HITACHI

MODEL VC-6145
DIGITAL STORAGE
OSCILLOSCOPE

SERVICE MANUAL

WARNING
TO AVOID ELECTRIC SHOCK , DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

IMPORTANT
READ RULE FOR SAFE INSTALLATION, OPERATION AND INSTRUCTION CAREFULLY.
RETAIN THIS MANUAL FOR FUTURE REFERENCE.

Hitachi Denshi,Ltd.

READ THE IMPORTANT SAFETY-RELATED MARKINGS CAREFULLY BEFORE USE.

NOTE THE FOLLOWING SAFETY RELATED MARKINGS AND SYMBOLS.

(1) Terms

DANGER: Risk of hazard which causes serious injury to persons.

WARNING: Risk of hazard which may cause serious injury to persons.

CAUTION: Risk of hazard which may cause injury to persons, fire hazard or serious damage to the oscilloscope.

IMPORTANT: Important note not related to risk of hazard directly

NOTICE: Important note not related to risk of hazard, but observed for installation, operation, maintenance, etc.

(2) Symbols

⚠**DANGER** : DANGER

⚠**WARNING** : WARNING

⚠**CAUTION** : CAUTION

: PROTECTIVE GROUND TERMINAL

Note: The model and serial numbers of your OSCILLOSCOPE are important for you to keep for your convenience and protection. These numbers appear on the nameplate located on the rear of the oscilloscope. Please record these numbers in the spaces provided below, and **retain this manual for future reference.**

Model No _____ Serial No. _____

CONTENTS

IMPORTANT

SAFETY INSTRUCTIONS

CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER.
NO USER - SERVICEABLE PARTS INSIDE.REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

Explanation of Graphical Symbols

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the oscilloscope's enclosure; that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the oscilloscope.

WARNING : TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS OSCILLOSCOPE TO RAIN OR MOISTURE.

IMPORTANT

SAFEGUARDS

Read Instructions

All the safety and operating instructions must be read before the oscilloscope is operated.

Retain Instructions

The safety and operating instructions must be retained for future reference.

Heed Warnings

All warnings on the oscilloscope and in the operating instructions must be adhered to.

Follow Instructions

All operating and use instructions must be followed.

Cleaning

Unplug this oscilloscope from the power source before cleaning.Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

⚠CAUTION

Attachments

Do not use attachments not recommended by the oscilloscope manufacturer as they may cause hazards.

⚠WARNING

Water and Moisture

Do not use this oscilloscope near water - for example, near a bath tub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool, and the like.

⚠WARNING

Accessories

Do not place this oscilloscope on an unstable cart, stand, tripod, bracket, or table. **The oscilloscope may fall, causing serious injury to a person, and serious damage to the oscilloscope.** Use only with a cart, stand, tripod, bracket, or table recommended by the manufacturer, or sold with the oscilloscope. Any mounting of the oscilloscope should follow the manufacturer's instructions, and must use a mounting accessory recommended by the manufacturer.

⚠CAUTION

Ventilation

Slots and openings in the cabinet are provided for ventilation and to ensure reliable operation of the oscilloscope and to protect it from over-heating, and these openings must not be blocked or covered.

The openings must never be blocked by placing the oscilloscope on a bed, sofa, rug, or similar surface. This oscilloscope should never be placed in a built-in installation such as a bookcase or rack unless proper ventilation is provided or the manufacturer's instructions have been adhered to.

Power Sources

This oscilloscope should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your home, consult your oscilloscope dealer or local power company. The oscilloscopes are not intended to operate from battery power.

⚠WARNING

Plug

This item is applicable only to the oscilloscopes having the plug connected to the wall outlet.

Three-wire Grounding-Type Plug -This plug having a third (grounding) pin will only fit into a grounding-type power outlet. This is a safety feature.If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet.Do not defeat the safety purpose of the grounding-type plug.

Power-Cord Protection

Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying partic ular attention to cords at plugs, convenience receptacles, and the point where they exit from the oscilloscope.

Lightning

For added protection for this oscilloscope during a lightning storm, of when it is left unattended and unused for long periods of time, unplug it from the power source. This will prevent damage to the oscilloscope due to lightning and power-line surges.

⚠WARNING

Overloading

Do not overload power source and extension cords **as this can result in a risk of fire or electric shock.**

⚠**WARNING**

Object and Liquid Entry

Never push objects of any kind into this oscilloscope through openings as they may touch dangerous voltage points or short out parts that could result in a fire or electric shock. Never spill liquid of any kind on the oscilloscope.

⚠**WARNING**

Flammable and Explosive Substance

Avoid using this oscilloscope where there are gases, and also where there are flammable and explosive substances in the immediate vicinity.

Heavy Shock or Vibration

When carrying this oscilloscope around, do not subject the oscilloscope to heavy shock or vibration.

⚠**WARNING**

Servicing

Do not attempt to service this oscilloscope yourself as opening or removing covers may expose you to dangerous voltage or other hazards.Refer all servicing to qualified service personnel.

⚠**WARNING**

Damage Requiring Service

Unplug this oscilloscope from the power source and refer servicing to qualified service personnel under the following conditions:

a. When the power-supply cord or plug is damaged.
b. If liquid has been spilled, or objects have fallen into the oscilloscope.
c. If the oscilloscope has been exposed to rain or water.
d. If the oscilloscope does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions as an improper adjustment of other controls may result in damage and will often require extensive work by a qual ified technician to restore the oscilloscope to its normal operation.

⚠**WARNING**

Replacement Parts

When replacement parts ar required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original part. **Unauthorized substitutions may result in fire, electric shock or other hazards.**

Safety Check

Upon completion of any service or repairs to this oscilloscope, ask the service technician to perform safety checks to determine that the oscilloscope is in proper operating condition.

IMPORTANT

SAFETY OPERATIONS

Before operating the oscilloscope, be sure to check the following items.

⚠DANGER **⏚ PROTECTIVE GROUND TERMINAL**

Connection with the AC power source

Be sure to plug the power cord into an AC outlet provided with a protective ground terminal to avoid the risk of electric shock.

The oscilloscope is provided with the protective ground terminal and the three line power cord and plug to be connected to the AC power source.

The lead of the protective ground terminal is connected to the metallic part of the oscilloscope.

⚠WARNING

Replacement of fuse

Do not try to use any fuse other than the specified ones. Otherwise, further damage may occur and this could be dangerous.

Use only specified fuses. The oscilloscope is protected by the fuse on the primary side of the power supply. When this fuse blows, contact your nearest Hitachi Denshi representative.

⚠DANGER

Operation in gas

Do not use the oscilloscope in flammable gas or vapor to avoid possible explosion.

POWER switch

Before plugging in the AC cord, be sure to check that the POWER switch is set to OFF for protection of the oscilloscope.

⚠**WARNING**

Removal of the chassis cover

Do not remove the chassis cover to avoid the risk of electric shock since a high voltage presents inside the oscilloscope.

⚠**WARNING**

Use the oscilloscope within the specified line voltage.

The oscilloscope operates normally on the specified line voltage. If an abnormal operation occurs, turn off power for a short time and check the line voltage. If the line voltage is the specified voltage, turn on power. If the line voltage is out of the specified range (especially low voltage), the normal operation may not be restored even after the correct line voltage is applied.

Specified line voltage : AC 90-250V

IMPORTANT

WARNING MARKING

The caution label is printed on the rear of the oscilloscope. (Refer to Fig. A.)
The caution label is shown in Fig. B.
Observe the caution to assure proper handling.

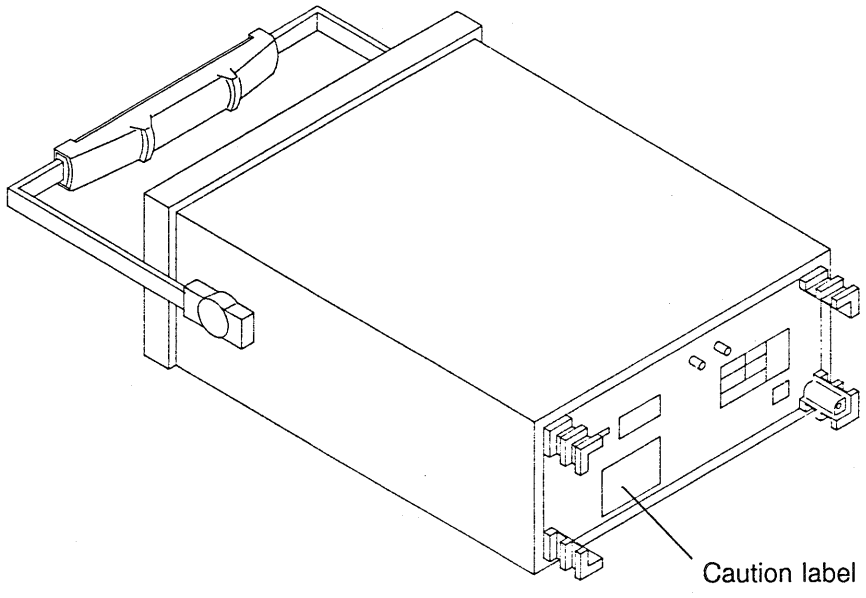


Fig. A

CAUTION

TO AVOID ELECTRIC SHOCK THE POWER CORD PROTECTIVE GROUNDING CONDUCTOR MUST BE CONNECTED TO GROUND.

DO NOT REMOVE COVERS. REFER SERVICING TO QUALIFIED PERSONNEL.

DISCONNECT INPUT POWER BEFORE REPLACING FUSE.

FOR CONTINUED FIRE PROTECTION REPLAC ONLY WITH SPECIFIED TYPE AND RATED FUSE.

LINE VOLTAGE RANGE	FUSE 250V
90-250V AC	2A SLOW
POWER APPROX 80W FREQ 48-440Hz	

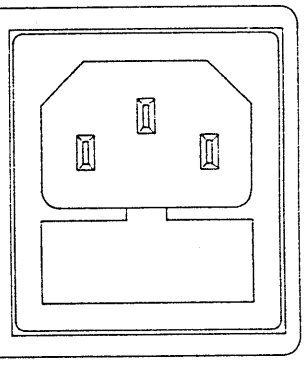


Fig. B

NOTES FOR A SAFETY OPERATION

Before operating the instrument, be sure to check the following items.

(1) Terms in this manual

WARNING: Indicates a possible injury to a body or danger to life if care is not taken as described.

CAUTION: Indicates possible damage to the instrument or other equipment if care is not taken as described.

(2) Symbols

DANGER : Indicates the part which may cause an injury to a body or danger to life.

DANGER : Indicates the high voltage part in the oscilloscope.

CAUTION : Indicates to read the applicable items in this manual.

: Protective earth terminal.

(3) Notes for operation

1 Replacement of fuse

Use only specified fuses.

The instrument is protected by a 2A fuse on the primary side of the power supply.

When this fuse is blown out, contact your nearest Hitachi Denshi representative. Do not try to use any fuse other than the specified ones.

Otherwise, further damage may occur and this could be dangerous.

(IMPORTANT: Use only the fuse of same size and rating as specified.)

Shape (Diameter × length) mm	Type
5.2ϕ × 20	218002 (EAK 2A) (250V 2A)

2 OPERATION IN GAS

Do not use the oscilloscope in combustible gas or vapor to avoid possible explosion.

3 POWER switch
Before plugging in the AC cord, be sure to check that the POWER switch is set to OFF for protection of the instrument.

4 Removal of the chassis
To avoid the risk of electric shock, do not remove the chassis by yourself. Contact your nearest Hitachi Denshi representative.

NOTES

WARNING:
Do not remove the chassis cover since a high voltage presents inside the instrument. When parts inside the instrument need to be adjusted or replaced, contact your nearest Hitachi Denshi representative.

1 The built-in microprocessor may misoperate when turning the power switch on/off rapidly. Avoid rapid toggling of the power switch and allow three seconds or more for toggling.
Further, in case the line voltage rises from 0V to rated voltage slowly (for three seconds or more), the built-in microprocessor may malfunction. In this case, turn off the power switch once, and turn on it again in three seconds or more.
If the instrument is not restored to the normal state by performing this operation, perform the initial settings (while pressing the AUTO of the TIME/DIV switch, turn off the power switch once and turn on it again in three seconds or more). In this case, the values are the initial settings shown in Table 8.2 (P.70).

2 In case of the storage mode, the intensities of both the waveform and readout (characters) are changed simultaneously by the READOUT INTEN control.

3 The trace in the real-time mode or the storage mode may fluctuate slightly until the instrument is warmed after power up. It takes about 15 or 20 minutes until a stable measurement is ensured.
An error between the trace in the real-time mode and that in the storage mode may occur. (Less than 0.5 div approx.)

4 Though the waveform is aligned with the graticule on the CRT in the storage mode, they may be deviated when plotted by the plotter. (Less than 0.5 div approx.)

CONTENTS

1. SPECIFICATIONS

o CRT

Graticule	6-inch screen with internal graticule and 0%, 10%, 90% and 100% markings 8 x 10DIV (1DIV = 1cm)
Phosphor	P31
Accelerating potential	17kV approx.
External intensity modulation	Coupling : DC coupling (dark at positive voltage) Voltage : 5Vp-p or more Maximum input voltage : 30V (DC + AC peak) or 30Vp-p AC at 1kHz or less Bandwidth : DC to 5MHz

o Vertical deflection system

Sensitivity	CH1 and CH2: 2mV/DIV to 5V/DIV ± 3% (switchable in 11 steps) Continuously adjustable by fine control CH3 and CH4: 0.1V/DIV and 0.5V/DIV ± 3% (switchable in 2 steps)
Frequency response	DC: 5mV/DIV to 5V/DIV: DC to 100MHz (-3dB) 2mV/DIV: DC to 20MHz (-3dB) AC: 5mV/DIV to 5V/DIV: 10Hz to 100MHz (-3dB) 2mV/DIV: 10Hz to 20MHz (-3dB)
Rise time	3.5ns approx. 2mV/DIV: 17.5ns approx.
Vertical signal delay	Leading edges can be observed (only in real-time mode).
Maximum input voltage	400V (DC + AC peak at 1kHz)
Input coupling	CH1 and CH2: AC, DC, GND CH3 and CH4: AC, DC
Input impedance	1M ohms ± 1.5%, 23pF approx.
Display modes	CH1, CH2, DUAL, CHOP (250kHz approx.), QUAD, ADD (DIFF mode can be established when the CH2 is in the INVERT mode.)
Bandwidth limiting function	20MHz
CH2 Polarity	Normal or inverted
Common-mode rejection ratio (CMRR)	20dB minimum at 20MHz

X-Y operation

Input	X-axis: Channel selectable from CH1, CH2, CH3 and CH4 (CH1 or CH2 only in storage mode) Y-axis: Channel selectable from CH1, CH2, and CH1&CH2 (CH3 or CH4 only in storage mode)
Sensitivity	CH1, CH2: 2mV to 5V/DIV CH3, CH4: 0.1V/DIV, 0.5V/DIV
Phase error	3° or less from DC to 50kHz (in real-time mode)
X bandwidth	DC to 500kHz (-3dB) (Depends on time range in storage mode.)

o Horizontal deflection system

Sweep mode	Main sweep, delay sweep, alternate sweep (in real-time mode only), single sweep
Sweep time	
A(main) sweep	50ns/DIV to 0.5s/DIV (UNCAL symbol ">" is displayed.) Continuously adjustable
B(delay) sweep	50ns/DIV to 50ms/DIV

Accuracy

	10 to 35°C	0 to 50°C
X1	±3%	±4%
MAG X10	±4%	±6%

(in real-time mode)

Holdoff	Variable
Delay time	1μs to 5s
Delay jitter	1/20,000 or less
Sweep magnification	X10
Maximum sweep rate	5ns/DIV
Trace separation	Variable (in real-time mode only)
Trigger lock function	Provided
Auto range function	Provided

o Trigger

Modes	Trigger and auto trigger
Source	A: CH1, CH2, CH3, CH4, ALT, and LINE B: Follows A.

TV sync

Exclusive sync separator circuit provided
Sensitivity: SYNC section
INT: 1 DIV or more
Sync polarity: Negative

Level

Variable range AUTO: Follows the trigger signal.
NORM: INT: ±4DIV or more

Sensitivity

NORM mode

	DC to 20MHz	20MHz to 100MHz
CH1, CH2	0.35DIV	1.5DIV
CH3, CH4	0.5DIV	1.5DIV

AUTO mode

	30 to 100Hz	100Hz to 20MHz	20 to 100MHz
CH1, CH2	1.5DIV	1DIV	1.5DIV
CH3, CH4	1.5DIV	1DIV	1.5DIV

DC coupling: DC
Slope: + or -
AUTO low frequency band: 30Hz

o Readout function

Panel setting display

Vertical axis: V/DIV (CH1, CH2), UNCAL, probe conversion, ADD(+)
Sweep speed: S/DIV, UNCAL, MAG (converted value)
Other: Delay time, X-Y, trigger, number of averaging, aliasing error display, smoothing display, sampling mode display, interpolation system, holdoff

o Cursor readout function

Voltage difference ΔV : Δ-REF (CH1 and CH2 waveforms)
Time difference ΔT : Δ-REF
Frequency 1/ΔT : Δ-REF

o Frequency counter

Frequency measurement

Source: A trigger signal selected by TRIG SOURCE OR X switch
Measuring range: 20Hz to 100MHz
Time base error: ±100ppm (15 to 35°C)

Ranges	Display format	Resolution	Accuracy
20Hz ≦ f < 100Hz	99.99Hz	0.01Hz	±time base error ±1 count
100Hz ≦ f < 1kHz	999.9Hz	1.0Hz max	
1kHz ≦ f < 10kHz	9.999kHz	0.002kHz max	
10kHz ≦ f < 100kHz	99.99kHz	0.04kHz max	
100kHz ≦ f < 1MHz	999.9kHz	0.1kHz	
1MHz ≦ f < 10MHz	9.999MHz	0.002MHz max	
10MHz ≦ f < 100MHz	99.99MHz	0.01MHz	
100MHz ≦ f	(100.0MHz)	Not specified	

o Memory backup

The panel settings and the save memory can be retained for about 48 hours after the power off.

o External output

TRIGGER SIGNAL OUT

Output voltage: 25mV/DIV approx. (Full scale on the CRT)
Frequency response: DC to 10MHz
Output impedance: 50 ohms approx.
(When terminated with 50 ohms.)

o Calibrator

Waveform: 1kHz ±20%, square wave
Voltage: 0.5V ±1%

DIGITAL STORAGE FUNCTION

o Maximum sampling rate

100Msps, 1-channel sampling (1μs/DIV)
50Msps, 2-channel simultaneous sampling (2μs/DIV)
25Msps, 4-channel simultaneous sampling (4μs/DIV)

o Memory capacity

Acquisition memory	4000 words (1-channel and 1μs/DIV to 50s/DIV) 2000 words/channel (2 channels or 4 channels and 2μs/DIV to 50s/DIV) 1000 words/channel (1 channel and 50ns/DIV to 0.5μs/DIV) (2 channels or 4 channels and 50ns/DIV to 1μs/DIV)
Display memory	1000 words x 4 waveforms
Save memory	1000 words x 4 waveforms (backup)

o Vertical resolution — 250 points/10 DIV

o Horizontal resolution — 100 points/DIV

o Maximum storage frequency — 5MHz (a single shot signal)
(Maximum amplitude error: 30% or less)
100MHz (repetition signal) (20MHz at 2mV/DIV) (-3dB)

o Sweep time

Sampling system	Number of channel(s)	Sweep time
Equivalent sampling (Repetition trace, and only A sweep)	1	50ns/DIV to 0.5μs/DIV
	2, 4	50ns/DIV to 1μs/DIV
A sweep realtime sampling (single shot trace)	1	1μs/DIV to 0.1s/DIV
	2, 4	2μs/DIV to 0.1s/DIV
B sweep realtime sampling (single shot trace)	1	1μs/DIV to 50ms/DIV
	2, 4	2μs/DIV to 50ms/DIV
Roll (A sweep only)	1, 2, 4	0.2μs/DIV to 50s/DIV

- Alternate sampling is made when two or four channels are operated in the time range from 50ns/DIV to 1μs/DIV
- Simultaneous samplings are made for CH1 and CH2, and CH3 and CH4 when the four channels are operated in 2μs/DIV. However, alternate sampling is made when either of CH1 or CH2 and either of CH3 or CH4 are operated.
- Simultaneous samplings are made for the two- or four-channel operation other than the above condition.

o Interpolation function	Linear interpolation or sine interpolation selectable (effective only in magnified display mode)
o Smoothing display	ON/OFF possible
o Pretrigger	Maximum 0 to 20DIV (1 channel and 1μs/DIV to 0.1s/DIV) (in 0.1DIV steps)
o Posttrigger	Maximum 0 to 10DIV (1 channel and 1μs/DIV to 0.1s/DIV) (in 0.1DIV steps)
o Data acquisition	
NORM storage mode	Updates the data on the CRT at each triggering.
AVG mode	Averages input signals by acquiring data specified times and displays the result after the specified number of averaging is reached. (Number of averagings: 4, 16, 64 and 256)
ROLL mode	Writes new data at the right edge of the CRT and shifts waveform from right to left continuously on the CRT. (The updating point is the right edge.)
HOLD mode	Holds the waveform displayed on the CRT.
SINGLE sweep	Performs an operation of the NORM storage, or AVG mode once at each pressing of the SINGLE RESET switch in the HOLD mode, and updates the data on the CRT.
o Data save	Up to four waveforms on the CRT can be saved. Maximum four stored waveforms out of four saved wave-forms and four current sampling waveforms can be displayed on the CRT.
o Plotter output	A hard copy can be produced by the plotter by using the HP-GL through RS-232C. The color is selectable from 6 colors.
o External output	The RS-232C interface is provided as a standard.

o Magnifying display

A storage waveform can be magnified ten times in the horizontal direction.
(A save waveform cannot be magnified.)

o Power supply

Voltage	90V to 250V AC
Frequency	48 to 440Hz
Power consumption	80W approx.

o Environment

Temperature	
Operating	0 to 40°C
Full specification	10 to 35°C
Storage	-20 to +70°C
Humidity	
Operating	45 to 85%
Storage	35 to 85% (70% or less at the temperature of 50°C or more)

o Dimensions and weight

Dimensions	310(W) x 130(H) x 450(D)mm approx. (excluding projections) (12.2 x 5.1 x 17.7 in. approx.)
Weight	9kg approx. (19.8 lb. approx.)

o Others

EMI	Conforms to VDE0871, Category B.

2. ACCESSORIES

The following standard accessories are supplied with the instrument.

Probes (AT-10AS1.5)	4
AC Power Cord (three-core)	1
Operation Manual	1
2A fuse	1

(Installed in the fuse holder of the instrument as spare)

3. PREVENTIVE MAINTENANCE

When preventive maintenance is performed periodically, the performance and reliability of the instrument can be maintained. The interval of such preventive maintenance depends on the environment to which this instrument subjected. It is recommended to perform preventive maintenance just prior to the recalibration of the instrument.

Be sure to disconnect the AC power cable of the instrument before performing preventive maintenance.

3.1 Disassembly

Remove all the screws on the top cover of the instrument, and remove the top cover. Take the same procedure for the bottom cover.

(See section 11. Exploded view.)

3.2 Cleaning

Clean the instrument appropriately to avoid possible failure due to dust.

Remove dust on the cover with a soft cleaning tissue or brush.

Remove contamination with soft cloth soaked in a neutral detergent.

To clean the interior, blow off dust with a vacuum cleaner. To clean narrow spaces, use a soft brush or a cotton-tipped applicator.

3.3 Visual inspection

Check the instrument from time to time for connectors, circuit boards, and parts are not damaged. If heated parts are found, locate the cause and remove it to maintain the performance of the instrument.

4. CALIBRATION

If the instrument becomes defective, contact your local Hitachi Denshi sales office or representative.

4.1 Calibration interval

To maintain the performance of the instrument, perform the calibration at least every 1000 hours of operation or every six months.

4.2 Test equipment required

The following test equipment and accessories or equivalent are required for the calibration. Specifications listed below are the minimum requirements to perform accurate calibration. Therefore, the specifications of any test equipment used must meet or exceed the listed specifications. Operating instructions for the test equipment are not given in this procedure. Refer to the respective instruction manuals of the test equipment if more information is need.

Table 4-1
Test equipment and accessories required

Description		Specifications	Applications	Examples of Applicable Test Equipment
1	Constant Amplitude Signal Generator	Reference frequency: 50kHz, Maximum frequency: 150MHz, Amplitude: Variable	Check horizontal, vertical and trigger bandwidths.	Tektronix SG503
2	Standard Amplitude Calibrator	Amplitude accuracy: 0.25%, Variable amplitude: 5mV to 40V, Frequency: 1kHz square wave	Check horizontal and vertical gains.	Tektronix PG506
3	Square-wave Generator	Variable frequency: 10Hz to 1MHz, Output amplitude: 10mV to 100V	Check probe and vertical compensation.	Tektronix PG506
4	Digital Multimeter	Accuracy: 0.1%	Check power supply.	Tektronix DM501A
5	Digital Frequency Counter	Accuracy: 0.1%	Check CAL frequency.	
6	Time Mark Generator	Accuracy: 0.1%	Check sweep time.	Tektronix TG501
7	Cable	Impedance: 50 ohms, Type: RG-58/U, Length: 42 inches, Connectors: BNC	This cable is used for almost all adjustment.	Hitachi Part No. 4202
8	Termination	Impedance: 50 ohms, Connectors: BNC feed through	Check vertical amplifier compensation.	
9	Attenuator	Ratio: 10X, Connectors: BNC, Impedance: 50 ohms	Check vertical amplifier bandwidth.	
10	T-Connector	Connectors: BNC	Check X-Y operation.	Hitachi part No. 1301

4.3 Preliminary procedure

This instrument should be calibrated at an ambient temperature of +20°C (±5°C) for the best overall accuracy.

1. Check that the instrument is not connected to AC source.
2. Ensure that the line voltage selector switch on the rear panel is set for the proper range.
3. Set the controls as follows (Table 4-2) before calibration.

4.4 Initial procedure

1. Connect the instrument to the AC source.
2. Set the POWER switch to ON.
3. Allow a few seconds until the cathode ray tube (CRT) is warmed.
   A trace appears on the CRT.
4. If trace disappears, increase (clockwise) the INTEN control until the trace is easily observed.
5. Allow at least fifteen minutes until the operation of the instrument becomes stable.
6. Adjust the FOCUS control for the optimum display.
7. Adjust the POSITION controls to center the trace, if necessary.

4.5 Calibration procedures

Refer to the adjustment points in the pullout pages.

Table 4-2 Preliminary control settings

Controls	Settings	Controls	Settings
POWER	OFF	CH1 VOLTS/DIV	10mV
INTEN	Midrange	CH2 VOLTS/DIV	10mV
FOCUS	Midrange	CH1 V VAR	CW (CAL)
READOUT INTEN	Midrange	CH2 V VAR	CW (CAL)
TRACE ROTATION	As desired	CH1 AC-DC	As desired
TRIG A LEVEL	Midrange	CH2 AC-DC	As desired
TRIG B LEVEL	Midrange	CH3 AC-DC	As desired
TRIG A MODE	AUTO	CH4 AC-DC	As desired
TRIG B MODE	AUTO	CH1 GND	GND, Pushed in
TRIG A SLOPE	+	CH2 GND	GND, Pushed in
TRIG B SLOPE	+	HORIZONTAL MODE	A
SOURCE OR X	CH1	TIME/DIV	As desired
VERTICAL MODE	CH1	SELECTOR	As desired
BW LIMIT	OFF	VARIABLES	As desired
CH2 INVERT	OFF	X10 MAG	OFF
CH1 V POSITION	Midrange	TRIGGER LOCK	OFF
CH2 V POSITION	Midrange	STORAGE	OFF
CH3 V POSITION	Midrange		
CH4 V POSITION	Midrange		

Note: CW: Clockwise

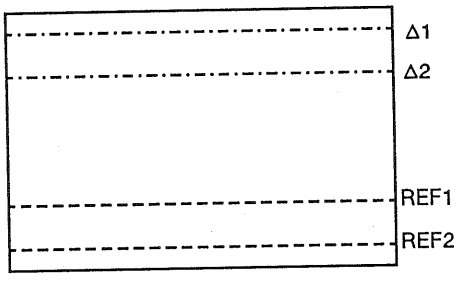
STORAGE DISPLAY

(1) While pressing the MENU, switch , press the [POWER] switch.
(Keep pressing the MENU switch after pressing the [POWER] switch.)

(2) When "COMPLETED" is displayed at the lower left of the screen for a short time, release the switch.

(3) Press the SELECTOR switch until the MEASURE LED lights.

(4) When establishing the DSO mode by using the STORAGE switch, the four cursors are displayed as shown below.



POWER SUPPLY

① +12V ADJ RV1506 (PEF-784)

Measure the voltage on pin 3 of connector P1501 on the PEF-784 board with a digital voltmeter, and adjust RV1506 so that the voltage is +11.975 to +12.025V.

② CRT BIAS RV1042 (PEF-784)

a. Set:

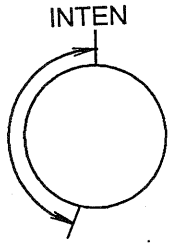
MODE:	CH1
SOURCE OR X:	CH2
GND (CH1,CH2):	ON (Push-in)
H MODE:	X-Y (Simultaneously push ALT and B.)
SELECTOR:	H POS

b. Position a spot at the center on the CRT screen by the CH1 POSITION (vertical position and the VARIABLES controls.)
Note: When the SELECTOR selects H POS, the VARIABLES control is used as a horizontal position control.

c. Adjust the INTEN control so that the voltage on Z OUT CHECK on the PEF-784 board is +15V.

d. Adjust CRT BIAS control RV1042 just before the spot starts to appear on the screen.

e. Adjust the INTEN control and verify that the spot starts to appear within the range (as illustrated below.)



③ TRACE ROTATION RV1606 (Front panel)

a. Set:

TIME/DIV:	A: 1ms
H MODE:	A
V MODE:	CH1

b. Adjust the horizontal position until the left end of the trace is lined up with the center of the leftmost vertical graticule line on the screen.

c. Adjust the TRACE ROTATION control on the front panel so that the trace is parallel with the horizontal graticule line.

d. Repeat b and c alternately until the trace is aligned with the center horizontal graticule line.

④ ASTIG RV1281 (PEF-784)
FOCUS RV1607 (Front panel)

a. Set:
   CH1 GND: ON (Push-in)
   CH2 GND: ON (Push-in)
   H MODE: X-Y (Simultaneously push ALT and B.)
   SOURCE OR X: CH2
   BW LIMIT: ON

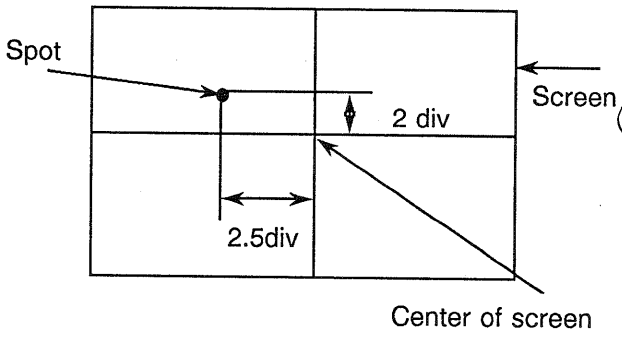
b. Locate a spot as illustrated in the following figure.Adjust CH1 V POSITION for the vertical position and H POSITION for the horizontal position.

c. Adjust INTEN control RV1601 (Front panel) just before halation starts to occur.

d. Rotate FOCUS control RV1607 (Front panel) fully clockwise.

e. Adjust ASTIG control RV1281 (PEF-783) so that the spot is a circule as true as possible.

f. Adjust FOCUS control RV1607 (Front panel) to obtain the smallest spot.



⑤ FOCUS CENT RV1253 (PEF-784)

a. Perform adjustment 4.

b. Set the FOCUS control to the mechanical mid-position.

c. Adjust FOCUS CENT control RV1253 (PEF-784) to obtain the smallest spot.

HORIZONTAL

While pressing the AUTO of the TIME/DIV switch, turn off the power switch once and turn on it again after three seconds or more. As a result, the sweep circuit operation is initialized. Then, proceed the following adjustment. (The adjustment in the X-Y mode is simultaneously performed.)

⑥ H GAIN RV834 (PEF-782)

Prior to this adjustment, adjust CH1 DC GAIN ㉑, CH2 DC GAIN ㉒ and INT HF COMP ㊱.

a. Set:
   CH2 AC/DC: AC
   CH2 VOLTS/DIV: 10mV (CAL)
   H MODE: X-Y
   V MODE: CH1
   SOURCE OR X: CH2
   CH1 GND: GND (Push-in)

b. Connect a 50mV square wave to the CH2 INPUT connector.

c. Adjust H GAIN control RV834 (PEF-782) so that the distance between the spots on the CRT is 5 div.

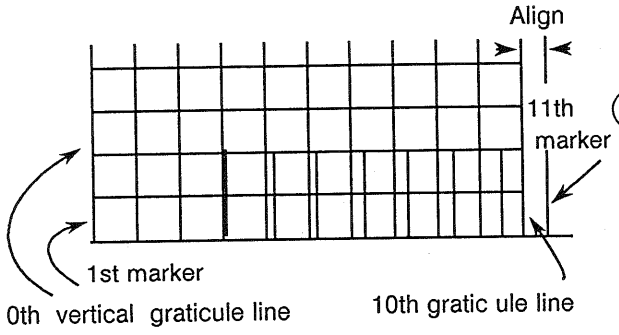
⑦ 1ms/div ADJ RV801 (PEF-782)

a. Set:
   V MODE: CH1
   CH1 AC/DC: DC
   H MODE: A
   A TIME/DIV: A = 1ms
   CH1 input: 1ms time mark signal from a time mark generator
   INTEN: As required
   READOUT INTEN: As required
   ×10 MAG: OFF

b. Align the 1st time marker with the zeroth (leftmost) vertical graticule line.

Note: This adjustment is performed by moving the horizontal position by the VARIABLES control with H POS selected by the SELECTOR.

C. Adjust 1ms/div ADJ control RV801 (PEF-782) so that the 11th time marker is aligned with the 10th (rightmost) vertical graticule line.



(8) ×10 MAG GAIN RV844 (PEF-782)

a. Set:

V MODE:	CH1
CH1 AC/DC:	DC
H MODE:	A
CH1 input:	1ms from the time mark generator
INTEN:	As required
READOUT INTEN:	As required
×10 MAG:	ON
A TIME/DIV:	A * 0.1ms (since the ×10 MAG control is ON)

b. Align the 1st time marker with the zeroth (leftmost) vertical graticule line.

c. Adjust MAG GAIN control RV844 (PEF-782) so that the 11th time marker is aligned with the 10th (rightmost) vertical graticule line

(9) MAG CENT RV831 (PEF-782)

a. Set:
Same as adjustment (8) - a.

b. Adjust the horizontal position, and align the rising portion of the 2nd time marker with the center vertical graticule line (6th line from the left).

c. Adjust MAG CENT control RV831 (PEF-782) so that the above 2nd time marker is not displaced from the center vertical graticule line when the ×10 MAG switch is set to off.

(10) H POS START RV807 (PEF-782)

a. Set the POWER switch to OFF first, and then turn it back to ON. At this time, leave the controls on the front panel as they are.

b. Adjust H POS START RV807 (PEF-782) so that the start point of the sweep is aligned with the leftmost graticule line.

(11) 5ns CV859 (PEF-784)

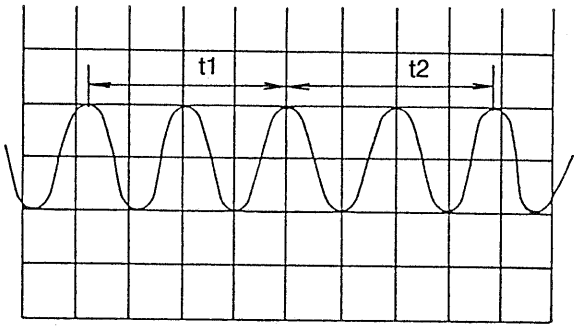
a. Set: A TIME/DIV: A = 50 ns

CH1 input:	10ns (Fed from the time mark generator) (When the rate is 10ns or more, a sinewave is supplied.)
H POS:	Adjust so that the numbers of the peaks on either side of the center vertical graticule line are equal.
×10 MAG:	ON

b. Adjust the H POS control so that the numbers of the peaks on either side of the center vertical graticule line are equal with the peak of the center wave aligned with the center vertical graticule line.

c. Adjust 5ns CV859 (PEF-876) so that the time (t1 and t2) from the center vertical

graticule line to the 2nd peaks on either side of the center line is equal.



VERTICAL

⑫ CH1 DC BAL RV37 (PEF-876)

a. Set:

V MODE: CH1
CH1 GND: ON (Push-in)
CH1 VOLTS/DIV: 2mV
A TIME/DIV: A = 1ms
CH1 V POSITION: Mid-position

b. Adjust CH1 DC BAL control RV37 (PEF-876) so that the displacement of the trace is within ±0.1 div when the CH1 VOLTS/DIV switch is switched between 2mV and 10mV.
In this case, verify that the information on the CH1 ATT contact at the lower left corner of the screen changes.

⑬ CH2 DC BAL RV137 (PEF-876)

a. Set:

V MODE: CH2
CH2 GND: ON (Push-in)
CH2 VOLTS/DIV: 5mV
A TIME/DIV: A = 1ms
CH2 V POSITION: Mid-position

b. Adjust CH2 DC BAL control RV137 (PEF-781) so that the displacement of the trace is within ±0.1 div when the CH2 VOLTS/DIV switch is switched between 2mV and 10mV.
In this case, verify that the information on the CH2 ATT contact on the lower left of the screen changes.

⑭ CH2 POS CENT RV162 (PEF-876)

a. Set:

V MODE: DUAL
V POSITION: Mid-position (CH1,CH2)
GND (CH1, CH2): ON (Push-in)
A TIME/DIV: A = 0.1ms

b. Adjust CH2 POS CENT control RV162 (PEF-876) so that the trace does not move when CH2 INV control S1611 (PEF-877) is turned on and off.

⑮ CH1 POS CENT RV62 (PEF-876)

a. Set:

V MODE: DUAL
CH2 V POSITION: As set in ⑭- a.

b. Adjust CH1 POS CENT control RV62 (PEF-876) so that the trace is aligned with the CH2 trace (See item ⑬).

⑯ CH3 POS CENT RV5337 (PEF-876)

a. Set:

V MODE: QUAD
V POSITION (CH1, CH2): Same as ⑭ - a.
CH3 V POSITION: Mid-position (of the angle of rotation)
CH3 0.1V/div-0.5V/div: 0.1V/div

b. Adjust CH3 POS CENT RV5337 (PEF-876) so that the CH3 trace coincides with the CH2 trace (the position set by ⑭.)

⑰ CH4 POS CENT RV5387 (PEF-876)

a. Set:

V MODE: QUAD

V POSITION (CH1, CH2): Same as 14 - a.

CH3 V POSITION: Same as 16 - a.

CH4 V POSITION: Mid-position (of the angle of rotation)

CH4 0.1V/div-0.5V/div: 0.1V/div

b. Adjust CH4 POS CENT RV5387 (PEF-876) so that the CH4 trace coincides with the CH2 trace (the position set by 14).

⑱ CHR Y CENT RV574 (PEF-785)

a. Set:

POWER switch to OFF first, and then back to ON to initialize the microcomputer.

CHR INTEN: As appropriate

V MODE: CH1

CH1 VOLTS/DIV: 10nV ("P10X0.1V" is displayed.)

(H MODE: A)

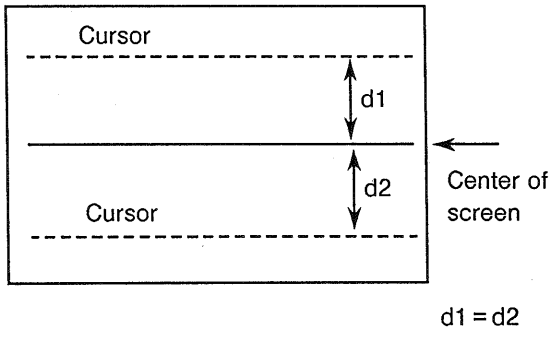
SELECTOR: △V of MEASURE

When power is turned on, H POS is automatically set. Consequently, when the SELECTOR switch is lowered one step further, MEASURE is selected (the LED lights) and △V is displayed on the screen.(If the SELECTOR switch is lowered one more step, △T is displayed on the screen with the MEASURE LED lit. If the switch is lowered one more step, 1/△T is displayed on the screen.)

VARIABLES: Do not touch to avoid a possible movement of the cursors.

b. Verify that the "△V = +600mV" is displayed at the top left of the screen.

c. Adjust CHR Y CENT RV574 (PEF-785) so that the cursors are at the same distance from the center of the screen.

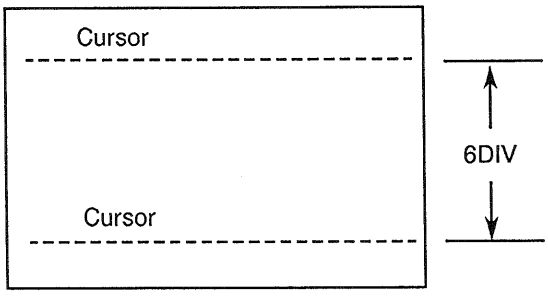


⑲ CHR Y GAIN RV576 (PEF-785)

a. Set:

Same as ⑱

b. Adjust CHR Y GAIN RV576 (PEF-785) so that the distance between the two cursors is 6 div.



⑳ CHR Y CENT RV574 (PEF-785)

Since the CHR Y GAIN adjustment is related to the CHR Y CENT adjustment, adjust the CHR Y CENT adjustment described in ⑱ again.

㉑ CH1 DC GAIN RV30 (PEF-876)

a. Set:

VERT MODE: CH1

CH1 VOLTS/DIV: 10mV

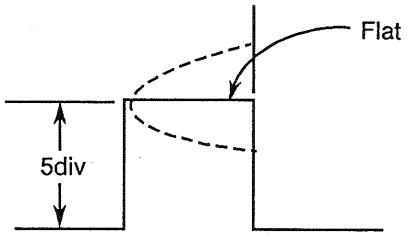
TIME/DIV: A = 2ms

CH1 AC-DC: DC

CH1 input: 1kHz, 50mVp-p square wave (from the Tektronix's pulse generator PG-506 or equivalent)
Set the PG-506 in the FAST RISE mode and connect the out put (1kHz square wave) in the 50-ohm termination. (In the FAST RISE mode, a waveform with a flat top is ensured.

b. Adjust the pulse generator so that the amplitude of the square wave is approx. 5 div at the center on the screen. (50-ohm terminated)

c. Adjust CH1 DC GAIN control RV30 (PEF-876) so that the square wave is flat at top.



(22) CH2 DC GAIN RV130 (PEF-876)

a. Set:

V MODE: CH2
CH2 VOLTS/DIV: 10mV
A TIME/DIV: A = 2ms
CH2 AC/DC: DC
CH2 input: Same as CH1 input (21)

b. Adjust the pulse generator so that the amplitude of the square wave is approx. 5 div on the screen.

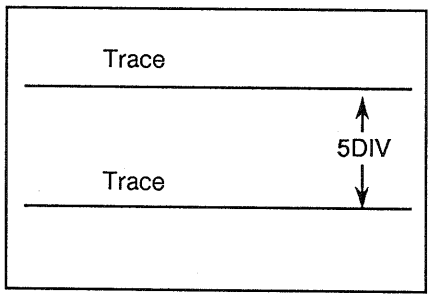
c. Adjust CH2 DC GAIN control RV130 (PEF-876) so that the square wave is flat at top.

(23) V GAIN RV505 (PEF-785) Total gain control common to CH1 and CH2

a. Set:

V MODE: CH1
SOURCE or X: CH2
A TRIG MODE: AUTO (Free-running scan)
Normally free-running scan is performed in the AUTO mode unless the trigger level is at the fringe of triggering.If the free-running scan is not performed, adjust the TRIG LEVEL control.
CH1 VOLTS/DIV:10mV
A TIME/DIV: A = 0.1ms
CH1 input: 1kHz, 50mVp-p square wave for calibration (from PG-506 on equivalent) (50-ohm termination open)

b. Adjust V GAIN control RV505 (PEF-785) so that the amplitude of the square wave is 5 div at the center on the screen.



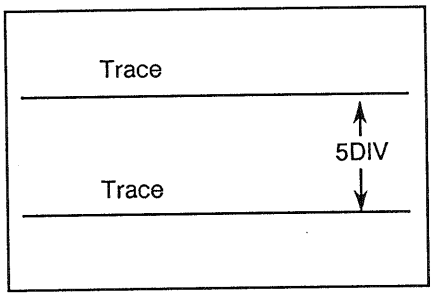
(24) CH2 GAIN control RV133 (PEF-876)

a. Set:

V MODE: CH2
SOURCE OR X: CH1
A TRIG MODE: AUTO (Free-running trace)

CH2 VOLTS/DIV: 10mV
A TIME/DIV: A = 0.1ms
CH2 input: Same as CH1 input (23)

b. Adjust CH2 GAIN control RV133 (PEF-876) so that the amplitude of the square wave is 5 div at the center on the screen.



(25) CH3 GAIN RV5335 (PEF-876)

a. Set:
V MODE: QUAD
SOURCE OR X: CH3
A TRIG MODE: AUTO (Free-running scan)
CH3 0.1V/div-0.5V/div: 0.1V/div
A TIME/DIV: A = 0.1ms
CH3 input: Same as CH1 input (23)

b. Adjust CH3 GAIN RV5335 (PEF-876) so that the amplitude at the center of screen is 5 div.

(26) CH4 GAIN RV5385 (PEF-876)

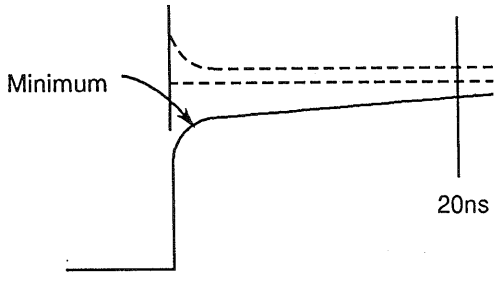
a. Set:
V MODE: QUAD
SOURCE OR X: CH4
A TRIG MODE: AUTO(Free-running scan)
CH4 0.1V/div-0.5V/div: 0.1V/div
A TIME/DIV: A = 0.1ms
CH4 input: Same as CH1 input (23)

b. Adjust CH4 GAIN RV5385 (PEF-876) so that the amplitude at the center of screen is 5 div.

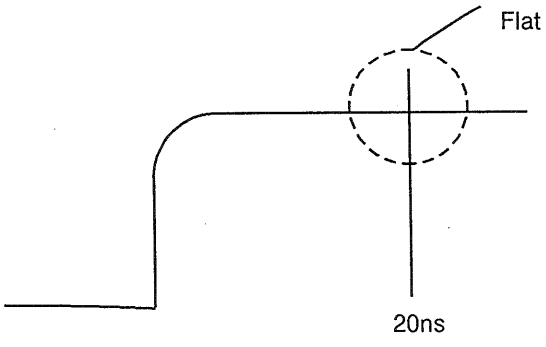
(27) CH1 HF COMP CV517, CV556, CV515 (PEF-785)

a. Set:
V MODE: CH1
CH1 AC/DC: DC
CH1 VOLTS/DIV:10mV/DIV
CH1 input: Tektronix's pulse generator PG506 or equivalent when the PG506 is in the FAST RISE mode, a square wave (Tr≦1 ns) is obtained. Connect this signal to CH1 in 50-ohm termination. (Trace of approx.5 div is displayed.)

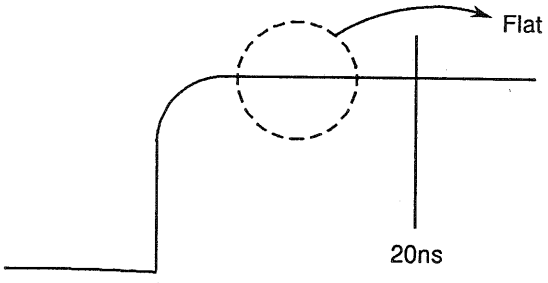
b. Adjust CV517 so that the amplitude around the rising edge is minimum.



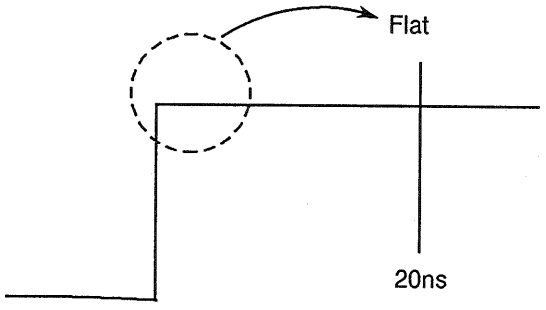
c. Adjust CV515 so that the portion near 20ns is flat.



d. Adjust CV556 so that the midway point between the rising edge and 20ns is flat.



e. Adjust CV517 so that the portion near the rising edge is flat.

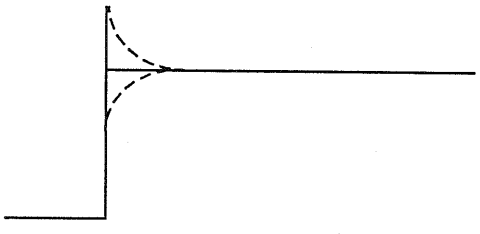


(28) CH2 HF COMP CV160 (PEF-876)

a. Set:

V MODE:	CH2
CH2 AC/DC SW:	DC
CH2 VOLTS/DIV:	10mV
CH2 input:	Same as CH1 input (27)

b. Adjust CV160 (PEF-876) so that the rising portion is flat.



(29) CH1 ATT CV4, CV5, CV14, CV15 (PEF-876)

(1) Attenuation characteristics

Connect the output of the PG-506 directly to CH1.

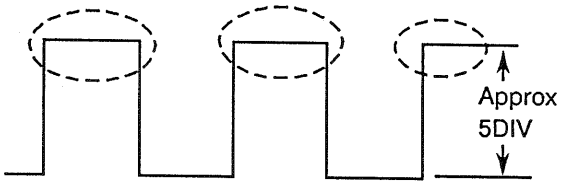
a. Set:

V MODE:	CH1
CH1 input:	Place the PG-506 in the HIGH AMPLITUDE range and connect the output (10kHz square wave) to CH1.

b. Set CH1 VOLTS/DIV to 0.1V. (CH1 ATTN is set to ÷10.)

c. Adjust the output amplitude control of the PG-506 so that the amplitude of the waveform is approx. 5 div.

d. Adjust CV5 (PEF-876) so that the top of the waveform is as flat as possible.



e. Set CH1 VOLTS/DIV to 1V. (CH1 ATTN is set to ÷100.)

f. Adjust the output amplitude control of the PG-506 so that the amplitude of the waveform is approx. 5 div.

g. Adjust CV15 (PEF-781) so that the top of the waveform is as flat as possible.

(2) Input capacitance

Connect the output of the PG-506 to CH1 by a 10:1 probe.

a. Set:

V MODE:	CH1
CH1 input:	Place the PG-506 in the HIGH AMPLITUDE range

and connect the output (10kHz square wave) to CH1 by the 10:1 probe.

b. Same as b of (1).
c. Same as c of (1).
d. Adjust CV4 (PEF-876) so that the top of the waveform is as flat as possible.
e. Same as e of (1).
f. Adjust the output amplitude adjustment of the PG-506 so that the amplitude of the waveform is 1 to 2 div on the screen.
g. Adjust CV14 (PEF-876) so that the top of the waveform is as flat as possible.

(30) CH2 ATT CV104, CV105, CV114, CV115 (PEF-876)

Same as 29 except that the V MODE input and the VOLTS/DIV settings are changed to CH2.

CV104 corresponds to CV4 of (29).
CV105 corresponds to CV5 of (29).
CV114 corresponds to CV14 of (29).
CV115 corresponds to CV15 of (29).

(31) CH3 ATT CV5303, CV5310 (PEF-876)

(1) Attenuation characteristics

Connect the output of the PG-506 directly to CH3.

a. Set:

V MODE: QUAD
CH3 input: Set PG-506 to the HIGH AMPLITUDE range, and connect the 10kHz square wave output to CH3.
0.1V/div-0.5 V/div Sw: 0.5V/div (Now, CH3 ATT is set to ÷5.)
(Corresponding to CH3 VOLTS/DIV)

b. Adjust the output amplitude control of PG-506 so that the square wave of approx. 5 div is displayed on CRT.
c. Adjust CV5310 (PEF-876) so that the top of the waveform becomes as flat as possible.

(2) Input capacity

Connect the output of PG-506 to CH3 through the 10:1 probe.

a. Set:

V MODE: QUAD
CH3 input: Set PG-506 to the HIGH AMPLITUDE range, and connect the 10kHz square wave output to CH3 through the 10:1 probe.
0.1V/div-0.5V/div SW: 0.5V/div

b. Same as b in (1)
c. Adjust CV5303 (PEF-876) so that the top of the waveform becomes as flat as possible.

(32) CH4 ATT CV5353, CV5360 (PEF-876)

Same as (31). However, read CV5303 as CV5353 and CV5310 as CV5360.

(33) CH3 HF COMP CV5336 (PEF-876)

a. Set:

V MODE: QUAD
CH3 AC/DC SW: DC
0.1V/div-0.5V/div SW: 0.1V/div
CH3 input: Same as the CH1 input of (27).

b. Adjust CV5336 (PEF-876) so that the rising portion becomes flat.

(34) CH4 HF COMP CV5386 (PEF-876)

Same as 33. However, read CH3 as CH4 and CV5336 as CV5386.

(35) TRIG SIG OUT DC LEVEL RV320 (PEF-876)

a. Set:
SOURCE OR X: CH1
CH1 GND: ON (Push in)

b. Connect the digital voltmeter or the oscilloscope to TRIG SIGNAL OUT J301.

C. Adjust RV320 (PEF-876) so that the output voltage is zero volts.

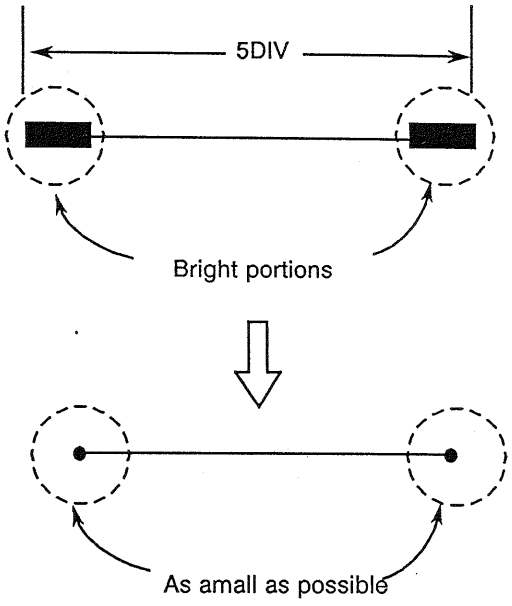
The following procedures ((36)) are needed for the adjustment of the frequency response of the amplifier in the TRIG system.

(36) INT HF COMP CV305 (PEF-876)

a. Set:
H MODE: X-Y
SOURCE OR X: CH1 (The signal connected to CH1 enters the X-AMP.)
V MODE: CH2 (To prevent beam from deflecting in the vertical direction, the no-signal CH2, not CH1 with the signal connected, is selected.)
CH1 VOLTS/DIV:10mV
CH1 input: When the PG-506 is in the FAST RISE mode, a 10kHz square wave (10kHz) is obtained. Connect this signal to CH1 in 50-ohm termination.

b. Adjust the output control of the PG-506 so that the trace of approx. 5 DIV is displayed in the horizontal direction of the screen.

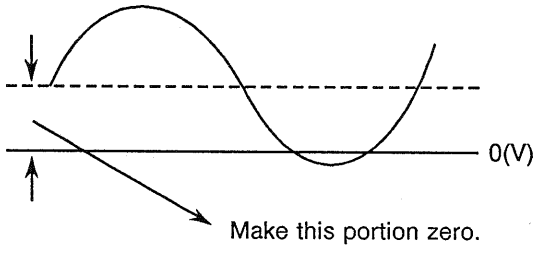
c. Adjust INT HF COMP CV305 (PEF-876) so that both ends of the trace is as small as possible.



(37) CH3 TRIG LEVEL CENT RV5318 (PEF-876)

a. Set:
V MODE: QUAD
SOURCE OR X: CH3
0.1V/div-0.5V/div SW: 0.1V/div
CH3 AC/DC: DC
CH3 input: 50kHz sine wave, screen display 1.2 div

b. Adjust CH3 TRIG LEVEL CENT RV5318 (PEF-876) so that the waveform becomes as follows.



c. As CH3 POS CENT is deviated, adjust 16 CH3 POS CENT RV5337 (PEF-876) again.

(38) CH4 TRIG LEVEL CENT RV5367 (PEF-876)

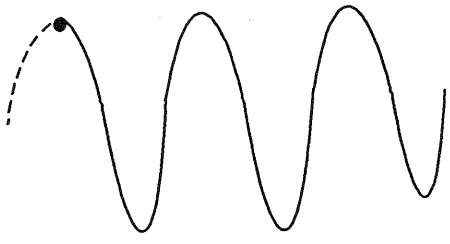
Same as 37. However, read CH3 as CH4, RV53(18) as RV5367, and (16) as (17).

(39) TRIG ⊕ PEAK RV685 (PEF-876)

a. Set:

SOURCE OR X:	CH1
V MODE:	CH1
TRIG MODE:	A = 20μs
CH1 VOLTS/DIV:	10mV or 20mV
SLOPE:	⊕
TRIG LEVEL:	CW
CH1 input:	Square wave of approx. 50kHz (4 DIV amplitude on screen)

b. The trigger point is changed as shown in dotted lines by the TRIG ⊕ PEAK control. Adjust TRIG ⊕ PEAK RV685 (PEF-876) so that the trace is triggered at as high a point as possible.



(40) TRIG - PEAK RV675 (PEF-782)

a. Set:

SLOPE:	⊖
TRIG LEVEL:	CCW

Other settings are the same as (39).

b. Adjust TRIG ⊖ PEAK RV675 (PEF-782) so that the trace is triggered at as low a point as possible.

External output

(41) PROBE ADJ RV1303 (PEF-782)

Measure the PROBE COMP output at J502 by the digital voltmeter, and adjust PROBE ADJ RV1303 (PEF-785) for 0.250V.

CHR X

(42) CHR X CENT RV876 (PEF-782)

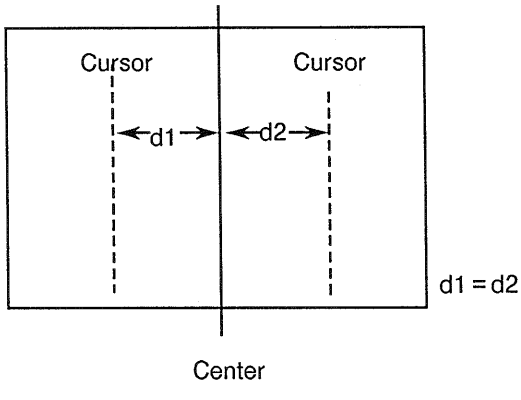
a. Set:

Turn the POWER switch to off first, and then back to on to initialize the microcomputer.

READOUT INTEN:	As appropriate
SELECTOR:	△T of MEASURE (Refer to SELECTOR of 18 -a.)
VARIABLES:	Do not move.

b. Verify that "8.00ms" is displayed on the top left of the screen.

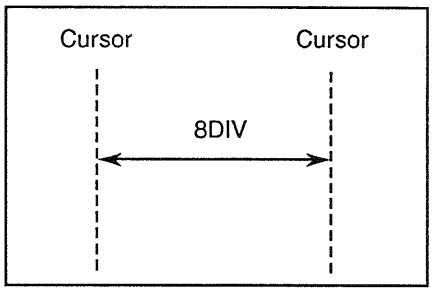
c. Adjust CHR X CENT RV876 (PEF-782) so that the distances between the center of the screen and the cursors are equal.



(43) CHR X GAIN RV884 (PEF-782)

a. Set: Same as (42).

b. Adjust CHR X GAIN RV884 (PEF-865) so that the distance between cursors is 8 DIV.



c. Perform the adjustment (42) again, when the cursor positions do not coincide with the scale.

NOTE

When the power switch of this instrument is turned on, the time base calibration and the diagnosis of the sweep circuit operation are performed by the built-in microcomputer.

If the result is normal, "CALIBRATION-COMPLETED" is displayed on the CRT 20 seconds after the power has been turned on, and the instrument is placed in the standard state.

If the result is not normal, "CALIBRATION-FAILED AT SWEEP CKT (or CYCLE CKT)" is displayed. When the power switch is turned on after storage in a low temperature, allow several minutes until circuits become stable. Then turn off the power switch and turn on the switch again.

If "CALIBRATION-COMPLETED" is displayed, the operation is normal. If "CALIBRATION-FAILED AT SWEEP CKT" is displayed again, check the sweep circuit (PEF-782 or PEF-837).

(44) STORAGE Y CENT RV5501 (PEF-922-1, PEF-922-2)

a. Adjust V CENT RV5501 (PEF-922-1) so that the Δ1 cursor position is exactly opposite to the REF1 cursor position on either side of the horizontal center line of the screen.

b. Adjust V CENT RV5501 (PEF-922-2) so that the Δ2 cursor position is exactly opposite to the REF2 cursor position on either side of the horizontal center line of the screen.

(45) STORAGE Y GAIN RV5502 (PEF-922-1, PEF-922-2)

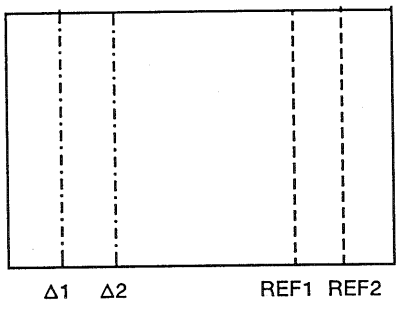
a. Adjust Y GAIN RV5502 (PEF-922-1) so that the distance between the Δ1 cursor and the REF1 cursor is 6 div.

b. Adjust Y GAIN RV5502 (PEF-922-2) so that the distance between the Δ2 cursor and the REF2 cursor is 6 div.

c. Repeat the procedure (44) .

(46) STORAGE X CENT RV5503 (PEF-922-1, PEF-922-2)

a. Press the SELECTOR switch one step again to establish the T cursor state. Then the four cursors are displayed as shown below.



b. Adjust H CENT RV5503 (PEF-922-1) so that the Δ1 cursor position is exactly opposite to the REF1 cursor position on either side of the horizontal center line of the screen.

c. Adjust H CENT RV5503 (PEF-922-2) so that the Δ2 cursor position is exactly opposite to the REF2 cursor position on either side of the horizontal center line of the screen.

(47) STORAGE X GAIN RV5504
(PEF-922-1, PEF-922-2)

a. Adjust H GAIN RV5504 (PEF-922-1) so that the distance between the Δ1 cursor and the REF1 cursor is 8 div.

b. Adjust H GAIN RV5504 (PEF-922-2) so that the distance between the Δ2 cursor and the REF2 cursor is 8 div.

c. Repeat the procedure (46) .

STORAGE A/D section

(48) S/H BALANCE RV8060
(PEF-922-1, PEF-922-2)

a. Press the STORAGE switch to establish the RTO mode.

b. Press the CH1 switch of VERTICAL MODE.

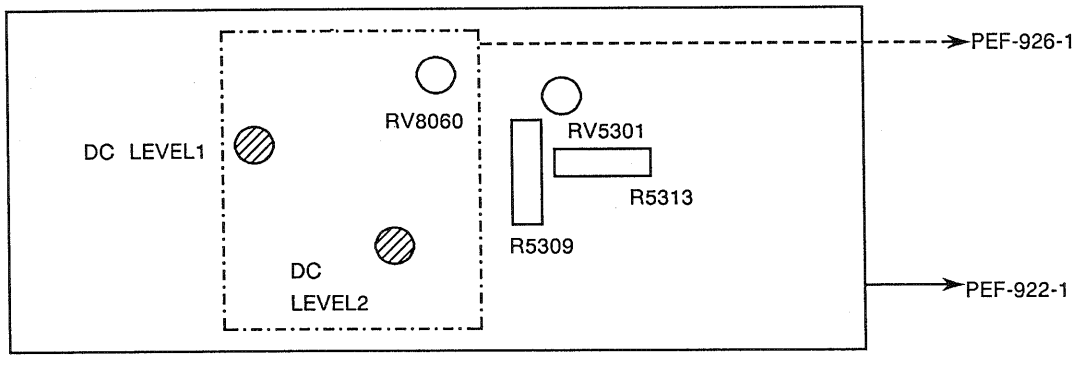
c. Press the GND switch of CH1 INPUT.

d. Rotate the POSITION control of CH1 so that the trace coincides with the horizontal center line on the screen. (Do not rotate the POSITION control any further.)

e. Press the A TIME/DIV switch until 50ns is displayed (equivalent mode).

f. Press the STORAGE switch to establish the DSO mode.

g. Measure the potential difference between DC LEVEL1 and DC LEVEL2 by using a digital voltmeter, and adjust S/H ADJ RV8060 (PEF-922-1) so that the potential difference is within ±10mV.



(**Note 1**) Measure the potential difference between the two points on PEF-926-1 through the holes (marked with o) in PEF-926-1.

(**Note 2**) DC LEVEL1 and DC LEVEL2 are silkscreened on PEF-922-1.

(**Note 3**) RV8060 is installed on PEF-922-1.

h. Set the STORAGE switch to establish the RTO mode, and press the CH2 switch of VERTICAL MODE. Then, press the GND switch of CH2, and adjust the POSITION control of CH2 INPUT so that the trace coincides with the horizontal center line.

(**Note**) Leave the A TIME/DIV switch as is.

i. Set the STORAGE switch to establish the DSO mode.

j. Adjust S/H ADJ RV8060 (PEF-922-2) so that the potential difference between DC LEVEL1 and DC LEVEL2 is within ± 10mV.

(49) Equivalent sampling starting point 1 RV5301 (PEF-922-1, PEF-922-2)

a. STORAGE: DSO
A TIME/DIV: 50ns

b. Press the CH1 switch of VERTICAL MODE.

c. Press the GND switch of CH1 INPUT.

d. Set TRIG MODE to AUTO.

e. Unlock the trigger by the TRIG LEVEL control.

f. Measure the waveform on the R5309 side of R5313 by using another oscilloscope. (For the check point, refer to the figure of (48) -g.)

(**Note**) Set the signal input of the instrument to DC.

g. Adjust EQS CENT RV5301 (PEF-922-1) so that the equivalent sampling starting voltage is 0.1V.

h. Press the CH2 switch of VERTICAL MODE, and press the GND switch of CH2 INPUT. Then unlock the trigger by TRIG LEVEL.

i. Measure the waveform on the R5309 side of R5313 by using another oscilloscope. Adjust EQS CENT RV5301 (PEF-922-2) so that the equivalent sampling starting voltage is 0.1V.

(50) Equivalent sampling gain RV5302 (PEF-922-1, PEF-922-2)

(**Note**) This is the gain adjustment of the horizontal axis (time base).

a. Press the CH1 switch of VERTICAL MODE and the GND switch of CH1 INPUT.
(The other settings are the same as the preceding adjustment.)

b. Enter the marker 50ns to CH1 and apply the trigger by TRIG LEVEL.

c. Adjust EQS GAIN RV5302 (PEF-922-1) so that the error of sweep accuracy is 0%.

d. Press the CH2 switch of VERTICAL MODE and the DC switch of CH2 INPUT.

e. Enter the marker 50ns to CH2 and apply the trigger by TRIG LEVEL.

f. Adjust EQS GAIN RV5302 (PEF-922-2) so that the error of sweep accuracy is 0%.

(51) Equivalent sampling starting point 2 RV5301 (PEF-922-2)

a. Press the DUAL switch of VERTICAL MODE. (The other settings are the same as the preceding adjustment.)

b. Enter the marker 50ns to CH1 and CH2 simultaneously.

c. Adjust EQS CENT RV5301 (PEF-922-2) so that the waveforms of CH1 and CH2 coincide with the horizontal axis.

(52) CH1 A/D-1 GAIN RV5201 (PEF-922-1)

a. Settings

V MODE:	CH1
SOURCE OR X:	CH2

TRIG MODE:
Free run in AUTO mode
CH1 VOLTS/DIV: 10mV
A TIME/DIV: 0.5μs
SM (smoothing): OFF

b. Connect a 1kHz square wave for calibration to CH1 by 50mV.
c. Establish the RTO mode, and check that the amplitude of the waveform on the screen is 5 div.
d. Adjust AD1 GAIN RV5201 (PEF-922-1) so that the amplitude of the waveform on the screen is 5 div in the DSO mode.

(53) CH1 A/D-1 EQ OFFSET RV5203 (PEF-922-1)

a. Settings: Same as (52)
b. Establish the RTO mode.
c. Press the GND switch of CH1 INPUT, and position the trace at the center of the screen by the POSITION control of CH1.
d. Establish the DSO mode, and adjust CH1 AD1 EQ OFFSET RV5203 (PEF-922-1) so that the trace is at the center of the screen.
e. Establish the DSO mode again, and check that the trace is at the center of the screen. When the trace is not at the center, repeat the above adjustment.

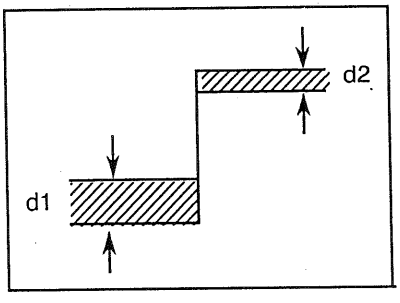
(54) CH1 A/D-1 NORM OFFSET RV5202 (PEF-922-1)

a. Settings:
A TIME/DIV: 1μs/div
Other settings: Same as (52)
b. Establish the DSO mode.
c. One to four traces are displayed on the screen.
Adjust RV5202 so that the trace which can be moved by CH1 AD1 NORM OFFSET RV5202 (PEF-922-1) is at the center of the screen.

(55-1) CH1 A/D-2 GAIN RV5251 (PEF-922-1)

(55-2) CH1 A/D-2 OFFSET RV5251 (PEF-922-1)

a. Settings:
CH1 AC-DC-GND: DC
CH1 INPUT:
100kHz square wave (Tr≦1ns)
SOURCE OR X: CH1
TRIG POINT (H POS in DSO mode): 5 div approx.
A TIME/DIV: 2μs
b. Establish the RTO mode, and adjust the square wave output so that the amplitude of the waveform is 5 div (50mV) on the screen.
c. When the DSO mode is established, the following waveform is displayed.



d. Adjust CH1 AD2 GAIN RV5251 (PEF-922-1) so that the widths of the upper and lower traces on the screen become equal (d1 = d2).
e. Adjust CH1 AD2 OFFSET RV5252 (PEF-922-1) so that the widths of the traces are minimum.
f. Repeat the above steps d. and e. appropriately.

(56) CH2 A/D-1 GAIN RV5201 (PEF-922-2)

a. Settings:

V MODE:	CH2
SOURCE OR X:	CH1
TRIG MODE:	Free run in AUTO
CH2 VOLTS/DIV:	10mV
A TIME/DIV:	0.5 μs
SM (smoothing):	OFF
CH2 AC-DC-GND:	DC

b. Connect the 1kHz square wave to CH2 by 50mV.

c. Adjust CH2 AD1 GAIN RV5201 (PEF-922-2) in the same manner as (52) .

(57) CH2 A/D-1 EQ OFFSET RV5203 (PEF-922-2)

a. Settings: Same as 56

b. Establish the RTO mode.

c. Set CH2 INPUT to GND, and position the trace at the center of the screen by the POSITION control of CH2.

d. Adjust CH2 AD1 EQ OFFSET RV5203 (PEF-922-2) in the same manner as steps d. and e. of (53) .

(58) CH2 A/D-1 NORM OFFSET RV5202 (PEF-922-2)

a. Settings:

A TIME/DIV: 1 μs/div

Other settings: Same as (56)

b. Establish the DSO mode.

c. One to four traces are displayed on the screen.

Adjust RV5203 so that the trace which can be moved by CH2 AD1 NORM OFFSET RV5202 (PEF-922-2) is at the center of the screen.

(59-1) CH2 A/D-2 GAIN RV5251 (PEF-922-2)

(59-2) CH2 A/D-2 OFFSET RV5252 (PEF-922-2)

a. Settings:

CH2 AC-DC-GND: DC

CH2 INPUT:

100kHz square wave (Tr≦1ns)

SOURCE OR X: CH2

TRIG POINT: 5 div approx.

(H POS in the DSO mode)

A TIME/DIV: 2μs

b. Adjust RV5251 (PEF-922-2) and RV5252 (PEF-922-2) in the same manner as b. to f. of (55) .

(60-1) GAIN of 100Msps DLY LINE DRIVER RV9013 (PEF-924)

(60-2) OFFSET of 100Msps DLY LINE DRIVER RV9007 (PEF-924)

a. Settings:

SOURCE OR X: CH1

V MODE: CH1

TRIG POINT: 5 div approx.

(H POS of DSO mode)

A TIME/DIV: 1μs

CH1 VOLTS/DIV: 10mV

CH1 AC-DC-GND: DC

CH1 INPUT:

100kHz square wave (Tr≦1ns)

b. Establish the RTO mode, and adjust the square wave output so that the amplitude of the waveform is 5 div (50mV) on the screen.

c. Establish the DSO mode.

d. Adjust GAIN RV9013 (PEF-924) so that the widths of the upper and lower traces on the screen become

equal. (Refer to the figure of (55) - c.)

e. Adjust BAL RV9007 (PEF-924) so that the widths of the traces are minimum.

f. Repeat the above steps d. and e. appropriately.

(61) Equivalent sampling CH1 frequency characteristics (for confirmation only)

(1) Overshoot

a. Settings:

V MODE:	CH1
SOURCE OR X:	CH1
CH1 AC-DC-GND:	DC
CH1 VOLTS/DIV:	10mV
CH1 INPUT:	1MHz square wave, 50mV (Tr≦1ns)
A TIME/DIV:	0.1μs
X10 MAG:	ON
TRIG A SLOPE:	⊖
STORAGE:	DSO mode

b. Adjust TRIG LEVEL for proper triggering.

c. Check that the overshoot is within ± 4%.

(2) Rise time

a. Settings:

CH1 INPUT:	50kHz sine wave
A TIME/DIV:	0.5μs
Other seggings:	Same as (1)

b. Set the output of the sine wave oscillator so that the amplitude of the waveform is 6 div on the screen.

c. When setting the sine wave frequency to 100MHz with A TIME/DIV set to 50ns, check that the amplitude of the waveform is 4.2V or more on the screen (that is,rise time is 3.5ns or less).

(62) Equivalent sampling CH2 frequency characteristics (for confirmation only)

Check the frequency characteristics in the same manner as (61) .

(63) CH1 STR GAIN RV9121 (PEF-924)

a. Settings:

SOURCE OR X:	CH1
V MODE:	CH1
CH1 VOLTS/DIV:	10mV
A TIME/DIV:	1ms
SM (Smoothing):	OFF
CH1 AC-DC-GND:	DC
CH1 INPUT:	1kHz square wave, 50mV

b. Establish the RTO mode and check that the amplitude of the waveform is 5 div on the screen.

c. Adjust RV9121 (PEF-924) so that the amplitude of the waveform is 5 div on the screen .

(64) CH1 STR OFFSET RV9130 (PEF-924)

a. Settings: Same as (63)

b. Establish the RTO mode, and press the GND switch of CH1 INPUT.

c. Position the trace at the center of the screen.

d. Establish the DSO mode, and adjust RV9130 (PEF-924) so that the trace is at the center of the screen.

e. Establish the RTO mode again for confirmation.
If the trace is not at the center of the screen, repeat the adjustment appropriately.

(65) CH2 STR GAIN RV9221 (PEF-924)

a. Settings:

SOURCE OR X:	CH2
V MODE:	CH2
CH2 VOLTS/DIV:	10mV
CH1 AC-DC-GND:	DC
CH2 INPUT:	1kHz square wave, 50mV
SM (Smoothing):	OFF

b. Establish the RTO mode, and check that the amplitude of the waveform is 5 div on the screen.

c. Establish the DSO mode, and adjust RV9221 (PEF-924) so that the amplitude of the waveform is 5 div on the screen.

(66) CH2 STR OFFSET RV9230 (PEF-924)

a. Settings: Same as 65

b. Establish the RTO mode, and press the GND switch of CH2 INPUT.

c. Position the trace at the center of the screen by POSITION of CH2.

d. Establish the DSO mode, and adjust RV9230 (PEF-924) so that the trace is at the center of the screen.

e. Establish the RTO mode again for confirmation.
If the trace is not at the center of the screen, repeat the adjustment appropriately.

(67) CH3 STR GAIN RV9321 (PEF-924)

a. Settings:

SOURCE OR X:	CH3
V MODE:	QUAD
CH3 VOLTS/DIV:	0.1V
A TIME/DIV:	1ms
SM (Smoothing):	OFF
CH3 AC-DC:	DC
CH3 INPUT:	1kHz square wave, 0.5V

b. Establish the RTO mode and check that the amplitude of the waveform is 5 div on the screen.

c. Establish the DSO mode, and adjust RV9321 (PEF-924) so that the amplitude of the waveform is 5 div on the screen.

(68) CH3 STR OFFSET RV9330 (PEF-924)

a. Settings:
CH3 INPUT: No input
Other settings: Same as (67)

b. Establish the RTO mode, and position the trace at the center of the screen by the POSITION control of CH3.

c. Establish the DSO mode and adjust RV9330 (PEF-924) so that the trace is on the center of the screen.

d. Establish the RTO mode again. If the trace is not on the center of the screen, repeat the adjustment.

(69) CH4 STR GAIN RV9421 (PEF-924)

a. Settings

SOURCE OR X:	CH4
V MODE:	QUAD
CH4 VOLTS/DIV:	0.1V
A TIME/DIV:	1ms
SM (Smoothing):	OFF
CH4 AC-DC:	DC
CH4 INPUT:	1kHz square wave, 0.5V

b. Establish the RTO mode, and check that the amplitude of the waveform is 5 div on the screen.

c. Establish the DSO mode, and adjust RV9421 (PEF-924) so that the amplitude of the waveform is 5 div on the screen.

(70) CH4 STR OFFSET RV9430 (PEF-924)

a. Settings:

CH4 INPUT: No input

Other settings: Same as (69)

b. Establish the RTO mode, and position the trace at the center of the screen by the POSITION control of CH4.

c. Establish the DSO mode, and adjust RV9430 (PEF-924) so that the trace is at the center of the screen.

d. Establish the RTO mode again for confirmation. If the trace is not at the center of the screen, repeat the adjustment appropriately.

5. DETAILED CIRCUIT DESCRIPTION

5.1 Vertical circuit

(◇1 , ◇2 , ◇3 1/2, ◇11 1/5)

The detailed block diagram of this circuit is shown in Fig. 5-1 and Fig. 5-2.

This circuit consists of the CH1 vertical circuit and the CH2 vertical circuit. The input signal to each channel is almost identical. Therefore, the signal on CH1 will mainly be described here, and signals on other channels will be described additionally as necessary. The CH1 SIG fed to J1 is routed to the CH1 INPUT COUPLING circuit, and the input-coupling modes are selected by switches S1 and S11 to AC, GND, or DC. The CH1 SIG is then fed to the CH1 1ST ATTENUATOR, and its signal level is attenuated to 1/1, 1/10 or 1/100. The attenuated CH1 SIG is fed to the CH1 INPUT AMP, and its impedance is converted (high input impedance and low output impedance).

The AC component of the CH1 SIG flows from C20 to TR25 to TR40 to TR41 to TR42, while the DC component flows from R21 to IC26 to TR28 to TR40 to TR41 to TR42. (Refer to circuit diagram ◇1 .)

IC26 is a DC amplifier. TR28 is a common-base transistor, and separates the AC component from the DC component to prevent them from being loaded to each other. Further, TR28 makes the load impedance of TR25 (FET) high and makes the gain of the FET 1.

When an input is zerovolts, an output should also be zero volts. However, even if an input is zero volts, some offset voltage appears at the output of an actual DC amplifier.

CH1 DC BAL RV37 compensates for an offset voltage of IC26. CH1 DC GAIN RV30 changes the amount of the DC feedback, controls the DC gain, and matches the DC gain to the AC gain.

Diodes D23, D25, and D26 protect the INPUT AMP against an excessive input voltage.

The voltage gain of the INPUT AMP is 2.5 times, but it is switched to 6.25 times by switch S2-3 at the 2mV/div range.

The output of the CH1 INPUT AMP is fed to the CH1 2ND ATTENUATOR, its signal level is attenuated to 1/1, 1/2, 1/4 or 1/10 by the setting position of the VOLTS/DIV switch. The output impedance is always 150 ohms.

The PANEL STATUS (1) is a circuit for transmitting the setting state of the VOLTS/DIV switch to a microcomputer. The relationship between the overall gain and the setting position of the VOLTS/DIV switch is shown in Table 5-1.

Table 5-1

VOLTS/DIV	1ST ATTN	INPUT AMP Gain	2ND ATTN	Overall Gain	VOLTS/DIV x Overall Gain
2mV	1	6.25(x2.5)	1	6.25	12.5mV/div
5mV	1	2.5	1	2.5	12.5mV/div
10mV	1	2.5	0.5(÷2)	1.25	12.5mV/div
20mV	1	2.5	0.25(÷4)	0.625	12.5mV/div
50mV	1	2.5	0.1(÷10)	0.25	12.5mV/div
0.1V	0.1(÷10)	2.5	0.5(÷2)	0.125	12.5mV/div
0.2V	0.1(÷10)	2.5	0.25(÷4)	0.0625	12.5mV/div
0.5V	0.1(÷10)	2.5	0.1(÷10)	0.025	12.5mV/div
1V	0.01(÷100)	2.5	0.5(÷2)	0.0125	12.5mV/div
2V	0.01(÷100)	2.5	0.25(÷4)	0.00625	12.5mV/div
5V	0.01(÷100)	2.5	0.1(÷10)	0.0025	12.5mV/div

At the CAL position of the CH1 VAR control, R52 is shorted. At the fully CCW position, the output of the CH1 INPUT AMP becomes less than 1/2.5 times the output at the CAL mode. The information on whether the mode is CAL or UNCAL is also fed to a microcomputer via [13] .

The CH1 SIG from the CH1 2ND ATTENUATOR is fed to the CH1 V.PREAMP, where the signal is converted from the single-ended signal to the paraphase signal, and then fed to the DIODE GATE 1 at the next stage.

The DC voltage at the TR58 base is changed by CH1 POS RV1604 in the circuit ⟨11⟩, and the vertical position of the CH1 SIG is changed.

TRIGGER PICKOFF (Refer also Fig. 5-1 and Fig. 5-2.)

A part of the CH1 SIG from the CH1 2ND ATTENUATOR is fed to the TRIGGER PICKOFF(1), and becomes the CH1 TRIG SIG. The time constant of the output impedance of the TRIGGER PICKOFF(1) is equal to that of the feedback impedance of the TRIGGER AMP in the next stage (Fig. 5-3). Therefore, the impedance ratio of the two circuits is always constant independent of frequency.

The DIODE GATE 1 is controlled by the $\overline{\text{CH1 DSP}}$ signal to ⟨14⟩ .

When the $\overline{\text{CH1 DSP}}$ signal is "L", D6000 (1/2) and D6000 (2/2) of ⟨14⟩ are made off. As a result, the CH1 SIG passes through the DIODE GATE 1, and it is supplied to the DELAY LINE DRIVER at the next stage.

TR6000 of ⟨14⟩ is a drive circuit of the DIODE GATE 1, and detects the display state of CH1 (whether the CH1 SIG is in the state to be displayed or not).

Likewise, TR6012 (⟨14⟩), TR6200, (⟨15⟩), and TR6212 (⟨15⟩) detect the display state of each channel by the drive circuits of DIODE GATE 2 (Fig. 5-1), DIODE

GATE 3 (Fig. 5-2) and DIODE GATE 4 (Fig. 5-2), respectively.

TR6002 of ◇14◇ is a stabilization circuit to prevent a shift of the DC level caused by the control switch.
In other words, TR6002 changes the current flowing in TR6002 according to the display states of CH1, CH2, CH3 and CH4 to maintain the DC voltages at points ⓐ and ⓑ constant of ◇2◇ .
The CH2 SIG is fed to the DIODE GATE 2 via TR SW (1) or TR SW (2). The polarities of the input and output of TR SW (2) are opposite to those of TR SW (1).

When CH2 INV switch S1611 of ◇11◇ is switched to the INV side, the $\overline{\text{CH2 INV}}$ signal is pulled down by the resistor in invertor IC172, and turned to"L".
Then, each base of TR175 and TR176 goes "H",and TR SW (2) (TR175 and TR176) turns to on. On the other hand, the TR SW (1) is turned off because the bases of TR171 and TR172 are"L". Thus, the CH2 signal is fed to the DIODE GATE 2 via TR SW (2), and the display polarity is inverted.
Fig. 5-2 shows the CH3 circuit and the CH4 circuit. The signals on both the circuits are almost identical. Therefore, only the CH3 circuit will be described here.
The CH3 signal fed in from J301 is coupled with AC or DC by CH3 INPUT COUPLING, and then fed to CH3 ATTENUATOR. The CH3 signal attenuated by CH3 ATTENUATOR to 1/1 or 1/5 is fed to CH3 INPUT AMP (high input impedance and low output impedance) for impedance conversion.
TR5313 is a dual FET whose temperature drift is suppressed.
TR5313 is a source follower whose voltage gain is 1.
TR5320 is an emitter follower whose voltage gain is also 1.
D5309 is a diode for protecting FET from minus surge input.

Two signals are fed out from CH3 INPUT AMP. One is fed out as the CH3 TRIG signal via TRIGGER PICKOFF (3), and the other is fed out as the CH3 signal via EMITTER FOLLOWER (1).
Refer to Fig. 5-1 again.
The signal is then supplied to the DELAY LINE DRIVER. Because this driver circuit is a common-emitter voltage feedback circuit, the impedance of the input and the output is low.
The signal from the DELAY LINE is fed to ◇28◇ (Fig. 5-22) via [15] and [16] .
In the RTO mode, this signal is fed from ◇28◇ to ◇3◇ (Fig. 5-1) via [17] and [18] .
For the DSO mode, refer to item 5.12. The signal fed to ◇3◇ is amplified by the V.AMP (1) consisting of TR501 and TR502 and the V.AMP (2) consisting of TR503 and TR504. GAIN RV505 adjusts the V. OUTPUT AMP so that its output is displayed corresponding to the deflection factor set by the VOLTS/DIV switch.
Because the V.AMP (2) is a parallel feedback amplifier, the input impedance is small.
The IC5521 output of ◇22◇ via the DIFF. AMP (1) is applied between the V.AMP (1) and the V.AMP (2).

In the RTO mode, the constant voltage (1V DC), A/B SEP BIAS signal, CHR-Y signal, or

cursor Y-direction signal is fed out from IC5521. In normal wave-form display, the constant voltage (1V DC) is fed out to determine the vertical position of the display waveform.
When the horizontal display is in the ALT sweep mode, the A/B SEP BIAS signal is fed out. This signal is the pulse for switching between 0V and 2V.
The CHR-Y is the character Y-direction signal and is fed out when a character is displayed.
In the DSO mode, the CHST-Y signal is fed out from IC5521. This signal is the Y-direction signal for both a waveform and a character in the DSO mode.
The DIFF. AMP (1) is a circuit for converting the single-ended signal into the paraphase signal.
The signal from the V. AMP (2) is fed to V. OUTPUT AMP consisting of the cascode amplifier, and amplified up to the voltage required for the vertical direction.
The bandwidth limiter (BWL) circuit is provided between the V. AMP (2) and the V. OUTPUT AMP to attenuate the frequency of more than 20MHz as necessary.

In the DSO mode, the $\overline{\text{BWL CONT}}$ signal goes L, and the BWL circuit of the V AMP is always energized, regardless of setting status of the [BW LIMIT 20MHz] switch.
In the RTO mode, whether the BWL circuit is energized or not depends on the [BW LIMIT 20MHz] switch.

5.2 Calibrator (◇3◇2/2)

For this circuit, refer to Fig. 5-1.
IC1301 is a clock generator, and its oscillation frequency is determined by R1301, R1302, and C1302.
The 2kHz frequency oscillated by R1301, R1302 and C1302 is counted down to 2:1 by IC1301, and a symmetrical 1kHz square waveform is fed out from pin 4 of IC1301.
The output level of IC1301 is adjusted by RV1302 so that the output from CAL J502 becomes 0.5Vp-p.

5.3 Trigger circuit (◇4◇, ◇5◇ 1/2, ◇11◇ 2/5)

The detailed block diagram of this circuit is shown in Fig. 5-3. Also refer to Fig. 5-4 and circuit diagrams of ◇4◇ , ◇5◇ and ◇11◇ , if necessary.

Outline

The circuit from the left side of Fig. 5-3 to the input to the TRIG AMP is the trigger source signal selector circuit.

The TRIG AMP output signal is sent to the A trigger circuit, the B trigger circuit, the trigger level circuit, the TV sync circuit, etc.

The A trigger circuit consists of the A TRIG SHAPER circuit, the A TRIG SLOPE SW circuit and the TR SW (1) circuit, and feeds out A TRIG PULSE.

The B trigger circuit consists of the B TRIG SHAPER circuit, the B TRIG SLOPE SW circuit and the TR SW (2) circuit and B TRIG CONTROL circuit, and feeds out the $\overline{\text{B DLY TRIG}}$ signal corresponding to the B TRIG PULSE.

The TRIG LEVEL circuit consists of the PEAK DETECTOR's circuits (⊕ and ⊖) and the TRIG LEVEL SW's (⊕ and ⊖), and determines the variable range of the trigger level.

The switches and controls shown around the center of Fig. 5-3 are used to determine the trigger mode, the trigger level and the trigger slope for each of the A trigger signal and the B trigger signal.

Trigger source signal selector circuit

Select ALT, CH1, CH2, CH3, CH4 or LINE by TRIG SOURCE switch S6401 (SOURCE OR X).

When a signal other than ALT is selected, the selected trigger source signal is fed out from either of the CH1/CH2 TRIG SIG SELECTOR circuit or the CH3/CH4 /LINE TRIG SIG SELECTOR circuit, and fed to the TRIG AMP circuit as a trigger signal. In this case, the ALT TRIG goes L, so that the $\overline{\text{CH1 DSP}}$ signal from [31] cannot pass through the CH1/CH2 SW CONTROL circuit.

When ALT is selected, either of the CH1 TRIG or the CH2 TRIG signal is fed out from the CH1/CH2 TRIG SIG SELECTOR circuit, and is fed in the TRIG AMP circuit as a source signal. In this case, the ALT TRIG signal goes H, and whether the $\overline{\text{CH1 DSP}}$ signal can pass through the CH1/CH2 SW CONTROL circuit or not is determined by the control of the $\overline{\text{CHOP + ADD}}$ signal.

The $\overline{\text{CHOP + ADD}}$ signal goes L when performing the CHOP or ADD operation, and it goes L when performing operations other than the CHOP and ADD operations.

The $\overline{\text{CH1 DSP}}$ signal goes L when VERTICAL MODE switch is set to CH1, and it goes H when the switch is set to CH2. During the CHOP or ALT operation, the $\overline{\text{CH1 DSP}}$ signal continuously goes H and L alternately at a certain speed. Since the $\overline{\text{CHOP + ADD}}$ signal goes L during the CHOP operation as described above, the $\overline{\text{CH1 DSP}}$ signal cannot pass through the CH1/CH2 SW CONTROL circuit, and the trigger source signal is fixed to the CH1 TRIG circuit.

CH1 DSP signal can pass through the CH1/CH2 SW CONTROL circuit during the ALT operation, and the CH1 TRIG signal and the CH2 TRIG signal are selected

alternately as the TRIG SOURCE signal. Table 5-2 lists the summary of their relationships.

Table 5-2

Setting status of VERTICAL MODE switch	Channel display on CRT	Operatingg status	VER-TICAL MODE	TRIG SOURCE signal					
				Setting of TRIG SOURCE switch					
				ALT	CH1	CH2	CH3	CH4	LINE
CH1	CH1		CH1	CH1	CH1	CH2	CH3	CH4	LINE
CH2	CH2		CH2	CH2	"	"	"	"	"
CH1 + CH2	CH1 + CH2	ADD	ADD	CH1	"	"	"	"	"
Note 1 DUAL	CH1/CH2	0.5s/div to 5ms/div: CHOP	DUAL	CH1	"	"	"	"	"
		2ms/div to 50ns/div:ALT		CH1/CH2					
DUAL + CH1	CH1/CH2	CHOP		CH1	"	"	"	"	"
Note 1 DUAL + CH1	CH1/CH2/ CH3/CH4	0.5s/div to 5ms/div: CHOP	QUAD	CH1	"	"	"	"	"
		2ms/div to 5ms/div: ALT		Note 4 CH1/CH2					
DUAL + CH1 + CH2	CH1/CH2/ CH3/CH4	CHOP		CH1	CH1	CH2	CH3	CH4	LINE

Note 1: When the TRIG SOURCE switch is set to ALT, the trigger source signal is automatically determined by the selected VERTICAL MODE and the TIME/DIV range.

Note 2: When the TRIG SOURCE switch is set to a mode other than ALT, the trigger source signal is determined by the setting of the TRIG SOURCE switch.

Note 3: The trigger source signal is fixed in the CHOP mode.
The trigger source signal to be fixed depends on the setting status of the TRIG SOURCE switch.

Note 4: When the TRIG SOURCE switch is set to ALT and four traces are displayed in the ALT mode, the signals of CH1 and CH2 are used alternately as a trigger source signal.

TRIG AMP

The trigger source signal is fed into the inverting amplifier TRIG AMP circuit and is fixed to a fixed signal level.
The AC component of the signal is fed from TR320 to TR325 to TR330, and the DC component is fed from R320 to IC320 to TR325 to TR330. (Refer to schematic diagram ◇4◇ .) TRIG DC BAL RV320 is the adjustment of the offset voltage of IC320, and the feedback impedance of the TRIG AMP circuit is comprised of R350, R304 and CV305.
For the TRIG AMP circuit, refer also to the description of TRIGGER PICKOFF of item 5.1 VERTICAL CIRCUIT.
Press BW LIMIT switch S1612 (◇11◇). Then the $\overline{\text{BWL}}$ signal fed in from 21 goes L, and switching transistor TR601 is

turned on. By this operation, the high frequency component of the signal is by-passed to the ground through C601 and C602 to limit the bandwidth of the trigger signal.

A TRIG CIRCUIT

This circuit consists of the A TRIG SHAPER, A TRIG SLOPE SW and TR SW(1) circuits. These circuits are controlled by A TRIG LEVEL RV1603, A TRIG SLOPE S1610 and A TRIG MODE S6402. A TRIG SHAPER is a comparator bearing the hysteresis characteristics, and the comparator compares the level set by A TRIG LEVEL RV1603 with TRIG SIG, and feeds out the pulses which are opposite in polarity each other to ① and ② .

The A TRIG SLOPE SW circuit consists of two current selector circuits. One current selector circuit consists of TR650 and TR651, and the other circuit consists of TR652 and TR653.

When A TRIG MODE S6402 is set to AUTO or NORM, +12V is supplied to A TRIG SLOPE S1610. Accordingly, when S1610 is set to the ⊕ slope, +12V is supplied to the current selector circuit consisting of TR650 and TR651, and the pulse ① is fed out from the A TRIG SLOPE SW circuit. When S1610 is set to the ⊖ slope, +12V is supplied to the current selector circuit consisting of TR652 and TR653 and the pulse ② is fed out from the A TRIG SLOPE SW circuit.

When A TRIG MODE S6402 is set to TV-V or TV-H, +12V is not supplied to either of the current selector circuits. Thus neither the pulse ① nor ② is fed out from the A TRIG SLOPE SW circuit. In this case, TR SW(1) is is turned on, and the pulse ③ is fed out from the TR SW(1) circuit.

As described above, a pulse ① , ② or ③ is fed out from [35] and [36] as the A TRIG PULSE by A TRIG MODE S6402 and A TRIG SLOPE S1610.

B TRIG circuit

A pulse ④ , ⑤ or ⑥ is fed out as the B TRIG PULSE signal in the same way as the A TRIG circuit.

The $\overline{\text{B DLY TRIG}}$ signal is fed out from the B TRIG CONTROL circuit, based on this B TRIG PULSE circuit. The B TRIG CONTROL circuit is controlled by the $\overline{\text{DLY TRIG}}$ signal, the $\overline{\text{SWP RS}}$ signal and the B TRIG AUTO signal.

There are two modes, AUTO and NORM, in the B TRIG mode. Select the NORM mode when observing waveforms with less jitter.

The B TRIG circuit and its control signal are described below by using Fig. 5-4. (Refer also to Fig. 5-3, as necessary.)

(1) When B TRIG MODE S6501 is set to AUTO.

Since the B TRIG AUTO signal goes H due to the function of the MPU for RTO, pin 9 of IC7003 (1/2) also goes H.

At the set delay time, the $\overline{\text{DLY TRIG}}$ signal goes L in the form of a pulse.

Thus a pulse of positive polarity is fed into T of IC7002 (1/2) and Q changes from L to H at the rising edge of a pulse.

As a result, L is fed out from pin 8 of IC7003 (1/2) and IC7002 (2/2) goes into the set state.

That is, the $\overline{\text{B DLY TRIG}}$ signal changes

from H to L, to start the B sweep.

When sweep finishes regardless of the A sweep or the B sweep, the $\overline{\text{SWP RS}}$ signal goes L. Thus both IC7002 (1/2) and IC7002 (2/2) go into the reset state, and the $\overline{\text{B DLY TRIG}}$ signal goes H.

(2) When B TRIG MODE S6501 is set to NORM.

When A TRIG MODE S6402 is set to AUTO or NORM, +12V is supplied to B TRIG SLOPE S6502, and the B TRIG SLOPE SW circuit is activated.

When A TRIG MODE S6402 is set to TV-V or TV-H, the TR SW(2) is turned on.

Thus, either of the pulse ④ , ⑤ or ⑥ is fed to T of IC7002 (2/2) as the B TRIG PULSE.

On the other hand, pin 9 of IC7003 (1/2) goes L since the B TRIG AUTO signal goes L due to the function of the MPU for RTO. At the set delay time, the $\overline{\text{DLY TRIG}}$ signal goes L, and Q of IC7002 (1/2) also changes from L to H. Thus both R and S of IC7002 go H, and IC7002 (2/2) goes into the trigger pulse wait state. Accordingly, Q changes from H to L at the rising edge of B TRIG PULSE which is fed first after both R and S of IC7002 (2/2) go H.

As a result, the $\overline{\text{B DLY TRIG}}$ signal goes L, to start the B sweep.

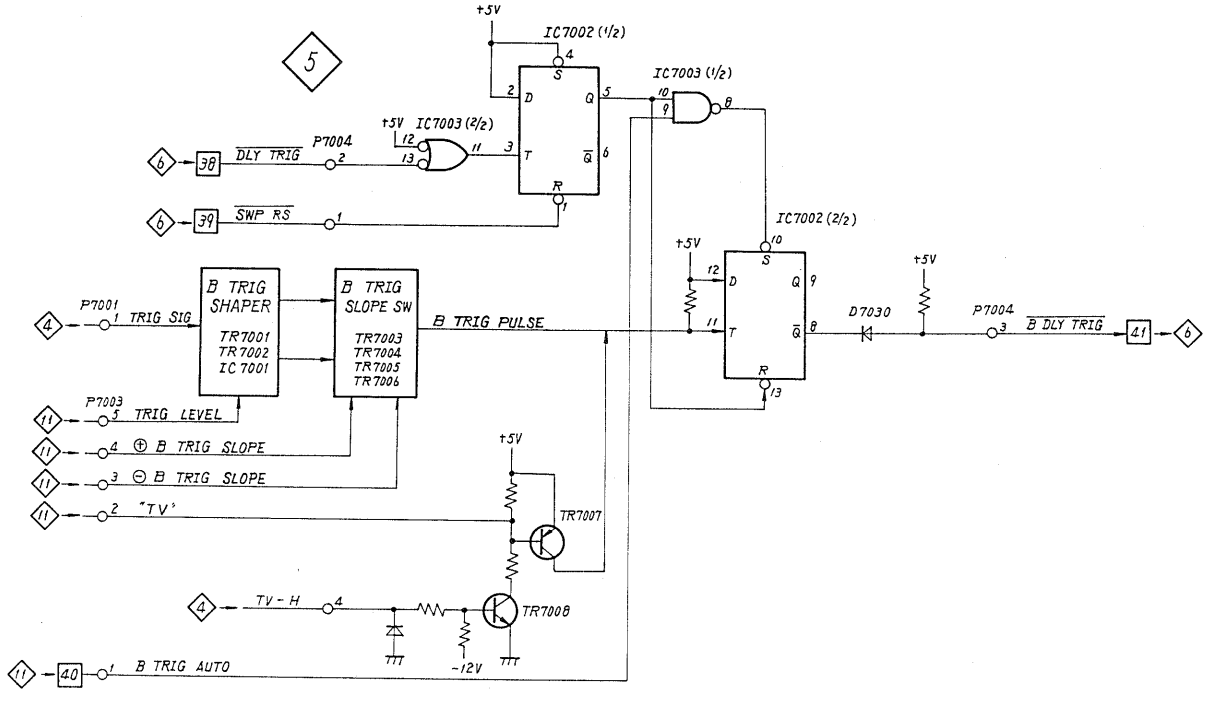


Fig. 5-4

TRIG LEVEL circuit

This circuit consists of ⊕ PEAK DETECTOR, ⊕ TRIG LEVEL SW, ⊖ PEAK DETECTOR, ⊖ TRIG LEVEL SW, A TRIG LEVEL RV1603, B TRIG LEVEL RV6501, etc. Since the TRIG AMP is an inverting amplifier, the polarity of the TRIG signal on the input connector is opposite to that on the input point of PEAK DETECTOR. The following description is made with the reference to the polarity of the TRIG signal on the input point.

The ⊖ peak voltage of the TRIG signal on the input is fed out to the a point by the ⊖ PEAK DETECTOR circuit.

Likewise, the ⊕ peak voltage of the TRIG signal on the input is fed out to the d point by the ⊕ PEAK DETECTOR circuit. Thus voltages on the (a) point and the (d) point vary according to the amplitude on the TRIG signal.

On the other hand, a positive fixed voltage is generated at the (b) point and a negative fixed voltage is generated at the (e) point. Therefore, the voltage on the (a) or (b) point is generated at the (c) point, and the voltage on the (d) or (e) point is generated at the (f) point. The voltages generated at the (c) point and the (f) point are determined by A TRIG MODE S6402.

When S6402 is set to AUTO, the voltage at the (a) point (the ⊖ peak voltage value of TRIG signal on the input) is fed to the (c) point, and the voltage at the (d) point (the ⊕ peak voltage value on the input) is fed to the (f) point. Thus the variable range of A TRIG LEVEL RV1603 and B TRIG LEVEL RV6501 can be set in accordance with the trigger signal amplitude, which facilitates the setting of trigger level.

When S6402 is set to NORM, TV-V or TV-H, the voltage (the ⊕ fixed voltage which is not affected by the amplitude of the trigger signal) at the (b) point is fed to the (c) point, and the voltage (the ⊖ fixed voltage) on the (e) point is fed to the (f) point. That is, the variable ranges of A TRIG LEVEL RV1603 and B TRIG LEVEL RV6501 are constant regardless of the trigger signal amplitude.

The information on whether the A TRIG MODE switch is set to AUTO or not is sent from [34] to circuit ◇6◇. The information on whether the B TRIG MODE switch, is set to AUTO or not is sent to the MPU of circuit ◇9◇ through RM1602 of circuit ◇11◇.

TV SYNC circuit

The AMP(1) circuit is a negative feedback amplifier and the trigger signal is inverted by this amplifier. Then it is fed to the TRIG SIG OUT J302 via the TV SYNC SEPARATOR circuit, and also fed out to circuit ◇8◇ as the X signal.

The SYNC component of the trigger signal fed out from the AMP (1) circuit is separated by the SYNC SEPARATOR circuit regardless of the H SYNC signal or the V SYNC signal.

When A TRIG MODE S6402 is set to AUTO or NORM, both TR634 of TR SW(1) and TR7007 of TR SW(2) are turned off. Therefore, the output of the TV SYNC SEPARATOR circuit cannot pass through the TR SW(1) circuit or the TR SW(2) circuit.

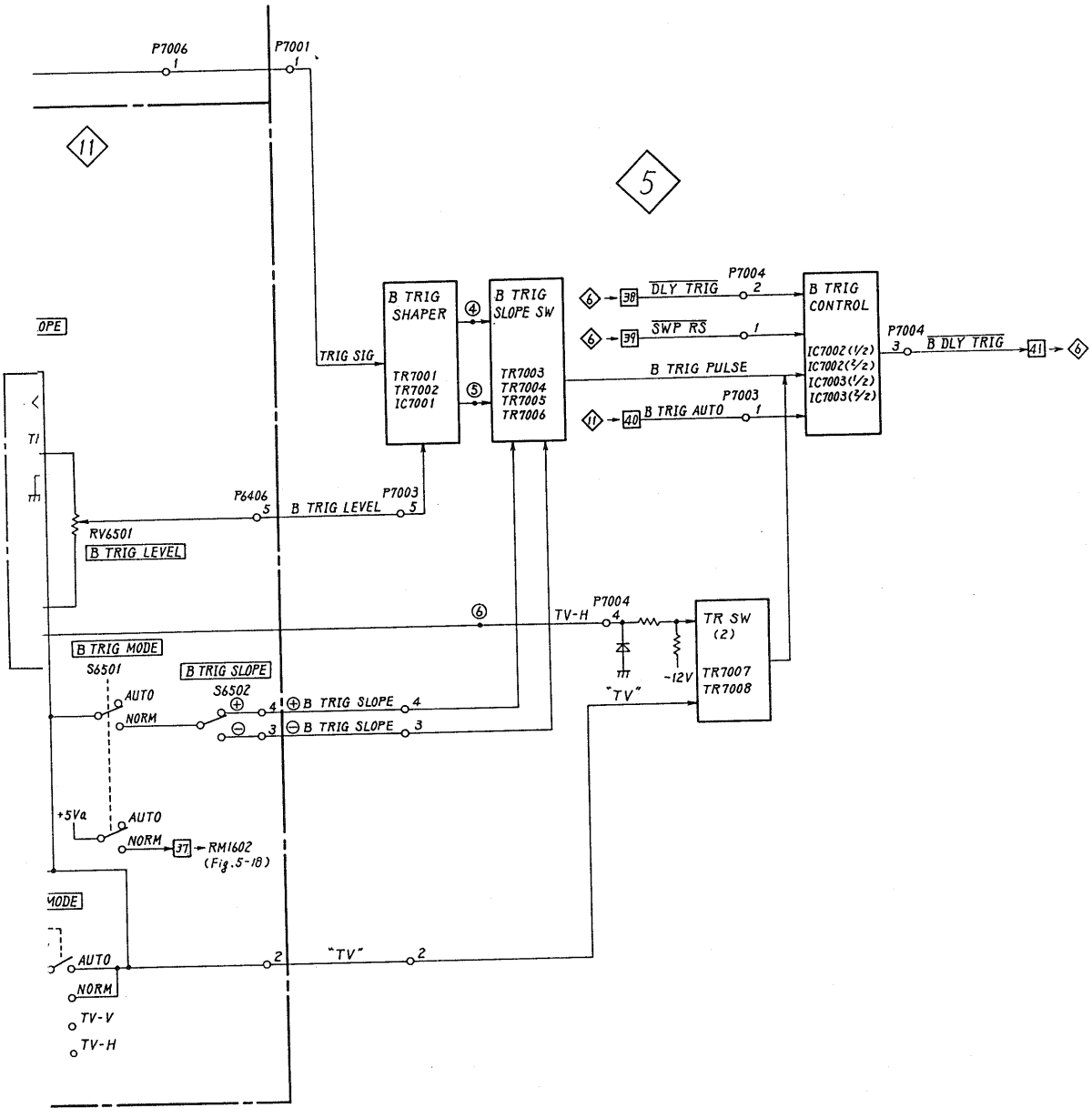

P7006
P7001
11
5
B TRIG SHAPER
TR7001
TR7002
IC7001
B TRIG SLOPE SW
TR7003
TR7004
TR7005
TR7006
TRIG SIG
DLY TRIG
SWP RS
B TRIG PULSE
B TRIG AUTO
P7004
P7003
B TRIG CONTROL
IC7002(1/2)
IC7002(2/2)
IC7003(1/2)
IC7003(2/2)
B DLY TRIG
P6406
B TRIG LEVEL
RV6501
B TRIG LEVEL
TV-H
TR SW (2)
TR7007
TR7008
-12V
"TV"
B TRIG MODE
S6501
AUTO
NORM
B TRIG SLOPE
S6502
B TRIG SLOPE
+5Va
RM1602
(Fig.5-18)
AUTO
NORM
TV-V
TV-H

Fig. 5-3

When A TRIG MODE S6402 is set to TV-V or TV-H, both TR SW(1) and TR SW(2) are turned on so that the output of the TV SYNC SEPARATOR circuit can pass through both the TR SW circuits.
In the TV-V mode, one side of C634 is grounded, and R634 and C634 comprise an integral circuit.
As a result, the H SYNC signal is interrupted, and the V SYNC signal only passes through TR SW(1). The signal is sent from the TV SYNC SEPARATOR circuit to TR SW(2) directly not through the integral circuit. Thus both the SYNC and V SYNC signals are sent to TR SW(2).

5.4 SWEEP CYCLE (◇6◇)

This circuit is provided to perform a cycle sweep, which is one of the major features of this oscilloscope. Since the sweep circuit and the hold-off circuit are operated independently, the cycle time (= sweep time + hold-off time) can be fixed. In other words, when the TRIGGER LOCK control on the front panel is pressed (the cycle lock on mode), the cycle time is fixed by the MPU and a stable trigger is obtained regardless of the sweep time (TIME/DIV range).

The main operation of this circuit is described below, referring to the simplified circuit diagram shown in Fig. 5-5 Also refer to Figs. 5-6 and 5-7, if necessary.

(1) The sweep state (the trigger sweep or the free-running sweep) is determined by the state of the signal on pin 2 of IC661 (3/4). In the trigger sweep mode, pin 3 goes "H" and D665 turns to off because pin 2 is "L".

(2) When the hold-off voltage $\overline{\text{HOLD OFF}}$ goes "L", DELAY GATE (CYCLE GATE) IC660 (2/2) is reset, and $\overline{Q2}$ goes "H".

(3) When Q2 goes "H", D664 is off, and the DLY GATE signal goes "H".

(4) Thus, switching transistor TR2010 turns on, and the gate voltage of BUFFER TR2060 is set to the starting level of the DELAY RAMP.

(5) When the hold-off period finishes, the $\overline{\text{HOLD OFF}}$ changes from "L" to "H". In other words, IC660 (2/2) is released from the reset state and is in the wait state.

(6) When the TRIG PULSE is fed to T2 from [35], $\overline{Q2}$ changes from "H" to "L" during the rising edge of the TRIG PULSE.

(7) When $\overline{Q2}$ goes "L", D664 is on, and the $\overline{\text{DLY GATE}}$ signal is "L".

(8) Then TR2010 turns to off, delay capacitor C_{DLY} (C2012 // C2013) starts to be charged, and the gate voltage of BUFFER TR2060 starts to increase.
The charging current is supplied from the delay current source, and the current value is changeable by the TIME/DIV setting. When the TIME/DIV setting value is set, the constant charging current flows in C_{DLY}. As a result, the gate voltage of TR2060 increases linearly.

The delay current signal from [46] is an analog voltage to determine the delay current. The voltage is held by C2017, and is applied to pin 10 of IC2040 (3/4) through the filter consisting of R2015 and C2015.

(9) Portion of the output of BUFFER TR2060 is sent to COMPARATOR IC2050 (2/2) as a DELAY RAMP signal. In this comparator, the output levels of ACTIVE FILTER IC2040 (1/4) and the DELAY RAMP signal are compared.
When the DELAY RAMP signal level exceeds the output level of the ACTIVE FILTER, the output of the COMPARATOR goes "L". Accordingly, the $\overline{\text{DLY TRIG}}$ signal goes "L". In the B sweep mode, the sweep starts after the predetermined delay time from the trigger point. Either the DLY REF signal from [59] or the DLY PRESET signal from [60] is fed to the ACTIVE FILTER.
The DLY REF signal is fed to the ACTIVE FILTER in the normal delay mode, and the DLY PRESET signal is fed to the ACTIVE FILTER in the automatic calibration mode. The DLY REF signal is the voltage corresponding to the delay time set by the controls on the front panel.
The other portion of the output of BUFFER TR2060 is fed to COMPARATOR TR2063, and used to detect the maximum voltage of the DELAY RAMP signal.
Normally, the output of COMPARATOR TR2063 is "H", the output ($\overline{Q}$) of RS LATCH IC2052 (3/3) is "L", and the output ($\overline{\text{HOLD OFF}}$) of IC2052 (2/3) is "H". When the DELAY RAMP signal reaches the maximum value, the output of COMPARATOR TR2063 goes "L" (because TR2063 turns to on).
Therefore, the RS LATCH is reset, Q goes "H", and the $\overline{\text{HOLD OFF}}$ signal goes "L".

(10) As a result, DELAY GATE (CYCLE GATE) IC660 2/2 is reset, $\overline{Q2}$ signal goes "H". This state is the same as that of step (3). Then D664 turns to off, TR2010 turns to on, and the gate voltage of BUFFER TR2060 is set to the start level of the DELAY RAMP.
Moreover, the output of COMPARATOR TR2063 returns to "H".

(11) Next, the circuit related to the HOLD OFF RAMP signal is described below.
When the $\overline{\text{DLY GATE}}$ is "L", TR2040 is on, and the collector voltage of TR2045 remains at the start level of the HOLD OFF RAMP signal.

(12) The integration of the DELAY RAMP signal finishes before the output of TR2063 described in step (10) goes "H", and TR2040 changes from on to off. At this time, the integration of the HOLD OFF RAMP starts.

(13) TR2040 turns to off, HOLD OFF CAPACITOR C_{HO} (C2042 // C2043) begins to be charged, and the collector voltage of TR2045 begins to increase.
The charging current is supplied from the HOLD OFF CURRENT SOURCE.
This current value is changeable by the TIME/DIV setting value. When the

TIME/DIV setting value is set, the constant charging current begins to flow, and the collector voltage of TR2045 increases linearly.

(14) The collector voltage of TR2045 and the VAR H/O voltage fed via VOLTAGE FOLLOWER IC2040 (4/4) are compared by COMPARATOR IC2050 (1/2) in the next stage. The VAR H/O voltage corresponds to the setting value of the VARIABLES and HOLD OFF controls on the front panel.

(15) When the HOLD OFF RAMP voltage (the collector voltage of TR2045) exceeds the VAR H/O voltage, the output of COMPARATOR IC2050 (1/2) goes "L".

(16) Thus, RS LATCH IC2052 (3/3) is in the set state, and $\overline{Q}$ goes "L".

(17) As a result, $\overline{\text{HOLD OFF}}$ (the output of IC2052 2/3) goes "H", and the period of the holdoff finishes.
In case of the single sweep, the collector voltage of TR2045 is clamped on the clamp voltage (the voltage obtained by dividing 5V by R2080 and R2081) by clamp circuit TR2080 so as not to operate the hold-off circuit.

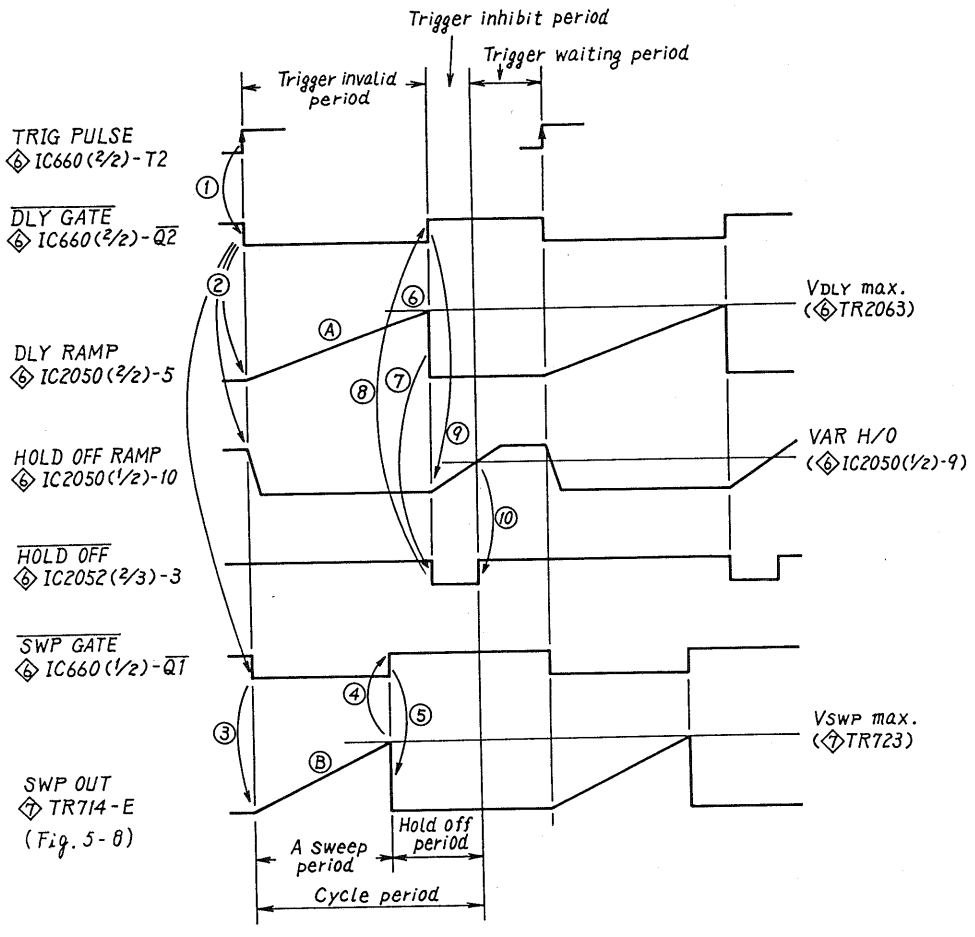


Fig. 5-6

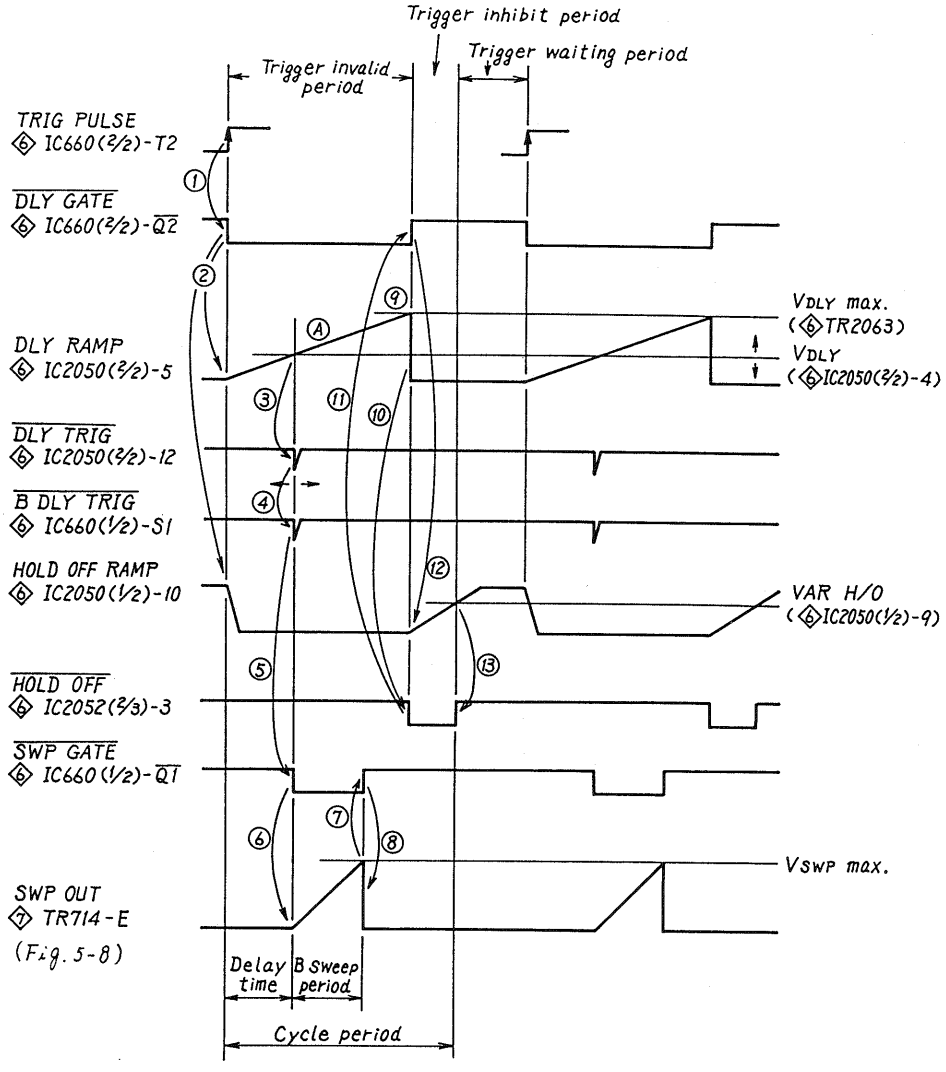


Fig. 5-7

Circuits related to the sweep

(i) A SWEEP

(a) Since the $\overline{A}$ signal from 47 is "L", the output from pin 11 of IC661 (1/4) is "H", and TR661 is on. Therefore, the $\overline{\text{B DLY TRIG}}$ signal cannot pass the differentiation circuit consisting of C669 and R669A in the next stage and S1 of SWP GATE IC660 (1/2) remains "H". This is because only the rapid changing component of the signal can pass the differentiation circuit. In other words, in the A SWEEP the route of S2 is not used.

(b) Moreover, since the output from pin 11 of IC661 (1/4) is "H", D660 turns to off, and pin 9 of IC659 goes "H". In case of the trigger sweep, pin 3 of IC661 (3/4) is also"H", and D661 is off.

(c) When $\overline{Q2}$ changes from "H" to "L" under the above state, the output from pin 8 of IC659 changes from "L" to "H". That is, when T1 of $\overline{\text{SWEEP GATE}}$ IC660 (1/2) changes from "L" to "H", Q1 changes

from "L" to "H", and the SWP GATE signal from Q1 changes from "H" to "L". Thus, the sweep begins.

(ii) B SWEEP

(a) Since the $\overline{A}$ signal from [47] is "H", the output from pin 11 of IC661 (1/4) goes "L".

(b) Therefore, D660 is on, and pin 9 of IC659 goes "L". The output of pin 8 remains "H" independent of the state of pin 10 of IC659. In case of the B SWEEP the route of S1 is not used.

(c) On the other hand, the output from pin 11 of IC661 (1/4) is "L", and TR661 becomes off.

(d) Therefore, when the $\overline{\text{B DLY TRIG}}$ signal changes from "H" to "L", the change is applied to terminal S1 of SWEEP GATE IC660 (1/2) through the differentiation circuit.

(e) As a result, IC660 (1/2) turns to the set state, $\overline{Q1}$ changes from "L" to "H", and Q1 changes from "H" to "L". Thus, the B SWEEP begins.

The DLY ADJUST signal from [42] is the signal for the automatic calibration of the delay time. Though the delay time is controlled by a screwdriver adjustment in conventional oscilloscopes, in this oscilloscope, the delay time is calibrated automatically by the built-in MPU when the power switch is turned on.

AUTO GATE circuit

(A) When A TRIG mode is set to NORM mode (trigger sweep)

The $\overline{\text{AUTO}}$ signal from [34] is "H", and TR660 is on. Pin 2 of IC661 (3/4) goes "L", and pin 3 goes "H". Therefore, D665 turns to off, the AUTO GATE circuit does not function in the NORM mode.

(B) When A TRIG mode is set to auto mode

The $\overline{\text{AUTO}}$ signal from [34] goes "L". There are two kinds of sweep in the AUTO mode: the trigger sweep and the free-running sweep.

(a) Trigger sweep

① When the TRIG PULSE is supplied to T2, Q2 changes from "L" to "H" during the rising edge of the pulse.

② When Q2 goes "H", TR660 turns to on, C664 is shorted, and pin 2 of IC661 (3/4) remains "L".

③ When the DELAY RAMP signal voltage reaches the maximum, the $\overline{\text{HOLD OFF}}$ signal is "L", and the hold-off period begins.

④ When the $\overline{\text{HOLD OFF}}$ signal goes "L", Q2 changes from "H" to "L", and TR660 turns to off. On the other hand, D663 turns to on, the anode side of D662 goes "L", and D662 becomes off. Therefore, C664 is not charged. Pin 2 of IC661 (3/4) remains "L".

⑤ When the hold-off period finishes, the $\overline{\text{HOLD OFF}}$ changes from "L" to "H", D663 turns to off, D662 turns to on, and C664 begins to be charged.

⑥ As a result, the voltage on pin 2 of IC661 (3/4) increases gradually. However, the trigger pulse is repeatedly fed to pin 2 of IC661 (3/4) before the voltage reaches the threshold level, and the "L" level, namely the trigger sweep

state, is maintained.

(b) Free-running sweep

If TRIG PULSE is not fed when the voltage on pin 2 of IC661 (3/4) reaches the threshold level in the above description (a) 6 (even when pin 2 changes from "L" to "H", the free-running sweep begins.

In other words, when pin 2 goes "H", pin 3 goes "L", and D661 and D665 turn to on. When D661 is on, pin 9 of IC659 goes "L", pin 8 goes "H", and the sweep begins. When D665 turns to on, the $\overline{\text{DLY GATE}}$ signal goes "L", and the DELAY RAMP signal is generated.

COUNTER circuit IC2170 (1/2, 2/2)

When the TRIG PULSE is fed to T3, the divided-by-two pulse is fed out from Q3, and the divided-by-four pulse is fed out from Q4. These pulse are sent to the MPU and used to count the frequency of the trigger pulse. The waveform of 1.6 to 4 cycles is displayed on the CRT in the AUTO range mode.

5.5 SWEEP (◇7◇1/2)

The detailed block diagram of this circuit is shown in Fig. 5-8.

When the sweep begins, the $\overline{\text{SWP GATE}}$ signal entered from [54] changes from "H" to "L", and the SWP GATE signal entered from [53] changes from "L" to "H". Accordingly, diodes D710, D711, and D712 turn to off. The TIMING CAPACITOR (C_T) is provided between the input and the output of the INVERTING AMP consisting of TR710, TR712, and TR714 to form an miller integrator. C_T is determined by C710 // C711 or C710 // C711 // C715.

The integration current I_T is determined by the input voltage of IC730 and the timing resistors (R_T), which are determined by the TIME/DIV setting. The value of C_T is determined by C710 // C711 or C710 // C711 // C715. The value of R_T is determined by R740, R740 // R741, R740 // R743 or R740 // R745. When diodes D710, D711, and D712 turn to off, the integration current I_T begins to flow to the TIMING CAPACITOR C_T, and the voltage of C_T begins to increase linearly corresponding to I_T.

The output voltage of the INVERTING AMP is fed out from [75] and [76] as the SWP OUT signal via ANALOG SW2 IC717. Part of the output voltage of the INVERTING AMP is fed to voltage comparator TR723 via ANALOG SW2 IC717, and the maximum voltage of the SWP OUT signal is determined by comparing the output voltage of the INVERTING AMP with the base voltage of TR723. When TR723 detects the maximum voltage, its collector voltage turns to "L", and the $\overline{\text{SWP RS}}$ signals fed from [77] and [56] also turn to "L". The $\overline{\text{SWP RS}}$ signal is applied to FF IC660(1/2) 13 shown in ◇6◇, and turns the output of the $\overline{\text{SWP GATE}}$ to "H". When the $\overline{\text{SWP GATE}}$ goes "H" and the $\overline{\text{SWP GATE}}$ goes "L", diodes D710, D711, and D712 turn to on. The input and the output of the INVERTING AMP are thus shorted, and the TIMING CAPACITOR C_T discharges rapidly. As a result, the output voltage of the INVERTING AMP falls down to the voltage

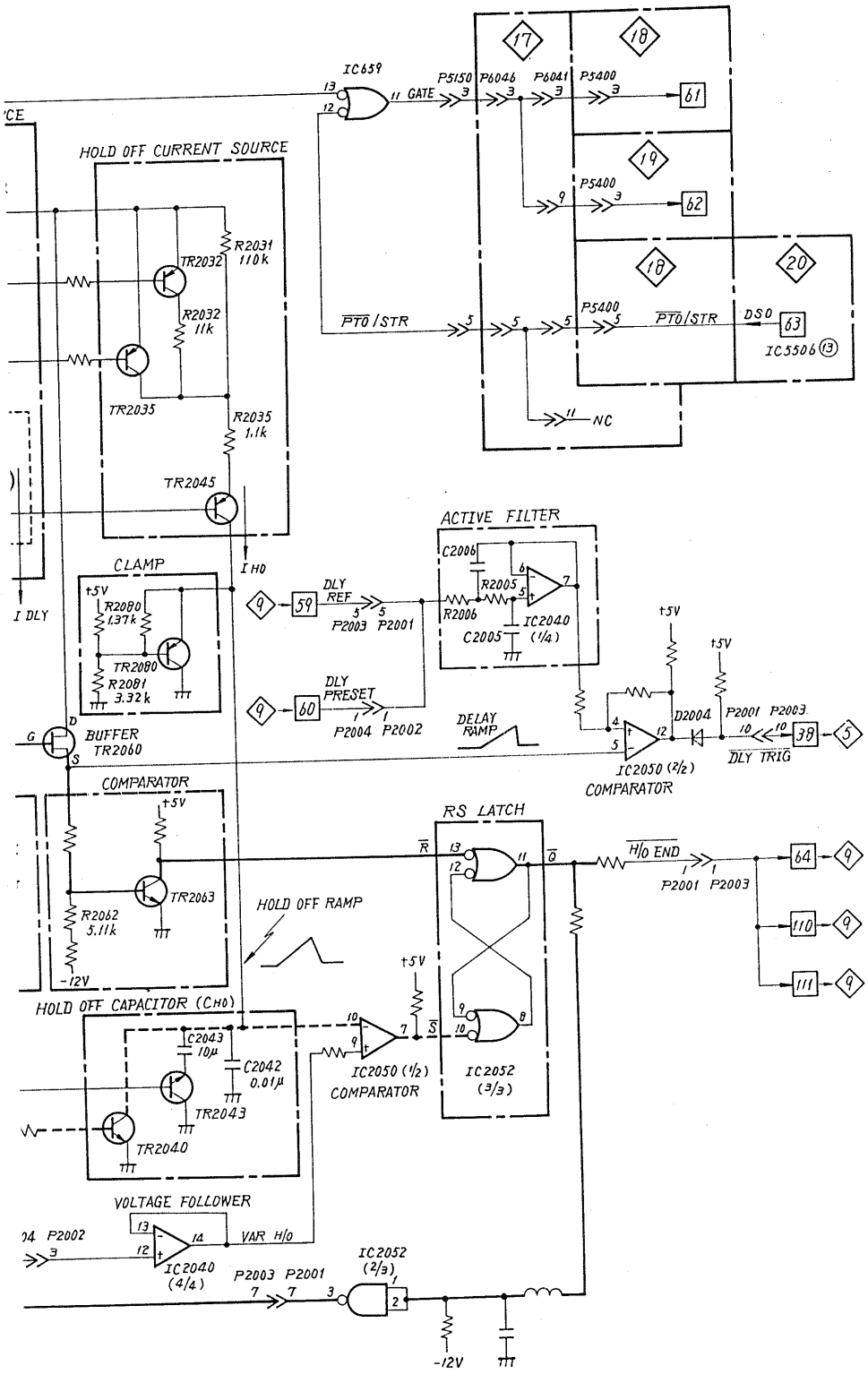

IC659
GATE
P5150
P6046
P6041
P5400
61
62
63
17
18
19
20
HOLD OFF CURRENT SOURCE
R2031 110k
TR2032
R2032 11k
TR2035
R2035 1.1k
TR2045
I HO
I DLY
PTO/STR
DSO
IC5506
NC
ACTIVE FILTER
C2006
R2005
R2006
C2005
IC2040 (1/4)
DLY REF
P2003 P2001
DLY PRESET
P2004 P2002
CLAMP
+5V
R2080 1.37k
TR2080
R2081 3.32k
BUFFER TR2060
DELAY RAMP
D2004
DLY TRIG
IC2050 (2/2) COMPARATOR
COMPARATOR
TR2063
R2062 5.11k
-12V
RS LATCH
H/O END
HOLD OFF RAMP
HOLD OFF CAPACITOR (CHO)
C2043 10μ
C2042 0.01μ
TR2043
TR2040
IC2050 (1/2) COMPARATOR
IC2052 (3/3)
VOLTAGE FOLLOWER
VAR H/O
IC2040 (4/4)
IC2052 (2/3)

Fig. 5-5

at the beginning of the sweep, voltage comparator TR723 turns to off, and the collector voltage of TR723 is reset to "H".

The CS A DATA signal entered from [70] is a DC voltage (analog value) corresponding to the A sweep, and the CS B DATA signal entered from [71] is a DC voltage (analog value) corresponding to the B sweep. The CS A and CS B DATA signals are changed by the TIME/DIV setting, and accordingly, the voltage V_T of the V_T/I_O CONVERTER is changed. The TIME/DIV setting is changed to 1:2:5 by changing the voltage V_T. The figures of the TIME/DIV setting value are determined by changing the value of the timing resistor R_T to 1:10:100:1000.

The Q_E output ($\overline{A}$) of SHIFT REGISTER IC2165 controls ANALOG SW1 IC717 via IC738. The CS A DATA signal and the CS B DATA signal are supplied to the V_T/I_O CONVERTER in the A sweep mode and in the B sweep mode, respectively. V_T is a voltage corresponding to the CS A DATA signal or the CS B DATA signal, and the current I_O corresponding to V_T flows across R732. The resulting voltage V_O is fed to the V_O/I_T CONVERTER and the output current I_T corresponding to V_O flows to the TIMING RESISTOR R_T. The V_T/I_T CONVERTER consists of the V_T/I_O CONVERTER and the V_O/I_T CONVERTER, and the current I_T corresponding to the CS A DATA signal or the CS B DATA signal is obtained. Since I_T is fed to the miller integrator, the SWP OUT signal corresponding to the CS A DATA signal or the CS B DATA signal is obtained.

R_{T1}, R_{T2}, and R_{T3} fed from Q_B, Q_C, and Q_D of SHIFT REGISTER IC2165 are control signals to switch the timing resistor R_T. R_{T1}, R_{T2}, and R_{T3} are supplied to switching transistors TR745, TR743 and TR741 via LEVEL SHIFT TR750, TR751, and TR752, respectively, and the value of R_T is determined. Only the A sweep is provided with the SWP VAR function, and the voltage value of the CS A DATA signal is changed continuously by the MPU.

IC2165 is an 8-bit shift register having serial inputs and parallel outputs.
The 8-bit shift register and the latch are packed onto a single chip. The S DATA signal fed to the SER is shifted to the register bit by bit during every rising edge of the shift register clock S CLK2 signal fed to the SRCK. The 8-bit data in the register is transferred simultaneously to the latch circuit during the rising edge of the register clock pulse entered at RCK and the latch data is updated. (While the S DATA signal is being acquired, Q_A to Q_H are being held in the previous state and the data on Q_A to Q_H is updated during the rising edge of RCK.)
The shift register and the latch circuit (storage register) have the individual clear signals (shift register clear $\overline{SRCLR}$ signal and register clear $\overline{RCLR}$ signal). The clear signals are synchronized with the clock pulse when they are high.

The S DATA signal from [67] switches the TIME/DIV setting and the vertical channel. The clock pulse S CLK2 is fed from [68] only when the content of the S DATA is changed.
The S CLK2 pulse is generated by PC2 and

PC6 pulses fed out from IC3101 of the microcomputer shown in ◇9◇ . PC2 is a clock pulse being fed out continuously.
PC6 is a clock enable signal and controls the clock pulse P2. The passage of the clock pulse through the gate circuit (IC2107 of ◇9◇) is controlled by the PC6 signal. The colck pulse passing through the gate circuit (IC2107 shown in ◇9◇) is an S CLK2 pulse.

The route of a register clock pulse fed to the RCK terminal (pin 12) of SHIFT REGISTER IC2165 is different in the normal sweep mode and in the non-sweep mode (mainly in the X-Y mode).

(1) When the sweep is performed
When the $\overline{\text{DLY GATE}}$ signal from [50] changes from "L" to "H" when the sweep finishes, the register clock pulse fed to the RCK terminal changes from "L" to "H", and the 8-bit data in the register is transferred simultaneously to the latch circuit during the rising edge of the register clock pulse. Strictly speaking, since the $\overline{\text{DLY GATE}}$ signal passes through the differentiation circuit consisting of C2167 and R2167, and gate circuit IC2162 (2/4), the register clock pulse changes from "L" to "H" after the $\overline{\text{DLY GATE}}$ signal has changed from "L" to "H". This is because the latch data is updated when the hold-off period begins completely.
The PC6 signal (the signal which notifies whether the microcomputer is ready or not.) from [65] changes the state of pin 5 of IC2162 (2/4), and controls the transmission of the change of the $\overline{\text{DLY GATE}}$ signal to the RCK terminal.
When the updating of the latch data is prohibited, namely when a new S DATA is being sent, PC6 from [65] is "H". Therefore, pin 5 of IC2164 (2/4) goes "L", and the change of the $\overline{\text{DLY GATE}}$ signal cannot pass throuth the gate circuit IC2162 (2/4).
When all the data of 8-bit S DATA is shifted to the shift register (PC6 goes "L"), and the sweep is finished (when DLY GATE goes "L"), data is transferred rom the shift register to the latch circuit.

(2) When the sweep is not performed (mainly in the X-Y mode)
The MPU controls the transmission of the latch data directly. When the data is updated, a negative pulse is fed from [66] .

The output of Q_H is sent to MPU IC4101 in 9 via [73] , and informs the microcomputer of the latch state. The S DATA fed to Q_H' is fed to the front panel board via [74] . The LED's (D1601, D1602, and D1605 to D1611 in ◇11◇) on the panel are blinked by this output of Q_H'.
TR708 and TR709 are switching transistors. When the TIME/DIV switch is set to 0.5ms or 0.2ms, the Q_A and Q_B outputs of SHIFT REGISTER IC2165 are "L" and "H", respectively, and TR708 and TR709 become on. Thus, R703 is shorted, and the current flowing across R703A increases. As a result, the reset duration of the sweep waveform can be made short, and a brighter waveform can be observed.

5.6 H AMP (◈8◈ 1/2, ◈11◈ 3/5)

Fig. 5-9 is the detailed block diagram of this circuit.

Normally the TR SW (1) circuit is not activated, and the SWP OUT signal from [75] is applied to the DIFF AMP(1) circuit via the AMP(1) circuit. In the X-Y mode, the X-Y signal from [79] goes" L", so that TR811 turns off and TR812 turns on. Therefore, the TR SW (1) circuit is activated, and the X-SIG from [33] is applied to the DIFF AMP(1) circuit via the AMP(1) circuit. On the other hand, the H POS signal from [80] is set to the optimum DC voltage by H POS START RV807, and is applied to the DIFF AMP(1) circuit via the AMP(2) circuit.

The DIFF AMP(1) circuit is activated in the waveform display mode, and the DIFF AMP(2) circuit is activated in the dot display mode. When I_1 or I_2 flows, the DIFF AMP(1) circuit is activated. When I_3 flows, the DIFF AMP(2) circuit is activated. Either of I_1, I_2 or I_3 is always flowing. I_1 flows in the x1 mode, I_2 in the x10 mode, and I_3 in the dot display mode.

The selection of I_1, I_2 or I_3 is controlled by the $\overline{X1}$ signal from [81] and the DOT EN signal from [83] .

The state of the $\overline{X1}$ signal is determined by DPDT switch (x10 MAG) S1605 in 11 .

One switching circuit (pins 4, 5, and 6) of S1605 controls the CURRENT SW(1) directly. The other switching circuit (pins 1, 2, and 3) informs the setting state (x1 or x10) of the microcomputer by changing the output voltage AN0 of D/A(2) RM1601. Pressing the [ALT] and [B] switches simultaneously results in the X-Y mode, and pin 4 of S1605 is grounded. Therefore, in the X-Y mode, even if the x10 MAG switch is set to the x10 side, the switch is forced to return to the x1 mode. The states of the [ALT] and [B] switches are informed of the MPU by the output voltage AN2 of D/A(1) RM1603.

D841 and D842 of DIFF AMP(1) are switching diodes, and change the current flow in the DIFF AMP(1) circuit according to the x1 or x10 mode. Both diodes turn off in the x1 mode, and on in the x10 mode.

In the waveform display mode, the output of the DIFF AMP(1) circuit is applied to the DIFF AMP(3) circuit.

In the dot display mode, the output of the DIFF AMP(2) circuit is applied to the DIFF AMP(3) circuit.

The DIFF AMP(3) circuit employs a common-base circuit, and the low impedance input and the high impedance output are realized. The output of the DIF AMP(3) circuit is sent to the CURRENT LIMITER circuit consisting of the DIFF AMP circuit (TR851 and TR852) and the diodes (D873 and D874). This CURRENT LIMITER prevents the H OUTPUT AMP circuit from being driven up to a saturation field.

For the following circuit description, refer to schematic diagram ◈8◈ .

The output signal current of TR851 is amplified by emitter follower stage TR881 and common-emitter stage TR885. The amplified output is fed back to the input through R857, R855, C857, and C855. The feedback amount at high frequency is adjusted by CV859 to optimize the linearity at the 5ns/div sweep.

TR871 is an active load of TR885. The AC component is applied to the base of TR871 through C883 so that the supply current increases when the output voltage changes to the positive at a high speed.

The operation of the circuits following TR852 is identical with the above operation except for signal polarities.

5.7 UNBLANKING & Z-AXIS AMP (◇8◇2/2, ◇11◇ 4/5, ◇12◇ 1/2)

Description on the UNBLANKING circuit and the Z-AXIS AMP circuit follows.

Refer to Figs. 5-10 and 5-11.

UNBLANKING circuit

The UNBLANKING circuit consists of two functional blocks. One consists of IC1101 1/3, IC1101 3/3 and D1113 and controls a waveform display, and the other consists of IC1121 3/4 and D1114 and controls the readout character display. The inten-sity of the displayed waveform is controlled by the [INTEN] control and that of the readout (characters or cursors) by the [READOUT] [INTEN] control.

The waveform display and the readout display (characters or cursors) are performed by the time division.

Like the X-axis circuit and the Y-axis circuit, the UNBLANKING circuit in the Z-axis circuit is switched according to the time division. In other words, either of the two functional blocks (the $\overline{\text{UNBL}}$ and $\overline{\text{CHR Z}}$ signals) of the UNBLANKING circuit is selected by the DOT EN signal or the $\overline{\text{DOT EN}}$ signal according to the kind of the requested display, the waveform o r the dots (characters of cursors).

To effect or not blanking of the waveform and the dots (characters or cursors) is controlled by the $\overline{\text{UNBL}}$ signal and the $\overline{\text{CHR Z}}$ signal, respectively. When the waveform is displayed, the $\overline{\text{UNBL}}$ signal is low, and the $\overline{\text{CHR Z}}$ signal is high.

Since the emitter voltage of TR901 is always zero volts, D1113 is on, and D1114 is off.

When the dots (characters or cursors) are displayed, the $\overline{\text{UNBL}}$ signal is high, and the $\overline{\text{CHR Z}}$ is low. Therefore, D1113 is off, and D1114 is on.

When the sweep begins and the $\overline{\text{SWP GATE}}$ signal from [55] goes low or the X-Y signal from [92] goes low in the $\overline{\text{X-Y}}$ mode, the UNBL signal fed out from pin 8 of IC1101 (3/3) goes low, resulting in the waveform display state.

When the CHR EN from [86] goes high to display characters, or the $\overline{\text{CUR EN}}$ signal low from [87] goes low to display cursors, the DOT EN signal is fed out from pin 11 of IC1121 (4/4), and resulting in the dot display state.

The waveform becomes the blanking state (UNBL = H)in the following cases (1) to (4).

(1) When the sweep finishes, and the $\overline{\text{SWP RS}}$ signal from [77] goes low.

(2) While the MPU for the RTO are operating
In this case, D1101 or D1105 turns on.

(3) When the switching part of the channel needs to be blanked. In this case, D1102 turns on.

(4) Dot display
In this case, D1103 and D1104 turn on.

The H AMP is changed by the DOT EN signal (corresponding to the the CHR-X EN signal) fed out from [83] , and the V AMP

is changed by the $\overline{\text{DOT EN}}$ signal (corresponding to the $\overline{\text{CHR-Y EN}}$ signal) fed out from [98] .

In the DSO mode, the STORAGE signal fed from [96] goes high and each switch of SELECTOR IC 4001 is switched to the B side. As a result, the $\overline{\text{STR-Z}}$ signal is fed out from 1Y, and 2Y becomes in the high state.

The 2Y output enters CURRENT SW(3) of ◇8◇ via [83] , and allows I3 to flow, resulting in operating DIFF AMP (2). (Fig. 5-9) I1 and I2 do not flow, and DIFF AMP (1) does not work, Thus, in any case of waveforms, characters and cursors the X-direction signal is fed out via DIFF AMP (2) in the DSO mode.

The $\overline{\text{DOT EN}}$ signal from [98] controls the switching of ANALOG SWITCH IC2220 of [10] . (Fig. 5-16) In the RTO mode, two kinds of blanking, waveforms and dots (characters or cursors), are controlled. In the DSO mode, the blanking of dots (waveforms, characters and cursors) is controlled by the $\overline{\text{STR Z}}$ signal from [95] . In this case, the caracter generator circuit in the RTO mode is stopped by the MPU for the RTO. (The $\overline{\text{CHR Z}}$ signal is high.)

Z-AXIS AMP

This circuit consists of the current limiter (TR901 and D901) and the feedback AMP (TR906, TR910, and TR912). There are two input channels to this AMP. One is the waveform display channel of D1113, and the other is the dot display channel of D1114.

These channels are selected by the DOT EN signal fed out from pin 11 of IC1121 (4/4).

In either case, the current from TR901 emitter increases, the intensity of the CRT increases. The change of the input current applied to TR901 emitter is not transmitted to the collector, but the change is not transmitted to TR906 by D901. Therefore, the output voltage of the Z. AXIS AMP is controlled so that it is not lower than approx. 5V.

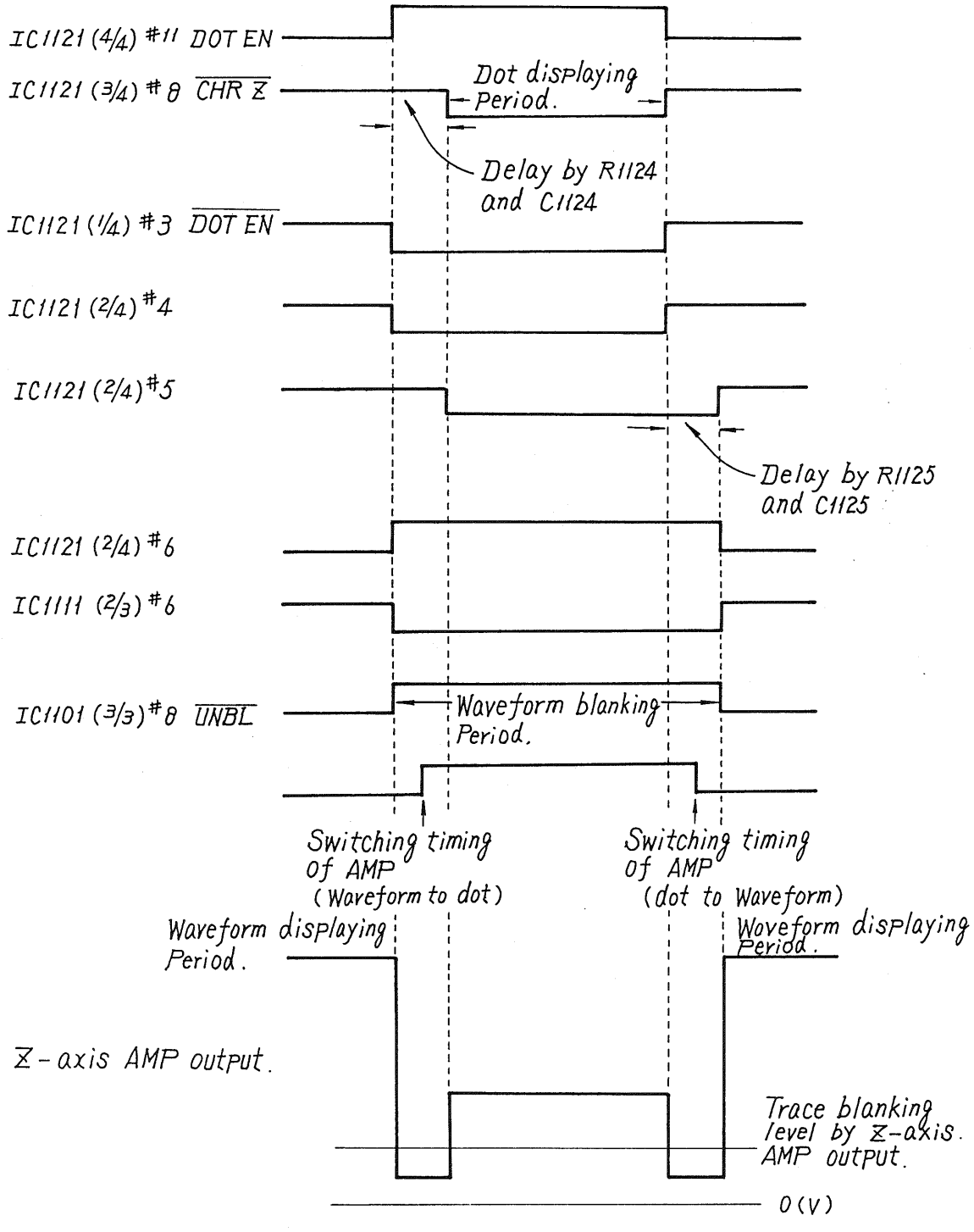
When the current of TR901 (from the emitter) increases, the current across D901 increases. Therefore, the base voltage of TR906 decreases. As a result, the base voltage of TR912 decreases, and the output voltage of the Z-AXIS AMP becomes more positive. This output is connected with the electrode G1 for the beam control of the CRT. So when the output voltage of the Z. AXIS AMP becomes further positive, the intensity increases accordingly.

5.8 MPU(RTO) & CHR GEN (◇9◇, ◇10◇)

1. Outline

The description on the MPU for the RTO and its peripheral circuits and the control circuit of information on characters and cursors is as follows. Refer to schematic diagrams ◇9◇ and ◇10◇ , detailed block diagram Fig. 5-17, block diagrams Figs. 5-12, 5-15 and 5-16, timing charts Figs. 5-13 and 5-14.

The 10 bits digital data among the control signals fed out from the MPU for the RTO is converted into analog data by DA1 RM2120. The analog signal for control is output from ANALOG SWITCH IC2130 as a continuously variable signal to control each circuit.



Note 1 ; The above waveforms are synchronous each other.

Note 2 ; The unblanking waveform in each sweep and the above waveforms are asynchronous.

Fig. 5-11

A digital control signal is fed out from port PC0 as an S-DATA (serial data), sent to the four shift registers* in Fig. 5-12, and fed out as bit information.

* Four shift registers: IC2165 of ◇7◇ , IC2166 of ◇9◇ , and IC6601 and IC1602 of ◇11◇

The frequency of the measured signal (max. 100MHz) is measured by measuring the frequency of the trigger signal developed from the measured signal.
The counter built in the MPU for the RTO counts up to 1MHz. Therefore, the trigger signal is counted down to 4:1 by the counter of (◇6◇ , Fig. 5-5).
The resultant signal is further counted down to 32:1 by the COUNTER (◇9◇ , Fig.5-17). Thus the trigger signal is counted down to 128:1 by the external counters. The resultant signal is fed to PC5, entrance to the counter of the MPU.
The MPU reads the frequency of the measured signal by counting the counted-down signal, and determines the sweep time automatically.

While the change of the setting state is being fed out from the MPU, the waveform display is blanked so as not to appear the disturbance of the waveform. For this purpose, the control signal is sent to the Z-CONT circuit from the output port PC3 via [93] . The H signal is fed out from PC3 in case of blanking. The character display data is fed out from LATCH 2 IC3005 and LATCH 3 IC3004, converted into analog data by RM2232 and RM2231 10 (Fig. 5-16), and then fed out as analog voltages CHR-X and CHR-Y from ANALOG SWITCH IC2220 (◇10◇ , Fig. 5-16). The A/B ALT SEP BIAS voltage is fed out from the same terminal as that of CHR-Y. The switching of characters, vertical and hori zontal cursor patterns, and A/B ALT SEP BIAS outputs is performed by ANALOG SWITCH IC2220 (◇10◇).

The machine clock of this MPU is 12 MHz, and oscillated by ceramic oscillator X3101.
While the power is on, terminal $\overline{\text{RESET}}$ is maintained to be low by the RESET circuit until the voltage for the digital circuit power supply becomes stable.

2. Read of status information

Information concerning the setting state of switches on the panel is fed to ports AN0 to AN7 of the MPU as an analog signal. When one of the variable control items as DELAY, HOLDOFF, TIME, H POS related to the X axis and the cursors (ΔV, ΔT and 1/ΔT) is selected by the SELECTOR switch, the MPU recognizes the DC output voltage of the endless variable resistor (VARIABLES) as the signal that controls the selected item, and processes the output voltage. When SINGL or SEP is selected by the SELECTOR switch, the VARIABLES is not valid. The MPU converts an analog signal into a digital signal by the built-in A/D converter, and performs various processes using the signal.
Terminals AV_{DD} and VA_{REF} are input terminals of the supply voltage and the reference voltage of the A/D converter, respectively.

3. **Read of programs and transmission of data (Refer to Fig. 5-12.)**

As many pins of MPU IC3101 are allotted to inputs and outputs, the number of pins for bus is limited. Therefore, the same bus is used on the time division basis. LATCH 1 IC3003 is the circuit which functions to separate only the address information among the common bus. The liest significant 8 bits of the memory address are output form PD7-PD0, and the most significant 8 bits are output from PF7-PF0.
The parallel data output from PD7-PD0 and PF7-PF0 are retained in IC3005 and IC3004, respectively.
The decoder to which $\overline{RD}$, $\overline{WR}$, and ALE signals are input determines the IC to be selected from ROM, RAM and latch circuits.
Fig. 5-12 illustrates the above description.

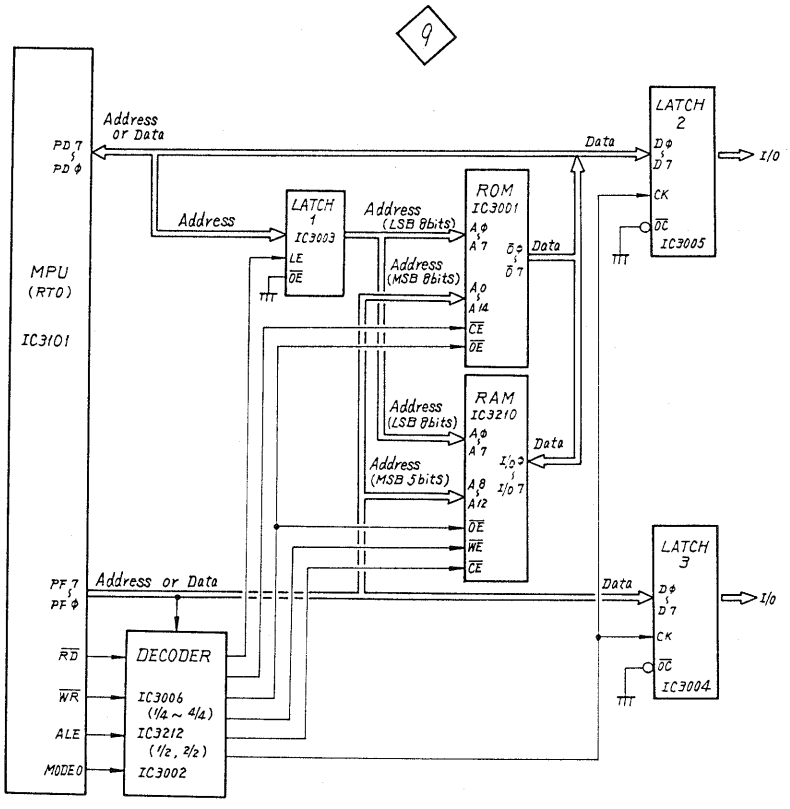


Fig. 5-12

Address information is sent to LATCH IC3003 from ports PD7 to PD0 of the MPU. At this time, terminal LE of IC3003 is high (latch enable), so that IC3001 latches this address information. Since terminal $\overline{OE}$ of IC3001 is always low, information on the latched address is transferred to ROM IC3001 immediately.
The high-order bits of address information is sent to ROM IC3001 from ports PF6 to PF0 of the MPU. At this time, $\overline{CE}$ (chip enable terminal) is low by the signals at PF7 and PF6.

(1) READ of ROM (Figs. 5-13 and 5-17)

The ALE output of the MPU is an address latch enable signal which is a strobe pulse for latching the address fed out to address/data buses PD0 to PD7 to an external address latch. In other words, only some part of the input signal can be taken out at good timing by this pulse. The pulse is high only during the period for taking out the signal. Assume that the ALE goes high, the LE of LATCH 1 IC3003 goes high accordingly, and LATCH 1 is in the latch enable state. In this case, if the high-order address and the low-order address are output from the MPU to PF7-0 and PD7-0, the $\overline{OE}$ (output enable) of LATCH 1 remains low. Therefore, the low-order address information of PD7-0 is output from LATCH 1 as DA7-0.

Further, when PF6 low and PF7 low passes through IC3004 (4/4), the $\overline{CE}$ of ROM IC3001 goes low, and the ROM is in the chip enable state.

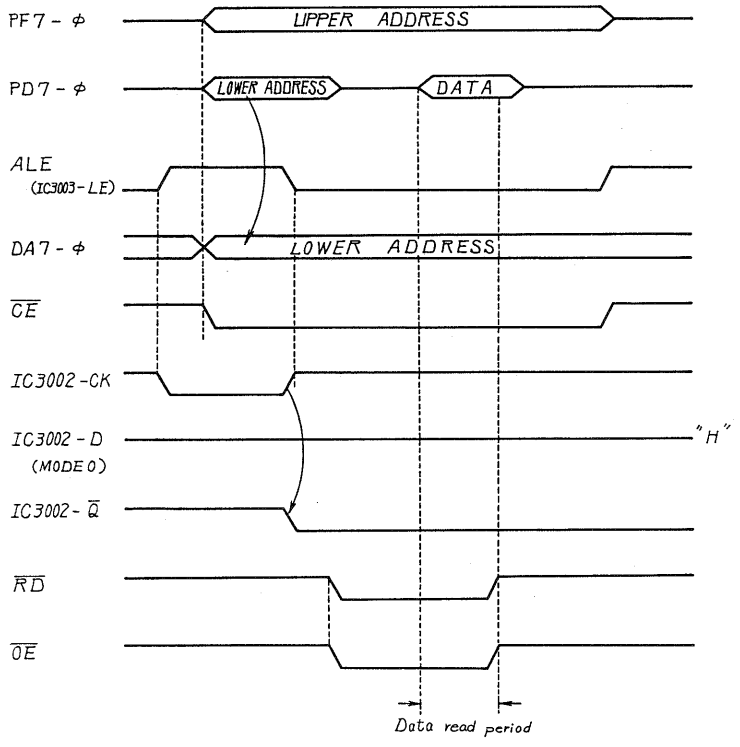


Fig. 5-13

The polarity of the ALE is inverted by IC3212 (2/2), and the resultant signal is fed to the CK of IC3002. IC3002 latches the state of the MODE O supplied to D by the rising edge of CK (ie. rising edge of the ALE). The MODE O goes high when the ROM is in the READ mode, and low is output from $\overline{Q}$ of IC3002. When the $\overline{RD}$ goes low in this state, the $\overline{OE}$ of the ROM goes low by the operation of IC3006 (2/4).

As a result, the MPU reads the data (program) of the ROM through bus PD7-0. When processing is executed in accordance with the program read by the MPU, the data on the results of processing is fed out from each port.

(2) READ to RAM

When PF6 high and PF7 high passes through RAM IC3210, the output of IC3212 goes low, and the $\overline{CE}$ of IC3210 goes low.

The $\overline{WR}$ goes low when the RAM is in the READ mode.

The description of (1) READ of ROM is applied except for the above.

(3) WRITE to RAM

The process until the low-order address information of PD7-0 is output to DA7-0 and the OE goes low is the same as de scribed in (1). The process until the $\overline{CE}$ goes low is the same as described in (2).

When the $\overline{WR}$ goes low with the Q of IC3002 low, the $\overline{WE}$ of RAM IC3210 goes low by the operation of IC3006 (1/4).

As a result, the MPU writes the data on the RAM through bus PD7-0.

While the RAM is in the WRITE mode, the $\overline{RD}$ of the MPU remains in the high state.

(4) WRITE to I/O (Figs. 5-14 and 5-17)

This circuit is provided with only output ports (LATCH 2 and LATCH 3), and not provided with input ports.

In this mode, the MODE O goes low from high at the timing that the ALE goes high. The MODE O remains in the high state even if the ALE goes back low.

Consequently, low is output from Q by the rising edge of the CK of IC3002.

During this period, the data for LATCH 2 and for LATCH 3 are output from PD7-0 and PF7-0, respectively. As low is being output from Q of IC3002, the output of IC3006 (3/4) #8 goes high when the $\overline{WR}$ goes high.

As the output of IC3006 (3/4) #8 is in the CK of LATCH, the CK goes high accordingly. The I/O data of PD7-0 and PF7-0 are latched by LATCH 2 and LATCH 3, respectively, by the rising edge from low to high.

In this case, the OE signals of ROM IC3001 and RAM IC3210 go high, and O7 to O0 of ROM and I/O 7 to I/O of RAM become the high impedance state. Therefore, the ROM and RAM have no relation with the I/O data transfer.

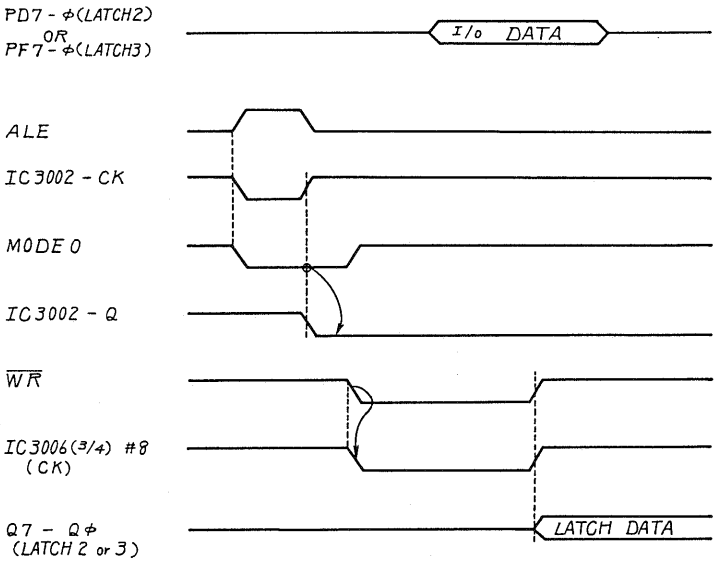


Fig. 5-14

4. Output of the analog control signal (Refer to Fig. 5-17.)

The 8 bits output of PA7 to PA0 of the MPU for the RTO and the 2 bits output of Q7 and Q6 of IC3005 are added. The resultant 10 bits data is converted into the analog voltage by D/A 1 (RM2120), and fed to ANALOG SWITCH IC2130.

D/A 1 has a resolving power of 1000, and feeds out the analog voltage between 0 and 5 V. ANALOG SWITCH IC2220 is constantly switched in the fixed order by a 3 bits control signal from PB2 to PB0.

The output voltage of the ANALOG SWITCH is maintained at the fixed voltage by a sample hold capacitor of each line. The INH signal in the high state is fed out from PB4 when the switch is changed to perform a "break before make" operation.

5. Transmission of serial data (Refer to Fig. 5-15.)

The S DATA (serial data) is the digital control signal that is fed out from port PCO of IC3101 of the MPU for the RTO. This signal is converted into the parallel signal by SHIFT REGISTER's IC2165(◇7◇), IC2166(◇9◇), IC6601(◇11◇) and IC1602(◇11◇) as the digital control signal.

There are three kinds of S DATA: Ⓐ , Ⓑ and Ⓒ . Ⓐ is the 16-bit parallel signal fed out from IC1602 and IC6601 which consist of the 9-bit signal to light the LED on the front panel and the SI SELA (1 bit) which is one of the control signals to switch an input signal to input import PC5 of the MPU. All of the 16 bits are not always used. Ⓑ is the 8-bit parallel signal related to the switching of the TIME/DIV setting value of the waveform sweep and of the DISPLAY mode. This signal is fed from IC2165.

Shift registers IC2165, IC6601 and IC1602 are connected in series, and the 24 bits S DATA (Ⓐ data + Ⓑ data) is acquired from data input terminal SER of IC2165.

Then Ⓐ data is allocated to IC1602 and Ⓑ data to IC1602 and B data to IC2165. Data of each shift register is acquired by

the clock pulse SCLK 2.

To change the content of a digital control signal, a 24-bit S DATA is sent only once whatever the bit to be chanted is.

The SCLK 2 is the pulse obtained when the 500kHz pulse that is fed out constantly from PC2 passes GATE1 (IC2107) of ◇9◇ . This pulse is controlled by the output signal from PC6 and fed out only when the signal on PC6 goes high.

PC6 is also used as a latch enable signal fed to the RCK terminal of IC2165 (◇7◇). Refer to item 5.5 for the latch operation.

C data is the 8-bit parallel signal which consists of the information for determining the cycle period and of X-Y mode and the control signal (Ci SEL B, Ci SEL C) for the switching of IC2161 (◇9◇). C data is fed to IC2166 (◇9◇), and shifted by the shift clock pulse SCLK1. This data is updated only when any bit of the digital control signal is needed to change, and an 8-bit S DATA is sent once. When all 8-bit data is shifted, the SCLK1 signal stops.

The SCLK1 signal is also a 500 kHz pulse which passes GATE 1. In this case, GATE 1 is controlled by the PC3 output and the timing is determined by the output. IC2165 latches the 8 bits at a time. Therefore, when updating B data, the 8-bit shift data is latched at a time when new 8-bit serial signal is completely shifted in sequence and when the waveform display is within the blanking period. Therefore, the switching of B data does not effect the display on the CRT.

On the other hand, the switching of C data is performed by the shift of an 8-bit S DATA. Therefore, when the switching is performed during the sweep period, the normal display is not obtained. When the PC3 output is high, the PC3 signal (SCLK1) is sent to the Z circuit to blank the display.

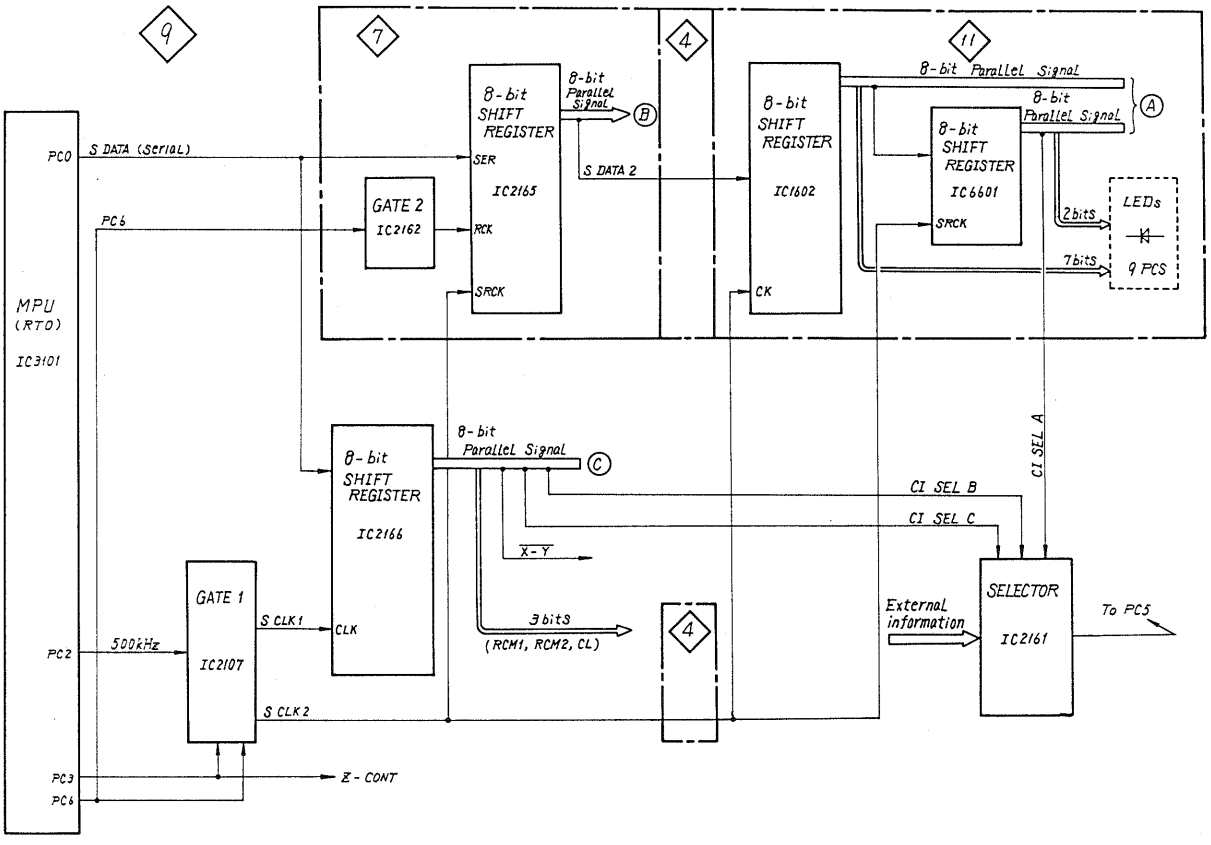


Fig. 5-15

6. Acquisition of a control signal (Refer to Fig. 5-17.)

The MPU acquires external information from PC5 via SELECTOR IC2161 (9).
When the power switch is turned to on, the MPU reads the DC voltage of terminals D7 to D5 of IC2161, discriminates the type of this oscilloscope, and selects the applicable program memorized in the ROM. Then, the MPU reads the DLY ADJUST and SWP GATE signals from D3 and D4, and exeutes the automatic calibration of the delay time and the sweep time. The automatic delay time calibration is executed by converging the DLY RAMP signal by the TEST SIG fed from PC4 via 43 , the analog output DLY PRESET, from 60 and the loop circuit consisting of the feedback signals DLY ADJ and SWP GATE.
Normally the switching control signals Ci SEL B and Ci SEL C of IC2161 are low. When the Ci SEL A goes low or high, D_0 or D_1 of the analog switch is connected, and the trigger pulse of the measured pulse is counted to determine the cycle time.
Moreover, the $\overline{\text{H/O END}}$ signal from 64 , 110 and 111 and the LATCH CHECK signal from 73 are fed to the MPU to transmit the external status.

7. Transmission of information on characters and cursor patterns (Refer to Fig. 5-16 and Fig. 5-17.)

Data of character information is output from LATCH 3 IC3004 and LATCH 2 IC3005. In other words, 3 bits data related to the Y component of information representing a character is output on PF2' to PF0', 3 bits data related to the X component of information representing a character is output on PF6' to PF4', and 5 bits data related to the X position of each character (number from first among 32 characters per line) is output on PD4' to PD0'.
After digital data related to the Y component of a character is converted to analog data by the D/A converter D/A 1 RM2232 (◇10◇), the DC voltage CUR-POS representing information about the vertical position (upper line or lower line) of a character or a cursor position is added to an analog data, and input to analog switch IC2220 (◇10◇). The CUR-POS is fed out from ANALOG SW1 IC2130 (◇9◇). Three bits data related to the X component of a character and 5 bits data related to the X position of each character are added, and the resultant 8 bits data is converted to the analog signal by D/A 2 RM2231 (◇10◇).

Dots for cursors generated by the CURSOR DOT GENERATOR (◇10◇) are converted by D/A 3 RM2211 (◇10◇), and fed to IC2220 (◇10◇). Moreover, the 1 V DC voltage determining the center position of the horizontal axis of the A sweep waveform is applied to the terminal X2 of IC2220. The A/B ALT SEP BIAS voltage determining the center position of the horizontal axis of the B sweep waveform in the A/B ALT mode is applied to the terminal X3. The switching of IC2220 corresponding to these input signals is performed by the control signal A via SECTION LOGIC (◇10◇), the CUR SEL signal, and the $\overline{\text{DOT EN}}$ signal. Table 5-3 shows the detail. The horizontal or vertical position of cursors on the CRT is determined by IC2220. The vertical or horizontal movement of cursors is determined by the CUR-POS signal.

Next, the description on the cursor pattern generator circuit follows. (Refer also to the schematic diagram ◇10◇ .) When the MEASURE switch on the front panel is selected, the CUR RESET signal fed from the MPU goes low, the pin 10 of CURSOR DOT GENERATOR IC2248 goes high, and the oscillation starts. The oscillated clock pulse is fed to $\overline{\text{CLK}}$ of COUNTER IC2212. The output from COUNTER is converted into an analog signal by D/A 3 RM2211 (◇10◇). The converted analog signal is fed out as a cursor pattern signal. Since the pin 4 of D/A 3 is grounded, cursor patterns are dotted lines.
When output D6 of counter IC2212 (◇10◇) goes high, pin 10 of CURSOR DOT GENERATOR IC2248 (◇10◇) goes low, and the oscillation stops. At the same time, the COUNTER sends the CUR END signal in the high state to the MPU from [104] .
The MPU receives the CUR END signal and sends the CUR RESET signal in the high state to reset counter IC2212 via [99] .
When the COUNTER is reset, D6 goes low, but pin 5 of IC2211 (2/4) is high.
Consequently pin 10 of IC2248 (3/3) is low, and the CURSOR DOT GENERATOR

continues to stop the oscillation. When the CUR. RESET goes low and the reset is released, the oscillation starts and the above operation is repeated.

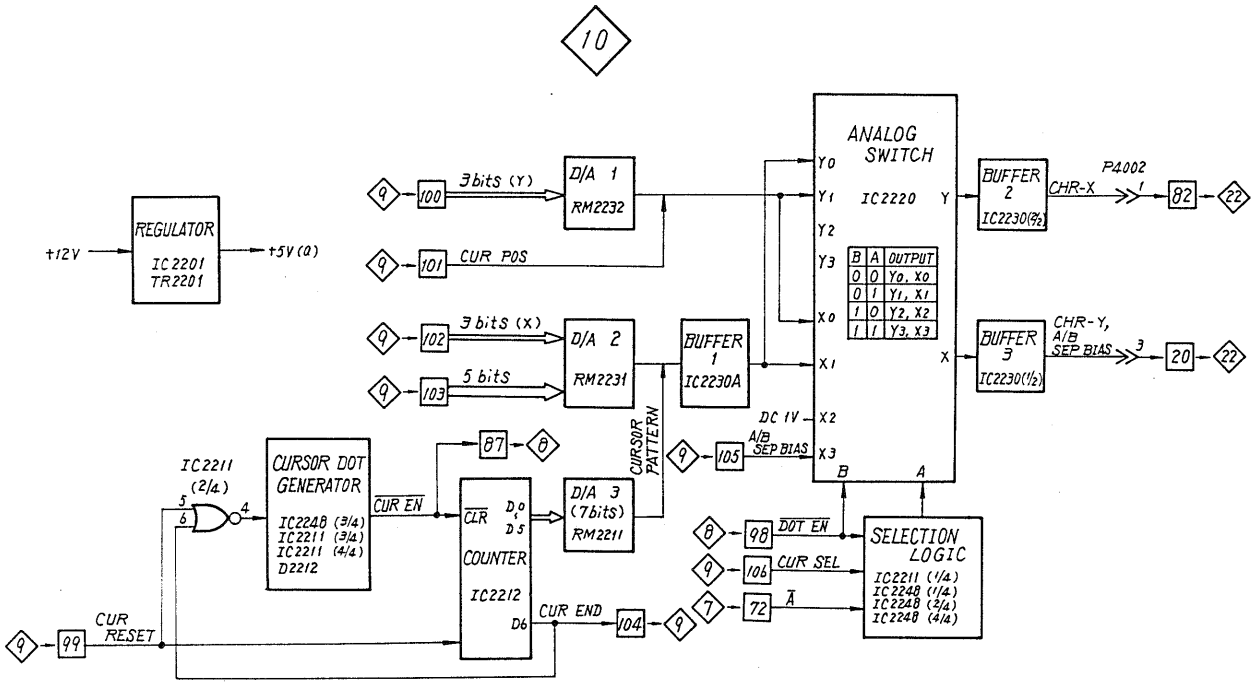


Fig. 5-16

Table 5-3

Kinds of DISPLAY		Control signal			Control signal of switch IC2220		Connection of switch IC2220	Output signal of X terminal	Output signal of Y terminal
		$\overline{\text{DOT EN}}$	CUR SEL	$\overline{\text{A}}$	Terminal B	Terminal A			
Waveform display	A sweep	H	*	L	H	L	X_2 — X Y_2 — Y	1V DC	No
	A/B ALT	H	*	H	H	H	X_3 — X X_3 — Y	A/B ALT SEP BIAS	No
Character display		L	L	*	L	L	X_0 — X Y_0 — Y	Y component of a character (added to the CUR POS)	X component of a character
Horizontal cursor display		L	L	*	L	L	X_0 — X Y_0 — Y	CUR POS	Cursor pattern
Vertical cursor display		L	H	*	L	H	X_1 — X Y_1 — Y	Cursor pattern	CUR POS

8. Others (Refer to Fig. 5-17)

(1) The RXD and TXD signals are used, in the DSO mode, for the data transfer between the MPU for the RTO and the MPU for the DSO.

(2) POWER UP RESET CIRCUIT
POWER UP RESET CIRCUITs (1) and (2) hold the $\overline{\text{RESET}}$ terminals of all the MPUs (one for RTO and two for DSO) to be low until +12V and +5V (d) reach the normal voltages after power on.

(3) MEMORY BACK UP
Under the normal operation, +5V (d) is applied to V_{CC} of RAM IC3210 via D3062. At this time, back-up capacitor C3050 is charged. When +5V (d) becomes lower than a specified value, +5V is applied to V_{CC} from C3050. (Back-up duration is 48 hours.) At the same time, TR3201 becomes off and the CE signal of RAM goes high. As a result, RAM IC3210 is electrically separated, and the holding current becomes minumum.
The backup voltage +5VBU supplied from C3050 is also routed to ◇20◇ and ◇21◇ via [117] to backup each RAM IC5503 of [20] and [21] of the MPU for the DSO.

5.9 Front panel (◇11◇ 5/5)

The detailed block diagram is shown in Fig. 5-18.
Fig. 5-18 includes only a part of the circuit ◇11◇ . The other parts are shown separately in Fig. 5-1, Fig. 5-2, Fig. 5-3, Fig. 5-10 and Fig. 5-11.
For the X-Y mode (when [ALT] and [B] are pressed simultaneously) and the x10 MAG

mode, refer to Section 5.6.

In the RTO mode, most of information on the switches at the right half side of the panel is acquired by the MPU for the RTO which controls the waveform display and the readout to obtain the optimum state. The switches of the storage mode under the screen, left half side of the front panel, are controlled by the MPU for the DSO.

Informatin on the panel switch setting is acquired as an analog signal from ports AN0 to AN7 of the MPU. The analog signal is converted into a digital signal by the A/D converter built in the MPU for the RTO.

The processing programs are stored in ROM IC3001.

The AN0, AN1 and An2 are the signals which notify the setting status of each switch to the MPU.

The AN1 notifies the setting status of the B TRIG MODE switch and the V MODE switch to the MPU.

The AN0 notifies the setting status of the CH2 UNCAL switch, the x10 MAG switch and the TIME/DIV switch to the MPU.

The AN2 notifies the each setting status of the CH1 UNCAL, H MODE, SELECTOR, TRIGGER LOCK, and CURSOR (REF.△ .TRACKING) switches to the MPU.

5.10 Switching of display channel in RTO mode (◇5◇2/2,◇7◇2/2)

For this circuit, refer to the block diagram Fig. 5-19, waveform diagram Fig. 5-20 and Table 5-4.

Table 5-4 shows the relationship between the vertical mode in the RTO mode and the control signals for channel switching. $\overline{CH1}$, $\overline{CH2}$, $\overline{ALT\ CONT\ 1}$, etc. are the control signals for channel switching. The data acquisition is synchronized with the display in the RTO mode, but not in the DSO mode. The following describes the RTO mode.

OUTLINE

Among four kinds of signals: $\overline{CH1\ DSP}$, $\overline{CH2\ DSP}$, $\overline{CH3\ DSP}$ and $\overline{CH4\ DSP}$ in Fig. 5-19, the signal corresponding to the displayed channel goes" L".

The clock pulse of 500kHz is always fed to the T terminal of toggle flip-flop IC2160 regardless of V MODE in the RTO mode. This pulse is used only in the CHOP mode, and the 250kHz pulses $\overline{CH1\ DSP}$ and $\overline{CH2\ DSP}$ which are opposite in polarity each other are fed out from the Q terminal and the $\overline{Q}$ terminal of IC2160, respectively.

When the $\overline{CH1\ DSP}$ signal passes through the gate IC2162 (4/4), the $\overline{CH2\ DSP}$ signal is developed.

When the $\overline{CH2\ DSP}$ signal passes through the gate IC2162 (3/4), the $\overline{CH1\ DSP}$ signal is developed. Likewise, the $\overline{CH1\ DSP}$ signal and the $\overline{CH2\ DSP}$ signal pass through the gates IC6102 (2/3) and IC6102 (1/3) respectively, the $\overline{CH4\ DSP}$ signal and the $\overline{CH3\ DSP}$ signal are developed.

Each gate is controlled by the $\overline{DOT\ EN}$, $\overline{ALT\ CONT\ 1}$, $\overline{ALT\ CONT\ 2}$ and $\overline{CH1/CH2\ UNDSP}$.

When $\overline{DOT\ EN}$ goes "L", and all the four gates are closed, dots are displayed.

Since all the outputs of the four gates go "H", no channel is displayed.

When $\overline{CH1/CH2\ UNDSP}$ goes "L", the two gates, IC2162 (4/4) and IC2162 (3/4) are closed, and neither CH1 nor CH2 is displayed.

When $\overline{\text{CH1/CH2 UNDSP}}$ goes "H", the two gates open, and either of CH1 or CH2, or both are displayed.

When the output CH3/CH4 DSP of inverter IC6101 (2/2) goes "L", two gates IC6102 (1/3) and IC6102 (2/3) are closed and neither CH3 nor CH4 is displayed.

The $\overline{\text{CH1/CH2 UNDSP}}$ signal and the CH3/CH4 DSP signal are controlled by the $\overline{\text{ALT CONT 1}}$ and $\overline{\text{ALT CONT 2}}$ signals.

IC6101 (1/2) is a toggle flip-flop, and IC6102 (3/3) is an inverter.

The status of the $\overline{\text{CH1}}$ signal and the $\overline{\text{CH2}}$ signal fed out from SHIFT REGISTER IC2165 is determined by the MPU for RTO in accordance with the setting status of the VERTICAL MODE and TIME/DIV switches.

The functions of the major VERTICAL MODE switches in the RTO mode are described below.

(1) CH1 mode

IC2160 goes into the reset state, because $\overline{\text{CH1}}$ = "L" and $\overline{\text{CH2}}$ = "H", as shown in Table 5-4, and "L" is fed out from Q and "H" is fed out from Q. (In this case, the clock pulse CKA from T is invalid.)

Gate IC2162 (4/4) is closed and its output $\overline{\text{CH2 DSP}}$ goes "H". Thus CH2 is not displayed.

The status of gate IC2162 (3/4) is determined by the status of pin 10.

When dots are not displayed, the $\overline{\text{DOT EN}}$ signal is "H". Since $\overline{\text{ALT CONT 1}}$ = "L" and $\overline{\text{ALT CONT 2}}$ = "H" as shown in Table 5-4, the toggle flip-flop IC6101 (1/2) enters the set state. Since H is fed out from Q2 and "L" is fed out from $\overline{\text{Q2}}$ based on the above operation, the output of inverter IC6102 (3/3) goes "H", and the output of inverter IC6101 (2/2) goes "L".

Thus the $\overline{\text{CH1/CH2 UNDSP}}$ signal goes "H", and the output of gate IC2162 (3/4), $\overline{\text{CH1 DSP}}$ goes "L" and CH1 is displayed.

On the other hand, since the output of inverter IC6101 (2/2) is "L" because of the reset state, both outputs of IC6102 (1/3) and IC6102 (2/3) go "H".

Because of this, neither CH3 nor CH4 is displayed. As a result, only CH1 is displayed.

(2) ADD mode

Because $\overline{\text{CH1}}$ = 1 and $\overline{\text{CH2}}$ = "L", "H" is fed out both from Q and $\overline{\text{Q}}$ of IC2160.

Since $\overline{\text{DOT EN}}$ = "H", $\overline{\text{ALT CONT 1}}$ = "L" and $\overline{\text{ALT CONT 2}}$ = "H", $\overline{\text{CH1/CH2 UNDSP}}$ signal goes "H", and the output of IC6101 (2/2) goes "L". As a result, the $\overline{\text{CH2 DSP}}$ and $\overline{\text{CH1 DSP}}$ signals go "L", and the $\overline{\text{CH3 DSP}}$ and $\overline{\text{CH4 DSP}}$ signals go "H". Thus CH1 and CH2 are displayed.

(3) When the DUAL switch is pressed and TIME/DIV is set to the range from 5ms/div to 0.5s/div (In this case, CHOP operation is performed.)

Since $\overline{\text{CH1}}$ = "H" and $\overline{\text{CH2}}$ = "H", IC2160 operates as a toggle flip-flop, and the outputs of Q and $\overline{\text{Q}}$ are inverted at each rising edge of 500kHz clock pulse fed to T. The outputs of Q and $\overline{\text{Q}}$ are 250kHz pulses which are opposite in polarity each other. Refer to waveform diagram Fig. 5-8.

The status of the $\overline{\text{DOT EN}}$, $\overline{\text{ALT CONT1}}$, $\overline{\text{ALT CONT2}}$ and $\overline{\text{CH1/CH2 UNDSP}}$ signals is the same as above items (1) and (2). As a result, the $\overline{\text{CH2}}$

$\overline{\text{DSP}}$ and $\overline{\text{CH1 DSP}}$ signals go "L" alternately, and CH1 and CH2 are displayed alternately.

(4) When the [DUAL] switch is pressed and TIME/DIV is set to the range from 50ns/div to 2ms/div (In this case, ALT operation is performed.)

The $\overline{\text{CH1}}$ and $\overline{\text{CH2}}$ signals are opposite in polarity each other, and further they are inverted every 20ms approximately. Thus IC2160 enters the set state and the reset state alternately at this interval. Other control signals are the same as items (1) and (2), and CH1 and CH2 are displayed alternately every 20ms approximately.

(5) When the [DUAL], [CH1] and [CH2] switches are pressed simultaneously (In this case, CHOP operation is performed.)

In the same way as item (3), since $\overline{\text{CH1}}$ = "H" and $\overline{\text{CH2}}$ = "H", 250kHz pulses which are opposite in polarity each other are fed out from Q and $\overline{\text{Q}}$ of IC2160.

Since $\overline{\text{ALT CONT 1}}$ = "H" and $\overline{\text{ALT CONT 2}}$ = "H", IC6101(1/2) operates as a toggle flip-flop. CH2 DSP of 250kHz pulse fed out from $\overline{\text{Q}}$ of IC2160 is fed into T2 of IC6101(1/2). Thus two 125kHz pulses which are opposite in polarity each other are fed out from Q2 and $\overline{\text{Q2}}$ of IC6101 (1/2).

(i) When Q2 is "H" and $\overline{\text{Q}}$ is "L"

"H" is fed out from IC6102 (3/3) and "L" is fed out from Q of IC6101 (2/2). When the dot display is not made, $\overline{\text{DOT EN}}$ is "H", and $\overline{\text{CH1/CH2 UNDSP}}$ is thus "H". Accordingly, $\overline{\text{CH2 DSP}}$ and $\overline{\text{CH1 DSP}}$ go "L" once alternately in this period. On the other hand, "CH3/CH4 DSP" which is Q output of IC6101(2/2) goes "L", and thus both $\overline{\text{CH3 DSP}}$ and $\overline{\text{CH4 DSP}}$ go "H". As described above, CH1 and CH2 are displayed once alternately in this period, and CH3 and CH4 are not displayed.

(ii) When Q2 is "L" and $\overline{\text{Q}}$ is "H"

"L"is fed out from IC6102(3/3) and $\overline{\text{CH1/CH2 UNDSP}}$ goes "L". Accordingly, both $\overline{\text{CH2 DSP}}$ and $\overline{\text{CH1 DSP}}$ go "H" in this period. On the other hand, since "CH3/CH4 DSP" goes "H", $\overline{\text{CH3 DSP}}$ goes "L" when "$\overline{\text{CH2 DSP}}$" is"H"and $\overline{\text{CH4 DSP}}$ goes "L" when "$\overline{\text{CH1 DSP}}$" is "H".

As described above, CH3 and CH4 are displayed once alternately in this period, and CH1 and CH2 are not displayed.

Since the above (i) and (ii) are repeated alternately, CH1, CH2, CH3 and CH4 are displayed in sequence.

For the above, refer also to waveform diagram Fig. 5-20.

Table 5-4

Classification of V MODE by number of display waveforms	V MODE switch			TIME/DIV	$\overline{CH1}$	$\overline{CH2}$	500kHz pulse (CKA signal) (IC2160-T)	$\overline{ALT}$ / $\overline{CONT}$ 1	$\overline{ALT}$ / $\overline{CONT}$ 2	Display channel
	Specified operation	Switch setting staturs	Actual operation							
SINGLE	CH1	[CH1]	CH1	50ns/div to 0.5s/div	L	H	Invalid	L	H	CH1
	CH2	[CH2]	CH2		H	L				CH2
	ADD	[CH1] + [CH2]	ADD		L	L				CH1/CH2
DUAL	ALT	[DUAL]	ALT	50ns/div to 2ms/div	L/H	H/L				CH1 + CH2 (ALT)
			CHOP	5ms/div to 0.5s/div	H	H	Valid			CH1/CH2 (CHOP)
	CHOP	[DUAL] + [CH1]	CHOP	50ns/div to 0.5s/div						
QUAD	ALT	[DUAL] + [CH2]	ALT	50ns/div to 2ms/div	L/H	H/L	Invalid	H		CH1/CH2/CH3/CH4 (ALT)
			CHOP	5ms/div to 0.5s/div	H	H	Valid			CH1/CH2/CH3/CH4 (CHOP)
	CHOP	[DUAL] + [CH1] + [CH2]	CHOP	50ns/div to 0.5s/div						

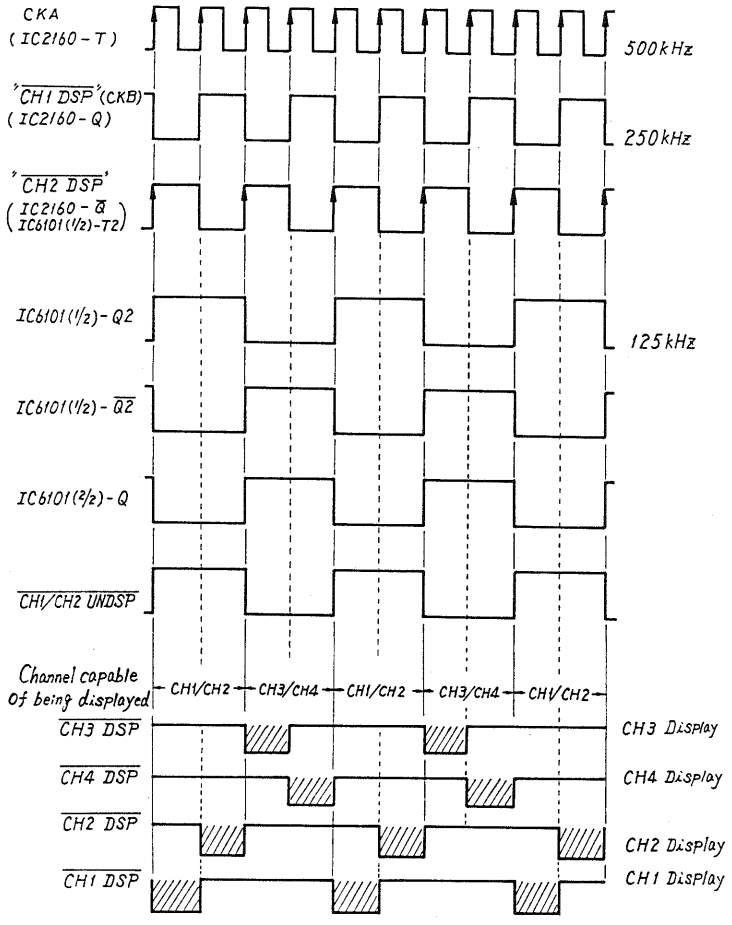


Fig. 5-20

5.11 Switching of input channels in RTO mode and sampling routes in DSO mode (◇14◇ and ◇15◇)

Fig. 5-21 shows the detailed block diagram. However, Fig. 5-21 omits the switch circuit (TR6060, D6062 and D6063) of ◇14◇ and the switch circuit (TR6260, D6262 and D6263) of ◇15◇ which are not used.

(1) Switching of input channels in RTO mode

CH1 V SIG is fed to DIODE GATE 1 which consists of D73, D74, D6000 (1/2) and D6000 (2/2). This gate is controlled by the channel swithcing signal $\overline{\text{CH1 DSP}}$. For open and close of the gate, refer to item 5.1, and for channel switching signal, refer to item 5.10. CH1, CH2, CH3 and CH4 are identical in operation.

(2) Switching of sampling routes in DSO mode

CH1 V SIG is fed to not only DIODE GATE 1 but also DIODE SW1. This DIODE SW1 is controlled by the PB3 signal fed to the base of TR6020.

When PB3 goes "L", TR6020 is made off and DIODE SW1 is also made off.

When PB3 goes "H", TR6020 is made on and CH1 V SIG is fed to the CH1 VIF circuit through DIODE SW1.

TR6024 adjusts the DC bias of CH1 VIF. CH1, CH2, CH3 and CH4 are identical in operation.

In any of the following A1, A2 and A3, PB3 fed from pin 10 of IC6001 (4/5) goes "L". As a result, all the four DIODE SWs are made off and no signals of the channels are fed to the VIF circuit.

A1: In RTO mode
A2: In RTO mode and ADD mode
A3: In DSO mode and equivalent sampling

In either case of the following B1 and B2, PB3 goes "H". As a result, all the four DIODE SWs are made on, and the signals of the all the channels are fed to each VIF circuit. Through this operation, data for sampling on multiple channels can be acquired simultaneously.

B1: In DSO mode and actual sampling (normal sampling)
B2: In DSO mode and ROLL mode

5.12 Switching of vertical signals (◇28◇) and sample-and-hold circuit (◇16◇ and ◇25◇)

Fig. 5-22 is a detailed block diagram of this circuit. Refer to the attached schematic diagrams, too.

The vertical signal fed from ◇2◇ is routed to relay K4101 via [15] and [16] .
The relay is controlled by the DSO signal fed from [147] . In the RTO mode, the AC signal passes through the relay, and fed out to ◇3◇ via [16] and [17] .
This relay is simply switched to the DSO side when the STORAGE switch on the lower left of the front panel is pressed to establish the DSO mode. The signal switched to the DSO side is not always used for all the DSO operations.
The signal is then switched again by the switch circuit of circuit ◇17◇ (described in item 5.13) and it is finally determined whether the signal is used in the DSO mode or not.
When the relay is switched to the DSO mode, the vertical signal is routed to the BUFF 1 circuit via the impedance matching circuit, and the paraphase signal is converted into the single-ended signal.
TR8062 is an emitter follower.
The output of the BUFF 1 is applied to the SAMPLE SW in the next stage. This is a high speed switch which can correspond to the sampling rate. The operation of this switch is controlled by the SW DRIVER. When (A) is high and B is low (Fig. 5-22), the switch is in the close state, and the signal passes through the switch. When A is low and B is high, the switch is in the open state, and the signal does not pass.
The signal which passes through the SAMPLE SW is applied to the BUFFER 2. The BUFFER 2 is of a high input impedance and a low output impedance, and the gain is designed to be 1 correctly. (The output is 1 with respect to the 1 input.)
TR8063 is a source follower and TR8066 is an emitter follower. S/H ADJ RV8060 controls an entire offset. A fine offset control for each mode is made in later steps.
The amplitude of the input of the A/D converter is limited (The maximum amplitude is determined.), and the output of the BUFFER is designed to be 0 ±0.5V. Namely, the voltage of -0.5 to +0.5V at the output point of the BUFFER corresponds to 10 div on the CRT. (Correct A/D conversion is not ensured to the signal in excess of the

voltage range.) The SH CLK signal from [149] is converted into the differential signals (SH CLK and $\overline{\text{SH CLK}}$) by the CURRENT SW. The rising edge of the SH CLK is a sampling point. The SH CLK signal fed from [150] is identical in operation.

Realtime sampling

In the real time sampling mode, the SH1 CLK is always low and $\overline{\text{SH CLK}}$ is high. Consequently, TR8068 is off and TR8069 is on. A goes high and B goes low. Thus, the SAMPLE HOLDER SW is in the close state, and the signal always passes.

Equivalent time sampling

In the equivalent time sampling mode, the SH1 CLK goes high and the SH CLK goes low at the sampling point. Consequently, TR8068 is on and TR8069 is off. (A) in Fig. 5-18 goes low and (B) goes high. Thus the SAMPLE SW is in the open state, and HOLD CAPACITOR C8064 holds the voltage at the sampling point.
Before the $\overline{\text{SH CLK}}$ goes low and the $\overline{\text{SH CLK}}$ goes high at the end of a sweep, the voltage of the HOLD CAPACITOR is converted into the digital signal in the A/D converter (◇18◇and◇19◇) via the BUFFER 2 and the BUFF 4 (◇18◇ and ◇19◇), because the operation speeds of the BUFFER 2, the 2X AMP and the A/D converter are slower than the switching speed of the SAMPLE HOLDER SW.
The CLAMPER (1) is provided to:

(1) limit the voltages at A and B in a given range when the SAMPLE SW is off, and
(2) limit the output range of the BUFFER 2.

TR8065 is an emitter follower, and the clamp voltage tracks the output voltage. The tracking range is limited to ±0.7 by D8067.

5.13 Switching of AD input (◇17◇)

This circuit switches the AD inputs in the DSO mode. Fig. 5-23 is the detailed block diagram. The switching is controlled by four signals: CH CTL 1, CH CTL 2, 100M CTL and EQCTL. These control signals are set as shown Table 5-5.
DLY LINE (2) is used at real-time sampling of 100Msps to delay the signal by 10ns.

(Note) Relationship between the switches and the signals in Fig. 5-23:

- The $\overline{\text{PB0}}$ switches are made on when PB0 is "L".
- The PB0 switches are made on when PB0 is "H".

Table 5-5

TIME/DIV	Sampling		Number of channels	CH CTL 1 (PB0)	CH CTL 2 (PB1)	$\overline{100M\ CTL}$ (PB2)	$\overline{EQ\ CTL}$ (PB3)
	System	Frequency					
50ns to 0.5μs	Equivalent sampling	—	1, 2, 4	*	*	1	0
1μs	Equivalent sampling	—	2, 4	*	*	1	0
	Realtime	100MHz	1	*	*	0	0
2μs	Realtime	50MHz	1 ADD	*	*	1	0
			Other than ADD	0	0	1	1
			2				
			4	0 ↓ 1	0 ↓ 1 #1 #2	1	1
4μs	Realtime	25MHz	1 ADD	*	*	1	0
			Other than ADD	0	0	**	1
			2			1	
			4	1			
5μs to 0.1s	Realtime	25MHz to 1kHz	1 ADD	*	*	1	0
			Other than ADD	0	0	**	1
			2	*		1	
			4	1			
ROLL 0.2s to 50s	Realtime	500Hz to 2Hz	1 ADD	*	*	1	0
			Other than ADD	1	0	**	1
			2, 4			1	

* Any setting is acceptable, but the signal is set to 0.

** Any setting is acceptable, but the signal isset to 0.

#1 First data acquired

#2 Second data acquired

5.14 A/D, SAMPLING PULSE, AND TIME BASE (⟨18⟩, ⟨19⟩, and ⟨20⟩)

For this circuit, refer to detailed block diagram Fig. 5-27, simplified schematic diagram Fig. 5-28, waveform timing chart Fig. 5-24, signal route diagrams Figs. 5-25 (a) to (h), ROLL mode diagram Fig. 5-26, and Tables 5-6 to 5-10.

5.14.1 BUFF 4, A/D, and LINE MEM (Refer to Fig. 5-28.)

BUFF 4

The S/H (sample holder) output of around zero volts is fed to the input (TR5201 base) of BUFF 4 (A) via [157].

The signal around +2.5V (+2.5V±1V) which is suitable to the A/D input in the following stage is fed out from BUFF 4 (A).
The amp gain of BUFF 4 (A) is approximately 3 times, and controlled by AD1 GAIN RV5201. The CURRENT SOURCE (1) consisting of TR5202 and its peripheral circuits functions to offset the center of the output voltage of this amp to +2.5V.
To make the center voltages in the real-time sampling (normal sampling) mode and the equivalent sampling mode equal, the offset voltages in both modes are controlled by AD1 NORM OFFSET RV5202 and AD1 EQ OFFSET RV5203. These two controls are switched by the ANALOG SW (1) that is controlled by the EQ CK EN signal.
As the A/D (2) is not used in the equivalent sampling mode, the switch of this kind is not provided for BUFF 4 (B).
The upper and lower limits of the output voltage of BUFF 4 (A) are controlled by TR5206 and TR5207, respectively. Normally, the voltage between the base and emitter of each limiter is biased reversely, and both transistors are in the off state.

A/D CONVERTER

The input range of the A/D (1) is from +1.5 to +3.5V.
Consequently, the lower limit voltage is applied to the V_{RT} terminal from the VOLTAGE FOLLOWER (1), and the upper limit voltage is applied to the V_{RB} terminal from the VOLTAGE FOLLOWER (2). The A/D (1) is an 8-bit flash A/D converter, and the A/D conversion is performed at each rising edge of the A/D clock signal.

LINE MEMORY

The LINE MEM (1) is a 2KB (2048 words x 8 bits) serial access memory (SAM).
As this circuit incorporates the counter for address memory generation, the external address signal is not needed, and the address scan becomes the serial access.
The internal address counter increments the address one by one from the clock pulse and is resets to zero address by the reset pulse. After data is written in address zero to 2047, the internal counter is reset to zero, and data is written.

5.14.2 Equivalent sampling pulse generator circuit (Refer to Fig. 5-28 and Fig. 5-24.)

This circuit generates SH CLK as the sampling pulse for real-time sampling and EQS CLK as the sampling pulse for equivalent sampling.
COUNTER IC5302 is a 12-stage binary counter. This counter is activated at the falling edge of the clock input (CK). When the clear input (CLR) goes high, the counter is reset regardless of the clock input, and all the outputs go low.
The (A SWEEP) GATE signal from 61 is fed to CK of this counter. This gate signal is developed, based on the trigger

signal in the RTO mode. Therefore, this counter is counted at each sweep.

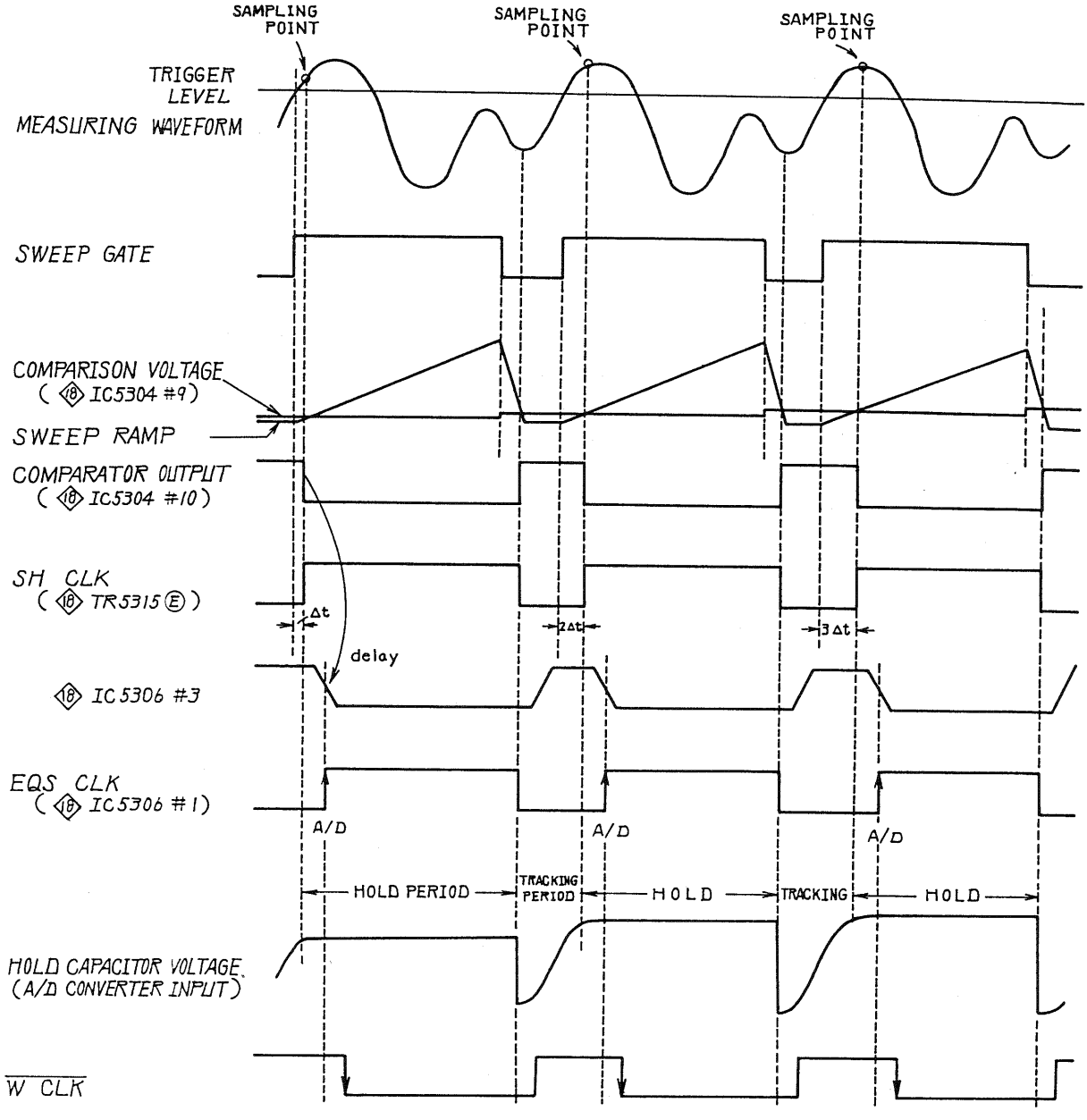


Fig. 5-24 Equivalent time sampling

The counter output is converted into the analog signal by D/A RM5301, and fed to the ⊕ input terminal of COMPARATOR IC5304 via AMP IC5303. This ⊕ input voltage increases every sweep. On the other hand, the SWEEP RAMP signal as shown in Fig. 5-24 is fed to the ⊖ input terminal.

When the SWEEP RAMP voltage exceeds the COMPARISON VOLTAGE fed to the ⊕ terminal, the "L" is output from the COMPARATOR.

The COMPARATOR output is fed to ◇16 as the SH CLK via IC5306 (2/2) and the BUFF & LVL CONV. The rising edge of the SH CLK becomes a sampling point.

In the BUFF & LVL CONV, a TTL level is converted into an ECL level. Whether the SH CLK is fed out or not is determined in IC5306 (2/2) by the EQ CK EN signal, which goes high in the equivalent sampling mode.

Part of the COMPARATOR output becomes the EQS CLK (equivalent sampling clock) via IC5314 (2/2) and IC5306 (1/2). In the equivalent sampling mode, the EQS CLK is fed to the CLK terminal of the A/D (1), and its rising edge performs the A/D conversion.

The A/D conversion is performed a little behind the sampling point by the delay circuit consisting of R5314 and C5409.

5.14.3 Time base (Refer to Fig. 5-28, Figs. 5-25 (a) to (h) and Tables 5-6 to 5-10.)

(1) OSC

The 20MHz pulse is always fed out from the terminal F of OSC (2) X4002.

The pulse obtained by dividing this pulse is fed out from the terminal D.

The output frequency from the terminal D is changed according to the TIME/DIV range setting, and controlled by OSC's A, B and C.

Table 5-6 shows the relationship between these control signals and terminal D outputs.

Table 5-6

TIME/DIV		Sampling system	Number of channles	OSC (2) x 4002				
				OSC A	OSC B	OSC C	Dividing radio	D output
50ns to 0.5μs		Equivalent	1, 2, 4	-	-	-	-	-
1μs		Equivalent Real time	2, 4 1	- 0	- 0	- 0	- 2	- 10MHz (20M ÷ 2)
2μs to 0.1s		Real time	1, 2, 4	0	0	0	2	10MHz
ROLL	0.2s to 5s	Real time	1, 2, 4	1	1	0	16	1.25MHz (20M ÷ 16)
	10s			0	0	1	32	625kHz (20M ÷ 32)
	20s			1	0	1	64	312.5kHz (20M ÷ 64)
	50s			1	1	1	256	78.125kHz (20M ÷ 256)

The 25MHz pulse is fed out from OSC(1)x4001. The 12.5MHz pulse is obtained by dividing the 25MHz pulse by 2 and fed out from IC4003 (2/2). 25MHz, 20MHz or 12.5MHz is fed out to the 25M/20M/12.5M line through the gate consisting of IC4001, IC4002 and IC4003. This gate is controlled by both the 25MCTL and 25MDIV. Table 5-7 shows the relationship between these control signals and output signals of 25M/20M/12.5M line.

Table 5-7

TIME/DIV	Sampling system	Number of channels	25M CTL	25M DIV	25M/20M/12.5M (IC4002 11)
50ns to 0.5μs	Equivalent	1, 2, 4	0	0	20MHz
1μs	Equivalent	2, 4	0	0	20MHz
	Real time	1	1	0	25MHz
2μs	Real time	1, 2, 4	1	0	25MHz
4μs	Real time	2, 4	1	0	25MHz
		1	1	1	12.5MHz
5μs to 0.1s	Real time	1, 2, 4	0	0	20MHz
0.2s to 50s (ROLL)	Real time	1, 2, 4	0	0	20MHz

(2) COUNTER (IC5310) AND SELECTOR (IC5550 and IC5309)

COUNTER/TIME IC5310 is a programmable counter/timer and has three 16-bit counters. The counter 0 (CLK 0, GATE 0 and OUT 0) is used as a divider, and the counter 1 (CLK 1, GATE 1 and OUT 1) is used as a pretrigger timer.

The used counter is selected by A0 and A1.

Data is sent to D0 to D7 in three parts per processing.

1st ... To which function data is used (counter or timer)

2nd... 8-bit data (including the dividing ratio per TIME/DIV setting)

3rd...8-bit data

16 bits in total

The maximum input frequency of COUNTER/TIMER IC5310 is 10MHz, and its maximum output frequency is 5MHz.

Consequently, the OSC output is fed to SELECTOR 2 IC5309 directly or via the counter 0 of the COUNTER/TIMER according to the TIME/DIV setting.

SELECTOR (1) IC5550 is controlled by the $\overline{\text{CHOP}}$ signal.

The $\overline{\text{CHOP}}$ signal is always "L" in the RTO mode and always "H" in the DSO mode.

The ALT CK signal is a pulse only when the number of channels is 2 or 4 in the equivalent sampling mode in the DSO mode. The signal is "L" in the other modes (including RTO).

SELECTOR (2) IC5309 is controlled by SEL A and CK SEL B as shown in Table 5-8.

Table 5-8

Select input		Data input				Strobe Output	
B	A	C0	C1	C2	C3	$\overline{G}$	Y
X	X	X	X	X	X	H	L
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
L	H	X	L	X	X	L	L
L	H	X	H	X	X	L	H
H	L	X	X	L	X	L	L
H	L	X	X	H	X	L	H
H	H	X	X	X	L	H	L
H	H	X	X	X	H	L	H

The pulses fed out from 1Y of IC5309 finally become the AD clocks (A/D 1 CLK and A/D CLK) and the write clocks ($\overline{\text{W CLK 1}}$ and $\overline{\text{W CLK 2}}$). The pulse fed out from the 2Y terminal of IC5309 finally becomes the clock counting the number of samples.

(3) 50Msps and 100Msps (Refer to Fig. 5-28.)

The maximum sampling rate of one A/D converter is 25Msps. Thus, to realze the sampling rate of 50Msps or 100Msps, the following (i) and (ii) methods are employed.

(i) 50Msps

One pair of A/D converters are comprised of two A/D converters, and the A/D clock of reversed polarity is supplied to each A/D converter.

(ii) 100Msps

Two pairs of the above A/D converters are used. The input signal to one pair of the converters is delayed from the input to the other pair of the converters. DLY LINE (2) of ◇17◇(Fig. 5-23) is the delay line for this purpose.

The circuit determining the polarity of the above (i) A/D clock is described below.

IC5316 (4/4) and IC5316 (3/4) form the gate circuit. When the OUT 1 output fed to pin 13 goes low, the clock (1Y output of IC5309) fed to pin 9 passes through this gate.

This clock enters exclusive OR circuit IC5314 (4/4) at pin 10, and exclusive OR circuit (2/4) at pin 5. As pin 9 of IC5315 is low, the clock fed to pin 10 is fed out from pin 8 as is, resulting in

the $\overline{\text{W CLK 1}}$.

When the 50M ADC signal fed to pin 4 goes low, the clock fed to pin 5 is fed out from pin 5 as is, resulting in the $\overline{\text{W CLK 2}}$.

In this case, the $\overline{\text{W CLK 1}}$ and the $\overline{\text{W CLK 2}}$ are quite identical.

When the 50M ADC signal is high, the clock fed to pin 5 is reversed and fed out from pin 6, resulting in the $\overline{\text{W CLK 2}}$.

In this case, the phase of the $\overline{\text{W CLK 1}}$ is opposite to that of the $\overline{\text{W CLK 2}}$.

The relationship between the A/D1 CLK and the A/D2 CLK is the same as that between the $\overline{\text{W CLK 1}}$ and the $\overline{\text{W CLK 2}}$.

(4) TIME/DIV and sampling frequency

Table 5-9 and Table 5-10 show the relationship between the TIME/DIV set value and the sampling frequency. Table 5-9 shows the case where the number of the display channel is one, and Table 5-10 shows the case where the number of the display channels is two or four.

Fig. 5-25 (a) to Fig. 5-25 (h) show the pulses used and their routes.

The phase of the A/D clock is controlled by the 50M ADC signal. When the signal is H, the phases of A/D (1) and A/D (2) clocks are opposite.

When the $\overline{\text{100M CTL}}$ signal is "L", the input signal to one pair of A/D converters is delayed from the input signal to the other pair of A/D converters by 10ns.

Table 5-9 When number of channel is one (DSO mode)

TIME/DIV		IC5310			$\overline{\text{CHOP}}$	ALT CK	CK SEL A	CK SEL B	SELECTOR (1) IC5550 (2) IC5309	IC5309-Y1 (A/D CLK to one A/D)	50M ADC	A/D CLK for one pair of A/Ds	$\overline{\text{100M}}$ $\overline{\text{CTL}}$	Sampling frequency
		CLK 0 (D OUTPUT)	Dividing ratio	OUT 0										
50ns-0.5μs		*	*	*	H	L	H	H	Fig.5-25(a)	EQS CLK	L	EQS CLK	H	EQS CLK
1μs		*	*	*	"	"	L	L	Fig.5-25(b)	25MHz	H	50MHz	L	100MHz
2μs		*	*	*	"	"	"	"	"	25MHz	"	50MHz	H	50MHz
4μs		*	*	*	"	"	L	"	Fig.5-25(b)	12.5MHz	"	25MHz	"	25MHz
5μs		*	*	*	"	"	H	L	Fig.5-25(c)	10MHz	"	20MHz	"	20MHz
10μs		10MHz	2	5MHz	"	"	L	H	Fig.5-25(d)	← Same as OUT 0)	"	←x2 (OUT 0)	"	←x2 10MHz
20μs		"	4	2.5MHz	"	"	"	"	"	"	"	"	"	5MHz
50μs		"	10	1MHz	"	"	"	"	"	"	"	"	"	2MHz
0.1ms		"	20	500kHz	"	"	"	"	"	"	"	"	"	1MHz
0.2ms		"	40	250kHz	"	"	"	"	"	"	"	"	"	500kHz
0.5ms		"	100	100kHz	"	"	"	"	"	"	"	"	"	200kHz
1ms		"	200	50kHz	"	"	"	"	"	"	"	"	"	100kHz
2ms		"	400	25kHz	"	"	"	"	"	"	"	"	"	50kHz
5ms		"	1,000	10kHz	"	"	"	"	"	"	"	"	"	20kHz
10ms		"	2,000	5kHz	"	"	"	"	"	"	"	"	"	10kHz
20ms		"	4,000	2.5kHz	"	"	"	"	"	"	"	"	"	5kHz
50ms		"	10,000	1kHz	"	"	"	"	"	"	"	"	"	2kHz
0.1s		10MHz	20,000	500Hz	"	"	"	"	Fig.5-25(d)	"	H	←x2	"	1kHz
ROLL	0.2s	1.25MHz	2,500	500Hz	"	"	"	"	Fig.5-25(e)	"	L	← (Same as OUT 0)	"	← 500Hz
	0.5s	"	6,250	200Hz	"	"	"	"	"	"	"	"	"	200Hz
	1s	"	12,500	100Hz	"	"	"	"	"	"	"	"	"	100Hz
	2s	"	25,000	50Hz	"	"	"	"	"	"	"	"	"	50Hz
	5s	1.25MHz	62,500	20Hz	"	"	"	"	"	"	"	"	"	20Hz
	10s	625kHz	62,500	10Hz	"	"	"	"	"	"	"	"	"	10Hz
	20s	312.5kHz	62,500	5Hz	"	"	"	"	"	"	"	"	"	5Hz
	50s	78.125kHz	39,062.5	2Hz	H	L	L	H	Fig.5-25(e)	←	L	←	H	2Hz

Table 5-10 When number of channels are two or four (DSO mode)

TIME/DIV	IC5310			$\overline{CHOP}$	ALT CK	CK SEL A	CK SEL B	SELECTOR (1) IC5550 (2) IC5309	IC5309-Y1 (A/D CLK to one A/D)	50M ADC	A/D CLK for one pair of A/Ds	$\overline{100M}$ $\overline{CTL}$	Sampling frequency
	CLK 0 (D OUTPUT)	Dividing ratio	OUT 0										
50ns-0.5μs	*	*	*	H		H	H	Fig.5-25(a)	EQS CLK	L	EQS CLK	H	EQS CLK
1μs	*	*	*	"		H	H	Fig.5-25(a)	EQS CLK	L	EQS CLK	"	EQS CLK
2μs	*	*	*	"	L	L	L	Fig.5-25(b)	25MHz	H	50MHz	"	50MHz
4μs	*	*	*	"	"	"	"	Fig.5-25(f)	25MHz	L	25MHz	"	25MHz
5μs	*	*	*	"	"	L	"	Fig.5-25(f)	20MHz	"	20MHz	"	20MHz
10μs	10MHz	*	*	"	"	H	L	Fig.5-25(g)	10MHz	"	10MHz	"	10MHz
20μs	"	2	5MHz	"	"	L	H	Fig.5-25(h)	← (Same as OUT 0)	"	← (Same as OUT 0)	"	← 5MHz
50μs	"	5	2MHz	"	"	"	"	"	"	"	"	"	2MHz
0.1ms	"	10	1MHz	"	"	"	"	"	"	"	"	"	1MHz
0.2ms	"	20	500kHz	"	"	"	"	"	"	"	"	"	500kHz
0.5ms	"	50	200kHz	"	"	"	"	"	"	"	"	"	200kHz
1ms	"	100	100kHz	"	"	"	"	"	"	"	"	"	100kHz
2ms	"	200	50kHz	"	"	"	"	"	"	"	"	"	50kHz
5ms	"	500	20kHz	"	"	"	"	"	"	"	"	"	20kHz
10ms	"	1,000	10kHz	"	"	"	"	"	"	"	"	"	10kHz
20ms	"	2,000	5kHz	"	"	"	"	"	"	"	"	"	5kHz
50ms	"	5,000	2kHz	"	"	"	"	"	"	"	"	"	2kHz
0.1s	10MHz	10,000	1kHz	"	"	"	"	"	"	"	"	"	1kHz
ROLL 0.2s	1.25MHz	2,500	500Hz	"	"	"	"	"	"	"	"	"	500Hz
ROLL 0.5s	"	6,250	200Hz	"	"	"	"	"	"	"	"	"	200Hz
ROLL 1s	"	12,500	100Hz	"	"	"	"	"	"	"	"	"	100Hz
ROLL 2s	"	25,000	50Hz	"	"	"	"	"	"	"	"	"	50Hz
ROLL 5s	1.25MHz	62,500	20Hz	"	"	"	"	"	"	"	"	"	20Hz
ROLL 10s	625kHz	62,500	10Hz	"	"	"	"	"	"	"	"	"	10Hz
ROLL 20s	312.5kHz	62,500	5Hz	"	"	"	"	"	"	"	"	"	5Hz
ROLL 50s	78.125kHz	39,062.5	2Hz	H	L	L	H	Fig.5-25(h)	←	L	←	H	2Hz

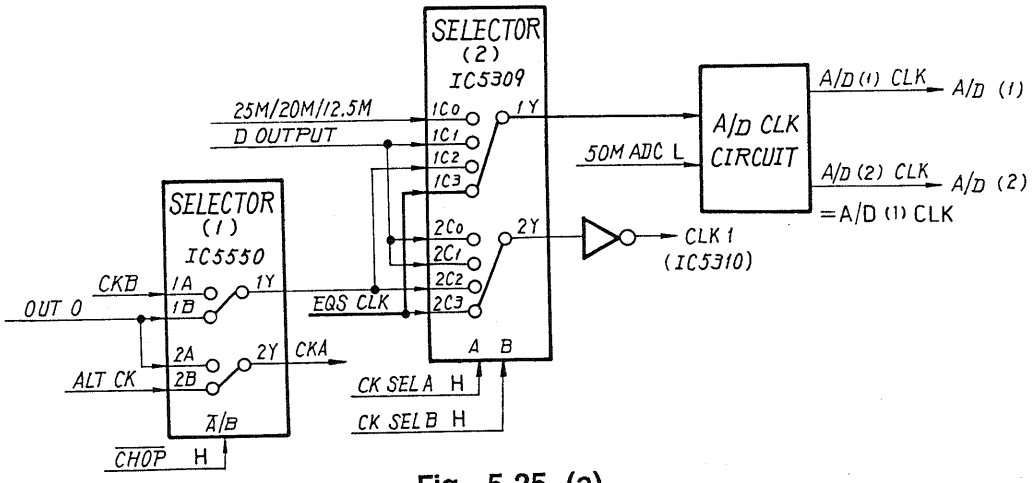


Fig. 5-25 (a)

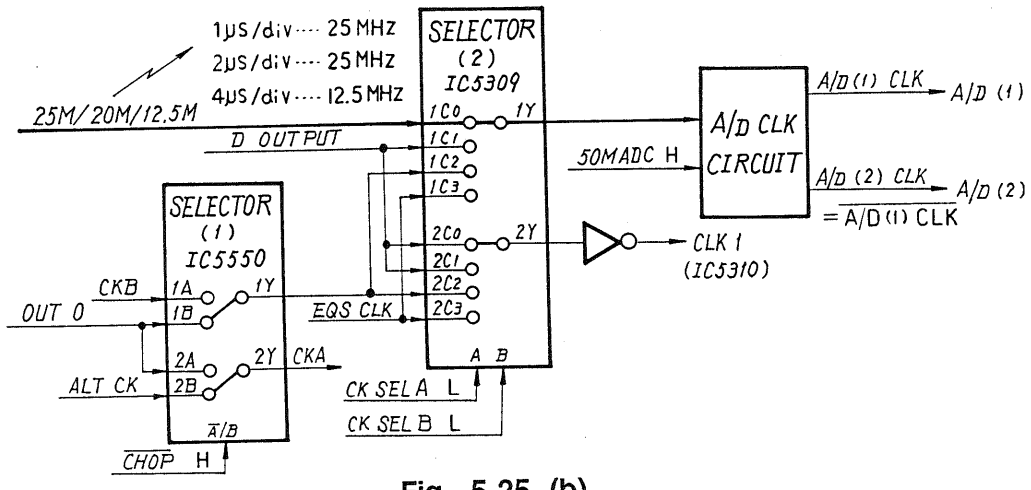


Fig. 5-25 (b)

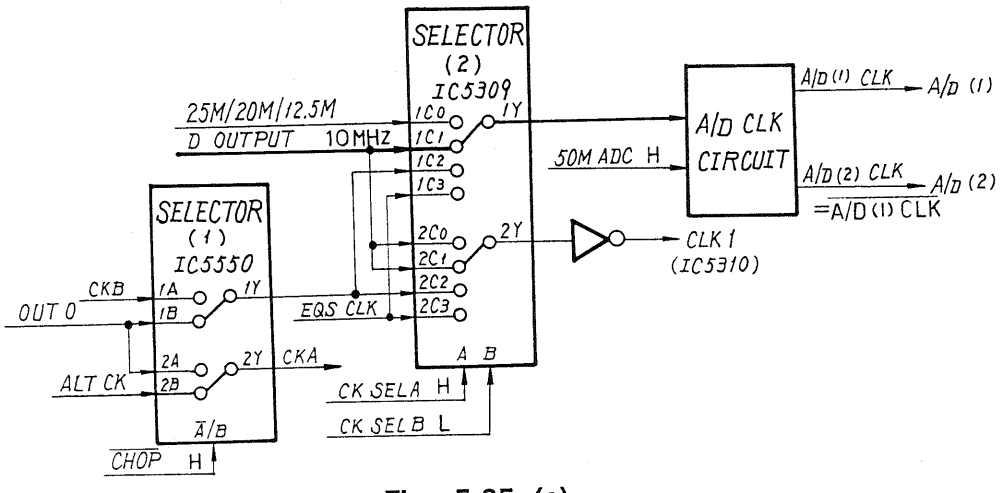


Fig. 5-25 (c)

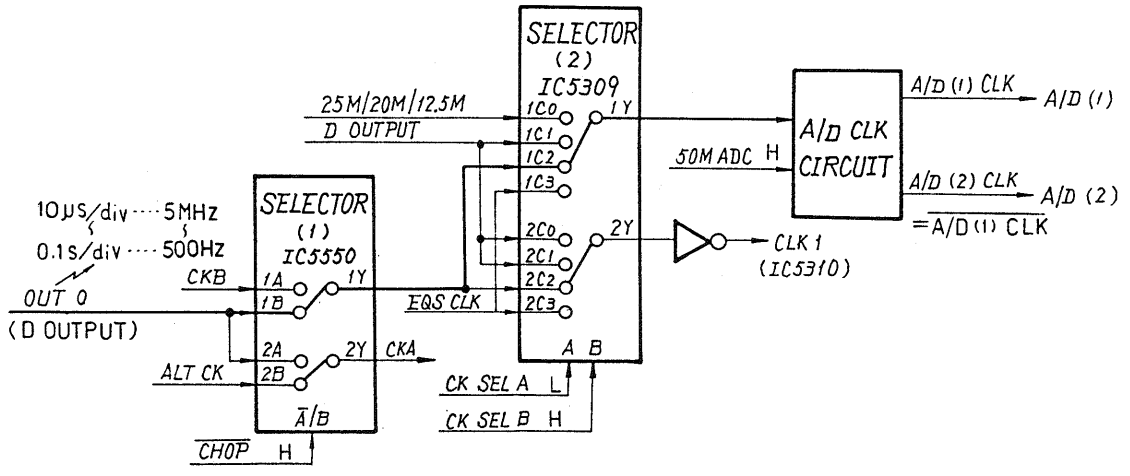


Fig. 5-25 (d)

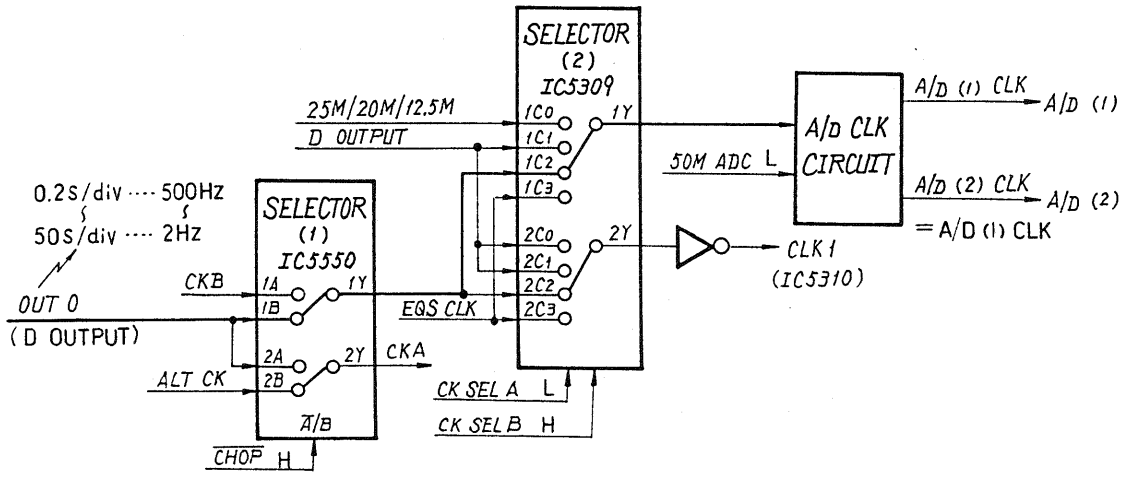


Fig. 5-25 (e)

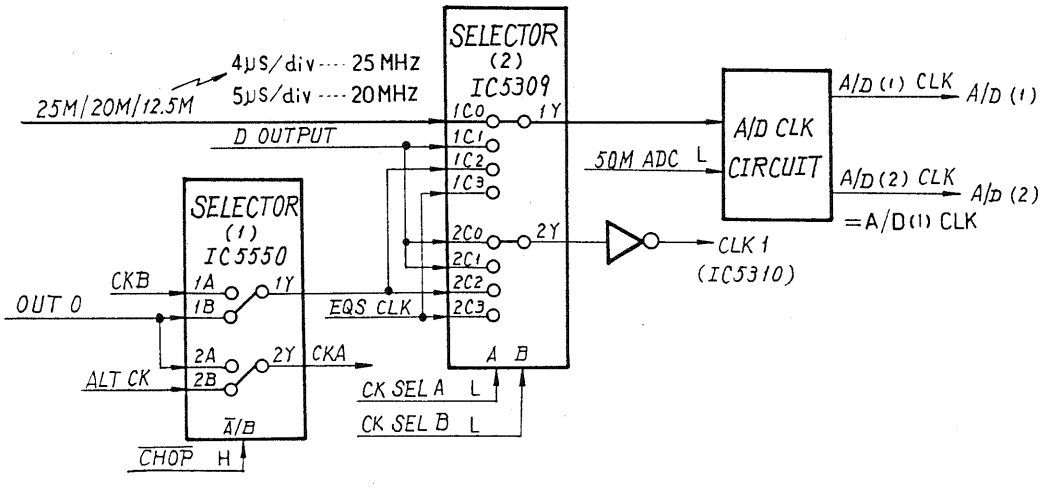


Fig. 5-25 (f)

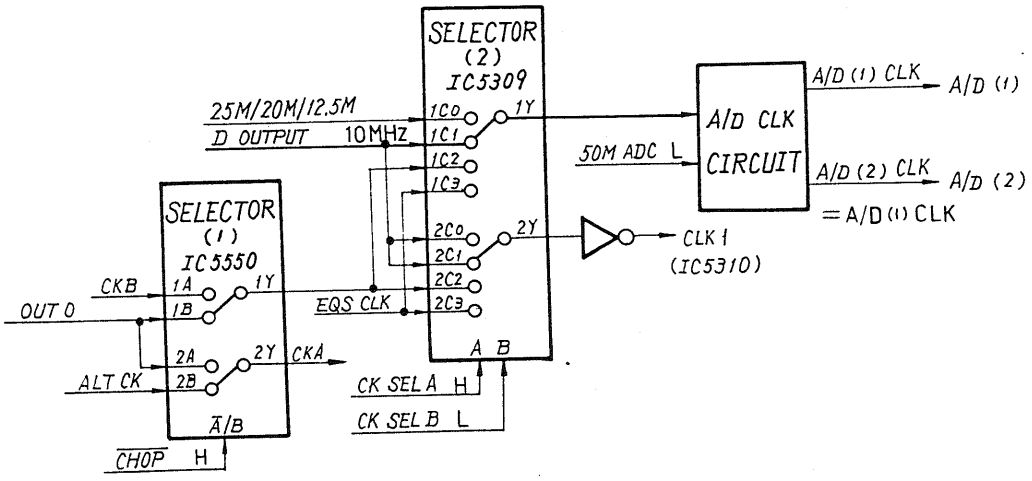


Fig. 5-25 (g)

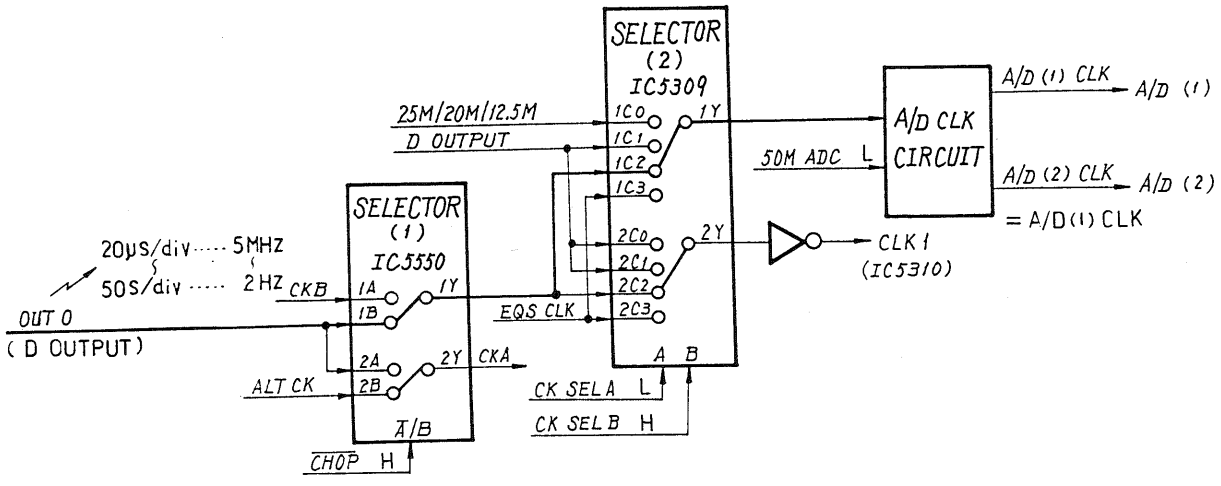


Fig. 5-25 (h)

(5) Write to LINE MEM and read of LINE MEM (Fig. 5-28)

Pin 12 of IC5313 (3/4) is low except for the ROLL mode.

Consequently, the $\overline{\text{WCLK1}}$ fed to pin 13 is fed out from pin 11 as is, and fed to pin 2 of IC5312 (1/4) and pin 5 of IC5312 (2/4). During the write period, as the $\overline{\text{ACQ1RD}}$, $\overline{\text{IORD}}$ and $\overline{\text{ACQ2RD}}$ are all high, the $\overline{\text{WCLK1}}$ is fed out from IC5312 (1/4) and IC5312 (2/4) as is, resulting in the $\overline{\text{R CLK1}}$ and the $\overline{\text{RCLK2}}$, respectively. As described above, the write clock and the read clock are identical during the write period. During the read period, the $\overline{\text{ACQ1RD}}$, $\overline{\text{IORD}}$ and $\overline{\text{ACQ2RD}}$ go low at the respective timings. Consequently, the $\overline{\text{RCLK1}}$ and the $\overline{\text{RCLK2}}$ are controlled by IC5313 (2/3) and IC5313 (1/3), respectively. $\overline{\text{OE1}}$ connects the LINE MEM(1) to the data bus during the read period.

(6) Stop of data update of LINE MEM (Refer to Fig. 5-28.)

Normally, the contents of the LINE memory is updated one by one according to the realtime sampling. However, it happens to stop the data update in the course of processing. For example, this happens when memory is reset or when the setting of TIME/DIV is changed.

Such stop of data update is made by COUNTER1 of COUNTER/TIMER IC5310, FF1 IC5308 (1/2), FF2 IC5318, etc. These circuit operations are shown below.

(i) To stop the data update of LINE MEM, set the TRIG EN1 signal to H. As a result, both D1 and R1 of FF1 also go "H".

(ii) The state of D1 is latched by the rising edge of the GATE (A sweep gate) signal fed to CK1 of FF1, then Q1 goes "H".

(iii) The signal is synchronized with the write clock ($\overline{\text{WCLK1}}$) by FF2 of the next stage, then this "H" signal is fed out from Q. As a result, GATE1 of IC5310 changes from "L" to "H".

(iv) When the 1024 clocks are fed to CLK1 after GATE1 changes to "H", OUT1 changes from "L" to "H". (The clock frequency fed to CLK1 depends on the set value of TIME/DIV and the number of the display channels.)

(a) While OUT1 is "L", the 1Y output can pass through the gate IC5316 (3/4 and 4/4). Accordingly, the write clock is supplied to LINE MEMO to continue to update data.

(b) When OUT1 goes "H", pin 8 of IC5316 (3/4) is finally held "H", and the 1Y output of SELECTOR(2) cannot pass through gate IC5316 (3/4 and 4/4). Accordingly, the supply of the write clock to LINE MEMO is stopped and data acquisition to LINE MEMO is also stopped.

(7) TRG10M and TRG20M (Refer to Fig. 5-28.)

COUNTER/TIMER IC5310 has restriction that the maximum input frequency is 10MHz. On the other

hand, the instrument performs samplings of 20Msps, 25Msps, 50Msps, and 100Msps which exceed the maximum frequency. Therefore, in these samplings, the number of sampling clocks cannot be directly measured by IC5310. Because of this, the above countings are performed by using the TRG10M and TRG20M signals fed out from the time measurement circuits FF3 and FF4. Actually, the phase relationship between the sampling clocks and the trigger signals (the rising edge of the GATE signal fed to FF1) for LINE MEM is checked based on the status of both the signals.

(8) ROLL operation (Refer to Fig. 5-28.)
When TIME/DIV is set within the range from 0.2s/div to 50s/div, the ROLL operation is automatically performed.
The outline of the ROLL operation is described below, using Fig. 5-26.

(i) Whenever LINE MEM receives one data, LINE MEM transfers the data to the buffer memory in RAM, "The period in which LINE MEM receives one data" and "the period in which LINE MEM stops receiving and transfers one data to the buffer memory" are controlled by the $\overline{\text{INT 0}}$ signal.

(ii) In this way, data is accumulated in the buffer memory in the RAM for a certain time (t1). (The number of accumulated data depends on the set value of TIME/DIV.)

(iii) At the unit (DU1) of the accumulated quantity of data , thedata of memory for ROLL in the same RAM is updated. The memory for ROLL in the same RAM is updated. The memory for ROLL is provided to facilitate various kinds of waveform process in the ROLL mode.

(iv) Then, at the same unit (DU1) of the quantity of data, the data in the display memory in the RAM is updated. Since data of only one waveform is stored in the display memory, only the quantity of DU1 out of one waveform data is updated.

(Note) When updating data, the data is shifted so that the oldest data is stored at address 0 in both the memories for ROLL and display.

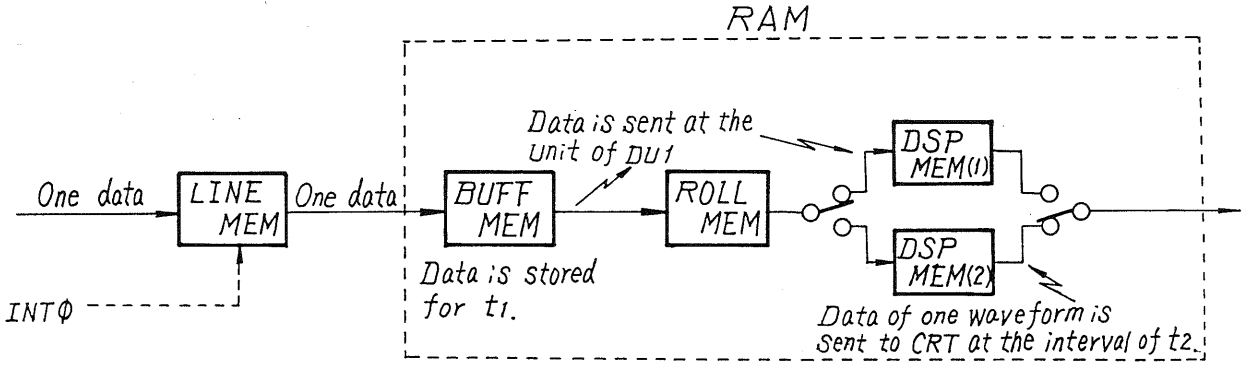


Fig. 5-26

(v)While DSP MEM(1) is updated, the contents of DSO MEM(2) are displayed on the CRT. The contents of DSP MEM(2) continue to be fed to the CRT at constant intervals (t2).

(vi) When the data update of DSP MEM(1) is finished, the switch of DSP MEM is changed and the contents of DSP MEM(1) are displayed on the CRT.
Items (v) and (vi) are repeated thereafter.

The operation of the interrupting signal $\overline{INT0}$ is described below.
(Refer to Fig. 5-28.)

(a) When acquiring data to LINE MEM, WE CTL (Write Enable Control) goes "H".

(b) The reset state of FF5 and FF6 is thus cancelled, and D5 of FF5 also goes "H".

(c) The state of D5 is latched at the rising edge of the clock fed to CK5, and Q5 goes "H".

(d) Q6 of FF6 is made "H" at the rising edge of the clock next to the clock fed to the above CK5.

(e) The ROLL signal is in the "L" state in a mode other than the ROLL mode, and pin 8 of IC5312 (3/4) thus goes "L".

(f) Therefore, $\overline{INT0}$ fed from $\overline{Q7}$ of FF7 goes "H".

When acquiring data to LINE MEM, $\overline{INT0}$ goes "H".

(g) The output of set-reset FF consisting of IC5316 (1/4 and 2/4)and IC5305 (2/5) is also "L".

(h) After a certain time elapses from the establishment of ROLL mode, the ROLL signal goes "H".

(i) Pin 8 of IC5312 (3/4) thus goes "H". At this point, $\overline{INT0}$ remains "H".

(j) $\overline{INT0}$ is changed from "H" to "L" at the rising edge of the clock fed to CK7 of FF3 thereafter.

(k) When the digital MPU detects that $\overline{INT0}$ becomes "L", it issues the instruction "Read the data of LINE MEM."

When reading the data of LINE MEM, $\overline{INT0}$ goes "L".

(l) Then, $\overline{ACQRD}$ and $\overline{IORD}$ go "L", and "L" is fed out from pin 11 of IC5312(4/4).

(m) As a result, FF7 is reset, and $\overline{INT0}$ is changed from "L" to "H".
This completes reading one data in the ROLL mode, and the ready state for acquiring next data is established.

5.15 Digital MPU(1) and (2) (◇20 and ◇21) DISP CONT(1) and (2) (◇22 , ◇23 and ◇26) FRONT PANEL (DSO) (◇24)

For this circuit, refer to the detailed block diagrams Figs. 5-29, 5-30 and 5-31. MPU IC5501 for the DSO is a CMOS 8-bit microprocessor, which has a high speed CPU, memory management unit (MMU), two direct memory access controllers (DMAC), timer, etc. The major functions of the MPU for the DSO include:

(i) Display of data

(ii) Control of the digital section

(iii) Communications with the MPU for the

RTO (transfer of data)

(vi) Interface with external equipment

5.15.1 Control of display

The area of the ACQ memory, the display memory, the save waveform memory, etc. are allotted in RAM IC5503. The waveform data (2KB) is transferred from the LINE memory to the buffer memory. Then the range 1KB to display one waveform data from the 2KB data by the H POS. This 1KB waveform data is transferred to the display memory. One frame is approximately 20ms. One frame includes the data of waveforms, characters, cursors, etc. The number of waveforms whose data is included in one frame is determined by operating modes (one channel, multi-channel, save mode, etc.). The maximum number of waveforms is four.

The display of one waveform is described in (1) to (3).

(1) Display in the Y direction of one waveform.

The waveform data in the display region of RAM IC5503 in Fig. 5-29 or 5-30 is fed out in sequence to OUTPUT CONTROLLER IC5518 in Fig. 5-31 by the DMAC. The DMAC has the start and stop addresses of the display region.

The DMAC generates addresses and updates the addresses successively (outputs the next address). The DMAC built in this MPU can transfer one data at 7 clock (0.8μs approx.).

The MPU and the DMAC have the common data bus and address bus. Therefore, they uses the buses at the time division basis. In the instrument, the MPU and the DMAC use the buses alternately at every data transfer.

The MPU detects that the DMAC is requested when the $\overline{\text{DREQ}}$ signal (DMAC Request) goes low and admits the use of the buses to the DMAC. Then, the DMAC lets the address bus to generate the start address, read one waveform data in the RAM, and transfer it to OUTPUT CONTROLLER IC5518. (The start address is previously established in the DMAC.)

The GATE 2 of TIMER IC5504 of ◇14◇ goes high every time when one waveform data is written in IC5518. When the GATE 2 goes high, the OUT 2 goes low.

Consequently, the $\overline{\text{DREQ}}$ goes high and the request to the DMAC is released.

When the specified number of clocks is fed to the CLK 2, the OUT 2 goes back high. Accordingly, the $\overline{\text{DREQ}}$ goes low, and the DMAC is requested again.

Then, the DMA cycle for the next waveform data output starts again.

The address is incremented every cycle.

The time between the data points is the sum of the DMA cycle (7 clocks), the count time of the TIMER 2 (GATE 2, CLK 2, OUT 2), and the reception time of the $\overline{\text{DREQ}}$. It is 3.2μs approx.

One waveform data is displayed by repeating the above processes until the stop address. (The stop address is also established previously in the DMAC.)

(2) Display of one waveform in the X direction (Refer to Fig. 5-31.)

The MPU for the DSO incorporates two DMAC's : DMAC 0 and DMAC 1. The

display in the X direction is controlled by DMAC 0 and that in the Y direction is controlled by DMAC 1. The zero address of the display memory is selected to be such an address that all of the lower 10 bits is zero.

Thus, the D/A (2) output becomes the stairstep waveform that starts from zero volts.

The above 10-bit address is latched by the address latches LATCH 2 and LATCH 3 in Fig. 5-31. IC 5514 controls all the address (upper and lower addresses), and IC5512 controls the lower address. In case of the waveform display, both LATCH 2 and LATCH 3 perform the latch operation.

The PC port of the OUTPUT CONTROLLER is in the input state by means of the MPU, and the signal is not output from the PC port to D/A (4).

As described above, in case of the waveform display, the Y-direction signal is fed to D/A (1) from the PA port of the OUTPUT CONTROLLER, and the X-direction signal is fed to D/A (2) from LATCH 2 and LATCH 3.

(3) Intensity control for the waveform display

IC5514 in Fig. 5-31 controls the Z signal. In case of the waveform display, pins 10 and 11 of IC5514 are low. The DREQ signal fed to pin 9 continues to be low only for the time determined by the counter 1 (GATE 1, CLK 1, OUT 1) of TIMER IC5504 in Fig. 5-29 or 5-30. During this period, one piece of data is bright.

(4) X-Y operation (Refer to Fig. 5-31.)

In this operation mode, the CH1 signalbecomes the X signal, and the CH2 signal becomes the Y signal. Like the Y signal in the waveform display mode, the Y signal is fed to D/A (1) from the PA port of the OUTPUT CONTROLLER. The X signal is fed to D/A (4) from the DC port of the OUTPUT CONTROLLER. In this case, the outputs of LATCH 2 and LATCH 3 are in high impedance state and not connected electrically with D/A (4).

(5) Display of characters (Refer to Fig. 5-31.)

One character consists of 3 bits each for the X and Y directions. The 3 bits in the X direction are output from terminals PB3 - PB5 of the OUTPUT CONTROLLER and converted into the analog signals by D/A (3). The 3 bits in the Y direction are output from terminals PB0 - PB1 and converted into the analog signals by D/A (2).

The number of the intensity bit which determines whether or not to brighten each for forming one character is one, which is output from terminal PB6. As described above, 7 bits are used for one character. The character pattern for each character is stored in the ROM at the unit of 8 bits.

The characters of one upper row and two lower rows, 3 rows in total, are displayed on the CRT. The information on position in the Y direction which determines the position of one row is output from terminal PA0 to PA7 and converted into the analog signal by D/A (1).

The 32 positions (5 bits) are set to display characters for one row.

The information on position in the X direction which determines the 32

positions is determined by the 5 bits of the upper address fed out from LATCH 3 to D/A (4). In this case, LATCH 2 is in the prohibit state.

The D/A (1) output whose voltage changes one time per row (every 2.5ms approx.) and the D/A (2) output whose voltage changes every one dot (every 2μs approx.) are added, resulting in the position signal in the Y direction.

Though the X direction of one screen consists of 10 bits (1024 points), the distance between two characters is $2^{10}/2^5 = 2^5$ (5 bits), because 32 characters (5 bits) are positioned with equal distance. In other words, the 5-bit point from the start point of the first character is the start point of the second point. Consequently, the voltage of the D/A (4) output changes every 32 x 2μs = 64μs approx. This D/A (4) output and the D/A(3) output whose voltage changes every one dot (every 2μs approx.) and added, resulting in the position signal in the X direction.

(6) Cursor display (Refer to Fig. 5-31.)

Like the character pattern, the cursor pattern is also stored in the ROM.

In case of the horizontal cursor, the position signal in the Y direction is constant and fed out from terminals PA0 - PA7. Then the output signal is converted into the analog signal by D/A (1). The position signal in the X direction changes and is fed to D/A (4) from terminals PC0 - PC7.

The horizontal cursor consi sts of the 8-bit X-direction signal. In case of the vertical cursor, the Y-direction signal changes and is fed out to D/A (1) from terminal PA0 - PA7. The position signal in the X direction is constant, and 10 bits are required according to waveform. The 10 bits are output from LATCH 2 and LATCH 3 and converted into the analog signal by D/A (4). As described above, the instrument does not require a conventional cursor pattern generator. Consequently, the number of bits is reduced to a minimum, and an affective operation is ensured.

5.15.2 ANALOG SW, MULTIPLEXER (Refer to Fig. 5-31.)

The switches X and Y of ANALOG SW IC5521A and IC5522A are controlled by the $\overline{\text{DOTj}}$ signal, and the smooth on-off switching is made. The signal passes LPF at the time of the smooth on. "Smooth on" or "smooth off " is displayed on the screen by switching the MENU switch at the lower left of the front panel.

The switch Z of ANALOG SW is controlled by the $\overline{\text{DSO1 DSO CONT}}$ signal and the signals of DIGITAL MPU (1) and (2) are switched. MULTIPLEXER is controlled by the DSO signal, and the signal flow is changed according to the RTO mode or the DSO mode.

In case of the RTO, the signal fed to the operational amplifier A side is fed out from MULTIPLEXER. In case of the DSO, the signal fed to the operational amplifier B side is fed out from MULTIPLEXER.

The Y-direction signal (CHR-Y) of characters and cursors or the A/B SEP BIAS signal in the RTO mode is fed to the operational amplifier A of MULTIPLEXER

(1). While, the Y-direction (CHST-Y) signal of waveforms, characters and cursors in the DSO mode is fed to the operational amplifier B.

The X-direction signal (CHR-X) of characters and cursors in the RTO mode is fed to the operational amplifier A in MULTIPLEXER (2). The X-direction signal (CHST-X) of waveforms, characters and cursors is fed to the operational amplifier B.

5.15.3 Control of the DSO switch and RS-232-C CONTROL switch (Refer to Fig. 5-29.)

The descriptions of the 6 DSO switches (S1601 - S1606) at the lower left of the front panel and the 8-circuit DIP switches on the rear follow.

As known from terminals PA0 - PA5 of I/O CONTROLLER IC5506, the status of the two switches can be judged by one line. In other words, the status of the DSO switch and the DIP switch is checked by the MPU for the DSO at some sequence.

When checking the status of the DSO switch, the MPU make the $\overline{\text{R PANEL}}$ signal high and PB6 low. Under this condition, all the switches of S5501 are the same as the off state when viewed from PA terminal side regardless of their actual setting positions.

Consequently, only the PA terminal corresponding to the on switch goes low.

Thus, the MPU judges the switch that is on. Later, the MPU make the corres-ponding terminal among PB0 thru PB5 low, and the LED corresponding to the pressed switch. When checking the DIP switches, the MPU makes the $\overline{\text{R PANEL}}$ signal low and PB6 high. The operation is identical with the DSO switch.

5.16 HV, CRT (⟨12⟩ 2/2)

The detailed block diagram of this circuit is shown in Fig. 5-32. This circuit consists of the following five blocks.

(1) High voltage generation circuit and the voltage regulator circuit (VCO, PULSE AMP, SWITCH, FLYBACK TRANSFORMER & RECTI-FIER, ERROR DETECTOR)
(2) Bias circuit for Grid No.1 (CHOPPER 1, DC RESTORER)
(3) Focus control circuit (VOLTAGE DIVIDER, CHOPPER 2, DC RE-STORER 2, focus and intensity control circuit)
(4) CRT
(5) Others (TRACE ROTATION, ASTIG)

The circuit operations of the above blocks (1), (2), and (3) are described below. For details, refer to the schematic diagram HV, Z, CRT ⟨12⟩ .

(1) High voltage generation circuit and the voltage regulator circuit

(a) Voltage controlled oscillator (VCO)

The VCO supplies a positive pulse voltage from the collector of TR1002 by turning on and off TR1001 and TR1002 alternately. When the power switch is turned on, TR1001 becomes on, and C1004 starts to be charged through R1004. The charging voltage of C1004 rises the emitter voltage of

TR1002 and then TR1002 becomes on. C1004 dis-charges immediately after TR1002 becomes on, the emitter voltage of TR1001 drops, and TR1001 becomes off.

Then, C1004 is charged in the opposite direction through R1003, the emitter voltage of TR1001 rises, and TR1001 becomes on.

These operations are repeated to continue generating the positive pulse.

The period of the pulse is determined by the on/off periods of TR1001 and TR1002. In other words, the period is determined by the time constants of R1003 and C1004, and R1004 and C1004 and the charging current. If the charging current is small, the pulse frequency becomes low, and the pulse width of the positive portion of the output pulse increases. Then, the energy in the primary coil of the FLYBACK TRANS-FORMER (FBT) increases and the output voltage of the secondary coil increases.

(b) PULSE AMP

The positive pulse is amplified by PULSE AMP TR1010, and is supplied to the base of switching transistor TR1013 through pulse transformer T1013. The PULSE AMP amplifies the VCO output up to the level enough to drive the switching transistor and shapes the drive current waveform to minimize the cut-off loss of the switching transistor.

The PULSE AMP also functions as a buffer to prevent the load variation at the output stage of the switching transistor from affecting the VCO.

(c) SWITCH

When the positive pulse is supplied to the base of switching transistor TR1013, TR1013 becomes on, the current which increases linearly flows into the primary coil of the FBT, and the energy is stored.

Even if the switching transistor becomes off, the current continues to flow in the same direction by the inductance inertia of the coil, and C1013 is charged.

The charging current decreases gradually, and the charging voltage becomes maximum when the charging current becomes zero. Then, a discharging current flows in the opposite direction through the coil.

When the voltage on C1013 becomes zero, the discharging current becomes maximum. D1013 becomes conductive by the counter electromotive force of the coil, and the current flows from the coil in the charging direction. The current decreases gradually, and becomes zero again.

Later, TR1013 becomes on by the next positive pulse, and the same circuit operation is repeated. Thus, the alternate current flows into the coil and the voltage is generated at the secondary circuit.

(d) Voltage regulator circuit

This circuit detects a change in the cathode voltage of the CRT, and feeds back the change to the VCO to control the oscillation frequency so that the output voltage is regu-lated.

A small current flows from the base of TR1023 to the cathode line (-1650V

line in the schematic diagram) through R1035. The current is the sum of the base current of TR1023, the current through R1024, and the base current of TR1022.

For example, when the cathode voltage changes in the positive direction, the current flowing across R1035 decreases. Since the base current of TR1023 and the current across R1024 are constant, the base current of TR1022 decreases. Then, the emitter current of TR1022 decreases, and the charging current of C1004 in the VCO also decreases.

Consequently, the oscillation frequency of the VCO becomes low as described in (a), and the cathode voltage of the CRT changes in the negative direction. The secondary output voltage of the FBT is thus regulated by the feed-back loop.

(e) FBT

A half-wave rectified output of 15kV is supplied from the secondary side of the FBT, and is applied to the electrode P3 of the CRT.

A half-wave rectified signal of -1650V is supplied to the cathode.

The heater voltage is connected to the cathode line and is the same electric potential with the cathode voltage. A -350V pulse voltage is obtained to produce the G1 bias voltage and the focus bias voltage.

(2) Bias circuit for Grid No.1 (CHOPPER 1, DC RESTORER 1)

This circuit generates a voltage applied to G1 of the CRT. A pulse voltage is supplied from T1013 via C1040 and R1040. The positive peak voltage is limited to the CRT bias voltage (E_A) by D1040 and the negative peak voltage is limited to the output voltage (E_Z) of the Z-AXIS AMP.

Then, the chopped waveform having the envelope of the difference between E_A and E_Z appears at point P (See the block diagram).

The chopped waveform is supplied to D1043 via C1041, and the positive peak voltage is clamped to the -1650V cathode voltage. The negative peak voltage is rectified by D1042 and D1043 to produce a negative DC voltage. As a result, the signal whose DC level is shifted to the voltage lower than the cathode voltage is supplied to G1. (The waveform of the signal is the same as that of the Z-AXIS AMP output.) The high-frequency component of E_Z is directly supplied to G1 via C1043.

(3) Focus control circuit

This circuit produces a voltage applied to P1 (focus) of the CRT.

The focus voltage is produced with the reference to E_{FR} (-1165V) obtained by dividing the cathode voltage (-1650V) and E_B at the FOCUS CENT control.

Since an optimum focus voltage changes due to the variations in characteristics of the CRT, set E_B so that the optimum focus is obtained when the FOCUS and INTEN controls are set to their respective mid-positions.

A pulse is supplied from T1013 via C1255 and R1260. The positive peak voltage is limited to E_B by D1282 and the negative peak voltage is limited to E_C set by the INTEN and FOCUS

controls.

Then, a chopped waveform having the envelope of the difference between E_B and E_C appears at point Q (see the block diagram).

The chopped waveform is supplied to D1284 via C1256, and the negative peak voltage is clamped to E_{FR} (-1165V). The positive peak voltage is rectified by D1283 to generate a positive DC voltage. As a result, the voltage whose DC level is shifted to the level higher than E_{FR} is produced, and is applied to the P1 electrode as the focus voltage.

The relationship between the intensity of the CRT and the voltage for the optimum focus is not linear. Consequently, the change in E_C caused when the INTEN control is adjusted is approximated to the actual CRT character istics using the polygonal line characteristics.

5.17 POWER (⟨13⟩)

Outline

This circuit supplies the voltages to the circuit performing the NON STORE operation.

This circuit is a power supply circuit using a switching regu-lator, and uses hybrid IC IC1501 (STK7308) as a switching circuit.

Fig. 5-33 is the simplified circuit diagram of this circuit.

When switching transistor TR5 in IC1501 is on, the energy is stored in pulse transformer T1501 by the collector current.

The stored energy is emitted to the secondary circuit while TR5 is off. The feedback loop circuit controls the duration of the on and off periods to control the transfer amount of energy, ie, to stabilize the output.

The description of the major functions follows.

(1) Switching operation
(2) Stabilizing operation of output
(3) Protection circuit of switching transistor

(1) Switching operation

The on and off operation is described.

(i) When the power switch is turned to on, the positive voltage is applied to the base of switching transistor TR5 in IC1501 via starting resistors R1503 and R1504, and TR5 is turned to on. Thus, the collector current Ic flows to the primary winding N1 of T1501.

(ii) The voltage induced between terminals 2 (positive) and 3 (negative) turns TR4 to on, increases the base current of TR5, and increases the collector current Ic.

(iii) When the collector current IC of TR5 reaches to saturation, the induced voltage of N2 turns to zero, and TR5 turns to off.

(iv) The energy stored in T1501 becomes a current and fed to thesecondary wiring N4(N5 through N8), and is emitted through D1513.

(v) The voltage induced at N2 (terminal 2: positive) turns TR5 on again.

The above operations are repeated.

The collector current of TR4, ie, the base current of TR5, becomes the constant-current controlled by Zener diode D1514 and resistor R9 in IC1501.

(ZD3 is off because the zener voltage of zener diode D1514 is 2.4V, and that of zener diode ZD3 in IC1501 is 5.1V.)

When the positive feedback induced at N2 exceeds the fixed value, D1515 is conducted and then TR1514 is turned to on.

Thus, the base current of TR4 is decreased, the collector current of TR4, ie, the base current of TR5 is also decreased, and the collector current of TR5 is decreased. These operations prevent the collector current of TR5 from flowing excessively.

(2) Stabilizing operation of output

The DC voltage (approx. -28V) is produced by rectifying the AC voltage fed back from winding N4 to windings N2 and N3 when TR5 is off. This DC voltage is divided, and added to the base of ERROR DETECTOR TR1 to stabilize the voltage of regulator output. In other words, the emitter potential of TR1 maintained constant by zener diode ZD1 is compared with the base potential of TR1 and the error signal is detected.This error signal is ampli-fied by TR2, and supplied to the base of TR3, and the collector current of TR3 is thus controlled.

When the output voltage of the regulator rises, the collector current of TR3 increases, and the base current of TR4 is decreased. Consequently, the base current of TR5 is also decreased and the saturation point of the collector current of TR5 is decreased. In other words, the amount of energy transferred to the secondary circuits of T1501 is reduced by making the on-duration of TR5 short. The voltage across R1502 is supplied to the base of TR2 through R1507 to match the timing to turn TR5 to off, ie, the timing to control the collector current of TR3 with the timing of the peak of the collector current of TR5.

(3) Protection circuit of the switching transistor

Circuit protection after turning power to on

(i) Immediately after the power switch is turned to on, triac thyristor D1502 is off, and the charging current of C1508 (and C1509) flows toR1501. This prevents the rush current from doing damage to the circuits.

The voltage induced at N2 is supplied to D1502 as a negative trigger pulse. Then, D1502 turns to on, and this power circuit becomes a steady state.

(ii) Immediately after the power switch is turned to on, the base voltage of TR1 is much highe than the emitter voltage of TR1, compared with the steady operation state, because the charging speed of C1508 and C1507 is different.

As a result, the collector current of

TR3 increases, and the base current of TR4 decreases. The base current of TR5 decreases, and the collector current of TR5 is limited to a small amount. After C1508 and C1507 are charged, this power circuit becomes a steady state.

Circuit for protecting the excessive current

D1502 is a 3.0V zener diode, and determines the upper limit of the base current of TR5 together with D1503 and R1502. This prevents the excessive current from flowing to TR5.

Others

The LINE TRIG signal for the line lock is taken out from the primary line.

After the signal passes through photo coupler IC1519, the waveform is shaped and supplied to the TRIG circuit via [32] .

5.18 Flow of V signal in DSO mode (Refer to Fig. 5-34.)

Flow of the V signal can be switched in various ways by each setting of the STORAGE switch, TIME/DIV switches and VERTICAL MODE switches. As a result, the sampling system, number of channels, quantity of data, sampling clock frequency, etc. also vary.

First, the switching of the V signal is summarized in the following (i) to (iii).

(i) Full time range
RTO: 50ns/div to 0.5s/div
DSO: 50ns/div to 50s/div (ROLL operation from 0.2/div to 50s/div)

(ii) Data acquisition and display in DSO
a. No synchronization relationship exists between acquisition and display.
b. Data acquisition is performed in either simultaneous or ALT mode, and it is not performed in the CHOP MODE.
c. Display is performed in the ALT mode, and it is not performed in the CHOP mode.

(iii) Quantity of data acquired to ACQ MEM

Table 5-11

No. of channels / TIME/DIV	1	2	4	
50ns to 0.5μs	1k	1kx2	1kx4	4-channel ALT sampling
1μs	4k	1kx2	1kx4	4-channel ALT sampling
2μs	4k	2kx2	2kx4	(1) 2-channel simultaneous sampling (CH1 and CH2 are simultaneous, and CH3 and CH4 are simultaneous.) (2) ALT sampling of two channels. (ALT sampling for CH1/CH2 and CH3/CH4)
4μs to 50s	4k	2kx2	2kx4	4-channel simultaneous sampling

Next, the switching of the V signal is described below, using Fig. 5-34.
DIODE SW's 1 to 4 are controlled by $\overline{\text{PB3}}$. When $\overline{\text{PB3}}$ goes "L", all the four switches are made on. This function is used when performing real-time sampling of multiple channels in some TIME/DIV range.

DIODE GATE's 1 to 4 are contorlled by $\overline{\text{CH1 DSP}}$ to $\overline{\text{CH4 DSP}}$, respectively.
When a control signal goes "L", the corresponding DIODE GATE is closed.
By this operation, the data acquisition channels are switched.

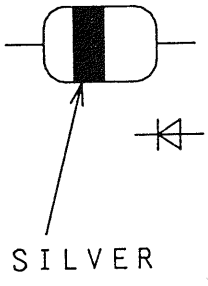
K4101 is controlled by the DSO signal. When the DSO signal goes "H", the DLY LINE(1) output is connected to the BUFF(1). K4101 thus switches between the RTO mode and the DSO mode.

The switch circuit ⟨17⟩ is controlled by the four control signals CHCT1 (PBO), CHCTL2 (PB1), $\overline{\text{100MCTL}}$ (PB2) and $\overline{\text{EQCTL}}$ (PB3). For these control signals, refer to Table 5-5 in 5.13. This switch circuit switches the input signal to AD.
DLY LINE (2) is used when performing real-time sampling of 100Msps, and delays a signal by 10ns. Whether the signal passes through DLY LINE (2) or not is controlled by $\overline{\text{100MCTL}}$ (PB2).
When performing real-time sampling of 50Msps, the phase relationship between A/D1 CLK and A/D2 clock is inverted. (A/D2 CLK = $\overline{\text{A/D1 CLK}}$)
This phase relationship is controlled by the 50MADC signal.

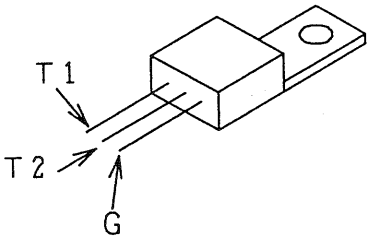
S1, S2, S3 and S4 are all software-like switches. Therefore, no such switches exist in the RAM, and switching is made by a program.
The analog switch IC5521A is controlled by the $\overline{\text{DSO1 DSP CONT}}$ signal fed from DIGITAL MPU(2) and switches between DSP MEM(1) and DSP MEM(2).

7. ELECTRICAL PARTS LEAD CONFIGURATIONS

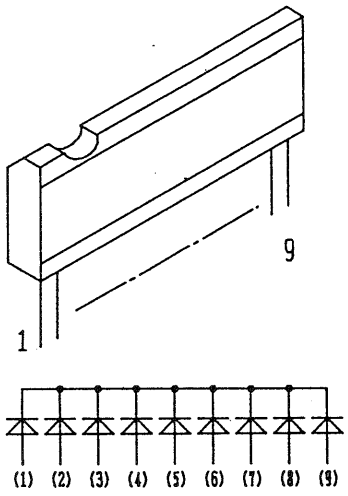
Diode



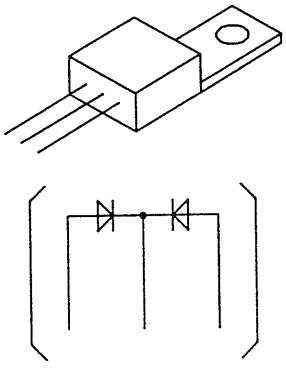
AU01
AU01A



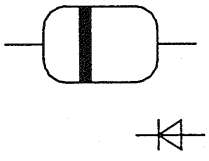
DTA10E



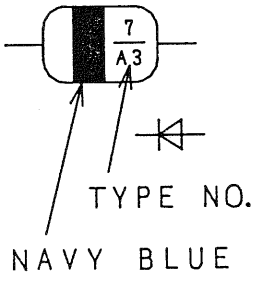
DAN803



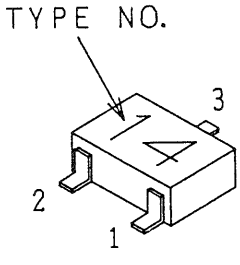
FMB-24
FMB-26



GZB 2.4B
GZB 3.0B
GZB 6.8B



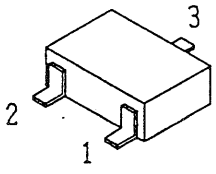
HZ7A1
HZ7A3



HZM SERIES

1.ANODE
2.ANODE
3.CATHODE

TYPE NO.14	HZM 4B
TYPE NO.17	HZM 5B
TYPE NO.24	HZM 7C

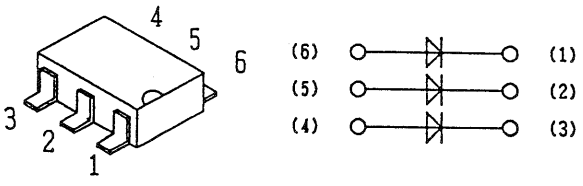


1. CATHODE 1

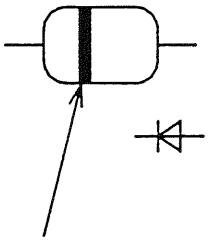
2. ANODE 2

3. CATHODE 2,
ANODE 1

HSM88S

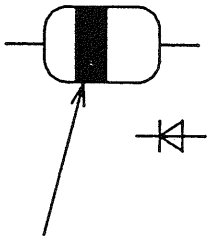


IMN10



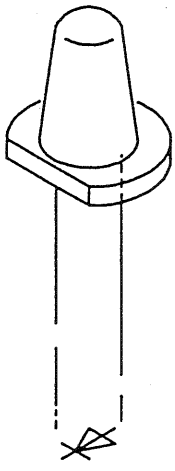
GREEN

MA161

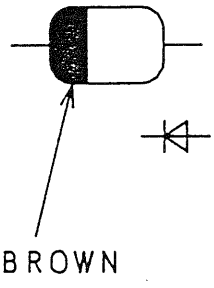


CATHODE BAND

1SS83
1SS110
1SS123
1SS133
1SS153
1SS165
1SS286
MTZ SERIES

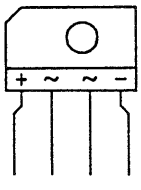


PG5534SY



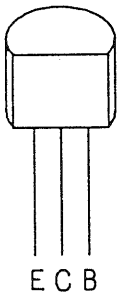
BROWN

RU3AMLF

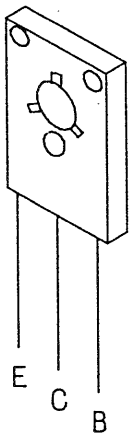


RBV-406

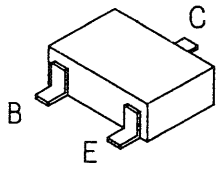
Transistor



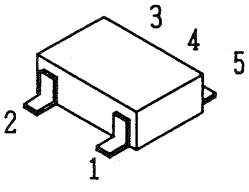
2SA778AK
2SA1029D
2SA1188E
2SC535C
2SC641K
2SC1213AC
2SC1906
2SC2853E
2SC3068
2SC458C



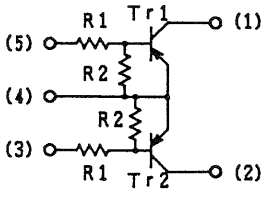
2SA1210S
2SC2912S



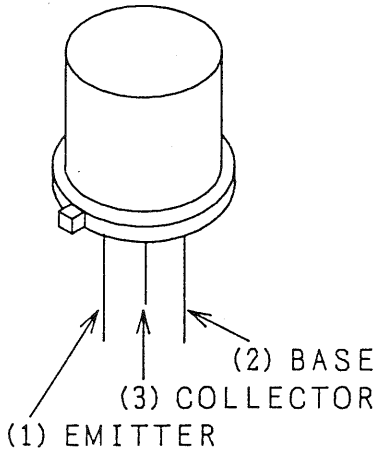
2SA1052
2SA1226E4
2SA1245
2SA1462
2SB624BV3
2SC1621B4
2SC2462LC
2SC2620QC
2SC2759-T2
2SC2735JC
2SC3772LY4
2SC3775OY-4
2SD596DV3



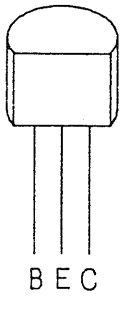
DTA124EK



(1) Tr1 OUT
(2) Tr2 OUT
(3) Tr2 IN
(4) GND (+)
(5) Tr1 IN

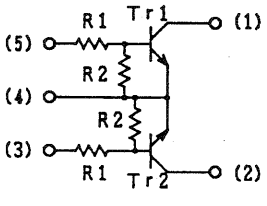


2SC1252

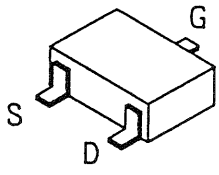


2SC2407 (1)

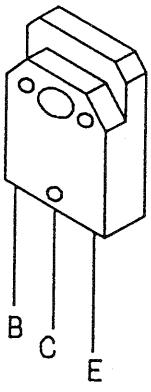
DTC124K



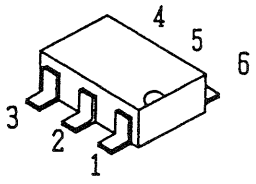
(1) Tr1 OUT
(2) Tr2 OUT
(3) Tr2 IN
(4) GND
(5) Tr1 IN



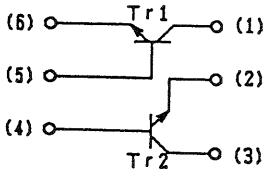
2SK303V4
2SK436A20
2SK508K52



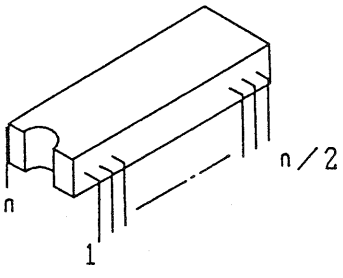
2SC3089



IMX3



IC



8PINS

MN3102

14PINS

HD74LS00P
HD74LS04P
HD74LS10P
HD74LS74AP
HD74LS164P
HD74LS393P
HD74HC00P
HD74HC02P
HD74HC04P
HD74HC08P
HD74HC32P
HD74HC74P
TC40H000P
TC40H002P
TC40H164P
SN74AS00N
SN74AS74N
TL064CN
NJM319D

16PINS

HD14040BP
HD14051BP
HD14053BP
HD74HC138P
HD74HC155P
HD74HC4040P
HD74LS157P
MC10H116L
MC74HC4052N
MC74HC4053N
SN74LS594N
TC40H151P

20PINS

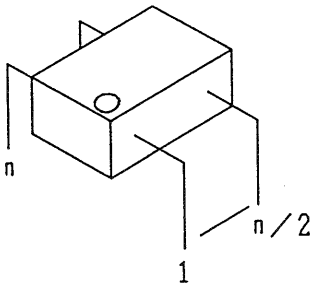
HD74HC573P
HD74HC574P

28PINS

HN27256G-25
HM63021P

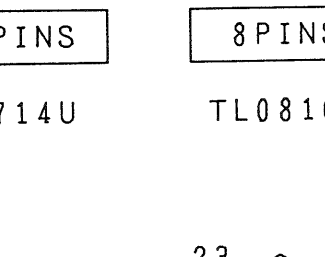
64PINS

μPD78C10G-36



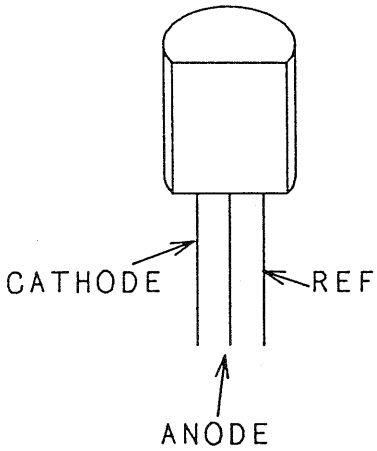
6PINS

PC714U

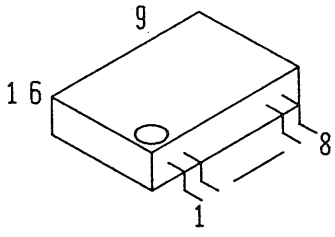


8PINS

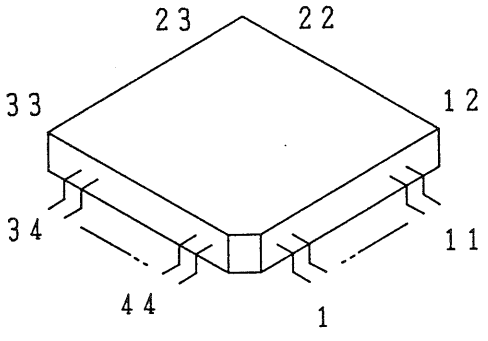
TL081CP



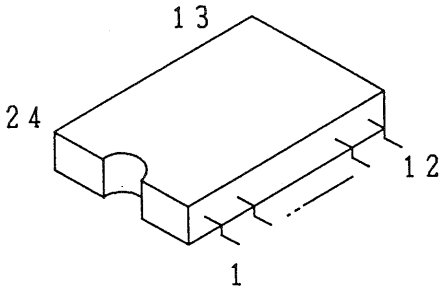
TL431CLP-B



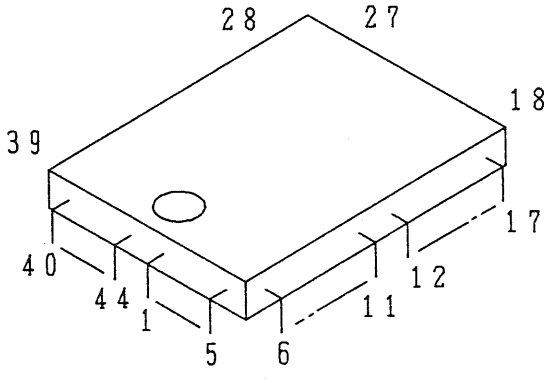
MC145406F
HD74HC153FP
TC74HC157AF



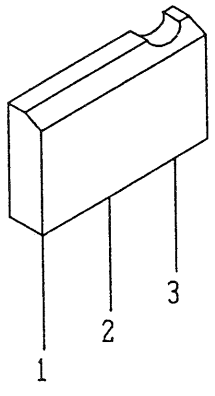
TMP182C55AF-10



TMP82C54M-2

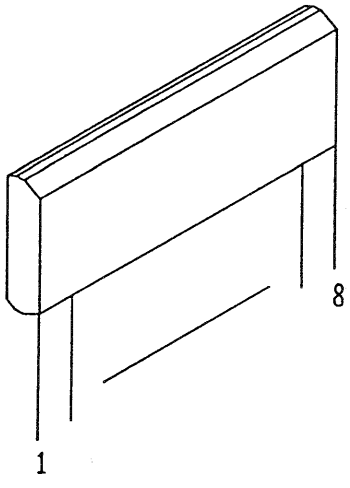


HA19211MP



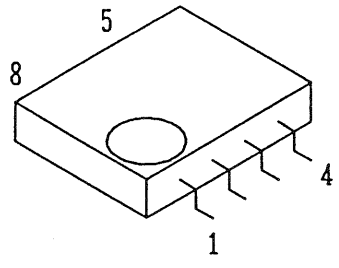
1. Vss
2. VDD
3. OUT

MN1280R

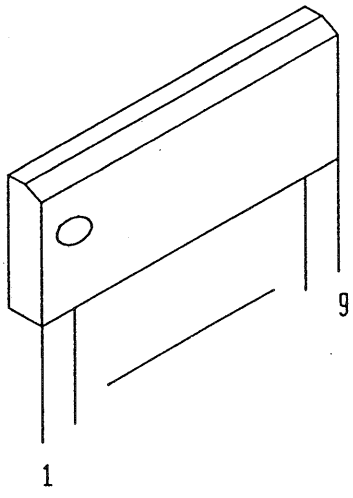


8PINS

M5201L

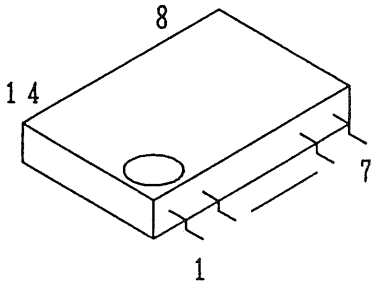


μA741PS
M5201FP

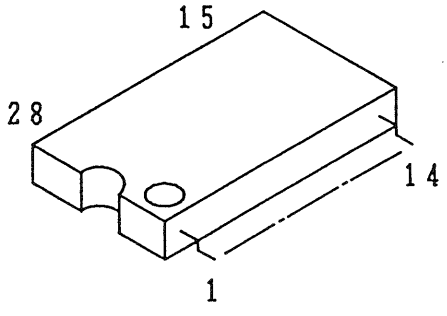


9PINS

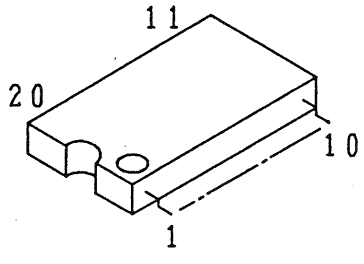
NJM072S



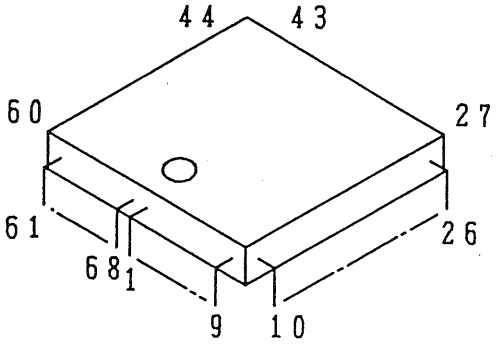
NJM319M
NJM2902M
HD74HC27FP
HD74HC32FP
TC74HC00F
TC74HC86F



HM62256LPF-10T
HM6264ALP-15



HD74HC377FP
TC74HC244F
TC74HC574AF



HD64180R1CP10

8. ELECTRICAL PARTS LIST

POWER SUPPLY (PEF-784)

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
	8480992	SHEET	35X65 UL94V-1	1	
	8480992	SHEET	35X65 UL94V-1	R25	
	8480993	SHEET	25X25 UL94V-1	1	
	8488452	SHEET	25X36 UL94V-1	1	
C 850	CCC1030	C.CERAMIC	50 V10000 PF+80-20%	1	
C 855	CCC1002	C.CERAMIC	50 V 10 PF+-5PF	1	
C 856	CCC1002	C.CERAMIC	50 V 10 PF+-5PF	1	
C 857	CCD0273	C.CERAMIC	500 V 2 PF+-0.25PF	1	
C 858	CCD0273	C.CERAMIC	500 V 2 PF+-0.25PF	1	
C 859	CCC1133	C.CERAMIC	50 V 1 PF+-0.25PF	1	
C 862	CCC1030	C.CERAMIC	50 V10000 PF+80-20%	1	
C 863	CCC1030	C.CERAMIC	50 V10000 PF+80-20%	1	
C 871	CQA0037	C.PLASTIC	250 V10000 PF+-10%	1	
C 872	CQA0037	C.PLASTIC	250 V10000 PF+-10%	1	
C 883	CQA0037	C.PLASTIC	250 V10000 PF+-10%	1	
C 884	CQA0037	C.PLASTIC	250 V10000 PF+-10%	1	
C 885	CCC1026	C.CERAMIC	50 V 150 PF+-10%	1	
C 886	CCC1026	C.CERAMIC	50 V 150 PF+-10%	1	
C 901	CES0032	C.AL ELYC	25 V 47 UF+-20%	1	
C 904	CCD0272	C.CERAMIC	500 V 1 PF+-0.25PF	1	
C 908	CCD0287	C.CERAMIC	500 V 4700 PF+100-0%	1	
C 911	CCC1030	C.CERAMIC	50 V10000 PF+80-20%	1	
C 912	CEK0162	C.AL ELYC	160 V 1 UF+-20%	1	
C 1004	CQA0139	C.PLASTIC	50 V 0.068UF +-5%	1	
C 1005	CEC0175	C.AL ELYC	25 V 10 UF	1	
C 1010	CQA0099	C.PLASTIC	50 V22000 PF+-10%	1	
C 1011	CES0032	C.AL ELYC	25 V 47 UF+-20%	1	
C 1013	CQE0121	C.PLASTIC	630 V 0.01UF+-5%	1	
C 1020	CES0540	C.AL ELYC	100 V 33 UF+-20%	1	
C 1021	CES0540	C.AL ELYC	100 V 33 UF+-20%	1	
C 1022	CES0134	C.AL ELYC	50 V 1 UF+-20%	1	
C 1023	CQA0101	C.PLASTIC	50 V47000 PF+-10%	1	
C 1024	CES0032	C.AL ELYC	25 V 47 UF+-20%	1	
C 1031	CCD0375	C.CERAMIC	2 KV 10000 PF+80-20%	1	
C 1032	CCD0231	C.CERAMIC	2000 V 4700 PF+80-20%	1	
C 1033	CCD0231	C.CERAMIC	2000 V 4700 PF+80-20%	1	
C 1034	CCD0231	C.CERAMIC	2000 V 4700 PF+80-20%	1	
C 1035	CCD0246	C.CERAMIC	2000 V 1000 PF+-10%	1	
C 1040	CCD0286	C.CERAMIC	500 V 1000 PF+100-0%	1	
C 1041	CCD0231	C.CERAMIC	2000 V 4700 PF+80-20%	1	
C 1042	CET0033	C.AL ELYC	160 V 1UF	1	
C 1043	CCD0231	C.CERAMIC	2000 V 4700 PF+80-20%	1	
C 1254	CCD0231	C.CERAMIC	2000 V 4700 PF+80-20%	1	
C 1255	CCD0286	C.CERAMIC	500 V 1000 PF+100-0%	1	
C 1256	CCD0231	C.CERAMIC	2000 V 4700 PF+80-20%	1	
C 1257	CCD0231	C.CERAMIC	2000 V 4700 PF+80-20%	1	
C 1258	CQA0037	C.PLASTIC	250 V10000 PF+-10%	1	
C 1259	CQA0037	C.PLASTIC	250 V10000 PF+-10%	1	
C 1280	CCC1030	C.CERAMIC	50 V10000 PF+80-20%	1	
C 1281	CCD0287	C.CERAMIC	500 V 4700 PF+100-0%	1	
C 1282	CCD0287	C.CERAMIC	500 V 4700 PF+100-0%	1	
C 1502	CCD0338	C.CERAMIC	DE7100F222M-VA1-KC	1	
C 1503	CCD0338	C.CERAMIC	DE7100F222M-VA1-KC	1	
C 1504	CCD0338	C.CERAMIC	DE7100F222M-VA1-KC	1	
C 1505	CCD0338	C.CERAMIC	DE7100F222M-VA1-KC	1	

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
D 1280	HDM0141	DIODE.ZEN	MTZ7.5JC	1	
D 1281	HDS0250	DIODE	1SS83	1	
D 1282	HDS0250	DIODE	1SS83	1	
D 1283	HDS0250	DIODE	1SS83	1	
D 1284	HDS0250	DIODE	1SS83	1	
D 1501	HDR0234	DIODE	RBV-406	1	
D 1502	HDG0082	DIODE.ZEN	GZB3.0B	1	
D 1503	HDA0071	DIODE	AU01	1	
D 1504	HDA0071	DIODE	AU01	1	
D 1514	HDG0081	DIODE.ZEN	GZB2.4B	1	
D 1515	HDG0083	DIODE.ZEN	GZB6.8B	1	
D 1520	HDD0141	DIODE	DTA10E	1	
D 1521	HDA0071	DIODE	AU01	1	
D 1531	HDA0074	DIODE	AU01A	1	
D 1541	HDA0071	DIODE	AU01	1	
D 1551	HDF0053	DIODE	FMB-26	1	
D 1561	HDF0052	DIODE	FMB-24	1	
D 1571	HDF0053	DIODE	FMB-26	1	
D 1591	HDS0437	DIODE	1SS133	1	
F 1001	EFZ0015	FUSE	ICP-F15 (0.6A)	1	
IC 1501	IZS0109	IC.HYBRID	STK7308	1	
IC 1591	HZP0030	PHOTOCOPUL	PC714V	1	
J 1502	ETZ0121	TAB	62747-1	1	
J 1503	ETZ0121	TAB	62747-1	1	
L 1001	TLE0173	COIL	EL0607SKI 101K (100UH)	1	
L 1002	TLE0172	COIL	EL0607SKI 470K (47UH)	1	
L 1502	TLL0174	COIL	LC0243	1	
L 1510	TLX0175	COIL	BL02RN1-R62	1	
L 1511	TLX0175	COIL	BL02RN1-R62	1	
L 1532	TLT0085	COIL	47 UH+-10% 0.94A	1	
L 1542	TLT0085	COIL	47 UH+-10% 0.94A	1	
L 1552	TLT0086	COIL	22 UH+-10% 1.3 A	1	
L 1562	TLT0086	COIL	22 UH+-10% 1.3 A	1	
L 1572	TLT0086	COIL	22 UH+-10% 1.3 A	1	
P 851	JBB0060	CONNECTOR	B5B-XH-A	1	
P 890	JBB0021	CONNECTOR	B3B-XH-A	1	
P 1042	JBB0022	CONNECTOR	B6B-XH-A	1	
P 1280	JBB0021	CONNECTOR	B3B-XH-A	1	
P 1290	JBB0021	CONNECTOR	B3B-XH-A	1	
P 1501	JBB0024	CONNECTOR	B15B-XH-A	1	
P 1502	JBB0023	CONNECTOR	B8B-XH-A	1	
R 851	RCE0756	R.CARBON	1/4W 82 OHM +-5%	1	
R 852	RCE0756	R.CARBON	1/4W 82 OHM +-5%	1	
R 855	RCE0775	R.CARBON	1/4W 3.3 KOHM +-5%	1	
R 856	RCE0775	R.CARBON	1/4W 3.3 KOHM +-5%	1	
R 857	RMR3726	R.METAL	1 W 22 KOHM +-5%	1	
R 858	RMR3726	R.METAL	1 W 22 KOHM +-5%	1	
R 859	RCE0761	R.CARBON	1/4W 220 OHM +-5%	1	
R 860	RCE0769	R.CARBON	1/4W 1.0 KOHM +-5%	1	
R 861	RCE0769	R.CARBON	1/4W 1.0 KOHM +-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
C 1506	CEK0179	C.AL ELYC	400 V 56 UF+-20%	1	
C 1507	CEK0208	C.AL ELYC	50 V 22 UF+-20%	1	
C 1508	CEK0186	C.AL ELYC	50 V 4.7 UF+-20%	1	
C 1509	CEK0178	C.AL ELYC	400 V 39 UF+-20%	1	
C 1511	CCD0341	C.CERAMIC	1KV 1000 PF+-10%	1	
C 1512	CEK0184	C.AL ELYC	25 V 47 UF+-20%	1	
C 1513	CCD0341	C.CERAMIC	1KV 1000 PF+-10%	1	
C 1514	CCC1030	C.CERAMIC	50 V10000 PF+80-20%	1	
C 1522	CCD0246	C.CERAMIC	2000 V 1000 PF+-10%	1	
C 1531	CEK0180	C.AL ELYC	160 V 4.7 UF+-20%	1	
C 1532	CES0376	C.AL ELYC	160 V 4.7 UF+-20%	1	
C 1533	CES0376	C.AL ELYC	160 V 4.7 UF+-20%	1	
C 1541	CEK0181	C.AL ELYC	63 V 47 UF+-20%	1	
C 1542	CES0377	C.AL ELYC	63 V 47 UF+-20%	1	
C 1551	CEK0172	C.AL ELYC	16 V 1000 UF+-20%	1	
C 1552	CES0318	C.AL ELYC	16 V 1000 UF+-20%	1	
C 1553	CES0318	C.AL ELYC	16 V 1000 UF+-20%	1	
C 1554	CEK0172	C.AL ELYC	16 V 1000 UF+-20%	1	
C 1561	CEK0171	C.AL ELYC	10 V 1000 UF+-20%	1	
C 1562	CES0318	C.AL ELYC	16 V 1000 UF+-20%	1	
C 1563	CES0318	C.AL ELYC	16 V 1000 UF+-20%	1	
C 1571	CEK0182	C.AL ELYC	16 V 330 UF+-20%	1	
C 1572	CES0378	C.AL ELYC	16 V 330 UF+-20%	1	
C 1573	CES0318	C.AL ELYC	16 V 1000 UF+-20%	1	
C 1574	CES0378	C.AL ELYC	16 V 330 UF+-20%	1	
C 1593	CES0038	C.AL ELYC	50 V 2.2 UF+-20%	1	
C 1594	CQA0124	C.PLASTIC	50 V 0.1 UF+-10%	1	
CV 859	CVT0054	C.VARIABLE	TZ03Z050NR169 (~5P)	1	
D 862	HDM0139	DIODE.ZEN	MTZ3.3JA	1	
D 863	HDM0139	DIODE.ZEN	MTZ3.3JA	1	
D 871	HDS0437	DIODE	1SS133	1	
D 872	HDS0437	DIODE	1SS133	1	
D 873	HDM0051	DIODE	MA161	1	
D 874	HDM0051	DIODE	MA161	1	
D 875	HDS0437	DIODE	1SS133	1	
D 901	HDS0437	DIODE	1SS133	1	
D 902	HDX0055	DIODE	1SS165	1	
D 903	HDS0437	DIODE	1SS133	1	
D 910	HDS0437	DIODE	1SS133	1	
D 911	HDM0139	DIODE.ZEN	MTZ3.3JA	1	
D 1013	HDR0215	DIODE	RU3AMLF-B1	1	
D 1022	HDS0437	DIODE	1SS133	1	
D 1023	HDH0175	DIODE.ZEN	HZ7A3	1	
D 1024	HDS0437	DIODE	1SS133	1	
D 1026	HDM0142	DIODE.ZEN	MTZ12JC	1	
D 1029	HDS0437	DIODE	1SS133	1	
D 1030	HDS0437	DIODE	1SS133	1	
D 1031	HDS0437	DIODE	1SS133	1	
D 1032	HDS0437	DIODE	1SS133	1	
D 1040	HDS0250	DIODE	1SS83	1	
D 1041	HDS0250	DIODE	1SS83	1	
D 1042	HDS0250	DIODE	1SS83	1	
D 1043	HDS0250	DIODE	1SS83	1	
D 1271	HDM0141	DIODE.ZEN	MTZ7.5JC	1	

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
R 862	RCE0755	R.CARBON	1/4W 68 OHM +-5%	1	
R 863	RCE0755	R.CARBON	1/4W 68 OHM +-5%	1	
R 865	RCE0796	R.CARBON	1/4W 180 KOHM +-5%	1	
R 866	RCE0796	R.CARBON	1/4W 180 KOHM +-5%	1	
R 867	RCE0778	R.CARBON	1/4W 5.6 KOHM +-5%	1	
R 868	RCE0778	R.CARBON	1/4W 5.6 KOHM +-5%	1	
R 869	RZZ0032	R.FUSING	1/4W 470 OHM +-5%	1	
R 870	RZZ0032	R.FUSING	1/4W 470 OHM +-5%	1	
R 871	RME1079	R.METAL	1/4W 3.92KOHM +-1%	1	
R 872	RME1079	R.METAL	1/4W 3.92KOHM +-1%	1	
R 873	RME1072	R.METAL	1/4W 1.00KOHM +-1%	1	
R 881	RCE0753	R.CARBON	1/4W 47 OHM +-5%	1	
R 882	RCE0753	R.CARBON	1/4W 47 OHM +-5%	1	
R 883	RCE0771	R.CARBON	1/4W 1.5 KOHM +-5%	1	
R 884	RCE0771	R.CARBON	1/4W 1.5 KOHM +-5%	1	
R 891	RCE0763	R.CARBON	1/4W 330 OHM +-5%	1	
R 892	RCE0763	R.CARBON	1/4W 330 OHM +-5%	1	
R 893	RCE0757	R.CARBON	1/4W 100 OHM +-5%	1	
R 894	RCE0757	R.CARBON	1/4W 100 OHM +-5%	1	
R 895	RME1077	R.METAL	1/4W 2.67KOHM +-1%	1	
R 896	RME1077	R.METAL	1/4W 2.67KOHM +-1%	1	
R 897	RCE0761	R.CARBON	1/4W 220 OHM +-5%	1	
R 898	RME1082	R.METAL	1/4W 6.81KOHM +-1%	1	
R 901	RME1080	R.METAL	1/4W 4.75KOHM +-1%	1	
R 902	RCE0781	R.CARBON	1/4W 10 KOHM +-5%	1	
R 904	RCE0721	R.CARBON	1/2W 22 KOHM +-5%	1	
R 905	RME1087	R.METAL	1/4W 18.2 KOHM +-1%	1	
R 907	RCE0753	R.CARBON	1/4W 47 OHM +-5%	1	
R 908	RCE0768	R.CARBON	1/4W 820 OHM +-5%	1	
R 909	RCE0790	R.CARBON	1/4W 56 KOHM +-5%	1	
R 910	RCE0788	R.CARBON	1/4W 39 KOHM +-5%	1	
R 911	RME1541	R.METAL	2 W 6.8 KOHM +-5%	1	
R 915	RZZ0031	R.FUSING	1/4W 220 OHM +-5%	1	
R 1001	RCE0782	R.CARBON	1/4W 12 KOHM +-5%	1	
R 1002	RCE0775	R.CARBON	1/4W 3.3 KOHM +-5%	1	
R 1003	RCE0772	R.CARBON	1/4W 1.8 KOHM +-5%	1	
R 1004	RCE0775	R.CARBON	1/4W 3.3 KOHM +-5%	1	
R 1005	RCE0785	R.CARBON	1/4W 22 KOHM +-5%	1	
R 1006	RCE0769	R.CARBON	1/4W 1.0 KOHM +-5%	1	
R 1007	RCE0769	R.CARBON	1/4W 1.0 KOHM +-5%	1	
R 1010	RCE0757	R.CARBON	1/4W 100 OHM +-5%	1	
R 1011	RCE0693	R.CARBON	1/2W 100 OHM +-5%	1	
R 1012	RCE0693	R.CARBON	1/2W 100 OHM +-5%	1	
R 1019	RCE0755	R.CARBON	1/4W 68 OHM +-5%	1	
R 1020	RCE0779	R.CARBON	1/4W 6.8 KOHM +-5%	1	
R 1021	RCE0780	R.CARBON	1/4W 8.2 KOHM +-5%	1	
R 1022	RCE0787	R.CARBON	1/4W 33 KOHM +-5%	1	
R 1023	RME1261	R.METAL	1/4W 43.2-K OHM +-1%	1	
R 1024	RME1726	R.METAL	ERO-S2CKF2432(24.3K)/SN14	1	
R 1025	RCE0779	R.CARBON	1/4W 6.8 KOHM +-5%	1	
R 1026	RCE0775	R.CARBON	1/4W 3.3 KOHM +-5%	1	
R 1027	RCE0763	R.CARBON	1/4W 330 OHM +-5%	1	
R 1028	RME1957	R.METAL	3 W 3.3 KOHM +-5%	1	
R 1029	RCE0785	R.CARBON	1/4W 22 KOHM +-5%	1	
R 1032	RCE0715	R.CARBON	1/2W 6.8 KOHM +-5%	1	
R 1035	RMV0012	R.METAL	1/2W 15 MOHM +-1%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
R 1040	RCE0798	R.CARBON	1/4W 330 KOHM +-5%	1	
R 1041	RCE0769	R.CARBON	1/4W 1.0 KOHM +-5%	1	
R 1042	RCE0790	R.CARBON	1/4W 56 KOHM +-5%	1	
R 1043	RSE0434	R.SOLID	1/4W 10 MOHM +-5%	1	
R 1251	RCE0795	R.CARBON	1/4W 150 KOHM +-5%	1	
R 1252	RMV0012	R.METAL	1/2W 15 MOHM +-1%	1	
R 1253	RSE0434	R.SOLID	1/4W 10 MOHM +-5%	1	
R 1254	RMV0014	R.METAL	1/2W 6.20MOHM +-1%	1	
R 1255	RCE0735	R.CARBON	1/2W 1.0 MOHM +-5%	1	
R 1256	RCE0792	R.CARBON	1/4W 82 KOHM +-5%	1	
R 1257	RCE0794	R.CARBON	1/4W 120 KOHM +-5%	1	
R 1258	RCE0781	R.CARBON	1/4W 10 KOHM +-5%	1	
R 1259	RCE0717	R.CARBON	1/2W 10 KOHM +-5%	1	
R 1260	RCE0725	R.CARBON	1/2W 47 KOHM +-5%	1	
R 1271	RCE0781	R.CARBON	1/4W 10 KOHM +-5%	1	
R 1272	RCE0794	R.CARBON	1/4W 120 KOHM +-5%	1	
R 1280	RCE0786	R.CARBON	1/4W 27 KOHM +-5%	1	
R 1281	RCE0781	R.CARBON	1/4W 10 KOHM +-5%	1	
R 1282	RCE0785	R.CARBON	1/4W 22 KOHM +-5%	1	
R 1283	RCE0757	R.CARBON	1/4W 100 OHM +-5%	1	
R 1284	RCE0757	R.CARBON	1/4W 100 OHM +-5%	1	
R 1501	RWK0003	R.WIRE	3W 10 OHM+-5%	1	
R 1502	RWK0002	R.WIRE	3W 2 OHM +-5%	1	
R 1503	RCE0729	R.CARBON	1/2W 100 KOHM +-5%	1	
R 1504	RCE0729	R.CARBON	1/2W 100 KOHM +-5%	1	
R 1505	RCE0769	R.CARBON	1/4W 1.0 KOHM +-5%	1	
R 1506	RCE0782	R.CARBON	1/4W 12 KOHM +-5%	1	
R 1507	RCE0778	R.CARBON	1/4W 5.6 KOHM +-5%	1	
R 1508	RCE0779	R.CARBON	1/4W 6.8 KOHM +-5%	1	
R 1509	RCE0782	R.CARBON	1/4W 12 KOHM +-5%	1	
R 1512	RMR2791	R.METAL	2 W 47 OHM +-5%	1	
R 1515	RCE0773	R.CARBON	1/4W 2.2 KOHM +-5%	1	
R 1521	RCE0685	R.CARBON	1/2W 22 OHM +-5%	1	
R 1522	RMR2789	R.METAL	2 W 22 OHM +-5%	1	
R 1591	RCE0729	R.CARBON	1/2W 100 KOHM +-5%	1	
R 1592	RCE0729	R.CARBON	1/2W 100 KOHM +-5%	1	
R 1593	RCE0789	R.CARBON	1/4W 47 KOHM +-5%	1	
RV 1042	RNE0088	VR.METAL	EVM-K3GA00B54(50K)	1	
RV 1253	RNE0089	VR.METAL	EVM-K3GA00B15(100K)	1	
RV 1281	RNE0089	VR.METAL	EVM-K3GA00B15(100K)	1	
RV 1506	RNE0087	VR.METAL	EVM-K3GA00B53(5K)	1	
S 1501	SSP0575	SW.PUSH	SDDS (W/O WIRE TERMINAL)	1	
T 1010	TTH0006	TRANSFORM	H-DRIVE HD-12	1	
T 1013	8474287 B	XFMR	15KV(+B=50VDC) FOR V-1060	1	
T 1501	8507597	XFMR	HTH1KA030	1	
TR 851	HTC0168	TRANSISTOR	2SC535C	1	
TR 852	HTC0168	TRANSISTOR	2SC535C	1	
TR 853	HTC0148	TRANSISTOR	2SC458C	1	
TR 854	HTC0148	TRANSISTOR	2SC458C	1	
TR 871	HTA0258	TRANSISTOR	2SA1210S	1	
TR 872	HTA0258	TRANSISTOR	2SA1210S	1	
TR 881	HTC0338	TRANSISTOR	2SC1906	1	

ATT READOUT (PEF-833)

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
RM 5153(	RZA0202	R.BLOCK EXB-LE5-502S(5BIT,5K)	1	

CRT SOCKET (PEF-789)

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
C 1044	CCD0231	C.CERAMIC	2000 V 4700 PF+80-20%	1	
C 1045	CCC1025	C.CERAMIC	50 V 100 PF+-10%	1	
J 1001	8390152	SOCKET	1339	1	
L 1061	TLE0107	COIL	ELE-Y-R47MA	1	
L 1062	TLE0107	COIL	ELE-Y-R47MA	1	
NL 1043	ELS0032	LAMP	SA-200DSS-ON-1	1	
P 1001	JBS0022	CONNECTOR	S3B-XH-A	1	
P 1043	JBB0022	CONNECTOR	B6B-XH-A	1	
P 1061	ETP0002	PIN	171255-1	1	
P 1062	ETP0002	PIN	171255-1	1	
P 1281	JBB0021	CONNECTOR	B3B-XH-A	1	
R 1061	RME1722	R.METAL	1/4W 165 OHM +-1%	1	
R 1062	RME1722	R.METAL	1/4W 165 OHM +-1%	1	
R 1066	RCE0781	R.CARBON	1/4W 10 KOHM +-5%	1	
R 1067	RCE0745	R.CARBON	1/4W 10 OHM +-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
TR 882	HTC0338	TRANSISTOR 2SC1906	1	
TR 885	HTC0669	TRANSISTOR 2SC2912S	1	
TR 886	HTC0669	TRANSISTOR 2SC2912S	1	
TR 901	HTC0192	TRANSISTOR 2SC641KC	1	
TR 906	HTC0338	TRANSISTOR 2SC1906	1	
TR 910	HTA0258	TRANSISTOR 2SA1210S	1	
TR 912	HTC0669	TRANSISTOR 2SC2912S	1	
TR 1001	HTA0224	TRANSISTOR 2SA1029D	1	
TR 1002	HTA0224	TRANSISTOR 2SA1029D	1	
TR 1010	HTC0056	TRANSISTOR 2SC1213AC	1	
TR 1013	HTC0921	TRANSISTOR 2SC3089	1	
TR 1020	HTC0148	TRANSISTOR 2SC458C	1	
TR 1021	HTC0148	TRANSISTOR 2SC458C	1	
TR 1022	HTA0224	TRANSISTOR 2SA1029D	1	
TR 1023	HTA0224	TRANSISTOR 2SA1029D	1	
TR 1251	HTA0104	TRANSISTOR 2SA778AK	1	
TR 1514	HTC0148	TRANSISTOR 2SC458C	1	

SWP LOGIC(PEF-782)

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
	XCF0033			R	
	8523280 A	PIN	OK-001-G	9	
	JYX0054			1	
	JJX0072	CONECTOR	CAP 1-480351-0	1	
6	ETP0141	PIN	DP-2	1	
7	ETP0141	PIN	DP-2	1	
12	ETP0141	PIN	DP-2	1	
14	ETP0141	PIN	DP-2	1	
16	ETP0141	PIN	DP-2	1	
17	ETP0141	PIN	DP-2	1	
C 630	CES0252	C.AL ELYC	16 V 10 UF+-20%BP	1	
C 632	CES0378	C.AL ELYC	16 V 330 UF+-20%	1	
C 634	CCG0209	C.CERAMIC	50 V 4700 PF+-10%	1	
C 640	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 643	CCG0143	C.CERAMIC	50 V 100 PF+-5%	1	
C 650	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 651	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 657	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 660	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 661	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 664	CQA0129	C.PLASTIC	50 V22000 PF+-10%	1	
C 669	CCG0141	C.CERAMIC	50 V 68 PF+-5%	1	
C 672	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 674	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 682	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 684	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 710	CMV0053	C.MICA	50 V 180 PF+-5%	1	
C 710A	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 711	CCG0130	C.CERAMIC	50 V 18 PF+-5%	1	
C 712	CCG0132	C.CERAMIC	50 V 22 PF+-5%	1	
C 714	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 715	CQE0049	C.PLASTIC	100 V 1 UF+-5%	1	
C 716	CCG0211	C.CERAMIC	50 V10000 PF+-10%	R	
C 717	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 718	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 722	CCG0132	C.CERAMIC	50 V 22 PF+-5%	1	
C 722A	CCG0130	C.CERAMIC	50 V 18 PF+-5%	1	
C 732	CCG0211	C.CERAMIC	50 V10000 PF+-10%	R	
C 733	CCG0144	C.CERAMIC	50 V 220 PF+-5%	1	
C 734	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 735	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 736	CCG0211	C.CERAMIC	50 V10000 PF+-10%	R	
C 738	CCG0211	C.CERAMIC	50 V10000 PF+-10%	R	
C 801	CES0378	C.AL ELYC	16 V 330 UF+-20%	1	
C 802	CES0378	C.AL ELYC	16 V 330 UF+-20%	1	
C 803	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 804	CCG0116	C.CERAMIC	50 V 2 PF+-0.25PF	1	
C 805	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 807	CES0131	C.AL ELYC	16 V 10 UF+-20%	1	
C 813	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 815	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 818	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 821	CCG0116	C.CERAMIC	50 V 2 PF+-0.25PF	1	
C 822	CCG0116	C.CERAMIC	50 V 2 PF+-0.25PF	1	
C 825	CET0033	C.AL ELYC	160 V 1UF	1	

FILTER (PEF-816)

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
C 1501	CQE0118	C.PLASTIC	250 V 0.22UF+-20%	1	
C 1510	CQE0118	C.PLASTIC	250 V 0.22UF+-20%	1	
L 1501	TLP0043	COIL	250VAC 15MH	1	
R 1510	RCE0733	R.CARBON	1/2W 470 KOHM +-5%	1	
SG 1501	EZH0084		AG20 P C 252F-L3N	1	
SG 1502	EZH0084		AG20 P C 252F-L3N	1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
C 826	CCG0176	C.CERAMIC	50	V	1	PF+-0.25PF	1	
C 833	CCG0211	C.CERAMIC	50	V10000		PF+-10%	R	
C 843	CCG0143	C.CERAMIC	50	V	100	PF+-5%	1	
C 851	CCG0211	C.CERAMIC	50	V10000		PF+-10%	R	
C 861	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	
C 862	CET0033	C.AL ELYC	160	V	1UF		1	
C 867	CCG0211	C.CERAMIC	50	V10000		PF+-10%	R	
C 872	CCG0143	C.CERAMIC	50	V	100	PF+-5%	1	
C 877	XCF0033						R	
C 878	XCF0033						R	
C 883	CCG0211	C.CERAMIC	50	V10000		PF+-10%	R	
C 1101	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 1102	CCG0124	C.CERAMIC	50	V	10	PF+-0.5PF	1	
C 1105	CCG0139	C.CERAMIC	50	V	47	PF+-5%	1	
C 1106	CCG0193	C.CERAMIC	50	V	150	PF+-5%	1	
C 1109	CCG0199	C.CERAMIC	50	V	330	PF+-5%	1	
C 1111	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 1121	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 1124	CCG0296	C.CERAMIC	50	V	1000	PF+-5%	1	
C 1125	CCG0296	C.CERAMIC	50	V	1000	PF+-5%	1	
C 1126	CCG0199	C.CERAMIC	50	V	330	PF+-5%	1	
C 1127	CCG0296	C.CERAMIC	50	V	1000	PF+-5%	1	
C 1127A	CCC1182	C.CERAMIC	50	V	1000	PF+-10%	1	
C 2100	CQA0121	C.PLASTIC	50	V33000		PF+-10%	1	
C 2101	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 2107	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2108	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 2110	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 2113	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2114	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2130	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2131	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2142	CCG0205	C.CERAMIC	50	V	1000	PF+-10%	1	
C 2143	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	
C 2144	CCG0205	C.CERAMIC	50	V	1000	PF+-10%	1	
C 2144A	CCG0201	C.CERAMIC	50	V	470	PF+-5%	1	
C 2145	CCG0211	C.CERAMIC	50	V10000		PF+-10%	R	
C 2146	CCG0209	C.CERAMIC	50	V	4700	PF+-10%	1	
C 2150	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	
C 2151	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	
C 2152	CCG0211	C.CERAMIC	50	V10000		PF+-10%	R	
C 2153	CQE0062	C.PLASTIC	50	V	1	UF+-5%	1	
C 2154	CQE0062	C.PLASTIC	50	V	1	UF+-5%	1	
C 2155	CEK0186	C.AL ELYC	50	V	4.7	UF+-20%	1	
C 2156	CCG0124	C.CERAMIC	50	V	10	PF+-0.5PF	1	
C 2157	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2160	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2161	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2162	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2163	CCG0143	C.CERAMIC	50	V	100	PF+-5%	1	
C 2164	CCG0143	C.CERAMIC	50	V	100	PF+-5%	1	
C 2165	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2166	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2167	CCG0143	C.CERAMIC	50	V	100	PF+-5%	1	
C 2168	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 2170	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
D 2107	HDS0437	DIODE	1SS133	1	
D 2108	HDM0176	DIODE.ZEN	MTZ6.8JC	1	
D 2155	HDS0437	DIODE	1SS133	1	
D 2165	HDS0437	DIODE	1SS133	1	
D 2166	HDS0437	DIODE	1SS133	1	
D 2212	HDS0437	DIODE	1SS133	1	
D 4002	HDS0437	DIODE	1SS133	1	
IC 659	IDS0444	IC.DIGITAL	SN74AS00N	1	
IC 660	IDS0455	IC.DIGITAL	SN74AS74N	1	
IC 661	IDH0982	IC.DIGITAL	HD74HC00P/TC74HC00P	1	
IC 670	ILM0431	IC.ANALOG	M5201L	1	
IC 680	ILM0431	IC.ANALOG	M5201L	1	
IC 694	HTD0160	TRANSISTOR	DTA124EK	1	
IC 716	HTD0161	TRANSISTOR	DTC124EK	1	
IC 717	IDM0706	IC.DIGITAL	MC74HC4053N	1	
IC 730	ILN0107	IC.ANALOG	NJM072BS	1	
IC 738	HTD0161	TRANSISTOR	DTC124EK	1	
IC 864	HTD0161	TRANSISTOR	DTC124EK	1	
IC 1101	IDH0475	IC.DIGITAL	HD74LS10P	1	
IC 1111	IDH0471	IC.DIGITAL	HD74LS04P	1	
IC 1121	IDH0467	IC.DIGITAL	HD74LS00P	1	
IC 2101	XCF0033			R	
IC 2107	IDH0467	IC.DIGITAL	HD74LS00P	1	
IC 2130	IDH0800	IC.DIGITAL	HD14051BP/MC14051BCP	1	
IC 2150	ILT0045	IC.ANALOG	TL064CN	1	
IC 2160	IDH0586	IC.DIGITAL	HD74LS74AP	1	
IC 2161	IDT0096	IC.DIGITAL	TC40H151P	1	
IC 2162	IDH0467	IC.DIGITAL	HD74LS00P	1	
IC 2165	IDS0479	IC.DIGITAL	SN74LS594N	1	
IC 2166	IDT0049	IC.DIGITAL	TC40H164P	1	
IC 2170	IDS0455	IC.DIGITAL	SN74AS74N	1	
IC 2171	IDH0914	IC.DIGITAL	HD74LS393P	1	
IC 2201	ILT0091	IC.ANALOG	TL431CLP-B	1	
IC 2211	IDT0047	IC.DIGITAL	TC40H002P	1	
IC 2212	IDH0795	IC.DIGITAL	HD14040BP/MC14040BCP	1	
IC 2220	IDM0704	IC.DIGITAL	MC74HC4052N	1	
IC 2230	ILN0042	IC.ANALOG	NJM072S	1	
IC 2230A	ILN0107	IC.ANALOG	NJM072BS	1	
IC 2248	IDT0039	IC.DIGITAL	TC40H000P	1	
IC 4001	IDH0630	IC	HD74LS157P	1	
L 643	TLE0084	COIL	707MA 1 UH+-20%	1	
L 645	TLN0005	COIL	450MA 220 NH+-20%	1	
L 801	TLE0172	COIL	EL0607SKI 470K (47UH)	1	
L 802	TLE0172	COIL	EL0607SKI 470K (47UH)	1	
L 2163	XCF0033			R	
L 2163	TLE0058	COIL	353MA 10 UH+-10%	1	
L 2164	TLE0058	COIL	353MA 10 UH+-10%	1	
L 2170	TLN0006	COIL	450MA 4.7 UH+-20%	1	
P 2003	JBB0076	CONNECTOR	B10P-SHF-GB	1	
P 2004	JBB0031	CONNECTOR	B8P-SHF-GB	1	
P 2115	JBB0022	CONNECTOR	B6B-XH-A	1	
P 2117	JBB0027	CONNECTOR	B2B-XH-A	1	
P 2118	JBB0021	CONNECTOR	B3B-XH-A	1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
C 2171	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2201	CES0033	C.AL ELYC	25	V	100	UF+-20%	1	
C 2202	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 2203	CCG0211	C.CERAMIC	50	V10000		PF+-10%	R	
C 2210	CCG0205	C.CERAMIC	50	V	1000	PF+-10%	1	
C 2211	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2212	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2215	CCG0296	C.CERAMIC	50	V	1000	PF+-5%	1	
C 2219	CCC1011	C.CERAMIC	50	V	33	PF+-5%	1	
C 2220	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2221	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2230	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 2230B	XCF0033						R	
C 2231	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 2247	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 2248	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 2249	CQA0124	C.PLASTIC	50	V	0.1	UF+-10%	1	
C 4001	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 5001	XCF0033						R	
C 5002	XCF0033						R	
C 5003	ZZZZZZZ	NOTHING	*****	NOTHING	*****		R	
D 630	HDM0140	DIODE.ZEN	MTZ4.7JB				1	
D 631	HDX0055	DIODE	1SS165				1	
D 632	HDS0437	DIODE	1SS133				1	
D 633	HDS0437	DIODE.	1SS133				1	
D 660	HDS0437	DIODE	1SS133				1	
D 661	HDS0437	DIODE	1SS133				1	
D 662	HDS0437	DIODE	1SS133				1	
D 663	HDS0437	DIODE	1SS133				1	
D 664	HDS0437	DIODE	1SS133				1	
D 665	HDS0437	DIODE	1SS133				1	
D 666	HDS0437	DIODE	1SS133				1	
D 668	HDS0437	DIODE	1SS133				1	
D 670	HDS0437	DIODE	1SS133				1	
D 675	HDS0437	DIODE	1SS133				1	
D 685	HDS0437	DIODE	1SS133				1	
D 692	HDS0437	DIODE	1SS133				1	
D 710	HDM0051	DIODE	MA161				1	
D 711	HDS0576	DIODE	1SS286				1	
D 712	HDS0576	DIODE	1SS286				1	
D 723	HDS0437	DIODE	1SS133				1	
D 724	HDH0228	DIODE.ZEN	HZ7A1				1	
D 740	HDM0139	DIODE.ZEN	MTZ3.3JA				1	
D 841	HDX0055	DIODE	1SS165				1	
D 842	HDX0055	DIODE	1SS165				1	
D 867	HDM0141	DIODE.ZEN	MTZ7.5JC				1	
D 1101	HDS0437	DIODE	1SS133				1	
D 1102	HDS0437	DIODE	1SS133				1	
D 1103	HDS0437	DIODE	1SS133				1	
D 1104	HDS0437	DIODE	1SS133				1	
D 1105	HDS0437	DIODE	1SS133				1	
D 1113	HDX0055	DIODE	1SS165				1	
D 1114	HDS0437	DIODE	1SS133				1	
D 1115	HDX0055	DIODE	1SS165				1	
D 1116	HDS0437	DIODE	1SS133				1	

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
P 2601	JBB0024	CONNECTOR	B15B-XH-A	1	
P 2602	JBB0026	CONNECTOR	B10B-XH-A	1	
P 2603	JBB0026	CONNECTOR	B10B-XH-A	1	
P 2604	JBB0022	CONNECTOR	B6B-XH-A	1	
P 2605	JBB0021	CONNECTOR	B3B-XH-A	1	
P 2610	JBB0024	CONNECTOR	B15B-XH-A	1	
P 2611	JBB0060	CONNECTOR	B5B-XH-A	1	
P 3101	JBB0031	CONNECTOR	B8P-SHF-GB	1	
P 3102	JBB0031	CONNECTOR	B8P-SHF-GB	1	
P 3103	JBB0031	CONNECTOR	B8P-SHF-GB	1	
P 3104	JBB0031	CONNECTOR	B8P-SHF-GB	1	
P 3105	JBB0031	CONNECTOR	B8P-SHF-GB	1	
P 3106	JBB0031	CONNECTOR	B8P-SHF-GB	1	
P 3107	JBB0031	CONNECTOR	B8P-SHF-GB	1	
P 3108	JBB0031	CONNECTOR	B8P-SHF-GB	1	
P 4001	JBB0028	CONNECTOR	B4B-XH-A	1	
P 4002	JBB0026	CONNECTOR	B10B-XH-A	1	
P 5150	JBB0022	CONNECTOR	B6B-XH-A	1	
P 61-5	ETP0002	PIN	171255-1	1	
P 6405	JBB0021	CONNECTOR	B3B-XH-A	1	
R 630	RME0869	R.METAL	1/8W 270 OHM +-5%	1	
R 631	RME0894	R.METAL	1/8W 33 KOHM +-5%	1	
R 632	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	
R 633	RME0892	R.METAL	1/8W 22 KOHM +-5%	1	
R 634	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	
R 635	RME0864	R.METAL	1/8W 100 OHM +-5%	1	
R 636	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	
R 637	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	
R 638	RME0892	R.METAL	1/8W 22 KOHM +-5%	1	
R 639	RME0876	R.METAL	1/8W 1.0 KOHM +-5%	1	
R 639A	RCE0777	R.CARBON	1/4W 4.7 KOHM +-5%	1	
R 640	RME0865	R.METAL	1/8W 120 OHM +-5%	1	
R 641	RME0865	R.METAL	1/8W 120 OHM +-5%	1	
R 643	RME1191	R.METAL	1/4W 432 OHM +-1%	1	
R 650	RME0872	R.METAL	1/8W 470 OHM +-5%	1	
R 651	RME0872	R.METAL	1/8W 470 OHM +-5%	1	
R 653	RME0856	R.METAL	1/8W 22 OHM +-5%	1	
R 655	RME0865	R.METAL	1/8W 120 OHM +-5%	1	
R 656	RME0878	R.METAL	1/8W 1.5 KOHM +-5%	1	
R 657	RME0852	R.METAL	1/8W 10 OHM +-5%	1	
R 660	RME0852	R.METAL	1/8W 10 OHM +-5%	1	
R 661	RME0852	R.METAL	1/8W 10 OHM +-5%	1	
R 661A	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	
R 661B	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	
R 662	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	
R 663	RME0896	R.METAL	1/8W 47 KOHM +-5%	1	
R 664	RME0892	R.METAL	1/8W 22 KOHM +-5%	1	
R 665	RME0881	R.METAL	1/8W 2.7 KOHM +-5%	1	
R 666	RME0878	R.METAL	1/8W 1.5 KOHM +-5%	1	
R 667	RME0908	R.METAL	1/8W 4.7 MOHM +-10%	1	
R 668	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	
R 669	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	
R 669A	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	
R 670	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	
R 671	RME0894	R.METAL	1/8W 33 KOHM +-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION				Q.TY A	Q.TY B
R 672	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 673	RME0890	R.METAL	1/8W	15	KOHM +-5%	1	
R 674	RME0901	R.METAL	1/8W	150	KOHM +-5%	1	
R 675	RME0884	R.METAL	1/8W	4.7	KOHM +-5%	1	
R 676	RME0868	R.METAL	1/8W	220	OHM +-5%	1	
R 681	RME0894	R.METAL	1/8W	33	KOHM +-5%	1	
R 682	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 683	RME0890	R.METAL	1/8W	15	KOHM +-5%	1	
R 684	RME0901	R.METAL	1/8W	150	KOHM +-5%	1	
R 685	RME0884	R.METAL	1/8W	4.7	KOHM +-5%	1	
R 686	RME0868	R.METAL	1/8W	220	OHM +-5%	1	
R 691	RME0880	R.METAL	1/8W	2.2	KOHM +-5%	1	
R 692	RME0884	R.METAL	1/8W	4.7	KOHM +-5%	1	
R 693	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 700	RME0856	R.METAL	1/8W	22	OHM +-5%	1	
R 701	RME0860	R.METAL	1/8W	47	OHM +-5%	1	
R 703	RME0874	R.METAL	1/8W	680	OHM +-5%	1	
R 703A	RME0872	R.METAL	1/8W	470	OHM +-5%	1	
R 704	RME0869	R.METAL	1/8W	270	OHM +-5%	1	
R 705	RME0880	R.METAL	1/8W	2.2	KOHM +-5%	1	
R 706	RME0890	R.METAL	1/8W	15	KOHM +-5%	1	
R 707	RME0852	R.METAL	1/8W	10	OHM +-5%	1	
R 708	RME0882	R.METAL	1/8W	3.3	KOHM +-5%	1	
R 709	RME0886	R.METAL	1/8W	6.8	KOHM +-5%	1	
R 710	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 710A	RME0882	R.METAL	1/8W	3.3	KOHM +-5%	1	
R 711	RME0886	R.METAL	1/8W	6.8	KOHM +-5%	1	
R 712	RME0852	R.METAL	1/8W	10	OHM +-5%	1	
R 713	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 713A	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 714	RME0858	R.METAL	1/8W	33	OHM +-5%	1	
R 715	RCE0704	R.CARBON	1/2W	820	OHM +-5%	1	
R 716	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 716A	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 717	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 718	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 719	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 720	RME1080	R.METAL	1/4W	4.75	KOHM +-1%	1	
R 721	RME1080	R.METAL	1/4W	4.75	KOHM +-1%	1	
R 722	RME0872	R.METAL	1/8W	470	OHM +-5%	1	
R 722A	RME0880	R.METAL	1/8W	2.2	KOHM +-5%	1	
R 723	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 723A	RME0880	R.METAL	1/8W	2.2	KOHM +-5%	1	
R 724	RME0878	R.METAL	1/8W	1.5	KOHM +-5%	1	
R 725	RME0898	R.METAL	1/8W	68	KOHM +-5%	1	
R 732	RME1078	R.METAL	1/4W	3.32	KOHM +-1%	1	
R 733	RME1174	R.METAL	1/4W	2.00	KOHM +-1%	1	
R 734	RME0852	R.METAL	1/8W	10	OHM +-5%	1	
R 735	RME0852	R.METAL	1/8W	10	OHM +-5%	1	
R 736	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 737	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 738	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 738A	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 740	RME1710	R.METAL	1/4W	1.00	MOHM +-0.5%	1	
R 740A	RME0882	R.METAL	1/8W	3.3	KOHM +-5%	1	
R 741	RME1163	R.METAL	1/4W	111	KOHM +-0.5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION				Q.TY A	Q.TY B
R 875	RME0884	R.METAL	1/8W	4.7	KOHM +-5%	1	
R 876	RME0885	R.METAL	1/8W	5.6	KOHM +-5%	1	
R 877	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 881	RME1070	R.METAL	1/4W	681	OHM +-1%	1	
R 882	RME1070	R.METAL	1/4W	681	OHM +-1%	1	
R 883	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	R	
R 884	RME0881	R.METAL	1/8W	2.7	KOHM +-5%	1	
R 885	RME0892	R.METAL	1/8W	22	KOHM +-5%	1	
R 886	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 887	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 1101	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 1102	RME0896	R.METAL	1/8W	47	KOHM +-5%	1	
R 1103	RME0892	R.METAL	1/8W	22	KOHM +-5%	1	
R 1104	RME0884	R.METAL	1/8W	4.7	KOHM +-5%	1	
R 1105	RME0872	R.METAL	1/8W	470	OHM +-5%	1	
R 1106	RME0892	R.METAL	1/8W	22	KOHM +-5%	1	
R 1109	RME0874	R.METAL	1/8W	680	OHM +-5%	1	
R 1112	RME0892	R.METAL	1/8W	22	KOHM +-5%	1	
R 1113	RME0892	R.METAL	1/8W	22	KOHM +-5%	1	
R 1114	RME0883	R.METAL	1/8W	3.9	KOHM +-5%	1	
R 1115	RME0886	R.METAL	1/8W	6.8	KOHM +-5%	1	
R 1116	RME0890	R.METAL	1/8W	15	KOHM +-5%	1	
R 1121	RME0912	R.METAL	1/8W	0	OHM	R	
R 1122	RME0912	R.METAL	1/8W	0	OHM	1	
R 1123	RME0878	R.METAL	1/8W	1.5	KOHM +-5%	1	
R 1124	RME0887	R.METAL	1/8W	8.2	KOHM +-5%	1	
R 1125	RME0872	R.METAL	1/8W	470	OHM +-5%	1	
R 1126	RME0868	R.METAL	1/8W	220	OHM +-5%	1	
R 1127	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 1127A	RCE0763	R.CARBON	1/4W	330	OHM +-5%	1	
R 2100	RCE0738	R.CARBON	1/2W	2.2	MOHM +-5%	1	
R 2104	XCF0033					R	
R 2105	RME0900	R.METAL	1/8W	100	KOHM +-5%	1	
R 2106	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 2107	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 2108	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 2109	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 2111	RME1125	R.METAL	1/4W	5.11	KOHM +-1%	1	
R 2112	RME1082	R.METAL	1/4W	6.81	KOHM +-1%	1	
R 2113	ZZZZZZZ	NOTHING	*****	NOTHING	*****	R	
R 2114	ZZZZZZZ	NOTHING	*****	NOTHING	*****	R	
R 2115	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 2116	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 2117	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 2118	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 2119	RME0902	R.METAL	1/8W	220	KOHM +-5%	1	
R 2120	RME0902	R.METAL	1/8W	220	KOHM +-5%	1	
R 2130	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 2131	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 2132	RME0874	R.METAL	1/8W	680	OHM +-5%	1	
R 2142	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 2146	RME0868	R.METAL	1/8W	220	OHM +-5%	1	
R 2150	RME0852	R.METAL	1/8W	10	OHM +-5%	1	
R 2151	RME0852	R.METAL	1/8W	10	OHM +-5%	1	
R 2155	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 2156	RME0860	R.METAL	1/8W	47	OHM +-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION				Q.TY A	Q.TY B
R 742	RME0887	R.METAL	1/8W	8.2	KOHM +-5%	1	
R 743	RME1156	R.METAL	1/4W	10.1	KOHM +-0.5%	1	
R 744	RME0887	R.METAL	1/8W	8.2	KOHM +-5%	1	
R 745	RME1711	R.METAL	1/4W	1.00	KOHM +-0.5%	1	
R 746	RME0887	R.METAL	1/8W	8.2	KOHM +-5%	1	
R 750	RME0882	R.METAL	1/8W	3.3	KOHM +-5%	1	
R 751	RME0882	R.METAL	1/8W	3.3	KOHM +-5%	1	
R 752	RME0882	R.METAL	1/8W	3.3	KOHM +-5%	1	
R 801	RCE0774	R.CARBON	1/4W	2.7	KOHM +-5%	1	
R 801A	RME0865	R.METAL	1/8W	120	OHM +-5%	1	
R 802	RME0863	R.METAL	1/8W	82	OHM +-5%	1	
R 803	RME1412	R.METAL	1/4W	4.32	KOHM +-1%	1	
R 804	RME1412	R.METAL	1/4W	4.32	KOHM +-1%	1	
R 805	RME1073	R.METAL	1/4W	1.21	KOHM +-1%	1	
R 806	RME1070	R.METAL	1/4W	681	OHM +-1%	1	
R 807	RME0890	R.METAL	1/8W	15	KOHM +-5%	1	
R 808	RME0889	R.METAL	1/8W	12	KOHM +-5%	1	
R 811	RME1058	R.METAL	1/4W	68.1	OHM +-1%	1	
R 812	RME1123	R.METAL	1/4W	2.43	KOHM +-1%	1	
R 813	RME1072	R.METAL	1/4W	1.00	KOHM +-1%	1	
R 815	RME0884	R.METAL	1/8W	4.7	KOHM +-5%	1	
R 816	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 817	RME0883	R.METAL	1/8W	3.9	KOHM +-5%	1	
R 818	RME0874	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 821	RME1074	R.METAL	1/4W	1.50	KOHM +-1%	1	
R 822	RME1074	R.METAL	1/4W	1.50	KOHM +-1%	1	
R 823	RCE0779	R.CARBON	1/4W	6.8	KOHM +-5%	1	
R 824	RCE0779	R.CARBON	1/4W	6.8	KOHM +-5%	1	
R 825	RCE0772	R.CARBON	1/4W	1.8	KOHM +-5%	1	
R 826	RME0872	R.METAL	1/8W	470	OHM +-5%	1	
R 831	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 832	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 833	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	R	
R 834	RME0883	R.METAL	1/8W	3.9	KOHM +-5%	1	
R 836	RME0896	R.METAL	1/8W	47	KOHM +-5%	1	
R 838	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 839	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 841	RME1071	R.METAL	1/4W	825	OHM +-1%	1	
R 842	RME1071	R.METAL	1/4W	825	OHM +-1%	1	
R 843	RME0860	R.METAL	1/8W	47	OHM +-5%	1	
R 844	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 845	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	R	
R 846	RME0896	R.METAL	1/8W	47	KOHM +-5%	1	
R 847	RME0868	R.METAL	1/8W	220	OHM +-5%	1	
R 852	RME1078	R.METAL	1/4W	3.32	KOHM +-1%	1	
R 853	RME1078	R.METAL	1/4W	3.32	KOHM +-1%	1	
R 861	RME0873	R.METAL	1/8W	560	OHM +-5%	1	
R 862	RME1081	R.METAL	1/4W	5.62	KOHM +-1%	1	
R 863	RME0880	R.METAL	1/8W	2.2	KOHM +-5%	1	
R 864	RME0892	R.METAL	1/8W	22	KOHM +-5%	1	
R 865	RME0850	R.METAL	1/8W	2.2	KOHM +-5%	1	
R 866	RME0892	R.METAL	1/8W	22	KOHM +-5%	1	
R 867	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 868	RME0879	R.METAL	1/8W	1.8	KOHM +-5%	1	
R 871	RME0868	R.METAL	1/8W	220	OHM +-5%	1	
R 872	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	R	

SYMBOL	..PART CODE..	..... DESCRIPTION				Q.TY A	Q.TY B
R 2157	RME0912	R.METAL	1/8W	0	OHM	1	
R 2161	RME0882	R.METAL	1/8W	3.3	KOHM +-5%	1	
R 2163	RME0872	R.METAL	1/8W	470	OHM +-5%	1	
R 2164	RME0872	R.METAL	1/8W	470	OHM +-5%	1	
R 2165	RME0882	R.METAL	1/8W	3.3	KOHM +-5%	1	
R 2166	RME0882	R.METAL	1/8W	3.3	KOHM +-5%	1	
R 2167	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 2168	RME0892	R.METAL	1/8W	22	KOHM +-5%	1	
R 2169	RME0872	R.METAL	1/8W	470	OHM +-5%	1	
R 2171	RME0912	R.METAL	1/8W	0	OHM	1	
R 2172	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	R	
R 2173	RME0912	R.METAL	1/8W	0	OHM	1	
R 2174	RME0912	R.METAL	1/8W	0	OHM	R	
R 2175	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 2176	RME0912	R.METAL	1/8W	0	OHM	R	
R 2177	RME0872	R.METAL	1/8W	470	OHM +-5%	1	
R 2178	RME0872	R.METAL	1/8W	470	OHM +-5%	1	
R 2201	RME0872	R.METAL	1/8W	470	OHM +-5%	1	
R 2202	RME0912	R.METAL	1/8W	0	OHM	1	
R 2203	RME0858	R.METAL	1/8W	33	OHM +-5%	1	
R 2204	RME1084	R.METAL	1/4W	10.0	KOHM +-1%	1	
R 2205	RME1084	R.METAL	1/4W	10.0	KOHM +-1%	1	
R 2210	RME1200	R.METAL	1/8W	1.5	MOHM +-10%	1	
R 2211A	RME1262	R.METAL	1/4W	90.9	K OHM +-1%	1	
R 2212	RME0879	R.METAL	1/8W	1.8	KOHM +-5%	1	
R 2213	RME0892	R.METAL	1/8W	22	KOHM +-5%	1	
R 2219	RCE0769	R.CARBON	1/4W	1.0	KOHM +-5%	1	
R 2220	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 2221	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	
R 2222	RME0874	R.METAL	1/8W	680	OHM +-5%	1	
R 2225	RME1069	R.METAL	1/4W	562	OHM +-1%	1	
R 2225A	RME1121	R.METAL	1/4W	1.37	KOHM +-1%	1	
R 2226	RME1123	R.METAL	1/4W	2.43	KOHM +-1%	1	
R 2226A	RME1371	R.METAL	1/4W	1.65	KOHM +-1%	1	
R 2229	RME1088	R.METAL	1/4W	22.1	KOHM +-1%	1	
R 2230	RME0852	R.METAL	1/8W	10	OHM +-5%	1	
R 2230B	XCF0033					R	
R 2231	RME0852	R.METAL	1/8W	10	OHM +-5%	1	
R 2232	RME0866	R.METAL	1/8W	150	OHM +-5%	1	
R 2235A	RCE0766	R.CARBON	1/4W	560	OHM +-5%	1	
R 2236A	RCE0773	R.CARBON	1/4W	2.2	KOHM +-5%	1	
R 2243	RME0880	R.METAL	1/8W	2.2	KOHM +-5%	1	
R 2244	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 2245	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 2246	RME1155	R.METAL	1/4W	4.00	KOHM +-0.5%	1	
R 2247	RME1711	R.METAL	1/4W	1.00	KOHM +-0.5%	1	
R 2249	RCE0757	R.CARBON	1/4W	100	OHM +-5%	1	
R 5150	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 5151	RME0860	R.METAL	1/8W	47	OHM +-5%	1	
R 5152	RME0877	R.METAL	1/8W	1.2	KOHM +-5%	1	
R 5153	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 5154	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 5155	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
RM 2120	RZA0166	R.BLOCK	EXB-LD10-503GC			1	
RM 2211	RCE0852	R.BLOCK	EXB-LD8-503G			1	

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
RM 2231	RCE0852	R.BLOCK	EXB-LD8-503G	1	
RM 2232	RCE0854	R.BLOCK	EXB-LD4-503G	1	
RT 847	HDX0062	THERMISTOR	112-202-2	1	
RV 675	RNE0047	VR.METAL	EVN 39C00YB54(50K)	1	
RV 685	RNE0047	VR.METAL	EVN 39C00YB54(50K)	1	
RV 801	RNE0058	VR.METAL	EVN 39C00YB13(1K)	1	
RV 807	RNE0042	VR.METAL	EVN-39C00YB14(10K)	1	
RV 831	RNE0048	VR.METAL	EVN 39C00YB22(200)	1	
RV 834	RNE0070	VR.METAL	EVN 39C00YB53(5K)	1	
RV 844	RNE0049	VR.METAL	EVN 39C00YB12(100)	1	
RV 876	RNE0042	VR.METAL	EVN-39C00YB14(10K)	1	
RV 884	RNE0070	VR.METAL	EVN 39C00YB53(5K)	1	
S 690	ZZZZZZZ	NOTHING	*****NOTHING *****	R	
TR 632	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 634	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 636	HTC0686	TRANSISTOR	2SC2462C (LC)	1	
TR 650	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 651	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 652	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 653	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 660	HTC0590	TRANSISTOR	2SC1621B4	1	
TR 661	HTC0590	TRANSISTOR	2SC1621B4	1	
TR 708	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 709	HTC0686	TRANSISTOR	2SC2462C (LC)	1	
TR 710	HTK0147	TRANSISTOR	2SK436A20	1	
TR 712	HTC0872	TRANSISTOR	2SC2620C (QC)	1	
TR 714	HTC0338	TRANSISTOR	2SC1906	1	
TR 723	HTC0686	TRANSISTOR	2SC2462C (LC)	1	
TR 732	HTC0813	TRANSISTOR	2SC2853E	1	
TR 734	HTA0336	TRANSISTOR	2SA1188E	1	
TR 741	HTD0202	TRANSISTOR	2SD596DV3	1	
TR 743	HTD0202	TRANSISTOR	2SD596DV3	1	
TR 745	HTD0202	TRANSISTOR	2SD596DV3	1	
TR 750	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 751	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 752	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 811	HTC0686	TRANSISTOR	2SC2462C (LC)	1	
TR 812	HTA0334	TRANSISTOR	2SA1226E4	1	
TR 821	HTC0691	TRANSISTOR	2SC2735JC/2SC2735J04	1	
TR 822	HTC0691	TRANSISTOR	2SC2735JC/2SC2735J04	1	
TR 831	HTA0334	TRANSISTOR	2SA1226E4	1	
TR 832	HTA0334	TRANSISTOR	2SA1226E4	1	
TR 863	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 865	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 867	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 881	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 882	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 2108	HTC0590	TRANSISTOR	2SC1621B4	1	
TR 2109	HTC0590	TRANSISTOR	2SC1621B4	1	
TR 2201	HTC0781	TRANSISTOR	2SC3068	1	
TR 5150	HTC0691	TRANSISTOR	2SC2735JC/2SC2735J04	1	

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
P 502	JBB0027	CONNECTOR	B2B-XH-A	1	
P 503	JBB0023	CONNECTOR	B8B-XH-A	1	
P 563	8355704 12	CORD	RED L=60	1	
P 564	8355704 12	CORD	RED L=60	1	
R 501	RCE0775	R.CARBON	1/4W 3.3 KOHM +-5%	R	
R 503	RME1060	R.METAL	1/4W 100 OHM +-1%	1	
R 504	RME1060	R.METAL	1/4W 100 OHM +-1%	1	
R 505	RME0860	R.METAL	1/8W 47 OHM +-5%	1	
R 507	RME1290	R.METAL	1/4W 1.1 KOHM +-1%	1	
R 508	RME1290	R.METAL	1/4W 1.1 KOHM +-1%	1	
R 509	RME0856	R.METAL	1/8W 22 OHM +-5%	1	
R 510	RME0856	R.METAL	1/8W 22 OHM +-5%	1	
R 511	RME0866	R.METAL	1/8W 150 OHM +-5%	1	
R 512	RME0866	R.METAL	1/8W 150 OHM +-5%	1	
R 513	RME0866	R.METAL	1/8W 150 OHM +-5%	1	
R 514	RCE0761	R.CARBON	1/4W 220 OHM +-5%	1	
R 515	RME0877	R.METAL	1/8W 1.2 KOHM +-5%	1	
R 516	RME0891	R.METAL	1/8W 18 KOHM +-5%	1	
R 517	RME0861	R.METAL	1/8W 56 OHM +-5%	1	
R 518	RCE0744	R.CARBON	1/4W 6.8 OHM +-5%	1	
R 519	RCE0744	R.CARBON	1/4W 6.8 OHM +-5%	1	
R 521	RME1078	R.METAL	1/4W 3.32KOHM +-1%	1	
R 522	RME1078	R.METAL	1/4W 3.32KOHM +-1%	1	
R 524	RME1104	R.METAL	1/4W 51.1 OHM +-1%	1	
R 524A	RME1086	R.METAL	1/4W 15.0 KOHM +-1%	1	
R 525	RME0858	R.METAL	1/8W 33 OHM +-5%	1	
R 526	RME0858	R.METAL	1/8W 33 OHM +-5%	1	
R 527	RME1064	R.METAL	1/4W 221 OHM +-1%	1	
R 528	RME1064	R.METAL	1/4W 221 OHM +-1%	1	
R 529	RCE0715	R.CARBON	1/2W 6.8 KOHM +-5%	1	
R 530	RCE0715	R.CARBON	1/2W 6.8 KOHM +-5%	1	
R 531	RME1066	R.METAL	1/4W 332 OHM +-1%	1	
R 532	RME1066	R.METAL	1/4W 332 OHM +-1%	1	
R 533	RME1067	R.METAL	1/4W 392 OHM +-1%	1	
R 534	RME1067	R.METAL	1/4W 392 OHM +-1%	1	
R 535	RME0858	R.METAL	1/8W 33 OHM +-5%	1	
R 536	RME0858	R.METAL	1/8W 33 OHM +-5%	1	
R 537	RME0862	R.METAL	1/8W 68 OHM +-5%	1	
R 538	RME0862	R.METAL	1/8W 68 OHM +-5%	1	
R 543	RME0858	R.METAL	1/8W 33 OHM +-5%	1	
R 544	RME0858	R.METAL	1/8W 33 OHM +-5%	1	
R 545	RME1058	R.METAL	1/4W 68.1 OHM +-1%	1	
R 546	RME1058	R.METAL	1/4W 68.1 OHM +-1%	1	
R 547	RME1058	R.METAL	1/4W 68.1 OHM +-1%	1	
R 548	RME1058	R.METAL	1/4W 68.1 OHM +-1%	1	
R 549	RME1048	R.METAL	1/4W 10.0 OHM +-1%	1	
R 550	RME1048	R.METAL	1/4W 10.0 OHM +-1%	1	
R 551	RME1063	R.METAL	1/4W 182 OHM +-1%	1	
R 552	RME1063	R.METAL	1/4W 182 OHM +-1%	1	
R 553	RME1063	R.METAL	1/4W 182 OHM +-1%	1	
R 554	RME1063	R.METAL	1/4W 182 OHM +-1%	1	
R 555	RME1104	R.METAL	1/4W 51.1 OHM +-1%	1	
R 556	RME0863	R.METAL	1/8W 82 OHM +-5%	1	
R 557	RME0883	R.METAL	1/8W 3.9 KOHM +-5%	1	
R 558	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	

V-OUT (PEF-785)

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
	EHN0007	HEAT SINK	NZ-5C	1	
	EHN0007	HEAT SINK	NZ-5C	1	
C 501	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 502	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 503	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 504	CET0033	C.AL ELYC	160 V 1UF	1	
C 505	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 509	CCG0205	C.CERAMIC	50 V 1000 PF+-10%	1	
C 510	CCG0205	C.CERAMIC	50 V 1000 PF+-10%	1	
C 516	CCG0120	C.CERAMIC	50 V 6 PF+-0.5PF	1	
C 517	CCG0128	C.CERAMIC	50 V 15 PF+-5%	1	
C 521	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 525	CCG0116	C.CERAMIC	50 V 2 PF+-0.25PF	1	
C 526	CCG0116	C.CERAMIC	50 V 2 PF+-0.25PF	1	
C 531	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 535	CCG0126	C.CERAMIC	50 V 12 PF+-5%	1	
C 536	CCG0126	C.CERAMIC	50 V 12 PF+-5%	1	
C 543	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 544	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 555	CCG0119	C.CERAMIC	50 V 5 PF+-0.25PF	R	
C 556	CCG0134	C.CERAMIC	50 V 27 PF+-5%	1	
C 557	CES0212	C.AL ELYC	10 V 100 UF+-20% BP	1	
C 558	CCG0209	C.CERAMIC	50 V 4700 PF+-10%	1	
C 561	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 565	CQA0037	C.PLASTIC	250 V10000 PF+-10%	1	
C 577	CCG0217	C.CERAMIC	50 V47000 PF+-10%	1	
C 578	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 580	CCG0141	C.CERAMIC	50 V 68 PF+-5%	1	
C 582	CCG0179	C.CERAMIC	50 V 150 PF+-5%	1	
C 592	CCG0197	C.CERAMIC	50 V 180 PF+-5%	1	
C 594	CCG0144	C.CERAMIC	50 V 220 PF+-5%	1	
C 1301	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 1302	CCG0203	C.CERAMIC	50 V 680 PF+-5%	1	
C 1303	CCG0205	C.CERAMIC	50 V 1000 PF+-10%	1	
CV 515	CVT0056	C.VARIABLE	TZ03Z100NR169 (~10P)	1	
CV 517	CVT0056	C.VARIABLE	TZ03Z100NR169 (~10P)	1	
CV 555	CVT0070	C.VARIABLE	TZB04R200BA	1	
CV 556	CVT0057	C.VARIABLE	TZ03T200NR169 (~20P)	1	
D 559	HDS0437	DIODE	1SS133	1	
D 591	HDM0141	DIODE.ZEN	MTZ7.5JC	1	
D 594	HDS0437	DIODE	1SS133	1	
IC 1301	IDM0539	IC.DIGITAL	MN3102	1	
JP 1	RME0912	R.METAL	1/8W 0 OHM	1	
JP 2	RME0912	R.METAL	1/8W 0 OHM	R	
JP 3	RME0912	R.METAL	1/8W 0 OHM	R	
L 563	8354946 B	COIL	T-COIL(3T.7T)	1	
L 564	8354946 B	COIL	T-COIL(3T.7T)	1	
L 581	TLE0076	COIL	174MA 100 UH+-10%	1	
P 501	JBS0070	CONNECTOR	S5B-XH-A	1	

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
R 559	RME0871	R.METAL	1/8W 390 OHM +-5%	1	
R 560	RCE0717	R.CARBON	1/2W 10 KOHM +-5%	1	
R 561	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	
R 563	RME0863	R.METAL	1/8W 82 OHM +-5%	1	
R 564	RME0863	R.METAL	1/8W 82 OHM +-5%	1	
R 565	RMR4032	R.METAL	(W/O FIN)2W 390 OHM +-1%	1	
R 566	RMR4032	R.METAL	(W/O FIN)2W 390 OHM +-1%	1	
R 571A	RME0871	R.METAL	1/8W 390 OHM +-5%	R	
R 571B	RME0871	R.METAL	1/8W 390 OHM +-5%	1	
R 572A	RME0871	R.METAL	1/8W 390 OHM +-5%	R	
R 572B	RME0871	R.METAL	1/8W 390 OHM +-5%	1	
R 573	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	
R 574	RME0890	R.METAL	1/8W 15 KOHM +-5%	1	
R 575	RME0874	R.METAL	1/8W 680 OHM +-5%	1	
R 576	RME0863	R.METAL	1/8W 82 OHM +-5%	1	
R 577	RME0894	R.METAL	1/8W 33 KOHM +-5%	1	
R 578	RME1077	R.METAL	1/4W 2.67KOHM +-1%	1	
R 579	RME1077	R.METAL	1/4W 2.67KOHM +-1%	1	
R 580	RME0876	R.METAL	1/8W 1.0 KOHM +-5%	1	
R 581	RME0878	R.METAL	1/8W 1.5 KOHM +-5%	1	
R 582	RME0878	R.METAL	1/8W 1.5 KOHM +-5%	1	
R 590	RME0860	R.METAL	1/8W 47 OHM +-5%	1	
R 591	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	
R 592	RME0900	R.METAL	1/8W 100 KOHM +-5%	1	
R 593	RME0896	R.METAL	1/8W 47 KOHM +-5%	1	
R 594	RME0868	R.METAL	1/8W 220 OHM +-5%	1	
R 1301	RME1198	R.METAL	1/8W 390 KOHM +-5%	1	
R 1302	RME0895	R.METAL	1/8W 39 KOHM +-5%	1	
R 1303	RME1174	R.METAL	1/4W 2.00KOHM +-1%	1	
R 1304	RME0860	R.METAL	1/8W 47 OHM +-5%	1	
R 1305	RME1065	R.METAL	1/4W 267 OHM +-1%	1	
RV 505	RNE0048	VR.METAL	EVN 39C00YB22(200)	1	
RV 574	RNE0042	VR.METAL	EVN-39C00YB14(10K)	1	
RV 576	RNE0049	VR.METAL	EVN 39C00YB12(100)	1	
RV 1303	RNE0050	VR.METAL	EVN 39C00YB52(500)	1	
TR 501	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 502	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 503	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 504	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 541	HTC0885	TRANSISTOR	2SC2407(1)	1	
TR 542	HTC0885	TRANSISTOR	2SC2407(1)	1	
TR 561A	HTC0397	TRANSISTOR	2SC1252N	1	
TR 562A	HTC0397	TRANSISTOR	2SC1252N	1	
TR 571	HTC0686	TRANSISTOR	2SC2462C (LC)	1	
TR 572	HTC0686	TRANSISTOR	2SC2462C (LC)	1	
TR 591	HTC0686	TRANSISTOR	2SC2462C (LC)	1	

CYCLE (PEF-837)

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
C 2003	CES0033	C.AL ELYC 25 V 100 UF+-20%	1	
C 2005	CQA0121	C.PLASTIC 50 V33000 PF+-10%	1	
C 2006	CQA0122	C.PLASTIC 50 V47000 PF+-10%	1	
C 2007	CES0378	C.AL ELYC 16 V 330 UF+-20%	1	
C 2008	CES0378	C.AL ELYC 16 V 330 UF+-20%	1	
C 2012	CMD0947	C.MICA 300 V 470 PF+-5%	1	
C 2013	CQE0116	C.PLASTIC 100 V 0.47UF+-5%	1	
C 2014	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 2015	CCG0213	C.CERAMIC 50 V 0.1 UF+80-20%	1	
C 2016	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 2017	CQA0132	C.PLASTIC 50 V 0.33UF+-10%	1	
C 2038	CQA0132	C.PLASTIC 50 V 0.33UF+-10%	1	
C 2039	CCG0213	C.CERAMIC 50 V 0.1 UF+80-20%	1	
C 2042	CCG0207	C.CERAMIC 50 V 2200 PF+-10%	1	
C 2043	CES0038	C.AL ELYC 50 V 2.2 UF+-20%	1	
C 2050	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 2051	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 2052	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 2060	CCG0136	C.CERAMIC 50 V 33 PF+-5%	1	
C 2061	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 2070	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 2071	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 2072	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 2092	CCG0144	C.CERAMIC 50 V 220 PF+-5%	1	
D 2004	HDS0437	DIODE 1SS133	1	
D 2020	HDM0139	DIODE.ZEN MTZ3.3JA	1	
IC 2040	ILT0045	IC.ANALOG TL064CN	1	
IC 2050	ILN0085	IC.ANALOG NJM319D	1	
IC 2052	IDH1221	IC.DIGITAL HD74LS00P/SN74LS00N	1	
IC 2090	HTD0161	TRANSISTOR DTC124EK	1	
IC 2091	HTD0161	TRANSISTOR DTC124EK	1	
L 2092	TLE0072	COIL 138MA 220 UH+-10%	1	
P 2001	JBS0071	CONNECTOR SQ-10-AP-GB-C	1	
P 2002	JBS0027	CONNECTOR SQ-8-AP-GB-C	1	
R 2001	RME0884	R.METAL 1/8W 4.7 KOHM +-5%	1	
R 2002	RME0902	R.METAL 1/8W 220 KOHM +-5%	1	
R 2003	RME0869	R.METAL 1/8W 270 OHM +-5%	1	
R 2004	RME0884	R.METAL 1/8W 4.7 KOHM +-5%	1	
R 2005	RME0907	R.METAL 1/8W 2.2 MOHM +-10%	1	
R 2006	RME0907	R.METAL 1/8W 2.2 MOHM +-10%	1	
R 2007	RME1064	R.METAL 1/4W 221 OHM +-1%	1	
R 2010	RME0880	R.METAL 1/8W 2.2 KOHM +-5%	1	
R 2011	RME0882	R.METAL 1/8W 3.3 KOHM +-5%	1	
R 2012	RME0896	R.METAL 1/8W 47 KOHM +-5%	1	
R 2013	RME0880	R.METAL 1/8W 2.2 KOHM +-5%	1	
R 2014	RME0892	R.METAL 1/8W 22 KOHM +-5%	1	
R 2015	RME0896	R.METAL 1/8W 47 KOHM +-5%	1	
R 2017	RME0912	R.METAL 1/8W 0 OHM	1	
R 2020	RCE0716	R.CARBON 1/2W 8.2 KOHM +-5%	1	
R 2021	RME1714	R.METAL 1/4W 221 KOHM +-0.5%	1	
R 2022	RME1713	R.METAL 1/4W 22.1 KOHM +-0.5%	1	

DIGITAL (PEF-922) A: PEF-922-1 B: PEF-922-2

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
	IYX0075	SOCKET.IC 10632-01-445	1	
	ETP0149	PIN DP-10 (10MM)	1	
1	ETP0002	PIN 171255-1	3	3
2	ETP0002	PIN 171255-1	1	1
3	ETP0002	PIN 171255-1	1	1
4	ETP0002	PIN 171255-1	R	1
5	ETP0002	PIN 171255-1	1	1
C 5203	CCG0295	C.CERAMIC 25 V 0.1 UF+80-20%	1	
C 5204	CEK0146	C.AL ELYC 16 V 10 UF+-20% BP	1	1
C 5210	CCG0274	C.CERAMIC 50 V 100 PF+-5%	1	1
C 5253	CCG0295	C.CERAMIC 25 V 0.1 UF+80-20%	1	1
C 5254	CEK0146	C.AL ELYC 16 V 10 UF+-20% BP	1	1
C 5260	CCG0274	C.CERAMIC 50 V 100 PF+-5%	1	1
C 5300	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5301	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5302	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5303	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5304	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5305	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5306	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5307	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5308	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5309	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5310	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5311	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5312	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5314	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5315	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5316	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5320	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5321	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5322	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5323	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5324	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5330	CCG0246	C.CERAMIC 50 V 1 PF+-0.25PF	1	1
C 5343	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
C 5344	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5345	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
C 5346	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5347	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
C 5348	CCG0295	C.CERAMIC 25 V 0.1 UF+80-20%	1	1
C 5349	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
C 5350	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5351	CCC1003	C.CERAMIC 50 V 12 PF+-5%	1	1
C 5400	CCG0286	C.CERAMIC 50 V 1000 PF+-10%	1	R
C 5401	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5402	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5403	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5404	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5405	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5406	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5407	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5408	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5409	CCG0278	C.CERAMIC 50 V 220 PF+-5%	1	1
C 5501	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
R 2023	RME0884	R.METAL 1/8W 4.7 KOHM +-5%	1	
R 2024	RME0888	R.METAL 1/8W 10 KOHM +-5%	1	
R 2025	RME1712	R.METAL 1/4W 2.21 KOHM +-0.5%	1	
R 2026	RME0884	R.METAL 1/8W 4.7 KOHM +-5%	1	
R 2027	RME0888	R.METAL 1/8W 10 KOHM +-5%	1	
R 2029	RME0855	R.METAL 1/8W 18 OHM +-5%	1	
R 2030	RME0864	R.METAL 1/8W 100 OHM +-5%	1	
R 2031	RME1098	R.METAL 1/4W 150 KOHM +-1%	1	
R 2032	RME1086	R.METAL 1/4W 15.0 KOHM +-1%	1	
R 2033	RME0884	R.METAL 1/8W 4.7 KOHM +-5%	1	
R 2034	RME0888	R.METAL 1/8W 10 KOHM +-5%	1	
R 2035	RME1074	R.METAL 1/4W 1.50KOHM +-1%	1	
R 2036	RME0884	R.METAL 1/8W 4.7 KOHM +-5%	1	
R 2037	RME0888	R.METAL 1/8W 10 KOHM +-5%	1	
R 2038	RME1090	R.METAL 1/4W 33.2 KOHM +-1%	1	
R 2039	RME1090	R.METAL 1/4W 33.2 KOHM +-1%	1	
R 2040	RME0878	R.METAL 1/8W 1.5 KOHM +-5%	1	
R 2041	RME0875	R.METAL 1/8W 820 OHM +-5%	1	
R 2043	RME0880	R.METAL 1/8W 2.2 KOHM +-5%	1	
R 2045	RME0912	R.METAL 1/8W 0 OHM	1	
R 2052	RME0881	R.METAL 1/8W 2.7 KOHM +-5%	1	
R 2054	RME0869	R.METAL 1/8W 270 OHM +-5%	1	
R 2055	RME0902	R.METAL 1/8W 220 KOHM +-5%	1	
R 2060	RME0869	R.METAL 1/8W 270 OHM +-5%	1	
R 2061	RME1077	R.METAL 1/4W 2.67KOHM +-1%	1	
R 2062	RME1083	R.METAL 1/4W 8.25KOHM +-1%	1	
R 2063	RME0880	R.METAL 1/8W 2.2 KOHM +-5%	1	
R 2065	RME0872	R.METAL 1/8W 470 OHM +-5%	1	
R 2080	RME1290	R.METAL 1/4W 1.1 KOHM +-1%	1	
R 2081	RME1078	R.METAL 1/4W 3.32KOHM +-1%	1	
R 2082	RME1718	R.METAL 1/8W 5.6 MOHM +-10%	1	
R 2085	RME0880	R.METAL 1/8W 2.2 KOHM +-5%	1	
R 2092	RME0892	R.METAL 1/8W 22 KOHM +-5%	1	
R 2093	RME0876	R.METAL 1/8W 1.0 KOHM +-5%	1	
R 2094	RME0876	R.METAL 1/8W 1.0 KOHM +-5%	1	
R 2095	RME0882	R.METAL 1/8W 3.3 KOHM +-5%	1	
TR 2010	HTC0590	TRANSISTOR 2SC1621B4	1	
TR 2013	HTC0686	TRANSISTOR 2SC2462C (LC)	1	
TR 2015	HTA0263	TRANSISTOR 2SA1052D (MD)	1	
TR 2022	HTB0177	TRANSISTOR 2SB624BV3	1	
TR 2025	HTB0177	TRANSISTOR 2SB624BV3	1	
TR 2032	HTB0177	TRANSISTOR 2SB624BV3	1	
TR 2035	HTB0177	TRANSISTOR 2SB624BV3	1	
TR 2038	HTC0813	TRANSISTOR 2SC2853E	1	
TR 2040	HTC0590	TRANSISTOR 2SC1621B4	1	
TR 2043	HTD0202	TRANSISTOR 2SD596DV3	1	
TR 2045	HTA0263	TRANSISTOR 2SA1052D (MD)	1	
TR 2060	HTK0160	TRANSISTOR 2SK303 V4	1	
TR 2063	HTC0686	TRANSISTOR 2SC2462C (LC)	1	
TR 2080	HTA0263	TRANSISTOR 2SA1052D (MD)	1	

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
C 5502	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5503	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5504	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5505	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5506	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5507	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5508	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5509	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5510	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5511	CCG0292	C.CERAMIC 50 V10000 PF+-10%	R	1
C 5512	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5513	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5514	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5515	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5516	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5517	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5518	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5518A	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
C 5519	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5520	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5521	CCG0282	C.CERAMIC 50 V 470 PF+-5%	1	R
C 5521A	CCC1011	C.CERAMIC 50 V 33 PF+-5%	1	R
C 5522	CCG0282	C.CERAMIC 50 V 470 PF+-5%	1	R
C 5523	CCG0282	C.CERAMIC 50 V 470 PF+-5%	1	R
C 5524	CCG0255	C.CERAMIC 50 V 10 PF+-0.5PF	1	R
C 5525	CCG0250	C.CERAMIC 50 V 5 PF+-0.25PF	1	R
C 5526	CCG0283	C.CERAMIC 50 V 560 PF+-5%	1	R
C 5527	CCG0283	C.CERAMIC 50 V 560 PF+-5%	1	R
C 5528	CCG0283	C.CERAMIC 50 V 560 PF+-5%	1	R
C 5532	CCG0259	C.CERAMIC 50 V 15 PF+-5%	1	R
C 5540	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
C 5541	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
C 5542	CES0411	C.AL ELYC 16 V 470 UF+-20%	1	1
C 5543	CES0379	C.AL ELYC 10 V 470 UF +-20%	1	1
C 5545	CCG0255	C.CERAMIC 50 V 10 PF+-0.5PF	R	R
C 5546	CCG0267	C.CERAMIC 50 V 33 PF+-5%	1	R
C 5550	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5560	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 5561	CCG0292	C.CERAMIC 50 V10000 PF+-10%	1	1
C 8081	CCG0292	C.CERAMIC 50 V10000 PF+-10%	R	R
C 8082	CCG0292	C.CERAMIC 50 V10000 PF+-10%	R	R
C 8083	CCG0295	C.CERAMIC 25 V 0.1 UF+80-20%	R	R
C 8084	CES0133	C.AL ELYC 16 V 47 UF+-20%	R	R
CN 1	JBP0407	PIN PM-1-14P	1	1
CN 2	JBP0406	PIN PM-1-4P	1	1
CN 3	JBP0406	PIN PM-1-4P	1	1
CN 4	JBP0406	PIN PM-1-4P	1	1
D 5210	HDS0437	DIODE 1SS133	1	1
D 5211	HDM0236	DIODE.ZEN HZM7C (24)	1	1
D 5260	HDS0437	DIODE 1SS133	1	1
D 5261	HDM0236	DIODE.ZEN HZM7C (24)	1	1
D 5501	HDI0007	DIODE IMN10	1	R
D 5502	HDI0007	DIODE IMN10	1	R
D 5560	HDS0437	DIODE 1SS133	1	1

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
D 6001	HDS0437	DIODE	1SS133	1	R
D 6002	HDS0437	DIODE	1SS133	1	R
D 8080	HDS0538	DIODE	1SS153	R	R
IC 5301	IDH1215	IC.DIGITAL	HD14053BFP/MC14053BFP	1	1
IC 5302	IDH1386	IC.DIGITAL	HD74HC4040FP	1	1
IC 5303	ILM0497	IC	UA741CPS	1	1
IC 5304	ILN0082	IC.ANALOG	NJM319M	1	1
IC 5305	IDH1300	IC.DIGITAL	HD74HC04FP	1	1
IC 5306	IDH1297	IC.DIGITAL	HD74HC02FP	1	1
IC 5307	IDH1388	IC.DIGITAL	HD74HC377FP	1	1
IC 5308	IDH1303	IC.DIGITAL	HD74HC74FP	1	1
IC 5309	IDH1289	IC.DIGITAL	HD74HC153FP	1	1
IC 5310	IDT0261	IC.DIGITAL	TMP82C54M-2	1	1
IC 5311	IDH1303	IC.DIGITAL	HD74HC74FP	1	1
IC 5312	IDH1301	IC.DIGITAL	HD74HC08FP	1	1
IC 5313	IDH1299	IC.LOGIC	HD74HC32FP	1	1
IC 5314	IDH1299	IC.LOGIC	HD74HC32FP	1	1
IC 5315	IDT0147	IC.DIGITAL	TC74HC86F	1	1
IC 5316	IDT0162	IC.DIGITAL	TC74HC00AF	1	1
IC 5317	IDH1303	IC.DIGITAL	HD74HC74FP	1	1
IC 5318	IDH1303	IC.DIGITAL	HD74HC74FP	1	1
IC 5320	ILN0081	IC.ANALOG	NJM2902M	1	1
IC 5321	IZH0032	IC	HA19211BMPW	1	1
IC 5322	IZH0032	IC	HA19211BMPW	1	1
IC 5323	INH0003	IC	HM63021P-34	1	1
IC 5324	INH0003	IC	HM63021P-34	1	1
IC 5501	IMH0006	IC	HD64180R1CP10	1	1
IC 5502	INM0037	IC	MBM27C1000-20	1	1
IC 5503	INH0012	IC	HM62256LFP-10T	1	1
IC 5504	IDT0261	IC.DIGITAL	TMP82C54M-2	1	1
IC 5505	AAE0024	XTAL	EXO-3 18.432 MHZ	1	1
IC 5506	IDT0260	IC.DIGITAL	TMP82C55AF-10	1	1
IC 5507	IDH1304	IC.DIGITAL	HD74HC138FP	1	1
IC 5508	IDH1304	IC.DIGITAL	HD74HC138FP	1	1
IC 5509	IDT0186	IC.DIGITAL	TC74HC244AF	1	1
IC 5510	IDT0190	IC.DIGITAL	TC74HC574F	1	1
IC 5511	IDM0822	IC.DIGITAL	MC145406F	R	1
IC 5512	IDT0162	IC.DIGITAL	TC74HC00AF	1	1
IC 5513	IDH1300	IC.DIGITAL	HD74HC04FP	1	1
IC 5514	IDH1387	IC.DIGITAL	HD74HC27FP	1	1
IC 5515	IDH1299	IC.LOGIC	HD74HC32FP	1	1
IC 5516	IDH1299	IC.LOGIC	HD74HC32FP	1	1
IC 5517	IDH1388	IC.DIGITAL	HD74HC377FP	1	1
IC 5518	IDT0260	IC.DIGITAL	TMP82C55AF-10	1	1
IC 5519	IDT0190	IC.DIGITAL	TC74HC574F	1	1
IC 5520	IDT0190	IC.DIGITAL	TC74HC574F	1	1
IC 5521	ILM0496	IC.ANALOG	M5201FP	1	R
IC 5521A	IDH1215	IC.DIGITAL	HD14053BFP/MC14053BFP	1	R
IC 5522	ILM0496	IC.ANALOG	M5201FP	1	R
IC 5522A	IDH1215	IC.DIGITAL	HD14053BFP/MC14053BFP	1	R
IC 5550	IDT0179	IC.DIGITAL	TC74HC157F	1	1
IC 5560	IDT0162	IC.DIGITAL	TC74HC00AF	1	1
IC 5561	IDH1300	IC.DIGITAL	HD74HC04FP	1	1
IC 8060	ILT0091	IC.ANALOG	TL431CLP-B	1	1

SYMBOL	..PART CODE..	..... DESCRIPTION			Q.TY A	Q.TY B
R 5309	RME1442	R.METAL	0.1W	2.2 KOHM+-5%	1	1
R 5310	RME1127	R.METAL	1/4W	6.19KOHM +-1%	1	1
R 5311	RME1464	R.METAL	0.1W	220 KOHM+-5%	1	1
R 5312	RME1446	R.METAL	0.1W	4.7 KOHM+-5%	1	R
R 5313	RME1426	R.METAL	0.1W	100 OHM+-5%	1	1
R 5314	RME1437	R.METAL	0.1W	820 OHM+-5%	1	1
R 5315	RME1426	R.METAL	0.1W	100 OHM+-5%	1	1
R 5316	RME1426	R.METAL	0.1W	100 OHM+-5%	1	1
R 5317	RME1442	R.METAL	0.1W	2.2 KOHM+-5%	1	1
R 5318	RME1438	R.METAL	0.1W	1.0 KOHM+-5%	1	1
R 5319	RME1426	R.METAL	0.1W	100 OHM+-5%	1	R
R 5320	RME1438	R.METAL	0.1W	1.0 KOHM+-5%	1	1
R 5321	RME1446	R.METAL	0.1W	4.7 KOHM+-5%	1	1
R 5323	RME1466	R.METAL	0.1W	470 KOHM+-5%	1	1
R 5325	RME1458	R.METAL	0.1W	47 KOHM+-5%	1	1
R 5330	RME1074	R.METAL	1/4W	1.50KOHM +-1%	1	1
R 5331	RME1074	R.METAL	1/4W	1.50KOHM +-1%	1	1
R 5332	RME1174	R.METAL	1/4W	2.00KOHM +-1%	1	1
R 5333	RME1438	R.METAL	0.1W	1.0 KOHM+-5%	1	1
R 5334	RME1425	R.METAL	0.1W	82 OHM+-5%	1	1
R 5335	RME1418	R.METAL	0.1W	22 OHM+-5%	1	1
R 5336	RME1437	R.METAL	0.1W	820 OHM+-5%	1	1
R 5337	RME1437	R.METAL	0.1W	820 OHM+-5%	1	1
R 5338	RME1444	R.METAL	0.1W	3.3 KOHM+-5%	1	1
R 5339	RME1444	R.METAL	0.1W	3.3 KOHM+-5%	1	1
R 5340	RME1444	R.METAL	0.1W	3.3 KOHM+-5%	1	1
R 5341	RME1444	R.METAL	0.1W	3.3 KOHM+-5%	1	1
R 5350	RME1426	R.METAL	0.1W	100 OHM+-5%	1	1
R 5351	RME1426	R.METAL	0.1W	100 OHM+-5%	1	1
R 5352	RME1426	R.METAL	0.1W	100 OHM+-5%	1	1
R 5354	RME1426	R.METAL	0.1W	100 OHM+-5%	1	1
R 5501	RME1450	R.METAL	0.1W	10 KOHM+-5%	1	1
R 5502	RME1450	R.METAL	0.1W	10 KOHM+-5%	1	1
R 5503	RME1450	R.METAL	0.1W	10 KOHM+-5%	1	1
R 5504	RME1450	R.METAL	0.1W	10 KOHM+-5%	1	1
R 5505	RME1450	R.METAL	0.1W	10 KOHM+-5%	1	1
R 5510	RME1413	R.METAL	0.1W	0 OHM	R	R
R 5510A	RME1413	R.METAL	0.1W	0 OHM	1	1
R 5511	RME1096	R.METAL	1/4W	100 KOHM +-1%	1	1
R 5512	RME1096	R.METAL	1/4W	100 KOHM +-1%	1	1
R 5513	RME1096	R.METAL	1/4W	100 KOHM +-1%	1	1
R 5514	RME1096	R.METAL	1/4W	100 KOHM +-1%	1	1
R 5515	RME1096	R.METAL	1/4W	100 KOHM +-1%	1	1
R 5516	RME1464	R.METAL	0.1W	220 KOHM+-5%	1	1
R 5517	RME1083	R.METAL	1/4W	8.25KOHM +-1%	1	1
R 5518	RME1590	R.METAL	1/4W	243 OHM +-%	1	1
R 5519	RME1461	R.METAL	0.1W	82 KOHM+-5%	1	1
R 5520	RME1084	R.METAL	1/4W	10.0 KOHM +-1%	1	R
R 5521	RME1155	R.METAL	1/4W	4.00KOHM +-0.5%	1	R
R 5521A	RME1711	R.METAL	1/4W	1.00 KOHM +-0.5%	1	R
R 5522	RME1285	R.METAL	1/4W	4.99KOHM +-0.5%	1	R
R 5522A	RME1285	R.METAL	1/4W	4.99KOHM +-0.5%	1	R
R 5523	RME1084	R.METAL	1/4W	10.0 KOHM +-1%	1	R
R 5524	RME1084	R.METAL	1/4W	10.0 KOHM +-1%	1	R
R 5530	RME1450	R.METAL	0.1W	10 KOHM+-5%	1	1
R 5531	RME1096	R.METAL	1/4W	100 KOHM +-1%	1	1

SYMBOL	..PART CODE..	..... DESCRIPTION			Q.TY A	Q.TY B
K 8060	SRK0007	RLY.LATCH	G5A-237P 12VDC		R	R
L 5201	TLN0036	COIL	40MA	100 UH+-10%	R	R
L 5251	TLN0036	COIL	40MA	100 UH+-10%	R	R
L 5352	TLN0036	COIL	40MA	100 UH+-10%	1	1
L 5354	TLN0036	COIL	40MA	100 UH+-10%	1	1
L 5355	TLN0036	COIL	40MA	100 UH+-10%	1	1
L 5356	TLN0036	COIL	40MA	100 UH+-10%	1	1
L 5506	TLT0085	COIL	47 UH+-10% 0.94A		R	R
L 5507	TLT0085	COIL	47 UH+-10% 0.94A		R	R
L 8060	TLE0058	COIL	353MA	10 UH+-10%	R	R
L 8140B	TLN0004	COIL	450MA	100 NH+-20%	R	R
L 8141B	TLN0004	COIL	450MA	100 NH+-20%	R	R
P 492A	JBB0021	CONNECTOR	B3B-XH-A		R	R
P 501A	JBB0027	CONNECTOR	B2B-XH-A		R	R
P 501B	JBB0027	CONNECTOR	B2B-XH-A		R	R
P 5400	JBB0022	CONNECTOR	B6B-XH-A		1	1
P 5501	JBB0024	CONNECTOR	B15B-XH-A		1	1
P 5502A	JBB0027	CONNECTOR	B2B-XH-A		R	R
P 5502B	JBB0027	CONNECTOR	B2B-XH-A		R	R
P 5502C	JBB0061	CONNECTOR	B9B-XH-A		1	R
P 5502D	JBB0022	CONNECTOR	B6B-XH-A		R	1
P 5502E	JBB0027	CONNECTOR	B2B-XH-A		R	R
P 5503	JBB0060	CONNECTOR	B5B-XH-A		1	1
P 5504	JBB0060	CONNECTOR	B5B-XH-A		1	1
P 5505	JBB0023	CONNECTOR	B8B-XH-A		1	R
P 5506	JBB0027	CONNECTOR	B2B-XH-A		1	R
P 5507	JBB0027	CONNECTOR	B2B-XH-A		R	1
P 5508	JBB0023	CONNECTOR	B8B-XH-A		R	1
P 5601	JBS0068	CONNECTOR	S10B-XH-A		1	R
P 5602	JBS0066	CONNECTOR	S4B-XH-A		1	R
P 5701	JBB0058	CONNECTOR	B12B-XH-A		1	1
P 6020	JBB0039	CONNECTOR	B5B-PH		1	1
P 6021	JBB0040	CONNECTOR	B6B-PH		1	1
P 6022	JBB0052	CONNECTOR	B2B-PH		R	R
P 6024	JBB0052	CONNECTOR	B2B-PH		R	1
P 6027	JBB0044	CONNECTOR	B3B-PH		1	1
R 5208	RME1077	R.METAL	1/4W	2.67KOHM +-1%	1	1
R 5208A	RME1434	R.METAL	0.1W	470 OHM+-5%	1	1
R 5212	RME1414	R.METAL	0.1W	10 OHM+-5%	1	1
R 5213	RME1437	R.METAL	0.1W	820 OHM+-5%	1	1
R 5216	RME1430	R.METAL	0.1W	220 OHM+-5%	1	1
R 5256A	RME1430	R.METAL	0.1W	220 OHM+-5%	1	1
R 5258	RME1077	R.METAL	1/4W	2.67KOHM +-1%	1	1
R 5258A	RME1434	R.METAL	0.1W	470 OHM+-5%	1	1
R 5262	RME1414	R.METAL	0.1W	10 OHM+-5%	1	1
R 5263	RME1437	R.METAL	0.1W	820 OHM+-5%	1	1
R 5301	RME1096	R.METAL	1/4W	100 KOHM +-1%	1	1
R 5302	RME1096	R.METAL	1/4W	100 KOHM +-1%	1	1
R 5303	RME1060	R.METAL	1/4W	100 OHM +-1%	1	1
R 5304	RME1238	R.METAL	1/4W	24.9 KOHM +-1%	1	1
R 5305	RME1078	R.METAL	1/4W	3.32KOHM +-1%	1	1
R 5306	RME1121	R.METAL	1/4W	1.37KOHM +-1%	1	1
R 5307	RME1221	R.METAL	1/4W	1.37KOHM +-1%	1	1

SYMBOL	..PART CODE..	..... DESCRIPTION			Q.TY A	Q.TY B
R 5532	RME1096	R.METAL	1/4W	100 KOHM +-1%	1	1
R 5533	RME1096	R.METAL	1/4W	100 KOHM +-1%	1	1
R 5534	RME1096	R.METAL	1/4W	100 KOHM +-1%	1	1
R 5535	RME1096	R.METAL	1/4W	100 KOHM +-1%	1	1
R 5536	RME1464	R.METAL	0.1W	220 KOHM+-5%	1	1
R 5537	RME1443	R.METAL	0.1W	2.7 KOHM +-5%	1	R
R 5538	RME1083	R.METAL	1/4W	8.25KOHM +-1%	1	1
R 5539	RME1065	R.METAL	1/4W	267 OHM +-1%	1	1
R 5540	RME1461	R.METAL	0.1W	82 KOHM+-5%	1	1
R 5541	RME1084	R.METAL	1/4W	10.0 KOHM +-1%	1	R
R 5543	RME1285	R.METAL	1/4W	4.99KOHM +-0.5%	1	R
R 5543A	RME1285	R.METAL	1/4W	4.99KOHM +-0.5%	1	R
R 5544	RME1084	R.METAL	1/4W	10.0 KOHM +-1%	1	R
R 5545	RME1084	R.METAL	1/4W	10.0 KOHM +-1%	1	R
R 5546	RME1450	R.METAL	0.1W	10 KOHM+-5%	R	R
R 5547	RME1450	R.METAL	0.1W	10 KOHM+-5%	R	R
R 5550	RME1078	R.METAL	1/4W	3.32KOHM +-1%	1	R
R 5551	RME1074	R.METAL	1/4W	1.50KOHM +-1%	1	R
R 5552	RME1436	R.METAL	0.1W	680 OHM+-5%	1	R
R 5553	RME1438	R.METAL	0.1W	1.0 KOHM+-5%	1	R
R 5554	RME1078	R.METAL	1/4W	3.32KOHM +-1%	1	R
R 5555	RME1074	R.METAL	1/4W	1.50KOHM +-1%	1	R
R 5558	RME1413	R.METAL	0.1W	0 OHM	R	R
R 5558A	RME1413	R.METAL	0.1W	0 OHM	R	R
R 5561	RME1458	R.METAL	0.1W	47 KOHM+-5%	1	R
R 5562	RME1458	R.METAL	0.1W	47 KOHM+-5%	1	R
R 5563	RME1458	R.METAL	0.1W	47 KOHM+-5%	1	R
R 5564	RME1458	R.METAL	0.1W	47 KOHM+-5%	1	R
R 5565	RME1458	R.METAL	0.1W	47 KOHM+-5%	1	R
R 5566	RME1458	R.METAL	0.1W	47 KOHM+-5%	1	R
R 5567	RME1458	R.METAL	0.1W	47 KOHM+-5%	1	R
R 5567A	RME1413	R.METAL	0.1W	0 OHM	1	R
R 5567B	RME1413	R.METAL	0.1W	0 OHM	R	1
R 5568	RME1458	R.METAL	0.1W	47 KOHM+-5%	1	R
R 6001	RME1413	R.METAL	0.1W	0 OHM	R	R
R 6002	RME1413	R.METAL	0.1W	0 OHM	1	1
R 6003	RME1413	R.METAL	0.1W	0 OHM	1	1
R 6004	RME1413	R.METAL	0.1W	0 OHM	1	1
R 6005	RME1413	R.METAL	0.1W	0 OHM	1	1
R 6006	RME1413	R.METAL	0.1W	0 OHM	1	1
R 6007	RME1413	R.METAL	0.1W	0 OHM	1	1
R 6008	RME1413	R.METAL	0.1W	0 OHM	1	1
R 6009	RME1413	R.METAL	0.1W	0 OHM	1	1
R 6010	RME1413	R.METAL	0.1W	0 OHM	R	R
R 6020	RME1413	R.METAL	0.1W	0 OHM	1	1
R 6021	RME1413	R.METAL	0.1W	0 OHM	1	1
R 6022	RME1413	R.METAL	0.1W	0 OHM	R	R
R 6023	RME1413	R.METAL	0.1W	0 OHM	1	1
R 6024	RME1413	R.METAL	0.1W	0 OHM	1	1
R 6025	RME1413	R.METAL	0.1W	0 OHM	R	R
R 6026	RME1413	R.METAL	0.1W	0 OHM	1	R
R 6027	RME1413	R.METAL	0.1W	0 OHM	R	1
R 6028	RME1413	R.METAL	0.1W	0 OHM	1	R
R 6029	RME1413	R.METAL	0.1W	0 OHM	R	1
R 6030	RME1413	R.METAL	0.1W	0 OHM	1	R
R 6031	RME1413	R.METAL	0.1W	0 OHM	R	1

S/H (PEF-926)

SYMBOL	..PART CODE..	..... DESCRIPTION				Q.TY A	Q.TY B
R 6032	RME1413	R.METAL	0.1W	0	OHM	1	R
R 6033	RME1413	R.METAL	0.1W	0	OHM	R	1
R 6034	RME1413	R.METAL	0.1W	0	OHM	R	R
R 6035	RME1413	R.METAL	0.1W	0	OHM	1	R
R 6037A	RME1413	R.METAL	0.1W	0	OHM	1	R
R 6037B	RME1413	R.METAL	0.1W	0	OHM	R	R
R 6038B	RME1413	R.METAL	0.1W	0	OHM	R	1
R 6039	RME1413	R.METAL	0.1W	0	OHM	R	R
R 6040	RME1413	R.METAL	0.1W	0	OHM	1	R
R 6042B	RME1413	R.METAL	0.1W	0	OHM	R	1
R 6043A	RME1413	R.METAL	0.1W	0	OHM	R	R
R 6043B	RME1413	R.METAL	0.1W	0	OHM	R	1
R 6044	RME1413	R.METAL	0.1W	0	OHM	R	1
R 6048	RME1413	R.METAL	0.1W	0	OHM	R	R
R 6049	RME1413	R.METAL	0.1W	0	OHM	R	R
R 6050	RME1413	R.METAL	0.1W	0	OHM	R	R
R 6051A	RME1413	R.METAL	0.1W	0	OHM	1	R
R 6052	RME1413	R.METAL	0.1W	0	OHM	R	R
R 6053	RME1413	R.METAL	0.1W	0	OHM	R	R
R 6055	RME1413	R.METAL	0.1W	0	OHM	1	R
R 8116	RME1446	R.METAL	0.1W	4.7 KOHM+-5%		1	1
R 8120	HDS0437	DIODE	1SS133			1	1
R 8130	RME1438	R.METAL	0.1W	1.0 KOHM+-5%		R	R
R 8140A	RME1413	R.METAL	0.1W	0	OHM	R	R
R 8140B	RME1413	R.METAL	0.1W	0	OHM	R	R
R 8141A	RME1413	R.METAL	0.1W	0	OHM	R	R
R 8141B	RME1413	R.METAL	0.1W	0	OHM	R	R
RM 5301	RZA0332	R.BLOCK	EXK-F20Z2075			1	1
RM 5501	RZA0332	R.BLOCK	EXK-F20Z2075			1	1
RM 5502	RZA0332	R.BLOCK	EXK-F20Z2075			1	1
RV 5201	RNE0070	VR.METAL	EVN 39C00YB53(5K)			1	1
RV 5202	RNE0058	VR.METAL	EVN 39C00YB13(1K)			1	1
RV 5203	RNE0058	VR.METAL	EVN 39C00YB13(1K)			1	1
RV 5251	RNE0070	VR.METAL	EVN 39C00YB53(5K)			1	1
RV 5252	RNE0058	VR.METAL	EVN 39C00YB13(1K)			1	1
RV 5301	RNE0054	VR.METAL	EVN 39C00YB15(100K)			1	1
RV 5302	RNE0058	VR.METAL	EVN 39C00YB13(1K)			1	1
RV 5501	RNE0047	VR.METAL	EVN 39C00YB54(50K)			1	1
RV 5502	RNE0042	VR.METAL	EVN-39C00YB14(10K)			1	1
RV 5503	RNE0047	VR.METAL	EVN 39C00YB54(50K)			1	1
RV 5504	RNE0042	VR.METAL	EVN-39C00YB14(10K)			1	1
RV 8060	RNE0047	VR.METAL	EVN 39C00YB54(50K)			1	1
TR 5202	HTI0012	TRANSISTOR	IMX3			1	1
TR 5252	HTI0012	TRANSISTOR	IMX3			1	1
TR 5315	HTC0848	TRANSISTOR	2SC2759-U23			1	1
TR 8040	HTD0161	TRANSISTOR	DTC124EK			R	R

SYMBOL	..PART CODE..	..... DESCRIPTION				Q.TY A	Q.TY B
C 5201	CCG0286	C.CERAMIC	50	V 1000	PF+-10%	1	1
C 5202	CCG0257	C.CERAMIC	50	V 12	PF+-5%	1	1
C 5205	CCG0295	C.CERAMIC	25	V 0.1	UF+80-20%	1	1
C 5206	CCG0295	C.CERAMIC	25	V 0.1	UF+80-20%	1	1
C 5207	CCG0257	C.CERAMIC	50	V 12	PF+-5%	1	1
C 5251	CCG0286	C.CERAMIC	50	V 1000	PF+-10%	1	1
C 5252	CCG0257	C.CERAMIC	50	V 12	PF+-5%	1	1
C 5255	CCG0295	C.CERAMIC	25	V 0.1	UF+80-20%	1	1
C 5256	CCG0295	C.CERAMIC	25	V 0.1	UF+80-20%	1	1
C 5257	CCG0257	C.CERAMIC	50	V 12	PF+-5%	1	1
C 8001.	CCG0295	C.CERAMIC	25	V 0.1	UF+80-20%	2	2
C 8049	CCG0275	C.CERAMIC	50	V 120	PF+-5%	1	1
C 8060	CCG0286	C.CERAMIC	50	V 1000	PF+-10%	1	1
C 8061	CCG0257	C.CERAMIC	50	V 12	PF+-5%	1	1
C 8062	CCG0286	C.CERAMIC	50	V 1000	PF+-10%	1	1
C 8063	CCC1002	C.CERAMIC	50	V 10	PF+-5PF	1	R
C 8064	CCG0254	C.CERAMIC	50	V 9	PF+-0.5PF	R	R
C 8065	CCG0259	C.CERAMIC	50	V 15	PF+-5%	1	1
C 8066	CCG0255	C.CERAMIC	50	V 10	PF+-0.5PF	R	R
C 8067	CCG0292	C.CERAMIC	50	V10000	PF+-10%	1	1
C 8068	CCG0286	C.CERAMIC	50	V 1000	PF+-10%	1	1
C 8070	CCG0279	C.CERAMIC	50	V 270	PF+-5%	1	1
C 8071	CCG0294	C.CERAMIC	50	V47000	PF+80-20%	1	1
C 8072	CCG0295	C.CERAMIC	25	V 0.1	UF+80-20%	R	R
C 8073	CCG0255	C.CERAMIC	50	V 10	PF+-0.5PF	R	R
C 8074	CCG0295	C.CERAMIC	25	V 0.1	UF+80-20%	R	R
C 8075	CCG0294	C.CERAMIC	50	V47000	PF+80-20%	1	1
C 8076	CCG0286	C.CERAMIC	50	V 1000	PF+-10%	1	1
C 8077	CCG0294	C.CERAMIC	50	V47000	PF+80-20%	1	1
C 8080	CCG0270	C.CERAMIC	50	V 47	PF+-5%	1	1
C 8081	CCG0295	C.CERAMIC	25	V 0.1	UF+80-20%	1	1
C 8082	CCG0292	C.CERAMIC	50	V10000	PF+-10%	1	1
C 8083	CCG0249	C.CERAMIC	50	V 4	PF+-0.25PF	R	1
C 8083	CCG0250	C.CERAMIC	50	V 5	PF+-0.25PF	1	R
C 8102	CCG0295	C.CERAMIC	25	V 0.1	UF+80-20%	1	1
C 8304.	CCG0295	C.CERAMIC	25	V 0.1	UF+80-20%	2	2
C 8879.	CCG0295	C.CERAMIC	25	V 0.1	UF+80-20%	2	2
CN 1	JB00002	PIN	0Y-003-14P			1	1
CN 2	JB00001	PIN	0Y-003-4P			1	1
D 5202	HDH0236	DIODE.ZEN	HZM7C	(24)		1	1
D 5252	HDH0236	DIODE.ZEN	HZM7C	(24)		1	1
D 8043	HDH0224	DIODE	HSM88S (C1)			1	1
D 8060	HDH0236	DIODE.ZEN	HZM7C	(24)		1	1
D 8061	HDH0224	DIODE	HSM88S (C1)			1	1
D 8062	HDH0224	DIODE	HSM88S (C1)			1	1
D 8063	HDH0224	DIODE	HSM88S (C1)			1	1
D 8064	HDH0224	DIODE	HSM88S (C1)			1	1
D 8065	HDS0496	DIODE	1SS123			1	1
D 8066	HDH0224	DIODE	HSM88S (C1)			1	1
D 8067	HDS0496	DIODE	1SS123			1	1
D 8068	HDS0538	DIODE	1SS153			1	1
D 8069	HDH0230	DIODE.ZEN	HZM5B	(17)		1	1
D 8070	HDS0538	DIODE	1SS153			1	1
D 8071	HDH0235	DIODE.ZEN	HZM4B	(14)		1	1

PANEL (DSO) (PEF-882)

SYMBOL	..PART CODE..	..... DESCRIPTION				Q.TY A	Q.TY B
R 1601	RME1432	R.METAL	0.1W	330	OHM+-5%	1	
R 1602	RME1435	R.METAL	0.1W	560	OHM+-5%	1	
R 1603	RME1435	R.METAL	0.1W	560	OHM+-5%	1	
R 1604	RME1435	R.METAL	0.1W	560	OHM+-5%	1	
R 1605	RME1435	R.METAL	0.1W	560	OHM+-5%	1	
R 1606	RME1435	R.METAL	0.1W	560	OHM+-5%	1	
S 1601	SSP0624	SW.PB	SKHQFG (GREEN)			1	
S 1602	SSP0611	SW.PB	SKHQFF (RED)			1	
S 1603	SSP0611	SW.PB	SKHQFF (RED)			1	
S 1604	SSP0611	SW.PB	SKHQFF (RED)			1	
S 1605	SSP0611	SW.PB	SKHQFF (RED)			1	
S 1606	SSP0611	SW.PB	SKHQFF (RED)			1	

SYMBOL	..PART CODE..	..... DESCRIPTION				Q.TY A	Q.TY B
D 8072	HDH0232	DIODE.ZEN	HZM6A	(19)		1	1
P 6025	JBS0029	CONNECTOR	S3B-PH			1	1
P 6026	JBS0044	CONNECTOR	S7B-PH			1	1
R 5201	RME1430	R.METAL	0.1W	220	OHM+-5%	1	1
R 5202	RME1445	R.METAL	0.1W	3.9	KOHM+-5%	1	1
R 5203	RME1443	R.METAL	0.1W	2.7	KOHM +-5%	1	1
R 5204	RME1418	R.METAL	0.1W	22	OHM+-5%	1	1
R 5205	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 5206	RME1433	R.METAL	0.1W	390	OHM+-5%	1	1
R 5207	RME1438	R.METAL	0.1W	1.0	KOHM+-5%	1	1
R 5210	RME1446	R.METAL	0.1W	4.7	KOHM+-5%	1	1
R 5211	RME1446	R.METAL	0.1W	4.7	KOHM+-5%	1	1
R 5214	RME1449	R.METAL	0.1W	8.2	KOHM+-5%	1	1
R 5215	RME1443	R.METAL	0.1W	2.7	KOHM +-5%	1	1
R 5216	RME1440	R.METAL	0.1W	1.5	KOHM+-5%	1	1
R 5217	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 5218	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 5251	RME1430	R.METAL	0.1W	220	OHM+-5%	1	1
R 5252	RME1445	R.METAL	0.1W	3.9	KOHM+-5%	1	1
R 5253	RME1443	R.METAL	0.1W	2.7	KOHM +-5%	1	1
R 5254	RME1418	R.METAL	0.1W	22	OHM+-5%	1	1
R 5255	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 5256	RME1433	R.METAL	0.1W	390	OHM+-5%	1	1
R 5257	RME1438	R.METAL	0.1W	1.0	KOHM+-5%	1	1
R 5260	RME1446	R.METAL	0.1W	4.7	KOHM+-5%	1	1
R 5261	RME1446	R.METAL	0.1W	4.7	KOHM+-5%	1	1
R 5264	RME1449	R.METAL	0.1W	8.2	KOHM+-5%	1	1
R 5265	RME1443	R.METAL	0.1W	2.7	KOHM +-5%	1	1
R 5266	RME1440	R.METAL	0.1W	1.5	KOHM+-5%	1	1
R 5267	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 5268	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 5326	RME1413	R.METAL	0.1W	0	OHM	R	1
R 5327	RME1413	R.METAL	0.1W	0	OHM	R	1
R 5328	RME1413	R.METAL	0.1W	0	OHM	R	1
R 6052	RME1413	R.METAL	0.1W	0	OHM	R	R
R 6053	RME1413	R.METAL	0.1W	0	OHM	R	R
R 6054	RME1413	R.METAL	0.1W	0	OHM	R	R
R 8031	RME1438	R.METAL	0.1W	1.0	KOHM+-5%	1	1
R 8032	RME1419	R.METAL	0.1W	27	OHM+-5%	1	1
R 8040	RME1434	R.METAL	0.1W	470	OHM+-5%	1	1
R 8041	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 8042	RME1422	R.METAL	0.1W	47	OHM+-5%	1	1
R 8043	RME1424	R.METAL	0.1W	68	OHM+-5%	1	1
R 8044	RME1424	R.METAL	0.1W	68	OHM+-5%	1	1
R 8060	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 8061	RME1428	R.METAL	0.1W	150	OHM+-5%	1	1
R 8062	RME1429	R.METAL	0.1W	180	OHM+-5%	1	1
R 8063	RME1429	R.METAL	0.1W	180	OHM+-5%	1	1
R 8064	RME1430	R.METAL	0.1W	220	OHM+-5%	1	1
R 8065	RME1440	R.METAL	0.1W	1.5	KOHM+-5%	1	1
R 8066	RME1442	R.METAL	0.1W	2.2	KOHM+-5%	1	R
R 8067	RME1469	R.METAL	0.1W	4.7	OHM +-10%	1	1
R 8068	RME1440	R.METAL	0.1W	1.5	KOHM+-5%	1	1
R 8069	RME1440	R.METAL	0.1W	1.5	KOHM+-5%	1	1

ROM PG CKT (PEF-890)

SYMBOL	..PART CODE..	DESCRIPTION				Q.TY A	Q.TY B
R 8070	RME1433	R.METAL	0.1W	390	OHM+-5%	1	1
R 8071	RME1429	R.METAL	0.1W	180	OHM+-5%	1	1
R 8072	RME1434	R.METAL	0.1W	470	OHM+-5%	1	1
R 8073	RME1431	R.METAL	0.1W	270	OHM+-5%	1	1
R 8074	RME1420	R.METAL	0.1W	33	OHM+-5%	R	1
R 8074	RME1422	R.METAL	0.1W	47	OHM+-5%	1	R
R 8075	RME1414	R.METAL	0.1W	10	OHM+-5%	1	1
R 8076	RME1428	R.METAL	0.1W	150	OHM+-5%	1	1
R 8077	RME1428	R.METAL	0.1W	150	OHM+-5%	1	1
R 8078	RME1418	R.METAL	0.1W	22	OHM+-5%	1	1
R 8079	RME1420	R.METAL	0.1W	33	OHM+-5%	R	R
R 8080	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 8080	RME1425	R.METAL	0.1W	82	OHM+-5%	R	R
R 8081	RME1426	R.METAL	0.1W	100	OHM+-5%	R	R
R 8082	RME1435	R.METAL	0.1W	560	OHM+-5%	1	1
R 8083	RME1435	R.METAL	0.1W	560	OHM+-5%	1	1
R 8084	RME1435	R.METAL	0.1W	560	OHM+-5%	1	1
R 8085	RME1435	R.METAL	0.1W	560	OHM+-5%	1	1
R 8086	RME1450	R.METAL	0.1W	10	KOHM+-5%	1	1
R 8087	RME1450	R.METAL	0.1W	10	KOHM+-5%	1	1
R 8088	RME1420	R.METAL	0.1W	33	OHM+-5%	1	1
R 8089	RME1414	R.METAL	0.1W	10	OHM+-5%	1	1
R 8090	RME1445	R.METAL	0.1W	3.9	KOHM+-5%	1	1
R 8091	RME1413	R.METAL	0.1W	0	OHM	1	1
R 8092	RME1442	R.METAL	0.1W	2.2	KOHM+-5%	1	1
R 8093	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 8094	RME1434	R.METAL	0.1W	470	OHM+-5%	1	1
R 8095	RME1426	R.METAL	0.1W	100	OHM+-5%	R	R
R 8096	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 8098	RME1418	R.METAL	0.1W	22	OHM+-5%	1	1
R 8099	RME1442	R.METAL	0.1W	2.2	KOHM+-5%	1	1
R 8100	RME1428	R.METAL	0.1W	150	OHM+-5%	1	1
R 8101	RME1427	R.METAL	0.1W	120	OHM+-5%	1	1
R 8102	RME1442	R.METAL	0.1W	2.2	KOHM+-5%	1	1
R 8103	RME1418	R.METAL	0.1W	22	OHM+-5%	1	1
R 8105	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 8106	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 8107	RME1428	R.METAL	0.1W	150	OHM+-5%	1	1
R 8108	RME1426	R.METAL	0.1W	100	OHM+-5%	1	1
R 8109	RME1426	R.METAL	0.1W	100	OHM+-5%	R	R
R 8110	RME1434	R.METAL	0.1W	470	OHM+-5%	1	1
R 8111	RME1430	R.METAL	0.1W	220	OHM+-5%	1	1
R 8112	RME1438	R.METAL	0.1W	1.0	KOHM+-5%	1	1
R 8113	RME1438	R.METAL	0.1W	1.0	KOHM+-5%	1	1
R 8114	RME1414	R.METAL	0.1W	10	OHM+-5%	1	1
R 8115	RME1432	R.METAL	0.1W	330	OHM+-5%	1	1
R 8117	RME1440	R.METAL	0.1W	1.5	KOHM+-5%	1	1
R 8118	RME1431	R.METAL	0.1W	270	OHM+-5%	1	1
R 8119	RME1430	R.METAL	0.1W	10	KOHM+-5%	1	1
R 8120	RME1428	R.METAL	0.1W	150	OHM+-5%	1	1
R 8121	RME1428	R.METAL	0.1W	150	OHM+-5%	1	1
R 8122	RME1414	R.METAL	0.1W	10	OHM+-5%	1	1
R 8124	RME1413	R.METAL	0.1W	0	OHM	1	1
R 8125	RME1413	R.METAL	0.1W	0	OHM	1	1
R 8150	RME1454	R.METAL	0.1W	22	KOHM+-5%	1	1

SYMBOL	..PART CODE..	DESCRIPTION				Q.TY A	Q.TY B
	IYX0041	SOCKET,IC		10628-01-445		1	
	JYX0054					1	
	JJX0072	CONECTOR		CAP 1-480351-0		1	
C 3001	CCG0211	C.CERAMIC		50	V10000 PF+-10%	1	
C 3002	CCG0211	C.CERAMIC		50	V10000 PF+-10%	1	
C 3003	CCG0211	C.CERAMIC		50	V10000 PF+-10%	1	
C 3004	CCG0211	C.CERAMIC		50	V10000 PF+-10%	1	
C 3005	CCG0211	C.CERAMIC		50	V10000 PF+-10%	1	
C 3006	CCG0211	C.CERAMIC		50	V10000 PF+-10%	1	
C 3007	CCG0179	C.CERAMIC		50	V 150 PF+-5%	1	
C 3010	CCG0205	C.CERAMIC		50	V 1000 PF+-10%	1	
C 3011	CCG0205	C.CERAMIC		50	V 1000 PF+-10%	1	
C 3012	CCG0205	C.CERAMIC		50	V 1000 PF+-10%	1	
C 3013	CCG0205	C.CERAMIC		50	V 1000 PF+-10%	1	
C 3014	CCG0205	C.CERAMIC		50	V 1000 PF+-10%	1	
C 3015	CCG0179	C.CERAMIC		50	V 150 PF+-5%	1	
C 3016	CCG0179	C.CERAMIC		50	V 150 PF+-5%	1	
C 3050	CDE0004	C.2-LAYER		5.5V	1.0 F+80-20%	1	
C 3051	CCG0213	C.CERAMIC		50	V 0.1 UF+80-20%	1	
C 3056	CEK0183	C.AL ELYC		10	V 470 UF +-20%	R	
C 3101	CCG0128	C.CERAMIC		50	V 15 PF+-5%	1	
C 3102	CCG0128	C.CERAMIC		50	V 15 PF+-5%	1	
C 3105	CCG0213	C.CERAMIC		50	V 0.1 UF+80-20%	1	
C 3106	CCG0213	C.CERAMIC		50	V 0.1 UF+80-20%	1	
C 3107	CES0133	C.AL ELYC		16	V 47 UF+-20%	1	
C 3108	CCG0211	C.CERAMIC		50	V10000 PF+-10%	1	
C 3109	CCG0211	C.CERAMIC		50	V10000 PF+-10%	1	
C 3210	CCG0211	C.CERAMIC		50	V10000 PF+-10%	1	
C 3211	CCG0211	C.CERAMIC		50	V10000 PF+-10%	1	
C 3212	CCG0211	C.CERAMIC		50	V10000 PF+-10%	1	
D 3001	HDM0139	DIODE.ZEN		MTZ3.3JA		1	
D 3002	HDS0437	DIODE		1SS133		1	
IC 3001	IDH1292	IC.DIGITAL		HN27256G-25		1	
IC 3002	IDH1051	IC.DIGITAL		HD74HC74P		1	
IC 3003	IDH1274	IC.DIGITAL		HD74HC573P/TC74HC573P		1	
IC 3004	IDH1275	IC.DIGITAL		HD74HC574P/TC74HC574P		1	
IC 3005	IDH1275	IC.DIGITAL		HD74HC574P/TC74HC574P		1	
IC 3006	IDH1003	IC.DIGITAL		HD74HC32P/TC74HC32P		1	
IC 3007	ILM0399	IC.ANALOG		MN1280R		1	
IC 3101	IDM0685	IC.DIGITAL		UPD78C10G-36		1	
IC 3210	INH0017	IC		HM6264ALP-15		1	
IC 3211	IDH1149	IC.DIGITAL		HD74HC155P		1	
IC 3212	IDH0982	IC.DIGITAL		HD74HC00P/TC74HC00P		1	
P 3001	JBS0027	CONNECTOR		SQ-8-AP-GB-C		1	
P 3002	JBS0027	CONNECTOR		SQ-8-AP-GB-C		1	
P 3003	JBS0027	CONNECTOR		SQ-8-AP-GB-C		1	
P 3004	JBS0027	CONNECTOR		SQ-8-AP-GB-C		1	
P 3005	JBS0027	CONNECTOR		SQ-8-AP-GB-C		1	
P 3006	JBS0027	CONNECTOR		SQ-8-AP-GB-C		1	
P 3007	JBS0027	CONNECTOR		SQ-8-AP-GB-C		1	
P 3008	JBS0027	CONNECTOR		SQ-8-AP-GB-C		1	
P 3210	JBB0058	CONNECTOR		B12B-XH-A		1	

SYMBOL	..PART CODE..	DESCRIPTION				Q.TY A	Q.TY B
TR 5201	HTD0202	TRANSISTOR		2SD596DV3		1	1
TR 5202	HTD0202	TRANSISTOR		2SD596DV3		1	1
TR 5203	HTD0202	TRANSISTOR		2SD596DV3		1	1
TR 5206	HTA0263	TRANSISTOR		2SA1052D (MD)		1	1
TR 5207	HTC0686	TRANSISTOR		2SC2462C (LC)		1	1
TR 5251	HTD0202	TRANSISTOR		2SD596DV3		1	1
TR 5252	HTD0202	TRANSISTOR		2SD596DV3		1	1
TR 5253	HTD0202	TRANSISTOR		2SD596DV3		1	1
TR 5256	HTA0263	TRANSISTOR		2SA1052D (MD)		1	1
TR 5257	HTC0686	TRANSISTOR		2SC2462C (LC)		1	1
TR 8060	HTC0884	TRANSISTOR		2SC3775-OY4		1	1
TR 8061	HTC0884	TRANSISTOR		2SC3775-OY4		1	1
TR 8062	HTC0884	TRANSISTOR		2SC3775-OY4		1	1
TR 8063	HTK0127	TRANSISTOR		2SK508K52/2SK508K52NV		1	1
TR 8064	HTK0127	TRANSISTOR		2SK508K52/2SK508K52NV		1	1
TR 8065	HTC0848	TRANSISTOR		2SC2759-U23		1	1
TR 8066	HTA0318	TRANSISTOR		2SA1462Y34		1	1
TR 8067	HTC0848	TRANSISTOR		2SC2759-U23		1	1
TR 8068	HTC0848	TRANSISTOR		2SC2759-U23		1	1
TR 8069	HTC0848	TRANSISTOR		2SC2759-U23		1	1
TR 8070	HTC0848	TRANSISTOR		2SC2759-U23		1	1
TR 8071	HTA0318	TRANSISTOR		2SA1462Y34		1	1
TR 8072	HTA0318	TRANSISTOR		2SA1462Y34		1	1
TR 8075	HTC0871	TRANSISTOR		2SC3772LY4		1	1
TR 8076	HTD0161	TRANSISTOR		DTC124EK		1	1

SYMBOL	..PART CODE..	DESCRIPTION				Q.TY A	Q.TY B
R 3002	RME0892	R.METAL	1/8W	22	KOHM +-5%	1	
R 3003	RME0892	R.METAL	1/8W	22	KOHM +-5%	1	
R 3004	RME0892	R.METAL	1/8W	22	KOHM +-5%	1	
R 3005	RME0884	R.METAL	1/8W	4.7	KOHM +-5%	1	
R 3006	RME0884	R.METAL	1/8W	4.7	KOHM +-5%	1	
R 3010	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3011	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3012	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3013	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3014	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3015	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3016	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3017	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3018	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3051	RME0869	R.METAL	1/8W	270	OHM +-5%	1	
R 3052	RME0870	R.METAL	1/8W	330	OHM +-5%	1	
R 3053	RME0880	R.METAL	1/8W	2.2	KOHM +-5%	1	
R 3054	RME0883	R.METAL	1/8W	3.9	KOHM +-5%	1	
R 3055	RME0862	R.METAL	1/8W	68	OHM +-5%	1	
R 3056	RME0912	R.METAL	1/8W	0	OHM	R	
R 3101	RME0906	R.METAL	1/8W	1.0	MOHM +-5%	1	
R 3210	RME0912	R.METAL	1/8W	0	OHM	1	
R 3211	RME0912	R.METAL	1/8W	0	OHM	R	
R 3212	RME0912	R.METAL	1/8W	0	OHM	1	
R 3213	RME0912	R.METAL	1/8W	0	OHM	R	
R 3214	RME0912	R.METAL	1/8W	0	OHM	1	
R 3215	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3216	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3217	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3218	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3219	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3220	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3221	RME0875	R.METAL	1/8W	820	OHM +-5%	1	
R 3251	RME0884	R.METAL	1/8W	4.7	KOHM +-5%	1	
R 3252	RCE0781	R.CARBON	1/4W	10	KOHM +-5%	1	
R 3253	RME0912	R.METAL	1/8W	0	OHM	R	
R 3254	RME0864	R.METAL	1/8W	100	OHM +-5%	1	
R 3255	RME0896	R.METAL	1/8W	47	KOHM +-5%	1	
R 3256	RME0896	R.METAL	1/8W	47	KOHM +-5%	1	
R 3257	RME0912	R.METAL	1/8W	0	OHM	R	
R 3258	RME0912	R.METAL	1/8W	0	OHM	1	
TR 3001	HTA0224	TRANSISTOR		2SA1029D		1	
TR 3002	HTC0686	TRANSISTOR		2SC2462C (LC)		1	
TR 3003	HTA0263	TRANSISTOR		2SA1052D (MD)		1	
TR 3201	HTC0590	TRANSISTOR		2SC1621B4		1	
X 3101	AAA0005	XTAL		AT-51	12.000 MHZ	1	

DLY6 (PEF-927)

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
C 495	CCG0121	C.CERAMIC 50 V 7 PF+-0.5PF	R	
C 496	CCG0121	C.CERAMIC 50 V 7 PF+-0.5PF	R	
C 497	CCG0121	C.CERAMIC 50 V 7 PF+-0.5PF	R	
C 498	CCG0121	C.CERAMIC 50 V 7 PF+-0.5PF	R	
C 499	CCG0117	C.CERAMIC 50 V 3 PF+-0.25PF	R	
CV 499	CVT0057	C.VARIABLE TZ03T200NR169 (~20P)	R	
L 495	RME0912	R.METAL 1/8W 0 OHM	1	
L 496	RME0912	R.METAL 1/8W 0 OHM	1	
L 497	TLN0012	COIL 450MA 68 NH+-20%	R	
P 492	JBX2210	CONNECTOR 05JQ-ST	1	

RS-232C (PEF-887)

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
D 5500	HDD0174	DIODE DAN803	1	
P 5505	JBS0025	CONNECTOR S15B-XH-A	1	
P 5506	JBX2450	CONNECTOR 17LE-13250-27(D3AB)	1	
S 5501	SSL0079	SW,LEVER DNT-8	1	

V-PRE&TRIG AMP (PEF-876)

SYMBOL ZZZZZZZ	..PART CODE.. NOTHING	..... DESCRIPTION ..... *****NOTHING *****	Q.TY A	Q.TY B
C 1	CQM0431	C.PLASTIC 400 V47000 PF+-10%	1	
C 2	CCG0128	C.CERAMIC 50 V 15 PF+-5%	1	
C 3	CCG0128	C.CERAMIC 50 V 15 PF+-5%	1	
C 5	CCD0274	C.CERAMIC 500 V 3 PF+-0.25PF	1	
C 8	CCG0136	C.CERAMIC 50 V 33 PF+-5%	1	
C 9	CCG0116	C.CERAMIC 50 V 2 PF+-0.25PF	1	
C 12	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 13	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 15	CCD0272	C.CERAMIC 500 V 1 PF+-0.25PF	1	
C 18	CCG0144	C.CERAMIC 50 V 220 PF+-5%	1	
C 19	CCG0142	C.CERAMIC 50 V 82 PF+-5%	1	
C 20	CCD0286	C.CERAMIC 500 V 1000 PF+100-0%	1	
C 24	CCG0126	C.CERAMIC 50 V 12 PF+-5%	1	
C 25	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 26	CCG0128	C.CERAMIC 50 V 15 PF+-5%	1	
C 27	CCG0201	C.CERAMIC 50 V 470 PF+-5%	1	
C 31	CCG0116	C.CERAMIC 50 V 2 PF+-0.25PF	1	
C 41	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 42	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 43	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 44	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 45	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 46	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 47	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 51	CCG0119	C.CERAMIC 50 V 5 PF+-0.25PF	1	
C 53	CCG0121	C.CERAMIC 50 V 7 PF+-0.5PF	1	
C 57	CCG0213	C.CERAMIC 50 V 0.1 UF+80-20%	1	
C 60	CCG0120	C.CERAMIC 50 V 6 PF+-0.5PF	1	
C 61	CCG0136	C.CERAMIC 50 V 33 PF+-5%	1	
C 62	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 65	CCG0203	C.CERAMIC 50 V 680 PF+-5%	1	
C 66	CES0252	C.AL ELYC 16 V 10 UF+-20%BP	1	
C 67	CCG0203	C.CERAMIC 50 V 680 PF+-5%	1	
C 69	CCG0120	C.CERAMIC 50 V 6 PF+-0.5PF	1	
C 70	CCG0117	C.CERAMIC 50 V 3 PF+-0.25PF	1	
C 71	CCG0117	C.CERAMIC 50 V 3 PF+-0.25PF	R	
C 73	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 74	CCG0116	C.CERAMIC 50 V 2 PF+-0.25PF	1	
C 92	CMU0047	C.MICA 500 V 27 PF+-0.5%	1	
C 93	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 94	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 95	CCG0117	C.CERAMIC 50 V 3 PF+-0.25PF	1	
C 101	CQM0431	C.PLASTIC 400 V47000 PF+-10%	1	
C 102	CCG0128	C.CERAMIC 50 V 15 PF+-5%	1	
C 103	CCG0128	C.CERAMIC 50 V 15 PF+-5%	1	
C 105	CCD0274	C.CERAMIC 500 V 3 PF+-0.25PF	1	
C 108	CCG0136	C.CERAMIC 50 V 33 PF+-5%	1	
C 109	CCG0116	C.CERAMIC 50 V 2 PF+-0.25PF	1	
C 112	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 113	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 115	CCD0272	C.CERAMIC 500 V 1 PF+-0.25PF	1	
C 118	CCG0144	C.CERAMIC 50 V 220 PF+-5%	1	
C 119	CCG0142	C.CERAMIC 50 V 82 PF+-5%	1	
C 120	CCD0286	C.CERAMIC 500 V 1000 PF+100-0%	1	

DLY5 (PEF-896)

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
L 491	RME0912	R.METAL 1/8W 0 OHM	1	
L 492	RME0912	R.METAL 1/8W 0 OHM	1	
P 491	JBX2203	CONNECTOR 03JQ-ST	1	

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
C 124	CCG0126	C.CERAMIC 50 V 12 PF+-5%	1	
C 125	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 126	CCG0128	C.CERAMIC 50 V 15 PF+-5%	1	
C 127	CCG0201	C.CERAMIC 50 V 470 PF+-5%	1	
C 131	CCG0116	C.CERAMIC 50 V 2 PF+-0.25PF	1	
C 141	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 142	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 143	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 144	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 145	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 146	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 147	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 151	CCG0119	C.CERAMIC 50 V 5 PF+-0.25PF	1	
C 153	CCG0121	C.CERAMIC 50 V 7 PF+-0.5PF	1	
C 157	CCG0213	C.CERAMIC 50 V 0.1 UF+80-20%	1	
C 161	CCG0136	C.CERAMIC 50 V 33 PF+-5%	1	
C 162	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 165	CCG0203	C.CERAMIC 50 V 680 PF+-5%	1	
C 166	CES0252	C.AL ELYC 16 V 10 UF+-20%BP	1	
C 167	CCG0203	C.CERAMIC 50 V 680 PF+-5%	1	
C 169	CCG0120	C.CERAMIC 50 V 6 PF+-0.5PF	1	
C 171	CCG0117	C.CERAMIC 50 V 3 PF+-0.25PF	R	
C 172	CCG0117	C.CERAMIC 50 V 3 PF+-0.25PF	1	
C 173	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 174	CCG0117	C.CERAMIC 50 V 3 PF+-0.25PF	1	
C 178	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 192	CMU0047	C.MICA 500 V 27 PF+-0.5%	1	
C 193	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 194	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 305	CCG0117	C.CERAMIC 50 V 3 PF+-0.25PF	1	
C 311	CCG0121	C.CERAMIC 50 V 7 PF+-0.5PF	1	
C 321	CCG0138	C.CERAMIC 50 V 39 PF+-5%	1	
C 322	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 323	CCG0213	C.CERAMIC 50 V 0.1 UF+80-20%	1	
C 324	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 325	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 326	CES0252	C.AL ELYC 16 V 10 UF+-20%BP	1	
C 327	CCG0213	C.CERAMIC 50 V 0.1 UF+80-20%	1	
C 328	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 329	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 332	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 333	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 341	CCG0201	C.CERAMIC 50 V 470 PF+-5%	1	
C 364	CCG0116	C.CERAMIC 50 V 2 PF+-0.25PF	1	
C 366	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	
C 367	CCG0213	C.CERAMIC 50 V 0.1 UF+80-20%	1	
C 368	CCG0213	C.CERAMIC 50 V 0.1 UF+80-20%	1	
C 380	CES0378	C.AL ELYC 16 V 330 UF+-20%	1	
C 381	CES0379	C.AL ELYC 10 V 470 UF +-20%	1	
C 382	CES0378	C.AL ELYC 16 V 330 UF+-20%	1	
C 404	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	
C 410	CCG0205	C.CERAMIC 50 V 1000 PF+-10%	R	
C 472	CCG0119	C.CERAMIC 50 V 5 PF+-0.25PF	1	
C 473	CCG0119	C.CERAMIC 50 V 5 PF+-0.25PF	1	
C 475	XCF0033		R	
C 476	XCF0033		R	

SYMBOL	..PART CODE..	DESCRIPTION					Q.TY A	Q.TY B
C 483	CCG0193	C.CERAMIC	50	V 150	PF+-5%		1	
C 484	CCG0186	C.CERAMIC	50	V22000	PF+-20%		1	
C 489	CES0133	C.AL ELYC	16	V 47	UF+-20%		1	
C 490	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 491	CCG0122	C.CERAMIC	50	V 8	PF+-0.5PF		1	
C 492	CCG0128	C.CERAMIC	50	V 15	PF+-5%		1	
C 493	CCG0134	C.CERAMIC	50	V 27	PF+-5%		1	
C 601	CCG0193	C.CERAMIC	50	V 150	PF+-5%		1	
C 602	CCG0213	C.CERAMIC	50	V 0.1	UF+80-20%		1	
C 607	CCG0217	C.CERAMIC	50	V47000	PF+-10%		1	
C 608	CES0252	C.AL ELYC	16	V 10	UF+-20%BP		1	
C 610	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 611	CES0133	C.AL ELYC	16	V 47	UF+-20%		1	
C 620	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 621	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 622	CES0252	C.AL ELYC	16	V 10	UF+-20%BP		1	
C 625	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 626	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 627	CES0252	C.AL ELYC	16	V 10	UF+-20%BP		1	
C 5300	CCG0120	C.CERAMIC	50	V 6	PF+-0.5PF		1	
C 5301	CQM0431	C.PLASTIC	400	V47000	PF+-10%		1	
C 5303	CCG0398	C.CERAMIC	500	V 3	PF+-0.25PF		1	
C 5304	CCG0398	C.CERAMIC	500	V 3	PF+-0.25PF		1	
C 5307	CCD0275	C.CERAMIC	500	V 5	PF+-0.25PF		1	
C 5307A	CCD0272	C.CERAMIC	500	V 1	PF+-0.25PF		1	
C 5309	CCD0328	C.CERAMIC	500	V 1000	PF+100-0%		1	
C 5312	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5313	CES0133	C.AL ELYC	16	V 47	UF+-20%		1	
C 5314	CES0133	C.AL ELYC	16	V 47	UF+-20%		1	
C 5315	XCF0033						R	
C 5317	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5318	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5320	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5322	XCF0033						R	
C 5323	CCG0145	C.CERAMIC	50	V 1000	PF+-20%		1	
C 5326	CCG0132	C.CERAMIC	50	V 22	PF+-5%		1	
C 5330	CCG0119	C.CERAMIC	50	V 5	PF+-0.25PF		1	
C 5335	CCG0116	C.CERAMIC	50	V 2	PF+-0.25PF		R	
C 5336	CCG0116	C.CERAMIC	50	V 2	PF+-0.25PF		1	
C 5336B	CCG0126	C.CERAMIC	50	V 12	PF+-5%		1	
C 5337	XCF0033						R	
C 5338	CES0252	C.AL ELYC	16	V 10	UF+-20%BP		1	
C 5341	CCG0203	C.CERAMIC	50	V 680	PF+-5%		1	
C 5342	CCG0203	C.CERAMIC	50	V 680	PF+-5%		1	
C 5342B	CCG0116	C.CERAMIC	50	V 2	PF+-0.25PF		1	
C 5343	CCC0996	C.CERAMIC	50	V 2	PF+-0.25PF		1	
C 5346	CES0133	C.AL ELYC	16	V 47	UF+-20%		1	
C 5347	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5349	CCG0117	C.CERAMIC	50	V 3	PF+-0.25PF		1	
C 5350	CCG0128	C.CERAMIC	50	V 15	PF+-5%		1	
C 5351	CQM0431	C.PLASTIC	400	V47000	PF+-10%		1	
C 5353	CCG0398	C.CERAMIC	500	V 3	PF+-0.25PF		1	
C 5354	CCG0398	C.CERAMIC	500	V 3	PF+-0.25PF		1	
C 5357	CCD0275	C.CERAMIC	500	V 5	PF+-0.25PF		1	
C 5359	CCD0286	C.CERAMIC	500	V 1000	PF+100-0%		1	
C 5362	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	

SYMBOL	..PART CODE..	DESCRIPTION		Q.TY A	Q.TY B
D 41	HDM0141	DIODE.ZEN	MTZ7.5JC	1	
D 42	HDS0477	DIODE	1SS110	1	
D 71	HDS0437	DIODE	1SS133	R	
D 72	HDS0437	DIODE	1SS133	R	
D 73	HDS0437	DIODE	1SS133		1
D 74	HDS0437	DIODE	1SS133		1
D 123	HDS0477	DIODE	1SS110		1
D 125	HDS0477	DIODE	1SS110		1
D 126	HDS0477	DIODE	1SS110		1
D 131	HDS0477	DIODE	1SS110		1
D 141	HDM0141	DIODE.ZEN	MTZ7.5JC		1
D 142	HDS0477	DIODE	1SS110		1
D 171	HDS0437	DIODE	1SS133	R	
D 172	HDS0437	DIODE	1SS133	R	
D 173	HDS0437	DIODE	1SS133		1
D 174	HDS0437	DIODE	1SS133		1
D 320	HDS0437	DIODE	1SS133		1
D 321	HDS0437	DIODE	1SS133		1
D 322	HDM0139	DIODE.ZEN	MTZ3.3JA		1
D 345	HDS0437	DIODE	1SS133		1
D 5301	HDS0437	DIODE	1SS133	R	
D 5302	HDS0437	DIODE	1SS133	R	
D 5303	HDS0437	DIODE	1SS133	R	
D 5304	HDS0437	DIODE	1SS133	R	
D 5305	HDS0437	DIODE	1SS133		1
D 5306	HDS0437	DIODE	1SS133		1
D 5307	HDS0437	DIODE	1SS133		1
D 5308	HDS0437	DIODE	1SS133		1
D 5309	HDS0477	DIODE	1SS110		1
D 5313	HDS0477	DIODE	1SS110		1
D 5359	HDS0477	DIODE	1SS110		1
D 5363	HDS0477	DIODE	1SS110		1
D 5401	HDS0437	DIODE	1SS133		1
D 5402	HDS0437	DIODE	1SS133		1
D 5403	HDS0437	DIODE	1SS133		1
D 5404	HDS0437	DIODE	1SS133		1
D 5405	HDS0437	DIODE	1SS133		1
D 5406	HDS0437	DIODE	1SS133		1
D 5407	HDS0437	DIODE	1SS133		1
D 5408	HDS0437	DIODE	1SS133		1
D 5409	HDS0437	DIODE	1SS133		1
D 5410	HDS0437	DIODE	1SS133		1
D 5411	HDS0437	DIODE	1SS133		1
D 5412	HDS0437	DIODE	1SS133		1
D 5413	HDS0437	DIODE	1SS133		1
D 5414	HDS0437	DIODE	1SS133		1
IC 26	8397023 A	IC.ANALOG	LF411CN-S1		1
IC 126	8397023 A	IC.ANALOG	LF411CN-S1		1
IC 171	HTD0161	TRANSISTOR	DTC124EK		1
IC 172	HTD0161	TRANSISTOR	DTC124EK		1
IC 320	ILT0037	IC.ANALOG	TL081CP		1
IC 610	IDM0575	IC.DIGITAL	MC10H116L		1
IC 5301	IDH0982	IC.DIGITAL	HD74HC00P/TC74HC00P		1
IC 5302	IZM0137	IC	UPD5201C		1

SYMBOL	..PART CODE..	DESCRIPTION					Q.TY A	Q.TY B
C 5363	CES0133	C.AL ELYC	16	V 47	UF+-20%		1	
C 5364	CES0133	C.AL ELYC	16	V 47	UF+-20%		1	
C 5365	XCF0033						R	
C 5367	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5368	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5369	CCG0134	C.CERAMIC	50	V 27	PF+-5%		1	
C 5370	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5372	XCF0033						R	
C 5373	CCG0145	C.CERAMIC	50	V 1000	PF+-20%		1	
C 5380	CCG0117	C.CERAMIC	50	V 3	PF+-0.25PF		1	
C 5385	XCF0033						R	
C 5386	CCG0118	C.CERAMIC	50	V 4	PF+-0.25PF		1	
C 5386B	CCG0126	C.CERAMIC	50	V 12	PF+-5%		1	
C 5387	XCF0033						R	
C 5388	CES0252	C.AL ELYC	16	V 10	UF+-20%BP		1	
C 5391	CCG0203	C.CERAMIC	50	V 680	PF+-5%		1	
C 5392	CCG0203	C.CERAMIC	50	V 680	PF+-5%		1	
C 5392B	CCG0116	C.CERAMIC	50	V 2	PF+-0.25PF		1	
C 5393	CCC0996	C.CERAMIC	50	V 2	PF+-0.25PF		1	
C 5396	CES0133	C.AL ELYC	16	V 47	UF+-20%		1	
C 5397	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5399	CCG0117	C.CERAMIC	50	V 3	PF+-0.25PF		1	
C 5406	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5407	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5408	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5409	CCG0213	C.CERAMIC	50	V 0.1	UF+80-20%		1	
C 5410	CCG0213	C.CERAMIC	50	V 0.1	UF+80-20%		1	
C 5411	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5412	CCG0213	C.CERAMIC	50	V 0.1	UF+80-20%		1	
C 5414	CCG0117	C.CERAMIC	50	V 3	PF+-0.25PF		R	
C 5419	CCG0213	C.CERAMIC	50	V 0.1	UF+80-20%		1	
C 5421	CCG0117	C.CERAMIC	50	V 3	PF+-0.25PF		1	
C 5461	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	
C 5464	CCG0117	C.CERAMIC	50	V 3	PF+-0.25PF		R	
CV 4	CVT0056	C.VARIABLE	TZ03Z100NR169		(~10P)		1	
CV 5	CVT0053	C.VARIABLE	TZ03Z2R3NR169		(~2.3P)		1	
CV 14	CVT0056	C.VARIABLE	TZ03Z100NR169		(~10P)		1	
CV 15	CVT0053	C.VARIABLE	TZ03Z2R3NR169		(~2.3P)		1	
CV 104	CVT0056	C.VARIABLE	TZ03Z100NR169		(~10P)		1	
CV 105	CVT0053	C.VARIABLE	TZ03Z2R3NR169		(~2.3P)		1	
CV 114	CVT0056	C.VARIABLE	TZ03Z100NR169		(~10P)		1	
CV 115	CVT0053	C.VARIABLE	TZ03Z2R3NR169		(~2.3P)		1	
CV 160	CVT0056	C.VARIABLE	TZ03Z100NR169		(~10P)		1	
CV 305	CVT0053	C.VARIABLE	TZ03Z2R3NR169		(~2.3P)		1	
CV 5303	CVT0056	C.VARIABLE	TZ03Z100NR169		(~10P)		1	
CV 5310	CVT0056	C.VARIABLE	TZ03Z100NR169		(~10P)		1	
CV 5336	CVT0054	C.VARIABLE	TZ03Z050NR169		(~5P)		1	
CV 5353	CVT0056	C.VARIABLE	TZ03Z100NR169		(~10P)		1	
CV 5360	CVT0056	C.VARIABLE	TZ03Z100NR169		(~10P)		1	
CV 5386	CVT0054	C.VARIABLE	TZ03Z050NR169		(~5P)		1	
D 23	HDS0477	DIODE	1SS110				1	
D 25	HDS0477	DIODE	1SS110				1	
D 26	HDS0477	DIODE	1SS110				1	
D 31	HDS0477	DIODE	1SS110				1	

SYMBOL	..PART CODE..	DESCRIPTION					Q.TY A	Q.TY B
JP 1	RME0912	R.METAL	1/8W	0	OHM		1	
JP 2	RME0912	R.METAL	1/8W	0	OHM		1	
JP 3	RME0912	R.METAL	1/8W	0	OHM		1	
JP 4	RME0912	R.METAL	1/8W	0	OHM		1	
JP 5	RME0912	R.METAL	1/8W	0	OHM		1	
JP 6	RME0912	R.METAL	1/8W	0	OHM		1	
JP 7	RME0912	R.METAL	1/8W	0	OHM		1	
JP 8	RME0912	R.METAL	1/8W	0	OHM		R	
JP 9	RME0912	R.METAL	1/8W	0	OHM		1	
JP 10	RME0912	R.METAL	1/8W	0	OHM		1	
JP 13	RME0912	R.METAL	1/8W	0	OHM		1	
JP 14	RME0912	R.METAL	1/8W	0	OHM		1	
JP 15	RME0912	R.METAL	1/8W	0	OHM		1	
JP 16	RME0912	R.METAL	1/8W	0	OHM		1	
JP 17	RME0912	R.METAL	1/8W	0	OHM		1	
JP 19	RME0912	R.METAL	1/8W	0	OHM		1	
JP 20	RME0912	R.METAL	1/8W	0	OHM		1	
JP 21	RME0912	R.METAL	1/8W	0	OHM		1	
JP 22	RME0912	R.METAL	1/8W	0	OHM		1	
JP 23	RME0912	R.METAL	1/8W	0	OHM		1	
JP 24	RME0912	R.METAL	1/8W	0	OHM		1	
JP 25	RME0912	R.METAL	1/8W	0	OHM		1	
JP 26	RME0912	R.METAL	1/8W	0	OHM		1	
JP 27	RME0912	R.METAL	1/8W	0	OHM		1	
JP 28	RME0912	R.METAL	1/8W	0	OHM		1	
L 47	TLM0047	L.CHIP	MLF321611DR39M				1	
L 94	TLM0045	L.CHIP	MLF321611A4R7M				1	
L 147	TLM0047	L.CHIP	MLF321611DR39M				1	
L 194	TLM0045	L.CHIP	MLF321611A4R7M				1	
L 380	TLE0173	COIL	ELO607SKI 101K (100UH)				1	
L 381	TLE0173	COIL	ELO607SKI 101K (100UH)				1	
L 382	TLE0173	COIL	ELO607SKI 101K (100UH)				1	
L 611	8363311 A						R	
P 301	JBB0021	CONNECTOR	B3B-XH-A				1	
P 490	JBB0021	CONNECTOR	B3B-XH-A				1	
P 601	JBB0022	CONNECTOR	B6B-XH-A				1	
P 613	JBX2205	CONNECTOR	3022-15B				1	
P 5000	JBX2079	CONNECTOR	3022-02B				1	
P 5001	JBX2079	CONNECTOR	3022-02B				1	
P 5002	JBX2079	CONNECTOR	3022-02B				1	
P 5003	JBX2079	CONNECTOR	3022-02B				1	
P 5004	JBX2079	CONNECTOR	3022-02B				1	
P 5401	JBB0026	CONNECTOR	B10B-XH-A				1	
P 5402	JBB0027	CONNECTOR	B2B-XH-A				R	
P 5403	JBB0027	CONNECTOR	B2B-XH-A				1	
P 7006	JBB0027	CONNECTOR	B2B-XH-A				1	
P 7007	JBB0028	CONNECTOR	B4B-XH-A				1	
R 2	RME0856	R.METAL	1/8W	22	OHM +-5%		1	
R 3	RME0858	R.METAL	1/8W	33	OHM +-5%		1	
R 4	RME0862	R.METAL	1/8W	68	OHM +-5%		1	
R 5	RMS0043	R.METAL	1/4W	900	KOHM +-0.5%		1	
R 6	RME1163	R.METAL	1/4W	111	KOHM +-0.5%		1	
R 7	RME0865	R.METAL	1/8W	120	OHM +-5%		1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	B
R 8	RME0858	R.METAL	1/8W	33	OHM	+-5%	1	
R 9	RME0873	R.METAL	1/8W	560	OHM	+-5%	1	
R 10	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 11	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 12	RME0888	R.METAL	1/8W	10	KOHM	+-5%	1	
R 13	RME0891	R.METAL	1/8W	18	KOHM	+-5%	1	
R 14	RME0853	R.METAL	1/8W	12	OHM	+-5%	1	
R 15	RMS0044	R.METAL	1/4W	990	KOHM	+-0.5%	1	
R 16	RME1156	R.METAL	1/4W	10.1	KOHM	+-0.5%	1	
R 17	RME0866	R.METAL	1/8W	150	OHM	+-5%	1	
R 18	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 19	RME0851	R.METAL	1/8W	6.8	OHM	+-10%	1	
R 21	RME1168	R.METAL	1/4W	500	KOHM	+-0.5%	1	
R 22	RME1168	R.METAL	1/4W	500	KOHM	+-0.5%	1	
R 23	RME1597	R.METAL	1/8W	10	MOHM	+-5%	1	
R 24	RME0876	R.METAL	1/8W	1.0	KOHM	+-5%	1	
R 25	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 26	RME0868	R.METAL	1/8W	220	OHM	+-5%	1	
R 27	RME0886	R.METAL	1/8W	6.8	KOHM	+-5%	1	
R 28	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 29	RME1591	R.METAL	1/4W	26.7	KOHM	+-0.5%	1	
R 30	RME0888	R.METAL	1/8W	10	KOHM	+-5%	1	
R 31	RME0866	R.METAL	1/8W	150	OHM	+-5%	1	
R 33	RME1081	R.METAL	1/4W	5.62	KOHM	+-1%	1	
R 34	RME0892	R.METAL	1/8W	22	KOHM	+-5%	1	
R 37	RME1662	R.METAL	1/4W	301	OHM	+-0.5%	1	
R 38	RME0897	R.METAL	1/8W	56	KOHM	+-5%	1	
R 39	RCE0768	R.CARBON	1/4W	820	OHM	+-5%	1	
R 40	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 41	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 42	RME1661	R.METAL	1/4W	100	OHM	+-0.5%	1	
R 43	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 44	RME0862	R.METAL	1/8W	68	OHM	+-5%	1	
R 45	RME1595	R.METAL	1/4W	475	OHM	+-0.5%	1	
R 46	RME0878	R.METAL	1/8W	1.5	KOHM	+-5%	1	
R 47	RME1663	R.METAL	1/4W	22.1	OHM	+-0.5%	1	
R 48	RME0868	R.METAL	1/8W	220	OHM	+-5%	1	
R 49	RME1157	R.METAL	1/4W	16.0	KOHM	+-0.5%	1	
R 50	RME1596	R.METAL	1/4W	24.0	KOHM	+-0.5%	1	
R 51	RME0870	R.METAL	1/8W	330	OHM	+-5%	1	
R 52	RME0870	R.METAL	1/8W	330	OHM	+-5%	1	
R 53	RME0865	R.METAL	1/8W	120	OHM	+-5%	1	
R 54	RME1193	R.METAL	1/4W	11.0	KOHM	+-1%	1	
R 55	RME0900	R.METAL	1/8W	100	KOHM	+-5%	1	
R 56	RME0888	R.METAL	1/8W	10	KOHM	+-5%	1	
R 57	RME1077	R.METAL	1/4W	2.67	KOHM	+-1%	1	
R 58	RME1077	R.METAL	1/4W	2.67	KOHM	+-1%	1	
R 59	RME1057	R.METAL	1/4W	56.2	OHM	+-1%	1	
R 60	RME0866	R.METAL	1/8W	150	OHM	+-5%	1	
R 61	RME0876	R.METAL	1/8W	1.0	KOHM	+-5%	1	
R 62	RME0892	R.METAL	1/8W	22	KOHM	+-5%	1	
R 63	RME0883	R.METAL	1/8W	3.9	KOHM	+-5%	1	
R 64	RME0862	R.METAL	1/8W	68	OHM	+-5%	1	
R 65	RME0854	R.METAL	1/8W	15	OHM	+-5%	1	
R 66	RME0869	R.METAL	1/8W	270	OHM	+-5%	1	
R 67	RME0854	R.METAL	1/8W	15	OHM	+-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	B
R 148	RME0868	R.METAL	1/8W	220	OHM	+-5%	1	
R 149	RME1157	R.METAL	1/4W	16.0	KOHM	+-0.5%	1	
R 150	RME1596	R.METAL	1/4W	24.0	KOHM	+-0.5%	1	
R 151	RME0870	R.METAL	1/8W	330	OHM	+-5%	1	
R 152	RME0870	R.METAL	1/8W	330	OHM	+-5%	1	
R 153	RME0865	R.METAL	1/8W	120	OHM	+-5%	1	
R 154	RME1193	R.METAL	1/4W	11.0	KOHM	+-1%	1	
R 155	RME0900	R.METAL	1/8W	100	KOHM	+-5%	1	
R 156	RME0888	R.METAL	1/8W	10	KOHM	+-5%	1	
R 157	RME1077	R.METAL	1/4W	2.67	KOHM	+-1%	1	
R 158	RME1077	R.METAL	1/4W	2.67	KOHM	+-1%	1	
R 159	RME0863	R.METAL	1/8W	82	OHM	+-5%	1	
R 160	RME0868	R.METAL	1/8W	220	OHM	+-5%	1	
R 161	RME0876	R.METAL	1/8W	1.0	KOHM	+-5%	1	
R 162	RME0892	R.METAL	1/8W	22	KOHM	+-5%	1	
R 163	RME0883	R.METAL	1/8W	3.9	KOHM	+-5%	1	
R 164	RME0862	R.METAL	1/8W	68	OHM	+-5%	1	
R 165	RME0854	R.METAL	1/8W	15	OHM	+-5%	1	
R 166	RME0869	R.METAL	1/8W	270	OHM	+-5%	1	
R 167	RME0854	R.METAL	1/8W	15	OHM	+-5%	1	
R 168	RME0869	R.METAL	1/8W	270	OHM	+-5%	1	
R 169	RME0912	R.METAL	1/8W	0	OHM		1	
R 170	RME0863	R.METAL	1/8W	82	OHM	+-5%	1	
R 171	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 172	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 173	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 174	RME0888	R.METAL	1/8W	10	KOHM	+-5%	1	
R 175	RME0888	R.METAL	1/8W	10	KOHM	+-5%	1	
R 176	RME0882	R.METAL	1/8W	3.3	KOHM	+-5%	1	
R 177	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 178	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 191	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 192	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 193	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 194	RCE0770	R.CARBON	1/4W	1.2	KOHM	+-5%	1	
R 195	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 196	RME0883	R.METAL	1/8W	3.9	KOHM	+-5%	1	
R 304	RME0874	R.METAL	1/8W	680	OHM	+-5%	1	
R 319	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%	1	
R 320	RME0906	R.METAL	1/8W	1.0	MOHM	+-5%	1	
R 321	RME0867	R.METAL	1/8W	180	OHM	+-5%	1	
R 322	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 323	RME0876	R.METAL	1/8W	1.0	KOHM	+-5%	1	
R 325	RME0876	R.METAL	1/8W	1.0	KOHM	+-5%	1	
R 326	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 328	RME0866	R.METAL	1/8W	100	OHM	+-5%	1	
R 329	RME0892	R.METAL	1/8W	22	KOHM	+-5%	1	
R 331	RME0856	R.METAL	1/8W	22	OHM	+-5%	1	
R 332	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 333	RME0906	R.METAL	1/8W	1.0	MOHM	+-5%	1	
R 334	RME0886	R.METAL	1/8W	6.8	KOHM	+-5%	1	
R 335	RME0906	R.METAL	1/8W	1.0	MOHM	+-5%	1	
R 336	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 340	RME0912	R.METAL	1/8W	0	OHM		1	
R 341	RME0891	R.METAL	1/8W	18	KOHM	+-5%	1	
R 342	RME0892	R.METAL	1/8W	22	KOHM	+-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	B
R 68	RME0869	R.METAL	1/8W	270	OHM	+-5%	1	
R 69	RME0912	R.METAL	1/8W	0	OHM		1	
R 70	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 71	RME0888	R.METAL	1/8W	10	KOHM	+-5%	1	
R 72	RME0882	R.METAL	1/8W	3.3	KOHM	+-5%	1	
R 73	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 74	RME0856	R.METAL	1/8W	22	OHM	+-5%	1	
R 75	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 91	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 92	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 93	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 94	RCE0770	R.CARBON	1/4W	1.2	KOHM	+-5%	1	
R 95	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 96	RME0883	R.METAL	1/8W	3.9	KOHM	+-5%	1	
R 102	RME0856	R.METAL	1/8W	22	OHM	+-5%	1	
R 103	RME0858	R.METAL	1/8W	33	OHM	+-5%	1	
R 104	RME0862	R.METAL	1/8W	68	OHM	+-5%	1	
R 105	RMS0043	R.METAL	1/4W	900	KOHM	+-0.5%	1	
R 106	RME1163	R.METAL	1/4W	111	KOHM	+-0.5%	1	
R 107	RME0865	R.METAL	1/8W	120	OHM	+-5%	1	
R 108	RME0858	R.METAL	1/8W	33	OHM	+-5%	1	
R 109	RME0873	R.METAL	1/8W	560	OHM	+-5%	1	
R 110	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 111	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 112	RME0888	R.METAL	1/8W	10	KOHM	+-5%	1	
R 113	RME0891	R.METAL	1/8W	18	KOHM	+-5%	1	
R 114	RME0853	R.METAL	1/8W	12	OHM	+-5%	1	
R 115	RMS0044	R.METAL	1/4W	990	KOHM	+-0.5%	1	
R 116	RME1156	R.METAL	1/4W	10.1	KOHM	+-0.5%	1	
R 117	RME0866	R.METAL	1/8W	150	OHM	+-5%	1	
R 118	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 119	RME0851	R.METAL	1/8W	6.8	OHM	+-10%	1	
R 121	RME1168	R.METAL	1/4W	500	KOHM	+-0.5%	1	
R 122	RME1168	R.METAL	1/4W	500	KOHM	+-0.5%	1	
R 123	RME1597	R.METAL	1/8W	10	MOHM	+-5%	1	
R 124	RME0876	R.METAL	1/8W	1.0	KOHM	+-5%	1	
R 125	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 126	RME0868	R.METAL	1/8W	220	OHM	+-5%	1	
R 127	RME0886	R.METAL	1/8W	6.8	KOHM	+-5%	1	
R 128	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 129	RME1591	R.METAL	1/4W	26.7	KOHM	+-0.5%	1	
R 130	RME0888	R.METAL	1/8W	10	KOHM	+-5%	1	
R 131	RME0866	R.METAL	1/8W	150	OHM	+-5%	1	
R 133	RME1081	R.METAL	1/4W	5.62	KOHM	+-1%	1	
R 134	RME0892	R.METAL	1/8W	22	KOHM	+-5%	1	
R 137	RME1662	R.METAL	1/4W	301	OHM	+-0.5%	1	
R 138	RME0897	R.METAL	1/8W	56	KOHM	+-5%	1	
R 139	RCE0768	R.CARBON	1/4W	820	OHM	+-5%	1	
R 140	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 141	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 142	RME1661	R.METAL	1/4W	100	OHM	+-0.5%	1	
R 143	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 144	RME0862	R.METAL	1/8W	68	OHM	+-5%	1	
R 145	RME1595	R.METAL	1/4W	475	OHM	+-0.5%	1	
R 146	RME0878	R.METAL	1/8W	1.5	KOHM	+-5%	1	
R 147	RME1663	R.METAL	1/4W	22.1	OHM	+-0.5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	B
R 350	RME1381	R.METAL	1/4W	60.0	KOHM	+-0.5%	1	
R 360	RME1072	R.METAL	1/4W	1.00	KOHM	+-1%	1	
R 361	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 362	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 363	RME1094	R.METAL	1/4W	68.1	KOHM	+-1%	1	
R 364	RME1075	R.METAL	1/4W	1.82	KOHM	+-1%	1	
R 366	RCE0769	R.CARBON	1/4W	1.0	KOHM	+-5%	1	
R 367	RME1060	R.METAL	1/4W	100	OHM	+-1%	1	
R 368	RME1060	R.METAL	1/4W	100	OHM	+-1%	1	
R 369	RCE0757	R.CARBON	1/4W	100	OHM	+-5%	1	
R 370	RME0870	R.METAL	1/8W	330	OHM	+-5%	1	
R 401	RME0883	R.METAL	1/8W	3.9	KOHM	+-5%	R	
R 402	RME0887	R.METAL	1/8W	8.2	KOHM	+-5%	R	
R 403	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	R	
R 404	RME1066	R.METAL	1/4W	332	OHM	+-1%	R	
R 405	RME0883	R.METAL	1/8W	3.9	KOHM	+-5%	R	
R 406	RME0887	R.METAL	1/8W	8.2	KOHM	+-5%	R	
R 407	RCE0773	R.CARBON	1/4W	2.2	KOHM	+-5%	R	
R 408	RME0852	R.METAL	1/8W	10	OHM	+-5%	R	
R 409	RME1066	R.METAL	1/4W	332	OHM	+-1%	R	
R 410	RME1093	R.METAL	1/4W	56.2	KOHM	+-1%	R	
R 414	RME0896	R.METAL	1/8W	47	KOHM	+-5%	R	
R 415	RME0896	R.METAL	1/8W	47	KOHM	+-5%	R	
R 470	RME1066	R.METAL	1/4W	332	OHM	+-1%	R	
R 471	RME1066	R.METAL	1/4W	332	OHM	+-1%	R	
R 472	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 473	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 475	RME1064	R.METAL	1/4W	221	OHM	+-1%	1	
R 476	RME1223	R.METAL	1/4W	432	OHM	+-1%	1	
R 477	RME1064	R.METAL	1/4W	221	OHM	+-1%	1	
R 478	RME0881	R.METAL	1/8W	2.7	KOHM	+-5%	1	
R 479	RME0870	R.METAL	1/8W	330	OHM	+-5%	1	
R 480	RME1117	R.METAL	1/4W	750	OHM	+-1%	1	
R 481	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 482	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 483	RME0893	R.METAL	1/8W	27	KOHM	+-5%	1	
R 484	RME0899	R.METAL	1/8W	82	KOHM	+-5%	1	
R 485	RCE0759	R.CARBON	1/4W	150	OHM	+-5%	1	
R 486	RME1071	R.METAL	1/4W	825	OHM	+-1%	1	
R 487	RME1071	R.METAL	1/4W	825	OHM	+-1%	1	
R 488	RME1060	R.METAL	1/4W	100	OHM	+-1%	1	
R 489	RME1060	R.METAL	1/4W	100	OHM	+-1%	1	
R 490	RME1072	R.METAL	1/4W	1.00	KOHM	+-1%	1	
R 491	RME0862	R.METAL	1/8W	68	OHM	+-5%	1	
R 492	RME0863	R.METAL	1/8W	82	OHM	+-5%	1	
R 493	RME0886	R.METAL	1/8W	6.8	KOHM	+-5%	1	
R 601	RME0862	R.METAL	1/8W	68	OHM	+-5%	1	
R 602	RME0873	R.METAL	1/8W	560	OHM	+-5%	1	
R 603	RME0873	R.METAL	1/8W	560	OHM	+-5%	1	
R 604	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 605	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 606	RME0878	R.METAL	1/8W	1.5	KOHM	+-5%	1	
R 607	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 608	RME0903	R.METAL	1/8W	330	KOHM	+-5%	1	
R 610	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 611	RME0867	R.METAL	1/8W	180	OHM	+-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
R 612	RME1072	R.METAL	1/4W	1.00	KOHM	+-1%	1	
R 613	RME1072	R.METAL	1/4W	1.00	KOHM	+-1%	1	
R 614	RME0872	R.METAL	1/8W	470	OHM	+-5%	1	
R 615	RME0872	R.METAL	1/8W	470	OHM	+-5%	1	
R 616	RME0872	R.METAL	1/8W	470	OHM	+-5%	1	
R 617	RME0872	R.METAL	1/8W	470	OHM	+-5%	1	
R 618	RME0863	R.METAL	1/8W	82	OHM	+-5%	1	
R 619	RME0863	R.METAL	1/8W	82	OHM	+-5%	1	
R 620	RME0891	R.METAL	1/8W	18	KOHM	+-5%	1	
R 621	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 622	RME0904	R.METAL	1/8W	470	KOHM	+-5%	1	
R 623	RME0873	R.METAL	1/8W	560	OHM	+-5%	1	
R 624	RME0873	R.METAL	1/8W	560	OHM	+-5%	1	
R 625	RME0891	R.METAL	1/8W	18	KOHM	+-5%	1	
R 626	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 627	RME0904	R.METAL	1/8W	470	KOHM	+-5%	1	
R 628	RCE0753	R.CARBON	1/4W	47	OHM	+-5%	1	
R 5300	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5302	RMS0048	R.METAL	1/2W	800	KOHM	+-0.5%	1	
R 5303	RME0912	R.METAL	1/8W	0	OHM		1	
R 5307	RME0867	R.METAL	1/8W	180	OHM	+-5%	1	
R 5308	RMS0049	R.METAL	1/2W	1	MOHM	+-0.5%	1	
R 5309	RCE0733	R.CARBON	1/2W	470	KOHM	+-5%	1	
R 5310	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5311	RME1216	R.METAL	1/4W	250	KOHM	+-0.5%	1	
R 5312	RME1059	R.METAL	1/4W	82.5	OHM	+-1%	1	
R 5313	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5314	RME1059	R.METAL	1/4W	82.5	OHM	+-1%	1	
R 5315	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5316	RME0875	R.METAL	1/8W	820	OHM	+-5%	1	
R 5317	RME0872	R.METAL	1/8W	470	OHM	+-5%	1	
R 5318	RME0897	R.METAL	1/8W	56	KOHM	+-5%	1	
R 5319	RME0878	R.METAL	1/8W	1.5	KOHM	+-5%	1	
R 5320	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5321	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 5322	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5323	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5324	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 5325	RME0865	R.METAL	1/8W	120	OHM	+-5%	1	
R 5326	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5326A	RME0866	R.METAL	1/8W	150	OHM	+-5%	1	
R 5330	RME0862	R.METAL	1/8W	68	OHM	+-5%	1	
R 5331	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 5332	RME1104	R.METAL	1/4W	51.1	OHM	+-1%	1	
R 5332A	RME0871	R.METAL	1/8W	390	OHM	+-5%	1	
R 5333	RME1077	R.METAL	1/4W	2.67	KOHM	+-1%	1	
R 5334	RME1077	R.METAL	1/4W	2.67	KOHM	+-1%	1	
R 5335	RME0866	R.METAL	1/8W	150	OHM	+-5%	1	
R 5336	RME0888	R.METAL	1/8W	10	KOHM	+-5%	1	
R 5336B	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%	1	
R 5337	RME0890	R.METAL	1/8W	15	KOHM	+-5%	1	
R 5338	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 5339	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 5341	RME0869	R.METAL	1/8W	270	OHM	+-5%	1	
R 5341B	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 5342	RME0869	R.METAL	1/8W	270	OHM	+-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
R 5404	RME0896	R.METAL	1/8W	47	KOHM	+-5%	1	
R 5405	RME0896	R.METAL	1/8W	47	KOHM	+-5%	1	
R 5406	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 5407	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 5408	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5410	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 5411	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5412	RME0882	R.METAL	1/8W	3.3	KOHM	+-5%	1	
R 5413	RME0896	R.METAL	1/8W	47	KOHM	+-5%		R
R 5414	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%		R
R 5415	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%		R
R 5416	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%		R
R 5417	XCF0033							R
R 5418	RME0896	R.METAL	1/8W	47	KOHM	+-5%	1	
R 5419	RME0876	R.METAL	1/8W	1.0	KOHM	+-5%	1	
R 5420	RME0912	R.METAL	1/8W	0	OHM		1	
R 5421	RME0912	R.METAL	1/8W	0	OHM		1	
R 5422	RME0912	R.METAL	1/8W	0	OHM		1	
R 5423	RME0912	R.METAL	1/8W	0	OHM		1	
R 5424	RME0912	R.METAL	1/8W	0	OHM		1	
R 5460	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 5461	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5462	RME0882	R.METAL	1/8W	3.3	KOHM	+-5%	1	
R 5463	RME0896	R.METAL	1/8W	47	KOHM	+-5%		R
R 5464	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%		R
R 5465	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%		R
R 5466	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%		R
R 5467	XCF0033							R
R 5470	XCF0033							R
R 5471	RME0912	R.METAL	1/8W	0	OHM		1	
RL 5301	SRN0017	RLY	G2Q-187P-V-DC12				1	
RL 5302	SRN0017	RLY	G2Q-187P-V-DC12				1	
RL 5303	SRN0017	RLY	G2Q-187P-V-DC12				1	
RM 52	3203299	R.NETWORK	EXB-D87059FNP				1	
RM 152	3203299	R.NETWORK	EXB-D87059FNP				1	
RV 30	RNE0042	VR.METAL	EVN-39C00YB14(10K)				1	
RV 37	RNE0047	VR.METAL	EVN 39C00YB54(50K)				1	
RV 62	RNE0047	VR.METAL	EVN 39C00YB54(50K)				1	
RV 130	RNE0042	VR.METAL	EVN-39C00YB14(10K)				1	
RV 133	RNE0048	VR.METAL	EVN 39C00YB22(200)				1	
RV 137	RNE0047	VR.METAL	EVN 39C00YB54(50K)				1	
RV 162	RNE0047	VR.METAL	EVN 39C00YB54(50K)				1	
RV 320	RNE0047	VR.METAL	EVN 39C00YB54(50K)				1	
RV 5318	RNE0070	VR.METAL	EVN 39C00YB53(5K)				1	
RV 5335	RNE0049	VR.METAL	EVN 39C00YB12(100)				1	
RV 5337	RNE0053	VR.METAL	EVN 39C00YB24(20K)				1	
RV 5367	RNE0070	VR.METAL	EVN 39C00YB53(5K)				1	
RV 5385	RNE0049	VR.METAL	EVN 39C00YB12(100)				1	
RV 5387	RNE0053	VR.METAL	EVN 39C00YB24(20K)				1	
S 1	SSP0574	SW.ROTARY	SPUJ-1				1	
S 2	8472813 D	SW.ROTARY	ADR255S18R11PY02(W.SS.GND				1	
S 11	SSP0574	SW.ROTARY	SPUJ-1				1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
R 5343	RME1060	R.METAL	1/4W	100	OHM	+-1%	1	
R 5345	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 5346	RME0888	R.METAL	1/8W	10	KOHM	+-5%	1	
R 5347	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5348	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 5349	RME1096	R.METAL	1/4W	100	KOHM	+-1%	1	
R 5350	RME0862	R.METAL	1/8W	68	OHM	+-5%	1	
R 5352	RMS0048	R.METAL	1/2W	800	KOHM	+-0.5%	1	
R 5353	RME0912	R.METAL	1/8W	0	OHM		1	
R 5354	RME0863	R.METAL	1/8W	82	OHM	+-5%	1	
R 5357	RME0868	R.METAL	1/8W	220	OHM	+-5%	1	
R 5358	RMS0049	R.METAL	1/2W	1	MOHM	+-0.5%	1	
R 5359	RCE0733	R.CARBON	1/2W	470	KOHM	+-5%	1	
R 5360	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5361	RME1216	R.METAL	1/4W	250	KOHM	+-0.5%	1	
R 5362	RME1059	R.METAL	1/4W	82.5	OHM	+-1%	1	
R 5363	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5364	RME1059	R.METAL	1/4W	82.5	OHM	+-1%	1	
R 5365	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5366	RME0875	R.METAL	1/8W	820	OHM	+-5%	1	
R 5367	RME0897	R.METAL	1/8W	56	KOHM	+-5%	1	
R 5368	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 5369	RME0878	R.METAL	1/8W	1.5	KOHM	+-5%	1	
R 5370	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5371	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 5372	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5373	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5374	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 5375	RME0865	R.METAL	1/8W	120	OHM	+-5%	1	
R 5376	RME0872	R.METAL	1/8W	470	OHM	+-5%	1	
R 5380	RME0862	R.METAL	1/8W	68	OHM	+-5%	1	
R 5381	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 5382	RME1104	R.METAL	1/4W	51.1	OHM	+-1%	1	
R 5382A	RME0869	R.METAL	1/8W	270	OHM	+-5%	1	
R 5383	RME1077	R.METAL	1/4W	2.67	KOHM	+-1%	1	
R 5384	RME1077	R.METAL	1/4W	2.67	KOHM	+-1%	1	
R 5385	RME0866	R.METAL	1/8W	150	OHM	+-5%	1	
R 5386	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 5386B	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%	1	
R 5387	RME0890	R.METAL	1/8W	15	KOHM	+-5%	1	
R 5388	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 5389	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 5390	RME0866	R.METAL	1/8W	150	OHM	+-5%	1	
R 5391	RME0869	R.METAL	1/8W	270	OHM	+-5%	1	
R 5391B	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 5392	RME0869	R.METAL	1/8W	270	OHM	+-5%	1	
R 5393	RME1060	R.METAL	1/4W	100	OHM	+-1%	1	
R 5394	RME0863	R.METAL	1/8W	82	OHM	+-5%	1	
R 5395	RME0864	R.METAL	1/8W	100	OHM	+-5%	1	
R 5396	RME0888	R.METAL	1/8W	10	KOHM	+-5%	1	
R 5397	RME0860	R.METAL	1/8W	47	OHM	+-5%	1	
R 5398	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 5399	RME1096	R.METAL	1/4W	100	KOHM	+-1%	1	
R 5401	RME0896	R.METAL	1/8W	47	KOHM	+-5%	1	
R 5402	RME0896	R.METAL	1/8W	47	KOHM	+-5%	1	
R 5403	RME0896	R.METAL	1/8W	47	KOHM	+-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	Q.TY B
S 101	SSP0574	SW.ROTARY	SPUJ-1	1	
S 102	8472813 D	SW.ROTARY	ADR255S18R11PY02(W.SS.GND	1	
S 111	SSP0574	SW.ROTARY	SPUJ-1	1	
S 5301	SSP0574	SW.ROTARY	SPUJ-1	1	
S 5302	SSP0574	SW.ROTARY	SPUJ-1	1	
S 5351	SSP0574	SW.ROTARY	SPUJ-1	1	
S 5352	SSP0574	SW.ROTARY	SPUJ-1	1	
TR 25	HTK0127	TRANSISTOR	2SK508K52/2SK508K52NV	1	
TR 28	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 40	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 41	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 42	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 57	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 58	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 71	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 72	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 93	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 125	HTK0127	TRANSISTOR	2SK508K52/2SK508K52NV	1	
TR 128	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 140	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 141	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 142	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 157	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 158	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 171	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 172	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 175	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 176	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 193	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 320	HTK0127	TRANSISTOR	2SK508K52/2SK508K52NV	1	
TR 325	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 330	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 362	HTC0686	TRANSISTOR	2SC2462C (LC)	1	
TR 363	HTC0686	TRANSISTOR	2SC2462C (LC)	1	
TR 365	HTC0686	TRANSISTOR	2SC2462C (LC)	1	
TR 401	HTC0686	TRANSISTOR	2SC2462C (LC)		R
TR 402	HTC0686	TRANSISTOR	2SC2462C (LC)		R
TR 407	HTC0686	TRANSISTOR	2SC2462C (LC)		R
TR 475	HTA0344	TRANSISTOR	2SA1245	1	
TR 476	HTA0344	TRANSISTOR	2SA1245	1	
TR 484	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 485	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 601	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 604	HTC0872	TRANSISTOR	2SC2620C (QC)	1	
TR 605	HTC0872	TRANSISTOR	2SC2620C (QC)	1	
TR 620	HTC0872	TRANSISTOR	2SC2620C (QC)	1	
TR 621	HTA0334	TRANSISTOR	2SA1226E4	1	
TR 625	HTA0334	TRANSISTOR	2SA1226E4	1	
TR 626	HTC0872	TRANSISTOR	2SC2620C (QC)	1	
TR 5313	HTK0099	TRANSISTOR	2SK404E	1	
TR 5313A	HTK0099	TRANSISTOR	2SK404E	1	
TR 5318	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 5320	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 5323	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 5331	HTC0871	TRANSISTOR	2SC3772LY4	1	

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	B
TR 5332	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 5341	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 5342	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 5363	HTK0099	TRANSISTOR	2SK404E	1	
TR 5363A	HTK0099	TRANSISTOR	2SK404E	1	
TR 5368	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 5370	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 5373	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 5381	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 5382	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 5391	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 5392	HTC0871	TRANSISTOR	2SC3772LY4	1	
TR 5409	HTD0160	TRANSISTOR	DTA124EK	1	
TR 5410	HTD0160	TRANSISTOR	DTA124EK	1	
TR 5411	HTD0160	TRANSISTOR	DTA124EK	1	
TR 5414	HTC0686	TRANSISTOR	2SC2462C (LC)	R	
TR 5464	HTC0686	TRANSISTOR	2SC2462C (LC)	R	

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	B
R 7003	RME0873	R.METAL	1/8W 560 OHM +-5%	1	
R 7004	RME0864	R.METAL	1/8W 100 OHM +-5%	1	
R 7005	RME0864	R.METAL	1/8W 100 OHM +-5%	1	
R 7006	RME0878	R.METAL	1/8W 1.5 KOHM +-5%	1	
R 7007	RME0860	R.METAL	1/8W 47 OHM +-5%	1	
R 7008	RME0903	R.METAL	1/8W 330 KOHM +-5%	1	
R 7010	RME0852	R.METAL	1/8W 10 OHM +-5%	1	
R 7011	RME0867	R.METAL	1/8W 180 OHM +-5%	1	
R 7012	RME1072	R.METAL	1/4W 1.00KOHM +-1%	1	
R 7013	RME1072	R.METAL	1/4W 1.00KOHM +-1%	1	
R 7014	RME0872	R.METAL	1/8W 470 OHM +-5%	1	
R 7015	RME0872	R.METAL	1/8W 470 OHM +-5%	1	
R 7016	RME0872	R.METAL	1/8W 470 OHM +-5%	1	
R 7017	RME0872	R.METAL	1/8W 470 OHM +-5%	1	
R 7018	RME0863	R.METAL	1/8W 82 OHM +-5%	1	
R 7019	RME0863	R.METAL	1/8W 82 OHM +-5%	1	
R 7020	RME0865	R.METAL	1/8W 120 OHM +-5%	1	
R 7021	RME0865	R.METAL	1/8W 120 OHM +-5%	1	
R 7022	RME0872	R.METAL	1/8W 470 OHM +-5%	1	
R 7023	RME0856	R.METAL	1/8W 22 OHM +-5%	1	
R 7024	RME0872	R.METAL	1/8W 470 OHM +-5%	1	
R 7025	RME0865	R.METAL	1/8W 120 OHM +-5%	1	
R 7026	RME0878	R.METAL	1/8W 1.5 KOHM +-5%	1	
R 7027	RME0852	R.METAL	1/8W 10 OHM +-5%	1	
R 7029	RME0852	R.METAL	1/8W 10 OHM +-5%	1	
R 7030	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	
R 7031	RME0864	R.METAL	1/8W 100 OHM +-5%	1	
R 7032	RME0876	R.METAL	1/8W 1.0 KOHM +-5%	1	
R 7033	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	
R 7034	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	
R 7035	RME0892	R.METAL	1/8W 22 KOHM +-5%	1	
R 7036	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	
R 7037	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	
R 7038	RME0860	R.METAL	1/8W 47 OHM +-5%	1	
TR 7001	HTC0872	TRANSISTOR	2SC2620C (QC)	1	
TR 7002	HTC0872	TRANSISTOR	2SC2620C (QC)	1	
TR 7003	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 7004	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 7005	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 7006	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 7007	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 7008	HTC0686	TRANSISTOR	2SC2462C (LC)	1	

B-TRIG (PEF-892)

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	B
	8523280	PIN	OK-001-G	2	
C 6101	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 6102	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 6105	CCG0139	C.CERAMIC	50 V 47 PF+-5%	1	
C 6202	CCG0143	C.CERAMIC	50 V 100 PF+-5%	1	
C 6204	CCG0143	C.CERAMIC	50 V 100 PF+-5%	1	
C 7007	CCG0217	C.CERAMIC	50 V47000 PF+-10%	1	
C 7008	CES0252	C.AL ELYC	16 V 10 UF+-20%BP	1	
C 7010	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 7011	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 7020	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 7022	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 7024	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 7027	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 7028	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 7029	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 7038	CCG0139	C.CERAMIC	50 V 47 PF+-5%	1	
D 6105	HDS0437	DIODE	1SS133	1	
D 6106	HDS0437	DIODE	1SS133	1	
D 7030	HDS0437	DIODE	1SS133	1	
D 7036	HDS0437	DIODE	1SS133	1	
IC 6101	IDH1051	IC.DIGITAL	HD74HC74P	1	
IC 6102	IDH1018	IC.DIGITAL	HD74HC10P	1	
IC 7001	IDM0575	IC.DIGITAL	MC10H116L	1	
IC 7002	IDS0455	IC.DIGITAL	SN74AS74N	1	
IC 7003	IDS0444	IC.DIGITAL	SN74AS00N	1	
L 6202	TLE0058	COIL	353MA 10 UH+-10%	1	
L 6204	TLE0058	COIL	353MA 10 UH+-10%	1	
L 7001	8363311 A			R	
L 7002	TLM0046	L.CHIP	MLF321606DR22M	1	
P 7001	JBB0027	CONNECTOR	B2B-XH-A	1	
P 7002	JBB0028	CONNECTOR	B4B-XH-A	1	
P 7003	JBB0023	CONNECTOR	B8B-XH-A	1	
P 7004	JBB0023	CONNECTOR	B8B-XH-A	1	
P 7005	JBB0027	CONNECTOR	B2B-XH-A	1	
P 7008	ETP0002	PIN	171255-1	1	
R 6101	RME0860	R.METAL	1/8W 47 OHM +-5%	1	
R 6102	RME0860	R.METAL	1/8W 47 OHM +-5%	1	
R 6105	RME0896	R.METAL	1/8W 47 KOHM +-5%	1	
R 6106	RCE0761	R.CARBON	1/4W 220 OHM +-5%	1	
R 6201	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	
R 6202	RME0872	R.METAL	1/8W 470 OHM +-5%	1	
R 6203	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	
R 6204	RME0872	R.METAL	1/8W 470 OHM +-5%	1	
R 6205	RCE0769	R.CARBON	1/4W 1.0 KOHM +-5%	1	
R 6206	RCE0769	R.CARBON	1/4W 1.0 KOHM +-5%	1	
R 6207	RCE0762	R.CARBON	1/4W 270 OHM +-5%	1	
R 6208	RCE0769	R.CARBON	1/4W 1.0 KOHM +-5%	1	
R 6209	RCE0769	R.CARBON	1/4W 1.0 KOHM +-5%	1	
R 7002	RME0873	R.METAL	1/8W 560 OHM +-5%	1	

PANEL (PEF-877)

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	B
	HYL0002	HLDR.LED	LE60-08	1	
	JYX0055			1	
	JPX0034	CONECTOR	PLUG I-480349-0	1	
	JYX0055			1	
	JPX0034	CONECTOR	PLUG I-480349-0	1	
C 1602	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 1604	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 1605	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
C 6601	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	
D 1601	HDP0033	LED	PG5534SY	1	
D 1602	8392133 4	LED	GL9PR2	1	
D 1605	8392133 4	LED	GL9PR2	1	
D 1606	8392133 4	LED	GL9PR2	1	
D 1607	8392133 4	LED	GL9PR2	1	
D 1608	8392133 4	LED	GL9PR2	1	
D 1609	8392133 4	LED	GL9PR2	1	
D 1610	8392133 4	LED	GL9PR2	1	
D 1611	8392133 4	LED	GL9PR2	1	
IC 1602	IDH0651	IC	HD74LS164P	1	
IC 6401	HTD0161	TRANSISTOR	DTC124EK	1	
IC 6601	IDS0479	IC.DIGITAL	SN74LS594N	1	
JP 1	RME0912	R.METAL	1/8W 0 OHM	R	
JP 2	RME0912	R.METAL	1/8W 0 OHM	R	
R 1601	RME0873	R.METAL	1/8W 560 OHM +-5%	1	
R 1602	RME0873	R.METAL	1/8W 560 OHM +-5%	1	
R 1605	RME0873	R.METAL	1/8W 560 OHM +-5%	1	
R 1606	RME0873	R.METAL	1/8W 560 OHM +-5%	1	
R 1607	RME0873	R.METAL	1/8W 560 OHM +-5%	1	
R 1608	RME0873	R.METAL	1/8W 560 OHM +-5%	1	
R 1609	RME0873	R.METAL	1/8W 560 OHM +-5%	1	
R 1610	RME0873	R.METAL	1/8W 560 OHM +-5%	1	
R 1611	RME0873	R.METAL	1/8W 560 OHM +-5%	1	
R 1612	RME0864	R.METAL	1/8W 100 OHM +-5%	1	
R 1619	RME0876	R.METAL	1/8W 1.0 KOHM +-5%	1	
R 1620	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	
R 1621	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	
R 1622	RME0868	R.METAL	1/8W 220 OHM +-5%	1	
R 1623	RME0898	R.METAL	1/8W 68 KOHM +-5%	1	
R 1631	RME0864	R.METAL	1/8W 100 OHM +-5%	1	
R 1632	RME1060	R.METAL	1/4W 100 OHM +-1%	1	
R 1633	RME1060	R.METAL	1/4W 100 OHM +-1%	1	
R 1634	RME1109	R.METAL	1/4W 200 OHM +-1%	1	
R 1635	RME1154	R.METAL	1/4W 600 OHM +-0.5%	1	
R 6401	RME0896	R.METAL	1/8W 47 KOHM +-5%	1	
R 6402	RME0896	R.METAL	1/8W 47 KOHM +-5%	1	
RM 1601	RZA0202	R.BLOCK	EXB-LE5-502S(5BIT.5K)	1	
RM 1602	RZA0202	R.BLOCK	EXB-LE5-502S(5BIT.5K)	1	
RM 1603	RZA0202	R.BLOCK	EXB-LE5-502S(5BIT.5K)	1	
RV 1601	RDV0546	VR.CARBON	V12L5(PVB)N10KOHM SHAFT18	1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
RV 1602	RNR0209	VR.METAL	1/2W	10 KOHMB	+-25%		1	
RV 1603	RDV0545	VR.CARBON	V12L5(PVB)N	1KOHM	SHAFT18		1	
RV 1604	RDV0546	VR.CARBON	V12L5(PVB)N	10KOHM	SHAFT18		1	
RV 1605	RDV0546	VR.CARBON	V12L5(PVB)N	10KOHM	SHAFT18		1	
RV 1606	RNR0210	VR.METAL	1/2W	4.7KOHMB	+-25%		1	
RV 1607	RDV0546	VR.CARBON	V12L5(PVB)N	10KOHM	SHAFT18		1	
RV 2400	RNR0229	VR METAL	RK163	10KOHM	L35		1	
RV 6201	RDV0546	VR.CARBON	V12L5(PVB)N	10KOHM	SHAFT18		1	
RV 6202	RDV0546	VR.CARBON	V12L5(PVB)N	10KOHM	SHAFT18		1	
RV 6501	RDV0545	VR.CARBON	V12L5(PVB)N	1KOHM	SHAFT18		1	
S 1601	SSP0572	SW.PUSH	SPPH2 TYPE-A	NONLOCK			1	
S 1602	SSP0572	SW.PUSH	SPPH2 TYPE-A	NONLOCK			1	
S 1603	SSL0076	SW.LEVER	AL2S-2M4(WITH	NOB AZ4004)			1	
S 1605	SSP0570	SW.PUSH	SPPH1 TYPE-A	SELFLOCK			1	
S 1606	SSP0573	SW.PUSH	SPUV30(STROKE	1.5MM.RESET)			1	
S 1607	SSP0571	SW.PUSH	SPPH1 TYPE-A	NONLOCK			1	
S 1608	SSP0573	SW.PUSH	SPUV30(STROKE	1.5MM.RESET)			1	
S 1609	SSP0571	SW.PUSH	SPPH1 TYPE-A	NONLOCK			1	
S 1610	SSP0570	SW.PUSH	SPPH1 TYPE-A	SELFLOCK			1	
S 1611	SSP0570	SW.PUSH	SPPH1 TYPE-A	SELFLOCK			1	
S 1612	SSP0570	SW.PUSH	SPPH1 TYPE-A	SELFLOCK			1	
S 6401	SSR0347	SW.ROTARY	SRBV16				1	
S 6402	SSR0348	SW.ROTARY	SRBV24				1	
S 6501	SSP0570	SW.PUSH	SPPH1 TYPE-A	SELFLOCK			1	
S 6502	SSP0570	SW.PUSH	SPPH1 TYPE-A	SELFLOCK			1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
CV 6235	CCC1007	C.CERAMIC	50	V	22	PF+-5%	1	
CV 6278	CCC1007	C.CERAMIC	50	V	22	PF+-5%	1	
CV 6279	CCC1007	C.CERAMIC	50	V	22	PF+-5%	1	
D 6000	HDD0159	DIODE	DCA010					1
D 6001	HDS0437	DIODE	1SS133					1
D 6011	HDS0437	DIODE	1SS133					1
D 6012	HDD0159	DIODE	DCA010					1
D 6022	HDD0159	DIODE	DCA010					1
D 6022A	HDS0540	DIODE	1SS166					1
D 6023	HDD0159	DIODE	DCA010					1
D 6023A	HDS0540	DIODE	1SS166					1
D 6024	HDS0437	DIODE	1SS133					1
D 6062	HDD0159	DIODE	DCA010				R	
D 6063	HDD0159	DIODE	DCA010				R	
D 6072	HDD0159	DIODE	DCA010					1
D 6072A	HDS0540	DIODE	1SS166					1
D 6073	HDD0159	DIODE	DCA010					1
D 6073A	HDS0540	DIODE	1SS166					1
D 6074	HDS0437	DIODE	1SS133					1
D 6200	HDD0159	DIODE	DCA010					1
D 6201	HDS0437	DIODE	1SS133					1
D 6211	HDS0437	DIODE	1SS133					1
D 6212	HDD0159	DIODE	DCA010					1
D 6222	HDD0159	DIODE	DCA010					1
D 6222A	HDS0540	DIODE	1SS166					1
D 6223	HDD0159	DIODE	DCA010					1
D 6223A	HDS0540	DIODE	1SS166					1
D 6224	HDS0437	DIODE	1SS133					1
D 6262	HDD0159	DIODE	DCA010				R	
D 6263	HDD0159	DIODE	DCA010				R	
D 6272	HDD0159	DIODE	DCA010					1
D 6272A	HDS0540	DIODE	1SS166					1
D 6273	HDD0159	DIODE	DCA010					1
D 6273A	HDS0540	DIODE	1SS166					1
D 6274	HDS0437	DIODE	1SS133					1
IC 6001	IDH1496	IC.LOGIC	HD74LS06FP					1
J 6000	JBX2081	CONNECTOR	5124-02BHPB					1
J 6001	JBX2081	CONNECTOR	5124-02BHPB					1
J 6002	JBX2081	CONNECTOR	5124-02BHPB					1
J 6006	JBX2206	CONNECTOR	5124-15BHPB					1
J 6200	JBX2081	CONNECTOR	5124-02BHPB					1
J 6201	JBX2081	CONNECTOR	5124-02BHPB					1
JP 6030	RME0860	R.METAL	1/8W	47	OHM	+-5%		1
JP 6040	RME0870	R.METAL	1/8W	330	OHM	+-5%		1
JP 6080	RME0860	R.METAL	1/8W	47	OHM	+-5%		1
JP 6090	RME0870	R.METAL	1/8W	330	OHM	+-5%		1
JP 6230	RME0860	R.METAL	1/8W	47	OHM	+-5%		1
JP 6240	RME0870	R.METAL	1/8W	330	OHM	+-5%		1
JP 6280	RME0860	R.METAL	1/8W	47	OHM	+-5%		1
JP 6290	RME0870	R.METAL	1/8W	330	OHM	+-5%		1
L 6070	TLE0173	COIL	EL0607SKI	101K	(100UH)			1

V INTERFACE (PEF-921)

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
C 6000	CCG0117	C.CERAMIC	50	V	3	PF+-0.25PF	1	
C 6001	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 6003	CCG0117	C.CERAMIC	50	V	3	PF+-0.25PF	R	
C 6012	CCG0117	C.CERAMIC	50	V	3	PF+-0.25PF	1	
C 6024	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 6030	CCG0176	C.CERAMIC	50	V	1	PF+-0.25PF	1	
C 6031	CCG0124	C.CERAMIC	50	V	10	PF+-0.5PF	1	
C 6032	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	1	
C 6033	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	1	
C 6043	XCF0033						R	
C 6047	CCG0123	C.CERAMIC	50	V	9	PF+-0.5PF	1	
C 6048	XCF0033						R	
C 6051	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 6056	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 6070	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 6071	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 6074	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 6080	CCG0176	C.CERAMIC	50	V	1	PF+-0.25PF	1	
C 6081	CCG0176	C.CERAMIC	50	V	1	PF+-0.25PF	1	
C 6082	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	1	
C 6083	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	1	
C 6087	CCG0126	C.CERAMIC	50	V	12	PF+-5%	1	
C 6088	XCF0033						R	
C 6091	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 6096	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 6097	XCF0033						R	
C 6200	CCG0117	C.CERAMIC	50	V	3	PF+-0.25PF	1	
C 6212	CCG0138	C.CERAMIC	50	V	39	PF+-5%	1	
C 6224	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 6230	CCG0176	C.CERAMIC	50	V	1	PF+-0.25PF	1	
C 6231	CCG0176	C.CERAMIC	50	V	1	PF+-0.25PF	1	
C 6232	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	1	
C 6233	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	1	
C 6243	XCF0033						R	
C 6247	CCG0123	C.CERAMIC	50	V	9	PF+-0.5PF	1	
C 6248	XCF0033						R	
C 6251	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 6256	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 6270	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 6271	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 6274	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 6280	CCG0176	C.CERAMIC	50	V	1	PF+-0.25PF	1	
C 6281	CCG0176	C.CERAMIC	50	V	1	PF+-0.25PF	1	
C 6282	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	1	
C 6283	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	1	
C 6287	CCG0126	C.CERAMIC	50	V	12	PF+-5%	1	
C 6288	XCF0033						R	
C 6291	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 6296	CCG0211	C.CERAMIC	50	V10000		PF+-10%	1	
C 6297	XCF0033						R	
CV 6034	CCC1007	C.CERAMIC	50	V	22	PF+-5%	1	
CV 6035	CCC1007	C.CERAMIC	50	V	22	PF+-5%	1	
CV 6078	CCC1007	C.CERAMIC	50	V	22	PF+-5%	1	
CV 6079	CCC1007	C.CERAMIC	50	V	22	PF+-5%	1	
CV 6234	CCC1007	C.CERAMIC	50	V	22	PF+-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
L 6071	TLE0173	COIL	EL0607SKI	101K	(100UH)		1	
L 6270	TLE0173	COIL	EL0607SKI	101K	(100UH)		1	
L 6271	TLE0173	COIL	EL0607SKI	101K	(100UH)		1	
P 613	JBB0024	CONNECTOR	B15B-XH-A				1	
P 6003	JBS0022	CONNECTOR	S3B-XH-A				1	
P 6004	JBS0022	CONNECTOR	S3B-XH-A				1	
P 6203	JBS0022	CONNECTOR	S3B-XH-A				1	
P 6204	JBS0022	CONNECTOR	S3B-XH-A				1	
P 6206	JBS0032	CONNECTOR	S2B-XH-A				1	
R 6000	RME0883	R.METAL	1/8W	3.9	KOHM	+-5%	1	
R 6001	RME0887	R.METAL	1/8W	8.2	KOHM	+-5%	1	
R 6002	RME1066	R.METAL	1/4W	332	OHM	+-1%	1	
R 6002A	RME1066	R.METAL	1/4W	332	OHM	+-1%	1	
R 6003	RME1093	R.METAL	1/4W	56.2	KOHM	+-1%	1	
R 6004	RME1066	R.METAL	1/4W	332	OHM	+-1%	1	
R 6005	RME1066	R.METAL	1/4W	332	OHM	+-1%	1	
R 6006	RME0896	R.METAL	1/8W	47	KOHM	+-5%	1	
R 6007	RME1066	R.METAL	1/4W	332	OHM	+-1%	1	
R 6008	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 6012	RME0883	R.METAL	1/8W	3.9	KOHM	+-5%	1	
R 6013	RME0887	R.METAL	1/8W	8.2	KOHM	+-5%	1	
R 6016	RME0896	R.METAL	1/8W	47	KOHM	+-5%	1	
R 6018	RME0880	R.METAL	1/8W	2.2	KOHM	+-5%	1	
R 6020	RME1075	R.METAL	1/4W	1.82	KOHM	+-1%	1	
R 6021	RME1085	R.METAL	1/4W	12.1	KOHM	+-1%	1	
R 6021A	RME0912	R.METAL	1/8W	0	OHM		1	
R 6022	RME1068	R.METAL	1/4W	475	OHM	+-1%	1	
R 6023	RME1068	R.METAL	1/4W	475	OHM	+-1%	1	
R 6024	RME1074	R.METAL	1/4W	1.50	KOHM	+-1%	1	
R 6025	RME1079	R.METAL	1/4W	3.92	KOHM	+-1%	1	
R 6025A	RME0912	R.METAL	1/8W	0	OHM		1	
R 6026	RME0872	R.METAL	1/8W	470	OHM	+-5%	1	
R 6027	RME0872	R.METAL	1/8W	470	OHM	+-5%	1	
R 6028	RME1253	R.METAL	1/4W	301	OHM	+-1%	1	
R 6029	RME1253	R.METAL	1/4W	301	OHM	+-1%	1	
R 6030	RME1064	R.METAL	1/4W	221	OHM	+-1%	1	
R 6031	RME1064	R.METAL	1/4W	221	OHM	+-1%	1	
R 6032	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 6033	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 6034	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 6035	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 6043	XCF0033						R	
R 6044	RME1067	R.METAL	1/4W	392	OHM	+-1%	1	
R 6045	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 6046	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 6047	RME0868	R.METAL	1/8W	220	OHM	+-5%	1	
R 6048	XCF0033						R	
R 6049	RCE0757	R.CARBON	1/4W	100	OHM	+-5%	1	
R 6050	RME1071	R.METAL	1/4W	825	OHM	+-1%	1	
R 6051	RME1071	R.METAL	1/4W	825	OHM	+-1%	1	
R 6052	RME0882	R.METAL	1/8W	3.3	KOHM	+-5%	1	
R 6053	RME1106	R.METAL	1/4W	75.0	OHM	+-1%	1	
R 6054	RME1106	R.METAL	1/4W	75.0	OHM	+-1%	1	
R 6055	RME1113	R.METAL	1/4W	365	OHM	+-1%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
R 6056	RCE0767	R.CARBON	1/4W	680	OHM	+-5%	R	
R 6060	RME1075	R.METAL	1/4W	1.82	KOHM	+-1%	R	
R 6061	RME1085	R.METAL	1/4W	12.1	KOHM	+-1%	R	
R 6061A	RME0912	R.METAL	1/8W	0	OHM		R	
R 6062	RME1068	R.METAL	1/4W	475	OHM	+-1%	R	
R 6063	RME1068	R.METAL	1/4W	475	OHM	+-1%	R	
R 6070	RME1075	R.METAL	1/4W	1.82	KOHM	+-1%	1	
R 6071	RME1085	R.METAL	1/4W	12.1	KOHM	+-1%	1	
R 6071A	RME0912	R.METAL	1/8W	0	OHM		1	
R 6072	RME1068	R.METAL	1/4W	475	OHM	+-1%	1	
R 6073	RME1068	R.METAL	1/4W	475	OHM	+-1%	1	
R 6074	RME1074	R.METAL	1/4W	1.50	KOHM	+-1%	1	
R 6075	RME1079	R.METAL	1/4W	3.92	KOHM	+-1%	1	
R 6075A	RME0912	R.METAL	1/8W	0	OHM		1	
R 6076	RME1253	R.METAL	1/4W	301	OHM	+-1%	1	
R 6077	RME1253	R.METAL	1/4W	301	OHM	+-1%	1	
R 6078	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 6079	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 6080	RME1064	R.METAL	1/4W	221	OHM	+-1%	1	
R 6081	RME1064	R.METAL	1/4W	221	OHM	+-1%	1	
R 6082	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 6083	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 6084	RME1067	R.METAL	1/4W	392	OHM	+-1%	1	
R 6085	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 6086	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 6087	RME0867	R.METAL	1/8W	180	OHM	+-5%	1	
R 6088	XCF0033						R	
R 6089	RCE0757	R.CARBON	1/4W	100	OHM	+-5%	1	
R 6090	RME1071	R.METAL	1/4W	825	OHM	+-1%	1	
R 6091	RME1071	R.METAL	1/4W	825	OHM	+-1%	1	
R 6092	RME0882	R.METAL	1/8W	3.3	KOHM	+-5%	1	
R 6093	RME1106	R.METAL	1/4W	75.0	OHM	+-1%	1	
R 6094	RME1106	R.METAL	1/4W	75.0	OHM	+-1%	1	
R 6095	RME1113	R.METAL	1/4W	365	OHM	+-1%	1	
R 6096	RCE0767	R.CARBON	1/4W	680	OHM	+-5%	R	
R 6097	XCF0033						R	
R 6101	ZZZZZZZ	NOTHING	*****	NOTHING	*****		R	
R 6102	ZZZZZZZ	NOTHING	*****	NOTHING	*****		R	
R 6200	RME0883	R.METAL	1/8W	3.9	KOHM	+-5%	1	
R 6201	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%	1	
R 6204	RME1068	R.METAL	1/4W	475	OHM	+-1%	R	
R 6205	RME1068	R.METAL	1/4W	475	OHM	+-1%	R	
R 6206	RME0896	R.METAL	1/8W	47	KOHM	+-5%	1	
R 6207	RME0912	R.METAL	1/8W	0	OHM		R	
R 6208	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%	1	
R 6212	RME0883	R.METAL	1/8W	3.9	KOHM	+-5%	1	
R 6213	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%	1	
R 6216	RME0896	R.METAL	1/8W	47	KOHM	+-5%	1	
R 6218	RME0884	R.METAL	1/8W	4.7	KOHM	+-5%	1	
R 6220	RME1075	R.METAL	1/4W	1.82	KOHM	+-1%	1	
R 6221	RME1085	R.METAL	1/4W	12.1	KOHM	+-1%	1	
R 6221A	RME0912	R.METAL	1/8W	0	OHM		1	
R 6222	RME1068	R.METAL	1/4W	475	OHM	+-1%	1	
R 6223	RME1068	R.METAL	1/4W	475	OHM	+-1%	1	
R 6224	RME1074	R.METAL	1/4W	1.50	KOHM	+-1%	1	
R 6225	RME1079	R.METAL	1/4W	3.92	KOHM	+-1%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
R 6294	RME1106	R.METAL	1/4W	75.0	OHM	+-1%	1	
R 6295	RME1113	R.METAL	1/4W	365	OHM	+-1%	1	
R 6296	RCE0767	R.CARBON	1/4W	680	OHM	+-5%	R	
R 6297	XCF0033						R	
R 6301	ZZZZZZZ	NOTHING	*****	NOTHING	*****		R	
R 6302	ZZZZZZZ	NOTHING	*****	NOTHING	*****		R	
TR 6000	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6002	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6012	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6020	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6024	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6030	HTA0344	TRANSISTOR	2SA1245				1	
TR 6031	HTA0344	TRANSISTOR	2SA1245				1	
TR 6045	HTA0318	TRANSISTOR	2SA1462Y34				1	
TR 6046	HTA0318	TRANSISTOR	2SA1462Y34				1	
TR 6060	HTC0686	TRANSISTOR	2SC2462C (LC)				R	
TR 6070	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6074	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6080	HTA0344	TRANSISTOR	2SA1245				1	
TR 6081	HTA0344	TRANSISTOR	2SA1245				1	
TR 6085	HTA0318	TRANSISTOR	2SA1462Y34				1	
TR 6086	HTA0318	TRANSISTOR	2SA1462Y34				1	
TR 6200	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6212	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6220	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6224	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6230	HTA0344	TRANSISTOR	2SA1245				1	
TR 6231	HTA0344	TRANSISTOR	2SA1245				1	
TR 6245	HTA0318	TRANSISTOR	2SA1462Y34				1	
TR 6246	HTA0318	TRANSISTOR	2SA1462Y34				1	
TR 6260	HTC0686	TRANSISTOR	2SC2462C (LC)				R	
TR 6270	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6274	HTC0686	TRANSISTOR	2SC2462C (LC)				1	
TR 6280	HTA0344	TRANSISTOR	2SA1245				1	
TR 6281	HTA0344	TRANSISTOR	2SA1245				1	
TR 6285	HTA0318	TRANSISTOR	2SA1462Y34				1	
TR 6286	HTA0318	TRANSISTOR	2SA1462Y34				1	

STR V-AMP (PEF-924)

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
R 6225A	RME0912	R.METAL	1/8W	0	OHM		1	
R 6226	RME0872	R.METAL	1/8W	470	OHM	+-5%	1	
R 6227	RME0872	R.METAL	1/8W	470	OHM	+-5%	1	
R 6228	RME1253	R.METAL	1/4W	301	OHM	+-1%	1	
R 6229	RME1253	R.METAL	1/4W	301	OHM	+-1%	1	
R 6230	RME1064	R.METAL	1/4W	221	OHM	+-1%	1	
R 6231	RME1064	R.METAL	1/4W	221	OHM	+-1%	1	
R 6232	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 6233	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 6234	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 6235	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 6243	XCF0033						R	
R 6244	RME1067	R.METAL	1/4W	392	OHM	+-1%	1	
R 6245	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 6246	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 6247	RME0868	R.METAL	1/8W	220	OHM	+-5%	1	
R 6248	XCF0033						R	
R 6249	RCE0757	R.CARBON	1/4W	100	OHM	+-5%	1	
R 6250	RME1071	R.METAL	1/4W	825	OHM	+-1%	1	
R 6251	RME1071	R.METAL	1/4W	825	OHM	+-1%	1	
R 6252	RME0882	R.METAL	1/8W	3.3	KOHM	+-5%	1	
R 6253	RME1106	R.METAL	1/4W	75.0	OHM	+-1%	1	
R 6254	RME1106	R.METAL	1/4W	75.0	OHM	+-1%	1	
R 6255	RME1113	R.METAL	1/4W	365	OHM	+-1%	1	
R 6256	RCE0767	R.CARBON	1/4W	680	OHM	+-5%	R	
R 6260	RME1075	R.METAL	1/4W	1.82	KOHM	+-1%	R	
R 6261	RME1085	R.METAL	1/4W	12.1	KOHM	+-1%	R	
R 6261A	RME0912	R.METAL	1/8W	0	OHM		R	
R 6262	RME1068	R.METAL	1/4W	475	OHM	+-1%	R	
R 6263	RME1068	R.METAL	1/4W	475	OHM	+-1%	R	
R 6270	RME1075	R.METAL	1/4W	1.82	KOHM	+-1%	1	
R 6271	RME1085	R.METAL	1/4W	12.1	KOHM	+-1%	1	
R 6271A	RME0912	R.METAL	1/8W	0	OHM		1	
R 6272	RME1068	R.METAL	1/4W	475	OHM	+-1%	1	
R 6273	RME1068	R.METAL	1/4W	475	OHM	+-1%	1	
R 6274	RME1074	R.METAL	1/4W	1.50	KOHM	+-1%	1	
R 6275	RME1079	R.METAL	1/4W	3.92	KOHM	+-1%	1	
R 6275A	RME0912	R.METAL	1/8W	0	OHM		1	
R 6276	RME1253	R.METAL	1/4W	301	OHM	+-1%	1	
R 6277	RME1253	R.METAL	1/4W	301	OHM	+-1%	1	
R 6278	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 6279	RME0861	R.METAL	1/8W	56	OHM	+-5%	1	
R 6280	RME1064	R.METAL	1/4W	221	OHM	+-1%	1	
R 6281	RME1064	R.METAL	1/4W	221	OHM	+-1%	1	
R 6282	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 6283	RME0852	R.METAL	1/8W	10	OHM	+-5%	1	
R 6284	RME1067	R.METAL	1/4W	392	OHM	+-1%	1	
R 6285	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 6286	RME0877	R.METAL	1/8W	1.2	KOHM	+-5%	1	
R 6287	RME0867	R.METAL	1/8W	180	OHM	+-5%	1	
R 6288	XCF0033						R	
R 6289	RCE0757	R.CARBON	1/4W	100	OHM	+-5%	1	
R 6290	RME1071	R.METAL	1/4W	825	OHM	+-1%	1	
R 6291	RME1071	R.METAL	1/4W	825	OHM	+-1%	1	
R 6292	RME0882	R.METAL	1/8W	3.3	KOHM	+-5%	1	
R 6293	RME1106	R.METAL	1/4W	75.0	OHM	+-1%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION					Q.TY A	Q.TY B
	JYX0055						1	
	JPX0034	CONECTOR	PLUG I-480349-0				1	
	JYX0054						1	
	JJX0072	CONECTOR	CAP 1-480351-0				1	
C 9006	CCG0124	C.CERAMIC	50	V	10	PF+-0.5PF	R	
C 9007	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	
C 9008	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	
C 9009	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	R	
C 9010	CCG0142	C.CERAMIC	50	V	82	PF+-5%	1	
C 9012	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	R	
C 9017	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	
C 9021	CCG0126	C.CERAMIC	50	V	12	PF+-5%	R	
C 9027	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	
C 9108	CCG0286	C.CERAMIC	50	V	1000	PF+-10%	1	
C 9114	CCG0255	C.CERAMIC	50	V	10	PF+-0.5PF	1	
C 9115	CCG0275	C.CERAMIC	50	V	120	PF+-5%	1	
C 9116	CCG0259	C.CERAMIC	50	V	15	PF+-5%	R	
C 9117	CCG0253	C.CERAMIC	50	V	8	PF+-0.5PF	R	
C 9118	CCG0295	C.CERAMIC	25	V	0.1	UF+80-20%	1	
C 9119	CCG0286	C.CERAMIC	50	V	1000	PF+-10%	1	
C 9120	CCG0263	C.CERAMIC	50	V	22	PF+-5%	R	
C 9121	CCG0295	C.CERAMIC	25	V	0.1	UF+80-20%	1	
C 9125	CCG0295	C.CERAMIC	25	V	0.1	UF+80-20%	1	
C 9126	CCG0270	C.CERAMIC	50	V	47	PF+-5%	1	
C 9127	CCG0292	C.CERAMIC	50	V	10000	PF+-10%	R	
C 9128	CCG0292	C.CERAMIC	50	V	10000	PF+-10%	R	
C 9151	CCG0295	C.CERAMIC	25	V	0.1	UF+80-20%	1	
C 9152	CES0379	C.AL ELYC	10	V	470	UF +-20%	1	
C 9153	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 9154	CES0379	C.AL ELYC	10	V	470	UF +-20%	1	
C 9155	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	
C 9208	CCG0286	C.CERAMIC	50	V	1000	PF+-10%	1	
C 9214	CCG0255	C.CERAMIC	50	V	10	PF+-0.5PF	1	
C 9215	CCG0275	C.CERAMIC	50	V	120	PF+-5%	1	
C 9216	CCG0259	C.CERAMIC	50	V	15	PF+-5%	R	
C 9217	CCG0253	C.CERAMIC	50	V	8	PF+-0.5PF	R	
C 9218	CCG0295	C.CERAMIC	25	V	0.1	UF+80-20%	1	
C 9219	CCG0286	C.CERAMIC	50	V	1000	PF+-10%	1	
C 9220	CCG0263	C.CERAMIC	50	V	22	PF+-5%	R	
C 9221	CCG0295	C.CERAMIC	25	V	0.1	UF+80-20%	1	
C 9225	CCG0295	C.CERAMIC	25	V	0.1	UF+80-20%	1	
C 9226	CCG0270	C.CERAMIC	50	V	47	PF+-5%	1	
C 9227	CCG0292	C.CERAMIC	50	V	10000	PF+-10%	R	
C 9228	CCG0292	C.CERAMIC	50	V	10000	PF+-10%	R	
C 9308	CCG0286	C.CERAMIC	50	V	1000	PF+-10%	1	
C 9314	CCG0255	C.CERAMIC	50	V	10	PF+-0.5PF	1	
C 9315	CCG0275	C.CERAMIC	50	V	120	PF+-5%	1	
C 9316	CCG0259	C.CERAMIC	50	V	15	PF+-5%	R	
C 9317	CCG0253	C.CERAMIC	50	V	8	PF+-0.5PF	R	
C 9318	CCG0295	C.CERAMIC	25	V	0.1	UF+80-20%	1	
C 9319	CCG0286	C.CERAMIC	50	V	1000	PF+-10%	1	
C 9320	CCG0263	C.CERAMIC	50	V	22	PF+-5%	R	
C 9321	CCG0295	C.CERAMIC	25	V	0.1	UF+80-20%	1	
C 9325	CCG0295	C.CERAMIC	25	V	0.1	UF+80-20%	1	
C 9326	CCG0270	C.CERAMIC	50	V	47	PF+-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
C 9327	CCG0292	C.CERAMIC 50 V10000 PF+-10%	R	
C 9328	CCG0292	C.CERAMIC 50 V10000 PF+-10%	R	
C 9408	CCG0286	C.CERAMIC 50 V 1000 PF+-10%	1	
C 9414	CCG0255	C.CERAMIC 50 V 10 PF+-0.5PF	1	
C 9415	CCG0275	C.CERAMIC 50 V 120 PF+-5%	1	
C 9416	CCG0259	C.CERAMIC 50 V 15 PF+-5%	R	
C 9417	CCG0253	C.CERAMIC 50 V 8 PF+-0.5PF	R	
C 9418	CCG0295	C.CERAMIC 25 V 0.1 UF+80-20%	1	
C 9419	CCG0286	C.CERAMIC 50 V 1000 PF+-10%	1	
C 9420	CCG0263	C.CERAMIC 50 V 22 PF+-5%	R	
C 9421	CCG0295	C.CERAMIC 25 V 0.1 UF+80-20%	1	
C 9425	CCG0295	C.CERAMIC 25 V 0.1 UF+80-20%	1	
C 9426	CCG0270	C.CERAMIC 50 V 47 PF+-5%	1	
C 9427	CCG0292	C.CERAMIC 50 V10000 PF+-10%	R	
C 9428	CCG0292	C.CERAMIC 50 V10000 PF+-10%	R	
CV 9012	CVT0056	C.VARIABLE TZ03Z100NR169 (~10P)	R	
D 9001	HDS0496	DIODE 1SS123	1	
D 9101	HDH0236	DIODE.ZEN HZM7C (24)	1	
D 9102	HDH0224	DIODE HSM88S (C1)	1	
D 9151	HDH0029	DIODE.ZEN HZ5B	1	
D 9152	HDH0029	DIODE.ZEN HZ5B	1	
D 9201	HDH0236	DIODE.ZEN HZM7C (24)	1	
D 9202	HDH0224	DIODE HSM88S (C1)	1	
D 9301	HDH0236	DIODE.ZEN HZM7C (24)	1	
D 9302	HDH0224	DIODE HSM88S (C1)	1	
D 9401	HDH0236	DIODE.ZEN HZM7C (24)	1	
D 9402	HDH0224	DIODE HSM88S (C1)	1	
IC 9101	IDT0280	IC.LOGIC TC74HC4066F	1	
IC 9102	IDT0280	IC.LOGIC TC74HC4066F	1	
IC 9103	IDT0280	IC.LOGIC TC74HC4066F	1	
IC 9104	IDT0280	IC.LOGIC TC74HC4066F	1	
IC 9105	IDT0280	IC.LOGIC TC74HC4066F	1	
IC 9106	IDH1300	IC.DIGITAL HD74HC04FP	1	
L 9151	TLT0085	COIL 47 UH+-10% 0.94A	R	
L 9152	TLT0085	COIL 47 UH+-10% 0.94A	R	
P 6028	JBB0091	CONNECTOR B7B-XH-A	1	
P 6030	JBB0091	CONNECTOR B7B-XH-A	1	
P 6031	JBB0060	CONNECTOR B5B-XH-A	1	
P 6032	JBB0060	CONNECTOR B5B-XH-A	1	
P 6033	JBB0022	CONNECTOR B6B-XH-A	1	
P 6034	JBB0022	CONNECTOR B6B-XH-A	1	
P 6039	JBB0022	CONNECTOR B6B-XH-A	1	
P 6040	JBB0022	CONNECTOR B6B-XH-A	1	
P 6041	8486439 C	CONNECTOR B14B-XH-A	1	
P 6042	JBB0058	CONNECTOR B12B-XH-A	1	
P 6043	JBB0058	CONNECTOR B12B-XH-A	1	
P 6044	JBB0060	CONNECTOR B5B-XH-A	1	
P 6045	JBB0021	CONNECTOR B3B-XH-A	1	
P 9001	JBB0027	CONNECTOR B2B-XH-A	1	
P 9002	JBB0027	CONNECTOR B2B-XH-A	1	

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
R 9129	RME1437	R.METAL 0.1W 820 OHM+-5%	1	
R 9130	RME1882	R.METAL 0.1W 2.0 KOHM +-5%	1	
R 9131	RME1441	R.METAL 0.1W 1.8 KOHM+-5%	1	
R 9132	RCE0777	R.CARBON 1/4W 4.7 KOHM +-5%	1	
R 9151	RME1119	R.METAL 1/4W 1.15KOHM +-1%	1	
R 9201	RME1427	R.METAL 0.1W 120 OHM+-5%	1	
R 9202	RME1431	R.METAL 0.1W 270 OHM+-5%	1	
R 9203	RME1429	R.METAL 0.1W 180 OHM+-5%	1	
R 9204	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9205	RME1431	R.METAL 0.1W 270 OHM+-5%	1	
R 9206	RME1427	R.METAL 0.1W 120 OHM+-5%	1	
R 9207	RME1431	R.METAL 0.1W 270 OHM+-5%	1	
R 9208	RME1414	R.METAL 0.1W 10 OHM+-5%	1	
R 9209	RME1430	R.METAL 0.1W 220 OHM+-5%	1	
R 9210	RME1469	R.METAL 0.1W 4.7 OHM +-10%	1	
R 9211	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	
R 9212	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	
R 9213	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	
R 9214	RME1442	R.METAL 0.1W 2.2 KOHM+-5%	1	
R 9215	RME1419	R.METAL 0.1W 27 OHM+-5%	1	
R 9216	RME1441	R.METAL 0.1W 1.8 KOHM+-5%	R	
R 9217	RME1428	R.METAL 0.1W 150 OHM+-5%	R	
R 9218	RME1429	R.METAL 0.1W 180 OHM+-5%	1	
R 9219	RME1414	R.METAL 0.1W 10 OHM+-5%	1	
R 9221	RME1421	R.METAL 0.1W 39 OHM+-5%	1	
R 9222	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9223	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9224	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9225	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9226	RME1418	R.METAL 0.1W 22 OHM+-5%	1	
R 9227	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	R	
R 9228	RME1437	R.METAL 0.1W 820 OHM+-5%	1	
R 9229	RME1437	R.METAL 0.1W 820 OHM+-5%	1	
R 9230	RME1882	R.METAL 0.1W 2.0 KOHM +-5%	1	
R 9231	RME1441	R.METAL 0.1W 1.8 KOHM+-5%	1	
R 9232	RCE0777	R.CARBON 1/4W 4.7 KOHM +-5%	1	
R 9301	RME1427	R.METAL 0.1W 120 OHM+-5%	1	
R 9302	RME1431	R.METAL 0.1W 270 OHM+-5%	1	
R 9303	RME1429	R.METAL 0.1W 180 OHM+-5%	1	
R 9304	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9305	RME1431	R.METAL 0.1W 270 OHM+-5%	1	
R 9306	RME1427	R.METAL 0.1W 120 OHM+-5%	1	
R 9307	RME1431	R.METAL 0.1W 270 OHM+-5%	1	
R 9308	RME1414	R.METAL 0.1W 10 OHM+-5%	1	
R 9309	RME1430	R.METAL 0.1W 220 OHM+-5%	1	
R 9310	RME1469	R.METAL 0.1W 4.7 OHM +-10%	1	
R 9311	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	
R 9312	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	
R 9313	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	
R 9314	RME1442	R.METAL 0.1W 2.2 KOHM+-5%	1	
R 9315	RME1419	R.METAL 0.1W 27 OHM+-5%	1	
R 9316	RME1441	R.METAL 0.1W 1.8 KOHM+-5%	R	
R 9317	RME1428	R.METAL 0.1W 150 OHM+-5%	R	
R 9318	RME1429	R.METAL 0.1W 180 OHM+-5%	1	
R 9319	RME1414	R.METAL 0.1W 10 OHM+-5%	1	
R 9321	RME1421	R.METAL 0.1W 39 OHM+-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
R 9001	RME0868	R.METAL 1/8W 220 OHM +-5%	1	
R 9003	RME0901	R.METAL 1/8W 150 KOHM +-5%	1	
R 9004	RME0876	R.METAL 1/8W 1.0 KOHM +-5%	1	
R 9005	RME0878	R.METAL 1/8W 1.5 KOHM +-5%	1	
R 9006	RME0878	R.METAL 1/8W 1.5 KOHM +-5%	1	
R 9007	RME0871	R.METAL 1/8W 390 OHM +-5%	1	
R 9008	RME0873	R.METAL 1/8W 560 OHM +-5%	1	
R 9009	RME0873	R.METAL 1/8W 560 OHM +-5%	R	
R 9010	RME0860	R.METAL 1/8W 47 OHM +-5%	1	
R 9011	RCE0770	R.CARBON 1/4W 1.2 KOHM +-5%	1	
R 9012	RME0863	R.METAL 1/8W 82 OHM +-5%	R	
R 9013	RME0870	R.METAL 1/8W 330 OHM +-5%	1	
R 9014	RME0873	R.METAL 1/8W 560 OHM +-5%	1	
R 9015	RME0889	R.METAL 1/8W 12 KOHM +-5%	1	
R 9016	RME0888	R.METAL 1/8W 10 KOHM +-5%	1	
R 9017	RCE0765	R.CARBON 1/4W 470 OHM +-5%	1	
R 9018	RCE0765	R.CARBON 1/4W 470 OHM +-5%	1	
R 9020	RME1871	R.METAL 1/8W 75 OHM +-1%	1	
R 9021	RME0876	R.METAL 1/8W 1.0 KOHM +-5%	R	
R 9023	RME1871	R.METAL 1/8W 75 OHM +-1%	1	
R 9025	RME0857	R.METAL 1/8W 27 OHM +-5%	1	
R 9027	RME0852	R.METAL 1/8W 10 OHM +-5%	1	
R 9030	RME0864	R.METAL 1/8W 100 OHM +-5%	1	
R 9031	RME0912	R.METAL 1/8W 0 OHM	1	
R 9032	RME0912	R.METAL 1/8W 0 OHM	1	
R 9033	RME0912	R.METAL 1/8W 0 OHM	1	
R 9034	RME0912	R.METAL 1/8W 0 OHM	1	
R 9035	RCE0691	R.CARBON 1/2W 68 OHM +-5%	R	
R 9036	RCE0691	R.CARBON 1/2W 68 OHM +-5%	R	
R 9101	RME1427	R.METAL 0.1W 120 OHM+-5%	1	
R 9102	RME1431	R.METAL 0.1W 270 OHM+-5%	1	
R 9103	RME1429	R.METAL 0.1W 180 OHM+-5%	1	
R 9104	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9105	RME1431	R.METAL 0.1W 270 OHM+-5%	1	
R 9106	RME1427	R.METAL 0.1W 120 OHM+-5%	1	
R 9107	RME1431	R.METAL 0.1W 270 OHM+-5%	1	
R 9108	RME1414	R.METAL 0.1W 10 OHM+-5%	1	
R 9109	RME1430	R.METAL 0.1W 220 OHM+-5%	1	
R 9110	RME1469	R.METAL 0.1W 4.7 OHM +-10%	1	
R 9111	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	
R 9112	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	
R 9113	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	
R 9114	RME1442	R.METAL 0.1W 2.2 KOHM+-5%	1	
R 9115	RME1419	R.METAL 0.1W 27 OHM+-5%	1	
R 9116	RME1441	R.METAL 0.1W 1.8 KOHM+-5%	R	
R 9117	RME1428	R.METAL 0.1W 150 OHM+-5%	R	
R 9118	RME1429	R.METAL 0.1W 180 OHM+-5%	1	
R 9119	RME1414	R.METAL 0.1W 10 OHM+-5%	1	
R 9121	RME1421	R.METAL 0.1W 39 OHM+-5%	1	
R 9122	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9123	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9124	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9125	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9126	RME1418	R.METAL 0.1W 22 OHM+-5%	1	
R 9127	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	R	
R 9128	RME1437	R.METAL 0.1W 820 OHM+-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
R 9322	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9323	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9324	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9325	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9326	RME1418	R.METAL 0.1W 22 OHM+-5%	1	
R 9327	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	R	
R 9328	RME1437	R.METAL 0.1W 820 OHM+-5%	1	
R 9329	RME1437	R.METAL 0.1W 820 OHM+-5%	1	
R 9330	RME1882	R.METAL 0.1W 2.0 KOHM +-5%	1	
R 9331	RME1441	R.METAL 0.1W 1.8 KOHM+-5%	1	
R 9332	RCE0777	R.CARBON 1/4W 4.7 KOHM +-5%	1	
R 9401	RME1427	R.METAL 0.1W 120 OHM+-5%	1	
R 9402	RME1431	R.METAL 0.1W 270 OHM+-5%	1	
R 9403	RME1429	R.METAL 0.1W 180 OHM+-5%	1	
R 9404	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9405	RME1431	R.METAL 0.1W 270 OHM+-5%	1	
R 9406	RME1427	R.METAL 0.1W 120 OHM+-5%	1	
R 9407	RME1431	R.METAL 0.1W 270 OHM+-5%	1	
R 9408	RME1414	R.METAL 0.1W 10 OHM+-5%	1	
R 9409	RME1430	R.METAL 0.1W 220 OHM+-5%	1	
R 9410	RME1469	R.METAL 0.1W 4.7 OHM +-10%	1	
R 9411	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	
R 9412	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	
R 9413	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	
R 9414	RME1442	R.METAL 0.1W 2.2 KOHM+-5%	1	
R 9415	RME1419	R.METAL 0.1W 27 OHM+-5%	1	
R 9416	RME1441	R.METAL 0.1W 1.8 KOHM+-5%	R	
R 9417	RME1428	R.METAL 0.1W 150 OHM+-5%	R	
R 9418	RME1429	R.METAL 0.1W 180 OHM+-5%	1	
R 9419	RME1414	R.METAL 0.1W 10 OHM+-5%	1	
R 9421	RME1421	R.METAL 0.1W 39 OHM+-5%	1	
R 9422	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9423	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9424	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9425	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 9426	RME1418	R.METAL 0.1W 22 OHM+-5%	1	
R 9427	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	R	
R 9428	RME1437	R.METAL 0.1W 820 OHM+-5%	1	
R 9429	RME1437	R.METAL 0.1W 820 OHM+-5%	1	
R 9430	RME1882	R.METAL 0.1W 2.0 KOHM +-5%	1	
R 9431	RME1441	R.METAL 0.1W 1.8 KOHM+-5%	1	
R 9432	RCE0777	R.CARBON 1/4W 4.7 KOHM +-5%	1	
RV 9007	RNE0070	VR.METAL EVN 39C00YB53(5K)	1	
RV 9013	RNE0048	VR.METAL EVN 39C00YB22(200)	1	
RV 9121	RNE0048	VR.METAL EVN 39C00YB22(200)	1	
RV 9130	RNE0048	VR.METAL EVN 39C00YB22(200)	1	
RV 9221	RNE0048	VR.METAL EVN 39C00YB22(200)	1	
RV 9230	RNE0048	VR.METAL EVN 39C00YB22(200)	1	
RV 9321	RNE0048	VR.METAL EVN 39C00YB22(200)	1	
RV 9330	RNE0048	VR.METAL EVN 39C00YB22(200)	1	
RV 9421	RNE0048	VR.METAL EVN 39C00YB22(200)	1	
RV 9430	RNE0048	VR.METAL EVN 39C00YB22(200)	1	
TR 9001	HTC0871	TRANSISTOR 2SC3772LY4	1	
TR 9002	HTC0871	TRANSISTOR 2SC3772LY4	1	

SYMBOL	..PART CODE...	..... DESCRIPTION		Q.TY A	B
TR 9003	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 9004	HTA0318	TRANSISTOR	2SA1462Y34	1	
TR 9005	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9006	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9101	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9102	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9103	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9104	HTD0161	TRANSISTOR	DTC124EK	R	
TR 9105	HTC0871	TRANSISTOR	2SC3772LY4	R	
TR 9106	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 9107	HTC0686	TRANSISTOR	2SC2462C (LC)	1	
TR 9201	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9202	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9203	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9204	HTD0161	TRANSISTOR	DTC124EK	R	
TR 9205	HTC0871	TRANSISTOR	2SC3772LY4	R	
TR 9206	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 9207	HTC0686	TRANSISTOR	2SC2462C (LC)	1	
TR 9301	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9302	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9303	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9304	HTD0161	TRANSISTOR	DTC124EK	R	
TR 9305	HTC0871	TRANSISTOR	2SC3772LY4	R	
TR 9306	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 9307	HTC0686	TRANSISTOR	2SC2462C (LC)	1	
TR 9401	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9402	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9403	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 9404	HTD0161	TRANSISTOR	DTC124EK	R	
TR 9405	HTC0871	TRANSISTOR	2SC3772LY4	R	
TR 9406	HTA0263	TRANSISTOR	2SA1052D (MD)	1	
TR 9407	HTC0686	TRANSISTOR	2SC2462C (LC)	1	

DSO/RTO SIG SKT (PEF-951)

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	B
C 4101	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 4102	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 4103	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	
C 4104	CCG0295	C.CERAMIC	25 V 0.1 UF+80-20%	1	
C 4105	CCG0292	C.CERAMIC	50 V10000 PF+-10%	1	
C 4106	CCG0292	C.CERAMIC	50 V10000 PF+-10%	1	
D 4101	HDS0538	DIODE	1SS153	1	
K 4101	SRK0007	RLY.LATCH	G5A-237P 12VDC	1	
L 4101	TLN0004	COIL	450MA 100 NH+-20%	1	
L 4102	TLN0004	COIL	450MA 100 NH+-20%	1	
L 4103	TLE0058	COIL	353MA 10 UH+-10%	1	
P 4101	JBS0070	CONNECTOR	S5B-XH-A	1	
P 4102	JBB0021	CONNECTOR	B3B-XH-A	1	
P 4103	JBB0027	CONNECTOR	B2B-XH-A	1	
P 4104	JBB0028	CONNECTOR	B4B-XH-A	1	
P 4105	JBB0021	CONNECTOR	B3B-XH-A	1	
P 4106	JBB0021	CONNECTOR	B3B-XH-A	1	
R 4101	RME1413	R.METAL	0.1W 0 OHM	R	
R 4102	RME1413	R.METAL	0.1W 0 OHM	1	
R 4103	RME1413	R.METAL	0.1W 0 OHM	1	
R 4104	RME1413	R.METAL	0.1W 0 OHM	R	
R 4105	RME1221	R.METAL	1/4W 1.37KOHM +-1%	1	
R 4106	RME1432	R.METAL	0.1W 330 OHM+-5%	1	
R 4107	RME1438	R.METAL	0.1W 1.0 KOHM+-5%	1	
R 4108	RME1438	R.METAL	0.1W 1.0 KOHM+-5%	1	
R 4109	RME1221	R.METAL	1/4W 1.37KOHM +-1%	1	
R 4110	RME1432	R.METAL	0.1W 330 OHM+-5%	1	
R 4111	RME1426	R.METAL	0.1W 100 OHM+-5%	1	
R 4112	RME1426	R.METAL	0.1W 100 OHM+-5%	1	
R 4113	RME1106	R.METAL	1/4W 75.0 OHM +-1%	1	
R 4114	RME1106	R.METAL	1/4W 75.0 OHM +-1%	1	
R 4115	RME1106	R.METAL	1/4W 75.0 OHM +-1%	1	
R 4116	RME1106	R.METAL	1/4W 75.0 OHM +-1%	1	
R 4117	RME1438	R.METAL	0.1W 1.0 KOHM+-5%	1	
TR 4101	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 4102	HTC0884	TRANSISTOR	2SC3775-0Y4	1	
TR 4103	HTD0161	TRANSISTOR	DTC124EK	1	

25M CLK (PEF-923)

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	B
1	ETP0141	PIN	DP-2	1	1
2	ETP0141	PIN	DP-2	1	1
C 4001	CCG0292	C.CERAMIC	50 V10000 PF+-10%	R	1
C 4002	CCG0292	C.CERAMIC	50 V10000 PF+-10%	1	1
C 4003	CCG0292	C.CERAMIC	50 V10000 PF+-10%	1	1
C 4004	CCG0292	C.CERAMIC	50 V10000 PF+-10%	R	1
C 4005	CCG0292	C.CERAMIC	50 V10000 PF+-10%	R	1
C 4006	CCG0295	C.CERAMIC	25 V 0.1 UF+80-20%	1	1
CN 3	JBD0001	PIN	0Y-003-4P	1	1
CN 4	JBD0001	PIN	0Y-003-4P	1	1
IC 4001	IDT0162	IC.DIGITAL	TC74HC00AF	R	1
IC 4002	IDT0162	IC.DIGITAL	TC74HC00AF	1	1
IC 4003	IDH1303	IC.DIGITAL	HD74HC74FP	1	1
P 4001	JBS0032	CONNECTOR	S2B-XH-A	1	1
P 4002	JBS0024	CONNECTOR	S8B-XH-A	1	1
P 4003	JBS0022	CONNECTOR	S3B-XH-A	1	1
P 4004	ETP0002	PIN	171255-1	R	1
R 4001	RME1413	R.METAL	0.1W 0 OHM	R	1
R 4002	RME1413	R.METAL	0.1W 0 OHM	1	R
R 4003	RME1413	R.METAL	0.1W 0 OHM	R	1
R 4004	RME1422	R.METAL	0.1W 47 OHM+-5%	R	1
R 4004	RME1413	R.METAL	0.1W 0 OHM	1	R
R 4005	RME1413	R.METAL	0.1W 0 OHM	1	R
R 4005	RME1422	R.METAL	0.1W 47 OHM+-5%	R	1
R 4006	RME1413	R.METAL	0.1W 0 OHM	R	1
R 4007	RME1413	R.METAL	0.1W 0 OHM	1	R
R 4008	RME1413	R.METAL	0.1W 0 OHM	R	1
R 4009	RME1413	R.METAL	0.1W 0 OHM	1	R
R 4010	RME1413	R.METAL	0.1W 0 OHM	R	1
R 4011	RME1413	R.METAL	0.1W 0 OHM	1	R
R 4012	RME1413	R.METAL	0.1W 0 OHM	R	1
R 4013	RME1413	R.METAL	0.1W 0 OHM	1	R
X 4001	AAC0047	XTAL	CX0-043C 25.0000 MHZ	R	1
X 4002	AAE0018	XTAL	EX0-3 20 MHZ	R	1

CHASSIS

SYMBOL	..PART CODE..	..... DESCRIPTION		Q.TY A	B
	8474248	TIP	CZ174	1	
	ERL0093	CABLE TIE	SKB-4M/T50L	1	
	ERL0089	CABLE TIE	PLTIM-XMR	6	
	ERL0009	CABLE TIE	SKB-3M/T50R	1	
	324662 B5	TERMINAL	B5	1	
	3211476 A	CABLE ASSY	FOR ROT.COIL	1	
	BMZ0011	WIRE	2CW-4B 0.14	R03	
	VEA0002	CEMEDINE	#575	R	
	ERH0014	TAPE	POLYESTER NO.56 W=12MM YEL.	R	
	ERI0010	TAPE	SCOTCH #29 20M/M	R	
	ERD0044	TUBING	IRRAX 1.0PHI YEL	R15	
	ERE0076	TUBING	SYURINK UL 3.5DIA BLK	R1	
	8363311 A			R	
	BSA0031			R	
	EOF0146	MOTOR.FAN	F818-D05M	1	
	JBX2265	CONNECTOR	XHP-3	1	
	BBE0039	WIRE	PVC UL-1007 #26 YEL	R6	
	BBE0046	WIRE	PVC UL-1007 #26 BLK	R6	
	BBA1150	WIRE.VINYL	UL-1015#22 7/0.26TA-SC GRN	R4	
	BBA1201	WIRE.VINYL	UL-1015 #18 GRN	R25	
	BBA1189	WIRE VINYL	UL1534 0S-1 AWG26 OR	R6	
	BBA1191	WIRE VINYL	UL1534 0S-1 AWG26 GR	1R7	
	BBZ0016			2	
	3211484 A	CABLE.ASSY	FOR V-660.665.1060.1065	R	
	3211475 BA	CABLE ASSY	3211475-BA	1	
	3211475 CA	CABLE ASSY	3211475-CA	R	
	3211475 CB	CABLE ASSY	3211475-CB	1	
	3211475 DB	CABLE ASSY	3211475-DB	1	
	3211475 EA	CABLE ASSY	3211475-EA	1	
	3211475 FB	CABLE ASSY	3211475 FB	1	
	3211475 HA	CABLE ASSY	3211475-HA	1	
	3211475 KC	CABLE ASSY	3211475 KC	1	
	3211475 NA	CABLE ASSY	3211475-NA	1	
	3211475 PA	CABLE ASSY	3211475-PA	1	
	3211475 QA	CABLE ASSY	3211475-QA	1	
	3211475 RA	CABLE ASSY	3211475-RA	1	
	3211475 SA	CABLE ASSY	3211475-SA	1	
	3211475 VA	CABLE ASSY	3211475-VA	1	
	3218945 WA	CABLE ASSY	3218945-WA	1	
	3218945 XA	CABLE ASSY	3218945-XA	1	
	ERE0076	TUBING	SYURINK UL 3.5DIA BLK	R	
	GBB0326	UNIT.PWR	LWT-3H-522	1	
	8529919 AB	CABLE ASSY	8529919 AB	1	
	8529938 AB	CABLE ASSY	8529938 AB	2	
	8529938 BA	CABLE ASSY	8529938 BA	1	
	8529938 BB	CABLE ASSY	8529938 BB	1	
	8529938 BC	CABLE ASSY	8529938 BC	1	
	3225037 AA	CABLE ASSY	3225037-AA	1	
	3225037 BA	CABLE ASSY	3225037-BA	1	
	3225037 CB	CABLE ASSY	3225037-CB	1	
	3225037 DA	CABLE ASSY	3225037-DA	1	
	3225037 EC	CABLE ASSY	3225037 EC	R	
	3225037 EB	CABLE ASSY	3225037-EB	1	
	3225037 FB	CABLE ASSY	3225037-FB	1	
	3225037 IA	CABLE ASSY	3225037-IA	1	
	3225037 JB	CABLE ASSY	3225037 JB	1	

SYMBOL	..PART CODE...	..... DESCRIPTION	Q.TY A	Q.TY B
	3225001 ED	CABLE ASSY 3225001 ED	1	
	3225001 GB	CABLE ASSY 3225001 GB	R	
	3225001 HB	CABLE ASSY 3225001 HB	1	
	3225001 JB	CABLE ASSY 3225001 JB	1	
	3225005 MD	CABLE ASSY 3225005 MD	1	
	3225005 KB	CABLE ASSY 3225005 KB	R	
	8529906 AC	CABLE ASSY 8529906 AC	1	
	8529906 AD	CABLE ASSY 8529906 AD	1	
	8529906 CD	CABLE ASSY 8529906 CD	1	
	8529906 CE	CABLE ASSY 8529906 CE	1	
	8529906 BA	CABLE ASSY 8529906 BA	R	
	8529906 BB	CABLE ASSY 8529906 BB	R	
	8529906 GC	CABLE ASSY 8529906 GC	1	
	8529906 HB	CABLE ASSY 8529906 HB	1	
	8529906 IB	CABLE ASSY 8529906 IB	1	
	8529906 JC	CABLE ASSY 8529906 JC	1	
	8529906 KB	CABLE ASSY 8529906 KB	1	
	8529906 LB	CABLE ASSY 8529906 LB	1	
	8529906 MC	CABLE ASSY 8529906 MC	R	
	8529906 NA	CABLE ASSY 8529906 NA	R	
	8529906 OB	CABLE ASSY 8529906 OC	1	
	8529907 AB	CABLE ASSY 8529907 AB	1	
	8529907 BC	CABLE ASSY 8529907 BC	1	
	8529907 CA	CABLE ASSY 8529907 CA	R	
	8529907 CB	CABLE ASSY 8529907 CB	R	
	8529907 EA	CABLE ASSY 8529907 EA	R	
	8529906 PB	CABLE ASSY 8529906 PB	1	
	8529908 AB	CABLE ASSY 8529908 AB	1	
	8529908 BE	CABLE ASSY 8529908 BE	1	
	8529908 BF	CABLE ASSY 8529908 BF	1	
	8529908 CC	CABLE ASSY 8529908 CC	2	
	8529909 A	CABLE ASSY 8529909 A	1	
	8529909 B	CABLE ASSY 8529909 B	1	
	8529909 C	CABLE ASSY 8529909 C	1	
	8529909 D	CABLE ASSY 8529909 D	1	
	8529909 E	CABLE ASSY 8529909 E	R	
	8529963 AA	CABLE ASSY 8529963 AA	1	
	8529963 BA	CABLE ASSY 8529963 BA	1	
	8529963 CC	CABLE ASSY 8529963 CC	1	
	8529963 DA	CABLE ASSY 8529963 DA	1	
	8540989 AA	CABLE ASSY 8540989 AA	1	
	8540989 BA	CABLE ASSY 8540989 BA	1	
	8540989 BB	CABLE ASSY 8540989 BB	1	
	8540989 CA	CABLE ASSY 8540989 CA	1	
	8540989 DA	CABLE ASSY 8540989 DA	1	
	8540989 EA	CABLE ASSY 8540989 EA	1	
	8540989 FA	CABLE ASSY 8540989 FA	1	
	8540989 GA	CABLE ASSY 8540989 GA	2	
	8544539 AA	CABLE ASSY 8544539 AA	1	
	8544539 BA	CABLE ASSY 8544539 BA	1	
	8483481 3	CABLE,ASSY	1	
C 10	CCC1013	C.CERAMIC 50 V 39 PF+-5%	1	
C 110	CCC1013	C.CERAMIC 50 V 39 PF+-5%	1	
C 303	CCC1136	C.CERAMIC 50 V 100 PF+-5%	1	

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
DL 490	8311698	DELAY LINE 758DL 100NS 1860HM	1	
F 1501	EFG0575	FUSE 218002(EAK2A) (250V 2A)	2	
J 1	JHB0088	CON.COAX BNC071	1	
J 101	JHB0088	CON.COAX BNC071	1	
J 301	JHB0088	CON.COAX BNC071	1	
J 302	JHB0117	CONNECTOR BNC355	1	
J 401	JHB0088	CON.COAX BNC071	1	
J 502	8474249	TIP CZ121	1	
J 1501	JSG0003	SOCKET GSI42R32.3111-200	1	
J 2605	JHB0117	CONNECTOR BNC355	1	
R 1	RCE0745	R.CARBON 1/4W 10 OHM +-5%	1	
R 101	RCE0745	R.CARBON 1/4W 10 OHM +-5%	1	
V 1001	DPX0091	CRT E8354B31	1	

11. MECHANICAL PARTS LIST AND EXPLODED VIEW

Symbol	Part Code	Description	Q'ty
G02	62M0053	CASE ASSY (SHiELD)	1
17	8481953 A	CASE (SHiELD)	1
29	2131507 A	iNSULATOR	1
46	4058852 A	LABEL	1
G03	62M0050	BEZEL ASSY	1
35	8525793 A	NAME PLATE	1
37	2110831 D	BEZEL	1
G04	62M0051	CHASSiS ASSY (FRONT)	1
3	2127783 BB	CHASSiS (FRONT)	1
42	8411928 G	CUSHiON	1
95	8411928 F	CUSHiON	1
G05	62M0027	BAND ASSY (SHiELD)	1
15	8316268 C	BAND (SHiELD)	1
46	4058852 A	LABEL	1
G06	62X0006	CRT ASSY	1
41	8396867 C	RUBBER PLATE	1
108	ERL0093	BAND	1
G07	62M0025	BRACKET ASSY (HiC)	1
14	8472571 A	BRACKET (HiC)	1
100	8505126 A	iNSULATOR	1
G08	62M0045	BRACKET ASSY (CRT HD)	1
11	3232566 A	BRACKET (CRT HD)	1
95	8411928 F	CUSHiON	1
G09	62M0037	KNOB ASSY (UM)	2
53	3227882 A	KNOB	2
55	8459020 A	SPRiNG (KNOB)	2
G10	62M0038	KNOB ASSY (POWER)	1
116	8483071 A	KNOB	1
125	8489102 A	RUBBER	1
G11	62M0052	CHASSiS ASSY (C)	1
5	2130822 AA	CHASSiS (C)	1
42	8411928 G	CUSHiON	1
142	8548903 A	iNSULATOR	1
G12	62M0054	PLATE ASSY (SHiELD 10)	1
112	3242461 A	PLATE (SHiELD)	1
130	8543457 A	iNSULATOR	1
G13	62M0055	PLATE ASSY (SHiELD 11)	1
113	3242462 A	PLATE (SHiELD)	1
131	8543458 A	iNSULATOR	1
G14	62M0056	COVER ASSY (SHiELD)	1
115	3240958 A	COVER (SHiELD)	1
138	8412892 D	iNSULATOR	1
139	8412892 E	iNSULATOR	1
G15	62M0057	HOOD ASSY (FAN)	1
135	3243341 A	HOOD (FAN)	1
136	8545025 A	DUSTPROOF	1
137	8545025 B	DUSTPROOF	3
1	2132901 A	COVER (TOP)	1

Symbol	Part Code	Description	Q'ty
2	2132902 A	COVER (BOTTOM)	1
2	2134601 A	COVER (BOTTOM) FOR VC-6145(C) ONLY	1
4	2130821 AA	CHASSiS (REAR)	1
6	3233788 B	ANGLE (RU)	1
7	8438037 A	BAND (CRT 1)	1
8	8483085 A	COVER (HV)	1
9	8507140 B	ANGLE (RB)	1
10	3212569 AA	CASE (SHiELD)	1
12	8448099 A	BAND (CRT 2)	1
13	3224318 A	BRACKET (SW)	1
16	2128659 B	CASE (CRT CHiELD)	1
18	8398476 A	PLATE (NUT)	2
19	8474935 A	PLATE (EARTH)	1
20	8474942 A	BRACKET	1
21	2130823 AA	CHASSiS (L)	1
22	8398477 A	SPACER (BNC)	4
23	8474929 E	STAY L=15.5	11
24	8474929 C	STAY L=21.5	2
25	8518682 A	iNSULATOR	1
26	8360723 F	SUPPORT	4
27	8507142 BB	SHiELD (FBT)	1
28	8483079 A	SPRiNG	1
30	8525802 A	BRACKET (PSW)	1
31	3238092 A	BRACKET	1
32	121381 C	FRAME (FRONT)	1
33	3227886 B	PANEL (FRONT)	1
34	3238091 B	PANEL (REAR)	1
36	8395445 A	FiLTER	1
38	3208902 C	HANDLE	1
39	3144055 B	RUBBER	2
43	3149317 C	FOOT (REAR)	4
44	3022087 A	FOOT (BOTTOM)	4
47	8473487 A	BUTTON (1)	14
48	8474945 A	HOLDER (LED)	1
49	8498217 A	RUBBER	1
50	3211025 AA	BUTTON	1
51	8481990 A	BAR	1
54	3149324 H	KNOB (S18B)	8
56	3196622 F	KNOB (ATS)	2
57	3149324 J	KNOB (S18B)	2
58	8377076 A	STOPPER (HANDLE)	2
59	8456381 C	BRACKET (iC)	1
60	8446132 A	PLATE (EARTH)	1
61	3238088 A	BRACKET (μ-COM 1)	1
62	3238089 A	BRACKET (μ-COM 2)	1
63	3196650 D	KNOB (M)	1
64	3238090 A	BRACKET (PW SP)	1
65	2132903 AA	BRACKET (HEAT SiNK)	1
69	8469114 A	ADAPTOR (HANDLE STOPPER)	2
71	8446145 B	GUiDE (KNOB)	8

Symbol	Part Code	Description	Q'ty
72	8441088 J	SPACER (LOCKiNG CARD)	6
73	8539736 A	SADDLE (EDGE)	1
74	8539737 J	CLAMP (MiNi)	1
75	8487187 A	SHORT RiNG	1
76	8487185 A	HEAT SINK (FBT)	1
77	8505143 A	BRACKET	1
78	8505142 A	BRACKET	1
80	8510770 A	SHiELD (V-PRE 3)	1
81	8484995 AA	HEAT SINK (V-OUT)	1
83	8485001 A	SHiELD (V-PRE 1)	1
84	8485015 A	SHiELD (V-PRE 2)	1
85	8485003 A	EARTH (V-PRE 1)	2
86	8485004 A	EARTH (V-PRE 2)	1
87	8485005 A	EARTH (V-PRE 3)	2
88	8510771 A	EARTH (BNC 1 CH2)	1
89	8510771 B	EARTH (BNC 1 CH4)	1
90	8485007 A	EARTH (BNC 2)	1
91	8510772 A	EARTH (BNC 3 CH3)	1
92	8472331 A	CLIP	1
93	8510773 A	EARTH (V-PRE 4 CH3, 4. B)	2
94	8518709 A	EARTH (V-PRE 5 CH2)	1
96	8487186 A	HEAT SINK (HiC)	1
97	8487166 A	HEAT SINK (T)	1
98	8427119 B	CAP (TR)	1
99	8516772 A	EARTH (V-PRE 6 CH3, 4. A)	1
102	8489090 A	CORE	1
103	8487181 A	PLATE (NUT)	1
104	8487180 A	COVER	1
105	8487179 A	CASE	1
106	8489068 A	BRACKET	1
107	8505145 A	BUTTON	6
109	8507172 A	BAND (SNAP)	2
110	8510743 A	BRACKET	1
111	8441088 C	SPACER (LOCKING CARD L=10)	2
114	8507604 AC	STAY (H=27)	2
117	8507604 B	STAY (H=5)	2
118	3238096 CC	SHIELD	1
119	8542269 A	BAND (CORD)	1
122	8543447 A	CASE (SHIELD)	1
126	3242474 AA	BRACKET (EARTH)	1
127	8543487 E	CORE	1
128	8543487 H	PARET FIX	1
129	8543461 E	STICKER (WIRE)	2
133	8545001 A	INSULATOR	1
134	8411928 H	CUSHION	2
140	3243856 B	EARTH (L)	1
141	3243856 A	EARTH (R)	1
143	8548902 A	PLATE (EARTH)	1
300	XCA7205	SCREW FLAT 2X5	6
301	XCA7306	SCREW FLAT 3X6	25

Symbol	Part Code	Description	Q'ty
302	XCA7410	SCREW FLAT 4X10	4
304	XCA7304	SCREW FLAT 3X4	1
305	XCA0661	SCREW SEMS 3X8	21
306	8340167 C	SCREW SEMS 4X20	4
307	XCA1369	SCREW 3X4	3
308	XCA6306	SCREW 3X6	3
309	XCA6308	SCREW 3X8	15
310	8340167 L	SCREW SEMS 4X8	1
311	XCA6205	SCREW 2X5	8
312	XCA6316	SCREW 3X16	6
314	XCA1820	SCREW 3X10	2
325	XCA6325	SCREW 3X25	4
408	XCA6408	SCREW 4X8	1

APPENDIX ABBREVIATIONS

AC	Alternating Current
ACQ	Acquisition
ACQCTL	Acquisition Control
AD	Analog to Digital
A/D	Analog to Digital
ADC	Analog to Digital Converter
ADJ	Adjustment, Adjuster
ADR	Address
ADR LE	Address Latch Enable
ADR OE	Address Output Enable
AMP	Amplifier
ASTIG	Astigmatism
ATTN	Attenuator
B	Byte
BAL	Balance
BLANK	Blanking
BLK	Black
BLU	Blue
BUFF	Buffer
BUSACK	Bus Acknowledge
BUSREQ	Bus Request
BW	Band Width Limiter
BWL	Band Width Limiter
C	Capacitor
CAL	Calibration, Calibrator
CCW	Counterclockwise
CE	Chip Enable
CENT	Center
CH	Channel
CHCTL1	Channel Control 1
CHCTL2	Channel Control 2
CHR	Character
CH RD	Channel Read
CHST	Character and Storage Waveform
CI SEL A	Counter Input Select A
CK	Clock
CKA	Clock A
CKA_0	Clock for Asynchronous SCI Channel 0
CKA_1	Clock for Asynchronous SCI Channel 1
CKB	Clock B
CKS	Clock for Serial I/O Port
CKT	Circuit
CLK	Clock
CLR	Clear
CN	Connector
CONT	Control
CPU	Central Processing Unit
CRT	Cathode Ray Tube
CS A DATA	Current Source A Data
C_T, CT	Timing Capacitor
CTC1CTL	Counter Timer Circuit 1 Control
CTC2CTL	Counter Timer Circuit 2 Control
CTL	Control
CTS_0	Clear To Send for Asynchronous SCI Channel 0
CTS_1	Clear To Send for Asynchronous SCI Channel 1
CUR	Cursor
CV	Variable Capacitor
CW	Clockwise
D	Diode
DA	Digital to Analog
DC	Direct Current
D/A	Digital to Analog
DAC	Digital to Analog Converter
DCD_0	Data Carrier Detect for Asynchronous SCI Channel 0
DG	Digital Ground
DIFF	Differential
DISP	Display
DIV	Division
DLY	Delay
DMA	Direct Memory Access
DMAC	Direct Memory Access Controller
DMARAM	Direct Memory Access RAM
DREQ	DMA Request
$DREQ_0$	DMA Request for Channel 0
$DREQ_1$	DMA Request for Channel 1
$DREQ_0E$	$DREQ_0$ Enable

$DREQ_1E$	$DREQ_1$ Enable
DSO	Digital Storage Oscilloscope
DSP	Display
DSP CHNG 1	Display Change 1
DSP CHNG 2	Display Change 2
DVM	Digital Volt Meter
E	Enable
ECL	Emitter Coupled Logic
EN	Enable
EQ	Equivalent Sampling
EQ CK EN	Equivalent Sampling Clock Enable
EQCTL	Equivalent Sampling Control
EQS	Equivalent Sampling
EQV	Equivalent Sampling
EQV SPL	Equivalent Sampling
EXT	External
EXTAL	External
F	Fuse
FBT	Fly Back Transformer
FET	Field Effect Transistor
FF	Flip-Flop
Fig.	Figure
F PANEL	Front Panel
G (A)	Analog Ground
GEN	Generator
GEOM	Geometry
GND	Ground
GRY	Gray
G1	Grid 1
H	High
H	Horizontal
H AMP	Horizontal Amplifier
HF	High Frequency
H GAIN	Horizontal Gain
H/O	Holdoff
H POS	Horizontal Position
HV	High Voltage
IC	Integrated Circuit
I/F	Interface
INT	Internal
INT_0	Interrupt 0
INT_1	Interrupt 1
INT_2	Interrupt 2
INTEN	Intensity
INV	Invert
I/O	Input/Output
IOE	I/O Enable
IORD	I/O Read
IOWR	I/O Write
J	Jack
KB	Kilo Byte
L	Low
LADR LE	Low Address Latch Enable
LED	Light Emitting Diode
LIR	Load Instruction Register
LSB	Least Significant Bit
LVL	Level
MAG	Magnification
ME	Memory Enable
MEM	Memory
MEMRD	Memory Read
MEMWR	Memory Write
MIFCTL	Microcomputer Interface Control
MMU	Memory Management Unit
MSB	Most Significant Bit
Msps	Mega Sampling per Second
MPU	Mircroprocessor Unit
NC	No Connection
NMI	Non-Maskable Interrupt
NORM	Normal
OE	Output Enable
OPPICTL	PPI OUTPUT CONTROL
OSC	Oscillator
OUTCTL	Output Control
P	Pin, Plug
POS	Position
PPI	Programable Peripheral Interface
R	Read, Resistor
RAM	Random Access Memory
RCLK	Read Clock
RD	Read
REF	Reference, Refresh
RLY	Relay

RM	Resister Module
ROM	Read Only Memory
R PANEL	Rear Panel
RRES	Read Reset
RSC	Shift Control for Received Data
RS FF	Reset Set FF
R_T, RT	Timing Resistor
RTO	Real Time Oscilloscope
RTS_0	Request To Send for Asynchronous SCI Channel 0
RV	Variable Resister
RXA_0	Receive Data for Asynchronous SCI Channel 0
RXA_1	Receive Data for Asynchronous SCI Channel 1
RXD	Received Data
RXS	Receive Data for Serial I/O Port
SCI	Serial Communication Interface
SAM	Serial Access Memory
S DATA	Serial Data
SEL	Select
SEP	Separation
SG	Signal Ground
SH	Sample-and-Hold Circuit
S/H	Sample-and-Hold Circuit
SIG	Signal
ST	Status
STD AMPL	Standard Amplitude
STR	Storage
SW	Switch
SWP	Sweep
SWP RS	Sweep Reset
SYNC	Synchronization
T	Time
$TEND_0$	Transfer End for Channel 0
$TEND_1$	Transfer End for Channel 1
TOUT	Timer Out
TR	Transistor
TRACE ROT	Trace Rotation
TRG	Trigger
TRIG	Trigger
TR REQ	Transfer Request
TSC	Shift Control for Transmitted Data
TTL	Transistor Transistor Logic
TXA_0	Transfer Data for Asynchronous SCI Channel 0
TXA_1	Transfer Data for Asynchronous SCI Channel 1
TXD	Transmitted Data
TXS	Transfer Data for Serial I/O Port
UNBLANK	Unblanking
UNCAL	Uncalibration
UNDSP	Undisplay
V	Vertical
V	Voltage
VAR	Variable
Vcc	Supply Voltage
VCO	Voltage Controlled Oscillator
VERT	Vertical
VIF	Vertical Interface
Vss	GND
VR	Variable Resister
W	Write
WCLK	Write Clock
WE	Write Enable
WECTL	Write Enable Control
WHT	White
WR	Write
WRES	Write Reset
WX	X direction signal of Waveform
XTAL	Crystal
μ-COM	Microcomputer
ϕ	System clock
WECTL	Write Enable Control
100MCTL	100MHz Sampling Control
25MCTL	25MHz Control
25MDIV	25MHz Divider

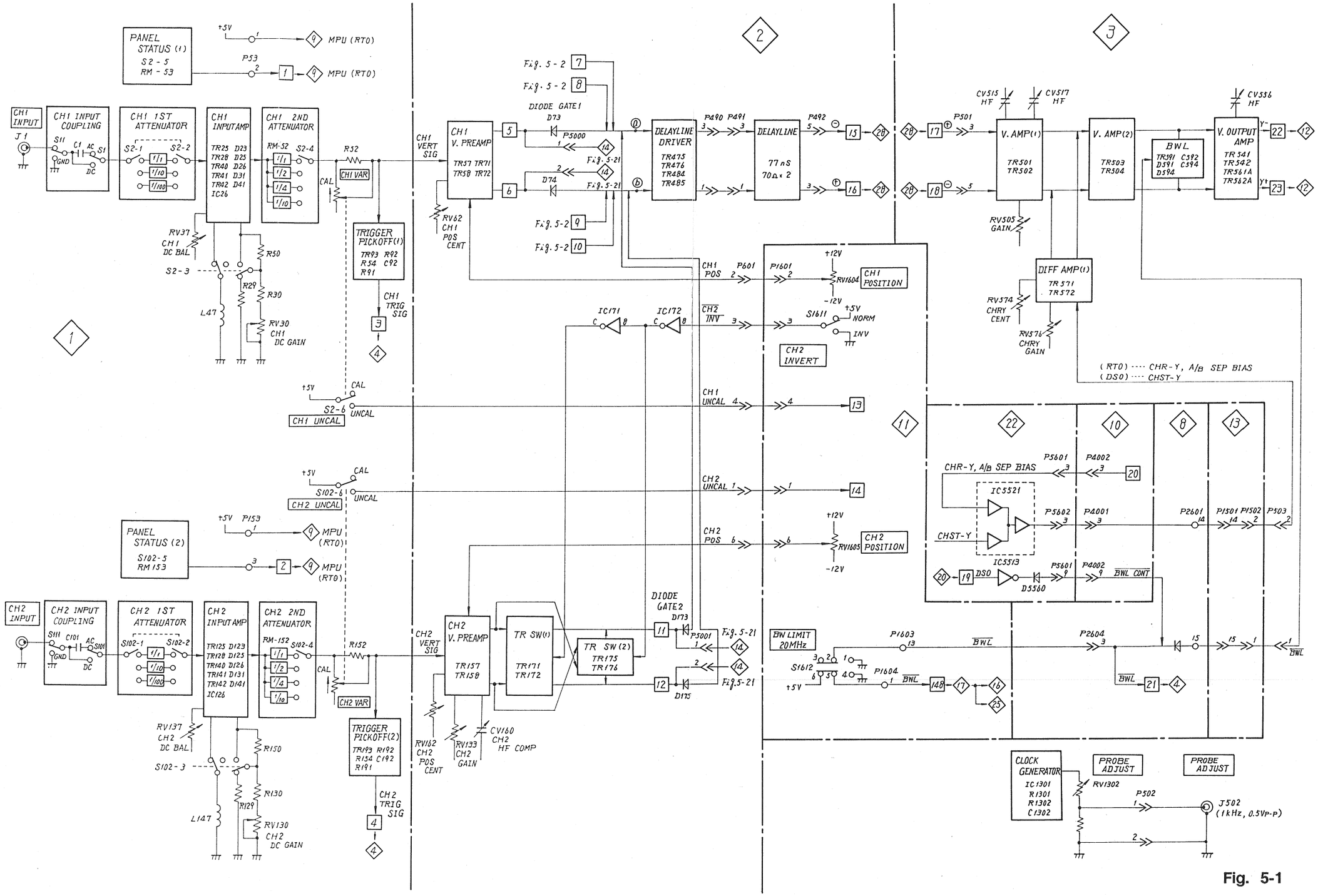

PANEL STATUS (1) S2-5 RM-53
+5V
P53
MPU (RT0)
CH1 INPUT
J1
CH1 INPUT COUPLING
S11
C1
AC
S1
GND
DC
CH1 1ST ATTENUATOR
S2-1
S2-2
1/1
1/10
1/100
CH1 INPUT AMP
TR25 D23
TR28 D25
TR40 D26
TR41 D31
TR42 D41
IC26
CH1 2ND ATTENUATOR
RM-52
S2-4
1/1
1/2
1/4
1/10
R52
CH1 VAR
CAL
RV37
CH1 DC BAL
S2-3
R50
R29
R30
L47
RV30
CH1 DC GAIN
TRIGGER PICKOFF(1)
TR93 R92
R54 C92
R91
CH1 TRIG SIG
CH1 VERT SIG
CH1 V. PREAMP
TR57 TR71
TR58 TR72
RV62
CH1 POS CENT
Fig. 5-2
DIODE GATE1
D73
D74
P5000
Fig. 5-21
DELAYLINE DRIVER
TR475
TR476
TR484
TR485
DELAYLINE
77 nS
70Ω × 2
P490 P491 P492
V. AMP(1)
TR501
TR502
V. AMP(2)
TR503
TR504
BWL
TR591 C592
D591 C594
D594
V. OUTPUT AMP
TR541
TR542
TR561A
TR562A
CV515 HF
CV517 HF
CV556 HF
P501
RV505 GAIN
DIFF AMP(1)
TR571
TR572
RV574 CHRY CENT
RV576 CHRY GAIN
CH1 POS
P601
P1601
+12V
RV1604
CH1 POSITION
-12V
IC171
IC172
CH2 INV
S1611
+5V
NORM
INV
CH2 INVERT
CH1 UNCAL
CAL
S2-6
UNCAL
CH1 UNCAL
(RT0) ···· CHR-Y, A/B SEP BIAS
(DS0) ···· CHST-Y
CHR-Y, A/B SEP BIAS
P5601
P4002
IC5521
CHST-Y
P5602
P4001
P2601
P1501 P1502
P503
IC5513
DS0
D5560
BWL CONT
PANEL STATUS (2) S102-5 RM153
CH2 INPUT
CH2 INPUT COUPLING
S111
C101
S101
CH2 1ST ATTENUATOR
S102-1
S102-2
CH2 INPUT AMP
TR125 D123
TR128 D125
TR140 D126
TR141 D131
TR142 D141
IC126
CH2 2ND ATTENUATOR
RM-152
S102-4
R152
CH2 VAR
RV137
CH2 DC BAL
S102-3
R150
R129
R130
L147
RV130
CH2 DC GAIN
TRIGGER PICKOFF(2)
TR193 R192
R154 C192
R191
CH2 TRIG SIG
CH2 VERT SIG
CH2 V. PREAMP
TR157
TR158
TR SW(1)
TR171
TR172
TR SW(2)
TR175
TR176
RV162
CH2 POS CENT
RV133
CH2 GAIN
CV160
CH2 HF COMP
DIODE GATE2
D173
D175
P5001
CH2 UNCAL
CH2 POS
RV1605
CH2 POSITION
BW LIMIT 20MHz
S1612
P1603
P1604
P2604
BWL
CLOCK GENERATOR
IC1301
R1301
R1302
C1302
PROBE ADJUST
RV1302
P502
J502
(1kHz, 0.5Vp-p)

Fig. 5-1

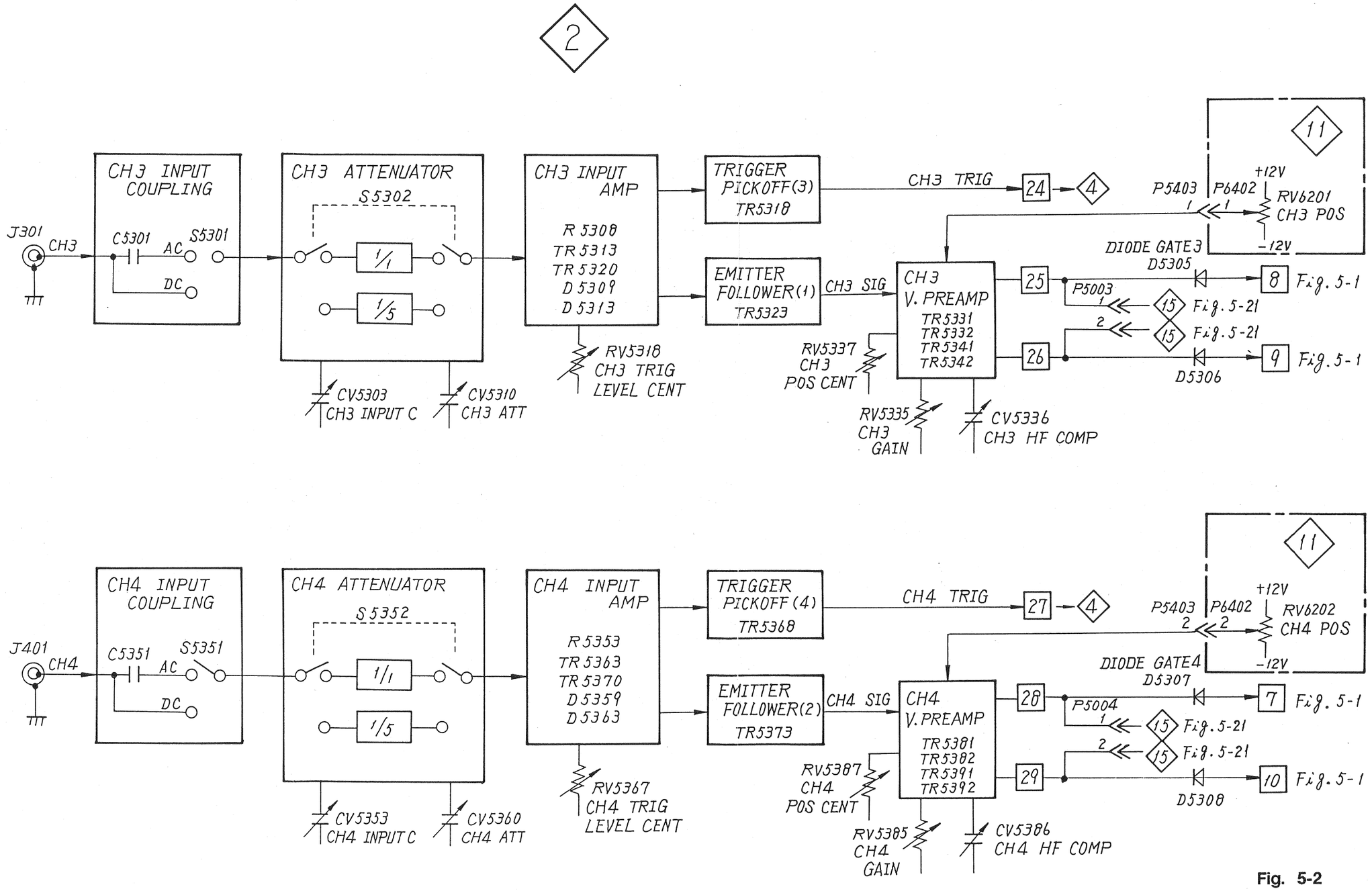

2
CH3 INPUT COUPLING
J301
CH3
C5301
AC
S5301
DC
CH3 ATTENUATOR
S5302
1/1
1/5
CV5303
CH3 INPUT C
CV5310
CH3 ATT
CH3 INPUT AMP
R5308
TR5313
TR5320
D5309
D5313
RV5318
CH3 TRIG
LEVEL CENT
TRIGGER PICKOFF(3)
TR5318
EMITTER FOLLOWER(1)
TR5323
CH3 TRIG
CH3 SIG
24
4
CH3 V. PREAMP
TR5331
TR5332
TR5341
TR5342
RV5337
CH3
POS CENT
RV5335
CH3
GAIN
CV5336
CH3 HF COMP
25
26
11
+12V
P5403
P6402
RV6201
CH3 POS
-12V
DIODE GATE3
D5305
D5306
P5003
8
9
15
Fig. 5-1
Fig. 5-21
CH4 INPUT COUPLING
J401
CH4
C5351
AC
S5351
DC
CH4 ATTENUATOR
S5352
1/1
1/5
CV5353
CH4 INPUT C
CV5360
CH4 ATT
CH4 INPUT AMP
R5353
TR5363
TR5370
D5359
D5363
RV5367
CH4 TRIG
LEVEL CENT
TRIGGER PICKOFF(4)
TR5368
EMITTER FOLLOWER(2)
TR5373
CH4 TRIG
CH4 SIG
27
4
CH4 V. PREAMP
TR5381
TR5382
TR5391
TR5392
RV5387
CH4
POS CENT
RV5385
CH4
GAIN
CV5386
CH4 HF COMP
28
29
11
+12V
P5403
P6402
RV6202
CH4 POS
-12V
DIODE GATE4
D5307
D5308
P5004
7
10
15
Fig. 5-1
Fig. 5-21

Fig. 5-2

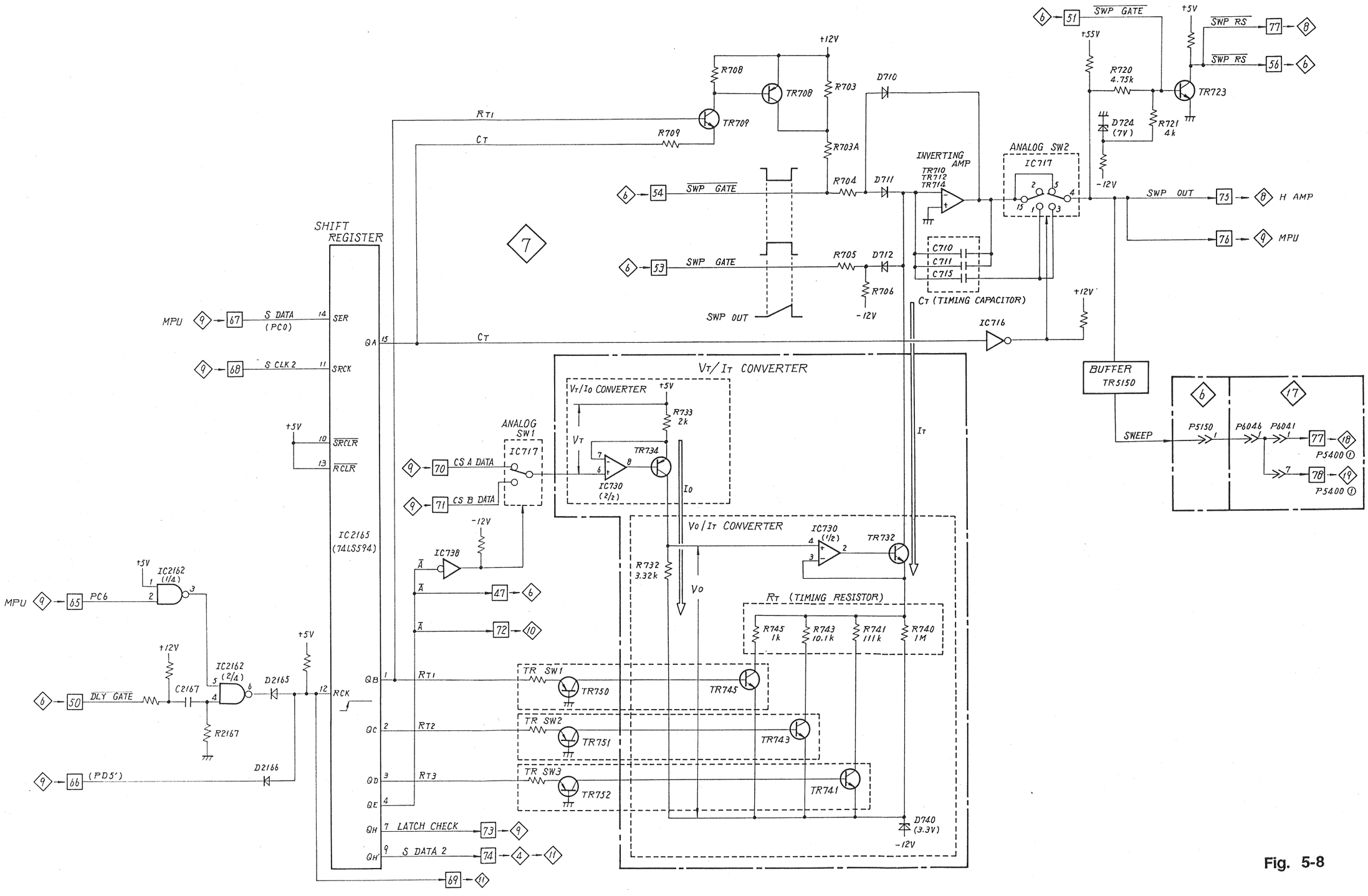

SHIFT REGISTER
7
MPU
S DATA (PC0)
S CLK 2
SRCK
SRCLR
RCLR
QA
SER
+5V
+12V
-12V
RT1
CT
R708
TR708
TR709
R709
R703
R703A
D710
R704
D711
R705
D712
R706
SWP GATE
SWP OUT
INVERTING AMP
TR710
TR712
TR714
ANALOG SW2
IC717
C710
C711
C715
CT (TIMING CAPACITOR)
IC716
R720 4.75k
R721 4k
D724 (7V)
TR723
SWP RS
SWP OUT
H AMP
MPU
BUFFER TR5150
SWEEP
P5150
P6046
P6041
P5400
VT/IT CONVERTER
VT/IO CONVERTER
R733 2k
TR734
IC730 (2/2)
ANALOG SW1
CS A DATA
CS B DATA
IO
IT
VO/IT CONVERTER
IC730 (1/2)
TR732
R732 3.32k
VO
RT (TIMING RESISTOR)
R745 1k
R743 10.1k
R741 111k
R740 1M
TR745
TR743
TR741
D740 (3.3V)
IC2165 (74LS594)
IC738
IC2162 (1/4)
IC2162 (2/4)
PC6
DLY GATE
C2167
R2167
D2165
D2166
(PD5')
RCK
QB
QC
QD
QE
QH
QH'
RT1
RT2
RT3
TR SW1
TR SW2
TR SW3
TR750
TR751
TR752
LATCH CHECK
S DATA 2

Fig. 5-8

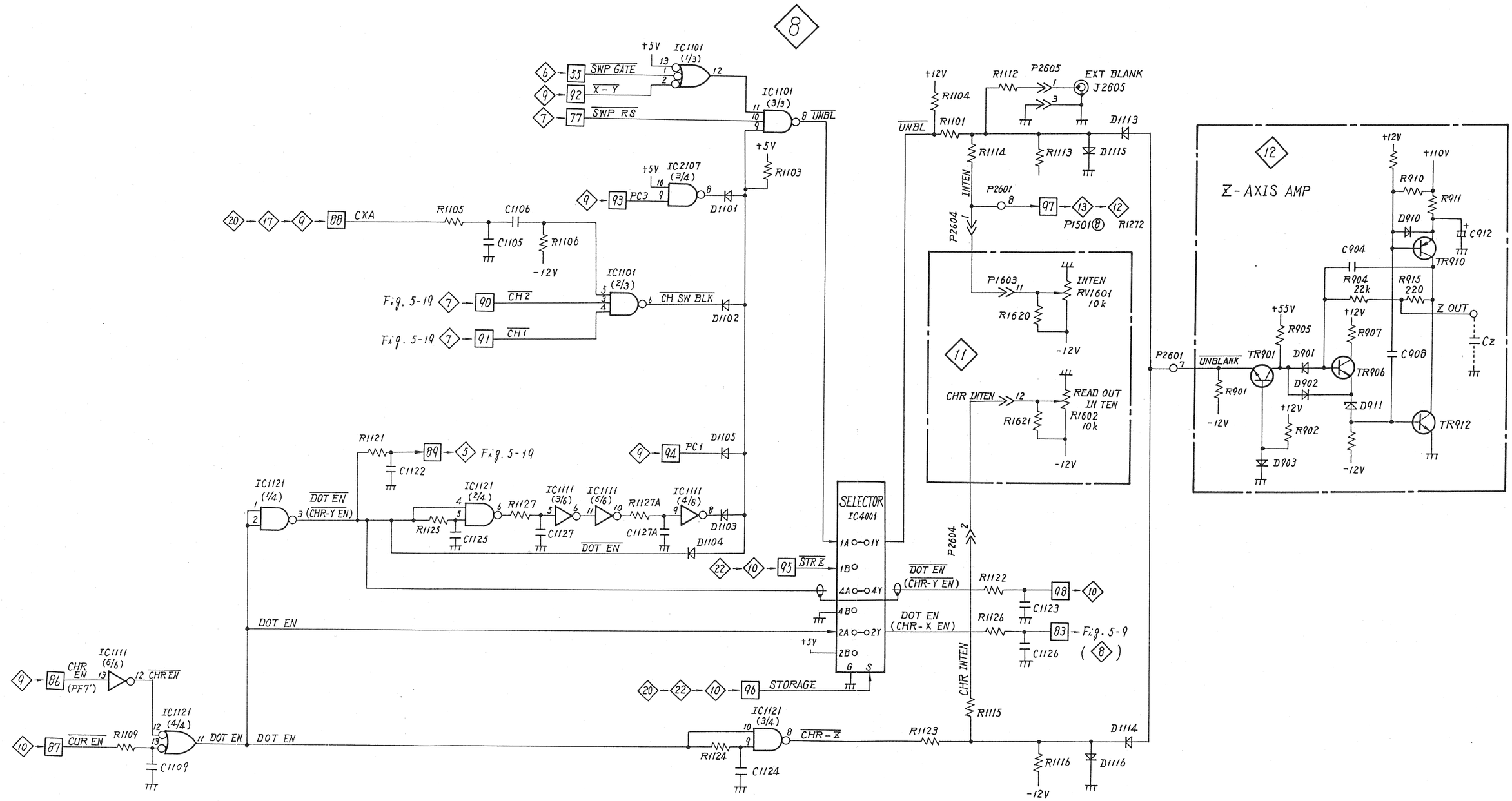

8
+5V
IC1101 (1/3)
SWP GATE
X-Y
SWP RS
IC1101 (3/3)
UNBL
R1103
IC2107 (3/4)
PC3
D1101
CXA
R1105
C1106
C1105
R1106
-12V
IC1101 (2/3)
CH2
CH1
CH SW BLK
D1102
R1121
C1122
PC1
D1105
IC1121 (1/4)
DOT EN
(CHR-Y EN)
IC1121 (2/4)
R1125
C1125
R1127
IC1111 (3/6)
IC1111 (5/6)
C1127
R1127A
C1127A
IC1111 (4/6)
D1103
D1104
DOT EN
SELECTOR IC4001
1A 1Y
1B
4A 4Y
4B
2A 2Y
2B
G S
STR Z
DOT EN (CHR-Y EN)
DOT EN (CHR-X EN)
R1122
C1123
R1126
C1126
Fig. 5-9 (8)
+5V
STORAGE
CHR INTEN
R1115
R1116
D1116
D1114
R1123
R1124
C1124
IC1121 (3/4)
CHR-Z
IC1111 (6/6)
CHR EN (PF7')
CHR EN
IC1121 (4/4)
CUR EN
R1109
C1109
DOT EN
+12V
R1104
R1101
UNBL
R1112
P2605
EXT BLANK
J2605
D1113
R1114
R1113
D1115
INTEN
P2601
P2604
P1501
R1272
P1603
INTEN
RV1601 10k
R1620
11
CHR INTEN
READ OUT IN TEN
R1602 10k
R1621
-12V
Z-AXIS AMP
12
+110V
R910
R911
D910
C912
C904
TR910
R904 22k
R915 220
Z OUT
Cz
+55V
R905
R907
C908
TR901
D901
TR906
UNBLANK
D902
R901
D911
TR912
R902
D903
R908

Fig. 5-10

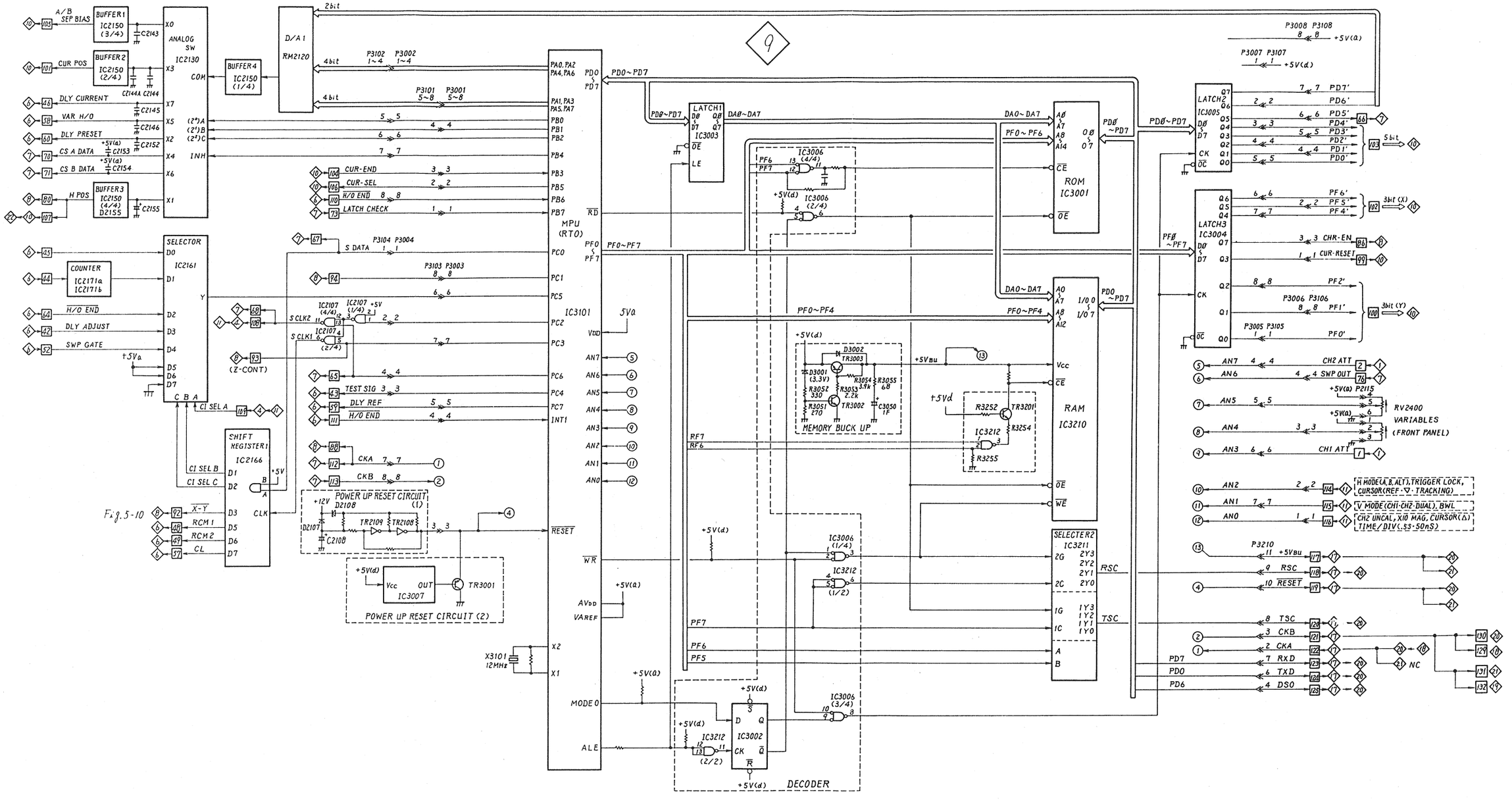

9
BUFFER1 IC2150 (3/4)
BUFFER2 IC2150 (2/4)
BUFFER3 IC2150 (4/4) D2155
BUFFER4 IC2150 (1/4)
ANALOG SW IC2130
D/A1 RM2120
2bit
4bit
A/B SEP BIAS
CUR POS
DLY CURRENT
VAR H/O
DLY PRESET
CS A DATA
CS B DATA
H POS
C2143
C2144
C2144A
C2145
C2146
C2152
C2153
C2154
C2155
+5V(a)
P3102 P3002 1~4
P3101 P3001 5~8
MPU (RTO) IC3101
PA0, PA2 PA4, PA6
PA1, PA3 PA5, PA7
PB0
PB1
PB2
PB4
PB3
PB5
PB6
PB7
PC0
PC1
PC5
PC2
PC3
PC6
PC4
PC7
INT1
AN7
AN6
AN5
AN4
AN3
AN2
AN1
AN0
VDD
AVDD
VAREF
X2
X1
X3101 12MHz
MODE 0
ALE
RD
WR
RESET
PD0~PD7
PF0~PF7
PF0~PF4
5Va
+5V(a)
CUR-END
CUR-SEL
H/O END
LATCH CHECK
S DATA
S CLK2
S CLK1
TEST SIG
DLY REF
CKA
CKB
(Z-CONT)
SELECTOR IC2161
COUNTER IC2171a IC2171b
H/O END
DLY ADJUST
SWP GATE
+5Va
C B A
CI SEL A
CI SEL B
CI SEL C
SHIFT REGISTER1 IC2166
X-Y
RCM 1
RCM 2
CL
CLK
Fig. 5-10
POWER UP RESET CIRCUIT (1)
D2108
D2107
C2108
TR2109
TR2108
+12V
POWER UP RESET CIRCUIT (2)
IC3007
TR3001
LATCH1 IC3003
DAØ~DA7
PDØ~PD7
IC3006 (4/4)
IC3006 (2/4)
IC3006 (1/4)
IC3006 (3/4)
IC3212 (1/2)
IC3212 (2/2)
IC3002
DECODER
ROM IC3001
RAM IC3210
MEMORY BUCK UP
D3002
TR3003
TR3002
TR3201
D3001 (3.3V)
R3052 330
R3053 2.2k
R3054 3.9k
R3055 6.8
R3051 270
C3050 1F
R3252
R3254
R3255
IC3212
+5VBu
+5Vd
SELECTER2 IC3211
RSC
TSC
LATCH2 IC3005
LATCH3 IC3004
PDØ~PD7
PFØ~PF7
3bit
5bit
CHR-EN
CUR-RESET
PF2'
PF1'
PF0'
PD7'
PD6'
PD5'
PD4'
PD3'
PD2'
PD1'
PD0'
PF6'
PF5'
PF4'
P3008 P3108
P3007 P3107
P3006 P3106
P3005 P3105
CH2 ATT
SWP OUT
CH1 ATT
RV2400 VARIABLES (FRONT PANEL)
H MODE(A,B,ALT),TRIGGER LOCK, CURSOR(REF·▽·TRACKING)
V MODE(CH1·CH2·DUAL), BWL
CH2 UNCAL, X10 MAG, CURSOR(Δ) TIME/DIV(.5S~50nS)
TSC
CKB
CKA
RxD
TxD
DSO
NC
PD7
PD0
PD6

Fig. 5-17

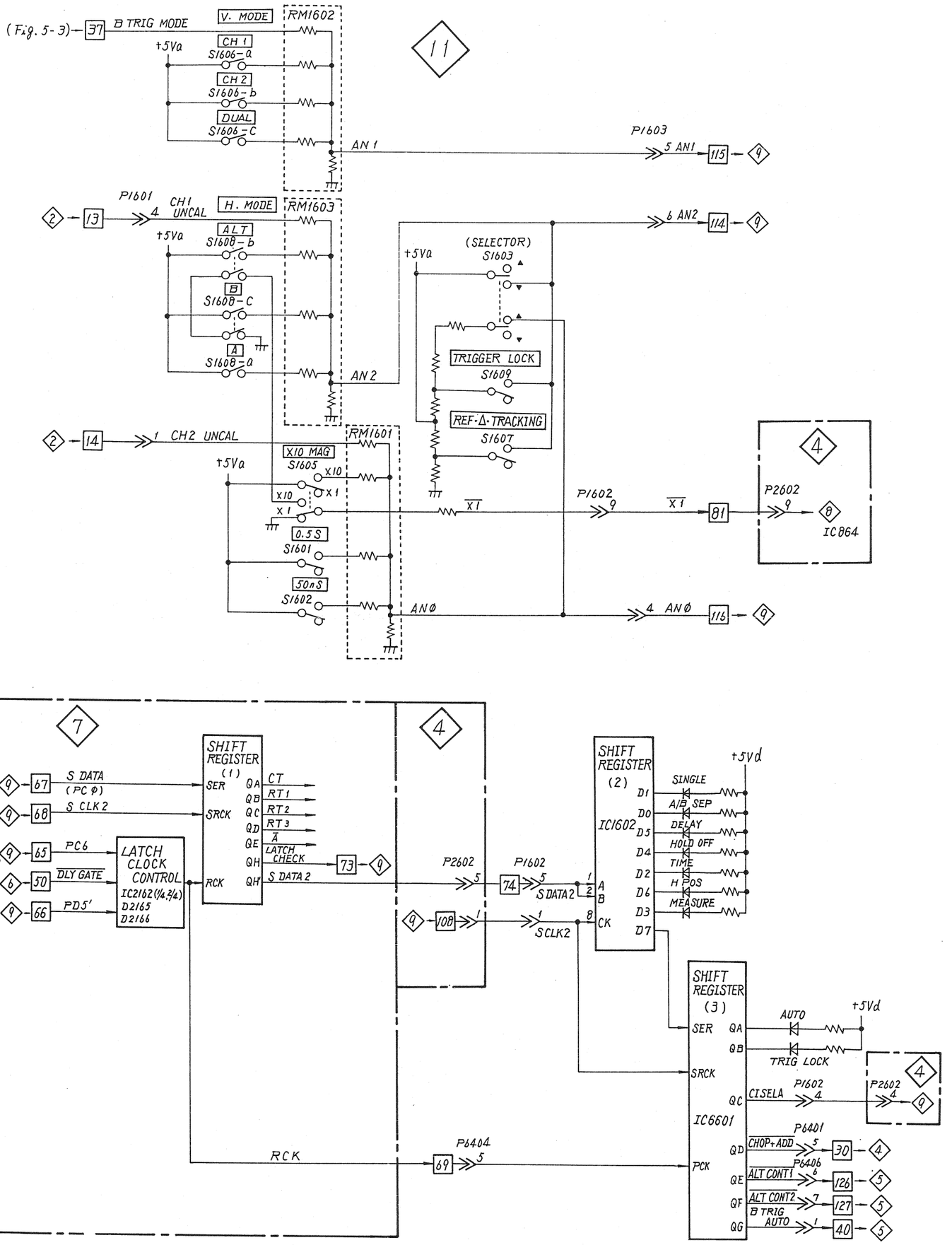

(Fig. 5-3)
37
B TRIG MODE
V. MODE
RM1602
+5Va
CH 1
S1606-a
CH 2
S1606-b
DUAL
S1606-C
AN 1
P1603
5 AN1
115
11
P1601
CH1 UNCAL
H. MODE
RM1603
ALT
S1608-b
B
S1608-C
A
S1608-a
AN 2
6 AN2
114
(SELECTOR)
S1603
TRIGGER LOCK
S1609
REF·Δ·TRACKING
S1607
RM1601
CH2 UNCAL
X10 MAG
S1605
X10
X1
0.5 S
S1601
50nS
S1602
ANØ
4 ANØ
116
X1
P1602
81
P2602
IC864
4
7
MPU
67
S DATA
(PC φ)
68
S CLK2
65
PC6
50
DLY GATE
66
PD5'
LATCH CLOCK CONTROL
IC2162(¼,¾,¼)
D2165
D2166
SHIFT REGISTER (1)
SER
SRCK
RCK
QA
QB
QC
QD
QE
QH
QH'
CT
RT1
RT2
RT3
Ā
LATCH CHECK
S DATA 2
73
P2602
74
P1602
S DATA2
108
SCLK2
SHIFT REGISTER (2)
IC1602
D1
D0
D5
D4
D2
D6
D3
D7
SINGLE
A/B SEP
DELAY
HOLD OFF
TIME
H POS
MEASURE
+5Vd
SHIFT REGISTER (3)
IC6601
AUTO
TRIG LOCK
CISELA
P6404
69
P6401
CHOP+ADD
30
P6406
ALT CONT1
126
ALT CONT2
127
B TRIG AUTO
40

Fig. 5-18

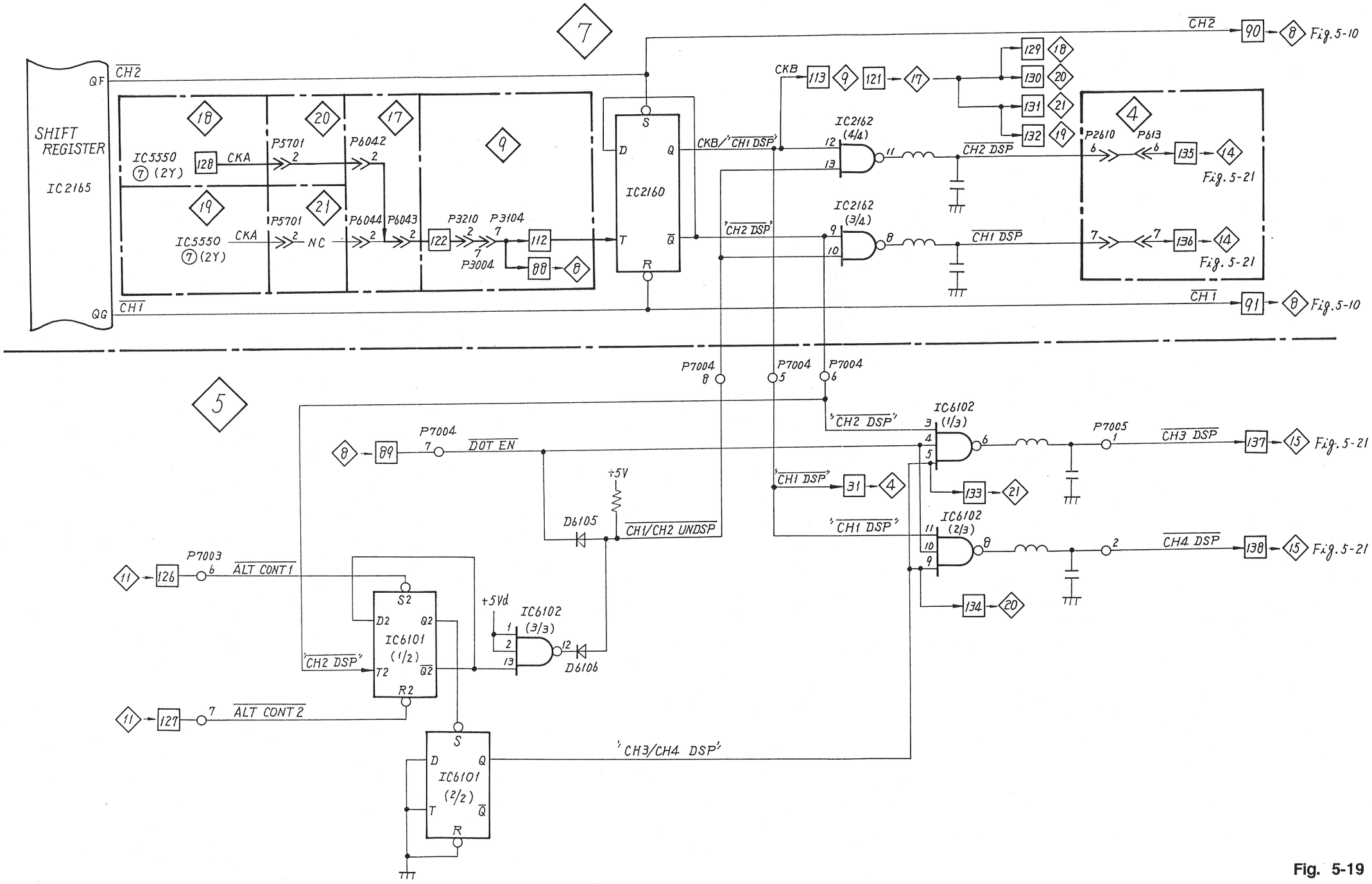

SHIFT REGISTER
IC2165
QF
QG
CH2
CH1
IC5550 (7) (2Y)
CKA
P5701
P6042
P6044
P6043
NC
P3210
P3104
P3004
IC2160
S
D
Q
T
R
CKB/'CH1 DSP'
'CH2 DSP'
CKB
IC2162 (4/4)
IC2162 (3/4)
CH2 DSP
CH1 DSP
P2610
P613
Fig. 5-21
Fig. 5-10
P7004
DOT EN
+5V
D6105
CH1/CH2 UNDSP
IC6102 (1/3)
IC6102 (2/3)
IC6102 (3/3)
'CH1 DSP'
CH3 DSP
CH4 DSP
P7005
P7003
ALT CONT1
ALT CONT2
IC6101 (1/2)
IC6101 (2/2)
+5Vd
D6106
'CH3/CH4 DSP'

Fig. 5-19

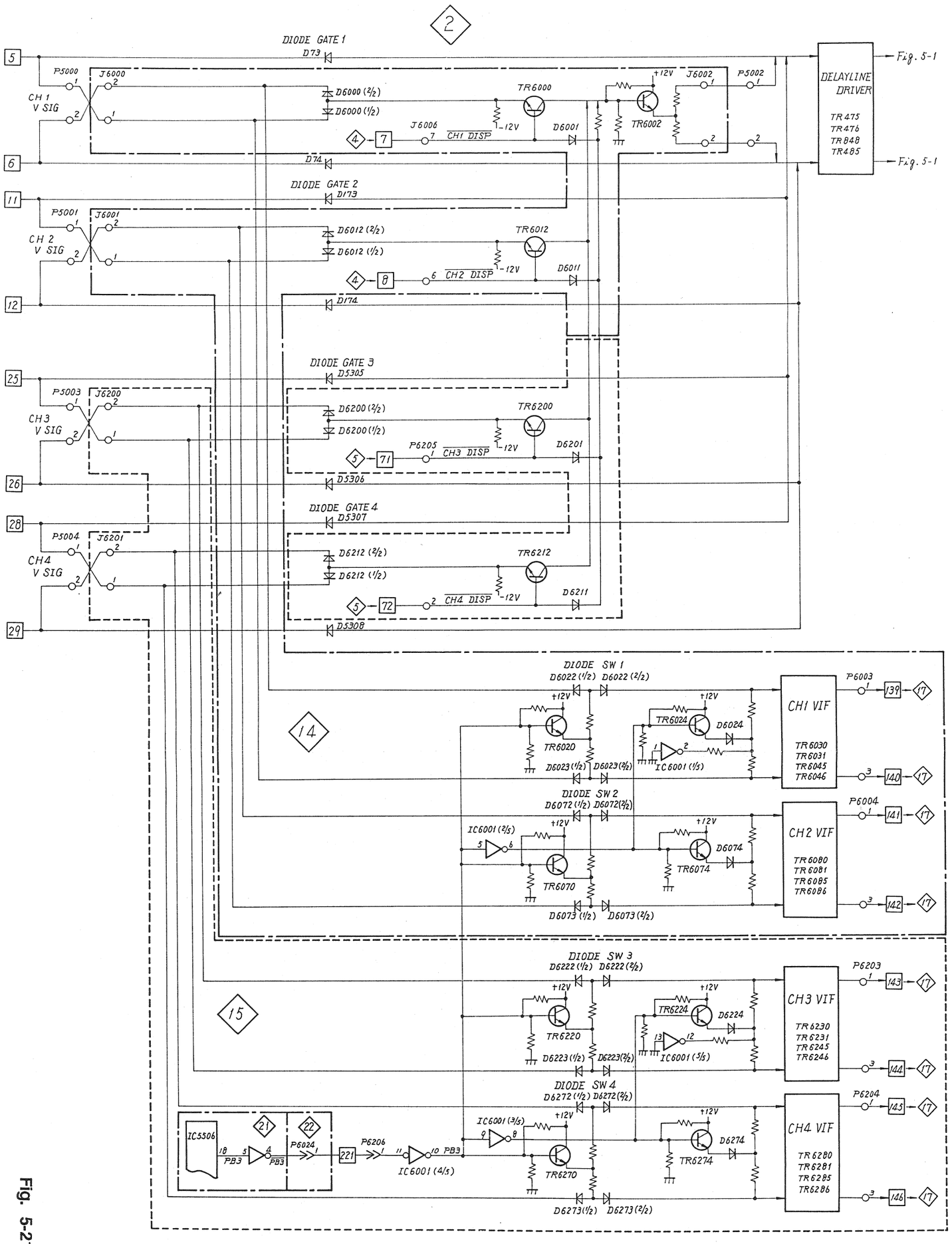

2
DIODE GATE 1
D73
5
P5000
J6000
CH 1
V SIG
D6000 (2/2)
D6000 (1/2)
TR6000
+12V
J6002
P5002
DELAYLINE
DRIVER
TR475
TR476
TR848
TR485
Fig. 5-1
Fig. 5-1
J6006
CH1 DISP
-12V
D6001
TR6002
4 - 7
6
D74
DIODE GATE 2
D173
11
P5001
J6001
CH 2
V SIG
D6012 (2/2)
D6012 (1/2)
TR6012
4 - 8
6
CH2 DISP
-12V
D6011
12
D174
DIODE GATE 3
D5305
25
P5003
J6200
CH3
V SIG
D6200 (2/2)
D6200 (1/2)
TR6200
P6205
CH3 DISP
-12V
D6201
5 - 71
26
D5306
DIODE GATE 4
D5307
28
P5004
J6201
CH4
V SIG
D6212 (2/2)
D6212 (1/2)
TR6212
5 - 72
2
CH4 DISP
-12V
D6211
29
D5308
14
DIODE SW 1
D6022 (1/2)
D6022 (2/2)
+12V
TR6020
D6023 (1/2)
D6023 (2/2)
TR6024
D6024
IC6001 (1/3)
P6003
CH1 VIF
TR6030
TR6031
TR6045
TR6046
139
140
17
DIODE SW 2
D6072 (1/2)
D6072 (2/3)
IC6001 (2/3)
TR6070
D6073 (1/2)
D6073 (2/3)
TR6074
D6074
P6004
CH2 VIF
TR6080
TR6081
TR6085
TR6086
141
142
15
DIODE SW 3
D6222 (1/2)
D6222 (2/2)
TR6220
D6223 (1/2)
D6223 (2/2)
TR6224
D6224
IC6001 (5/3)
P6203
CH3 VIF
TR6230
TR6231
TR6245
TR6246
143
144
DIODE SW 4
D6272 (1/2)
D6272 (2/3)
IC6001 (3/3)
TR6270
D6273 (1/2)
D6273 (2/3)
TR6274
D6274
P6204
CH4 VIF
TR6280
TR6281
TR6285
TR6286
145
146
IC5506
18
PB3
5
PB3
21
22
P6024
221
P6206
IC6001 (4/3)
10
PB3

Fig. 5-21

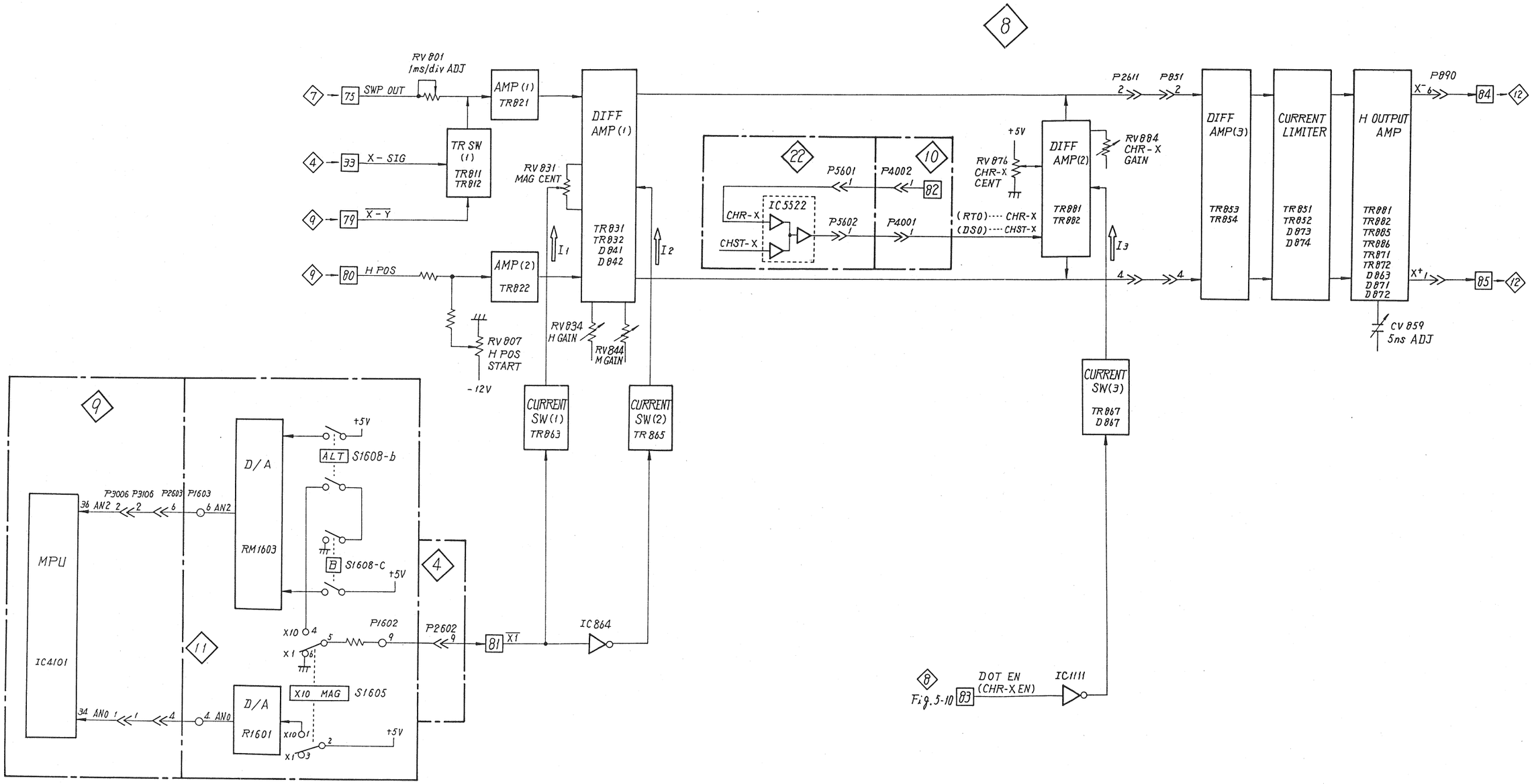

8
RV 801
1ms/div ADJ
7
75
SWP OUT
AMP (1)
TR821
DIFF
AMP (1)
4
33
X - SIG
TR SW
(1)
TR811
TR812
9
79
X - Y
RV 831
MAG CENT
TR831
TR832
D841
D842
I1
I2
9
80
H POS
AMP (2)
TR822
RV 807
H POS
START
-12V
RV 834
H GAIN
RV 844
M GAIN
CURRENT
SW (1)
TR863
CURRENT
SW (2)
TR865
22
10
P5601
P4002
82
CHR-X
IC 5522
CHST-X
P5602
P4001
(RTO)···· CHR-X
(DSO)···· CHST-X
+5V
RV 876
CHR-X
CENT
DIFF
AMP(2)
TR881
TR882
RV 884
CHR-X
GAIN
I3
CURRENT
SW(3)
TR867
D887
P2611
2
P851
2
4
4
DIFF
AMP(3)
TR853
TR854
CURRENT
LIMITER
TR851
TR852
D873
D874
H OUTPUT
AMP
TR881
TR882
TR885
TR886
TR871
TR872
D863
D871
D872
CV 859
5ns ADJ
P890
X-6
84
12
X+1
85
12
9
D/A
RM1603
+5V
ALT
S1608-b
B
S1608-C
+5V
P3006 P3106 P2603 P1603
36 AN2 2
2
6
6 AN2
MPU
IC4101
4
11
X10 4
5
P1602
9
P2602
9
81
X1
IC 864
X1 6
D/A
R1601
X10 MAG
S1605
34 AN0 1
1
4
4 AN0
X10 1
+5V
2
X1 3
8
Fig. 5-10
83
DOT EN
(CHR-X EN)
IC1111

Fig. 5-9

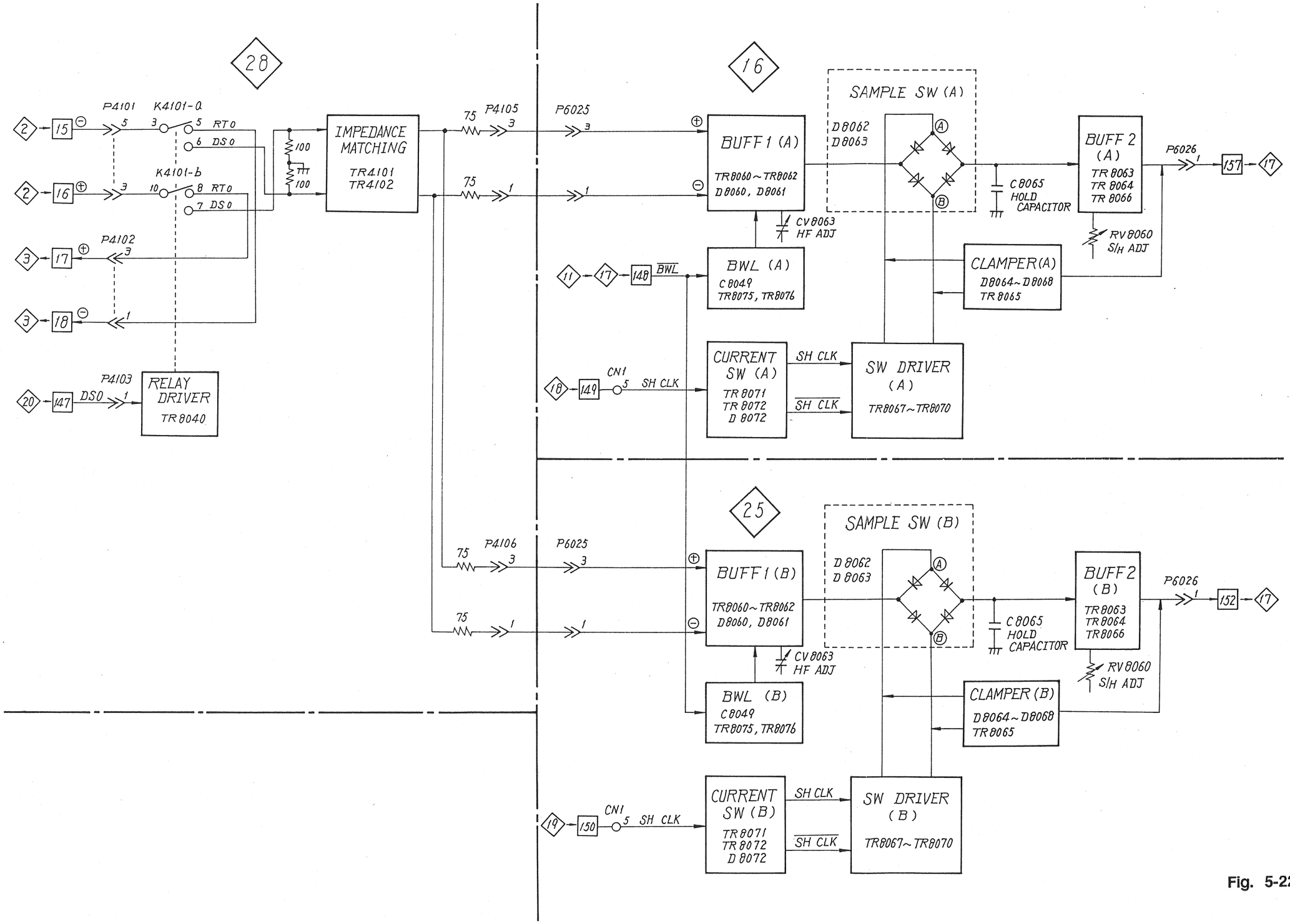

28
P4101
K4101-a
K4101-b
P4102
P4103
RELAY DRIVER
TR8040
DS0
RT0
IMPEDANCE MATCHING
TR4101
TR4102
100
100
75
P4105
P6025
16
SAMPLE SW (A)
D8062
D8063
BUFF 1 (A)
TR8060~TR8062
D8060, D8061
CV8063
HF ADJ
BWL (A)
C8049
TR8075, TR8076
BWL
CURRENT SW (A)
TR8071
TR8072
D8072
SH CLK
SW DRIVER (A)
TR8067~TR8070
CLAMPER(A)
D8064~D8068
TR8065
C8065
HOLD CAPACITOR
BUFF 2 (A)
TR8063
TR8064
TR8066
RV8060
S/H ADJ
P6026
157
17
25
SAMPLE SW (B)
BUFF 1 (B)
BWL (B)
CURRENT SW (B)
SW DRIVER (B)
CLAMPER (B)
BUFF 2 (B)
152
150
149
147
148
P4106

Fig. 5-22

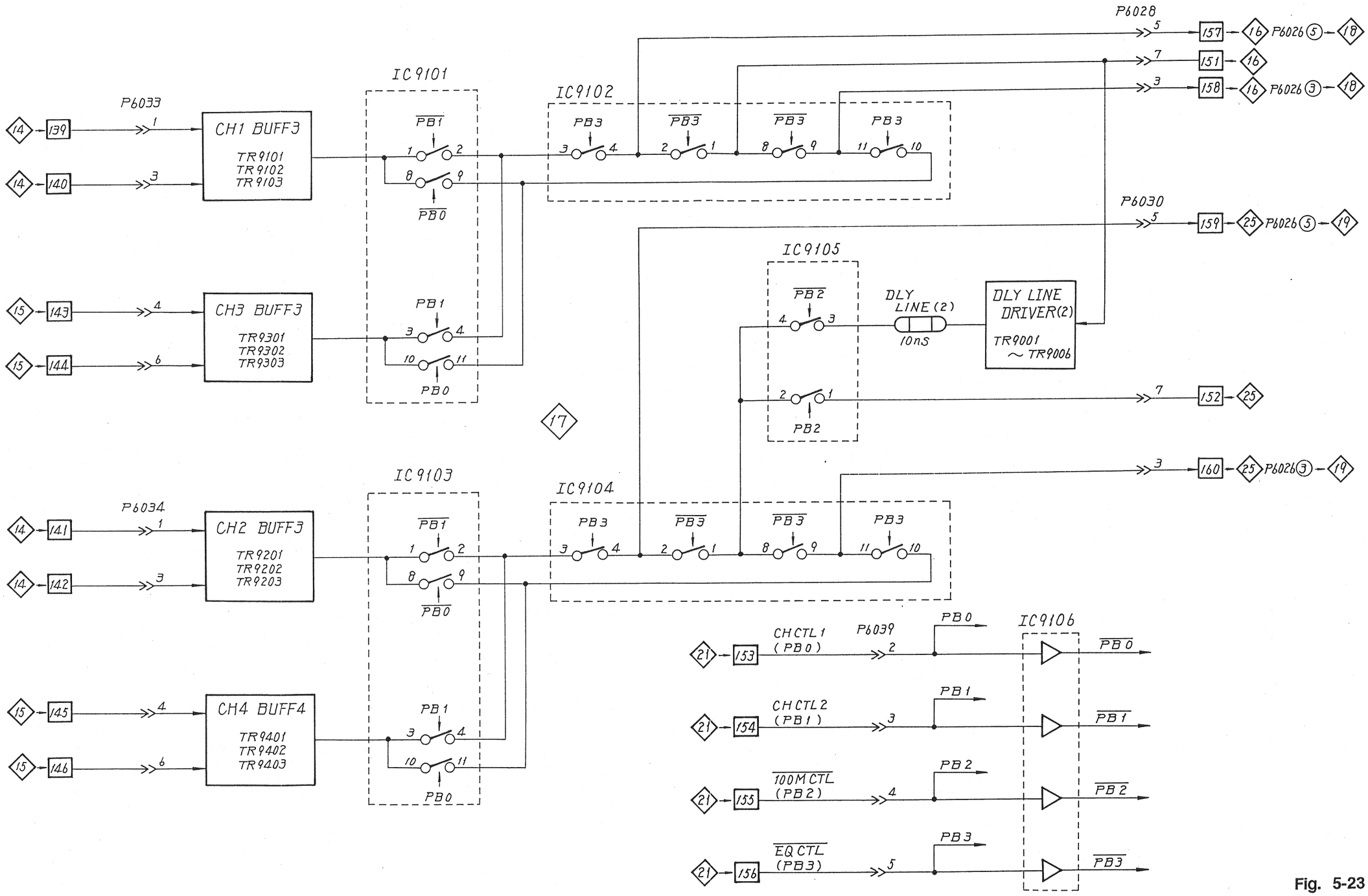

P6033
CH1 BUFF3
TR9101
TR9102
TR9103
CH3 BUFF3
TR9301
TR9302
TR9303
P6034
CH2 BUFF3
TR9201
TR9202
TR9203
CH4 BUFF4
TR9401
TR9402
TR9403
IC9101
IC9102
IC9103
IC9104
IC9105
IC9106
PB1
PB0
PB3
PB2
DLY LINE (2)
10nS
DLY LINE DRIVER(2)
TR9001 ~ TR9006
P6028
P6030
P6026
CHCTL1 (PB0)
CHCTL2 (PB1)
100MCTL (PB2)
EQCTL (PB3)
17

Fig. 5-23

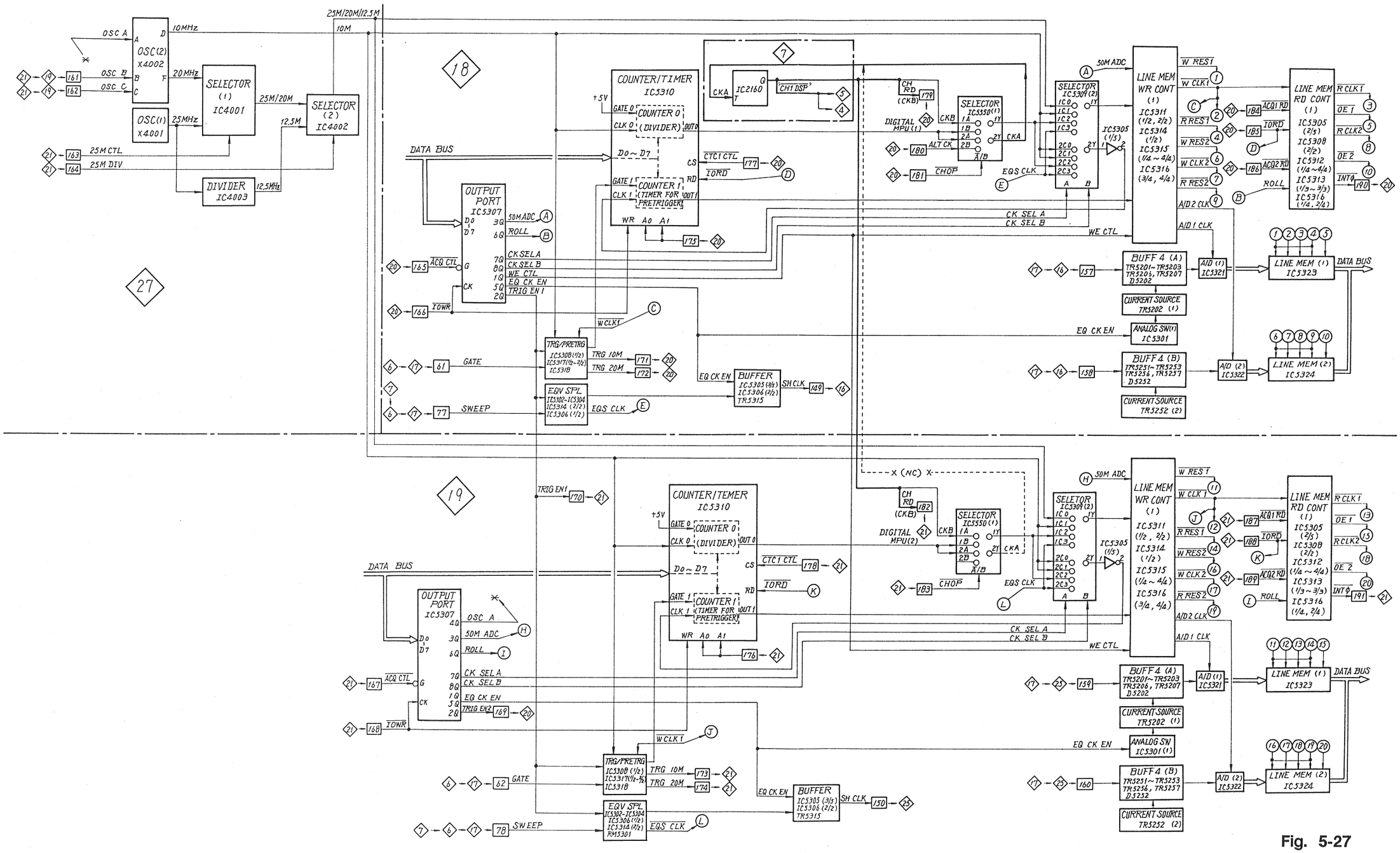

OSC A
OSC B
OSC C
OSC(2) X4002
10MHz
20MHz
OSC(1) X4001
25MHz
SELECTOR (1) IC4001
SELECTOR (2) IC4002
25M/20M
12.5M
25M/20M/12.5M
10M
25M CTL
25M DIV
DIVIDER IC4003
12.5MHz
27
18
DATA BUS
COUNTER/TIMER IC5310
COUNTER 0 (DIVIDER)
COUNTER 1 (TIMER FOR PRETRIGGER)
OUTPUT PORT IC5307
ACQ CTL
IOWR
CK SEL A
CK SEL B
WE CTL
EQ CK EN
TRIG EN1
W CLK1
TRG/PRETRG IC5308 (1/2) IC5317 (1/2-2/2) IC5318
TRG 10M
TRG 20M
GATE
SWEEP
EQV SPL IC5302-IC5304 IC5306 (1/2) IC5314 (2/2) IC5306 (1/2)
EQS CLK
BUFFER IC5305 (3/4) IC5306 (2/2) TR5315
SH CLK
7
IC2160
CH1 DSP'
CH RD (CKB)
DIGITAL MPU (1)
SELECTOR IC5350 (1)
ALT CK
CHOP
SELECTOR IC5309 (2)
IC5305 (1/5)
50M ADC
LINE MEM WR CONT (1) IC5311 (1/2, 2/2) IC5314 (1/2) IC5315 (1/4~4/4) IC5316 (3/4, 4/4)
W RES1
W CLK1
R RES1
W RES2
W CLK2
R RES2
A/D2 CLK
A/D1 CLK
LINE MEM RD CONT (1) IC5305 (2/5) IC5308 (2/2) IC5312 (1/4~4/4) IC5313 (1/3~3/3) IC5316 (1/4, 2/4)
R CLK1
OE 1
R CLK2
OE 2
INT0
ACQ1 RD
IORD
ACQ2 RD
ROLL
BUFF 4 (A) TR5201~TR5203 TR5206, TR5207 D5202
BUFF 4 (B) TR5251~TR5253 TR5256, TR5257 D5252
CURRENT SOURCE TR5202 (1)
CURRENT SOURCE TR5252 (2)
ANALOG SW(1) IC5301
A/D (1) IC5321
A/D (2) IC5322
LINE MEM (1) IC5323
LINE MEM (2) IC5324
X (NC) X

Fig. 5-27

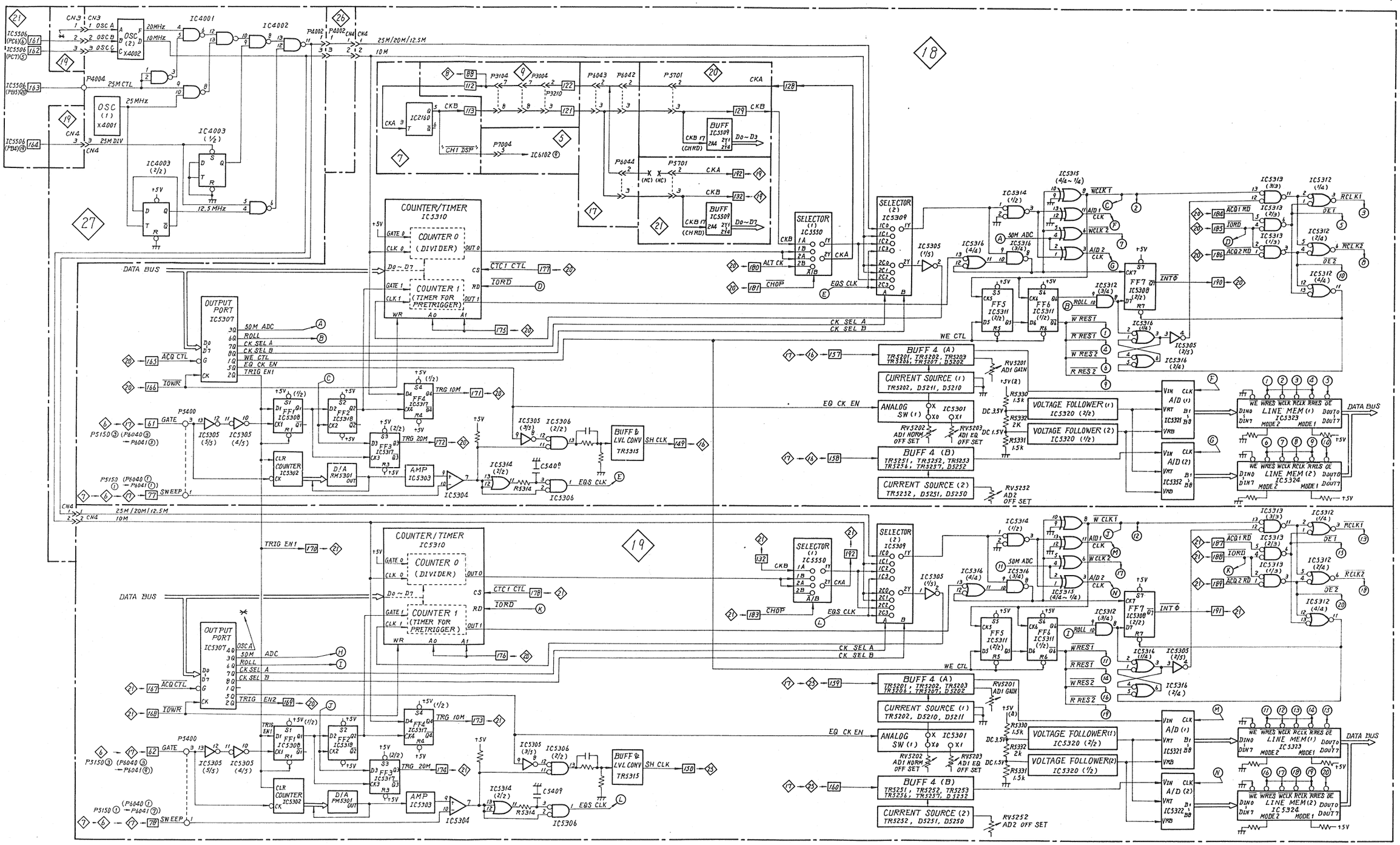

18
19
27
COUNTER/TIMER IC5310
COUNTER 0 (DIVIDER)
COUNTER 1 (TIMER FOR PRETRIGGER)
OUTPUT PORT IC5307
DATA BUS
50M ADC
ROLL
CK SEL A
CK SEL B
WE CTL
EQ CK EN
TRIG EN1
TRIG EN2
ACQ CTL
IOWR
IORD
CTC1 CTL
GATE
SWEEP
TRG 10M
TRG 20M
SH CLK
EQS CLK
ALT CK
CHOP
CKA
CKB
BUFF & LVL CONV TR5315
BUFF 4 (A) TR5201, TR5202, TR5203 TR5206, TR5207, D5202
BUFF 4 (B) TR5251, TR5252, TR5253 TR5256, TR5257, D5252
CURRENT SOURCE (1) TR5202, D5211, D5210
CURRENT SOURCE (2) TR5232, D5251, D5250
ANALOG SW (1) IC5301
VOLTAGE FOLLOWER (1) IC5320 (2/2)
VOLTAGE FOLLOWER (2) IC5320 (1/2)
LINE MEM (1) IC5323
LINE MEM (2) IC5324
A/D (1) IC5321
A/D (2) IC5322
SELECTOR (1) IC5350
SELECTOR (2) IC5309
FF5 IC5311 (2/2)
FF6 IC5311 (1/2)
FF7 IC5308 (2/2)
BUFF IC5309
IC2160
IC6102
IC5305 (1/5)
IC5305 (2/5)
IC5305 (3/5)
IC5305 (4/5)
IC5306
IC5314 (1/2)
IC5316 (4/4)
IC5316 (3/4)
IC5316 (2/4)
IC5316 (1/4)
IC5315 (4/4~1/4)
IC5313 (3/3)
IC5313 (2/3)
IC5313 (1/3)
IC5312 (1/4)
IC5312 (2/4)
IC5312 (3/4)
IC5312 (4/4)
OUT PUT PORT IC5307
COUNTER IC5302
D/A RM5301
AMP IC5303
IC5304
FF1 IC5308
FF2 IC5318
FF3 IC5317
FF4 IC5317
RV5201 AD1 GAIN
RV5202 AD1 NORM OFF SET
RV5203 AD1 EQ OFF SET
RV5232 AD2 OFF SET
DC 3.5V
DC 1.5V
R5330 1.5k
R5332 2k
R5331 1.5k
C5409
R5314
+5V
CN3
CN4
OSC (2) X4002
OSC (1) X4001
IC4001
IC4002
IC4003 (1/2)
IC4003 (2/2)
20MHz
10MHz
25M/20M/12.5M
10M
25M CTL
25MHz
25M DIV
12.5MHz

Fig. 5-28

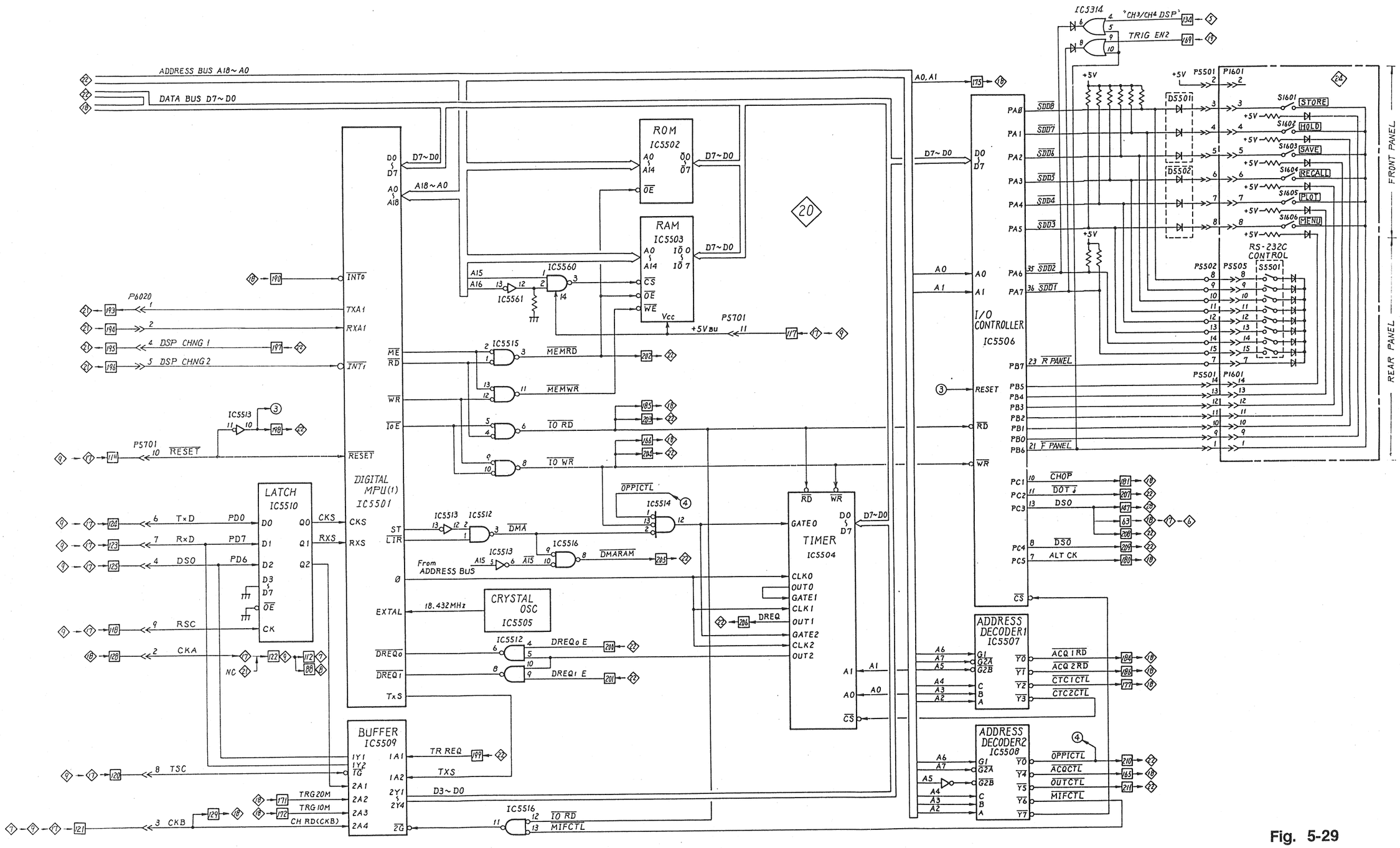

ADDRESS BUS A18~A0
DATA BUS D7~D0
20
ROM
IC5502
RAM
IC5503
IC5560
IC5561
IC5515
P6020
TXA1
RXA1
DSP CHNG 1
DSP CHNG2
INT0
INT1
RESET
P5701
IC5513
LATCH
IC5510
T×D
R×D
DSO
RSC
CKA
TSC
CKB
DIGITAL MPU(1) IC5501
CKS
RXS
EXTAL
18.432MHz
CRYSTAL OSC IC5505
BUFFER IC5509
TR REQ
TXS
D3~D0
TRG20M
TRG10M
CH RD(CKB)
MEMRD
MEMWR
IO RD
IO WR
DMA
DMARAM
IC5512
IC5514
IC5516
OPPICTL
DREQ0 E
DREQ1 E
From ADDRESS BUS
TIMER IC5504
GATE0
OUT0
GATE1
CLK1
OUT1
GATE2
CLK2
OUT2
DREQ
I/O CONTROLLER IC5506
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PB7
PB5
PB4
PB3
PB2
PB1
PB0
PB6
PC1
PC2
PC3
PC4
PC5
CHOP
DOT
DSO
ALT CK
ADDRESS DECODER1 IC5507
ADDRESS DECODER2 IC5508
ACQ1RD
ACQ2RD
CTC1CTL
CTC2CTL
ACQCTL
OUTCTL
MIFCTL
IC5314
CH3/CH4 DSP
TRIG EN2
+5V
+5V Bu
P5501
P1601
D5501
D5502
S1601 STORE
S1602 HOLD
S1603 SAVE
S1604 RECALL
S1605 PLOT
S1606 MENU
RS-232C CONTROL
S5501
P5502
P5505
R PANEL
F PANEL
FRONT PANEL
REAR PANEL

Fig. 5-29

ADDRESS BUS A18~A0

DATA BUS D7~D0

RS-232C CONNECTOR

P5506 P5505 P5502

RTS CTS Tx Data Rx Data

LEVEL SHIFT & INVERTER

IC5511

RTSo DCOo CTSo TxAo RxAo INTo

INT0

P6020

TXA1 RXA1 INTT

DSP CHNG 1 DSP CHNG 2

IC5513 IC5512 IC5516 IC5514 IC5515 IC5560 IC5561

P5701 RESET

DIGITAL MPU(2) IC5501

CKS RXS ST LIR Ø EXTAL DREQo DREQ1 TxS

18.432MHz

CRYSTAL OSC IC5505

DMA DMARAM OPPICTL DREQo E DREQ1 E

From ADDRESS BUS

ROM IC5502

RAM IC5503

D7~D0 A18~A0 A15 A16 CS OE WE Vcc +5V Bu

MEMRD MEMWR IO RD IO WR

TIMER IC5504

GATE0 CLK0 OUT0 GATE1 CLK1 OUT1 GATE2 CLK2 OUT2 DREQ

BUFFER IC5509

TRG20M TRG10M CH RD(CKB) 3 CKB

IO RD MIFCTL

A0, A1

I/O CONTROLLER IC5506

P5501

PB0 CHCTL 1

PB1 CHCTL 2

PB2 100MCTL

PB3 (EQCTL) EQ CTL

IC5305 PB3 (EQCTL)

PB4 25MDIV

PB5 25MCTL

PB7 DSO1 DSP CONT

PA6 "CH3/CH4 DSP" Fig. 5-19

PA7 TRIG EN1

RESET RD WR

PC1 CHOP

PC6 OSC B

PC7 OSC C

CS

ADDRESS DECODER1 IC5507

ACQ1RD ACQ2RD CTC1CTL CTC2CTL

ADDRESS DECODER2 IC5508

OPPICTL ACQCTL OUTCTL MIFCTL

Fig. 5-31

Fig. 5-31

Fig. 5-30

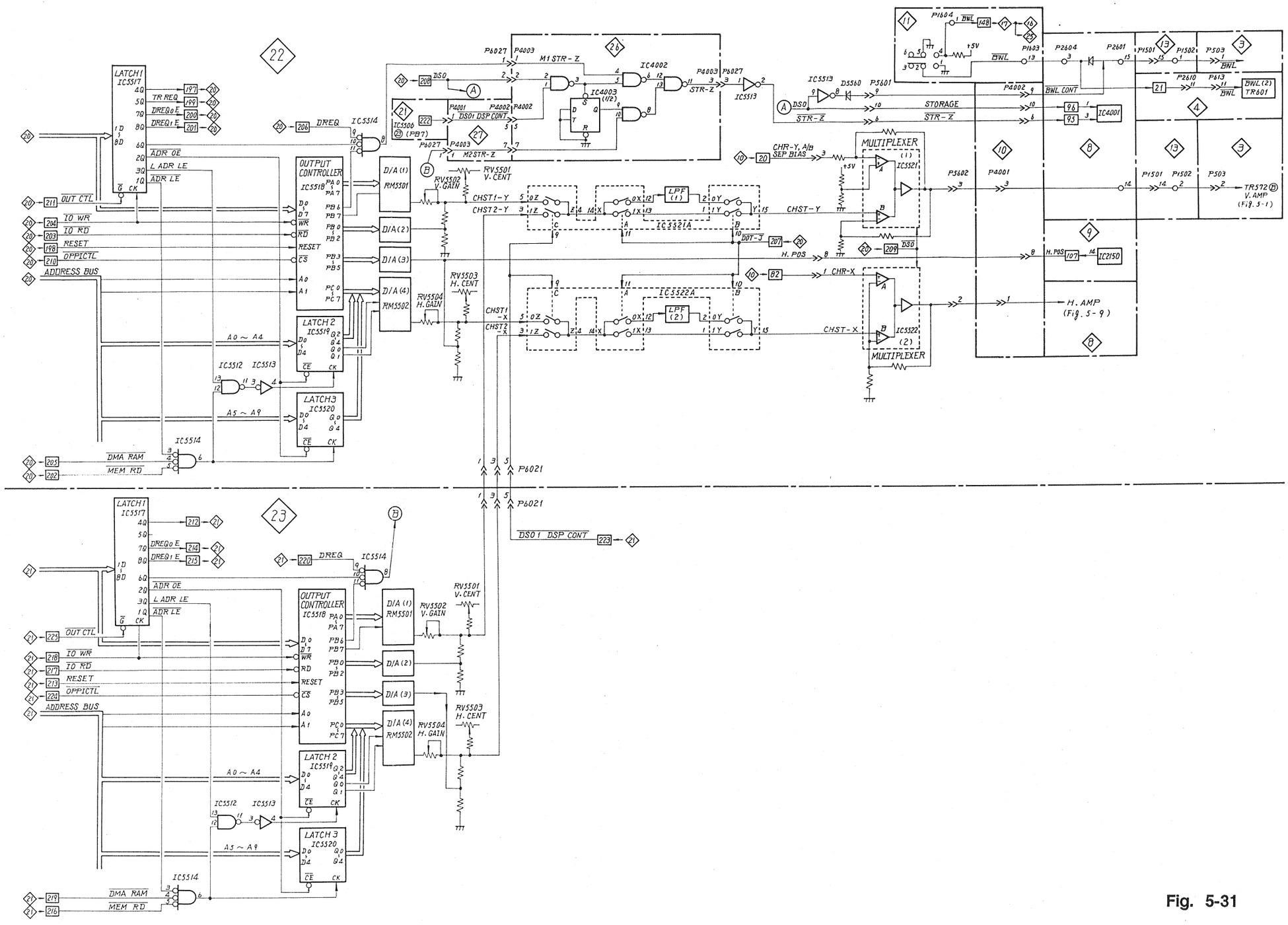

LATCH1 IC5517
OUTPUT CONTROLLER IC5518
LATCH 2 IC5519
LATCH 3 IC5520
D/A (1) RM5501
D/A (2)
D/A (3)
D/A (4) RM5502
RV5501 V. CENT
RV5502 V. GAIN
RV5503 H. CENT
RV5504 H. GAIN
IC5514
IC5512
IC5513
IC4002
IC4003 (1/2)
IC5506 (PB7)
IC5321A
IC5322A
LPF (1)
LPF (2)
MULTIPLEXER (1)
MULTIPLEXER (2)
IC5521
IC5522 (2)
IC4001
IC2150
TR572 V. AMP (Fig. 5-1)
H. AMP (Fig. 5-9)
P6021
P6027
P4003
P4001
P4002
P1604
P2604
P2601
P1501
P1502
P503
P2610
P613
P5602
P5601
P5560
IC5513
M1 STR-Z
M2 STR-Z
DSO1 DSP CONT
STR-Z
STORAGE
BWL CONT
BWL(2) TR601
CHR-Y, A/B SEP BIAS
CHR-X
CHR-Y
CHST1-Y
CHST2-Y
CHST1-X
CHST2-X
H. POS
DOT-J
DSO
DREQ
BWL
+5V
TR REQ
DREQ0 E
DREQ1 E
ADR OE
L ADR LE
ADR LE
OUT CTL
IO WR
IO RD
RESET
OPPICTL
ADDRESS BUS
A0 ~ A4
A5 ~ A9
DMA RAM
MEM RD
22
23
26
27

Fig. 5-31

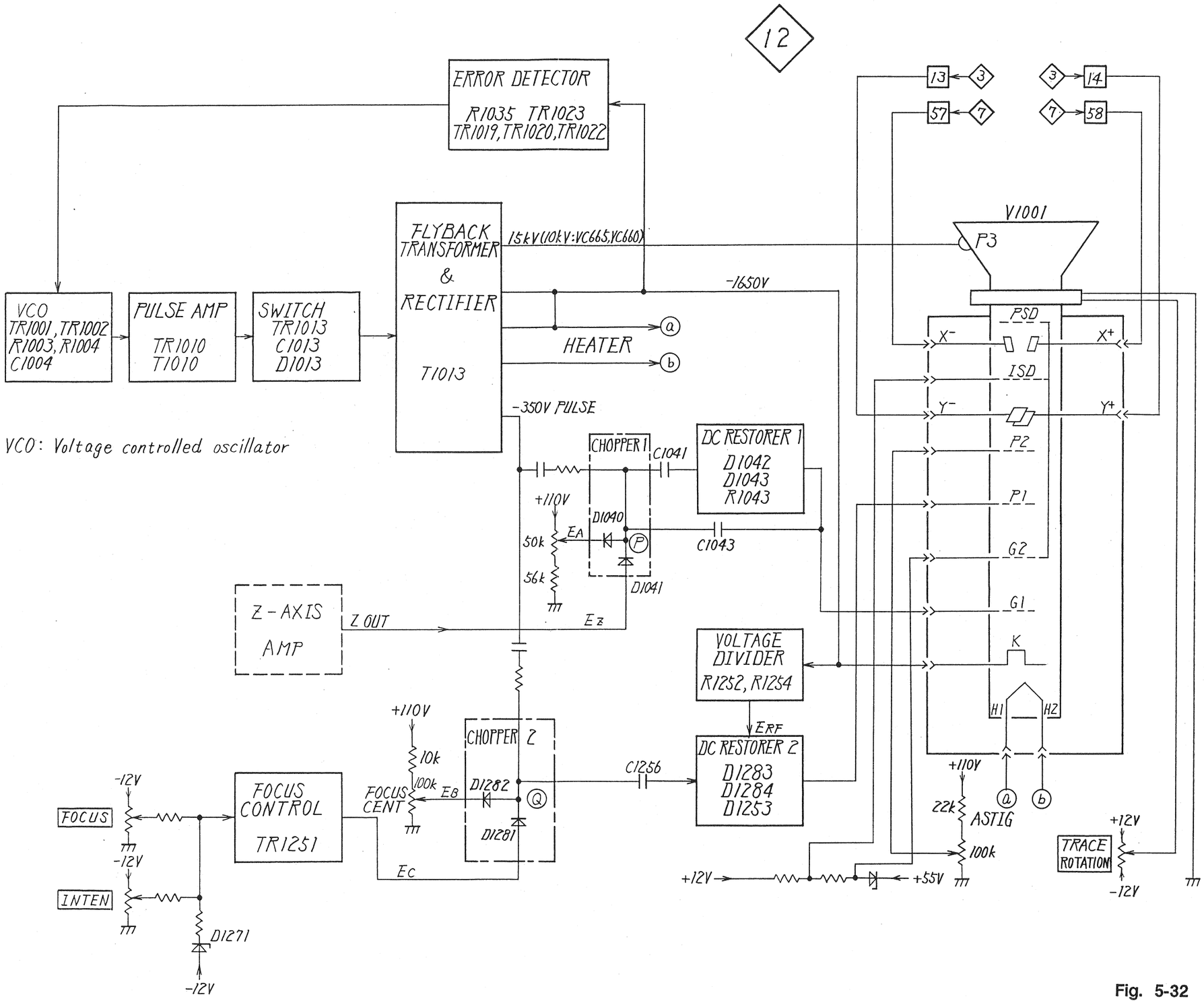

ERROR DETECTOR
R1035 TR1023
TR1019, TR1020, TR1022
VCO
TR1001, TR1002
R1003, R1004
C1004
PULSE AMP
TR1010
T1010
SWITCH
TR1013
C1013
D1013
FLYBACK
TRANSFORMER
&
RECTIFIER
T1013
15kV (10kV: VC665, VC660)
-1650V
HEATER
a
b
-350V PULSE
VCO: Voltage controlled oscillator
CHOPPER 1
C1041
DC RESTORER 1
D1042
D1043
R1043
+110V
50k
EA
D1040
C1043
D1041
56k
Z-AXIS
AMP
Z OUT
Ez
VOLTAGE
DIVIDER
R1252, R1254
ERF
+110V
10k
100k
FOCUS
CENT
EB
CHOPPER 2
D1282
D1281
C1256
DC RESTORER 2
D1283
D1284
D1253
-12V
FOCUS
FOCUS
CONTROL
TR1251
-12V
INTEN
D1271
-12V
Ec
+110V
22k
ASTIG
100k
+12V
+55V
TRACE
ROTATION
+12V
-12V
V1001
P3
PSD
X-
X+
ISD
Y-
Y+
P2
P1
G2
G1
K
H1
H2
13
3
3
14
57
7
7
58

Fig. 5-32

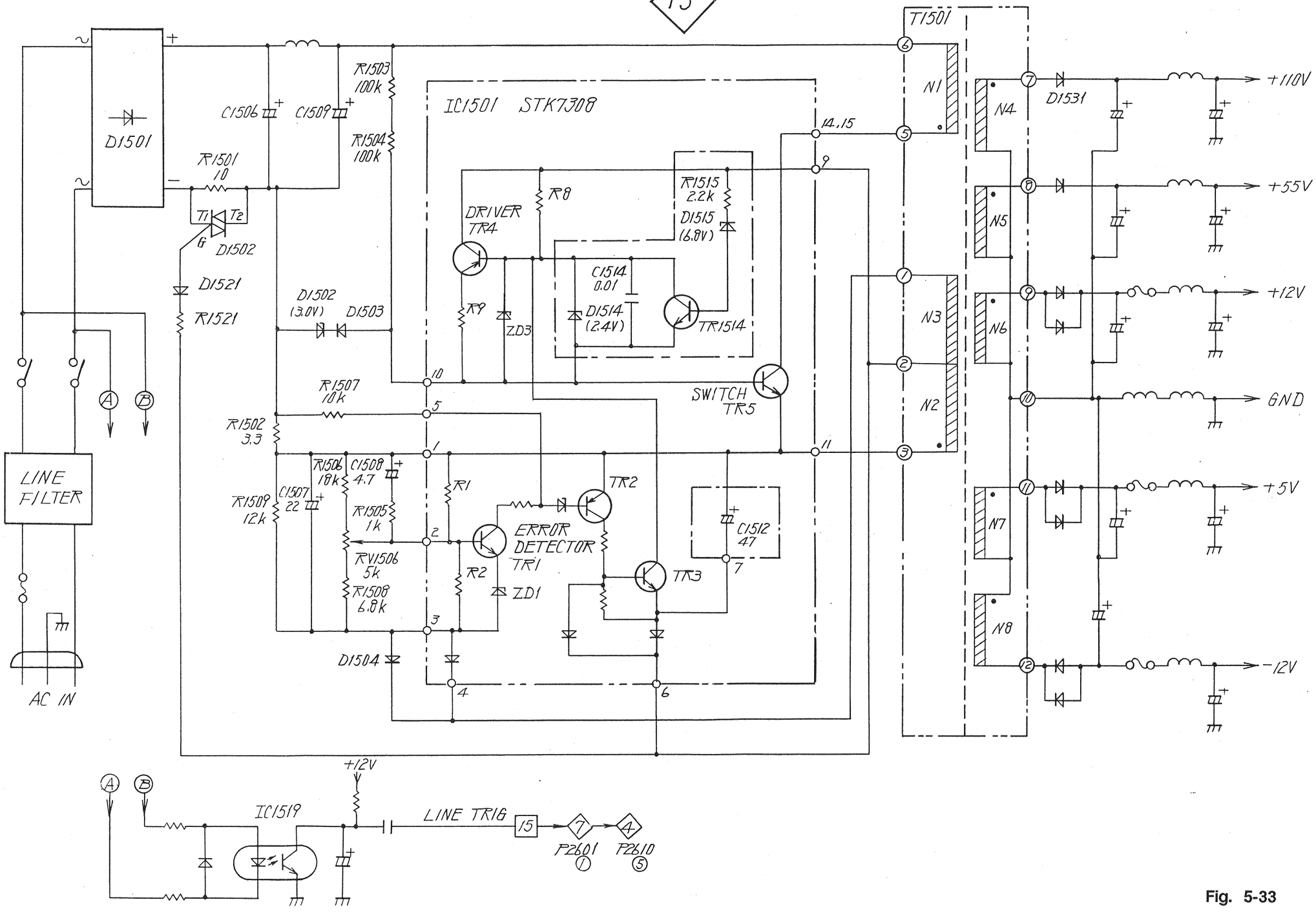

AC IN
LINE FILTER
D1501
R1501 10
T1
T2
G
D1502
D1521
R1521
C1506
C1509
R1503 100k
R1504 100k
D1502 (3.0V)
D1503
R1507 10k
R1502 3.3
R1506 18k
C1508 4.7
R1509 12k
C1507 22
R1505 1k
RV1506 5k
R1508 6.8k
D1504
IC1501 STK7308
DRIVER TR4
R8
R9
ZD3
R1515 2.2k
D1515 (6.8V)
C1514 0.01
D1514 (2.4V)
TR1514
SWITCH TR5
R1
R2
ZD1
ERROR DETECTOR TR1
TR2
TR3
C1512 47
14,15
9
10
5
1
2
3
4
6
7
11
T1501
N1
N2
N3
N4
N5
N6
N7
N8
D1531
+110V
+55V
+12V
GND
+5V
-12V
A
B
+12V
IC1519
LINE TRIG
15
P2601
P2610

Fig. 5-33

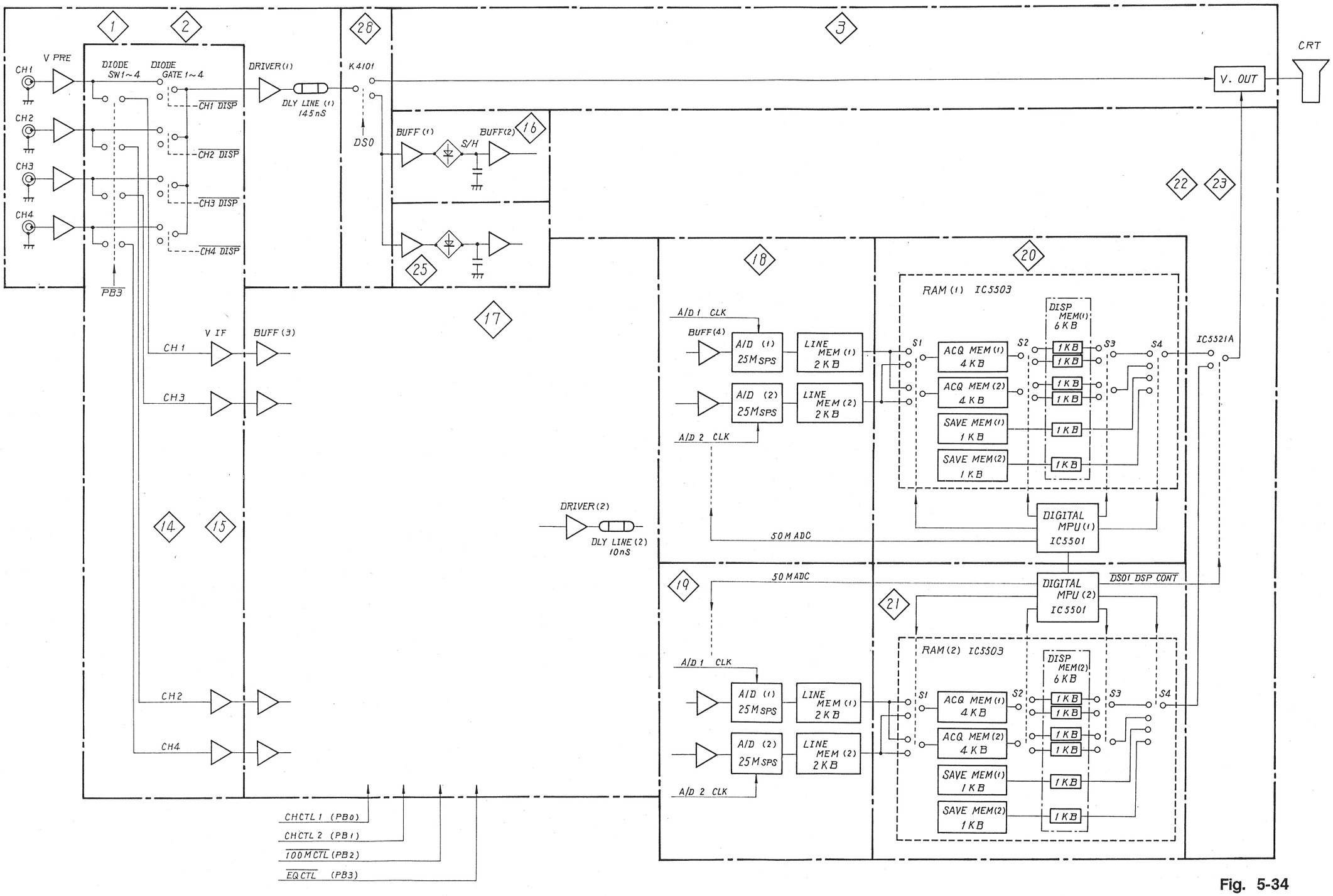
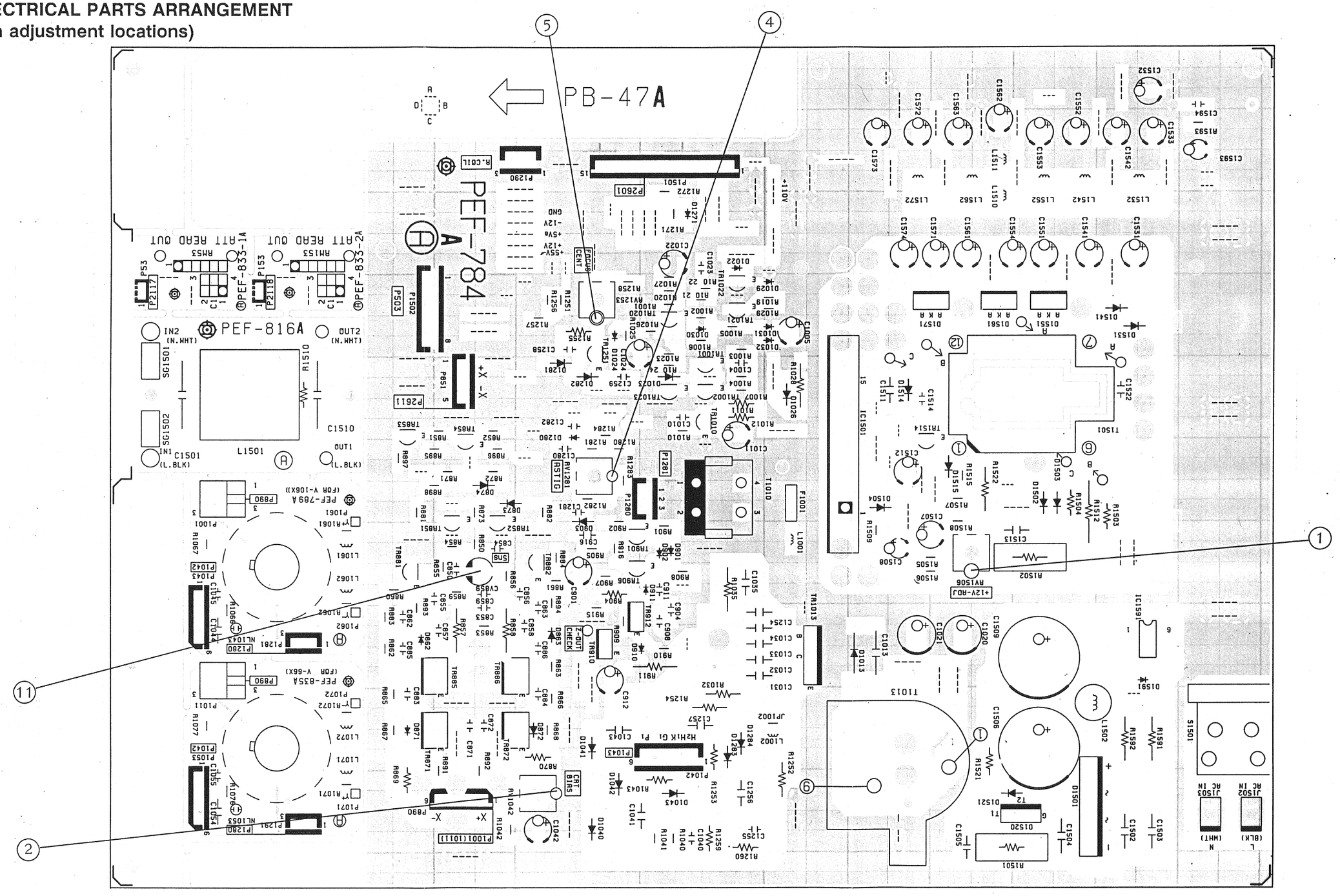
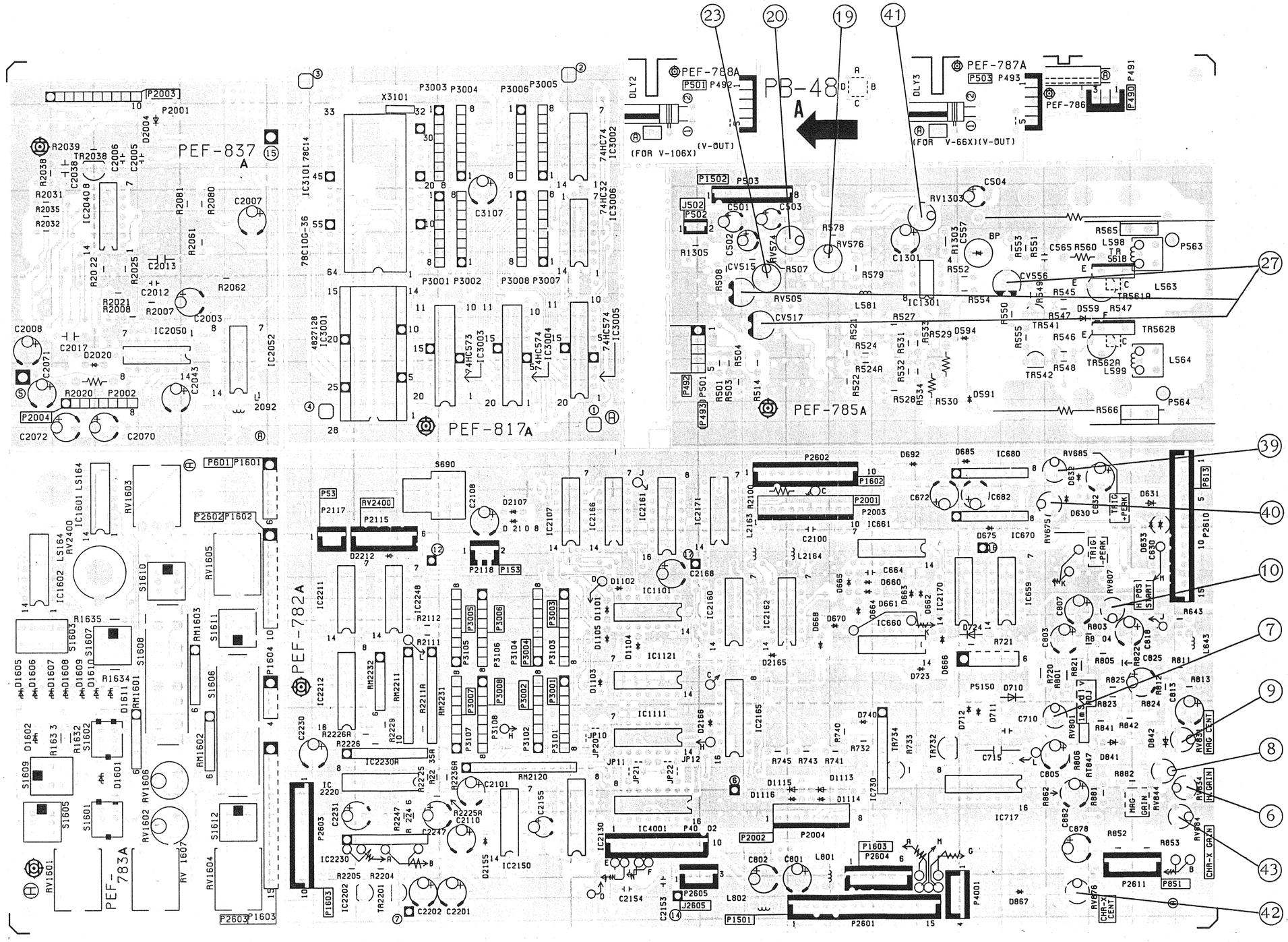

1
2
28
3
CRT
V PRE
CH1
CH2
CH3
CH4
DIODE SW1~4
DIODE GATE 1~4
DRIVER(1)
K4101
V. OUT
DLY LINE (1) 145nS
CH1 DISP
CH2 DISP
CH3 DISP
CH4 DISP
DSO
BUFF(1)
BUFF(2)
S/H
16
25
22
23
PB3
V IF
BUFF(3)
CH1
CH3
17
18
20
A/D 1 CLK
BUFF(4)
A/D (1) 25MSPS
LINE MEM (1) 2KB
A/D (2) 25MSPS
LINE MEM (2) 2KB
A/D 2 CLK
RAM(1) IC5503
DISP MEM(1) 6KB
S1
S2
S3
S4
ACQ MEM(1) 4KB
ACQ MEM(2) 4KB
SAVE MEM(1) 1KB
SAVE MEM(2) 1KB
1KB
IC5521A
DIGITAL MPU(1) IC5501
50MADC
DRIVER(2)
DLY LINE(2) 10nS
14
15
19
21
DIGITAL MPU(2) IC5501
DSO1 DSP CONT
RAM(2) IC5503
DISP MEM(2) 6KB
CH2
CH4
CHCTL 1 (PB0)
CHCTL 2 (PB1)
100MCTL (PB2)
EQCTL (PB3)

Fig. 5-34

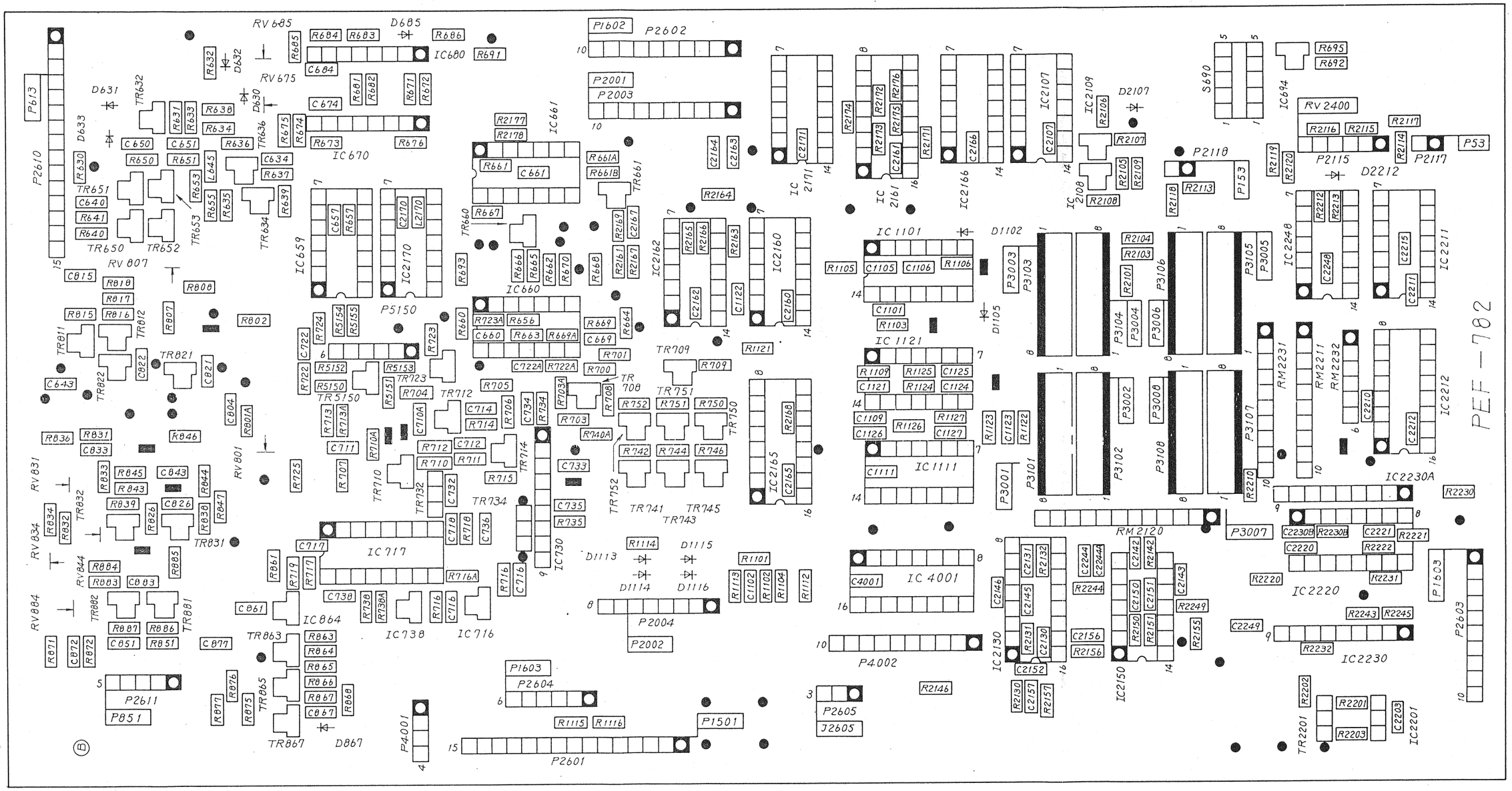
6. ELECTRICAL PARTS ARRANGEMENT
(With adjustment locations)



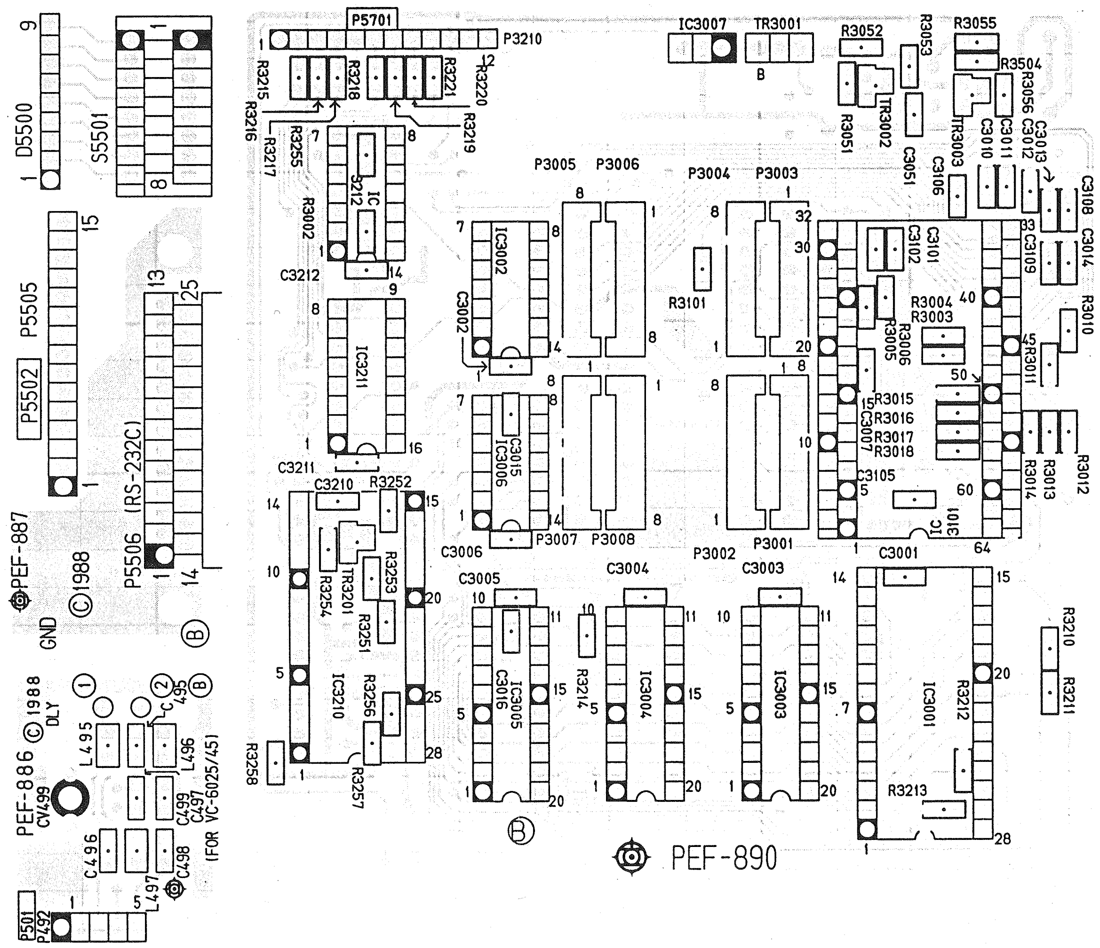
PEF-784, 789A, 816A, 833-1A, 833-2A (Parts side)



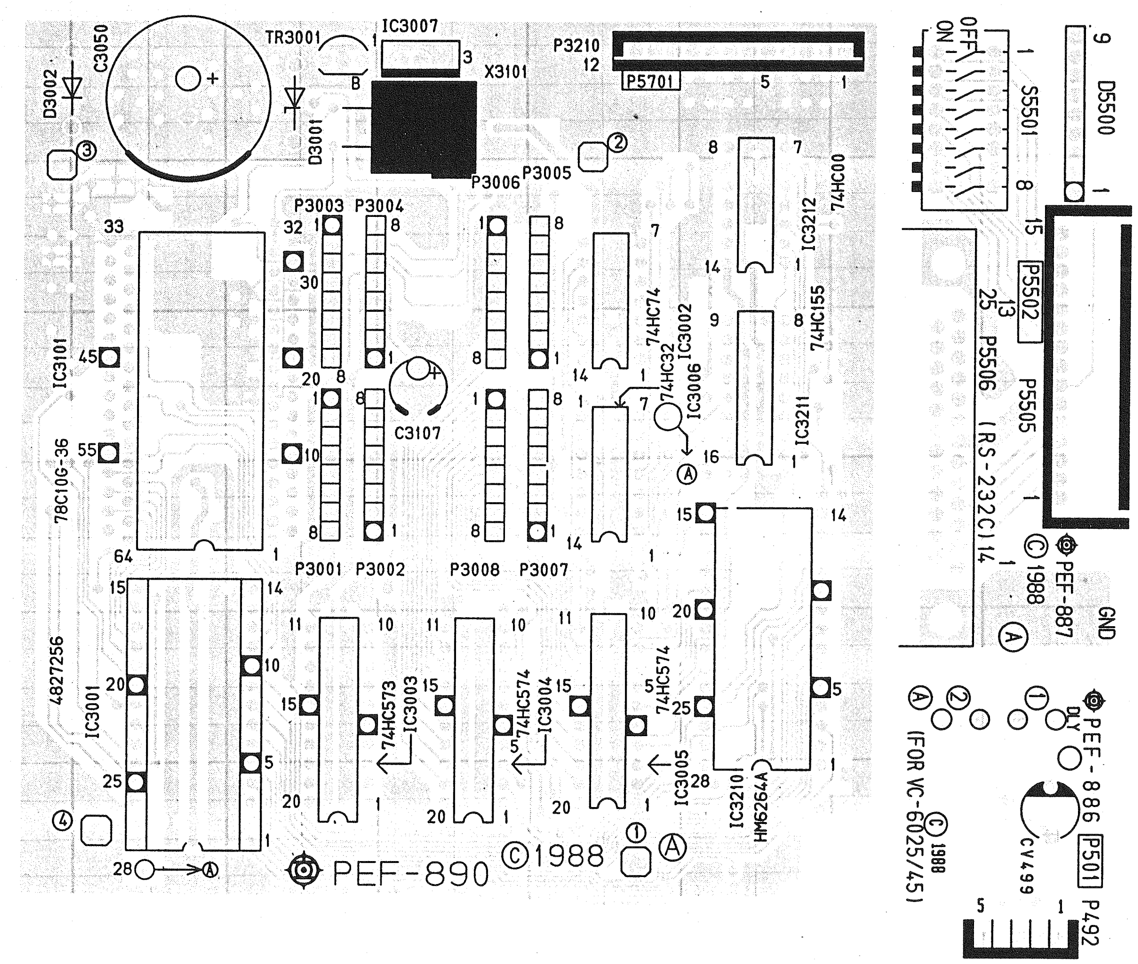
PEF-782, 785, 837(Parts side)



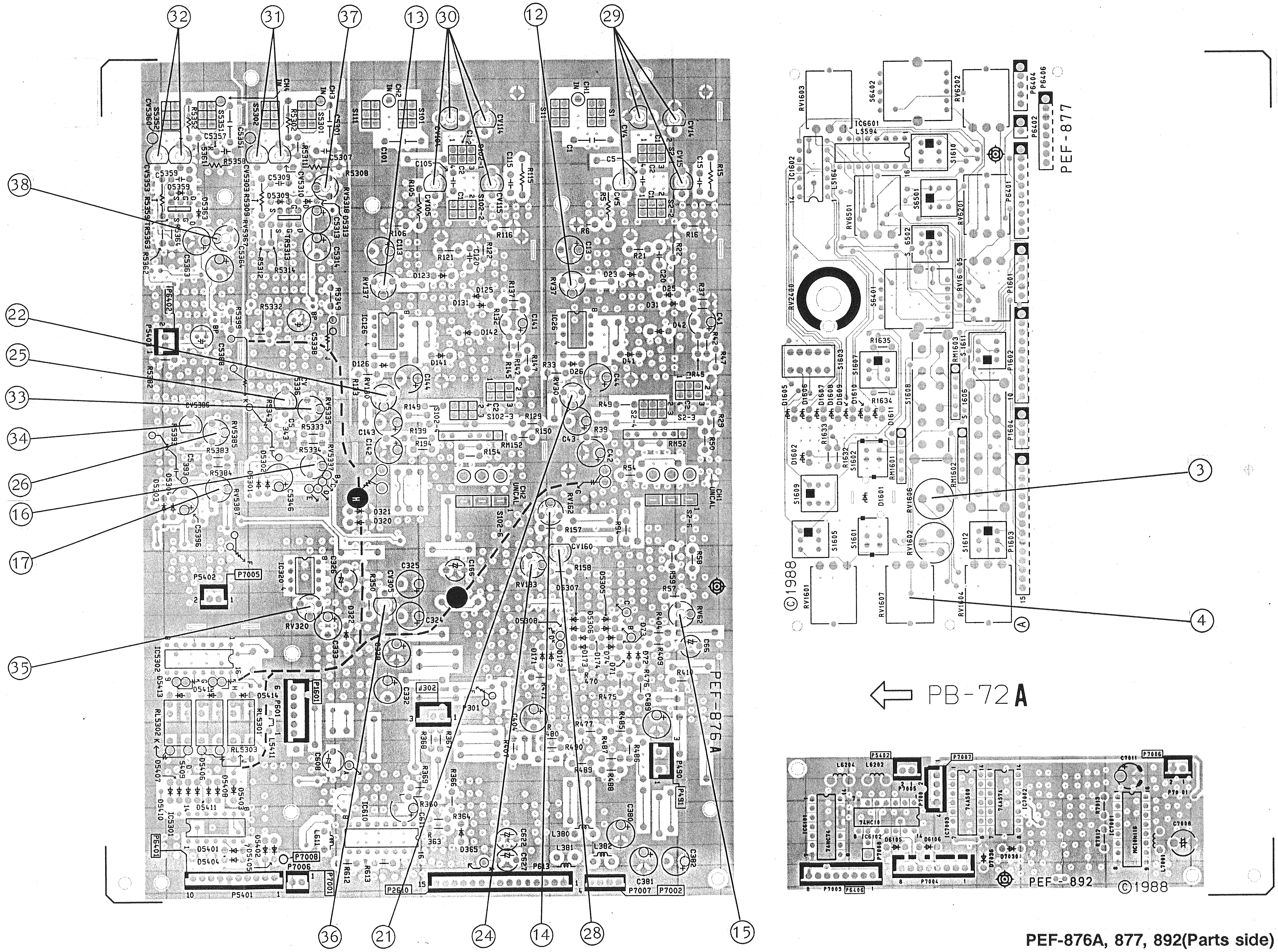
PEF-782(Soldering side)



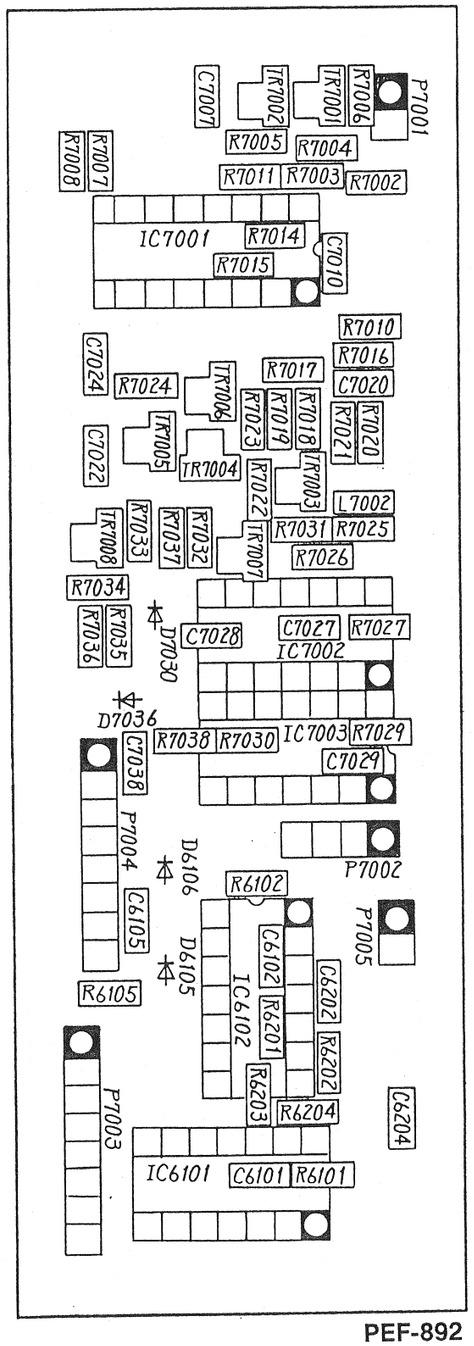
PEF-886, 887, 890(Soldering side)



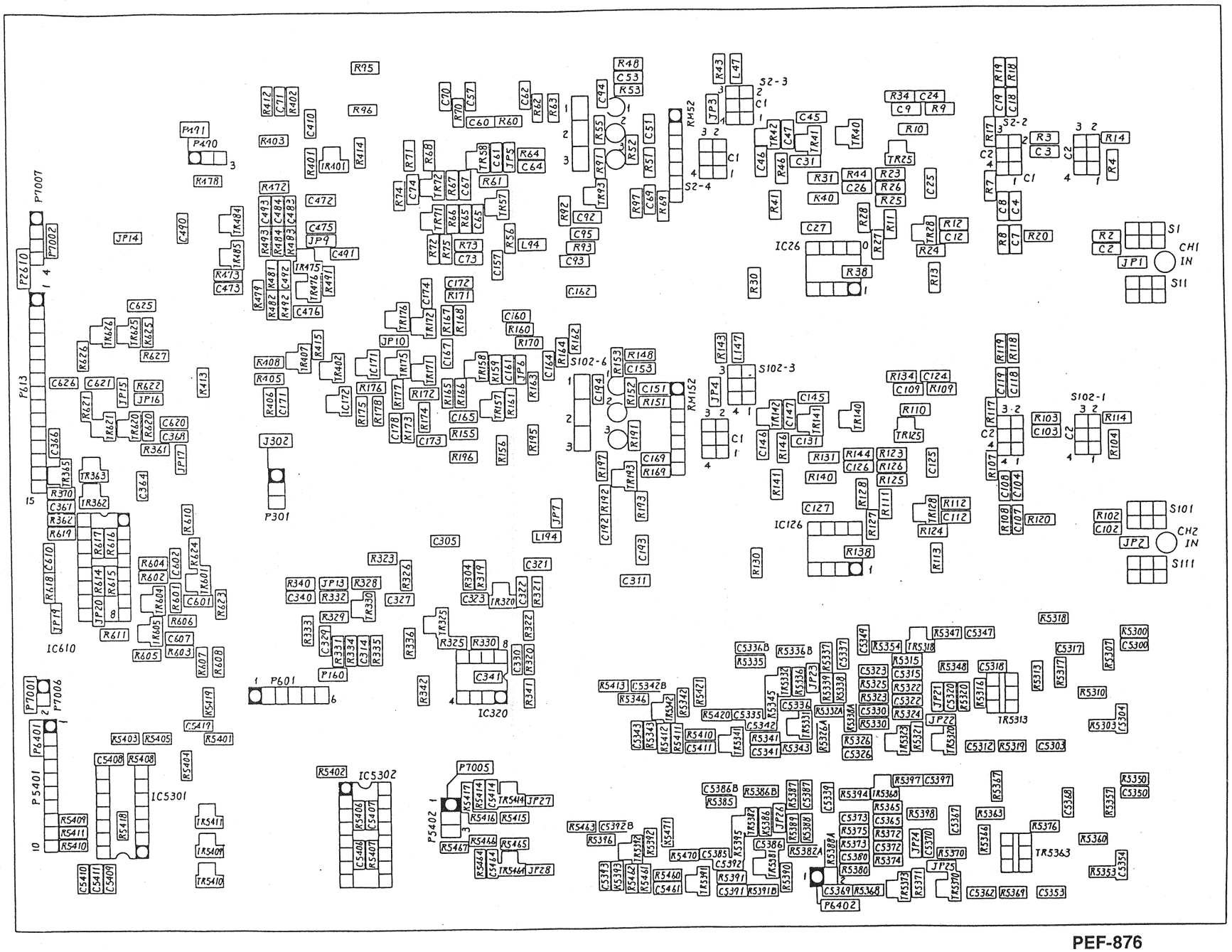
PEF-886, 887, 890(Parts side)



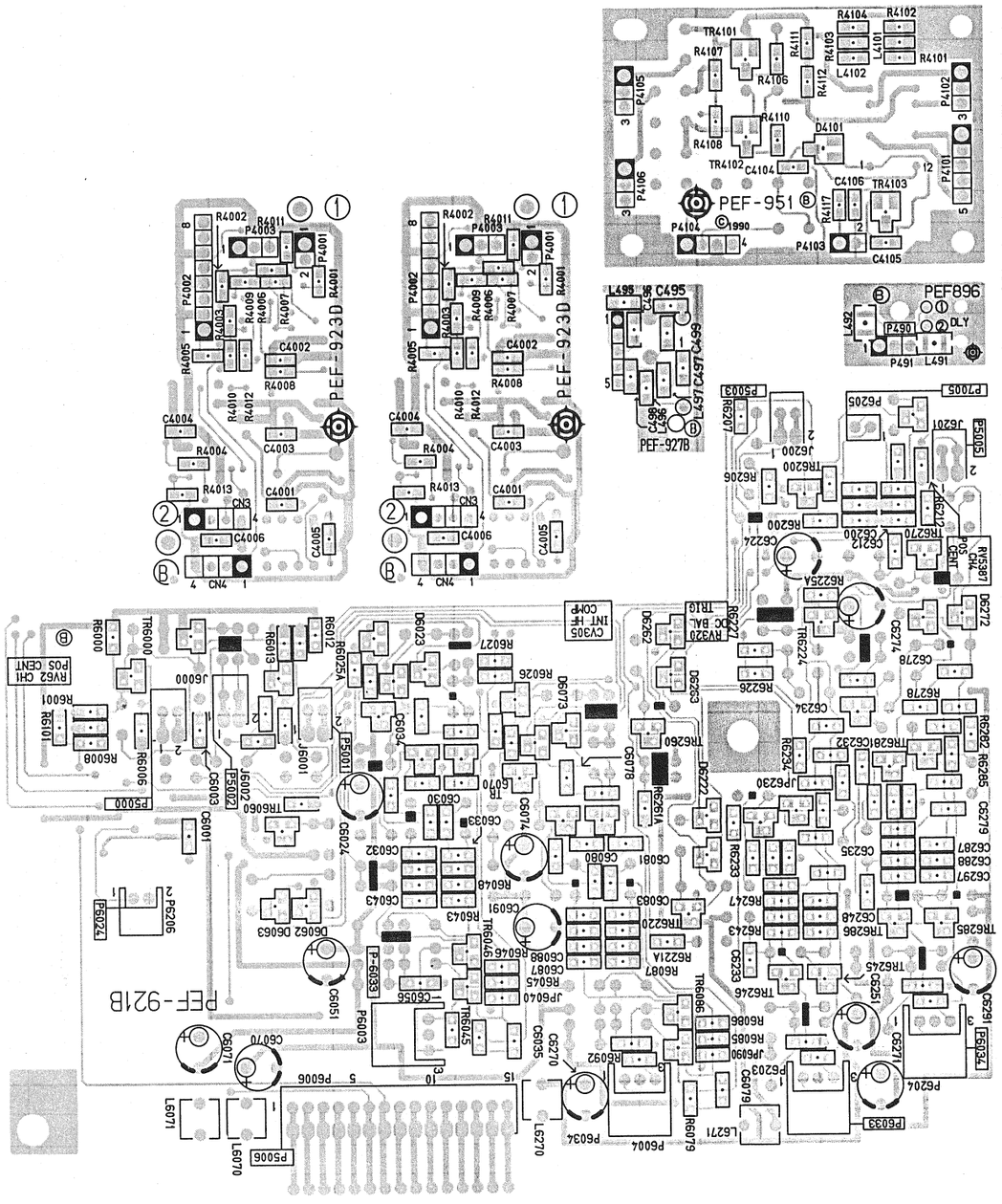
PEF-876A, 877, 892(Parts side)



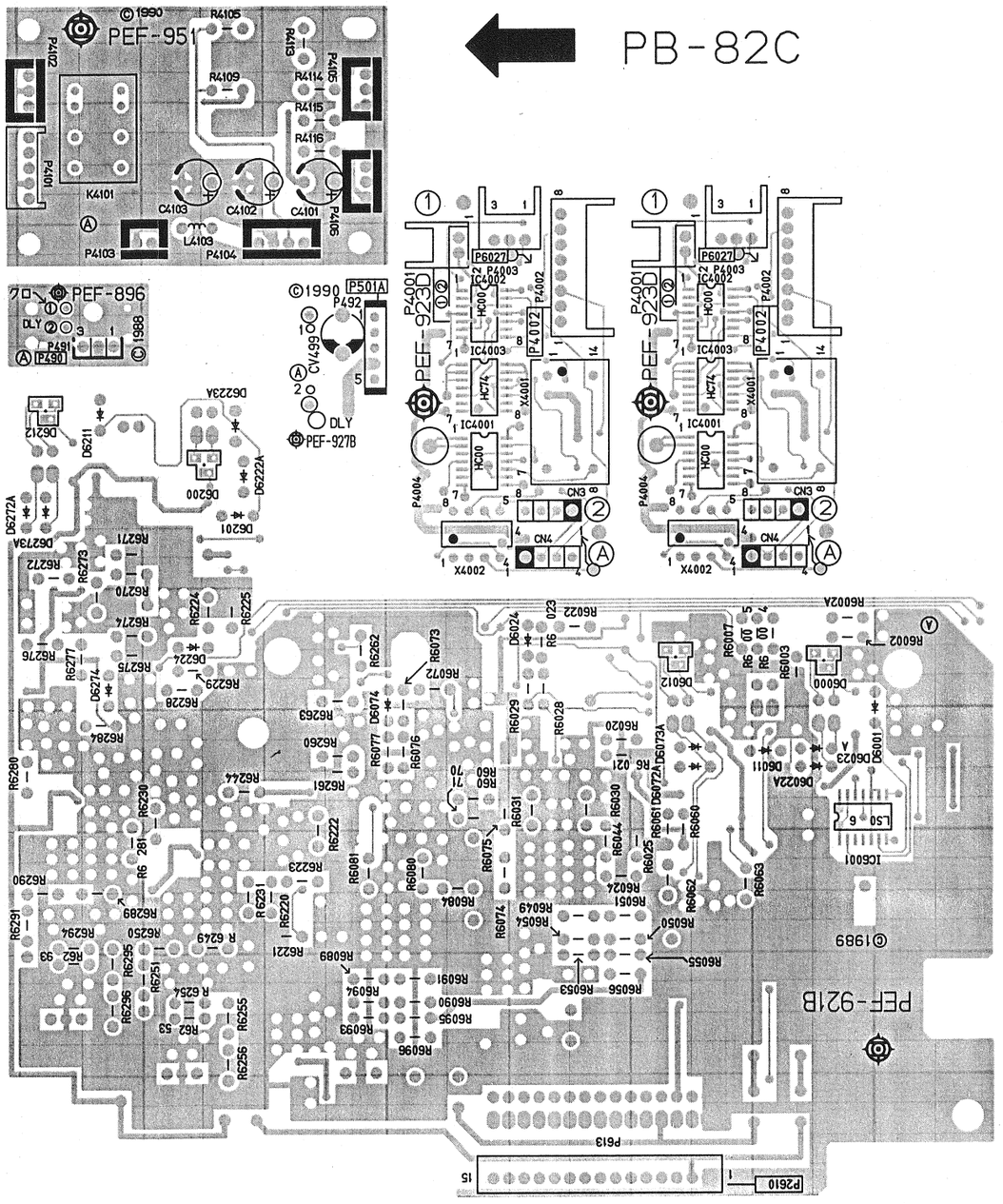
PEF-892



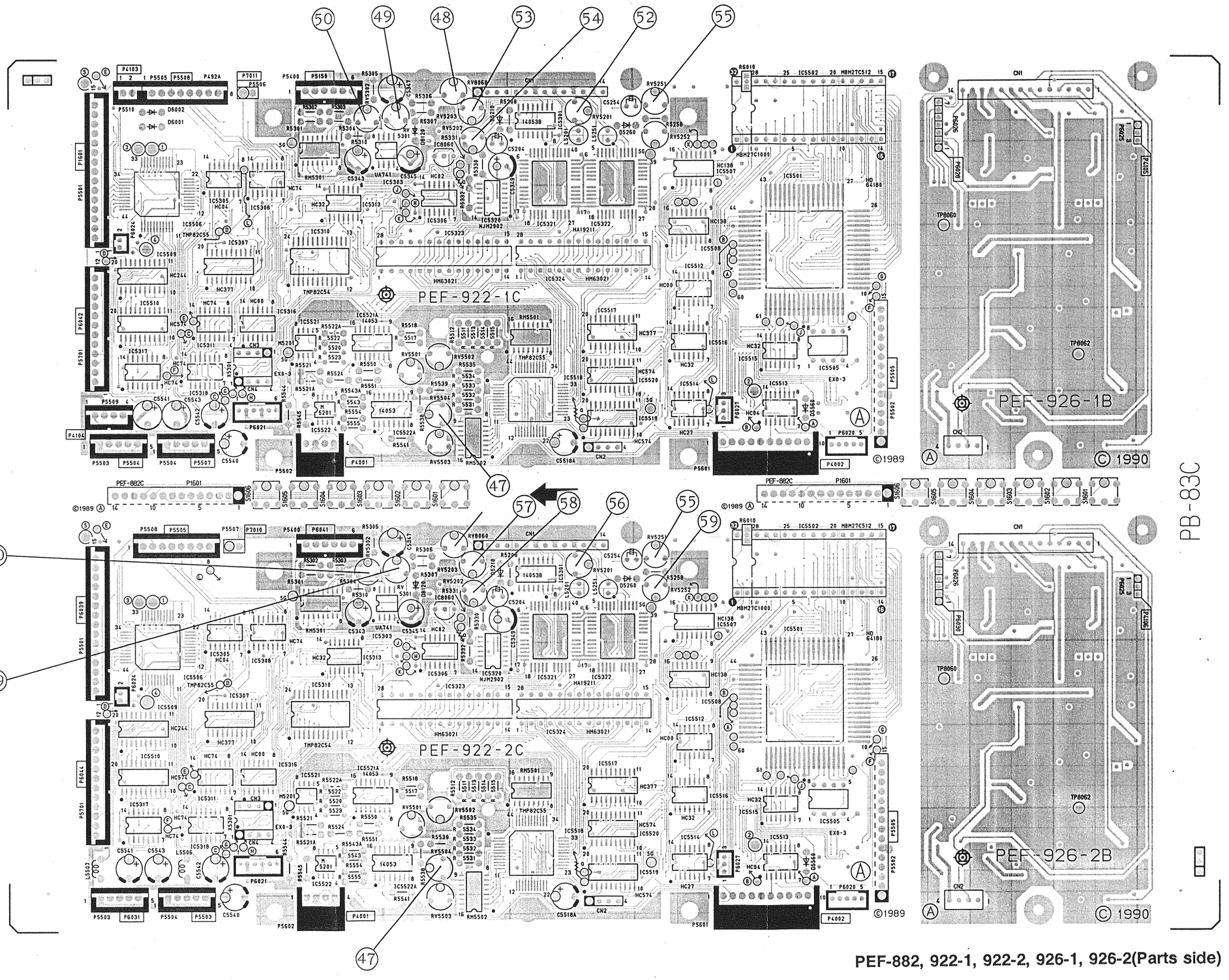
PEF-876



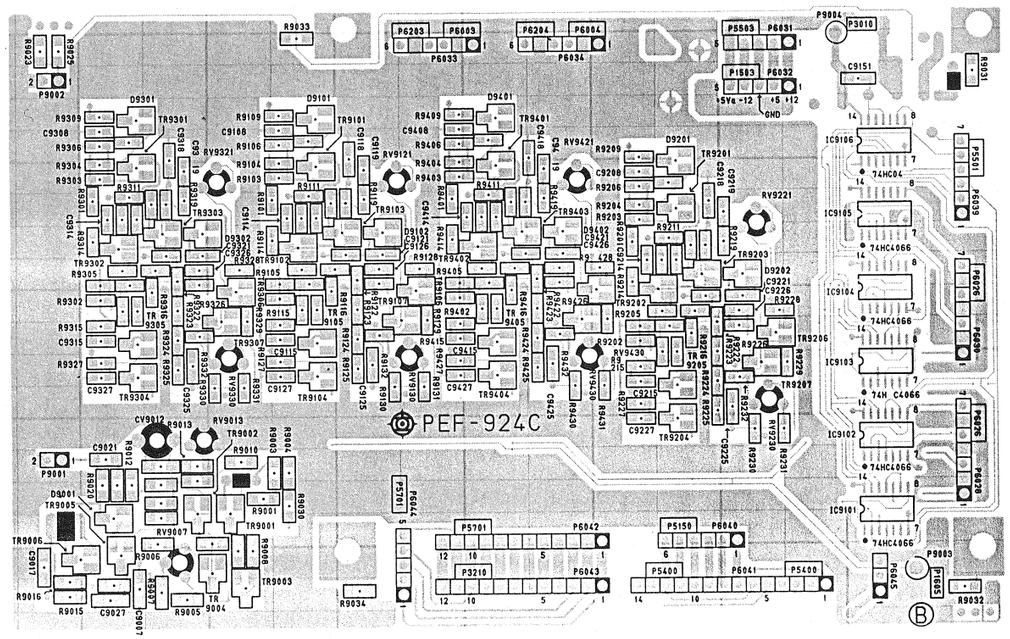
PEF-896, 921, 923, 927, 951(Soldering side)



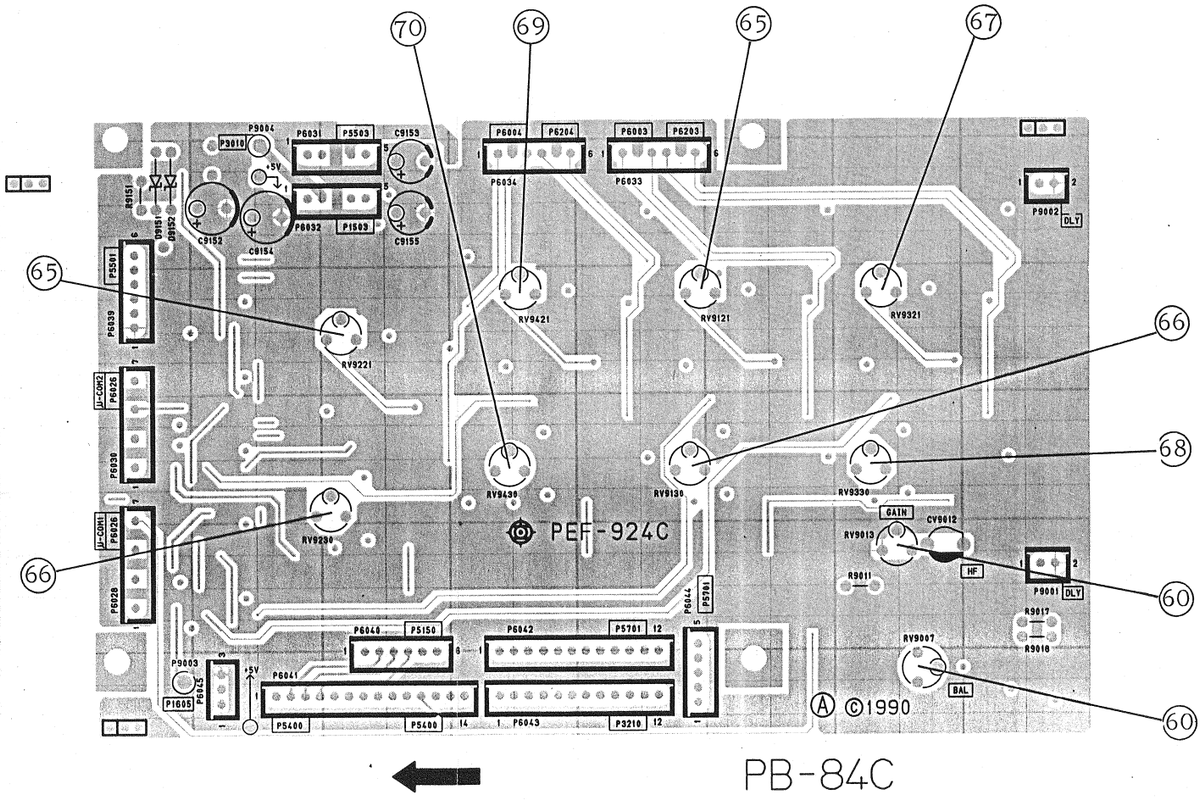
PEF-896, 921, 923, 927, 951(Parts side)



PEF-882, 922-1, 922-2, 926-1, 926-2(Parts side)

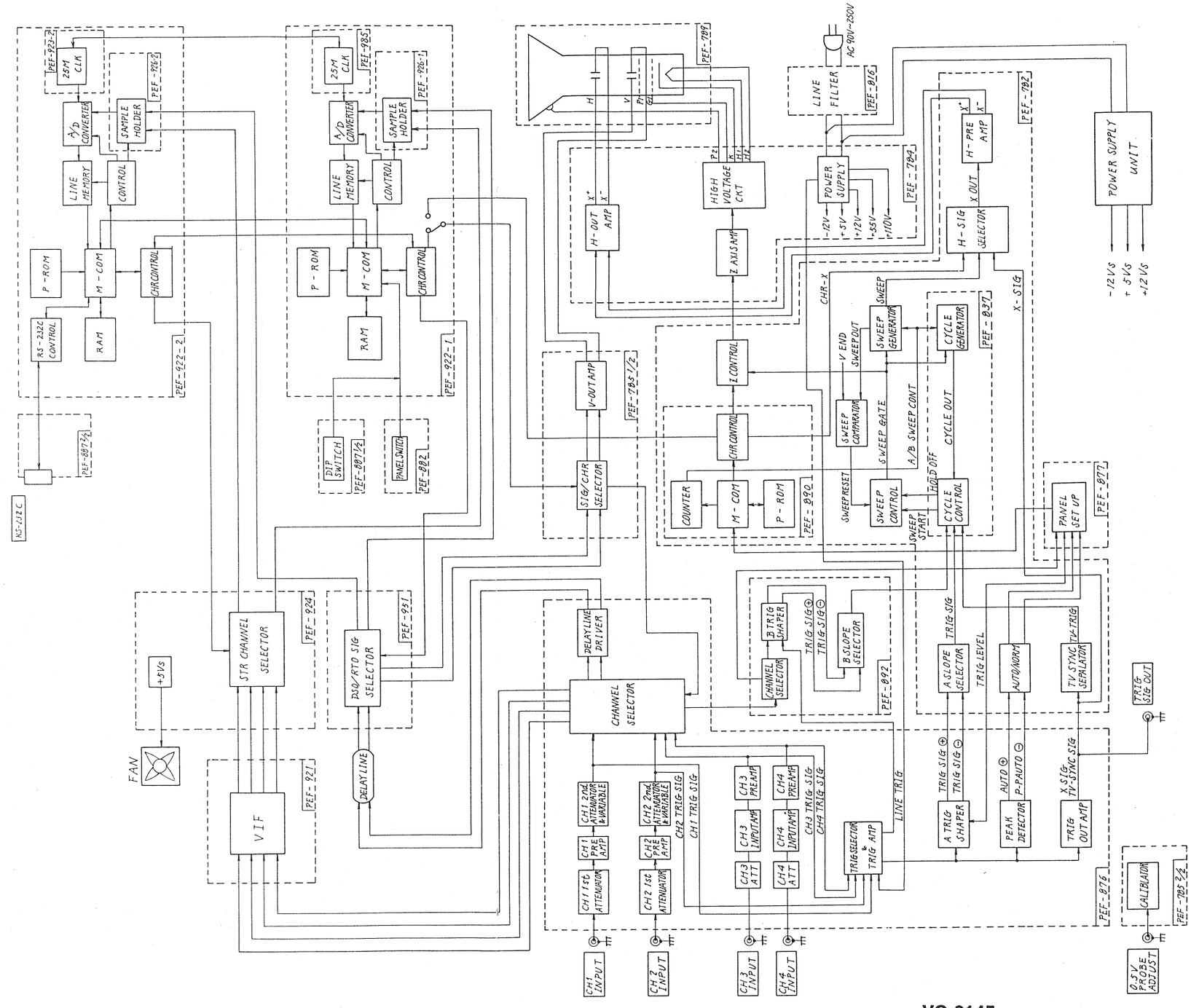


PEF-924(Soldering side)



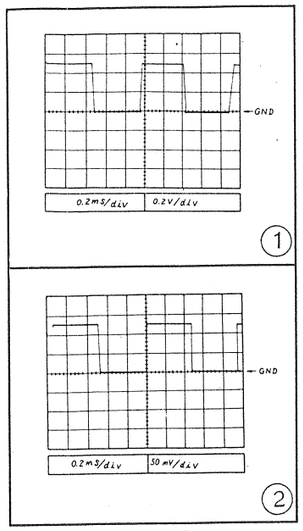
PEF-924(Parts side)

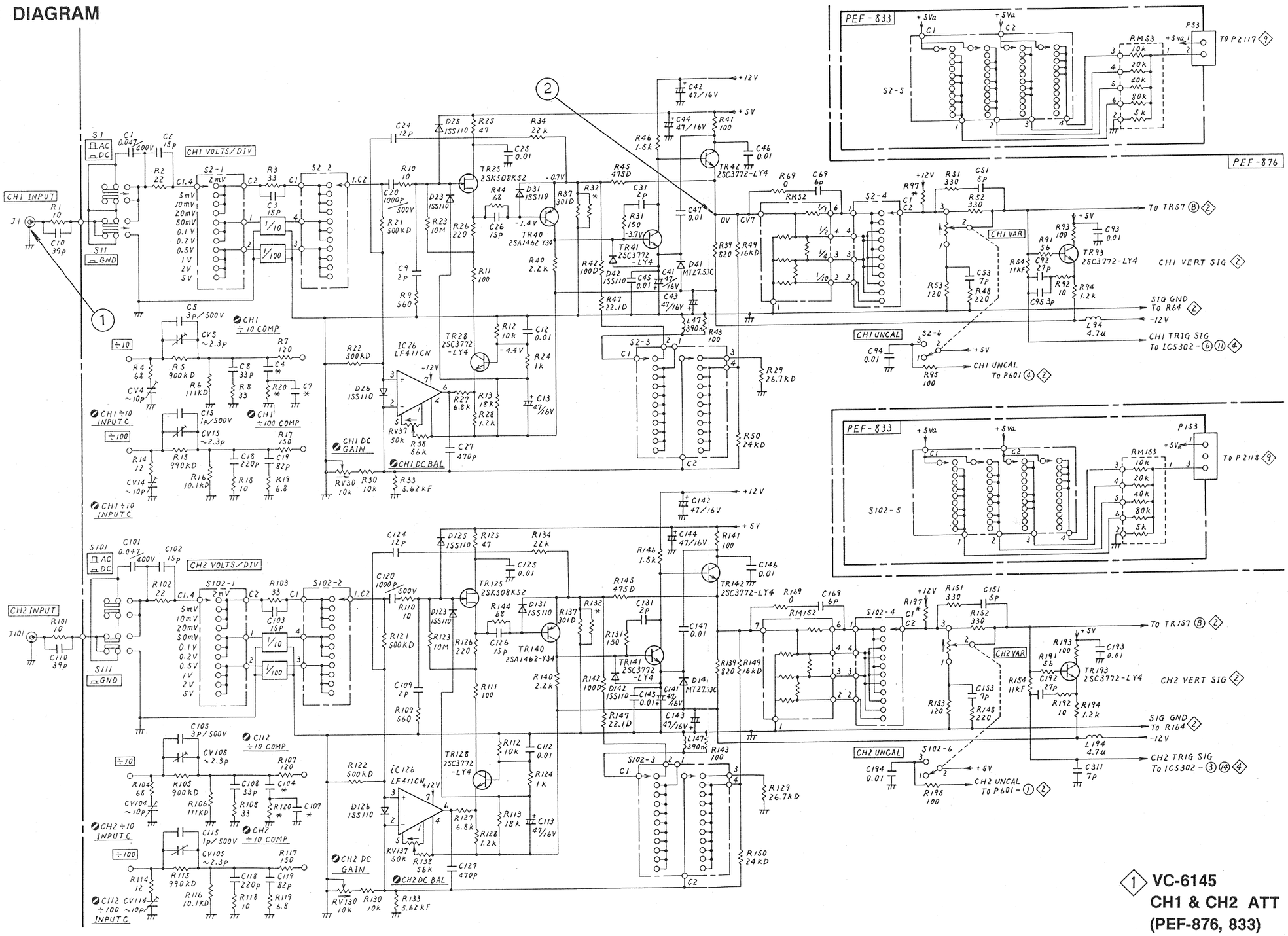
9. GENERAL BLOCK DIAGRAM



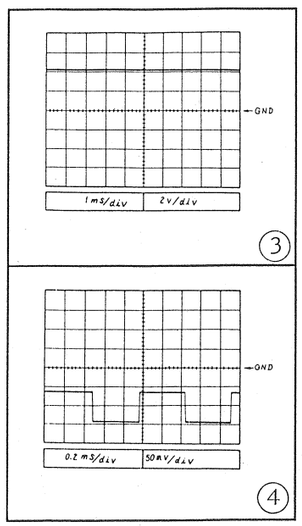
VC-6145
GENERAL BLOCK DIAGRAM

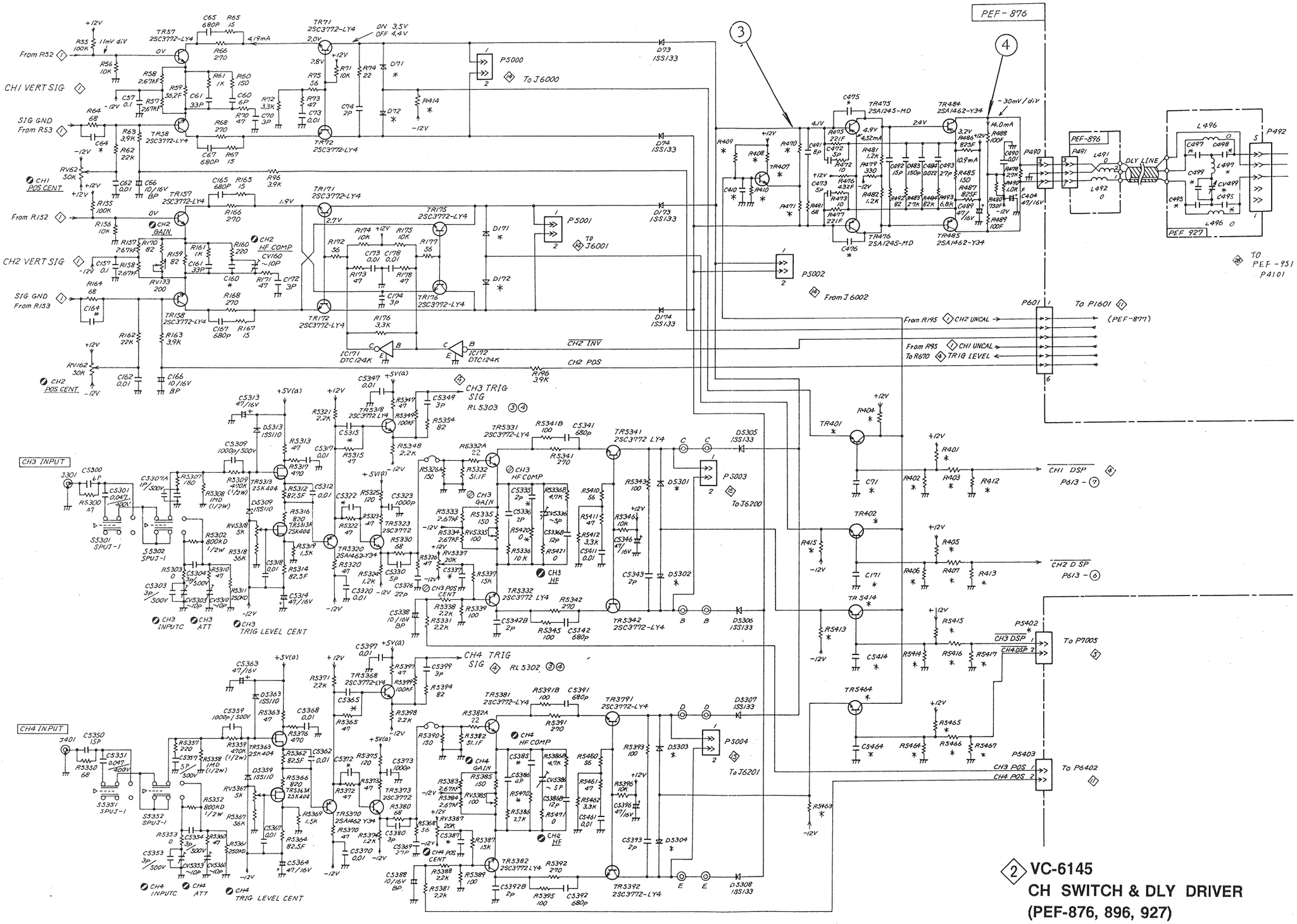
10. SCHEMATIC DIAGRAM



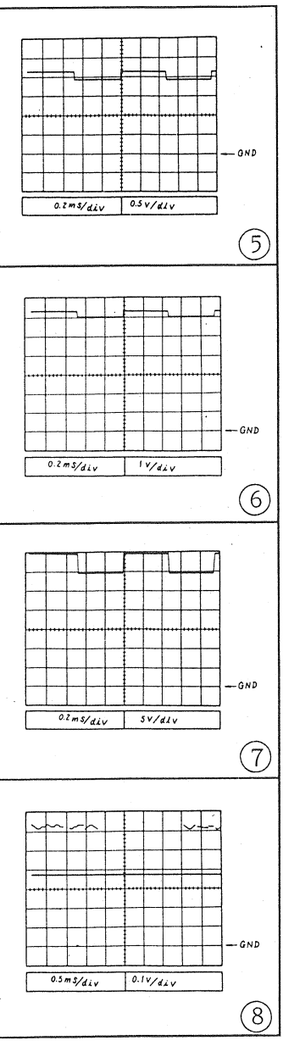


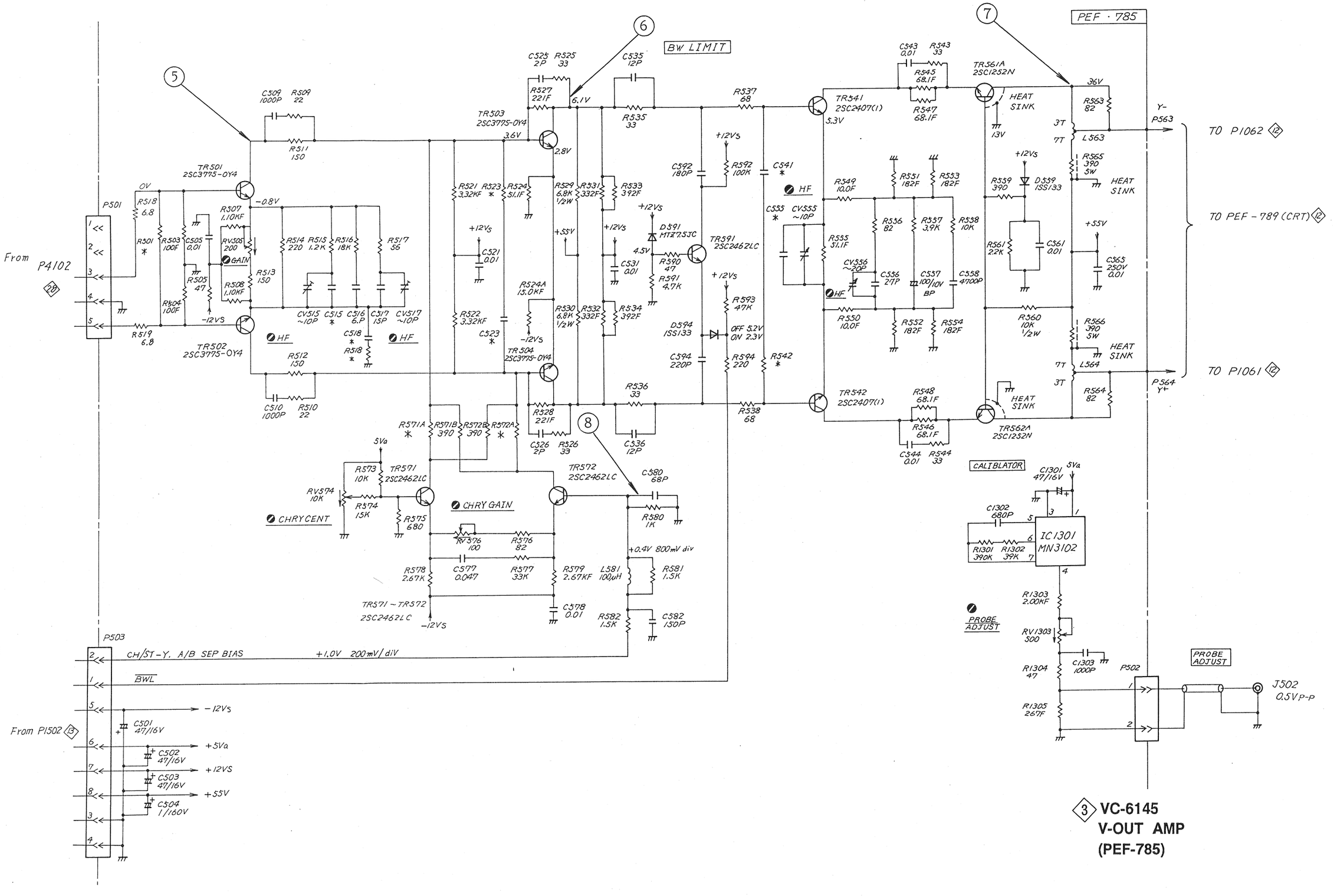
1 VC-6145
CH1 & CH2 ATT
(PEF-876, 833)



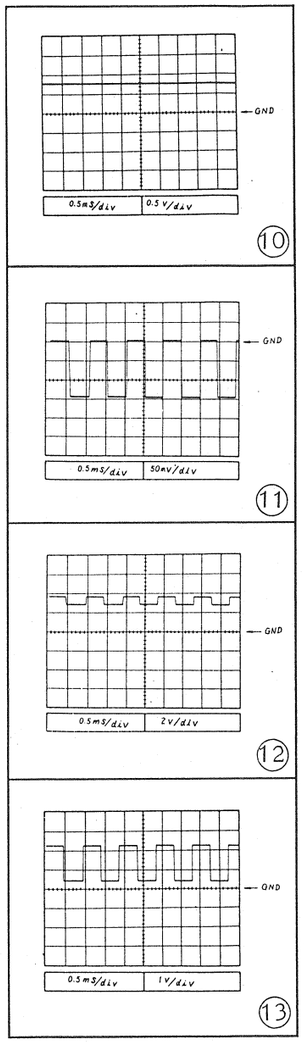


2 VC-6145
CH SWITCH & DLY DRIVER
(PEF-876, 896, 927)

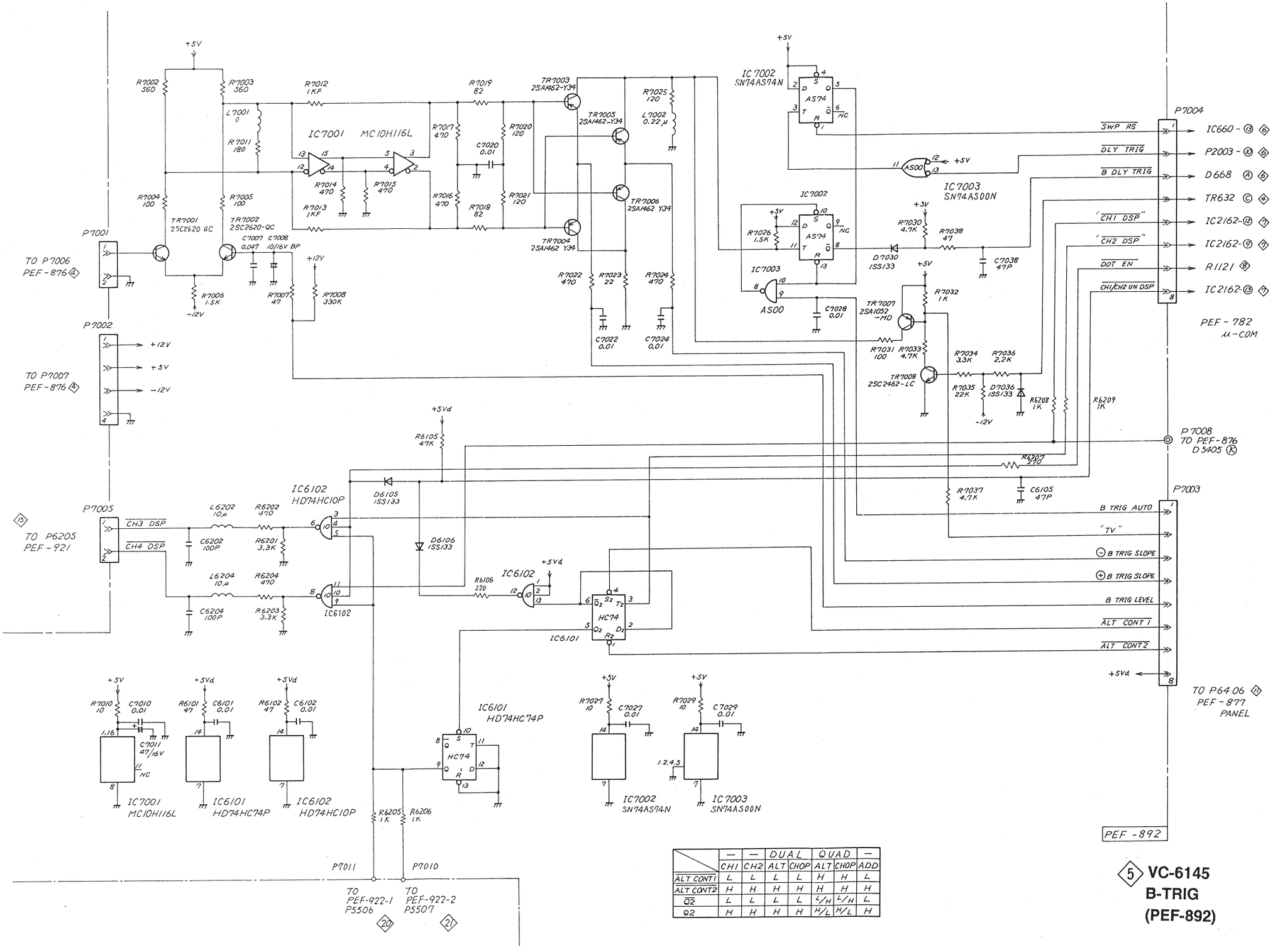




◇3 VC-6145
V-OUT AMP
(PEF-785)

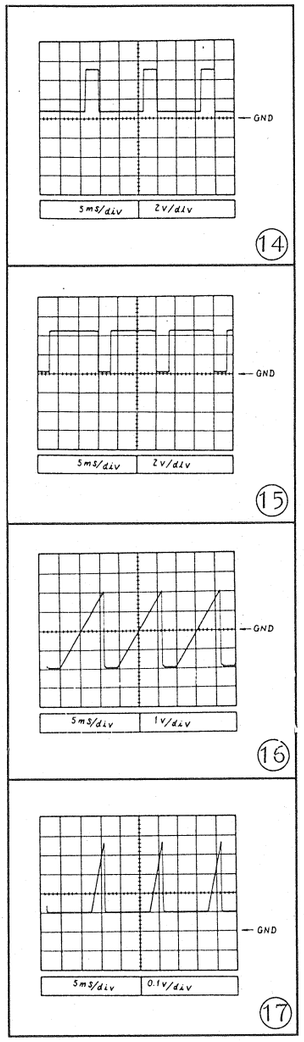


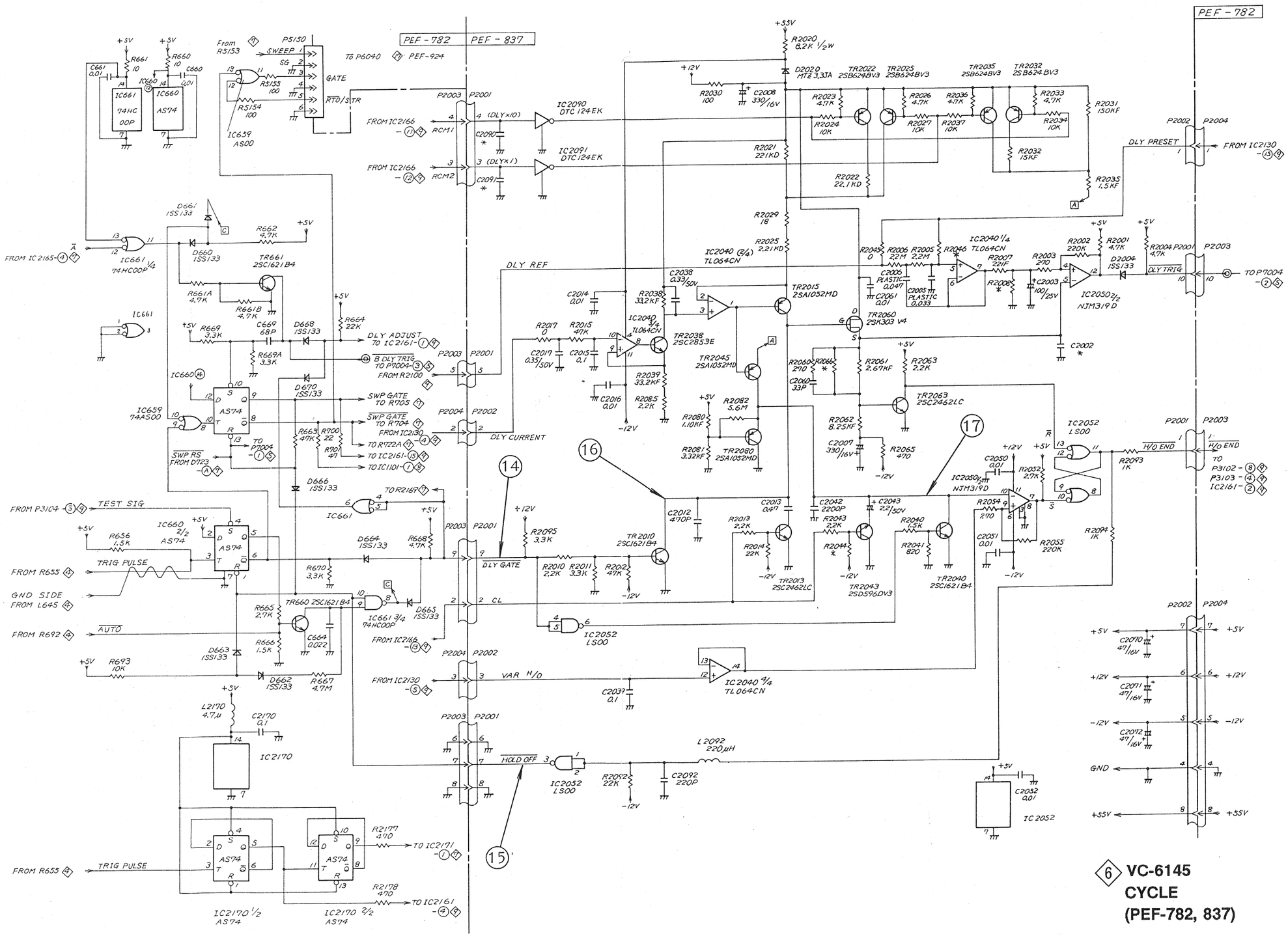
4 VC-6145
TRIG AMP & TRIG GEN
(PEF-876, 782)



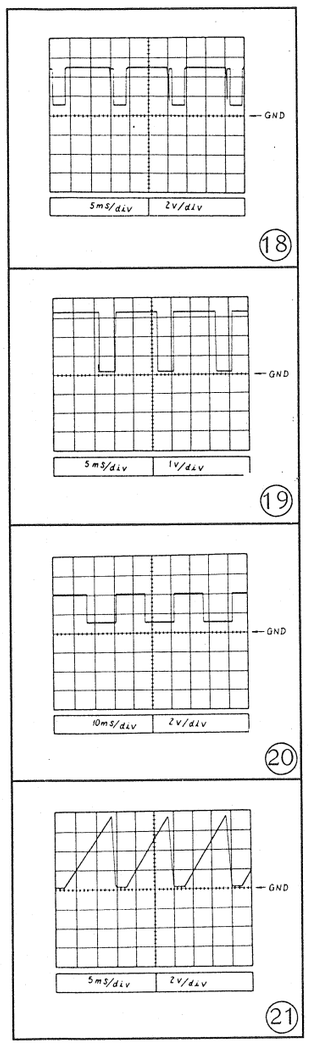
	—	—	DUAL		QUAD		—
	CH1	CH2	ALT	CHOP	ALT	CHOP	ADD
ALT CONT1	L	L	L	L	H	H	L
ALT CONT2	H	H	H	H	H	H	H
Q2	L	L	L	L	L/H	L/H	L
Q2	H	H	H	H	H/L	H/L	H

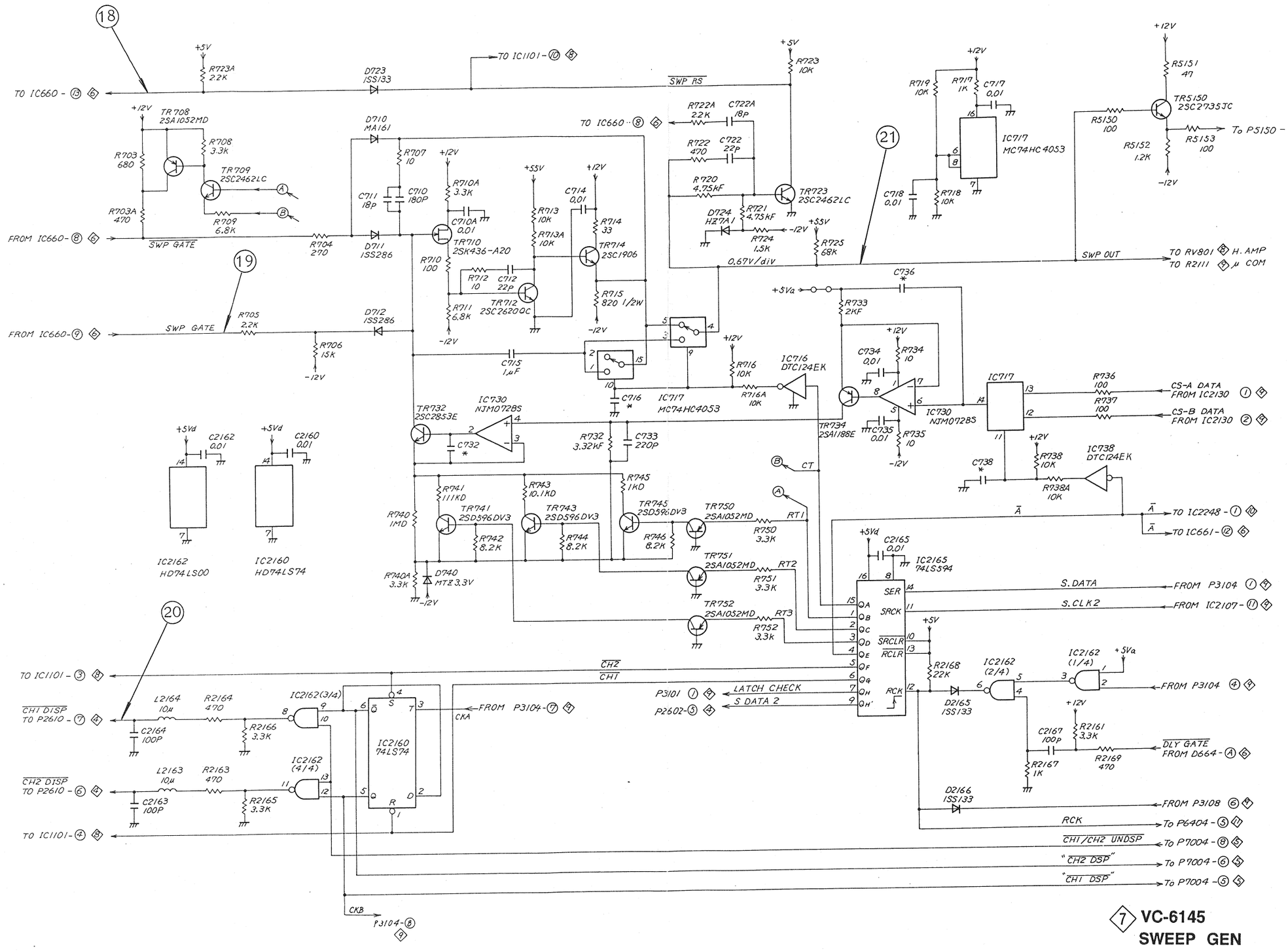
5 VC-6145 B-TRIG (PEF-892)



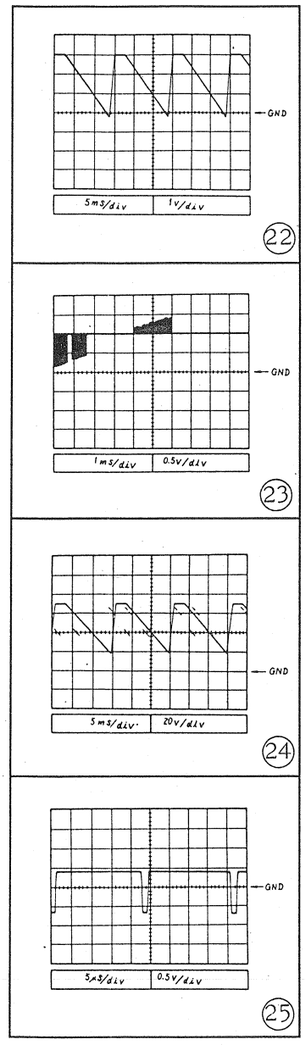


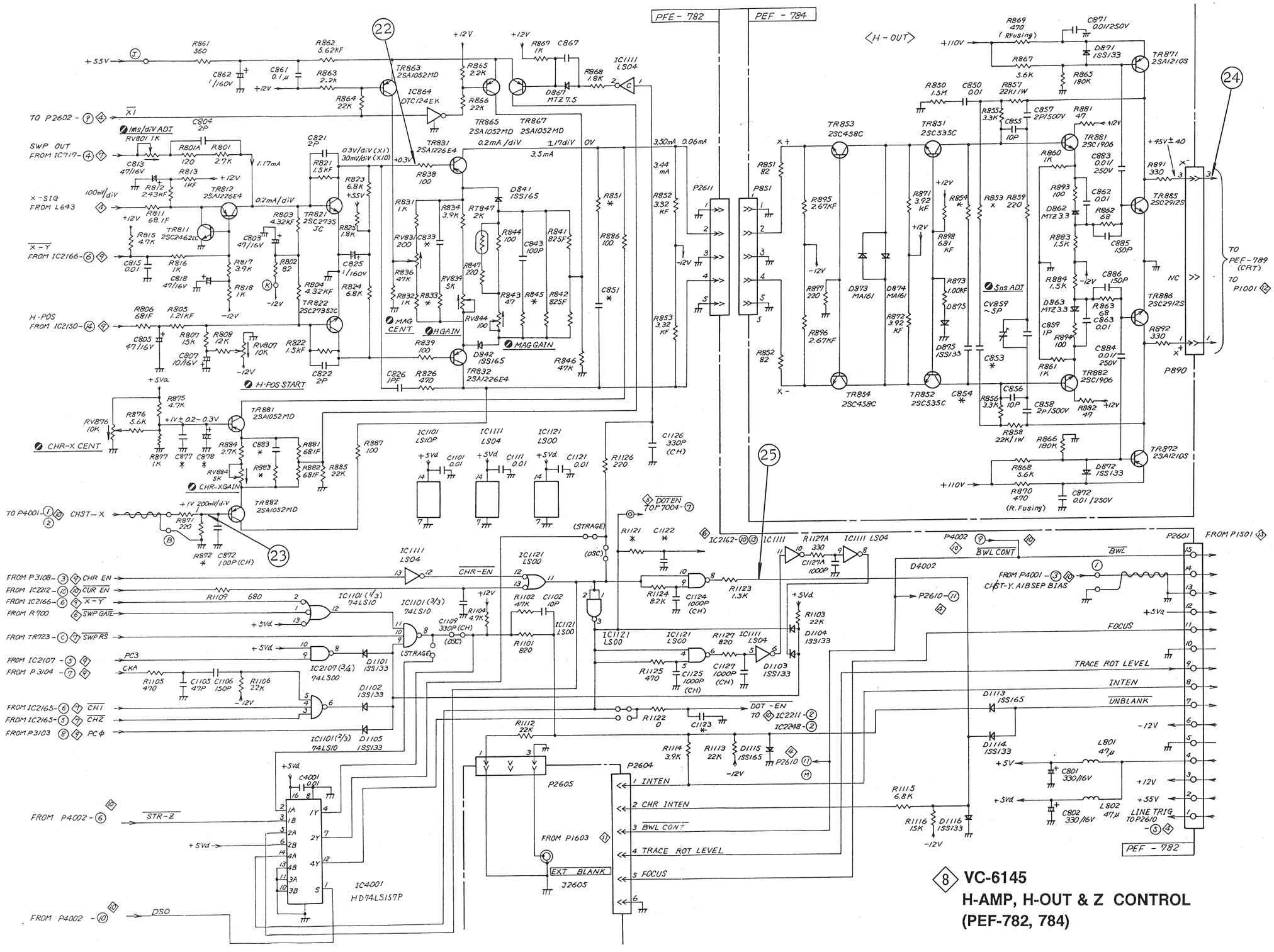
6 VC-6145 CYCLE (PEF-782, 837)



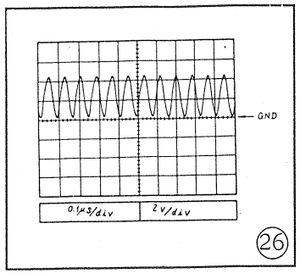


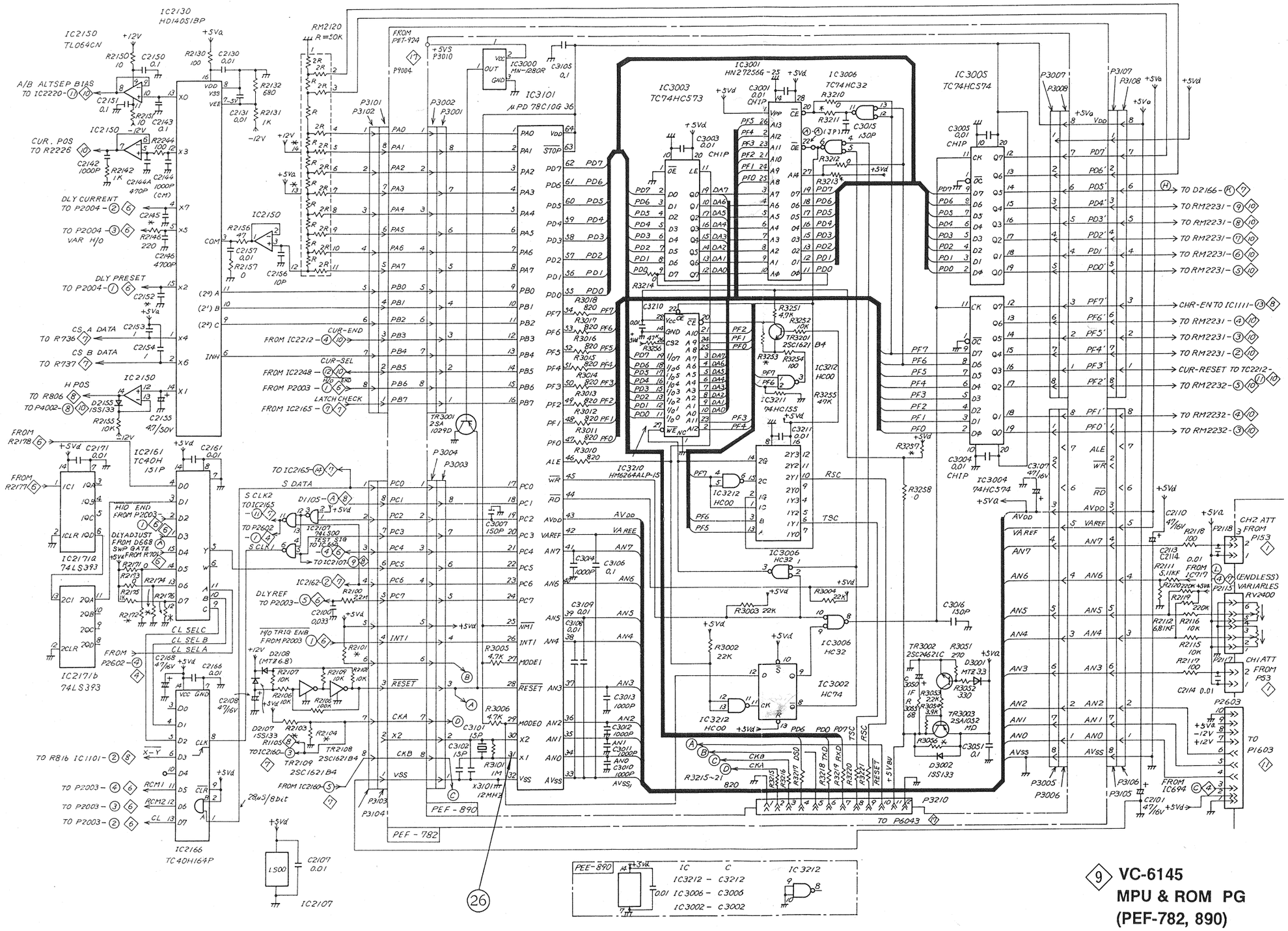
7 VC-6145 SWEEP GEN (PEF-782)





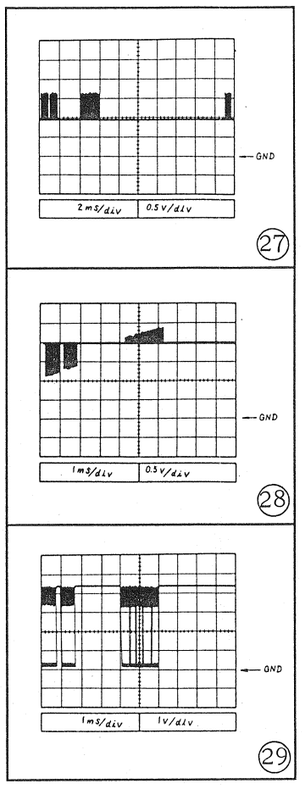
⑧ VC-6145
H-AMP, H-OUT & Z CONTROL
(PEF-782, 784)



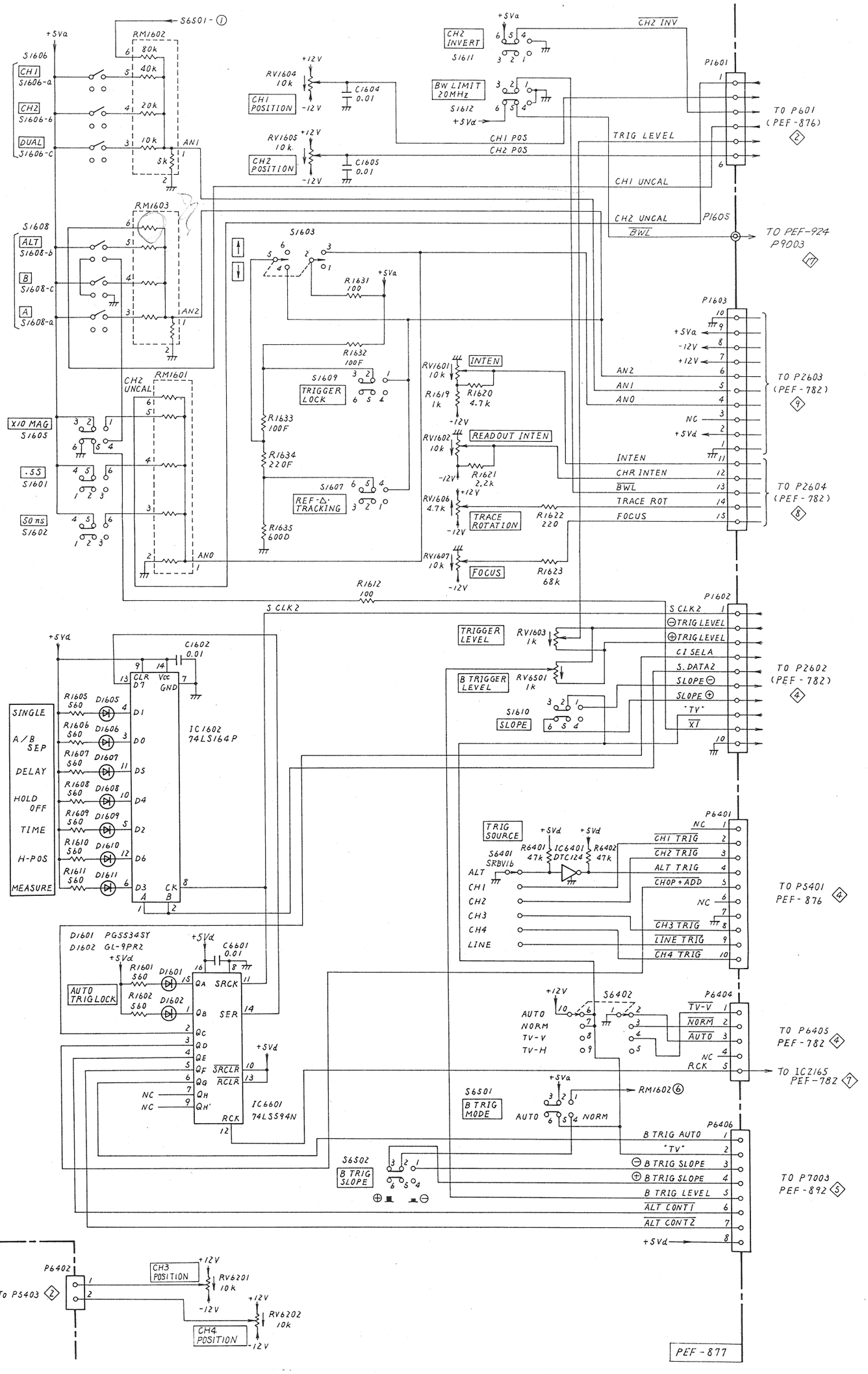


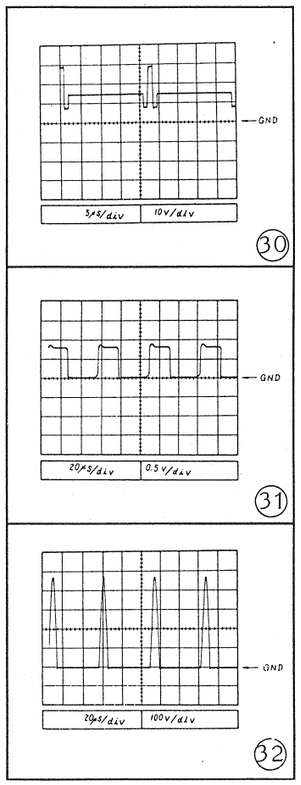
9 VC-6145
MPU & ROM PG
(PEF-782, 890)

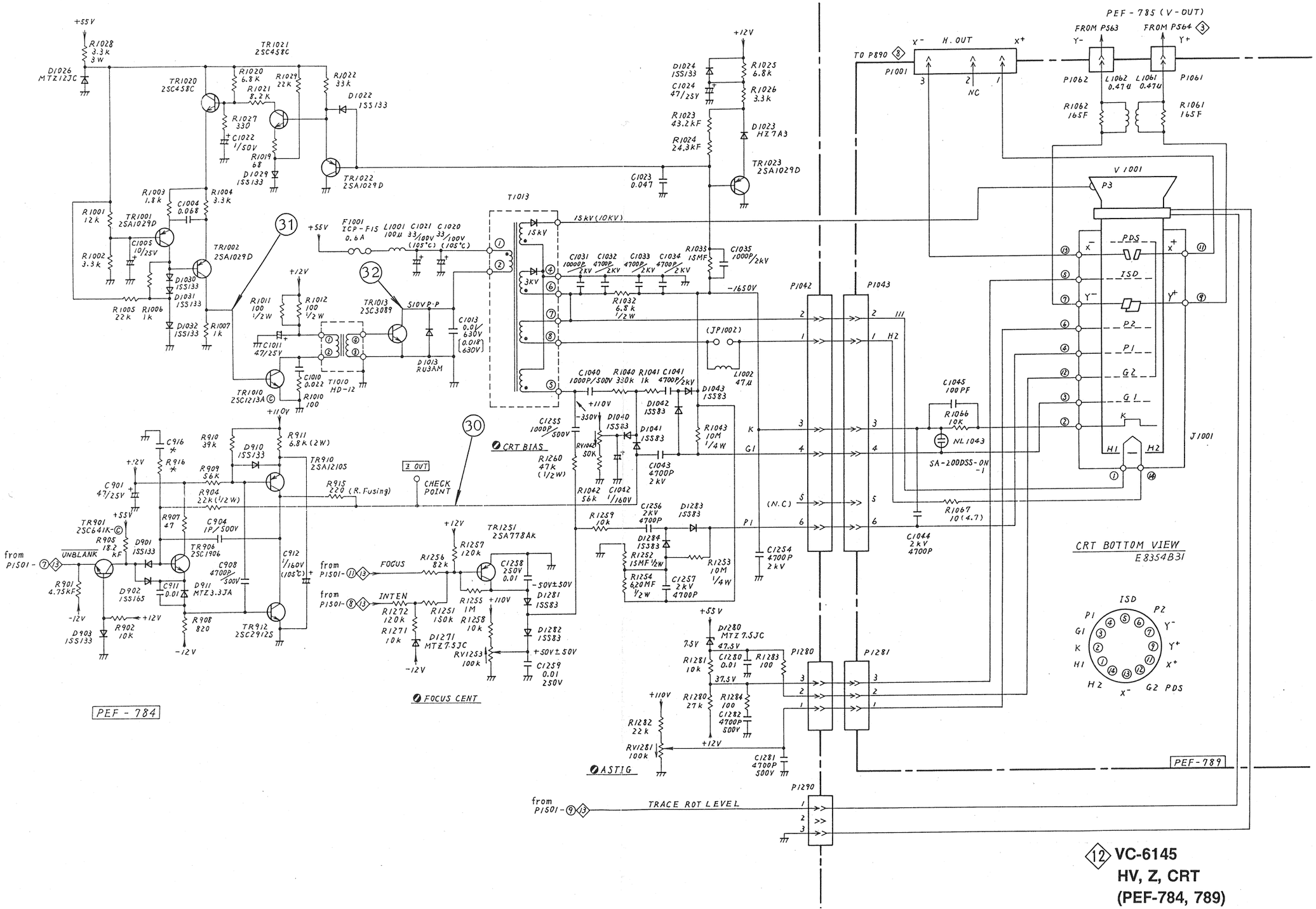
PEF - 782



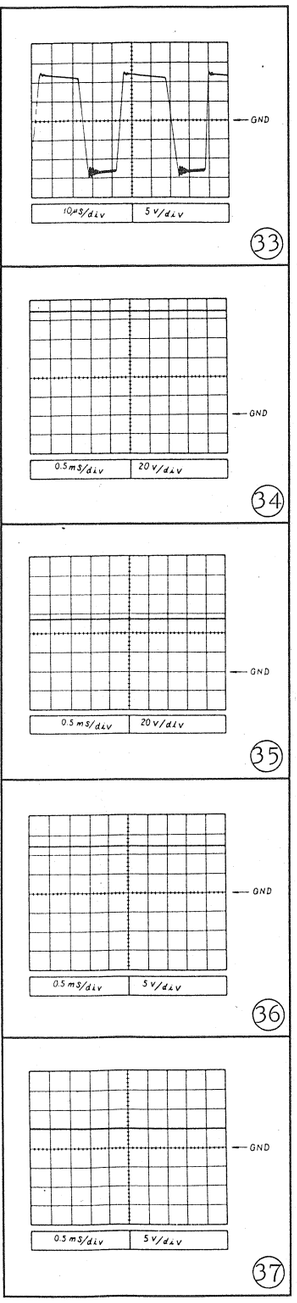
IC2248 TC40H000P
IC2211 TC40H002P
RM2232 R=50K
RM2231 R=50K
CHR PATTERN
IC2230A NJM072BS
IC2220 MC74HC4052N
IC2230 NJM072S
P4002
P4001
To P5601
FROM P5602
CURSOR PATTERN
IC2212 HD14040B
IC2211(1/4) TC40H002P
IC2248(4/4) TC40H000P
IC2248(2/4) TC40H000P
IC2248(1 4) TC40H000P
IC2248(3/4) TC40H000P
IC2211(3/4) TC40H002P
TR2201 2SC3068
IC2201 TL431C
IC2230A NJM072BS

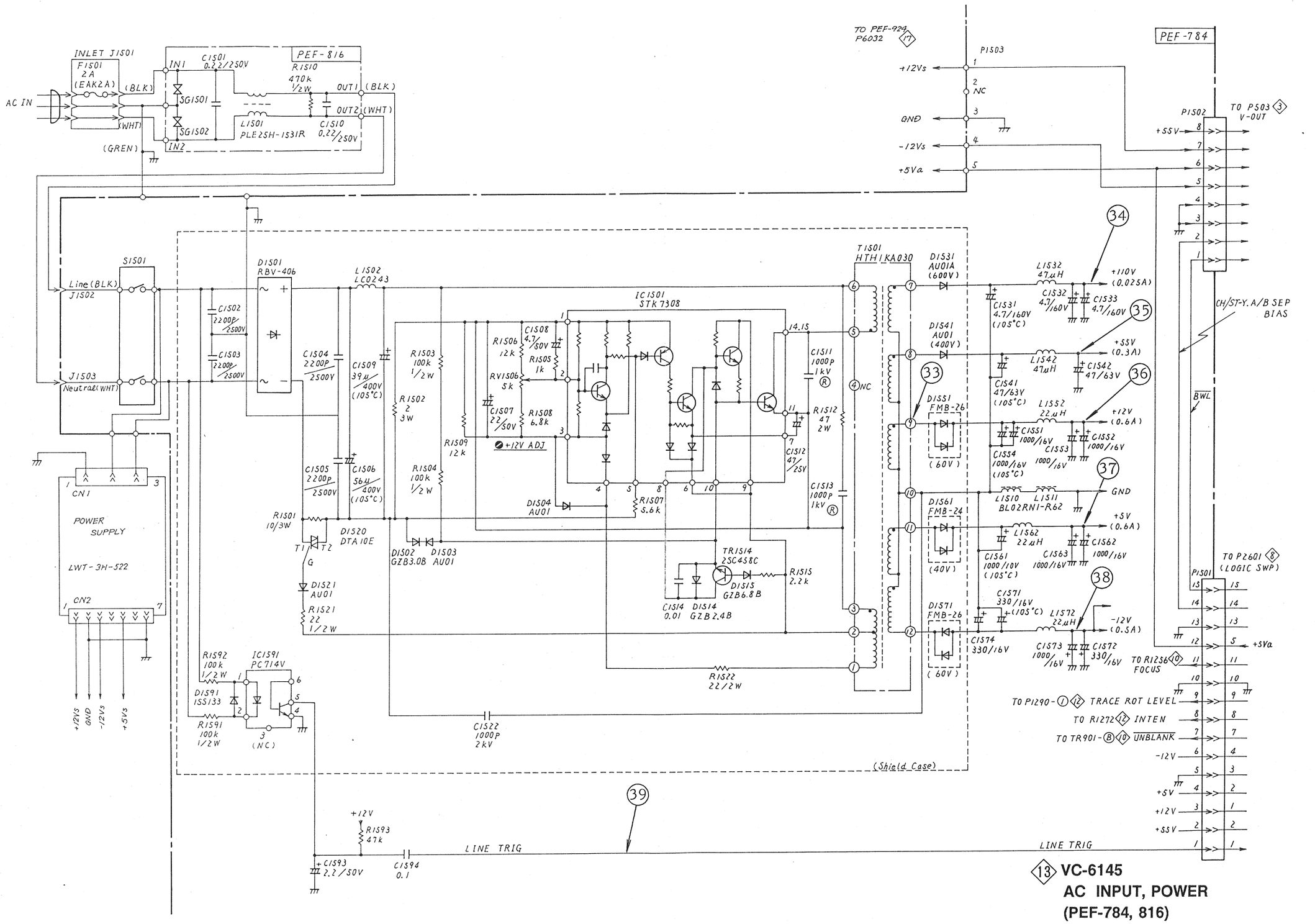

S6501 - (1)
+5Va
RM1602
S1606
CH1 S1606-a
CH2 S1606-b
DUAL S1606-C
80k
40k
20k
10k
5k
AN1
RM1603
S1608
ALT S1608-b
B S1608-c
A S1608-a
AN2
RM1601
CH2 UNCAL
X10 MAG S1605
.5S S1601
50ns S1602
AN0
S1603
R1631 100
R1632 100F
R1633 100F
R1634 220F
R1635 600D
S1609
TRIGGER LOCK
S1607
REF-Δ-TRACKING
RV1604 10k
CH1 POSITION
C1604 0.01
RV1605 10k
CH2 POSITION
C1605 0.01
+12V
-12V
CH2 INVERT S1611
BW LIMIT 20MHz S1612
CH1 POS
CH2 POS
CH2 INV
TRIG LEVEL
CH1 UNCAL
CH2 UNCAL
BWL
P1601
TO P601 (PEF-876) (2)
P1605
TO PEF-924 P9003 (17)
P1603
INTEN
RV1601 10k
R1619 1k
R1620 4.7k
READOUT INTEN
RV1602 10k
R1621 2.2k
TRACE ROTATION
RV1606 4.7k
R1622 220
FOCUS
RV1607 10k
R1623 68k
AN2
AN1
AN0
NC
+5Vd
INTEN
CHR INTEN
BWL
TRACE ROT
FOCUS
TO P2603 (PEF-782) (9)
TO P2604 (PEF-782) (8)
R1612 100
S CLK2
P1602
TRIGGER LEVEL
RV1603 1k
B TRIGGER LEVEL
RV6501 1k
S1610 SLOPE
S CLK2
⊖TRIG LEVEL
⊕TRIG LEVEL
C1 SEL A
S. DATA2
SLOPE ⊖
SLOPE ⊕
"TV"
XT
TO P2602 (PEF-782) (4)
C1602 0.01
IC1602 74LS164P
SINGLE
A/B SEP
DELAY
HOLD OFF
TIME
H-POS
MEASURE
D1605 S D1611 GL-9PR2
P6401
TRIG SOURCE
S6401 SRBV16
R6401 47k
IC6401 DTC124
R6402 47k
ALT
CH1
CH2
CH3
CH4
LINE
NC
CH1 TRIG
CH2 TRIG
ALT TRIG
CHOP+ADD
CH3 TRIG
LINE TRIG
CH4 TRIG
TO P5401 PEF-876 (4)
D1601 PG5534SY
D1602 GL-9PR2
C6601 0.01
AUTO TRIG LOCK
IC6601 74LS594N
S6402
AUTO
NORM
TV-V
TV-H
P6404
TV-V
NORM
AUTO
NC
RCK
TO P6405 PEF-782 (4)
TO IC2165 PEF-782 (7)
S6501 B TRIG MODE
RM1602 (6)
S6502 B TRIG SLOPE
P6406
B TRIG AUTO
"TV"
⊖B TRIG SLOPE
⊕B TRIG SLOPE
B TRIG LEVEL
ALT CONT1
ALT CONT2
TO P7003 PEF-892 (5)
(11) VC-6145 FRONT PANEL (PEF-877)
P6402
To PS403 (2)
CH3 POSITION
RV6201 10k
CH4 POSITION
RV6202 10k
PEF-877



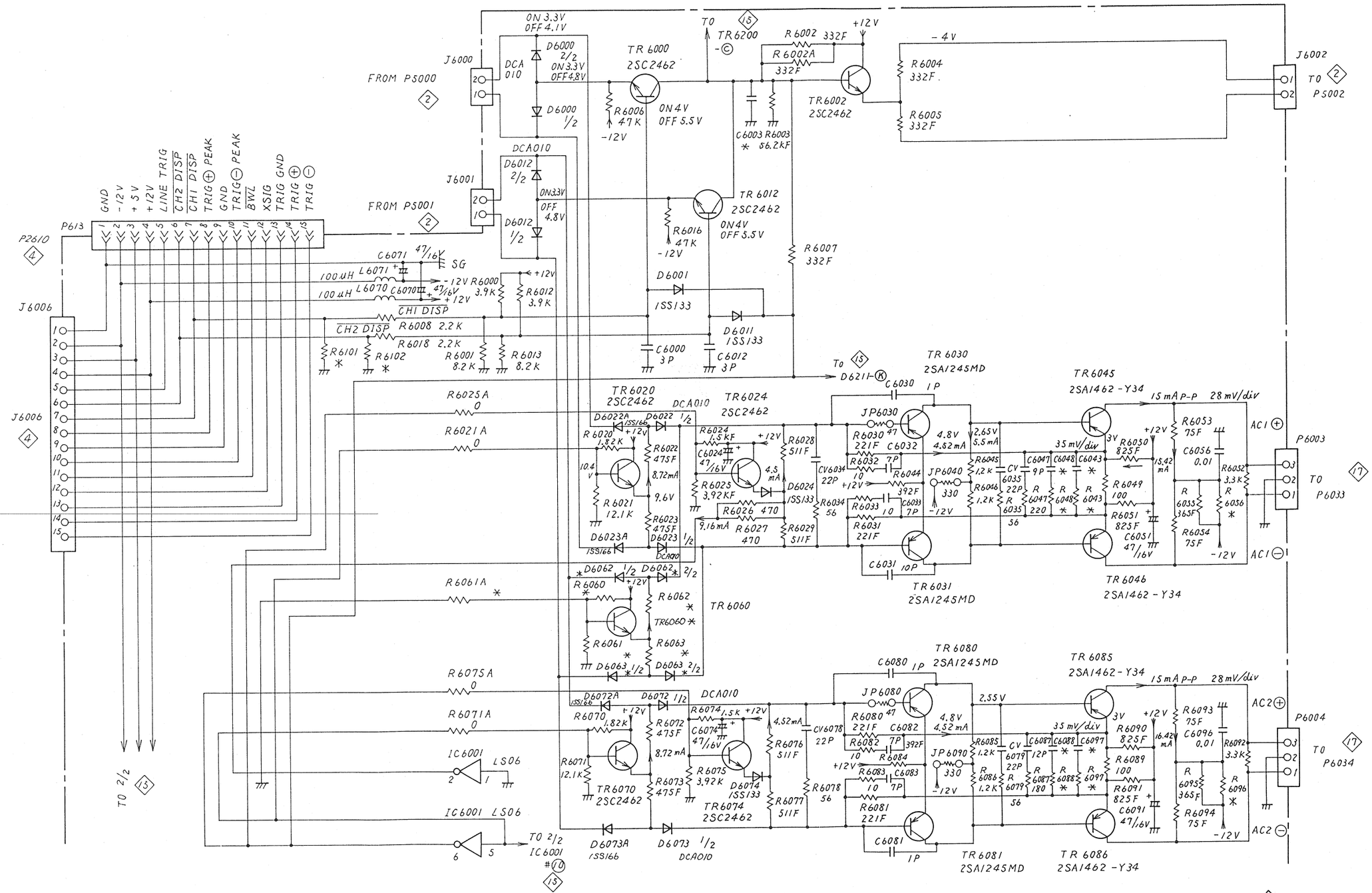


12 VC-6145
HV, Z, CRT
(PEF-784, 789)

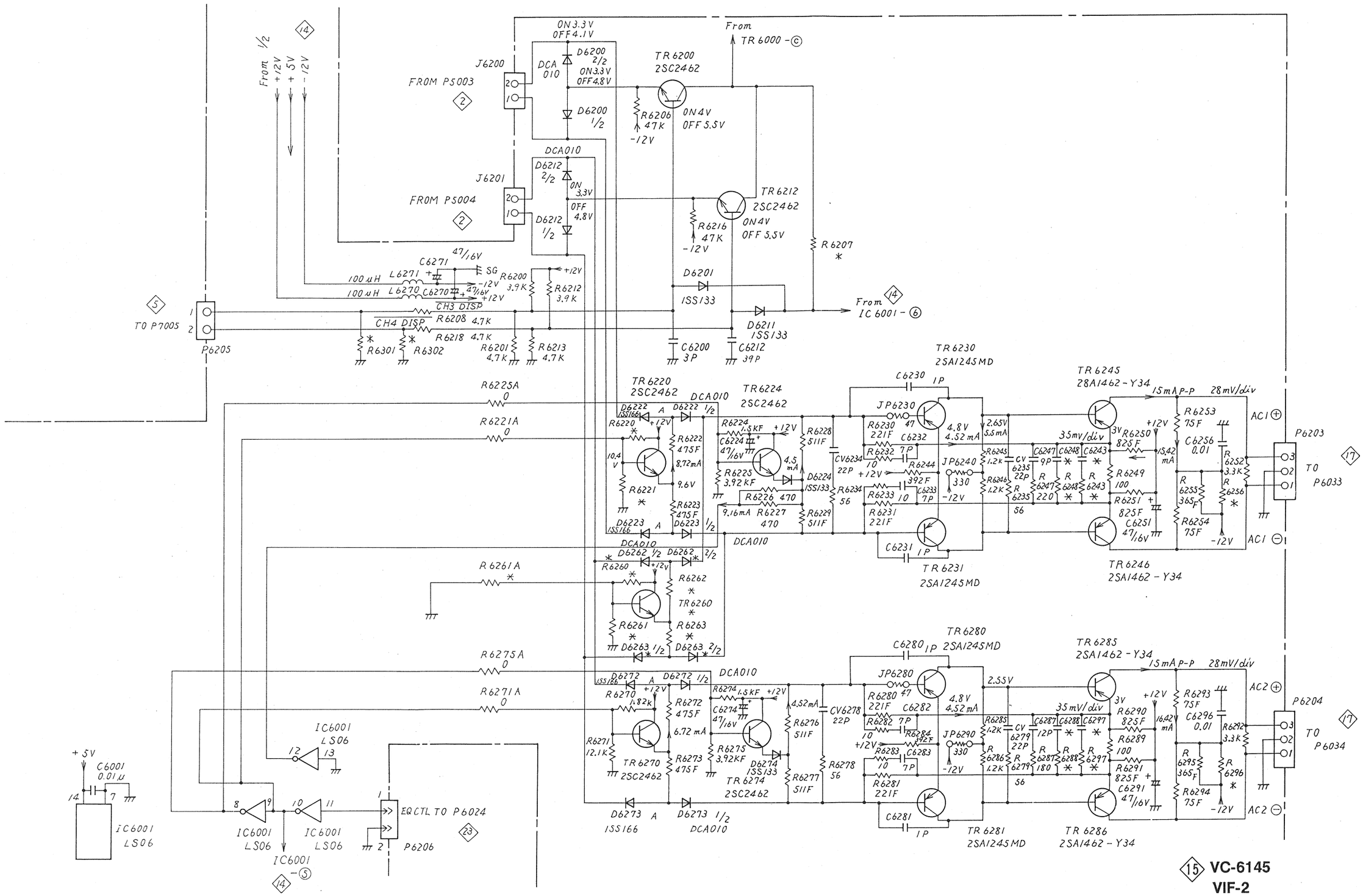




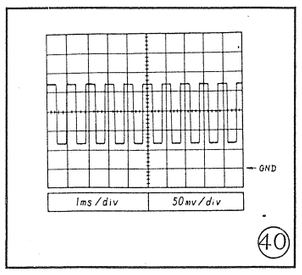
13 VC-6145
AC INPUT, POWER
(PEF-784, 816)

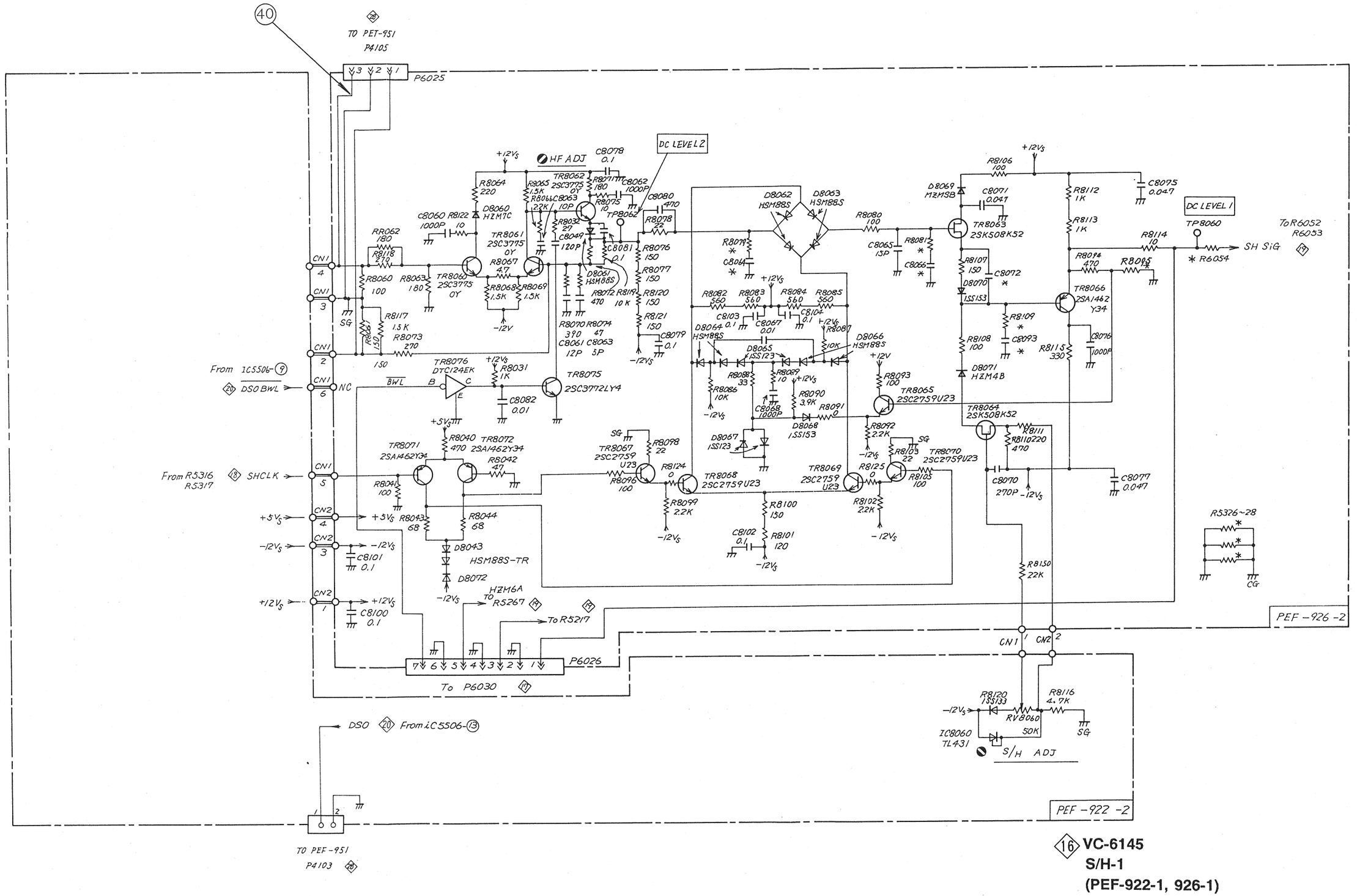


⑭ VC-6145
VIF-1
(PEF-921)

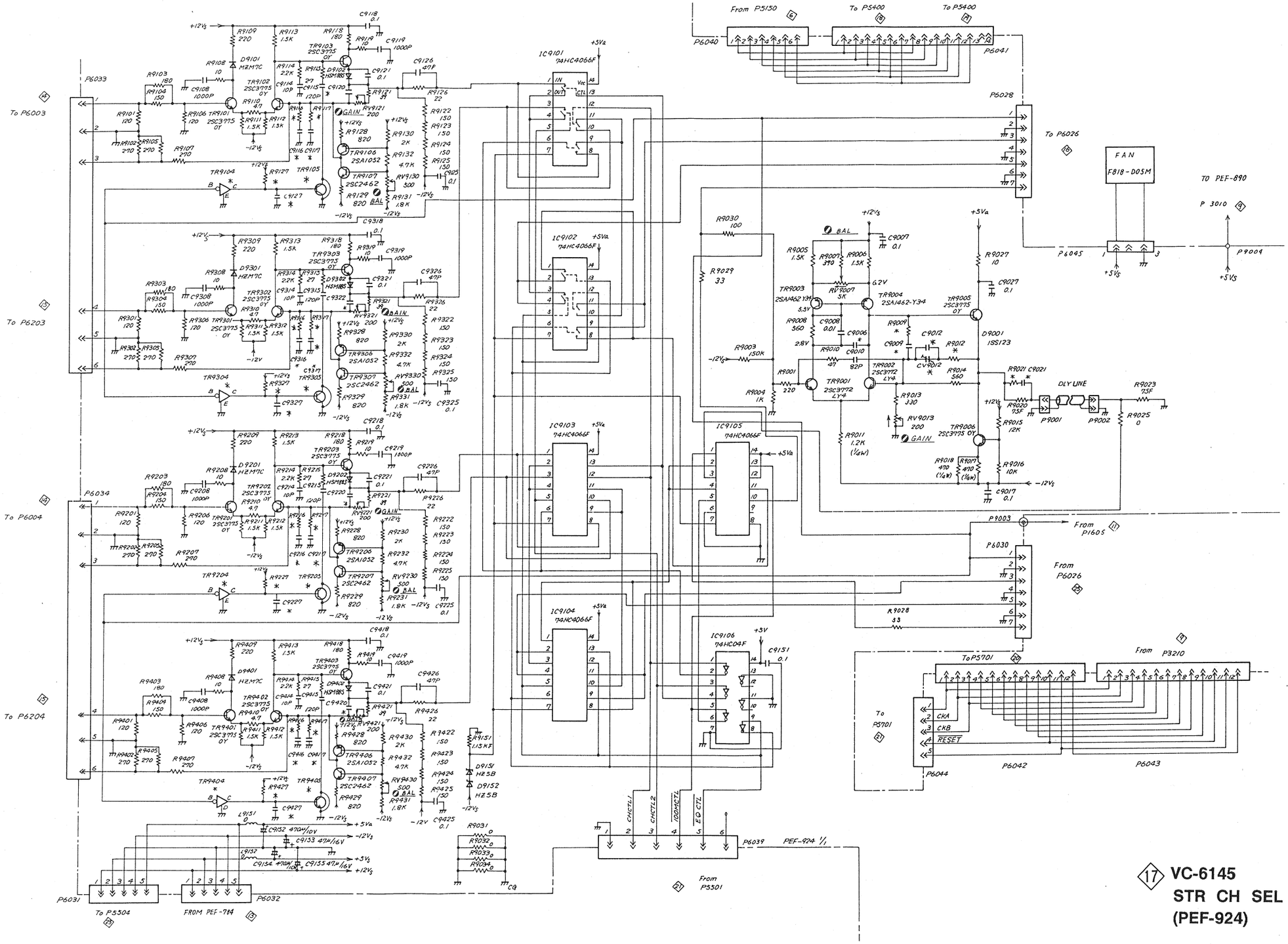


⑮ VC-6145
VIF-2
(PEF-921)

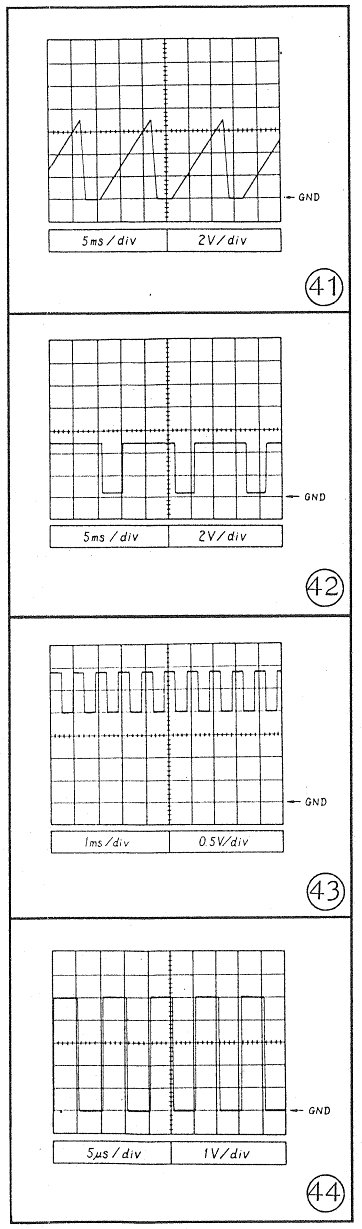


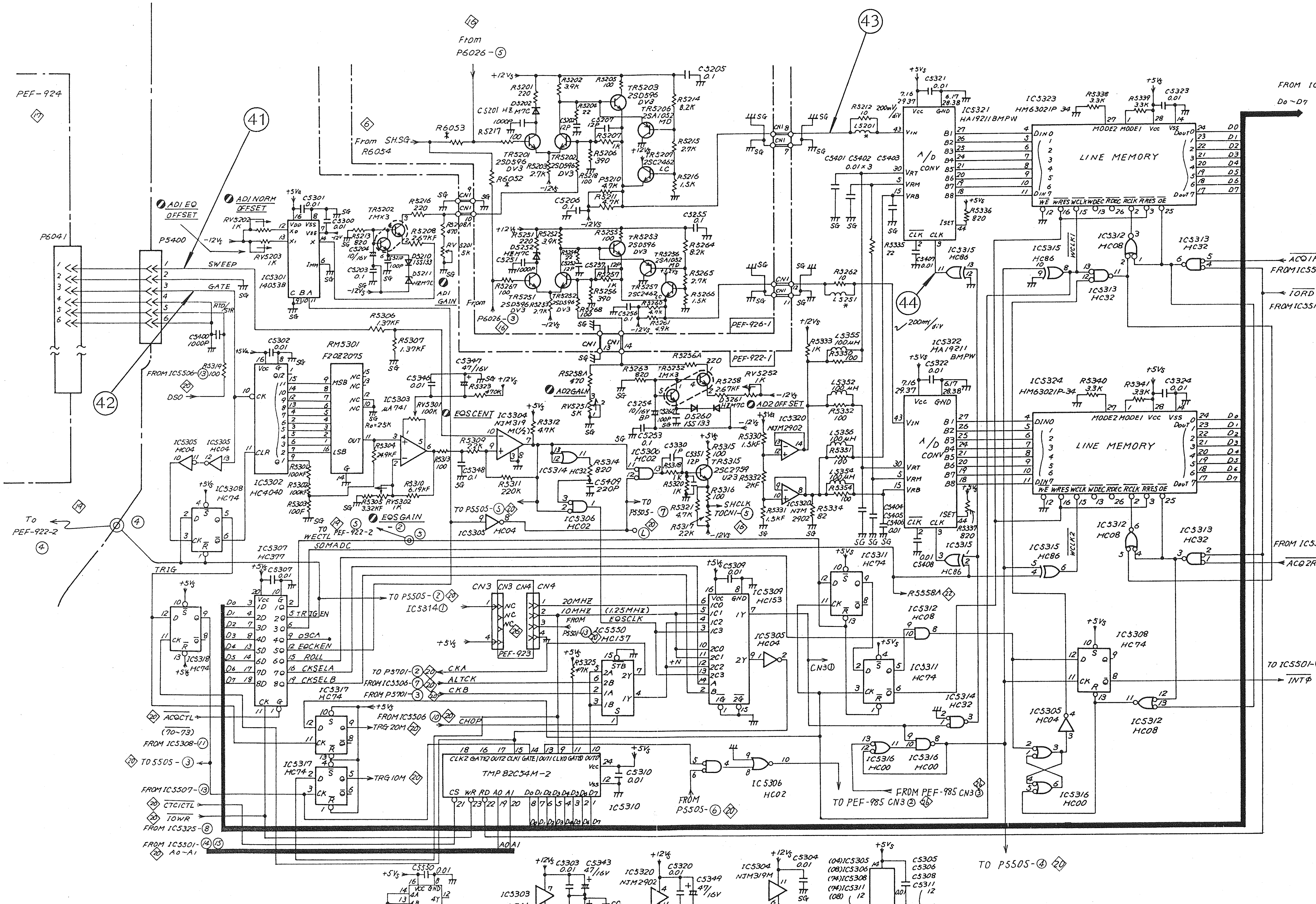


16 VC-6145
S/H-1
(PEF-922-1, 926-1)

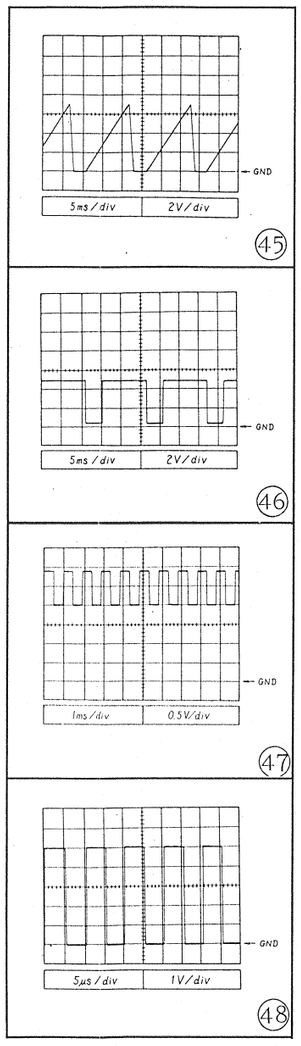


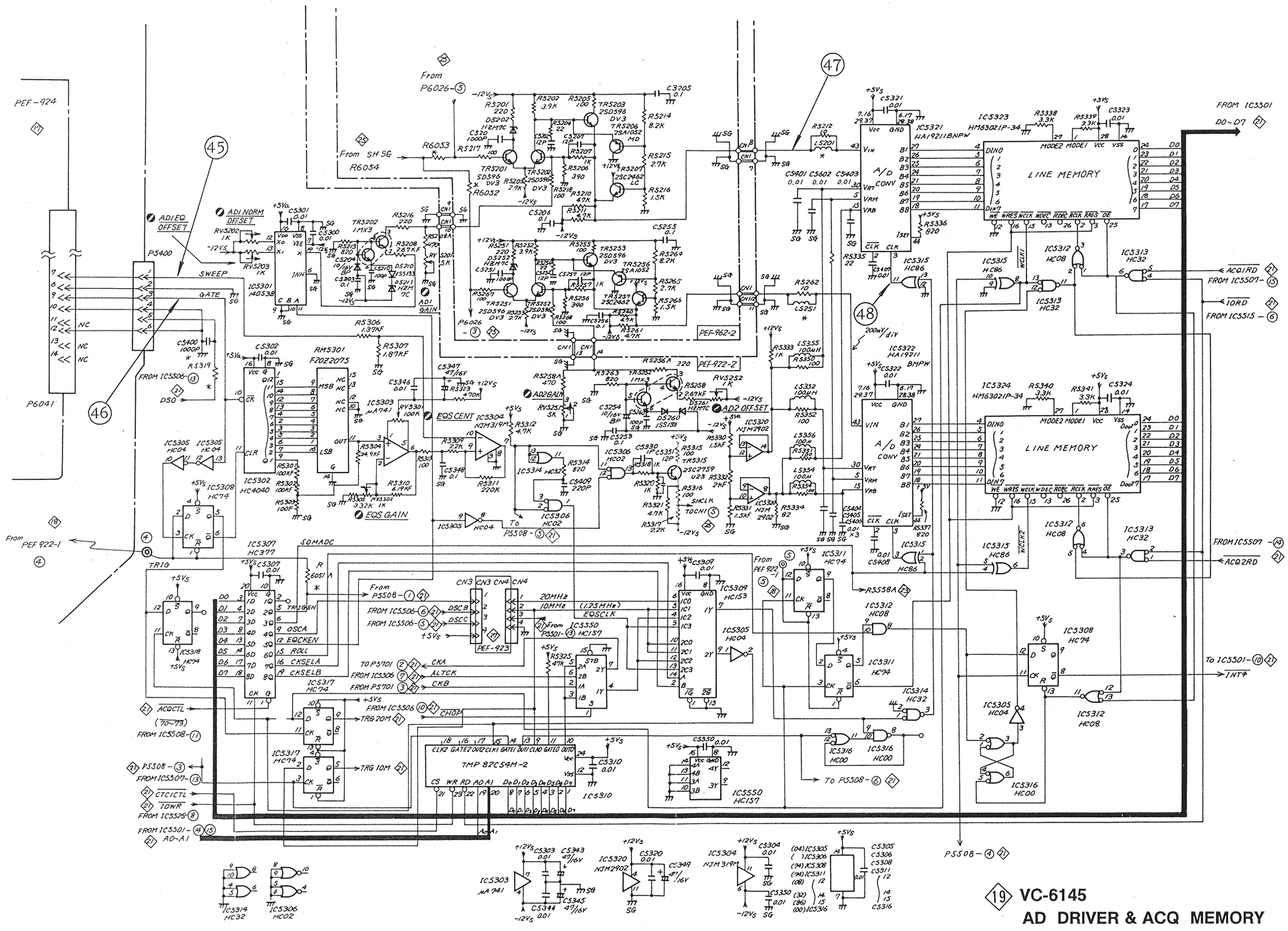
17 VC-6145 STR CH SEL (PEF-924)

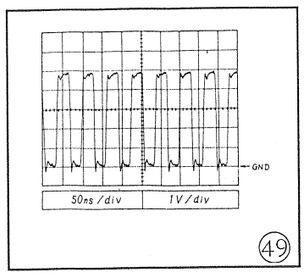


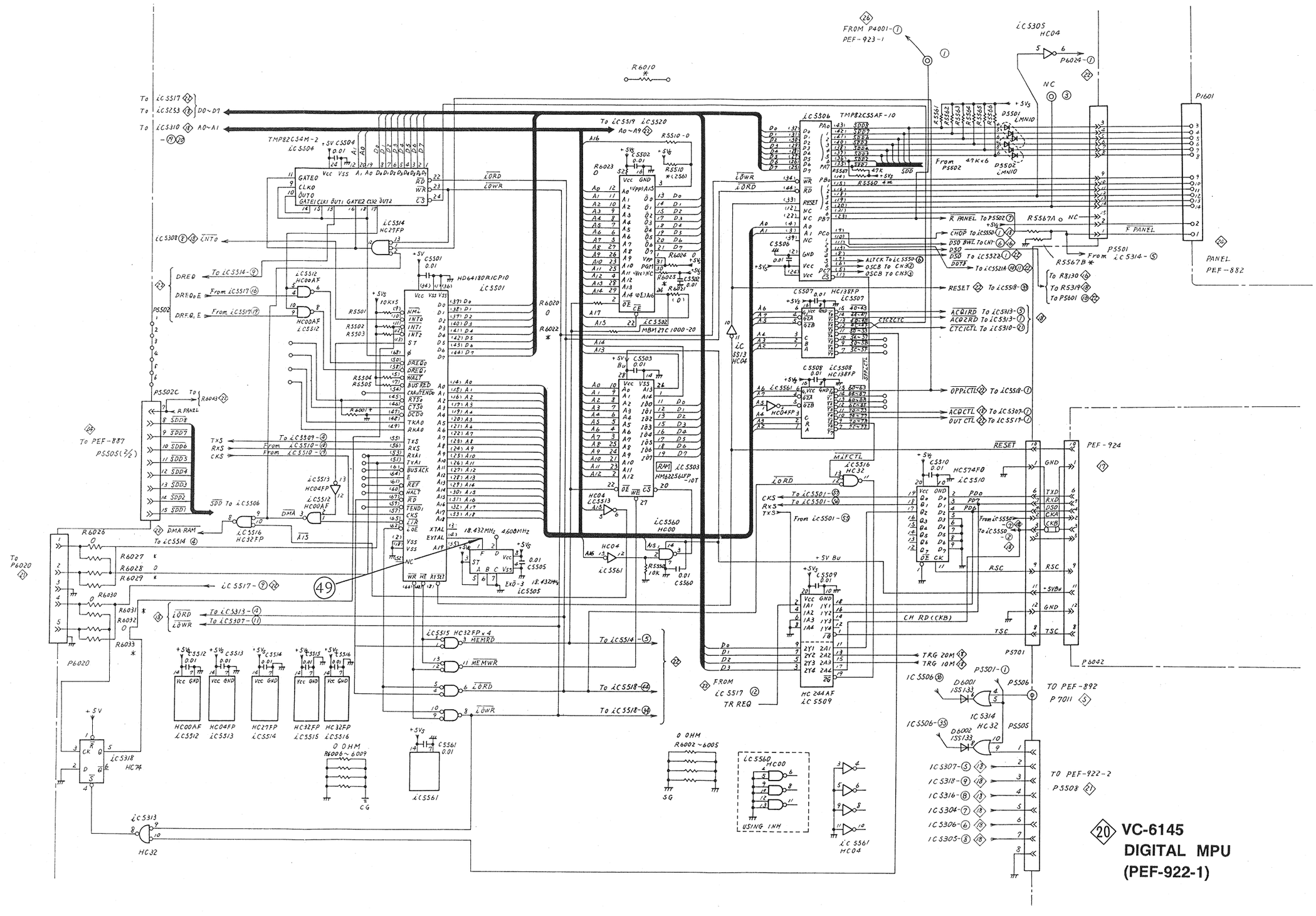


⑱ VC-6145
AD DRIVER & ACQ MEMORY
(PEF-922-1, 926-1)

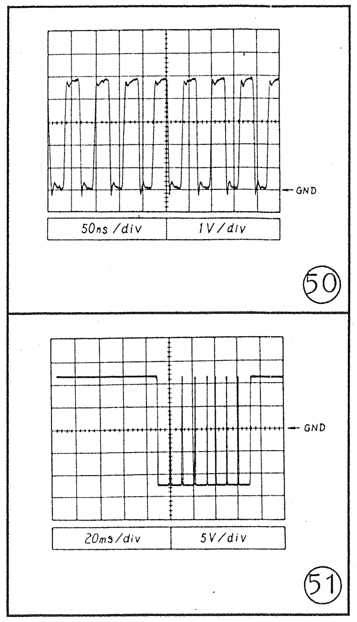

GND
5ms/div
2V/div
45
GND
5ms/div
2V/div
46
GND
1ms/div
0.5V/div
47
GND
5μs/div
1V/div
48

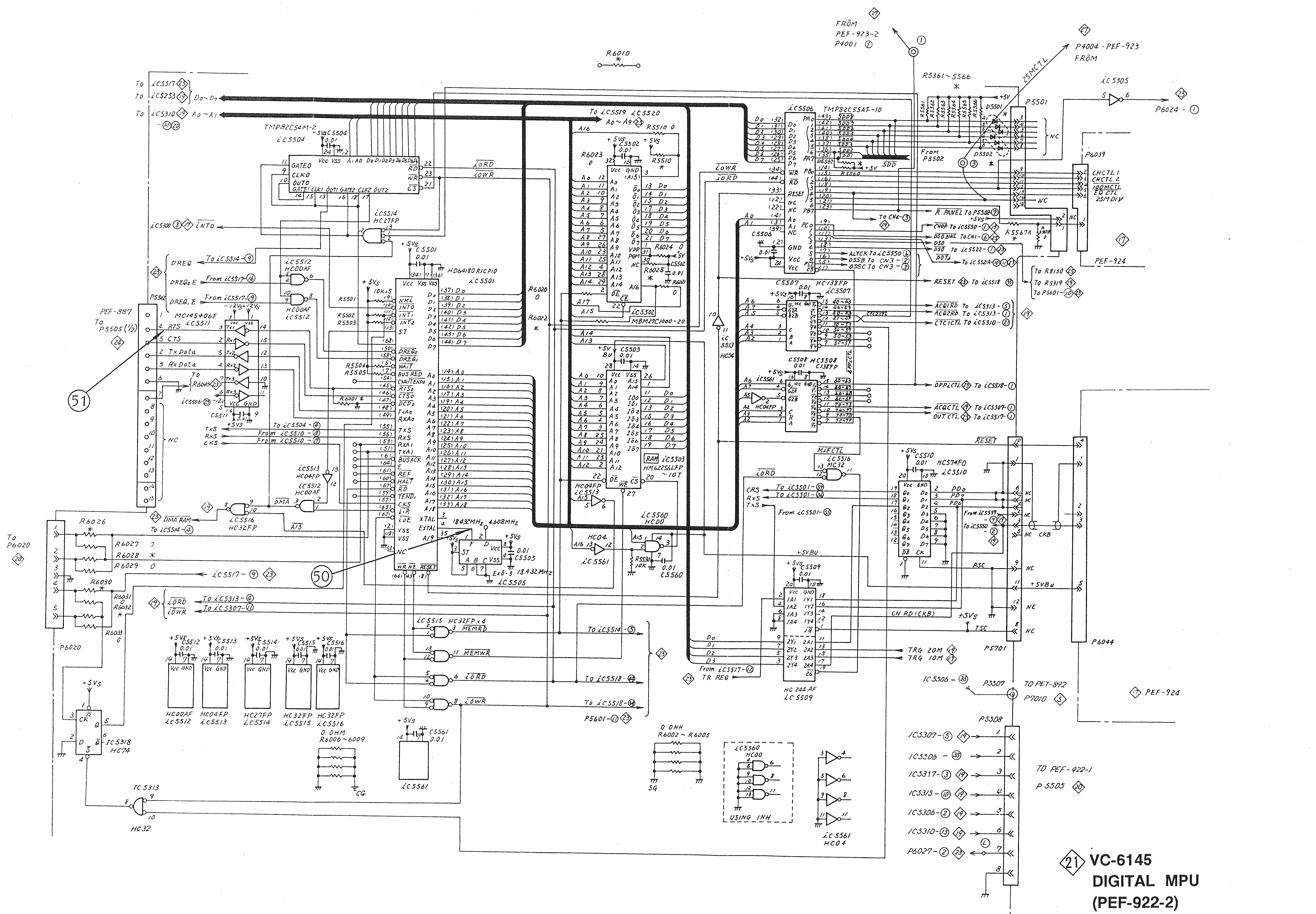

PEF-924
P6041
P5400
ADI EQ OFFSET
ADI NORM OFFSET
SWEEP
GATE
ADI GAIN
EQS CENT
EQS GAIN
AD2GAIN
AD2 OFFSET
From P6026-⑤
From SH SG R6054
R6053
R6052
PEF-962-2
PEF-922-2
PEF-923
P6026-③
FROM IC5506-⑬
DSO
CLR
CK
IC5301 M5M53B
IC5302 HC4040
IC5303 μA741
IC5304 NJM3/9M
IC5305 HC04
IC5306 HC02
IC5307 HC377
IC5308 HC74
IC5309 HC153
IC5310 TMP 82C54M-2
IC5311 HC74
IC5312 HC08
IC5313 HC32
IC5314 HC32
IC5315 HC86
IC5316 HC00
IC5317 HC74
IC5318 HC74
IC5320 NJM2902
IC5321 HA19211BNPW
IC5322 HA19211 BMPW
IC5323 HM63021P-34
IC5324 HM63021P-34
IC5330 NJM 2902
IC5350 HC157
IC5550 HC157
A/D CONV
LINE MEMORY
FROM IC5501 D0~D7 ㉑
ACQ1RD
IORD
ACQ2RD
INT4
To IC5501-⑩ INT4
To P5508-⑥
P5508-④
SQMADC
TRIG
TRG 20M
TRG 10M
CHOP
ACQCTL
CTCICTL
IOWR
AD~A1
DSCB
DSCC
CKA
ALTCK
CKB
CKSELA
CKSELB
EQSCLK
20MHz
10MHz
(1.25MHz)
VC-6145
AD DRIVER & ACQ MEMORY
(PEF-922-2, 926-2)



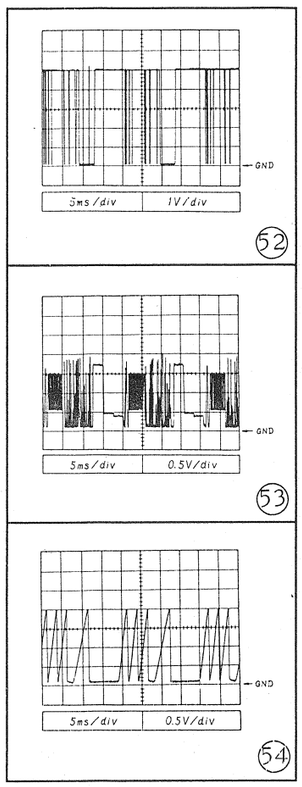


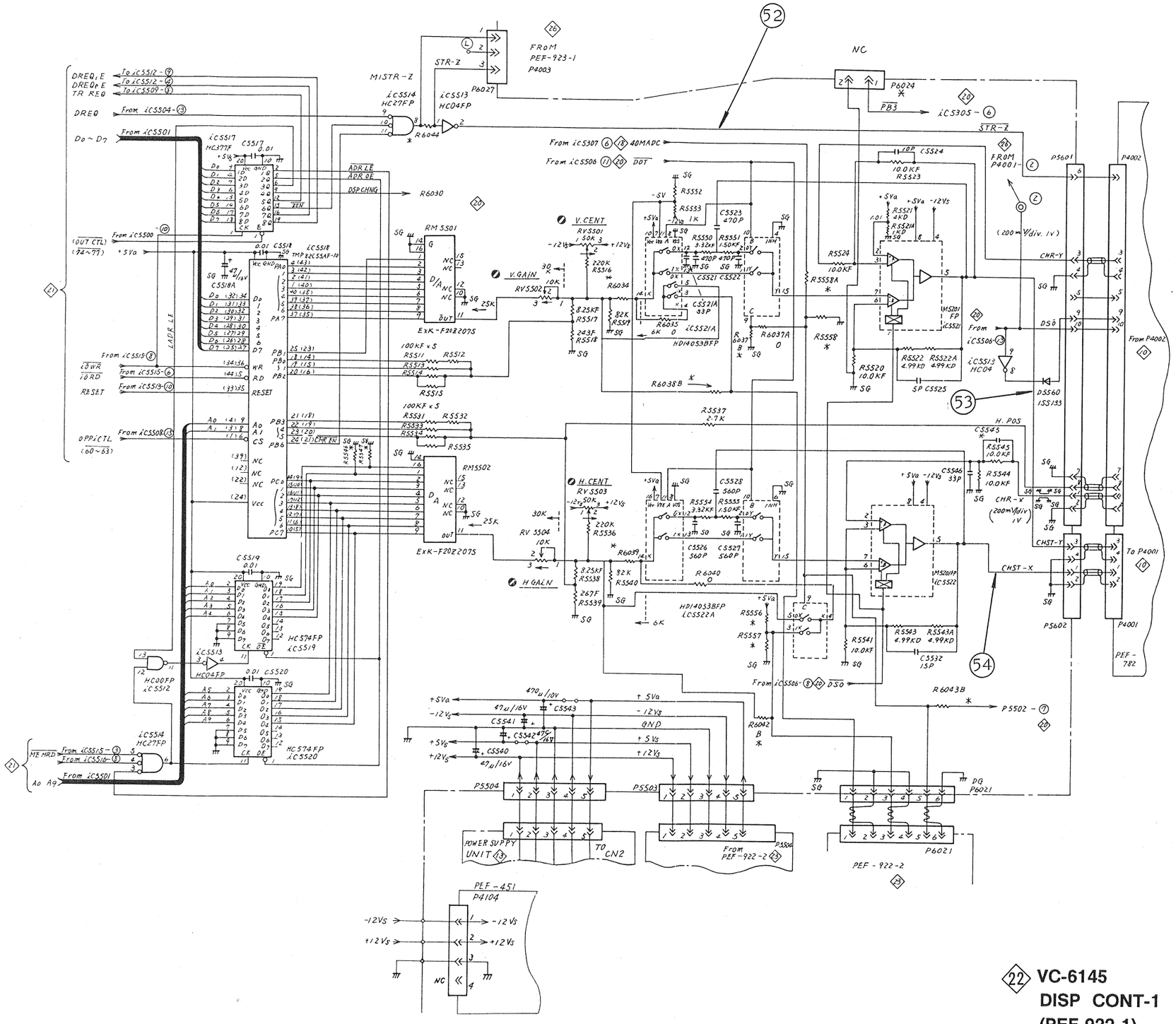
20 VC-6145
DIGITAL MPU
(PEF-922-1)



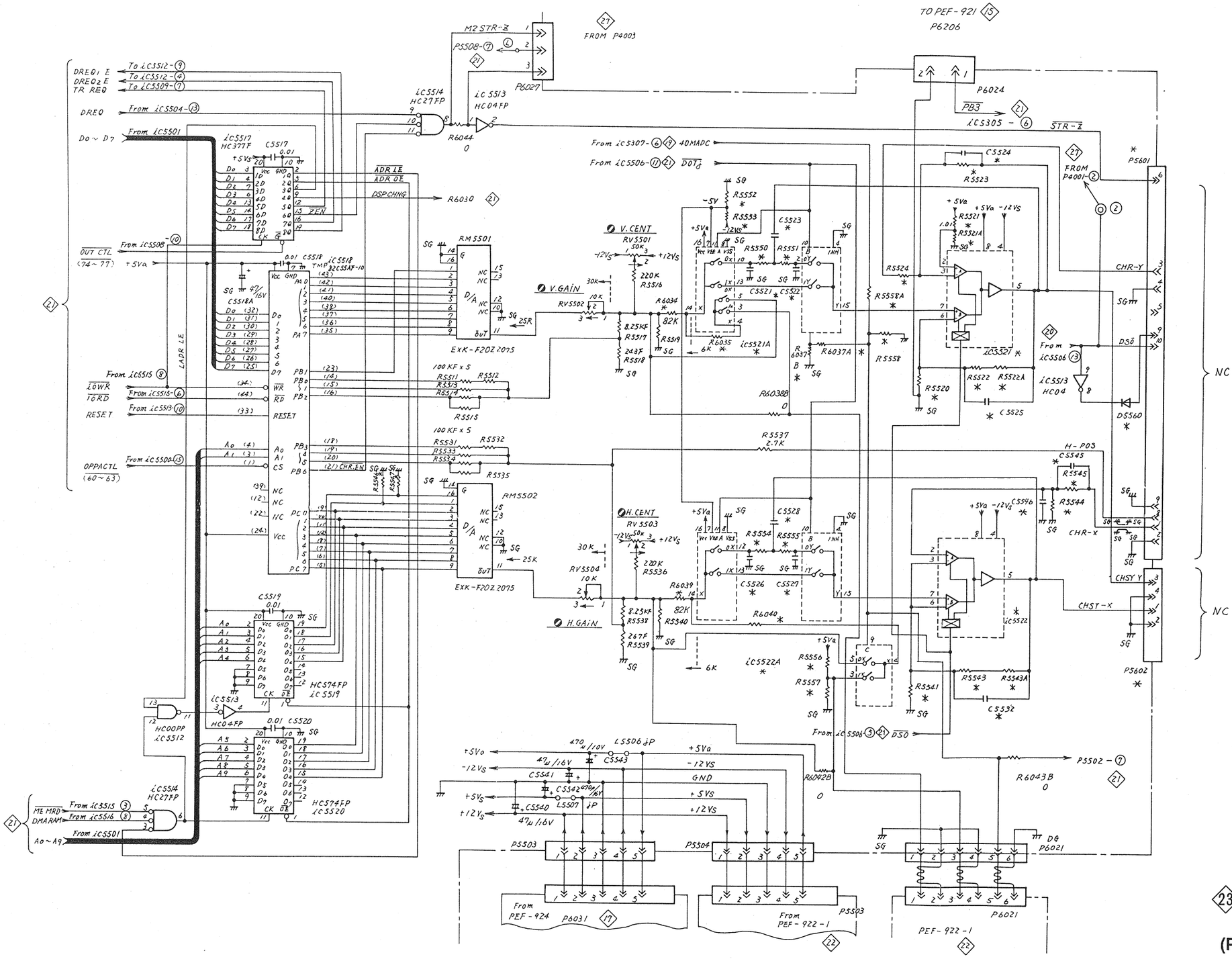


21 VC-6145 DIGITAL MPU (PEF-922-2)

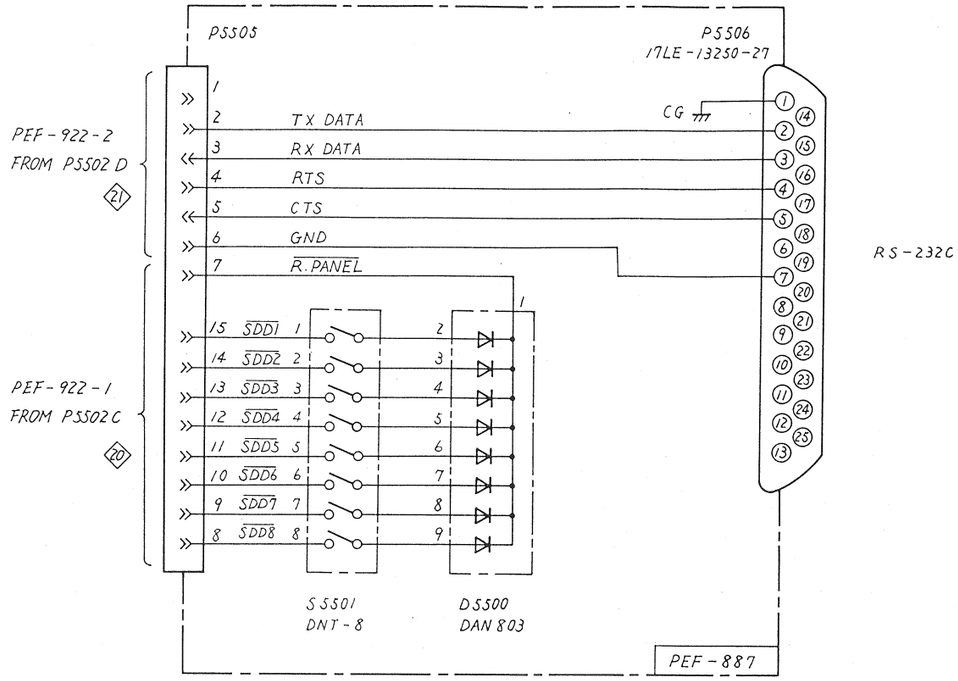


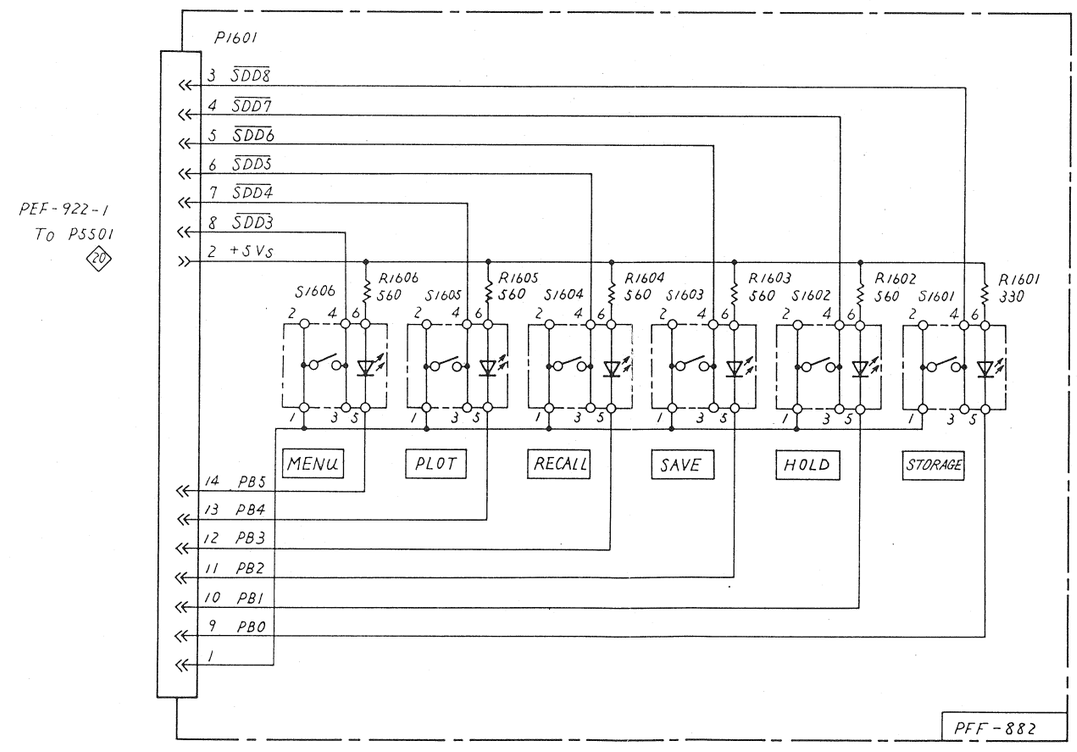


22 VC-6145
DISP CONT-1
(PEF-922-1)



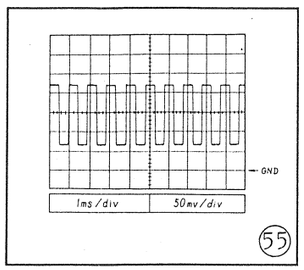
23 VC-6145 DISP CONT-2 (PEF-922-2)

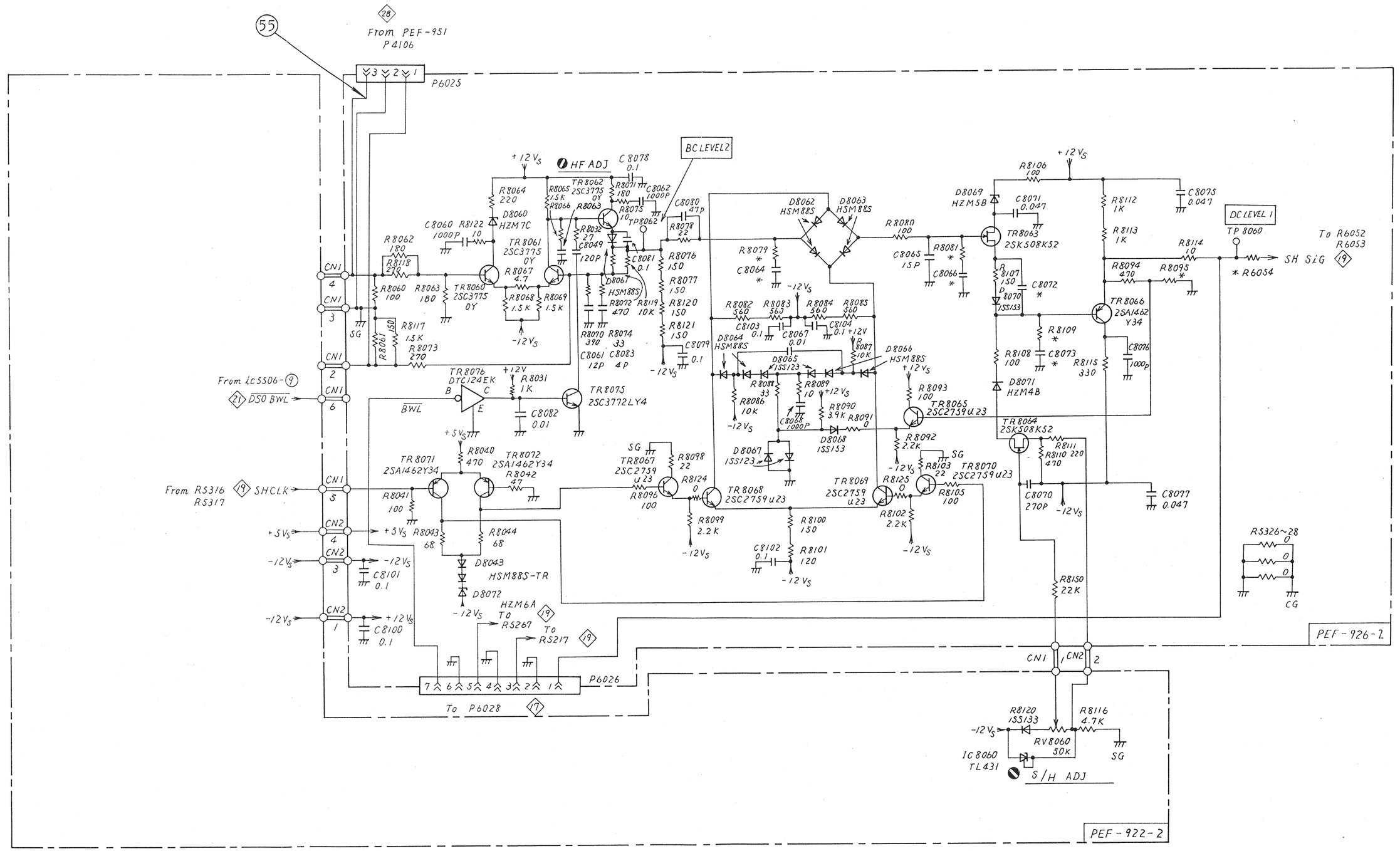




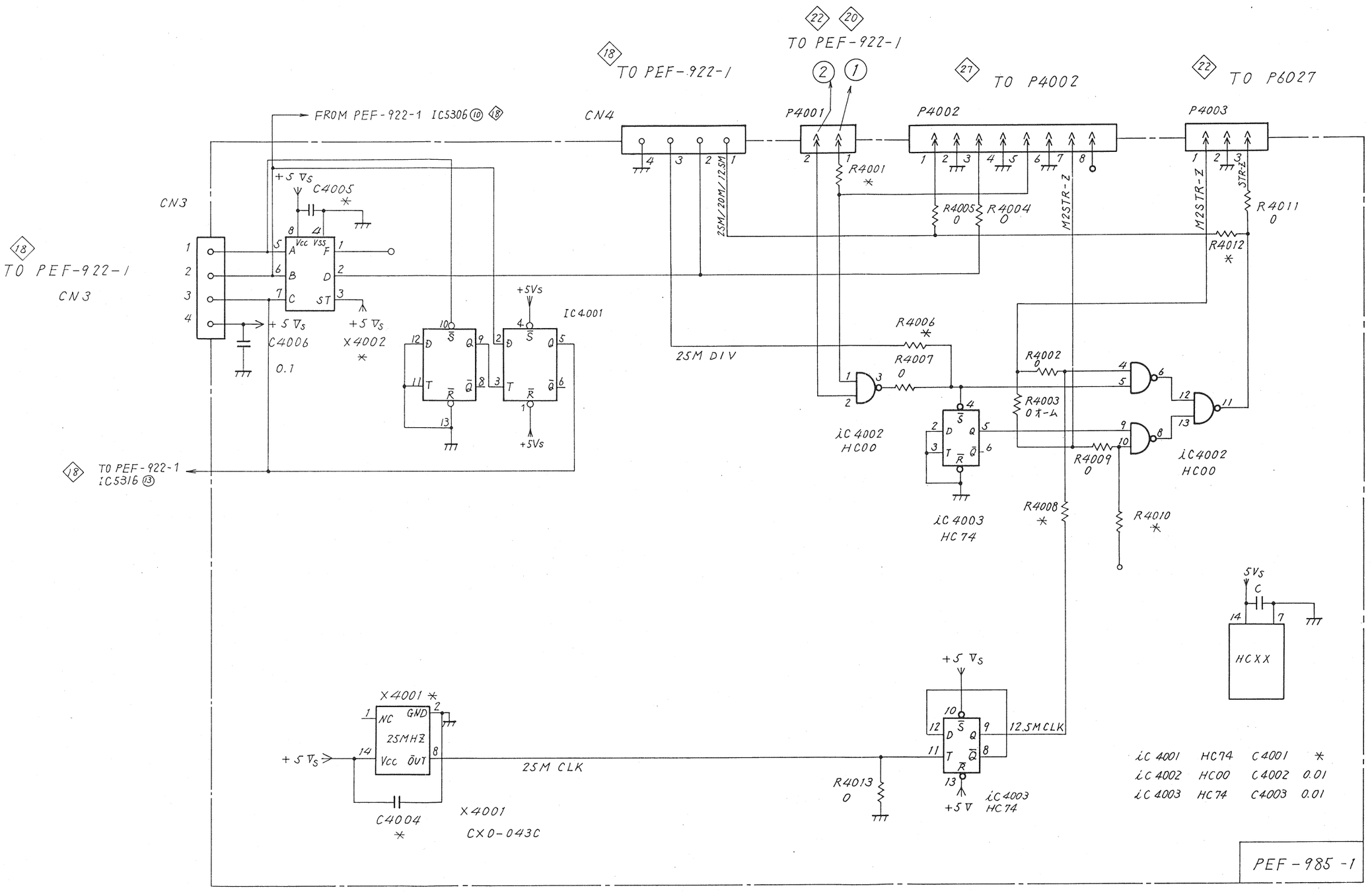
S1601 : SKHQFG (GREEN)
S1602 ~ 06 : SKHQFF (RED)

24 VC-6145
RS-232-C & FRONT PANEL (DSO)
(PEF-887, 882)

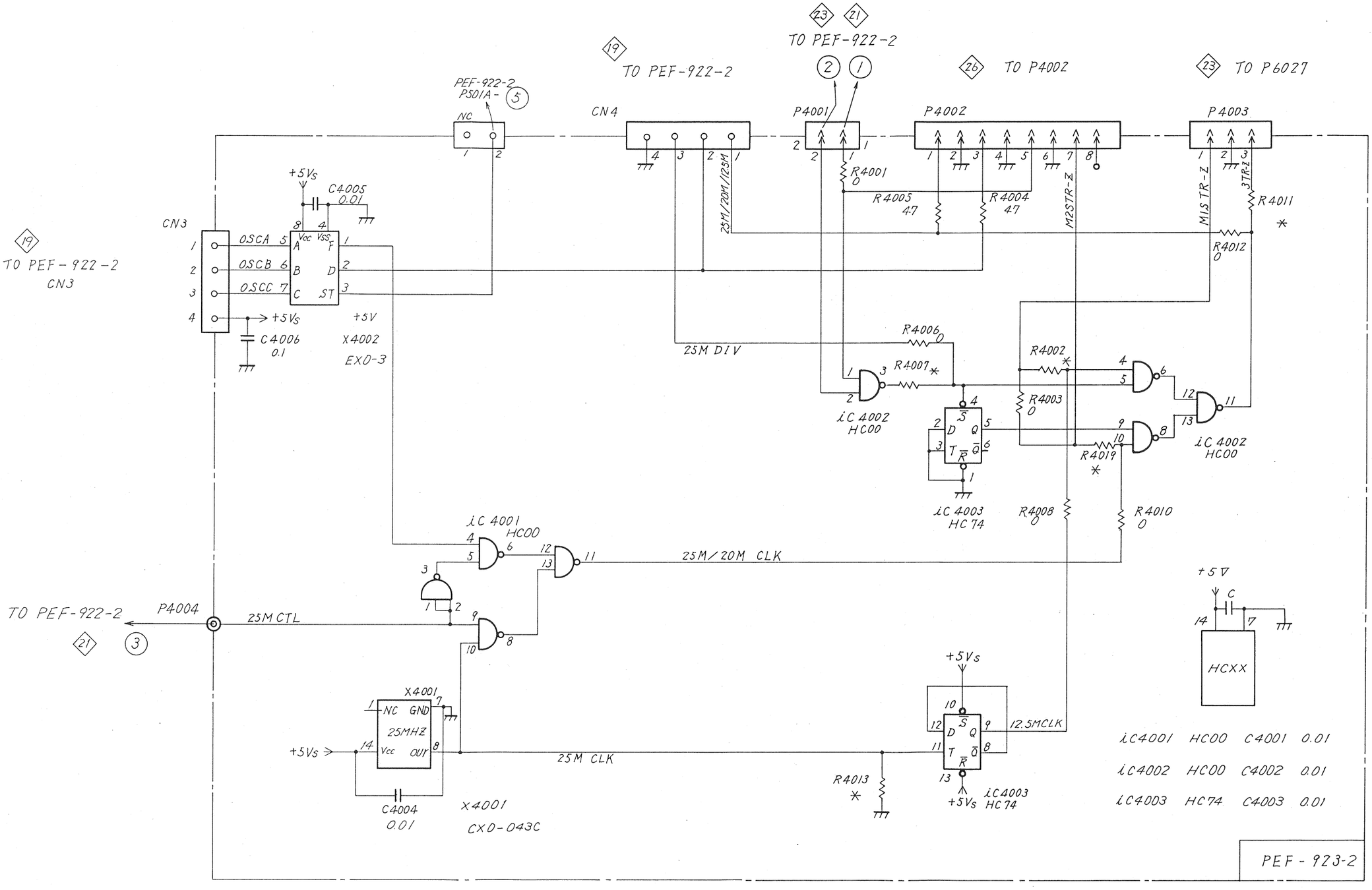




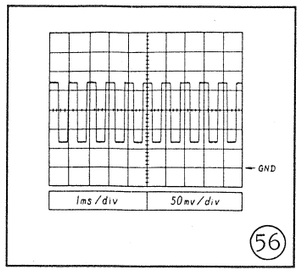
25 VC-6145
S/H-2
(PEF-922-2, 926-2)

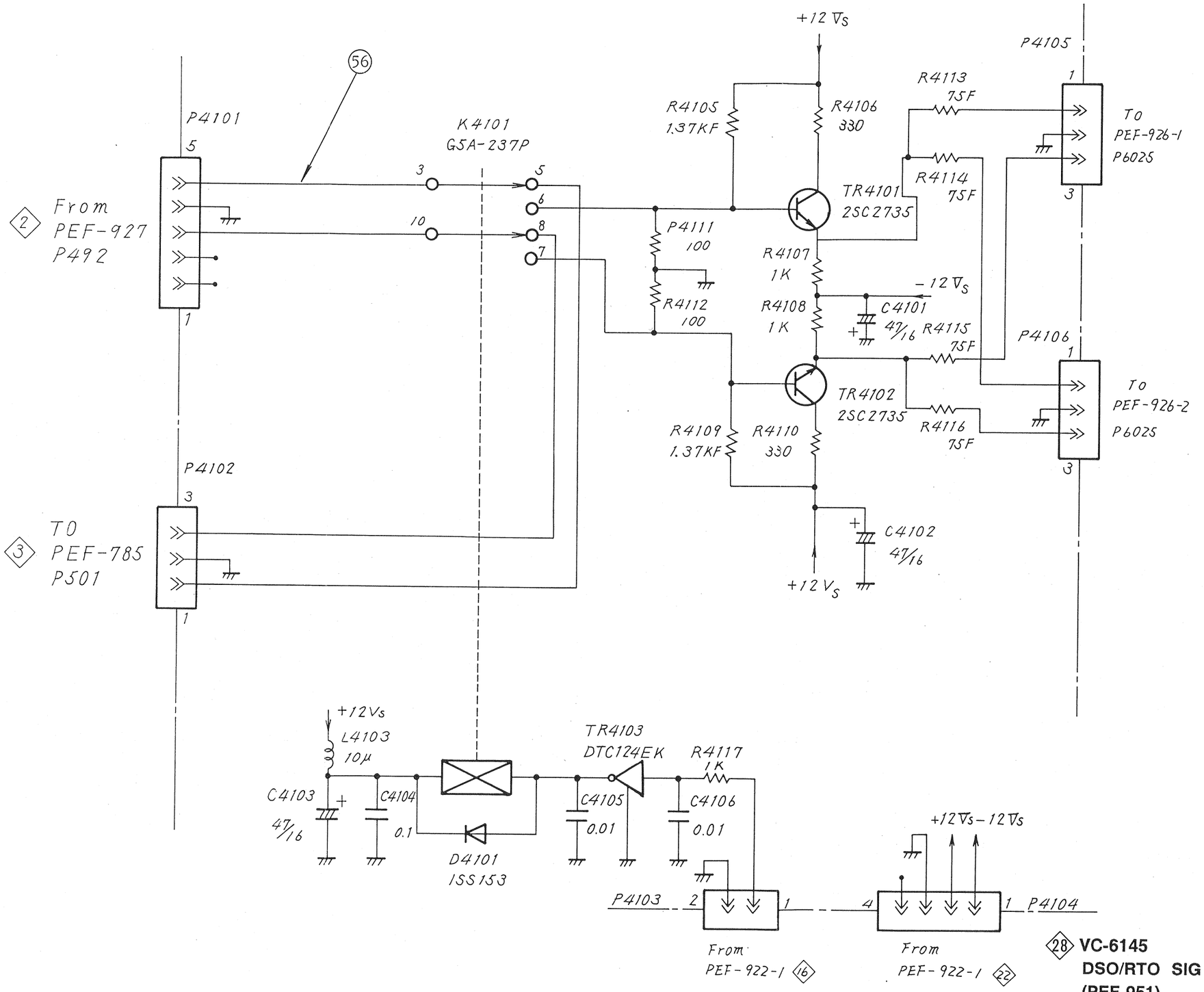


26 **VC-6145**
25M CLK-1
(PEF-985)

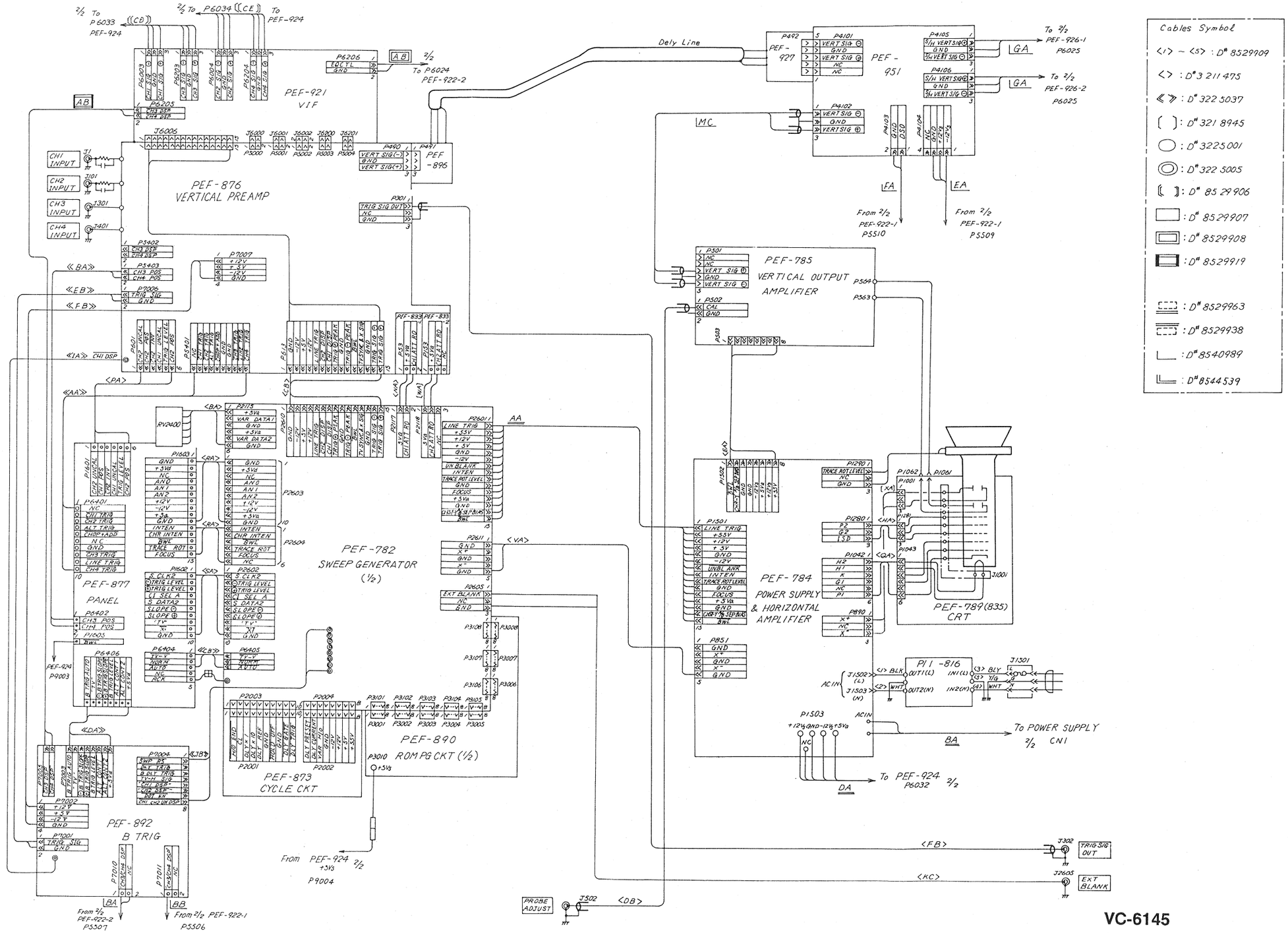


27 VC-6145
25M CLK-2
(PEF-923-2)



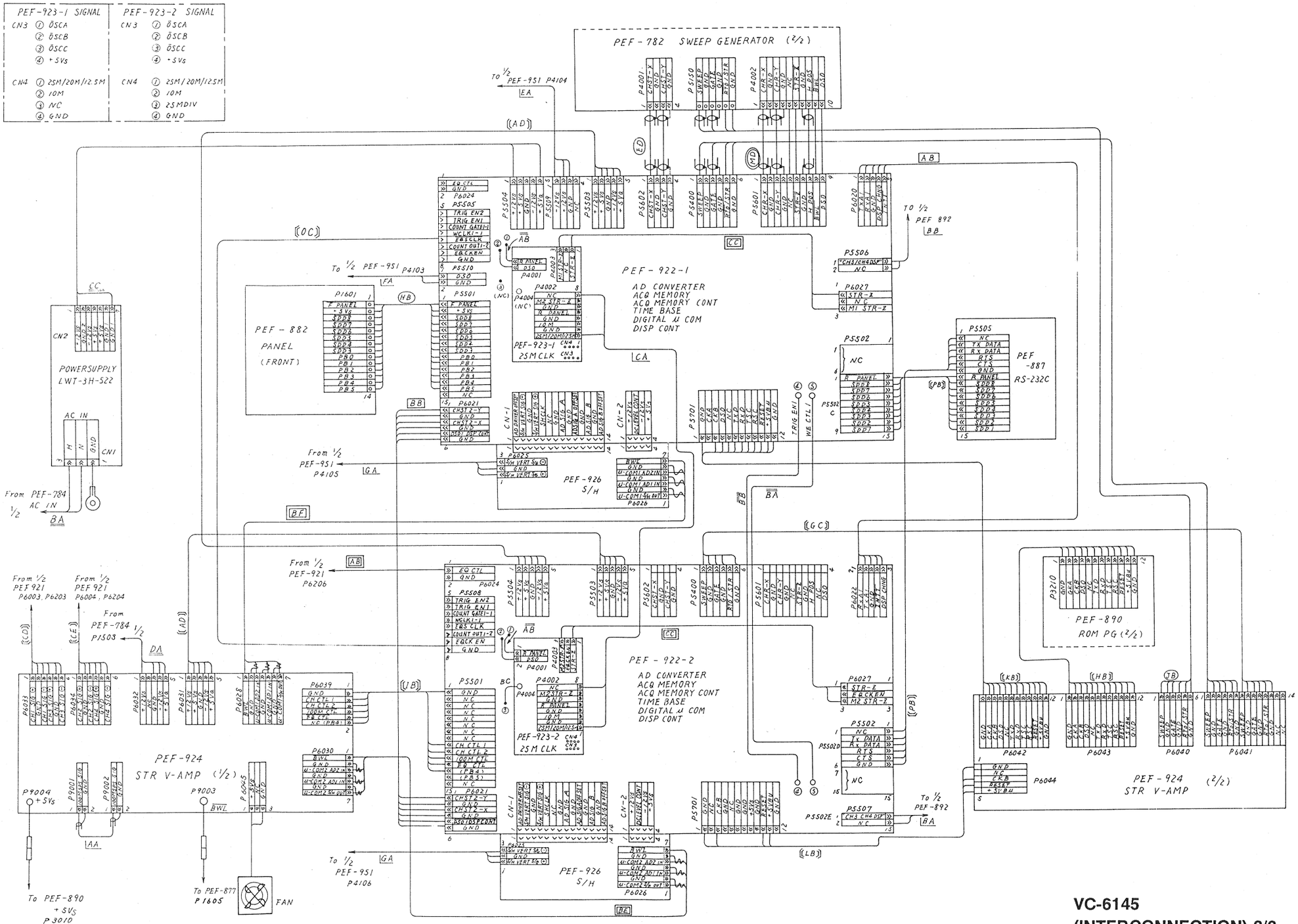


28 **VC-6145**
DSO/RTO SIG SEL
(PEF-951)

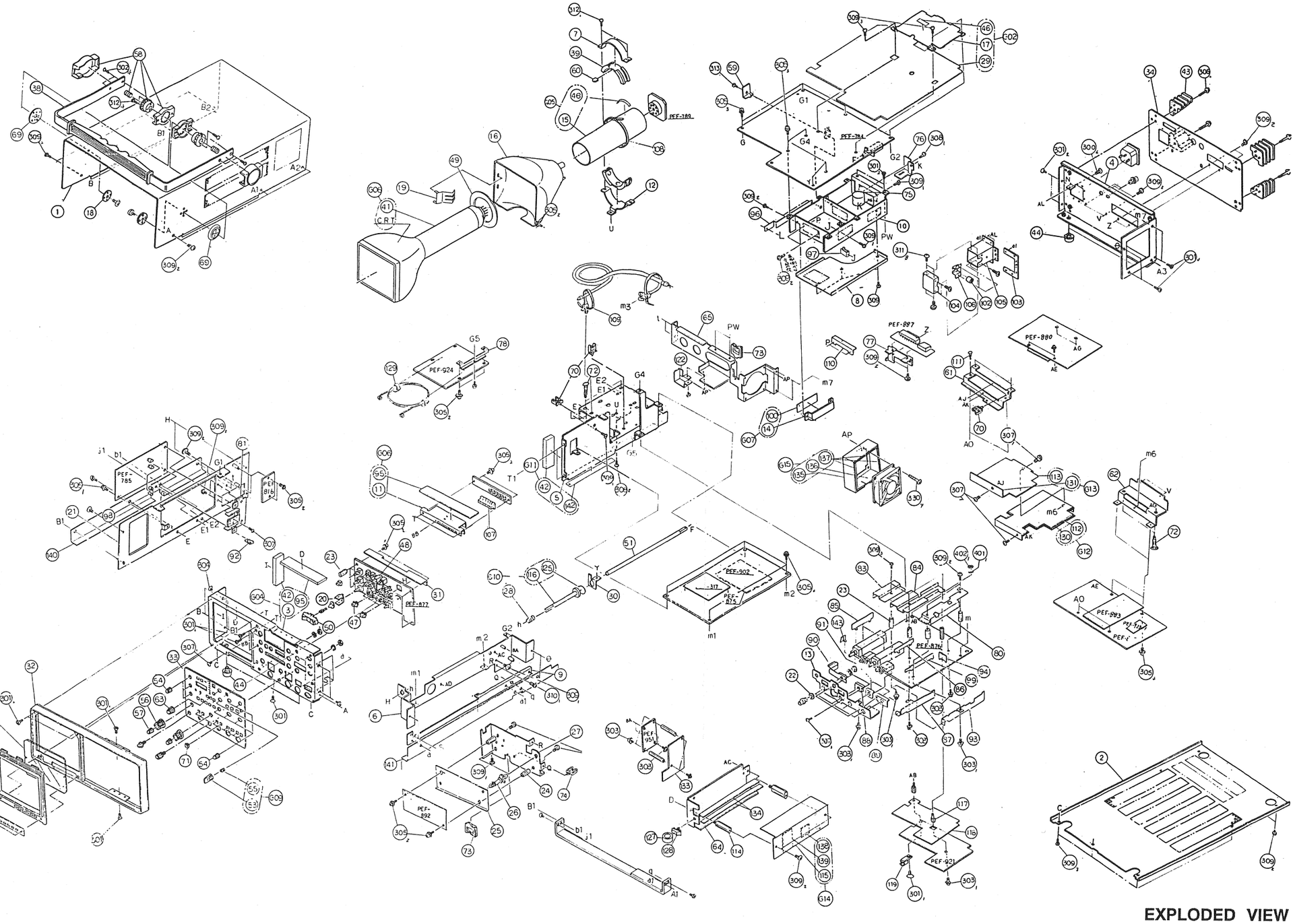


Cables Symbol

- <1> ~ <5> : D# 8529909
- <> : D# 3211475
- ≪≫ : D# 3225037
- [ ] : D# 3218945
- ⬭ : D# 3225001
- ◎ : D# 3225005
- ⟨ ⟩ : D# 8529906
- ▭ : D# 8529907
- ▭ : D# 8529908
- ▭ : D# 8529919
- ▭ : D# 8529963
- ▭ : D# 8529938
- └ : D# 8540989
- └ : D# 8544539



VC-6145
(INTERCONNECTION) 2/2



EXPLODED VIEW