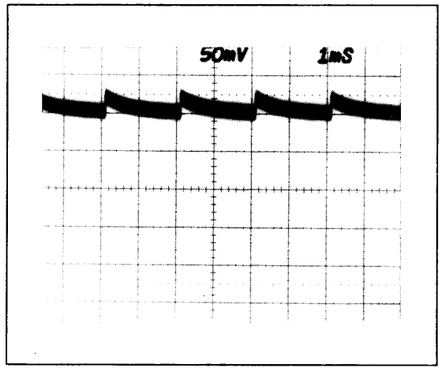
1

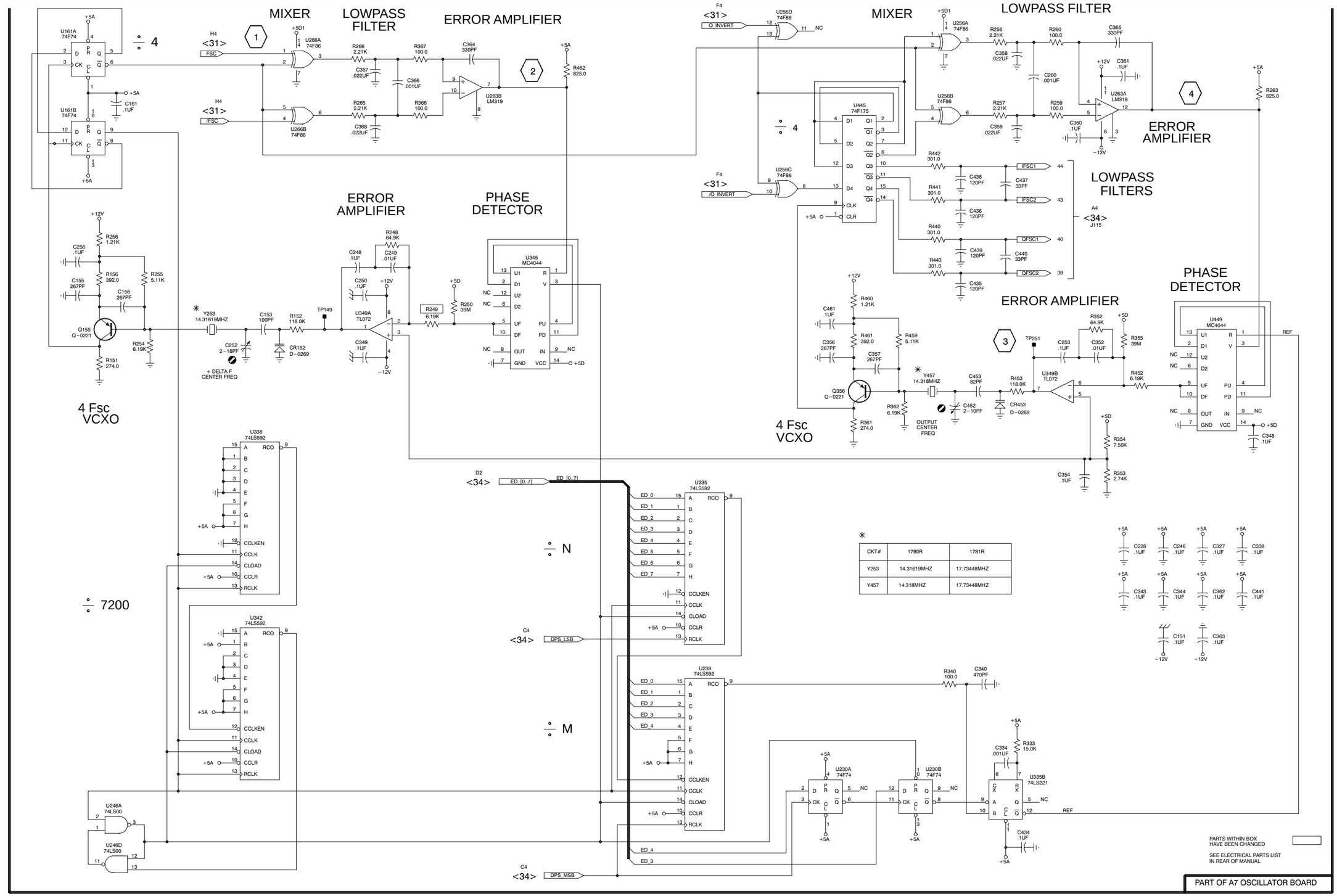


2



3





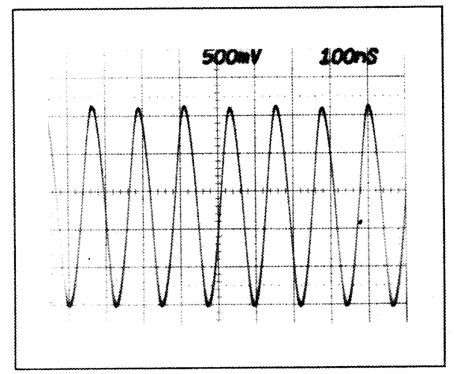
CKT#	1780R	1781R
Y253	14.31619MHZ	17.73448MHZ
Y457	14.318MHZ	17.73448MHZ

A7 Oscillator Board <33> Component Locator

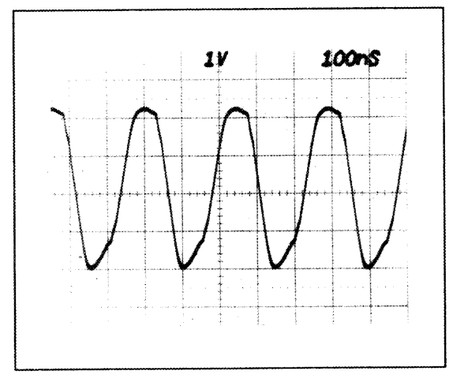
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C131	A5	R200	G3
C133	B5	R203	E2
C139	C5	R209	C5
C142	B5	R210	G3
C143	F5	R211	G3
C144	A5	R212	G3
C149	B5	R225	D5
C165	F5	R303	A2
C202	E2	R304	A2
C203	E2	R305	G2
C206	E2	R307	G2
C207	F5	R308	B3
C209	C5	R309	G2
C210	E1	R310	D2
C212	C5	R311	G2
C226	F5	R313	D4
C259	D5	R405	B2
C261	D5	R406	D1
C302	F2	R407	B3
C303	A2	R408	B3
C304	D3	R409	B1
C306	B3	R410	B1
C307	B1	R411	C2
C308	B3	R412	C2
C311	D1	R413	C1
C350	F5	R414	D2
C408	B3	R415	C2
C412	D2	R507	B2
C413	C1	R509	B3
C414	D2		
C415	D2	TP130	B5
C416	F5	TP145	C4
C513	C1	TP148	B4
CR130	B5	U135	A5
CR139	A5	U136	C5
CR145	B5	U147	A5
CR303	A2	U214	D4
CR310	E1	U307A	E2
		U307B	F2
L158	D5	U307C	F2
L202	E2	U307D	F2
L203	E2	U307E	G2
L225	D5	U307F	G3
L401	D3	U403	D3
		U407A	B2
Q209	G3	U407C	B2
Q307	G2	U407D	B2
Q309	D1	U415A	D2
Q408	B1	U415B	C1
Q409	B1		
Q411	C2	VR209	C5
Q412	C2		
		W143	E5
R130	A5		
R134	A5		

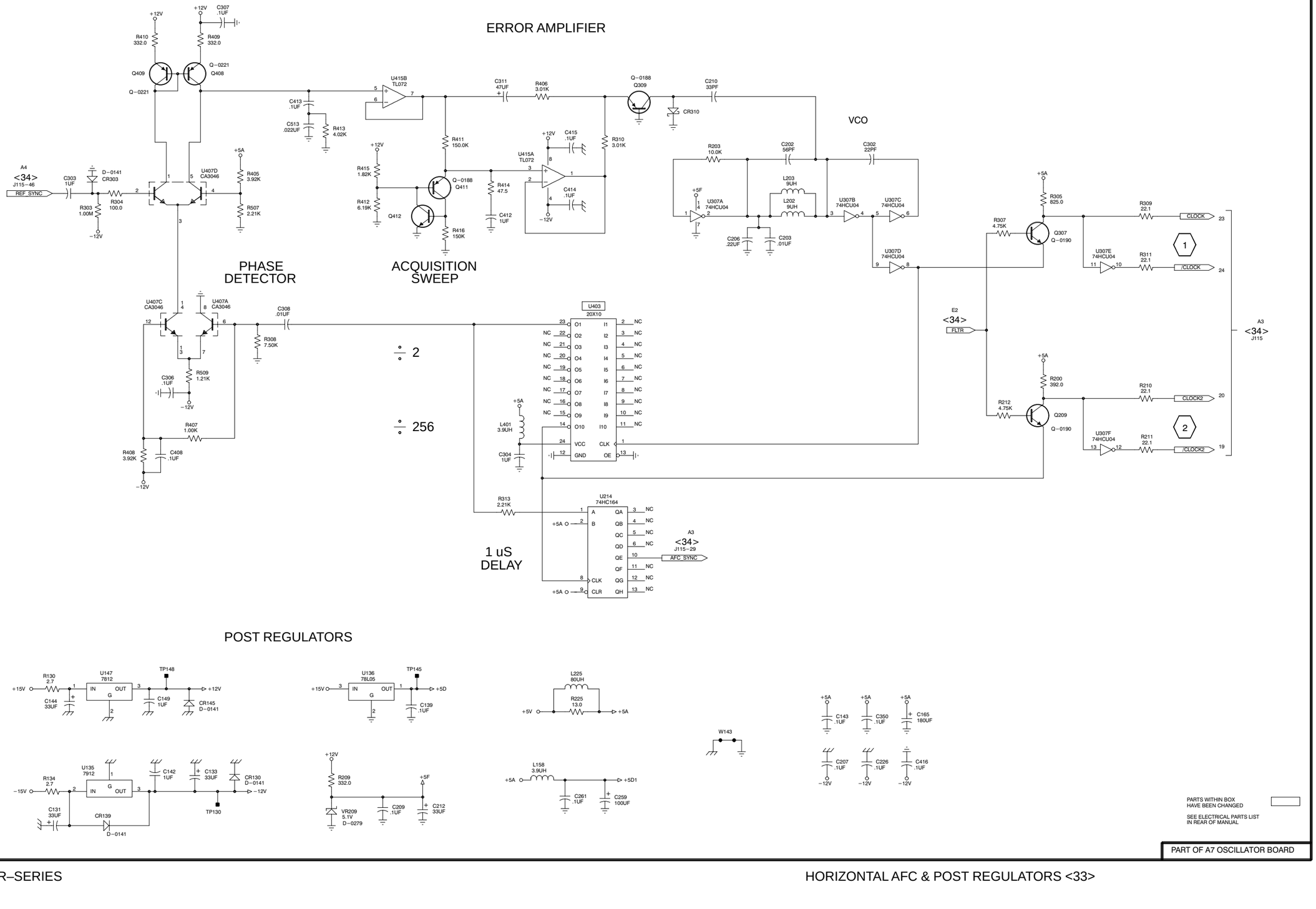
33

1



2



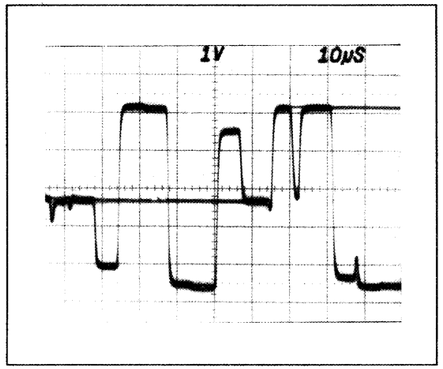

ERROR AMPLIFIER
VCO
PHASE DETECTOR
ACQUISITION SWEEP
÷ 2
÷ 256
1 uS DELAY
POST REGULATORS
A4 <34> J115–46 REF SYNC
A3 <34> J115–29 AFC SYNC
E2 <34> FLTR
A3 <34> J115
U403 20X10
U214 74HC164
U407D CA3046
U407C CA3046
U407A CA3046
U415A TL072
U415B TL072
Q–0221 Q408
Q409
Q–0188 Q309
Q–0188 Q411
Q412
Q307 Q–0190
Q209 Q–0190
U307A 74HCU04
U307B 74HCU04
U307C 74HCU04
U307D 74HCU04
U307E 74HCU04
U307F 74HCU04
CR303 D–0141
CR310
L401 3.9UH
L202 9UH
L203 9UH
L225 80UH
L158 3.9UH
W143
U147 7812
U136 78L05
U135 7912
VR209 5.1V D–0279
CR145 D–0141
CR139 D–0141
CR130 D–0141
TP148
TP145
TP130
CLOCK
/CLOCK
CLOCK2
/CLOCK2
AFC_SYNC
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A7 OSCILLATOR BOARD

A7 Oscillator Board <34> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C219	E4	R421	G2
C225	E4	R422	H2
C227	E4	R423	F2
C320	F4	R424	G2
C417	H1	R426	F1
C418	H1	R427	F1
C419	H1	R428	F1
C433	C4	R429	G1
		R430	G1
J115	A2	R433	C4
J320	D1		
		U217A	E2
P320	D1	U217B	E2
		U217C	E2
Q322	F2	U217D	E3
		U221A	E4
R213	E2	U221B	F4
R214	E1	U243	C4
R314	E1	U246B	D3
R315	F4	U246C	D3
R317	E2	U325	D4
R318	F2	U330	D3
R319	F4	U335A	C4
R320	F4	U417A	D1
R321	F4	U417B	F1
R322	E4	U422	H1
R323	F1	U425	G2
R324	D4	U425	G2
R417	H1		
R418	G1	VR324	D4
R420	F2		

34

1



2

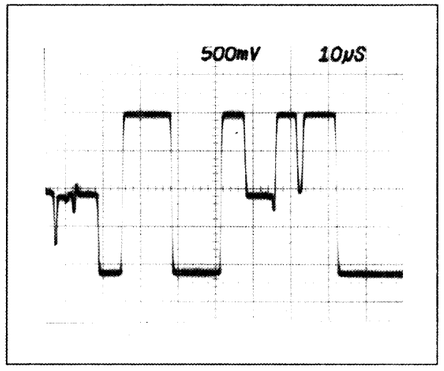


Table 34

J115 Connects with these pins via the Interconnect Board.

J115 Pin#	To / From	Destination / Origin
1	→	J515-38 <21>
2	→	J515-37 <21>
3	→	J515-35 <21>
4	→	J515-34 <21>
6	→	J515-33 <21>
7	→	J415-29 <21>
9	→	J415-27 <21>
10	→	J415-26 <21>
17	←	J310-25 <35>
18	→	J147-16 <12>
19	←	J310-32 <35>
20	←	J310-31 <35>
23	←	J310-33 <35>
27	←	J310-28 <35>
28	←	J310-27 <35>
29	←	J310-29 <35> J147-14 <12>
31	→	J147-18 <12>
33	←	J130-15 <12>
35	→	J415-9 <21>
39	←	J885-24 <25>
40	←	J885-23 <25>
43	←	J885-20 <25>
44	←	J885-19 <25>
46	→	J147-20 <12>
47	←	J180-29 <38>
49	→	J310-4 <35>
51	←	J380-11 <35> J147-8 <12>
52	←	J310-26 <35>
53	→	J515-19 <21>
54	→	J515-9 <21>
55	→	J515-14 <21>
56	→	J515-15 <21>
57	→	J885-35 <25>
58	→	J515-13 <21>

SWITCH CONTROL

ALTERNATE MODE SWITCH

DEMODULATED CHROMA SOURCE SWITCH

DATA LATCH

OFFSET DAC

OFFSET DAC

DECODER

J320
DIFF. PHASE DISPLAY
1–2 DOUBLE
2–3 SINGLE

J115
CONNECTS TO J303
E1
<44>
A11 INTERCONNECT BOARD

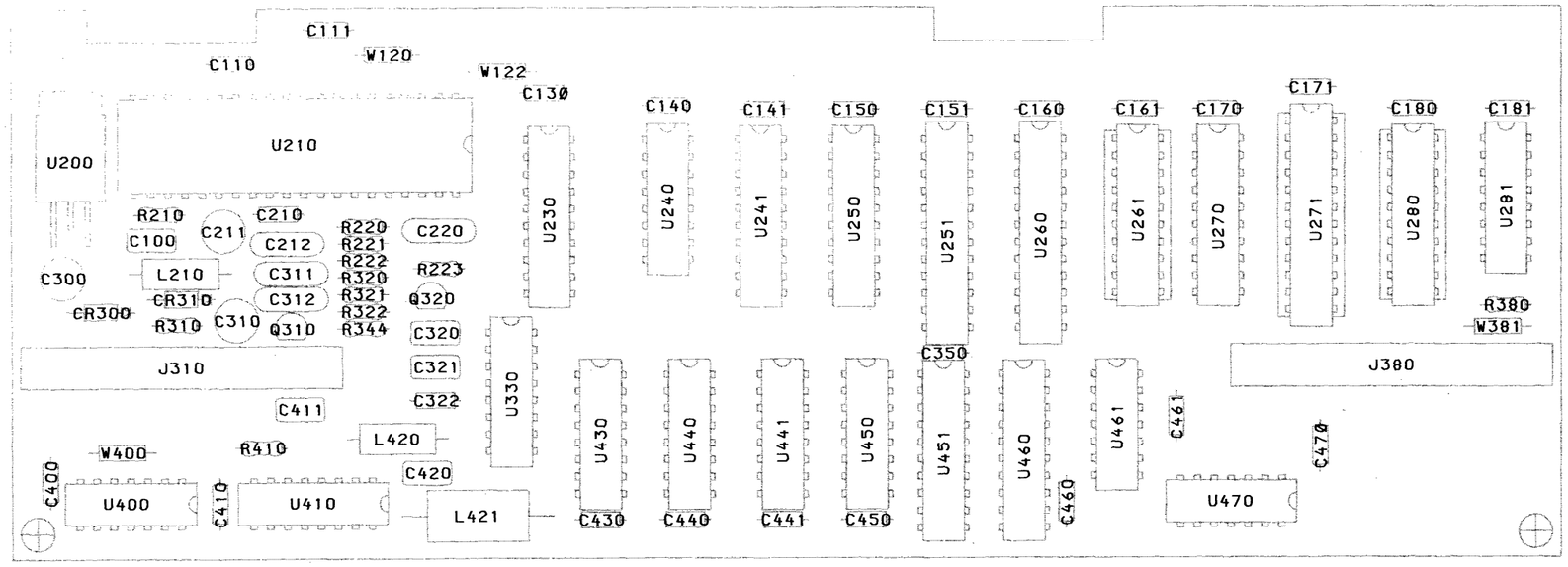
NOTE:
SEE TABLE 34 FOR SIGNAL ORIGIN OR DESTINATION

CKT#	1780R	1781R
R319	3.32K	6.81K
R320	2.00K	2.80K

PARTS WITHIN BOX HAVE BEEN CHANGED

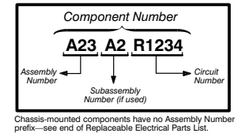
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL

PART OF A7 OSCILLATOR BOARD



FILTER CIRCUIT BOARD (A15)

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

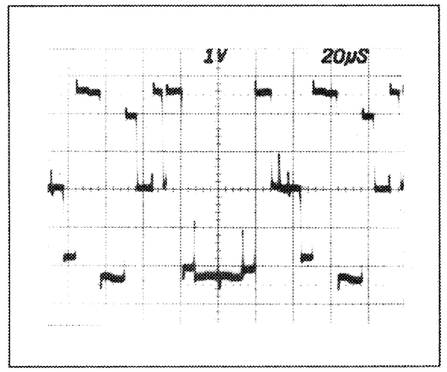
STATIC SENSITIVE DEVICES

A15 Filter Board <35> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C100	H3	C470	A2	U270	E1
C110	G2			U271	C4
C111	H2	CR300	G3	U280	G4
C130	A1	CR310	H3	U281	F4
C140	A1			U330	D4
C141	A1	J310	A1	U400A	B3
C150	B1	J380	A3	U400B	B4
C151	B1			U410A	E3
C160	A1	L210	H3	U410B	E3
C161	A1	L420	G4	U430	C1
C170	A1	L421	G4	U440	C2
C171	A1			U441	C1
C180	A1	Q310	H1	U450	C2
C181	B1	Q320	G1	U451	D2
C210	G2	R210	F1	U460	F3
C211	G2	R220	G1	U461A	B2
C212	G1	R221	G1	U461B	B2
C220	G1	R222	G2	U461C	B2
C300	G3	R223	G1	U461D	B2
C310	H3	R310	H1	U461E	D5
C311	H1	R320	H1	U461F	F5
C312	H1	R321	H1	U470A	C3
C320	H1	R322	H1	U470B	B1
C321	H2	R344	H1	U470C	B1
C322	A1	R380	H5	U470D	A3
C350	B1	R410	B1	U470E	B1
C400	B1			U470F	B1
C410	A1	U200	G3		
C411	G4	U210	F1	W120	G2
C420	G4	U230	E2	W121	G2
C430	A1	U240	C2	W122	G1
C440	A1	U241	F2	W123	G1
C441	A1	U250	D1	W381	H5
C450	B1	U251	E4	W400	H4
C460	A2	U260	F4		
C461	A2	U261	B3		

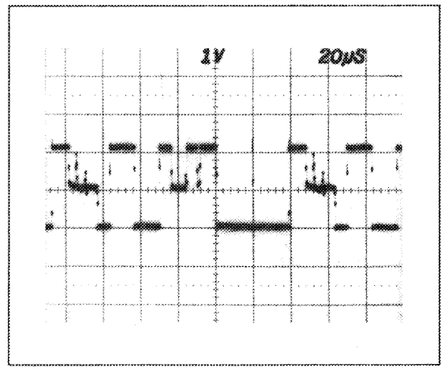
35

1



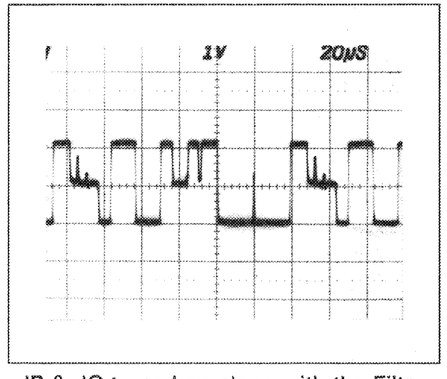
dP & dG turned on.

2



dP & dG turned on along with the Filter.

3



dP & dG turned on along with the Filter.

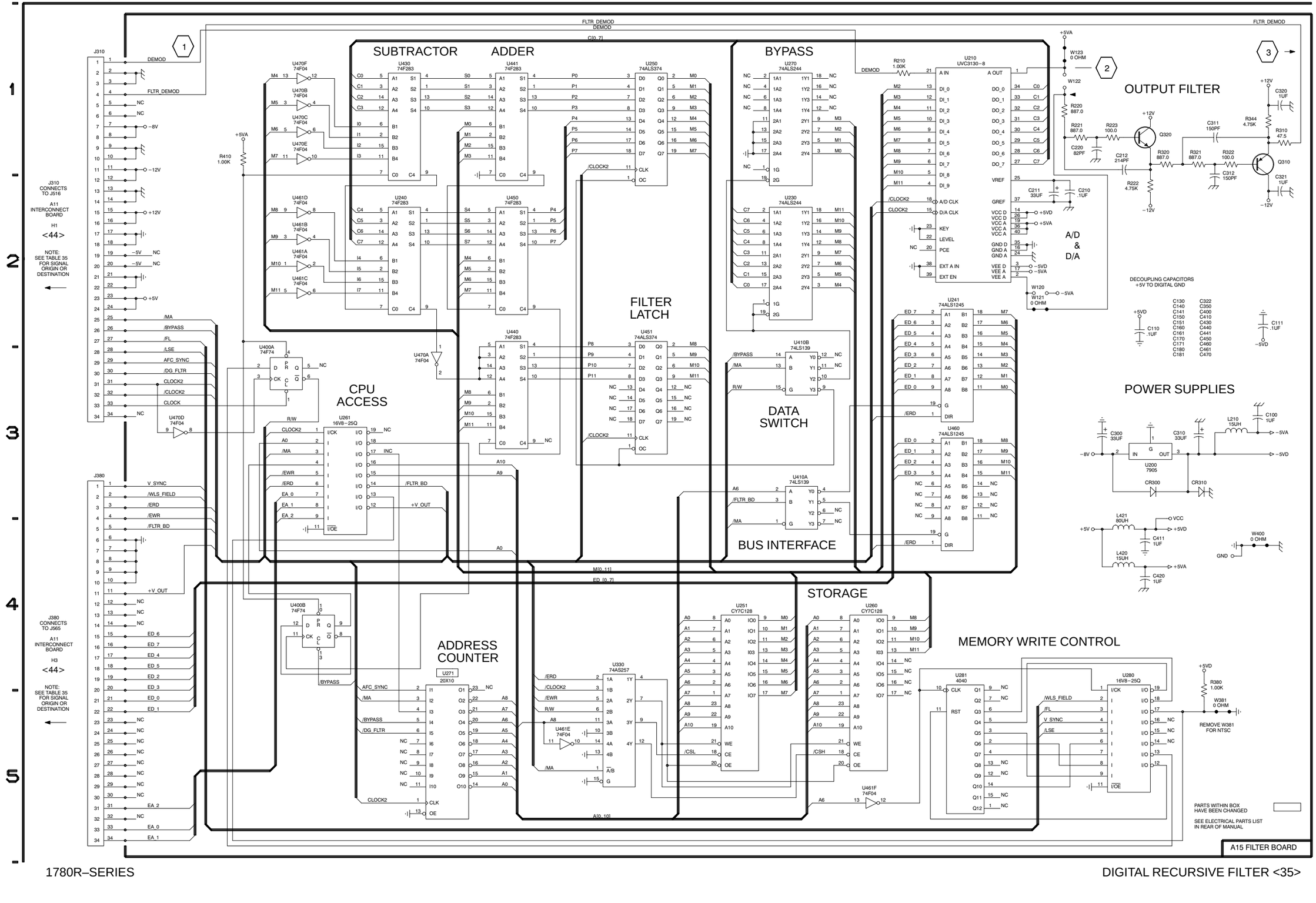
Table 35

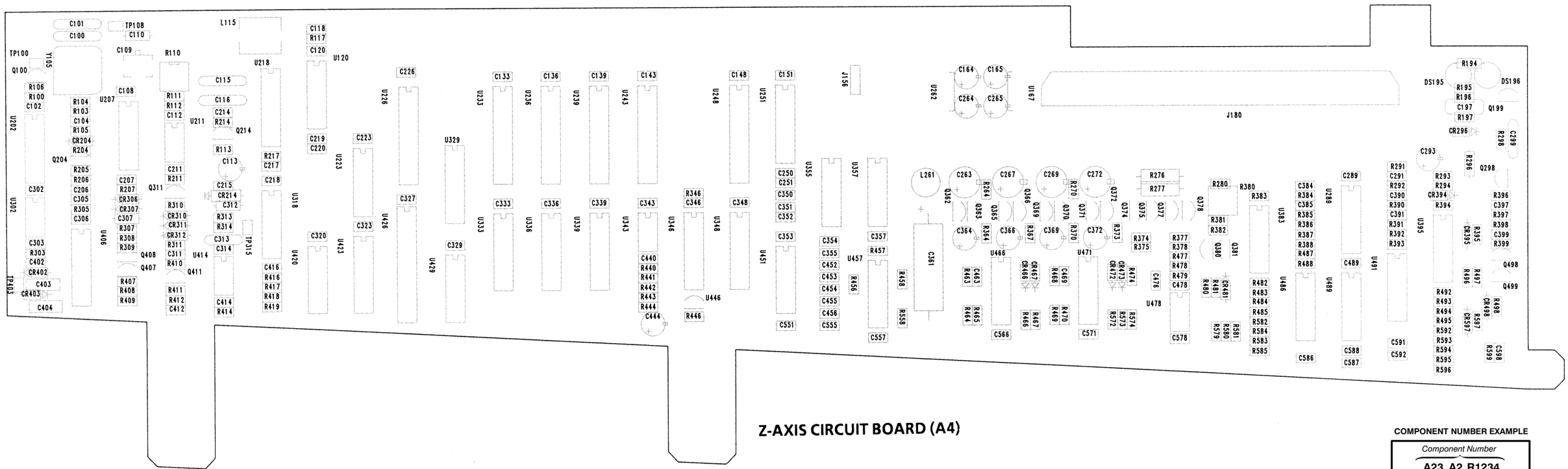
J310 Connects with these pins via the Interconnect Board.

J310 Pin#	To / From	Destination / Origin
1	→	J885-35 <25>
4	←	J115-49 <34>
25	→	J115-17 <34>
26	→	J115-52 <34>
27	→	J115-28 <34>
28	→	J115-27 <34>
29	→	J115-29 <34>
30	→	J885-14 <25>
31	→	J115-20 <34>
32	→	J115-19 <34>
33	→	J115-23 <34>

J380 Connects with these pins via the Interconnect Board.

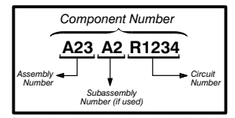
J380 Pin#	To / From	Destination / Origin
1	→	J147-18 <12>
2	→	J515-39 <21>
3	→	J515-7 <21>
4	→	J515-9 <21>
5	→	J415-37 <21>
11	→	J115-51 <34>
15	↔	J515-37 <21>
16	↔	J515-38 <21>
17	↔	J515-34 <21>
18	↔	J515-35 <21>
19	↔	J415-29 <21>
20	↔	J515-33 <21>
21	↔	J415-26 <21>
22	↔	J415-27 <21>
31	→	J515-13 <21>
33	→	J515-15 <21>
34	→	J515-14 <21>


SUBTRACTOR
ADDER
BYPASS
OUTPUT FILTER
FILTER LATCH
CPU ACCESS
DATA SWITCH
BUS INTERFACE
STORAGE
ADDRESS COUNTER
MEMORY WRITE CONTROL
POWER SUPPLIES
A/D & D/A
DECOUPLING CAPACITORS +5V TO DIGITAL GND
REMOVE W381 FOR NTSC
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
A15 FILTER BOARD
J310 CONNECTS TO J516
A11 INTERCONNECT BOARD
H1
<44>
NOTE: SEE TABLE 35 FOR SIGNAL ORIGIN OR DESTINATION
J380 CONNECTS TO J565
A11 INTERCONNECT BOARD
H3
<44>
NOTE: SEE TABLE 35 FOR SIGNAL ORIGIN OR DESTINATION



Z-AXIS CIRCUIT BOARD (A4)

COMPONENT NUMBER EXAMPLE



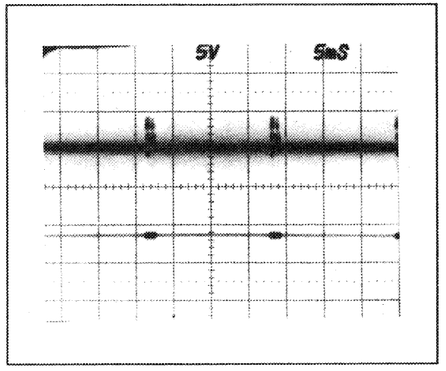
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

STATIC SENSITIVE DEVICES

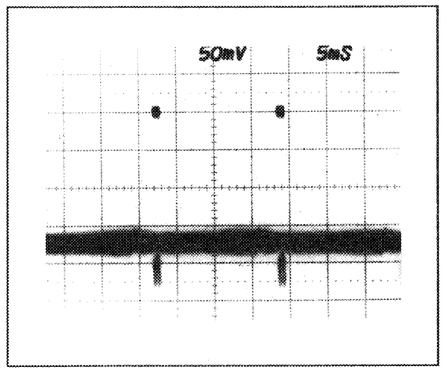
A4 Z–Axis Board <36> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C164	G3	R291	G4	R498	G2
C165	G3	R292	E2	R579	D5
C197	G1	R293	E3	R580	C5
C264	H3	R294	D2	R581	C5
C265	H3	R296	G2	R582	E5
C289	G4	R298	G1	R583	D5
C291	E2	R380	B4	R584	C5
C293	H4	R381	C4	R585	C5
C299	G1	R382	C4	R592	D3
C384	E4	R383	D4	R593	C3
C385	C4	R384	E4	R594	C3
C390	B2	R385	C4	R595	B3
C391	D1	R386	D4	R596	C3
C397	F2	R387	E4	R597	B2
C399	G1	R388	C4	R599	F1
C598	F1	R390	B2		
		R391	D1	U167	G3
CR296	H2	R392	C2	U262	G3
CR394	D2	R393	C2	U289A	B4
CR395	E2	R394	E2	U289B	B1
CR481	C5	R395	C2	U357B	B2
CR498	F2	R396	F2	U383A	C4
CR597	B2	R397	F2	U383B	D5
		R398	G1	U383C	D5
DS195	H1	R399	G1	U383D	D4
DS196	H1	R480	B4	U395A	D2
		R481	B4	U395B	E2
Q199	G1	R482	D4	U395C	E3
Q298	G1	R483	E5	U395D	C2
Q380	B4	R484	E5	U486A	D5
Q381	C5	R485	E5	U486B	E4
Q498	G2	R487	E5	U486C	E5
Q499	G2	R488	E4	U486D	E4
		R492	C2	U491A	D3
R194	H1	R493	E3	U491B	D3
R195	G1	R494	E3	U491C	C3
R196	G1	R495	E3	U491D	C2
R197	G1	R496	E2		
R280	B4	R497	D2		

1



2



WAVEFORM Z–AXIS AMP

WAVEFORM Z–AXIS

POWER SUPPLIES

VECTORSCOPE Z–AXIS

NOTE: THE VECTORSCOPE Z–AXIS AMP IS LOCATED ON THE VECTOR HIGH VOLTS BOARD.

PARTS WITHIN BOX HAVE BEEN CHANGED

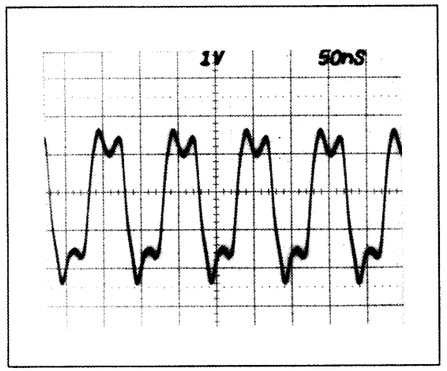
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL

PART OF A4 Z–AXIS BOARD

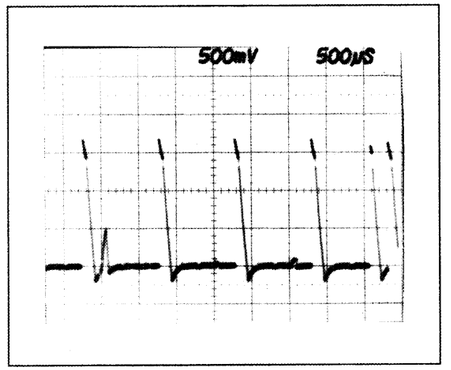
A4 Z–Axis Board <37> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C100	G1	R105	H1
C101	G1	R106	G1
C102	H4	R110	C4
C104	H1	R111	C4
C108	C2	R112	C4
C109	H1	R113	C2
C110	H1	R117	E4
C112	B4	R204	F1
C113	C2	R205	F1
C115	B2	R206	F2
C116	B2	R207	C3
C118	E4	R211	D3
C120	E4	R214	B2
C206	F2	R303	E1
C207	C3	R305	F2
C211	B4	R307	A2
C214	B2	R308	A2
C215	C2	R309	A2
C218	D4	R310	B4
C219	E5	R311	B4
C302	E2	R313	C2
C303	E2	R314	C2
C305	F2	R407	A3
C306	H4	R408	A3
C307	A3	R409	C3
C311	B4	R410	B4
C312	C2	R411	B3
C313	C4	R412	B4
C314	C5	R414	C5
C402	E1	R416	C5
C403	D2	R417	C5
C404	D2	R418	C5
C412	B3	R419	C5
C414	C5		
C416	D4	TP100	D2
		TP108	G1
CR204	F1	TP315	B4
CR214	C2	TP403	E2
CR306	C3		
CR307	A2	U120	E5
CR310	B4	U202A	G1
CR311	B4	U202C	F1
CR312	B4	U207	D3
CR402	E1	U211A	B4
CR403	F2	U211B	C4
		U218A	E4
L115	B2	U302A	E2
		U302B	D2
Q100	G1	U318	D4
Q204	F1	U406A	E2
Q214	C2	U406B	D2
Q311	D4	U406C	B5
Q407	B3	U406D	B5
Q408	A2	U414A	C5
Q411	B4	U414B	C5
R100	G1	Y105	H1
R103	H1		
R104	G1		

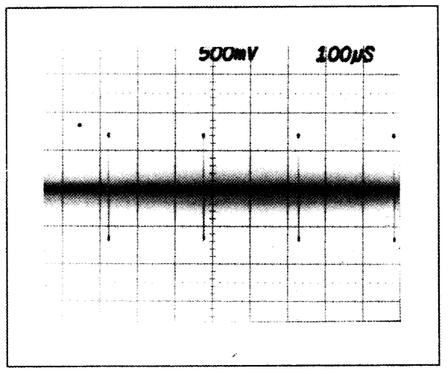
1

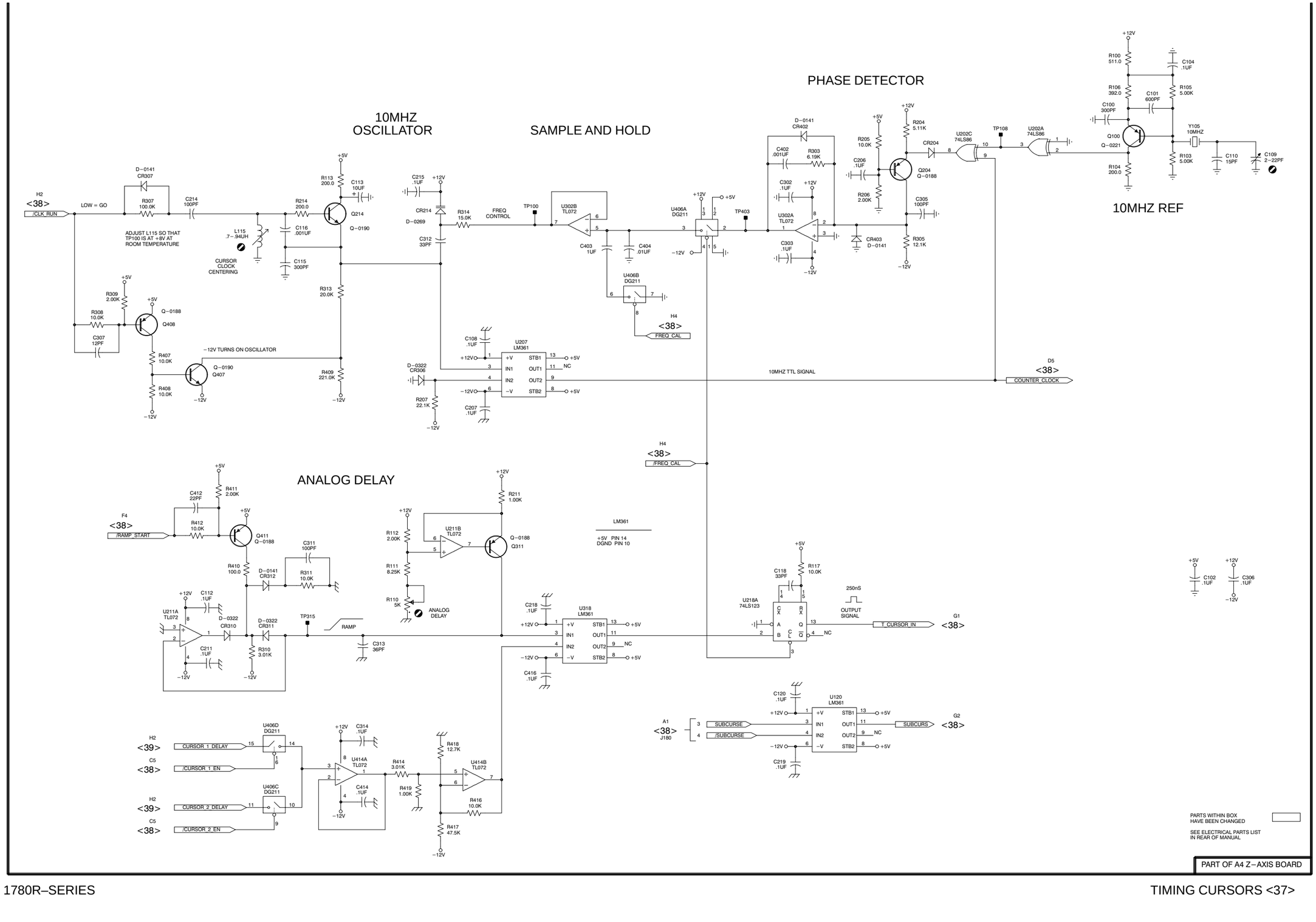


2



3




10MHZ OSCILLATOR
SAMPLE AND HOLD
PHASE DETECTOR
ANALOG DELAY
10MHZ REF
H2
<38>
/CLK RUN
LOW = GO
D−0141
CR307
R307
100.0K
C214
100PF
ADJUST L115 SO THAT
TP100 IS AT +8V AT
ROOM TEMPERATURE
L115
.7−.94UH
CURSOR
CLOCK
CENTERING
R214
200.0
C116
.001UF
C115
300PF
R113
200.0
C113
10UF
Q214
Q−0190
+5V
R309
2.00K
R308
10.0K
C307
12PF
Q−0188
Q408
R407
10.0K
R408
10.0K
Q−0190
Q407
−12V TURNS ON OSCILLATOR
R313
20.0K
R409
221.0K
−12V
C215
.1UF
+12V
CR214
D−0269
C312
33PF
R314
15.0K
FREQ
CONTROL
TP100
U302B
TL072
C403
1UF
C404
.01UF
U406A
DG211
U406B
DG211
TP403
H4
<38>
FREQ_CAL
C108
.1UF
U207
LM361
D−0322
CR306
R207
22.1K
C207
.1UF
+V
−V
STB1
STB2
OUT1
OUT2
IN1
IN2
NC
10MHZ TTL SIGNAL
D5
<38>
COUNTER_CLOCK
D−0141
CR402
C402
.001UF
R303
6.19K
C302
.1UF
U302A
TL072
C303
.1UF
R204
5.11K
CR204
R205
10.0K
C206
.1UF
R206
2.00K
Q204
Q−0188
C305
100PF
CR403
D−0141
R305
12.1K
U202C
74LS86
TP108
U202A
74LS86
R100
511.0
R106
392.0
C100
300PF
Q100
Q−0221
R104
200.0
C104
.1UF
C101
600PF
R105
5.00K
Y105
10MHZ
R103
5.00K
C110
15PF
C109
2−22PF
H4
<38>
/FREQ_CAL
F4
<38>
/RAMP START
C412
22PF
R411
2.00K
R412
10.0K
Q411
Q−0188
R410
100.0
C311
100PF
D−0141
CR312
R311
10.0K
R211
1.00K
U211B
TL072
Q−0188
Q311
R112
2.00K
R111
8.25K
R110
5K
ANALOG
DELAY
LM361
+5V PIN 14
DGND PIN 10
U211A
TL072
C112
.1UF
D−0322
CR310
D−0322
CR311
TP315
RAMP
C211
.1UF
R310
3.01K
C313
36PF
C218
.1UF
U318
LM361
C416
.1UF
C118
33PF
R117
10.0K
U218A
74LS123
250nS
OUTPUT
SIGNAL
T_CURSOR_IN
G1
<38>
NC
C102
.1UF
C306
.1UF
H2
<39>
C5
<38>
CURSOR 1 DELAY
/CURSOR 1 EN
CURSOR 2 DELAY
/CURSOR 2 EN
U406D
DG211
U406C
DG211
C314
.1UF
U414A
TL072
C414
.1UF
R414
3.01K
R419
1.00K
R418
12.7K
U414B
TL072
R416
10.0K
R417
47.5K
A1
<38>
J180
SUBCURSE
/SUBCURSE
C120
.1UF
U120
LM361
C219
.1UF
SUBCURS
G2
<38>
PARTS WITHIN BOX
HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST
IN REAR OF MANUAL
PART OF A4 Z−AXIS BOARD

A4 Z–Axis Board <38> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION
C133	D5
C136	E5
C139	E5
C143	E5
C217	F4
C220	E5
C223	F5
C320	F5
C323	F5
C327	G5
C329	G5
C333	F5
C336	G5
C339	G5
J156	A1
J180	A1
R217	F4
U218B	F4
U223A	D5
U223B	G3
U233	D4
U236	D2
U239	D3
U243	D1
U329	C4
U333	E2
U336	E3
U339	E4
U420A	G4
U423	G4
U426	G1
U429A	F1
U429B	G3

Table 38

J180 Connects with these pins via the Interconnect Board.

J180 Pin#	To / From	Destination / Origin
3	→	J885-43 <25>
4	→	J885-44 <25>
5	→	J147-16 <12>
7	→	J130-27 <12>
9	→	J148-18 <12>
12	→	J515-39 <21>
13	←	J116-7 <45>
15	→	J515-13 <21>
16	→	J415-1 <21>
17	→	J515-14 <21>
19	←	J116-6 <45>
20	←	J116-5 <45>
22	←	J150-6 <45>
23	→	J147-22 <12>
24	←	J150-5 <45>
25	→	J515-15 <21>
26	←	J150-7 <45>
27	→	J415-56 <21>
28	→	J415-22 <21>
29	→	J115-47 <34>
30	→	J515-18 <21>
31	→	J415-19 <21>

Con't next column.

J180 Con't from previous column.

J180 Pin#	To / From	Destination / Origin
32	→	J885-41 <25>
34	→	J515-21 <21>
36	→	J147-13 <12>
38	→	J415-11 <21>
39	←	P143-2 <41>
40	←	J100-3 <41>
41	←	P165-2 <42>
43	←	J100-4 <41>
45	→	J415-3 <21>
46	←	J885-26 <25>
47	←	J885-32 <25>
48	→	J515-38 <21>
49	→	J515-37 <21>
50	→	J515-35 <21>
51	→	J515-34 <21>
52	→	J515-33 <21>
53	→	J415-29 <21>
54	→	J415-27 <21>
55	→	J415-26 <21>
56	→	J415-25 <21>
57	→	J515-5 <21>
58	→	J515-9 <21>
59	←	J885-46 <25>
60	←	J885-45 <25>

CURSOR VS SWEEP SYNCHRONIZATION & CURSOR ENABLE

DIGITAL DELAY

COUNTERS

CURSOR SELECT

FREQ CAL TIMER

J156 CONNECTS TO J550

A16 WAVEFORM HIGH VOLTS BOARD

A4 <42>

J180 CONNECTS TO J492

A11 INTERCONNECT BOARD

A1 <45>

NOTE: SEE TABLE 38 FOR SIGNAL ORIGIN OR DESTINATION

J156: CURSOR, W_FOCUS <39> F1, WFM_Z–AXIS <36> H1

J180: −15V, +15V, SUBCURSE, /SUBCURSE <37> E5, −REF_H_SYNC, TRIG_EN, V_SYNC, +5V, +100V, /WLS_FIELD <36> B2, VECT_INT_LAMP <40> G1, W_RO_BLNK <36> E2, VECT_EXT_LAMP <40> G2, VECT_SCALE_GND <40> G2, WFM_EXT_LAMP <40> G4, /WFM_BLANK <36> A1, WFM_SCALE_GND <40> G3, WFM_INT_LAMP <40> G3, V_BLANK_EN <36> A4, W_BLANK_EN, PHASE_BLANK <36> A4, WLS_LINE, V_LINESEL <36> A4, /VECTOR_BLNK <36> A4, /CURSOR_CLK, PIX_SIG <36> B4, SEG_INTENS <36> F4, V_COIL <40> E5, V_FOCUS <39> F1, W_COIL <40> G5, VECT_Z–AXIS <36> E4, V_RO_BLNK <36> F4, X_POSITION <39> H3, Y_POSITION <39> H3, ED_7, ED_6, ED_5, ED_4, ED_3, ED_2, ED_1, ED_0, /MUX_SEL <39> A5, /DAC_SEL <39> A4, VECT_H_POS <39> H1, VECT_V_POS <39> H1

AGND; W_BLANK_EN; WLS_LINE; A1 <36>

U329 74LS138: EA_0, EA_1, EA_2, +5V, G1, /CURSOR_CLK, G2A, /EWR, G2B; Y0, Y1, Y2, Y3, Y4 GRAT_CLK B3 <40>, Y5 NC, Y6 NC, Y7 NC

A4 <39> /EWR; A3 <39> A2 <40> ED [0..7]

U243, U236, U239, U233 74LS374: ED_7 … ED_0; D0 … D7; Q0 … Q7; NC; D8 … D11; CLK; OC

CURSOR 1 DATA (12 BITS); CURSOR 2 DATA (12 BITS)

U333, U336, U339 74LS163: +5V, ENT, ENP, CLR, LOAD, CLK, D0 … D11, A … D, QA … QD, RCO

G3 <37> COUNTER_CLOCK

HI = COUNTER ENABLE

U429A 74LS74: TRIG_EN, −REF_H_SYNC, LINE_SEL_PHASE, +5V

U218B 74LS123: C217 200PF, R217 10.0K, 1US, A4 <37> /RAMP_START

U426 20V8–15: F4 <37> T_CURSOR_IN, C3 <40> LINESEL, CURSOR, WLS_LINE, TRIG_EN, HALF_TRIG_EN, /COUNTER_ENABLE, W_BLANK_EN, V_SYNC, C2 <40> TIME_DOTS_EN, C2 <40> SUBC_DOTS_EN, F5 <37> SUBCURS, C3 <40> /T_C_LOCATE_CTRL, I/CK, I/O, NC, 160–8232; A2 <37> /CLK_RUN; /CURSOR_LOCATE F1 <36>; /FREQ_CAL

COUNTER_ENABLE_DATA; /COUNTER_ENABLE; U429B 74LS74, U223B 74LS74; −REF_H_SYNC; /RAMP_START

8 COUNT DELAY; U423 74LS163; FREQ_CAL_CLK; U420A 74LS74; 512US E2 <37> FREQ_CAL, /FREQ_CAL E3 <37>

U223A 74LS74: +5V, /CURSOR_1_EN, /CURSOR_2_EN B5 <37>, /FREQ_CAL

C133 .1UF, C136 .1UF, C139 .1UF, C143 .1UF, C220 .1UF, C223 .1UF, C233 .1UF, C320 .1UF, C323 .1UF, C327 .1UF, C329 .1UF, C336 .1UF, C339 .1UF

PARTS WITHIN BOX HAVE BEEN CHANGED

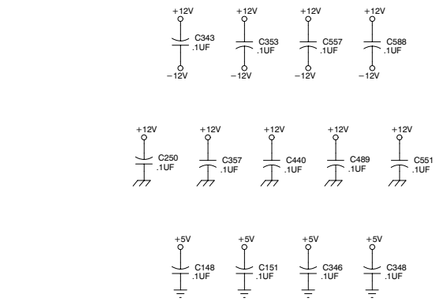
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL

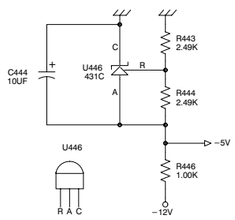
PART OF A4 Z–AXIS BOARD

A4 Z–Axis Board <39> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C148	A2	R443	B2
C151	B2	R444	B2
C250	A1	R446	B3
C251	G1	R456	E3
C343	A1	R457	E2
C346	B2	R458	E2
C348	B2	R558	E2
C350	G3		
C351	G1	U248	B5
C352	G3	U251	B3
C353	B1	U343A	C3
C354	E1	U343B	C3
C355	E1	U346	D3
C357	B1	U348	D4
C440	B1	U355A	G1
C444	B2	U355B	G1
C452	G2	U355C	G3
C453	G2	U355D	G3
C454	E2	U357A	B5
C455	E2	U357D	B4
C456	G4	U446	B2
C489	B1	U451A	E1
C551	B1	U451B	G2
C555	G4	U451C	G2
C557	B1	U451D	E1
C586	E4	U457A	E2
C587	E4	U457B	G4
C588	B1	U457C	G4
C591	E3	U457D	E2
C592	E3	U489A	E4
		U489B	E4
R346	C3	U489C	E3
R440	C3	U489D	E3
R441	C3		
R442	C4		

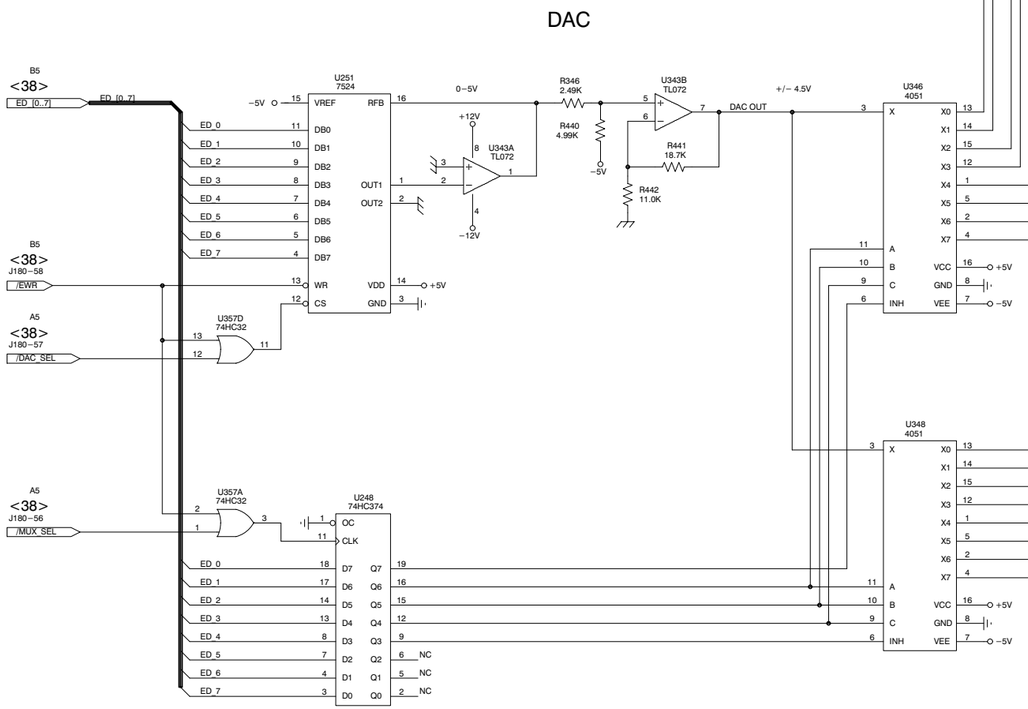
A4 Z–Axis Board <39> Component Locator



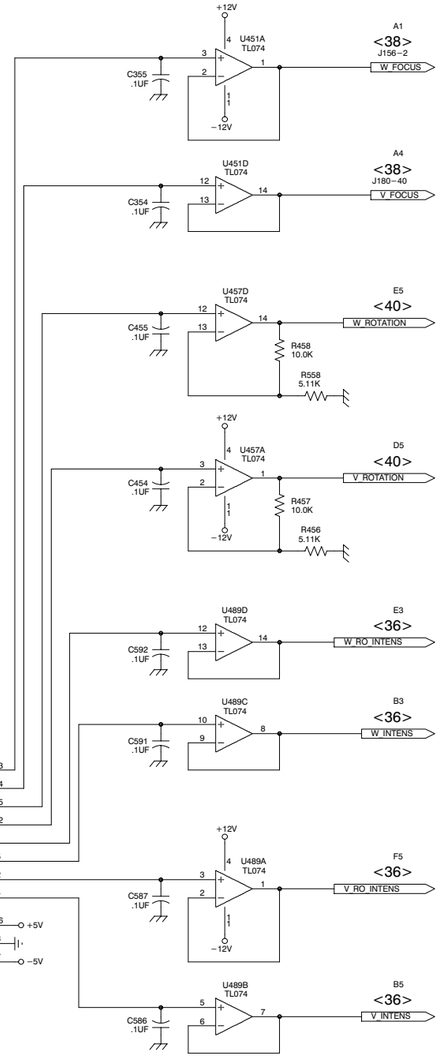


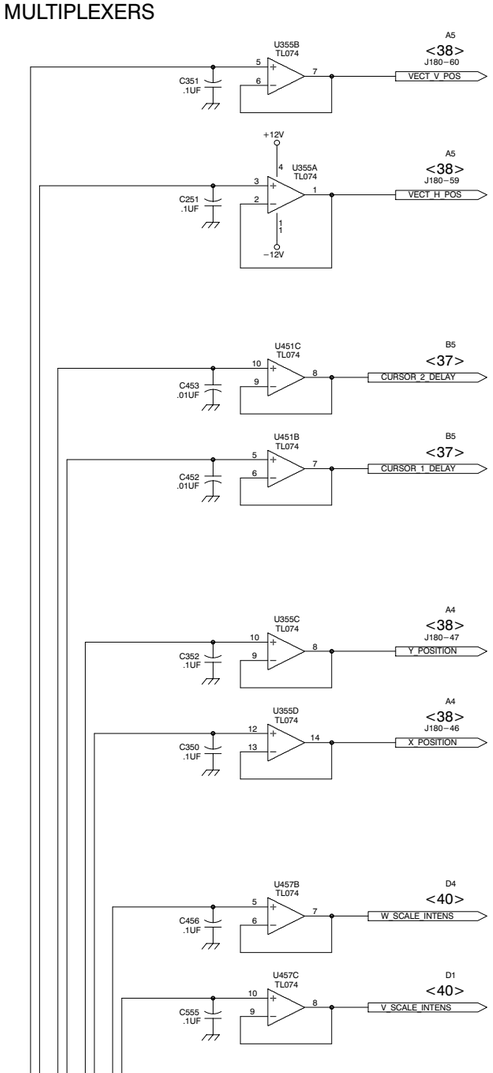
DAC REF

DAC



ANALOG MULTIPLEXERS





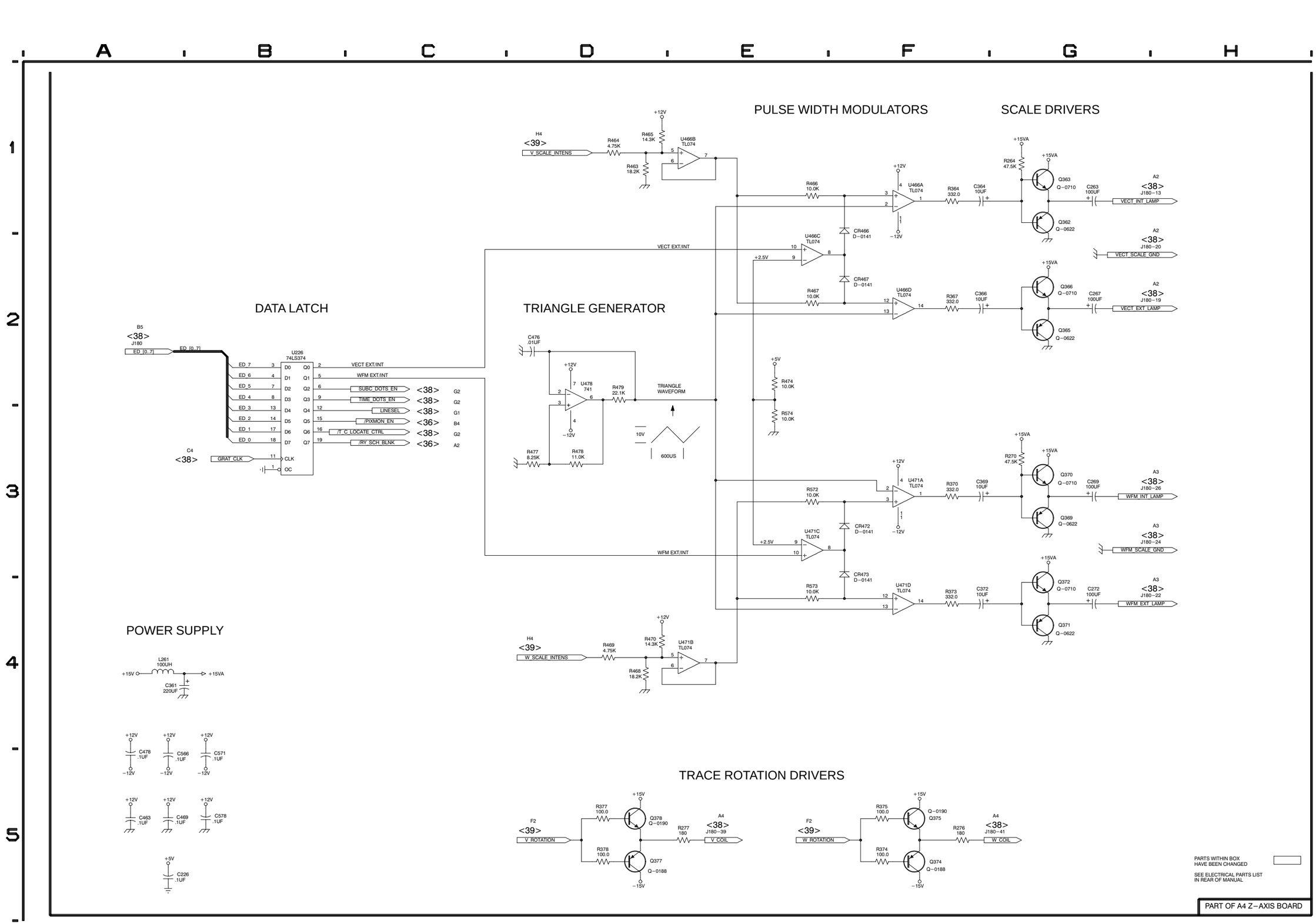
PARTS WITHIN BOX
HAVE BEEN CHANGED

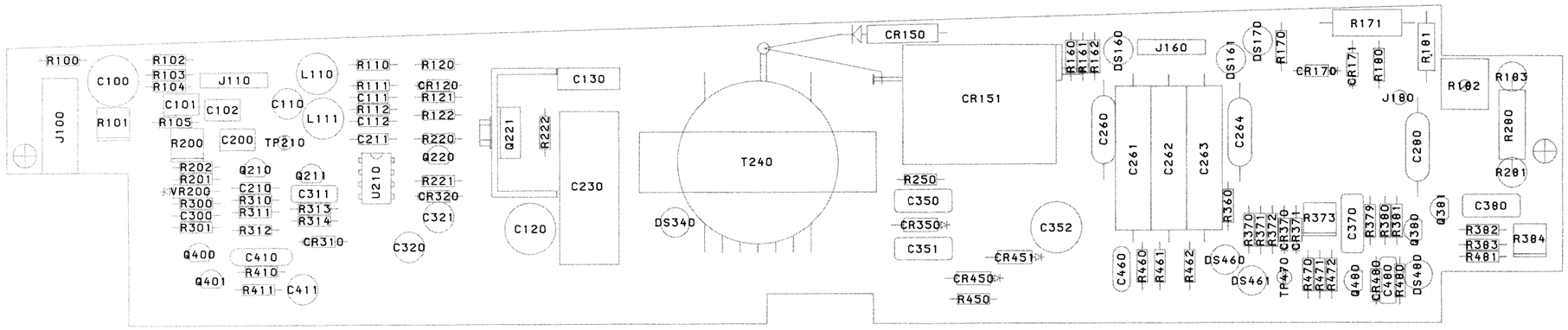
SEE ELECTRICAL PARTS LIST
IN REAR OF MANUAL

PART OF A4 Z−AXIS BOARD

A4 Z–Axis Board <40> Component Locator

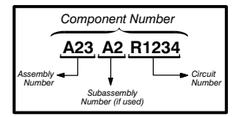
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C226	A5	R270	G3
C263	G1	R276	F5
C267	G2	R277	E5
C269	G3	R364	F1
C272	G4	R367	F2
C361	A4	R370	F3
C364	F1	R373	F4
C366	F2	R374	F5
C369	F3	R375	F5
C372	F4	R377	D5
C463	A5	R378	D5
C469	A5	R463	D1
C476	D2	R464	D1
C478	A5	R465	D1
C566	A5	R466	E1
C571	B5	R467	E2
C578	B5	R468	D4
		R469	D4
CR466	F1	R470	D4
CR467	F2	R474	E2
CR472	F3	R477	D3
CR473	F3	R478	D3
		R479	D2
L261	A4	R572	E3
		R573	E4
Q362	G1	R574	E3
Q363	G1		
Q365	G2	U226	B2
Q366	G2	U466A	F1
Q369	G3	U466B	E1
Q370	G3	U466C	E2
Q371	G4	U466D	F2
Q372	G3	U471A	F3
Q374	F5	U471B	E4
Q375	F5	U471C	E3
Q377	D5	U471D	F4
Q378	D5	U478	D2
R264	G1		


PULSE WIDTH MODULATORS
SCALE DRIVERS
DATA LATCH
TRIANGLE GENERATOR
POWER SUPPLY
TRACE ROTATION DRIVERS
H4
<39>
V_SCALE_INTENS
R464
4.75K
R465
14.3K
R463
18.2K
U466B
TL074
+12V
R466
10.0K
U466A
TL074
R364
332.0
C364
10UF
C263
100UF
R264
47.5K
Q363
Q-0710
Q362
Q-0622
+15VA
A2
<38>
J180-13
VECT_INT_LAMP
VECT EXT/INT
U466C
TL074
+2.5V
CR466
D-0141
CR467
D-0141
A2
<38>
J180-20
VECT_SCALE_GND
R467
10.0K
U466D
TL074
R367
332.0
C366
10UF
C267
100UF
Q366
Q-0710
Q365
Q-0622
A2
<38>
J180-19
VECT_EXT_LAMP
B5
<38>
J180
ED_[0..7]
U226
74LS374
ED_7
ED_6
ED_5
ED_4
ED_3
ED_2
ED_1
ED_0
D0
D1
D2
D3
D4
D5
D6
D7
Q0
Q1
Q2
Q3
Q4
Q5
Q6
Q7
VECT EXT/INT
WFM EXT/INT
SUBC_DOTS_EN
TIME_DOTS_EN
LINESEL
/PIXMON_EN
/T_C_LOCATE_CTRL
/RY_SCH_BLNK
<38>
<36>
G2
G1
B4
A2
C4
<38>
GRAT_CLK
CLK
OC
C476
.01UF
U478
741
R479
22.1K
R477
8.25K
R478
11.0K
TRIANGLE
WAVEFORM
10V
600US
+5V
R474
10.0K
R574
10.0K
R572
10.0K
U471A
TL074
R370
332.0
C369
10UF
C269
100UF
R270
47.5K
Q370
Q-0710
Q369
Q-0622
A3
<38>
J180-26
WFM_INT_LAMP
CR472
D-0141
U471C
TL074
WFM EXT/INT
CR473
D-0141
R573
10.0K
U471D
TL074
R373
332.0
C372
10UF
C272
100UF
Q372
Q-0710
Q371
Q-0622
A3
<38>
J180-22
WFM_EXT_LAMP
A3
<38>
J180-24
WFM_SCALE_GND
H4
<39>
W_SCALE_INTENS
R469
4.75K
R470
14.3K
R468
18.2K
U471B
TL074
L261
100UH
C361
220UF
+15V
+15VA
C478
.1UF
C566
.1UF
C571
.1UF
C463
.1UF
C469
.1UF
C578
.1UF
C226
.1UF
F2
<39>
V_ROTATION
R377
100.0
R378
100.0
Q378
Q-0190
Q377
Q-0188
R277
180
A4
<38>
J180-39
V_COIL
W_ROTATION
R375
100.0
R374
100.0
Q-0190
Q375
Q374
Q-0188
R276
180
A4
<38>
J180-41
W_COIL
PARTS WITHIN BOX
HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST
IN REAR OF MANUAL
PART OF A4 Z-AXIS BOARD



VECTOR HIGH VOLTAGE CIRCUIT BOARD (A3)

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

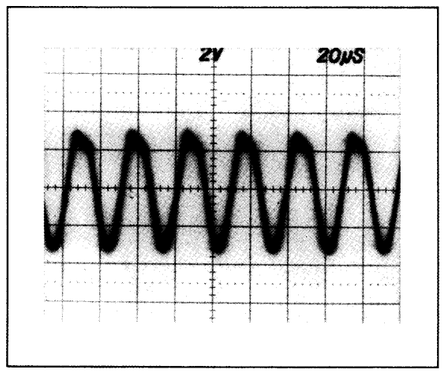
STATIC SENSITIVE DEVICES

A3 Vector High Volts Board <41> Component Locator

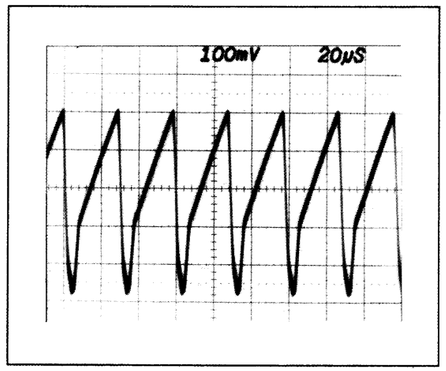
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C100	C3	C352	C3	DS170	E1			R202	B5	R383	E5
C101	F3	C370	D3	DS340	A1	R100	F2	R220	B3	R384	E5
C102	F3	C380	E4	DS460	D4	R101	F3	R221	B2	R410	C4
C110	C2	C410	C4	DS461	D4	R102	A2	R222	B2	R411	A4
C111	B3	C411	B4	DS480	E5	R103	F2	R250	C3	R450	D4
C112	B2	C460	D2			R104	F3	R280	E2	R460	C2
C120	B2	C480	E5	J100	A4	R105	F3	R281	E2	R461	D2
C130	A3			J110	F3	R110	B3	R300	C5	R462	E2
C200	F4	CR120	A3	J160	F1	R111	B3	R301	B5	R470	E5
C210	C4	CR150	C1			R112	B3	R310	C5	R471	E5
C211	B3	CR151	C1	L110	B2	R120	A3	R311	C4	R472	D4
C230	B1	CR170	D2	L111	C3	R121	A3	R312	C5	R480	E5
C260	D1	CR171	D2			R122	B3	R313	C4	R481	E5
C261	C2	CR310	D5	P143	H4	R160	C1	R314	C4		
C262	D2	CR320	A3			R161	C1	R360	D2	T240	B1
C263	E2	CR350	D3	Q210	C4	R162	D1	R370	D2		
C264	D2	CR370	D3	Q211	C4	R170	E2	R371	D3	TP210	F4
C280	E2	CR371	D3	Q220	A3	R171	E2	R372	D3	TP470	F4
C300	B5	CR450	D3	Q221	B2	R180	D1	R373	D3		
C311	C4	CR451	C3	Q380	D4	R181	E2	R379	D4	U210	B3
C320	A3	CR480	E5	Q381	E4	R182	E2	R380	D4		
C321	B3			Q400	C5	R183	E2	R381	E2	VR200	B5
C350	D3	DS160	D1	Q401	C5	R200	F4	R382	E4		
C351	C3	DS161	E2	Q480	E5	R201	C5				

41

1



2



3

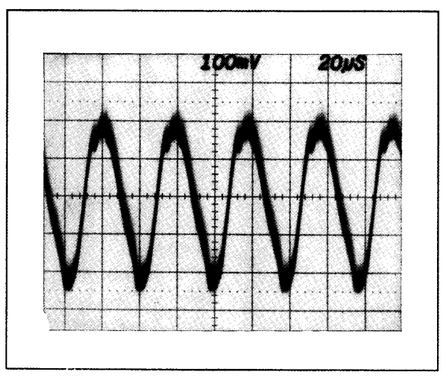


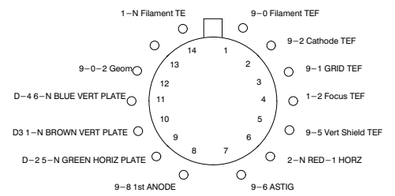
Table 41

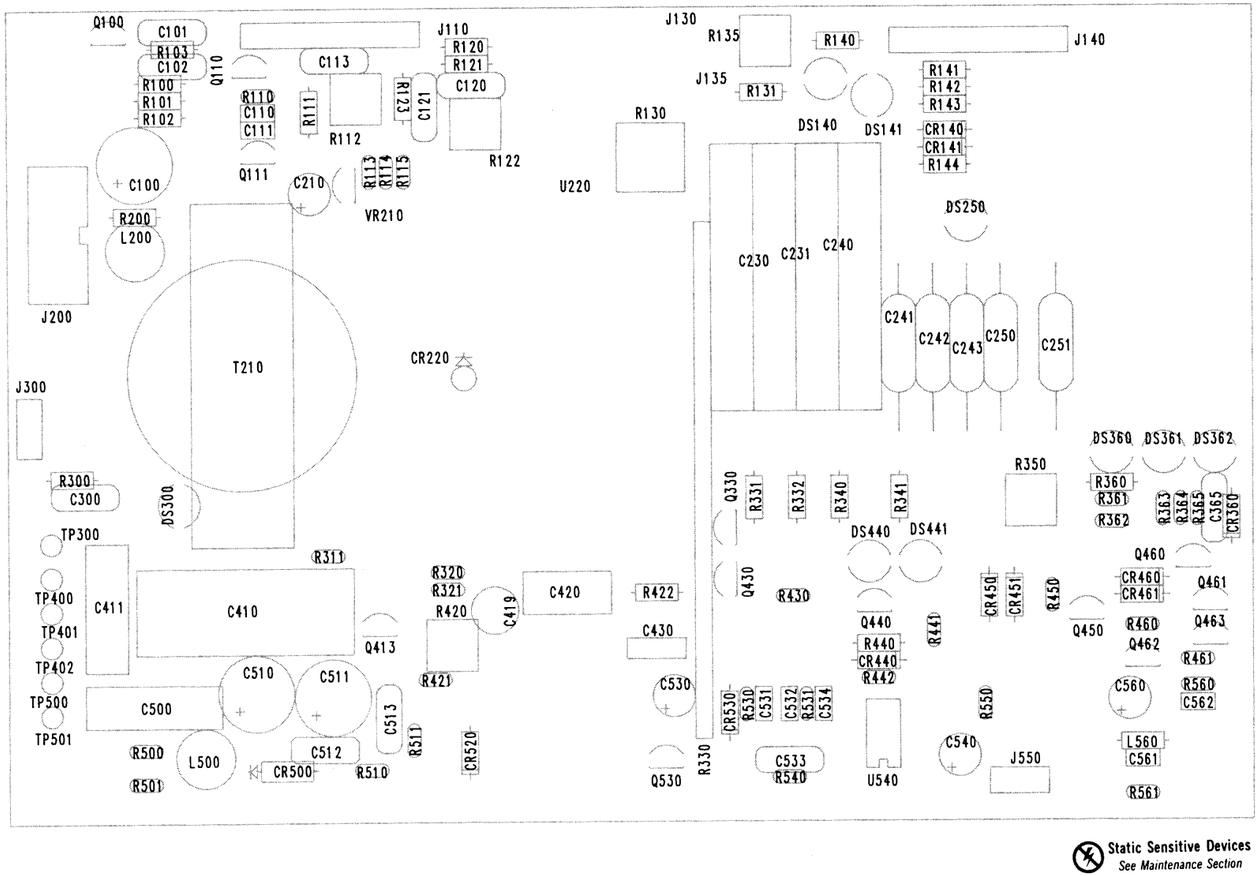
J100 Connects with these pins via the Interconnect Board.

J100 Pin#	To / From	Destination / Origin
3	→	J180-40 <38>
4	→	J180-43 <38>
5	→	J415-21 <21>

A3 Vector High Volts Board <41> Component Locator, waveforms, and J100 connections

CRT TUBE SOCKET VISUAL AID



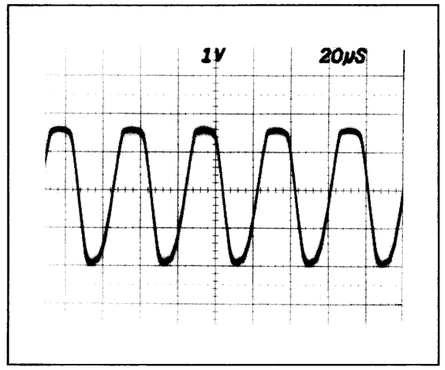


Static Sensitive Devices
See Maintenance Section

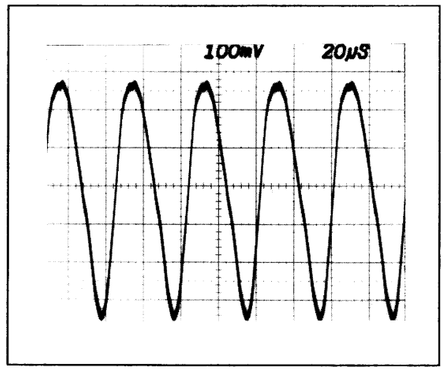
WAVEFORM HIGH VOLTAGE SUPPLY CIRCUIT BOARD (A16)

42

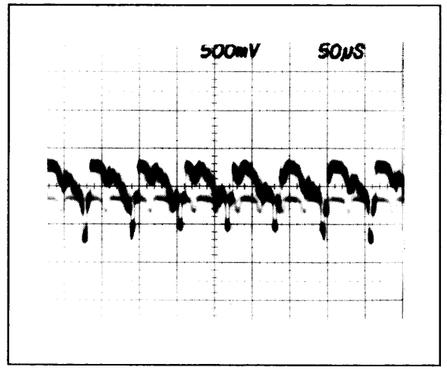
1



2



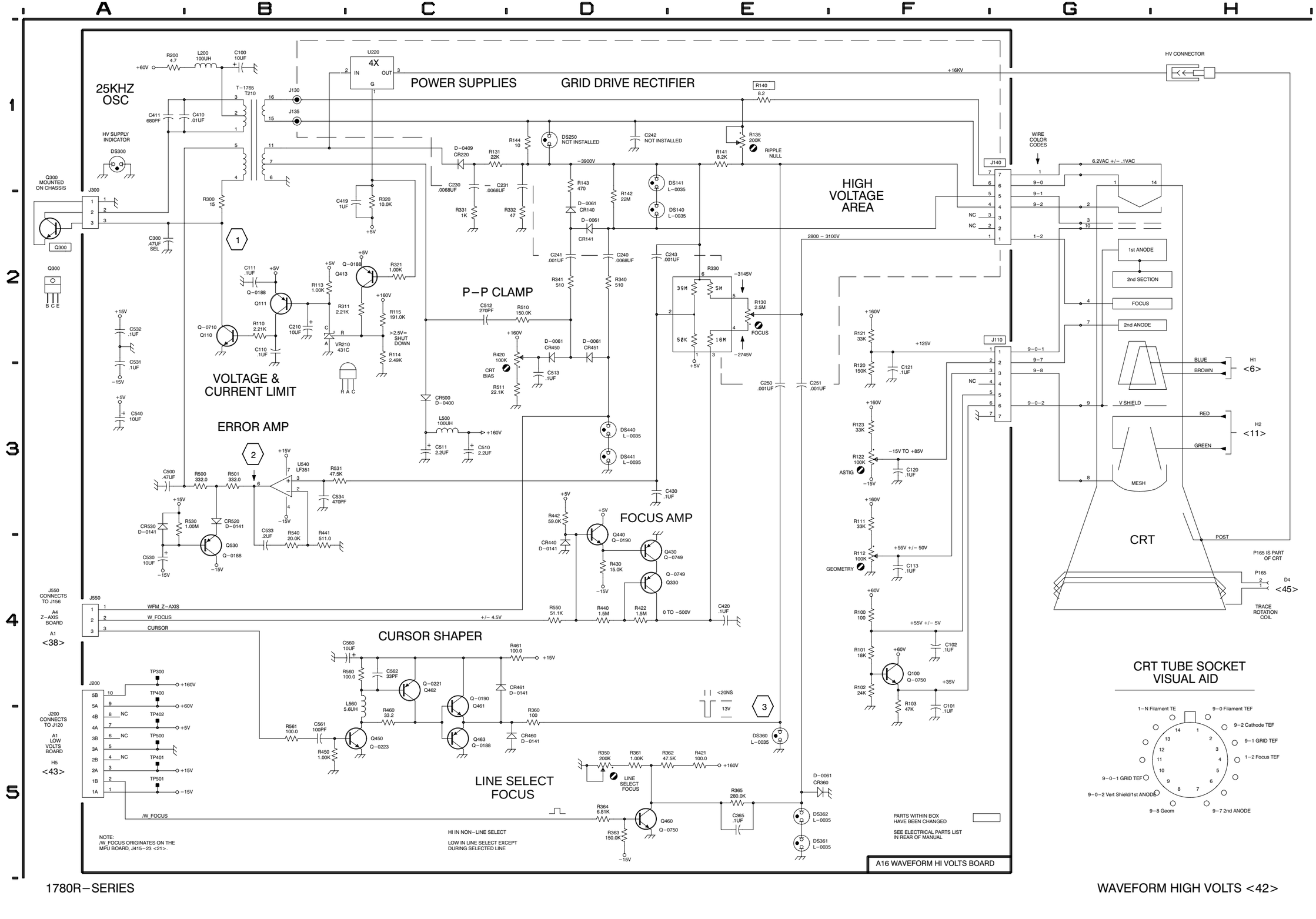
3



A16 Waveform Hi Volts Board <42> Component Locator

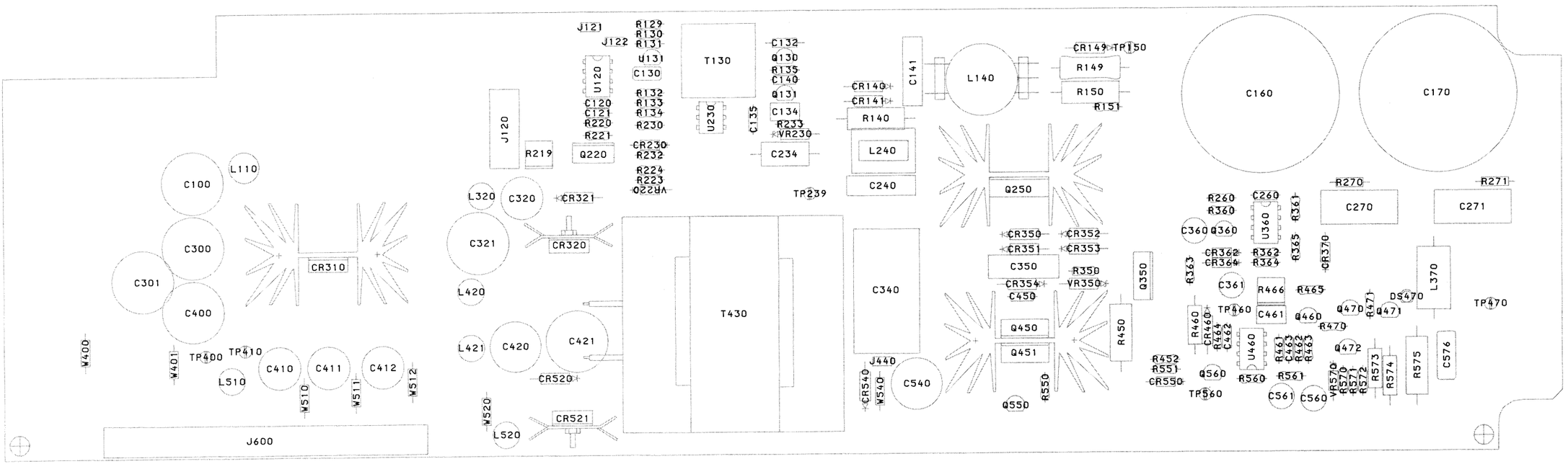
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C100	B1	C300	A2	C540	A3			J550	A4	Q460	D5	R120	F2	R321	C2	R430	D4	R561	B5
C101	F4	C365	E5	C560	B4	DS140	D2			Q461	C4	R121	F2	R330	E2	R440	D4		
C102	F4	C410	A1	C561	B5	DS141	D1	L200	B1	Q462	C4	R122	F3	R331	C2	R441	B4	T210	B1
C110	B2	C411	A1	C562	C4	DS250	D1	L500	C3	Q463	C5	R123	F3	R332	D2	R442	D3	TP300	A4
C111	B2	C419	C2			DS300	A1	L560	C4	Q530	B4	R130	E2	R340	D2	R450	B5	TP400	A4
C113	F4	C420	E4	CR140	D2	DS360	E5					R131	C1	R341	D2	R460	C5	TP401	A5
C120	F3	C430	D3	CR141	D2	DS361	E5	P165	H4	R100	F4	R135	E1	R350	D5	R461	C4	TP402	A5
C121	F3	C500	A3	CR220	C1	DS362	E5			R101	F4	R140	E1	R360	D5	R500	B3	TP500	A5
C210	B2	C510	C3	CR360	E5	DS440	D3	Q100	F4	R102	F4	R141	E1	R361	D5	R501	B3	TP501	A5
C230	C1	C511	C3	CR440	D4	DS441	D3	Q110	B2	R103	F4	R142	D1	R362	D5	R510	D2		
C231	D1	C512	C2	CR450	D2			Q111	B2	R110	B2	R143	D1	R363	D5	R511	D3	U220	C1
C240	D2	C513	D3	CR451	D2	J110	G2	Q300	A2	R111	F3	R144	D1	R364	D5	R530	A3	U540	B3
C241	D2	C530	A4	CR460	C5	J130	B1	Q330	D4	R112	F4	R200	A1	R365	E5	R531	B3		
C242	D1	C531	A2	CR461	C4	J135	B1	Q413	C2	R113	B2	R300	B2	R420	D2	R540	B4	VR210	B2
C243	D2	C532	A2	CR500	C3	J140	G1	Q430	D4	R114	C2	R311	C2	R421	E5	R550	D4		
C250	E3	C533	B4	CR520	B3	J200	A4	Q440	D3	R115	C2	R320	C2	R422	D4	R560	C4		
C251	E3	C534	B3	CR530	A3	J300	A2	Q450	B5										

A16 Waveform Hi Volts Board <42> Component Locator



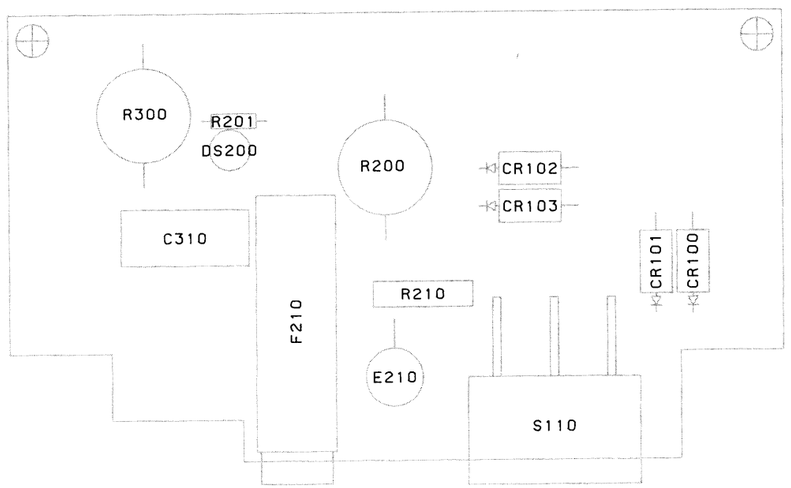
1780R−SERIES

WAVEFORM HIGH VOLTS <42>



POWER SUPPLY CIRCUIT BOARD (A1)

Static Sensitive Devices
See Maintenance Section

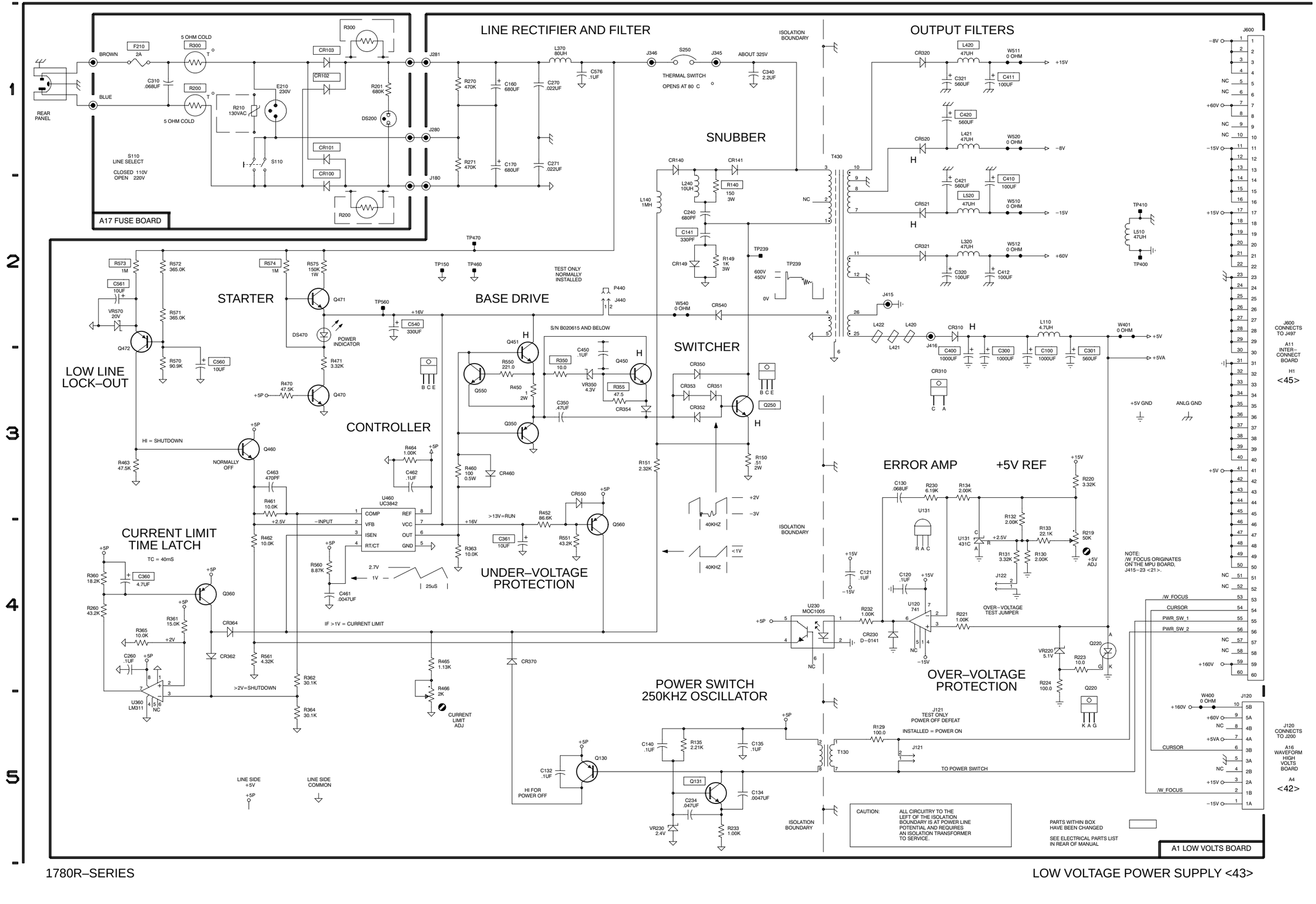


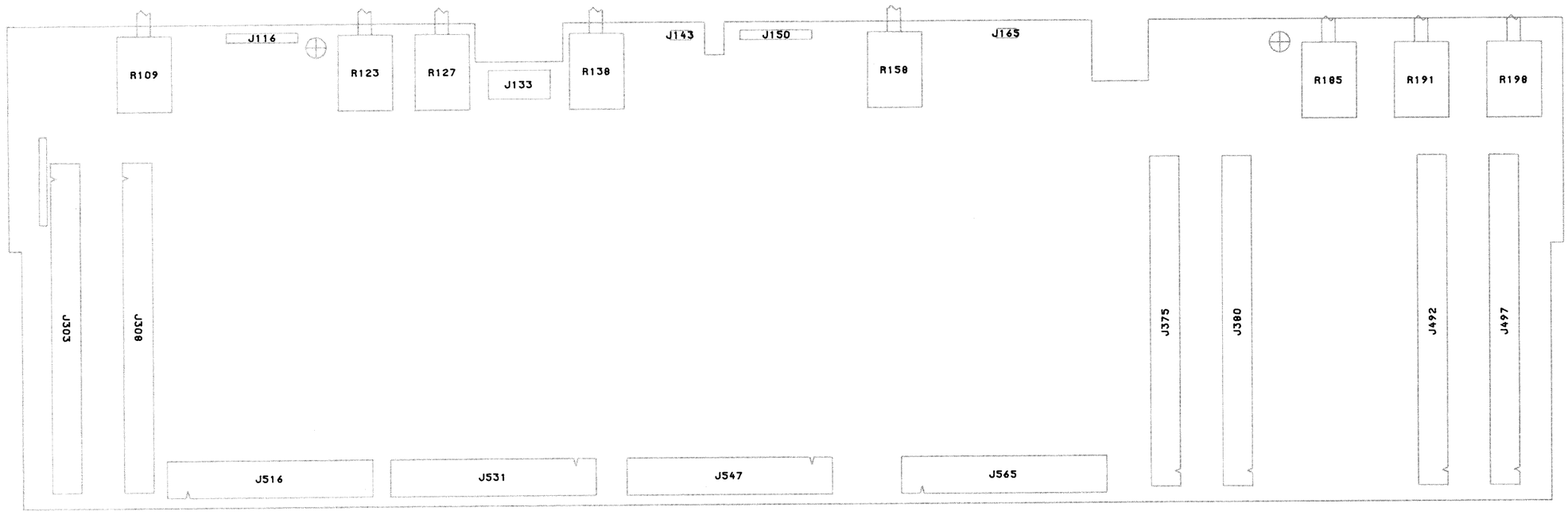
FUSE CIRCUIT BOARD (A17)

A1 Low Volts Board <43> Component Locator

A1 Low Volts Board <43> Component Locator

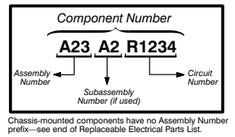
CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	CIRCUIT NUMBER	SCHEM LOCATION
C100	G3	C400	F3	CR321	F2	J440	D2	Q451	D2	R223	G4	R466	C4	TP460	C2
C120	F4	C410	F2	CR350	E3	J600	H1	Q460	B3	R224	G4	R470	B3	TP470	C2
C121	F4	C411	F1	CR351	E3			Q470	B3	R230	F3	R471	B3	TP560	C2
C130	F3	C412	F2	CR352	E3	L110	G2	Q471	B2	R232	F4	R550	C3		
C132	D5	C420	F1	CR353	E3	L140	D2	Q472	A2	R233	E5	R551	D4	U120	F4
C134	E5	C421	F2	CR354	D3	L240	E2	Q550	C3	R260	A4	R560	B4	U131	F4
C135	E5	C450	D3	CR362	B4	L320	F2	Q560	D3	R270	C1	R561	B4	U230	E4
C140	D5	C461	B4	CR364	B4	L370	D1			R271	C1	R570	A3	U360	A4
C141	E2	C462	C3	CR370	C4	L420	F1	R129	F5	R300	B1	R571	A2	U460	C3
C160	C1	C463	B3	CR460	C3	L420	F2	R130	G4	R350	D3	R572	A2		
C170	C1	C540	C2	CR520	F1	L421	F1	R131	G4	R360	A4	R573	A2	VR220	G4
C234	E5	C560	B3	CR521	F2	L421	F2	R132	G3	R361	A4	R574	B2	VR230	D5
C240	E2	C561	A2	CR540	E2	L422	F2	R133	G4	R362	B4	R575	B2	VR350	D3
C260	A5	C576	D1	CR550	D3	L510	G2	R134	F3	R363	C4			VR570	A2
C270	D1					L520	F2	R135	E5	R364	B5	S110	B1		
C271	D1	CR100	B2	DS200	C1			R140	E2	R365	A4	S250	D1	W400	H5
C300	F3	CR101	B1	DS470	B2	P440	D2	R149	E2	R450	D3			W401	G2
C301	G3	CR102	B1					R150	E3	R452	D4	T130	E5	W510	G2
C310	A1	CR103	B1	E210	B1	Q130	D5	R151	D3	R460	C3	T430	E2	W511	G1
C320	F2	CR140	E1			Q131	E5	R200	B2	R461	B3			W512	G2
C321	F1	CR141	E1	F210	A1	Q220	G4	R201	C1	R462	B4	TP150	C2	W520	G1
C340	E1	CR149	E2			Q250	E3	R210	B1	R463	A3	TP239	E2	W540	E2
C350	D3	CR230	F4	J120	H5	Q350	D3	R219	G4	R464	C3	TP400	G2		
C360	A4	CR310	F2	J121	F5	Q360	B4	R220	G3	R465	C4	TP410	G2		
C361	D4	CR320	F1	J122	F4	Q450	D3	R221	F4						


LINE RECTIFIER AND FILTER
OUTPUT FILTERS
SNUBBER
STARTER
BASE DRIVE
SWITCHER
LOW LINE LOCK–OUT
CONTROLLER
CURRENT LIMIT TIME LATCH
UNDER–VOLTAGE PROTECTION
ERROR AMP
+5V REF
OVER–VOLTAGE PROTECTION
POWER SWITCH 250KHZ OSCILLATOR
A17 FUSE BOARD
A1 LOW VOLTS BOARD
ISOLATION BOUNDARY
THERMAL SWITCH OPENS AT 80 C
S110 LINE SELECT CLOSED 110V OPEN 220V
TEST ONLY NORMALLY INSTALLED
S/N B020615 AND BELOW
HI = SHUTDOWN
NORMALLY OFF
>2V=SHUTDOWN
IF >1V = CURRENT LIMIT
>13V=RUN
HI FOR POWER OFF
TC = 40mS
OVER–VOLTAGE TEST JUMPER
J121 TEST ONLY POWER OFF DEFEAT
INSTALLED = POWER ON
TO POWER SWITCH
LINE SIDE +5V
LINE SIDE COMMON
+5V GND
ANLG GND
J600 CONNECTS TO J497
A11 INTER–CONNECT BOARD H1 <45>
J120 CONNECTS TO J200
A16 WAVEFORM HIGH VOLTS BOARD A4 <42>
NOTE: /W_FOCUS ORIGINATES ON THE MPU BOARD, J415–23 <21>.
CAUTION: ALL CIRCUITRY TO THE LEFT OF THE ISOLATION BOUNDARY IS AT POWER LINE POTENTIAL AND REQUIRES AN ISOLATION TRANSFORMER TO SERVICE.
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL



INTERCONNECT CIRCUIT BOARD (A11)

COMPONENT NUMBER EXAMPLE



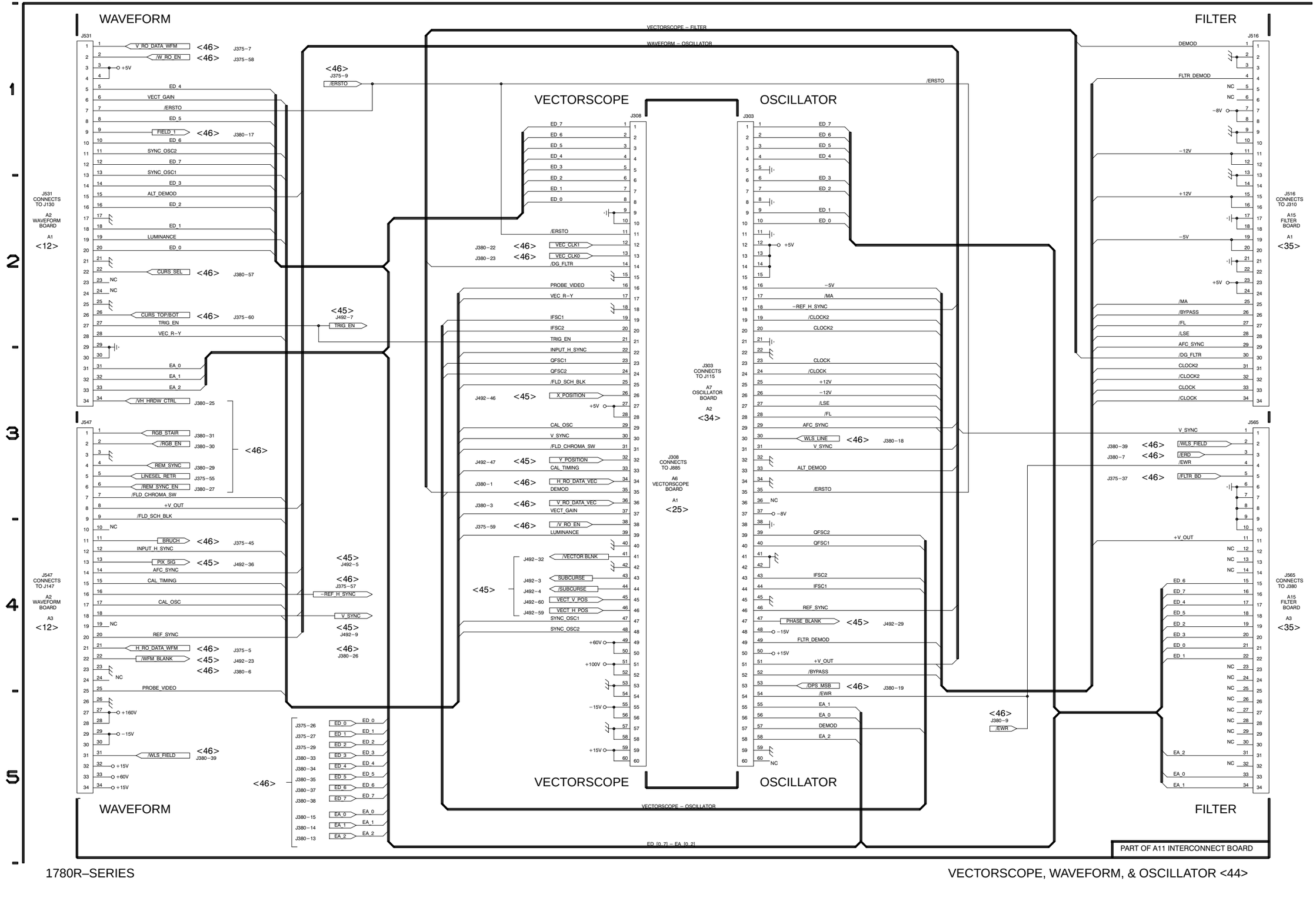
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

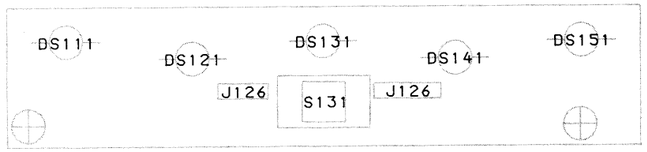
STATIC SENSITIVE DEVICES

A11 Interconnect Board <44> Component Locator

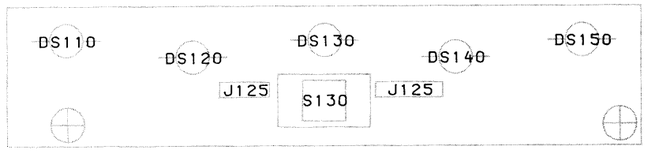
CIRCUIT NUMBER	SCHEM LOCATION
J303	E1
J308	D1
J516	H1
J531	A1
J547	A3
J565	H3

A11 Interconnect Board <44> Component Locator


WAVEFORM
VECTORSCOPE
OSCILLATOR
FILTER
VECTORSCOPE – FILTER
WAVEFORM – OSCILLATOR
VECTORSCOPE – OSCILLATOR
ED_[0..7] – EA_[0..2]
J531
J531 CONNECTS TO J130
A2 WAVEFORM BOARD
A1
<12>
V_RO_DATA_WFM
/W_RO_EN
+5V
ED_4
VECT_GAIN
/ERSTO
ED_5
FIELD_1
ED_6
SYNC_OSC2
ED_7
SYNC_OSC1
ED_3
ALT_DEMOD
ED_2
ED_1
LUMINANCE
ED_0
CURS_SEL
NC
NC
CURS_TOP/BOT
TRIG_EN
VEC_R–Y
EA_0
EA_1
EA_2
/VH_HRDW_CTRL
J380–25
J547
J547 CONNECTS TO J147
A2 WAVEFORM BOARD
A3
<12>
RGB_STAIR
/RGB_EN
REM_SYNC
LINESEL_RETR
/REM_SYNC_EN
/FLD_CHROMA_SW
+V_OUT
/FLD_SCH_BLK
NC
BRUCH
INPUT_H_SYNC
PIX_SIG
AFC_SYNC
CAL_TIMING
CAL_OSC
NC
REF_SYNC
H_RO_DATA_WFM
/WFM_BLANK
NC
PROBE_VIDEO
+160V
–15V
/WLS_FIELD
+15V
+60V
+15V
J308
J308 CONNECTS TO J885
A6 VECTORSCOPE BOARD
A1
<25>
ED_7
ED_6
ED_5
ED_4
ED_3
ED_2
ED_1
ED_0
/ERSTO
VEC_CLK1
VEC_CLK0
/DG_FLTR
PROBE_VIDEO
VEC_R–Y
IFSC1
IFSC2
TRIG_EN
INPUT_H_SYNC
QFSC1
QFSC2
/FLD_SCH_BLK
X_POSITION
+5V
CAL_OSC
V_SYNC
/FLD_CHROMA_SW
Y_POSITION
CAL_TIMING
H_RO_DATA_VEC
DEMOD
V_RO_DATA_VEC
VECT_GAIN
/V_RO_EN
LUMINANCE
/VECTOR BLNK
SUBCURSE
/SUBCURSE
VECT_V_POS
VECT_H_POS
SYNC_OSC1
SYNC_OSC2
+60V
+100V
–15V
+15V
J303
J303 CONNECTS TO J115
A7 OSCILLATOR BOARD
A2
<34>
ED_7
ED_6
ED_5
ED_4
ED_3
ED_2
ED_1
ED_0
+5V
–5V
/MA
–REF_H_SYNC
/CLOCK2
CLOCK2
CLOCK
/CLOCK
+12V
–12V
/LSE
/FL
AFC_SYNC
WLS_LINE
V_SYNC
ALT_DEMOD
/ERSTO
NC
–8V
QFSC2
QFSC1
IFSC2
IFSC1
REF_SYNC
PHASE_BLANK
–15V
FLTR_DEMOD
+15V
+V_OUT
/BYPASS
/DPS_MSB
/EWR
EA_1
EA_0
DEMOD
EA_2
NC
J516
J516 CONNECTS TO J310
A15 FILTER BOARD
A1
<35>
DEMOD
FLTR_DEMOD
NC
NC
–8V
–12V
+12V
–5V
+5V
/MA
/BYPASS
/FL
/LSE
AFC_SYNC
/DG_FLTR
CLOCK2
/CLOCK2
CLOCK
/CLOCK
J565
J565 CONNECTS TO J380
A15 FILTER BOARD
A3
<35>
V_SYNC
/WLS_FIELD
/ERD
/EWR
/FLTR_BD
+V_OUT
NC
NC
NC
ED_6
ED_7
ED_4
ED_5
ED_2
ED_3
ED_0
ED_1
NC
NC
NC
NC
NC
NC
NC
EA_2
NC
EA_0
EA_1
<45>
J492–7
TRIG_EN
<45>
J492–5
<46>
J375–57
–REF_H_SYNC
V_SYNC
<45>
J492–9
<46>
J380–26
<46>
J375–9
/ERSTO
<46>
J380–22
<46>
J380–23
<45>
J492–46
<45>
J492–47
<46>
J380–1
<46>
J380–3
<46>
J375–59
<45>
J492–32
<45>
J492–3
J492–4
J492–60
J492–59
<46>
J380–9
/EWR
<46>
J375–26
J375–27
J375–29
J380–33
J380–34
J380–35
J380–37
J380–38
J380–15
J380–14
J380–13
ED_0
ED_1
ED_2
ED_3
ED_4
ED_5
ED_6
ED_7
EA_0
EA_1
EA_2
<46>
J380–17
<46>
J380–57
<46>
J375–60
<46>
J375–58
<46>
J380–31
<46>
J380–30
<46>
J380–29
<45>
J375–55
<46>
J380–27
<46>
J375–45
<45>
J492–36
<46>
J375–5
<45>
J492–23
<46>
J380–6
<46>
J380–39
<46>
J380–18
<45>
J492–29
<46>
J380–19
<46>
J380–39
<46>
J380–7
<46>
J375–37
PART OF A11 INTERCONNECT BOARD

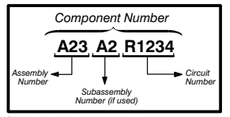


VECTOR GRATICULE LIGHT CIRCUIT BOARD (A13)



WAVEFORM GRATICULE LIGHT CIRCUIT BOARD (A14)

COMPONENT NUMBER EXAMPLE



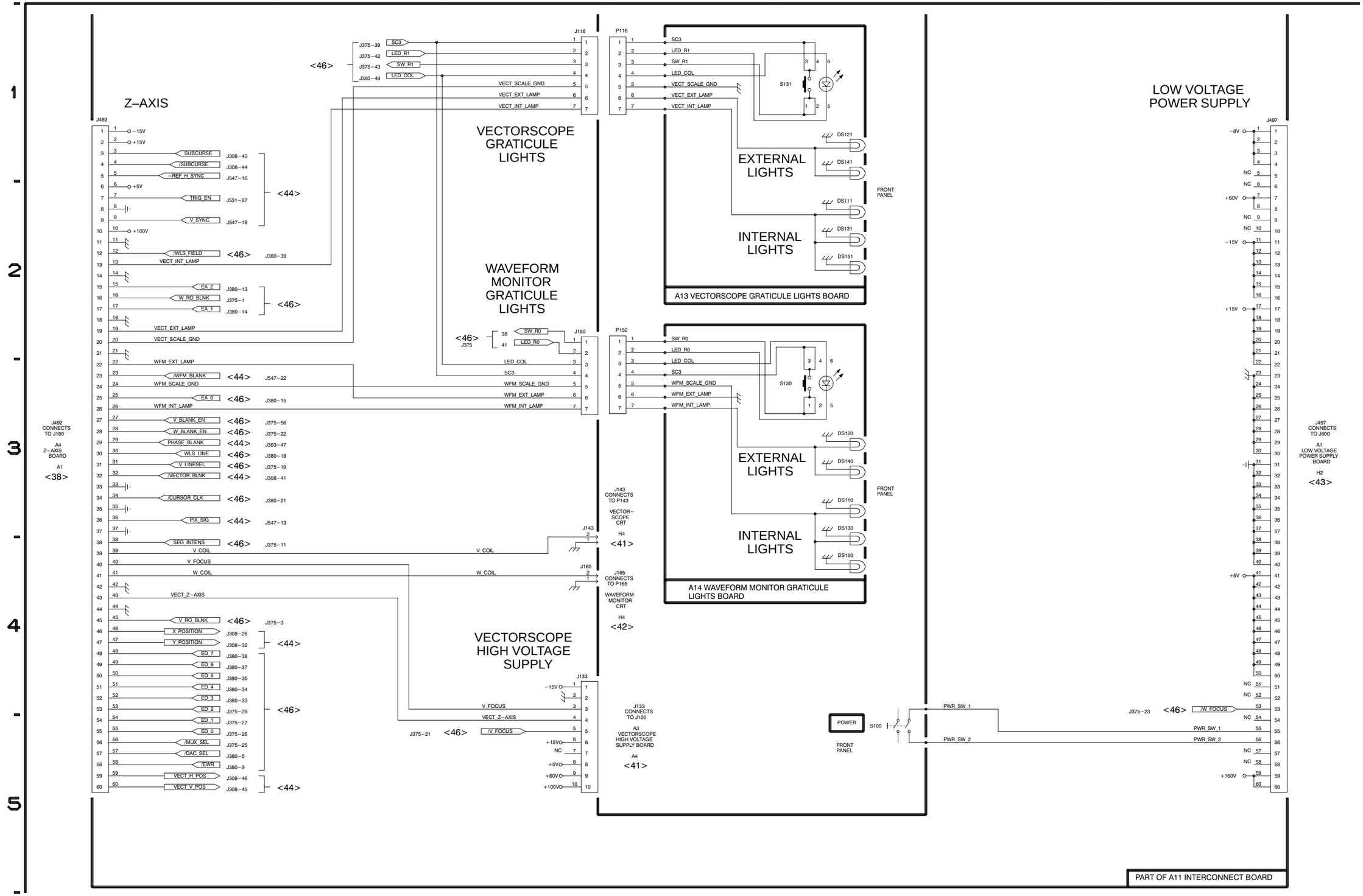
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

STATIC SENSITIVE DEVICES

A11 Interconnect Board <45> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION
A11	
J116	D1
J133	D4
J143	D3
J150	D2
J165	D4
J492	A1
J497	H1
S100	F5
A13	
DS111	E2
DS121	E1
DS131	E2
DS141	E1
DS151	E2
P116	D1
S131	E1
A14	
DS110	E3
DS120	E3
DS130	E3
DS140	E3
DS150	E4
P150	D2
S130	E3

A11 , A13, and A14 Boards <45> Component Locator


Z–AXIS
J492
−15V
+15V
SUBCURSE
/SUBCURSE
−REF_H_SYNC
+5V
TRIG_EN
V_SYNC
+100V
/WLS_FIELD
VECT_INT_LAMP
EA_2
W_RO_BLNK
EA_1
VECT_EXT_LAMP
VECT_SCALE_GND
WFM_EXT_LAMP
/WFM_BLANK
WFM_SCALE_GND
EA_0
WFM_INT_LAMP
V_BLANK_EN
W_BLANK_EN
PHASE_BLANK
WLS_LINE
V_LINESEL
/VECTOR_BLNK
/CURSOR_CLK
PIX_SIG
SEG_INTENS
V_COIL
V_FOCUS
W_COIL
VECT_Z–AXIS
V_RO_BLNK
X_POSITION
Y_POSITION
ED_7
ED_6
ED_5
ED_4
ED_3
ED_2
ED_1
ED_0
/MUX_SEL
/DAC_SEL
/EWR
VECT_H_POS
VECT_V_POS
J308–43
J308–44
J547–16
J531–27
J547–18
J380–39
J380–13
J375–1
J380–14
J547–22
J380–15
J375–56
J375–22
J303–47
J380–18
J375–19
J308–41
J380–21
J547–13
J375–11
J375–3
J308–26
J308–32
J380–38
J380–37
J380–35
J380–34
J380–33
J375–29
J375–27
J375–26
J375–25
J380–5
J380–9
J308–46
J308–45
<44>
<46>
J492 CONNECTS TO J180
A4 Z–AXIS BOARD
A1
<38>
VECTORSCOPE GRATICULE LIGHTS
J116
P116
J375–39 SC3
J375–42 LED_R1
J375–43 SW_R1
J380–49 LED_COL
VECT_SCALE_GND
VECT_EXT_LAMP
VECT_INT_LAMP
S131
EXTERNAL LIGHTS
INTERNAL LIGHTS
DS121
DS141
DS111
DS131
DS151
FRONT PANEL
A13 VECTORSCOPE GRATICULE LIGHTS BOARD
WAVEFORM MONITOR GRATICULE LIGHTS
J150
P150
J375 38 SW_R0
41 LED_R0
LED_COL
SC3
WFM_SCALE_GND
WFM_EXT_LAMP
WFM_INT_LAMP
S130
DS120
DS140
DS110
DS130
DS150
A14 WAVEFORM MONITOR GRATICULE LIGHTS BOARD
J143 CONNECTS TO P143
VECTOR–SCOPE CRT
H4
<41>
J165 CONNECTS TO P165
WAVEFORM MONITOR CRT
H4
<42>
VECTORSCOPE HIGH VOLTAGE SUPPLY
J133
−15V
+15V
NC
+5V
+60V
+100V
J375–21 /V_FOCUS
J133 CONNECTS TO J100
A3 VECTORSCOPE HIGH VOLTAGE SUPPLY BOARD
A4
<41>
POWER
S100
PWR_SW_1
PWR_SW_2
FRONT PANEL
LOW VOLTAGE POWER SUPPLY
J497
−8V
NC
+60V
−15V
+15V
+5V
+160V
J375–23 /W_FOCUS
J497 CONNECTS TO J600
A1 LOW VOLTAGE POWER SUPPLY BOARD
H2
<43>
PART OF A11 INTERCONNECT BOARD

A11 Interconnect Board <46> Component Locator

CIRCUIT NUMBER	SCHEM LOCATION
J375	A1
J380	H1
R109	E2
R123	E3
R127	E3
R138	E4
R158	E4
R185	D4
R191	D4
R198	D3

A11 Interconnect Board <46> Component Locator

MICROPROCESSOR

J375

1	W_RO_BLNK	J492–16	<45>	
2				
3	V_RO_BLNK	J492–45		
4				
5	H_RO_DATA_WFM	J547–21	<44>	
6				
7	V_RO_DATA_WFM	J531–1		
8				
9	/ERSTO	J303–35, J308–11, J531–7		
10	NC			
11	SEG_INTENS	<45> J492–38		
12				
13	NC			
14	NC			
15	NC			
16				
17	NC			
18	NC			
19	V_LINESEL	J492–31	<45>	
20				
21	/V_FOCUS	J133–5		
22	W_BLANK_EN	J492–28		
23	/W_FOCUS	J497–53		
24				
25	/MUX_SEL	J492–56		
26	ED_0	<44> <45> J492–55	J303–10, J308–8, J531–20, J565–21	
27	ED_1			
28				
29	ED_2	<44> <45> J492–53	J303–7, J308–6, J531–16, J565–19	J303–9, J308–7, J531–18, J565–22 <44> <45> J492–54
30	NC			
31	NC			
32				
33	NC			
34	NC			
35	+5V			
36				
37	/FLTR_BD	<44> J565–5		
38	SW_R0	J150–1		
39	SC3	J116–1, J150–4		
40				
41	LED_R0	J150–2	<45>	
42	LED_R1	J116–2		
43	SW_R1	J116–3		
44				
45	BRUCH	<44> J547–11		
46	VAR_SWP_2			
47	VAR_SWP_1			
48	WFM_GAIN_2			
49	WFM_GAIN_1			
50	VECT_GAIN_2			
51	VECT_GAIN_1			
52	FOCUS_2			
53	INTENS_2			
54	SCALE_2			
55	LINESEL_RETR	<44> J547–5		
56	V_BLANK_EN	<45> J492–27		
57	–REF_H_SYNC	J547–16		
58	/W_RO_EN	J531–2		
59	/V_RO_EN	J308–38	<44>	
60	CURS_TOP/BOT	J531–26		

J375 CONNECTS TO J415 A5 MICROPROCESSOR BOARD F1 <21>

SCALE_1 → SCALE, R109 10K, +5V → SCALE_2

FOCUS_1 → FOCUS, R123 10K, +5V → FOCUS_2

INTENS_1 → INTENSITY, R127 10K, +5V → INTENS_2

V_POS_1 → VERT POS, R138 10K, +5V → V_POS_2

H_POS_1 → HORIZ POS, R158 10K, +5V → H_POS_2

VAR_SWP_1 → SWEEP RATE, R198 10K, +5V → VAR_SWP_2

WFM_GAIN_1 → WAVEFORM, R191 10K, +5V → WFM_GAIN_2

VECT_GAIN_1 → VECTOR, R185 10K, +5V → VECT_GAIN_2

S/N B020244 AND BELOW

H_POS_1 → HORIZ POS (SPRING RETURN), R158 10K, +5V → NC, H_POS_2

MICROPROCESSOR

J380

1	H_RO_DATA_VEC	<44> J308–34		
2				
3	V_RO_DATA_VEC	<44> J308–36		
4				
5	/DAC_SEL	J492–57 <45>		
6	/WFM_BLANK	J547–22		
7	/ERD	<44> J565–3		
8				
9	/EWR	J303–54, J565–4 <44> J492–58 <45>		
10	NC			
11	NC			
12				
13	EA_2	J303–58, J531–33, J565–31 <44> J492–15 <45>		
14	EA_1	J303–55, J531–32, J565–34 <44> J492–17 <45>		
15				
16	EA_0	J303–56, J531–31, J565–33 <44> J492–25 <45>		
17	FIELD_1	J531–9 <44>		
18	WLS_LINE	J303–30 <44> J492–30 <45>		
19	/DPS_MSB	J303–53 <44>		
20				
21	/CURSOR_CLK	J492–34 <45>		
22	VEC_CLK1	J308–12		
23	VEC_CLK0	J308–13		
24				
25	/VH_HRDW_CTRL	J531–34		
26	V_SYNC	J547–18	<44>	
27	/REM_SYNC_EN	J547–6		
28				
29	REM_SYNC	J547–4		
30	/RGB_EN	J547–2		
31	RGB_STAIR	J547–1		
32				
33				
34	ED_3	J303–6, J308–5, J531–14, J565–20 <44> J492–52 <45>		
35	ED_4	J303–4, J308–4, J531–5, J565–17 <44> J492–51 <45>		
36				
37	ED_5	J303–3, J308–3, J531–8, J565–18 <44> J492–50 <45>		
38				
39	ED_6	J303–2, J308–2, J531–10, J565–15 <44> J492–49 <45>		
40	INTENS_1			
41	+5V			
42	H_POS_1			
43	SCALE_1			
44	V_POS_1			
45	H_POS_2			
46	V_POS_2			
47	FOCUS_1			
48	NC			
49	LED_COL	J116–4, J150–3 <45>		
50				
51	+5V			
52				
53	+5V			
54				
55	–15V			
56				
57	CURS_SEL	J531–22 <44>		
58				
59	+15V			
60				

ED_7 ← J303–1, J308–1, J531–12, J565–16 <44> <45> J492–48; J547–31, J565–2 <44> J492–12 <45>; /WLS_FIELD

J380 CONNECTS TO J515 A5 MICROPROCESSOR BOARD H1 <21>

PARTS WITHIN BOX HAVE BEEN CHANGED

SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL

PART OF A11 INTERCONNECT BOARD

Mechanical Parts List

This section contains a list of the replaceable mechanical components for this instrument. Use this list to identify and order replacement parts.

Parts Ordering Information

Replacement parts are available through your local Tektronix, Inc., Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest circuit improvements. Therefore, when ordering parts, it is important to include the following information in your order:

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If you order a part that has been replaced with a different or improved part, your local Tektronix, Inc., Field Office or representative will contact you concerning any change in part number.

Using the Replaceable Mechanical Parts List

Table 10–1 describes each column in the replaceable parts list.

Table 10–1: Replaceable parts list column descriptions

Column Name	Description
Fig. & Index Number	Items in this column are referenced to the exploded view item numbers.
Tektronix Part Number	Use this part number when ordering replacement parts from Tektronix.
Serial No. Effective	This column indicates the instrument serial number at which the part was first effective. No entry indicates the part is good for all serial numbers.
Serial No. Discont'd	This column indicates the instrument serial number at which the part was discontinued. No entry indicates the part is good for all serial numbers.
Qty	This column indicates the quantity of parts used.
Name & Description	An item name is separated from the description by a colon (:). Because of space limitations an item name may sometimes appear incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.
Mfr. Code	This column indicates the code of the actual manufacturer of the part. (Code to name and address cross reference is located after this page.)
Mfr. Part Number	This column indicates the actual manufacturer's or vender's part number.

Cross Index–Mfr. Code Number to Manufacturer

The Mfg. Code Number to Manufacturer Cross Index for the mechanical parts list is located immediately after this page. The cross index provides codes, names, and addresses of manufacturers of components listed in the mechanical parts list.

Abbreviations

Abbreviations conform to American National Standards Institute (ANSI) standard Y1.1—1972.

Instrument Accessories

The part numbers for the standard and optional accessories available with this instrument are located at the end of the replaceable parts list.

Manufacturers Cross Index

Mfr. Code	Manufacturer	Address	City, State, Zip Code
06383	PANDUIT CORP	17301 RIDGELAND	TINLEY PARK IL 07094–2917
07416	NELSON NAME PLATE CO	3191 CASITAS	
0KB01	STAUFFER SUPPLY CO	810 SE SHERMAN	PORTLAND, OR 97214–4657
12327	FREEWAY CORP	9301 ALLEN DRIVE	CLEVELAND OH 44125–4632
15912	THOMAS AND BETTS CORP ELECTRONICS GROUP	4371 VLY BLVD	LOS ANGELES CA 90032–3632
28520	HEYCO MOLDED PRODUCTS	750 BOULEVARD P O BOX 160	KENILWORTH NJ 07033–1721
53387	MINNESOTA MINING MFG CO	P O BOX 2963	AUSTIN TX 78769–2963
54583	TDK ELECTRONICS CORP	12 HARBOR PARK DR	PORT WASHINGTON NY 11550
71400	BUSSMANN DIV OF COOPER INDUSTRIES INC	114 OLD STATE RD P O BOX 14460	ST LOUIS MO 63178
71468	ITT CANNON DIV OF ITT CORP	666 E DYER RD	SANTA ANA CA 92702
75915	LITTELFUSE TRACOR INC SUB OF TRACOR INC	800 E NORTHWEST HWY	DES PLAINES IL 60016–3049
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF DIV	ST CHARLES ROAD	ELGIN IL 60120
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077–0001
80126	PACIFIC ELECTRICORD CO	747 W REDONDO BEACH P O BOX 10	GARDENA CA 90247–4203
83385	MICRODOT MFG INC GREER–CENTRAL DIV	3221 W BIG BEAVER RD	TROY MI 48098
83486	ELCO INDUSTRIES INC	1101 SAMUELSON RD	ROCKFORD IL 61101
86928	SEASTROM MFG CO INC	701 SONORA AVE	GLENDALE CA 91201–2431
93907	TEXTRON INC CAMCAR DIV	600 18TH AVE	ROCKFORD, IL 61108–5181
S3774	OSHINO ELECTRIC LAMP WORKS LTD	5 2 MINAMI SHINAGAWA 2 CHORE SHINAGAWA KU	TOKYO JAPAN
S4307	SCHAFFNER ELEKTRONIK AG		LUTERBACH SWITZERLAND
TK0435	LEWIS SCREW CO	4300 S RACINE AVE	CHICAGO IL 60609–3320
TK0518	SUTCO MANUFACTURING CO	1819 SOUTH CENTRAL BAY 37	KENT WA 98031
TK1373	PATELEC–CEM (ITALY)	10156 TORINO	VAICENTALLO 62/45S ITALY
TK1543	CAMCAR/TEXTRON	600 18TH AVE	ROCKFORD, IL 61108–5181
TK2165	TRIQUEST CORP		

Replaceable Parts List

Fig. & Index Number	Tektronix Part Number	Serial No. Effective	Serial No. Discont'd	Qty	Name & Description	Mfr. Code	Mfr. Part Number
1–1	426–2293–00			2	FRAME,CRT:ASSY,INNER BEZEL/IR FILTER	80009	426–2293–00
–2	378–0332–00			2	FILTER:SMOKE GRAY	80009	378–0332–00
–3	378–0338–00			2	FILTER,CLEAR:4.146 X 3.376,ACRYLIC	80009	378–0338–00
–4	366–0649–00			8	KNOB:GY,0.127 ID X 0.392 OD X 0.5 H	80009	366–0649–00
–5	333–3653–00			1	PANEL,FRONT:CRT	80009	333–3653–00
–6	_____ _____			1	CIRCUIT BD ASSY:FRONT TOUCH PANEL (SEE A9 REPL)	80009	
					MOUNTING PARTS		
–7	211–0690–02			3	SCREW,MACHINE:6–32 X 0.375PNH,SST	TK1543	B20–70430
					END MOUNTING PARTS		
–8	131–1315–01			1	CONN,RF JACK	80009	131–1315–01
–9	174–1448–00			1	CA ASSY,RF: 50 OHM	80009	174–1448–00
–10	333–3607–00			1	PANEL,FRONT: (1780R ONLY)	80009	333–3607–00
	333–3694–00			1	PANEL,FRONT: (1781R ONLY)	80009	333–3694–00
–11	211–0721–00			2	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
–12	_____ _____			1	CIRCUIT BD ASSY:FRONT SW PANEL (SEE A12 REPL)		
					MOUNTING PARTS		
–13	211–0721–00			4	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–14	348–0660–00			8	CUSHION,CRT:POLYURETHANE	80009	348–0660–00
–15	378–0285–00			2	REFLECTOR,LIGHT:INTERNAL SCALE ILLUM	TK2165	378–0285–00
–16	_____ _____			1	CIRCUIT BD ASSY:VECTORSCOPE MONITOR GRATICULE LIGHTS (SEE A13 REPL)		
–17	_____ _____			1	CIRCUIT BD ASSY:WAVEFORM MONITOR GRATICULE LIGHTS (SEE A14 REPL)		
–18	426–2267–00			1	FRAME SECT,CAB:FRONT	80009	426–2267–00
					MOUNTING PARTS		
–19	211–0721–00			4	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–20	136–0387–01			1	JACK,TIP:U/W 0.04 DIA PIN,BLACK	80009	136–0387–01
–21	196–3245–00			1	LEAD,ELECTRICAL:24AWG,2.0L ORANGE	80009	196–3245–00
–22	337–3564–00			1	SHIELD,ELEC:FUSE,4.725 X 2.65,LEXAN PLASTIC	80009	337–3564–00
					MOUNTING PARTS		
–23	211–0721–00			2	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–24	334–3003–00			1	MARKER,IDENT:MKD DANGER	80009	334–3003–00

Replaceable Parts List (Cont.)

Fig. & Index Number	Tektronix Part Number	Serial No. Effective	Serial No. Discont'd	Qty	Name & Description	Mfr. Code	Mfr. Part Number
–25	_____ _____			1	CIRCUIT BD ASSY:FUSE (SEE A17 REPL)		
					MOUNTING PARTS		
–26	129–1308–00			2	SPACER,POST:6–32 X 0.75,HEX,STL,CAD PL	80009	129–1308–00
–27	211–0721–00			2	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
	198–5665–01			1	WIRE SET,ELEC,1780R,AC WIRE,3,22AWG,6.0 L SAFETY CONTROLLED (ATTACHED FROM A17 TO A1)	80009	198–5665–01
–28	337–3563–00			2	SHIELD,ELEC:WAVE HI VOLTS COVER	39951	337–3563–00
					MOUNTING PARTS		
–29	211–0721–00			2	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–30	334–2363–00			1	MARKER,IDENT:MKD DANGER, HIGH VOLTAGE	80009	334–2363–00
–31	_____ _____			1	CIRCUIT BD ASSY:WAVEFORM HIGH VOLTAGE (SEE A16 REPL)		
					MOUNTING PARTS		
–32	129–1308–00			2	SPACER,POST:6–32 X 0.75,HEX,STL,CAD PL	80009	129–1308–00
–33	211–0721–00			4	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–34	174–1499–00			1	CA ASSY,SP,ELEC:3,26 AWG,5.5L	80009	174–1499–00
–35	337–3423–00			1	SHIELD,ELEC:UNDER WAVEFORM HIGH VOLTAGE 7.125 X 4.725,LEXAN PLASTIC	80009	337–3423–00
–36	_____ _____			1	CIRCUIT BD ASSY:MPU ANNEX (SEE A10 REPL)		
					MOUNTING PARTS		
–37	211–0721–00			4	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–38	337–3557–00			1	SHIELD,ELEC:COVER,LARGE	80009	337–3557–00
					MOUNTING PARTS		
–39	211–0721–00			9	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–40	337–3550–00			1	SHIELD,ELEC:COVER,SMALL	80009	337–3550–00
					MOUNTING PARTS		
–41	210–0457–00			1	NUT,PL, ASSEM WA:6–32 X 0.312,STL CD PL	78189	511–061800–00
–42	211–0721–00			1	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–43	_____ _____			1	CIRCUIT BD ASSY:LOW VOLTAGE (SEE A1 REPL)		
					MOUNTING PARTS		

Replaceable Parts List (Cont.)

Fig. & Index Number	Tektronix Part Number	Serial No. Effective	Serial No. Discont'd	Qty	Name & Description	Mfr. Code	Mfr. Part Number
–44	211–0721–00			13	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–45	337–3549–00			1	SHIELD,ELEC:POWER SUPPLY, ALUMINUM	80009	337–3549–00
					MOUNTING PARTS		
–46	211–0721–00			3	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–47	386–4443–00			1	SUPPORT,SHIELD:CRT,FRONT,PLASTIC	80009	386–4443–00
–48	337–3487–00			1	SHIELD,ELEC:CRT STL	80009	337–3487–00
–49	334–1379–00			2	MARKER,IDENT:MKD HIGH VACUUM	07416	ORDER BY DESCR
–50	346–0120–00			2	STRAP,TIEDOWN,E:5.5 L MIN,PLASTIC, WHITE	06383	SST1.5M
–51	136–1011–00			1	SKT,PL–IN ELEK:CRT,14 PIN	80009	136–1011–00
–52	337–3513–00			1	SHIELD,ELEC:WAVEFORM TUBE	80009	337–3513–00
–53	342–0313–00			1	GROMMET,PLASTIC: 0.437 ID X 0.562 OD, NYLON	28520	2066
–54	136–1012–00			1	SKT,PL–IN ELEK:CRT,14 PIN	80009	136–1012–00
–55	426–2096–00			2	MOUNT,RESILIENT:CRT REAR	80009	426–2096–00
					MOUNTING PARTS		
–56	210–0457–00			4	NUT,PL, ASSEM WA:6–32 X 0.312,STL CD PL	78189	511–061800–00
					END MOUNTING PARTS		
–57	200–2519–00			2	CAP,CRT SOCKET:NATURAL LEXAN	80009	200–2519–00
–58	333–3608–01			2	PANEL,REAR:1780R	80009	333–3608–01
					MOUNTING PARTS		
–59	211–0721–00			7	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–60	337–3511–00			1	SHIELD,ELEC:INPUT ECB	80009	337–3511–00
					MOUNTING PARTS		
–61	211–0721–00			2	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–62	_____ _____			1	CIRCUIT BD ASSY: (SEE A8 REPL)		
					MOUNTING PARTS		
–63	211–0033–00			8	SCR,ASSEM WSHR:4–40 X 0.312,PNH,STL,CD,PL	TK0435	ORDER BY DESCR
					END MOUNTING PARTS		
–64	352–0908–00			1	HOLDER, FILTER:ALUMINUM	80009	352–0908–00
					MOUNTING PARTS		
–65	211–0530–00			2	SCREW,MACHINE:6–32 X 1.750,PNH,STL	83385	ORDER BY DESCR
					END MOUNTING PARTS		
–66	378–0337–00			1	FILTER,AIR:3.2 X 3.2,POLY FOAM	80009	378–0337–00

Replaceable Parts List (Cont.)

Fig. & Index Number	Tektronix Part Number	Serial No. Effective	Serial No. Discont'd	Qty	Name & Description	Mfr. Code	Mfr. Part Number
–67	_____ _____			1	FAN,TUBE AXIAL:12V, 1.56W,37CFM,80 MM, W/SOLID MOUNTING FLANGES (SEE B1 REPL)		
					MOUNTING PARTS		
–68	211–0530–00			2	SCREW,MACHINE:6–32 X 1.750,PNH,STL	83385	ORDER BY DESCR
					END MOUNTING PARTS		
–69	119–1536–00			1	FILTER,RFI 3A,250VAC,50/60HZ SAFETY CONTROLLED	TK2058	ZUB2203–00
					MOUNTING PARTS		
–70	211–0014–00			2	SCREW,MACHINE:4–40 X 0.5,PNH,STL	93907	ORDER BY DESCR
					END MOUNTING PARTS		
	198–5702–00			1	WIRE SET,ELEC (ATTACHED FROM LINE FILTER TO A17)	80009	198–5702–00
–71	131–4131–00			1	CONN,PLUG,ELEC:MALE W/LOCKING ADAPTER, EXT MTG	80009	131–4131–00
–72	210–0202–00			1	TERMINAL,LUG:0.146 ID,LOCKING,BRZ,TIN PL	86928	A–373–158–2
					MOUNTING PARTS		
–73	210–0586–00			1	NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL	80009	211–041800–00
					END MOUNTING PARTS		
–74	131–0106–02			9	CONN, RF JACK:	80009	131–0106–02
					ATTACHED PARTS		
–75	210–0255–00			1	TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	12327	ORDER BY DESCR
–76	196–3146–00			1	FLEX STRIP: SINGLE JUMPER, 1.0 L	15912	FSN–LA
–77	174–1498–00			1	CABLE ASSY, RF:50 OHM COAX, 12.75 L	80009	174–1498–00
	276–0569–00			1	CORE, EM:TOROID FERRITE	80009	276–0569–00
					END ATTACHED PARTS		
–78	_____ _____			1	CIRCUIT BD ASSY:MICROPROCESSOR (SEE A5 REPL)		
					MOUNTING PARTS		
–79	211–0721–00			8	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
–80	214–3903–01			4	SCREW,JACK:4–40 X 0.312 EXT THD,4–40 INT THD, 0.188 HEX, STEEL,CAD PLATE	80009	214–3903–01
					END MOUNTING PARTS		
–81	174–1403–00			1	CABLE ASSY, SP,ELEC:34,28 AWG,3.0L,RIBBON	80009	174–1403–00
–82	343–1430–00			1	CLAMP,WIRE:5.8 X 1.9,PLASTIC	80009	343–1430–00
–83	_____ _____			1	CIRCUIT BD ASSY:Z AXIS (SEE A4 REPL)		
					MOUNTING PARTS		
–84	211–0721–00			6	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		

Replaceable Parts List (Cont.)

Fig. & Index Number	Tektronix Part Number	Serial No. Effective	Serial No. Discont'd	Qty	Name & Description	Mfr. Code	Mfr. Part Number
–85	337–3581–00			1	SHIELD,ELEC:HIGH VOLTAGE TRANSFORMER	80009	337–3581–00
					MOUNTING PARTS		
–86	211–0721–00			2	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–87	253–0415–00			1	TAPE,FOAM:1 X 1.5 X 0.125 THK,ADHSVE ONE SIDE	80009	253–0415–00
–88	_____ _____			1	CIRCUIT BD ASSY:VECTOR HIGH VOLT (SEE A3 REPL)		
					MOUNTING PARTS		
–89	211–0721–00			2	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
–90	129–1325–00			4	SPACER,POST:6–32 X 1.5, STL,HEX,CAD PL	80009	129–1325–00
					END MOUNTING PARTS		
–91	337–3516–00			1	SHIELD,ELEC:UNDER VECTOR HIGH VOLTAGE	80009	337–3516–00
–92	348–0429–00			2	BUMPER,PLASTIC:BLACK POLYURETHANE	53387	SJ–5003
–93	_____ _____			1	CIRCUIT BD ASSY:OSCILLATOR (SEE A7 REPL)		
					MOUNTING PARTS		
–94	211–0721–00			6	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–95	_____ _____			1	CIRCUIT BD ASSY:VECTOR SCOPE (SEE A6 REPL)		
					MOUNTING PARTS		
–96	211–0721–00			8	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
–97	214–3903–01			2	SCREW,JACK:4–40 X 0.312 EXT THD,4–40INT THD, 0.188 HEX, STEEL,CAD PLATE	80009	214–3903–01
					END MOUNTING PARTS		
–98	174–1445–00			1	CA ASSY,RF: 50 OHM COAX, 8.0 L	80009	174–1445–00
–99	174–1446–00			1	CA ASSY,RF: 50 OHM COAX, 13.0 L	80009	174–1446–00
–100	_____ _____			1	CIRCUIT BD ASSY:FILTER (SEE A15 REPL)		
					MOUNTING PARTS		
–101	211–0721–00			4	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–102	337–3577–00			1	SHIELD,ELEC:UNDER FILTER	80009	337–3577–00
–103	_____ _____			1	CIRCUIT BD ASSY:INTERCONNECT (SEE A11 REPL)		
					MOUNTING PARTS		
–104	211–0721–00			5	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
–105	210–0586–00			1	NUT,PL,ASSEM WA:4–40 X 0.25,STL CD PL	78189	211–041800–00
					END MOUNTING PARTS		
–106	337–3512–00			1	SHIELD,ELEC:UNDER INTERCONNECT ECB	80009	337–3512–00

Replaceable Parts List (Cont.)

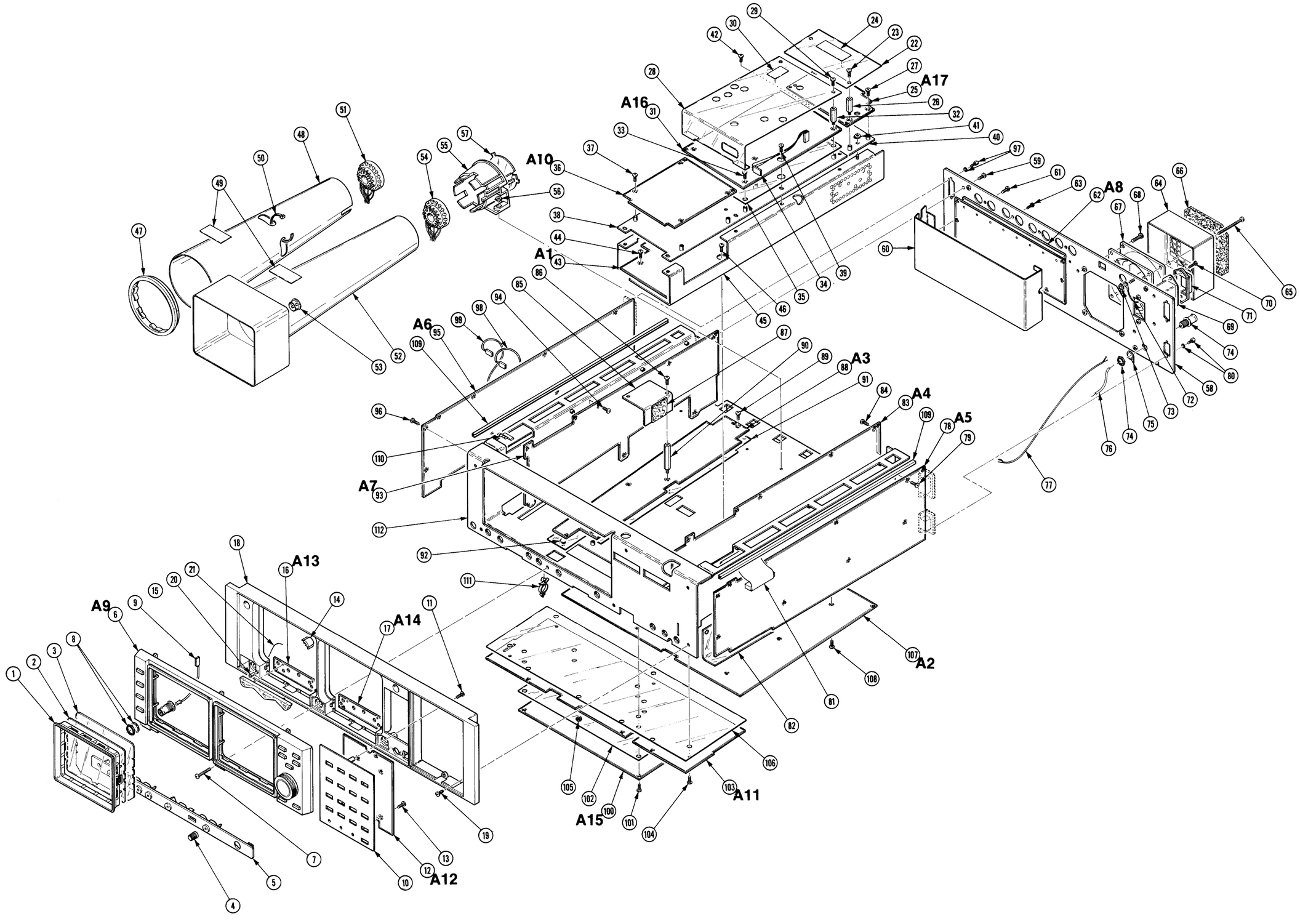
Fig. & Index Number	Tektronix Part Number	Serial No. Effective	Serial No. Discont'd	Qty	Name & Description	Mfr. Code	Mfr. Part Number
–107	_____ _____			1	CIRCUIT BD ASSY:VERT/HORIZ (SEE A2 REPL)		
					MOUNTING PARTS		
–108	211–0721–00			10	SCREW,MACHINE:6–32 X 0.375 PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
–109	255–0249–01			2	PLASTIC CHANNEL:11.25 L,VINYL	80009	255–0249–01
	255–0249–02			2	PLASTIC CHANNEL:14.625 L,VINYL	80009	255–0249–02
–110	214–4263–00			2	SPRING,GROUND:BE CU, NI PL	80009	214–4263–00
–111	344–0441–00			1	CLIP,CABLE:0.71,NYLON,NATURAL	80009	344–0441–00
–112	426–2268–00			1	FRAME ASSEMBLY:SAFETY CONTROLLED	80009	426–2268–00

Replaceable Parts List (Cont.)

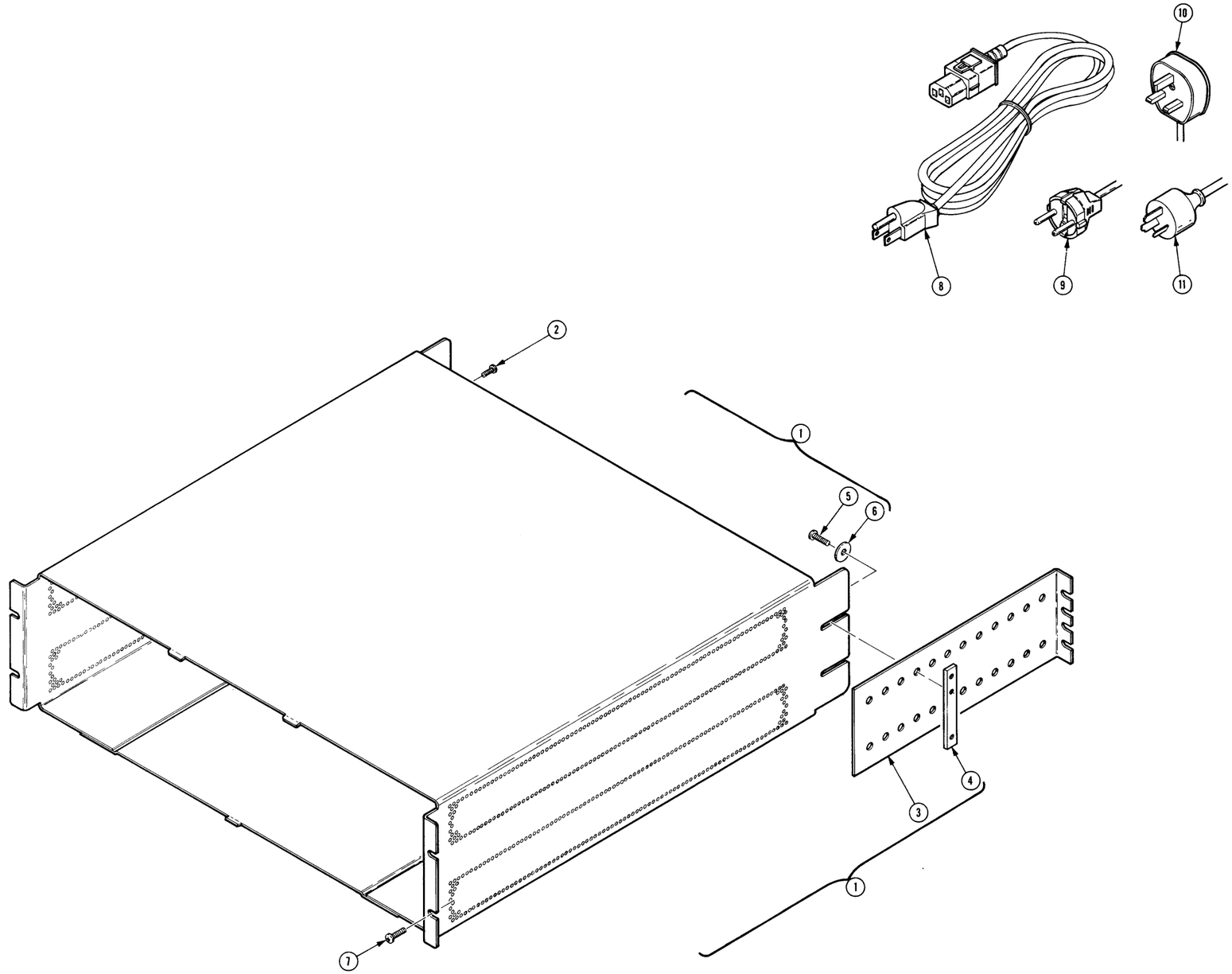
Fig. & Index Number	Tektronix Part Number	Serial No. Effective	Serial No. Discont'd	Qty	Name & Description	Mfr. Code	Mfr. Part Number
2–1	390–1039–00			1	CAB,WRAPAROUND:1780R	80009	390–1039–00
					MOUNTING PARTS		
–2	211–0720–01			4	SCREW,MACHINE:6–32 X 0.50 PNH,STL,TORX T–15	0KB01	211–0720–01
					END MOUNTING PARTS		
					CABINET,WRAPAROUND INCLUDES:		
–3	407–3752–00			2	BRACKET,EXT:2.5 X 8.06 X 0.06,STEEL	80009	407–3752–00
					MOUNTING PARTS		
–4	381–0251–00			2	NUT BAR:(3) 10–32 X 3.0 X 0.375 X 0.125,AL	TK0518	ORDER BY DESCR
–5	212–0577–00			4	SCREW,MACHINE:10–32 X 0.625,THR,STL	93907	ORDER BY DESCR
–6	210–1061–00			4	WASHER,FLAT:0.203 ID X 0.625 OD X 0.062,STL	86928	A371–141–62
					END MOUNTING PARTS		
–7	212–0577–00			8	SCREW,MACHINE:10–32 X 0.625,THR,STL	93907	ORDER BY DESCR
					STANDARD ACCESSORIES		
–8	161–0216–00			1	CABLE ASSY,PWR:3,18 AWG,2.5M L (NORTH AMERICAN STANDARD ONLY)	80216	C7120–25M–BL
	150–1136–00			3	LAMP,INCAND:	S3774	OL–381 BPR–022
	159–0023–00			1	FUSE,CARTRIDGE:3AG,2A,250V,SLOW BLOW	71400	MDX2
	331–0519–00			1	SCALE,CRT:NTSC,VISUAL (1780R ONLY)	80009	331–0519–00
	331–0520–00			1	SCALE,CRT:NTSC,PHOTO (1780R ONLY)	80009	331–0520–00
	331–0523–00			1	SCALE,CRT:PAL,VISUAL (1781R ONLY)	80009	331–0523–00
	331–0524–00			1	SCALE,CRT:PAL,PHOTO (1781R ONLY)	80009	331–0524–00
	378–0332–00			2	FILTER:SMOKE GRAY	80009	378–0332–00
	378–0337–00			1	FILTER,AIR:3.2 X 3.2,POLY FOAM	80009	378–0337–00
	378–0338–00			2	FILTER,CLEAR:4.146 X 3.376,ACRYLIC	80009	378–0338–00
	070–6890–XX			1	MANUAL,TECH:OPERATORS,1780R	80009	070–6890–XX
					OPTIONAL ACCESSORIES		
–9	161–0066–09			1	CABLE ASSY,PWR:3,0.75MM SQ,220V,99.0 L (EUROPEAN OPTION A1 ONLY)	80009	161–0066–09
–10	161–0066–10			1	CABLE ASSY,PWR: (UNITED KINGDOM OPTION A2 ONLY)	TK1373	24230
–11	161–0066–11			1	CABLE ASSY,PWR:3,0.75MM,240V,96.0 L (AUSTRALIAN OPTION A3 ONLY)	80009	161–0066–11
	070–8030–XX			1	MANUAL,TECH:SERVICE,1780R	80009	070–8030–XX

Replaceable Parts List (Cont.)

Fig. & Index Number	Tektronix Part Number	Serial No. Effective	Serial No. Discont'd	Qty	Name & Description	Mfr. Code	Mfr. Part Number
	016–1011–00			1	ACCESS KIT: CABINET,PORTABLE:1780F02	80009	016–1011–00
	016–0475–00			1	VIEWING HOOD:	80009	016–0475–00



1780R–Series Figure 1 Exploded View



1780R–Series Figure 2 Cabinet & Accessories