HEWLETT PACKARD

OPERATING AND SERVICE MANUAL

3717A

70 MHz MODULATOR-DEMODULATOR

SERIAL NUMBERS

This manual applies directly to the instrument with serial number 2028U00160. For additional information about serial numbers, see INSTRUMENTS COVERED BY MANUAL in Section I and SECTION VII MANUAL CHANGES.

Manual Part Number 03717-90000
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Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 034		
A50	03717-60067	3	1	BELL 1500 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60067
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C24	0160-5065	7	1		28480	0160-5065
A50C25	0160-5079	3	1		28480	0160-5079
A50C26	0160-4380	7	1	CAPACITOR-FXD 1PF +-.25PF 200VDC CER	51642	150-200-NP0-109C
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L2	03717-60022	2	1	INDUCTOR ASSEMBLY	28480	03717-60022
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

SERVICE SHEET 6

SERVICE SHEET 7

SERVICE SHEET 8

SERVICE SHEET 9

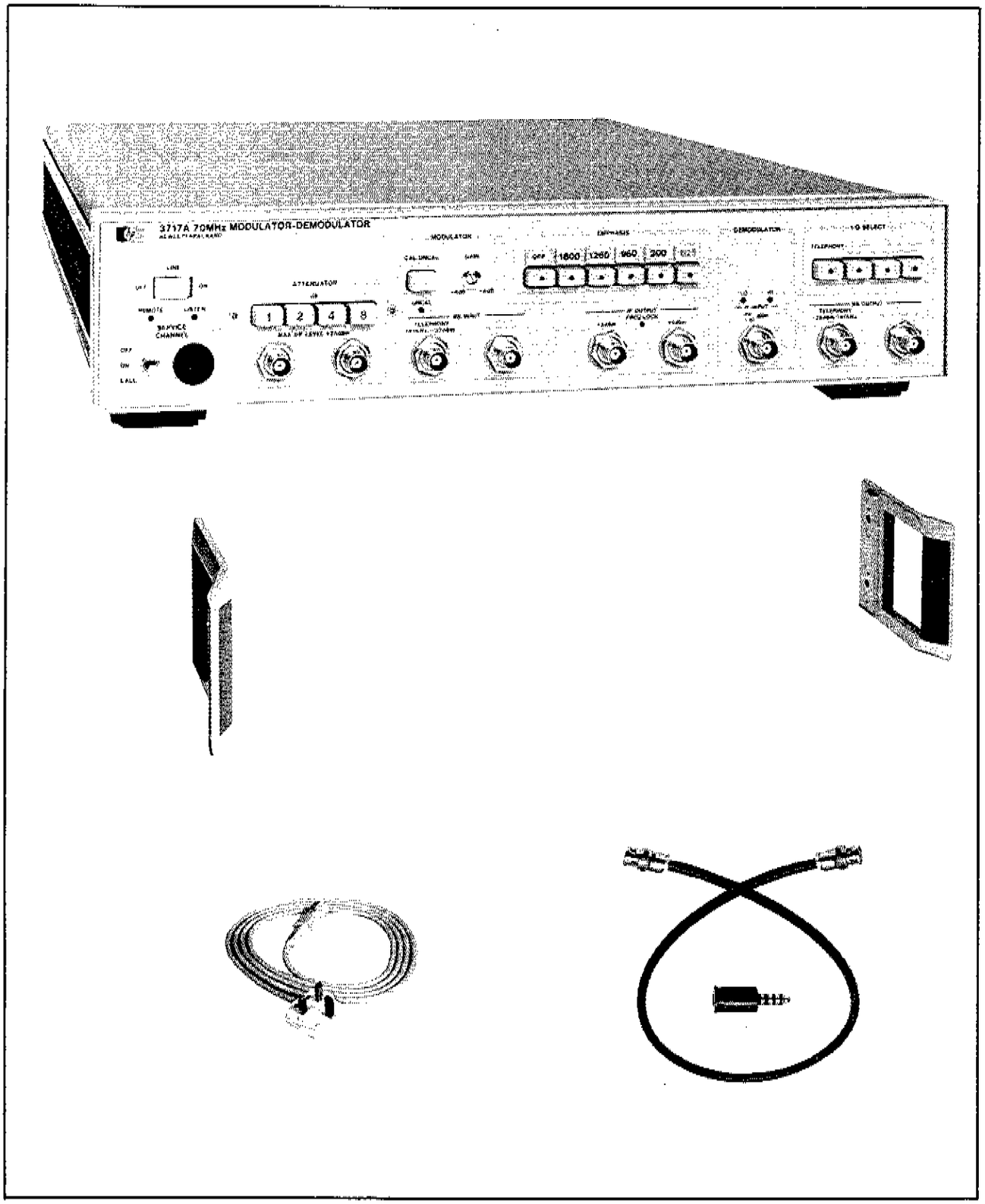


Figure 1-1 3717A Modulator-Demodulator and Accessories

SECTION I
GENERAL INFORMATION

1-1 INTRODUCTION

This Operating and Service Manual contains information required to install, operate, test, adjust and service the Hewlett-Packard Model 3717A Modulator-Demodulator, Figure 1-1 shows the 3717A and the accessories supplied.

This section of the manual describes the instrument and includes information on identification, accessories, specifications, safety and other basic information.

Listed on the title page of this manual is a microfiche part number. This number can be used to order 4 x 6 inch microfilm transparencies of the manual. Each microfiche contains up to 96 photo duplicates of the manual pages. The microfiche package also includes the latest Manual Changes supplement.

1-2 SPECIFICATIONS

Instrument specifications are listed in Table 1-1. These specifications are the performance standards against which the instrument is tested.

1-3 SAFETY CONSIDERATIONS

This Safety Class 1 instrument (provided with a protective earth terminal) has been designed and tested according to international safety standards. Information with regard to safety is presented at appropriate places throughout the manual.

1-4 DESCRIPTION

The HP3717A Modulator-Demodulator is a portable test modem for use on 70MHz IF microwave radio links. Its primary function is to enable baseband to baseband (BB-BB) measurements such as white noise loading and video waveform measurements to be made at non-demodulating repeater stations. It can also be used as a substitute for the radio link modulator and/or demodulator. All the inputs and outputs are designed to interface with equipment manufactured to the pertinent CCIR or BELL recommendations.

Two BB inputs and two BB outputs are provided, one each for Telephony and one each for Video. Variable gain allows the modulator to operate with BB input levels over a 12dB range. An AGC system allows the demodulator to operate with IF input levels over a 16dB range, video signals can be inverted in both the modulator and demodulator sections so that the 3717A may be used with any modulation scheme. Two independent IF outputs are provided, one to supply the system being tested, the other to be used as a monitor point if required. Available as an option in addition to the normal Telephony input and Telephony output is a balanced Telephony input and balanced Telephony output at 124 Ohm impedance.

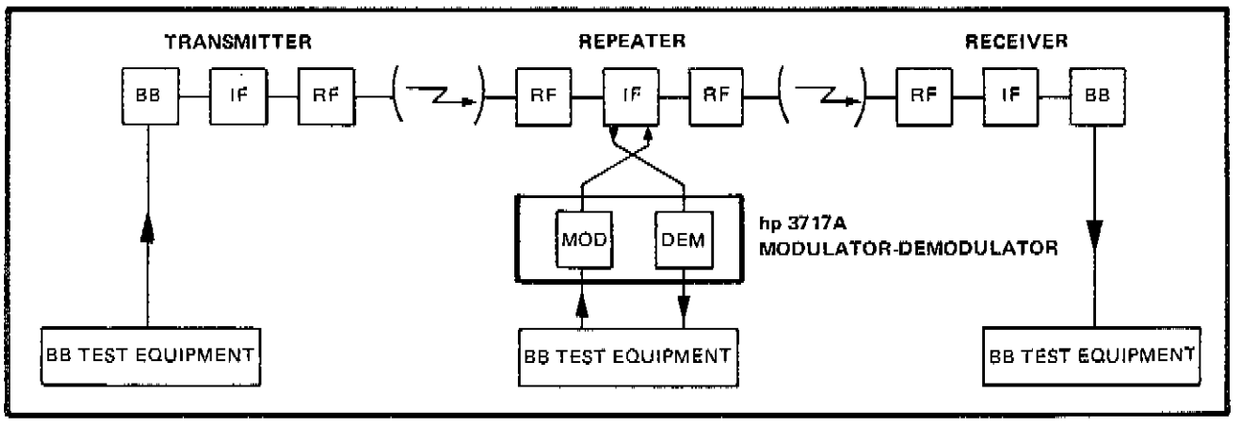


Figure 1-2 Typical Test Setup

A selection of optional pre/de-emphasis networks is available which cover the range from 24 to 1800 channel and 525, 625 and 819 line video according to CCIR recommendations 275-1 and 405-1 and the range 600 to 1800 channel according to BELL recommendations 457A/B/D/E. Up to five pre/de-emphasis networks can be fitted in the 3717A at any one time, selection being by front panel pushbutton keys, or optionally by remote control via the HP-IB.

1-5 INSTRUMENTS COVERED BY MANUAL

Attached to the instrument is a serial number plate. The serial number is in the form: 0000U00000. It is in two parts the first four digits and the letter are the serial prefix and the last five digits are the suffix. The prefix is the same for all identical instruments it changes only when a change is made to the instrument. The suffix, however, is assigned sequentially and is different for each instrument. The contents of this manual apply to instruments with the serial number prefix listed under SERIAL NUMBERS on the title page.

An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates the instrument is different from those described in this manual. The manual for this newer instrument is accompanied by a Manual Changes supplement. This supplement contains 'change information' that explains how to adapt the manual to the newer instrument.

In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is identified with the manual print date and part number, both of which appear on the manual title page. Complimentary copies of the supplement are available from Hewlett-Packard.

For information concerning a serial number prefix that is not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

1-6 OPTIONS

Options are available to, change the front panel connectors, delete either the modulator or demodulator, supply a range of emphasis networks, provide remote control via the HP-IB, to convert the instrument to rack mounting with or without front handles.

Option 003 substitutes Siemens 1.56/6.5mm front panel connectors for the standard BNC connectors.

Option 004 substitutes commercial equivalents of WECO 477B type connectors for the standard BNC connectors and adds additional Telephony inputs and Telephony outputs at 124 Ohm balanced impedance.

Option 006 deletes the modulator section.

Option 007 deletes the demodulator section.

Option 136 is a combination of options 003 and 006.

Option 137 is a combination of options 003 and 007.

Option 146 is a combination of options 004 and 006.

Option 147 is a combination of options 004 and 007.

Options 011 to 018 are the telephony emphasis networks which are manufactured to CCIR recommendations, they are as follows:

011	24 channel loading	015	600 channel loading
012	60 channel loading	016	960 channel loading
013	120 channel loading	017	1260 channel loading
014	300 channel loading	018	1800 channel loading

Options 021 to 023 are the video emphasis networks which are manufactured to CCIR recommendations, they are as follows:

021 525 line 022 625 line 023 819 line

Options 031 to 035 are the telephony emphasis networks which are manufactured to BELL recommendations, they are as follows:

031	600 channel loading	034	1500 channel loading
032	900 channel loading	035	1800 channel loading
033	1200 channel loading		

Additional emphasis networks may be obtained by ordering the HP part number given in the Replaceable Parts List for the appropriate A50 Assembly.

Option 100 provides remote control of the instrument via the HP-IB, refer to paragraph 1-7 for further details.

Rack Flange Kit. The HP 3717A can be mounted in a standard instrument rack without front handles with the rack flange kit. Order HP part number 5061-0074.

Rack Flange and Front Handle Combination Kit. The 3717A can be mounted with front handles in a standard instrument rack. The kit is made up of unique parts which combine both functions. Order HP part number 5061-0075.

1-7 HEWLETT-PACKARD INTERFACE BUS

When HP-IB interface (Option 100) is fitted it can be used with any HP-IB compatible computing controller or computer for automatic systems applications. HP-IB is Hewlett-Packard's implementation of IEEE Standard 488-1978. The 3717A is compatible with the HP-IB to the extent indicated by the following function codes: SH0, AH1, T0, TE0, L2, LE0, SR0, RL2, PP0, DC1, DT0, C0. For more detailed information relating to remote operation of the HP 3717A, refer to Section III of this manual.

HP-IB Address Selection. The HP-IB address switches are located inside the 3717A. To determine the 3717A address, refer to Section III of this manual.

1-8 ACCESSORIES SUPPLIED

The accessories supplied with the 3717A are shown in Figure 1-1. The power cable supplied will have one of several plug configurations depending on the destination of the original shipment. Refer to the Power Cables paragraph in Section II.

Dummy handles replace the front handles for shipping. Instructions for fitting the front handles will be found packed with the front handles. Keep the dummy handles for future use.

Supplied with the 3717A but not shown in Figure 1-1 are two straight extender boards and a right angle extender board. The Location of Assemblies Figure in Section VIII shows the location of these boards within the instrument.

1-9 RECOMMENDED TEST EQUIPMENT

Equipment required to maintain the 3717A is listed in Table 1-2. Alternative equipment may be substituted if it meets or exceeds the critical specifications listed in the table.

Table 1-1 Specifications

Except where otherwise indicated, the following parameters are warranted performance specifications. Parameters described as "typical" or "nominal" are supplemental characteristics which provide a useful indication of typical, but non-warranted, performance characteristics.

Back-to-Back Performance (Telephony)

[1] **BB FREQUENCY RESPONSE** (with or without Emphasis)
10 kHz to 10 MHz. ⩽ ± 0.2 dB.
50 Hz to 20 MHz: typically ⩽ ± 3 dB.

NOISE LOADING PERFORMANCE
At Nominal Loading for all Slots, 70 to 7600kHz (1800 channel loading with CCIR Emphasis):
Thermal Plus Intermod: ⩽ 25 pW0p (57 dB NPR).
Thermal: mod/demod is thermally dominated and will typically tolerate a 6 dB overload with no degradation in performance.

SPURIOUS RESPONSE
10kHz to 10MHz : typically ⩽–72dBm0.

Back-to-Back Performance (Video)

BB Frequency Response
50 Hz to 10 MHz: ⩽ ± 0.2 dB.
Square Wave Tilt (50 Hz): ⩽ 1%.
K Rating: typically 0.5%.
[4] **Diff Gain:** ⩽ 0.7%.
[4] **Diff Phase:** ⩽ 0.7°.

Modulator

BB INPUT (TELEPHONY 10 kHz to 10 MHz)
[2] **Sensitivity:** CAL mode, 141 kHz rms deviation for –37 dBm ± 1 dB. UNCAL mode, nominally 141 kHz rms deviation/–45 to –33 dBm (adjustable by front panel screwdriver control).
Impedance: 75Ω.
Return Loss: ⩾ 30 dB.

BB INPUT (VIDEO 50 Hz to 10 MHz)
[2] **Sensitivity:** 8 MHz pk-pk deviation for 1V pk-pk ± 0.1V.
Impedance: 75Ω.
Return Loss: ⩾ 28 dB (10 kHz to 10 MHz).

IF OUTPUTS
Frequency: 70 MHz ± 10 kHz.
Stability: typically ± 1 kHz per 24 hour period.
Output Level: +5 dBm ± 1 dB.
Return Loss: ⩾ 30 dB.

[3] **BB-IF SWEPT RESPONSE (TELEPHONY or VIDEO 70 ± 10 MHz)**
Flatness: ⩽ ± 0.2 dB.
Linearity: ⩽ 2.2%
Diff Gain: ⩽ 2%.
Group Delay: ⩽ 1.0 ns.
Diff Phase. ⩽ 1.5°.

Demodulator

IF INPUT (60 to 80 MHz centred on 70 MHz ± 100 kHz)
Level Range: –10 to +6 dBm (out of range indicated by LED).
Impedance: 75Ω.
Return Loss: ⩾ 30 dB.
Spurious (100kHz to 10MHz): ⩽–72dBm0

BB OUTPUT (TELEPHONY 10 kHz to 10 MHz)
[2] **Level:** –28 dBm ± 1 dB for 141 kHz rms deviation.
Impedance: 75Ω.
Return Loss: ⩾ 30 dB.

BB OUTPUT (VIDEO 50 Hz to 10 MHz)
[2] **Level:** 1V pk-pk ± 0.1V for 8 MHz pk-pk deviation.
Impedance. 75Ω.
Return Loss. ⩾ 30 dB (10 kHz to 10 MHz).

[3] **IF-BB SWEPT RESPONSE (TELEPHONY or VIDEO 70 ± 10 MHz)**
Linearity: ⩽ 2%.
Diff Gain: ⩽ 2%.
Group Delay (70 ± 8 MHz). ⩽ 1.5 ns.
Diff Phase: ⩽ 1.5°.

Attenuator

Frequency Range: 50 Hz to 10 MHz and 60 to 80 MHz.
Attenuation: 15 dB in 1 dB steps.
Flatness: ⩽ ± 0.2 dB.
Impedance: 75Ω.
Input/Output Return Loss: ⩾ 30 dB

Service Channel

Nominal Frequency Range: 0.3 to 3 kHz with 10 kHz signal tone.
Nominal Sensitivity: 50 kHz rms deviation for 25 mV rms.

Emphasis Networks (Optional)

Manufactured to CCIR recommendation 275-1, 405-1, and Bell 457A/B/D/E.
Accuracy: ± 0.2 dB (typically ± 0.1 dB).
Note: When CCIR emphasis selected, the BB Input/Output specifications are unchanged at the crossover frequency. However, when Bell emphasis is selected the following specifications apply:
BB Input (Telephony) Sensitivity: 141 kHz rms deviation for –32 dBm ± 1 dB at crossover frequency.
BB Output (Telephony) Level: –33 dBm ± 1 dB for 141 kHz rms deviation at crossover frequency.

General

Power Requirements: 100, 120, 220, 240V ac, +5 –10%, 48 to 66 Hz; consumption 150 VA.
Dimensions: 88 mm (3.5 in) high, 426 mm (16.75 in) wide. 498 mm (19.6 in) deep.
Weight: 13.6 kg (30 lb), net.
Operating Temperature Range: 0 to 40°C.

Options

CONNECTORS (select any one)
Std : BNC.
003 : Siemens 1.6/5.6 mm.
004 : WECO 477B equivalent, with 124Ω bal/75Ω unbal converter.
BB Frequency Response (60 kHz to 10 MHz): ⩽ ± 0.4 dB.
Return Loss (100 kHz to 10 MHz): ⩾ 26 dB.

EMPHASIS NETWORKS (up to five may be installed)

CCIR		BELL	
011	24 channel	**021**	525 line
012	60 channel	**022**	625 line
013	120 channel	**023**	819 line
014	300 channel	**031**	600 channel
015	600 channel	**032**	900 channel
016	960 channel	**033**	1200 channel
017	1260 channel	**034**	1500 channel
018	1800 channel	**035**	1800 channel

MISCELLANEOUS

006	delete Modulator section.	**146**	combination of Options 004, 006.
007	delete Demodulator section.	**147**	combination of Options 004, 007.
100	HP-IB (listener only).	**908**	Rack Mount Kit.
136	combination of Options 003, 006.	**909**	Front Handle/Rack Mount Kit.
137	combination of Options 003, 007.	**910**	Extra Manual.

Notes

1. Up to max frequency of emphasis network.
2. With no emphasis network selected.
3. Measured on an HP Microwave Link Analyzer (MLA). For Diff Gain/Diff Phase the following test tones are used: Telephony, 5.6 MHz; Video, 3.58 or 4.43 MHz.
4. As Note 3, with 625 line video emphasis inserted and HP MLA sweep voltage calibrated for 1.4V pk-pk.

Table 1-2 Recommended Test Equipment

Instrument	Critical Specification	Recommended Model	Use*
Network Analyzer	Freq 50Hz – 10MHz Freq Response +–0.05dB	hp 3040A Opt 111/121	P, A, O, T
Spectrum Analyzer	Freq 60 – 80MHz Accuracy +–1dB	hp 141T/8552B/8553B	P, T
Tracking Generator	Freq 60 – 80MHz Output 0dBm Compatible with 60 – 80MHz Spectrum Analyzer	hp 8443A	P
Spectrum Analyzer	Freq 50Hz – 10MHz Residual Response –115dBm with 300Hz Bandwidth	hp 3585A	P
Signal Generator	Freq 70MHz Spurious not detectable	hp 8640A/B	P
Square Wave Generator	50Hz Square wave, 1V p-p/75 ohm	hp 3311A	P
Frequency Counter	70MHz, 10 second gate time	hp 5383A	P, A, O
Power Meter	Accuracy @ 70MHz +–1dB Impedance 75 ohm	hp 435A/8483A	P, O
Microwave Link Analyzer 70MHz IF/BB Generator	Unique	hp 3710A/3716A or hp 3711A/3791A	P, A T, O
70MHz IF/BB Receiver	Unique	hp 3702B/3705A or hp 3712A/3793A	P, A T, O
White Noise Test Set	NPR Measurement Range 70dB	Marconi TF2091, TF2092C	P, O, A
NPR Filters for White Noise Test Set Generator	60kHz Highpass 4100kHz, 8160kHz Lowpass 70kHz, 534kHz, 1248kHz, 2438kHz 3886kHz, 5340kHz, 7600kHz.	Marconi	P, O, A
NPR Filters for White Noise Test Set Receiver	Bandpass 70kHz, 534kHz, 1248kHz 2438kHz, 3886kHz, 5340kHz, 7600kHz	Marconi	P, O, A
Oscilloscope	Vert, Sensitivity 5mV	hp 1740A	P, A, T
DVM	Sensitivity 1mV	hp 3465A	A
Desktop Computer	Unique	hp 9825A	P,T
HP-IB Interface	Unique	hp 98034A	P,T
75 Ohm Feedthrough (2 off)	Accuracy +–1%	hp 11094B	P, A
75 Ohm Load (2 off)	Accuracy +–1%	hp 15522C	P, A
Unbalanced Return Loss Bridge	Freq 10kHz – 10MHz Impedance 75 ohm Balance >40dB	hp 15590A	P
1800 Ch. Emphasis Network	Unique	hp 03717-60058	P
Balanced Return Loss Bridge Kit	Freq 10kHz – 10MHz Bal. Reference 124 ohm Balance >35dB	hp 15594A	P
Logic Probe	–	hp 10525T	T
6dB Hybrid (70MHz Return Loss Bridge)	Freq 60 – 80MHz	hp 15520C	P, A
17dB Mismatch	Unique	hp 15521A	P, A

* P = Performance Tests, A = Adjustments, T = Troubleshooting, O = Operation Verification

SECTION II
INSTALLATION

2-1 INTRODUCTION

This section provides the information needed to install the 3717A. Included is information pertinent to initial inspection, power requirements, line voltage selection, power cables, inter-connection, environment, instrument mounting, storage and shipment. In addition, this section also contains the procedure for setting the internal HP-IB listen address switches.

2-2 INITIAL INSPECTION

WARNING

To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the outer enclosure (covers, panels, meters).

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. The contents of the shipment should be as shown in Figure 1-1. Procedures for checking electrical performance are given in Section IV. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the electrical performance tests, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for the carrier's inspection.

2-3 PREPARATION FOR USE

Front Handles

Remove the dummy handles fitted for shipping and fit the front handles according to the instructions packed with them. Keep the dummy handles for future use.

Power Requirements

The 3717A requires a power source of 100, 120, 220, or 240V ac, +5% to −10%, 48 to 66Hz single phase. Power consumption is 150VA maximum.

WARNING

This is a Safety Class I product (i.e. provided with a protective earth terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and be secured against unintended operation.

If this instrument is to be energized via an external autotransformer, make sure the autotransformer's common terminal is connected to the earthed pole of the power source.

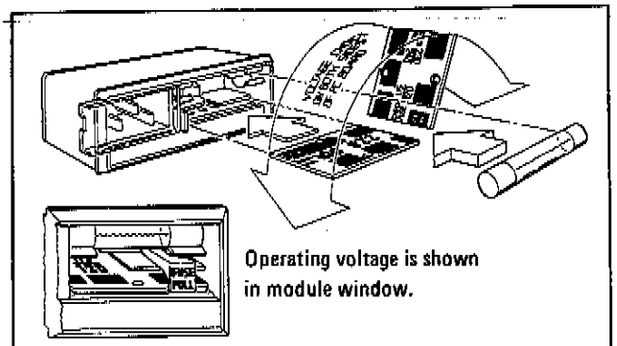
Line Voltage and Fuse Selection

CAUTION

Before plugging this instrument into the Mains (line) voltage, be sure the correct voltage and fuse have been selected.

Verify that the line voltage selection card and the fuse are matched to the power source. Refer to Figure 2-1 Line Voltage and Fuse Selection.

Fuses may be ordered under HP part number 2110-0303 2A (250V slow blow) for 100/120V ac operation and 2110-0007 1A (250V slow blow) for 220/240V ac operation.



SELECTION OF OPERATING VOLTAGE

1. Open cover door, pull the FUSE PULL lever and rotate to left. Remove the fuse.
2. Remove the Line Voltage Selection Card. Position the card so the line voltage appears at top-left cover. Push the card firly into the slot.
3. Rotate the Fuse Pull lever to its normal position. Insert a fuse of the correct value in the holder. Cose the cover door.

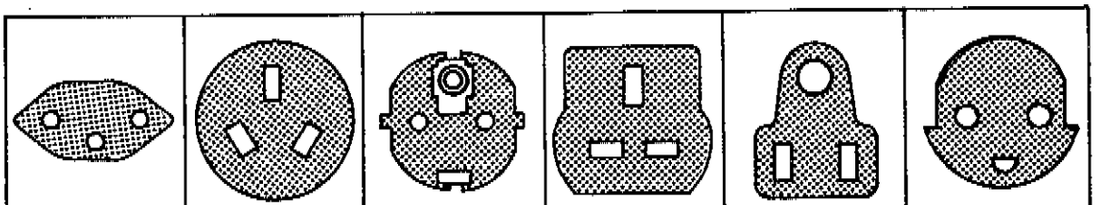
Figure 2-1 Line Voltage and Fuse Selection

Power Cables

WARNING

Before connecting this instrument, the protective earth terminals of this instrument must be connected to the protective conductor of the (Mains) power cord. The Mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord (power cable) without a protective conductor (grounding).

This instrument is equipped with a three-wire power cable. When connected to an appropriate ac power receptacle, this cable grounds the instrument cabinet. The type of power cable plug shipped with each instrument depends on the country of destination. Refer to Figure 2-2 for the part numbers of the power cable available.



8120-2104	8120-1369	*8120-1689	8120-1351	8120-1378	8120-2956

Colour codes for each cable are: LINE-Brown, NEUTRAL-Blue, EARTH-Green/Yellow.

Figure 2-2 Power Cable and Mains Plug Part Numbers

2-4 HP-IB ADDRESS SELECTION (OPTION 100)

WARNING

This task should be performed only by service trained persons who are aware of the potential shock hazard of working on an instrument with protective covers removed.

To avoid hazardous electrical shock, the line (Mains) power cable should be disconnected before attempting to change the HP-IB address.

In the 3717A Option 100 the HP-IB listen address is selectable by an internal switch. The following procedure explains how the switch is to be set. Refer to Table 2-1 for a listing of addresses. The address is factory set to "1". In binary, this is 00001, in decimal it is 01. To change the HP-IB address, the top cover of the 3717A Option 100 must be removed.

(a) Disconnect the line (Mains) power cable.

(b) Remove any HP-IB cables or connectors from the HP-IB connector.

(c) Remove the top cover.

(d) Remove the central metal strap holding the printed circuit boards.

(e) Locate the HP-IB Assembly A9 near the rear of the instrument. The A9 assembly may be recognised as having one black and one white printed circuit board extractor.

(f) Lift the printed circuit board extractor and raise the A9 assembly far enough to allow the address switches to be set.

(g) Use a pencil to set the switches to the desired HP-IB listen address. The switch is illustrated in Figure 2-3. Facing the board, the left hand switch is the LEAST significant address bit (A5 in Table 2-1). Setting a switch "up" towards the black dot on the switch body places it in its "0" position.

(h) Reinstall the A9 assembly, the central metal strap and the top cover.

(i) Connect the line (Mains) power cable to the Line Power Module and reconnect the HP-IB cable to the HP-IB connector.

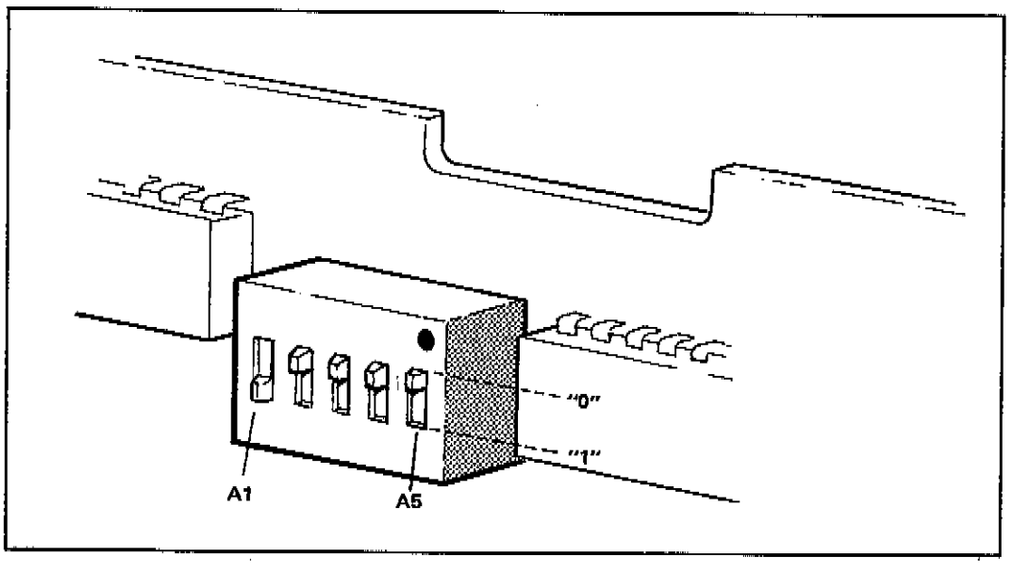


Figure 2-3 The HP-IB Address Switch shown as set by the Factory. The Address shown is 00001 in Binary

2-5 EMPHASIS NETWORK INSTALLATION

WARNING

This task should be performed only by service trained persons who are aware of the potential shock hazard of working on an instrument with protective covers removed.

To avoid hazardous electrical shock, the line (Mains) power cable should be disconnected before attempting to change emphasis networks.

It may be necessary at some time, eg during performance testing to either exchange or add an emphasis network, if so use the following procedure:

(a) Disconnect the line (Mains) power cable.

(b) Remove the two upper rear feet if fitted and the top cover.

(c) Remove the central metal scrap securing the pc boards.

(d) Locate the emphasis pc assemblies towards the front of the instrument. There are five emphasis network locations marked A50EMP1 to A50EMP5 on the mother board, they can also be identified by their green and black pc guides and extractors.

(e) In order that the emphasis network being installed can be identified from the front panel remove one of the two plastic button labels, they are a push fit in the pc board, and fit it in the position on the front panel which corresponds to the position to be used on the mother board – the front panel is marked adjacent to the respective buttons, E1 to E5 which correspond with the mother board locations EMP1 to EMP5.

(f) Fit the emphasis pc board in the position chosen, replace the metal strap, the rear feet if required, the top cover and reconnect the line (Mains) power cable.

2-6 INTERCONNECTIONS

Interconnection data for the Hewlett-Packard Interface Bus is provided in Figure 2-4.

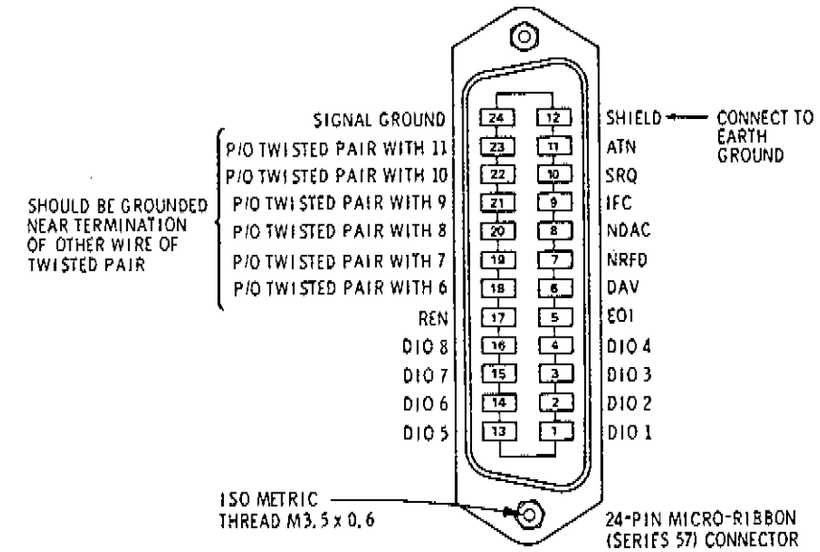
2-7 MATING CONNECTORS

Interface Connector

The HP-IB mating connector is shown in Figure 2-4. Note that the two securing screws are metric.

Service Channel Jack Plug

The jack plug connections are shown in Figure 2-5.



Logic Levels

The Hewlett-Packard Interface Bus logic levels are TTL compatible, ie., the true (1) state is 0.0V dc to +0.4V dc and the false (0) state is +2.5V dc to +5.0V dc.

Programming and Output Data Format

Refer to Section III (Operation).

Mating Connector

HP1251-0293; Amphenol 57-30240.

Mating Cables Available

HP10833A, 1 metre (3.3ft)
HP10833B, 2 metres (6.6ft)
HP10833C, 4 metres (13.2ft)
HP10833D, 0.5 metres (1.6ft)

Cabling Restrictions

1. An HP-IB System may contain no more than 2 metres (6ft) of connecting cable per instrument.
2. The maximum accumulative length of connecting cable for any HP-IB System is 20.0 metres (65.6ft).

Figure 2-4 Hewlett-Packard Interface Bus Connection

Coaxial Connectors

Coaxial mating connectors used with the 3717A should be 75 ohm BNC male connectors for the standard instrument, Siemens 1.6/5.6mm male connectors for Option 003 instruments and WECO 477B or the commercial equivalents for Option 004 instruments.

2-8 OPERATING ENVIRONMENT

The operating environment should be within the following limitations and protected from temperature extremes which cause condensation within the instrument

Temperature	0 to +40C
Humidity	<95% relative
Altitude	<4570 metres (15,000 feet)

2-9 BENCH OPERATION

The instrument cabinet has plastic feet which are shaped to ensure self-aligning of the instruments when stacked.

2-10 RACK MOUNTING

Rack mounting information is provided with the rack mounting kits. If the kits were not ordered with the instrument as options, they may be ordered through the nearest Hewlett-Packard office. Refer to Paragraph 1-6 in Section I.

2-11 STORAGE AND SHIPMENT

Environment

The instrument should be stored in a clean, dry environment. The following environmental limitations apply to both storage and shipment. Protect the instrument from temperature extremes which cause condensation within the instrument.

Temperature	−55 to +65C
Humidity	<95% relative
Altitude	<15300 metres (50,000 feet)

Packaging

Original Packaging. Containers and materials identical to those used in the factory are available through Hewlett-Packard offices. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number and full serial number. Also mark the container FRAGILE to ensure careful handling. In any correspondance refer to the instrument by model number and full serial number.

Front Handles. Before packing the instrument remove the front handles and fit the dummy handles which were fitted when the instrument was first shipped.

Other Packaging. The following general instructions should be used for repackaging with commercially available materials:

(a) Wrap the instrument in heavy paper or plastic. (If shipping to a Hewlett-Packard office or

service centre, attach a tag indicating the service required, return address, model number and full serial number.)

(b) Use a strong shipping container. A double-wall carton made of 2.4MPa (350psi) test material is adequate.

(c) Use enough shock-absorbing material (75 to 100mm layer, 3 to 4 inches) around all sides of the instrument to provide a firm cushion and prevent movement inside the container. Protect the front panel with cardboard.

(d) Seal the shipping container securely.

(e) Mark the shipping container FRAGILE to ensure careful handling.

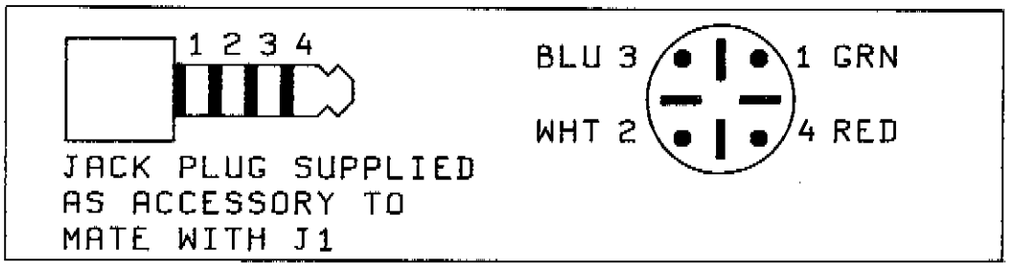


Figure 2-5 Jack Plug Connections

Table 2-1 Allowable HP-IB Address Codes

Address Switches					Talk* Address Character	Listen Address Character	Decimal Equivalent
A5	A4	A3	A2	A1			
0	0	0	0	0	@	SP	0
0	0	0	0	1	A	!	1 †
0	0	0	1	0	B	"	2
0	0	0	1	1	C	#	3
0	0	1	0	0	D	$	4
0	0	1	0	1	E	%	5
0	0	1	1	0	F	&	6
0	0	1	1	1	G	'	7
0	1	0	0	0	H	(	8
0	1	0	0	1	I	)	9
0	1	0	1	0	J	*	10
0	1	0	1	1	K	+	11
0	1	1	0	0	L	,	12
0	1	1	0	1	M	-	13
0	1	1	1	0	N	.	14
0	1	1	1	1	O	/	15
1	0	0	0	0	P	0	16
1	0	0	0	1	Q	1	17
1	0	0	1	0	R	2	18
1	0	0	1	1	S	3	19
1	0	1	0	0	T	4	20
1	0	1	0	1	U	5	21
1	0	1	1	0	V	6	22
1	0	1	1	1	W	7	23
1	1	0	0	0	X	8	24
1	1	0	0	1	Y	9	25
1	1	0	1	0	Z	:	26
1	1	0	1	1	[	;	27
1	1	1	0	0	\	<	28
1	1	1	0	1	]	=	29
1	1	1	1	0	^	>	30

*The 3717A is not a talker. †Factory set address

SECTION III
OPERATION

3-1 INTRODUCTION

This section provides the information necessary to operate the 3717A Modulator-Demodulator. It describes its operating characteristics, modes of operation and front panel controls and indicators.

3-2 OPERATING CHARACTERISTICS

The 3717A contains a modulator and a demodulator designed for use on 70MHz IF radio links. The instrument can be used with either telephony or video BB signals, with or without a wide range of optional emphasis networks. (Refer to Table 1-1 Specifications for a complete list.) Flexibility of the instrument is enhanced by the inclusion of a separate 15dB step attenuator and a sub-baseband service channel.

Modulator

The Telephony input has a frequency range of 10kHz to 10MHz and for 141kHz rms deviation requires an input of −37dBm. The sensitivity can be altered in the Uncal mode by +8dB and −4dB by means of a screwdriver adjustment on the front panel. The Video input has a frequency range of 50Hz to 10MHz and to produce 8MHz p-p deviation requires 1V pk-pk. The video signal can be inverted to produce the modulation sense required. The two IF outputs both provide swept IF signals centred on 70MHz at +5dBm.

Demodulator

The IF input should be between 60 and 80MHz centred on 70MHz and be between −10 and +6dBm. The Telephony output has a frequency range of 10kHz to 10MHz and produces a level of −28dBm for 141kHz rms deviation of the IF Input signal. The video output has a frequency range of 50Hz to 10MHz and produces a level of 1V pk-pk for 8MHz pk-pk deviation. As in the modulator section, the demodulated video signal can be inverted if required.

3-3 PANEL FEATURES

Front and rear panel features are described in Figure 3-1.

3-4 OPERATORS CHECKS

The operator may make a quick evaluation of the instrument by checking the turn-on conditions listed in paragraph 3-5. If further verification is required, the Operation Verification Tests in Section IV should be performed.

3-5 TURN-ON CONDITIONS

At turn-on the instrument resets the controls as follows:

* Local mode (REMOTE indicator off)
* Unaddressed (LISTEN indicator off)
* Calibrated (UNCAL indicator off)
* Emphasis off (OFF indicator on)
* Telephony mode (TELEPHONY indicator on)

3-6 LOCAL OPERATION

Local operation is largely self-explanitory. Refer to Figure 3-1 for a description of the controls and connectors. All the operator is required to do is to make the appropriate connections to/from the modulator and/or the demodulator, select the appropriate mode with the I/O SELECT keys and select the emphasis network corresponding to the system being tested with the EMPHASIS keys. Figure 1-2 shows the 3717A in a typical test setup. Other configurations are possible but are not shown because the general operating procedure is the same.

3-7 REMOTE OPERATION

The 3717A Modulator-Demodulator is capable of remote operation via the Hewlett-Packard Interface Bus (HP-IB if Option 100 is fitted. Instructions pertinent to HP-IB operation follow. In addition to the information in this section, HP-IB address changing instructions appear in Section II of this manual.

All the Modulator-Demodulator controls except the LINE switch, the ATTENUATOR and the SERVICE CHANNEL are programmable via the HP-IB. A check of the HP-IB operation is described in the Operation Verification Tests in Section IV of this manual. This checks that the Modulator-Demodulator responds to each of the applicable bus messages described in the Message Reference Table 3-1.

3-8 HP-IB Compatibility

The Modulator-Demodulator's compatability as defined in the IEEE Standard 488-1978 and the ANSI Standard MC1.1 is as follows: SH0, AH1, T0, TE0, L2, LE0, SR0, RL2, PP0, DC1, DT0, C0.

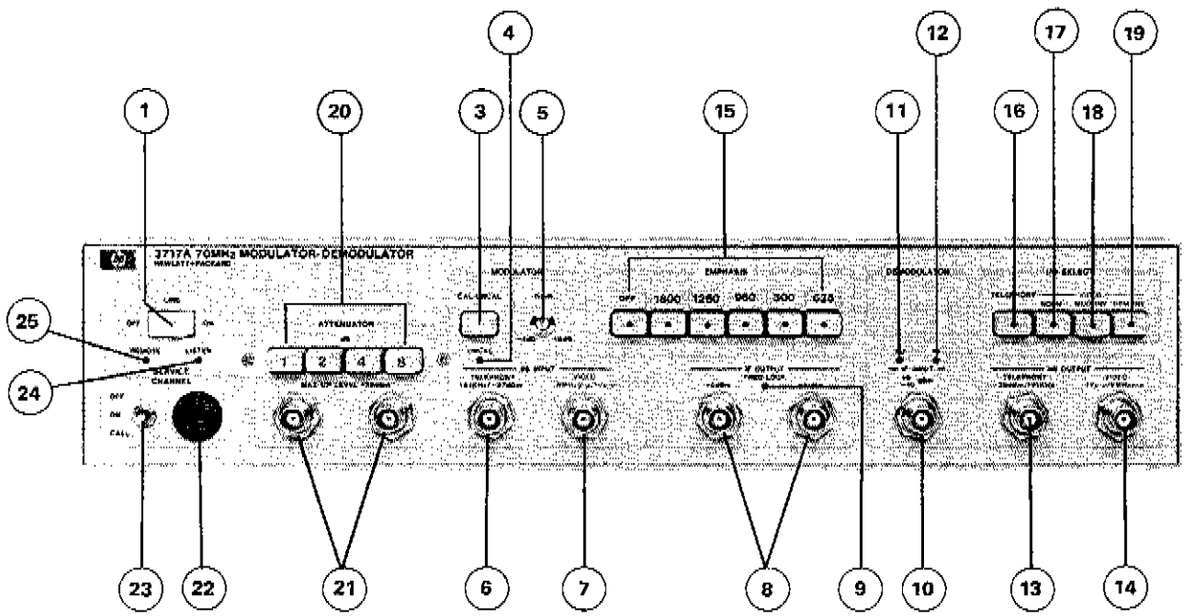


Figure 3-1 Front Panel Features

Note: The annotation of baseband controls and connectors is colour coded as follows:

BLACK = CCIR TELEPHONY GREEN = BELL TELEPHONY BLUE = VIDEO

POWER

(1) LINE switch applies power to the instrument.

(2) LINE connector and fuse, see Section II for details.

MODULATOR

(3) CAL/UNCAL key selects calibrated sensitivity or variable uncalibrated sensitivity.

(4) UNCAL indicator shows that the modulator sensitivity is uncalibrated.

(5) GAIN screwdriver adjustment can vary the modulator sensitivity by +8dB to −4dB in the UNCAL mode.

(6) TELEPHONY BB INPUT when selected by the TELEPHONY I/O SELECT key connects the telephony baseband signal to the modulator.

(7) VIDEO BB INPUT when selected by one of the VIDEO I/O SELECT keys connects the video baseband signal to the modulator.

(8) IF OUTPUT, two independent 70MHz IF outputs at +5dBm.

(9) FREQ LOCK indicator indicates that the IF output is locked to the internal AFC crystal reference.

DEMODULATOR

(10) IF INPUT connects the 70MHz centred IF signals to the demodulator.

(11) LO IF INPUT indicator indicates that the IF input is below approx. −10dBm.

(12) HI IF INPUT indicator indicates that the IF input is above approx. +6dBm.

(13) TELEPHONY BB OUTPUT is connected to the demodulator when selected by the TELEPHONY I/O SELECT key.

(14) VIDEO BB OUTPUT is connected to the demodulator when selected by one of the VIDEO I/O SELECT keys.

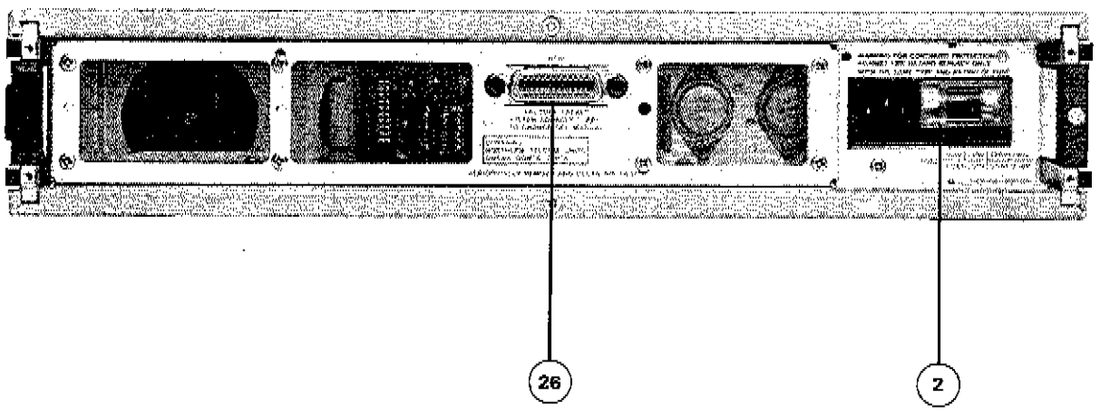


Figure 3-1 Rear Panel Features

EMPHASIS

(15) EMPHASIS keys select one of five pre- and de-emphasis networks. Note that networks supplied may differ from those shown, see list of optional networks in Table 1-1. To install optional networks, refer to Section II, paragraph 2-5.

I/O SELECT

(16) TELEPHONY key connects the TELEPHONY BB INPUT to the modulator and the demodulator to the TELEPHONY BB OUTPUT.

(17) VIDEO NORM key connects the VIDEO BB INPUT to the modulator and the demodulator to the VIDEO BB OUTPUT.

(18) VIDEO MOD INV key inverts the video signal (selected by the VIDEO NORM key) between the VIDEO BB INPUT and the modulator.

(19) VIDEO DEM INV key inverts the video signal (selected by the VIDEO NORM key) between the demodulator and the VIDEO BB OUTPUT.

ATTENUATOR

(20) dB keys select attenuation in 1dB steps up to 15dB. Note that this function can not be remotely controlled.

(21) ATTENUATOR INPUT/OUTPUT connectors, can be used at BB or IF.

SERVICE CHANNEL

(22) Jack Socket connects handset to modulator/demodulator service channel.

(23) Three position switch enables the microphone and buzzer circuits and allows a remote instrument to be called with a 10kHz signalling tone.

HP-IB (Option 100)

(24) LISTEN indicator, on when the instrument is connected to the HP-IB and addressed to listen.

(25) REMOTE indicator, on when the instrument is set to remote by the HP-IB controller.

(26) HP-IB connector, see Section II for details.

3-9 Remote Mode

Remote Capability

In remote, most of the front panel controls except for the LINE, ATTENUATOR, and SERVICE CHANNEL are disabled. When addressed to listen (the 3717A is a listener only) it will respond to the Data, Clear (SDC) and Local messages. Whether addressed or not, it will respond to the Clear (DCL) and Abort messages.

Local-to-Remote Change

The instrument switches to remote upon receipt of the Remote message which is in two parts. First, the Remote Enable bus control line (REN) is set true by the controller, then the Device Listen Address must be received once while REN is true. When in the Remote mode, both the LISTEN and REMOTE indicators are on. The control settings remain unchanged with the remote-to-local transition.

3-10 Local Mode

Local Capability

In Local the front panel controls are all fully operational and if addressed the instruments will respond to the Remote message. Whether addressed or not it will respond to the Clear (DCL) and Abort messages.

Remote-to-Local Change

The instrument switches to local control from remote on receipt of the Local message (GTL). The control settings remain unchanged with the local-to-remote transition.

3-11 Addressing

The instrument interprets the byte on the eight data lines as an address or a command if the bus is in the command mode ATN true and IFC false. Whenever the instrument is addressed (whether in local or remote) the LISTEN indicator will turn on.

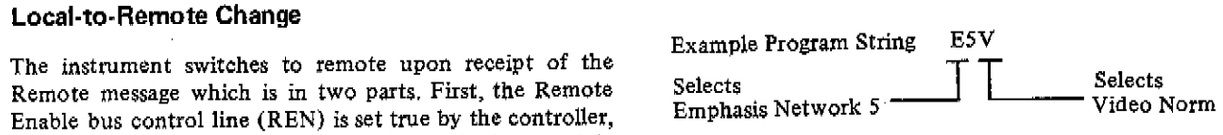
The listen address (the instrument is a listener only) is switch selectable as described in Section II of this manual. Refer to Table 2-1 for a list of all valid HP-IB listen address codes.

3-12 Data Messages

Communication with the 3717A on the HP-IB is mainly via data messages. Data messages consist of one or more bytes (which include the Program Codes listed in Table 3-2) sent over the eight data lines when the bus is in the data mode (ATN false). The 3717A is a listener only and as such, when addressed, can only receive data messages, it cannot send them. All but three of the controls available in local mode are available in remote via data messages. The exceptions are the LINE switch, the ATTENUATOR and the SERVICE CHANNEL switch. However, operation of these controls is not inhibited in the remote mode. For convenience the program codes are printed on the front panel adjacent to each programmable key as well as in Table 3-2.

3-13 Receiving the Data Message

The data message, or program string, consists of one or more ASCII codes. Each code is equivalent to a front panel key-stroke in local mode. The example below shows a typical data message for selecting two functions. The order in which the functions are selected is irrelevant.



Note that in the remote mode, unlike the local mode, emphasis positions can be selected whether or not an emphasis network is fitted in that position.

3-14 Receiving the Clear Message

The 3717A responds to the Clear message by assuming the settings below:

* Remote mode (REMOTE indicator on)
* Addressed (LISTEN indicator on)
* Calibrated (UNCAL indicator off)
* Emphasis off (OFF indicator on)
* Telephony mode (TELEPHONY indicator on)

The response is the same to both SDC when addressed and to DCL whether addressed or not.

3-15 Receiving the Remote Message

The controller sets the REN bus control line true then sends the device listen address. The two actions combine to put the 3717A into the remote mode. Thus, the 3717A is enabled to go to remote at the start of the Remote message but does not actually switch to remote until it receives the listen address. The control settings are unchanged by the transition from local to remote. When in remote, the front panel REMOTE indicator will be on.

3-16 Receiving the Local Message

The Local message is the means by which the controller sends the GTL command. When addressed to listen the 3717A returns to front panel control when it receives the Local message. No control settings are changed by the transition from remote to local. When in local, the front panel REMOTE indicator will be off. However, the LISTEN indicator will remain on.

3-17 Receiving the Abort Message

The Abort message is the means by which the controller sets the IFC bus control line true. When the Abort message is received, the 3717A becomes unaddressed, it stops listening and the LISTEN indicator will go off.

Table 3-1 HP-IB Message Reference Table

HP-IB Message	Applicable	Response	Related Commands & Cntls*	Interface Functions *
Data	Yes	All front panel functions except LINE, ATTENUATOR and SERVICE CHANNEL are programmable.		AH1
Trigger	No	The 3717A does not respond.		DT0
Clear	Yes	Sets Emp OFF, I/O to TELEPHONY, Mod Sensitivity to CAL	DCL	DC1
Remote	Yes	Remote mode enabled when REN set true by controller, remote mode not entered until 3717A addr'sd. REMOTE ind on when inst actually in remote. Cnt'l unaffected by transition.	REN	RL2
Local	Yes	3717A returns to frnt pnl cntl REMOTE ind off. Cntls unchanged.	GTL	RL2
Local Lockout	No	The 3717A does not respond.		RL2
Clr Lk't/ Set Local	No	The 3717A does not respond.		RL2
Pass Cntl/ Take Cntl	No	The 3717A has no control capability.		C0
Rqr Svce	No	The 3717A does not use SRQ line.		SR0
St's Byte	No	The 3717A is not a talker.		T0
St's Bit	No	The 3717A does not respond.		PP0
Abort	Yes	The 3717A stops listening.	IFC	L2

*Commands, control lines and interface functions are defined in IEEE Std. 488-1978 and ANSI MC1.1. Knowledge of these might not be necessary if your controllers manual describes programming in terms of the twelve HP-IB messages shown in the left hand column above.

Complete HP-IB capability as defined in IEEE Std. 488-1978 and ANSI MC1.1 is: SH0, AH1, T0, TE0, L2, LE0, SR0, RL2, PP0, DC1, DT0, C0.

Table 3-2 HP-IB Program Codes

Function	Program Code		Function	Program Code
Modulator			I/O Select	
CAL	C		TELEPHONY	T
UNCAL	U		VID NORM	V
			MOD INV on	J
Emphasis			MOD INV off	M
OFF	E0		DEM INV on	K
EMP 1	E1		DEM INV off	D
EMP 2	E2		BAL	B
EMP 3	E3		UNBAL	T
EMP 4	E4		(Telephony)	
EMP 5	E5			

SECTION IV
PERFORMANCE TESTS

4-1 INTRODUCTION

The procedures in this section test the instrument's electrical performance using the specifications in Table 1-1 as the performance standards. The procedures to test fully the specifications are summarized in Table 4-1 as are simpler Operation Verification checks. If a quick check that does not test any specifications is required, refer to the Operators Checks in Section III.

Note: Allow about 15 minutes for the instrument to warm-up before making any performance measurements.

4-2 OPERATION VERIFICATION

To ensure that the instrument is operating correctly without testing all the specifications in Table 1-1, Operation Verification checks are provided. These are an abbreviated version of the complete performance tests and are identified in Table 4-1 by ******.

A Functional test may be obtained by performing Paragraphs 8-9, 8-10 and 8-11 in Section VIII, and Paragraph 4-19 in this section.

4-3 TEST RECORD

Results of the performance tests may be recorded on the Test Record at the end of this section. The Test Record lists all the tested specifications and their acceptable limits.

4-4 PERFORMANCE VERIFICATION PERIOD

This instrument requires periodic performance verification. Depending on the use and environmental conditions, it should be checked at least once a year.

Table 4-1 Performance Tests & Operation Verification

Para. No.	Operation Verification	Performance Test
4-6		RETURN LOSS TESTS
4-7		PRE-EMPHASIS & SENSITIVITY TEST
4-8	******	BB INPUT & BB OUTPUT SENSITIVITY TEST
4-9		BB-IF SWEPT RESPONSE TEST
4-10	******	IF OUTPUT TEST
4-11		IF-BB SWEPT RESPONSE TEST
4-12		VIDEO DIFF GAIN/PHASE TEST
4-13		50Hz SQUARE WAVE TILT TEST
4-14	******	BB-to-BB RESPONSE & EMPHASIS TEST
4-15		OPTION 004 – BB-to-BB FREQUENCY RESPONSE TEST
4-16		DEMODULATOR TELEPHONY SPURIOUS RESPONSE TEST
4-17	******	1800 CHANNEL NOISE LOADING TEST
4-18		ATTENUATOR RANGE & FREQUENCY RESPONSE TEST
4-19		HP-IB FUNCTIONAL TEST

4-5 EQUIPMENT REQUIRED

Equipment required for the performance tests is listed in the Recommended Test Equipment Table in Section I and with each performance test. Any equipment that satisfies the critical specifications given in the table may be substituted for the recommended models.

Network Analyzer: The Network Analyzer used may be either a 50 or 75 ohm system. To allow a 50 ohm system to be used 50/75 ohm matching pads must be available. In order that the results of the network analyzer can be displayed on a standard oscilloscope, an external dc offset control is required as shown in Figure 4-1.

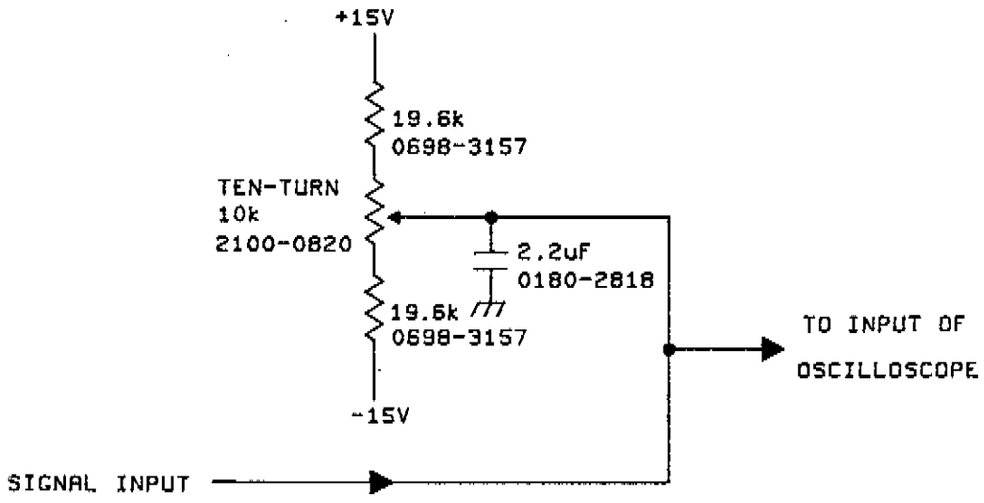


Figure 4-1 DC Offset Circuit for Network Analyzer

4-6 RETURN LOSS TESTS

SPECIFICATION

BB INPUT (10kHz to 10MHz) –	
TELEPHONY	>= 30dB
VIDEO	>= 28dB
BB OUTPUT (10kHz to 10MHz) –	
TELEPHONY/VIDEO	>= 30dB
IF OUTPUT (70MHz + – 10MHz)	>= 30dB
IF INPUT (70MHz + – 10MHz)	>= 30dB
ATTENUATOR (10kHz to 10MHz, 60 to 80MHz)	
INPUT/OUTPUT	>= 30dB
OPTION 004 – TELEPHONY (60kHz to 10MHz)	
BALANCED 124 ohm BB INPUT/OUTPUT	>= 26dB

DESCRIPTION

An Unbalanced 75 Ohm Return Loss Bridge is used to measure the power reflected by the INPUTs and OUTPUTs of the 3717A. A Spectrum Analyzer with a built-in Tracking Generator is used in conjunction with the return loss bridge to make swept measurements across the BB frequency range of 10kHz to 10MHz. The option 004 3717A is checked using a Balanced Return Loss Bridge. The 70MHz +–10MHz IF frequency range is checked using another Spectrum Analyzer and Tracking Generator and a 6dB Hybrid (70MHz Return Loss Bridge).

TEST EQUIPMENT

Spectrum Analyzer	hp 3585A	1
Return Loss Bridge (0.01-10MHz)	hp 15590A	1
75 Ohm Load	hp 15522C	2
Short Circuit Load	hp 1250-0929	2
6dB Hybrid (Return Loss Bridge70+–10MHz	hp 15520C	1
Balanced Return Loss Bridge*	hp 15594A	1
BNC/WECO Adapter*	hp 1251-0929	1
Spectrum Analyzer	hp 141T/9552B/8553B	1
Tracking Generator	hp 8443A	1

* Option 004 only.

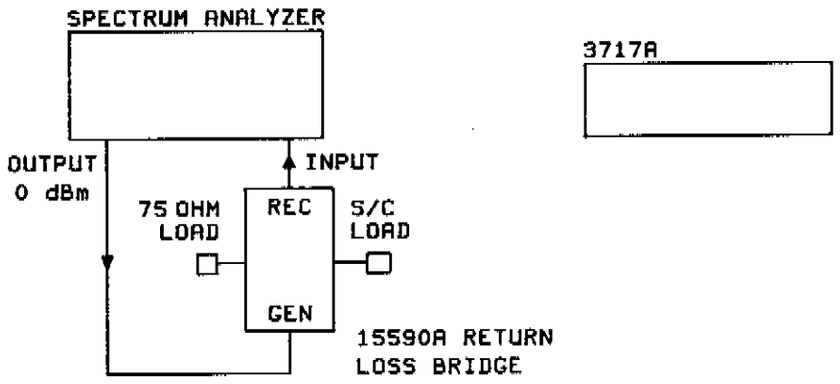


Figure 4-2 BB Return Loss Test

PROCEDURE

BB Return Loss (10kHz-10MHz)

1. Connect the equipment as shown in Figure 4-2.

2. Select "Instrument Preset" on the Spectrum Analyzer, and select the following parameters:

   IMPEDANCE . . . . . .75 Ohm
   CENTER FREQUENCY. 5MHz
   FREQUENCY SPAN 10MHz
   dB/Div 10

3. Adjust the Spectrum Analyzer controls to position the trace along the top line of the CRT graticule.

4. Remove the Short-Circuit Load from the Return Loss Bridge and replace it with a 75 Ohm Load. Check that the Spectrum Analyzer trace falls by at least 40dB.

5. Remove the 75 Ohm Load used in step 4, and replace it with a short BNC/BNC cable.

6. Select the 3717A BB INPUT – TELEPHONY and connect the short BNC cable to it.

7. Check that the Spectrum Analyzer trace is at least 30dB below the top graticule line.

8. Repeat steps 6 and 7 with the VIDEO BB INPUT and both BB OUTPUT connectors checking the applicable specification, namely:

   BB INPUT – VIDEO 28dB
   BB OUTPUT – TELEPHONY 30dB
   BB OUTPUT – VIDEO 30dB

Attenuator Return Loss (10kHz-10MHz)

9. Terminate the OUTPUT of the 3717A Attenuator in 75 Ohm and connect the short BNC cable to the INPUT.

10. Check that the Spectrum Analyzer trace drops by at least 30dB for all settings of the attenuator.

11. Remove the 75 Ohm Load from the OUTPUT of the Attenuator and connect it to the INPUT of the Attenuator, connect the short BNC cable to the OUTPUT of the Attenuator.

12. Check that the Spectrum Analyzer trace drops by at least 30dB with all settings of the Attenuator.

Option 004 — BB Input/Output Telephony (60kHz-10MHz)

13. Replace the 15590A Return Loss Bridge with the Balanced Return Loss Bridge.

14. Connect the equipment as shown in Figure 4-3.

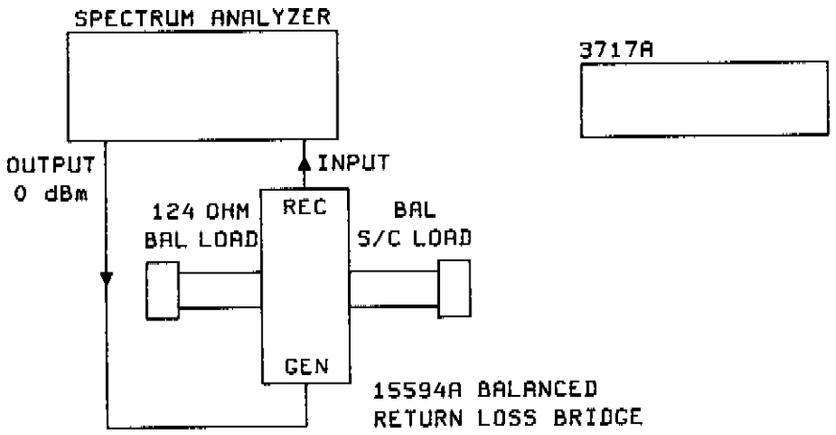


Figure 4-3 Balanced Return Loss Test

15. Adjust the Spectrum Analyzer controls to position the trace along the top line of the CRT graticule.

16. Remove the balanced short circuit load and replace it with the 124 ohm Balanced Load and check that the Spectrum Analyzer trace falls by at least 40dB.

17. Remove the 124 ohm Balanced Load from the signal port and connect this port to the BALANCED TELEPHONY BB INPUT using the BNC/WECO adapters.

18. Check that the Spectrum Analyzer traced falls by at least 26dB.

19. Disconnect the Balanced Bridge from the BB INPUT and connect it to the BALANCED TELEPHONY BB OUTPUT. Check that the trace on the Spectrum/Analyzer falls by at least 26dB.

IF Return Loss (70MHz ± 10MHz)

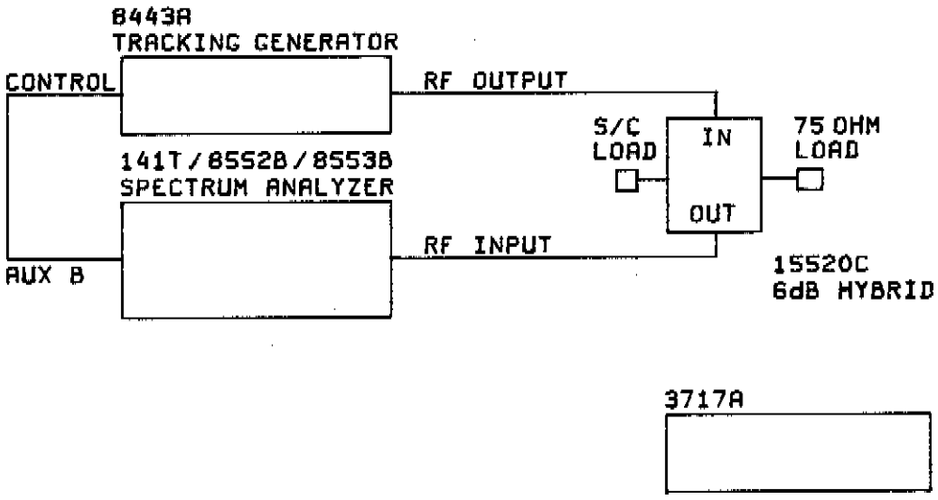


Figure 4-4 IF Return Loss Test

20. Connect the equipment as shown in Figure 4-4 and set the controls as follows:

    8443A

    OUTPUT LEVEL 0dBm
    FUNCTION . . . . . .TRACK ANALYZER

    8553B

    FREQUENCY TUNE. 70MHz
    SCAN WIDTH PER DIV. 2MHz
    BANDWIDTH. 30kHz
    INPUT ATTENUATOR 10dB

    8552B

    SCAN TIME/DIV 100ms
    LOG REF LEVEL. 0dBm
    VIDEO FILTER . . . . . .OFF
    SCAN MODE . . . . . .INT
    SCAN TRIGGER . . . . . .AUTO
    2dB LOG/10dB LOG/LIN. . . . . .10dB LOG

21. Adjust the 8552B LOG REF LEVEL control to place the trace near the top of the CRT. Adjust the 8443A ADJ control to peak the trace. Adjust the 8552B LOG REF LEVEL to place the trace at the LOG REF LEVEL (the top graticule line) of the CRT.

22. Remove the short circuit load and connect the 6dB Hybrid to the 3717A IF OUTPUTs and IF INPUTS in turn.

23. Check that the return loss of each port is at least 30dB, ignoring the spike at 70MHz on the IF OUTPUTS due to the internally generated 70MHz carrier.

Attenuator Return Loss (70MHz ±10MHz)

24. Connect the 6dB Hybrid to the 3717A Attenuator Input and terminate the Output in 75 ohm.

25. Check that the return loss is at least 30dB for all settings of the attenuator.

26. Reverse the connections to the Attenuator and repeat step 25.

4-7 PRE-EMPHASIS & SENSITIVITY TEST

SPECIFICATION

OPTIONS 011 through 018
Pre/De-emphasis networks for Telephony according to CCIR Recommendation 275-1
Accuracy: +–0.2dB

OPTIONS 031 through 037
Pre/De-emphasis networks for BELL Systems according to BELL 475A/B/D/E.
Accuracy: +–0.2dB

OPTIONS 021 through 023
Pre/De-emphasis networks for Television according to CCIR Recommendation 405-1.
Accuracy: +–0.2dB

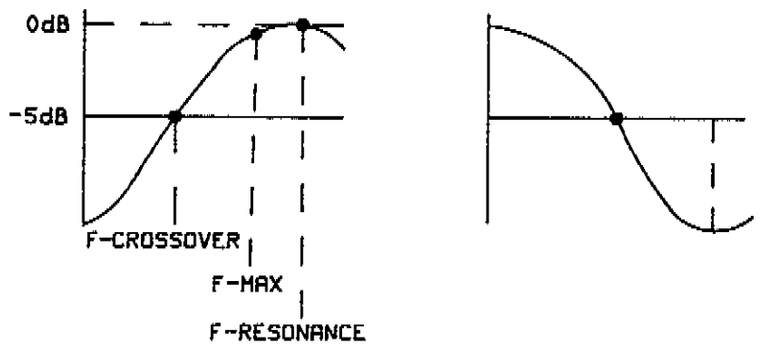


Figure 4-5 CCIR Pre-/De-emphasis Characteristics

DESCRIPTION

Figure 4-6 shows schematically the test setup used for this test.

CCIR Pre- and De-emphasis networks are based on resonant networks, as defined by the appropriate CCIR Recommendation. The series resonance transfer characteristic is used for the pre-emphasis shape, while the parallel resonance transfer characteristic is used for the de-emphasis shape. The first part of the test verifies the CCIR Pre-emphasis Networks at baseband frequencies by checking two points on the characteristic, namely at the cross-over frequency and at the 5dB resonant frequency, see Figure 4-5. As the CCIR De-emphasis shape is the exact opposite of the Pre-emphasis shape, by performing the BB-BB Frequency Response Test, Paragraph 4-14 the pre-/de-emphasis shape is checked against the BB-BB specification of +–0.2dB. Steps 8 and 23 check the "with emphasis" modulator or BB INPUT sensitivity of the CCIR Telephony and the CCIR Video Emphasis Networks.

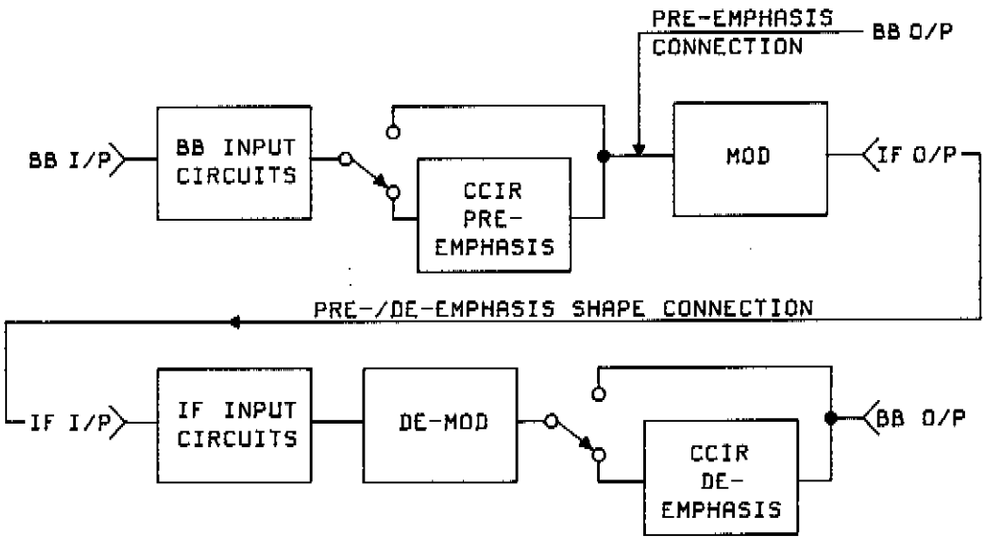


Figure 4-6 3717A Emphasis Shape Configuration

The BELL Telephony, and the CCIR Video Pre/De-emphasis Networks are non resonant networks based on CR and LR networks, respectively. The shape of the CR or Pre-emphasis networks are checked across their frequency range using a Network Analyzer, while the de-emphasis shape is checked, as for the CCIR Telephony networks by checking BB-BB Frequency Response. The variation in BB INPUT sensitivity when a BELL Network is selected, is checked by testing the loss of the Network at a particular frequency, allowing for an additional pad that reduces the sensitivity for all BELL Networks to the least sensitivie. The Network Analyzer used should ideally be a 75 ohm system but a 50 ohm system can be used if 50/75 ohm matching pads are available. To allow a standard oscilloscope to be used an external dc offset control must be used – see the introductory paragraphs of this section.

TEST EQUIPMENT

Network Analyzer	hp 3040A Opt 111/121	1
75 Ohm Feedthrough	hp 11094B	2
75/50 Ohm Matching Pad*	hp 85428B	2

*Only required if a 50 ohm Network Analyzer system is used.

PROCEDURE

WARNING

This procedure requires that the protective covers of the instrument to be removed. The procedure therefore should only be performed by qualified service personnel.

1. Remove the line cord from the instrument and remove the two upper rear feet if fitted before unscrewing the top cover.

2. Connect the Network Analyzer's "A" and "B" channels back-to-back via 75 ohm Feedthroughs, and 50/75 ohm Matching Pads if necessary.

3. Adjust the Amplitude Zero controls for a 0dB reading in the B-A mode of operation.

4. Disconnect the blue coded cable (W6) from A31J1 as shown in Figure 4-7, and connect a 75 ohm Conhex to BNC cable to A31J1, and to the Network Analyzer's "B" INPUT via the 75 Ohm Feedthrough. Reconnect the line cord to the 3717A and switch ON.

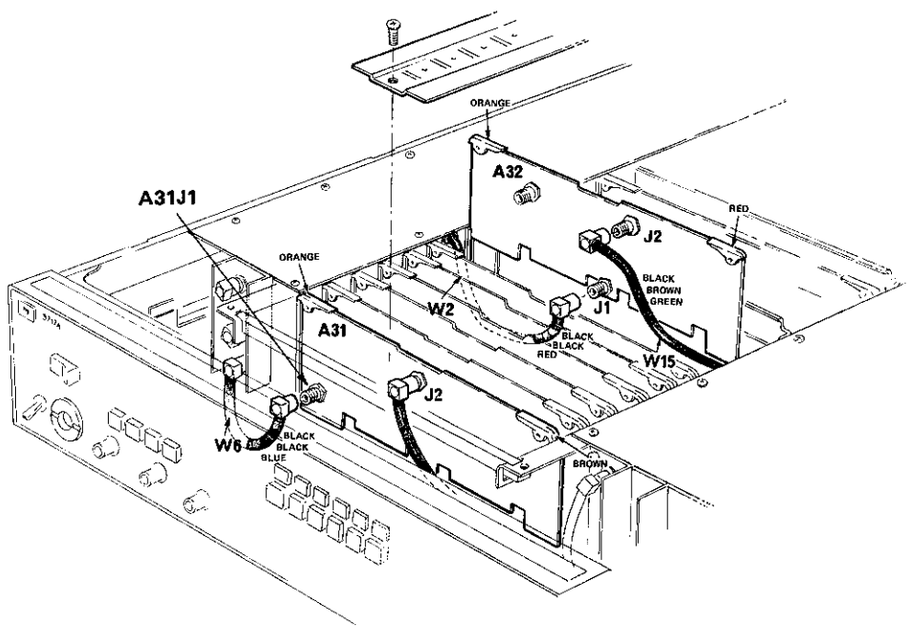


Figure 4-7 Internal Location of A31J1

5. Connect the equipment as shown in Figure 4-8, and proceed with step 6 for CCIR Networks, step 11 for BELL and step 20 for the VIDEO networks.

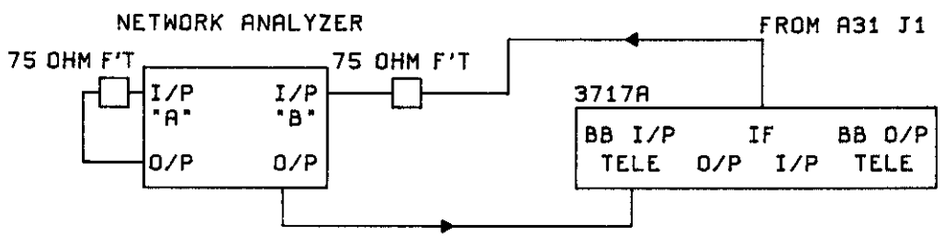


Figure 4-8 Pre-Emphasis Shape Test

CCIR Pre-Emphasis & Input Sensitivity

6. Set the Network Analyzer to the cross-over frequency, given in Table 4-2, of the first Emphasis Network of interest, and at a level of −10dBm.

7. Adjust the Amplitude Zero controls on the Network Analyzer to obtain a 0.00dB reading.

8. Select the CCIR Network of interest and check that the level display does not vary by more than +−1dB (typically 0.5dB).

9. Set the Network Analyzer to the resonant frequency, given in Table 4-2, and check the level reading is +5dB +−0.2dB.

Table 4-2 CCIR Emphasis Characteristics

Option Number	Channel Loading	Pre-emphasis Resonant Freq.	Cross-over Frequency
011	24	135kHz	66.23kHz
012	60	375kHz	183.98kHz
013	120	690kHz	338.98kHz
014	300	1625kHz	797.23kHz
015	600	3325kHz	1631.25kHz
016	960	5235kHz	2568.29kHz
017	1260	7045kHz	3456.28kHz
018	1800	10255kHz	5031.10kHz

10. Repeat steps 6 through 9 for each of the CCIR Emphasis Networks installed.

Bell Pre-emphasis Shape

11. Set the Network Analyzer to 10kHz at a level of −15dBm.

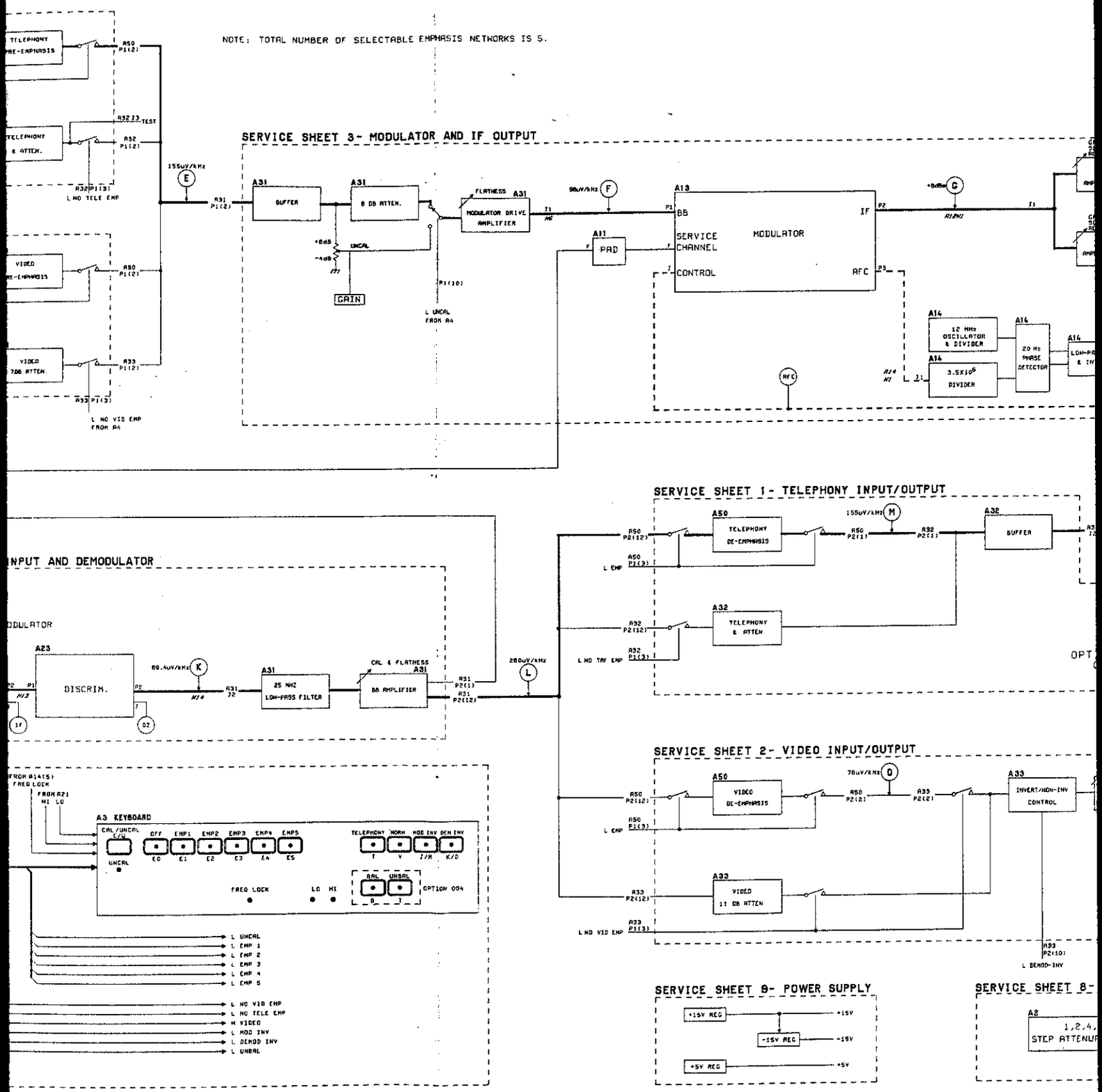
12. Adjust the Network Analyzer's "B" Amplitude Zero control for a 0.00dB reading with the first BELL EMPHASIS selected.

13. Program the Network Analyzer to 1MHz and check that the level reading is as per Table 4-3 +−0.2dB.

14. Program the Network Analyzer to 3MHz and 8MHz for Options 032 to 035, and check that the level reading is as per Table 4-3 +−0.2dB.

15. Repeat steps 11 through 14 for each of the BELL Emphasis Network installed.

Fig 8-4 Sht 2 of 3



23. Select the VIDEO Emphasis Network of interest and check that the level reading does not change by more than +–1dB (typically 0.2dB).

24. Adjust the Network Analyzer's "B" Amplitude Zero control for a level display of 0.00dB.

25. Set the Network Analyzer to each of the frequencies given in Table 4-4, except the 0.00dB frequency, and check that the level display indicates the correct level as per Table 4-4.

26. Repeat steps 21 through 25 for each of the VIDEO Emphasis Networks installed.

Table 4-4 VIDEO Pre-emphasis Characteristics

Option Number	Television Lines	Video Pre-emphasis Shape	
		Frequency	Level
021	525	50kHz	– 9.71dB
		762kHz	0.00dB
		5000kHz	3.28dB
022	625	50kHz	–10.91dB
		1512kHz	0.00dB
		5000kHz	2.59dB
023	819	50kHz	– 6.97dB
		1402kHz	0.00dB
		5000kHz	5.61dB

27. Switch the 3717A OFF and reconnect W6 to A31J1 – see Figure 4-7. Replace the top cover and if fitted, the two rear feet.

Note: To ensure that the de-emphasis characteristic is within specification the BB-BB FREQUENCY RESPONSE TEST must now be performed – refer to Paragraph 4-14.

4-8 BB INPUT & BB OUTPUT SENSITIVITY TEST

SPECIFICATION

BB INPUT Sensitivity

TELEPHONY – without Emphasis from 10kHz – 10MHz:	–37dBm +–1dB for 141kHz rms deviation.
TELEPHONY – with CCIR Emphasis at cross-over frequency:	–37dBm +–1dB for 141kHz rms deviation.
TELEPHONY – with BELL Emphasis at cross-over frequency:	–32dBm +–1dB for 141kHz rms deviation.
VIDEO – without Emphasis from 50Hz – 10MHz:	1V pk-pk +–0.1V for 8MHz pk-pk deviation.
VIDEO – with CCIR Emphasis at cross-over frequency:	1V pk-pk +–0.1V for 8MHz pk-pk deviation.

BB OUTPUT Sensitivity

TELEPHONY – without Emphasis from 10kHz to 10MHz:	–28dBm +–1dB for 141kHz rms deviation.
TELEPHONY – with CCIR Emphasis at cross-over frequency:	–28dBm +–1dB for 141kHz rms deviation.
TELEPHONY – with BELL Emphasis at cross-over frequency:	–33dBm +–1dB for 141kHz rms deviation.
VIDEO – without Emphasis from 50Hz to 10MHz:	1V pk-pk +–0.1V for 8MHz pk-pk deviation.
VIDEO – with Emphasis at cross-over frequency:	1V pk-pk +–0.1V for 8MHz pk-pk deviation.

DESCRIPTION

The Modulator sensitivity, or BB INPUT Sensitivity is measured using the Bessel Zero method to set up a known deviation according to the formula:

$$Fdev(pk) = Fmod \times M$$

where M = Modulation Index

If Fdev = 141kHz (rms) = 199.40kHz (pk) and M = 2.4048 (the first carrier null) then:

$$\begin{aligned} Fmod &= 199.40/2.4048 \\ &= 82.92kHz \end{aligned}$$

Using a synthesizer to provide a test-tone of 82.92kHz the amount of deviation can be set by observing on a Spectrum Analyzer the 70MHz carrier nulling while varying the baseband power level. This method is used to preset the deviation to 141kHz rms without an Emphasis Network selected. The "with emphasis" specification is checked during the Pre-Emphasis Shape Test (Paragraph 4-7) and the BB-BB Frequency Response Test (Paragraph 4-14). In the Pre-Emphasis Shape Test the change in level of the modulator drive signal is checked within the specification of +–1dB with and without the pre-emphasis network. The BB-BB Frequency Response Test checks that the De-emphasis Networks match the Pre-emphasis Networks resulting in a BB response of less than 0.4dB. The VIDEO specification is checked using the Bessel Zero method to determine the baseband frequency at which the first carrier null occurs when the Modulation Index is 2.4048, and the deviation required is 8MHz pk-pk or 4MHz.

$$\begin{aligned} Fmod &= Fdev(pk)/M \\ &= 4000/2.4048 \\ &= 1663.34kHz \end{aligned}$$

With the modulator deviation preset to 8MHz pk-pk the BB INPUT Sensitivity is checked without a VIDEO Emphasis Network selected. As for the TELEPHONY INPUT the VIDEO with emphasis specification is checked by the Pre-emphasis Shape Test (Paragraph 4-7) and the BB-BB Frequency Response Test (Paragraph 4-14).

The BB OUTPUT Sensitivity is tested by setting up the correct deviation from the Modulator and driving the IF INPUT with the 70MHz FM Carrier from the IF OUTPUT. The BB OUTPUT Sensitivity across the frequency range is checked as for the BB INPUT Sensitivity, by the BB-BB Frequency Response Test (Paragraph 4-14).

TEST EQUIPMENT

Network Analyzer	hp 3040A Opt 111/121	1
Spectrum Analyzer	hp 141T/8552B, 8553B	1
75 Ohm Feedthrough	hp 11094B	2
50/75 Ohm Matching Pad*	hp 85428B	2

*Required if Network Analyzer is a 50 ohm System.

PROCEDURE

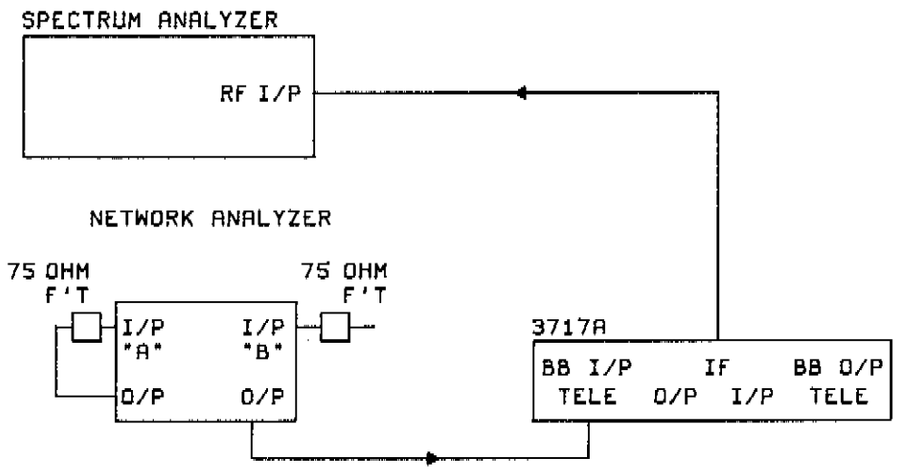


Figure 4-9 BB Input Sensitivity Test

Telephony

1. Switch the 3717A OFF and then ON to preset the controls, and connect the test equipment as shown in Figure 4-9.

Note: If a 50 ohm Network Analyzer system is used then it should be used with 75/50 ohm matching pads.

2. Set the Network Analyzer to 82.92kHz for a level of −40dBm at the 3717A TELEPHONY BB INPUT taking into account the insertion loss of any matching pad used.

3. Set the Spectrum Analyzer to observe the 70MHz carrier and at least 2 pairs of 82.92kHz sidebands.

4. With the Network Analyzer "Time/Step" set to 300ms, increase the level slowly using 0.5dB, 0.1dB and lastly 0.01dB amplitude steps until the Spectrum Analyzer indicates the first carrier null.

5. Check that the Synthesiser output level, i.e. the BB INPUT Sensitivity is −37dBm +−1dB, taking into account the insertion loss of any matching pad used.

6. Connect the Network Analyzer OUTPUT to its INPUT via a 75 ohm Feedthrough, and adjust the Amplitude Zero controls to obtain a 0.00dB reading.

7. Re-connect the Network Analyzer OUTPUT to the BB INPUT, and connect the IF OUTPUT to the IF INPUT, and the BB OUTPUT to the Network Analyzer INPUT via a 75 ohm Feedthrough.

8. Check that the Tracking Receiver indicates a level of +9.00dB +−1dB.

Video

9. Disconnect the Network Analyzer OUTPUT from the TELEPHONY BB INPUT and connect it to the VIDEO BB INPUT.

10. Disconnect the 3717A IF OUTPUT from the IF INPUT and connect the IF OUTPUT to the input of the Spectrum Analyzer.

11. Set the 3717A I/O SELECT to VIDEO NORM.

12. Set the Network Analyzer to a frequency of 1663.34kHz at a level of 1V pk-pk as measured on an oscilloscope loaded in 75 ohms.

13. Set the Spectrum Analyzer to show the 70MHz carrier and at least 2 pairs of 1663.34kHz sidebands.

14. Adjust the level from the Network Analyzer if necessary, in 0.5, 0.1 and 0.01dB steps until the Spectrum Analyzer indicates the first carrier null.

15. As the deviation is now set to 8MHz pk-pk, measure the BB INPUT level by connecting the BB INPUT signal to the Oscilloscope via a 75 Ohm Feedthrough.

16. Check that the Oscilloscope indicates 1V pk-pk +−0.1V.

17. Reconnect the Network Analyzer OUTPUT to the VIDEO BB INPUT and connect the IF OUTPUT to the IF INPUT.

18. Connect the VIDEO BB OUTPUT to the Oscilloscope and check that it indicates a signal of 1V pk-pk +−0.1V.

4-9 BB-IF SWEPT RESPONSE TEST

SPECIFICATION

(Telephony or Video 70 +–10MHz)

IF Flatness:	<= +–0.2dB (<0.4dB pk-pk)
Linearity:	<=2.2%
Diff Gain:	<2%
Group Delay:	<1.0ns
Diff Phase:	<1.5 degree

DESCRIPTION

The measurements are performed using the hp Microwave Link Analyser (MLA).

The MLA BB + SWEEP OUTPUT is applied to the 3717A Modulator Input. The 3717A IF Output is applied to the MLA IF INPUT. The MLA SWEEP CAL is adjusted to provide a swept IF OUTPUT from the modulator of 70MHz +–10MHz (measured using the MLA markers). Linearity and Group Delay are measured using a 500kHz or 555.556kHz Baseband Test Tone. Differential Gain and Differential Phase are measured using a 5.6MHz Test Tone for Telephony and 3.58MHz or 4.43MHz for Video.

TEST EQUIPMENT

70MHz IF/BB Generator	hp 3710A/3716A	1
70MHz IF/BB Receiver	hp 3702B/3705A	1

PROCEDURE

1. Set the MLA controls:

Transmitter

SWEEP	INT
SWEEP WIDTH	20MHz
BB POWER	–37dBm
BB FREQUENCY	500kHz (or 555ΔkHz)
SWEEP CAL	quarter clockwise
BB + SWEEP O/P VERNIER	CAL

Receiver

BLANKING	OFF
SWEEP SOURCE	INT IF
BB INPUT	INT
Y1 DISPLAY	IF
Y2 DISPLAY	DELAY
IF ATTENUATOR	15dB
MARKERS	SLIDING
MARKER OFFSET	4
BB FREQUENCY	as MLA TRANSMITTER
DISPLAY BANDWIDTH	5kHz

2. Set the 3717A controls:

MODULATOR CAL/UNCAL	CAL
EMPHASIS	OFF
I/O SELECT	TELEPHONY

3. Connect the MLA Transmitter BB + SWEEP OUTPUT to the 3717A BB INPUT-TELEPHONY.
4. Connect one of the 3717A IF OUTPUTS to the MLA Receiver IF INPUT.
5. Check that the MLA Receiver IF meter is reading on scale.
6. Adjust the MLA Receiver X-PHASE SHIFT to superimpose the markers on the forward and return traces. Set the BLANKING to ON.
7. Set the MLA Receiver MARKER OFFSET to 10 and adjust the MLA Transmitter SWEEP CAL to bring the markers to the edge of the display.

Note: The accuracy of the marker offset should be checked by setting the MARKERS switch to SLIDING + COMB and checking against the 2MHz comb markers.

8. Set the MARKERS to OFF.
9. Set the MLA Receiver Y1Y2 CALIBRATION to 0.1dB and adjust the Y1 GAIN for a calibration of 0.1dB over 1 div. Set the Y1Y2 CALIBRATION to OFF.
10. Check that the IF Flatness, ie. the total non linearity of the Y1 display is less than 0.4dB pk-pk with reference to 70MHz. Repeat using the other IF OUTPUT.
11. Set the MLA Receiver Y1 DISPLAY to BB and adjust the MLA BB POWER to give an on scale meter reading.
12. Adjust the MLA Receiver PHASE LOCK control, if necessary, for a steady meter reading and the SET LEVEL control to bring the meter readings into the green band.
13. Set the MLA DIFF PHASE CALIBRATION to 1ns and adjust the Y2 GAIN for a calibration of 1ns over 2 div (0.5ns/div). Set the DIFF PHASE CALIBRATION to OFF.
14. Set the MLA Y1Y2 CALIBRATION to 1% and adjust the Y1 GAIN for a calibration of 1% over 1 div (1%/div). Set the Y1Y2 CALIBRATION to OFF.
15. Check that the Linearity, ie. the total non-linearity of the Y1 display is less than 2.2% (2.2 div).
16. Check that the Group Delay, ie. the total non-linearity of the Y2 display is less than 1ns (2 div).
17. Repeat 15 and 16 using the other 3717A IF OUTPUT.
18. Set the MLA Transmitter and Receiver BB FREQUENCY to 5.6MHz and repeat step 12.
19. Check that the Diff Gain, ie. the total non-linearity of the Y1 Display is less than 2% (2 div).
20. Set the MLA Receiver DIFF PHASE CALIBRATION to 1 degree and adjust the Y2 GAIN for a calibration of 1 degree over 3 div. Set the DIFF PHASE CALIBRATION to OFF.
21. Check that the Diff Phase, ie. the total non-linearity of the Y2 display is less than 1.5 degree (3 div).
22. Repeat steps 19 and 21 using the other 3717A IF OUTPUT.
23. Disconnect the cable from the 3717A BB INPUT-TELEPHONY and connect it to the BB INPUT-VIDEO.
24. Set the 3717A I/O SELECT to VIDEO NORM.
25. Set the MLA Transmitter BB Power to −24dBm, the BB FREQUENCY to 500kHz or 555ΔkHz, and the SWEEP WIDTH to 50MHz.
26. Set the MLA Receiver BB FREQUENCY to the same setting as the MLA Transmitter, Y1 DISPLAY to IF and the MARKERS to SLIDING and BLANKING to OFF.
27. Repeat steps 5 through 22 but using BB FREQUENCY of 3.58 or 4.43MHz in step 18 to measure the Video Diff Gain and Phase.
28. Repeat step 27 with the 3717A I/O SELECT set to VIDEO MOD INV.

4-10 IF OUTPUT TEST

SPECIFICATION

Frequency: 70MHz+−10kHz
Level: +5dBm+−1dB

DESCRIPTION

The Frequency is measured using a Frequency Counter. The level is measured using a Power Meter and a 75 ohm sensor. If a 75 ohm Power Sensor is not available a 50 ohm sensor can be used in conjunction with a suitable 50/75 ohm Impedance Converter.

TEST EQUIPMENT

Frequency Counter	hp 5383A	1
Power Meter/75 ohm Sensor	hp 435A/8483A	1

PROCEDURE

1. Set the 3717A controls as follows:

   MODULATOR CAL/UNCAL . . . . . .CAL
   EMPHASIS . . . . . .OFF
   I/O SELECT. . . . . .TELEPHONY

2. If the 3717A has been switched OFF, allow a 5 minute warm up time before proceeding, to allow the frequency to stabilize.

3. Connect the Frequency Counter to the IF OUTPUT and check the counter reading is 70MHz+−10kHz.

4. Disconnect the Frequency Counter and connect the 75 ohm Power Meter to the IF OUTPUT and check for a level of 5dBm+−1dB.

5. Repeat step 4 with the Power Meter connected to the other IF OUTPUT.

6. Repeat step 4 with the I/O SELECT set to VIDEO NORM and VIDEO MOD INV.

4-11 IF-BB SWEPT RESPONSE TEST

SPECIFICATION

(Telephony or Video 70+ -10MHz)

IF Level Range:	–10 to +6dBm
Linearity:	<2%
Diff Gain:	<2%
Group Delay (70+–8MHz):	<1.5ns
Diff Phase:	<1.5 degree

DESCRIPTION

The measurements are performed using the HP Microwave Link Analyser.

The MLA Transmitter IF OUTPUT is set to sweep 70MHz+–10MHz and applied to the 3717A Demodulator input. The 3717A BB Output is applied to the MLA Receiver BB INPUT. The MLA Transmitter IF UNCAL OUTPUT is applied to the Receiver IF INPUT to provide markers.

Linearity and Group Delay are measured using a Baseband Test Tone of 500kHz or 555.556kHz. Differential Gain and Differential Phase are measured using a Test Tone of 5.6MHz for Telephony and 3.58MHz or 4.43MHz for Video.

Note: The Group Delay is only specified over an IF range of 70MHz+–8MHz.

TEST EQUIPMENT

70MHz IF/BB Generator	hp 3710A/3716A	1
70MHz IF/BB Receiver	hp 3702B/3705A	1

PROCEDURE

1. Set the MLA controls:

Transmitter

SWEEP	INT
SWEEP WIDTH	20MHz
BB FREQUENCY	500kHz (or 555ΔkHz)
DEVIATION	200kHz
IF FREQUENCY	70MHz
IF ATTENUATOR	20dB
IF VERNIER	0
AUX OUTPUT	IF UNCAL

Receiver

BLANKING	OFF
SWEEP SOURCE	EXT BB+
BB INPUT	EXT
Y1 DISPLAY	Ref
Y2 DISPLAY	DELAY
IF ATTENUATOR	5dB
MARKERS	SLIDING
MARKERS OFFSET	8MHz
BB FREQUENCY	as MLA TRANSMITTER
DISPLAY BANDWIDTH	5kHz

2. Set the 3717A controls:

   EMPHASIS . . . . . .OFF
   I/O SELECT. . . . . .TELEPHONY

3. Connect the MLA Transmitter IF OUTPUT to the 3717A IF INPUT.

4. Connect the 3717A BB OUTPUT-TELEPHONY to the MLA Receiver BB INPUT.

5. Connect the MLA Transmitter IF UNCAL OUTPUT to the MLA Receiver IF INPUT.

6. Adjust the MLA Receiver X-PHASE SHIFT control to superimpose the markers on the forward and return traces. Set the BLANKING to ON.

7. Set the MLA Receiver MARKER OFFSET to 10 and if necessary adjust the MLA Transmitter SWEEP WIDTH for exactly 20MHz. (The markers at the edge of the display.)

Note: The accuracy of the MARKER OFFSET should be checked against the 2MHz marker comb by setting the MARKERS switch to SLIDING + COMB.

8. Set the MARKER OFFSET to 8. (Check the accuracy against marker comb as in step 7.)

9. Set the MLA Receiver Y1 DISPLAY to BB and adjust the BB POWER for an on scale BB meter reading.

10. Adjust the MLA Receiver PHASE LOCK control if necessary for a steady meter reading and the SET LEVEL control to bring the reading into the green band.

11. Set the MLA DIFF PHASE CALIBRATION to 1ns and adjust the Y2 GAIN for a calibration of 1ns over 2 div (0.5ns/div). Set the DIFF PHASE CALIBRATION to OFF.

12. Set the MLA Y1Y2 CALIBRATION to 1% and adjust the Y1 GAIN for a calibration of 1% over 1 div (1%/div). Set the Y1Y2 CALIBRATION to OFF.

13. Check that the Linearity, ie. the total non-linearity of the Y1 display is less than 2% (2 div).

14. Check that the Group Delay, ie. the total non-linearity of the Y2 display between the 8MHz markers is less than 1.5ns (3 div).

15. Set the MLA Transmitter IF ATTENUATOR to 4dB and repeat steps 13 and 14.

16. Set the MLA Transmitter and Receiver BB FREQUENCY to 5.6MHz and repeat steps 10 and 13 to measure the Diff Gain.

17. Set the MLA Receiver DIFF PHASE CALIBRATION to 1 degree and adjust the Y2 GAIN for a calibration of 1 degree over 2 div. Set the DIFF PHASE CALIBRATION to OFF.

18. Check that the Diff Phase, ie. the total non-linearity of the Y2 display is less than 1.5 degree (3 div).

19. Set the MLA Transmitter IF ATTENUATOR to 20dB and repeat steps 13 and 18.

20. Disconnect the cable from the 3717A BB OUTPUT-TELEPHONY and connect it to the BB OUTPUT-VIDEO.

21. Set the 3717A I/O select to VIDEO NORM.

22. Set the MLA Transmitter BB FREQUENCY to 500kHz or 555ΔkHz, and the MLA Receiver BLANKING to OFF.

23. Set the MLA Receiver BB FREQUENCY to the same setting as the MLA Transmitter.

24. Repeat steps 6 and 9 through 19 but using a BB FREQUENCY of 3.58MHz or 4.43MHz in step 16.

25. Repeat step 24 with the 3717A I/O SELECT set to VIDEO DEM INV.

4-12 VIDEO DIFF GAIN/PHASE TEST

SPECIFICATION

With 625 Line Emphasis

Diff Gain: <0.7%
Diff Phase: <0.7 degree

DESCRIPTION

The total amplitude of the TV picture waveform is 1V pk-pk comprising of 0.3V of sync, and 0.7V of picture. This waveform is ac coupled and so the mean dc level will change depending on the picture content. The normal recommendation for Differential Gain and Phase measurements using the Microwave Link Analyser is to use a test signal of sweep content 2 x pk-pk picture voltage (1.4V pk-pk) with a Baseband Test Tone of 3.58MHz or 4.43MHz superimposed on it.

The MLA BB + SWEEP output is set for 1.4V pk-pk of sweep and −24dBm of baseband. This signal is applied to the 3717A VIDEO INPUT and the Modulated IF OUTPUT is coupled to the Demodulator IF INPUT. The Demodulator VIDEO OUTPUT is applied to the MLA Receiver BB INPUT and the Differential Phase and Gain measured.

Note: This test can only be performed if a 625 line emphasis network is fitted. If one is available but not fitted, refer to Section II Installation.

TEST EQUIPMENT

70MHz IF/BB Generator	hp 3710A/3716A	1
70MHz IF/BB Receiver	hp 3702B/3705A	1
Oscilloscope	hp 1740A	1

PROCEDURE

1. Set the MLA controls:

Transmitter

SWEEP	INT
SWEEP WIDTH	20MHz
BB POWER	−24dBm
BB FREQUENCY	3.58MHz (or 4.43MHz)
SWEEP CAL	counter clockwise
BB + SWEEP O/P VERNIER	CAL

Receiver

BLANKING	OFF
SWEEP SOURCE	EXT BB+
BB INPUT	EXT
Y1 DISPLAY	IF
Y2 DISPLAY	DELAY
IF ATTENUATOR	15dB
BB FREQUENCY	as MLA TRANSMITTER
MARKERS	SLIDING
MARKER OFFSET	10
DISPLAY BANDWIDTH	5kHz

2. Set the 3717A controls:

MODULATOR CAL/UNCAL	CAL
EMPHASIS	625
I/O SELECT	VIDEO/NORM

3. Connect the MLA Transmitter BB + SWEEP OUTPUT terminated in 75 Ohms to the Oscilloscope.

4. Adjust the MLA Transmitter SWEEP CAL to give 1.4V pk-pk. Disconnect the Oscilloscope and 75 Ohm termination.

5. Connect the MLA Transmitter BB + SWEEP OUTPUT to the 3717A BB INPUT – VIDEO.

6. Connect one of the 3717A IF OUTPUTS to the 3717A IF INPUT.

7. Connect the other 3717A IF OUTPUT to the MLA Receiver IF INPUT.

8. Connect the 3717A BB OUTPUT – VIDEO to the MLA Receiver BB INPUT.

9. Adjust the MLA Receiver X-PHASE shift to superimpose the markers on the forward and return traces. (Only 1 marker will be displayed on each trace.)

10. Set the MLA BLANKING to ON and the MARKERS to OFF.

11. Set the MLA Receiver Y1 DISPLAY to BB.

12. Adjust the MLA Receiver BB POWER for an on-scale meter reading.

13. Adjust the MLA Receiver PHASE LOCK control for a steady meter reading and the SET LEVEL control for a reading in the green band.

14. Set the MLA Receiver DIFF PHASE CALIBRATION to 1 degree and adjust the Y2 GAIN for a calibration of 1 degree over 2 div (0.5 degree/div). Set the DIFF PHASE CALIBRATION to OFF.

15. Set the MLA Receiver Y1Y2 CALIBRATION to 1% and adjust the Y1 GAIN for a calibration of 1% over 2 div (0.5%/div). Set the Y1Y2 CALIBRATION to OFF.

16. Check that the Diff Gain, ie. the total non-linearity of the Y1 display is less than 0.7% (1.4 div).

17. Check that the Diff Phase, ie. the total non-linearity of the Y2 display is less than 0.5 degree (1 div).

18. Interchange the cable connections to the two 3717A IF OUTPUTS and repeat steps 16 and 17.

19. Repeat steps 16, 17 and 18 with the 3717A I/O SELECT, MOD INV and DEM INV selected.

4-13 50Hz SQUARE WAVE TILT TEST

SPECIFICATION

50Hz Square Wave Tilt: <=1%

DESCRIPTION

The 50Hz Square Response is defined as per the CCIR Recommendation 451-2, and is illustrated below (with the specication of the 3717A indicated). With the 3717A connected back-to-back (IF OUTPUT to IF INPUT, a square wave signal is applied to the VIDEO INPUT and the recovered VIDEO signal from the VIDEO BB OUTPUT is checked on an oscilloscope.

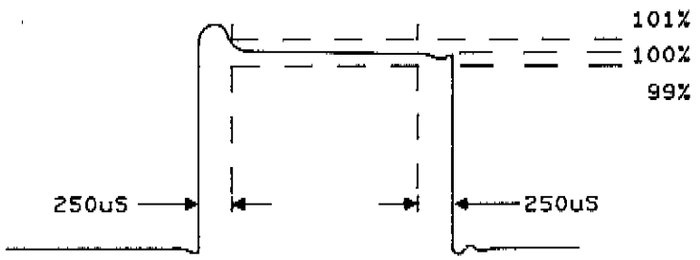


Figure 4-10 50Hz Square Wave Specification

TEST EQUIPMENT

Function Generator	hp 3311A	1
Oscilloscope	hp 1740A	1
75 ohm Feedthrough	hp 11094B	1

PROCEDURE

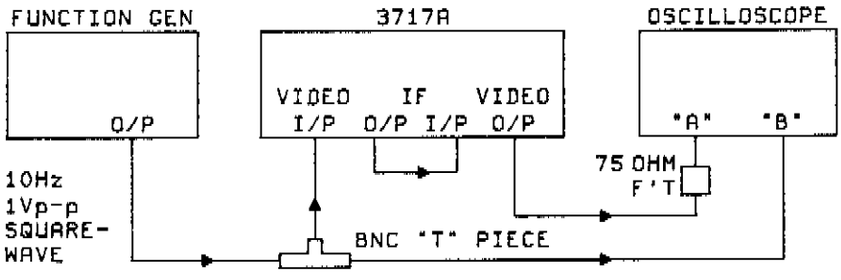


Figure 4-11 50Hz Square Wave Tilt Test

1. Connect the test equipment as shown in Figure 4-11, with the oscilloscope dc coupled, 0.2V/div on both channels, and 2ms/div.

2. Set the I/O SELECT to VIDEO NORM, with EMPHASIS OFF.

3. Adjust the Function Generator's amplitude controls for a 1V pk-pk signal (5 divisions), and set its frequency to 50Hz.

4. Increase the vertical sensitivity of the oscilloscope to 0.05V/div using the position control obtain a display.

5. Select the VIDEO BB OUTPUT on the oscilloscope and adjust the amplitude of the trace using the 3717A CAL control to give exactly 5 divisions.

6. Select a vertical sensitivity on the oscilloscope of 0.05V/div using the position control obtain a display.

7. Set the timebase on the oscilloscope of 1ms/div and carefully adjust the frequency of the function generator for exactly 10 divisions on the display.

8. Set the oscilloscope to its A+B mode and invert one channel. Set both channels of the oscilloscope to 0.02V/div and fine adjust the position controls to obtain a trace on the display.

9. Check that the overall flatness of the trace disregarding the first and last 1/4 divisions (250μs) is less than + or – one-half of a division with respect to the centre of the trace.

10. Repeat step 9 with the VIDEO – DEM INV function selected.

11. Repeat step 9 with the VIDEO – MOD INV function selected.

4-14 BB-to-BB RESPONSE & SENSITIVITY TEST

SPECIFICATION

With*/Without Emphasis Network

Telephony -- 10kHz to 10MHz . . . . . .<= +–0.2dB (<=0.4dB pk-pk)
Video -- 50Hz to 10MHz . . . . . .<= +–0.2dB (<= 0.4dB pk-pk)

*Up to maximum frequency of emphasis network selected.

DESCRIPTION

The TELEPHONY and VIDEO inputs and outputs are checked back-to-back by using a low-frequency Network Analyzer System. The 3717A is connected back-to-back by driving the IF INPUT from the IF OUTPUT directly. With the nominal sensitivities, the BB outputs are always 9dB higher in level than the BB INPUT, i.e. for the TELEPHONY input, the input level is –10dBm which corresponds to –1dBm at the BB OUTPUT. The procedure is then repeated with each of the installed Emphasis Networks selected. The Network Analyzer used should be ideally a 75 ohm system but a 50 ohm system can be used if matching pads are available. To allow a standard oscilloscope to be used an external dc offset facility must be added – see the introductory paragraphs of this section.

TEST EQUIPMENT

Network Analyzer	hp 3040A Opt 111/121	1
Oscilloscope	hp 1740A	1
75 Ohm Feedthrough	hp 11094B	2
50/75 Ohm Matching Pads*	hp 85428B	2

*Only required if a 50 ohm Network Analyzer is used.

PROCEDURE

Telephony Response 10kHz to 10MHz

1. Connect the Network Analyzer's rear panel AMPLITUDE FUNCTION output to the vertical input, and the front panel SWEEP OUTPUT to the external horizontal input of the oscilloscope. Connect the output of the dc offset control to the same input of the oscilloscope.

2. Connect the Network Analyzer "A" and "B" channels back-to-back via 75 ohm terminations, and 50/75 ohm matching pads if necessary.

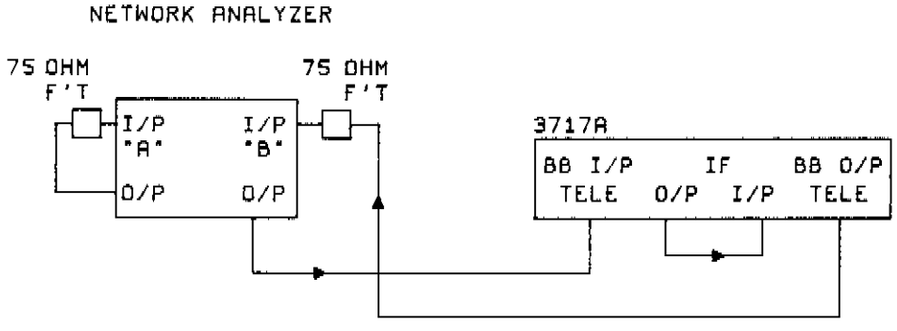


Figure 4-12 BB-to-BB Frequency Response Test

3. Set the Network Analyzer to sweep between 10kHz and 10010kHz at a level of −10dBm, in a "B-A" mode.

   For the hp 3040A Network Analyzer

   OUTPUT LEVEL . . . . . .−10dBm
   FREQUENCY 5010kHz
   FREQUENCY STEP 10kHz
   NO. OF STEPS 1000

4. Adjust the Network Analyzer's "A" and "B" Amplitude Zero controls to obtain a 0.00dB reading.

5. With the oscilloscope set to 0.02V/div (0.2dB/div), adjust the oscilloscope position control and the additional dc offset control to obtain a display. Initialize a single sweep and check that the back-to-back flatness is better than 0.2dB.

6. Connect the "B" OUTPUT of the Analyzer to the TELEPHONY BB INPUT and the "B" INPUT to the TELEPHONY BB OUTPUT of the 3717A as Figure 4-12. Re-adjust the Amplitude Zero controls to obtain a 0.00dB reading, and if necessary readjust the offset control for a display.

7. Initialize a single sweep and check that the peak-to-peak variations across the display is equal or better than 0.4dB pk-pk, with EMPHASIS OFF.

CCIR

8. Set the oscilloscope to 0.1V/div (1dB/div) and check that when the CCIR Network to be tested is selected, the Tracking Receiver level does not vary by more than 2dB.

9. Reset the oscilloscope to 0.02V/div (0.2dB/div) and initialize a single sweep on the Network Analyzer. Check that the flatness is within 0.4dB pk-pk up to the maximum useable frequency of the network – see Table 4-5.

10. Repeat steps 8 AND 9 for each of the CCIR networks fitted.

BELL

11. With the oscilloscope set to 0.1V/div check that when the first BELL network is selected the level drops to −9dB +−2dB.

12. Reset the oscilloscope to 0.02V/div and initialize a single sweep on the Network Analyzer. Check that the flatness is within 0.4dB pk-pk.

13. Repeat steps 11 AND 12 for each of the BELL networks fitted.

Table 4-5 Maximum Frequency of Emphasis Networks

Option	Channel Loading/Lines	Maximum Usable Frequency
CCIR		
011	24 CH	100kHz
012	60 CH	300kHz
013	120 CH	550kHz
014	300 CH	1300kHz
015	600 CH	2660kHz
016	960 CH	4200kHz
017	1260 CH	5640kHz
018	1800 CH	8210kHz
BELL		
031	600 CH	3000kHz
032	900 CH	5000kHz
033	1200 CH	6000kHz
034	1500 CH	7000kHz
035	1800 CH	10000kHz
VIDEO		
021	525 LINES	6000kHz
022	625 LINES	6000kHz
023	819 LINES	10000kHz

Note: Proceed to step 15 only if there are VIDEO Emphasis Networks installed.

Video Response 50Hz to 10MHz

14. Disconnect the Analyzer from the TELEPHONY BB INPUT and OUTPUT and connect them to the VIDEO BB INPUT and OUTPUT, and set the I/O SELECT to VIDEO NORM.

15. Re-set the Network Analyzer for a sweep between 50Hz and 10.000050MHz at a level of 0dBm.

    For the hp 3040A Network Analyzer:

    OUTPUT LEVEL 0dBm
    FREQUENCY 5,000,050,00Hz
    FREQUENCY STEP 10kHz
    NO. OF STEPS 1000

16. Set the Network Analyzer to 5000,05kHz and re-adjust the Amplitude Zero controls to obtain a 0.00dB reading. Re-set the oscilloscope's vertical position and dc offset control for a display.

17. Initialize a single sweep on the Network Analyzer and check that the VIDEO flatness with EMPHASIS OFF is equal to or better than 0.4dB pk-pk from 50Hz to 10MHz.

18. Set the oscilloscope to 0.1V/div (1dB/div) and the Network Analyzer to 5000.50kHz and check that when the VIDEO Network is selected, the level does not vary by more than 2dB.

19. Reset the oscilloscope to 0.02V/div (0.2dB/div) and if necessary re-adjust the dc offset control for a display.

20. Initialize a single sweep on the Network Analyzer and check that the flatness is within 0.4dB pk-pk up to the maximum frequency of the network – see Table 4-5.

21. Repeat steps 18 to 20 for any other VIDEO network fitted.

4-15 OPTION 004 – BB-to-BB FREQUENCY RESPONSE TEST

SPECIFICATION

Frequency Response 60kHz – 10MHz: <= +–0.4dB (<= 0.8dB pk-pk)

DESCRIPTION

The 3717A Option 004 contains a 124 Ohm balanced BB INPUT-TELEPHONY and 124 Ohm Balanced BB OUTPUT-TELEPHONY. They are checked by connecting the 124 Ohm Outputs to the 124 Ohm Inputs, and checking the response of the complete balanced/unbalanced Converter using a Network Analyzer. The results of this test show the amount of degradation which has to be added to the back-to-back frequency response measured in Paragraph 4-14. The Network Analyzer used should ideally be a 75 Ohm system but if matching pads are available then a 50 Ohm system can be used. To allow a normal oscilloscope to be used an external dc offset control must be used – see the introductory paragraphs of this section.

TEST EQUIPMENT

Network Analyzer	hp 3040A Opt 111/121	1
Oscilloscope	hp 1740A	1
75 Ohm Feedthrough	hp 11094B	2
50/75 Ohm Matching Pad*	hp 85428B	2

*Only required if a 50 Ohm Network Analyzer system is used.

PROCEDURE

NOTE

The 124 Ohm balanced telephony inputs and outputs return loss test must be performed before this test to ensure accurate results. Refer to Paragraph 4-6.

WARNING

This procedure requires that the protective covers of the instrument be removed. The procedure therefore should only be performed by qualified service personnel.

1. Connect the Network Analyzer's rear panel AMPLITUDE FUNCTION output to the vertical input, and the front panel SWEEP OUTPUT to the external horizontal input of the oscilloscope. Connect the output of the dc offset control to the same input of the oscilloscope.

2. Connect the Network Analyzer "A" and "B" channels back-to-back via 75 ohm Feedthroughs, and 50/75 ohm matching pads if necessary.

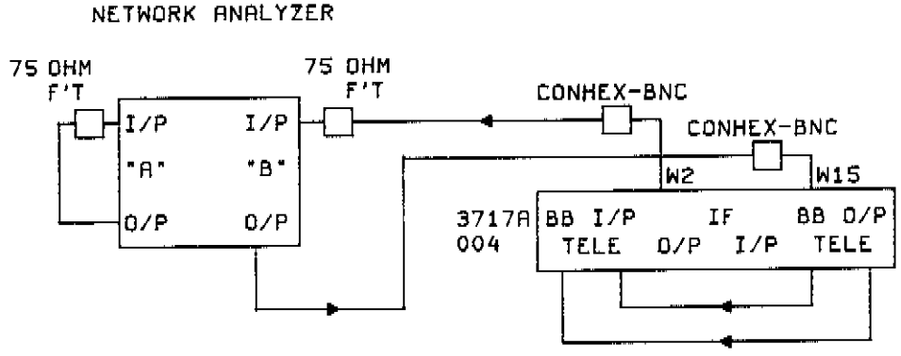


Figure 4-13 Option 004 BB-to-BB Frequency Response Test

3. Set the Network Analyzer to sweep between 60kHz and 10010kHz at a level of 0dBm, in a "B-A" mode.

   For the hp 3040A Network Analyzer:

   OUTPUT LEVEL 0dBm
   FREQUENCY 5060kHz
   FREQUENCY STEP 10kHz
   NO. OF STEPS 1000

4. Adjust the Network Analyzer's "A" and "B" Amplitude Zero controls to obtain a 0.00dB reading.

5. With the oscilloscope set to 0.02V/div (0.2dB/div), adjust the oscilloscope position control and the dc offset control to obtain a display. Initialize a single sweep and check that the back-to-back flatness is better than 0.2dB.

6. Switch the 3717A OFF, remove the line cord from the instrument and remove the two upper rear feet if fitted, before unscrewing the top cover. Remove the central metal strap and lift A32, see Figure 4-14.

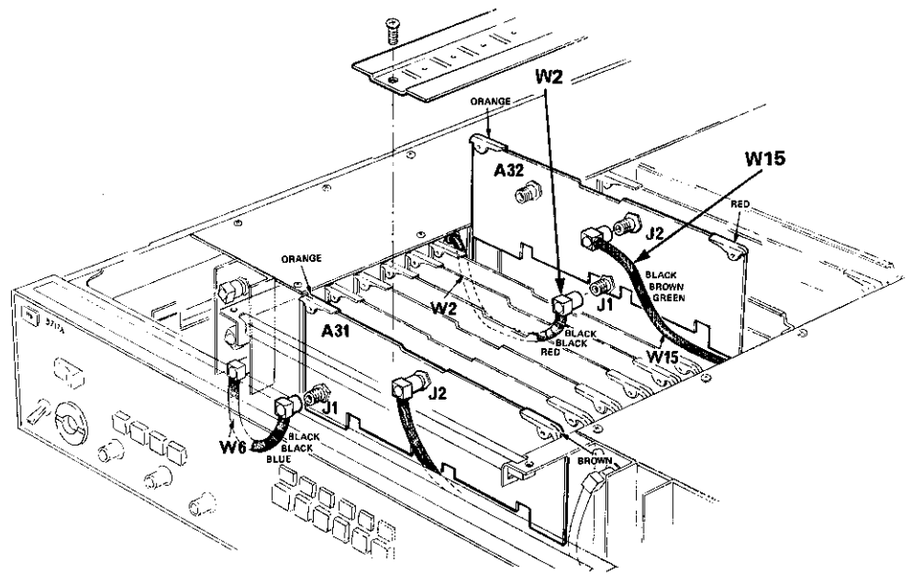


Figure 4-14 Internal Location of W2 and W15

7. Refer to Figure 4-14 and disconnect the brown-green coded cable (W15) from A32J2 and connect the "B" OUTPUT of the Network Analyzer via a 75 Ohm Conhex to BNC adapter to the free end of W15 as shown in Figure 4-13.

8. Disconnect the red coded cable (W2) from A32J1 and connect the "B" INPUT of the Network Analyzer via a 75 Ohm Conhex to BNC adapter to the free end of W2 as shown in Figure 4-13.

9. Connect the TELEPHONY BAL INPUTs to the TELEPHONY BAL OUTPUTs using cables of the same length. Reconnect the line cord and switch ON.

10. Select the BAL inputs and outputs with the BAL key.

11. Initialize a single sweep on the Network Analyzer and check that the total peak-to-peak variations across the display is typically better than 0.4dB pk-pk, and when added to the back-to-back response of the UNBAL inputs (measured in Paragraph 4-14) is better than 0.8dB pk-pk).

12. Switch the 3717A OFF, refer to Figure 4-14 and reconnect W2 and W15 to A32, install A32 in its slot, replace the central metal strap, top cover and if fitted, the two upper rear feet.

4-16 DEMODULATOR TELEPHONY SPURIOUS RESPONSE TEST

SPECIFICATION

With 1800 Channel Emphasis inserted.

TELEPHONY OUTPUT spurious 10kHz to 10MHz: <−100dBm

DESCRIPTION

With a spectraly pure 70MHz signal connected to the IF INPUT, a Spectrum Analyzer is used to monitor the spurious outputs performance of the Demodulator. Due to the performance required, the spectrum analyzer must be used with a 3kHz or less measurement bandwidth in order to reduce its own noise floor to enable any spurious signal to be identified.

TEST EQUIPMENT

Signal Generator	hp 8640A/B	1
Spectrum Analyzer	hp 3585A	1

PROCEDURE

1. Set the Signal Generator to 70MHz at 0dBm, and connect the RF OUTPUT to the 3717A IF INPUT.
2. Select the 1800 Channel Emphasis, if not installed see Section II for instructions for installing the standard 1800 Channel Emphasis Network supplied with the instrument.
3. Connect the TELEPHONY OUTPUT to the input of the Spectrum Analyzer.
4. Set the Spectrum Analyzer to 75 ohm input impedance, 3kHz or less resolution bandwidth, and set it to sweep between 10kHz and 10MHz.
5. Check that there are no spurious signals above −100dBm.

4-17 1800 CHANNEL NOISE LOADING TEST

SPECIFICATION

System Capacity	Band Defining Filters High-Pass	Low-Pass	Noise Loading Level	Measurement Filters	NPR
1800	60kHz	8160kHz	−19.5dBm	70kHz	>57dB
				534kHz	>57dB
				1248kHz	>57dB
				2438kHz	>57dB
				3886kHz	>57dB
				5340kHz	>57dB
				7600kHz	>57dB

DESCRIPTION

This specification is only applicable to the TELEPHONY input and outputs, with a CCIR 1800 Channel Emphasis Network selected. The method used to check the NPR specifications is as per CCIR recommendations, as illustrated in Figure 4-15. To make an NPR measurement, white noise of the appropriate bandwidth and power level, corresponding to the system loading and specified by CCIR, is applied from the generator to the BB INPUT with the measurement bandstop filters switched out. The IF OUTPUT of the Modulator is connected back-to-back to the IF INPUT of the Demodulator. The BB OUTPUT is then connected to the noise receiver which is tuned to the frequency of the bandstop filter selected in the generator, and the receiver's sensitivity adjusted to give a reference meter reading (P1). The bandstop filter is then selected in the generator which attenuates the baseband input noise within that "slot" by more than 70dB. If no noise were generated in the 3717A the reference mark on the receiver would be restored by decreasing the input attenuator setting of the receiver by a similar amount. However, because of the inherent distortion and thermal noise produced by Modulators and Demodulators, the attenuation will have to be reduced by less than 70dB. The change in attenuation from the reference setting, i.e. P1-P2, is the "Noise Power Ratio".

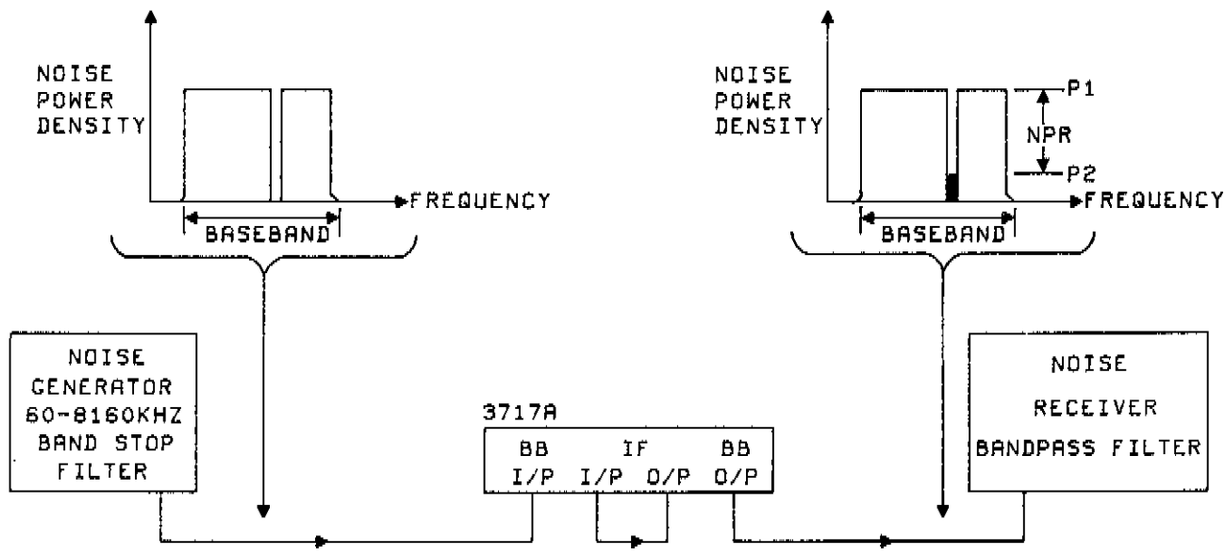


Figure 4-15 Principle of NPR Measurements

TEST EQUIPMENT

White Noise Generator	Marconi TF2091B
White Noise Receiver	Marconi TF2092C
Filters for Generator	Marconi 60kHz Highpass Marconi 8160kHz Lowpass Marconi 70kHz, 534kHz, 1248kHz, 2438kHz, 3886kHz, 5340kHz and 7600kHz Bandstop.
Bandpass Filters for the Noise receiver	Marconi 70kHz, 534kHz, 1248kHz, 2438kHz, 3886kHz, 5340kHz and 7600kHz.

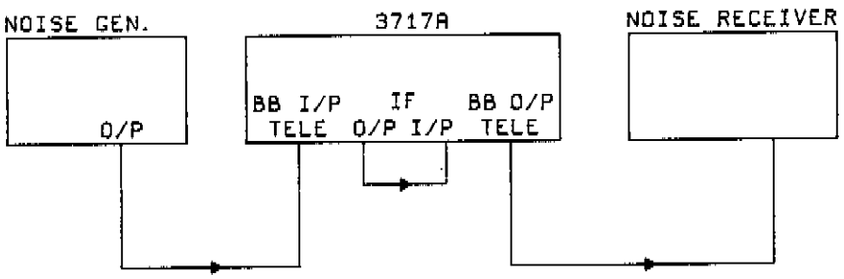


Figure 4-16 Telephony Noise Loading Test

PROCEDURE

Note: This procedure requires a CCIR 1800 Channel Emphasis Network. If not installed refer to Section II Installation.

1. Connect the White Noise Test Set as shown in Figure 4-16 with the 60kHz High-pass and the 8160kHz Low-pass

2. Set the attenuator of the Noise Receiver to 0dB and select the 70kHz slot on the Receiver. Set the Receiver's sensitivity to produce a 0dB reading on the NPR meter by adjusting the "Set Reference" control on the Noise Receiver.

3. Switch in the 70kHz Bandstop Filter on the Generator and adjust the Receiver's attenuator for a 0dB reading, or as close as possible. Check that the attenuator reading is 57dB or greater, and record the reading in the Performance Test Record at the end of the Performance Test Section.

4. Repeat steps 2 and 3 for the remaining "slots" listed in the Specification above.

4-18 ATTENUATOR RANGE & FREQUENCY RESPONSE TEST

SPECIFICATION

Attenuation Range:	15dB in 1dB steps
Frequency Response 50Hz – 10MHz:	<= +–0.2dB (< = 0.4dB pk-pk)
Frequency Response 60 – 80MHz:	<= +–0.2dB (< = 0.4dB pk-pk)

DESCRIPTION

The specification is checked using a Network Analyzer for the 50Hz to 10MHz frequency range, and with a 3710A 70MHz MLA System for the IF range between 60 and 80MHz. The Network Analyzer used should ideally be a 75 ohm system, but a 50 ohm system can be used if matching pads are available. To allow a standard oscilloscope to be used an external dc offset facility must be added – see the introductory paragraphs at the beginning of this section.

TEST EQUIPMENT

Network Analyzer	hp 3040A Opt 111/121	1
Oscilloscope	hp 1740A	1
MLA 70MHz Generator	hp 3710A	1
MLA 70MHz Receiver	hp 3702B	1
75 Ohm Feedthrough	hp 11094B	2
50/75 Ohm Matching Pad*	hp 85428B	2

*Only required if a 50 ohm Network Analyzer is used.

PROCEDURE

50Hz to 10MHz

1. Connect the Network Analyzer's rear panel AMPLITUDE FUNCTION output to the vertical input, and the front panel SWEEP OUTPUT to the external horizontal input of the oscilloscope. Connect the output of the dc offset control to the same input of the oscilloscope.

2. Connect the Network Analyzer "A" and "B" channels back-to-back via 75 ohm terminations and 50/75 ohm matching pads if necessary.

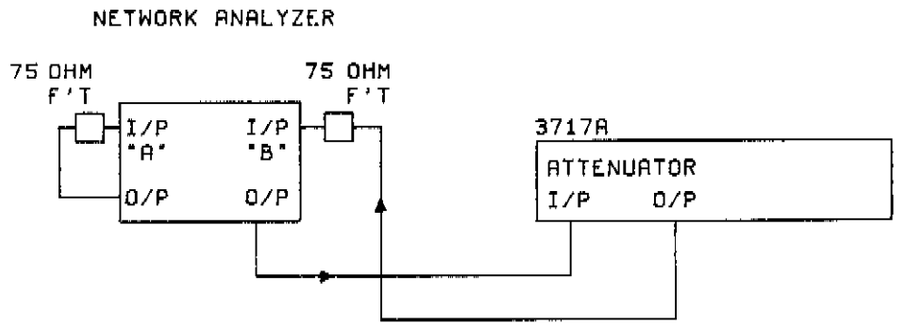


Figure 4-17 Attenuator Range & Low Frequency Response Test

3. Set the Network Analyzer to sweep between 50Hz and 10000.05kHz at a level of 0dBm, in a "B-A" mode.

   For the hp 3040A Network Analyzer

   OUTPUT LEVEL 0dBm
   FREQUENCY 5000.05kHz
   FREQUENCY STEP 10kHz
   NO. OF STEPS 100
   BANDWIDTH. 10Hz
   TIME/STEP 300ms

4. Adjust the Network Analyzer's "A" and "B" AMPLITUDE ZERO controls to obtain a 0.00dB reading.

5. With the oscilloscope set to 0.02V/div (0.2dB/div), adjust the oscilloscopes position control and the additional dc offset control to obtain a display. Initialize a single sweep and check that the back-to-back flatness is better than 0.2dB.

6. Connect the "B" OUTPUT of the Analyzer to the Attenuator INPUT and the "B" INPUT to the Attenuator OUTPUT as Figure 4-17.

7. Select each attenuator step in turn and check that the corresponding reading on the Network Analyzer at the centre frequency is within +–0.5dB.

8. Select 1dB on the 3717A Attenuator and initialize a single sweep on the Network Analyzer and check that the total variation across the band is equal or less than 0.4dB pk-pk.

9. Repeat step 8 for all other settings of the 3717A Attenuator.

60 to 80MHz

10. Set the MLA System up in a back-to-back mode with the IF OUTPUT of the MLA Generator connected to the IF INPUT of the MLA Receiver.

11. Check the residual IF Flatness of the MLA System across a sweep of 60 to 80MHz, with the Attenuator of the MLA Generator set to 5dB (IF OUTPUT of +5dBm), and the Attenuator of the MLA Receiver set to –15dB (IF INPUT of –10dBm). With a calibration of 0.1dB/div note the residual flatness.

12. Re-connect the MLA Generator IF OUTPUT to the MLA Receiver IF INPUT via the 3717A Attenuator, and adjust the IF VERNIER, on the MLA Generator, to zero the IF/BB LEVEL meter on the MLA Receiver.

13. Select 1dB on the 3717A Attenuator and remove 1dB from the MLA Receiver attenuator. Check that the MLA IF/BB LEVEL meter remains within range and that the flatness (less the residual flatness from step 10) is equal or less than 0.4dB pk-pk.

14. Repeat step 13 for all settings of the 3717A Attenuator with the equivalent attenuation being removed from the attenuator of the MLA Receiver.

4-19 HP-IB FUNCTIONAL TEST

SPECIFICATION

Listener only as defined in IEEE Std. 488-1975

SH0	No Source Handshake Capability
AH1	Has Acceptor Handshake Capability
T0	No Talker Capability
TE0	No Extended Talker Capability
L2	Basic Listener
LE0	No Extended Listener Capability
SR0	No Service Request Capability
RL2	No Local Lockout Capability
PP0	No Parallel Poll Capability
DC1	Has Device Clear Capability
DT0	No Device Trigger Capability
C0	No Controller Capability

DESCRIPTION

The Hewlett-Packard Interface Bus is Hewlett-Packard's implementation of the IEEE Standard 488-1978, Standard Digital Interface for Programmable Instrumentation. The 3717A is configured as a basic listener only with the interface capability as shown above. The functional test uses an hp 9825A Desktop Computer, and checks each programmable function. From the overall block diagram in Section VIII it can be seen that the HP-IB Control Assembly drives the A4 Control Logic Assembly which in turn controls the instrument. Verification therefore of the HP-IB function, can be achieved by simply checking that each of the LEDs, which are normally driven by the A4 assembly, can be controlled via the HP-IB interface assemblies. The test assumes that the 3717A listen address is the factory pre-set address. If it is required to change the address see Section II Installation and also before running this test, correct line 8 of the program which specifies the address in the program.

TEST EQUIPMENT

Desktop Computer	hp 9825A	1
General I/O ROM – Extended	hp 98213A	1
HP-IB Interface Card	hp 98034A	1

PROCEDURE

1. Set the HP-IB Interface Card to select code 7.
2. Connect the HP-IB cable from the Interface Card to the 3717A.
3. Switch the Desktop Computer ON and load the program listed below.
4. Press the RUN button of the Desktop Computer to initiate the test.

Note: Unlike the local mode, in the remote mode, selection of an emphasis position does NOT depend on their being an Emphasis Network installed in that position.

```
0: spc
1: prt "     3717A"
2: prt "     *****"
3: spc
4: prt "     HP-IB"
5: prt "FUNCTIONAL TEST"
6: prt "REV A  OCT 1980"
7: prt "***************"
8: dev "3717",701
9: dim H$[16]
10: ent "Is OPTION 004 fitted?YES-NO?",H$
11: if H$[1,1]="y" or H$[1,1]="Y"⁞sfg 4
12: if flg4⁞prt "   OPTION 004"⁞spc
13: prt "Press CONTINUE","if LEDs respond","correctly."
14: spc 2
15: wrt "3717"
16: clr "3717"
17: dsp "REMOTE+LISTEN+EMP OFF+TELE   on"⁞stp
18: wrt "3717","U"
19: dsp "UNCAL    on"⁞stp
20: wrt "3717","C"
21: dsp "UNCAL    off"⁞stp
22: dsp "CONTINUE to cycle EMPHASIS leds"⁞stp
23: wrt "3717","E1"
24: wait 100
25: wrt "3717","E2"
26: wait 100
27: wrt "3717","E3"
28: wait 100
29: wrt "3717","E4"
30: wait 100
31: wrt "3717","E5"
32: wait 100
33: wrt "3717","E0"
34: dsp "Press CONTINUE  when complete"⁞stp
35: if flg4⁞wrt "3717","B"
36: if flg4⁞dsp "BAL   on"⁞stp
37: wrt "3717","V"
38: dsp "TELEPHONY  off & NORM  on"⁞stp
39: wrt "3717","J"
40: dsp "NORM & MOD INV on"⁞stp
41: wrt "3717","K"
42: dsp "MOD INV & DEM INV on"⁞stp
43: wrt "3717","M"
44: dsp "NORM & DEM INV on"⁞stp
45: wrt "3717","D"
46: dsp "NORM  on"⁞stp
47: dsp "CONTINUE if controls inoperative"⁞stp
48: lcl "3717"
49: dsp "CONTINUE if MANUAL operation OK"⁞stp
50: cmd 7,"?"
51: dsp "REMOTE & LISTEN  off"⁞stp
52: rem "3717"
53: wrt "3717","U"
54: dsp "REMOTE-LISTEN & UNCAL on"⁞stp
55: clr "3717"
56: dsp "REMOTE+LISTEN+EMP OFF+TELE  on"⁞stp
57: prt "End of test"⁞spc 2
58: end
*8469
```

Performance Test Record

Hewlett-Packard	Tested by .....
	Date .....
	Serial No. .....

Para No.	Test Description	Result		
		Min.	Actual	Max.
4-6	**RETURN LOSS TESTS**			
	BB RETURN LOSS (10kHz-10MHz)			
	Telephony Input	30dB	.....	
	Video Input	28dB	.....	
	Telephony Output	30dB	.....	
	Video Output	30dB	.....	
	ATTEN. RETURN LOSS (10kHz-10MHz)			
	Attenuator Input 1dB	30dB	.....	
	Attenuator Input 2dB	30dB	.....	
	Attenuator Input 3dB	30dB	.....	
	Attenuator Input 4dB	30dB	.....	
	Attenuator Input 5dB	30dB	.....	
	Attenuator Input 6dB	30dB	.....	
	Attenuator Input 7dB	30dB	.....	
	Attenuator Input 8dB	30dB	.....	
	Attenuator Input 9dB	30dB	.....	
	Attenuator Input 10dB	30dB	.....	
	Attenuator Input 11dB	30dB	.....	
	Attenuator Input 12dB	30dB	.....	
	Attenuator Input 13dB	30dB	.....	
	Attenuator Input 14dB	30dB	.....	
	Attenuator Input 15dB	30dB	.....	
	Attenuator Output 1dB	30dB	.....	
	Attenuator Output 2dB	30dB	.....	
	Attenuator Output 3dB	30dB	.....	
	Attenuator Output 4dB	30dB	.....	
	Attenuator Output 5dB	30dB	.....	
	Attenuator Output 6dB	30dB	.....	
	Attenuator Output 7dB	30dB	.....	
	Attenuator Output 8dB	30dB	.....	
	Attenuator Output 9dB	30dB	.....	
	Attenuator Output 10dB	30dB	.....	
	Attenuator Output 11dB	30dB	.....	
	Attenuator Output 12dB	30dB	.....	
	Attenuator Output 13dB	30dB	.....	
	Attenuator Output 14dB	30dB	.....	
	Attenuator Output 15dB	30dB	.....	
	BAL I/O RET. LOSS (60kHz-10MHz)			
	Balanced Input	26dB	.....	
	Balanced Output	26dB	.....	

Performance Test Record (continued)

Para No.	Test Description	Result		
		Min.	Actual	Max.
4-6 cont.	IF RETURN LOSS (70MHz +—10MHz)			
	IF Output	30dB	.....	
	IF Output	30dB	.....	
	IF Input	30dB	.....	
	ATTEN. RET. LOSS (70MHz +—10MHz)			
	Attenuator Input 1dB	30dB	.....	
	Attenuator Input 2dB	30dB	.....	
	Attenuator Input 3dB	30dB	.....	
	Attenuator Input 4dB	30dB	.....	
	Attenuator Input 5dB	30dB	.....	
	Attenuator Input 6dB	30dB	.....	
	Attenuator Input 7dB	30dB	.....	
	Attenuator Input 8dB	30dB	.....	
	Attenuator Input 9dB	30dB	.....	
	Attenuator Input 10dB	30dB	.....	
	Attenuator Input 11dB	30dB	.....	
	Attenuator Input 12dB	30dB	.....	
	Attenuator Input 13dB	30dB	.....	
	Attenuator Input 14dB	30dB	.....	
	Attenuator Input 15dB	30dB	.....	
	Attenuator Output 1dB	30dB	.....	
	Attenuator Output 2dB	30dB	.....	
	Attenuator Output 3dB	30dB	.....	
	Attenuator Output 4dB	30dB	.....	
	Attenuator Output 5dB	30dB	.....	
	Attenuator Output 6dB	30dB	.....	
	Attenuator Output 7dB	30dB	.....	
	Attenuator Output 8dB	30dB	.....	
	Attenuator Output 9dB	30dB	.....	
	Attenuator Output 10dB	30dB	.....	
	Attenuator Output 11dB	30dB	.....	
	Attenuator Output 12dB	30dB	.....	
	Attenuator Output 13dB	30dB	.....	
	Attenuator Output 14dB	30dB	.....	
	Attenuator Output 15dB	30dB	.....	
4-7	**PRE-EMPHASIS & SENSITIVITY TEST**			
	CCIR PRE-EMPHASIS & I/P SENS.			
	BB sens. at 24Ch. c'vr freq.	—1dB	.....	+1dB
	24Ch. resonant freq. accuracy	+4.8dB	.....	+5.2dB
	BB sens. at 60Ch. c'vr freq.	—1dB	.....	+1dB
	60Ch. resonant freq. accuracy	+4.8dB	.....	+5.2dB
	BB sens. at 120Ch. c'vr freq.	—1dB	.....	+1dB
	120Ch. resonant freq. accuracy	+4.8dB	.....	+5.2dB
	BB sens. at 300Ch. c'vr freq.	—1dB	.....	+1dB
	300Ch. resonant freq. accuracy	+4.8dB	.....	+5.2dB
	BB sens. at 600Ch. c'vr freq.	—1dB	.....	+1dB

Performance Test Record (continued)

Para No.	Test Description	Result		
		Min.	Actual	Max.
4-7 cont.	600Ch. resonant freq. accuracy	+4.8dB	.....	+5.2dB
	BB sens. at 960Ch. c'vr freq.	−1dB	.....	+1dB
	960Ch. resonant freq. accuracy	+4.8dB	.....	+5.2dB
	BB sens. at 1260Ch. c'vr freq.	−1dB	.....	+1dB
	1260Ch. resonant freq. accuracy	+4.8dB	.....	+5.2dB
	BB sens. at 1800Ch. c'vr freq.	−1dB	.....	+1dB
	1800Ch. resonant freq. accuracy	+4.8dB	.....	+5.2dB
	BELL PRE-EMPHASIS SHAPE			
	600Ch. 1000kHz accuracy	+5.26dB	.....	+5.66dB
	600Ch. 3000kHz accuracy	+11.04dB	.....	+11.44dB
	900Ch. 1000kHz accuracy	+1.13dB	.....	+1.43dB
	900Ch. 300kHz accuracy	+5.70dB	.....	+6.10dB
	900Ch. 8000kHz accuracy	+10.88dB	.....	+11.28dB
	1200Ch. 1000kHz accuracy	+1.13dB	.....	+1.43dB
	1200Ch. 3000kHz accuracy	+5.7dB	.....	+6.10dB
	1200Ch. 8000kHz accuracy	+10.88dB	.....	+11.28dB
	1500Ch. 1000kHz accuracy	+1.13dB	.....	+1.43dB
	1500Ch. 3000kHz accuracy	+5.70dB	.....	+6.10dB
	1500Ch. 8000kHz accuracy	+10.88dB	.....	+11.28dB
	1800Ch. 1000kHz accuracy	1.13dB	.....	+1.43dB
	1800Ch. 3000kHz accuracy	+5.70dB	.....	+6.10dB
	1800Ch. 8000kHz accuracy	+10.88dB	.....	+11.28dB
	BELL INPUT SENSITIVITY			
	BB Input Sens. with 600Ch.	−1.44dB	.....	+0.56dB
	BB Input Sens. with 900Ch.	+1.10dB	.....	+3.1dB
	BB Input Sens. with 1200Ch.	−0.4dB	.....	+1.6dB
	BB Input Sens. with 1500Ch.	−1.9dB	.....	+0.1dB
	BB Input Sens. with 1800Ch.	−2.4dB	.....	−0.4dB
	VIDEO PRE-EMPHASIS & I/P SENS.			
	BB sens. at 525 Line 0dB point	−1dB	.....	+1dB
	525 Line 50kHz accuracy	−9.51dB	.....	−9.91dB
	525 Line 5000kHz accuracy	+3.08dB	.....	+3.48dB
	BB sens. at 625 Line 0dB point	−1dB	.....	+1dB
	625 Line 50kHz accuracy	−11.11dB	.....	−10.71dB
	625 Line 5000kHz accuracy	+2.39dB	.....	+2.79dB
	BB sens. at 819 Line 0dB point	−1dB	.....	+1dB
	819 Line 50kHz accuracy	−7.17dB	.....	−6.77dB
	819 Line 5000kHz accuracy	+5.41dB	.....	+5.81dB
4-8	**BB INPUT & BB OUTPUT SENSITIVITY TEST**			
	TELEPHONY			
	Telephony Input at 82.92kHz	−38dBm	.....	−36dBm
	Telephony Output at 82.92kHz	+8dB	.....	+10dB
	VIDEO			
	Video Input at 1663.34kHz	0.9V pk-pk	.....	1.1V pk-pk
	Video Output at 1663.34kHz	0.9V pk-pk	.....	1.1V pk-pk

Performance Test Record (continued)

Para No.	Test Description	Result		
		Min.	Actual	Max.
4-9	**BB-IF SWEPT RESPONSE TEST**			
	TELEPHONY			
	1st IF O/P Resp: <= 0.4dB pk-pk		.....	
	2nd IF O/P Resp: <= 0.4dB pk-pk		.....	
	1st IF O/P Linearity: <= 2.2%		.....	
	1st IF O/P Group Delay: <1.0ns		.....	
	2nd IF O/P Linearity: <= 2.2%		.....	
	2nd IF O/P Group Delay: <1.0ns		.....	
	1st IF O/P Diff Gain: <2%		.....	
	1st IF O/P Diff Phase: <1.5 deg		.....	
	2nd IF O/P Diff Gain: <2%		.....	
	2nd IF O/P Diff Phase: <1.5 deg		.....	
	VIDEO NORM			
	1st IF O/P Resp: <= 0.4dB pk-pk		.....	
	2nd IF O/P Resp: <= 0.4dB pk-pk		.....	
	1st IF O/P Linearity: <= 2.2%		.....	
	1st IF O/P Group Delay: <1.0ns		.....	
	2nd IF O/P Linearity: <= 2.2%		.....	
	2nd IF O/P Group Delay: <1.0ns		.....	
	1st IF O/P Diff Gain: <2%		.....	
	1st IF O/P Diff Phase: <1.5 deg		.....	
	2nd IF O/P Diff Gain: <2%		.....	
	2nd IF O/P Diff Phase: <1.5 deg		.....	
	VIDEO MOD INV			
	1st IF O/P Resp: <= 0.4dB pk-pk		.....	
	2nd IF O/P Resp: <= 0.4dB pk-pk		.....	
	1st IF O/P Linearity: <2.2%		.....	
	1st IF O/P Group Delay: <1.0ns		.....	
	2nd IF O/P Linearity: <= 2.2%		.....	
	2nd IF O/P Group Delay: <1.0ns		.....	
	1st IF O/P Diff Gain: <2%		.....	
	1st IF O/P Diff Phase: <1.5 deg		.....	
	2nd IF O/P Diff Gain: <2%		.....	
	2nd IF O/P Diff Phase: <1.5 deg		.....	
4-10	**IF OUTPUT TEST**			
	Frequency	69.990MHz	.....	70.010MHz
	TELEPHONY			
	Level (1st IF OUTPUT)	4dBm	.....	6dBm
	Level (2nd IF OUTPUT)	4dBm	.....	6dBm
	VIDEO NORM			
	Level	4dBm	.....	6dBm
	VIDEO NORM INV			
	Level	4dBm	.....	6dBm

Performance Test Record (continued)

Para No.	Test Description	Result		
		Min.	Actual	Max.
4-11	**IF-BB SWEPT RESPONSE TEST**			
	TELEPHONY			
	Linearity (−10dBm I/P): <2%		.....	
	Group Delay (−10dBm I/P): <1.5ns		.....	
	Linearity (+6dBm I/P): <2%		.....	
	Group Delay (+6dBm I/P): <1.5ns		.....	
	Diff Gain (−10dBm I/P): <2%		.....	
	Diff Phase (−10dBm I/P): <1.5 deg		.....	
	Diff Gain (+6dBm I/P): <2%		.....	
	Diff Phase (+6dBm I/P): <1.5 deg		.....	
	VIDEO NORM			
	Linearity (−10dBm I/P): <2%		.....	
	Group Delay (−10dBm I/P): <1.5 ns		.....	
	Linearity (+6dBm I/P): <2%		.....	
	Group Delay (+6dBm I/P): <1.5ns		.....	
	Diff Gain (−10dBm I/P): <2%		.....	
	Diff Phase (−10dBm I/P): <1.5 deg		.....	
	Diff Gain (+6dBm I/P): <2%		.....	
	Diff Phase (+6dBm I/P): <1.5 deg		.....	
	VIDEO DEV INV			
	Linearity (−10dBm I/P): <2%		.....	
	Group Delay (−10dBm I/P): <1.5ns		.....	
	Linearity (+6dBm I/P): <2%		.....	
	Group Delay (+6dBm I/P): <1.5ns		.....	
	Diff Gain (−10dBm I/P): <2%		.....	
	Diff Phase (−10dBm I/P): <1.5 deg		.....	
	Diff Gain (+6dBm I/P): <2%		.....	
	Diff Phase (+6dBm I/P): <1.5 deg		.....	
4-12	**VIDEO DIFF GAIN/PHASE TEST**			
	VIDEO-NORM			
	1st IF OUTPUT		.....	
	Diff Gain: 0.7%		.....	
	Diff Phase: 0.5 deg			
	2nd IF OUTPUT			
	Diff Gain: 0.7%		.....	
	Diff Phase: 0.5 deg		.....	
	VIDEO - MOD INV & DEM INV			
	1st IF OUTPUT			
	Diff Gain: 0.7%		.....	
	Diff Phase: 0.5 deg		.....	

Performance Test Record (continued)

Para No.	Test Description	Result		
		Min.	Actual	Max.
4-12 cont.	2nd IF OUTPUT			
	Diff Gain: 0.7%		.....	
	Diff Phase: 0.5 deg		.....	
4-13	**50Hz SQUARE WAVE TILT TEST**			
	Flatness (VIDEO – NORM): +–0.5 div		.....	
	Flatness (VIDEO – DEM INV): +–0.5 div		.....	
	Flatness (VIDEO – MOD INV): +–0.5 div		.....	
4-14	**BB-to-BB RESPONSE & SENSITIVITY TEST**			
	TELEPHONY			
	No Emp. 10kHz-10MHz: = <0.4dB pk-pk		.....	
	CCIR			
	Output sens. with 24Ch. Emp.	–2dB	.....	+2dB
	24Ch. response: = <0.4dB pk-pk		.....	
	Output sens. with 60Ch. Emp.	–2dB	.....	+2dB
	60Ch. response: = <0.4dB pk-pk		.....	
	Output sens. with 120Ch. Emp.	–2dB	.....	+2dB
	120Ch. response: = <0.4dB pk-pk		.....	
	Output sens. with 300Ch. Emp.	–2dB	.....	+2dB
	300Ch. response: = <0.4dB pk-pk		.....	
	Output sens. with 600Ch. Emp.	–2dB	.....	+2dB
	600Ch. response: = <0.4dB pk-pk		.....	
	Output sens. with 960Ch. Emp.	–2dB	.....	+2dB
	960Ch. response: = <0.4dB pk-pk		.....	
	Output sens. with 1260Ch. Emp.	–2dB	.....	+2dB
	1260Ch. response: = <0.4dB pk-pk		.....	
	Output sens. with 1800Ch. Emp.	–2dB	.....	+2dB
	1800Ch. response: = <0.4dB pk-pk		.....	
	BELL			
	Output sens. with 600Ch. Emp.	–11dB	.....	–7dB
	600Ch. response: = <0.4dB pk-pk		.....	
	Output sens. with 900Ch. Emp.	–11dB	.....	–7dB
	900Ch. response: = <0.4dB pk-pk		.....	
	Output sens. with 1200Ch. Emp.	–11dB	.....	–7dB
	1200Ch. response: = <0.4dB pk-pk		.....	
	Output sens. with 1500Ch. Emp.	–11dB	.....	–7dB
	1500Ch. response: = <0.4dB pk-pk		.....	
	Output sens. with 1800Ch. Emp.	–11dB	.....	–7dB
	1800Ch. response: = <0.4dB pk-pk		.....	

Performance Test Record (continued)

Para No.	Test Description	Result		
		Min.	Actual	Max.
4-14 cont.	VIDEO			
	No Emp 50Hz-10MHz: = <0.4dB pk-pk		.....	
	Output sens, with 525L Emp.	−2dB	.....	+2dB
	525 line response: = <0.4dB pk-pk		.....	
	Output sens, with 625L Emp.	−2dB	.....	+2dB
	625 line response: = <0.4dB pk-pk		.....	
	Output sens, with 819L Emp.	−2dB	.....	+2dB
	819 line response: = <0.4dB pk-pk		.....	
4-15	**OPTION 004 BB-to-BB FREQUENCY RESPONSE**			
	Bal/Uncal converter			
	60kHz-10MHz: = <0.4dB pk-pk		z ..... dB	
	zdB + 24Ch, CCIR Response		..... dB	0.8dB pk-pk
	zdB + 60Ch, CCIR Response		..... dB	0.8dB pk-pk
	zdB + 120Ch, CCIR Response		..... dB	0.8dB pk-pk
	zdB + 300Ch, CCIR Response		..... dB	0.8dB pk-pk
	zdB +1260Ch, CCIR Response		..... dB	0.8dB pk-pk
	zdB + 1800Ch, CCIR Response		..... dB	0.8dB pk-pk
	zdB + 600Ch, BELL Response		..... dB	0.8dB pk-pk
	zdB + 960Ch, BELL Response		..... dB	0.8dB pk-pk
	zdB + 1200Ch, BELL Response		..... dB	0.8dB pk-pk
	zdB + 1500Ch, BELL Response		..... dB	0.8dB pk-pk
	zdB + 1800Ch, BELL Response		..... dB	0.8dB pk-pk
4-16	**TELEPHONY SPURIOUS RESPONSE TEST**			
	Spurious signals		.....	−100dBm
4-17	**1800 CHANNEL NOISE LOADING TEST**			
	70kHz Filter	57dB	.....	
	534kHz Filter	57dB	.....	
	1248kHz Filter	57dB	.....	
	2438kHz Filter	57dB	.....	
	3886kHz Filter	57dB	.....	
	5340kHz Filter	57dB	.....	
	7600kHz Filter	57dB	.....	
4-18	**ATTENUATOR RANGE & FREQ RESP**			
	RANGE			
	1dB	0.5dB	.....	1.5dB
	2dB	1.5dB	.....	2.5dB
	3dB	2.5dB	.....	3.5dB
	4dB	3.5dB	.....	4.5dB
	5dB	4.5dB	.....	5.5dB
	6dB	5.5dB	.....	6.5dB
	7dB	6.5dB	.....	7.5dB

Performance Test Record (continued)

Para No.	Test Description	Result		
		Min.	Actual	Max.
4-18 cont.				
	8dB	7.5dB	.....	8.5dB
	9dB	8.5dB	.....	9.5dB
	10dB	9.5dB	.....	10.5dB
	11dB	10.5dB	.....	11.5dB
	12dB	11.5dB	.....	12.5dB
	13dB	12.5dB	.....	13.5dB
	14dB	13.5dB	.....	14.5dB
	15dB	14.5dB	.....	15.5dB
	FLATNESS 50Hz-10MHz			
	1dB: = <0.4dB pk-pk		.....	
	2dB: = <0.4dB pk-pk		.....	
	3dB: = <0.4dB pk-pk		.....	
	4dB: = <0.4dB pk-pk		.....	
	5dB: = <0.4dB pk-pk		.....	
	6dB: = <0.4dB pk-pk		.....	
	7dB: = <0.4dB pk-pk		.....	
	8dB: = <0.4dB pk-pk		.....	
	9dB: = <0.4dB pk-pk		.....	
	10dB: = <0.4dB pk-pk		.....	
	11dB: = <0.4dB pk-pk		.....	
	12dB: = <0.4dB pk-pk		.....	
	13dB: = <0.4dB pk-pk		.....	
	14dB: = <0.4dB pk-pk		.....	
	15dB: = <0.4dB pk-pk		.....	
	FLATNESS 60-80MHz			
	1dB: = <0.4dB pk-pk		.....	
	2dB: = <0.4dB pk-pk		.....	
	3dB: = <0.4dB pk-pk		.....	
	4dB: = <0.4dB pk-pk		.....	
	5dB: = <0.4dB pk-pk		.....	
	6dB: = <0.4dB pk-pk		.....	
	7dB: = <0.4dB pk-pk		.....	
	8dB: = <0.4dB pk-pk		.....	
	9dB: = <0.4dB pk-pk		.....	
	10dB: = <0.4dB pk-pk		.....	
	11dB: = <0.4dB pk-pk		.....	
	12dB: = <0.4dB pk-pk		.....	
	13dB: = <0.4dB pk-pk		.....	
	14dB: = <0.4dB pk-pk		.....	
4-19	**HP-IB FUNCTIONAL TEST**			
	Program run O.K.: YES/NO			

Fig 8-30 Sht 2 of 3

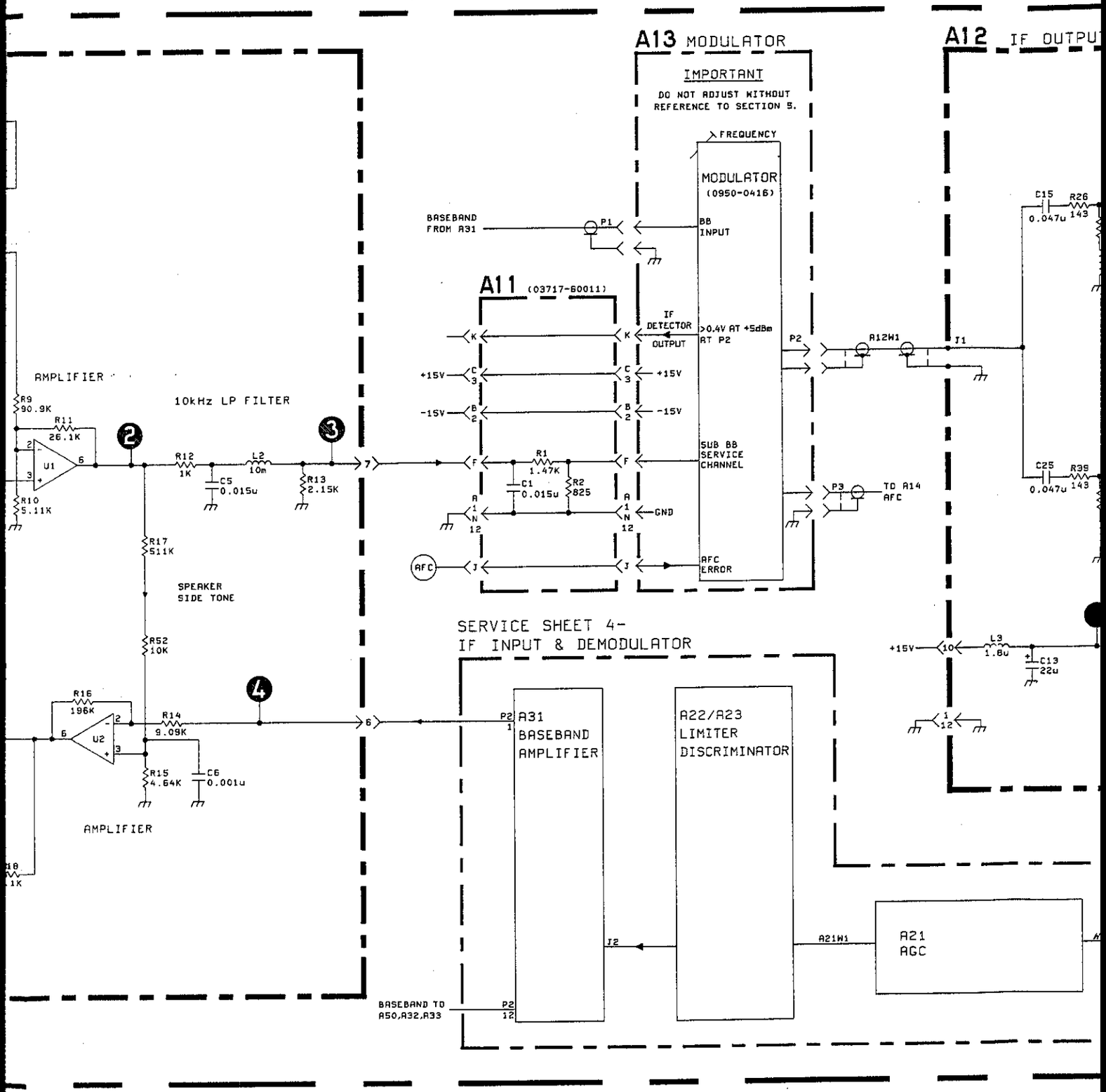


Table 5-1 3717A Adjustable Components

Reference Designator	Adjustment Name	Para. No.	Service Sheet	Description
A6R6	Power Supply	5-6	9	Adjusts +15V supply to +15V +–0.02V. NOTE: –15V Supply tracks +15V supply within +–0.3V
A6R27	+5V Adjust	5-6		Adjust +5V to +5V +–0.2V.
A12L6, C23	Return Loss	5-7	3	Adjusts return loss for >30dB at IF OUTPUT 1.
A12L9, C33	Return Loss	5-7	3	Adjusts return loss for >30dB at IF OUTPUT 2.
A14L4	Frequency	5-8	3	Adjusts 12MHz Crystal Oscillator for maximum output at A14TP2.
A14C6	Frequency	5-8	3	Adjusts frequency of 12MHz Crystal Oscillator to 12MHz +–50Hz at A14TP2.
A12R32/C35	Level/ Flatness	5-10	3	Adjusts output level of IF OUTPUT 1 to +5dBm and flatness from 60-80MHz for better than +–0.2dB.
A12R45/C36	Level/ Flatness	5-10	3	Adjusts output level of IF OUTPUT 2 to +5dBm and also flatness from 60 to 80MHz for better than +–0.2dB.
A21R26	Gain	5-10	4	Adjusts gain between IF INPUT and A21 output to –7dB at 70MHz.
A21L4	Return Loss	5-11	4	Adjusts return loss for >30dB at A21 output.
A21R12	Flatness	5-11	4	Adjusts flatness between IF INPUT and A21J2 for better than +–0.5dB.
A21R29	LO	5-11	4	Adjusts LO threshold of IF INPUT to –10dBm.
A21R31	HI	5-11	4	Adjusts HI thresholds of IF INPUT to +6dBm.
A32R17	Gain	5-12	1	Adjusts A32 gain for a Modulator Sensitivity of –37dBm for 141kHz RMS deviation using the Bessel Null method. NOTE: If a replacement Modulator is used then A31R37 should be selected as per Table 5-3 before this adjustment.

Table 5-1 3717A Adjustable Components (continued)

Reference Designator	Adjustment Name	Para. No.	Service Sheet	Description
A33R9	Gain	5-13	2	Adjusts A33 gain in MOD INV mode for a Modulator Sensitivity of –24dBm for 141kHz RMS deviation using the Bessel Null method.
A33R7	Equalize Gain	5-13	2	Adjusts the A33 gain in the NORM mode for a Modulator Sensitivity of –24dBm for 141kHz RMS deviation using the Bessel Null method.
A31R57	Gain	5-14	3	Adjusts TELEPHONY Demodulator Sensitivity to –28dBm using an MLA to provide an IF INPUT of 141kHz deviation with a 83kHz test tone.
A33R52	Gain	5-14	2	Adjusts VIDEO Demodulator Sensitivity in DEMOD INV mode to –24dBm using an IF INPUT of 141kHz deviation with a 83kHz test tone.
A33R50	Equalize Gain	5-14	2	Adjusts VIDEO Demodulator Sensitivity in NORM mode to –24dBm using an IF INPUT of 141kHz deviation with a 83kHz test tone.
A32C8	Flatness	5-15	1	Adjusts flatness between TELEPHONY input and TEST connector A32J3 for better than +–0.1dB across 10kHz-10MHz.
A31C12	Flatness	5-15	3	Adjusts flatness between TELEPHONY input and A31J1 for better than +–0.1dB across 10kHz-10MHz.
A33C5	Flatness	5-15	2	Adjusts flatness between VIDEO input and A31J1 in NORM and MOD INV modes for better than +–0.1dB across 50Hz to 10MHz.
A31C24/R68	Shape	5-16	3	Adjusts flatness between A31J2 and TELEPHONY output for an inverse parabolic shape of less than +–0.1dB across 50Hz and 10MHz.
A33C18	Flatness	5-16	2	Adjusts flatness between A31J2 and VIDEO output in NORM and DEMOD INV modes for better than +–0.1dB.

Table 5-1 3717A Adjustable Components (continued)

Reference Designator	Adjustment Name	Para. No.	Service Sheet	Description
A13 MODULATOR	FREQ	5-9	3	Only after checking if IF OUTPUT centre frequency is wrong. adjusts Modulator's centre frequency to 70MHz by setting the dc level on the AFC test point to 0+—0.07V.
A22 LIMITER	IF Level	5-19	4	Adjusts (only after a replacement Limiter is fitted) the output level at A1 test point IF (A22 P2) for 350mV +—100mV with —7dBm IF INPUT.
A23C43	C43	5-19	4	Only adjusted when a replacement Discriminator and Limiter is used. Fine adjusts back-to-back BB Flatness from 10kHz to 10MHz.
A23R82	R82	5-19	4	Only adjusted when a replacement Discriminator and Limiter is used. Adjusts the Discriminator zero point with no IF INPUT to 0+—10mV at A1 test point DZ (A23J).
A23R61	R61	5-19	4	Only adjusted when a replacement Discriminator or Limiter is used. Adjusts for best NPR figure when testing bottom slot of 70kHz.
A50L1	L1	5-17	1/2	Adjusts the resonant frequency of the pre-emphasis network.
A50L2	L2	5-17	1/2	Adjusts the resonant frequency of the de-emphasis network.
A23L9/C22	L9/C22	5-19	4	Only adjusted when a replacement Discriminator and Limiter are used. Adjust for better than 1% slope.
A23R57	R57	5-19	4	Only adjusted when a replacement Discriminator and Limiter are used. Adjusts the Discriminator zero point with 70MHz IF INPUT to 0 +— 10mV at A1 test point DZ (A23J).
A22L1/L2	L1/L8	5-19	4	Only adjusted when a replacement Discriminator and Limiter are used and only then if MPR is less than 57dB when testing the 7600kHz slot.

Table 5-2 Related Adjustments

Circuit Repaired	Carry out Adjustments	See Para.
Telephony Input	Telephony Input Sensitivity Adjustment	5-12
	Video Input Sensitivity Adjustment	5-13
	Baseband Input Flatness Adjustment	5-15
Video Input	Telephony Input Sensitivity Adjustment	5-12
	Video Input Sensitivity Adjustment	5-13
	Baseband Input Flatness Adjustment	5-15
Modulator	AFC Adjustment	5-8
	Telephony Input Sensitivity Adjustment	5-12
	Video Input Sensitivity Adjustment	5-13
	Baseband Input Flatness Adjustment	5-15
IF Output	IF Output Return Loss Adjustment	5-7
	IF Level and Flatness Adjustment	5-10
IF Input	AGC Adjustments	5-11
Limiter and Discriminator	AGC Adjustments	5-11
	Back to Back Discriminator Adjustments	5-19
Telephony Output	Baseband Output Sensitivity Adjustment	5-14
	Baseband Output Flatness Adjustment	5-16
Video Output	Baseband Output Sensitivity Adjustment	5-14
	Baseband Output Flatness Adjustment	5-16
Emphasis Network	Emphasis and De-emphasis Adjustment	5-17

Table 5-3 Factory Selected Components

Component	Service Sheet	Value Range	Basis of Selection
A12R33	3	42 – 68 ohms	Correct gain of IF output J6 (See Para 5-10).
A12R46	3	42 – 68 ohms	Correct gain of IF output J7 (See Para 5-10).
A31R37	3	287 – 422 ohms	BB I/O Sensitivity (See Para 5-12).

5-5 PRELIMINARY PROCEDURE

1. Disconnect the power cord.
2. Read the WARNING on Page 5-1.
3. Remove the upper rear feet if fitted and the top cover.
4. Remove the central metal strap for access to the assemblies in the centre section of the instrument, the left-hand screen for access to the Modulator, AFC and Service Channel and IF Amplifier assemblies, the right hand screen for access to the Limiter, Discriminator, and the AGC Input assembly.
5. Connect the line cord to the 3717A and switch ON.
6. Allow 15 minutes warm-up before making any adjustments.

5-6 POWER SUPPLY CHECKS AND ADJUSTMENTS

REFERENCE Service Sheet 9.

DESCRIPTION

The +15V supply is adjusted. The −15V supply is checked to be within 0.3V of the value of the +15V supply. The +5V supply is adjusted.

EQUIPMENT

Variable Voltage Transformer
Digital Voltmeter . . . . . .hp 3465A
Oscilloscope . . . . . .hp 1740A

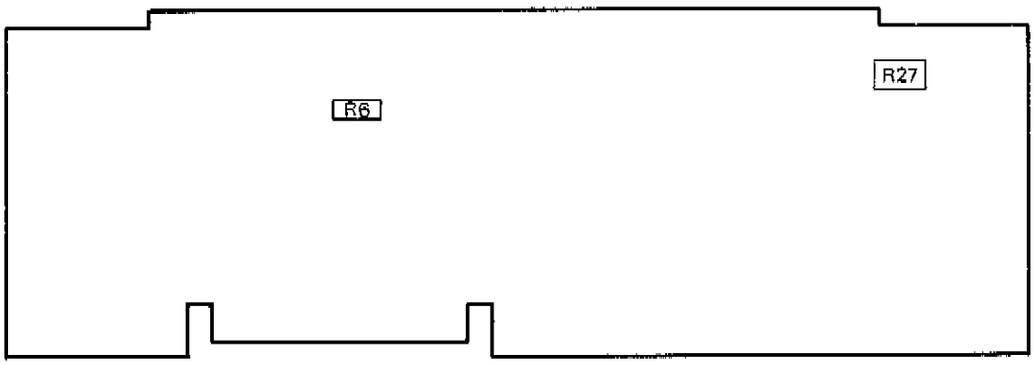


Figure 5-1 A6 Adjustment Locations

Note: Due to the proximity of A6F1 and F2 to R6, an insulated tool should be used for the adjustment.

PROCEDURE

1. Connect the DVM between A6, +15V test point and ground. Adjust A6R6 for +15.00V +−0.02V. Note the +15V supply voltage.
2. Connect the DVM between A6, −15V test point and ground. Check that the DVM reads the same value as the +15V supply as measured in step 1, +−0.3V.
3. Connect the DVM between A6, +5V test point and ground. Adjust A6R27 for +5.15V+−0.05V.

4. Connect the oscilloscope to each of the supplies in turn and check that the ripple does not exceed the limits below, over the range of the line voltage setting being used.

Line Voltage Setting	Lower Limit	Upper Limit
100V	90V	105V
120V	108V	126V
220V	198V	231V
240V	216V	252V

Power Supply	Max Ripple (mV pk-pk)
+15V	5
−15V	5
+5V	20

5-7 IF OUTPUT RETURN LOSS ADJUSTMENT

REFERENCE Service Sheet 3.

DESCRIPTION

The return loss of both the IF outputs is checked and adjusted.

EQUIPMENT

70MHz MLA Generator . . . . . .hp 3710A
70MHz MLA Receiver . . . . . .hp 3702B
75 ohm Termination . . . . . .hp 15522C
17dB Mismatch. . . . . .hp 15521A
6dB Hybrid . . . . . .hp 15520C

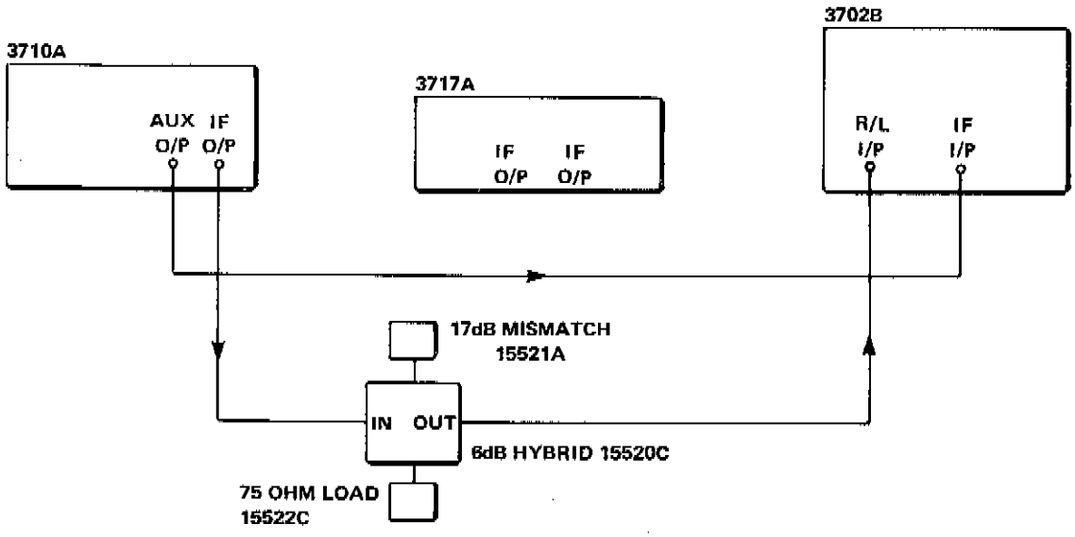


Figure 5-2 Return Loss Setup

1. Connect the equipment as shown in Figure 5-5. Set the controls as follows:

3710A
IF FREQUENCY 70MHz
SWEEP WIDTH. 20MHz
SWEEP . . . . . .INT
IF ATTENUATOR 10dB
AUX OUTPUT . . . . . .IF UNCAL

3702B
Y1 DISPLAY . . . . . .RET LOSS
Y2 DISPLAY . . . . . .IF
IF ATTENUATOR 4dB
RETURN LOSS ATTENUATOR 17dB
Y1 Y2 CALIBRATION 1dB
Y1 POSITION . . . . . .CENTRED
Y1 GAIN. . . . . .FULL CCW
MARKERS . . . . . .SLIDING
MARKER OFFSET. 10MHz

Adjust the 3702B X GAIN, X POSITION and X PHASE SHIFT to obtain a 10cm trace with the markers superimposed.

2. Adjust the 3702B RETURN LOSS CALIBRATION for 0dB meter reading. Increase the Y1 GAIN till the split trace is 1cm. Switch Y1 Y2 CALIBRATION to OFF. Adjust the RETURN LOSS CALIBRATION if necessary for a 0dB meter reading. Set the Y1 POSITION to place the trace on the centre line of the CRT. The 3702B Return Loss Attenuator is now calibrated directly in dB.

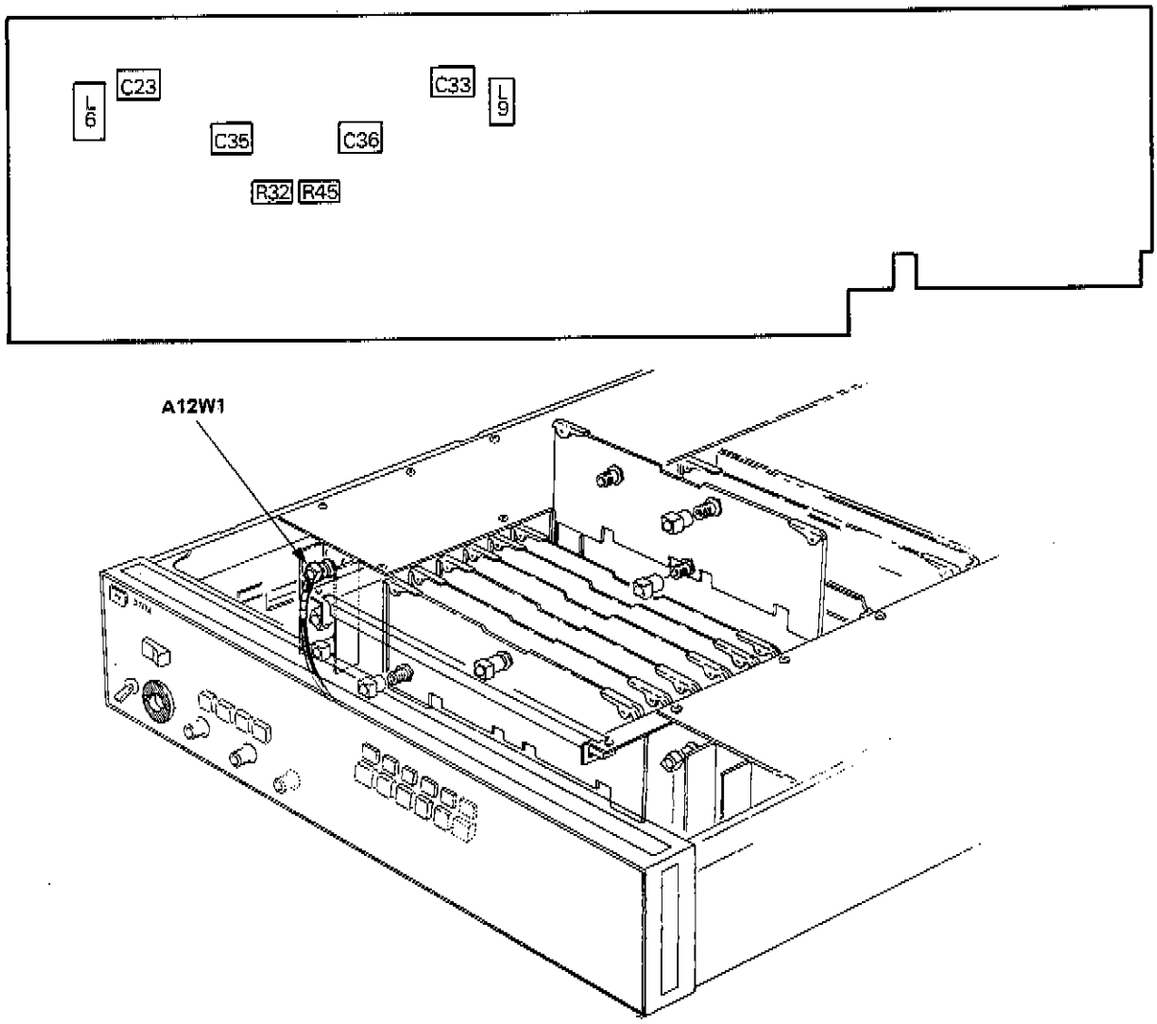


Figure 5-3 A12 Adjustment Locations and Position of A12W1

3. Remove the 17dB Mismatch from the Return Loss Bridge and connect the bridge (using a short cable or adaptor) to the LEFT 3717A IF output. Disconnect 3717A A12W1 from the A13 Modulator Assembly.

4. Set the 3702B Return Loss Attenuator to 30dB. Check that the trace is below the centre of the display (indicating return loss greater than 30dB) over the full display. If necessary, adjust A12L6 and A12C23 for return loss greater than 30dB, 70MHz +−10MHz. (See Figure 5-3 for adjustment locations.)

5. Connect the Return Loss Bridge to the RIGHT 3717A IF Output. Check that the 3702B trace is below the centre of the screen. If necessary adjust A12L9 and A12C33 for return loss greater than 30dB, 70MHz +−10MHz. (See Figure 5-3 for adjustment locations.)

6. Reconnect A12W1 to the A13 Modulator Assembly.

5-8 AFC ADJUSTMENTS

REFERENCE Service Sheet 3.

DESCRIPTION

The level and frequency of the AFC 12MHz reference oscillator are checked and adjusted.

EQUIPMENT

Frequency Counter . . . . . .hp 5381A
Oscilloscope . . . . . .hp 1740A
Digital Voltmeter . . . . . .hp 3465A

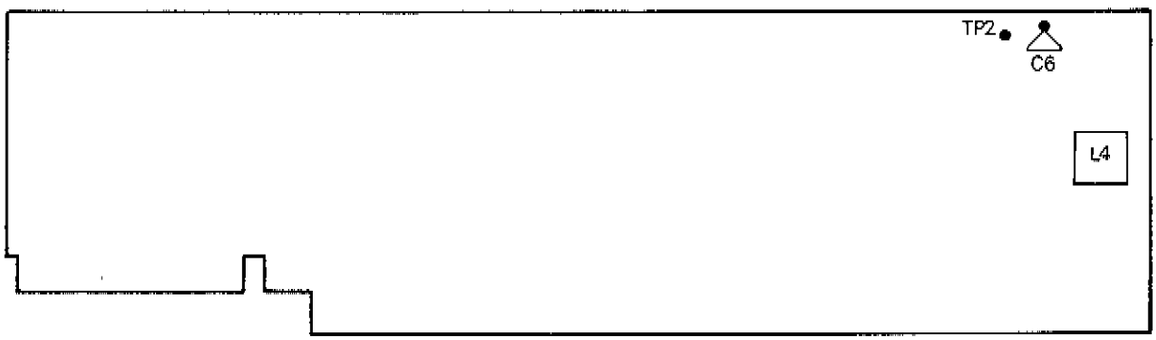


Figure 5-4 A14 Adjustment Locations

PROCEDURE

1. Connect the Oscilloscope via a 10:1 probe to A14TP2. Adjust A14L4 for maximum amplitude of oscillation. (Typical value approx. 1V pk-pk).

2. Disconnect Oscilloscope and connect Frequency Counter input to A14TP2 via the 10:1 probe. Set the counter input to 1M ohm x 1. Adjust A14C6 for 12MHz +−50Hz.

3. Connect the Frequency Counter to a 3717A IF Output. Set the counter input to 50 ohm. Using the 10 sec gate time, check that the IF output frequency is 70MHz +−10kHz.

4. Connect the DVM between the "AFC" test point beside the A13 Modulator connector on the A1 Motherboard and ground. Check that the AFC voltage is less than +−150mV.

5. If the AFC voltage is greater than +−150mV, remove the A14 AFC Assembly. Set A13 "FREQ" (accessible through the left of the A13 modulator housing) for an IF output frequency of 70MHz +−100kHz. (If the A13 "FREQ" adjustment has insufficient range, reset it to its mid point, then carry out the Modulator Adjustment, Paragraph 5-9).

6. Replace the A14 AFC Assembly.

7. Check that the 3717A IF OUTPUT FREQ LOCK indicator is lit.

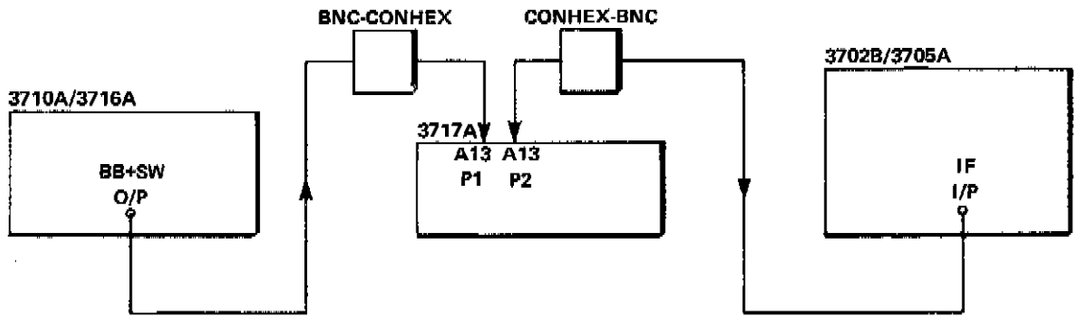
5-9 MODULATOR ADJUSTMENT

DESCRIPTION

If the BB-IF Swept Response Test (Para 4-10) is out of specification, or the A13 "FREQ" adjustment has insufficient range to allow proper adjustment as detailed in the AFC Adjustment (Para 5-8), minor adjustments to the A13 Modulator Assembly may be carried out.

EQUIPMENT

70MHz MLA Generator . . . . . .hp 3710A/3716A
70MHz MLA Receiver . . . . . .hp 3702B/3705A



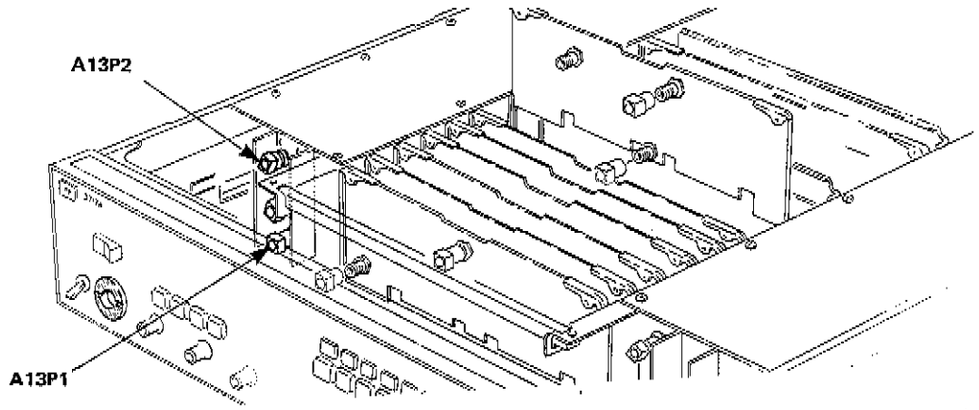


Figure 5-5 Modulator Adjustment Setup and Location of A13P1 and P2

PROCEDURE

Note: This adjustment procedure should not be attempted unless the adjustment in Paragraph 5-8 AFC Adjustments cannot be carried out, or the performance test in Paragraph 4-10 BB-IF Swept Response is out of specification.

1. Connect the equipment as shown in Figure 5-5. Set the controls as follows:

3716A
BB FREQUENCY . . . . . .500kHz (555kHz Opt 010)
BB POWER . . . . . .–37dBm

3710A
SWEEP WIDTH. 20MHz
SWEEP . . . . . .INT

3702B
Y1 DISPLAY . . . . . .BB
Y1 GAIN. . . . . .FULL CCW
Y1 POSITION . . . . . .CENTRED
Y2 DISPLAY . . . . . .DELAY
Y2 GAIN. . . . . .FULL CCW
Y2 POSITION . . . . . .CENTRED
SWEEP SOURCE . . . . . .INT IF
MARKERS . . . . . .SLIDING
MARKER OFFSET 10MHz
IF ATTENUATOR 15dB
BB POWER . . . . . .–30dB

3705A
BB FREQUENCY . . . . . .500kHz (555kHz Opt 010)
BANDWIDTH. 5kHz

2. Adjust the 3716A SWEEP CAL to place the 3702B +–10MHz markers at the ends of the trace.

3. Set the 3702B BB POWER for an on scale meter reading. Set the Y1 Y2 CALIBRATION to 1% and adjust the Y1 GAIN for a 1cm split trace. Set the Y1 Y2 CALIBRATION to OFF.

4. Set the 3705A SET LEVEL for a meter reading in the green area. Set the DIFF PHASE CALIBRATION to 1ns and adjust the 3702B Y2 GAIN for a 1cm split trace. Set the 3705A DIFF PHASE CALIBRATION to OFF.

5. Remove the 3717A A14 AFC Assembly.

6. Check that the Y1 (linearity) display is less than 2.2% with no irregularities and the Y2 (delay) display is less than 1ns, and the 70MHz marker is at the centre of the CRT.

7. If necessary, adjust Modulator A13R17 and R21 IN SMALL INCREMENTS to maintain the centre frequency at 70MHz with linearity and delay as detailed in step 6.

NOTES

1. **To obtain access to R17 and R21, the modulator top cover must be removed. Remove the 4 screws retaining the back plate and the 2 screws in the front connector housing securing the top cover. Prise off the top cover. R17 and R21 are identified on the printed circuit board toward the rear of the Assembly.**

2. **Before making any adjustments, the Modulator should be operated for 10 minutes after it has been switched on.**

3. **To decrease the centre frequency, adjust R17 clockwise and R21 counter-clockwise. Because of the interactive nature of these adjustments, it is recommended that the initial position of the two adjustments is noted before beginning the adjustment.**

8. Reassemble the modulator assembly, then perform the AFC Adjustments (Paragraph 5-8) and the Baseband Input Sensitivity Performance Checks (Paragraph 4-8).

5-10 IF LEVEL AND FLATNESS ADJUSTMENTS

REFERENCE Service Sheet 5.

DESCRIPTION

The IF Output Amplifier slope and IF output level at the two IF outputs are adjusted.

EQUIPMENT

70MHz MLA Generator . . . . . .hp 3710A/3716A
70MHz MLA Receiver . . . . . .hp 3702B

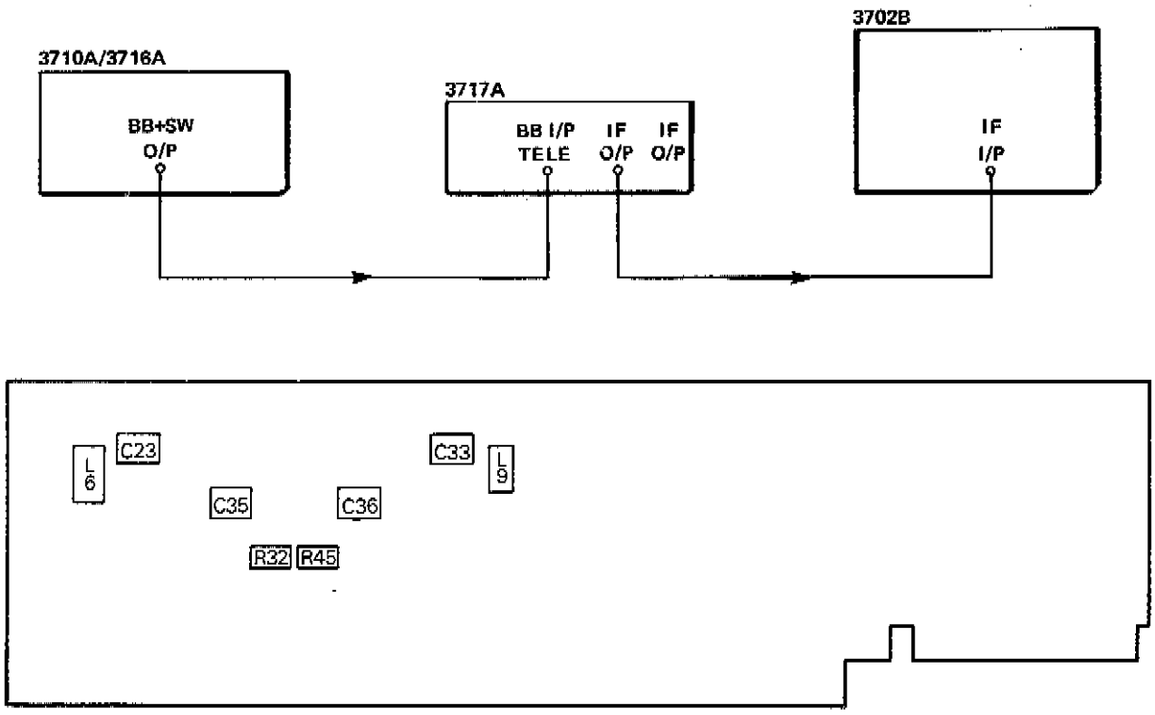


Figure 5-6 IF Level and Flatness Setup and A12 Adjustment Locations

PROCEDURE

1. Connect the equipment as shown in Figure 5-6. Connect the 3702B IF INPUT to the 3717A LEFT IF Output. Set the controls as follows:

3717A
I/O SELECT. . . . . .TELEPHONY
EMPHASIS . . . . . .OFF
MODULATOR GAIN. . . . . .CAL

3710A
SWEEP WIDTH. 20MHz
SWEEP . . . . . .INT

3716A
BB FREQUENCY . . . . . .OFF
BB POWER . . . . . .–37dBm

3702B
Y1 DISPLAY . . . . . .IF
MARKERS . . . . . .SLIDING
MARKER OFFSET 10MHz
SWEEP SOURCE . . . . . .INT IF
IF ATTENUATOR 15dB
Y1 POSITION . . . . . .CENTRED
Y1 GAIN . . . . . .FULL CCW

2. Adjust the 3716A SWEEP CAL to place the +−10MHz markers at the ends of the 3702B display. Adjust the 3702B X GAIN, X POSITION and X PHASE SHIFT controls for a 10cm display centred on the CRT with the markers superimposed.

3. Adjust 3717A A12R32 (LEFT IF OUTPUT) or A12R45 (RIGHT IF OUTPUT) for a 3702B meter reading of 0+−1dB. (See Figure 5-6 for adjustment locations.) If the meter reading cannot be set on scale see step 9.

4. Set the 3702B Y1 Y2 CALIBRATION switch to 0.1dB and adjust Y1 GAIN for 1cm split trace. Switch the Y1 Y2 CALIBRATION to OFF.

5. Adjust A12C35 (LEFT IF OUTPUT) or A12C36 (RIGHT IF OUTPUT) for a slope of less than 2cm over the 3702B display.

6. Readjust A12R32 (A12R45) if necessary for a 3702B meter reading of 0+−0.5dB.

7. Repeat steps 5 and 6 as necessary to obtain a meter reading of 0+−1dB and a slope of less than 2cm over the 3702B display.

8. Repeat the entire procedure for the right IF output.

9. A12R33 and A12R46 SELECTION PROCEDURE

   If the 3702B Level meter cannot be set to 0+−1dB in step 3 or 6, selection of A12R33 (LEFT input) or A12R46 (RIGHT input) is required.

   Set A12R32 (A12R45) to its mid position and select A12R33 (A12R46) for an on scale meter reading. (Reducing the value increases the reading). When an on scale reading has been obtained, fine adjust using A12R32 (A12R45). Repeat the entire procedure if selection is necessary.

5-11 AGC ADJUSTMENT

REFERENCE Service Sheet 4

DESCRIPTION

The Return Loss of the AGC Amplifier input and output are checked. The AGC control circuitry is adjusted to give an output level of −7dBm over the range 60 to 80MHz. The threshold detectors are adjusted to operate if the input signal is outside the AGC range. If a replacement Limiter and Discriminator have been fitted, the Limiter IF Output level and Discriminator Zero are checked.

EQUIPMENT

70MHz MLA Generator . . . . . .hp 3710A
70MHz MLA Receiver . . . . . .hp 3702B
6dB Hybrid . . . . . .hp 15520C
75 ohm Termination . . . . . .hp 15522C
17dB Mismatch . . . . . .hp 15521A
Digital Voltmeter . . . . . .hp 3456A

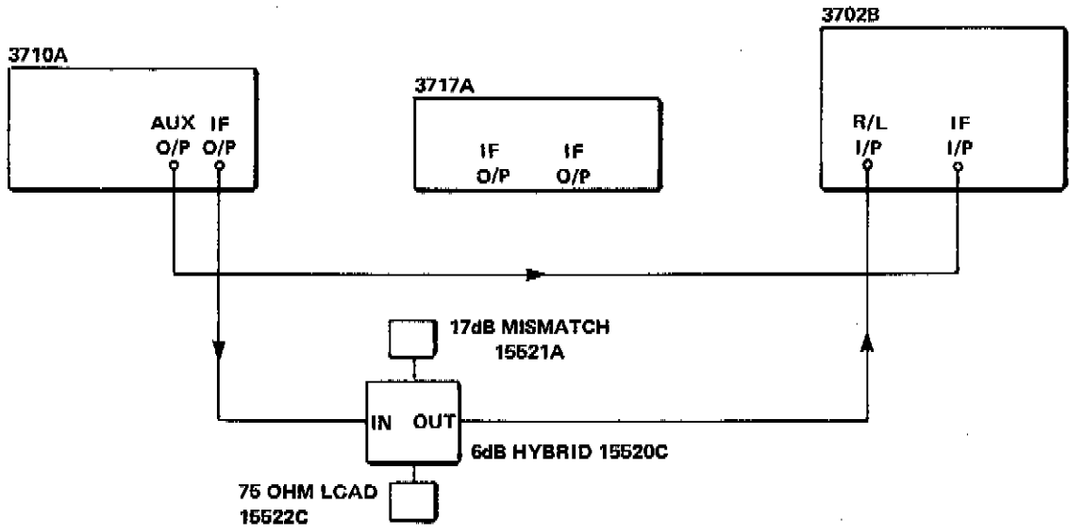


Figure 5-7 Return Loss Setup

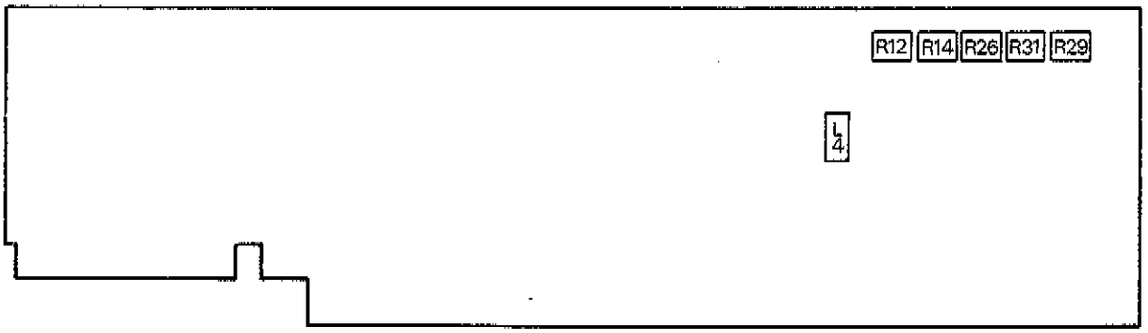


Figure 5-8 A21 Adjustment Locations

PROCEDURE

1. Connect the equipment as shown in Figure 5-7. Set the controls as follows:

   3710A
   IF FREQUENCY 70MHz
   SWEEP WIDTH. 20MHz
   SWEEP . . . . . .INT
   IF ATTENUATOR 10dB
   AUX OUTPUT . . . . . .IF UNCAL

   3702B
   Y1 DISPLAY . . . . . .RET LOSS
   Y2 DISPLAY . . . . . .IF
   SWEEP SOURCE . . . . . .INT IF
   IF ATTENUATOR 4dB
   RETURN LOSS ATTENUATOR 17dB
   Y1 POSITION . . . . . .CENTRED
   Y1 GAIN. . . . . .FULL CCW
   MARKERS . . . . . .SLIDING
   MARKER OFFSET 10MHz

2. Adjust the 3702B X GAIN, X POSITION and X PHASE SHIFT to obtain a 10cm trace with the markers superimposed.

3. Adjust the 3702B RETURN LOSS CALIBRATION for a 0dB meter reading. Set the Y1 Y2 CALIBRATION to 1dB. Adjust the Y1 GAIN for a 1cm split trace. Set the Y1 Y2 CALIBRATION to OFF. Adjust the Y1 POSITION to position the trace at the centre of the CRT. The Return Loss Attenuator is now calibrated directly in dB.

4. Remove the 17dB Mismatch and connect the bridge (using a short cable or adapter) to the 3717A IF input. Set the 3702B Return Loss Attenuator to 30dB. Check that the display is below the centre line of the CRT over the full trace.

5. Disconnect cable A21W1 from Limiter A22P1. Connect the cable via a suitable adaptor to the return loss bridge.

6. Set the 3702B Return Loss Attenuator to 27dB. Adjust A21L4 if necessary for a return loss of greater than 27dB over the range 60 to 80MHz.

7. Connect the equipment as shown in Figure 5-9. Set the controls as follows:

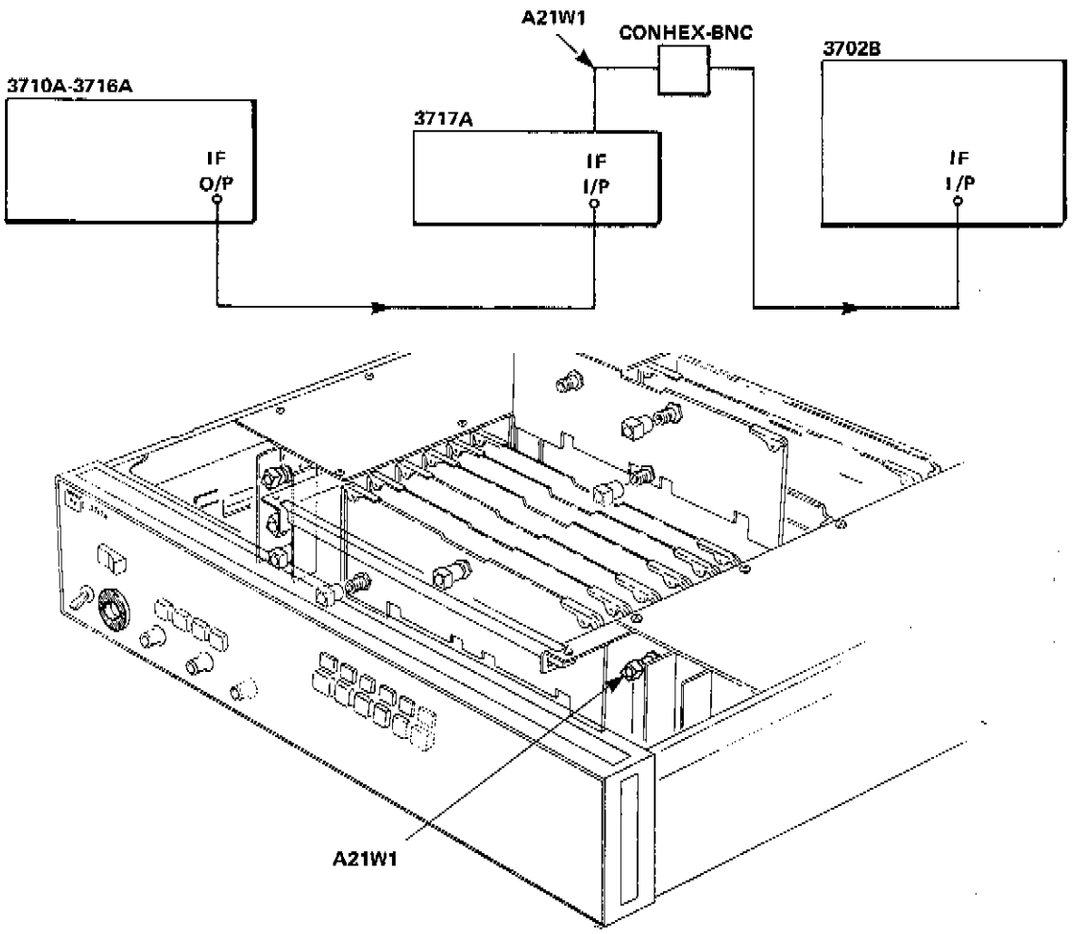


Figure 5-9 IF Input Flatness Setup and Location of A21W1

3710A
IF FREQUENCY 70MHz
SWEEP WIDTH. 20MHz
IF ATTENUATOR 10dB
IF VERNIER 0

3702B
Y1 DISPLAY . . . . . .IF
Y1 POSITION . . . . . .CENTRED
Y1 GAIN. . . . . .FULL CCW
IF ATTENUATOR 3dB
MARKERS . . . . . .SLIDING
MARKER OFFSET. 10MHz

8. Adjust A21R26 (LEVEL) for a meter reading of 0 on the 3702B IF/BB Level Meter.

9. Set the 3702B Y1 Y2 CALIBRATION switch to 0.1dB. Adjust the 3702B Y1 GAIN for a 1cm split trace. Set the Y1 Y2 CALIBRATION to OFF.

10. Adjust A21R12 (FLATNESS) for a total slope of less than 2cm over the 3702B trace.

11. Readjust A21R26 (LEVEL) if necessary for a reading of 0 on the 3702B IF/BB Level Meter.

12. Set the 3710A IF ATTENUATOR in 1dB steps from 4dB to 20dB and ensure that the 3702B meter stays on scale, and the slope of the trace does not exceed 2cm at any setting.

13. Disconnect A21W1 from the 3702B and reconnect it to Limiter A22P1.

14. Set the 3710A IF ATTENUATOR to 20dB and adjust A21R29 (SET LO) so that the front panel "LO" LED just goes out. Set the 3710A IF ATTENUATOR to 21dB and check that the LED lights.

15. Set the 3710A IF ATTENUATOR to 4dB and adjust A21R31 (SET HI) so that the front panel "HI" LED just goes out. Set the 3710A IF ATTENUATOR to 3dB and check that the LED lights.

NOTES

If steps 16 and 17 are performed, the Back to Back Discriminator Adjustments (Paragraph 5-18) should also be performed after completion of all other required adjustments to the 3717A.

The A22 Limiter and A23 Discriminator Assemblies are a matched pair and must be replaced together.

16. If the A22 Limiter Assembly has been replaced, the level at its IF Test Point should be set as detailed below:

    (a) Connect the 3710A IF OUTPUT to the 3717A IF INPUT. Set the controls as follows:

    3710A
    SWEEP . . . . . .OFF
    IF FREQUENCY 70MHz
    ATTENUATOR 10dB

    (b) Connect the DVM to the 3717A Mother Board IF Test Point (located beside XA22). Adjust the A22 Limiter GAIN ADJ (accessible through the right side of the limiter assembly) for 350mV +—100mV as measured on the DVM.

17. If the A23 Discriminator Assembly has been replaced, the discriminator zero point should be set as detailed below:

    (a) Disconnect all inputs to the 3717A. Connect the Digital Voltmeter to the Mother Board DZ test point (located beside XA23).

    (b) Adjust A23R82 (accessible through the right side of the A23 discriminator assembly) for 0V +—50mV.

5-12 TELEPHONY INPUT SENSITIVITY ADJUSTMENT

REFERENCE Service Sheet 1/Service Sheet 3.

DESCRIPTION

If the Modulator (A13) has been replaced, the gain of the modulator driver is adjusted to suit by selecting A31R37. The input telephony input sensitivity is then adjusted.

EQUIPMENT

70MHz MLA Generator . . . . . .hp 3710A/3716A
70MHz MLA Receiver . . . . . .hp 3702B

PROCEDURE

1. If the A13 Modulator Assembly has NOT been replaced, proceed directly to step 7.

2. Connect the equipment as shown in Figure 5-10. Set the controls as follows:

   3710A
   SWEEP . . . . . .OFF

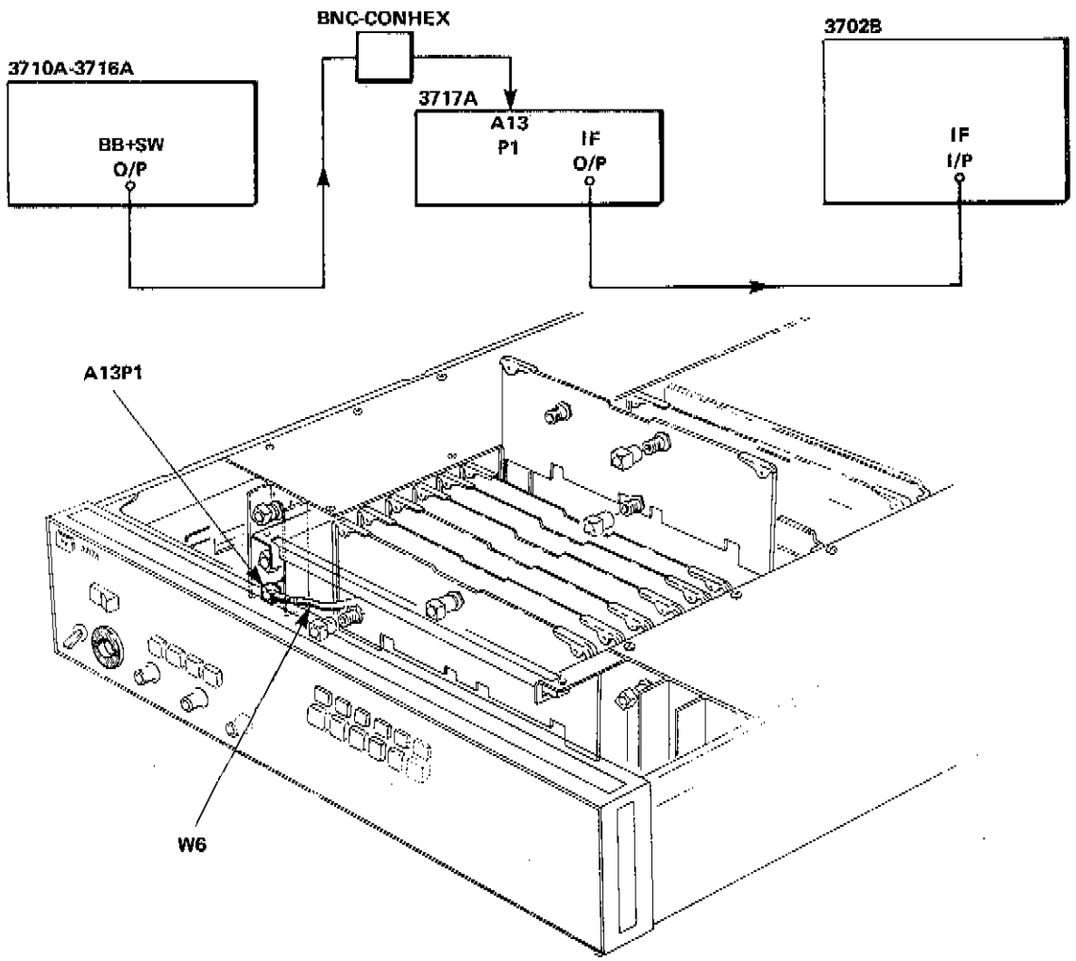


Figure 5-10 Telephony Input Sensitivity Setup and Location of A13P1

3716A
BB FREQUENCY . . . . . .83kHz (92kHz Opt 010)
BB POWER . . . . . .–49dBm

3702B
Y1 DISPLAY . . . . . .SPECTRUM
Y1 DISPLAY . . . . . .IF
Y2 POSITION . . . . . .CENTRED
Y2 GAIN . . . . . .CENTRED
IF ATTENUATOR 15dB

3. Adjust the 3702B X GAIN, X PHASE SHIFT, X POSITION, SPECTRUM WIDTH to clearly show the individual birdie markers on the Y2 Display.

4. Increase the 3716A BB POWER until the carrier goes to a null. (To easily identify the carrier, switch the 3716A BB FREQUENCY to OFF, locate the carrier then reset the BB FREQUENCY to 83kHz (92kHz Opt 010).

5. Select A31R37 according to the following table. (See Figure 5-11 for component location.)

Modulation Sensitivity (dBm)		A31R37 Value
83kHz BB Tone	92kHz BB Tone	
–24	–23	422
–25	–24	383
–26	–25	348
–27	–26	316
–28	–27	287

6. Disconnect the MLA Generator from A13P1 and reconnect W6 from A31J1 to A13P1.

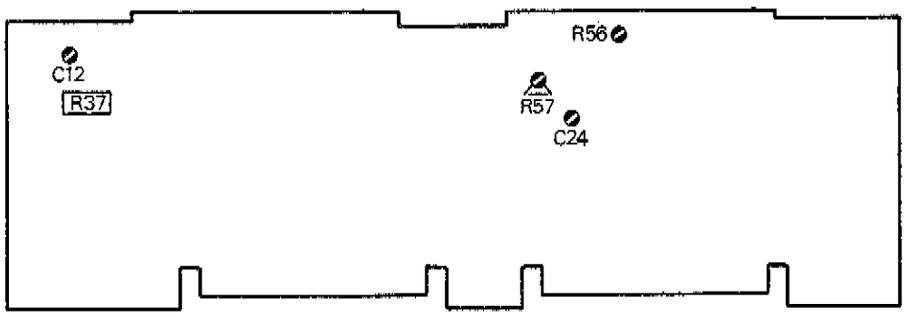


Figure 5-11 A31 Adjustment Locations

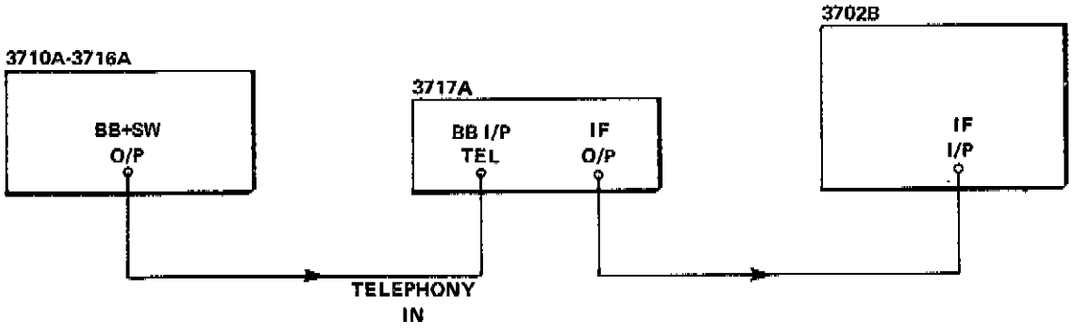


Figure 5-12 Telephony Sensitivity Setup

7. Connect the equipment as shown in Figure 5-12. Set the controls as follows:

3717A
I/O SELECT. . . . . .TELEPHONY
EMPHASIS . . . . . .OFF
MODULATOR GAIN. . . . . .CAL

3710A
SWEEP . . . . . .OFF

3716A
BB FREQUENCY . . . . . .83kHz (92kHz Opt 010)
BB POWER . . . . . .–49dBm

3702B
Y2 DISPLAY . . . . . .SPECTRUM
Y1 DISPLAY . . . . . .IF
Y2 POSITION . . . . . .CENTRED
Y2 GAIN. . . . . .CENTRED
IF ATTENUATOR 15dB

8. Set the 3702B X GAIN, X PHASE SHIFT, X POSITION, SPECTRUM CENTRE and SPECTRUM WIDTH to clearly show the individual birdie markers on the Y2 display.

9. Set the 3716A BB POWER to –37dBm (–36dBm Opt 010). Adjust 3717A A32R17 for the first carrier null. (See Figure 5-13 for Adjustment locations.)

10. On the 3717A, select MODULATOR GAIN UNCAL and adjust the front panel GAIN pot fully clockwise.

11. Adjust 3716A BB POWER to obtain the first carrier null on the 3702B. The BB POWER should be –45dBm or LESS.

12. Set the 3717A MODULATOR GAIN control FULL CCW. Set the 3716A BB POWER for the first carrier null on the 3702B. The 3716A BB POWER should be –33dBm or GREATER.

13. If steps 2 to 6 of this procedure were carried out, the Video Input Sensitivity must also be adjusted as detailed in Paragraph 5-13.

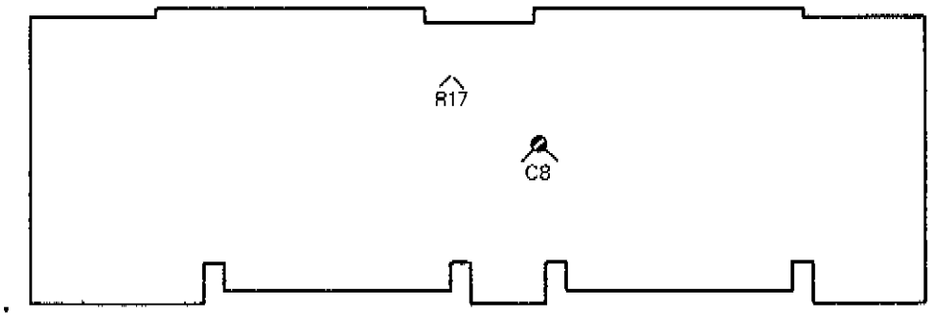


Figure 5-13 A32 Adjustment Locations

5-13 VIDEO INPUT SENSITIVITY ADJUSTMENTS

REFERENCE Service Sheet 2.

DESCRIPTION

The Video input sensitivity for both NORM and INV modes is adjusted.

Note: If the A13 Modulator has been replaced, the Telephony Input Sensitivity Adjustments (Paragraph 5-12) must be carried out before attempting this adjustment.

EQUIPMENT

0MHz MLA Generator	hp 3710A/3716A
70MHz MLA Receiver	hp 3702B

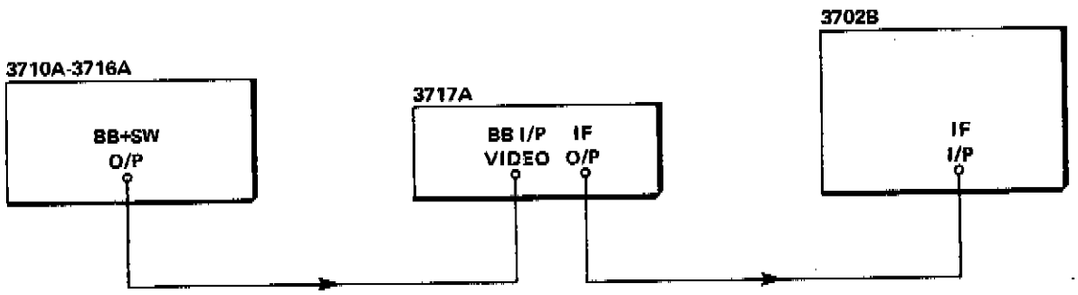


Figure 5-14 Video Input Sensitivity Setup

PROCEDURE

1. Connect the equipment as shown in Figure 5-14. Set the controls as follows:

3717A	
I/O SELECT	VIDEO NORM
EMPHASIS	OFF
MODULATOR GAIN	CAL
3710A	
SWEEP	OFF
3716A	
BB POWER	–24dBm (–23dBm Opt 010)
BB FREQUENCY	OFF
3702B	
Y1 DISPLAY	IF
Y2 DISPLAY	SPECTRUM
Y2 POSITION	CENTRED
Y2 GAIN	CENTRED
IF ATTENUATOR	15dB

2. Set the 3702B X GAIN, X POSITION, SPECTRUM WIDTH and SPECTRUM CENTRE to clearly show the 70MHz spectrum birdie.

3. Set the 3717A VIDEO MODE to MOD INV. Set the 3716A BB FREQUENCY to 83kHz (92kHz Opt 010). Adjust A33R9 for the first carrier null on the 3702B display. (See Figure 5-13 for Adjustment Locations.)

4. Switch the 3717A VIDEO mode to NORM, and adjust A33R7 for the first carrier null on the 3702B display.

5. Switch the 3717A VIDEO mode to MOD INV and check that the carrier is nulled. If necessary, repeat steps 3 and 4 to obtain the first carrier null in both NORM and MOD INV modes.

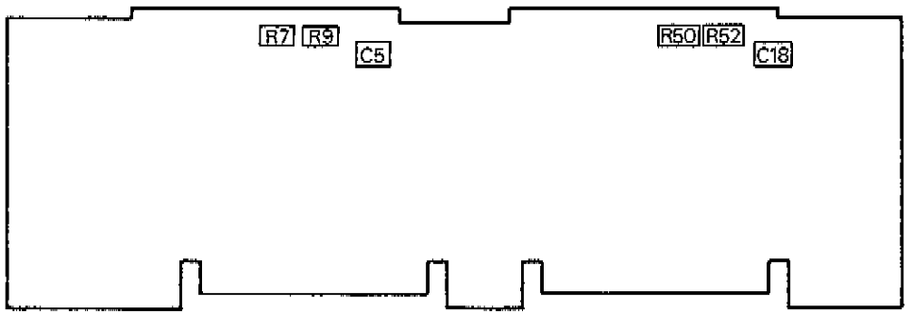


Figure 5-15 A33 Adjustment Locations

5-14 BASEBAND OUTPUT SENSITIVITY ADJUSTMENTS

REFERENCE Service Sheet 2, Service Sheet 4.

DESCRIPTION

The Telephony output sensitivity is adjusted. The Video output sensitivity is then adjusted if necessary.

EQUIPMENT

70MHz MLA Generator	hp 3710A/3716A
70MHz MLA Receiver	hp 3702B

PROCEDURE

1. Connect the 3710A IF OUTPUT to the 3702B IF INPUT. Set the controls as follows:

3710A	
SWEEP	OFF
IF FREQUENCY	70MHz
IF ATTENUATOR	10dB
3716A	
BB FREQUENCY	83kHz (92kHz Opt 010)
3702B	
Y1 DISPLAY	BB
Y1 GAIN	CCW
Y1 POSITION	CENTRED
Y2 DISPLAY	SPECTRUM
Y2 GAIN	CENTRED
Y2 POSITION	CENTRED
IF ATTENUATOR	10dB

2. Adjust the 3702B X GAIN, X PHASE SHIFT, X POSITION, SPECTRUM WIDTH and SPECTRUM CENTRE controls to display the individual birdie markers clearly.

3. Adjust the 3710A DEVIATION control for the first carrier null on the 3702B display. This sets the deviation on the 3710A IF OUTPUT to 141kHz rms (157kHz rms for 3716A Opt 010). The 3710A DEVIATION control should be left at this position throughout this adjustment.

4. Connect the 3710A IF OUTPUT to the 3717A IF INPUT and the 3717A TELEPHONY OUTPUT to the 3702B BB INPUT. Reset the 3702B controls as follows:

Y2 DISPLAY	IF
BB INPUT	EXT
BB POWER	−28dBm (−27dBm for 3716A Opt 010)

Note: No sweep will be present during the following steps.

5. Set the 3717A I/O SELECT to TELEPHONY and EMPHASIS to OFF. Adjust 3717A A31R57 for a reading of 0dB on the 3702B IF/BB LEVEL meter. (See Figure 5-11 for Adjustment Locations.)

6. Disconnect the 3717A TELEPHONY OUTPUT and connect the VIDEO OUTPUT to the 3702B BB INPUT. Set the 3717A I/O SELECT to VIDEO NORM, then DEMOD INV.

7. Set the 3702B BB POWER to −24dBm (−23dBm for 3716A Opt 010). Adjust 3717A A33R52 for a reading of 0 on the 3702B IF/BB LEVEL meter. (See Figure 5-15 for Adjustment Locations.)

8. Set the 3717A I/O SELECT to VIDEO NORM. Adjust 3717A A33R50 for a reading of 0 on the 3702B IF/BB LEVEL meter. (See Figure 5-15 for Adjustment Locations.)

9. Repeat steps 6 to 8 to obtain a meter reading of 0 in both VIDEO NORM and DEMOD INV modes.

5-15 BASEBAND INPUT FLATNESS ADJUSTMENTS

REFERENCE Service Sheet 1, Service Sheet 2, Service Sheet 3.

DESCRIPTION

A Network Analyzer is used to adjust the flatness of the telephony and video input circuits.

EQUIPMENT

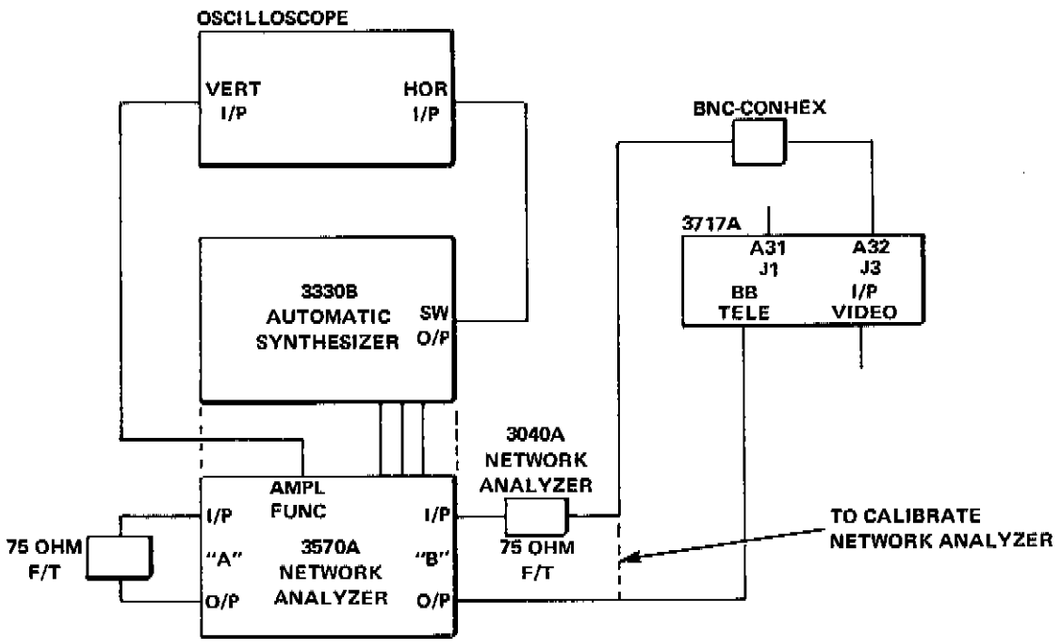
Network Analyzer	hp 3040A Opt 111, 121
Oscilloscope	hp 1740A
75 Ohm Feedthru Terminations (2 required)	hp 11049B

PROCEDURE

1. Connect the equipment as shown in Figure 5-16.

2. Connect the 3570A Channel A output via a 75 ohm feedthrough termination to the Channel A input, and the Channel B output via a 75 ohm termination to the Channel B input.

Note: Use all the cabling that will be used to make the measurement during the calibration of the network analyzer. Connect the cables using adaptors as necessary.



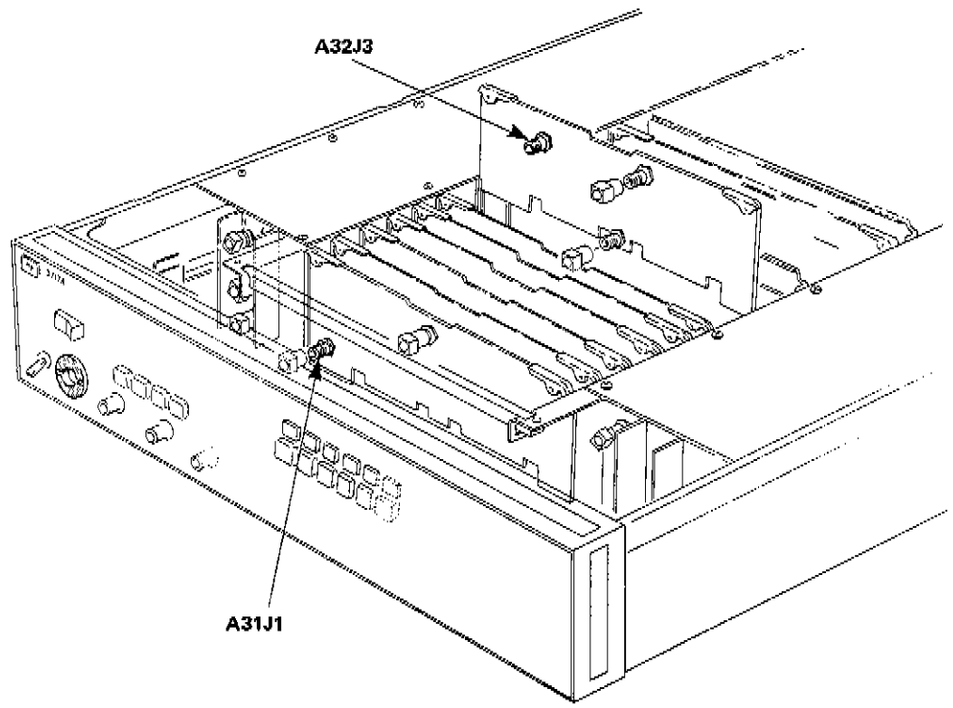


Figure 5-16 BB Input Flatness Setup and Location of A32J3 and A31J1

3. Set the controls as follows:

3330B AUTOMATIC SYNTHESIZER
AMPLITUDE . . . . . .–20dBm
FREQUENCY 5.01MHz
FREQ STEP. 100kHz
STEPS/SWEEP 100
TIME/STEP 30ms
SWEEP . . . . . .FREQ, UP, START CONT

3570A NETWORK ANALYZER
AMPLITUDE FUNCTION . . . . . .B-A
BANDWIDTH. 100Hz
MAX/REF INPUT VOLTAGE. 0dBm

1740A OSCILLOSCOPE
FUNCTION . . . . . .A vs B (for X-Y display)
VOLTS/DIV A . . . . . .0.1V (vertical)
VOLTS/DIV B 1V (horizontal)
INPUT COUPLING A and B . . . . . .DC

4. Adjust the 3570A Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A A POSITION to display the back to back frequency response of the network analyzer at the centre of the CRT. Mark this response on the face of the CRT using a grease pencil.

5. Connect the 3570A Channel B output to the 3717A Telephony Input and the 3570A Channel B input via the 75 ohm termination to 3717A A32J3 (TEST). Set the 3717A I/O Select to Telephony. Set the Emphasis to OFF.

6. Adjust the 3570A Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A A POSITION so that the left (low frequency) end of the display is at the same point as during calibration. Adjust A32C8 to make the response the same as the calibration response within +–0.1dB. (1 division) (See Figure 5-17 for Adjustment Locations).

7. Disconnect A32J3 and connect the 3570A Channel B input via the 75 ohm feedthrough termination to the output of the A31 Modulator Drive Amplifier (J1). Adjust the 3570A Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A A POSITION so that the left (low frequency) end of the display is at the same point as during calibration. Adjust A31C12 to make the response the same as the calibration response +–0.1dB. (See Figure 5-17 for Adjustment Locations.)

9. Reset the 3330B controls as follows:

FREQUENCY 5.000 050MHz
SWEEP . . . . . .START CONT

10. Connect the 3570A Channel B output via a 75 ohm feedthrough termination to the Channel B input. Adjust the 3570A Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A A POSITION to display the back to back frequency response of the analyzer at the centre of the CRT. Mark this calibration response on the face of the CRT.

11. Connect the 3570A Channel B output to the 3717A Video Input and the 3570A Channel B input via the 75 ohm Feedthrough Termination to A31J1. Set the 3717A I/O SELECT to VIDEO NORM and the EMPHASIS to OFF.

12. Adjust the 3570A Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A A POSITION so that the left end of the display is at the same point as during calibration. Adjust A33C5 to make the response the same as during calibration +–0.1dB. (See Figure 5-17 for Adjustment Locations.)

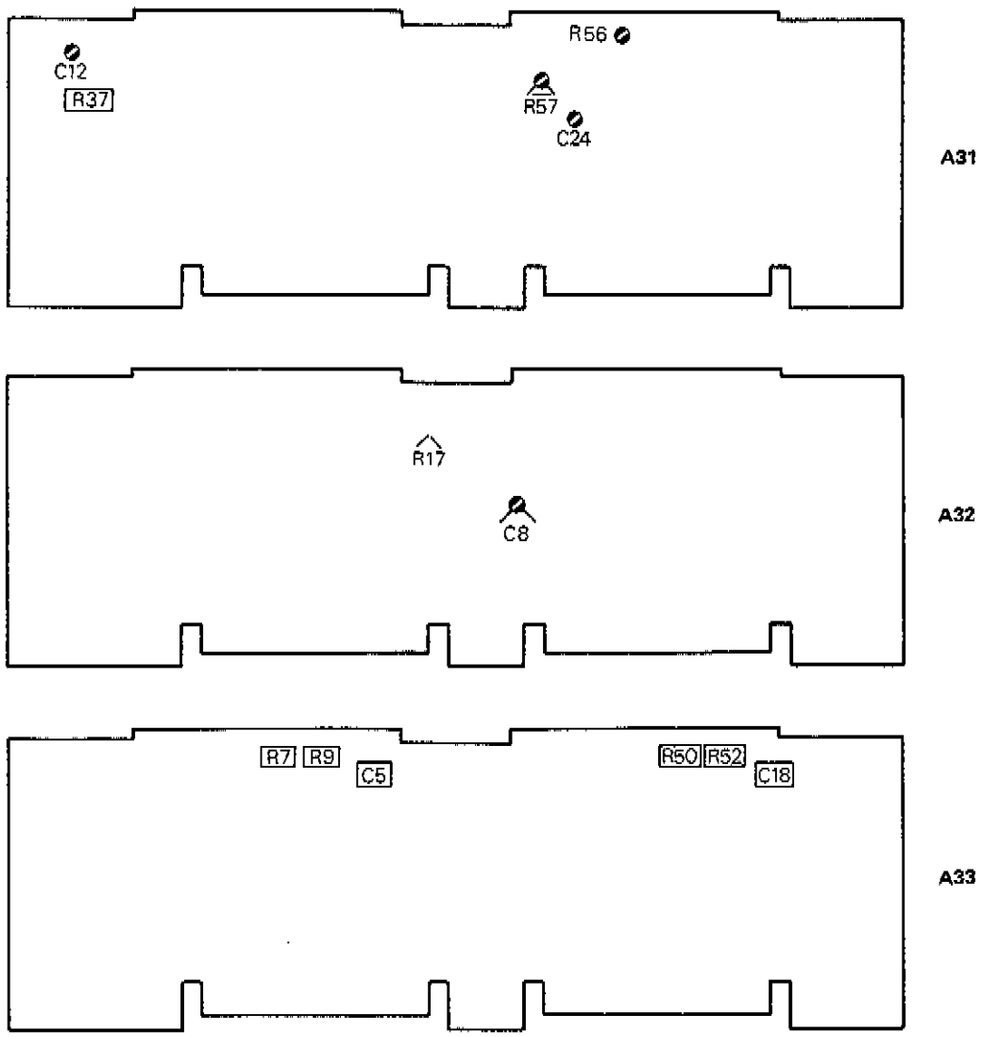


Figure 5-17 A31, A32 and A33 Adjustment Locations

5-16 BASEBAND OUTPUT FLATNESS ADJUSTMENTS

REFERENCE Service Sheet 2, Service Sheet 4.

DESCRIPTION

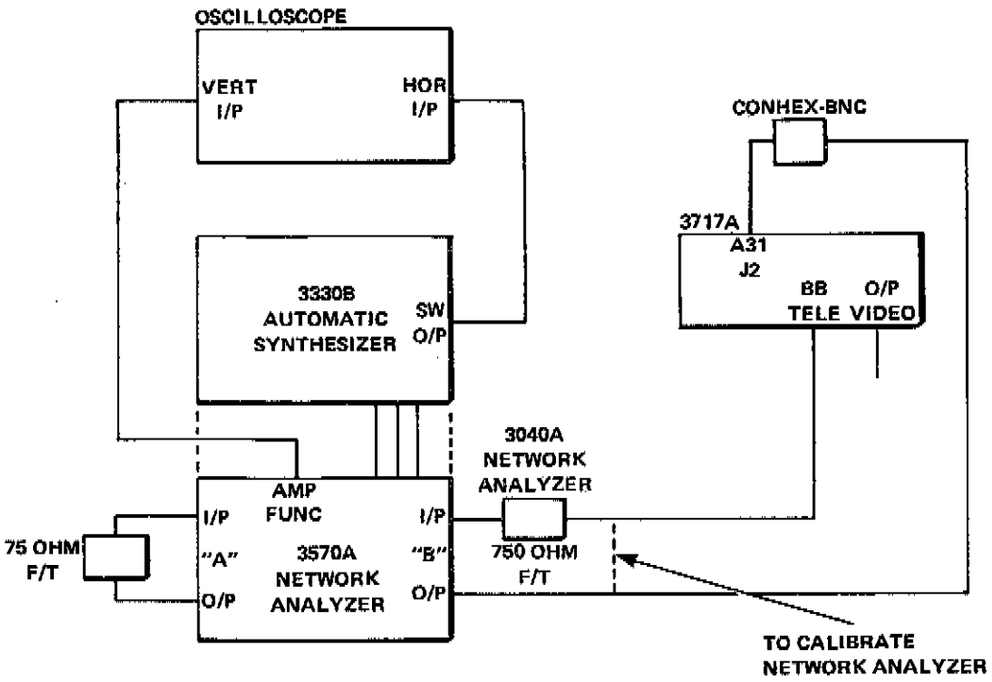
A Network Analyzer is used to adjust the flatness of the Telephony and Video Output circuits.

EQUIPMENT

Network Analyzer	hp 3040A Opt 111, 121
Oscilloscope	hp 1740A
75 Ohm Feedthrough Terminations (2)	hp 11094B

PROCEDURE

1. Connect the equipment as shown in Figure 5-18.



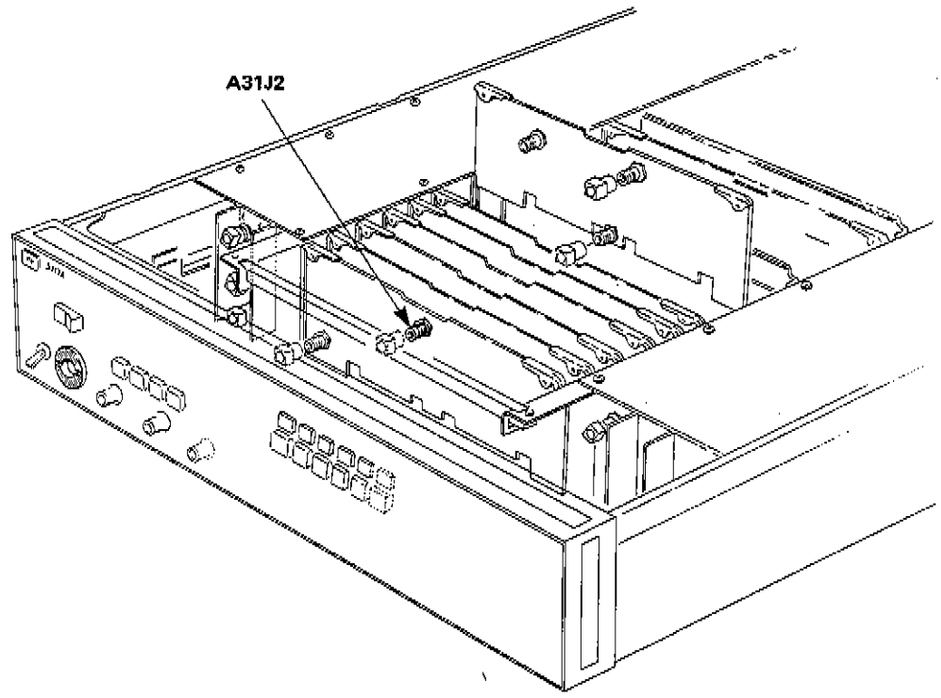


Figure 5-18 BB Output Flatness Setup and Location of A31J2

2. Connect the 3570A Channel A Output via the 75 ohm feedthrough termination to the Channel A Input, and the Channel B Output via a 75 ohm feedthrough termination to the Channel B Input. Set the controls as follows:

Note: Use all the cabling that will be used to make the measurement during calibration of the network analyzer. Connect the cables using adaptors as necessary.

3330B
AMPLITUDE . . . . . .−20dBm
FREQUENCY 5.01MHz
FREQ STEP. 100kHz
STEPS/SWEEP 100
TIME/STEP . . . . . .30ms.
SWEEP . . . . . .FREQ, UP, START CONT

3570A
AMPLITUDE FUNCTION . . . . . .B-A
BANDWIDTH. 100Hz
MAX/REF INPUT VOLTAGE. 0dBm

1740A
FUNCTION . . . . . .A vs B (for X-Y display)
VOLTS/DIV A . . . . . .0.01V (vertical)
VOLTS/DIV B 1V (horizontal)
INPUT COUPLING A and B . . . . . .DC

3. Adjust the 3570A Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A A POSITION to display the back to back frequency response of the network analyzer at the centre of the CRT. Mark this calibration response on the CRT using a grease pencil.

4. Connect the 3570A Channel B Output to 3717A A31J2 and the 3570A Channel B Input via a 75 ohm termination to the 3717A Telephony Output. On the 3717A, set the I/O SELECT to TELEPHONY and the EMPHASIS to OFF.

5. Adjust the 3570A Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A A POSITION to place the left (low frequency) end of the display at the same point as during calibration. Adjust 3717A A31C24 for slope and A31R56 for shape to make the response the same as during calibration +−0.1dB. (See Figure 5-19 for adjustment locations.)

6. Reset the 3330B controls as follows:

FREQUENCY 5.000 050MHz
SWEEP . . . . . .START CONT

7. Connect the 3570A Channel B output via a 75 ohm Feedthrough Termination to the Channel B input. Adjust the Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A A POSITION to display the back to back frequency response of the network analyzer at the centre of the CRT. Mark this calibration response on the face of the CRT.

8. Connect the 3570A Channel B output to 3717A A31J2 and the Channel B input via the 75 ohm Feedthrough Termination to the 3717A Video Output. Set the 3717A I/O SELECT to VIDEO NORM.

9. Adjust the 3570A Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A A POSITION to place the left end of the display at the same point as during calibration. Adjust 3717A A33C18 to make the response the same as during calibration +−0.1dB. See Figure 5-19 for Adjustment Locations.)

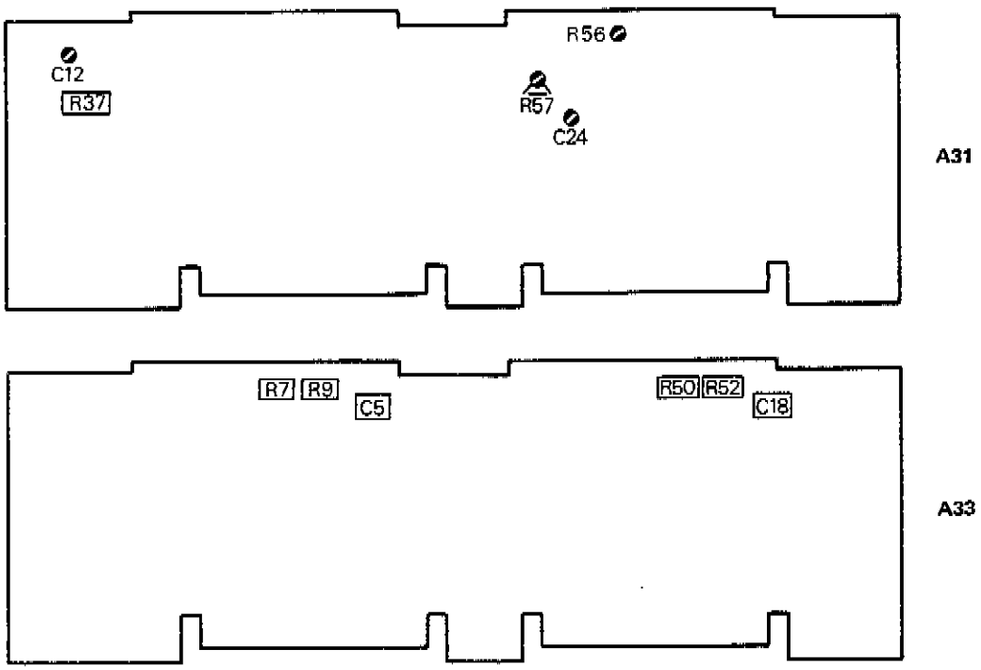


Figure 5-19 A31 and A33 Adjustment Locations

5-17 EMPHASIS AND DE-EMPHASIS ADJUSTMENTS

REFERENCE Service Sheet 1

DESCRIPTION

The resonant points of each of the CCIR emphasis networks are adjusted. The de-emphasis networks are adjusted for back to back flatness.

Note: The BELL and VIDEO option emphasis networks are not adjustable but the de-emphasis networks must be adjusted as detailed in the second part of this procedure.

EQUIPMENT

Network Analyzer	hp 3040A Opt 111, 121
Oscilloscope	hp 1740A
75 ohm Feedthrough Termination (2)	hp 11094B

PROCEDURE

Note: Steps 1 through 4 of this procedure apply to options 011 through 018 only.

1. Connect the equipment as shown in Figure 5-20. Set the controls as follows:

3717A
I/O SELECT. . . . . .TELEPHONY
EMPHASIS . . . . . .Desired network selected

3330B
AMPLITUDE . . . . . .–20dBm
FREQUENCY . . . . . .Resonant frequency of selected network. See Table 5-4.

3570A
AMPLITUDE FUNCTION . . . . . .B
MAX/REF INPUT VOLTAGE. 0dBm
BANDWIDTH. 100Hz

Table 5-4 CCIR Emphasis Network Details

Option	Channels	Resonant Frequency	Crossover Frequency
011	24	135kHz	66.231kHz
012	60	375kHz	183.975kHz
013	160	690kHz	383.514kHz
014	300	1625kHz	797.225kHz
015	600	3325kHz	1631.245kHz
016	960	5235kHz	2568.291kHz
017	1260	7045kHz	3456.277kHz
018	1800	10255kHz	5031.103kHz

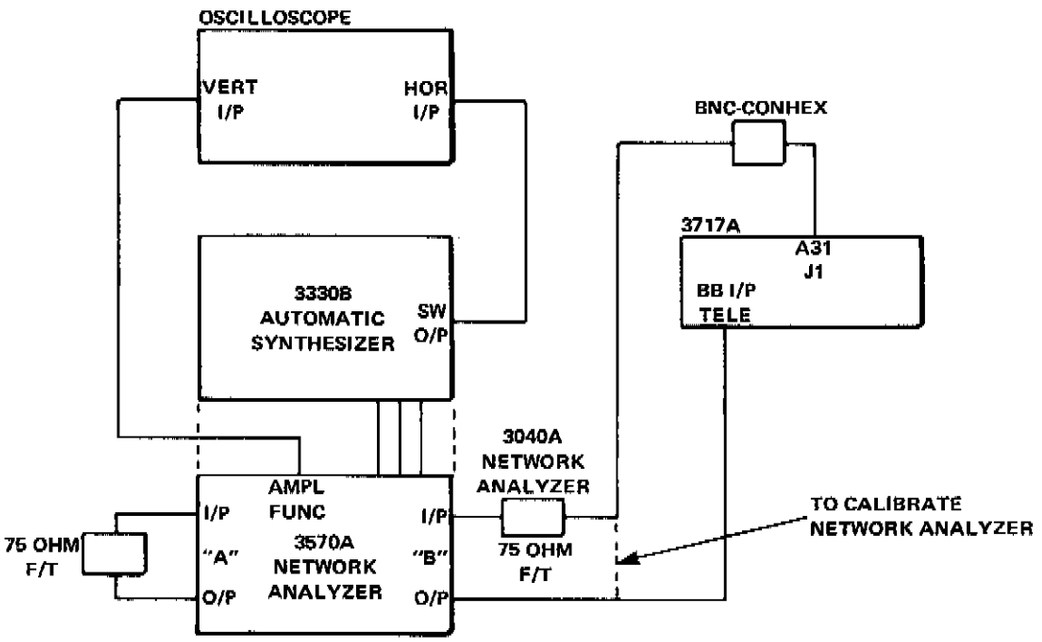


Figure 5-20 CCIR Emphasis Setup

2. Tune A50L1 for a maximum amplitude reading on the 3570A. Note the reading. (See Figure 5-21 for Adjustment Locations).

Amplitude . . . . . dB

Note:1 Care should be taken when adjusting L1 and L2 on Telephony Networks of 120 Channels and over that a trimming tool of the correct design is used; e.g. hp Part Number 8710-0712.

Note:2 Adjustment of the emphasis networks may be affected by performing the adjustment with the board mounted on extender boards. It is recommended that the network to be adjusted is placed in the rearmost of the XA50 slots in the 3717A and the other networks removed to allow access to its adjustments.

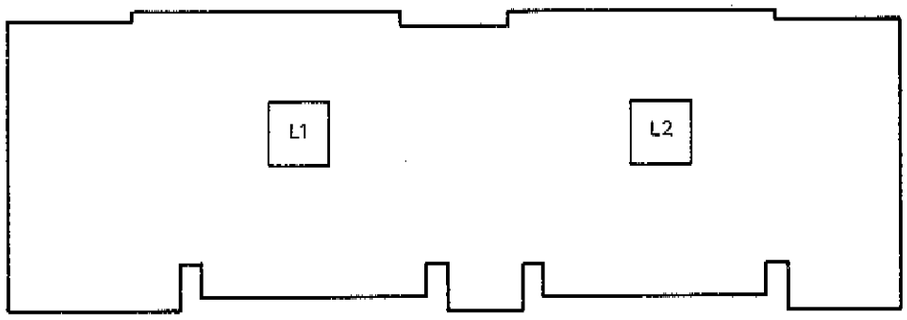


Figure 5-21 A50 Adjustment Locations

3. Set the 3330B FREQUENCY to the crossover frequency for the network given in Table 5-4. Check that the amplitude has fallen by 5.0 +—0.1dB from the value recorded in step 2. Note the new reading.

Amplitude . . . . . dB

4. Set the 3717A EMPHASIS to OFF. Check that the 3570A amplitude reading is within 0.2dB of the value recorded in step 3.

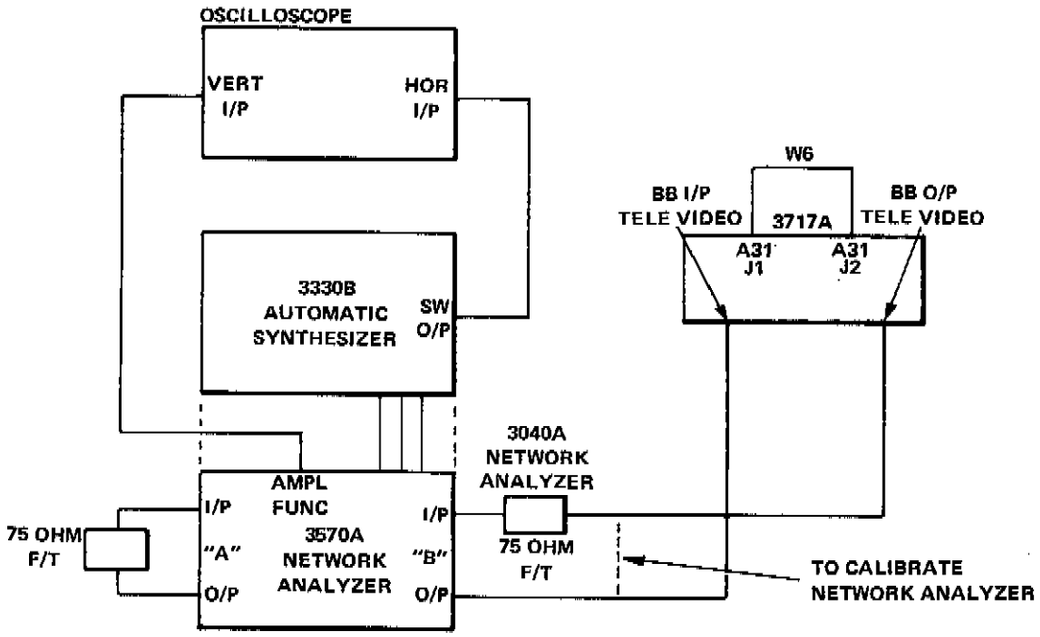
5. Connect the equipment as shown in Figure 5-22. Set the controls as follows:

3717A
I/O SELECT (except options 021 through 023) . . . . . .TELEPHONY
I/O SELECT (options 021 through 023 only). . . . . .VIDEO NORM
EMPHASIS . . . . . .Desired Network Selected

3570A
AMPLITUDE FUNCTION . . . . . .B-A
MAX/REF INPUT VOLTAGE. 0dBm
BANDWIDTH. 100Hz

3330B
FREQUENCY . . . . . .See Table 5-5
FREQUENCY STEP . . . . . .See Table 5-5
AMPLITUDE . . . . . .—20dBm
STEPS/SWEEP 100
TIME/STEP 30ms
SWEEP . . . . . .FREQ, UP, START CONT

1740A
FUNCTION . . . . . .A vs B (for X-Y display)
VOLTS/DIV A . . . . . .0.01V (vertical)
VOLTS/DIV B . . . . . .1V (horizontal)
INPUT COUPLING A and B . . . . . .DC



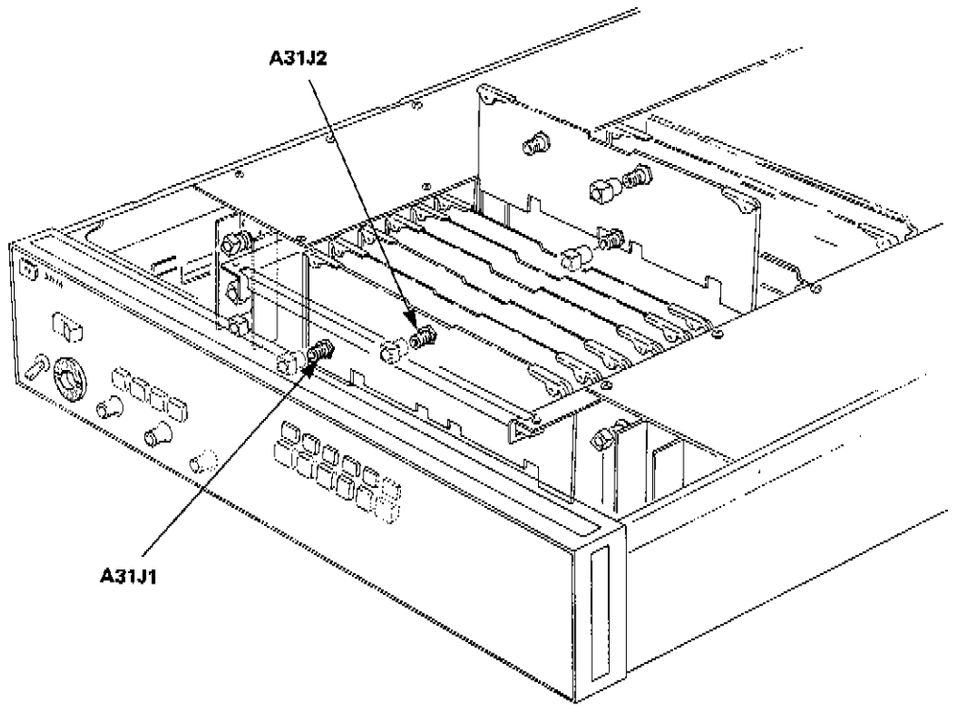


Figure 5-22 Back to Back De-Emphasis Setup and Location of A31J1/J2

Table 5-5 Flatness Adjustment Analyzer Settings

Option	Channels or Lines	Frequency	Frequency Step
CCIR			
011	24	65kHz	900Hz
012	60	160kHz	2.8kHz
013	120	310kHz	5.8kHz
014	300	650kHz	13kHz
015	600	1.36MHz	26.8kHz
016	960	2.26MHz	44.8kHz
017	1260	3.01MHz	59.8kHz
018	1800	4.26MHz	84.8kHz
VIDEO			
021	525	2.01MHz	39.8kHz
022	625	3.01MHz	59.8kHz
023	819	5.01MHz	99.8kHz
BELL			
031	600	1.51MHz	29.8kHz
032	900	2.26MHz	44.8kHz
033	1200	3.01MHz	59.8kHz
034	1500	3.76MHz	74.8kHz
035	1800	4.26MHz	84.8kHz

6. Connect the 3570A Channel A output via a 75 ohm Feedthrough Termination to the Channel A input. Connect the Channel B output via a 75 ohm Feedthrough Termination to the Channel B input.

Note: Use all the cabling that will be used to make the measurement during calibration of the network analyzer. Connect the cables using adaptors as necessary.

7. Adjust the 3570A Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A A POSITION to display the back to back frequency response of the network analyzer at the centre of the CRT. Mark this response on the CRT using a grease pencil.

8. Connect the 3570A Channel B output to the 3717A Telephony Input (Video Input for options 021 through 023) and the 3717A Telephony Output (Video Output for options 021 through 023) via the 75 ohm Feedthrough Termination to the 3570A Channel B Input.

9. Adjust the 3570A Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A A POSITION to place the left end of the display at the same point as during calibration.

10. Adjust A50L2 to make the response the same as during calibration +–0.1dB.

11. Repeat the entire procedure for any other emphasis options fitted.

5-18 BACK TO BACK DISCRIMINATOR ADJUSTMENTS

REFERENCE Service Sheet 4

DESCRIPTION

If a replacement Limiter and Discriminator have been fitted the back to back performance of the 3717A should be optimized. Minor adjustments to the discriminator are made to achieve this.

Note1: All other adjustments required to the 3717A should be performed before this adjustment is carried out.

Note2: No adjustment should be carried out unless the relevant check is out of tolerance as the adjustments are highly interactive.

Note3: Adjusting the limiter and discriminator is simplified if the unit being adjusted is turned on its side and connected to the mother board via one of the extender boards and the right angle extender which will be found attached to the modulat or extender board.

EQUIPMENT

Network Analyzer	hp 3040A Opt 111, 121
Oscilloscope	hp 1740A
75 ohm Feedthrough Termination (2)	hp 11094B
70MHz MLA Generator	hp 3710A/3716A
70MHz MLA Receiver	hp 3702B/3705A
6dB Hybrid	hp 15520C
17dB Mismatch	hp 15521A
75 ohm Termination	hp 15522C
Digital Voltmeter	hp 3465A
White Noise Generator	Marconi TF2091B
White Noise Receiver	Marconi TF2092C
Filters for Noise Generator	Marconi 60kHz Highpass Marconi 8160kHz Lowpass Marconi 70kHz Bandstop Marconi 7600kHz Bandstop
Filters for Noise Receiver	Marconi 70kHz Bandpass Marconi 7600kHz Bandpass

PROCEDURE

1. Connect the equipment as shown in Figure 5-23.

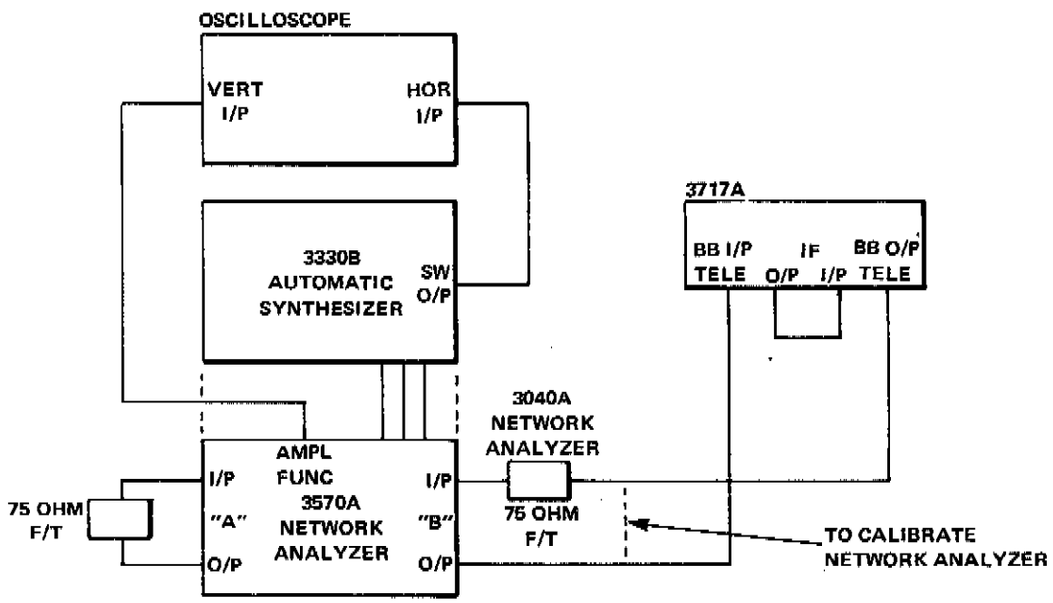


Figure 5-23 Optimization Setup 1

2. Connect the 3570A Channel A Output via a 75 ohm feedthrough termination to the Channel A Input, and the Channel B Output via a 75 ohm feedthrough termination to the Channel B Input. Set the controls as follows:

Note: Use all the cabling that will be used to make the measurement during calibration of the network analyzer. Connect the cables using adaptors as necessary.

3330B
AMPLITUDE . . . . . .−20dBm
FREQUENCY 5.01MHz
FREQ STEP. 100kHz
STEP/SWEEP. 100
TIME/STEP 100ms
SWEEP . . . . . .FREQ, UP, START CONT

3570A
AMPLITUDE FUNCTION . . . . . .B-A
BANDWIDTH. 100Hz
MAX/REF INPUT VOLTAGE. 0dBm

1740A
FUNCTION . . . . . .A vs B (for X-Y display)
VOLTS/DIV A . . . . . .0.01V (vertical)
VOLTS/DIV B . . . . . .1V (horizontal)
INPUT COUPLING A and B . . . . . .DC

3. Adjust the 3570A Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A to display the back to back frequency response of the Network Analyzer at the centre of the CRT. Mark this as the calibration response on the face of the CRT using a grease pencil.

4. Connect the 3570A Channel B Output to the 3717A Telephony Input and the 3717A Telephony Output to the 3570A Channel B Input via a 75 ohm termination. Connect the 3717A IF Output to the 3717A IF Input. Set the I/O SELECT to TELEPHONY and the EMPHASIS to OFF. Set the MODULATOR GAIN to CAL.

5. Adjust the 3570A Amplitude Zero calibration controls for an amplitude display of approx 0dB. Adjust the 1740A A POSITION to place the left (low frequency) end of the display at the same point as during calibration. On the A23 Discriminator Assembly adjust A23C43 (accessible through the right side of the assembly) to make the response the same as during calibration + −0.2dB.

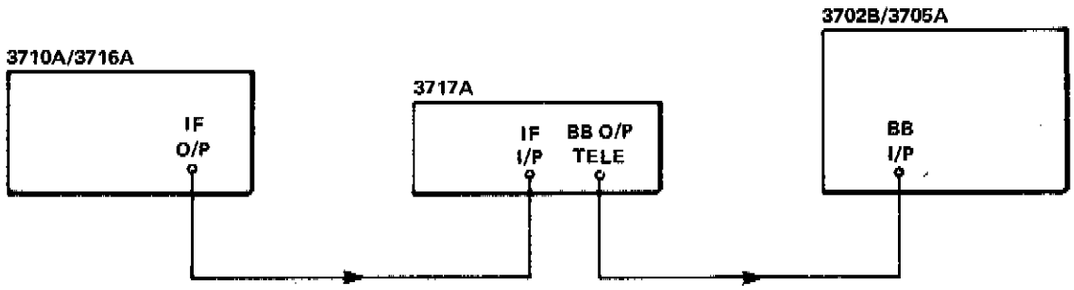


Figure 5-24 Optimization Setup 2

6. Connect the equipment as shown in Figure 5-24. Set the controls as follows:

3716A
BB FREQUENCY . . . . . .500kHz (555kHz Opt 010)

3710A
SWEEP . . . . . .INT
SWEEP WIDTH. 25MHz
IF ATTENUATOR 10dB
IF FREQUENCY 70MHz
DEVIATION 200kHz

3702B
BB POWER . . . . . .–36dBm
Y1 DISPLAY . . . . . .BB
Y1 GAIN. . . . . .FULL CCW
Y1 POSITION . . . . . .CENTRED
Y2 DISPLAY . . . . . .DELAY
Y2 GAIN. . . . . .FULL CCW
Y2 POSITION . . . . . .CENTRED

3705A
BB FREQUENCY . . . . . .500kHz (555kHz Opt 010)
BANDWIDTH. 5kHz

7. Set the 3702B X GAIN, X POSITION and X PHASE SHIFT controls for a 10cm display with the traces in phase. Adjust the BB POWER for an on scale meter reading.

8. Set the Y1 Y2 CALIBRATION to 1% and adjust the Y1 GAIN for a 1cm split trace. Set the Y1 Y2 CALIBRATION to OFF.

9. Set the 3705A SET LEVEL control for a meter reading in the green area. Set the DIFF PHASE CALIBRATION to 1ns and adjust the 3702B Y2 GAIN for a 1cm split trace. Set the 3705A DIFF PHASE CALIBRATION to OFF.

10. Adjust Discriminator A23L9 and C22 for a linearity slope of less than 1%. Ensure that the delay is less than 1ns. Remove the 3717A IF input and adjust A23R82 for 0V +– 10mV at the Mother Board DZ test point.

11. Set the 3710A AUX IF OUTPUT to 70MHz XTAL and connect it to the 3717A IF input. Adjust A23R57 for 0V +– 10mV at the DZ test point.

12. Reconnect the 3717A IF OUTPUT to the 3717A IF INPUT and recheck steps 10 and 11.

13. Connect the equipment as shown in Figure 5-25. Install the 60kHz High Pass and the 8160kHz Low Pass Filters in the Noise Generator. On the 3717A, set the I/O SELECT to TELEPHONY, and the EMPHASIS to 1800 Channel.

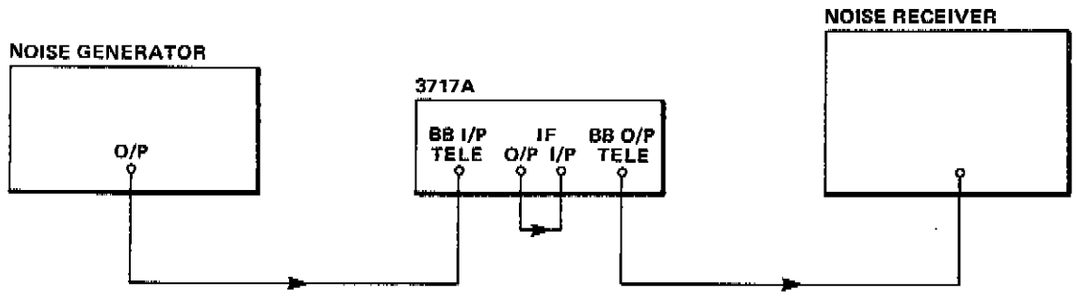


Figure 5-25 NPR Setup

14. Set the attenuator of the Noise Receiver to 0dB and select the 70kHz slot. Set the noise generator output level to −19.5dBm. Using the Set Reference control, set the receiver sensitivity for a 0dB meter reading.

15. Switch in the 70kHz Bandstop filter in the noise generator and adjust the receiver attenuator for a 0dB meter reading. The attenuator setting should be 57dB or greater.

16. If the NPR is less than 57dB, the discriminator may be adjusted as follows:

    (a) Set the attenuator of the noise receiver to 0dB and set the noise generator output to −13.5dBm. Using the Set Reference controls set the receiver sensitivity for a 0dB meter reading.

    (b) Switch in the 70kHz Bandstop filter and adjust the receiver attenuator for a 0dB meter reading.

    (c) Adjust A23R61 (accessible through the right side of the A23 Discriminator Assembly) for a minimum reading on the noise receiver.

    (d) Repeat steps 14 and 15.

17. Connect the DVM to the mother board DZ test point and adjust A23R82 if necessary for 0V +−5mV.

18. Repeat steps 16 and 17 as necessary to obtain best NPR and 0V +− 10mV at the DZ test point.

19. On the noise generator, select the 7600Hz slot, reset the attenuator to 0dB and adjust the Set Reference controls for a 0dB meter reading.

20. Switch in the 7600kHz Bandstop filter and set the receiver attenuator for a 0dB meter reading. The attenuator setting should be 57dB or greater.

21. If necessary adjust A22 Limiter Assembly L1 and L2 for NPR greater than 57dB.

Note: If L1 and L2 were adjusted, the Return Loss of the Limiter input (P1) must be checked. Perform steps 22 to 27 only if L1 and L2 were adjusted, otherwise proceed directly to step 28.

22. Connect the equipment as shown in Figure 5-26. Set the controls as follows:

3710A
IF FREQUENCY 70MHz
SWEEP WIDTH. 20MHz
SWEEP . . . . . .INT
IF ATTENUATOR 10dB
AUX OUTPUT . . . . . .IF UNCAL

3702B
Y1 DISPLAY . . . . . .RET LOSS
Y2 DISPLAY . . . . . .IF
SWEEP SOURCE . . . . . .INT IF
IF ATTENUATOR 4dB
RETURN LOSS ATTENUATOR 17dB
Y1 POSITION . . . . . .CENTRED
Y1 GAIN. . . . . .FULLY CCW
MARKERS . . . . . .SLIDING
MARKER OFFSET 10MHz

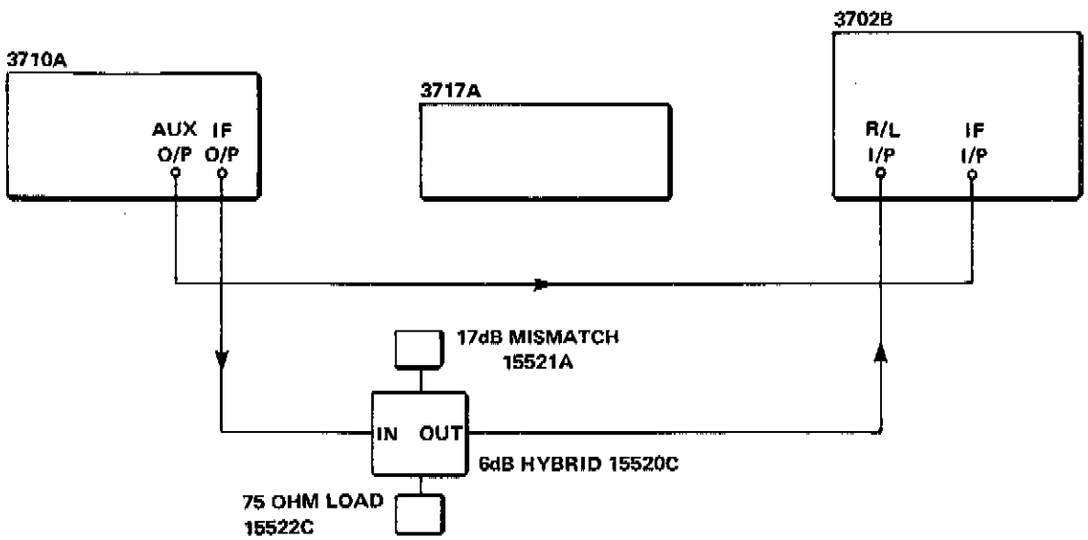


Figure 5-26 Return Loss Setup

23. Adjust the 3702B X GAIN, X POSITION and X PHASE SHIFT to obtain a 10cm trace with the markers superimposed.

24. Adjust the 3702B RETURN LOSS CALIBRATION for a 0dB meter reading. Set the Y1 Y2 CALIBRATION to 1dB. Adjust the Y1 GAIN for a 1cm split trace. Set the Y1 Y2 CALIBRATION to OFF. Adjust the Y1 POSITION to position the trace at the centre of the CRT. The Return Loss Attenuator is now calibrated directly in dB.

25. Remove the 17dB Mismatch and connect the Bridge using a short cable or adaptor to the A22 Limiter Assembly input (P1). Set the 3702B RETURN LOSS ATTENUATOR to 34dB. Check that the display is below the centre of the CRT over the full trace.

26. If necessary, readjust A22 L1 and L2 for a return loss greater than 34dB.

27. If L1 and L2 were readjusted, repeat the procedure starting at step 13 for the best compromise to obtain a NPR greater than 57dB and a return loss at P1 greater than 34dB.

28. Repeat the Baseband Output Sensitivity Tests, Paragraph 4-8.

SECTION VI
REPLACEABLE PARTS

6-1 INTRODUCTION

6-2 This section contains information for ordering parts. Table 6-1 lists abbreviations used in the parts list and throughout the manual. Table 6-2 lists all replaceable parts in reference designator order. Table 6-3 contains the names and addresses that correspond to the manufacturers code numbers.

6-3 ABBREVIATIONS

6-4 Table 6-1 lists all abbreviations used in the parts list, the schematics and throughout the manual. In some cases two forms of the abbreviation are used, one all in capital letters, and one partial or no capitals. This occurs because the abbreviations in the parts list are always all capitals. However, in the schematics and other parts of the manual, other abbreviation forms are used with both lower and upper case letters.

6-5 REPLACEABLE PARTS LIST

6-6 Table 6-2 is the list of replaceable parts and is organised as follows:

(a) Electrical assemblies and their components in alpha-numeric order by reference designation.
(b) Chassis-mounted parts in alpha-numeric order by reference designation.
(c) Miscellaneous parts.
(d) Illustrated parts breakdown.

The information given for each part consists of the following:

(a) The Hewlett-Packard part number.
(b) Part number check digit (CD).
(c) The total quantity (Qty) in the instrument.
(d) The description of the part.
(e) A typical manufacturer of the part in a five-digit code.
(f) The manufacturers number for that part.

The total quantity for each part is given only once – at the first appearance of the part in the list.

6-7 ORDERING INFORMATION

6-8 To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number (with the check digit), indicate the quantity required, and address the order to the nearest Hewlett-Packard office. The check digit will ensure accurate and timely processing of your order.

6-9 To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard Office.

6-10 DIRECT MAIL ORDER SYSTEM

6-11 Within the USA, Hewlett-Packard can supply parts through a direct mail order system. Advantages of using the system are as follows:

(a) Direct ordering and shipment from the HP Parts Centre in Mountain View, California.

(b) No maximum or minimum on any mail order (there is a minimum order amount for parts ordered through a local HP office when the orders require billing and invoicing).

(c) Prepaid transportation (there is a small handling charge for each order).

(d) No invoices – to provide these advantages, a cheque or money order must accompany each order.

6-12 Mail Order forms and specific ordering information are available through your local HP office. Addresses and phone numbers are located at the back of this manual.

Table 6-1 Reference Designations and Abbreviations

REFERENCE DESIGNATIONS

A . . . . . assembly
AT . . attenuator; isolator; termination
B . . . . . fan; motor
BT . . . . . battery
C . . . . . capacitor
CP . . . . . coupler
CR . . . . . diode; diode thyristor; varactor
DC . . . directional coupler
DL . . . . . delay line
DS . . . . . annunciator; signaling device (audible or visual); lamp; LED
E . . . . . miscellaneous electrical part
F . . . . . fuse
FL . . . . . filter
H . . . . . hardware
HY . . . . . circulator
J . . . electrical connector (stationary portion); jack
K . . . . . relay
L . . . . . coil; inductor
M . . . . . meter
MP . . . . . miscellaneous mechanical part
P . . . electrical connector (movable portion); plug
Q . . . . . transistor: SCR; triode thyristor
R . . . . . resistor
RT . . . . . thermistor
S . . . . . switch
T . . . . . transformer
TB . . . . . terminal board
TC . . . . . thermocouple
TP . . . . . test point
U . . . . . integrated circuit; microcircuit
V . . . . . electron tube
VR . . . . voltage regulator; breakdown diode
W . . . . cable; transmission path; wire
X . . . . . socket
Y . . . . crystal unit (piezoelectric or quartz)
Z . . . . tuned cavity; tuned circuit

ABBREVIATIONS

A . . . . . ampere
ac . . . . alternating current
ACCESS . . . . . accessory
ADJ . . . . . adjustment
A/D . . . . analog-to-digital
AF . . . . . audio frequency
AFC . . . . . automatic frequency control
AGC . . . . . automatic gain control
AL . . . . . aluminum
ALC . . . . . automatic level control
AM . . . amplitude modulation
AMPL . . . . . amplifier
APC . . . . automatic phase control
ASSY . . . . . assembly
AUX . . . . . auxiliary
avg . . . . . average
AWG . . . . American wire gauge
BAL . . . . . balance
BCD . . . . . binary coded decimal
BD . . . . . board
BE CU . . . . . beryllium copper
BFO . . . . . beat frequency oscillator
BH . . . . . binder head
BKDN . . . . . breakdown
BP . . . . . bandpass
BPF . . . . . bandpass filter
BRS . . . . . brass
BWO . . . . . backward-wave oscillator
CAL . . . . . calibrate
ccw . . counter-clockwise
CER . . . . . ceramic
CHAN . . . . . channel
cm . . . . . centimeter
CMO . . cabinet mount only
COAX . . . . . coaxial
COEF . . . . . coefficient
COM . . . . . common
COMP . . . . . composition
COMPL . . . . . complete
CONN . . . . . connector
CP . . . . . cadmium plate
CRT . . . cathode-ray tube
CTL . . . . complementary transistor logic
CW . . . . . continuous wave
cw . . . . . clockwise
cm . . . . . centimeter
D/A . . . . digital-to-analog
dB . . . . . decibel
dBm . . . . decibel referred to 1 mW
dc . . . . . direct current
deg . . degree (temperature interval or difference)
° . . . . . degree (plane angle)
°C . . . . . degree Celsius (centigrade)
°F . . . . degree Fahrenheit
°K . . . . . degree Kelvin
DEPC . . deposited carbon
DET . . . . . detector
diam . . . . . diameter
DIA . . . diameter (used in parts list)
DIFF AMPL . . differential amplifier
div . . . . . division
DPDT . . . . . double-pole, double-throw
DR . . . . . drive
DSB . . . . double sideband
DTL . . . . diode transistor logic
DVM . . . digital voltmeter
ECL . . . . emitter coupled logic
EMF . . electromotive force
EDP . . . . . electronic data processing
ELECT . . . . . electrolytic
ENCAP . . . . encapsulated
EXT . . . . . external
F . . . . . farad
FET . . . . . field-effect transistor
F/F . . . . . flip-flop
FH . . . . . flat head
FIL H . . . . . fillister head
FM . . frequency modulation
FP . . . . . front panel
FREQ . . . . . frequency
FXD . . . . . fixed
g . . . . . gram
GE . . . . . germanium
GHz . . . . . gigahertz
GL . . . . . glass
GRD . . . . . ground(ed)
H . . . . . henry
h . . . . . hour
HET . . . . . heterodyne
HEX . . . . . hexagonal
HD . . . . . head
HDW . . . . . hardware
HF . . . . . high frequency
HG . . . . . mercury
HI . . . . . high
HP . . . . . Hewlett-Packard
HPF . . . . . high pass filter
HR . . . . . hour (used in parts list)
HV . . . . . high voltage
Hz . . . . . Hertz
IC . . . . integrated circuit
ID . . . . . inside diameter
IF . . . . . intermediate frequency
IMPG . . . . . impregnated
in . . . . . inch
INCD . . . . . incandescent
INCL . . . . . include(s)
INP . . . . . input
INS . . . . . insulation
INT . . . . . internal
kg . . . . . kilogram
kHz . . . . . kilohertz
kΩ . . . . . kilohm
kV . . . . . kilovolt
lb . . . . . pound
LC . . . . . inductance-capacitance
LED . . light-emitting diode
LF . . . . . low frequency
LG . . . . . long
LH . . . . . left hand
LIM . . . . . limit
LIN . . . linear taper (used in parts list)
lin . . . . . linear
LK WASH . . . lock washer
LO . . . low; local oscillator
LOG . . . . logarithmic taper (used in parts list)
log . . . . . logrithm(ic)
LPF . . . . . low pass filter
LV . . . . . low voltage
m . . . . . meter (distance)
mA . . . . . milliampere
MAX . . . . . maximum
MΩ . . . . . megohm
MEG . . . . meg (10^6) (used in parts list)
MET FLM . . . . metal film
MET OX . . metallic oxide
MF . . . medium frequency; microfarad (used in parts list)
MFR . . . . . manufacturer
mg . . . . . milligram
MHz . . . . . megahertz
mH . . . . . millihenry
mho . . . . . mho
MIN . . . . . minimum
min . . . . . minute (time)
. . . ' . . . . . minute (plane angle)
MINAT . . . . . miniature
mm . . . . . millimeter
MOD . . . . . modulator
MOM . . . . . momentary
MOS . . . . . metal-oxide semiconductor
ms . . . . . millisecond
MTG . . . . . mounting
MTR . . . meter (indicating device)
mV . . . . . millivolt
mVac . . . . . millivolt, ac
mVdc . . . . . millivolt, dc
mVpk . . . . millivolt, peak

NOTE

All abbreviations in the parts list will be in upper-case.

Table 6-1 Reference Designations and Abbreviations (continued)

mVp-p . . . millivolt, peak-to-peak
mVrms . . . . millivolt, rms
mW . . . . . milliwatt
MUX . . . . . multiplex
MY . . . . . mylar
μA . . . . . microampere
μF . . . . . microfarad
μH . . . . . microhenry
μmho . . . . . micromho
μs . . . . . microsecond
μV . . . . . microvolt
μVac . . . . . microvolt, ac
μVdc . . . . . microvolt, dc
μVpk . . . microvolt, peak
μVp-p . . . microvolt, peak-to-peak
μVrms . . . . microvolt, rms
μW . . . . . microwatt
nA . . . . . nanoampere
NC . . . . . no connection
N/C . . . . normally closed
NE . . . . . neon
NEG . . . . . negative
nF . . . . . nanofarad
NI PL . . . . . nickel plate
N/O . . . . . normally open
NOM . . . . . nominal
NORM . . . . . normal
NPN . . . negative-positive-negative
NPO . . . . negative-positive zero (zero temperature coefficient)
NRFR . . not recommended for field replacement
NSR . . . . . not separately replaceable
ns . . . . . nanosecond
nW . . . . . nanowatt
OBD . . . order by description
OD . . . . . outside diameter
OH . . . . . oval head
OP AMPL . . . operational amplifier
OPT . . . . . option
OSC . . . . . oscillator
OX . . . . . oxide
oz . . . . . ounce
Ω . . . . . ohm
P . . . . peak (used in parts list)
PAM . . . . pulse-amplitude modulation
PC . . . . . printed circuit
PCM . . pulse-code modulation; pulse-count modulation
PDM . . . . . pulse-duration modulation
pF . . . . . picofarad
PH BRZ phosphor bronze
PHL . . . . . Phillips
PIN . . . positive-intrinsic-negative
PIV . . . . . peak inverse voltage
pk . . . . . peak
PL . . . . . phase lock
PLO . . . . . phase lock oscillator
PM . . . . phase modulation
PNP . . . positive-negative-positive
P/O . . . . . part of
POLY . . . . . polystyrene
PORC . . . . . porcelain
POS . . positive; position(s) (used in parts list)
POSN . . . . . position
POT . . . . . potentiometer
p-p . . . . . peak-to-peak
PP . . . peak-to-peak (used in parts list)
PPM . . . . . pulse-position modulation
PREAMPL . . . preamplifier
PRF . . . . pulse-repetition frequency
PRR . . . . pulse repetition rate
ps . . . . . picosecond
PT . . . . . point
PTM . . . . . pulse-time modulation
PWM . . . . . pulse-width modulation
PWV . . . . . peak working voltage
RC . . . . . resistance-capacitance
RECT . . . . . rectifier
REF . . . . . reference
REG . . . . . regulated
REPL . . . . . replaceable
RF . . . . . radio frequency
RFI . . . . radio frequency interference
RH . . . . round head; right hand
RLC . . . . . resistance-inductance-capacitance
RMO . . . rack mount only
rms . . . . root-mean-square
RND . . . . . round
ROM . . read-only memory
R&P . . . . . rack and panel
RWV . . . reverse working voltage
S . . . scattering parameter
s . . . . . second (time)
. . . " . second (plane angle)
S-B . . . . . slow-blow (fuse) (used in parts list)
SCR . . . silicon controlled rectifier; screw
SE . . . . . selenium
SECT . . . . . sections
SEMICON . . . . . semiconductor
SHF . . . . . superhigh frequency
SI . . . . . silicon
SIL . . . . . silver
SL . . . . . slide
SNR . . signal-to-noise ratio
SPDT . . . . . single-pole, double-throw
SPG . . . . . spring
SR . . . . . split ring
SPST . . . . . single-pole, single-throw
SSB . . . . . single sideband
SST . . . . . stainless steel
STL . . . . . steel
SQ . . . . . square
SWR . . standing-wave ratio
SYNC . . . . . synchronize
T . . timed (slow-blow fuse)
TA . . . . . tantalum
TC . . . . . temperature compensating
TD . . . . . time delay
TERM . . . . . terminal
TFT . . thin-film transistor
TGL . . . . . toggle
THD . . . . . thread
THRU . . . . . through
TI . . . . . titanium
TOL . . . . . tolerance
TRIM . . . . . trimmer
TSTR . . . . . transistor
TTL . . transistor-transistor logic
TV . . . . . television
TVI television interference
TWT . . traveling wave tube
U . . . . . micro (10^{-6}) (used in parts list)
UF . . . microfarad (used in parts list)
UHF . . ultrahigh frequency
UNREG . . . . unregulated
V . . . . . volt
VA . . . . . voltampere
Vac . . . . . volts, ac
VAR . . . . . variable
VCO . . . voltage-controlled oscillator
Vdc . . . . . volts, dc
VDCW . . volts, dc, working (used in parts list)
V(F) . . . . . volts, filtered
VFO . . variable-frequency oscillator
VHF . . . . . very-high frequency
Vpk . . . . . volts, peak
Vp-p . . volts, peak-to-peak
Vrms . . . . . volts, rms
VSWR . . . voltage standing wave ratio
VTO . . . . . voltage-tuned oscillator
VTVM . . . . vacuum-tube voltmeter
V(X) . . . . . volts, switched
W . . . . . watt
W/ . . . . . with
WIV . . . . working inverse voltage
WW . . . . . wirewound
W/O . . . . . without
YIG . . yttrium-iron-garnet
Z_o . . . . . characteristic impedance

NOTE

All abbreviations in the parts list will be in upper-case.

MULTIPLIERS

Abbreviation	Prefix	Multiple
T	tera	10^{12}
G	giga	10^{9}
M	mega	10^{6}
k	kilo	10^{3}
da	deka	10
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}
f	femto	10^{-15}
a	atto	10^{-18}

Table 6-2 Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	03717-60001	5	1	MOTHER BOARD	28480	03717-60001
A1J1	1251-5720	5	1	CONNECTOR 34-PIN M POST TYPE	28480	1251-5720
A1J2	1251-5717	0	1	CONNECTOR 10-PIN M POST TYPE	28480	1251-5717
A1J3	1251-6091	5	1		28480	1251-6091
A1L1	03717-80025	5	1	COIL ASSEMBLY	28480	03717-80025
A1R1	0698-0082	7	25	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A1R2	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A1XA4A	1251-1626	2	27	CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA4B	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA6	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA9A	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA9B	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA12	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA13	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA14	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA21	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA22	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA23	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA31A	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA31B	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA32A	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA32B	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA33A	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA33B	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA50A	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA50B	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA50C	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA50D	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA50E	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA50F	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA50G	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA50H	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA50I	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
A1XA50J	1251-1626	2		CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-1626
				A1 MISCELLANEOUS PARTS		
	1251-0600	0	7	CONNECTOR-SGL CONT PIN 1.14"MM-BSC-SZ SQ	28480	1251-0600
	1251-5595	2	3	POLARIZING KEY-POST CONN	28480	1251-5595
A2	03717-60015	1	1	ATTENUATOR	28480	03717-60015
A2MP1	03717-20105	6	1	ATTENUATOR CASE	28480	03717-20105
A2MP2	03717-00014	4	1	ATTENUATOR LID	28480	03717-00014
A2MP3	5041-1877	4	1	KEY CAP "1"	28480	5041-1877
A2MP4	5041-1878	5	1	KEY CAP "2"	28480	5041-1878
A2MP5	5041-1879	6	1	KEY CAP "4"	28480	5041-1879
A2MP6	5041-1880	9	1	KEY CAP "8"	28480	5041-1880
A2A1	03717-60002	6	1	ATTENUATOR	28480	03717-60002
A2A1J1	1250-0932	9	2	CONNECTOR-RF SM-SNP M PC 75-OHM	28480	1250-0932
A2A1J2	1250-0932	9		CONNECTOR-RF SM-SNP M PC 75-OHM	28480	1250-0932
A2A1R1	0698-7017	2	2	RESISTOR 1.305K .5% .25W F TC=0+-100	28480	0698-7017
A2A1R2	0698-7020	7	1	RESISTOR 8.6 .5% .25W F TC=0+-150	00327	4013A-1/4-8R6-D
A2A1R3	0698-7017	2		RESISTOR 1.305K .5% .25W F TC=0+-100	28480	0698-7017
A2A1R4	0698-7015	0	2	RESISTOR 654 .5% .25W F TC=0+-100	28480	0698-7015
A2A1R5	0698-7002	5	1	RESISTOR 17.4 .5% .25W F TC=0+-100	28480	0698-7002
A2A1R6	0698-7015	0		RESISTOR 654 .5% .25W F TC=0+-100	28480	0698-7015
A2A1R7	0698-7445	0	2	RESISTOR 332 .5% .25W F TC=0+-100	28480	0698-7445
A2A1R8	0698-7434	7	1	RESISTOR 36 .5% .25W F TC=0+-100	28480	0698-7434
A2A1R9	0698-7445	0		RESISTOR 332 .5% .25W F TC=0+-100	28480	0698-7445
A2A1R10	0698-7441	6	2	RESISTOR 174 .5% .25W F TC=0+-100	28480	0698-7441
A2A1R11	0698-7438	1	1	RESISTOR 79.3 .5% .25W F TC=0+-100	28480	0698-7438
A2A1R12	0698-7441	6		RESISTOR 174 .5% .25W F TC=0+-100	28480	0698-7441
A2A1S1	3101-0427	4	1	SWITCH-PB 4-STATION 15MM C-C SPACING	28480	3101-0427
A3	03717-60003	7	1	KEYBOARD	28480	03717-60003
A3CR1	1990-0665	3	21	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR2	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR3	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR4	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR5	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3CR6	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR8	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR9	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR10	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR11	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR12	1990-0486	6	4	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4484
A3CR13	1990-0486	6		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4484
A3CR14	1990-0487	7	4	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A3CR15	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A3Q1	1854-0071	7	2	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A3R1	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R2	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R3	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R4	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R5	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R6	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R8	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R9	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R10	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R11	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R12	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R13	0757-0279	0	2	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3R14	0757-0401	0	4	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3R15	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3R16	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3S1	5060-9436	7	23	PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S2	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S3	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S4	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S5	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S6	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S8	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S9	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S10	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S11	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S12	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3W1	03717-60100	5	2	CABLE-RIBBON, 34-WAY	28480	03717-60100
				A3 MISCELLANEOUS PARTS		
	5041-0277	6	2	KEY CAP	28480	5041-0277
	5041-0286	7	21	KEY CAP-LIGHT PG	28480	5041-0286

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 004		
A3	03717-60005	9	1	KEYBOARD ASSEMBLY	28480	03717-60005
A3CR1	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR2	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR3	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR4	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR5	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR6	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR7	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR8	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR9	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR10	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR11	1990-0665	3		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0665
A3CR12	1990-0486	6		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4684
A3CR13	1990-0486	6		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4684
A3CR14	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A3CR15	1990-0487	7		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4584
A3J1	1251-4938	5	1	CONNECTOR 3-PIN M METRIC POST TYPE	28480	1251-4938
A3Q1	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A3R1	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R2	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R3	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R4	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R5	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R6	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R7	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R8	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R9	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R10	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R11	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R12	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3R13	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3R14	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3R15	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3R16	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3S1	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S2	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S3	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S4	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S5	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S6	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S7	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S8	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S9	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S10	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S11	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3S12	5060-9436	7		PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A3W1	03717-60100	5		CABLE-RIBBON, 34-WAY	28480	03717-60100
				A3 MISCELLANEOUS PARTS		
	5041-0277	6		KEY CAP	28480	5041-0277
	5041-0286	7		KEY CAP-LIGHT PG	28480	5041-0286

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4	03717-60004	8	1	KEYBOARD LOGIC	28480	03717-60004
A4C1	0180-2662	6	13	CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C2	0180-2662	6		CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C3	0180-2662	6		CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C4	0180-2662	6		CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C5	0180-2662	6		CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C6	0180-2662	6		CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C7	0180-2662	6		CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C8	0180-2662	6		CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C9	0180-2662	6		CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C10	0180-2662	6		CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C11	0180-2662	6		CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C12	0180-2662	6		CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C13	0180-2662	6		CAPACITOR-FXD 10UF+-10% 10VDC TA	25088	D4R7G81A10K
A4C14	0180-2698	8	5	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	28480	0180-2698
A4C15	0180-2698	8		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	28480	0180-2698
A4C16	0180-2816	2	1	CAPACITOR-FXD 68UF+-20% 10VDC TA	28480	0180-2816
A4C17	0180-2698	8		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	28480	0180-2698
A4C18	0160-2055	9	14	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4C19	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4CR1	1901-0040	1	5	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4Q1	1854-0215	1	5	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A4Q2	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A4Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A4Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A4R1	0698-3441	8	13	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R2	1810-0206	8	3	NETWORK-RES 8-SIP10.0K OHM X 7	01121	208A103
A4R3	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R4	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R5	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R6	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R7	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R8	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R9	1810-0206	8		NETWORK-RES 8-SIP10.0K OHM X 7	01121	208A103
A4R10	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R11	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R12	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R13	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R14	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R15	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A4R16	0698-3160	8	2	RESISTOR 31.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A4R17	0698-3136	8	1	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4R18	0698-3161	9	1	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A4R19	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A4R20	0698-3160	8		RESISTOR 31.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A4R21	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A4R22	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A4R23	1810-0280	8	1	NETWORK-RES 10-SIP10.0K OHM X 9	01121	210A103
A4R24	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A4R25	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A4U1	1820-1416	5	3	IC SCHMITT-TRIG TTL LS INV HEX 1-INP	01295	SN74LS14N
A4U2	1820-1416	5		IC SCHMITT-TRIG TTL LS INV HEX 1-INP	01295	SN74LS14N
A4U3	1820-1206	1	1	IC GATE TTL LS NOR TPL 3-INP	01295	SN74LS27N
A4U4	1820-1416	5		IC SCHMITT-TRIG TTL LS INV HEX 1-INP	01295	SN74LS14N
A4U5	1820-1199	1	4	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A4U6	1820-1201	6	3	IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A4U7	1820-1437	0	3	IC MV TTL LS MONOSTBL DUAL	01295	SN74LS221N
A4U8	1820-1196	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A4U9	1820-1112	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A4U10	1820-1195	7	3	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A4U11	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A4U12	1820-1194	6	1	IC GATE TTL LS NOR QUAD 2-INP	01295	SN74LS02N
A4U13	1820-1197	9	4	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A4U14	1820-1437	0		IC MV TTL LS MONOSTBL DUAL	01295	SN74LS221N
				A4 MISCELLANEOUS PARTS		
	1251-0600	0	12	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
	1480-0116	8	6	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	4040-0748	3	3	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0752	9	1	EXTR-PC BD YEL POLYC .062-BD-THKNS	28480	4040-0752
	9170-0817	7	1	BEAD FERRITE	28480	9170-0817

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A6	03717-60006	0	1	POWER SUPPLY	28480	03717-60006
A6C1	0180-2603	3	2	CAPACITOR-FXD 7200UF+75-10% 50VDC AL	28480	0180-2603
A6C2	0180-2603	5		CAPACITOR-FXD 7200UF+75-10% 50VDC AL	28480	0180-2603
A6C3	0160-3486	2	5	CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A6C4	0160-3486	2		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A6C5	0180-2698	8		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	28480	0180-2698
A6C6	0160-3878	6	1	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6C7	0180-2821	9	2	CAPACITOR-FXD 22UF+-20% 35VDC TA	28480	0180-2821
A6C8	0160-0574	3	1	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A6C9	0180-2821	9		CAPACITOR-FXD 22UF+-20% 35VDC TA	28480	0180-2821
A6C10	0160-3486	2		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A6C11	0160-3486	2		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A6C12	0180-0480	2	1	CAPACITOR-FXD 4500UF+75-10% 25VDC AL	00853	500452U025AA2A
A6C13	0180-2817	3	1	CAPACITOR-FXD 47UF+-20% 10VDC TA	28480	0180-2817
A6C14	0160-3486	2		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A6CR1	1884-0066	3	3	THYRISTOR-SCR 2N4443 VRRM=400	04713	2N4443
A6CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR4	1990-0450	4	3	LED-VISIBLE LUM-INT=600UCD IF=50MA-MAX	28480	5082-4484
A6CR5	1902-0025	4	2	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A6CR6	1884-0066	3		THYRISTOR-SCR 2N4443 VRRM=400	04713	2N4443
A6CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A6CR8	1884-0066	3		THYRISTOR-SCR 2N4443 VRRM=400	04713	2N4443
A6CR9	1990-0450	4		LED-VISIBLE LUM-INT=600UCD IF=50MA-MAX	28480	5082-4484
A6CR10	1902-0952	6	1	DIODE-ZNR 5.6V 5% DO-35 PD=.4W TC=+.046%	28480	1902-0952
A6CR11	1990-0450	4		LED-VISIBLE LUM-INT=600UCD IF=50MA-MAX	28480	5082-4484
A6CR12	1902-0025	4		DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A6CR13	1902-0184	6	2	DIODE-ZNR 16.2V 5% DO-35 PD=.4W	28480	1902-0184
A6CR14	1902-0184	6		DIODE-ZNR 16.2V 5% DO-35 PD=.4W	28480	1902-0184
A6CR15	1901-0673	6	1	DIODE-PWR RECT 100V 5A SUS	03508	A15A
A6F3	2110-0043	8	1	FUSE 1.5A 250V NTD 1.25X.25 UL	28480	2110-0043
A6J1	1251-4348	1	1	CONNECTOR 6-PIN M POST TYPE	28480	1251-4348
A6J2	1251-4350	5	1	CONNECTOR 7-PIN M POST TYPE	28480	1251-4350
A6J3	1251-4349	2	1	CONNECTOR 4-PIN M POST TYPE	28480	1251-4349
A6Q3	1853-0036	2	2	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A6Q4	1854-0090	0	1	TRANSISTOR NPN SI TO-39 PD=1W FT=100MHZ	28480	1854-0090
A6Q5	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A6R1	0757-0747	7	2	RESISTOR 5.11K 1% .25W F TC=0+-100	24546	C5-1/4-TO-5111-F
A6R2	0757-0442	9	3	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A6R3	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1961-F
A6R4	0812-0019	4	2	RESISTOR .33 5% 3W PW TC=0+-90	28480	0812-0019
A6R5	0698-3152	8	1	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-TO-3481-F
A6R6	2100-3352	7	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A6R7	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-TO-3161-F
A6R8	0698-3446	3	2	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-TO-383R-F
A6R9	0757-0747	7		RESISTOR 5.11K 1% .25W F TC=0+-100	24546	C5-1/4-TO-5111-F
A6R10	0757-0401	0	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-TO-101-F
A6R11	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-TO-2611-F
A6R12	0757-0274	5	1	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1213-F
A6R13	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-TO-10R0-F
A6R14	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-TO-10R0-F
A6R15	0812-0019	4		RESISTOR .33 5% 3W PW TC=0+-90	28480	0812-0019
A6R16	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5111-F
A6R17	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A6R18	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1002-F
A6R19	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-TO-383R-F
A6R20	0698-3447	4	2	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-TO-422R-F
A6R21	0757-0280	3	6	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1001-F
A6R22	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5111-F
A6R23	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-TO-681R-F
A6R24	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-TO-422R-F
A6R25	0757-0417	8	1	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-TO-562R-F
A6R26	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1001-F
A6R27	2100-3426	6	1	RESISTOR -TRMR 20 10%	28480	2100-3426
A6R28	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-TO-316R=F
A6U1	1820-0196	6	1	IC 723 V REGLTR TO-100	04713	MC1723CG
A6U2	1826-0634	9	1	IC OP AMP HV TO-99	27014	LM343H
				A6 MISCELLANEOUS PARTS		
	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-BZ SQ	28480	1251-0600
	1480-0116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	2110-0269	0	6	FUSEHOLDER-CLIP TYPE 5A .250-FUSE	28480	2110-0269
	4040-0748	3		EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0754	1	1	EXTR-PC BD BLU POLYC .062-BD-THKNS	28480	4040-0754
	1205-0011	0	1	HEAT SINK U2	28480	1205-0011

See introduction to this section for ordering information
*Indicates factory selected value

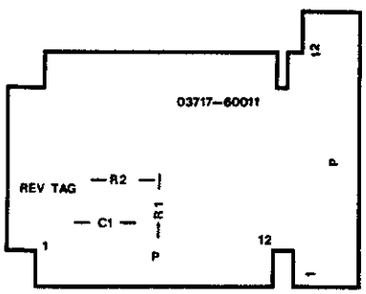


Figure 8-28 A11 Component Location

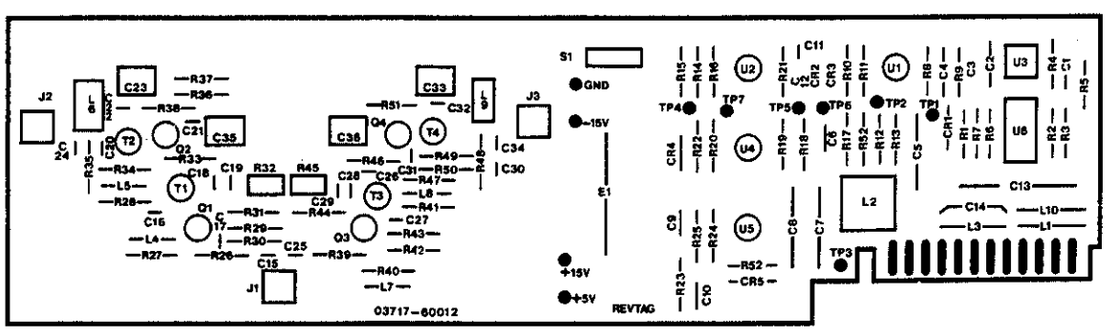


Figure 8-29 A12 Component Location

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A10C1	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10C2	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10C3	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10C4	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10C5	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10C6	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10C7	0160-0576	5	2	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A10C8	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A10J1	1251-4040	0	1	CONNECTOR 24-PIN F MICRO RIBBON	28480	1251-4040
A10J2	1251-5649	7	1	CONNECTOR 20-PIN M POST TYPE	28480	1251-5649
A10R1	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10R2	0698-3438	3		RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A10R3	0698-3438	3		RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A10U1	1820-1689	4	4	IC UART TTL QUAD	04713	MC3446P
A10U2	1820-1689	4		IC UART TTL QUAD	04713	MC3446P
A10U3	1820-1689	4		IC UART TTL QUAD	04713	MC3446P
A10U4	1820-1689	4		IC UART TTL QUAD	04713	MC3446P
A10U5	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A10U6	1820-1207	2	1	IC GATE TTL LS NAND 8-INP	01295	SN74LS30N
				A10 MISCELLANEOUS PARTS		
	0380-0643	3	2	STANDOFF-HEX .255-IN-LG 6-32THD	00000	ORDER BY DESCRIPTION
	0380-0741	2	2	STANDOFF-RVT-ON .187-IN-LG 6-32THD	00000	ORDER BY DESCRIPTION
	1251-5595	2		POLARIZING KEY-POST CONN	28480	1251-5595
	2190-0067	8	2	WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0067

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11	03717-60011	7	1	RT ANGLE EXT FOR A13	28480	03717-60011
A11C1	0160-0194	3	2	CAPACITOR-FXD .015UF +-10% 200VDC POLYE	28480	0160-0194
A11R1	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A11R2	0757-0421	4	3	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A11XA13	1251-2159	8	1	CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS	28480	1251-2159
A12	03717-60012	8	1	IF OUTPUT AMP & SERVICE CHANNEL	28480	03717-60012
A12C1	0180-2814	0	5	CAPACITOR-FXD 22UF+-20% 10VDC TA	28480	0180-2814
A12C2	0140-2221	1	1	CAPACITOR-FXD 1300PF +-5% 300VDC MICA	28480	0140-2221
A12C3	0160-2055	9	18	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C4	0180-0197	8	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A12C5	0160-0194	3		CAPACITOR-FXD .015UF +-10% 200VDC POLYE	28480	0160-0194
A12C6	0160-3456	6		CAPACITOR-FXD .001UF +80-20% 100VDC CER	28480	0160-3456
A12C7	0160-0157	8	2	CAPACITOR-FXD 4700PF +-10% 200VDC POLYE	28480	0160-0157
A12C8	0160-0157	8		CAPACITOR-FXD 4700PF +-10% 200VDC POLYE	28480	0160-0157
A12C9	0160-3486	2	7	CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A12C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C11	0160-0575	4	16	CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C12	0160-3508	9	21	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A12C13	0180-1794	3	1	CAPACITOR-FXD 22UF+-10% 35VDC TA	56289	150D226X9035R2
A12C14	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A12C15	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C16	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C17	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C18	0160-3879	7	4	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A12C19	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C20	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C21	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C22	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A12C23	0121-0059	7	5	CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	52763	304324 2/8PF NPO
A12C24	0160-3873	1	2	CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A12C25	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C26	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C27	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C28	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A12C29	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C30	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C31	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C32	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A12C33	0121-0059	7		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	52763	304324 2/8PF NPO
A12C34	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A12C35	0121-0059	7		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	52763	304324 2/8PF NPO
A12C36	0121-0059	7		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	52763	304324 2/8PF NPO
A12CR1	1901-0040	1	6	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A12CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A12CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A12CR4	1901-0535	9	1	DIODE-SCHOTTKY	28480	1901-0535
A12CR5	1901-0040	1		DIODE-SWITCHING 30V 50mA 2NS DO=35	28480	1901-0040
A12E1	9164-0123	5	1	BUZZER	28480	9164-0123
A12J2	1250-0668	8	2	CONNECTOR-RF SM-SNP M PC 75-OHM	28480	1250-0668
A12J3	1250-0668	8		CONNECTOR-RF SM-SNP M PC 75-OHM	28480	1250-0668
A12L1	9100-1641	0	2	INDUCTORRF-CH-MLD 240UH 5% .166Dx.385LG	28480	9100-1641
A12L2	03717-80029	9	1	COIL ASSEMBLY	28480	03717-80029
A12L3	9140-0121	3	1	INDUCTORRF-CH-MLD 1.8UH 10%	28480	9140-0121
A12L4	9100-2257	6	4	INDUCTORRF-CH-MLD 820NH 10% .105Dx.26LG	28480	9100-2257
A12L5	9100-2257	6		INDUCTORRF-CH-MLD 820NH 10% .105Dx.26LG	28480	9100-2257
A12L6	03717-80026	6	3	COIL ASSEMBLY	28480	03717-80026
A12L7	9100-2257	6		INDUCTORRF-CH-MLD 820NH 10% .105Dx.26LG	28480	9100-2257
A12L8	9100-2257	6		INDUCTORRF-CH-MLD 820NH 10% .105Dx.26LG	28480	9100-2257
A12L9	03717-80026	6		COIL ASSEMBLY	28480	03717-80026
A12L10	9100-1641	0		INDUCTORRF-CH-MLD 240UH 5% .166Dx.385LG	28480	9100-1641
A12Q1	1854-0345	8	10	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A12Q2	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A12Q3	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A12Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A12R1	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A12R2	0757-0442	9	11	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R3	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R4	0757-0459	8	16	RESISTOR 56.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5622-F
A12R5	0698-3158	4	1	RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12R6	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R7	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R8	0757-0280	3	10	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12R9	0757-0464	5		RESISTOR 90.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9092-F
A12R10	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A12R11	0698-3159	5	1	RESISTOR 26.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2612-F
A12R12	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12R13	0698-0084	9	2	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A12R14	0757-0288	1	1	RESISTOR 9.09K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-9091-F
A12R15	0698-3155	1	8	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A12R16	0698-3453	2	3	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A12R17	0698-6958	2	1	RESISTOR 511K 1% .125W F TC=0+-100	28480	0698-6958
A12R18	0757-0424	7	2	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A12R19	0757-0416	7	8	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A12R20	0757-0123	3	1	RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A12R21	0757-0417	8	5	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A12R22	0757-0462	3		RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
A12R23	0698-3457	6	5	RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A12R24	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12R25	0757-0441	8	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A12R26	0698-4412	5	2	RESISTOR 143 1% .125W F TC=0+-100	24546	C4-1/8-T0-143R-F
A12R27	0757-0417	8		RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A12R28	0757-0346	2	39	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A12R29	0698-3151	7	8	RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A12R30	0698-3151	7		RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A12R31	0698-3440	7	4	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A12R32	2100-3352	7	2	RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A12R33	0757-0395	1		RESISTOR 56.2 1% .125W F TC=0+-100 ★	24546	C4-1/8-T0-56R2-F
A12R34	0757-0417	8		RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A12R35	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A12R36	0698-3151	7		RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A12R37	0698-3151	7		RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A12R38	0757-0398	4	10	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A12R39	0698-4412	5		RESISTOR 143 1% .125W F TC=0+-100	24546	C4-1/8-T0-143R-F
A12R40	0757-0417	8		RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A12R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A12R42	0698-3151	7		RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A12R43	0698-3151	7		RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A12R44	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A12R45	2100-3352	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	28480	2100-3352
A12R46	0757-0395	1		RESISTOR 56.2 1% .125W F TC=0+-100 ★	24546	C4-1/8-T0-56R2-F
A12R47	0757-0417	8		RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A12R48	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A12R49	0698-3151	7		RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A12R50	0698-3151	7		RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A12R51	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A12R52	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R53	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A12S1	3101-1162	6	1	SWITCH-SLSPDT MINTR .5A 125VAC/DC	28480	3101-1162
A12T1	03717-80027	7	3	COIL ASSEMBLY PC	28480	03717-80027
A12T2	03717-80027	7		COIL ASSEMBLY	28480	03717-80027
A12T3	03717-80028	8	3	COIL ASSEMBLY	28480	03717-80028
A12T4	03717-80028	8		COIL ASSEMBLY	28480	03717-80028
A12U1	1826-0043	4	7	IC OP AMP GP TO-99	01928	CA3077
A12U2	1826-0043	4		IC OP AMP GP TO-99	01928	CA3077
A12U3	1826-0180	0	1	IC TIMER TTL MONO/ASTBL	04713	MC1455P1
A12U4	1826-0043	4		IC OP AMP GP TO-99	01928	CA3077
A12U5	1826-0026	3	1	IC COMPARATOR PRCN TO-99	01295	LM311L
A12U6	1820-1200	5	1	IC INV TTL LS HEX	01295	SN74LS05N
A12W1	03717-60107	2	1	CABLE ASSEMBLY-COAX	28480	03717-60107
				A12 MISCELLANEOUS PARTS		
A12Z1	0361-0010	8			28480	0361-0010
	0403-0026	6	5	GLIDE NYLON FITS 0.192 HOLD 0.156HI	28480	0403-0026
	1251-0600	0	34	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-BZ 3G	28480	1251-0600
	9170-0617	7	8	CORE-MAGNETIC (MISC ITEM)	28480	9170-0617
	01801-01206	7	2	AGL BRACKET	28480	01801-01206
A13	0950-0416	5	1	NORTHERN TELECOM OMG6 MODULATOR	28480	0950-0416
A14	03717-60014	0	1	AUTOMATIC FREQUENCY CONTROL	28480	03717-60014
A14C1	0180-2208	6	1	CAPACITOR-FXD 220UF+-10% 10VDC TA	56289	150D227X9010B2
A14C2	0180-2618	4	2	CAPACITOR-FXD 2.2UF+-20% 35VDC TA	28480	0180-2618
A14C3	0180-2618	4		CAPACITOR-FXD 2.2UF+-20% 35VDC TA	28480	0180-2618
A14C4	0160-3486	2		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A14C5	0160-4492	2	1	CAPACITOR-FXD 18PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-180J
A14C6	0121-0036	0		CAPACITOR-V TRMR-CER 5.5-18PF 350V PC-MTG	52763	304324 5.5/18PF NP0

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A14C7	0160-4511	6	1	CAPACITOR-FXD 220PF +-5% 200VDC CER	51642	200-200-NP0-221J
A14C8	0160-0576	5	31	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A14C9	0160-4515	0	1	CAPACITOR-FXD 2200PF +-5% 100VDC CER	28480	0160-4515
A14C10	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A14C11	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C12	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A14C13	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C14	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C15	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C16	0160-3878	6	2	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A14C17	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A14C18	0160-3486	2		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A14C19	0160-3486	2		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A14C20	0160-3486	2		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A14C21	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C22	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C23	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C24	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C25	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C26	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C27	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C28	0160-3486	2		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A14C29	0160-3486	2		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A14C30	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A14C31	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A14C32	0160-2199	2	1	CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A14C33	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C34	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C35	0160-0127	2	2	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A14C36	0160-0170	5	1	CAPACITOR-FXD .22UF +80-20% 35VDC CER	28480	0160-0170
A14C37	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14C38	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A14C39	0160-0575	4		CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A14C40	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A14CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A14CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A14CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A14CR4	1990-0450	4	7	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A14L1	9140-0096	1	1	INDUCTORRF-CH-MLD 1UH 10% .166DX.385LG	28480	9140-0096
A14L2	9100-1623	8	2	INDUCTORRF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A14L3	9100-1623	8		INDUCTORRF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A14L4	03717-60001	7	1	COIL ASSEMBLY	28480	03717-60001
A14L5	9100-2247	4	1	INDUCTORRF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A14L6	9100-2269	0	2	INDUCTORRF-CH-MLD 27UH 10% .105DX.26LG	28480	9100-2269
A14L7	9100-2269	0		INDUCTORRF-CH-MLD 27UH 10% .105DX.26LG	28480	9100-2269
A14Q1	1854-0215	1	29	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A14Q2	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A14Q3	1853-0015	7	2	TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A14Q4	1853-0015	7		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A14Q5	1853-0405	9	2	TRANSISTOR PNP SI PD=300MW FT=650MHZ	04713	2N4209
A14Q6	1853-0405	9		TRANSISTOR PNP SI PD=300MW FT=650MHZ	04713	2N4209
A14Q7	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A14R1	0698-3132	4	5	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A14R2	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A14R3	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A14R4	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A14R5	0757-0465	6	8	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A14R6	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A14R7	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A14R8	0698-3154	0	3	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A14R9	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A14R10	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A14R11	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A14R12	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A14R13	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A14R14	0698-4420	5	2	RESISTOR 226 1% .125W F TC=0+-100	24546	C4-1/8-T0-226R-F
A14R15	0757-0395	1	1	RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A14R16	0698-4420	5		RESISTOR 226 1% .125W F TC=0+-100	24546	C4-1/8-T0-226R-F
A14R17	0757-0400	9	6	RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A14R18	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A14R19	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A14R20	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A14R21	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A14R22	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A14R23	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A14R24	0757-0274	5	9	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A14R25	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A14R26	0757-0418	9	1	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A14R27	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A14R29	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A14R30	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A14R31	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A14R32	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A14R33	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A14R34	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A14R35	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A14R36	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A14R37	0698-4529	5	3	RESISTOR 226K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2263-F
A14R38	0698-4529	5		RESISTOR 226K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2263-F
A14R39	0757-0465	7	1	RESISTOR 110K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1103-F
A14R40	0698-4529	5		RESISTOR 226K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2263-F
A14R41	0698-3460	1	2	RESISTOR 422K 1% .125W F TC=0+-100	28480	0698-3460
A14R42	0698-3450	9	1	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
A14R43	0698-3454	3	3	RESISTOR 215K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2153-F
A14R44	0698-3460	1		RESISTOR 422K 1% .125W F TC=0+-100	28480	0698-3460
A14R45	0757-0419	0		RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-6810-F
A14R46	0698-3156	2	10	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A14R47	0757-0419	0		RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-6810-F
A14R48	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A14R49	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A14R50	0698-3442	9	3	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A14R51	0757-0278	9	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A14R52	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A14T1	03747-80013	7	1	TRANSFORMER	28480	03747-80013
A14U1	1820-1991	1	4	IC CNTR TTL LS DECD DUAL 4-BIT	01295	SN74LS390N
A14U2	1820-1442	7	3	IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A14U3	1820-1991	1		IC CNTR TTL LS DECD DUAL 4-BIT	01295	SN74LS390N
A14U4	1820-0810	1	1	IC RCVR ECL LINE RCVR TPL 2-INP	04713	MC10116P
A14U5	1820-1009	2	1	IC DIVR ECL DECD	07263	95H90DC
A14U6	1820-1991	1		IC CNTR TTL LS DECD DUAL 4-BIT	01295	SN74LS390N
A14U7	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A14U8	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A14U9	1820-1991	1		IC CNTR TTL LS DECD DUAL 4-BIT	01295	SN74LS390N
A14U10	1820-1420	1	1	IC CNTR TTL LS DIV-X-12 ASYNCHRO	01295	SN74LS92N
A14U11	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A14U12	1820-0630	3	1	IC MISC TTL	04713	MC8044P
A14U13	1820-0223	0	1	IC OP AMP GP TO-99	04713	MLM301AG
A14U14	1826-0111	7	8	IC OP AMP GP DUAL TO-99	04713	MC1458G
A14U15	1826-0111	7		IC OP AMP GP DUAL TO-99	04713	MC1458G
A14W1	03717-60108	3	1	CABLE ASSEMBLY-COAX	28480	03717-60108
A14Y	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A14Y1	0410-1303	9	1	CRYSTAL- 12 MHZ DS	28480	0410-1303
				A14 MISCELLANEOUS PARTS		
	0361-0010	3	2		28480	0361-0010
	0403-0026	6		GLIDE NYLON FITS 0.192 HOLD 0.156HI	28480	0403-0026
A14Z3	01801-01206	7		AGL BRACKET	28480	01801-01206
	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SG	28480	1251-0600
A21	03717-60021	9	1	AGC AMPLIFIER	28480	03717-60021
A21C1	0160-4619	5		CAPACITOR-FXD 2.7PF +-.25PF 200VDC CER	28480	0160-4619
A21C2	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C3	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C4	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C5	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C7	0160-4521	8	2	CAPACITOR-FXD 12PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-120J
A21C8	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C9	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C10	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A21C11	0180-0562	1	1	CAPACITOR-FXD 33UF+-20% 10VDC TA	56289	196D336X0010KA1
A21C12	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C13	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C14	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C15	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C16	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C17	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A21C19	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A21CR1	1901-0639	4	3	DIODE-PIN 110V	28480	5082-3080
A21CR2	1901-0639	4		DIODE-PIN 110V	28480	5082-3080
A21CR3	1901-0639	4		DIODE-PIN 110V	28480	5082-3080
A21CR4	1901-0179	7	18	DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A21CR5	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A21CR6	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A21CR7	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A21CR8	1901-0044	5	35	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A21CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A21CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A21CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A21CR12	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A21CR13	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A21CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A21CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A21J1	1250-1320	1	1	CONNECTOR-RF SM-SLD M PC 75-OHM	28480	1250-1320
A21L3	03717-80030	2	1	CHOKE ASSEMBLY	28480	03717-80030
A21L4	03717-80026	6		INDUCTOR-VARIABLE	28480	03717-80026
A2101	1854-0890	8	2	TRANSISTOR-NPN SI	28480	1854-0890
A2102	1854-0890	8		TRANSISTOR-NPN SI	28480	1854-0890
A2103	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A2104	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A2105	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A21R1	0757-0397	3	2	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A21R2	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
A21R3	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A21R4	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A21R5	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A21R6	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
A21R7	0757-0399	5	4	RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A21R8	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A21R9	0757-0200	7	1	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A21R10	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A21R11	0757-0278	9		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A21R12	2100-3274	2	5	RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A21R13	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A21R14	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A21R15	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A21R16	0698-3458	7	2	RESISTOR 348K 1% .125W F TC=0+-100	28480	0698-3458
A21R17	0698-3458	7		RESISTOR 348K 1% .125W F TC=0+-100	28480	0698-3458
A21R18	0698-8960	6	2	RESISTOR 750K 1% .125W F TC=0+-100	28480	0698-8960
A21R19	0698-8960	6		RESISTOR 750K 1% .125W F TC=0+-100	28480	0698-8960
A21R20	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A21R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A21R22	0698-8827	4	7	RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A21R23	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A21R24	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A21R25	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A21R26	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A21R27	0757-0461	2	1	RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6812-F
A21R28	0757-0443	0	2	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1102-F
A21R29	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A21R30	0698-3161	9	1	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A21R31	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A21R32	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A21R33	0757-0447	4	2	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A21R34	0757-0447	4		RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A21R35	0698-3153	9	1	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A21R36	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A21T1	03717-80027	7		COIL ASSEMBLY	28480	03717-80027
A21T2	03717-80028	8		COIL ASSEMBLY	28480	03717-80028
A21U1	1826-0111	7		IC OP AMP GP DUAL TO-99	04713	MC1458G
A21U2	1826-0111	7		IC OP AMP GP DUAL TO-99	04713	MC1458G
A21W1	03717-60112	9	1	CABLE ASSEMBLY-COAX	28480	03717-60112
	9170-0817	7		CORE-MAGNETIC (MISC ITEM)	28480	9170-0817
A22, A23	0950-0417	6		NORTHERN TELECOM QDM1A DISCRIMATOR & QLM1A LIMITER	28480	0950-0417

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A31	03717-60031	1	1	MODULATOR DRIVER & BASEBAND AMPLIFIER	28480	03717-60031
A31C1	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A31C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A31C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A31C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A31C7	0180-2617	1	37	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C8	0160-4521	8		CAPACITOR-FXD 12PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-120J
A31C9	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C11	0180-2814	0		CAPACITOR-FXD 22UF+-20% 10VDC TA	28480	0180-2814
A31C12	0121-0036	0	3	CAPACITOR-V TRMR-CER 5.5-18PF 350V	52763	304324 5.5/18PF NPO
A31C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C18	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C19	0160-4494	4	2	CAPACITOR-FXD 39 PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-390J
A31C20	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C22	0160-4512	7	3	CAPACITOR-FXD 120PF +-5% 200VDC CER	51642	200-200-NP0-121J
A31C23	0180-2814	0		CAPACITOR-FXD 22UF+-20% 10VDC TA	28480	0180-2814
A31C24	0121-0105	4	1	CAPACITOR-V TRMR-CER 9-35PF 350V	52763	304324 9/35PF NP0
A31C25	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C26	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C27	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C28	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C29	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C30	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C31	0160-4385	2	3	CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-150J
A31C32	0160-0336	5	2	CAPACITOR-FXD 100PF +-1% 300VDC MICA	28480	0160-0336
A31C33	0160-3011	9	1	CAPACITOR-FXD 204PF +-1% 300VDC MICA	28480	0160-3011
A31C34	0160-0336	5		CAPACITOR-FXD 100PF +-1% 300VDC MICA	28480	0160-0336
A31C36	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A31C37	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A31C39	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31C40	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A31CR1	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A31CR2	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A31CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A31CR6	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A31CR7	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A31CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A31CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A31CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A31CR11	1990-0450	4		LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A31J1	1250-0932	9	7	CONNECTOR-RF SM-SNP M PC 75-OHM	28480	1250-0932
A31J2	1250-0932	9		CONNECTOR-RF SM-SNP M PC 75-OHM	28480	1250-0932
A31L1	03717-80003	9	2	COIL ASSEMBLY	28480	03717-80003
A31L2	03717-80003	9		COIL ASSEMBLY	28480	03717-80003
A31L3	9140-0141	7	1	INDUCTORRF-CH-MLD 680NH 10% .105DX.26LG	28480	9140-0141
A31Q1	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A31Q2	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A31Q3	1853-0036	2	19	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A31Q4	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A31Q5	1855-0420	2	14	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A31Q6	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A31Q7	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A31Q8	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A31Q9	1853-0271	7	6	TRANSISTOR PNP 2N4403 SI TO-92 PD=310MW	04713	2N4403
A31Q10	1853-0271	7		TRANSISTOR PNP 2N4403 SI TO-92 PD=310MW	04713	2N4403
A31Q11	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A31Q12	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A31Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A31Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A31Q15	1853-0271	7		TRANSISTOR PNP 2N4403 SI TO-92 PD=310MW	04713	2N4403
A31Q16	1853-0271	7		TRANSISTOR PNP 2N4403 SI TO-92 PD=310MW	04713	2N4403
A31Q17	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A31Q18	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A31Q19	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A31Q20	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A31R1	0698-3441	8	14	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A31R2	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A31R3	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A31R4	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A31R5	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A31R6	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A31R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A31R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A31R9	0757-0405	4	2	RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A31R10	0757-0401	0	6	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A31R11	2100-3178	5	1	RESISTOR-VAR CONTROL CCP 100 10% LIN	28480	2100-3178
A31R12	0698-3432	7	3	RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A31R13	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A31R14	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A31R15	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A31R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A31R17	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A31R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A31R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A31R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A31R21	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A31R22	0757-0346	2		RESISTOR 10 1% .125W F TC = 0+-100	24546	C4-1/8-T0-75R0-F
A31R23	0757-0346	2		RESISTOR 10 1% .125W F TC = 0+-100	24546	C4-1/8-T0-75R0-F
A31R24	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A31R25	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A31R26	0698-3433	8	2	RESISTOR 28.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-28R7-F
A31R27	0757-0289	2	2	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A31R28	0757-0428	1	2	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A31R29	0698-3428	1	1	RESISTOR 14.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-14R7-F
A31R30	0757-1094	9	2	RESISTOR 1.47K 1% .125W F TC = 0+-100	24546	C4-1/8-T0-1471-F
A31R31	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A31R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A31R33	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A31R34	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A31R35	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A31R37	0698-3445	2	9	RESISTOR 348 1% .125W F TC=0+-100 *	24546	C4-1/8-T0-348R-F
A31R38	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A31R39	0698-3441	8	1	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A31R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A31R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A31R44	0698-3433	8		RESISTOR 28.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-28R7-F
A31R45	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A31R46	0757-0428	1		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A31R47	0698-3427	0		RESISTOR 13.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-13R3-F
A31R48	0757-0424	7		RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A31R49	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A31R50	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A31R51	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A31R52	0698-4037	0	3	RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A31R53	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A31R54	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A31R55	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A31R57	2100-3350	5	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	28480	2100-3350
A31R58	0698-3451	0	5	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A31R59	0757-0444	1	5	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A31R60	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A31R62	0698-8821	8	1	RESISTOR 5.62 1% .125W F TC=0+-100	28480	0698-8821
A31R64	0698-8820	7	1	RESISTOR 4.64 1% .125W F TC=0+-100	28480	0698-8820
A31R66	2100-3350	5	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	28480	2100-3350
A31U1	1826-0111	7		IC OP AMP GP DUAL TO-99	04713	MC1458G
A31U2	1826-0102	6	2	IC OP AMP LOW-BIAS-H-IMPD TO-99	27014	LM312H
A31U3	1826-0102	6		IC OP AMP LOW-BIAS-H-IMPD TO-99	27014	LM312H
	1480-0116	8	5	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	4040-0749	4	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0749
	4040-0751	6	4	EXTR-PC BD ORN POLYC .062-BD-THKNS	28480	4040-0751
A32	03717-60032	2	1	TELEPHONY I/O	28480	03717-60032
A32C1	0160-4386	3	1	CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-4386
A32C2	0180-2814	0		CAPACITOR-FXD 22UF+-20% 10VDC TA	28480	0180-2814
A32C3	0160-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A32C4	0160-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A32C5	0160-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A32C6	0160-4385	2		CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-150J
A32C7	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A32C8	0121-0036	0		CAPACITOR-V TRMR-CER 5.5-18PF 350V	52763	304324 5.5/18PF NPO
A32C9	0160-4511	6		CAPACITOR-FXD 220PF +-5% 200VDC CER	51642	200-200-N00-221
A32C10	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A32C11	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A32C12	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A32C13	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A32C14	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A32C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A32C16	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A32C17	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A32C18	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A32C19	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A32C20	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A32C21	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A32C22	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A32C23	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A32C24	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A32C25	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A32C26	0180-2814	0		CAPACITOR-FXD 22UF+-20% 10VDC TA	28480	0180-2814
A32C32	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A32C33	0160-4383	0	1	CAPACITOR-FXD 6.8PF +-.5PF 200VDC CER	20932	5034E0200RD689D
A32C34	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A32CR1	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A32CR2	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A32CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A32CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A32CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A32CR6	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A32CR7	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A32CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A32CR11	1990-0450	4		LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A32J1	1250-0932	9		CONNECTOR-RF SM-BNP M PC 75-OHM	28480	1250-0932
A32J2	1250-0932	9		CONNECTOR-RF SM-BNP M PC 75-OHM	28480	1250-0932
A32J3	1250-0932	9		CONNECTOR-RF SM-BNP M PC 75-OHM	28480	1250-0932
A32Q1	1853-0271	7		TRANSISTOR PNP 2N4403 SI TO-92 PD=310MW	04713	2N4403
A32Q2	1853-0271	7		TRANSISTOR PNP 2N4403 SI TO-92 PD=310MW	04713	2N4403
A32Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A32Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A32Q5	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A32Q6	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A32Q7	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A32Q8	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A32Q9	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A32Q10	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A32Q11	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A32Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A32Q13	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A32Q14	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A32Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A32Q16	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A32Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A32Q18	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A32R1	0698-4393	1		RESISTOR 73.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-73R2-F
A32R2	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R3	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R4	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A32R6	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A32R7	0698-3457	6		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A32R8	0698-3457	6		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A32R9	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A32R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R12	0698-3433	8		RESISTOR 28.7 1% .125W F TC=0+-100	24546	C4-1/8-T0-28R7-F
A32R13	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A32R14	0698-3152	8	1	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A32R15	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A32R16	0757-0417	8	1	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A32R17	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A32R18	0757-0180	2		RESISTOR 31.6 1% .125W F TC=0+-100	24546	C4-1/8-TO-31R6-F
A32R19	0757-0397	5		RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A32R20	0699-4049	8		RESISTOR 50 1% .125W F TC=0+-100	28480	0699-0049
A32R21	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A32R22	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A32R23	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A32R24	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A32R25	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R26	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R27	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A32R28	0757-0400	9		RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A32R29	0757-0400	9		RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A32R30	0757-0440	7	2	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A32R31	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A32R32	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A32R33	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R34	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R35	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R36	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R37	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R38	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R39	0698-3457	6		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A32R40	0698-4393	1	1	RESISTOR 73.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-73R2-F
A32R41	0698-3457	6		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A32R42	0757-0405	4		RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A32R43	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-261R-F
A32R44	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A32R45	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A32R46	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A32R47	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A32R48	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R49	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A32R50	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A32R51	0698-3451	0		RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A32R52	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A32R53	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A32R55	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A32U1	1826-0043	4		IC OP AMP GP TO-99	01928	CA3077
A32U2	1826-0043	4		IC OP AMP GP TO-99	01928	CA3077
A32U3	1826-0043	4		IC OP AMP GP TO-99	01928	CA3077
	1480-0116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	4040-0750	7	1	EXTR-PC BD RED POLYC .062-BD-THKNS	28480	4040-0750
	4040-0751	8		EXTR-PC BD ORN POLYC .062-BD-THKNS	28480	4040-0751
A33	03717-60033	3	1	VIDEO I/O	28480	03717-60033
A33C1	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A33C2	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A33C3	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A33C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A33C5	0121-0520	7	2	CAPACITOR-VAR 3.5/10 PF CER	28480	0121-0520
A33C6	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A33C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A33C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A33C9	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A33C10	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A33C11	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A33C12	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A33C13	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A33C14	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A33C15	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A33C16	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A33C17	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A33C18	0121-0520	7		CAPACITOR-VAR 3.5/10 PF CER	28480	0121-0520
A33C19	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A33C20	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A33C21	0160-4492	2	1	CAPACITOR-FXD 18PF +-5PF 200VDC CER	28480	0160-4492
A33C22	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A33C23	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A33C24	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A33C25	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A33C26	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A33C27	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A33C28	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A33C29	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A33C30	0160-4493	3		CAPACITOR-FXD 27PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-270J
A33C31	0160-4385	2		CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-150J
A33C32	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A33C33	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A33C34	0160-3872	0	2	CAPACITOR-FXD 2.2PF +-.25PF 200VDC CER	28480	0160-3872
A33C35	0160-3872	0		CAPACITOR-FXD 2.2PF +-.25PF 200VDC CER	28480	0160-3872
A33C36	0160-4512	7		CAPACITOR-FXD 120PF +-5% 200VDC CER	51642	200-200-NP0-121J
A33C37	0160-4619	5		CAPACITOR-FXD 2.7 +-.5PF 200V DC CER	51642	200-200-NP0-279D
A33C38	0160-4498	8		CAPACITOR-FXD 5.6PF +-.5PF 200VDC CER	51642	200-200-NP0-569D
A33CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A33CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A33CR7	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A33CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A33CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A33CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A33CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A33CR16	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A33CR19	1990-0450	4		LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A33CR20	1990-0450	4		LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A33CR21	1990-0450	4		LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A33CR22	1990-0450	4		LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A33CR23	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A33CR24	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A33CR25	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A33J1	1250-0932	9		CONNECTOR-RF SM-SNP M PC 75-OHM	28480	1250-0932
A33J2	1250-0932	9		CONNECTOR-RF SM-SNP M PC 75-OHM	28480	1250-0932
A33L1	9100-2204	3	1	INDUCTORRF-CH-MLD 60NH 10% .095DX.25LG	28480	9100-2204
A33Q1	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A33Q2	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A33Q3	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A33Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A33Q5	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A33Q6	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A33Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A33Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A33Q9	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A33Q10	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A33Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A33Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A33Q13	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A33Q14	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A33Q15	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A33Q16	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A33Q17	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A33Q18	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A33Q19	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A33Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A33Q21	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A33Q22	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A33Q23	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A33Q24	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A33Q25	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A33Q26	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A33Q27	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A33Q28	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A33Q29	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A33Q30	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A33R1	0757-0402	1	2	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A33R2	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A33R3	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A33R4	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A33R5	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A33R6	0698-3442	9		RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A33R7	2100-3349	2		RESISTOR-TRMR 100 10% C SIDE-ADJ 1-TRN	28480	2100-3349
A33R8	0698-0403	2	1	RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-TO-121R-F
A33R9	2100-3350	5		RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	28480	2100-3350
A33R10	0757-0316	6		RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-42R2-F
A33R11	0757-0316	6		RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-42R2-F
A33R12	0757-0422	5	4	RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A33R13	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A33R14	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A33R15	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A33R16	0698-3435	0	2	RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A33R17	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A33R18	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A33R19	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A33R20	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A33R21	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-10	24546	C4-1/8-T0-825R-F
A33R22	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A33R23	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A33R24	0757-0397	3		RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-TO-68R1-F
A33R25	0757-0399	5		RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A33R26	0757-0397	3		RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A33R27	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A33R28	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A33R29	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A33R30	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A33R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A33R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A33R33	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A33R34	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A33R35	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A33R36	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A33R37	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A33R38	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A33R39	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A33R40	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A33R41	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A33R42	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A33R43	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A33R44	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A33R45	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-1[illegible]	24546	C4-1/8-T0-215R-F
A33R46	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A33R47	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A33R48	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A33R49	0698-3442	9		RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A33R50	2100-3349	2		RESISTOR-TRMR 100 10% C SIDE-ADJ 1-TRN	28480	2100-3349
A33R51	0757-0399	5		RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A33R52	2100-3349	2		RESISTOR-TRMR 100 10% C SIDE-ADJ 1-TRN	28480	2100-3349
A33R53	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A33R54	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A33R55	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A33R56	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A33R57	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A33R58	0698-3435	0		RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A33R59	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A33R60	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A33R61	0698-4393	1		RESISTOR 73.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-73R2-F
A33R62	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A33R63	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A33R64	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A33R65	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A33R66	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A33R67	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A33R68	0698-3451	0		RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A33R69	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A33R70	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A33R71	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A33R72	0698-3451	0		RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A33R73	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A33R74	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A33R75	0757-0499	8		RESISTOR 56.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5622-F
A33R76	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A33R77	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A33R78	0757-0400	9		RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A33R79	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A33R80	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A33R81	0698-3451	0		RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A33R82	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A33R83	0757-0199	3		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A33R84	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A33R85	0757-0199	3		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A33U1	1826-0111	7		IC OP AMP GP DUAL TO-99	04713	MC1458G
A33U2	1826-0111	7		IC OP AMP GP DUAL TO-99	04713	MC1458G
A33U3	1826-0111	7		IC OP AMP GP DUAL TO-99	04713	MC1458G
A33U4	1820-0478	7	1	IC OP AMP LOW-BIAS-H-IMP TO-99	03406	SL9974
	1480-0116	8		PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	4040-0751	8		EXTR-PC BD ORN POLYC .062-BD-THKNS	28480	4040-0751
	9170-0817	7		CORE-MAGNETIC (MISC ITEM)	28480	9170-0817

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 004		
A34	03717-60034	4	1	BAL/UNBAL	28480	03717-60034
A34C1	0160-3094	8	24	CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C2	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C3	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C4	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C5	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C6	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C7	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C8	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C17	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C18	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C19	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C20	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C21	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C22	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C23	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C24	0160-3094	8		CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A34C25	0160-3486	2	1	CAPACITOR-FXD .47UF +80-20% 50VDC CER	28480	0160-3486
A34CR1	1901-0044	5	5	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A34CR2	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A34CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A34CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A34CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A34CR6	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=30MA-MAX	28480	5082-4484
A34K1	0490-1262	7	2	RELAY 2C 12VDC-COIL 2A 120VAC	28480	0490-1262
A34K2	0490-1262	7		RELAY 2C 12VDC-COIL 2A 120VAC	28480	0490-1262
A34L1	9140-0261	6	2	INDUCTOR RF-CH-MLD 100NH 5% .166DX-385LG	28480	9140-0261
A34L2	9140-0261	6	2	INDUCTOR RF-CH-MLD 100NH 5% .166DX-385LG	28480	9140-0261
A34Q1	1853-0036	2	2	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A34Q2	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A34R1	0757-0123	1	1	RESISTOR 34.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3482-F
A34R2	0698-4566	0	1	RESISTOR 147 1% .25W F TC=0+-100	24546	C5-1/4-T0-147R-F
A34R3	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-10O2-F
A34R4	0757-0398	4	2	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A34R5	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A34R6	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A34T1	03717-60023	3	2	TRANSFORMER ASSEMBLY	28480	03717-60023
A34T2	03717-60023	3		TRANSFORMER ASSEMBLY	28480	03717-60023
	1250-0932	9	2	CONNECTOR-RF SM-SNP M PC 75-OHM	28480	1250-0932
	1251-4938	5	1	CONNECTOR 3-PIN M METRIC POST TYPE	28480	1251-4938
	1400-0664	3	2	CLIP-CMPNT .187-DIA .3-HD NYL	28480	1400-0664

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 012		
A50	03717-60052	6	1	60 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60052
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C21	0160-5076	0	1		28480	0160-5076
A50C22	0160-5160	3	1		28480	0160-5160
A50C24	0160-5082	8	1		28480	0160-5082
A50C25	0160-5159	0	1		28480	0160-5159
A50C26	0160-0493	3	1	CAPACITOR-FXD 27PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-270J
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR16	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR19	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-4410	3	2	RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R14	0757-0398	4	2	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-4410	3		RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R35	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP QP DUAL TO-99	04713	MC1458G
				A50 (OPT 011) MISCELLANEOUS		
	1480-0116	6	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	03717-40006	8	2	LABEL MOULDED (24)	28480	03717-40006

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 012		
A50	03717-60052	6	1	60 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60052
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C21	0160-5076	0	1		28480	0160-5076
A50C22	0160-5160	3	1		28480	0160-5160
A50C24	0160-5082	8	1		28480	0160-5082
A50C25	0160-5159	0	1		28480	0160-5159
A50C26	0160-4493	3	1	CAPACITOR-FXD 27PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-270J
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR6	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-4410	3	2	RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R14	0757-0398	4	2	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-4410	3		RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R35	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP QP DUAL TO-99	04713	MC14588
				A50 (OPT 012) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	03717-40007	9	2	LABEL MOULDED (60)	28480	03717-40007

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 013		
A5J	03717-60053	7	1	120 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60053
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R808J835K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C21	0160-5082	8	1		28480	0160-5082
A50C22	0160-5199	0	1		28480	0160-5199
A50C23	0160-4350	1	1	CAPACITOR-FXD 68PF +-5% 200VDC CER 0+-30	28480	0160-4350
A50C24	0160-5162	9	1		28480	0160-5162
A50C25	0160-5069	1	1		28480	0160-5069
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 4NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 4NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 4NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 4NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 4NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 4NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 4NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 4NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=600UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 4NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 4NS	28480	1901-0044
A50L1	03717-80012	0	1	COIL ASSEMBLY	28480	03717-80012
A50L2	03717-80013	1	1	COIL ASSEMBLY	28480	03717-80013
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	8	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-4410	3	2	RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R14	0757-0390	8	2	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-4410	3		RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R35	0757-0390	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP GP DUAL TO-99	04713	MC1458G
				A50(OPT 013) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1460-0114	8	2	PIN-ORV .062-IN-DIA .25-IN-LG STL	28480	1460-0114
	03717-40008	0	2	LABEL MOULDED (120)	28480	03717-40008

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 014		
A50	03717-60054	8	1	300 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60054
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R8081835K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R8081835K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R8081835K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R8081835K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R8081835K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R8081835K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R8081835K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R8081835K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C21	0160-5162	5	1		28480	0160-5162
A50C23	0160-4827	4	1	CAPACITOR-FXD 56PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-560J
A50C24	0160-5159	0	1		28480	0160-5159
A50C26	0160-4330	1	1	CAPACITOR-FXD 68PF +-5% 200VDC CER 0+-30	28480	0160-4330
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L1	03717-80011	9	1	COIL ASSEMBLY	28480	03717-80011
A50L2	03717-80010	8	1	COIL ASSEMBLY	28480	03717-80010
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-4410	3	2	RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R14	0757-0398	4	2	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-4410	3		RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R35	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3491	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP GP DUAL TO-99	04713	MC1458G
				A50(OPT 014) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	03717-40009	1	2	LABEL MOULDED (300)	28480	03717-40009

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 015		
A50	03717-60055	9	1	600 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60055
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C21	0160-5069	1	1		28480	0160-5069
A50C22	0160-5071	9	1		28480	0160-5071
A50C24	0160-5067	9	1		28480	0160-5067
A50C26	0160-3873	1	1	CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L1	03717-80008	4	1	COIL ASSEMBLY	28480	03717-80008
A50L2	03717-80009	5	1	COIL ASSEMBLY	28480	03717-80009
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-4410	3	2	RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R14	0757-0398	4	2	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-4410	3		RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R35	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP QP DUAL TO-99	04713	MC1458Q
				A50(OPT 015) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	03717-40010	4	2	LABEL MOULDED (600)	28480	03717-40010

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 016		
A50	03717-60056	0	1	960 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60056
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C21	0160-5069	1	1		28480	0160-5069
A50C23	0160-4619	5	1	CAPACITOR-FXD 2.7PF +-.25PF 200VDC CER	28480	0160-4619
A50C24	0160-5065	7	1		28480	0160-5065
A50C26	0160-4498	6	1	CAPACITOR-FXD 5.6PF +-.5PF 200VDC CER	51642	200-200-NP0-569D
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR6	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L1	03717-80007	3	1	COIL ASSEMBLY	28480	03717-80007
A50L2	03717-80006	2	1	COIL ASSEMBLY	28480	03717-80006
A50Q1	1853-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1853-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1853-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1853-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-4410	3	2	RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R14	0757-0398	4	2	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-4410	3		RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R35	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R57	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP GP DUAL TO-99	04713	MC1458G
				A50(OPT 016)MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	03717-40011	5	2	LABEL MOULDED (960)	28480	03717-40011

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 017		
A50	03717-60057	1	1	1240 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60057
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C21	0160-5160	3	1		28480	0160-5160
A50C23	0160-3875	3	1	CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A50C24	0160-5157	8	1		28480	0160-5157
A50C26	0160-3873	1	1	CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L1	03717-80005	1	1	COIL ASSEMBLY	28480	03717-80005
A50L2	03717-80004	0	1	COIL ASSEMBLY	28480	03717-80004
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	8	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	6	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-6410	3	2	RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R14	0757-0398	4	2	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-6410	3		RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R35	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MFAC1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MFAC1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MFAC1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MFAC1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R57	0698-0080	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP GP DUAL TO-99	4713	MC1458G
				A50(OPT 017) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC SD BLK POLYC .062-RD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC RD GRN POLYC .062-RD-THKNS	28480	4040-0753
	1480-0114	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0114
	03712-40012	6	2	LABEL MOULDED (1260)	28480	03712-40012

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 018		
A50	03717-60058	2	1	1800 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60058
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C21	0160-5157	8	1		28480	0160-5157
A50C22	0160-5155	6	1		28480	0160-5155
A50C24	0160-5193	2	1		28480	0160-5193
A50C27	0160-4494	4	1	CAPACITOR-FXD 39PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-390J
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L1	03717-60003	9	1	COIL ASSEMBLY	28480	03717-60003
A50L2	03717-60002	8	1	COIL ASSEMBLY	28480	03717-60002
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	6	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-4410	3	2	RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R14	0757-0398	4	2	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-4410	3		RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A50R35	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R57	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP GP DUAL TO-99	04713	MC1458G
				A50(OPT 018) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	03717-40013	7	2	LABEL MOULDED (1800)	28480	03717-40013

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 021		
A50	03717-60061	7	1	925L CHANNEL EMPHASIS ASSEMBLY	28480	03717-60061
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C21	0160-5082	8	1		28480	0160-5082
A50C22	0160-5163	6	1		28480	0160-5163
A50C27	0160-4497	7	1	CAPACITOR-FXD 82PF +-5% 200VDC CER 0+-30	28480	0160-4497
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L2	03717-80018	6	1	COIL ASSEMBLY	28480	03717-80018
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	17	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0757-0409	8	2	RESISTOR 274 1% .125W F TC=0+-100	24546	C4-1/8-T0-274R-F
A50R14	0698-0084	9	2	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A50R15	0698-3441	8	6	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0757-0409	8		RESISTOR 274 1% .125W F TC=0+-100	24546	C4-1/8-T0-274R-F
A50R35	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R54	0698-3430	5	1	RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
A50R55	0698-3564	8	1	RESISTOR 53 1% .125W F TC=0+-100	03888	PME55-1/8-T0-53R0-F
A50R56	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R57	0698-8238	1	1	RESISTOR 64.3 1% .125W F TC=0+-100	19701	MF4C1/8-T0-64R3-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP GP DUAL TO-99	04713	MC1456G
				A50 (OPT 021) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	03717-40014	8	2	LABEL MOULDED (525)	28480	03717-40014

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 022		
A50	03717-60062	8	1	625L EMPHASIS ASSEMBLY	28480	03717-60062
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81835K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C21	0160-5088	4	1		28480	0160-5088
A50C22	0160-5162	5	1		28480	0160-5162
A50C27	0160-4387	4	1	CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR6	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L2	03717-80019	7	1	COIL ASSEMBLY	28480	03717-80019
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-6346	8	2	RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6346
A50R14	0698-0084	9	2	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-6346	8		RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6346
A50R35	0757-0398	4	1	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R54	0698-3431	6	1	RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A50R55	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A50R57	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP QP DUAL TO-99	04713	MC14580
				A50 (OPT 022) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0118	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0118
	03717-40015	9	2	LABEL MOULDED (625)	28480	03717-40015

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 023		
A50	03717-60063	9	1	819L EMPHASIS ASSEMBLY	28480	03717-60063
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R868|835K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R868|835K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R868|835K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R868|835K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R868|835K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R868|835K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R868|835K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D&R868|835K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C21	0160-4493	3	1	CAPACITOR-FXD 27PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-270J
A50C22	0160-5159	0	1		28480	0160-5159
A50C27	0160-4497	7	1	CAPACITOR-FXD 82PF +-5% 200VDC CER 0+-30	28480	0160-4497
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L2	03717-80020	0	1	COIL ASSEMBLY	28480	03717-80020
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-6346	8	2	RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6346
A50R14	0757-0398	4	1	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-6346	8		RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6346
A50R35	0698-0084	9	2	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R55	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A50R56	0698-4377	1	2	RESISTOR 37.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-37R4-F
A50R57	0698-4377	1		RESISTOR 37.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-37R4-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP QP QUAL TO-99	04713	MC1458Q
				A50 (OPT 023) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	03717-40016	0	2	LABEL MOULDED (819)	28480	03717-40016

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 031		
A50	03717-60064	0	1	BELL 600 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60064
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R868J835K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C24	0160-5159	0	1		28480	0160-5159
A50C25	0160-5163	6	1		28480	0160-5163
A50C26	0160-4498	8	1	CAPACITOR-FXD 5.6PF +-.5PF 200VDC CER	51642	200-200-NP0-569D
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM=INT=600UCD IF=50MA-MAX	28480	5082-4484
A50CR16	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L2	03717-60021	1	1	COIL ASSEMBLY	28480	03717-60021
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-6346	8	2	RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6346
A50R14	0698-3178	8		RESISTOR 487 1% .125W F TC=0+-100	24546	C4-1/8-T0-487R-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-6346	8		RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6346
A50R35	0757-0278	9	1	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3491	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0448	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R54	0698-3431	6	1	RESISTOR 23.7 1% .125W F TC=0+-100	19701	MF4C1/8-T0-23R7-F
A50R55	0698-4389	5	1	RESISTOR 64.9 .1% .125W F TC=0+-25	28480	0698-4389
A50R56	0698-3427	0	1	RESISTOR 13.3 1% .125W F TC=0+-100	28480	0698-3427
A50R57	0698-4389	5	1	RESISTOR 64.9 1% .125W F TC=0+-100	19701	MF4C1/8-T0-64R9
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP GP DUAL TO-99	04713	MC1458G
				A50 (OPT 031) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	03717-40017	1	2	LABEL MOULDED (600)	28480	03717-40017

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 032		
A50	03717-60065	1	1	BELL 900 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60065
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C24	0160-5065	7	1		28480	0160-5065
A50C25	0160-5079	3	1		28480	0160-5079
A50C26	0160-4386	7	1	CAPACITOR-FXD 1PF +-.25PF 200VDC CER	51642	150-200-NP0-109C
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L2	03717-60022	2	1	INDUCTOR ASSEMBLY	28480	03717-60022
A50Q1	1855-0420	2	6	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-6346	8	2	RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6346
A50R14	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	2	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156			RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0460	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0460	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-6346	8		RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6346
A50R35	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R54	0698-3433	8	1	RESISTOR 28.7 .1% .125W F TC=0+-25	28480	0698-3433
A50R57	0757-0393	9	1	RESISTOR 47.5 1% .125W F TC=0+-25	28480	0757-0393
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP GP DUAL TO-99	04713	MC1458G
				A50 (OPT 032) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	03717-40018	2	2	LABEL MOULDED (900)	28480	03717-40018

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 033		
A90	03717-60066	2	1	BELL 1200 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60066
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R6G81B35K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R6G81B35K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R6G81B35K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R6G81B35K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R6G81B35K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R6G81B35K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R6G81B35K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R6G81B35K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C24	0160-5065	7	1		28480	0160-5065
A50C25	0160-5079	3	1		28480	0160-5079
A50C26	0160-4380	7	1	CAPACITOR-FXD 1PF +-.25PF 200VDC CER	51642	150-200-NP0-109C
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0490	4	1	LED-VISIBLE LUM-INT=600UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L2	03717-80022	2	1	INDUCTOR ASSEMBLY	28480	03717-80022
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-6346	8	2	RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6346
A50R14	0757-0408	7		RESISTOR 243 1% .125W F TC=0+-100	24546	C4-1/8-T0-243R-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-6346	8		RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6346
A50R35	0698-3178	8		RESISTOR 487 1% .125W F TC=0+-100	24546	C4-1/8-T0-487R-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R54	0698-4364	6	1	RESISTOR 17.4 1% .125W F TC=0+-100	19701	MF4C1/8-T0-17R4-F
A50R55	0757-0400	9	1	RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A50R56	0698-3431	6	1	RESISTOR 23.7 .1% .125W F TC=0+-25	28480	0698-3431
A50R57	0698-4389	5	1	RESISTOR 64.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-64R9-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP GP DUAL TO-99	04713	MC1458G
				A50 (OPT 033) MISCELLANEOUS		
	5001-4872	1	1	LABEL-PCB IDENT	28480	5001-4872
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	03717-40019	3	2	LABEL MOULDED (1200)	28480	03717-40019

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 034		
A50	03717-60067	3	1	BELL 1500 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60067
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C24	0160-5065	7	1		28480	0160-5065
A50C25	0160-5079	3	1		28480	0160-5079
A50C26	0160-4380	7	1	CAPACITOR-FXD 1PF +-.25PF 200VDC CER	51642	150-200-NP0-109C
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=800UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L2	03717-60022	2	1	INDUCTOR ASSEMBLY	28480	03717-60022
A50Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-6344	8	2	RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6344
A50R14	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A50R15	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-6344	8		RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6344
A50R35	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R54	0698-3431	6	1	RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A50R55	0757-0395	1	1	RESISTOR 56.2 1% .125W F TC=0+-100	03888	PME55-1/8-T0-56R2-F
A50R56	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A50R57	0757-0397	3	1	RESISTOR 68.1 1% .125W F TC=0+-25	28480	0757-0397
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP GP DUAL TO-99	04713	MC1458G
				A50 (OPT 034) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	03717-40020	6	2	LABEL MOULDED (1500)	28480	03717-40020

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				OPTION 035		
A50	03717-60068	4	1	BELL 1800 CHANNEL EMPHASIS ASSEMBLY	28480	03717-60068
A50C1	0160-3508	9	8	CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C2	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C3	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C4	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C5	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C6	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C7	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C8	0160-3508	9		CAPACITOR-FXD 1UF +80-20% 50VDC CER	28480	0160-3508
A50C9	0180-2617	1	8	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C10	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C11	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C12	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C13	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C14	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C15	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C16	0180-2617	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	25088	D6R8G81B35K
A50C17	0160-0576	5	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C18	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C19	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C20	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A50C24	0160-5065	7	1		28480	0160-5065
A50C25	0160-5079	3	1		28480	0160-5079
A50C26	0160-4380	7	1	CAPACITOR-FXD 1PF +-.25PF 200VDC CER	51642	150-200-NP0-109C
A50CR2	1901-0044	5	10	DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR3	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR4	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR5	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR8	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR9	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR10	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR11	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR13	1990-0450	4	1	LED-VISIBLE LUM-INT=600UCD IF=50MA-MAX	28480	5082-4484
A50CR14	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50CR15	1901-0044	5		DIODE-SWITCHING 50V 50MA 6NS	28480	1901-0044
A50L2	03717-80022	2	1	INDUCTOR ASSEMBLY	28480	03717-80022
A50Q1	1855-0420	2	9	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q2	1854-0215	1	10	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q3	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q4	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q5	1853-0036	2	10	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q6	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q7	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q9	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q11	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q12	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q13	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q14	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q15	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q16	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q17	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q18	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q19	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q20	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A50Q21	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q22	1853-0036	2		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A50Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A50R1	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R2	0757-0402	1	4	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R3	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R4	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R5	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A50R6	0757-0346	2	16	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R8	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R9	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R11	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R12	0698-6346	8	2	RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6346
A50R13	0698-3441	8	4	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R14	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R21	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R22	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R23	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R24	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A50R25	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R26	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A50R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R33	0698-6346	8		RESISTOR 300 .1% .125W F TC=0+-25	28480	0698-6346
A50R35	0698-4417	0		RESISTOR 174 1% .125W F TC=0+-100	24546	C4-1/8-T0-174R-F
A50R36	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R37	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A50R38	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R39	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A50R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R41	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A50R42	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A50R43	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A50R44	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A50R45	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A50R46	0698-3152	8	4	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R47	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R48	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R49	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R50	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R51	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R52	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A50R53	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A50R54	0757-0291	6	1	RESISTOR 24.9 1% .125W F TC=0+-100	19701	MF4C1/8-T0-24R9-F
A50R55	0698-5068	9	1	RESISTOR 50 1% .125W F TC=0+-25	28480	0698-5068
A50R56	0757-0347	3		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R-F
A50R57	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A50TL1	1460-1336	4	7	WIREFORM CU BRT-TIN	28480	1460-1336
A50TL2	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL3	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL4	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL5	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL6	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50TL7	1460-1336	4		WIREFORM CU BRT-TIN	28480	1460-1336
A50U1	1826-0111	7	1	IC OP AMP GP DUAL TO-99	04713	MC1458G
				A50 (OPT 035) MISCELLANEOUS		
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0116	8	2	PIN-GRV .062-IN-DIA .25-IN-LG STL	28480	1480-0116
	03717-40021	7	2	LABEL MOULDED (1800)	28480	03717-40021

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				3717A MAIN LIST		
B1	03717-60158	3	1	FAN ASSY	28480	03717-60158
CR1	1906-0093	4	1	DIODE-FW BRDG 100V 35A	04713	MDA3501
CR2	1901-0524	8	1	DIODE-FW BRDG 100V 5A	14099	SCAJ1
E1	0960-0488	6	1	LINE MODULE-FILTERED	05245	F1927
F1	2110-0303	3	1	FUSE 2A 250V SLO-BLO 1.25X.25 UL IEC	0470C	313.500
F1	2110-0007	4	1	FUSE 1A 250V SLO-BLO 1.25X.25 UL IEC	0470C	313.001
J1	1251-6609	1	1	CONNECTOR-TELE JACK	28480	1251-6609
MP1	1500-0433	6	1	FLEX COUPLING-NYLON/BR	28480	1500-0433
MP2	5001-0438	7	2	TRIM STRIP-SIDE	28480	5001-0438
MP3	5020-8801	4	1	FRAME-FRONT UPPER	28480	5020-8801
MP4	5020-8802	5	1	FRAME-REAR UPPER	28480	5020-8802
MP5	5020-8832	1	2	STRUT-SID 3.5 X 20	28480	5020-8832
MP6	5040-3055	2	9	NECO INS (OPT 004)	28480	5040-3055
MP7	5040-3057	4	2	NECO INS (OPT 004)	28480	5040-3057
MP8	5040-6898	7	6	PANEL-LIGHT PIPE	28480	5040-6898
MP9	5040-7201	8	2	FOOT(STANDARD)	28480	5040-7201
MP10	5040-7202	9	1	TRIM, TOP	28480	5040-7202
MP11	5040-7219	8	1	HANDLE-FRONT STRAP	28480	5040-7219
MP12	5040-7220	1	1	HANDLE-REAR STRAP	28480	5040-7220
MP13	5040-7221	2	4		28480	5040-7221
MP14	5040-7222	3	2	FOOT-NON-SKID	28480	5040-7222
MP15	5060-9804	3	1	STRAP-HANDLE	28480	5060-9804
MP16	5060-9835	0	1	TOP COVER	28480	5060-9835
MP17	5060-9847	4	1	BOTTOM COVER	28480	5060-9847
MP18	5060-9876	9	1	COVER-SIDE	28480	5060-9876
MP19	5060-9907	7	1	COVER-PERFORATED-SIDE	28480	5060-9907
MP20	03717-00003	1	1	REAR PANEL	28480	03717-00003
MP21	03717-00004	2	1	DECK	28480	03717-00004
MP22	03717-00005	3	1	BRACKET-FAN	28480	03717-00005
MP23	03717-00006	4	1	SCREEN-MOD	28480	03717-00006
MP24	03717-00007	5	1	SCREEN-DEMOD	28480	03717-00007
MP25	03717-00008	6	1	SUPPORT CENTRAL	28480	03717-00008
MP26	03717-00010	0	1	STRAP-PCB	28480	03717-00010
MP27	03717-00011	1	1	COVER-DEMOD	28480	03717-00011
MP28	03717-00012	2	1	COVER-MODULATOR	28480	03717-00012
MP29	03717-00013	3	1	SPACER-STRIP R/H	28480	03717-00013
MP30	03717-00015	5	1	DRESS-FRONT PANEL	28480	03717-00015
MP30	03717-00017	7	1	PANEL-FRONT DRESS (OPT 004)	28480	03717-00017
MP30	03717-00035	9	1	DRESS-FRONT PANEL (OPT 003)	28480	03717-00035
MP31	03717-00016	6	1	PANEL-FRONT, SUB	28480	03717-00016
MP31	03717-00018	8	1	PANEL-FRONT SUB (OPT 004)	28480	03717-00018
MP31	03717-00036	0	1	FRONT PANEL-SUB (OPT 003)	28480	03717-00036
MP32	03717-00023	5	1	FILTER-FAN	28480	03717-00023
MP33	03717-00026	8	1	PLATE-INH MPIB	28480	03717-00026
MP34	03717-00027	9	2	PLATE-OUT MPIB	28480	03717-00027
MP35	03717-00028	0	1	PLATE-CONNECTOR	28480	03717-00028
MP36	03717-00031	5	1	SCREEN-BASEBAND	28480	03717-00031
MP37	03717-00032	6	1	SPACER-STRIP L/H	28480	03717-00032
MP38	03717-00033	7	1	INSULATOR-SHEET	28480	03717-00033
MP39	03717-00039	3	1	COVER-PRIMARY	28480	03717-00039
MP40	03717-20100	1	2	TRANSFORMER MOUNTING-BLOCK	28480	03717-20100
MP41	03717-20102	3	1	BAR TIE	28480	03717-20102
MP42	03717-20104	5	10	BLOCK MOUNTING	28480	03717-20104
MP43	03717-20110	3	1	BUSH	28480	03717-20110
MP44	03717-20111	4	1	SHAFT	28480	03717-20111
MP45	03717-20115	8	6	ADAPTOR-NECO CONNECTOR	28480	03717-20115
MP46	5060-9898	5	2	HANDLE SIDE	28480	5060-9898
MP47	5020-8895	6	2	TRIM HANDLE	28480	5020-8895
MP48	03717-60020	8	2	RGT ANG BD EXTENDER	28480	03717-60020
MP49	03717-60020	8		RGT ANG BD EXTENDER	28480	03717-60020
Q1	1854-0411	1	1	TRANSISTOR NPN 2N6055 SI DARL TO-3	04713	2N6055
Q2	1853-0351	4	1	TRANSISTOR PNP 2N6053 SI DARL TO-3	04713	2N6053
S1	3101-2369	7	1	SWITCH-RKR SUBMIN DPDT 5A 250VAC SPD-LUG	28480	3101-2369
S2	3101-2462	4	1	SWITCH-TOGGLE SP3T-NS	28480	T74471
S3	3103-0075	2	1	SWITCH-THRM FXD +92C 10A OPN-ON-RISE	28480	3103-0075
T1	03717-80000	6	1	TRANSFORMER ASSY-POWER	28480	03717-80000
U1	1820-0430	1	1	IC 309 V RGLTR TO-3	07263	LM309K
W1	03717-60101	6	1	CABLE ASSY-COAX BLK/BRN	28480	03717-60101
W1A	03717-60126	5	1	CABLE ASSY-COAX BLK/BRN (OPT 003)	28480	03717-60126
W1B	03717-60127	6	1	CABLE ASSY-COAX BLK/BRN (OPT 004)	28480	03717-60127
W2	03717-60102	7	1	CABLE ASSY-COAX BLK/RED	28480	03717-60102
W2A	03717-60130	1	1	CABLE ASSY-COAX BLK/RED (OPT 003)	28480	03717-60130
W2B	03717-60105	0	1	CABLE ASSY-COAX BLK/RED (OPT 004)	28480	03717-60105

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2 Replaceable Parts (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
W6	03717-60106	1	1	CABLE ASSY-COAX BLK/BLU	28480	03717-60106
W9	03717-60109	4	1	CABLE ASSY-COAX BLK/WHT	28480	03717-60109
W9A	03717-60136	7	1	CABLE ASSY-COAX BLK/WHT (OPT 003)	28480	03717-60136
W9B	03717-60137	6	1	CABLE ASSY-COAX BLK/WHT (OPT 004)	28480	03717-60137
W10	03717-60110	7	1	CABLE ASSY-COAX BLK/BRN/BLK	28480	03717-60110
W10A	03717-60140	3	1	CABLE ASSY-COAX BLK/BRN/BLK (OPT 003)	28480	03717-60140
W10B	03717-60141	4	1	CABLE ASSY-COAX BLK/BRN/BLK (OPT 004)	28480	03717-60141
W11	03717-60111	8	1	CABLE ASSY-COAX BLK/BRN/BRN	28480	03717-60111
W11A	03717-60144	7	1	CABLE ASSY-COAX BLK/BRN/BRN (OPT 003)	28480	03717-60144
W11B	03717-60145	8	1	CABLE ASSY-COAX BLK/BRN/BRN (OPT 004)	28480	03717-60145
W13	03717-60113	0	1	CABLE ASSY-COAX BLK/BRN/ORN	28480	03717-60113
W14	03717-60114	1	1	CABLE ASSY-COAX BLK/BRN/YEL	28480	03717-60114
W15	03717-60115	2	1	CABLE ASSY-COAX BLK/BRN/GRN	28480	03717-60115
W15A	03717-60161	8	1	CABLE ASSY-COAX BLK/BRN/GRN (OPT 003)	28480	03717-60161
W15B	03717-60117	4	1	CABLE ASSY-COAX BLK/BRN/GRN (OPT 004)	28480	03717-60117
W16	03717-60116	3	1	CABLE ASSY-COAX BLK/GRN/BLU	28480	03717-60116
W16A	03717-60148	1	1	CABLE ASSY-COAX BLK/GRN/BLU (OPT 003)	28480	03717-60148
W16B	03717-60149	2	1	CABLE ASSY-COAX BLK/GRN/BLU (OPT 004)	28480	03717-60149
W20	03717-60120	9	1	CABLE-RIBBON 10-WAY	28480	03717-60120
W21	03717-60121	0	1	CABLE-LINE SWITCH	28480	03717-60121
W22	03717-60122	1	1	CABLE ASSY-5 VREG	28480	03717-60122
W23	03717-60123	2	1	CABLE ASSY-15 VREG	28480	03717-60123
W24	03717-60124	3	1	JUMP WIRE-EARTH	28480	03717-60124
W25	03717-60153	6	2	CABLE ASSY-COAX	28480	03717-60153
W25	03717-60155	0	2	CABLE ASSY-COAX (OPT 003)	28480	03717-60155
W25B	03717-60156	1	2	CABLE ASSY-COAX (OPT 004)	28480	03717-60156
W26	03717-60153	6		CABLE ASSY-COAX	28480	03717-60153
W26	03717-60155	0		CABLE ASSY-COAX (OPT 003)	28480	03717-60155
W26B	03717-60156	1		CABLE ASSY-COAX (OPT 004)	28480	03717-60156
W27	03717-60159	4	1	CABLE-RIBBON, 20-WAY (OPT 100)	28480	03717-60159
W28	03717-60164	1	1	CABLE ASSY	28480	03717-60164
	1251-6915	2	1	CONNECTOR-TELE PLUG	28480	774967
	03717-60165	2	1	CABLE ASSY-COAX	28480	03717-60165
	03717-60167	4	1	CABLE ASSY-COAX (OPT 003)	28480	03717-60167
	03717-60168	5	1	CABLE ASSY-COAX (OPT 004)	28480	03717-60168
	03717-90000	7	1	MANUAL	28480	03717-90000
	03717-00040	6	2	SHIELD	28480	03717-00040

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3 Manufacturers Code List

MFR No.	Manufacturers Name	Address		Zip Code
00000	ANY SATISFACTORY SUPPLIER			
00327	WELWYN INTERNATIONAL INC	WESTLAKE	OH	44091
00853	SANGAMO ELEC CO S CAROLINA DIV	PICKENS	SC	29671
01121	ALLEN-BRADLEY CO	MILWAUKEE	WI	53204
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS	TX	75222
01928	RCA CORP SOLID STATE DIV	SOMERVILLE	NJ	08876
03508	GE CO SEMICONDUCTOR PROD DEPT	SYRACUSE	NJ	13201
03888	KDI PYROFILM CORP	WHIPPANY	NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX	AZ	85062
05245	CORCOM INC	CHICAGO	IL	60657
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW	CA	94042
14099	SEMTECH CORP	NEWBURY PARK	CA	91320
19701	MEPCO/ELECTRA CORP	MINERAL WELLS	TX	76067
20932	EMCON DIV ITW	SAN DIEGO	CA	92129
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD	PA	16701
25088	SIEMENS CORP	ISELIN	NJ	08830
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA	CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO	CA	94304
51642	CENTRE ENGINEERING INC	STATE COLLEGE	PA	16801
52763	STETTNER-TRUSH INC	CAZENOVIA	NY	13035
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS	MA	01247

Fig 6-1
Sht 1 of 2

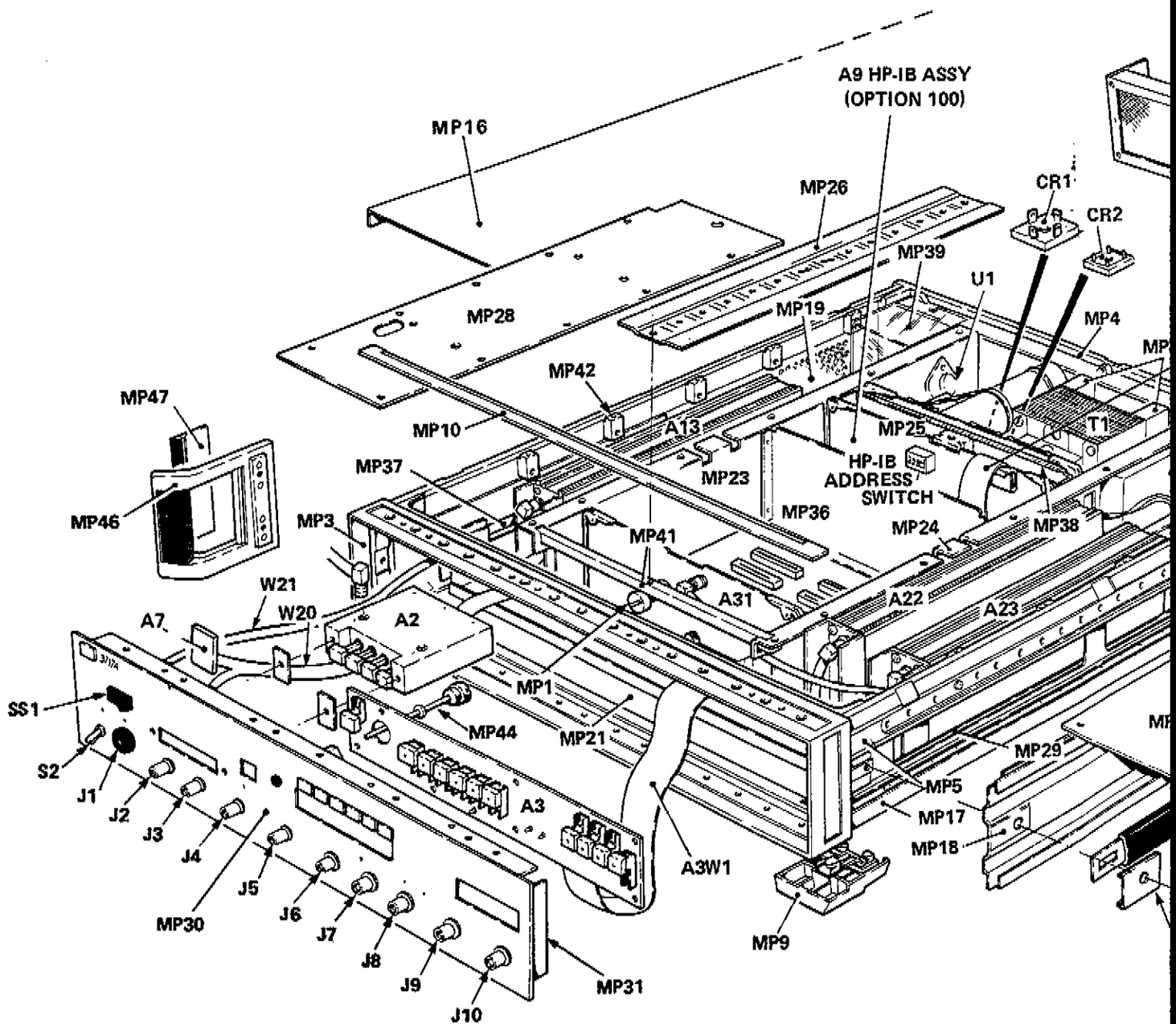


Fig 6-1
Sht 2 of 2

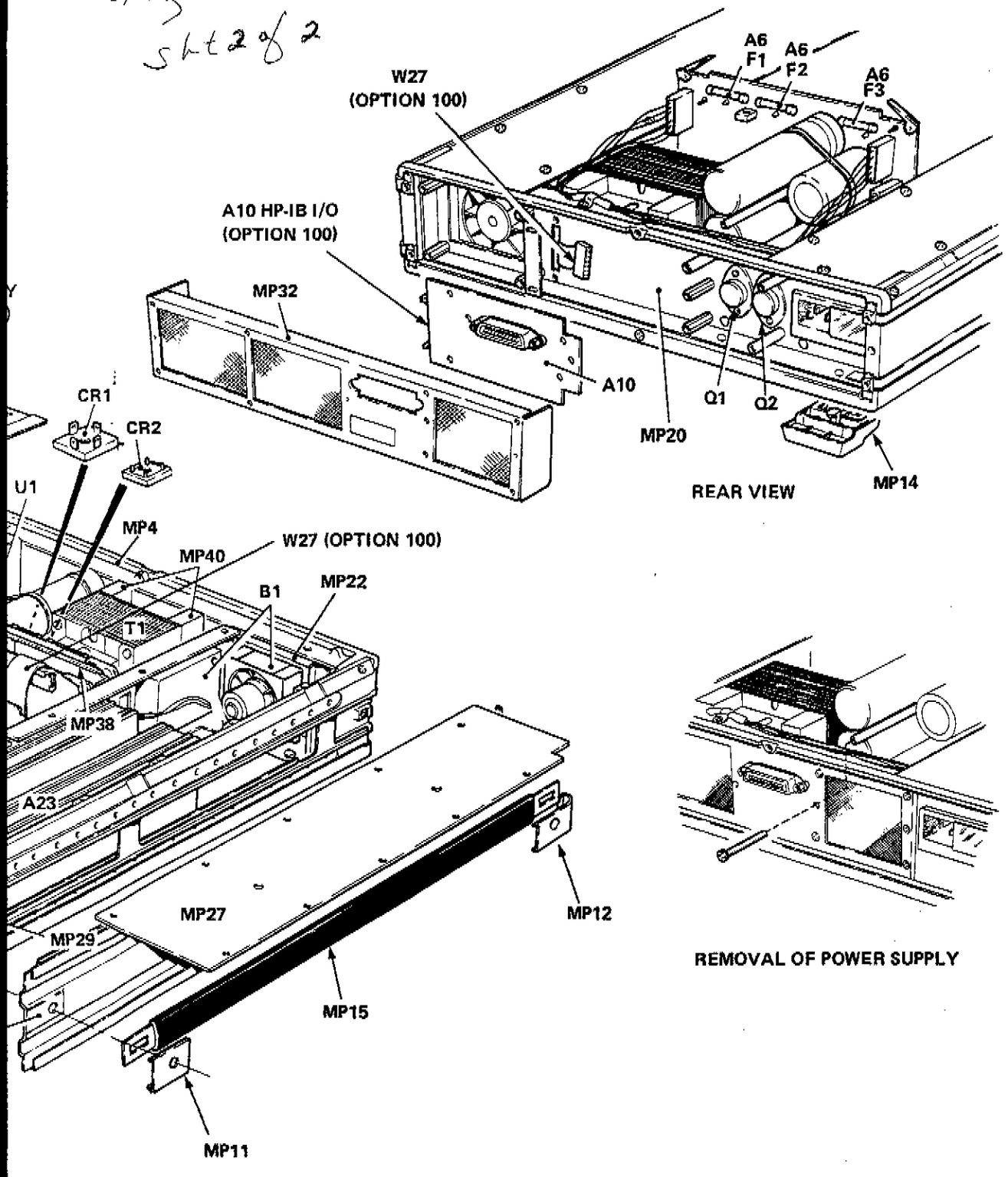


Figure 6-1 Cabinet and Chassis Mounted Parts

SECTION VII
MANUAL CHANGES

7-1 MANUAL BACKDATING

This manual applies directly to the 3717A with the serial number 2028U00160. To make this manual applicable to instruments with serial numbers below 2028U00160, make the following changes.

Figure 8-40 A6 Schematic Diagram: Delete A6R27 and A6R28. Replace A6R27 with a connection between A6J3 (GND) and ground.

Table 6-1 Replaceable Parts List: Delete A6R27 and A6R28.

Table 5-1 3717A Adjustable Components: Delete A6R27.

Paragraph 5-6 Step 3: Change to read:-

3. Connect the DVM between A6, +5V test point and ground. Check that the DVM reads +5V ±0.2V.

7-2 MANUAL UPDATING

For instruments with serial numbers above 2028U00160. Refer to the MANUAL CHANGES supplement.

SECTION VIII
SERVICE

8-1 INTRODUCTION

This section of the manual contains the information required to repair the 3717A Modulator-Demodulator. It contains overall theory of operation, troubleshooting, and in eight service sheets, circuit descriptions, component locations and circuit schematics. The position of assemblies within the instrument may be found by referring to Figure 8-3 Location of Assemblies.

8-2 SAFETY CONSIDERATIONS

WARNING

Procedures described in this section are performed with protective covers removed and power supplied to the instrument. Servicing should only be performed by trained personnel who are aware of the hazard involved.

8-3 RECOMMENDED TEST EQUIPMENT

Test equipment required to maintain the 3717A is listed in Table 1-2. Any equipment that satisfies the critical specifications given in the table may be substituted for the recommended models. Two extender boards are provided (refer to Figure 8-3 Location of Assemblies) to allow access to assemblies while they remain operational.

8-4 SERVICE SHEETS

For clarity and ease of troubleshooting, the instrument has been divided into eight service sheets (refer to Figure 8-1) which group together blocks of associated circuitry. Table 8-1 cross-references assemblies to service sheets. Each service sheet contains circuit descriptions, component locations and circuit descriptions.

8-5 THEORY OF OPERATION

Figure 8-1 shows the 3717A Modulator-Demodulator divided into the eight major blocks which correspond to the eight service sheets. Blocks 1, 2 and 3 comprise the Modulator, and blocks 1, 2 and 4 the Demodulator. Blocks 5, 6, 7, 8 and 9 are common to both the Modulator and the Demodulator.

The Block Diagram, Figure 8-4 shows the circuit blocks which comprise the service sheets.

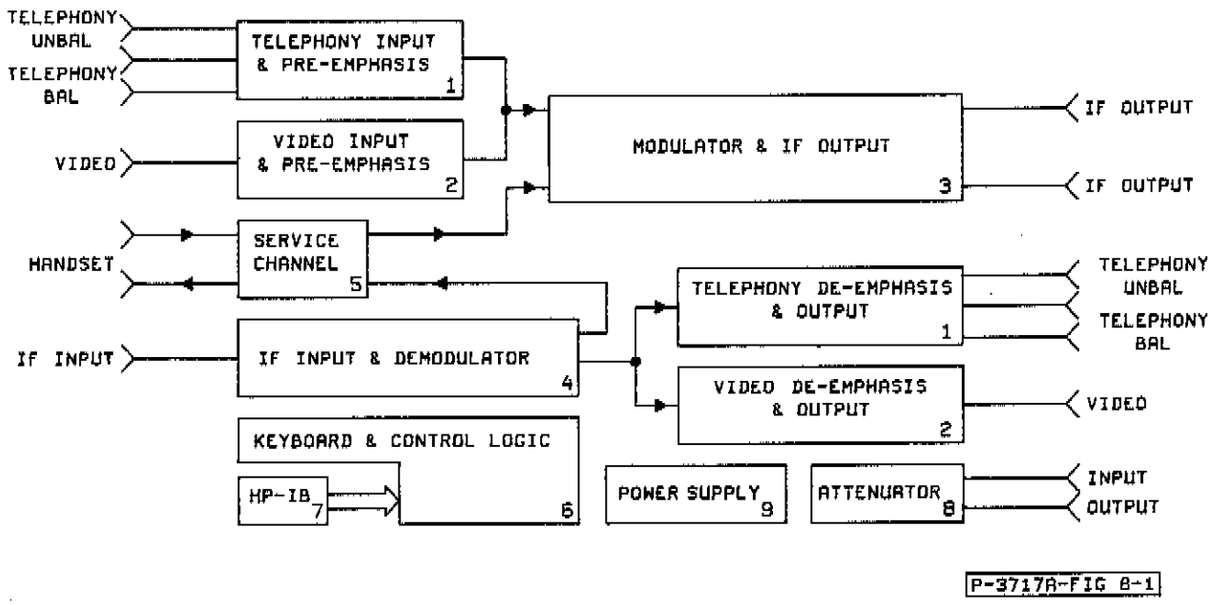


Figure 8-1 Simplified Block Diagram

Service Sheet 1 contains details of all the telephony circuitry – the input and output amplifiers, the pre/de-emphasis networks and the optional balanced inputs and outputs.

The telephony pre/de-emphasis networks are manufactured to the relevant CCIR or BELL recommendations. Figure 8-2 shows the basic pre-emphasis shapes as recommended by CCIR and by BELL.

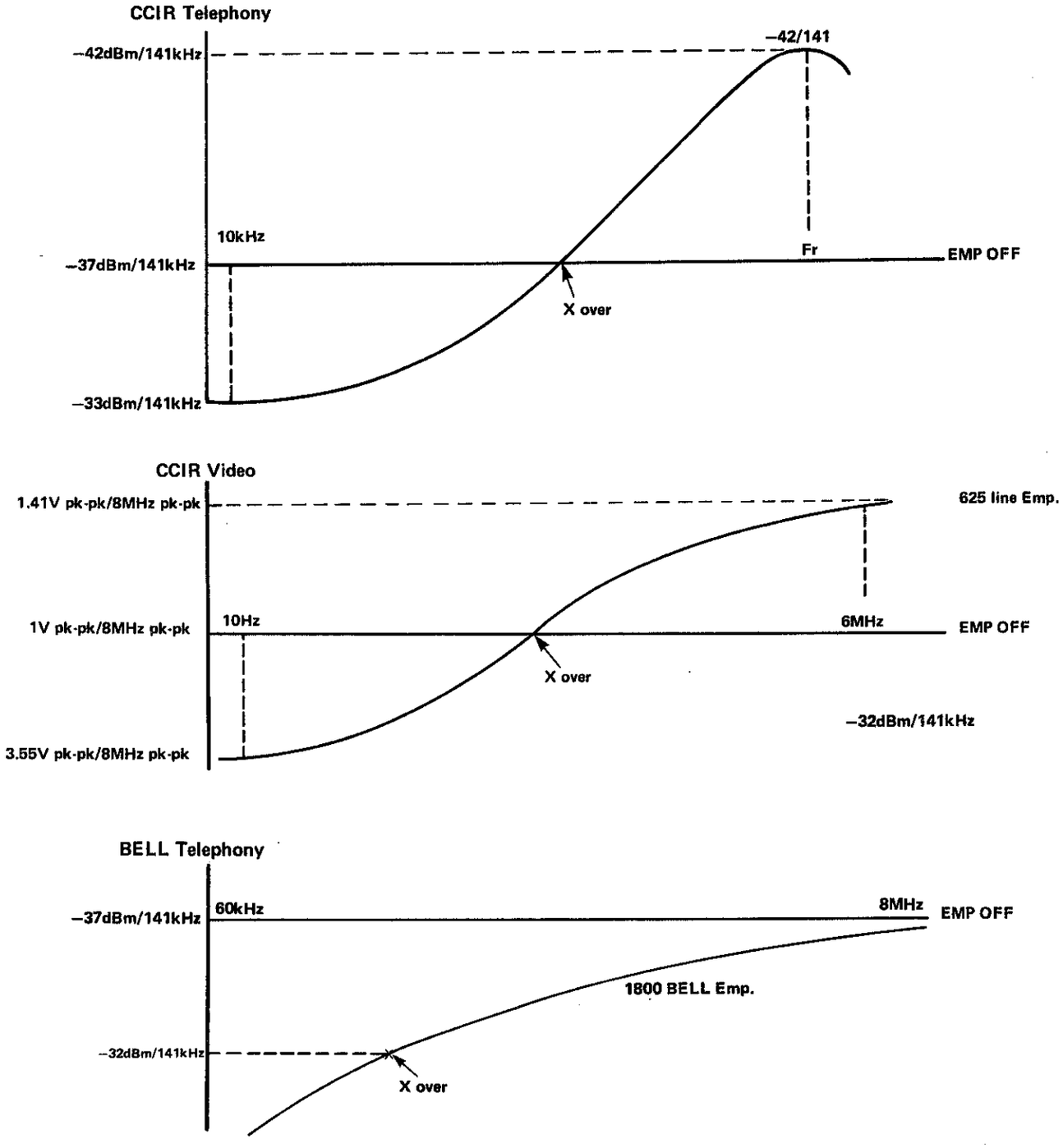


Figure 8-2 Pre-Emphasis Curves

CCIR telephony networks are based on resonant networks, a series resonant transfer characteristic being used to produce the pre-emphasis shape and the opposite parallel resonant transfer characteristic to produce the de-emphasis shape. The resonant frequency of the network is altered according to the channel loading being used.

BELL telephony and CCIR video emphasis networks use non-resonant networks based on CR and LR networks for the pre and de-emphasis networks respectively. The same curve is used for all values of loading but the portion of the curve used is changed by adding or subtracting attenuation.

Provision is made for up to five pre/de-emphasis networks to be fitted at one time (including video networks). Note that the Block Diagram shows only one telephony and one video emphasis network fitted, additional networks are connected in parallel (refer to the A3/A4 Assembly schematic diagram in Service Sheet 6).

Service Sheet 2 contains details of all the video circuitry – the input and output amplifiers, the inverting controls and the pre/de-emphasis networks.

The video pre/de-emphasis networks are manufactured to the relevant CCIR recommendations as described above. Up to five networks may be fitted (including telephony networks).

Service Sheet 3 is the Modulator and IF Output service sheet. The modulator receives the video or telephony signal via the modulator drive amplifier and converts it to a frequency modulated 70MHz IF carrier. The IF carrier is applied to two IF amplifiers each of which produces an IF Output at +5dBm. The frequency of the IF carrier is stabilized by a narrow bandwidth phase locked loop. The 70MHz AFC signal from the modulator is divided down to 20Hz and phase locked to a 20Hz signal derived from a 12MHz crystal oscillator.

Service Sheet 4 contains the IF input and demodulated baseband circuits. The IF input is applied to an AGC circuit consisting of an amplifier, a PIN diode attenuator and its associated integrator and detector. The resulting constant level IF is applied to the limiter and discriminator. The demodulated baseband is filtered to remove any remaining IF and then amplified before being applied to the de-emphasis networks.

Service Sheet 5 contains details of the Service Channel supplied to give operators at either end of a link the means by which they can talk to each other. The sub baseband voice signals from and to an external handset are modulated directly on to, and demodulated directly from, the IF carrier. A call tone, generated by a 10kHz oscillator, can also be modulated directly onto the IF, which when demodulated, energises a buzzer in the receiving instrument.

Service Sheet 6 documents the control circuits. All control switching in the 3717A except for the power, service channel, and attenuator is by FET switches. The front panel keys are mounted on a keyboard assembly immediately behind the front panel. Their operation is detected by the keyboard logic assembly A4 and routed to the appropriate assembly where the FET switches perform the required switching functions.

Service Sheet 7 has details of the optional HP-IB interface which allows the 3717A to be controlled remotely via the Hewlett-Packard Interface Bus. All the functions that are controlled by front panel keys, that is everything except the power, service channel and attenuator can be remotely controlled.

Service Sheet 8 documents the attenuator. Attenuation can be selected in 1dB steps up to 15dB.

Service Sheet 9 contains circuit details of the three power lines, +15V, −15V and +5V produced by the power supply.

Table 8-1 Service Sheet Index

SS1 TELEPHONY INPUT/OUTPUT	A32/A34 A50
SS2 VIDEO INPUT/OUTPUT	A33 A50
SS3 MODULATOR & IF OUTPUT	A31/A11/A13/A12/ A14
SS4 IF INPUT & DEMODULATOR	A21/A22/A23/A31
SS5 SERVICE CHANNEL	A12/A11/A13/A22/A23
SS6 CONTROL	A3/A4
SS7 OPTION 100 HP-IB	A9/A10/A7
SS8 ATTENUATOR	A2
SS9 POWER SUPPLY	A6

8-6 TROUBLESHOOTING

The following procedures provide information to enable a fault to be traced to a particular service sheet or assembly. Further troubleshooting information is provided in the relevant service sheet. The first three procedures, Telephony, Video and Service Channel Checks plus the HP-IB Functional Test in Section IV paragraph 4-19 can be used as a functional test of the 3717A if required.

Initial troubleshooting should be performed with reference to the Block Diagram Figure 8-4. The troubleshooting of circuitry common to both Telephony and Video modes is performed in the Telephony mode.

8-7 TEST EQUIPMENT

Power Meter. . . . . .hp 435A, 8483A. 1
Synthesizer . . . . . .hp 3330B Opt 111. 1
Oscilloscope. . . . . .hp 1740A 1
Spectrum Analyzer . .hp 141T/8552B/8553B 1

8-8 PRELIMINARY TROUBLESHOOTING PROCEDURE

a. Read the WARNING on Page 8-1.

b. Disconnect the line cord from the 3717A.

c. Remove the top rear feet if fitted, and the top cover.

d. Remove the central metal strap for access to the assemblies in the centre section of the instrument, the left-hand screen for access to the Modulator, AFC and Service Channel and IF Amplifier assemblies, the right hand screen for access to the Limiter, Discriminator, and the AGC Input assembly.

e. Connect the line cord to the 3717A and switch ON. Allow approximately 5 minutes for the instrument to warm up.

8-9 TELEPHONY OPERATION CHECK

Set the 3717A controls:

MODULATOR CAL/UNCAL . . . . . CAL
EMPHASIS . . . . . OFF
I/O SELECT. . . . . TELEPHONY

Procedure	If Wrong Reference
1. Check that the IF OUTPUT frequency is 70MHz ±10kHz.	Service Sheet 3
2. Check that the power level at both IF OUTPUTs is +5dBm ±1dB. ***Note: IF OUTPUT impedance is 75 ohm. If a 50 ohm power sensor is used, measure the output power via a 50/75 ohm impedance converter and allow for the converter loss.***	Service Sheet 3
3. Set the Synthesizer to 83.3kHz at –37dBm (75 ohm). ***Note: If the Synthesizer output impedance is 50 ohm, –37dBm should be set up at the output of a 50/75 ohm converter (–37dBm = 0.011V pk-pk into 75 ohm.)***	
4. Connect the Synthesizer output, via a 50/75 ohm converter if necessary, to the TELEPHONY INPUT. Connect one of the IF OUTPUTs to the Spectrum Analyzer and check that the FIRST carrier null occurs at a TELEPHONY INPUT level of –37dBm ±1dB. Set the Synthesizer level for the first carrier null.	Check the MODULATOR Section signal levels as per Paragraph 8-12.
5. Connect the other IF OUTPUT to the ATTENUATOR INPUT and the ATTENUATOR OUTPUT to the IF INPUT. Connect the TELEPHONY OUTPUT, terminated in 75 ohm, to the Oscilloscope. Check that the output is 0.031V pk-pk ±0.004V. Check that the amplitude remains constant with 15dB inserted in the ATTENUATOR. Reset the ATTENUATOR to 0dB.	Check the DEMODULATOR section signal levels as per Paragraph 8-13.
6. To check that the Emphasis Networks are functioning, check the levels as per Table 8-2. ***Note: This only checks that the Emphasis Networks are being selected and functioning. For a complete check refer to the Performance Tests in Section IV.***	Service Sheet 1.

Table 8-2 Emphasis Levels

Emphasis	BB Input Frequency (kHz)	BB Input Level		BB Output
		dBm ±1dB	V pk-pk/75 ohm	V pk-pk/75 ohm
CCIR TEL				
OFF	83.33	–37	0.011 ±0.001	0.031 ±0.004
24	66.23	–38.98	0.009 ±0.001	0.025 ±0.003
60	183.98	–30.10	0.024 ±0.003	0.068 ±0.008
120	338.98	–24.80	0.045 ±0.005	0.127 ±0.014
300	797.23	–17.37	0.105 ±0.012	0.296 ±0.034
600	1631.25	–11.15	0.215 ±0.025	0.610 ±0.070
960	2568.29	– 7.21	0.338 ±0.040	0.950 ±0.100
1260	3456.28	– 4.63	0.455 ±0.050	1.280 ±0.150
1800	5031.10	– 1.37	0.743 ±0.080	2.100 ±0.200
BELL TEL				
OFF	83.33	–37	0.011 ±0.001	0.031 ±0.004
600	1000	– 9.61	0.270 ±0.033	0.241 ±0.024
900	1000	– 7.73	0.318 ±0.040	0.283 ±0.023
1200	1000	– 6.23	0.378 ±0.045	0.337 ±0.034
1500	1000	– 4.73	0.450 ±0.055	0.401 ±0.040
1800	1000	– 4.23	0.476 ±0.055	0.424 ±0.043
VIDEO				
OFF	1663.34	+ 2.21	1.000 ±0.100	1.000 ±0.100
525	762	– 4.56	0.460 ±0.046	0.460 ±0.046
625	1512	+ 1.17	0.900 ±0.090	0.900 ±0.009
819	1402	+ 0.74	0.840 ±0.084	0.840 ±0.084

8-10 VIDEO OPERATION CHECK

Note: The tests to check the functions common to both Video and Telephony are provided in Paragraph 8-9. The troubleshooting information given in this paragraph therefore, assumes that the 3717A is functioning correctly in the Telephony mode.

Set the 3717A controls:

MODULATOR CAL/UNCAL . . . . . CAL
EMPHASIS . . . . . OFF
I/O SELECT. . . . . VIDEO NORM

Procedure	If Wrong Reference
1. Set the Synthesizer to 1MHz and the level to –2.2dBm. ***Note: If the Synthesizer output impedance is 50 ohm, –2.2dBm should be set up at the output of a 50/75 ohm converter (–2.2dBm = 0.6V pk-pk into 75 ohm.)***	
2. Connect the Synthesizer output, via a 50/75 ohm converter if necessary, to the VIDEO INPUT. Connect one of the IF OUTPUTs to the Spectrum Analyzer and check that the FIRST carrier null occurs at a VIDEO INPUT level of –2.2dBm ±1dB. Set the Synthesizer level for the first carrier null.	Service Sheet 2 (This assumes that the 3717A functions correctly in the Telephony mode.)
3. Connect the other IF OUTPUT to the IF INPUT. Connect the VIDEO OUTPUT, terminated in 75 ohm, to the Oscilloscope. Check that the output is 0.6V pk-pk ±0.06V.	Service Sheet 2 (This assumes that the 3717A functions correctly in the Telephony mode.)
4. To check that the Emphasis Networks are functioning, check the levels as per Table 8-2. ***Note: This only checks that the Emphasis Networks are being selected and functioning. For a complete check refer to the Performance Tests in Section IV.***	Service Sheet 2
5. To check that the VIDEO I/O SELECT controls operate correctly, trigger the Oscilloscope externally from the VIDEO INPUT ("T" connector may be used). Check that when MOD INV is selected there is a 180 degree phase shift at the VIDEO OUTPUT. Reset the controls to VIDEO NORM then check that when DEMOD INV is selected there is a 180 degree phase shift at the VIDEO OUTPUT.	Service Sheet 2

8-11 SERVICE CHANNEL OPERATION CHECK

1. Set the 3717A controls:

I/O SELECT. . . . . TELEPHONY
EMPHASIS . . . . . OFF

2. Connect the IF OUTPUT to the IF INPUT.

3. Check that the BUZZER DISABLE switch A12S1 is in the enable position.

4. Set the SERVICE CHANNEL switch on the front panel to CALL and check that the buzzer sounds.

8-12 MODULATOR SECTION TROUBLE-SHOOTING

1. Set the 3717A controls:

MODULATOR CAL/UNCAL . . . . . CAL
EMPHASIS . . . . . OFF
O/O SELECT . . . . . TELEPHONY

2. Set the Synthesizer to 83.33kHz and the level to −37dBm (75 ohm).

Note: If the Synthesizer output is 50 ohm, −37dBm should be set up at the output of a 50/75 ohm impedance converter (−37dBm = 0.011V pk-pk into 75 ohm).

3. Connect the Synthesizer output via the 50/75 ohm impedance converter if necessary, to the TELEPHONY INPUT.

4. Check the waveforms as follows:

Test Point	Location	Procedure	Typical Waveform
B	A32P1(12)	Monitor with oscilloscope	Sinewave 0.11V pk-pk
E	A31P1(2)	Monitor with oscilloscope	Sinewave 0.06V pk-pk
F	A31J1	Monitor with oscilloscope a. With cable connected b. With cable disconnected	Sinewave 0.04V pk-pk 0.08V pk-pk
G	A13P2	Disconnect the BRN/RED/BRN cable from A13P2. Connect A13P2 to an oscilloscope using a BNC to Conhex coaxial cable (hp15539A). (Ensure that bandwidth of oscilloscope is adequate for 70MHz signal.) Check that the signal is present with no BB INPUT and that it is frequency modulated when a BB INPUT signal is applied. Expand the oscilloscope timebase to observe the frequency modulation.	70MHz Sinewave 2.5V pk-pk ±1.4V

8-13 DEMODULATOR SECTION TROUBLE-SHOOTING

1. Set the 3717A controls:

MODULATOR CAL/UNCAL . . . . . CAL
EMPHASIS . . . . . OFF
I/O SELECT. . . . . TELEPHONY

2. Set the Synthesizer to 83.33kHz and the level to −37dBm (75 ohm).

Note: If the Synthesizer output is 50 ohm, −37dBm should be set up at the output of a 50/75 ohm impedance converter (−37dBm = 0.011V pk-pk into 75 ohm).

3. Connect the Synthesizer output via the 50/75 ohm impedance converter if necessary, to the TELEPHONY INPUT.

4. Connect one IF OUTPUT to the Spectrum Analyzer and adjust the Synthesizer output to give the FIRST carrier null.

5. Connect the IF OUTPUT to the ATTENUATOR input and the ATTENUATOR output to the IF INPUT. Set the ATTENUATOR for no attenuation.

6. Check the waveforms as follows:

Test Point	Location	Procedure	Typical Waveform
J	A21J2 (A21W1)	Monitor with oscilloscope (Ensure that bandwidth of oscilloscope is adequate for 70MHz signal). Check that the amplitude is constant with 15dB in the ATTENUATOR. Reset the ATTENUATOR to 0dB.	70MHz Sinewave 0.33V pk-pk (Frequency Modulated by the BB INPUT.)
K	A31J2	Monitor with oscilloscope	Sinewave 0.03V pk-pk
L	A31P2(12)	Monitor with oscilloscope	Sinewave 0.1V pk-pk
M	A32P2(1)	Monitor with oscilloscope	Sinewave 0.07V pk-pk

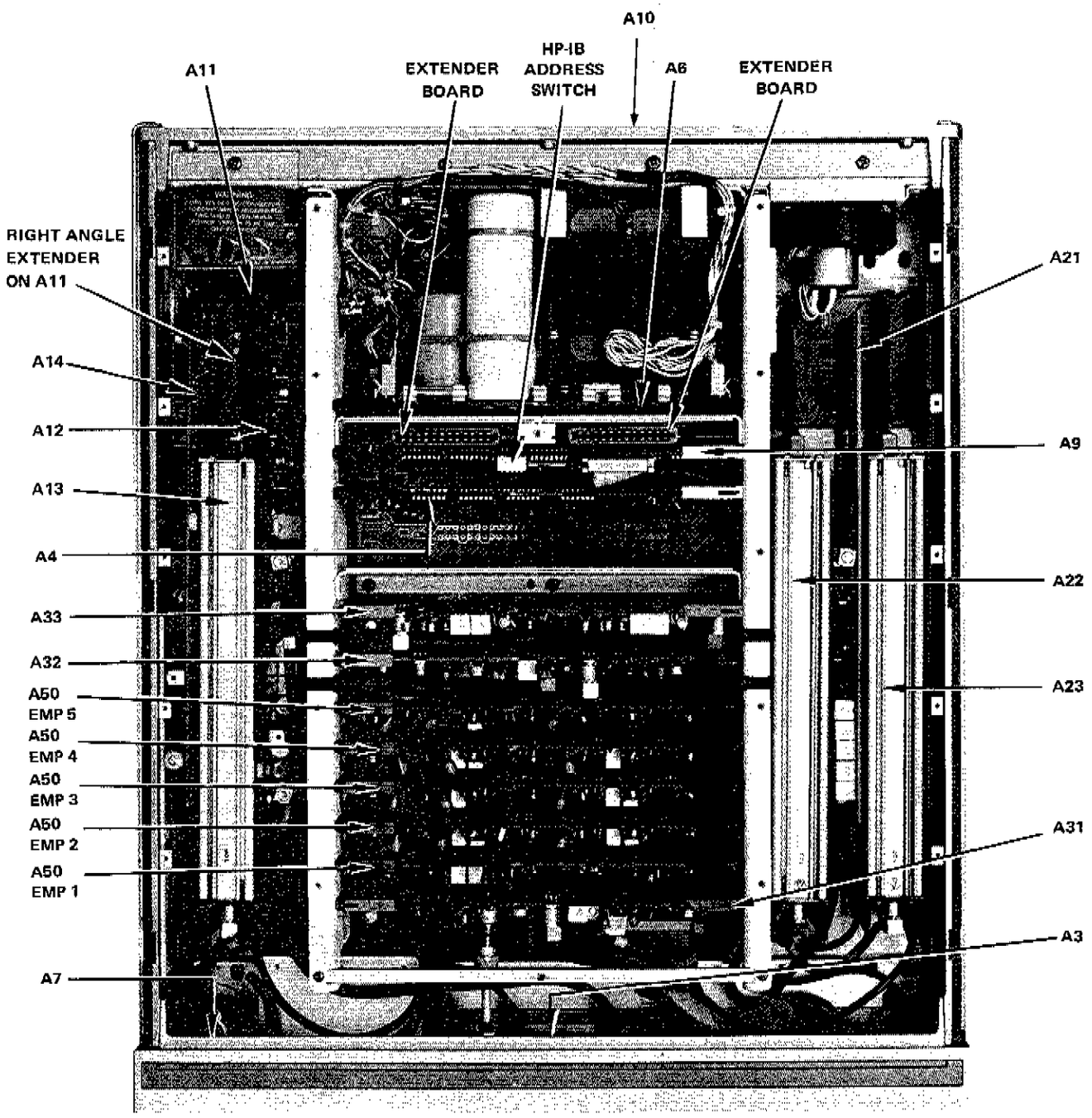


Figure 8-3 Location of Assemblies

Fig 8-4 Sht 1 of 3

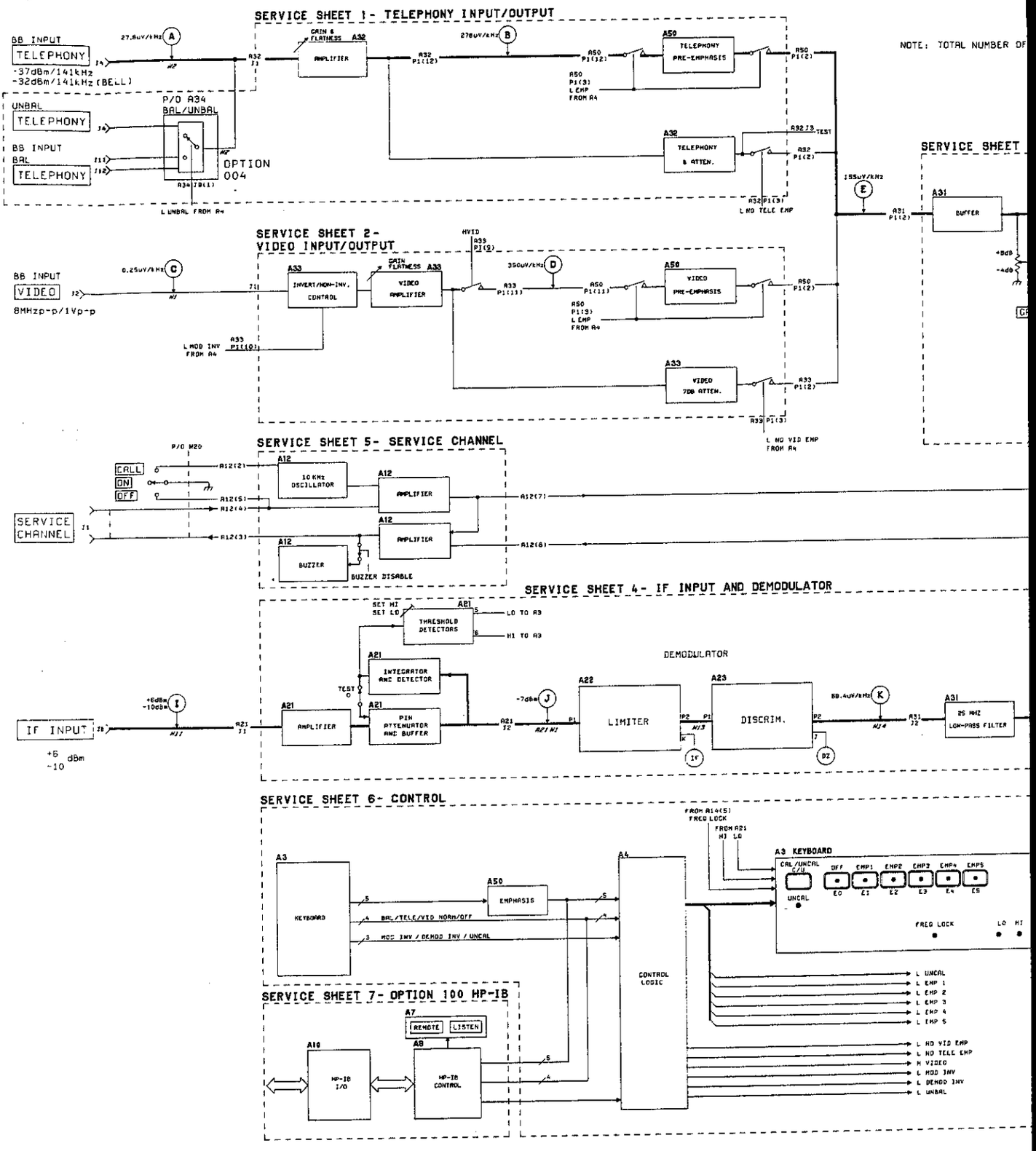


Fig 8-4 Sht 2 of 3

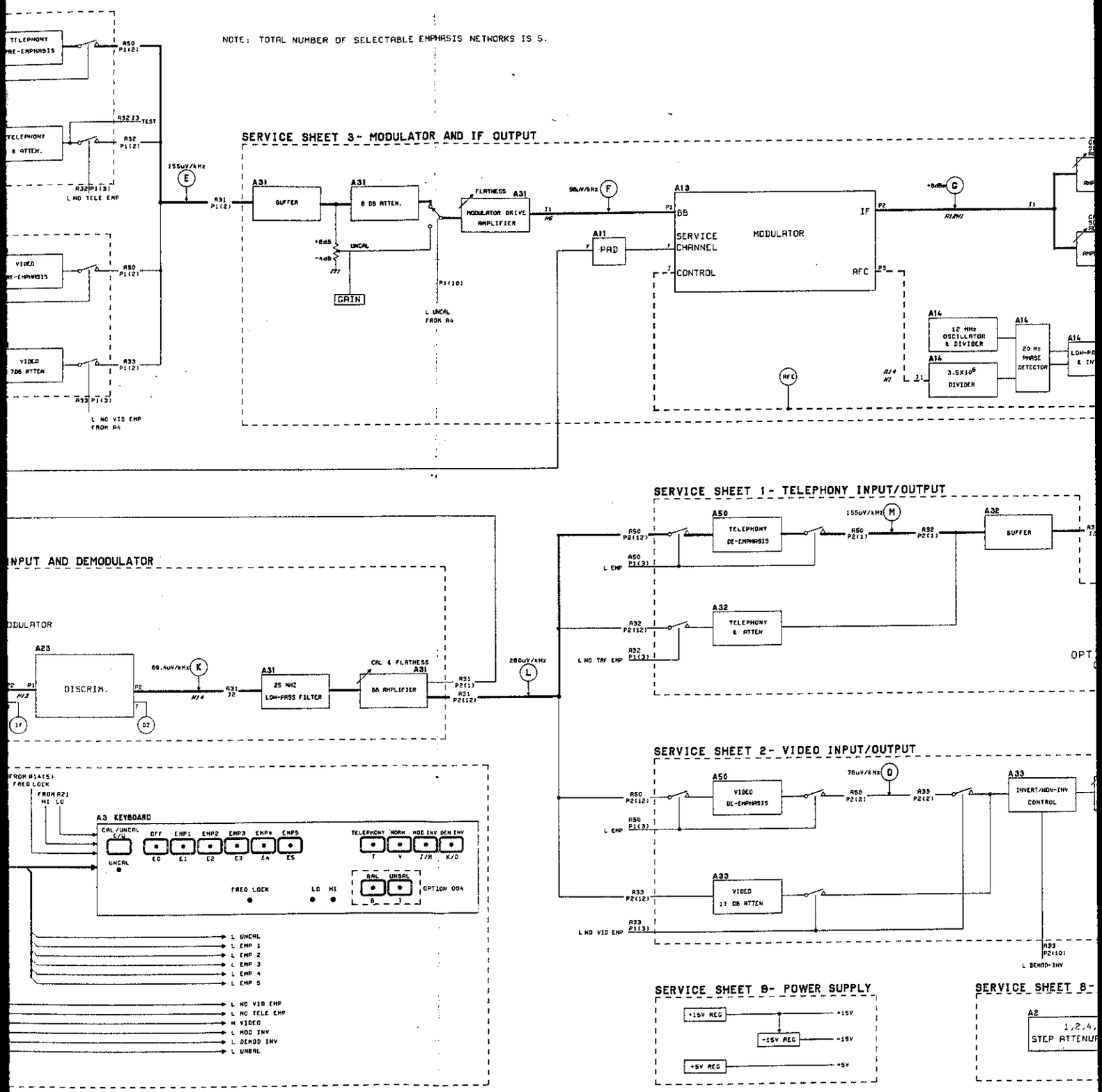


Fig 8-4 Sht 3 of 3

IF SELECTABLE EMPHASIS NETWORKS IS S.

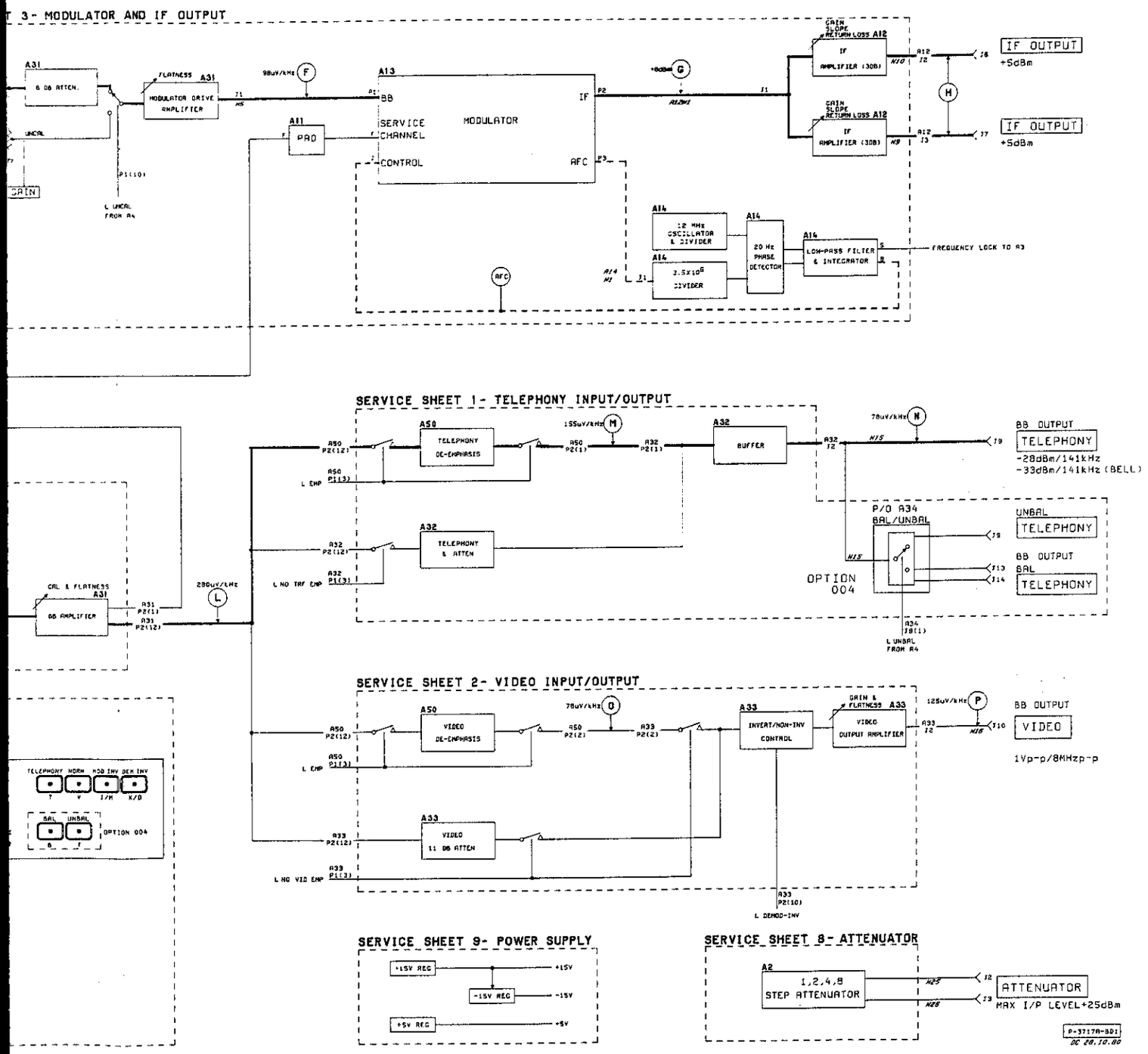


Figure 8-4 Block Diagram

8-14 INTRODUCTION

This Service Sheet contains details of all the telephony circuitry – the input and output amplifiers, the pre/de-emphasis networks and the Option 004 balanced inputs and outputs.

The Block Diagram, Figure 8-4, shows the circuit blocks which comprise this service sheet. The relevant circuit diagrams, A32, A50 and A34, and corresponding component locations will be found at the end of the service sheet.

Like all the baseband assemblies, A32 and A50 are in two halves, input or modulator side, and output or demodulator side. The two halves function independently except for the common control signals.

8-15 CIRCUIT DESCRIPTIONS (INPUT SIDE)

8-15-1 The purpose of the input or modulator side of A32 is to take a fairly low level telephony signal in the frequency range 10kHz to 10MHz, and amplify it to a level suitable for applying to a pre-emphasis filter network. This is achieved by the telephony input amplifier.

8-15-2 The configuration of the telephony input amplifier is that of a cascode pair and emitter follower. Q1 and Q2 (in parallel for optimum noise performance with a 75 ohm source) form the first half of the cascode pair and Q6 the common base half. Q4 and Q5 form a class AB complementary emitter follower. Signal feedback via R16, R17 and C8 forms a virtual earth at the bases of Q1 and Q2. Q4 and Q5 are biased into class AB by CR1, CR2 and R12, the diodes being temperature compensation for the emitter/base junctions of the transistors.

8-15-3 The dc operating point of the amplifier is set by measuring the mean dc output level and comparing it to dc ground in an integrator (U1). A dc error voltage is generated and fed back via emitter follower Q3 to the amplifier input to maintain its output at a mean level of 0V dc. This feedback happens very slowly so as not to degrade the very low frequency (<1Hz) response of the amplifier.

8-15-4 R17 adjusts the gain of the amplifier by controlling the amount of signal feedback. C8 allows flatness adjustment by changing the phase of the high frequency feedback. Other components around the amplifier are for decoupling and frequency compensation.

8-15-5 On the output of the telephony input amplifier is a pad followed by a buffer. The purpose of this is to provide a "flat" path, ie without pre-emphasis. The pad provides a mean loss equivalent to that of one pre-emphasis network.

8-15-6 The buffer or complementary emitter follower is similar to that described above as part of the amplifier. CR3 and CR4 are temperature compensation for Q7 and Q8 and the divider chain R23, CR3, R21, R22, CR4 and R24 bias Q7 and Q8 into class AB.

8-15-7 In the output path of the buffer is a FET switch which switches the pre-emphasis bypass path on or off depending on whether emphasis is selected or not.

8-15-8 A TTL control signal from the keyboard logic assembly A4 switches the output of the op-amp U3 between + and −15V. When the output of the op-amp is at +15V (or >0V) the gate-source junction of the FET is forward biased, turing it on to its maximum current,low resistance state. The source becomes electrically connected to the drain with the equivalent of approximately 25 ohm in series. When the output of the op-amp is at −15V, as there is a low impedance path between the source and ground, the gate-source voltage is well beyond pinch-off, and the FET takes its high impedance state, equivalent to a few pF between source and drain. An LED on the output of U3 indicates that the bypass paths have been selected.

8-15-9 There are therefore, two outputs from the input side of the A32 assembly, a signal to the pre-emphasis assembly A50, and an attenuated signal which bypasses the pre-emphasis circuitry.

8-15-10 The A50 assembly contains the circuitry to generate and control the filters which provide the frequency response shaping. Pre-emphasis requires high pass filtering, and de-emphasis, low pass filtering. The shapes of the pre-emphasis curves are shown in Figure 8-2. The pre and de-emphasis curves are precisely opposite so that a signal passing through both should still have a flat frequency response.

8-15-11 In the 3717A constant voltage filter networks are used, which halves the number of precision inductors and capacitors required for constant impedance networks, but requires a good constant voltage source and 75 ohm load for it to operate accurately.

8-15-12 On the A50 assembly the constant voltage source is a buffer similar to that described in Paragraph 8-15-6 except that there are three sets of complementary transistors in parallel to lower the output impedance.

8-15-13 The A50 assembly is designed to cater for CCIR Telephony, BELL Telephony and video networks. CCIR pre-emphasis networks are based on a series resonant LCR network as shown in Figure 8-5. The values of L1 and the three capacitors are altered to shift the resonant frequency of the network to correspond with the maximum frequency of the particular channel loading used.

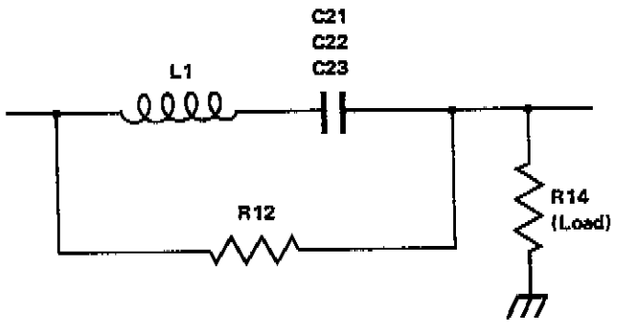


Figure 8-5 CCIR Telephony Pre-Emphasis Network

8-15-15 BELL Telephony and Video pre-emphasis is based on a CR network with the addition of pads to alter which portion of the curve is used. Figure 8-6 shows the components of a BELL Telephony or Video network.

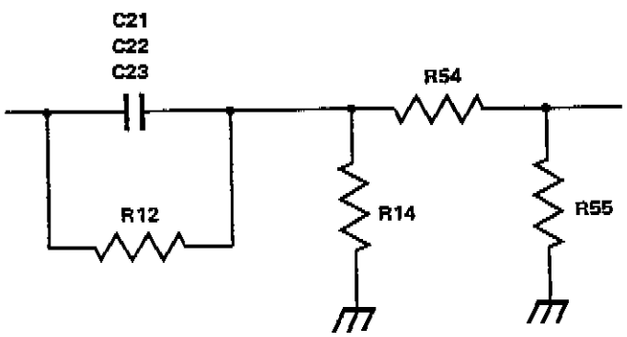


Figure 8-6 BELL Telephony or Video Pre-Emphasis Network

8-15-15 The output buffer is similar to that described in Paragraph 8-15-6.

8-15-16 FET switches at the input and output of the emphasis circuits allow emphasis assemblies to be parallel with minimal interaction. Since it is possible to select one of five, or no emphasis – the unused emphasis assemblies are both electrically isolated from the signal path, and have their power removed to reduce internal heat generation. An LED CR13, on the +15V power rail shows when a particular assembly is selected.

8-16 CIRCUIT DESCRIPTIONS (OUTPUT SIDE)

8-16-1 The output or de-emphasis sides of the emphasis assemblies produce, with low pass filters, curves precisely opposite to that of the pre-emphasis side. CCIR Telephony networks employ parralel resonant LCR networks as shown in Figure 8-7. On the highest networks, a small capacitor C27, and a resistor are added in parallel with the load resistor to compensate mainly for stray capacitance in the inductors.

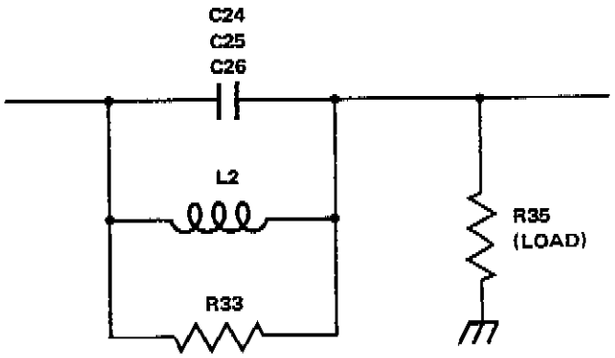


Figure 8-7 CCIR De-Emphasis Network

8-16-2 BELL Telephony and Video de-emphasis is based on parallel LR networks, with the addition of pads to alter which portion of the curve is used. Figure 8-8 shows the components of a BELL Telephony or Video de-emphasis network.

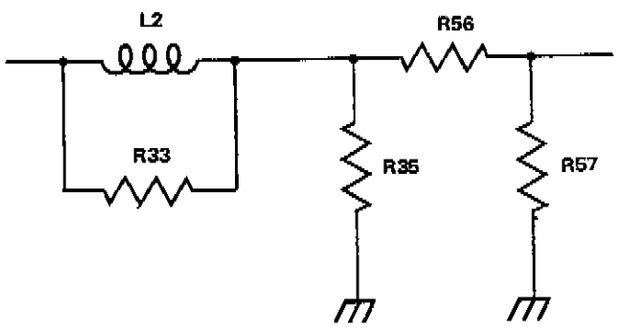


Figure 8-8 BELL Telephony or Video De-Emphasis Network

8-16-3 The buffers and switches either side of the de-emphasis networks are identical to those described above for the pre-emphasis networks.

8-16-4 The purpose of the output side of the A32 assembly is to accept a signal from either a de-emphasis network, or from before the de-emphasis network and to transform both to a level and impedance suitable for the front panel output.

8-16-5 The signal bypassing the de-emphasis network is attenuated by an amount equivalent to that of a de-emphasis network providing a "flat" path (no de-emphasis) at the same level as the de-emphasised signal. The attenuated signal is buffered by the class AB emitter follower Q16, Q17 and applied to a FET switch Q18 which switches the bypass path in or out depending on whether emphasis is selected or not. The same TTL signal controls both the pre and de-emphasis bypass paths as described in Paragraph 8-15-8.

8-16-6 There are therefore two signals which may be applied to the output buffer, a de-emphasised signal or an attenuated "flat" signal. The output buffer is similar to that described in paragraph 8-15-6 except that there are three sets of complementary transistors in parallel to reduce the output impedance. The dc offset of the output is kept to a minimum by the use of the integrator U2 which compares the dc output of the buffer, compares it with dc ground and generates an error voltage which is fed back to the buffer input to maintain the output at 0V dc. This feedback operates very slowly so as not to degrade the low frequency response (<1Hz) of the buffer.

8-17 CIRCUIT DESCRIPTION (BALANCED INPUTS/OUTPUTS)

8-17-1 On the A32 assembly schematic will be found details of the optional (Opt 004) Bal/Unbal Telephony Input and Output Assembly A34. At switch on, and when UNBAL is selected, Q1 is held off by a TTL high on its base and the selector circuitry is in its quiescent state. The relays are unenergised and so the relay contacts in their normally closed position select the UNBAL input and output connectors. During the time Q1 is switched off, C25 is charged up to approx. −14.4V via R6, CR6, R2, and CR5, and so Q2 has −15V on its emitter and −14.4V on its base, holding it off. When BAL is selected, the TTL low at A34J9(1) reverse biases CR2, 3 and 4 and allows Q1 to be switched on. When Q1 is on, Q2 emitter is grounded, Q2 is immediately turned on and a dc path to ground is provided for the relays K1 and K2, energising them. The potential on C25 discharges via CR5 and Q2 is eventually turned off due to its base potential becoming more positive. When Q2 is off, the dc path for the relays is via R2 which limits, to a suitable holding level, the current in the relays.

8-18 TROUBLESHOOTING A32

1. Set the controls:

MODULATOR CAL/UNCAL . . . . . CAL
EMPHASIS . . . . . OFF
I/O SELECT. . . . . TELEPHONY

2. Set a Synthesizer to 83.3kHz at −37dBm (75 ohm) and connect it, via a 50/75 ohm converter if necessary, to the 3717A TELEPHONY INPUT. Connect one of the IF OUTPUTS to the IF INPUT.

Note: If the Synthesizer output impedance is 50 ohm, −37dBm should be set up at the output of a 50/75 ohm converter (−37dBm = 0.011V pk-pk into 75 ohm).

3. Measure the signal and dc levels as required below:

A32 Modulator Section		A32 Demodulator Section	
Signal Levels		Signal Levels	
A32P1(12)	0.1V pk-pk sinewave	A32P2(1)	0.6V pk-pk sinewave
A32P1(2)	0.05V pk-pk sinewave	A32P2(12)	0.1V pk-pk sinewave
A32J3 (Test)	0.05V pk-pk sinewave		
DC Levels		DC Levels	
Q1 emitter	+0.6V	Q10 base	+0.1V
Q1 collector	−12.5V	Q13 base	−0.8V
Q2 emitter	+0.6V	Q16 base	+0.8V
Q2 collector	−12.5V	Q17 base	−0.8V
Q3 emitter	+0.7V		
Q3 collector	+9.5V		
Q4 emitter	+0.1V		
Q5 emitter	−0.1V		
Q6 base	−11.5V		
Q7 emitter	+0.1V		
Q8 emitter	−0.1V		

8-19 A50 TROUBLESHOOTING

1. Select the appropriate emphasis network and measure as required the dc levels below.

A50 Modulator Section		A50 Demodulator Section	
DC Levels		DC Levels	
Q4 base	+0.8V	Q12 base	+0.8V
Q5 base	−0.8V	Q15 base	−0.8V
Q8 base	+0.8V	Q18 base	+0.8V
Q9 base	−0.8V	Q19 base	−0.8V

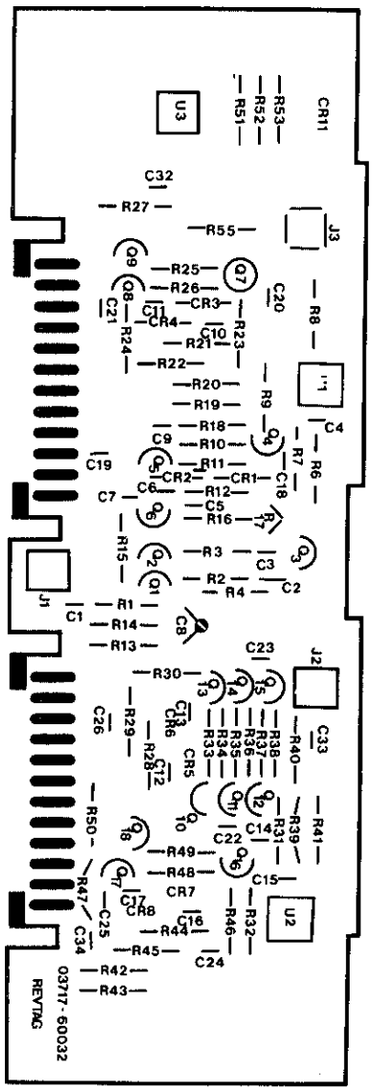


Figure 8-9 A32 Component Location

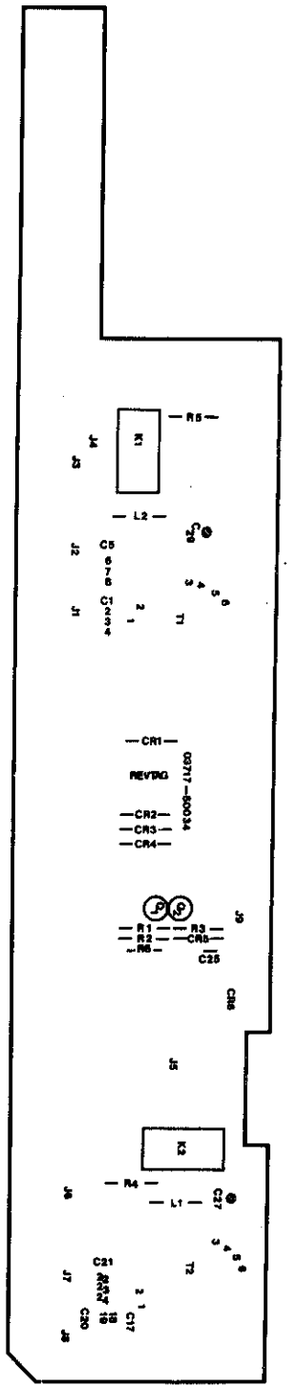


Figure 8-10 A34 Component Location

Fig 8-11 sht 1 of 3

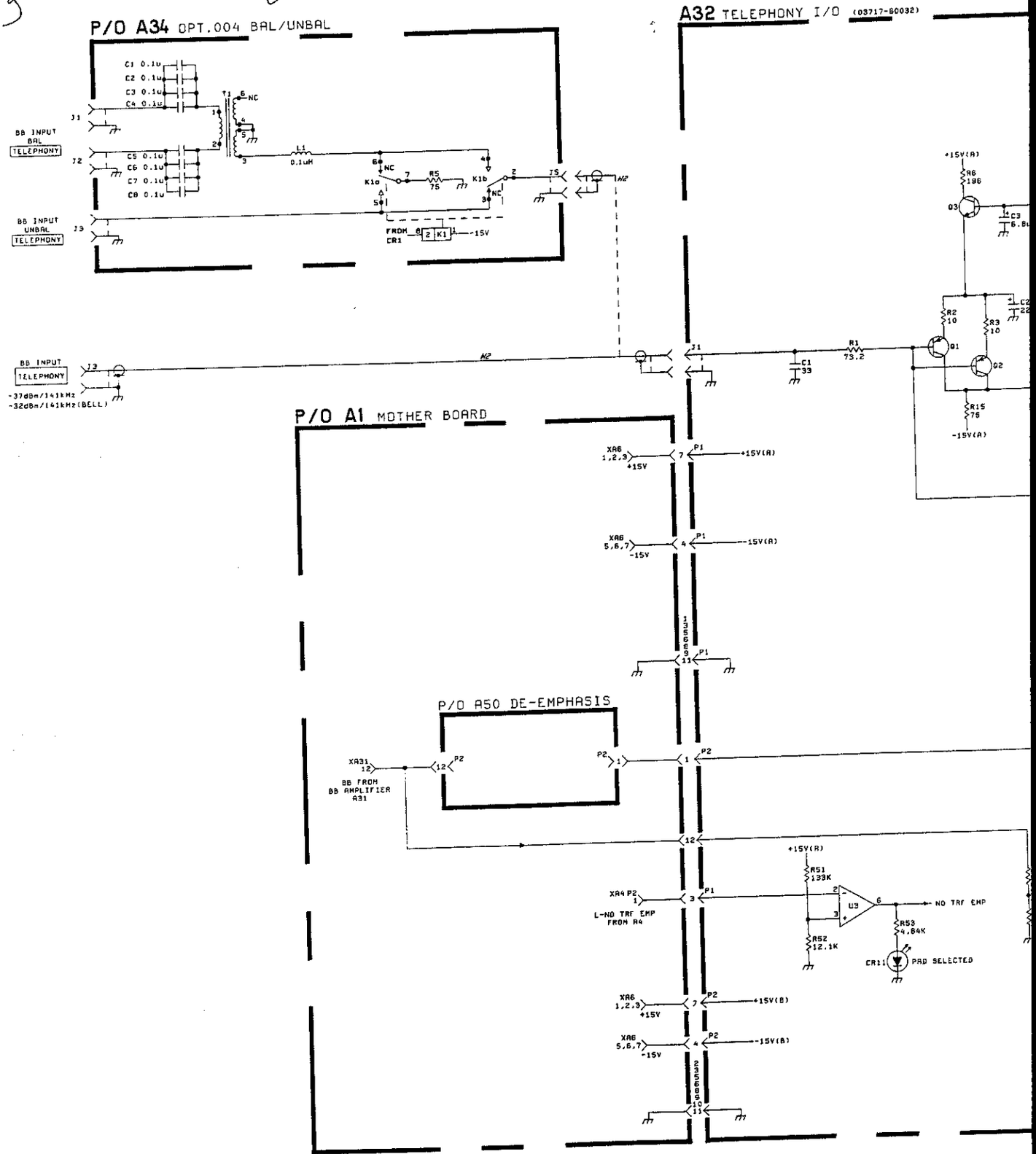


Fig 8-11 Sht 2 of 3

NY I/O (03717-60032)

P/O A1

TELEPHONY AMPLIFIER

5dB PAD & BUFFER

BB OUTPUT BUFFER

5dB PAD & BUFFER

NO TRF EMP

PAD SELECTED

FLATNESS

R17 GAIN

P/O

FROM A3 J2

L BAL 1
-15V 2
GND 3

IC CONNECTIONS

IC	TYPE	+V	-V
U1,2,3	LM307H	7	4

P-03717-60032/34

DC 26.11.80

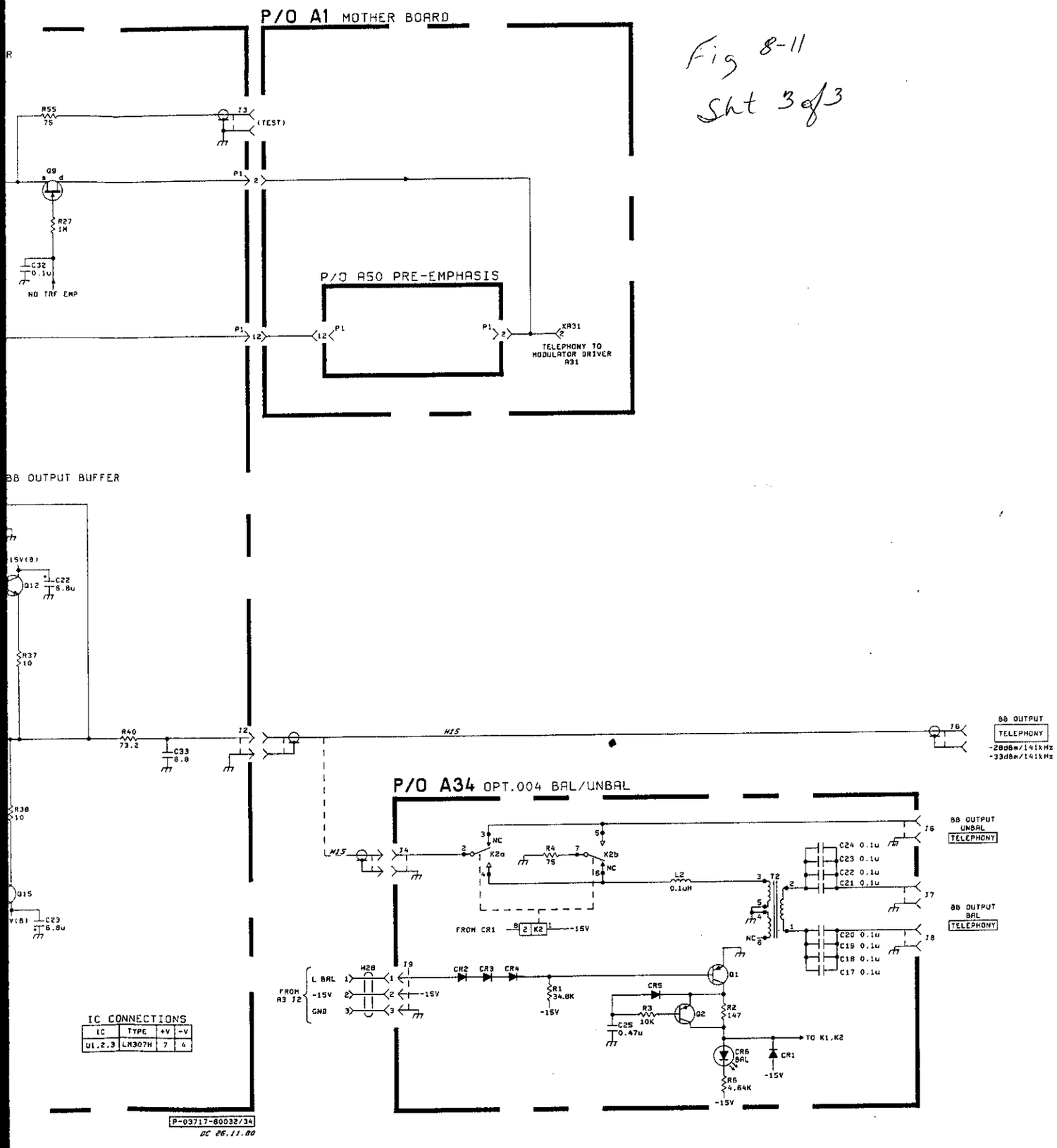


Figure 8-11 A32/A34 Schematic Diagram

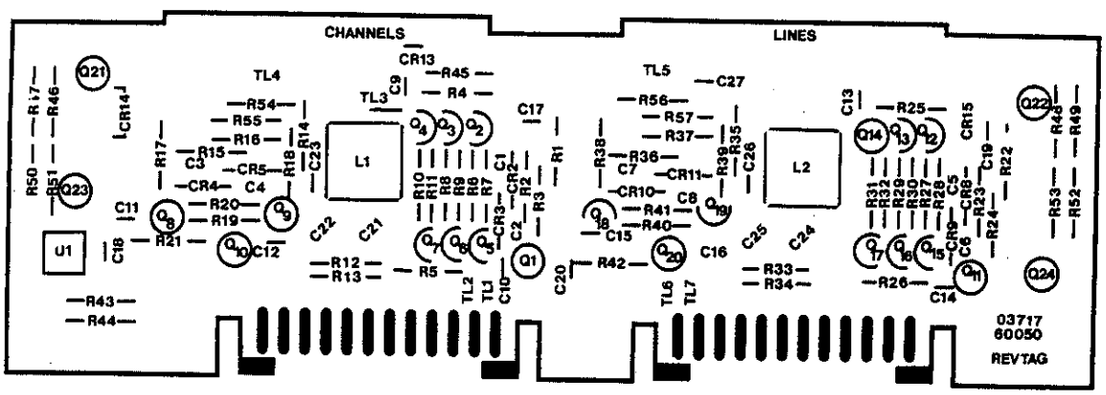


Figure 8-12 A50 Component Location

Fig 8-13 Sht 1 of 3

CCIR OPTION	BOARD PART No. 03717--	CHANNELS	L1	C21	C22	C23	R12	R13	R14	R54	R55	L2	C24	C25	C26	C27	R33	R34	R35	R56	R57
011	-60051	24	68.9u	15000	4700	180	137		75	-	-	130u	10000	680	12	-	137		75	-	-
012	-60052	60	25.2u	6800	360	-	137		75	-	-	46.8u	3000	820	27	-	137		75	-	-
013	-60053	120	13.7u	3000	820	68	137		75	-	-	25.4u	1600	510	-	-	137		75	-	-
014	-60054	300	5.8u	1600	-	56	137		75	-	-	10.8u	820	-	68	-	137		75	-	-
015	-60055	800	2.84u	510	300	-	137		75	-	-	5.28u	430	-	4.7	-	137		75	-	-
016	-60056	960	1.80u	510	-	2.7	137		75	-	-	3.35u	270	-	5.6	-	137		75	-	2.15K
017	-60057	1260	1.34u	360	-	22	137		75	-	-	2.49u	200	-	4.7	-	137		75	-	2.15K
018	-60058	1800	0.92u	200	62	-	137		75	-	-	1.71u	141	-	-	39	137		75	-	2.15K
		VIDEO																			
021	-60061	525	-	3000	82	-	274		2.15K	21.5	53	50.2u	-	-	-	82	274		2.15K	10	64.9
022	-60062	625	-	91	1600	91	300		2.15K	23.7	51.1	30.5u	-	-	-	47	300		75	-	2.15K
023	-60063	819	-	27	820	27	300		75	-	2.15K	15.3u	-	-	-	82	300		2.15K	37.4	37.4
BELL OPTION		CHANNELS																			
031	-60064	600	-	820	82	5.6	300		487	23.7	64.9	82.14u	-	-	-	-	300		1.78K	13.3	64.9
032	-60065	900	-	270	56	1.0	300		75	-	-	29.6u	-	-	-	-	300		4.64K	28.7	47.5
033	-60066	1200	-	270	56	1.0	300		243	17.4	80.8	29.6u	-	-	-	-	300		487	23.7	64.9
034	-60067	1500	-	270	56	1.0	300		1.21K	23.7	56.2	29.6u	-	-	-	-	300		1.98K	10	68.1
035	-60068	1800	-	270	56	1.0	300		-	24.9	50	29.6u	-	-	-	-	300		174	10	121

P/O A1 MOTHER BOAR

FROM EMPHASIS SELECT SWITCHES ON KEYBOARD REFER TO A3/A4 SCHEMATIC

XA32P1
TELEPHONY 12

XA33P1
VIDEO 11

XA4P
L EMP 1 8
L EMP 2 9
L EMP 3 10
L EMP 4 11
L EMP 5 12

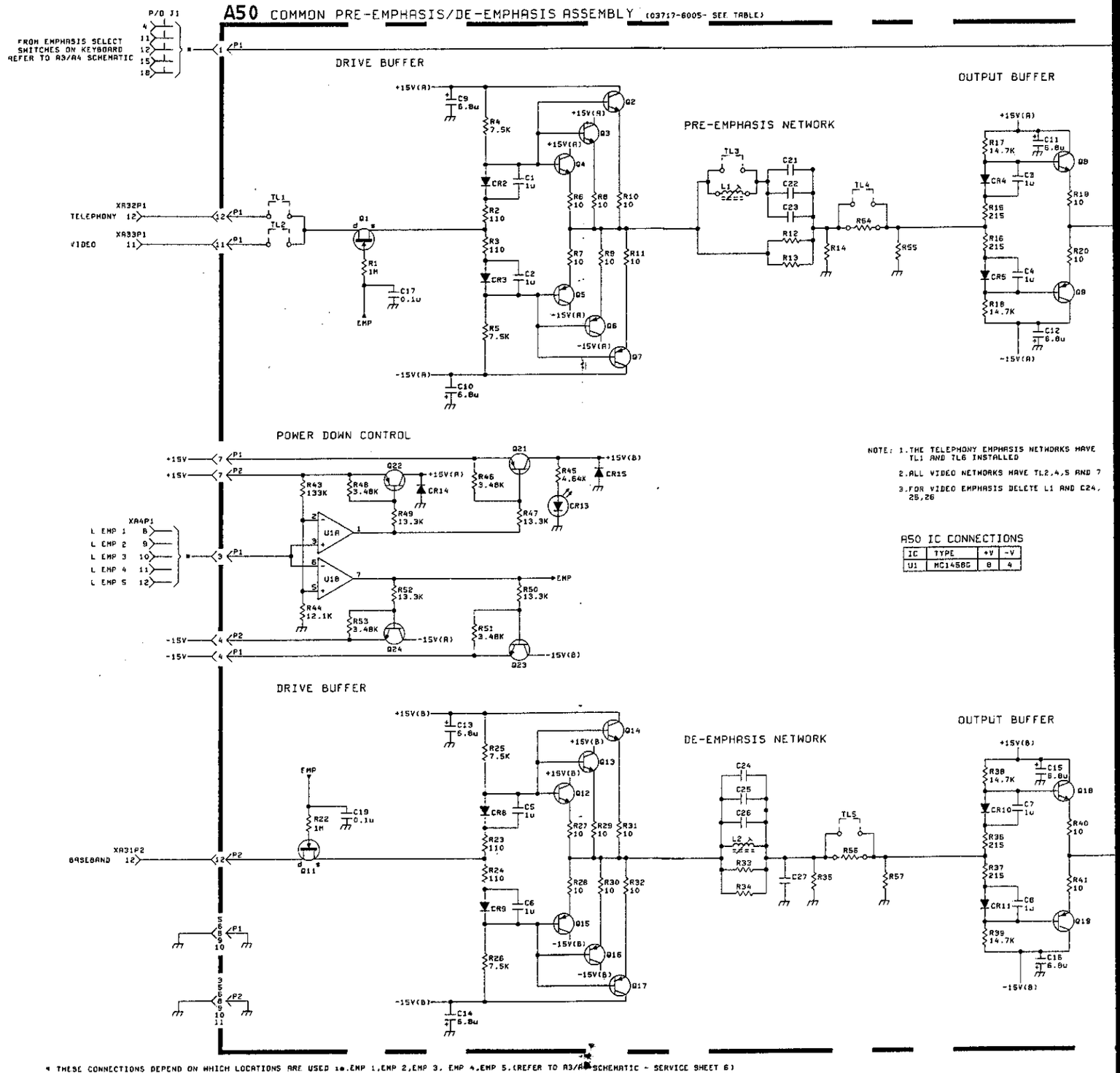
XA31P2
BASEBAND 12

* THESE CONNECTIONS

Fig 8-13 Sht 2 of 3

I/O A1 MOTHER BOARD (03717-60001)

A50 COMMON PRE-EMPHASIS/DE-EMPHASIS ASSEMBLY (03717-6005- SEE TABLE)



NOTE: 1. THE TELEPHONY EMPHASIS NETWORKS HAVE TL1 AND TL6 INSTALLED

2. ALL VIDEO NETWORKS HAVE TL2,4,5 AND 7

3. FOR VIDEO EMPHASIS DELETE L1 AND C24, 25,26

A50 IC CONNECTIONS

IC	TYPE	+V	-V
U1	MC1458G	8	4

* THESE CONNECTIONS DEPEND ON WHICH LOCATIONS ARE USED ie. EMP 1, EMP 2, EMP 3, EMP 4, EMP 5. (REFER TO A3/A4 SCHEMATIC - SERVICE SHEET 6)

Fig 8-13 Sht 3 of 3

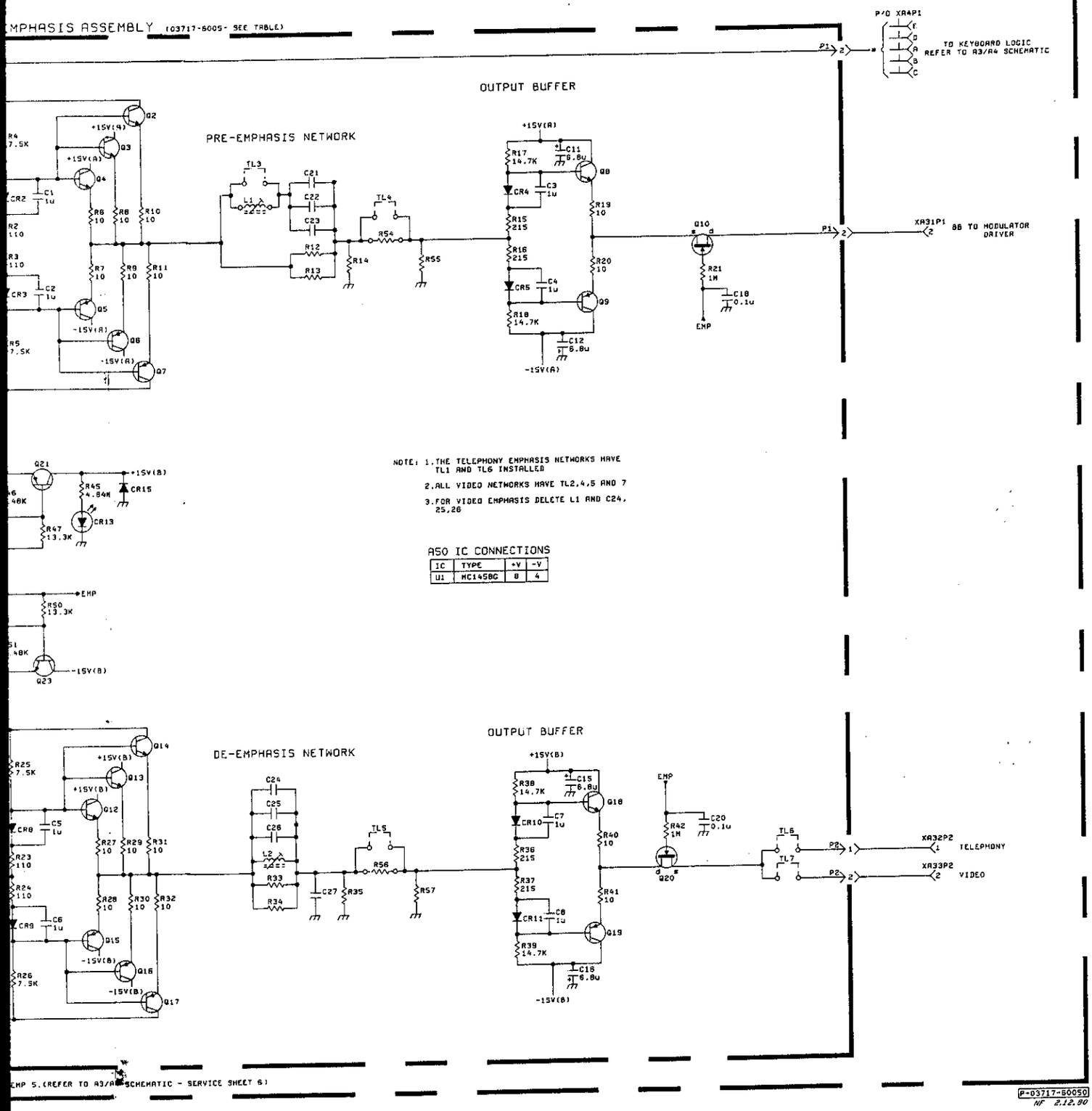


Figure 8-13 A50 Schematic Diagram

8-20 INTRODUCTION

This Service Sheet contains details of all the video circuitry – the input and output amplifiers and the pre and de-emphasis networks.

The Block Diagram, Figure 8-4, shows the circuit blocks which comprise this service sheet. The relevant circuit diagrams, A33 and A50 and the corresponding component locations will be found at the end of this service sheet.

Like all the baseband assemblies, A33 and A50 are in two halves, input or modulator side, and output or demodulator side. The two halves function independently except for the common control signals.

8-21 CIRCUIT DESCRIPTIONS (INPUT SIDE)

8-21-1 The purpose of the input or modulator side of A33 is to take a standard 1V pk-pk video signal and amplify it to a level suitable for applying to a pre-emphasis filter network. It also has to provide a pre-emphasis bypass path for the signal and a pad of equivalent loss to that of one pre-emphasis network. Both of these signals must be capable of being inverted with respect to the input.

Note 1: On both the modulator and demodulator sides of the instrument, the video signal passes through two amplifiers, one on A33 and the other on A31 both of which invert the signal, so that the phase of the output signal is the same as that of the input. Therefore, to invert the output signal with respect to the input, one of the amplifiers has to be capable of producing a non-inverted signal.

Note 2: The Table on the A33 schematic showing the various states of the op-amps, refers to the FRONT PANEL control settings ie. the phase of the video outputs with respect to the inputs, and NOT the state of the video amplifier on that assembly.

8-21-2 The video amplifier on A33 performs the invert/non-invert function. It is configured as shown in Figure 8-14. Q1, Q2 and Q3 are FET switches the operation of which is described in Service Sheet 1, Paragraph 8-15-9. In the non-inverting mode, the input signal is connected to the +ve input via Q2, and R2 is connected in parallel with R1 so that the input impedance is the same as in the inverting mode. In the inverting mode, Q2 and Q3 cause the amplifier to invert by disconnecting the signal from, and grounding the +ve input forcing the –ve input to become a virtual earth.

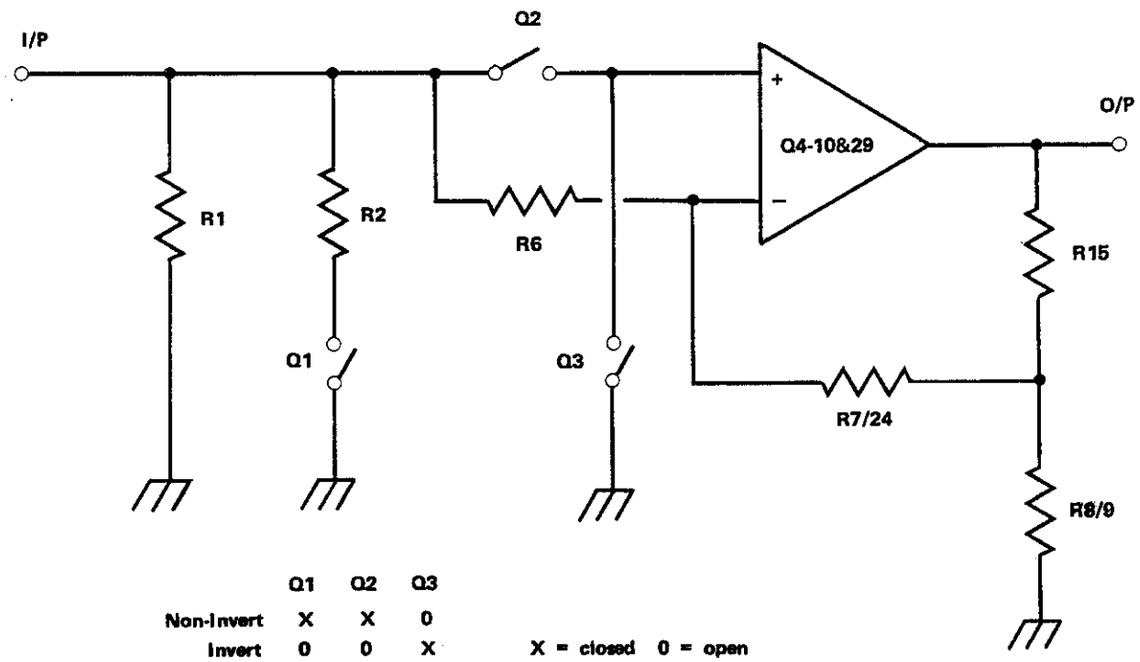


Figure 8-14 Video Inverting/Non-inverting Amplifier

8-21-3 The amplifier itself is a wide bandwidth (<1Hz to 10MHz) discrete op-amp. Q4 and Q5 form a differential amplifier driving a cascode pair Q7 and Q29 and complementary class AB emitter follower Q9 and Q10. Q6 is a current source for the differential amplifier, and Q8 a current source for the emitter followers.

8-21-4 By referring to Figure 8-14 it can be seen that R15 (Z15) affects the gain in both +ve and –ve modes, and consequently the frequency response. The flatness adjustment C5 is therefore connected across R15. R8/R9 are also common to both modes and therefore adjusting R9 adjusts both gains. R7/R24 are unique to the inverting mode, so adjusting R7 adjusts only the inverting gain allowing the gain of the amplifier to be made identical in both modes.

8-21-5 On the output of the video amplifier is a pad, buffer and FET switch similar to that described in Service Sheet 1 Paragraphs 8-15-5 to 8-15-7 except that there is, in addition, a switch in the pre-emphasis path so that the entire video assembly can be isolated when the instrument is in the telephony mode.

8-21-6 Four TTL control signals from the keyboard logic assembly A4 control seven op-amps U1A to U4A which in turn control the FET switches which perform the various functions described above. The operation of the FET switches is described in Service Sheet 1 Paragraph 8-15-8. As mentioned above in Note 2, the states of the op-amps listed in the table on the schematic refer to the FRONT PANEL controls and NOT the particular video amplifiers.

8-21-7 There are therefore two outputs from the input side of the A33 assembly, a signal to the pre-emphasis assembly A50, and an attenuated signal which bypasses the pre-emphasis circuitry.

8-21-8 A description of the pre and de-emphasis assemblies will be found in Service Sheet 1 Paragraphs 8-15-10 to 8-16-3.

8-22 CIRCUIT DESCRIPTION (OUTPUT SIDE)

8-22-1 The purpose of the output side of the A33 assembly is to accept a signal from either a de-emphasis network, or from before the de-emphasis network, and to transform both to a level and impedance suitable for the front panel output.

8-22-2 The signal bypassing the de-emphasis network is attenuated by an amount equivalent to that of a de-emphasis network, providing a "flat" path (no de-emphasis) at the same level as the de-emphasised signal.

8-22-3 Both signal paths have FET switches in their paths so that, either signal may be selected, or the video assembly isolated, depending on the mode selected. Both signals are then buffered by the class AB emitter follower Q17, Q18 which passes them to the invert/non-invert control and video amplifier.

8-22-4 Operation of the output invert/non-invert video amplifier is the same as that described above for the input side in Paragraphs 8-21-2 to 8-21-4.

8-23 TROUBLESHOOTING A33

1. Set the controls:

MODULATOR CAL/UNCAL . . . . . CAL
EMPHASIS . . . . . OFF
I/O SELECT. . . . . VIDEO NORM

2. Set a Synthesizer to 1MHz at –2.2dBm (75 ohm) and connect it, via a 50/75 ohm converter if necessary, to the 3717A VIDEO INPUT. Connect one of the IF OUTPUTs to the IF INPUT.

Note: If the Synthesizer output impedance is 50 ohm, –2.2dBm should be set up at the output of a 50/75 ohm converter (–2.2dBm = 0.6V pk-pk into 75 ohm).

3. Measure the signal and dc levels as required below:

A33 Modulator Section		A33 Demodulator Section	
Signal Levels		Signal Levels	
A33P1(11)	0 with emp OFF 1.5V pk-pk sinewave vid emp ON	A33P2(12)	1.4V pk-pk sinewave vid emp OFF 1.2V pk-pk sinewave Video Emp ON
A33P1(2)	0.66V pk-pk sinewave vid emp OFF 0.54V pk-pk sinewave vid emp ON		
Q8 collector or Q9 base or Q10 base	1.8V pk-pk sinewave vid emp ON	Q17 base or Q18 base	0.36V pk-pk sinewave
		Q22 collector or Q23 collector	0.05V pk-pk sinewave
DC Levels		Q28 collector or Q30 collector	1.3V pk-pk sinewave
Q4 collector	+12.7V	DC Levels	
Q5 collector	+13V		
Q6 collector	–0.86V	Q17 base	+0.8V
Q7 collector	+11.3V	Q18 base	–0.8V
Q8 collector	–0.85V	Q22 collector	+12.7V
Q9 collector	+0.65V	Q23 collector	+13.2V
Q10 base	–0.8V	Q24 collector	–0.8V
		Q30 collector	+0.6V
		Q28 collector	–0.96V

8-24 A50 TROUBLESHOOTING

1. Select the appropriate emphasis network and measure as required, the dc levels below:

A50 Modulator Section		A50 Demodulator Section	
DC Levels		DC Levels	
Q4 base	+0.8V	Q12 base	+0.8V
Q5 base	–0.8V	Q15 base	–0.8V
Q8 base	+0.8V	Q18 base	+0.8V
Q9 base	–0.8V	Q19 base	–0.8V

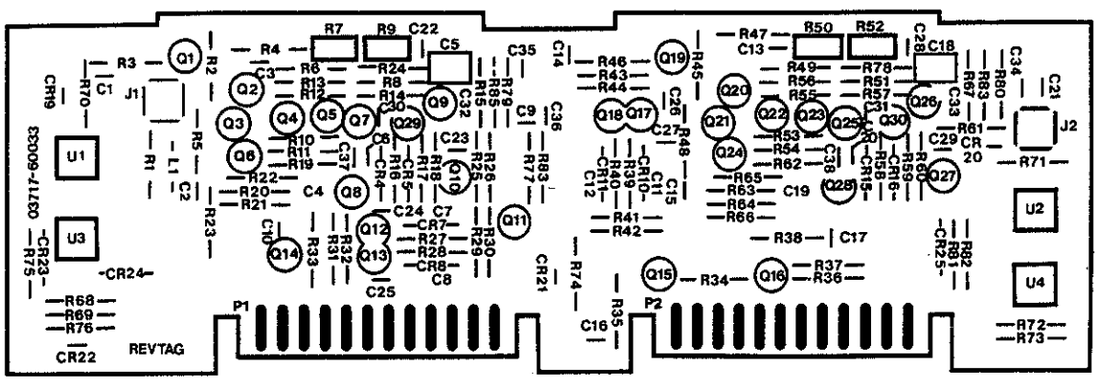


Figure 8-15 A33 Component Location

◀ SERVICE SHEET 2

Fig 8-16 Sht 1 of 3

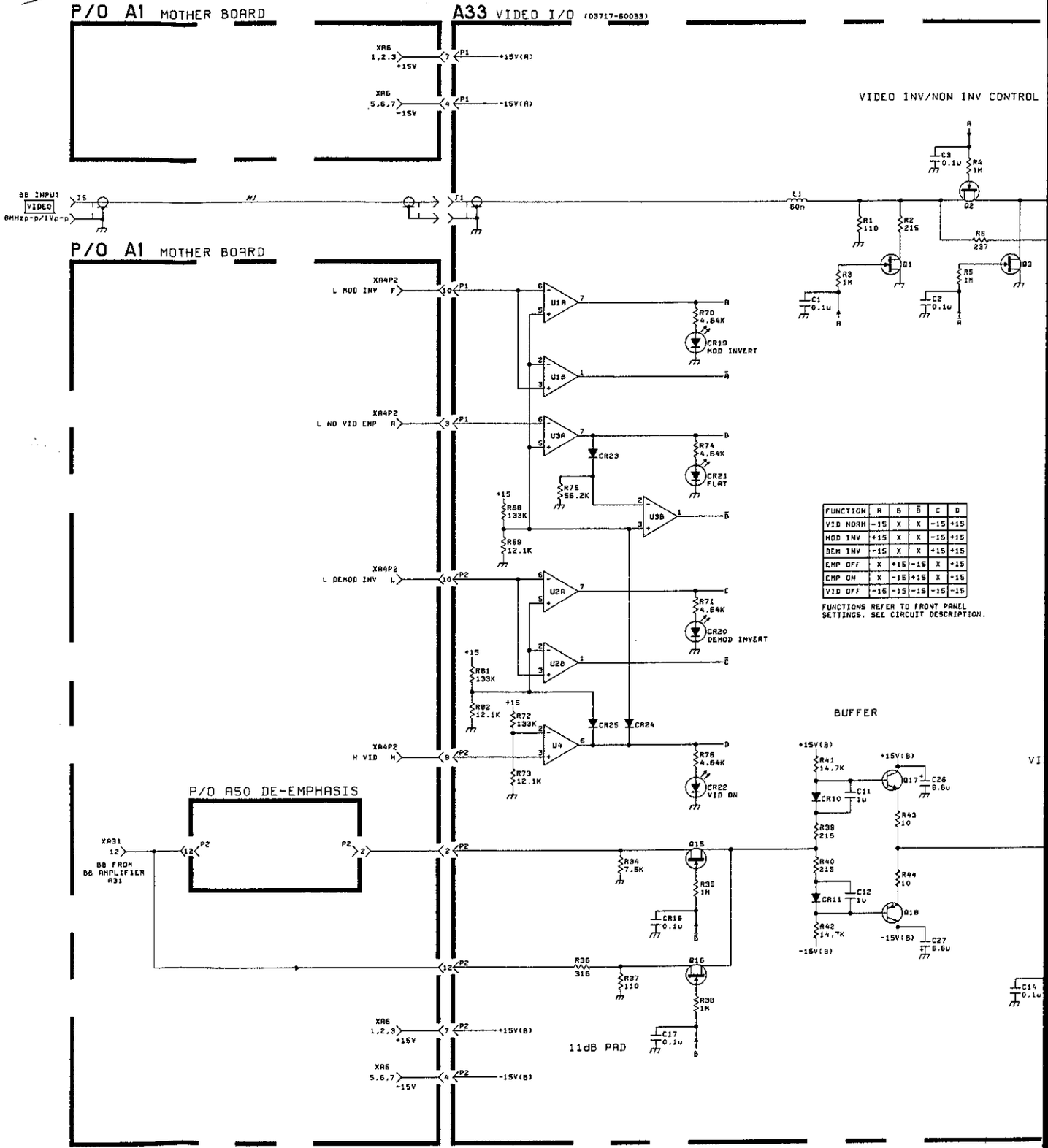
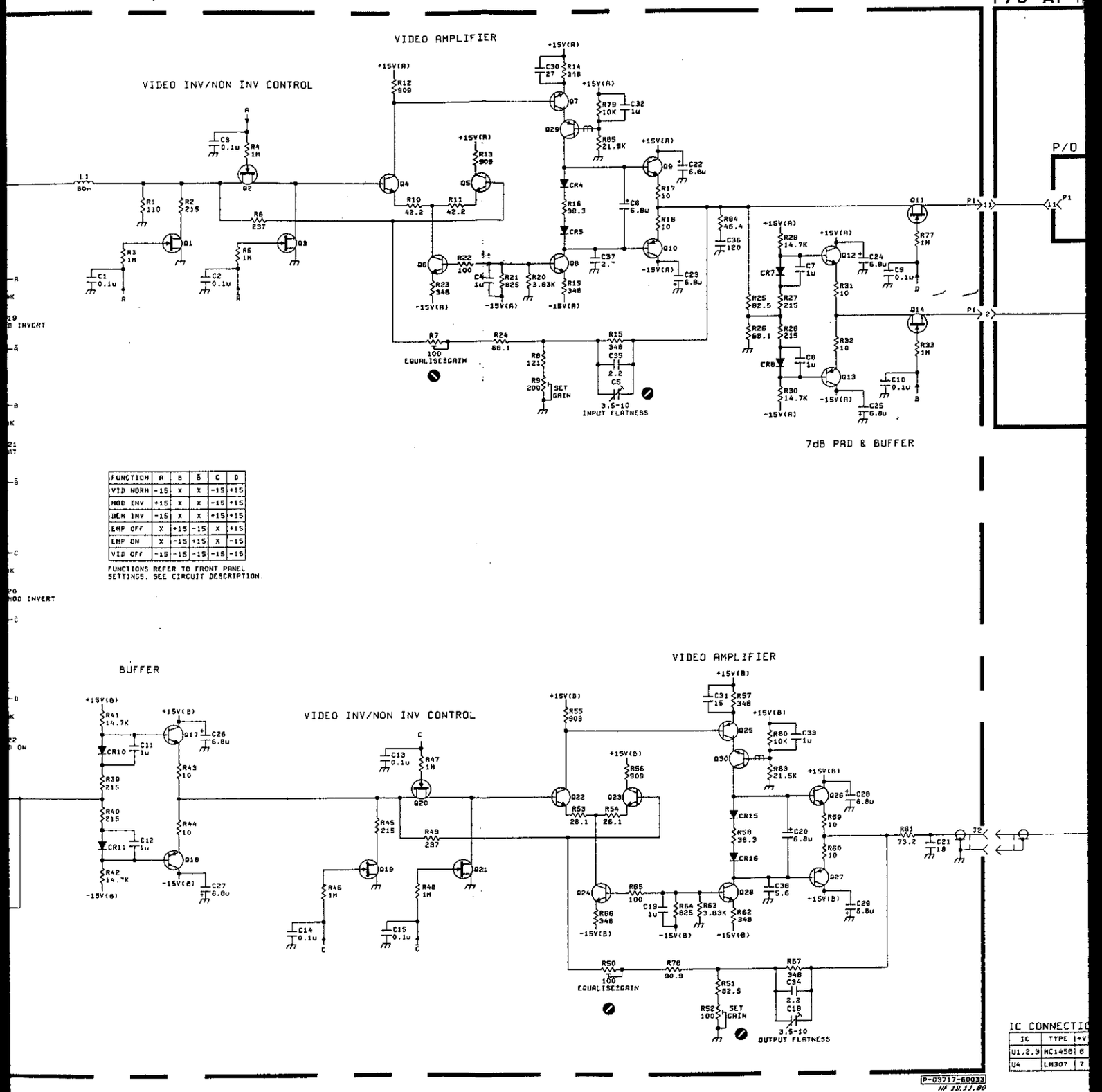


Fig 8-16 Sht 2 of 3



FUNCTION	A	B	$\overline{B}$	C	D
VID NORM	-15	X	X	-15	+15
MOD INV	+15	X	X	-15	+15
DEM INV	-15	X	X	+15	+15
EMP OFF	X	+15	-15	X	+15
EMP ON	X	-15	+15	X	-15
VID OFF	-15	-15	-15	-15	-15

IC	TYPE	+V
U1,2,3	HC1458	8
U4	LM307	7

P-03717-60033
MF 10.11.00

Fig 8-16 Sht 3 of 3

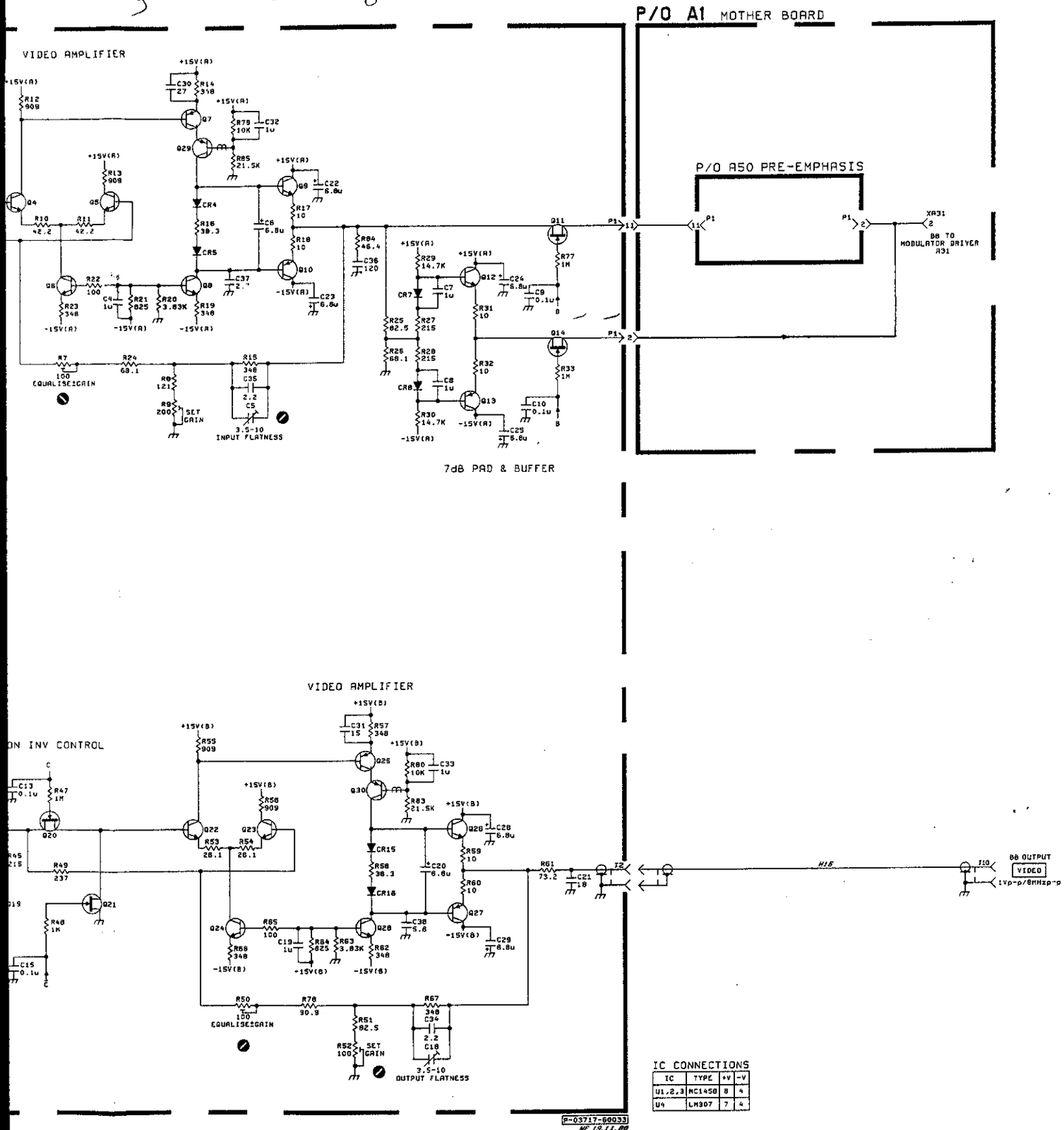


Figure 8-16 A33 Schematic Diagram

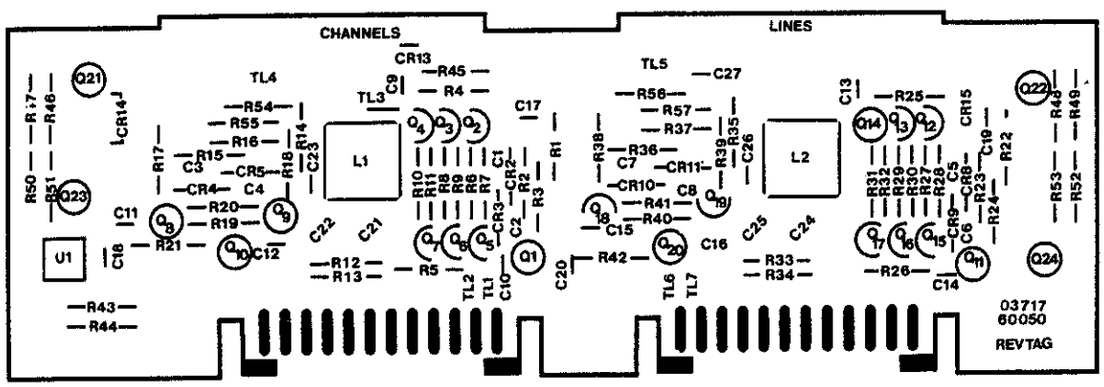


Figure 8-17 A50 Component Location

Fig 8-18 sht 1 of 3

CCIR OPTION	BOARD PART No. 03717-	CHANNELS	L1	C21	C22	C23	R12	R13	R14	R54	R55	L2	C24	C25	C26	C27	R33	R34	R35	R56	R57
011	-60051	24	69.9u	15000	4700	180	137		75	-	-	130u	10000	680	12	-	137		75	-	-
012	-60052	60	25.2u	6800	360	-	137		75	-	-	46.8u	3000	820	27	-	137		75	-	-
013	-60053	120	13.7u	3000	820	68	137		75	-	-	25.4u	1600	510	-	-	137		75	-	-
014	-60054	300	5.8u	1600	-	56	137		75	-	-	10.8u	820	-	68	-	137		75	-	-
015	-60055	600	2.84u	510	300	-	137		75	-	-	5.28u	430	-	4.7	-	137		75	-	-
016	-60056	960	1.80u	510	-	2.7	137		75	-	-	3.36u	270	-	5.6	-	137		75	-	2.15K
017	-60057	1260	1.34u	360	-	22	137		75	-	-	2.48u	200	-	4.7	-	137		75	-	2.15K
018	-60058	1800	0.92u	200	82	-	137		75	-	-	1.71u	141	-	-	39	137		75	-	2.15K
		VIDEO																			
021	-60061	525	-	3000	82	-	274		2.15K	21.5	53	50.2u	-	-	-	82	274		2.15K	10	84.5
022	-60062	625	-	91	1600	91	300		2.15K	23.7	51.1	30.5u	-	-	-	47	300		75	-	2.15K
023	-60063	818	-	27	820	27	300		75	-	2.15K	15.3u	-	-	-	82	300		2.15K	37.4	37.4
BELL OPTION		CHANNELS																			
031	-60064	600	-	820	82	5.6	300		487	23.7	64.9	82.14u	-	-	-	-	300		1.78K	13.3	84.9
032	-60065	900	-	270	56	1.0	300		75	-	-	29.6u	-	-	-	-	300		4.64K	28.7	47.5
033	-60066	1200	-	270	56	1.0	300		243	17.4	90.9	29.6u	-	-	-	-	300		487	23.7	84.9
034	-60067	1500	-	270	56	1.0	300		1.21K	23.7	56.2	29.6u	-	-	-	-	300		1.98K	10	88.1
035	-60068	1800	-	270	56	1.0	300		-	24.9	50	29.6u	-	-	-	-	300		174	10	121

P/O A1 MOTHER BOA

FROM EMPHASIS SELECT SWITCHES ON KEYBOARD REFER TO A3/A4 SCHEMATIC

XA32P1
TELEPHONY 12

XA33P1
VIDEO 11

XA4P
L EMP 1 8
L EMP 2 9
L EMP 3 10
L EMP 4 11
L EMP 5 12

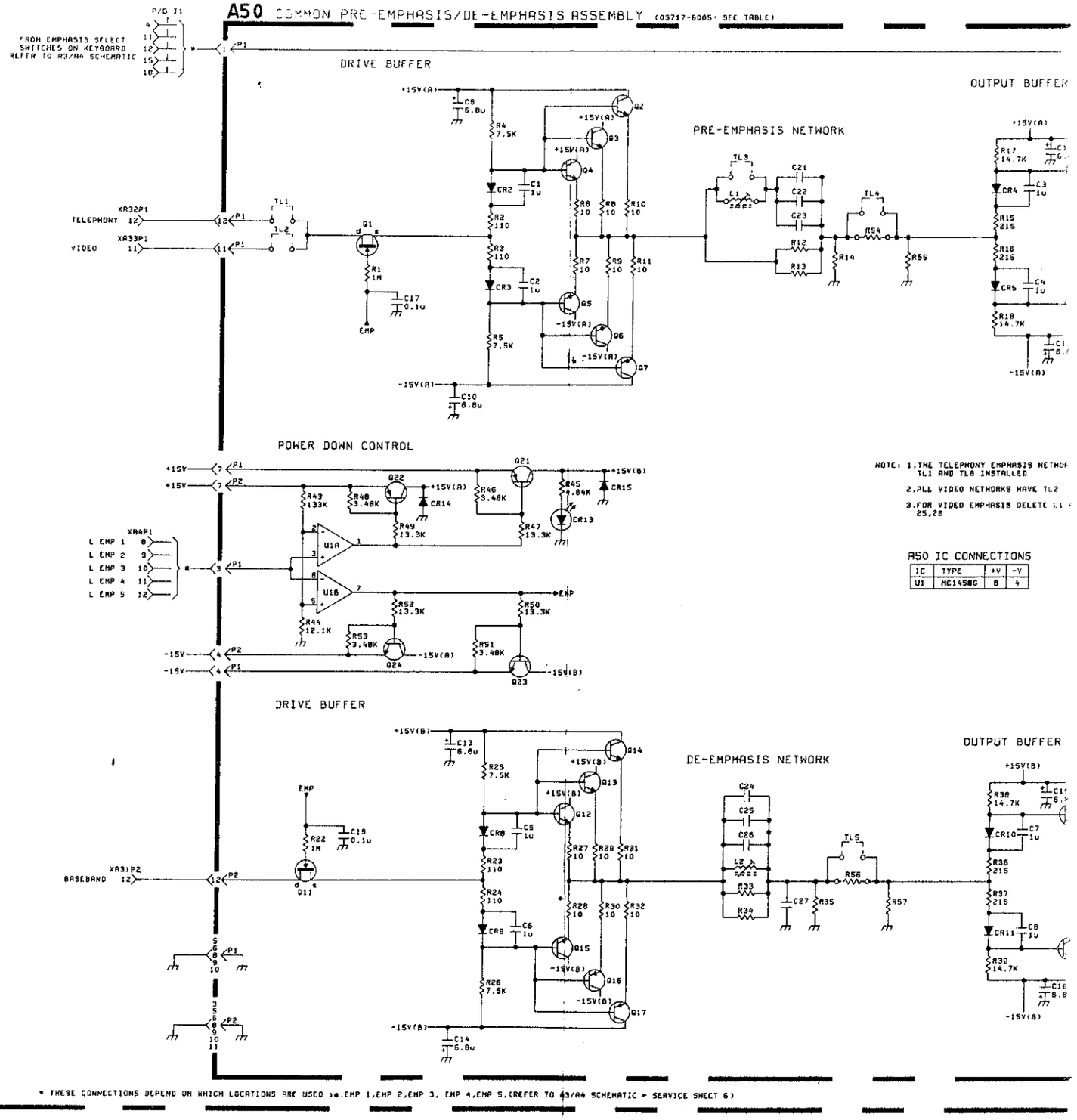
XA31P2
BASEBAND 12

* THESE CONNECTIONS DO

Fig 8-18 Sht 2 of 3

P/O A1 MOTHER BOARD (03717-60001)

A50 COMMON PRE-EMPHASIS/DE-EMPHASIS ASSEMBLY (03717-6005* SEE TABLE)



NOTE: 1.THE TELEPHONY EMPHASIS NETWORK TL1 AND TL8 INSTALLED

2.ALL VIDEO NETWORKS HAVE TL2

3.FOR VIDEO EMPHASIS DELETE L1 & 25,28

A50 IC CONNECTIONS

IC	TYPE	+V	-V
U1	MC1458G	8	4

* THESE CONNECTIONS DEPEND ON WHICH LOCATIONS ARE USED 1=EMP 1,EMP 2,EMP 3, EMP 4,EMP 5.(REFER TO A3/A4 SCHEMATIC - SERVICE SHEET 6)

Fig 8-18 Sht 3 of 3

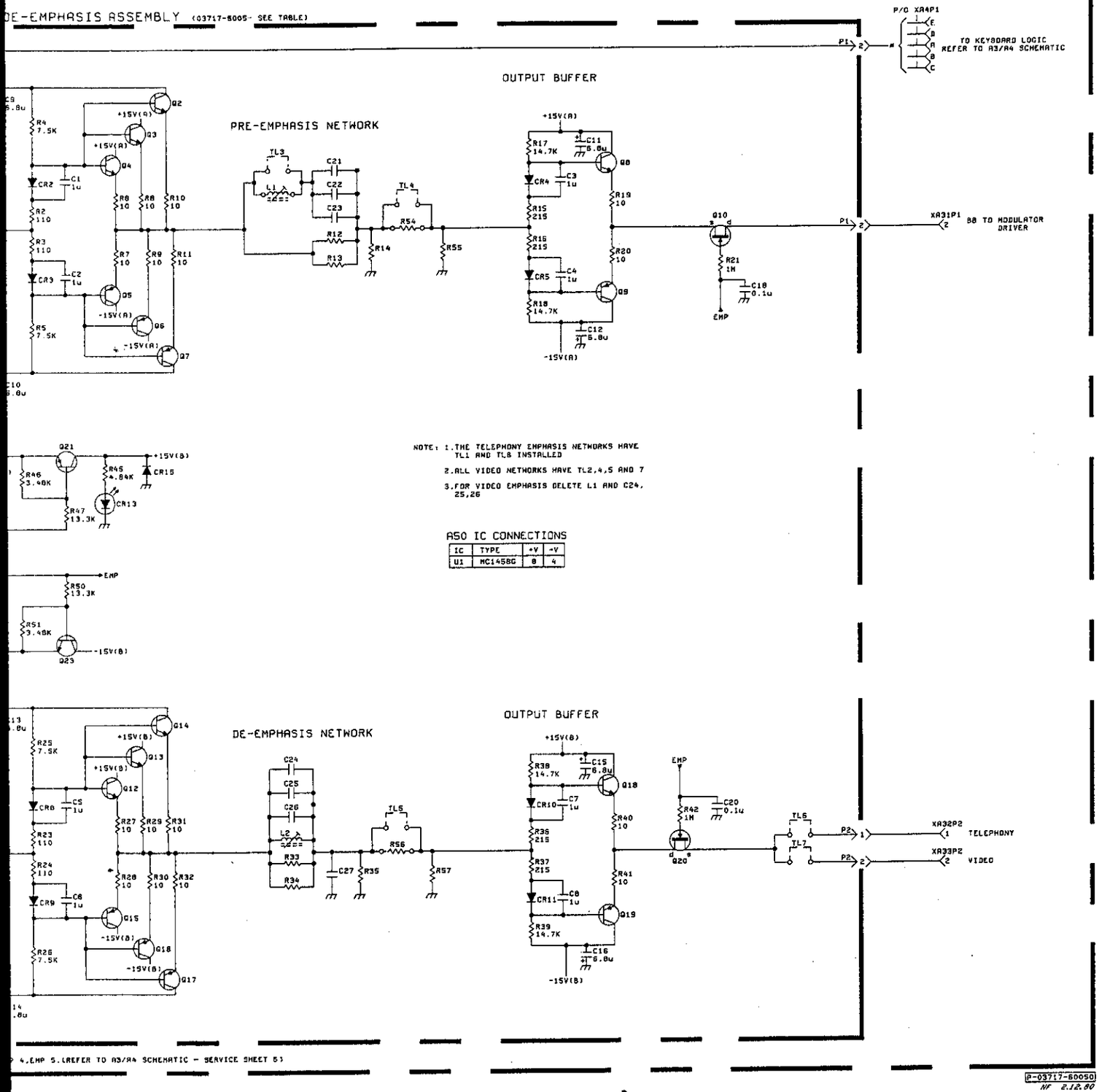


Figure 8-18 A50 Schematic Diagram

SERVICE SHEET 3

8-25 INTRODUCTION

This service sheet contains details of the modulator driver, IF output and AFC circuits. Note that no details are given in this manual of the modulator, limiter or discriminator which are units supplied by Northern Telecom Ltd.

The Block Diagram Figure 8-4 shows the circuit blocks which comprise this service sheet. The relevant circuit diagrams, A31, A11, A12 and A14, and corresponding component locations will be found at the end of this service sheet.

8-26 A31 CIRCUIT DESCRIPTIONS

8-26-1 Like all the baseband assemblies A31 is in two halves, modulator side and demodulator side. The purpose of the modulator side of A31 is to take the baseband (telephony or video) which may or may not have been pre-emphasised and amplify it to the level required by the modulator.

8-26-2 The input buffer is a class AB complementary emitter follower similar to that described in Service Sheet 1 Paragraph 8-15-6 except that the transistors are paralleled to handle the higher signal levels at this point.

8-26-3 The output of the buffer is connected to both an 8dB pad (CAL) and the variable gain control R11 (UNCAL). FET switches (controlled by a TTL signal from the keyboard logic assembly A4) control which is selected. An LED CR11 indicates when the UNCAL mode is selected. Operation of the FET switches is described in Service Sheet 1 Paragraph 8-15-8.

8-26-4 The signal is again buffered by a complementary emitter follower before being applied to the modulator drive amplifier. The modulator drive amplifier is the same as the telephony input amplifier on the A32 assembly, a description of which is given in Service Sheet 1 Paragraphs 8-15-2 to 8-15-4. The output of the A31 assembly is connected directly to the modulator assembly A13.

8-26-5 No circuit details of the modulator (a Northern Telecom unit) are given in this manual other than the input/output connections shown on the schematic diagram at the end of this service sheet. Power is supplied to the modulator via the connector board A11 which connects the modulator to the mother board.

8-27 A12 CIRCUIT DESCRIPTIONS

8-27-1 The frequency modulated IF output from the modulator is connected via a coaxial cable to the two IF output amplifiers on assembly A12. The purpose of the output amplifiers is to produce from the modulator output, two front panel IF OUTPUTs at the required impedance (75 ohm) and power level (+5dBm). Each amplifier consists of two common base transistors Q1/Q2 and Q3/Q4. The level at each output is controlled respectively by R32 and R45 and the flatness or slope by C35 and C36. L6 and C23 and L9 and C33 adjust the return loss of the respective IF OUTPUTs.

8-28 A14 CIRCUIT DESCRIPTIONS

8-28-1 To control the IF output frequency to precisely 70MHz, an AFC voltage, generated by the A14 AFC assembly, is applied to the modulator. An IF output provided by the modulator is divided down to 20Hz and phase locked to a 20Hz signal derived from a 12MHz reference oscillator.

8-28-2 The 12MHz reference oscillator Q1 is a crystal controlled oscillator using L4, C7, C9 and Y1, with C5 and C6 as the tuned elements. A buffer (Q2) prevents oscillator loading. Q3 and Q4 convert the oscillator output to a TTL square wave which is then divided down to 20Hz by U1, U2, U10 and U3.

8-28-3 The 70MHz signal from the modulator is connected to the isolating transformer T1 which prevents TTL ground currents reaching the modulator metalwork via the interconnecting coaxial cable. R14, 15 and 16 are buffering to improve the return loss of U4.

8-28-4 U4 is a line receiver which buffers the modulator from the first divider (U5), preventing dividing products from being fed back to the modulator and at the same time squaring up the signal at ECL levels.

8-28-5 U5 is an ECL divide by 10 pre-scaler to bring the frequency of the IF signal within the operating range of the TTL dividers. The output of U5 is converted to TTL levels by Q5 and Q6 and the TTL dividers U6, 7, 9 and 11 divide the signal down to 20Hz.

8-28-6 The two 20Hz signals are compared in the phase/frequency detector U12. When both signals are equal in phase and frequency, the outputs (pins 13 and 2) will both be high. The device is edge triggered, and when the inputs differ in either phase or frequency, one or other output will pulse low.

8-28-7 The two outputs of U12 are compared by differentail amplifier U13. In the phase lock condition, when both inputs are high, U13 output will be 0V. For any condition

other than phase lock, either +ve or –ve pulses will be produced. C29, 28, 30, 31 are filtering, and U14A is a lowpass filter, all of which prevent breakthrough of the 20Hz reference to the modulator.

8-28-8 U14B is a differentiator to cancel a frequency lag produced by an integrator in the Northern Telecom modulator. C38 and R44 introduce an equal and opposite time constant to that produced by the integrator in the modulator.

8-28-9 The error voltage thus generated is fed back to the modulator and applied to the centre point of two varactors which control the IF centre frequency directly.

8-28-10 U15A and U15B detect the "out of lock" condition and turn the front panel FREQUENCY LOCK indicator off. They do this by measuring the error voltage fed back to the modulator, which gives an indication of how far out the IF frequency was, before the AFC loop pulled it back in. The actual pull-in range of the loop is several MHz, but because the modulator normally remains within ±0.5MHz without AFC, any more than ±0.5MHz indicates a fault. The bandwidth of the loop is 0.15Hz.

8-29 A31 TROUBLESHOOTING

1. Set the controls:

MODULATOR CAL/UNCAL . . . . . CAL
EMPHASIS . . . . . OFF
I/O SELECT. . . . . TELEPHONY

2. Set a Synthesizer to 83.3kHz at –37dBm (75 ohm) and connect it, via a 50/75 ohm converter if necessary, to the 3717A TELEPHONY INPUT. Connect one of the IF OUTPUTS to the IF INPUT.

Note: If the Synthesizer output impedance is 50 ohm, –37dBm should be set up at the output of a 50/75 ohm converter (–37dBm = 0.011V pk-pk into 75 ohm).

3. Measure the signal and dc levels as required below:

Signal Levels		DC Levels (continued)	
A31P1(2)	0.6V pk-pk sinewave	Q8 base	–0.8V
		Q9 base	0V
A31J1	0.04V pk-pk sinewave	Q9 collector	–14V
		Q12 base	–0.8V
DC Levels			
Q1 base	+0.8V	Q13 base	+0.8V
		Q14 collector	+10.4V
Q3 base	–0.8V	Q14 emitter	+0.9V
Q7 base	+0.8V		

8-30 MODULATOR & AFC LOOP TROUBLESHOOTING

If the waveform at test point F (A31J1) is correct, and that at test point G (A13P2) incorrect, the fault could lie in either the modulator or the AFC loop. In order to identify which assembly is at fault, the AFC loop is disabled by grounding A14TP19.

If test point G remains incorrect with the AFC loop disabled, and if AFC adjustment does not correct it (refer to Section IV paragraphs 5-8 and 5-9) the modulator is at fault and will have to be replaced.

If the level at test point G is correct and the frequency at approximately 70MHz when the AFC loop is disabled, refer to the following A14 troubleshooting.

8-31 A14 TROUBLESHOOTING

The waveforms at test points 1 and 2 are 12MHz 10V pk-pk and 1V pk-pk sinewaves respectively.

The waveforms at test points 3, 4, 5, 6 and 7 are all TTL level squarewaves and each stage divides by the amount specified on the schematic.

The waveforms at test points 8 and 9 are 70MHz sinewaves, 0.35V pk-pk at test point 8 and 1V pk-pk at test point 9.

The waveforms at test points 10, 11, 12, 13 and 14 are all TTL level squarewaves and each stage divides by the amount specified on the schematic.

The waveforms at test points 15 and 16 are such that, when test point 19 is grounded, one or other of them will be at TTL high and the opposite one have negative going TTL pulses, the mark-to-space ratio of which will be changing at a rate dependant on the difference between the two frequencies applied to U12.

The waveform at test point 17, with test point 19 grounded, will be either +ve or –ve ripple the amplitude and dc level of which will be changing for the reasons given above for test points 15 and 16.

Test points 18 and 19 will have approximately 0V dc on them at lock, but the dc level will vary for the reasons given above for test points 15 and 16.

8-32 A12 TROUBLESHOOTING

Measure the signal and dc levels as required below:

Signal Levels		DC Levels (continued)	
A12J1	1.5V pk-pk sinewave	Q2 emitter	+6.8V
		Q3 emitter	+6.8V
DC Levels			
		Q4 emitter	+6.8V
Q1 emitter	+6.8V		

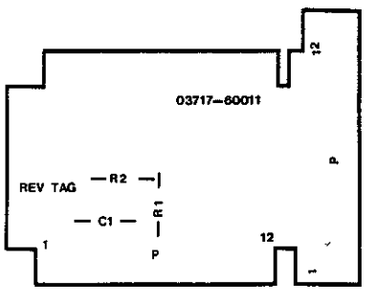


Figure 8-19 A11 Component Location

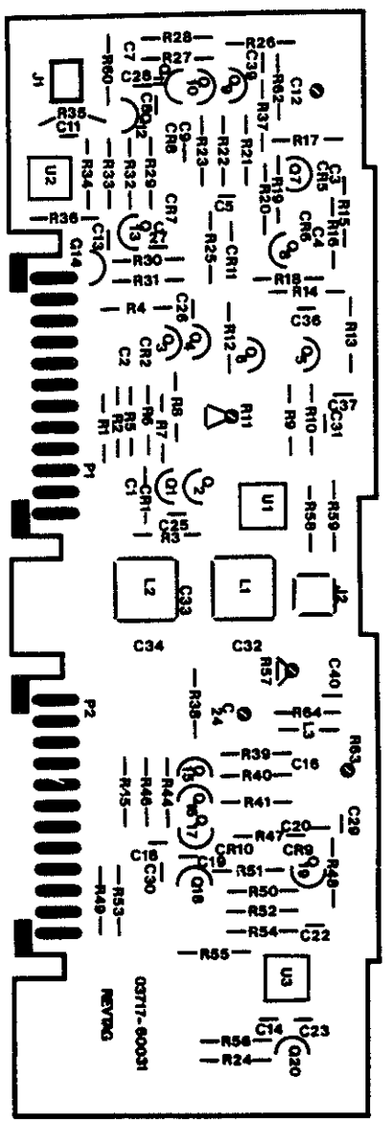


Figure 8-20 A31 Component Location

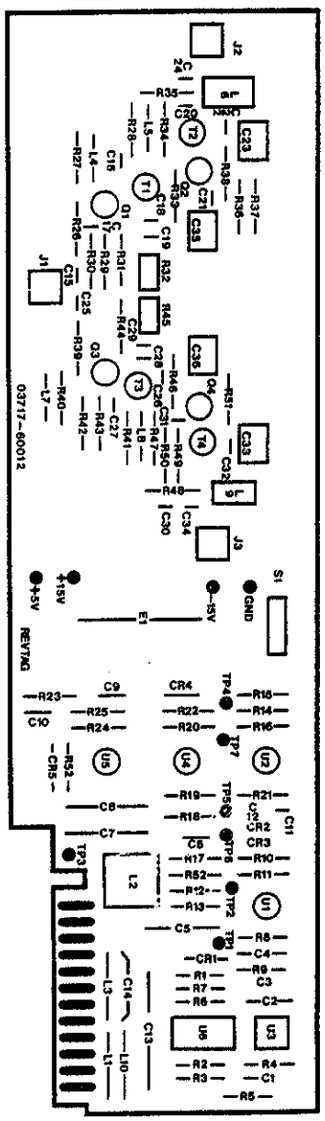
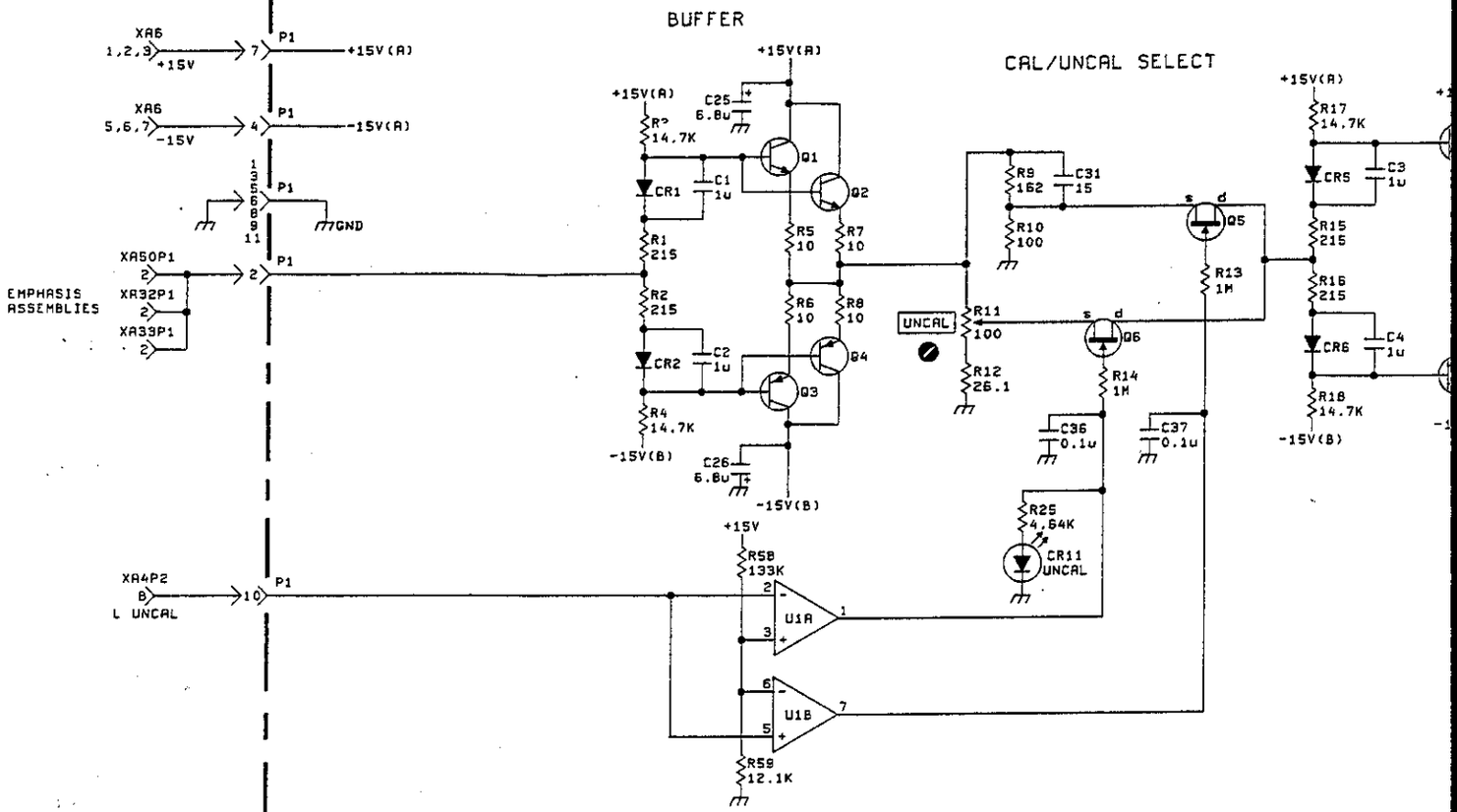


Figure 8-21 A12 Component Location

SERVICE SHEET 3

Fig 8-22
Sht 1 of 4

A31 MODULATOR DRIVER & BASEBAND AMPLIFIER (03717-60031)



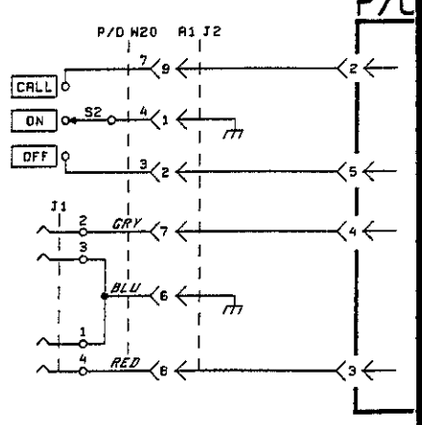


Fig 8-22
Sht 2 of 4

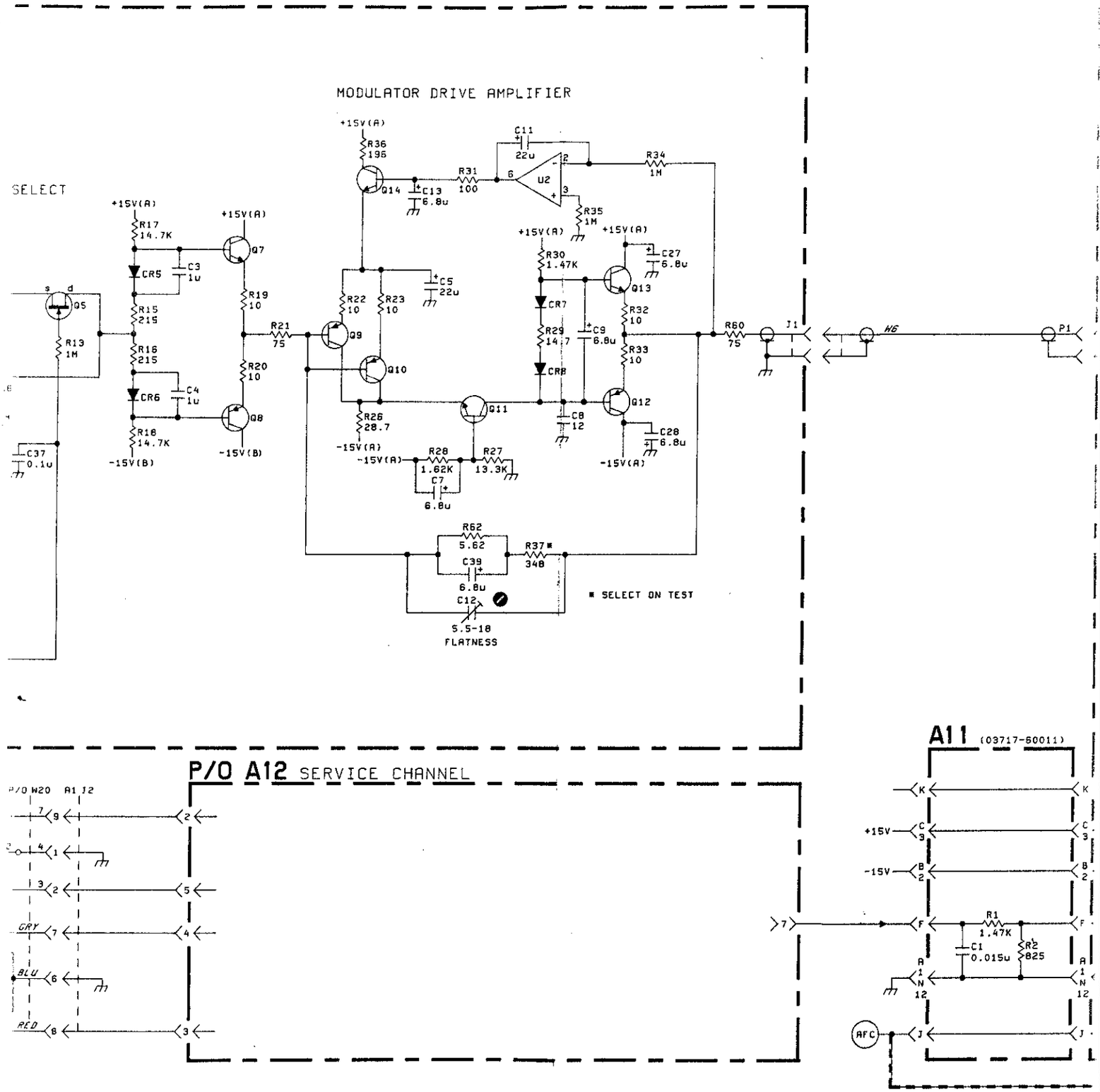
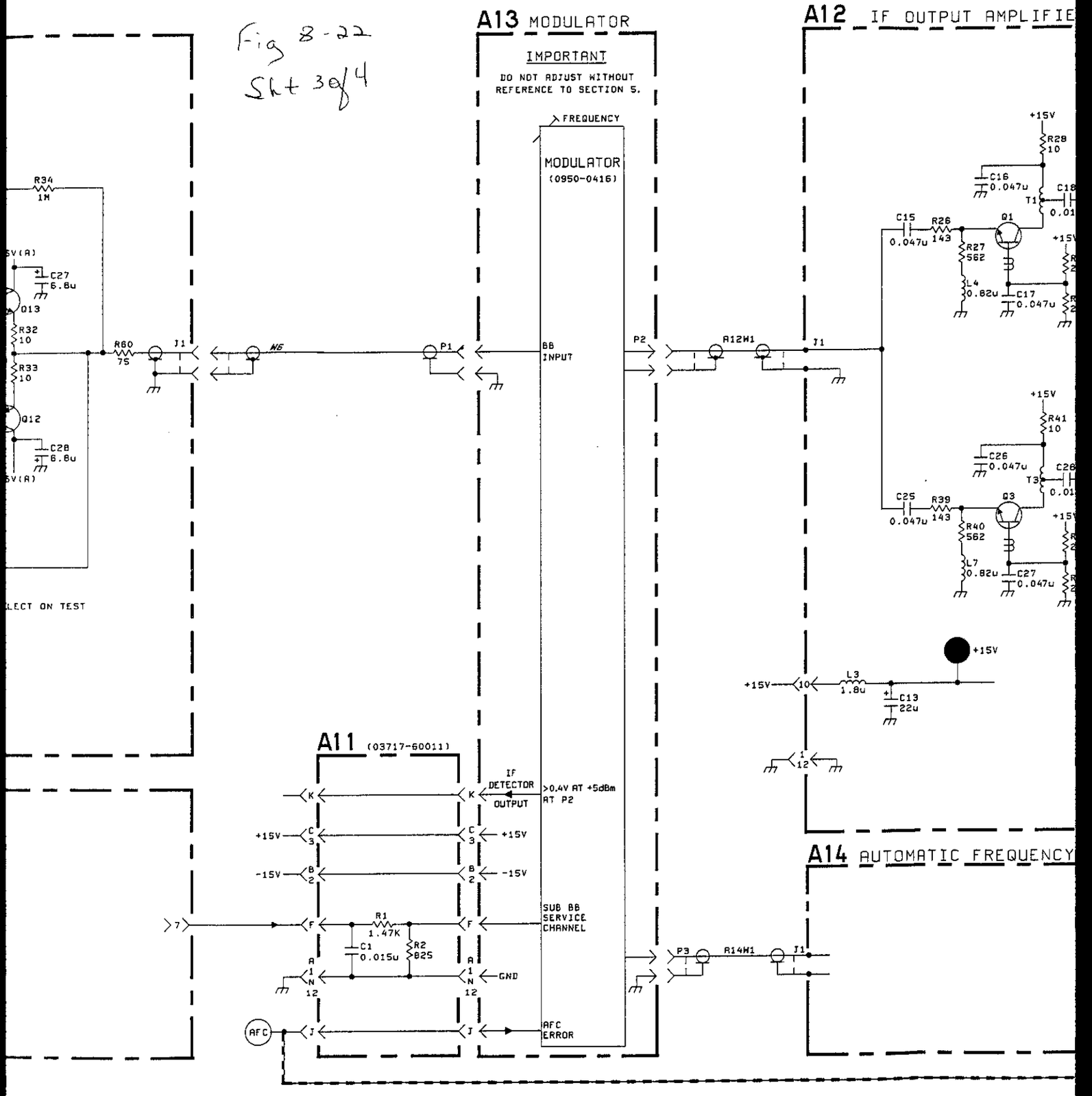


Fig 8-22
Sht 3 of 4



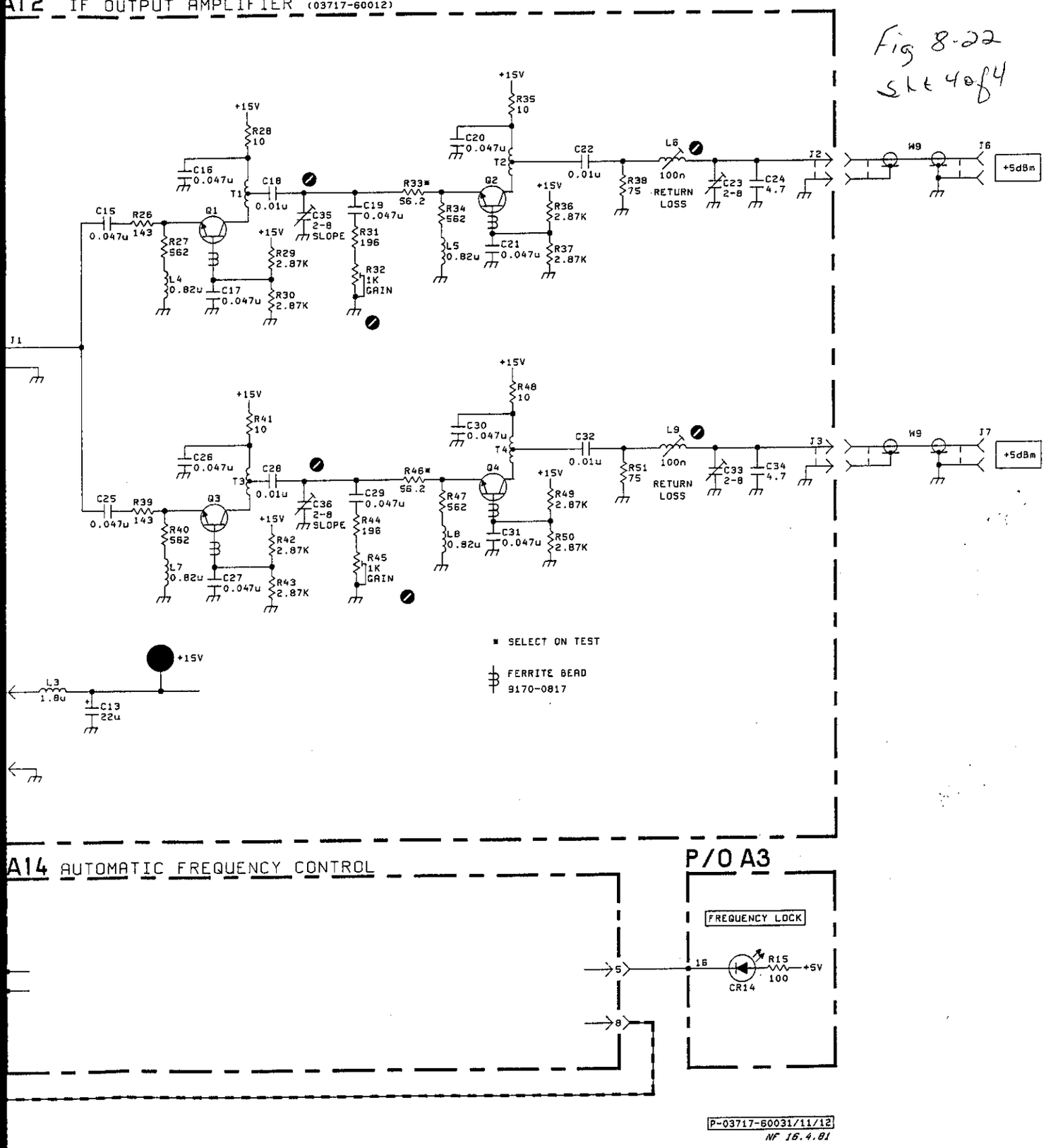


Figure 8-22 A31/A11/A12 Schematic Diagram

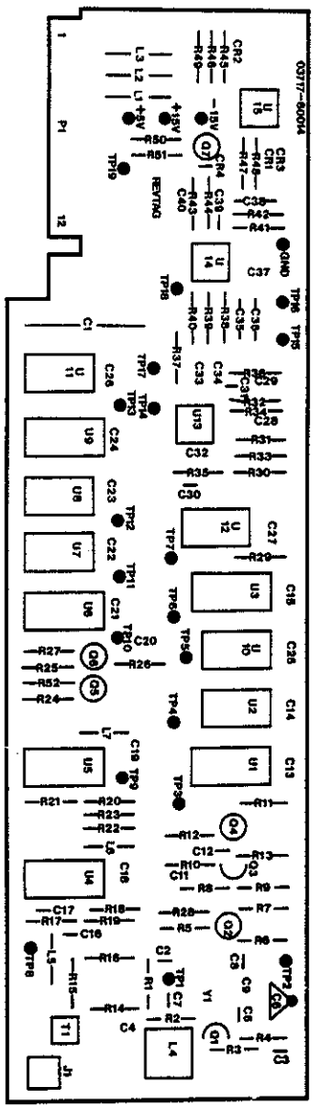


Figure 8-23 A14 Component Location

Fig 8-24
Sht 1 of 3

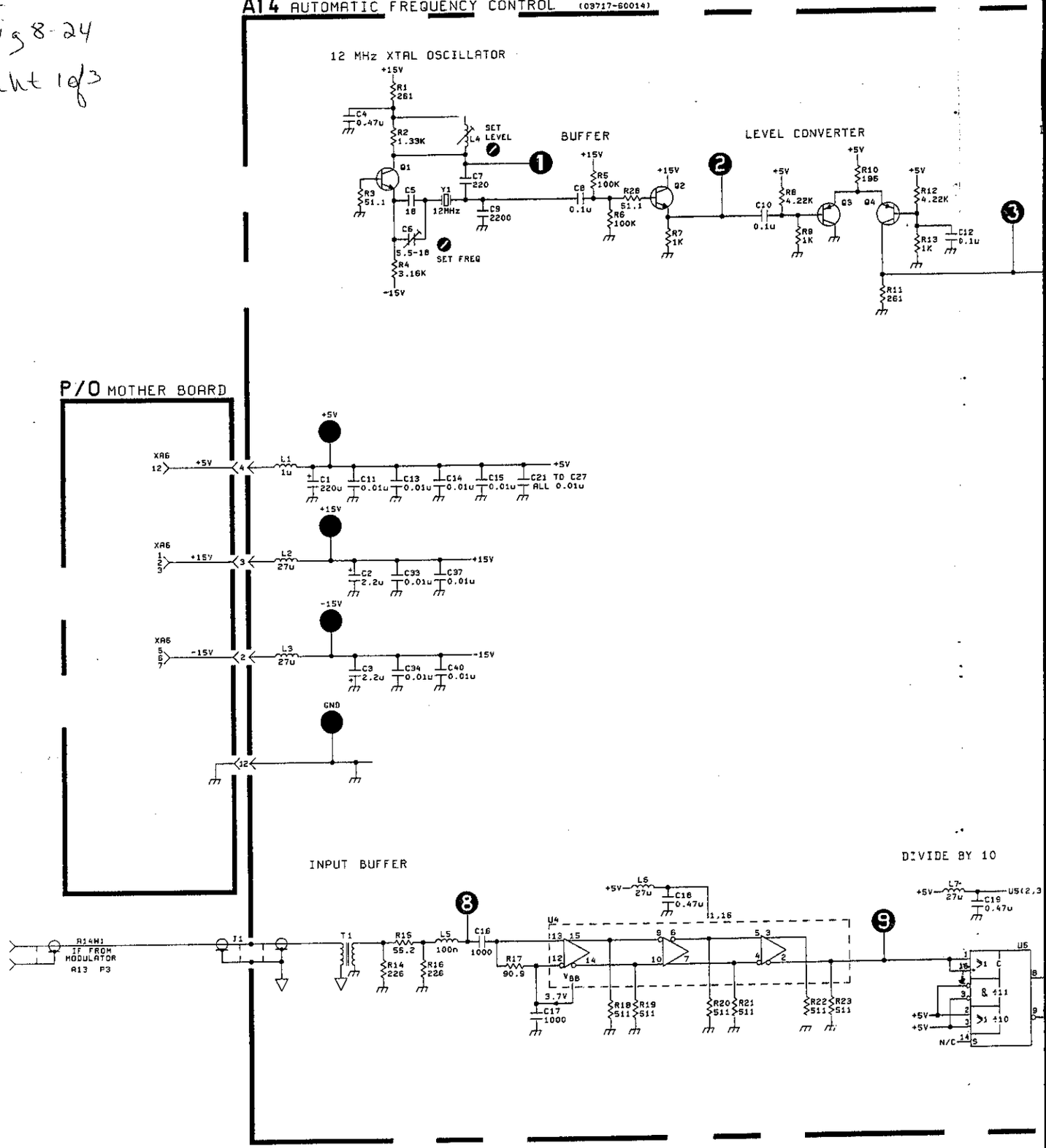
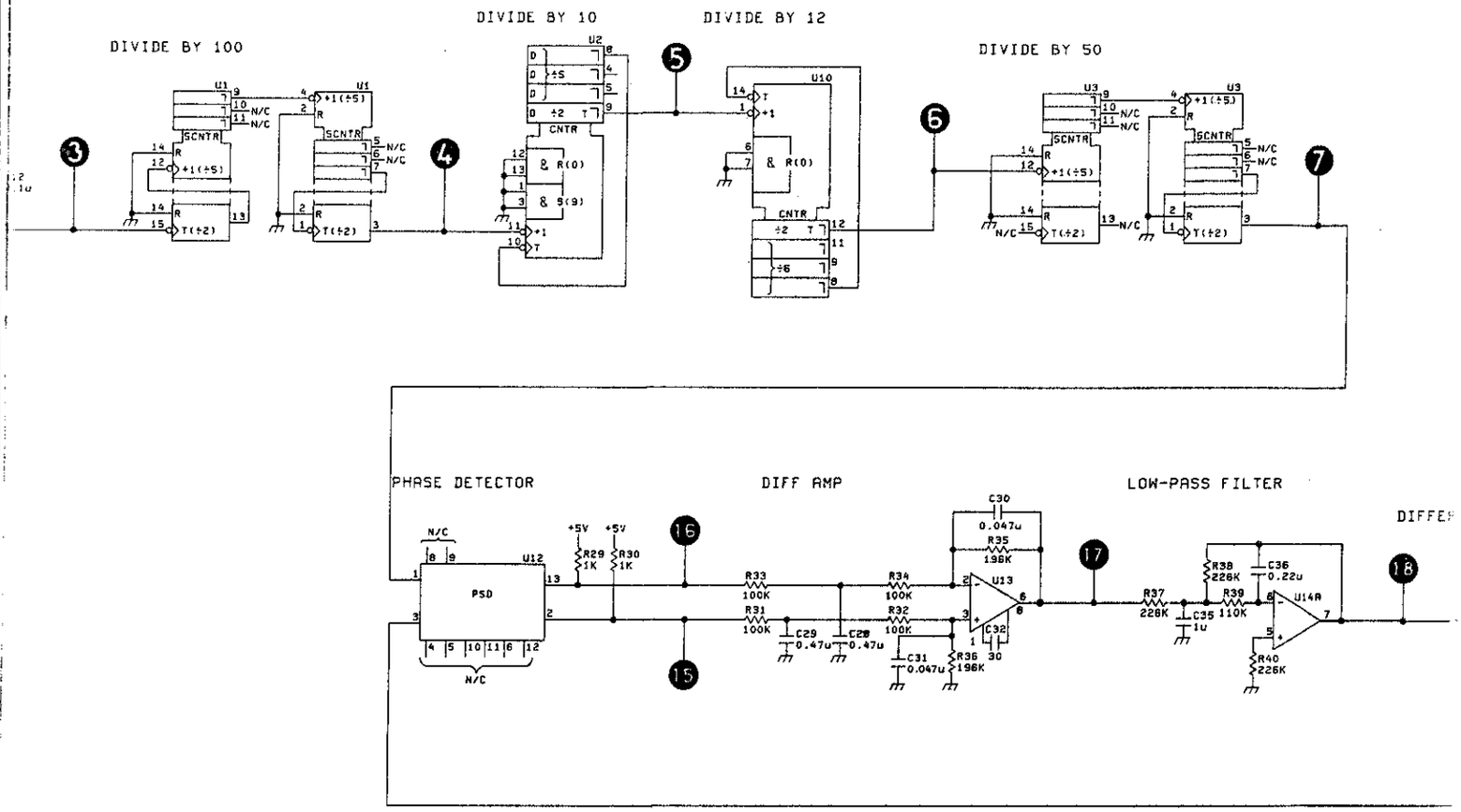


Fig 8-24
Sht 2 of 3



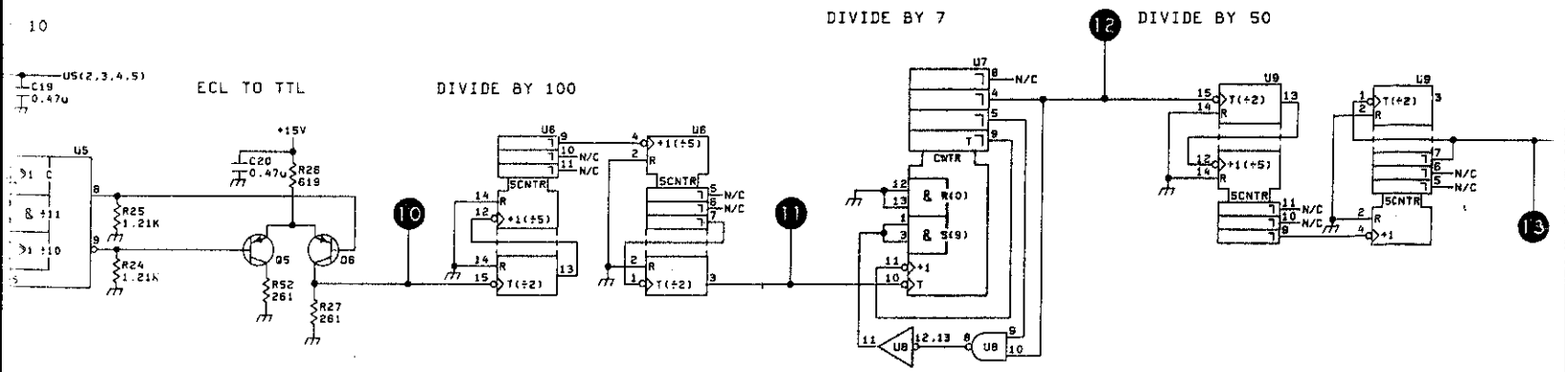
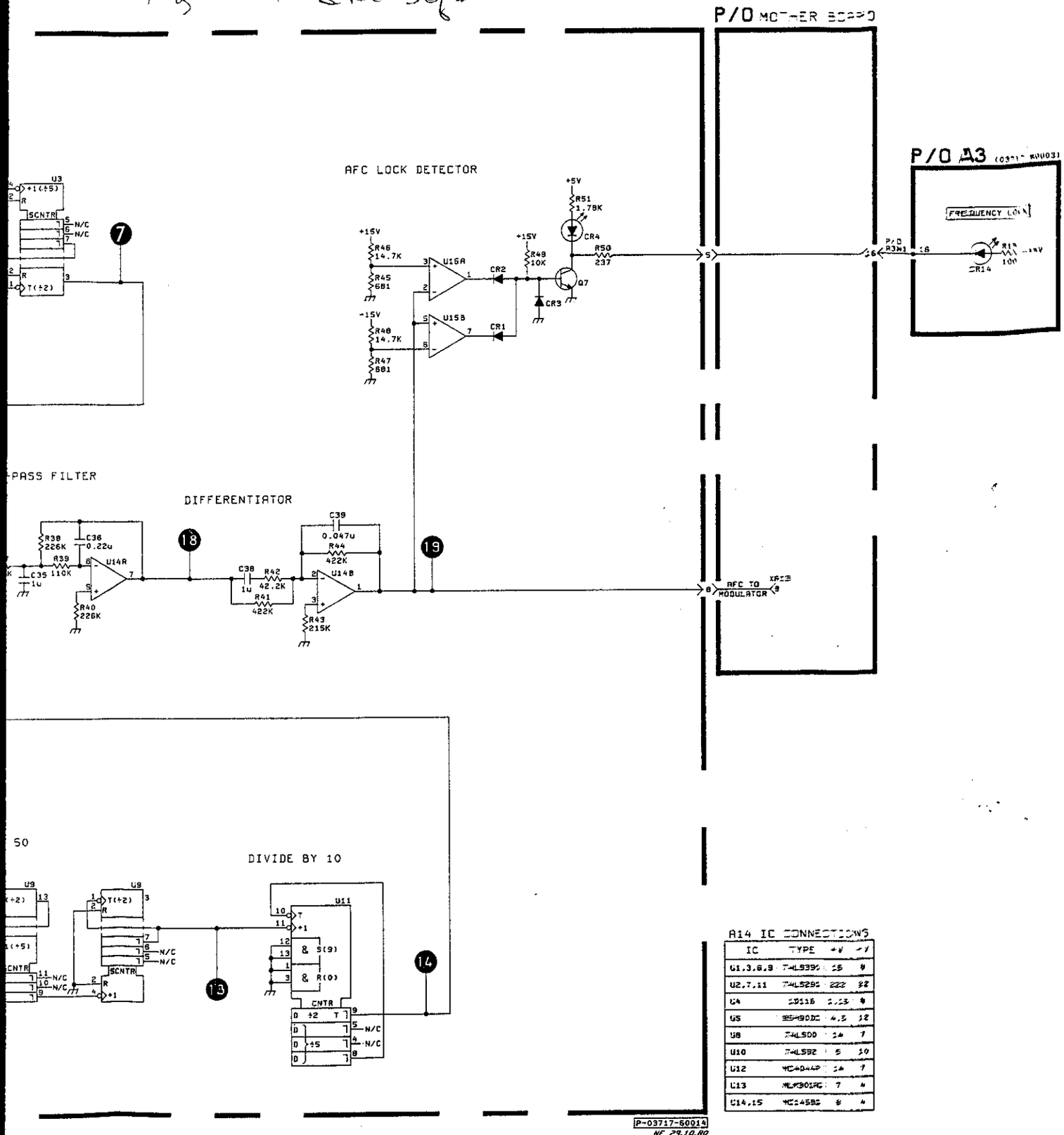


Fig 8-24 sht 3 of 3



A14 IC CONNECTIONS

IC	TYPE	+V	-V
U1,3,6,9	74LS339	14	4
U2,7,11	74LS221	222	22
U4	10116	1.13	4
U5	25H90DC	4.5	12
U8	74LS00	14	7
U10	74LS32	5	10
U12	MC4044P	14	7
U13	ML4301AC	7	4
U14,15	MC1458C	8	4

Figure 8-24 A14 Schematic Diagram

8-33 INTRODUCTION

This service sheet contains details of the IF input AGC and demodulated baseband amplifier circuits. Note that no circuit details are given in this manual of the limiter, discriminator or modulator which are units supplied by Northern Telecom Ltd.

The Block Diagram, Figure 8-4 shows the circuit blocks which comprise this service sheet. The relevant circuit diagrams, A21 and A31, and corresponding component locations will be found at the end of this service sheet.

8-34 A21 CIRCUIT DESCRIPTIONS

8-34-1 The purpose of the A21 assembly is to accept a 70MHz IF input signal in the range −10 to +6dBm and to produce a constant −7dBm for application to the limiter and discriminator.

8-34-2 On the IF INPUT is a common base amplifier Q1 providing about 6dB of gain. The output of Q1 is transformer coupled to a PIN diode constant impedance, pi network attenuator CR1 to 3. A unity gain common base amplifier Q2 with a transformer coupled output feeds the limiter assembly via a lowpass filter.

8-34-3 A balanced detector CR4 to 7 and U1A on the output of Q2, measures the output voltage and feeds it to an integrator U1B where it is compared with a dc reference level. The integrator output adjusts the PIN diode attenuator by altering its dc reference level via Q3.

8-34-4 Also on the output of the integrator is a window detector U2A and B which operates the front panel "HI" and "LO" LEDs on reaching the thresholds set by R31 and R29 respectively. Temperature compensation is provided by CR10 to CR15 on the "HI" threshold detector since at this level, the PIN diodes are in their active region and are very sensitive to control voltage and temperature and so the integrator output, and thus the input to the window detector is also changing with temperature. The "LO" threshold detector is not affected since it is set at the point where the attenuation is minimum, and a small change in integrator output has little effect.

8-34-5 The output level is adjusted by setting the dc reference of the integrator with R26, which alters the integrator output and thus the dc reference of the PIN diodes via Q3. A test position allows manual control via R14 of the PIN diode attenuator by opening the feedback loop. Flatness is adjusted with R12 which adjusts the ratio of series to shunt current in the PIN diodes. Output return loss is adjusted by using the inherent output capacitance as one element of a lowpass LC filter and adjusting the inductive element L4.

8-34-6 In this way, a constant −7dBm IF signal is applied to the limiter assembly A22 and from there to the discriminator assembly A23.

8-35 A31 CIRCUIT DESCRIPTION

8-35-1 The output of the discriminator is applied to the demodulator side of A31, the purpose of which is to remove unwanted signals above 20MHz, which it does with lowpass filter L1, L2, C32, C33 and C34, and to amplify the wanted ones (1Hz to 10MHz) to a level suitable for application to the de-emphasis networks.

8-35-2 The configuration of the baseband amplifier is the same as that of the telephony input amplifier described in Service Sheet 1 Paragraphs 8-15-2 to 8-15-4. There are two outputs from the amplifier, one to the de-emphasis networks or bypass pads, and one to the service channel.

8-6 A21 TROUBLESHOOTING

Set the test link on the A21 assembly to TEST and connect the IF OUTPUT via the ATTENUATOR to the IF INPUT, set the ATTENUATOR to 0dB.

Observe the waveform on the cathode of CR5 and set it to 1.0V pk-pk by adjusting R14. Under these conditions, the dc level on the collector of Q3 will be approximately 5.5V, but will depend on the setting of the flatness adjustment R12 and can differ appreciably. Do NOT adjust R12 unless the complete adjustment procedure in Section V, Paragraph 5-11 is to be performed.

Measure the dc level on U1 pin 1 for the attenuator settings shown below. Note that the levels shown may differ appreciably, but should remain in approximately the same proportion to each other.

ATTEN	U1(1)
0	6.2V typically
1	5.5V typically
2	4.8V typically
4	3.6V typically
8	2.0V typically

8-37 A31 TROUBLESHOOTING

1. Set the controls:

MODULATOR CAL/UNCAL . . . . . CAL
EMPHASIS . . . . . OFF
I/O SELECT. . . . . TELEPHONY

2. Set a Synthesizer to 83.3kHz at −37dBm (75 ohm) and connect it, via a 50/75 ohm converter if necessary, to the 3717A TELEPHONY INPUT. Connect one of the IF OUTPUTS to the IF INPUT.

Note: If the Synthesizer output impedance is 50 ohm, −37dBm should be set up at the output of a 50/75 ohm converter (−37dBm = 0.011V pk-pk into 75 ohm).

3. Measure the signal and dc levels as required below:

Signal Levels		DC Levels (continued)	
A31J2	0.3V pk-pk sinewave	Q17 base	−13.8V
		Q18 base	−0.9V
A31P2(1)	0.8V pk-pk sinewave	Q19 base	+0.9V
A31P2(12)	0.11V pk-pk sinewave	Q20 collector	+11.0V
DC Levels			
Q15 base	−0.04V		
Q15 collector	−14.5V		

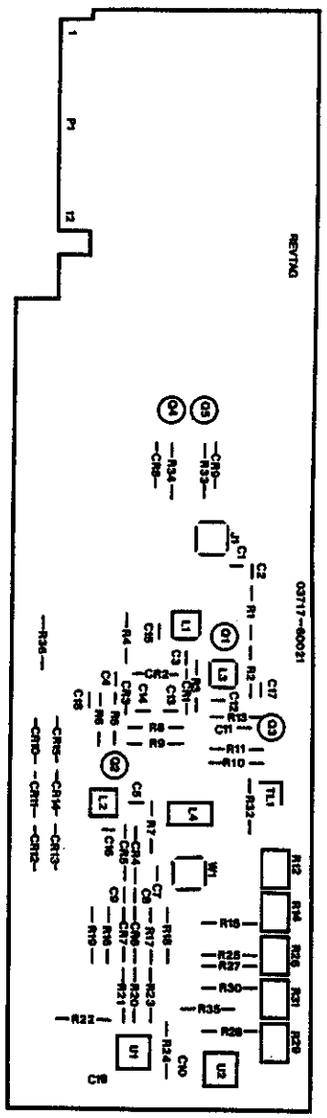


Figure 8-25 A21 Component Location

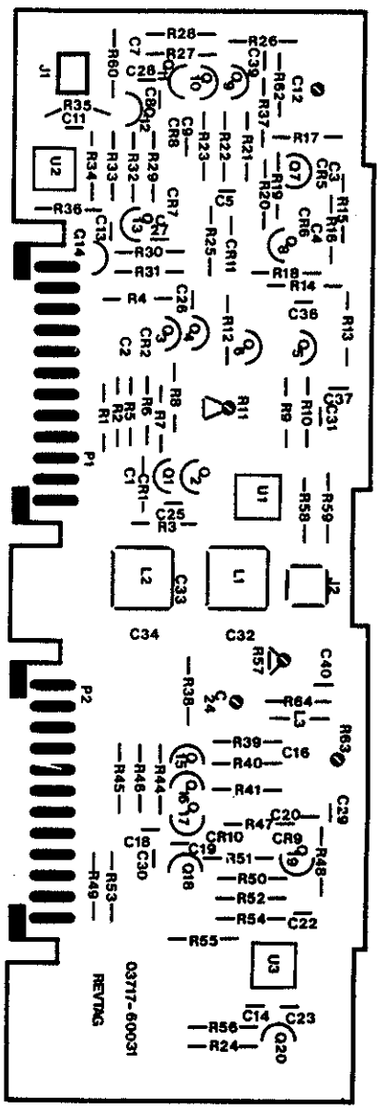


Figure 8-26 A31 Component Location

Fig 8-27
Sht 1 of 4

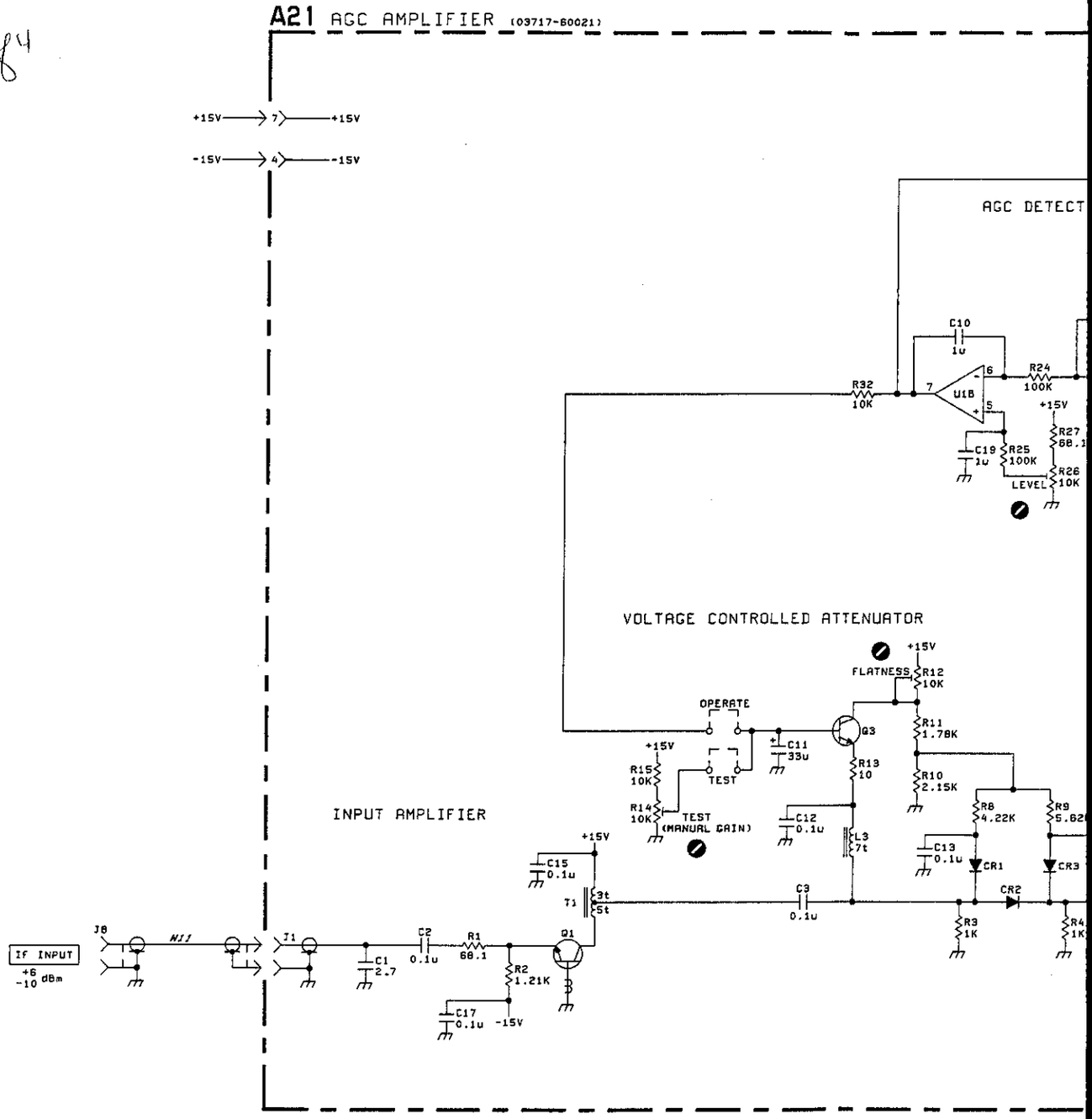


Fig 8-27
Sht 2 of 4

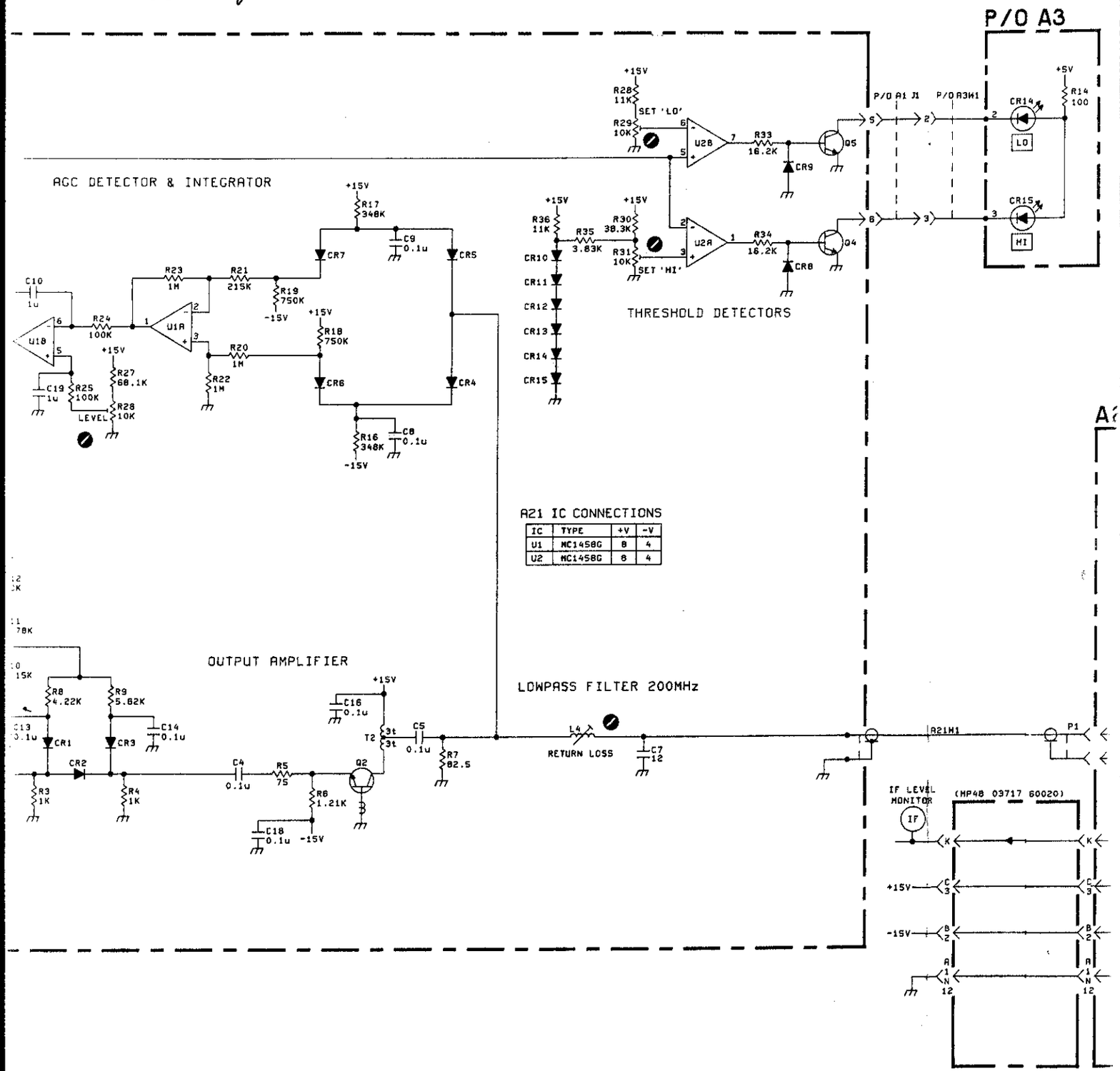
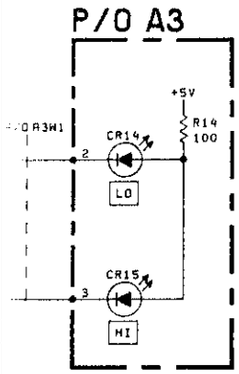


Fig 8-27
Sht 3 of 4



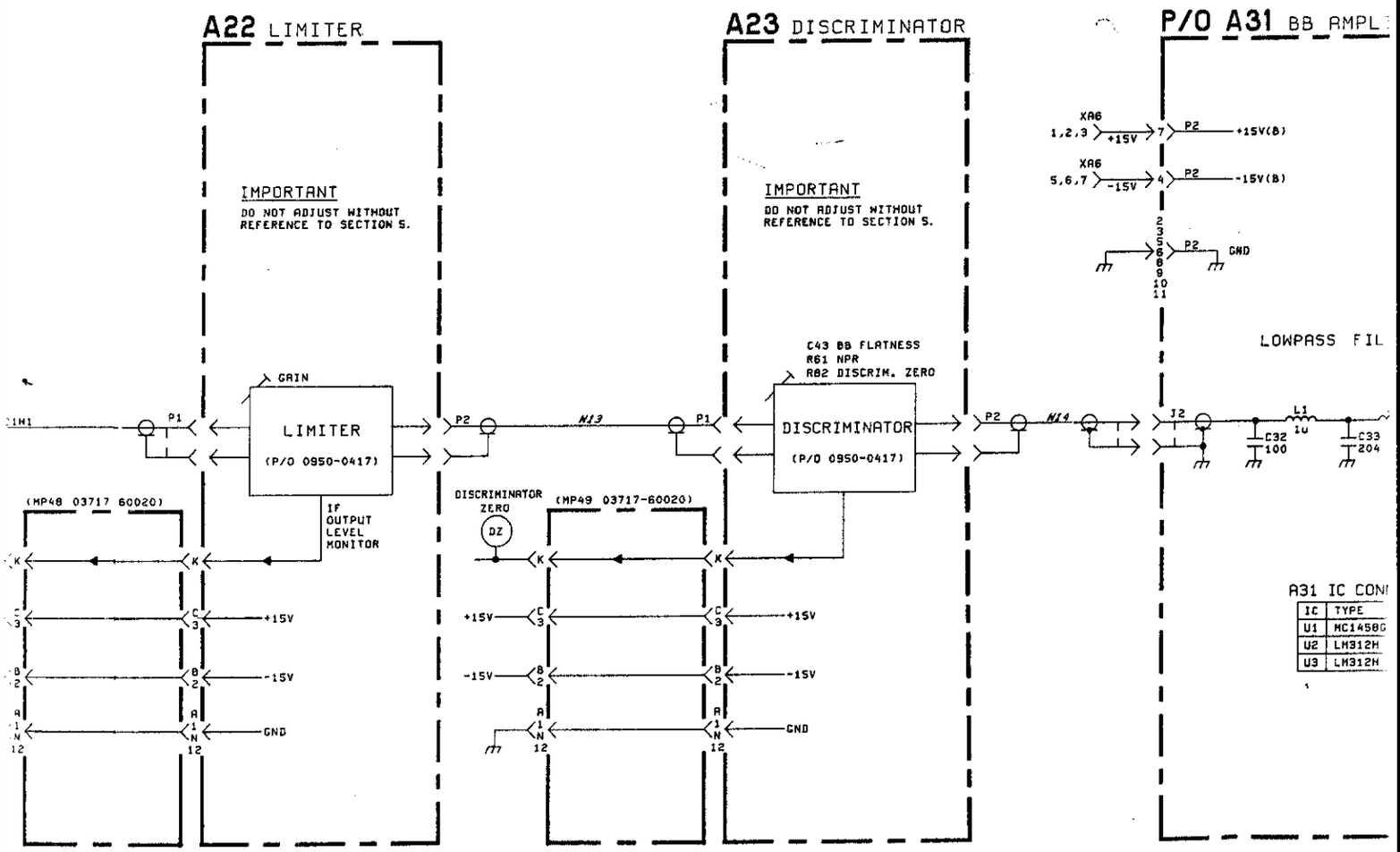


Fig 8-27
Sht 4 of 4

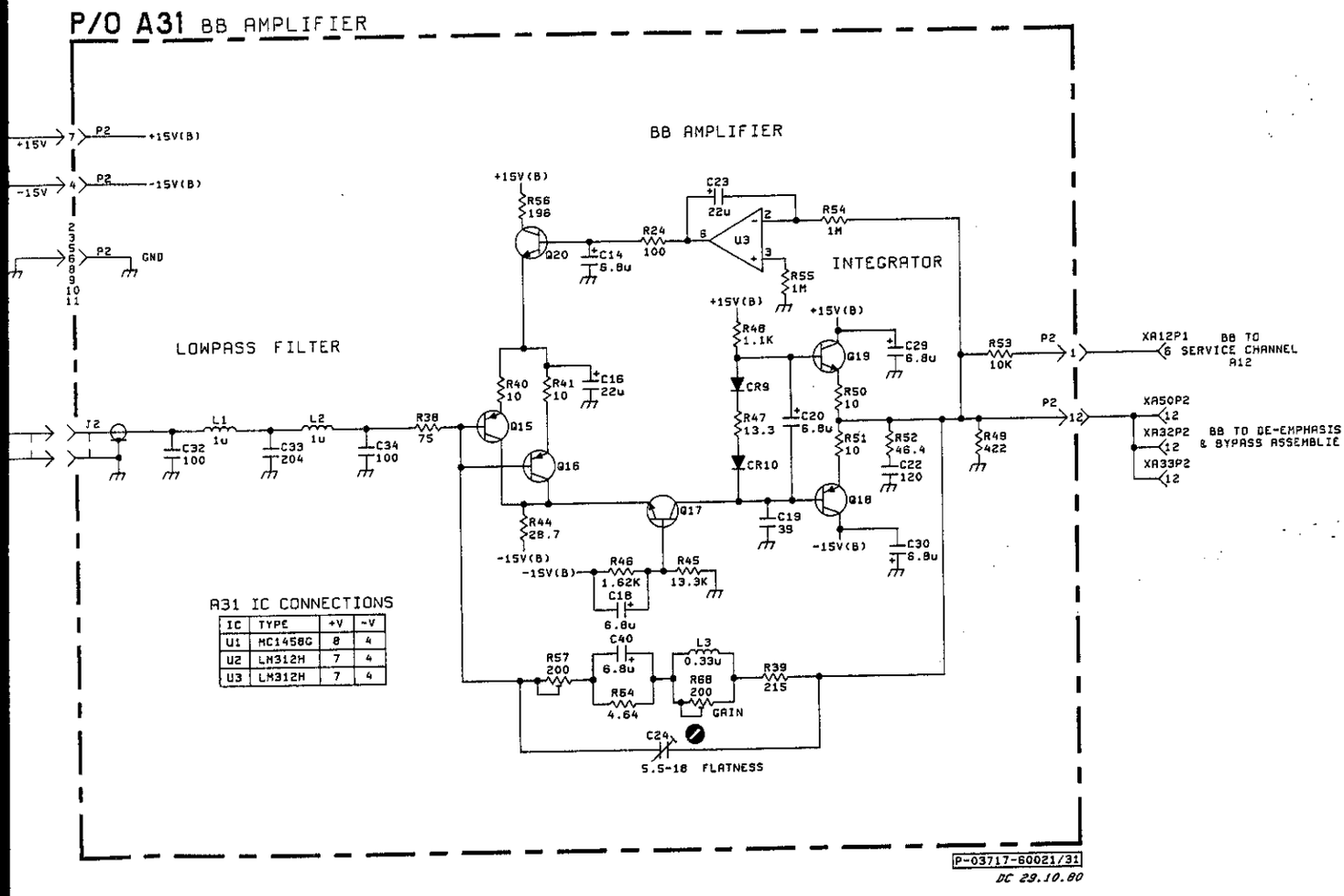


Figure 8-27 A21/A31 Schematic Diagram

SERVICE SHEET 5

8-38 INTRODUCTION

This service sheet contains details of the service channel, a sub baseband voice channel which allows in the telephony mode two-way voice communication, and a 10kHz calling facility by direct modulation of the 70MHz IF. The service channel is disabled in the video mode.

8-39 CIRCUIT DESCRIPTIONS

8-39-1 The call tone is generated by a 10kHz oscillator U3. U3 is enabled by the front panel SERVICE CHANNEL switch grounding U6(3), which causes U6(4) to go high and so enable the oscillator.

8-39-2 The microphone output is amplified by U1, which also accepts on its inverting input (pin 2), the 10kHz call tone. The speech or calling signals are lowpass filtered by C5, L2 and another capacitor (A11C1) of the same value as C5 but located on the A11 assembly (the pcb connector assembly for the modulator). A matching pad consisting of R13 and the resistors R1 and R2 on assembly A11 set the level applied to the modulator. R17 passes the speech side tone to the earpiece circuits.

8-39-3 R1 sets the microphone bias current via CR1. In the video mode, the microphone is disabled by a TTL high from the keyboard logic assembly A4, which causes U6(8) to go low and pass the microphone current to ground. The microphone is also disabled by the front panel SERVICE CHANNEL switch, which in the OFF position grounds U6(11) which causes U6(12) to go low and pass the microphone bias current to ground.

8-39-4 The A31 assembly amplifies the demodulated speech and call signals and applies them to U2 on the A12 assembly. Amplifier U2 passes the speech signals to lowpass filter R21, C11 and to the earpiece via J1(3). CR2 and CR3 prevent overload transients reaching the earpiece.

8-39-5 A 10kHz call tone received by U2 is bandpass filtered and amplified by U4, then detected by CR4. So that the buzzer comparator U5 does not trigger on transients, R22 slows the charging of C9. When the charge on C9 reaches approximately 0.5V, the comparator triggers, pulling U5(7) low, turning the buzzer E1 on.

8-39-6 Comparator U5 is disabled in the video mode by a TTL high from the A4 keyboard logic assembly which causes U6(6) to go low. The buzzer is also disabled by the front panel SERVICE CHANNEL switch, which in the OFF position, grounds the cathode of CR5, which also pulls U5(6) low disabling the buzzer.

8-40 A12 SERVICE CHANNEL TROUBLE-SHOOTING

Set the I/O SELECT to TELEPHONY and remove any inputs on the TELEPHONY INPUT. Connect one of the IF OUTPUTs to the IF INPUT. Ensure that S1 on the A12 assembly is in the buzzer enable position. If the buzzer does not sound, check with a spectrum analyzer that the 70MHz IF OUTPUT is deviated by about 100kHz pk-pk. If it is not, check test points 2 and 3 as described below. If the IF OUTPUT is correct, check test points 4, 5, 6 and 7 as described below.

A12 Modulator Section		A12 Demodulator Section	
Signal Levels		Signal Levels	
TP 2	0 to −1.5V 100kHz sq wave	TP 4	0.01V pk-pk 1000kHz sinewave
TP 3	0 to −0.8V 100kHz sinewave	TP 5	0.4V pk-pk 100kHz sinewave
		TP 6	0.2V pk-pk 100kHz sinewave
		TP 7	5.6V pk-pk 100kHz sinewave

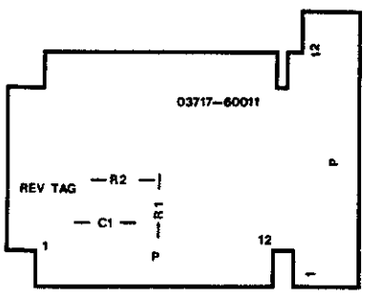


Figure 8-28 A11 Component Location

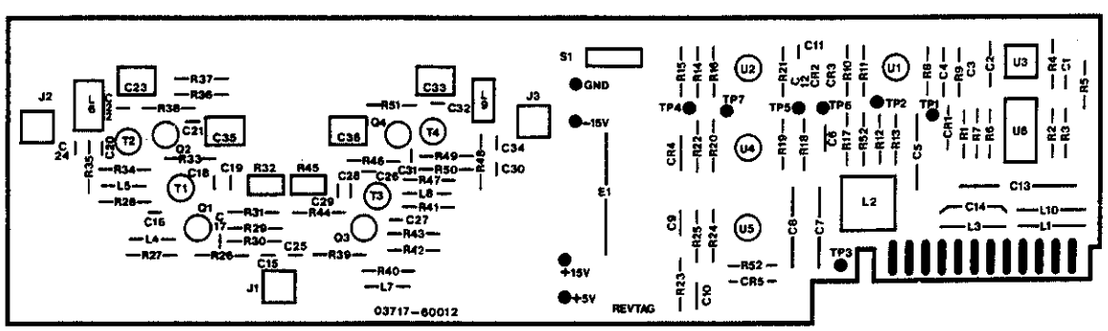


Figure 8-29 A12 Component Location

Fig 8-30
Sht 1 of 3

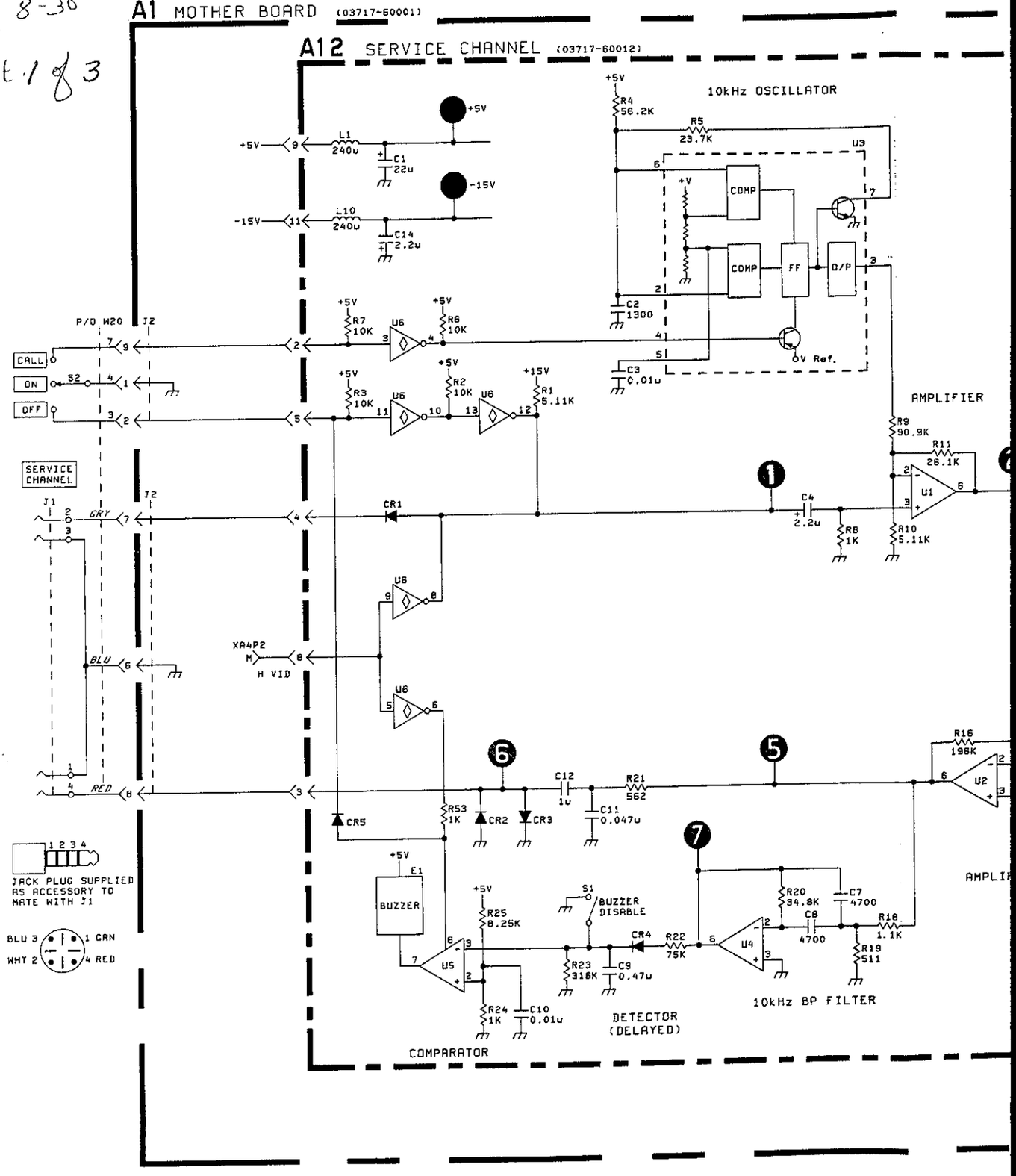


Fig 8-30 Sht 2 of 3

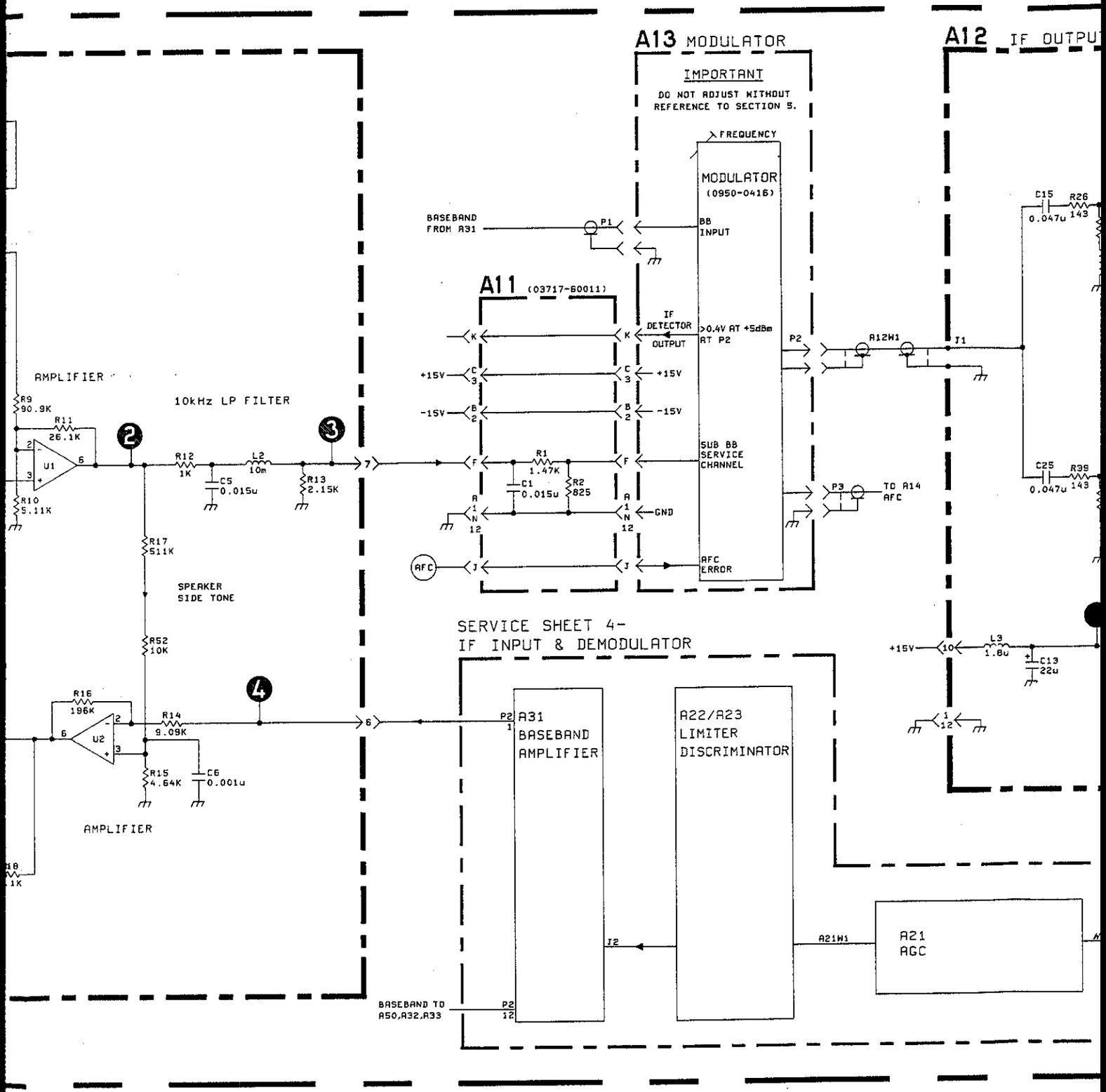
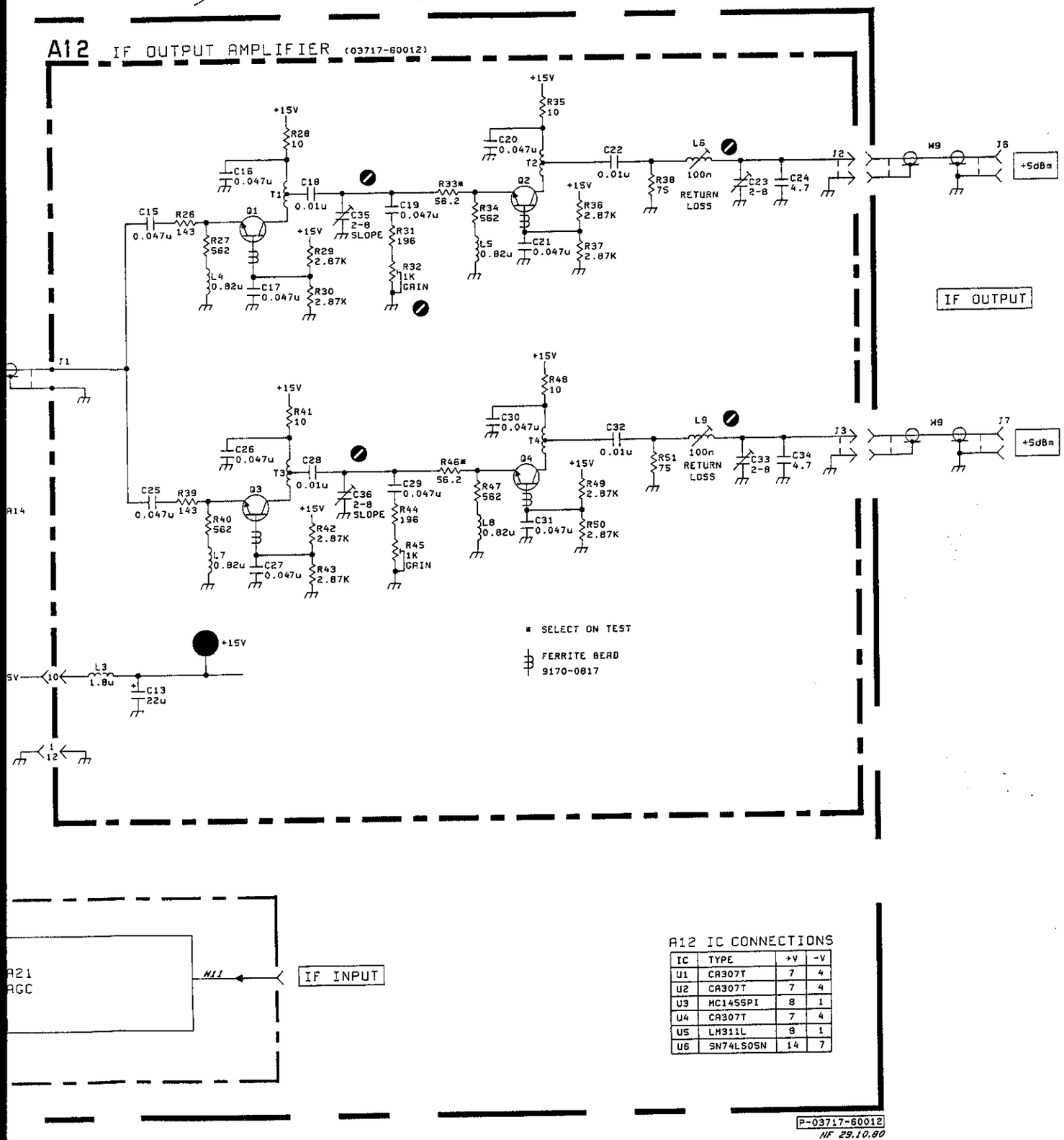


Fig 8-30 Sht 3 of 3



A12 IC CONNECTIONS

IC	TYPE	+V	-V
U1	CA3077T	7	4
U2	CA3077T	7	4
U3	MC1455PI	8	1
U4	CA3077T	7	4
U5	LM311L	8	1
U6	SN74LS05N	14	7

Figure 8-30 A12/A11 Schematic Diagram

SERVICE SHEET 6

8-41 INTRODUCTION

The CAL/UNCAL, EMPHASIS, TELEPHONY and VIDEO switching functions are all accomplished by FET switches on the various assemblies, controlled by front panel keys mounted on the A3 assembly immediately behind the front panel. The operation of the keys is detected by the keyboard logic on assembly A4, converted to TTL levels and routed to the appropriate assemblies. This service sheet contains details of the keyboard assembly A3 and the keyboard logic assembly A4. At the end of this service sheet will be found the relevant schematic diagrams and component locations.

8-42 CIRCUIT DESCRIPTIONS

8-42-1 In the local mode, or in the absence of HP-IB control, A3Q1 is held on by +5V on its base. Pressing one of the EMPHASIS keys, discharges to ground through A3Q1, the capacitor on the selected line. A resistor in the discharge path slows the rate of discharge and avoids ringing on the input of A4U1.

8-42-2 When the input to A14U1 (a schmitt trigger inverter) goes low, a TTL high is produced on its output. The high on the output of A4U1 is inverted by A4U5 and so a low is applied to the D-type flip-flops A4U8. The high on the output of A4U1 is also applied to the NOR gates A4U3A and B which produce a low on pin 1 of the monostable A4U7A, which triggers it. The rising edge of the pulse produced by the monostable, clocks the data on the inputs of the D-type flip-flops onto their outputs and from there to the various emphasis assemblies.

8-42-3 The operation of the BAL, TELEPHONY and NORM keys is the same as that described above, except that an equivalent of the inverter A4U5 is not required as the $\bar{Q}$ outputs of the flip-flops are used.

8-42-4 The operation of the MOD INV, DEM INV and UNCAL keys is complicated by the necessity of providing, for HP-IB operation, the means to turn these functions off, without selecting another function as is the case with the other keys. This is accomplished with D-type flip-flops A4U11A, B, and 9A and the three low true OR (+ve AND) gates A4U6. In the local mode, A4U11A and B are reset by a TTL high on the NORM line or if the NORM line is low, by the high on the $\bar{Q}$ output (pin 11) of A4U10. A4U9A is reset by the LPON signal. In this state, the $\bar{Q}$ output of the flip-flops is high and so a high is applied to the D inputs. When the relevant key is pressed, the high on the D input is clocked onto the Q output and consequently a low appears on the $\bar{Q}$ output and therefore on the control line.

8-42-5 The four NAND gates A4U13 detect, when the video mode is selected, (to turn on, the video assembly A33 and to disable the service channel), and when there is no telephony or no video emphasis required (to select the appropriate emphasis bypass path).

8-42-6 A4U12D detects, when the video NORM mode is selected, and neither MOD INV or DEM INV is selected.

8-42-7 When the instrument is under HP-IB control, the keyboard is disabled by the REM line going low, which turns A3Q1 off. The HP-IB lines (except MOD INV, DEM INV and UNCAL) are in parallel with the keyboard lines and therefore, when they go to their active low state, control the instrument in the same way as the keyboard.

8-42-8 The other three lines (MOD INV, DEM INV and UNCAL) control the instrument in the HP-IB mode by setting the "S" inputs of the appropriate flip-flops low which sets the $\bar{Q}$ outputs and therefore the control lines low. Turning these functions off (MOD NORM, DEM NORM and CAL) is accomplished by setting the "R" inputs of the flip-flops low via A4U6A, B and C which sets the $\bar{Q}$ outputs and therefore the control lines high. On receipt of any of the HP-IB CLEAR messages, A4U4B sets pin 9 of the monostable A4U14 high, when the CLEAR line goes high again, the high-to-low transition on pin 9 of A4U14 triggers the monostable and the emphasis is set to OFF, the I/O select to TELEPHONY and the cal/uncal to CAL – via A4Q1, Q2 and U6A respectively.

8-42-9 At switch-on the instrument is set to the same state as it is when it is cleared, the only difference being that the monostable A4U14 is triggered by a low-to-high transition on pin 10, instead of a high-to-low transition on pin 9.

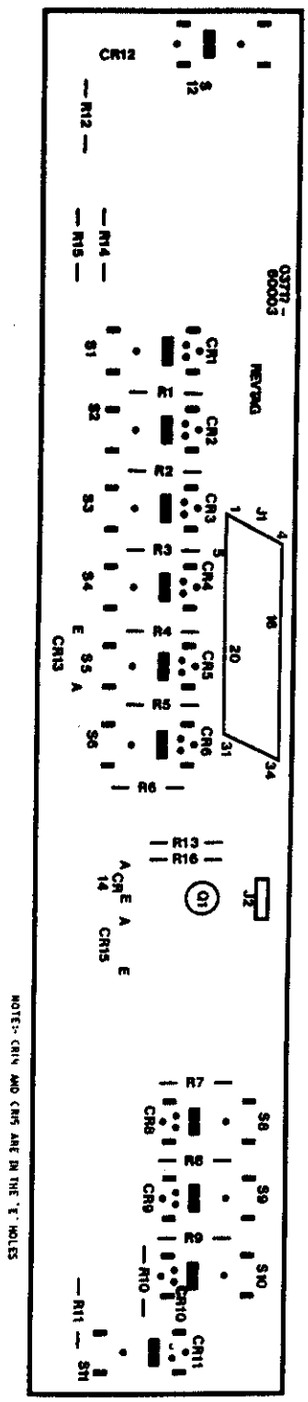


Figure 8-31 A3 Component Location

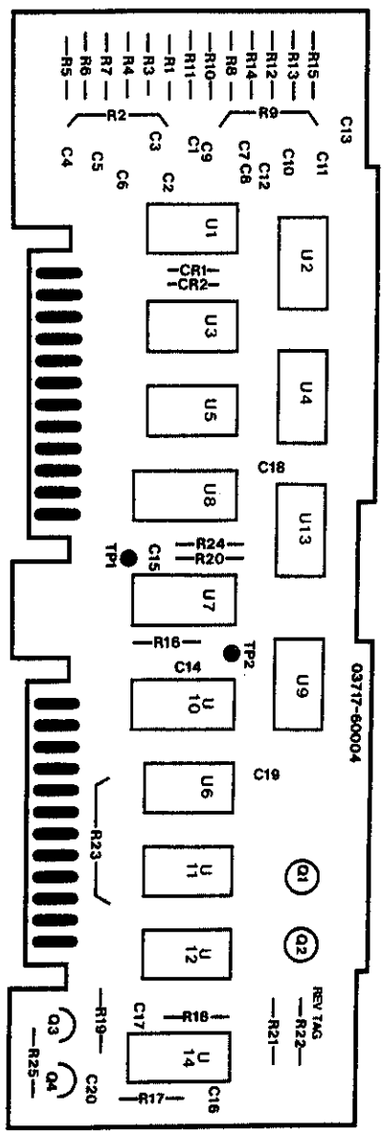
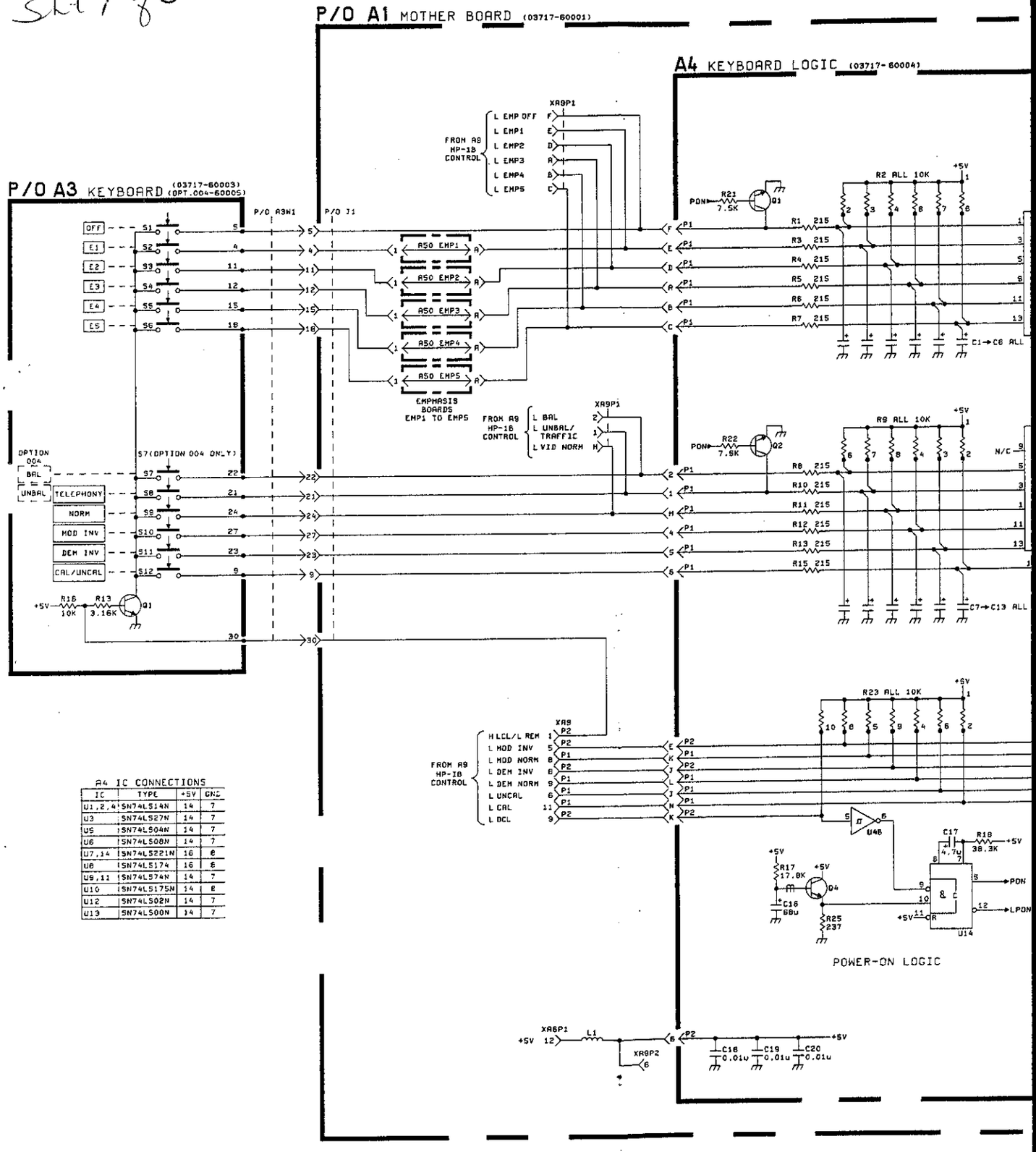


Figure 8-32 A4 Component Location

Fig 8-33
Sht 1 of 3



A4 IC CONNECTIONS

IC	TYPE	+5V	GND
U1,2,4	SN74LS14N	14	7
U3	SN74LS27N	14	7
U5	SN74LS04N	14	7
U6	SN74LS08N	14	7
U7,14	SN74LS221N	16	8
U8	SN74LS174	16	8
U9,11	SN74LS74N	14	7
U10	SN74LS175N	14	8
U12	SN74LS02N	14	7
U13	SN74LS00N	14	7

Fig 8-33
Sht 2 of 3

GIC (09717-60004)

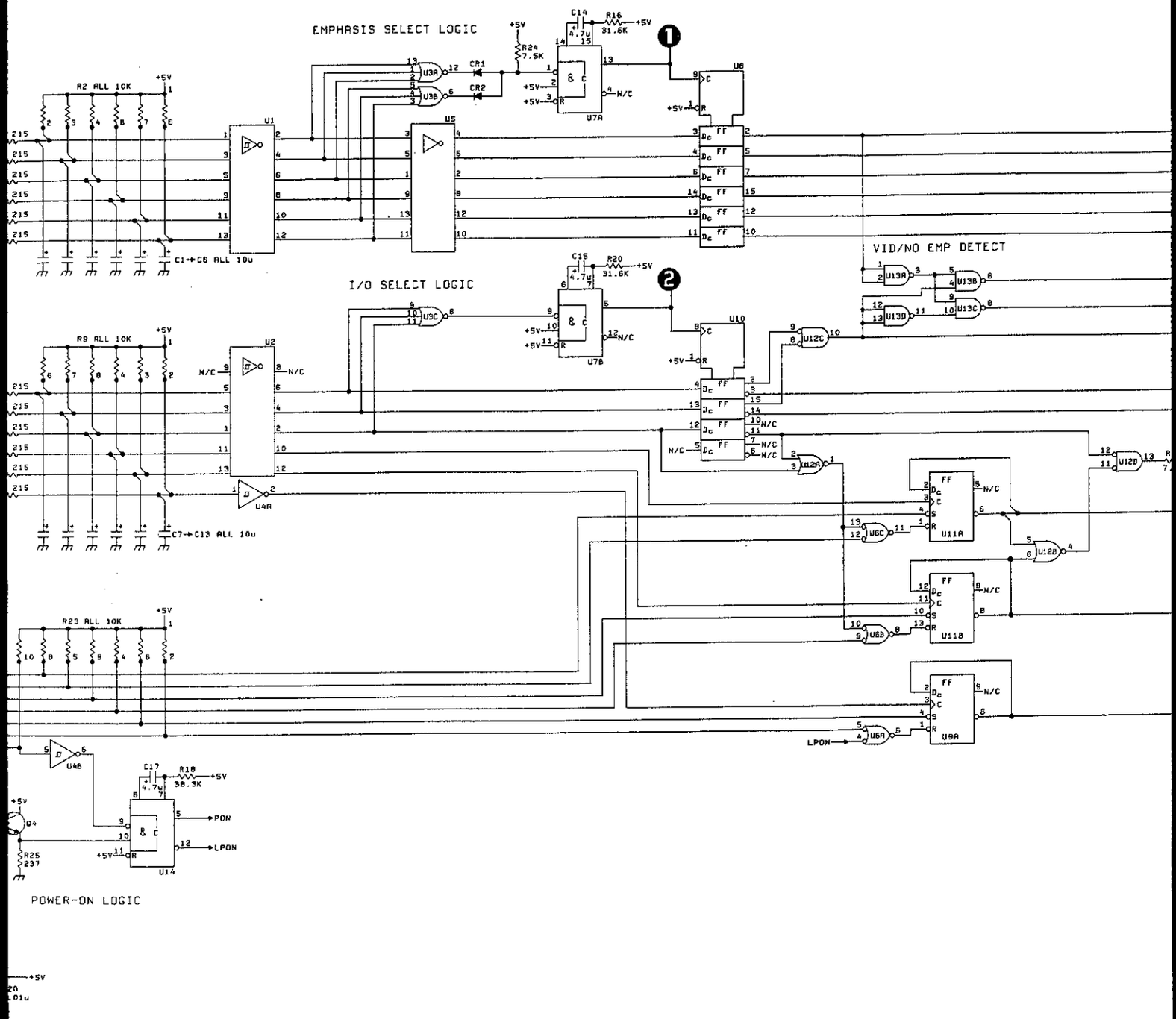


Fig 8-33 Sht 3 of 3

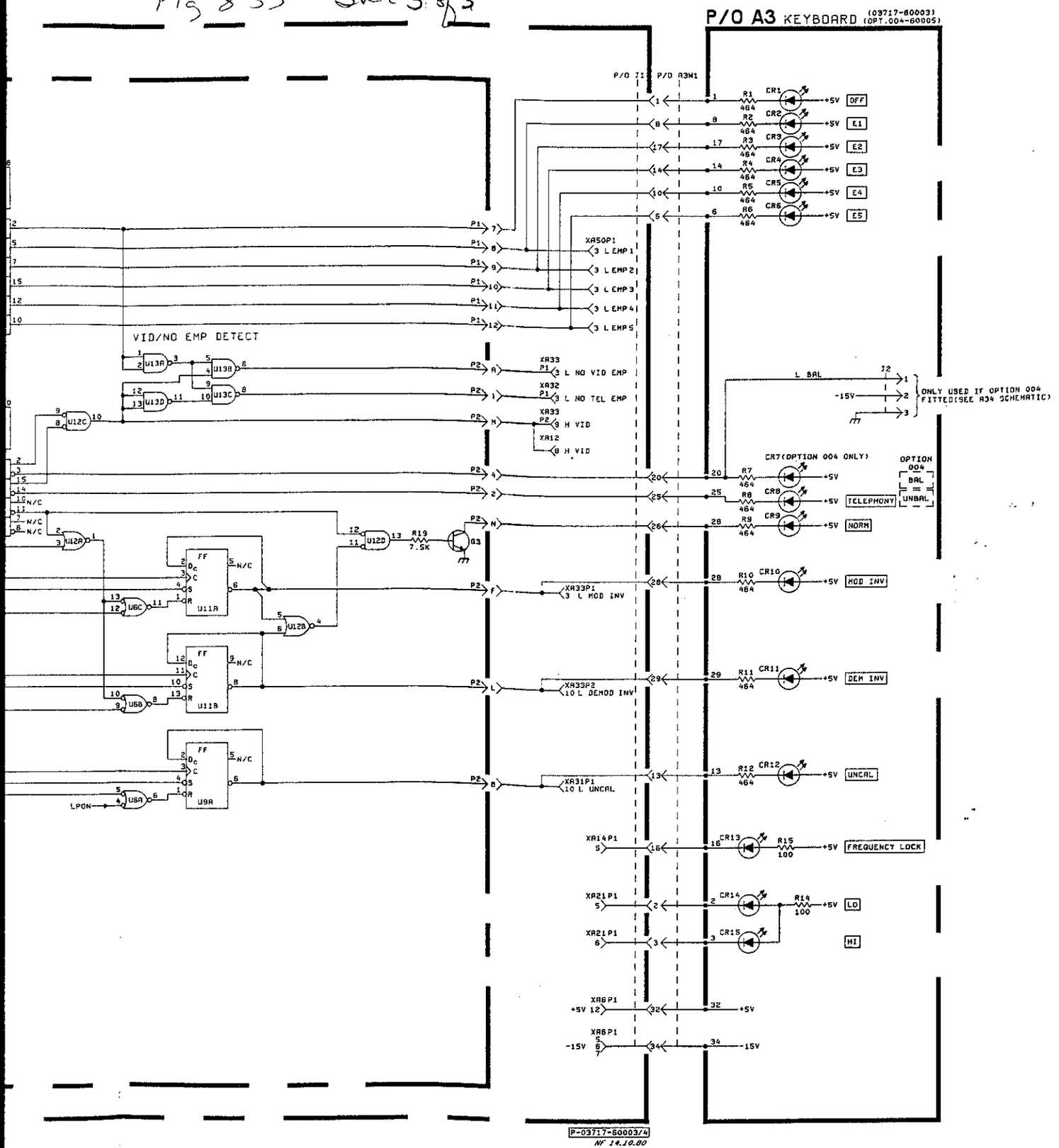


Figure 8-33 A3/A4 Schematic Diagram

SERVICE SHEET 7

8-43 INTRODUCTION

The Hewlett-Packard Interface Bus (HP-IB) is Hewlett-Packard's implementation of the IEEE Std. 488-1978. This service sheet contains details of the 3717A HP-IB option (Opt 100). The HP-IB assemblies A9 and A10 allow the bus controller to control the EMPHASIS, CAL/UNCAL and I/O SELECT functions. (The Service Channel, Attenuator and Power On/Off can not be remotely controlled.) The A9/A10 schematic diagrams and component locations will be found at the end of this service sheet. The circuit descriptions which follow assume a basic knowledge of HP-IB operation. Those unfamiliar with the bus are recommended to refer to the "Tutorial Description of the Hewlett-Packard Interface Bus" (hp Part Number 5952-0156).

8-44 CIRCUIT DESCRIPTIONS

8-44-1 The HP-IB connector (details of which will be found in Section II) is on the A10 assembly which is mounted on the rear panel of the instrument and connected to the A9 assembly via a ribbon cable.

8-44-2 The bus lines are input via non-inverting transceivers A10U1 to 4 which maintain the low-true logic of the bus. Also on the A10 assembly is the detector which responds to the bus command "UNLISTEN" (ASCII "?"/binary 111111) by setting the LUNL line low which sets the Listener Interface flip-flop on the A9 assembly.

8-44-3 In the command mode the controller dictates the role of each device on the bus by setting the ATN line true (low) and sending talk and listen addresses on the data lines. While ATN is true all devices must listen to the data lines. When ATN is false (high) only devices that have been addressed will respond.

8-44-4 The MLA (my listen address) detector A9U3 compares the address on the data lines DIO 1 to DIO 5 with the address as set by the HP-IB address switches A1 to A5 (refer to Section II for further information about the address switches). When the detector senses that both addresses are the same it sets A9U3 pin 14 high. Note that A9U3 has to be enabled by a low on pin 1 which only happens when data lines 7 and 6 are high and low respectively, indicating a listen address. (The 3717A is a listener only and can not respond to a talk address.) The MLA line is set high when both addresses are the same and ATN is true (in this case $\overline{\text{LATN}}$ high).

8-44-5 The acceptor handshake is accomplished in the 3717A by a SR flip-flop (A9U11 pin 3 is the Q output and A9U11 pin 11 the $\overline{Q}$ output). At the start of a handshake sequence (DAV high) and with the flip-flop reset, NRFD and NDAC will be low (true). In the command mode, the controller sets ATN true (low) which changes the S input from high to low, setting the flip-flop Q output high and therefore NRFD high (acceptor ready state). When the controller senses NRFD high, it sets DAV low (true) which sets the acceptor handshake logic to ACDS (accept data state) and NRFD low again while data is being transferred. After a delay of 1.5μs (the delay on the $\overline{\text{LDAV}}$ line to A9U14 pin 2) the acceptor flip-flop is set by the R input going low which sets NDAC high (false). The controller senses when the last NDAC line has gone high and sets DAV false indicating that the data on the lines is no longer valid which sets NRFD high (false) and resets the flip-flop to ACRS (acceptor ready state).

8-44-6 Because the DCL (device clear) and SDC (selected device clear) messages (both sent in the command mode) are decoded in a ROM (A9U9) a delay of 150ns is added by R10/C13 to the ACDS line (ACDS 1 + 150ns = ACDS 2) to allow the ROM address lines time to settle before enabling the outputs. The ROM sets the LDCL (low device clear) line low on receipt of DCL or SDC, which in addition to resetting the instrument, resets the acceptor flip-flop, which sets NDAC high, causing the controller to set DAV high which sets NRFD high and resets the flip-flop to ACRS.

8-44-7 The listener interface provides the 3717A with the capability to receive device dependent data over the data bus, which it does only when addressed. It is comprised of a SR flip-flop in which A9U11(6) is the Q output and A9U4(8) the $\overline{Q}$ output. With the flip-flop reset, LIDS (listener idle state) is true (high). If in this state, ATN goes false (data mode) the 3717A is prevented from handshaking by LTX (low transmit) going high which disables the bus transceiver A10U3, preventing NRFD from being set high on the bus. The interface is set and LADS (listener addressed state) true (high) when the acceptor handshake sets ACDS 1 high and the MLA detector sets MLA high. In this condition, LIDS being low turns the front panel LISTEN led on and sets LTX low allowing the acceptor handshake to set NRFD high on the bus, indicating to the controller that the instrument is ready to accept data. When the controller goes into the data mode and sets ATN high and then indicates that the data is valid by setting DAV low, the acceptor handshake is set to ACDS and the FLG CLK (flag clock) line is set low (test point 1).

Figure 8-33 A3/A4 Schematic Diagram

8-44-8 The falling edge of the FLG CLK line triggers the local message flag monostable A9U15A which provides a pulse of 150ms duration, delaying the generation of the LRDY 1 (low ready 1) line and providing time for the outputs of the decoders (connected to the A4 debounce circuits) to float high. The falling edge of the monostable pulse clocks the J-K flip-flop A9U16A producing a negative pulse on its Q output and therefore on the LRDY 1 line. The negative pulse on the LRDY 1 line resets the acceptor handshake flip-flop and NDAC goes high indicating to the controller that the data has been accepted. The controller sets DAV high which sets NDAC low and puts the FLG CLK line high clocking (via CLK 1) the data on the D-type flip-flops A9U1 and 2 onto their outputs. At the same time the monostable A9U15B is triggered, producing the CLK 2 signal which enables the decoder outputs via LOUT 1, LOUT 2 and LOUT 3 for 30ms (the duration of the monostable pulse). This gives the A4 assembly sufficient time to accept the data. After 30ms the falling edge of the monostable pulse clocks the J-K flip-flop A9U16B setting the $\overline{Q}$ output and therefore the LRDY 2 line low. The LRDY 2 line sets the acceptor flip-flop to ACRS, NRFD goes high, and a new handshake sequence can begin when DAV goes low.

8-44-9 A ROM (A9U9) detects the bus commands DCL, SDC and GTL and sets the appropriate line low. ACDS 2 which occurs 150ns after ACDS 1, is used to enable the ROM so that the ROM address lines (data lines DIO 1 to DIO 7) have time to settle. Note that the LSREM line is low for all bus messages except the "local" message.

8-44-10 The remote/local SR flip-flop in the set state sets the LCL (local) line high and the REM (remote) line low. When the instrument is addressed, MLA is set high, REN is automatically set low (true) and the flip-flop is reset putting REM high, which enables the detector enable circuit, disables the keyboard (by setting LCL low) and turns the front panel REMOTE led on. The flip-flop can be set again to the local state if LSLCL (low set local) is decoded by the ROM A9U9.

8-44-11 The four D-type flip-flops of A9U9 latch the data on data lines DIO 1 to DIO 4 onto the inputs of decoders A9U21, 13 and 12. A9U21 is a four-to-eight line decoder which decodes the emphasis information. A9U13, a four-to-sixteen line decoder, and A9U12, a four-to-eight line decoder, together decode all the remaining functions. The D-type flip-flops of A9U1 latch the data on data lines DIO 5, 6 and 7 onto the decoder enable logic which decodes the data and enables the appropriate decoder/s via LOUT 1, LOUT 2 and LOUT 3. The time the decoder outputs are enabled (30ms) is determined by the CLK 2 line as described previously.

8-45 HP-IB TROUBLESHOOTING

Equipment Required:

Desktop Computer	.hp9825A	
Desktop Computer	.hp98210A	String-Advance Programming
. . . . .	.hp9862A	General I/O-Extended I/O
HP-IB Interface Card . . .	.hp98034A	
Logic Probe	.hp10525T	
Oscilloscope	.hp1740A	

Procedure:

Before starting this procedure initialise the 3717A by switching off for about 3s and then switch on again.

1 LISTEN CHECK

1-a Key the following instruction into the desktop computer.

wrt701

1-b Press EXECUTE and check that the LISTEN indicator lights. If this check is successful proceed to check 2, Remote Indicator Check.

Basic Handshake Check

1-c Check that the wrt 701 display has disappeared from the desktop computer display and has been replaced by the lazy T symbol. If this check is successful proceed to the My Listen Address Detector check 1-j.

1-d Press RESET on the desktop computer and check the following signals in the Listen Function logic on A9.

LATN at U17(5) is low
LTX at U17(6) is low

1-e Check the following signals in the Acceptor Handshake logic on A9.

LDAV at U19(12) is high
NDAC at U19(6) is low
NRFD at U19(11) is high

IMPORTANT

If a failure occurs at this point in the test, check that the ribbon cable connecting the A9 and A10 assemblies is installed correctly.

HINT: 1. All inputs to the Acceptor Handshake logic should be high except for $\overline{\text{LDAV}}$ and $\overline{\text{LATN}}$.

2. If the NRFD signal is low enter the wrt 701 instruction into the desktop computer and press EXECUTE. Check that the LATN signal goes low when EXECUTE is pressed causing a low going pulse at U20(11) that resets the flip-flop in the Acceptor.

1-f Enter the wrt 701 instruction into the desktop computer and press EXECUTE. Check the following HP-IB control signals on A9.

LATN at U20(9) is low
LDAV at U19(12) is low

1-g If either signal fails to go low check the contunuity of the DAV, ATN, NRFD and NDAC control lines through the Bus Transceivers on A10.

1-h Check the following signals on A9.

NRFD at U19(11) is low
NDAC at U19(6) is high

1-i Check continuity of the NRFD and NDAC signals through the Bus Transceivers on A10.

My Listen Address Detector Check

1-j Press ERASE, EXECUTE, then key the following program into the desktop computer.

0: cmd7, "!"
1: gto 0

1-k Press RUN and check for a repetitive high going pulse appearing at A9 TP2. If no pulse is present check the MLA Detector logic on A9.

1-l Check the following signals in the Listen Function logic on A9.

U11(6) is high
U4(8) is low

HINT: 1. The LIFC, LPON, and LUNL signals should all be high.

2. The MLA signal is a high going pulse that was checked at TP2 in the previous step.

3. The ACDS 1 signal should be a fast high going pulse that occurs when the $\overline{\text{LDAV}}$ signal rises. The width of the ACDS 1 pulse should be about 1μs and is determined by the time constant of R1 and C8 in the Acceptor Handshake logic.

1-m If the LISTEN indicator still fails to illuminate, check continuity of the LIDS signal to the LISTEN indicator on A7.

2 REMOTE INDICATOR CHECK

2-a Check the REMOTE indicator is illuminated. If this check is successful proceed to check 3, Local Lockout Check.

2-b Press ERASE, EXECUTE, then key the following program into the desktop computer.

0: cmd7, "!"
1: gto 0

2-c Press RUN and check the following signals in the Remote/Local logic on A9.

U6(3) pulses
U8(6) is high
U8(3) is low

If any of the signals are incorrect check the Remote/Local logic on A9.

HINT: 1. The MLA and inverted LSREM signals should both be pulsing high causing U14(6) to pulse low.

2. The LSCL and LPON signals should both be high.

2-d If the REMOTE indicator is still off check continuity of the REM signal line to the REMOTE indicator LED on A7.

3 LOCAL LOCKOUT CHECK

3-a Check that the front panel controls on the 3717A are disabled. If the controls are disabled proceed to check 4, Go-To-Local Check.

3-b Check the following signals in the Remote/Local logic on the A9 Assembly.

REM at U8(6) is high
U8(1) is high.

3-c Check that the low LCL signal turns off Q1 in A3 (Keyboard Assembly).

4 GO-TO-LOCAL CHECK

4-a Key the following instruction into the desktop computer then press EXECUTE.

lcl 701

4-b If the 3717A REMOTE indicator is off and the front panel controls are operative go to check 5, Unlisten Detect Check.

4-c Press ERASE, EXECUTE, then key the following program into the desktop computer.

```
0: cmd7, char (1)
1: gto 1
```

4-d Check that the LSCL signal at U9(3) pulses. If the LSCL signal fails to pulse check that all of the DIO lines except DIO 1 are high. DIO 1, LADS and ACDS 2 should all pulse.

4-e Check the following signals in the Remote/Local logic on A9.

U14(11) pulses
LPON at U14(10) is high
U14(8) pulses
LCL at U8(3) is high

4-f If the front panel controls are still inoperative check that the high LCL signal turns on Q1 in A3 (Keyboard Assembly).

5 UNLISTEN DETECT CHECK

5-a Key the following instruction into the desktop computer then press EXECUTE.

```
cmd7, "?"
```

5-b If the LISTEN indicator goes off proceed to check 6, Programming Check.

5-c Press ERASE, EXECUTE, then key the following program into the desktop computer.

```
0: cmd7, "?"
1: gto 0
```

5-d Press RUN and check the LUNL signal at A9 U6(4) pulses. If LUNL fails to pulse check the Unlisten Detector on A10.

HINT: The HP-IB data lines DIO 2 through DIO 7 should all be pulsing. DIO 1 should be high.

5-e Check the following signals in the Listen Function logic on A9.

U4(13) pulses
U4(8) is high

6 PROGRAMMING CHECK

6-a Check the programming ability on the 3717A by keying in the following instruction.

```
wrt 701, "U"
```

6-b Press EXECUTE and check that the UNCAL indicator lights.

6-c By substituting the appropriate ASCII character from Table 8-3 for the U in the above instruction, check that it is possible to select all of the other front panel controls.

6-d If the checks given in check 6-c are successful proceed to check 7, Selective Device Clear Check.

6-e If only 1 or 2 front panel controls can not be selected remotely proceed to step 6-j. If the majority of front panel controls cannot be selected proceed with step 6-f.

6-f Press ERASE, EXECUTE, then key the following program into the desktop computer.

```
0: wti 0,7
1: wti 4,52
2: gto 2
```

6-h Connect an oscilloscope to A9 TP(1) and press RUN on the desktop computer.

6-i Check that the waveform at A9 TP(1) is a repetitive signal which is high for approximately 30ms and low for approximately 160ms. If the signal is significantly different from this check the operation of the Local Message Flags Logic, see the description in Paragraph 8-44-8.

6-j Enter the program given in step 6-f into the desktop computer and press RUN. Line 2 in the program outputs decimal 52 (equivalent to ASCII character 4) onto the HP-IB data lines. The program will continually output this data which is the program code to select EMPHASIS 4. The following procedure checks the EMPHASIS 4 selection. To check any other code selection substitute the appropriate decimal code from Table 1 in place of the 52 in line 1 of the program.

6-k Check that the data latched into the Output Enable flip-flop U1 holds the output of NAND gate U5(8) low and that the signal line L OUT 1 is being pulsed low at U6(11).

6-l Check that the EMP 4 signal line at U21(7) is being pulsed low.

6-m If the EMPHASIS 4 indicator on the front panel is not illuminating check continuity of the EMP 4 signal line to A4 (Keyboard Logic Assembly).

Table 8-3 3717A Programming Codes

Function	ASCII Character	Decimal Code
Emphasis		
OFF	0	48
1	1	49
2	2	50
3	3	51
4	4	52
5	5	53
Modulator		
CAL	C	67
UNCAL	U	85
I/O Select		
TELEPHONY	T	84
VIDEO NORM	V	86
MOD INV (on)	J	74
MOD INV (off)	M	77
DEMOD INV (on)	K	75
DEMOD INV (off)	D	68
(Option 004)		
BAL	B	66
UNBAL (TELEPHONY)	T	84

Note: The "E" prefix to the emphasis codes given in Table 3-2 is not strictly necessary.

7 SELECTIVE DEVICE CLEAR CHECK

7-a Switch the 3717A off for about 3s then switch on. Press the CAL/UNCAL pushbutton to illuminate the UNCAL indicator.

7-b Key the following instruction into the desktop computer.

clr 701

7-c Press EXECUTE and check that the UNCAL indicator extinguishes. If this check is successful proceed to check 8, Device Clear Check.

7-d Press ERASE, EXECUTE then key the following program into the desktop computer.

0: cmd7, "!"
1: cmd7, char (4)

7-e Press RUN. Check A9 TP(4) pulses. If no pulse is present replace U9 in the DCL/SDC/GTL Detector.

7-f Check following signals in the Local Message Flags Logic on A9.

U15(1) pulses

7-g Check that the CLEAR signal on A4 Assembly triggers the monostable A4 U14 in the Power-On logic, causing U14(5) (PON) to pulse high.

8 DEVICE CLEAR CHECK

8-a Switch the 3717A off for about 3s then switch on. Press the CAL/UNCAL pushbutton to illuminate the UNCAL indicator.

8-b Key the following instruction line into the desktop computer.

clr 7

8-c Press EXECUTE and check that the UNCAL indicator extinguishes. If this check is successful the HP-IB troubleshooting is completed.

8-d Press ERASE, EXECUTE then key the following program into the calculator.

0: cmd7, char (20)
1: gto 0

8-e Press RUN and check A9 TP4 pulses. If no pulse is present replace U9 in the DCL/SDC/GTL Detector.

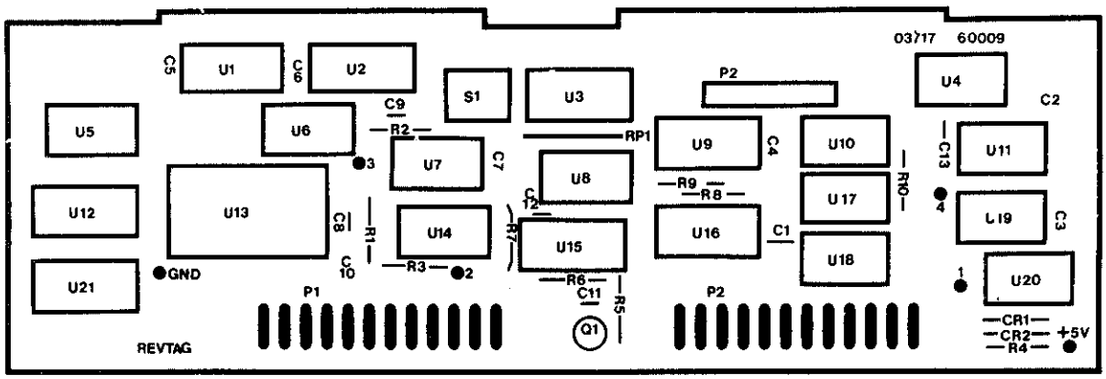


Figure 8-34 A9 Component Location

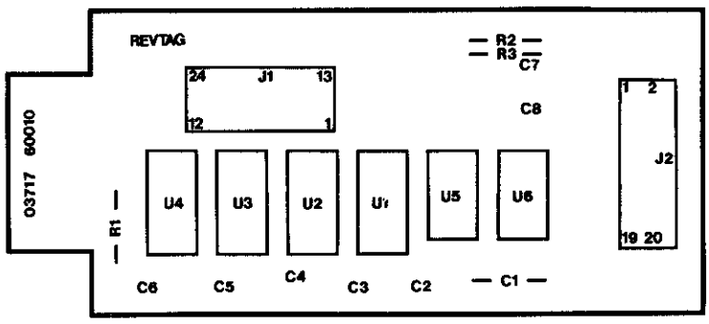


Figure 8-35 A10 Component Location

Fig 8-36
Sht 1 of 4

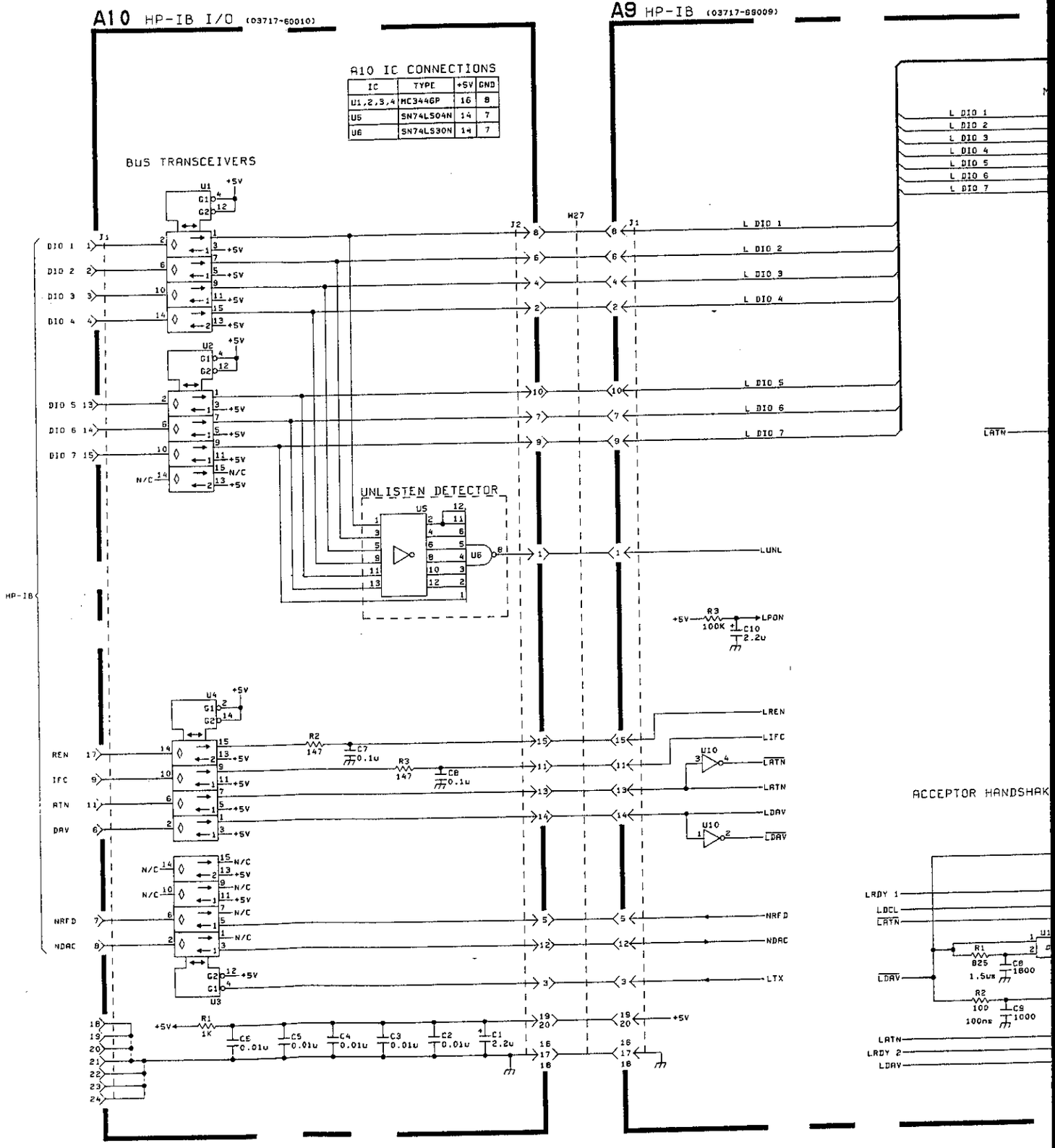
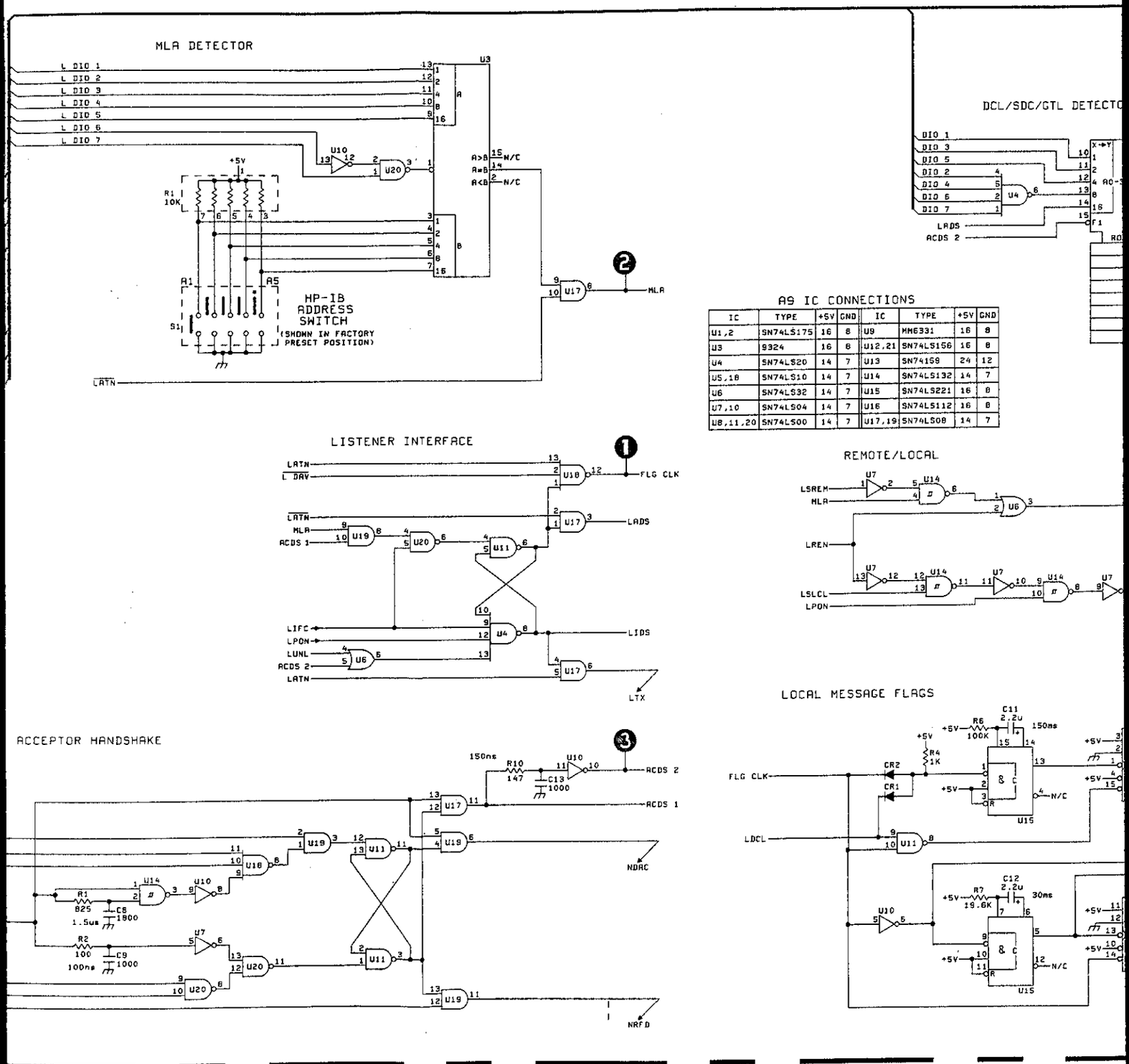


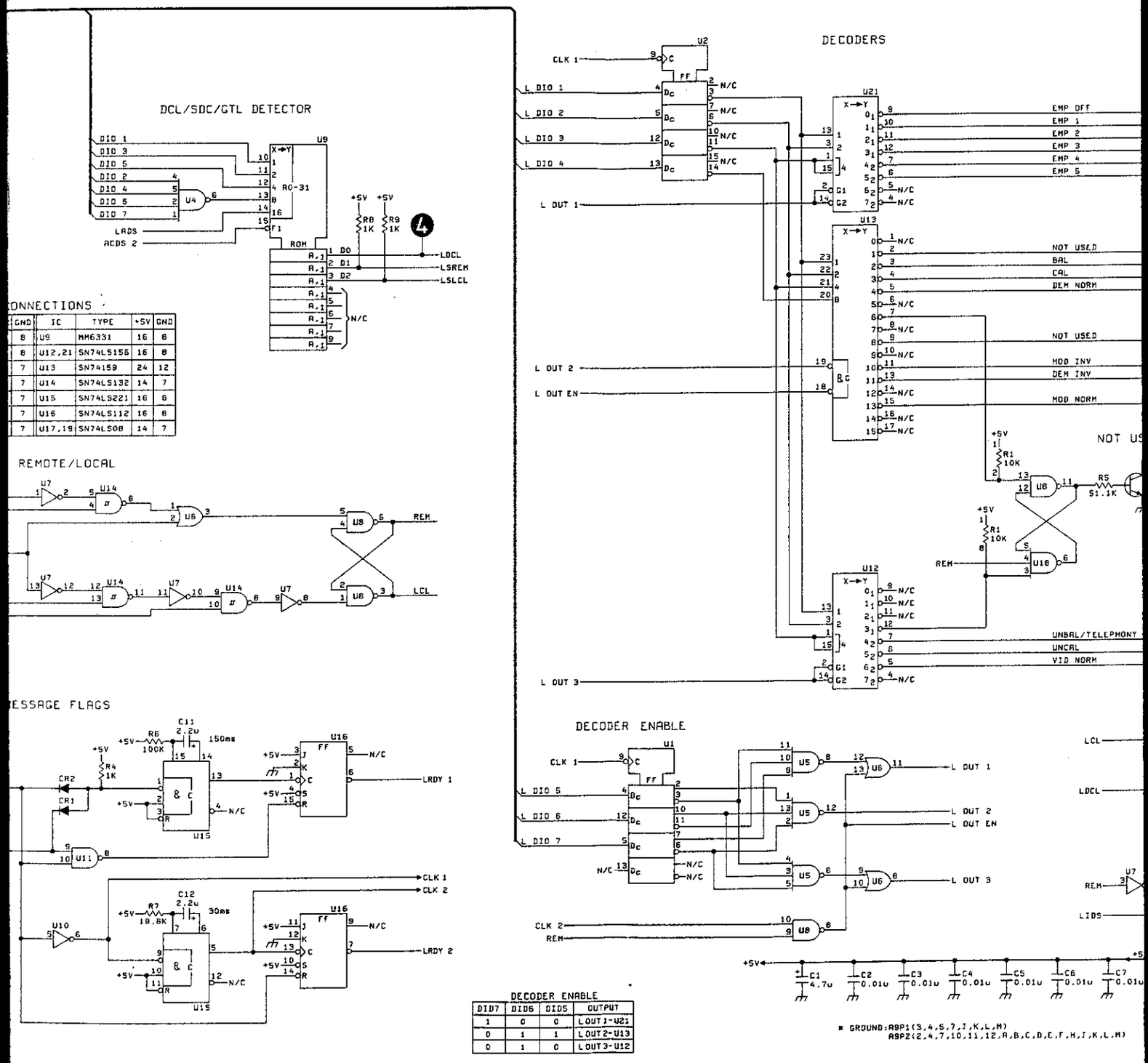
Fig 8-36
Sht 2 of 4



A9 IC CONNECTIONS

IC	TYPE	+5V	GND	IC	TYPE	+5V	GND
U1,2	SN74LS175	16	8	U9	MM6331	16	8
U3	9324	16	8	U12,21	SN74LS156	16	8
U4	SN74LS20	14	7	U13	SN74159	24	12
U5,18	SN74LS10	14	7	U14	SN74LS132	14	7
U6	SN74LS32	14	7	U15	SN74LS221	16	8
U7,10	SN74LS04	14	7	U16	SN74LS112	16	8
U8,11,20	SN74LS00	14	7	U17,19	SN74LS08	14	7

Fig 8-36
sht 3 of 4



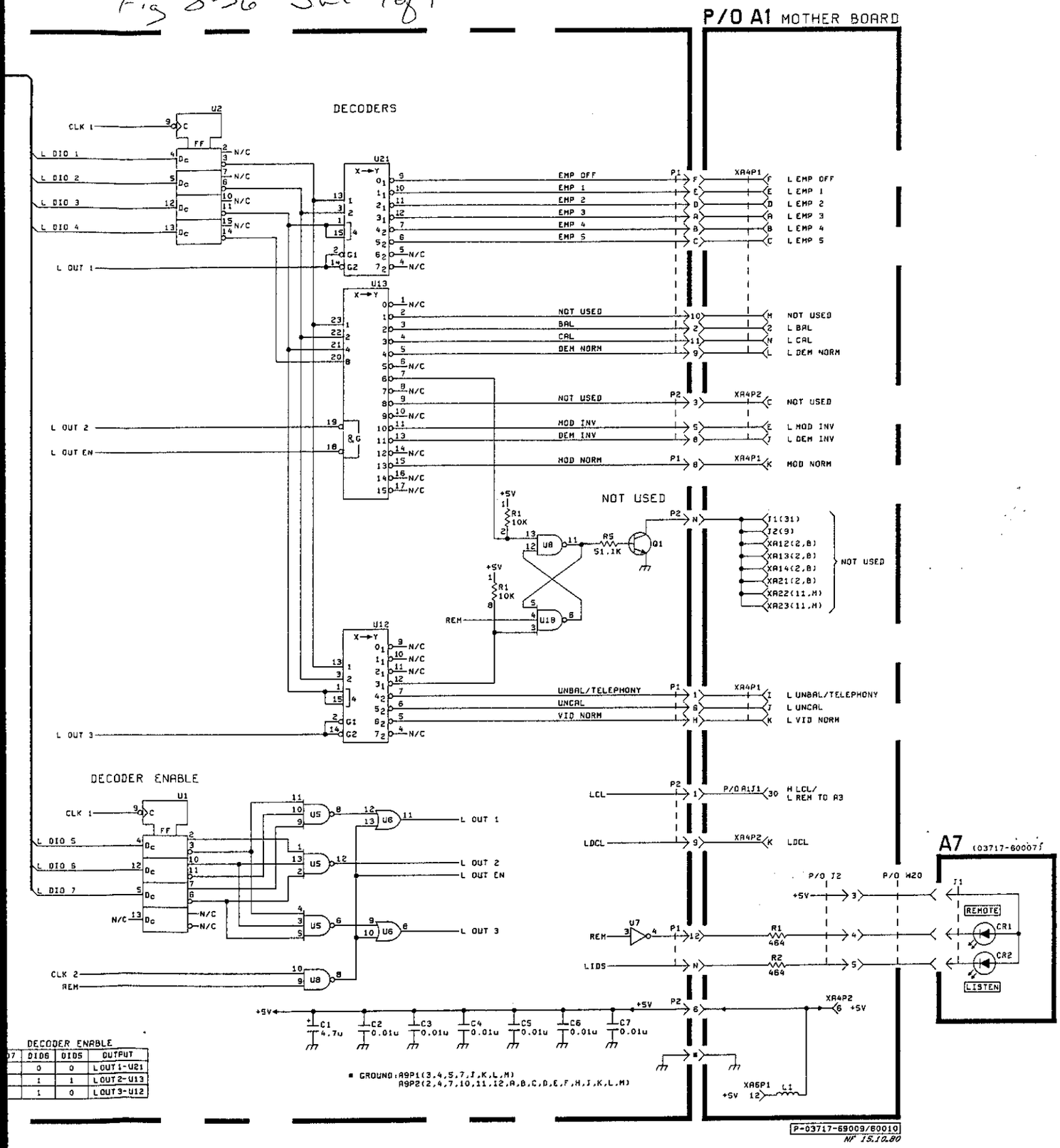
CONNECTIONS

GND	IC	TYPE	+5V	GND
8	U9	MM6331	16	8
8	U12,21	SN74LS155	16	8
7	U13	SN74159	24	12
7	U14	SN74LS132	14	7
7	U15	SN74LS221	16	8
7	U16	SN74LS112	16	6
7	U17,19	SN74LS08	14	7

DECODER ENABLE

DIO7	DIO6	DIO5	OUTPUT
1	0	0	LOUT1-U21
0	1	1	LOUT2-U13
0	1	0	LOUT3-U12

Fig 8-36 Sht 4 of 4



DECODER ENABLE

DIO6	DIO5	OUTPUT
0	0	L OUT 1-U21
1	1	L OUT 2-U13
1	0	L OUT 3-U12

Figure 8-36 A9/A10 Schematic Diagram

SERVICE SHEET 8

8-46 CIRCUIT DESCRIPTION

The 0-15dB Attenuator (which can be used at both BB and IF) is independent of the rest of the 3717A. Connections to and from the attenuator are made via the front panel connectors. Attenuation is provided by 1, 2, 4 and 8dB by network pads on a circuit board A2A1 mounted within a die-cast aluminium box A2MP1/MP2.

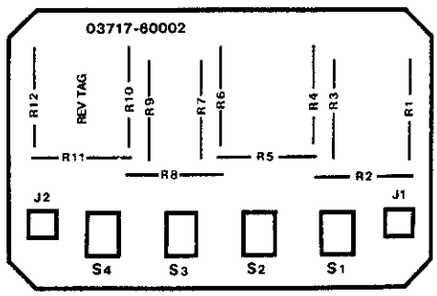


Figure 8-37 A2 Component Location

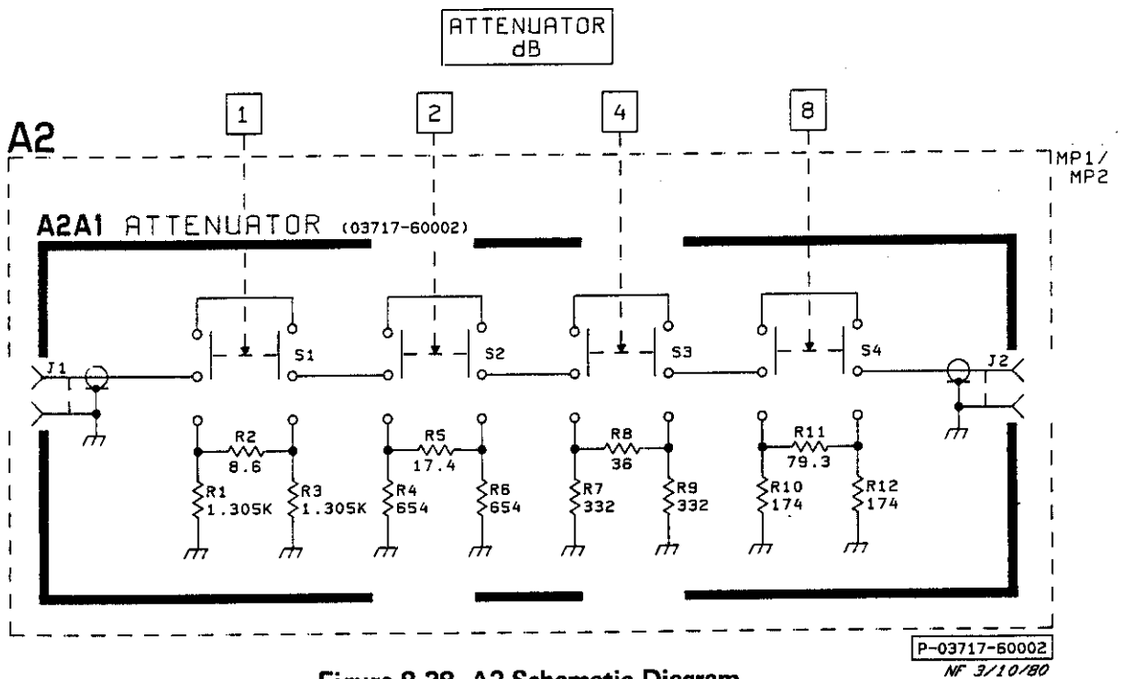


Figure 8-38 A2 Schematic Diagram

SERVICE SHEET 9

8-47 INTRODUCTION

This service sheet contains details of the power supply assembly A6. A component location and a schematic diagram will be found after the circuit description.

8-48 CIRCUIT DESCRIPTION

8-48-1 The A6 assembly provides three power lines to the 3717A circuits, +15V, −15V and +5V.

8-48-2 The +15V supply is provided by an integrated circuit voltage regulator A6U1 with a power transistor Q1 to increase the current handling ability.

8-43-3 The −15V supply is provided by the unity gain op-amp A6U2 which inverts the +15V line. The power transistor Q2 acts as an emitter follower on the output of Q2, increasing the current available. R15 and Q3 are the current sense components for the −15V supply and R15 and Q4 shut down the +15V regulator A6U1 when the −15V line current limits, to prevent damage to the 3717A circuits.

8-48-4 The +5V supply is provided by a conventional regulator U1 adjusted by R27.

8-48-5 Overvoltage sensing on all the lines is by a zener diode and a resistor. When approximately 0.7 to 0.8V is developed across the resistor an SCR is triggered which short circuits the supply, blowing the fuses. The trigger voltage to the −15V SCR is inverted by A6Q5.

8-48-6 LEDs on each supply indicate that a voltage is present, and that is approximately correct.

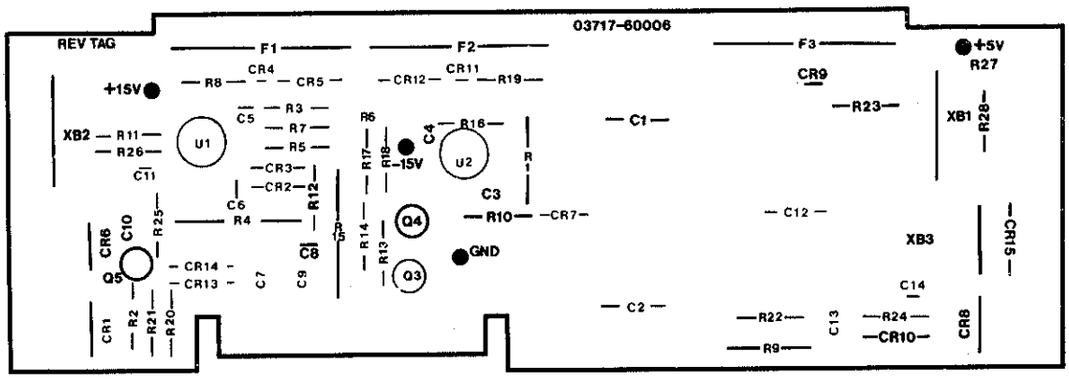


Figure 8-39 A6 Component Location

Fig 8-40
Sht 1 of 3

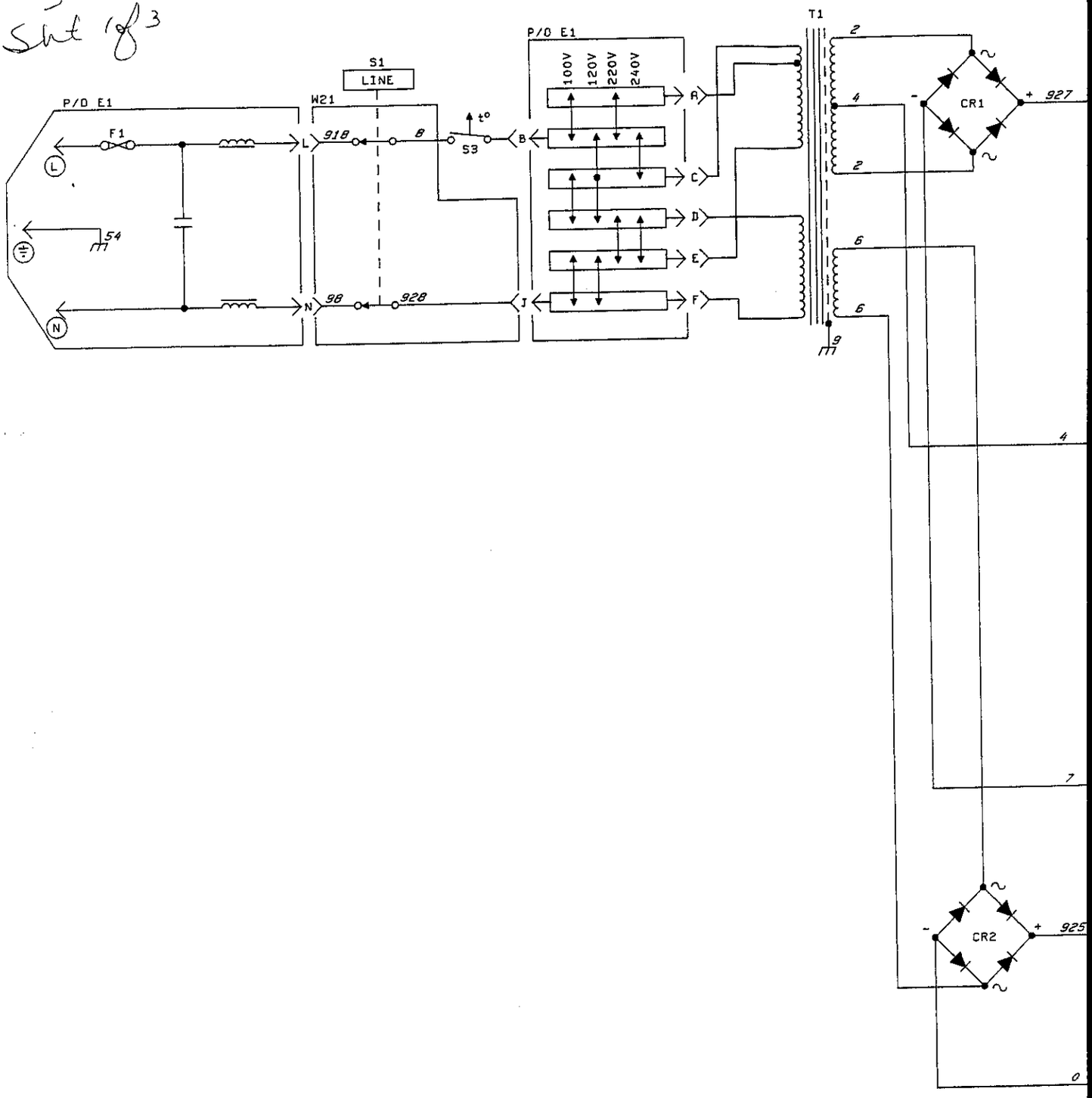
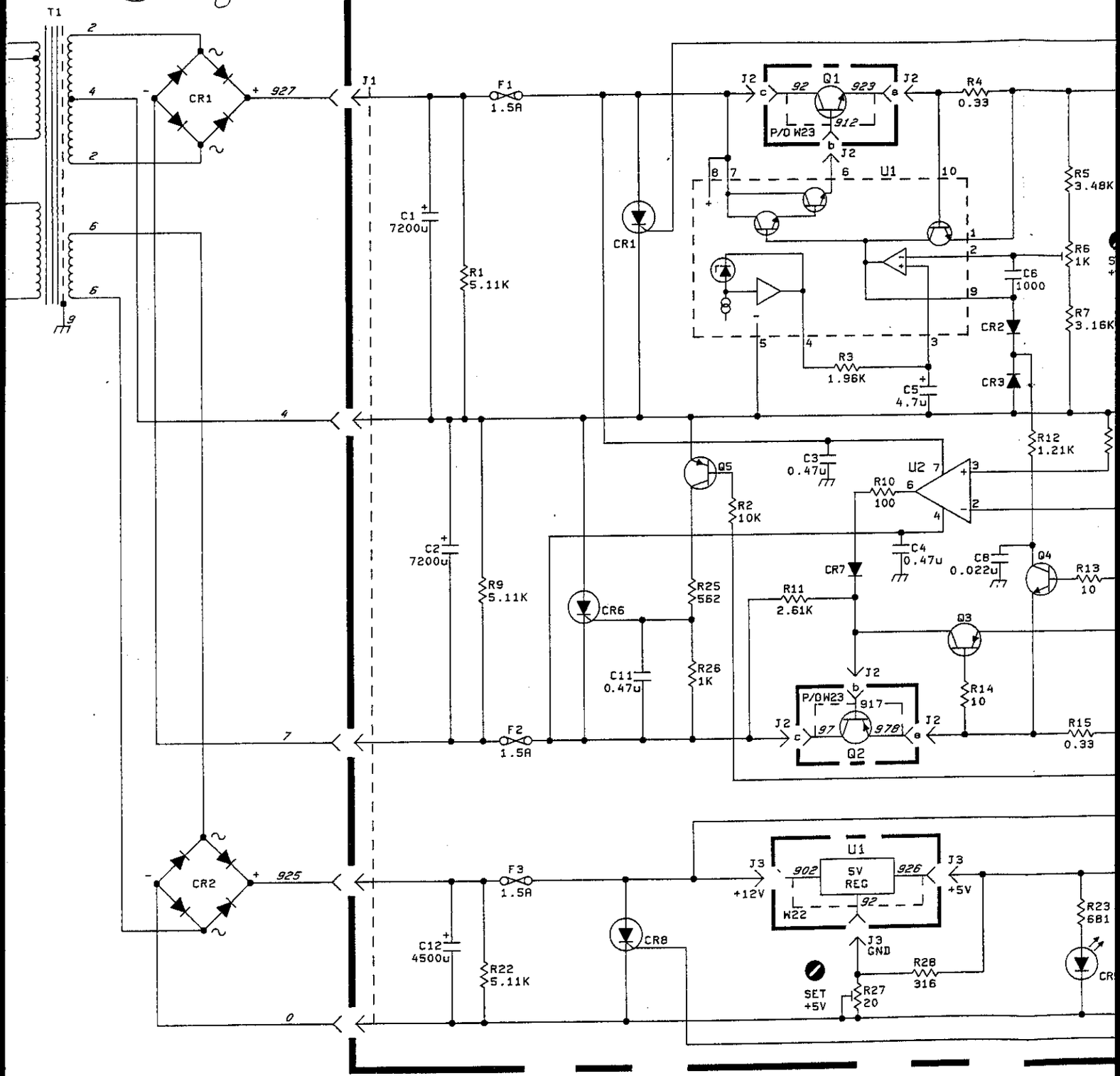


Fig 8-40
Sht 2 of 3

A6 POWER SUPPLY (03717-60006)



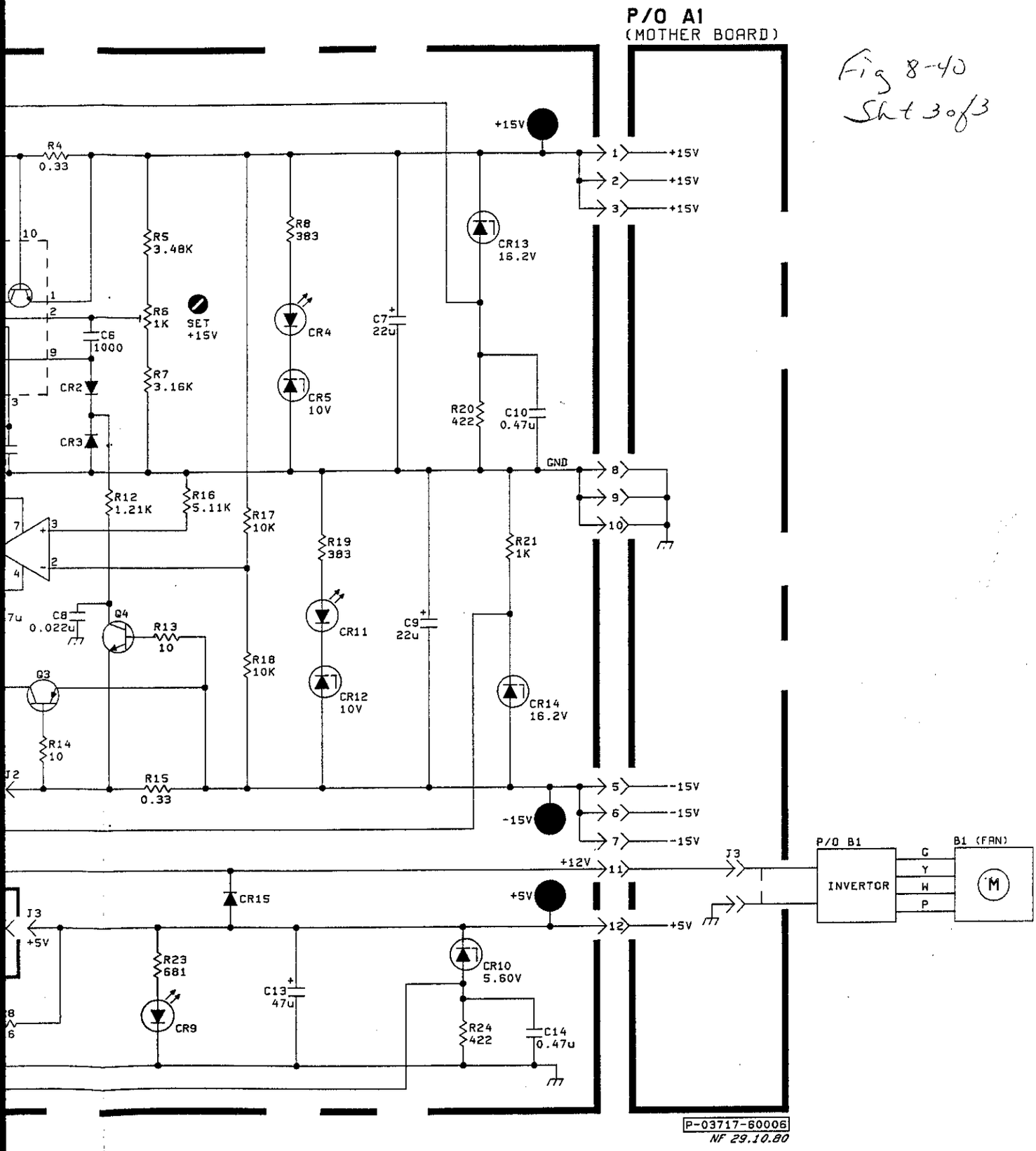


Figure 8-40 A6 Schematic Diagram