Notice

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`http://www.agilent.com/find/assist`

If you do not have access to the Internet, contact your field engineer. In any correspondence or telephone conversation, refer to your instrument by its model number and full serial number.

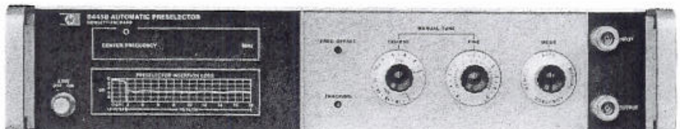
Agilent Technologies

Printed in USA July 2004

OPERATION AND SERVICE MANUAL

AUTOMATIC PRESELECTOR

8445B



HEWLETT PACKARD

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

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HEWLETT PACKARD

OPERATION AND SERVICE MANUAL

8445B
AUTOMATIC PRESELECTOR

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 2034A.

With modifications described in Section VII this manual also applies to earlier serial number prefixes.

For additional important information about serial numbers, see INSTRUMENTS COVERED BY MANUAL in Section I.

1400 FOUNTAIN GROVE PARKWAY, SANTA ROSA, CALIFORNIA, 95404, U.S.A.

MANUAL PART NO. 08445-90027
Microfiche Part No. 08445-90028

Printed: AUGUST 1980

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SAFETY CONSIDERATIONS
Safety Symbols

The following safety symbols are used throughout this manual and in the instrument. Familiarize yourself with each of the symbols and its meaning before operating this instrument.

⚠ Instruction manual symbol: the apparatus will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the apparatus against damage.

ϟ Indicates dangerous voltages.

CAUTION The CAUTION sign denotes a hazard. It calls attention to an operation procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the equipment. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

WARNING The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

Operation

WARNING

BEFORE THIS INSTRUMENT IS SWITCHED ON, its rear panel power module protective earth terminal must be connected through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact. Failure to ground the instrument can result in personal injury.

WARNING

The 8445B Automatic Preselector should not be operated without protective covers. Adjustments, performance tests, and service procedures which require operation of the 8445B with the covers removed should be performed only by trained service personnel.

CAUTION

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure that its rear panel power module switch is set to the voltage of the ac power source. Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

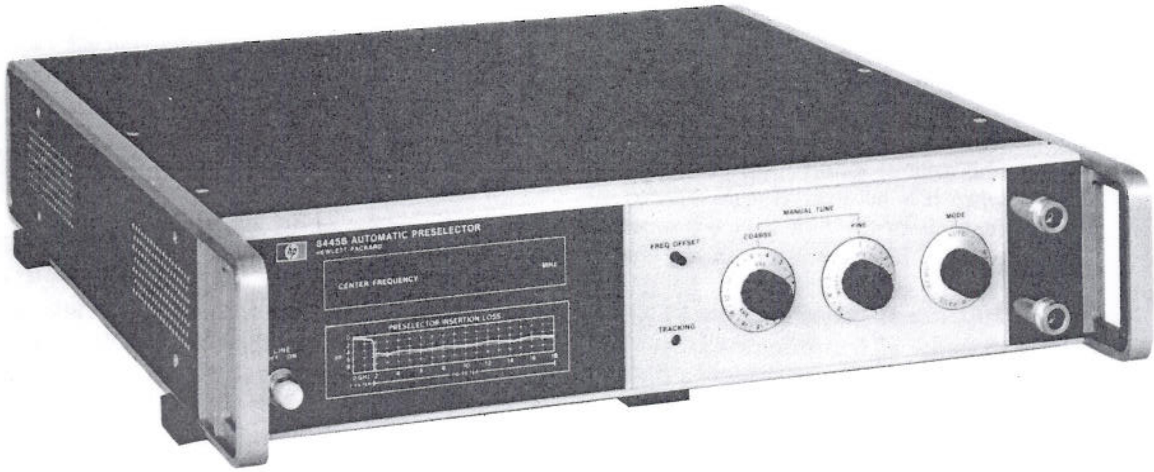
Service and Adjustments

WARNING

There are voltages at many points in the instrument which can, if contacted, cause personal injury. Be extremely careful. Service and adjustments should be performed only by trained service personnel.

WARNING

Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal may cause personal injury.



MODEL 8445B (OPTION 002/003)

LINE POWER CABLE

RF INTERCONNECT CABLE

INTERCONNECT CABLE

NOTE: See ACCESSORIES SUPPLIED in Table 1-3 for part number information.

Figure 1-1. Model 8445B and Accessories Supplied

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This manual contains all information required to install, operate, test, adjust and service the Hewlett-Packard Model 8445B Automatic Preselector. This section covers instrument identification, description, options, accessories, specifications and other basic information.

1-3. Figure 1-1 shows the Hewlett-Packard Model 8445B Automatic Preselector with Option 002 (manual tuning controls) and Option 003 (digital readout of center frequency). Accessories supplied with the 8445B are also shown in Figure 1-1.

1-4. The various sections in this manual provide information as follows:

SECTION I, GENERAL INFORMATION; contains the instrument description and specifications, explains accessories and options, and lists recommended test equipment

SECTION II, INSTALLATION, contains information concerning initial mechanical inspection, preparation for use, operating environment, and packaging and shipping.

SECTION III, OPERATION, contains detailed operating instructions for operation of the instrument.

SECTION IV, PERFORMANCE TESTS, contains the necessary tests to verify that the electrical operation of the instrument is in accordance with published specifications.

SECTION V, ADJUSTMENTS, contains the necessary adjustment procedures to properly adjust the instrument after repair.

SECTION VI, REPLACEABLE PARTS, contains the information necesssary to order parts and/or assemblies for the instrument.

SECTION VII, MANUAL BACKDATING CHANGES; contains backdating information to make this manual compatible with earlier equipment configurations

SECTION VIII, SERVICE; contains schematic diagrams, block diagrams, component location illustrations, circuit descriptions, and troubleshooting information to aid in repair of the instrument.

1-5. Supplied with this manual is an Operating Information Supplement. The Supplement is a copy of the first three sections of the manual, and should be kept with the instrument for use by the operator.

1-6. Also 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 containing up to 60 photoduplicates of the manual pages. The microfiche package also includes the latest Manual Changes supplement and all pertinent Service Notes.

1-7. SPECIFICATIONS

1-8. Specifications for the instrument are listed in Table 1-1. These are the performance standards the instrument is tested against. A list of typical operating characteristics is provided in Table 1-2. They are included as additional information only; they are not specifications.

1-9. SAFETY CONSIDERATIONS

1-10. Before operating this instrument, you should familiarize yourself with the safety markings on the instrument and safety instructions in this manual. This instrument has been manufactured and tested according to international safety standards. However, to ensure safe operation of the instrument and personal safety of the user and service personnel, the cautions and warnings in this manual must be followed. Refer to the summary of safety considerations in the front of this manual. Refer also to individual sections of this manual for detailed safety notations concerning the use of the instrument as described in those individual sections.

Table 1-1. 8445B Specifications

SPECIFICATIONS

Frequency Range: DC to 1.8 GHz Low-Pass Filter. 1.8 to 18 GHz Tracking Filter.

Digital Frequency Readout (Option 003):

Resolution: 100 kHz
Accuracy: 0.01 to 1.0 GHz: ±6 MHz
1.0 to 4.0 GHz: ±8 MHz
4.0 to 18.0 GHz: ±0.2%

Out-of-Band Rejection: For Yig tuned filter 1 GHz from center of passband >70 dB.

Limiting Level: >+5 dBm (Maximum input level for <1 dB signal compression).

Burnout Level: >+20 dBm

Hysteresis: <25 MHz

Tuning Linearity: <±10 MHz

Insertion Loss:

	Frequency	Insertion Loss (except Option 004)	Insertion Loss Option 004
Low-Pass Filter	Dc – 1.8 GHz @2.05 GHz	<2.5 dB >50 dB	*
Tracking Filter (YIG)	1.8 – 12 GHz 12 – 18 GHz	<8 dB <10 dB	<7 dB <8 dB

*Low-Pass Filter deleted with Option 004

Table 1-2. Typical Operating Characteristics

TYPICAL OPERATING CHARACTERISTICS

Tracking Filter 3 dB Bandwidth: Typically 20 - 45 MHz.

Tracking Filter Skirt Roll-off: Characteristics of a three-pole filter.

Input VSWR: Typically < 2.0 (1.8–18 GHz).

8555A Local Oscillator Emission with Preselector: Typically <–70 dBm over recommended operating ranges with Spectrum Analyzer input attenuator set to 0 dB. (See Table 3-1.)

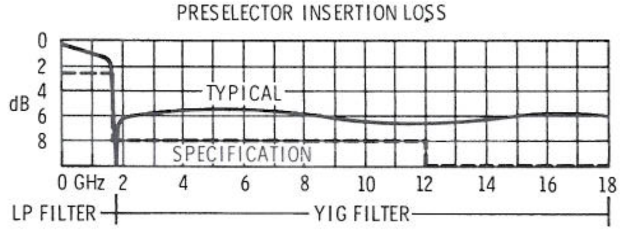
Remote Function: YIG filter frequency can be set by externally supplied voltage. Differential input utilized to eliminate ac hum or other common mode signals which may be present on remote drive input cable.

Sensitivity: Nominally +1 volt/GHz (with direction of tuning from low to high frequency).

Settling Time: Typically within 3 MHz of final frequency after 5 ms.

Remote Input Connector: BNC female, outer conductor isolated.

Typical Insertion Loss: The following chart shows typical versus specification values of insertion loss. (The typical curve is developed from eleven spot checks. See paragraph 5-15.)



1-11. INSTRUMENTS COVERED BY MANUAL

1-12. Attached to the instrument is a serial number plate (Figure 1-2). The serial number is in two parts. The first four digits and the letter are the serial number prefix; 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(es) listed under SERIAL NUMBERS on the title page.

1-13. 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 yellow Manual Changes supplement. This supplement contains "change information" which tells you how to adapt the manual to the newer instrument.

1-14. 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 this manual's print date and part number, both of which appear on the manual title page. Complementary copies of the supplement are available from Hewlett-Packard.

1-15. 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.

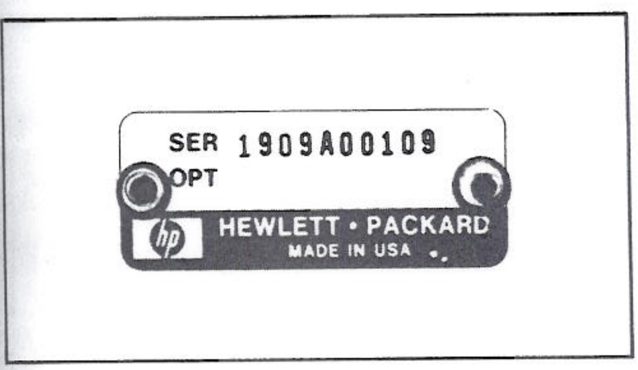


Figure 1-2. Typical Serial Number Plate

1-16. DESCRIPTION

1-17. The Model 8445B Automatic Preselector is designed to complement the Model 8555A Spectrum Analyzer RF Section. The Standard Preselector covers the frequency range of dc to 18 GHz. When used with the 8555A Spectrum Analyzer, the Preselector functions to reduce or eliminate signal intermodulation, in addition to multiple and spurious responses. The Standard Preselector has a fixed frequency low-pass filter for the dc to 1.8 GHz frequency range, and a voltage tuned filter, using a YIG (yttrium-iron-garnet) crystal as a resonant tuning circuit in the RF signal path, for the frequency range of 1.8 to 18 GHz. When used with the 8555A/8552/140 Spectrum Analyzer system, the YIG filter is a swept selective filter that tracks the frequency of the analyzer as the analyzer sweeps across its selected range. The YIG filter is electronically tuned by sweep voltage and band code signals from the analyzer. In addition to its primary function as a Preselector, the YIG filter may be used as a manually or electronically tuned bandpass filter.

1-18. The YIG filter may be tuned remotely with an external sweep voltage, or it may be tuned manually with the front panel controls (Option 002). A Digital Panel Meter (Option 003) normally indicates the Spectrum Analyzer center frequency. In the remote or manual control modes, however, the frequency indicated by the Digital Panel Meter (DPM) is that to which the YIG filter is tuned.

1-19. OPTIONS

1-20. The Standard 8445B. An Automatic Preselector consisting of a YIG-tuned tracking filter operating between 1.8 and 18 GHz, and a dc to 1.8 GHz low-pass filter. The input and output ports of the instrument are Type N coaxial connectors. Included is an HP 08445-20022 rigid coaxial cable for connection of the 8445B output to an 8555A Spectrum Analyzer when the preselector is mounted above the 8555A with a joining bracket kit. For other mounting configurations, order 8445B Option 005 to delete the HP 08445-20022. Then select the appropriate cable indicated in Table 1-4.

1-21. Option 001. The standard Type N input and output port connectors are replaced with APC-7® connectors. An HP 08445-20050 inter-

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connect cable (with APC-7 connectors) is included in place of the HP 08445-20022 cable. An 8445B Option 001 must be used with an 8555A Option 001 which has an APC-7 RF Input connector. (An APC-7 terminated RF interconnect cable can be ordered from Table 1-4. Order Option 005 to delete the standard Type N interconnect cable.)

1-22. Option 002. A front panel MODE switch and two MANUAL TUNE controls are added to the Automatic Preselector to provide selection of manual tuning, automatic tuning, and remote tuning of the YIG-tuned filter, or substitution of a 1.8 MHz low-pass input filter.

1-23. Option 003. A digital readout of the center frequency of the spectrum analyzer is displayed by a digital panel meter (DPM) on the front panel of the preselector. The DPM indicates the frequency of the YIG-tuned filter when voltage fed to the REMOTE input BNC connector is used to control the YIG.

1-24. Option 004. The 1.8 GHz low-pass filter is deleted.

1-25. Option 005. Deletes the Joining Bracket Kit (HP 5060-8543) and the RF cable (HP 08445-20022 or HP 08445-20050) that would have been supplied with the instrument.

1-26. ACCESSORIES SUPPLIED

1-27. Table 1-3 lists the accessories supplied with the Preselector. The accessories supplied are for a standard installation which provides for the Preselector to be mounted on an 8555A Spectrum Analyzer and fastened with a joining bracket kit. A different mounting installation will require a different RF cable to connect between the Preselector output and the Spectrum Analyzer input (Figure 1-3). The power cable supplied with the instrument is selected at time of shipment. Selection is based on shipping destination. Figure 2-2 illustrates the different power cable connectors that are currently available.

1-28. EQUIPMENT REQUIRED BUT NOT SUPPLIED

1-29. The Automatic Preselector is intended for use with the 8555A Spectrum Analyzer System. This includes an 8555A RF Section, an 8552 series IF Section, and a 140 or 141 series Display Section.

Table 1-3. Accessories Supplied

HP Part Number	Name	Description
*	Line Power Cable	7-1/2 feet, 3-wire Ac, Line Cord
08445-20022	RF Interconnect Cable	Rigid Coaxial Cable, Connects Preselector RF output to Spectrum Analyzer RF Input. Type N connectors.
08445-60007	Interconnect Cable	20-inch Control Cable, interconnects Preselector with Spectrum Analyzer.
5060-8543	Joining Bracket Kit	Hardware and parts for strapping Preselector to Spectrum Analyzer.

*See paragraph 2-10 and Figure 2-2.
**See paragraph 1-25 and Figure 1-3; item not supplied with Option 005.

1-30. EQUIPMENT AVAILABLE

1-31. The rigid RF Interconnect cable used to couple a Preselector to a Spectrum Analyzer is illustrated in Figure 1-3. Standard Preselectors are made to operate above the Spectrum Analyzer. The possible mounting configurations, connector types, dimensions and part numbers are indicated in Table 1-4. For information regarding RF Interconnect cables used when the Preselector is mounted BELOW the Spectrum Analyzer, contact your local Hewlett-Packard Sales Office.

1-32. A Rack Mounting Kit is availabe to install the 8445B in a 19-inch rack. Rack Mounting Kits may be obtained through your nearest Hewlett-Packard office. Order Part Number 5060-8739.

1-33. RECOMMENDED TEST EQUIPMENT

1-34. Table 1-5 lists the test equipment and accessories required to check, adjust and repair the Preselector. If substitute equipment is used it must meet the Minimum Specifications listed.

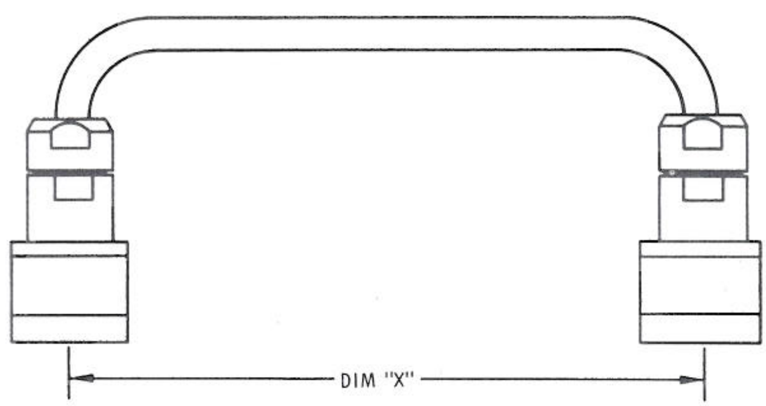


Figure 1-3. RF Interconnect Cable W1

Table 1-4. RF Interconnect Cable Information

Preselector Analyzer	Connector Type	Dimension of "X", Figure 1-3		HP Part Number
		Inches	Cm	
With feet on Preselector	N	4.72	11.99	08445-20042
With feet on Preselector	APC-7	4.72	11.99	08445-20043
Rack Mounted	N	4.58	11.63	08445-20046
Rack Mounted	APC-7	4.58	11.63	08445-20047
With Joining Bracket Kit	N	4.36	11.07	08445-20022*
With Joining Bracket Kit	APC-7	4.36	11.07	08445-20050**

*Cable supplied with instrument.
**Cable supplied with Option 001 instruments.

Table 1-5. Test Equipment and Accessories (1 of 2)

Item	Minimum Specifications	Suggested Model	Use*
Frequency Comb Generator	Frequency markers spaced 1, 10, 100 MHz apart; usable to 8 GHz Frequency Accuracy: ±0.01% Output Amplitude: >–40 dBm to 2 GHz	HP 8406A	A, T
Signal Generator	Frequency Range: 1.8–4.0 GHz Frequency Accuracy: ±1% Output Amplitude: >+5 dBm Output Impedance: 50 ohms	HP 8616A	P
Sweep Oscillator	Frequency Range: 2.0–18 GHz Output Amplitude: >–5 dBm Output Impedance: 50 ohms	HP 8620A with 86290A; or 8620C with 86290A/B	P, A
Digital Voltmeter	Voltage Accuracy: ±0.01% of reading +0.01% of range Resolution: ±1 mV @ 10 volts Overrange: 50% Input Impedance: 10 megohms	HP 3480B with HP 3484A	A, T
Oscilloscope with 10:1 Divider Probes (2)	Frequency Range: DC to 50 MHz Time Base: 1 μs/div to 10 ms/div Time Base Accuracy: ±3% Dual Channel, Alternate Operation Ac or dc Coupling External Sweep Mode Voltage Accuracy: ±3% Sensitivity: 0.005V/div	HP 180A with HP 1801A and HP 1821A HP 10004	T
Power Meter	Frequency Range: 0.01–18.0 GHz Accuracy: ±1% Power Range: –20 to +10 dBm	HP 435A with HP 8481A	P
Power Supply Dual Dc	Output Voltage: Variable, 0–20 Vdc Output Current: 0–300 mA Meter Accuracy: 3% Control: Fine adjustment	HP 6205B	P, A, T

*A = Adjustments; T = Troubleshooting; P = Performance

Table 1-5. Test Equipment and Accessories (2 of 2)

Item	Minimum Specifications	Suggested Model	Use*
DC Volt-ohm-Ammeter	Voltmeter Voltage Range: 1mV–300mV Accuracy: ±1% Input Resistance: 10 megohms Ammeter Current Range: 1 μA–1A Accuracy: ±2% Ohmmeter Resistance range: 1 ohm–100 megohm Accuracy: ±5% reading at center scale	HP 412A	T
Spectrum Analyzer	Frequency Range: 0.01–18 GHz Frequency Response: <± 2.0 dB	HP 8555A with HP 8552 and HP 141T	P, A, T
AC Voltmeter	Voltage Accuracy: ±2% of full scale Voltage Range: 300 Vac full scale Input Impedance: 10 megohms	HP 427A	A
Variable Voltage Transformer	Voltage Range: 102–127 Vac	General Radio W5MT3A or Superior Electric UC1M	A
Coaxial Cable	Male BNC connectors, 44 inches long with alligator clips	HP 10501A with alligator clips	P, A
Frequency Meter	Frequency Range: 2–18 GHz Overall Accuracy: 0.2%	HP 536A/537A/P532A	A
Swept Frequency Response Test Set	Sensitivity: 5 dB/div Blanking: 0–5V gate Vertical Input Impedance: 75K ohm	HP 8755B with 180D Opt. 807 Display, 11664D Detector and 11665A Modulator	A
6 dB Coaxial Attenuator	Frequency Range: Dc–18 GHz	HP 8491B Opt. 006	A
10 dB Coaxial Attenuator	Frequency Range: Dc–18 GHz	HP 8491B Opt. 010	A
Adapter	APC-7 to Type N male	HP 11525A	A
Clip-on Milliammeter	Dc Current Range: 1 mA–10A Accuracy: ±3% of full scale	HP 428B	T

*A = Adjustments; T = Troubleshooting; P = Performance

SECTION II
INSTALLATION

2-1. INTRODUCTION

2-2. This section includes information on initial inspection, preparation for use, storage and shipment of the HP Model 8445B.

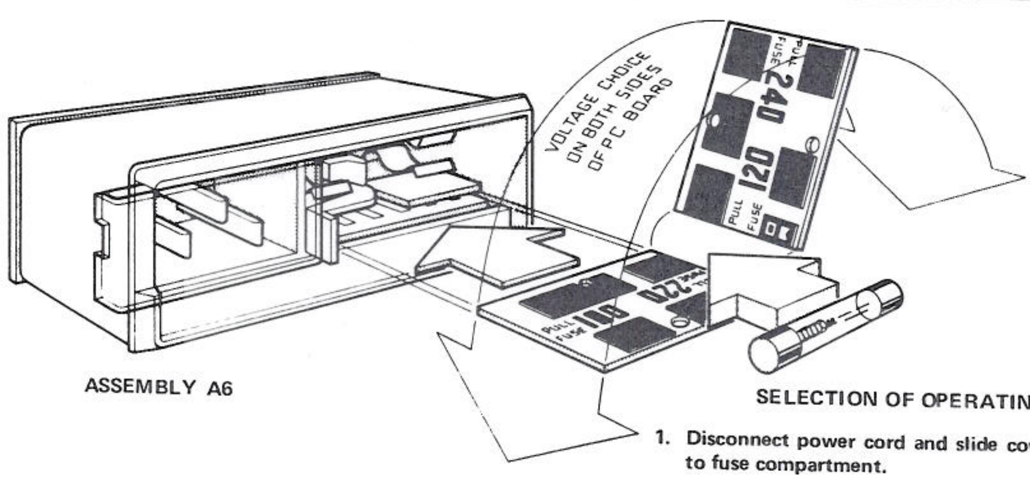
2-3. INITIAL INSPECTION

2-4. 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 electronically. The contents of the shipment should be as shown in Figure 1-1. Procedures for checking electrical performance are given in Section IV. For an abbreviated electrical performance test, refer to paragraph 4-15. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the electrical performance test, 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 carrier's inspection. The HP office will arrange for repair or replacement without waiting for claim settlement.

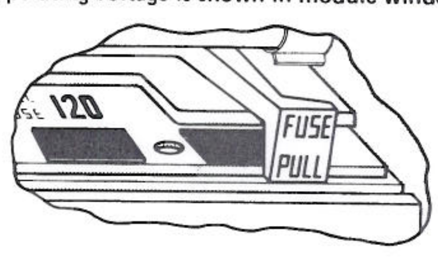
2-5. PREPARATION FOR USE

2-6. Power Requirements

2-7. The Model 8445B requires a power source of 100, 120, 220, or 240 VAC +5% −10%, 48 to 440 Hz single phase. (440 Hz operation requires a special H16 440 Hz fan modification. Contact your nearest HP representative.) Power consumption is less than 110 volt-amperes.



Operating voltage is shown in module window.



SELECTION OF OPERATING VOLTAGE

1. Disconnect power cord and slide cover to left to gain access to fuse compartment.
2. Remove line fuse by pulling outward on FUSE PULL.
3. To select operating voltage:
   a. Rotate FUSE PULL to left and remove PC board with long nose pliers.
   b. Orient PC board so that desired voltage marking is on top left-hand side.
   c. Push PC board firmly into its slot.
4. Rotate FUSE PULL back to its normal position and insert fuse in holder. Be sure to use the correct fuse value.

Figure 2-1. Line Voltage Selection

2-8. Line Voltage and Fuse Selection

2-9. Select the line voltage and fuse as follows:

a. Measure the ac line voltage.

b. Refer to Figure 2-1. At the instrument's rear panel power line module, select the line voltage (100V, 120V, 220V, or 240V) closest to the voltage you measured in step a. Line voltage must be within +5% or −10% of the voltage setting.

c. Make sure the correct fuse is installed in the fuse holder. The required fuse rating for each line voltage selection is indicated at the power module.

d. Connect the ac power cord to the instrument ac power receptacle.

2-10. Power Cable

2-11. In accordance with international safety standards, this instrument is equipped with a three-wire power cable. When connected to an appropriate power line outlet, this cable grounds the instrument cabinet. Figure 2-2 shows the styles of mains plugs available on power cables supplied with HP instruments. The numbers shown with the plugs are part numbers for complete power cables.

WARNING

The protection provided by grounding the instrument may be lost if any power cable other than the 3-pronged type is used to couple the ac line voltage to the instrument.

2-12. Mating Connectors

2-13. A list of possible connectors on the front and rear panels of the Model 8445B is given in Table 2-1.

2-14. Operating Environment

2-15. The operating environment should be within the following limits:

Temperature . . . . 0 to 55°C
Humidity . . . . <95% relative
Altitude. . . <4572 meters (15,000 feet)

2-16. A forced-air cooling system is used to reduce operating temperatures in the instrument. The air intake and filter are located on the rear of the instrument; warm air is exhausted through the side panel perforations. When operating the instrument, choose a location that provides at least three inches of clearance around the rear and sides.

2-17. Installation Instructions

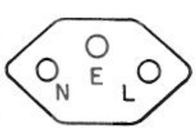
2-18. When used with the Spectrum Analyzer, the Preselector should be both mechanically and electrically connected to the Spectrum Analyzer. The preferred mounting configuration is with the Preselector mounted on top of and secured to the Spectrum Analyzer. A joining bracket kit is supplied to secure the Preselector to the analyzer. A rigid coaxial cable (for the preferred mounting configuration) is supplied to connect the OUTPUT on the Preselector to the INPUT connector of the Spectrum Analyzer. For mounting installations other than the preferred configuration refer to Figure 1-3 and Table 1-4 for cable information.

2-19. Bench Operation

2-20. The instrument cabinet has plastic feet and a foldaway tilt stand for convenience in bench operation. The tilt stand raises the front of the instrument for easier viewing of the control panel, and the plastic feet are shaped to make full-width modular instruments self-aligning when stacked.

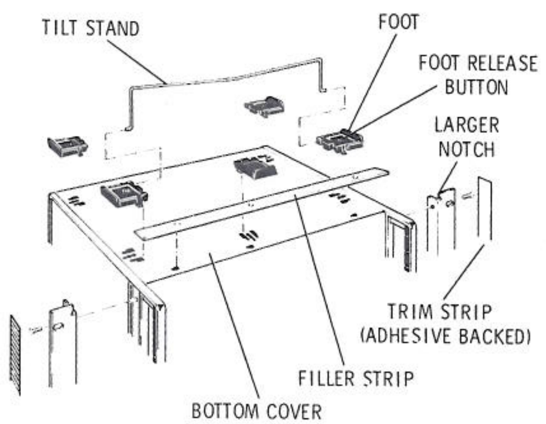
2-21. Rack Mounting

2-22. A rack mounting kit (HP Part Number 5060-8739) is available for installing the 8445B in a 19-inch rack. The kit contains all the necessary hardware and installation instructions. Installation instructions are also given in Figure 2-3.

Plug Type	HP Part Number	C D	Plug Description	Length cm (inches)	Color	Country of Use
250V 	8120-1351 8120-1703	0 6	Straight *BS1363A 90°	229 (90) 229 (90)	Mint Gray Mint Gray	United Kingdom, Cyprus, Nigeria, Rhodesia, Singapore, South Africa, India
250V 	8120-3169 8120-0696	0 4	Straight *NZSS198/ASC112 90°	201 (79) 221 (87)	Gray Gray	Australia, New Zealand
250V 	8120-1689 8120-1692	7 2	Straight *CEE7-Y11 90°	201 (79) 201 (79)	Mint Gray Mint Gray	East and West Europe, Saudi Arabia, Egypt, South Africa, India, (unpol-arized in many nations)
125V 	8120-1348 8120-1398 8120-1754 8120-1378 8120-1521 8120-1676	5 5 7 1 6 2	Straight *NEMA5-15P 90° Straight *NEMA5-15P Straight *NEMA5-15P 90° Straight *NEMA5-15P	203 (80) 203 (80) 91 (36) 203 (80) 203 (80) 91 (36)	Black Black Black Jade Gray Jade Gray Jade Gray	United States, Canada, Japan (100V or 200V), Mexico, Philip-pines, Taiwan
250V 	8120-2104	3	Straight *SEV1011 1959-24507 Type 12	201 (79)	Gray	Switzerland
220V 	8120-1957 8120-2956	2 3	Straight *DHCK 107 90°	201 (79) 201 (79)	Gray Gray	Denmark

*Part number shown for plug is industry identifier for plug only. Number shown for cable is HP Part Number for complete cable including plug.
E = Earth Ground; L = Line; N = Neutral

Figure 2-2. AC Power Cables and Plugs



INSTRUCTIONS

1. REMOVE TILT STAND, PLASTIC FEET AND TRIM STRIPS.
2. ATTACH FILLER STRIP AND RACK MOUNTING FLANGES, KEEPING LARGE NOTCH ON FLANGES TO INSTRUMENT BOTTOM.

Figure 2-3. Preparation for Rack Mounting

2-23. MODIFICATIONS REQUIRED

2-24. Display Sections

2-25. HP Model 140T Display Sections with serial prefix 1105A and below, HP Model 141T Display Sections with serial prefix 1047A and below, all HP Model 140S/141S Display Sections and all HP Model 140-series Oscilloscope Mainframes require modification for Preselector compatibility (refer to Table 2-2). The modification consists of adding a cable assembly to the Display Section. This cable connects between the Auxiliary "B" output connector on the rear panel of the 8555A RF Section and the rear panel of the Display Section.

2-26. 8555A RF Section

2-27. Spectrum Analyzer RF Sections with Serial Prefixes 1232A and below must be modified for compatibility with 8445B Option 003 instruments. (See Appendix A.)

2-28. STORAGE AND SHIPMENT

2-29. Environment

2-30. The instrument should be stored in a clean dry environment. The following environmental limitations apply to both storage and shipment:

Temperature . . . . −40 to +75°C
Humidity . . . . <95% relative
Altitude. . . <7620 meters (25,000 feet)

2-31. Packaging

2-32. Original Packaging. Containers and materials identical with those used in factory packaging 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 correspondence, refer to the instrument by model number and full serial number.

2-33. 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 center, attach a tag indicating the type of service required, return address, model number, and full serial number.)

b. Use a strong shipping container. A double-wall carton made of 350-pound test material is adequate.

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

d. Seal the shipping container securely.

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

Table 2-1. Model 8445B Mating Connector

Connector	Industry Identification	HP Part Number	Alternate Sources
J1 INPUT	Type N, male connector, UG-21G/U	1250-0882	Amphenol Bendix Specialty Connector
	(Option 001) Type APC-7® connector	1250-1183	Amphenol
J2 OUTPUT	Type N, male connector, UG-21G/U	1250-0882	Amphenol Bendix Specialty Connector
	(Option 001) Type APC-7® connector	1250-1183	Amphenol
J4 REMOTE input	Type BNC, male connector, UG-88/U	1250-0256	Amphenol Bendix Specialty Connector
J5 Interconnect cable connector	R&P Series, 17 contact, female connector	1250-1286	Cannon Cinch

®APC-7 is a registered trademark of the Bunker Ramo Corporation.

Table 2-2. Modification of Display Sections for Preselector Compatibility

Modification Kit HP Part Number	Display Section	
	HP Model Number	Serial Prefix
00140-69505*	140T 141T 140S/141S (Option TG-1)	1105A and below 1047A and below All
00140-69504**	140S/141S (except Option TG-1 Instruments)	All

*Included with 8445B Option 100.
**Included with 8445B Option 200.

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This section describes the operation of the 8445B Automatic Preselector with an HP 8555A/8552/140 Spectrum Analyzer system. It describes front and rear panel controls and connectors, and outlines operation of the system.

3-3. SPECTRUM ANALYZER PRESELECTION

3-4. The 8555A Spectrum Analyzer RF Section has a 2.01 to 4.4 GHz YIG-tuned first local oscillator (LO), and selects either a 550 or 2050 MHz first IF, depending on the frequency band in use.

3-5. The untuned input circuitry of the 8555A accepts any signals from 10 MHz to over 18 GHz. These signals are mixed with the first LO's harmonics as well as with its primary frequency. Identifying the several signals displayed as a result of this mixing can sometimes be a problem. With the 8445B Automatic Preselector, however, signal identification is greatly facilitated because the Preselector removes unwanted signals from the CRT display.

3-6. The standard Preselector uses a low-pass filter for preselection in the frequency range of dc to 1.8 GHz. For the frequency range of 1.8 to 18 GHz, preselection is accomplished with a YIG resonator employed as a tunable, 30 MHz (nominal bandwidth), microwave filter. Tuning voltage for the YIG filter is derived from the voltage that drives the YIG first LO in the 8555A RF Section. Since the Preselector tracks the Spectrum Analyzer tuning, virtually all image, multiple, and spurious responses are eliminated from the display.

CAUTION

Installation of a coaxial attenuator or a coaxial isolator at the Preselector INPUT is recommended when operating with signal sources that are not capable of absorbing their own reflected power. Any signals outside the passband of the Preselector input will be reflected back to the source.

3-7. Multiple responses occur when the local oscillator harmonics cause more than one display for a single input frequency. For example when a 9.5 GHz signal is fed to the analyzer RF INPUT, responses due to the 5^-, 3^+, 4^-, 2^+, and 3^- appear on the display (see Figure 3-1). Follow the signal frequency line for 9.5 GHz across Figure 3-1 noting the intersections with solid lines representing mixing modes. The Preselector tracks the selected mixing mode so that responses from other mixing modes are not present on the display.

3-8. When the analyzer first LO is tuned to 3 GHz (2050 MHz 1st IF), image responses may occur at different frequencies. Refer to Figure 3-1. Following the 3 GHz local oscillator line up the graph, note the intersections with solid lines, representing mixing modes. Each of these signals will appear at the same place on the CRT, although they are products of different mixing modes. The Preselector eliminates images by allowing only selected frequency band signals to enter the analyzer's RF INPUT, and allowing only one mixing mode to be used at a time.

3-9. Spurious signal responses are caused when signals entering the RF INPUT of the analyzer are of sufficient amplitude to cause intermodulation products. The narrow bandwidth of the Preselector YIG filter (30 MHz nominal) acts to eliminate spurious signal responses on the display. Input signals that are farther apart than the Preselector filter bandwidth cannot appear in the analyzer input at the same time.

3-10. RECOMMENDED MIXING MODES

3-11. Table 3-1 lists the frequency ranges that the Preselector will track when operating with an 8555A Spectrum Analyzer. It indicates signal frequencies from 0.01 – 18 GHz and the recommended 8555A frequency bands to be used for them. Analyzer responses, tracked by the Preselector, overlap at the edges of different frequency bands. Note the intersection of the n=3 – tuning curves at 4.1 GHz in Figure 3-1. Signals near the intersection points can appear in the passband of the Preselector from both of these mixing modes.

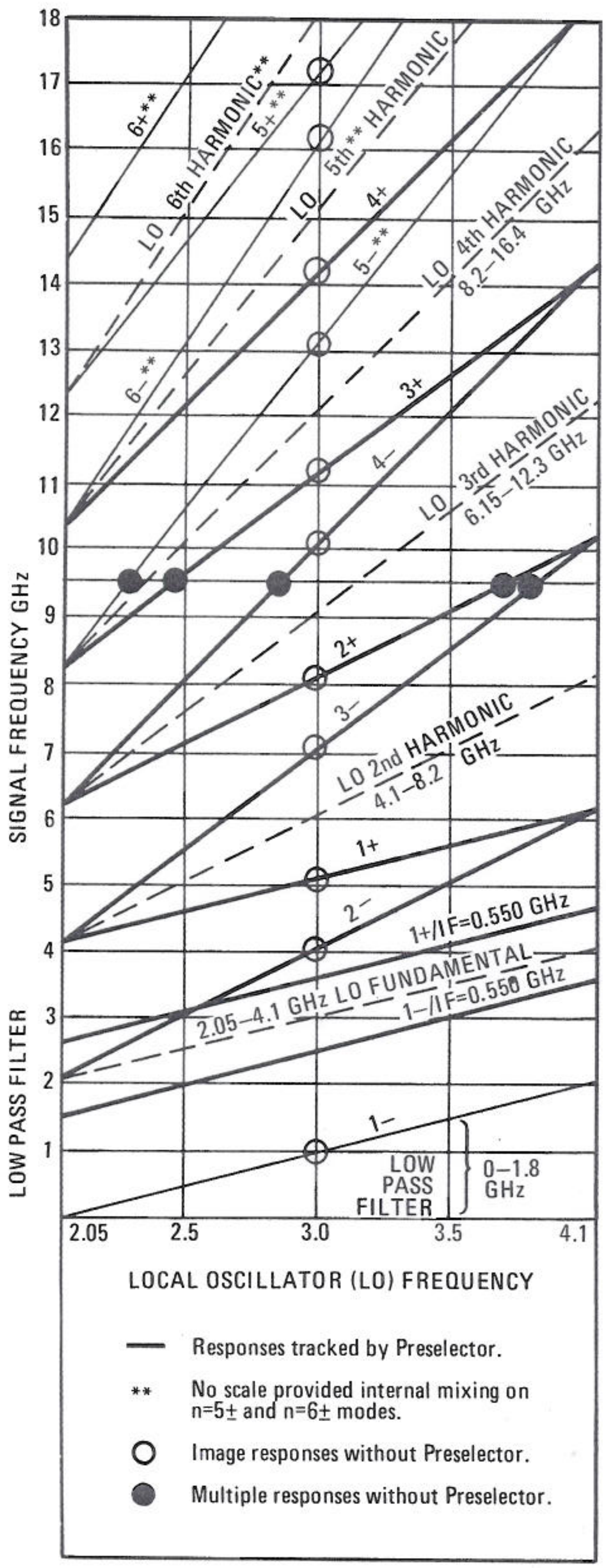


Figure 3-1. Spectrum Analyzer Tuning Curves and Responses

3-12. PRESELECTOR TRACKING

3-13. The Preselector tracking with the Spectrum Analyzer is governed by the linearity of the 8555A's YIG Drive sweep voltage versus the first LO frequency. Preselector tracking in both REMOTE and MANUAL operating modes is affected by the front panel FREQ OFFSET and TRACKING controls. Adjustment of these controls changes the accuracy of the +1V/GHz remote tuning and the dial accuracy of the manual controls. To adjust FREQ OFFSET and TRACKING controls for correct REMOTE or MANUAL operation, perform the YIG DRIVER ADJUSTMENTS in Section V of this manual.

3-14. PRESELECTOR BANDWIDTH

3-15. The YIG filter has a 3 dB bandwidth that is typically 20 to 45 MHz depending on the portion of the frequency spectrum in which it is being used. Figure 3-2 illustrates a typical 3-dB YIG filter passband display at 4 GHz, using a 10 MHz/DIV analyzer sweep. The Preselector is fixed-tuned to 4 GHz. The input signal is tuned through the passband.

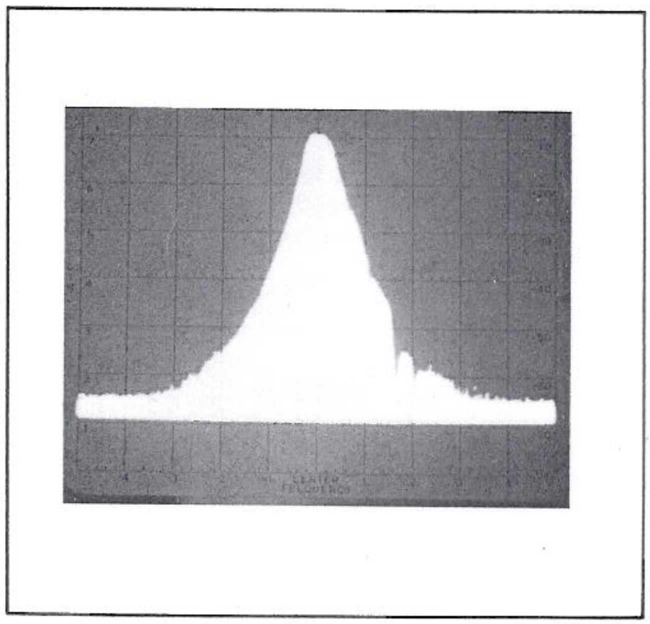


Figure 3-2. Typical 3-dB YIG Filter Passband Display at 4 GHz with 10 MHz/DIV Sweep

3-16. PANEL FEATURES

3-17. Front and rear panel features of the Standard, Option 002, and Option 003 8445B Automatic Preselectors are described in Figure 3-3. Front and rear panel views of a Preselector connected to the HP 8555A/8552/141T Spectrum Analyzer are shown in Figures 3-4 and 3-5. For a detailed description of the Spectrum Analyzer system controls and indicators, refer to the operating and service manuals for the system instruments. Preselector and Spectrum Analyzer interconnections are shown on the block and schematic diagrams in Section VIII of this manual.

3-18. OPERATOR'S CHECKS

3-19. Upon receipt of the instrument, or whenever the Preselector is to be used with a different analyzer, perform the Operator's Checks listed in Figures 3-4 and 3-5. These procedures correct minor tracking differences between the Preselector and Spectrum Analyzer.

3-20. OPERATING INSTRUCTIONS

3-21. General operating instructions are contained in Figure 3-3. These instructions will familiarize the operator with the basic operating functions of the Preselector. Additional operating techniques and information are contained in Figures 3-4 and 3-5.

3-22. OPERATOR'S MAINTENANCE

3-23. Operator's Maintenance involves changing or replacing fuses, cleaning the air filter, and replacing a defective LINE switch lamp. To remove the air filter you will need a Pozidriv screwdriver; otherwise, no tools are required.

3-24. Fuses

3-25. The primary power fuse is inside the A6 Power Module assembly on the rear panel of the 8445B. A fuse change may be necessary when the instrument is moved to a location with a different ac line voltage or when the fuse has burned out. Figure 2-1 shows how to change or replace the fuse. Power Module fuse A6F1 and internal A2 and A3 assembly fuse information is in Section VI.

3-26. Air Filter

3-27. The air filter should be removed, checked, and cleaned every three months and, if necessary, washed in warm water and detergent. After washing, allow the filter to dry for a few minutes before reinstalling it.

3-28. Fan

3-29. The fan in this instrument is self-lubricating and does not require maintenance.

3-30. Lamp Replacement

3-31. There is a lamp, DS1, in the white plastic lens on the pushbutton for the LINE switch. When the switch in ON, the lamp should be lit. Figure 3-6 shows how to remove and install the lamp. The lamp is HP part number 2140-0244.

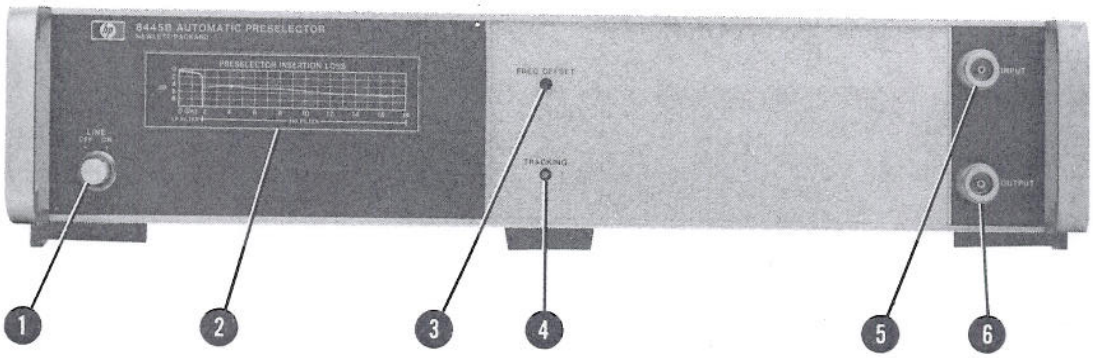
Table 3-1. 8555A Frequency Ranges and Recommended Mixing Modes

Signal Frequency GHz	Recommended Mixing Modes (n)	Analyzer Frequency Range GHz
0.01 – 1.8	1–	0.01 – 2.05
1.8 – 3.5	1–*	1.50 – 3.55
2.8 – 4.5	1+*	2.60 – 4.65
2.8 – 5.5	2–	2.07 – 6.15
4.3 – 5.8	1+	4.11 – 6.15
4.9 – 9.0	3–	4.13 – 10.25
6.6 – 9.5	2+	6.17 – 10.25
7.3 – 13.0	4–	6.19 – 14.35
9.0 – 13.3	3+	8.23 – 14.35
11.0 – 18.0	4+	10.29 – 18.00

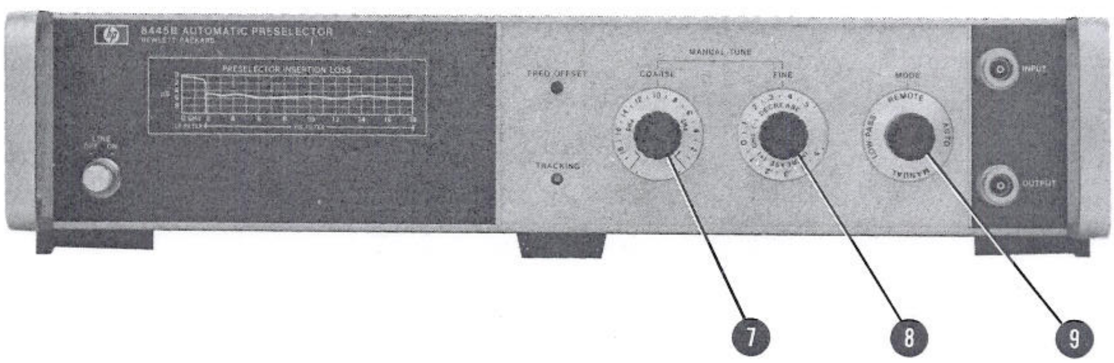
*Indicates .550 GHz IF. 2.05 GHz IF used on other bands.

8445B FRONT PANEL FEATURES

STANDARD PRESELECTOR



PRESELECTOR WITH OPTION 002



PRESELECTOR WITH OPTION 003

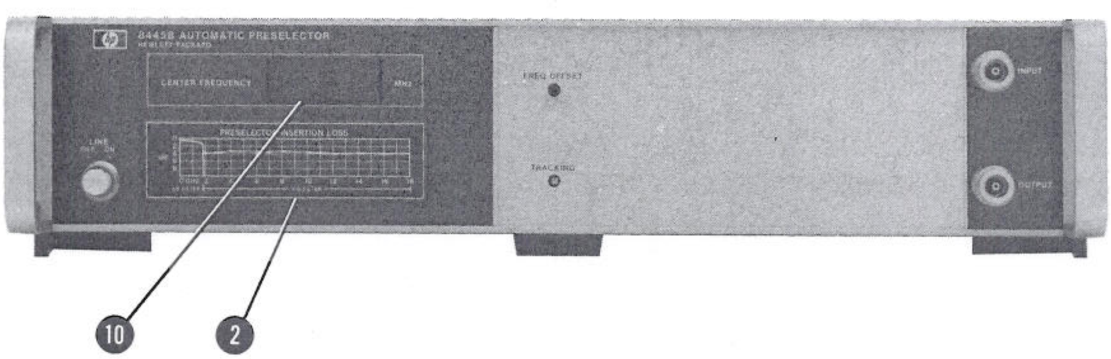


Figure 3-3. 8445B Controls, Connectors and Indicators (1 of 3)

8445B FRONT PANEL FEATURES

1 **LINE-ON/OFF.** Controls primary power. Lamp lights when switch is energized. Type A1H bulb.

2 **PRESELECTOR INSERTION LOSS Chart.** Indicates insertion loss versus frequency. Calibration chart extrapolated from point-to-point measurements of YIG filter insertion loss. FREQ OFFSET control adjusted for minimum insertion loss at each test point. During power level measurement, Spectrum Analyzer LOG REF LEVEL vernier control may be adjusted to compensate for the indicated insertion loss.

3 **FREQ OFFSET.** Adjusts YIG driver to compensate for offset in YIG filter tuning caused by residual magnetism in core structure. Adjusted to center the YIG filter at 2.0 GHz for wide-range tracking. Adjusted for minimum filter insertion loss during power level measurements. (See Figure 3-5.)

4 **TRACKING.** Adjusts YIG driver gain to match linear current-frequency curve of YIG filter. Adjusted during operational adjustments at a frequency of 8 GHz. Adjustment required to match tuning of Preselector with tuning of Spectrum Analyzer. Interacts with FREQ OFFSET adjustment. (See Figure 3-5).

5 **INPUT.** Type N coaxial connector normally provided. Option 001 instruments supplied with APC-7 connectors.

6 **OUTPUT.** Type N coaxial connector normally provided. Option 001 instruments supplied with APC-7 connector. See Table 1-3 for optional rigid coaxial interconnect cables.

7 **MANUAL TUNE COARSE—Option 002 Instruments.** Manual YIG filter frequency tune control. Sets YIG filter center frequency in manual operating mode.

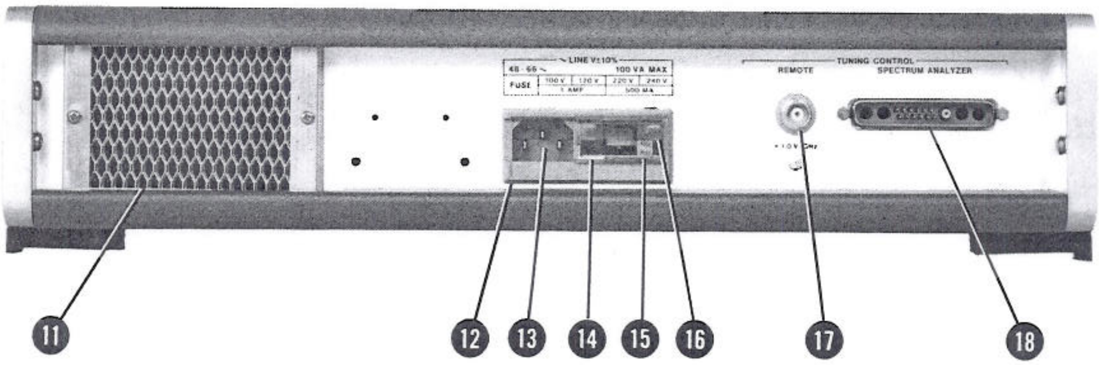
8 **MANUAL TUNE FINE — Option 002 instruments.** Fine tune control for YIG filter frequency in manual operating mode.

9 **MODE — Option 002 Instruments.** Selects Preselector mode of operation. MANUAL – YIG filter tuned by front panel controls. AUTO – Low-pass filter and/or YIG filter selected by control signals from analyzer RF Section. YIG frequency tuned by signal from RF Section. REMOTE – YIG filter tuned by input voltage to BNC connector on rear panel. LOW-PASS (except Option 004) – selects 1.8 GHz low-pass filter. Inhibits Spectrum Analyzer control of Preselector.

10 **DIGITAL PANEL METER Frequency Readout – Option 003 Instruments.** Indicates center frequency of the YIG filter pass-band in Manual or Remote Mode. In AUTOMATIC Mode, indicates center frequency of 8555A Spectrum Analyzer, reads zero above 18 GHz or in LOW-PASS Mode.

Figure 3-3. 8445B Controls, Connectors and Indicators (2 of 3)

8445B REAR PANEL FEATURES



⑪ **Air Intake.** Maintain at least 3-inch clearance from surrounding objects.

⑫ **Power Module Assembly.** 100, 120, 220 and 240 Vac +5%, −10%, 48 to 440 Hz 100 VA max.

⑬ **Line Input.** Connects to external ac power supply.

⑭ **Line Voltage Selector Card.** Printed circuit board used to match the available line voltage to the transformer primary.

⑮ **Fuse Extractor and Selector Lock.** Prevents line voltage selector card from being removed until fuse is extracted.

⑯ **Line Input Fuse.** Rating of fuse to be used is marked on rear panel near the Power Module Assembly.

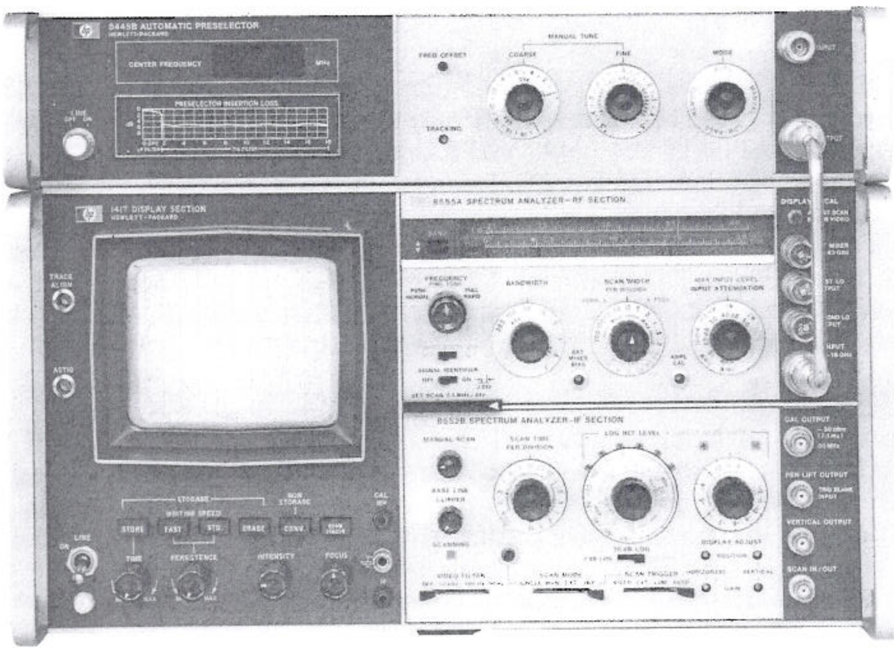
⑰ **TUNING CONTROL—REMOTE.** Input for remote tuning voltage to YIG filter. Enabled when Spectrum Analyzer is not operating (power off), when interconnect cable is disconnected or (on Option 002) when the mode switch is set to REMOTE. Type BNC connector. YIG filter frequency to voltage ratio: 1.0 GHz/Volt.

⑱ **TUNING CONTROL — SPECTRUM ANALYZER Input.** Input control voltage (for selection of YIG or low-pass filter), YIG tuning voltage, and band code information. Disconnect input cable when using REMOTE input to tune YIG filter.

Figure 3-3. 8445B Controls, Connectors and Indicators (3 of 3)

OPERATOR'S CHECKS USING LOW-PASS FILTER

FRONT VIEW



REAR VIEW

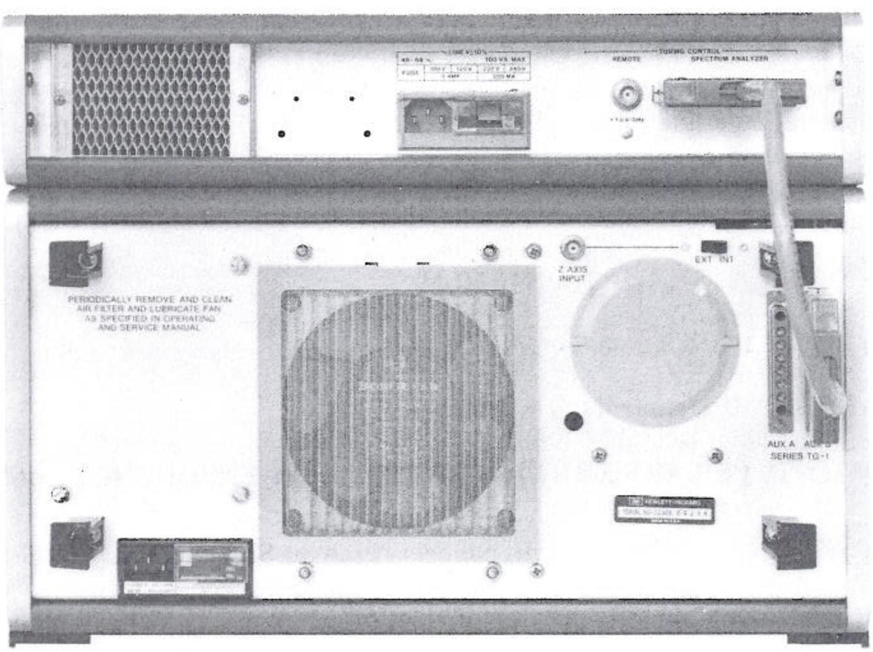


Figure 3-4. Low-Pass Filter Operation, 10 MHz to 1.8 GHz (1 of 3)

OPERATOR'S CHECKS USING LOW-PASS FILTER

1. Check that the Line voltage Selection Card is positioned to correspond to the available line voltage. Refer to the information on Line Voltage Selection in Section II.
2. Connect interconnect cable between AUX B output on Spectrum Analyzer Display Section and TUNING CONTROL-SPECTRUM ANALYZER input on Preselector.
3. Connect Preselector and Spectrum Analyzer to line voltage source and apply power.
4. Perform Spectrum Analyzer Operational Adjustments described in Section III of 8555A Spectrum Analyzer RF Section Operating and Service Manual.

NOTE

The information below does not apply to an Automatic Preselector with Option 004, which deletes the low-pass filter. Adjustments for Option 004 instruments are outlined in Figure 3-5.

5. Set Analyzer LOG/LINEAR switch to LINEAR and rotate LOG REF LEVEL control until 1 mV/DIV is matched with the lighted index lamp.
6. Connect Analyzer CAL OUTPUT to INPUT of Preselector.
7. Connect rigid coaxial cable between Preselector OUTPUT and Analyzer INPUT.
8. Note and record low-pass filter insertion loss at 30 MHz. From 7th graticule line from bottom of CRT to 5th graticule line represents approximately 3 dB. Low-pass filter insertion loss should be < 1 dB.
9. Remove rigid coaxial cable connecting Preselector OUTPUT to Analyzer INPUT.
10. Set Analyzer INPUT ATTENUATION to 40 dB.
11. Set Analyzer LOG/LINEAR control to LOG.
12. Rotate LOG REF LEVEL control to (+) 10 dBm.
13. Set SCAN WIDTH PER DIVISION to 10 MHz and set FREQUENCY control to position cursor at 1.5 GHz on frequency scale.
14. With INPUT ATTENUATION at 40 dB, connect Analyzer SECOND LO OUTPUT to INPUT.
15. Center 1.5 GHz LO signal on CRT display. Reduce SCAN WIDTH PER DIVISION to 0.2 MHz, keeping signal centered on CRT with FREQUENCY control.

Figure 3-4. Low-Pass Filter Operation, 10 MHz to 1.8 GHz (2 of 3)

OPERATOR'S CHECKS USING LOW-PASS FILTER

16. Rotate LOG REF LEVEL control fully counterclockwise.
17. Set LOG/LINEAR switch to LINEAR and adjust LINEAR SENSITIVITY controls for a 7.1 division display of the 1.5 GHz signal.
18. Disconnect cable at Analyzer INPUT and connect it to INPUT connector on Preselector.
19. Connect rigid coaxial cable between Preselector OUTPUT and Analyzer INPUT.
20. Note and record low-pass filter insertion loss at 1.5 GHz. From 7th graticule line (from bottom of CRT)) to 5th graticule line represents approximately 3 dB. 1.5 GHz low-pass filter insertion loss of $\leqslant -2.5$ dB.
21. Set LOG/LINEAR switch to LOG. Set LOG REF LEVEL vernier control to compensate for the amount of insertion loss indicated in step 20.
22. The Preselector and Analyzer are now calibrated at 1.5 GHz.
23. Remove cable between Preselector INPUT and Analyzer SECOND LO OUTPUT.
24. Install 50-ohm termination on SECOND LO OUTPUT connector.
25. Connect signal (10 MHz to 1.8 GHz) under investigation to INPUT connector of Preselector.
26. Set LOG REF LEVEL vernier control to compensate for insertion loss using data obtained in steps 8 or 20, or the data on the PRESELECTOR INSERTION LOSS chart.

Figure 3-4. Low-Pass Filter Operation, 10 MHz to 1.8 GHz (3 of 3)

OPERATOR'S CHECKS
USING YIG-TUNED FILTER

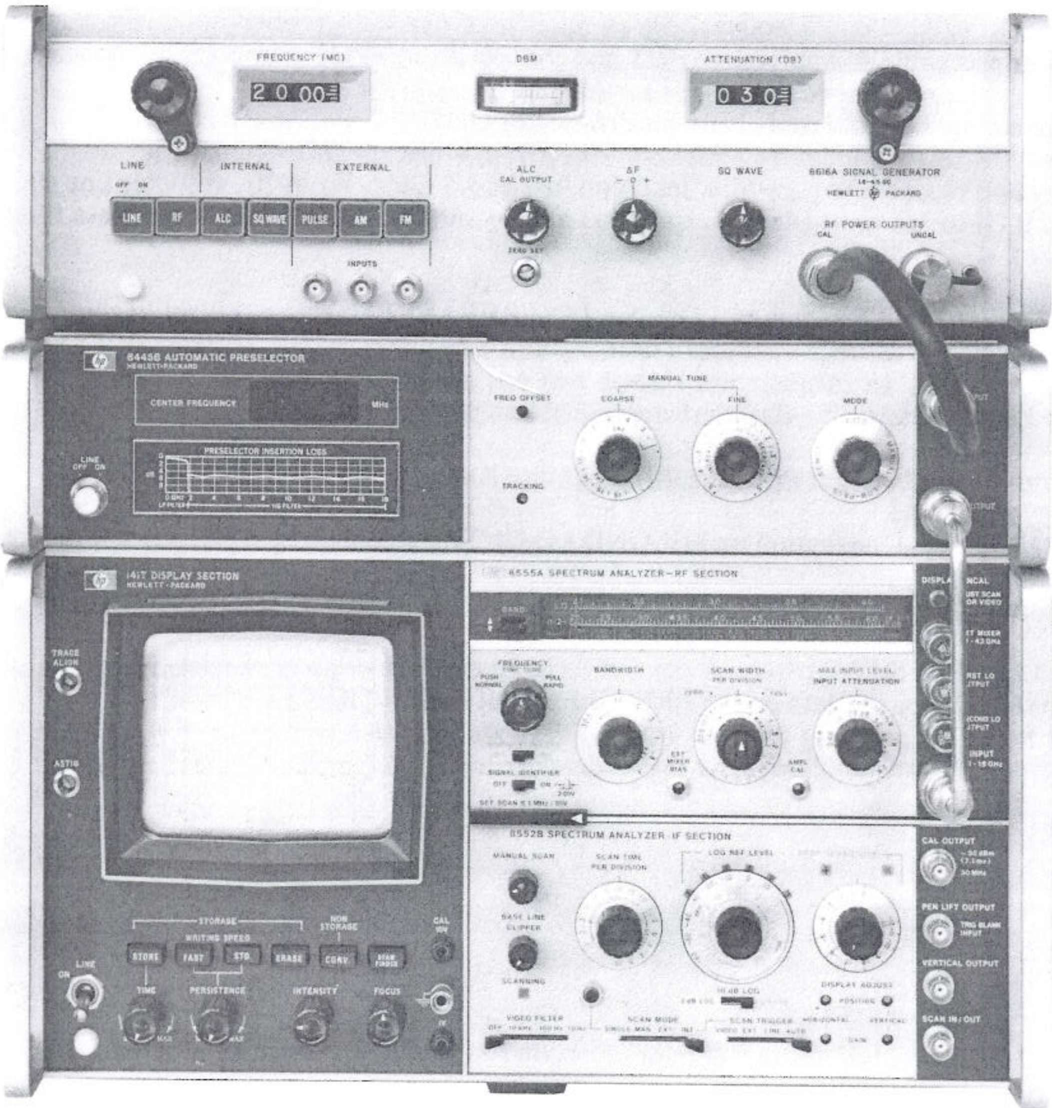


Figure 3-5. 1.8 to 18 GHz YIG-Tuned Filter Operation (1 of 3)

OPERATOR'S CHECKS USING YIG-TUNED FILTER

1. Check that the Line Voltage Selection Card is positioned to correspond to the available line voltage. Refer to information on Line Voltage Selection in Section II.
2. Connect interconnect cable W3 between AUX B output on Spectrum Analyzer Display Section and TUNING CONTROL-SPECTRUM ANALYZER input on Preselector.
3. Connect Preselector and Spectrum Analyzer to line voltage source and apply power.
4. Perform Spectrum Analyzer operational Adjustments described in Section III of 8555A Spectrum Analyzer RF Section Operating and Service Manual.
5. Connect rigid coaxial cable W1 between Preselector OUTPUT and RF Section INPUT.
6. Set LOG REF LEVEL to 0 dBm.
7. Set SCAN WIDTH PER DIVISION to 10 MHz.
8. Connect a −30 dBm 2.0 GHz signal to INPUT connector on Preselector.
9. Select n=1−/IF=550 MHz frequency BAND and tune Analyzer FREQUENCY control to center the 2.0 GHz signal on CRT display.
10. Reduce SCAN WIDTH PER DIVISION to 0.5 MHz, keeping signal centered on display with FREQUENCY control.
11. Reduce SCAN WIDTH PER DIVISION to 100 kHz; center signal on display with FINE TUNE control.
12. Set LOG/LINEAR switch to LINEAR and LINEAR SENSITIVITY control to 1 mV/DIV.
13. Adjust Preselector FREQ OFFSET control to center YIG filter passband on the 2 GHz signal and maximize signal on CRT display.
14. Set Analyzer LOG/LINEAR control to 10 dB LOG.
15. Rotate LOG REF LEVEL control to −30 dBm.
16. Adjust LOG REF LEVEL vernier control to position signal peak on LOG REF LEVEL graticule line.
17. Connect a −30 dBm 8.0 GHz signal to INPUT connector on Preselector.
18. Select n=2+/IF=2050 MHz frequency BAND on Analyzer, set SCAN WIDTH PER DIVISION to 10 MHz, and tune FREQUENCY control to center the 8.0 GHz signal on CRT display.

Figure 3-5. 1.8 to 18 GHz YIG-Tuned Filter Operation (2 of 3)

OPERATOR'S CHECKS
USING YIG-TUNED FILTER

19. Reduce SCAN WIDTH PER DIVISION to 0.5 MHz, keeping signal centered on display with FREQUENCY control.

20. Reduce SCAN WIDTH PER DIVISION to 100 kHz; center signal on display with FINE TUNE control.

21. Set LOG/LINEAR switch to LINEAR and LINEAR SENSITIVITY control to 1 mV/DIV.

22. Adjust Preselector TRACKING control to maximize signal on CRT display.

23. If signal is already at maximum, no further adjustment of FREQ OFFSET or TRACKING is required.

24. If signal is not at maximum, repeat steps 7 through 22 until a setting is found which satisfies requirements of steps 13 and 22.

NOTE

Incorrect preselector tracking of the Spectrum Analyzer may be due to aging or misadjustment of the 8555A YIG Driver Assembly. Follow the directions given in Section V of the 8555A Operation and Service manual under YIG Driver Adjustments.

25. To check YIG filter tuning with an external dc voltage, set the −30 dBm signal source to 2.0 GHz and the 8555A to a band to display this frequency. Disconnect interconnect cable W3 from the rear of either the 8445B or the 8555A.

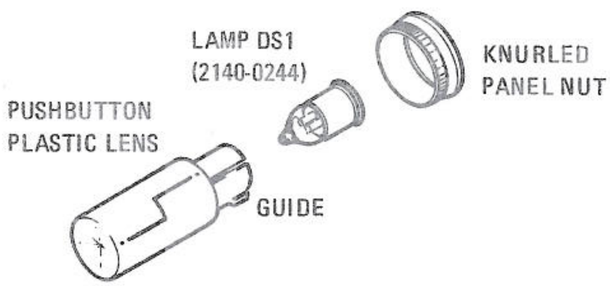
26. Apply a positive voltage from a variable dc power supply to the center connection of the REMOTE input BNC connector at the rear of the 8445B. Monitor the REMOTE input voltage with a voltmeter. The signal on the CRT should peak at +2 volts. (If not, the Remote Control Buffer Amplifier, described in Service Sheet 5, should be checked.)

27. Adjust signal source to 4.0 GHz and vary the dc voltage. The signal should peak on the CRT at +4 volts.

NOTE

When switching the 8555A INPUT ATTENUATION from 10 dB to 0 dB, signal level displayed on CRT may not change by 10 dB. This is caused by the high mismatch error between the 8445B OUTPUT port and the 8555A INPUT port.

Figure 3-5. 1.8 to 18 GHz YIG-Tuned Filter Operation (3 of 3)



POWER LAMP REPLACEMENT

1. Remove lens by pulling straight out.
2. Replace lamp.
3. To replace lens, align guide with notch in receptacle. Push straight in.

Figure 3-6. Power Lamp Replacement

SECTION IV
PERFORMANCE TESTS

4-1. INTRODUCTION

4-2. The procedures in this section test the instrument's ability to operate in accordance with the electrical specifications given in Table 1-1. All the tests can be performed without access to the inside of the instrument. A simpler operational test is included in Section III under Operator's Checks. For an abbreviated Performance Test, see paragraph 4-15.

4-3. Equipment required for the performance tests is listed in the Recommended Test Equipment table in Section I. Any equipment that satisfies the critical specifications given in the table may be substituted for the recommended model(s).

4-4. TEST RECORD

4-5. Results of the performance tests may be tabulated on the Test Record at the end of the procedures. The Test Record lists all the tested specifications and their acceptable limits. Test results recorded at incoming inspection can be used for comparison in periodic maintenance and troubleshooting, and after repairs or adjustments.

4-6. FRONT PANEL CHECKS

4-7. Before proceeding to the performance tests, the instrument must be adjusted and all controls set as specified in the preset adjustment instructions in paragraphs 4-8 and 4-9. After the instrument controls are set, proceed with the front panel checks and adjustments. The instrument should perform as called out in the preset adjustment procedures before you go on to the performance tests (paragraphs 4-17 through 4-20).

4-8. PRESET ADJUSTMENTS

4-9. Install Preselector with Spectrum Analyzer. Ensure that the line voltage selector is set to correspond with the available line voltage (refer to Line Voltage Selection in Section II). Connect the interconnect cable between the AUX B output on the Display Section and the TUNING CONTROL-SPECTRUM ANALYZER input on the Preselector. Connect the Preselector and the Spectrum Analyzer to the line voltage source and apply power. While the instruments are warming up, make the following control settings:

a. PRESELECTOR (with manual controls Option 002):

MODE. . . . . AUTO

b. SPECTRUM ANALYZER:

BAND . . . . $n=1-$/IF=2.05 GHz
FREQUENCY. . . . . 30 MHz
FINE TUNE . . . . Centered
BANDWIDTH. . . . . 100 kHz
SCAN WIDTH. . . . . PER DIVISION
SCAN WIDTH PER
DIVISION. . . . . 10 MHz
INPUT ATTENUATION. . . . . 10 dB
SIGNAL IDENTIFIER . . . . OFF
BASE LINE CLIPPER. . . . . CCW
SCAN TIME PER
DIVISION. . . . . 10 MILLISECONDS
LOG/LINEAR. . . . . 10 dB LOG
LOG REF LEVEL. . . . . 0 dBm
LOG REF LEVEL Vernier 0
VIDEO FILTER . . . . OFF
SCAN MODE . . . . INT
SCAN TRIGGER . . . . LINE

c. Connect Spectrum Analyzer CAL OUTPUT to its own INPUT.

d. Adjust FREQUENCY to align LO feedthrough signal on the -3 graticule line.

e. Check level of 30 MHz signal at CENTER FREQUENCY line. Signal level should be -30 dBm. Perform AMPL CAL Adjustment if signal level is incorrect. (See 8555A Operation and Service Manual.)

NOTE

If your 8445B Preselector is an Option 004 instrument it does not have a low-pass filter, and you can, therefore, disregard steps f through i.

f. Connect Spectrum Analyzer CAL OUTPUT to INPUT port on Preselector.

g. Connect OUTPUT port of Preselector to Spectrum Analyzer INPUT.

h. Check level of 30 MHz signal at CENTER FREQUENCY graticule line. There should be little change in level of the −30 dBm signal through the low-pass in the Preselector.

i. Select BAND n=1+/IF=.550 GHz. Note that there is an audible click (from the coaxial switches in the Preselector) and the signal disappears from the CRT display.

j. Select BAND n=1−/IF=.550 GHz.

k. Connect a 2.0 GHz, −30 dBm signal to the Preselector INPUT.

l. Tune Spectrum Analyzer to center the 2.0 GHz signal on CRT display.

m. Adjust Preselector FREQ OFFSET to peak the 2.0 GHz signal.

n. Select BAND n=3+ and connect a 12 GHz, −30 dBm signal to the Preselector input.

o. Tune Spectrum Analyzer FREQUENCY control to center the signal on the CRT display.

p. Adjust Preselector TRACKING control to maximize the signal level on the CRT display.

q. Repeat steps j through p for optimum adjustment.

4-10. PERFORMANCE TESTS

4-11. The performance tests, given in this section, are suitable for incoming inspection, troubleshooting, or preventive maintenance. During any performance test, all shields and connecting hardware must be in place. The tests are designed to verify published instrument specifications. Perform the tests in the order given, and record data on test card (Table 4-1) and/or in the data spaces provided in each test.

4-12. The tests are arranged in the following order:

Paragraph	Test Description
4-17	Out-of-Band Rejection
4-18	Low-Pass Filter Insertion Loss
4-19	YIG Filter Insertion Loss
4-20	Limiting Level (Signal Compression)

4-13. Each test is arranged so that the specification is written as it appears in Table 1-1, Specifications. Next, a description of the test and any special instructions or problem areas are included. Each test that requires test equipment shows the test setup and lists the required equipment. Step 1 of each procedure gives control settings required for that particular test.

4-14. Required minimum specifications for test equipment are detailed in Table 1-5. If substitute test equipment is used, it must meet the listed specifications.

4-15. ABBREVIATED PERFORMANCE TEST

4-16. To make sure the Preselector is performing properly without testing all of the specifications listed in Table 1-1, the following procedure is suggested as an abbreviated performance test:

a. Perform OPERATOR'S CHECKS in Figure 3-4 and Figure 3-5, as applicable.

b. Perform only the following performance tests:

1. Paragraph 4-18, Low-Pass Filter Insertion Loss Test.

2. Paragraph 4-19, YIG Filter Insertion Loss Test.

PERFORMANCE TESTS

4-17. OUT-OF-BAND REJECTION TEST

SPECIFICATION

For YIG-tuned filter, 1 GHz from center of passband >70 dB.

DESCRIPTION

The YIG filter is tuned to a 3 GHz fixed frequency (either manually, or remotely by applying +3 Vdc to the REMOTE input). A 3 GHz signal is applied through the filter and the power output level measured. The signal source is then shifted 1 GHz and the power output level is again measured. The difference between the two power levels is the out-of-band rejection for 1 GHz frequency separation.

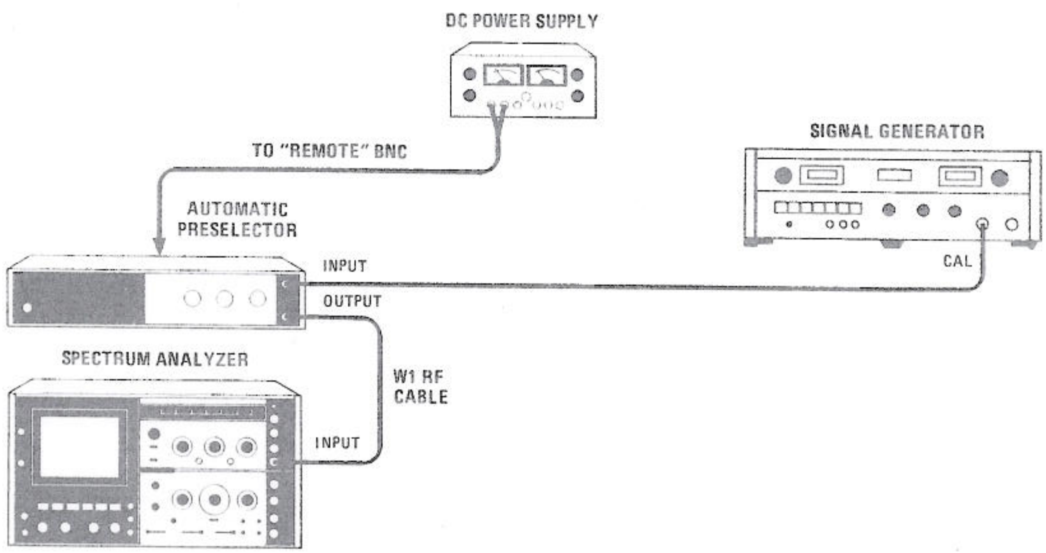


Figure 4-1. Out-of-Band Rejection Test Setup

EQUIPMENT:

Spectrum Analyzer.................................... HP 8555A/8552A/141T
Signal Generator .... HP 8616A
Power Supply*.. HP 6205B
Coaxial Cable (BNC to alligator clips)* .... HP 10501A

*Required for Preselectors without manual controls

4-17. OUT-OF-BAND REJECTION TEST (Cont'd)

1. Connect test setup as indicated in figure 4-1 and set controls as follows:

PRESELECTOR: (without manual controls)

LINE OFF/ON	ON
Interconnect Cable (W3)	Disconnected

PRESELECTOR: (with manual controls)

LINE OFF/ON	ON
MODE	MANUAL
MANUAL TUNE COARSE	3 GHz
MANUAL TUNE FINE	0 GHz

POWER SUPPLY:

Output Voltage	+3 Vdc

ANALYZER:

BAND	n=2−
FREQUENCY	3 GHz
BANDWIDTH	300 kHz
SCAN WIDTH PER DIVISION	10 MHz
INPUT ATTENUATION	10 dB
BASE LINE CLIPPER	12 o'clock
SCAN TIME PER DIVISION	10 MILLISECONDS
LOG REF LEVEL	0 dBm
LOG/LINEAR	10 dB LOG
VIDEO FILTER	10 kHz

SIGNAL GENERATOR:

FREQUENCY	3 GHz
ATTENUATION	0 dBm
ALC CAL OUTPUT	0 dBm (on meter)

2. Adjust Signal Generator frequency to place the signal in the center of the Preselector passband, as indicated by maximum signal level displayed on the CRT.

3. Adjust Spectrum Analyzer FREQUENCY control to center signal on CRT display.

4. Record Signal Generator frequency.

5. Adjust Spectrum Analyzer LOG REF LEVEL Vernier control to set signal peak at LOG REF line of CRT.

6. Disconnect RF interconnect cable W1 from Spectrum Analyzer input. Disconnect Signal Generator from Preselector input and connect it to Spectrum Analyzer input. DO NOT CHANGE amplitude controls on Spectrum Analyzer or Signal Generator.

7. Tune Generator to a frequency 1 GHz above that recorded in step 4 above. Record frequency.

PERFORMANCE TESTS

4-17. OUT-OF-BAND REJECTION TEST (Cont'd)

8. Tune Spectrum Analyzer to frequency of Signal Generator.
9. Center Signal Generator signal on CRT display.
10. Reduce Spectrum Analyzer BANDWIDTH to 30 kHz and SCAN WIDTH PER DIVISION to 0.5 MHz. Center signal on CRT display with FINE TUNE control.
11. Reconnect Signal Generator output to Preselector input. Reconnect interconnect cable W1 between Spectrum Analyzer input and Preselector output.
12. Note and record signal level. Signal should be at least 70 dB below the reference level set in step 5.

Out-of-Band Rejection_________ dB

4-18. LOW-PASS FILTER INSERTION LOSS TEST (Omit for Instruments with Option 004)

SPECIFICATION

Low-Pass Filter Insertion Loss; DC − 1.8 GHz <2.5 dB. At 2.05 GHz >50 dB.

DESCRIPTION

Insertion loss is measured at the high end of the filter's operating range (1.8 GHz) by applying a known input power level and measuring the output power level. Filter rejection at 2.05 GHz is measured in the same manner.

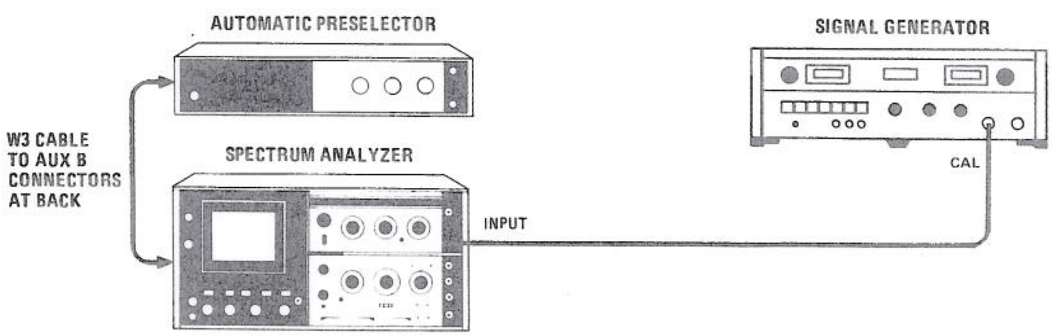


Figure 4-2. Insertion Loss Test Setup, Dc–1.8 GHz

4-18. LOW-PASS FILTER INSERTION LOSS TEST (Omit for Instrument With Option 004) (Cont'd)

EQUIPMENT:

Spectrum Analyzer . . . . HP 8555A/8552A/141T
Signal Generator . . . . HP 8616A

1. Connect test setup as indicated in Figure 4-2 and set controls as follows:

PRESELECTOR:

LINE OFF/ON . . . . ON

ANALYZER:

BAND . . . . n=1−/IF=2.05 GHz
FREQUENCY . . . . 1.8 GHz
BANDWIDTH . . . . 300 kHz
SCAN WIDTH PER DIVISION . . . . 10 MHz
INPUT ATTENUATION . . . . 10 dB
BASE LINE CLIPPER . . . . 9 o'clock
SCAN TIME PER DIVISION . . . . 10 MILLISECONDS
LOG REF LEVEL . . . . −20 dBm
LOG/LINEAR . . . . 10 dB LOG
VIDEO FILTER . . . . 10 kHz
SCAN MODE . . . . INT
SCAN TRIGGER . . . . AUTO
POWER . . . . ON

SIGNAL GENERATOR:

LINE . . . . On
RF . . . . On
ALC . . . . On
FREQUENCY . . . . 1800 MHz
ATTENUATION . . . . 10 dB

2. Center 1.8 GHz signal on CRT display with FREQUENCY control. Set TUNING STABILIZER to ON and reduce SCAN WIDTH PER DIVISION to 100 kHz. Center signal on CRT display with FINE TUNE control.

3. Adjust Signal Generator CAL OUTPUT (8616A only) level for an indicated −20 dBm on CRT display.

4. Connect Signal Generator output to Preselector INPUT.

5. Connect Preselector OUTPUT to Analyzer INPUT.

6. Note and record insertion loss. Insertion loss should not exceed 2.5 dB.

≤2.5 dB________dB

7. Repeat steps 2 through 5 using 2050 MHz.

8. Insertion loss should be > 50 dB.

≥50 dB________dB

PERFORMANCE TESTS

4-19. YIG FILTER INSERTION LOSS TEST

SPECIFICATION

Tracking Filter Insertion Loss: 1.8 – 12 GHz, <8 dB; 12 – 18 GHz, <10 dB. (Option 002 only; 1.8 – 12 GHz, <7 dB; 12 – 18 GHz, <8 dB.)

DESCRIPTION

YIG filter insertion loss is measured at fixed frequency points by applying a known signal level, tuning the YIG filter passband to the signal and measuring the power out the filter output port. Perform the Operator's Check in Figure 3-5 prior to performing the test below. The Operator's Check sets the FREQ OFFSET and TRACKING controls. The YIG filter is tuned by applying a voltage to the REMOTE input. Voltage-to-frequency tuning ratio is +1 GHz/volt. The Preselector FREQ OFFSET control is used as a fine tuning control.

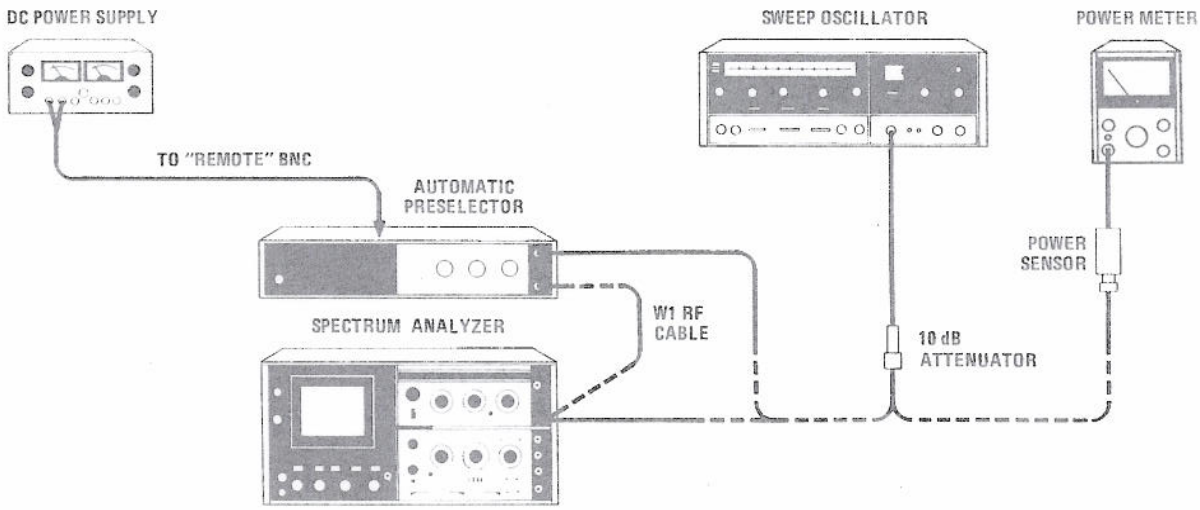


Figure 4-3. Insertion Loss Test Setup, 1.8–18 GHz

EQUIPMENT:

Power Meter & Power Sensor	HP 435A/8481A
Spectrum Analyzer	HP 8555A/8552A/141T
Sweep Oscillator	HP 8620A/86290A
Power Supply	HP 6205B
Coaxial Cable (BNC to alligator clips)	HP 10501A
Coaxial Attenuator, 10 dB	HP 8491B Option 010

PERFORMANCE TESTS

4-19. YIG FILTER INSERTION LOSS TEST (Cont'd)

1. Connect test setup as indicated in Figure 4-3 and set the controls as follows:

PRESELECTOR: (with manual controls)
- LINE OFF/ON . . . . ON
- MODE . . . . REMOTE

PRESELECTOR: (without manual controls)
- LINE OFF/ON
- Interconnect Cable (W3) . . . . Disconnected

POWER SUPPLY:
- Output Voltage . . . . +4.0 Vdc

SWEEP OSCILLATOR:
- LINE . . . . ON
- CW frequency . . . . 4.0 GHz
- CW Pushbutton . . . . Depressed
- ALC . . . . INT
- RF . . . . ON
- POWER LEVEL . . . . 12 o'clock

ANALYZER:
- BAND . . . . n=2−
- FREQUENCY . . . . 4.0 GHz
- SCAN WIDTH PER DIVISION . . . . 10 MHz
- INPUT ATTENUATION . . . . 10 dB
- BASE LINE CLIPPER . . . . 9 o'clock
- SCAN TIME PER DIVISION . . . . 10 MILLISECONDS
- LOG REF LEVEL . . . . −20 dBm
- LOG LINEAR SWITCH . . . . 10 dB LOG
- VIDEO FILTER . . . . OFF
- SCAN MODE . . . . INT
- SCAN TRIGGER . . . . AUTO
- POWER . . . . ON

2. Connect BNC fitting of coaxial cable to REMOTE input on Preselector.
3. Connect center conductor of coaxial cable to "+" terminal on Power Supply.
4. Connect outer conductor of coaxial cable to "−" terminal on Power Supply.
5. Connect Sweep Oscillator RF Output to Spectrum Analyzer INPUT.
6. Reduce Spectrum Analyzer SCAN WIDTH PER DIVISION to 1 MHz. Center signal on CRT display with FREQUENCY control.

PERFORMANCE TESTS

4-19. YIG FILTER INSERTION LOSS TEST (Cont'd)

7. Set SIGNAL IDENTIFIER switch to ON. Perform signal identification (see 8555A Manual) to ensure signal displayed is result of $n = 2-$ mixing mode. Set SIGNAL IDENTIFIER switch to OFF.

8. Adjust Sweep Oscillator POWER LEVEL and/or Analyzer LOG REF LEVEL Vernier for a convenient signal level.

9. Disconnect 10 dB attenuator from Spectrum Analyzer. Connect Power Meter and Power Sensor to 10 dB attenuator and measure power level. Record signal power level.

_________ dBm

10. Connect Sweep Oscillator RF output with 10 dB attenuator to Preselector INPUT.

11. Install rigid coaxial cable W1 between Preselector OUTPUT and Spectrum Analyzer INPUT.

12. Adjust Power Supply Vernier voltage control for maximum signal level indication on CRT display.

NOTE

Tuning rate is critical. The frequency tuning of the Preselector passband is changed at a rate of 1 MHz/mV.

13. Adjust FREQ OFFSET for maximum signal level on CRT display.

14. Record signal level.

_________ dBm

15. Subtract level recorded in step 9.

_________ dB

16. Record insertion loss at 4 GHz. Insertion loss should be <8 dB at 4 GHz.

_________ dB

17. Repeat the above procedure at selected frequency points to 18 GHz. See specifications for acceptable limits of insertion loss.

4-20. LIMITING LEVEL TEST

SPECIFICATION

$>+5$ dBm for <1 dB signal compression.

4-20. LIMITING LEVEL TEST (Cont'd)

DESCRIPTION

YIG filter compression is checked at the low frequency end of the operating range (point of maximum filter compression). Compression is measured by applying a −5 dBm signal to the filter input; the power level at the filter output is measured to establish a reference level. The input power level is increased by 10 dB and the output level is checked for a corresponding increase. In the actual test, a 10 dB fixed attenuator is switched from between the signal source and filter to the filter output. Using this procedure, any change in output level would be due to compression and not to errors in the measurement test setup.

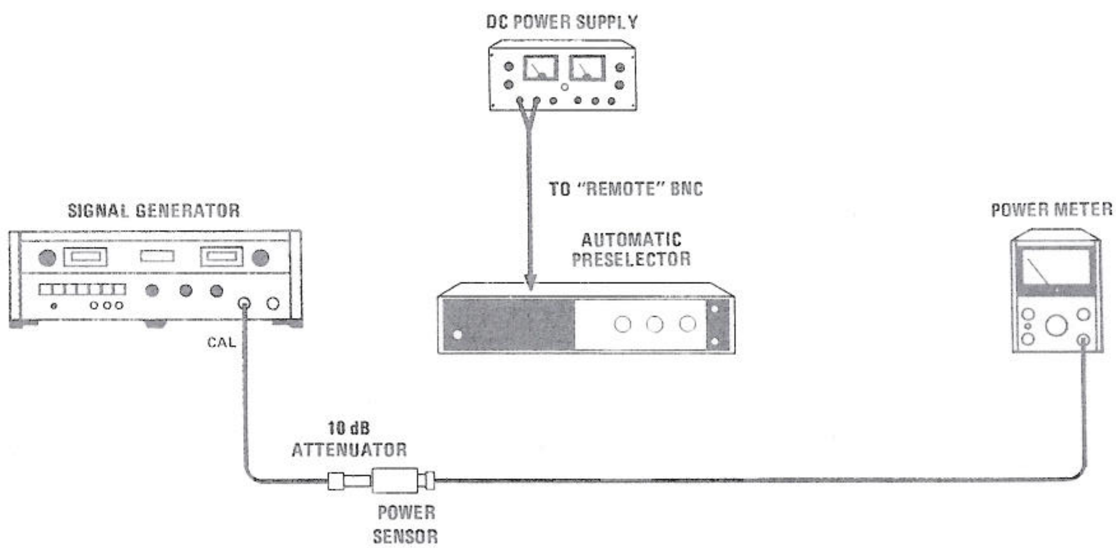


Figure 4-4. YIG Filter Signal Compression Test Setup

EQUIPMENT:

Power Meter & Power Sensor . . . . HP 435A/8481A
Power Supply . . . . HP 6205B
Signal Generator . . . . HP 8616A
Coaxial Attenuator, 10 dB . . . . HP 8491B Option 010

1. Connect test setup as indicated in Figure 4-4 and set the controls as follows:

PRESELECTOR:
LINE OFF/ON . . . . ON

POWER SUPPLY:
Output Voltage . . . . 1.8 Vdc

4-20. LIMITING LEVEL TEST (Cont'd)

SIGNAL GENERATOR:
- LINE .... On
- RF. .... On
- ALC .... On
- FREQUENCY .... 1800 MHz

POWER METER:
- LINE .... ON
- RANGE .... −5 dBm

2. Adjust Signal Generator output level for an indication of −5 dBm on Power Meter.
3. Connect Signal Generator output through the 10 dB attenuator to Preselector INPUT.
4. Connect Power Meter and Power Sensor to Preselector OUTPUT.
5. Adjust Power Supply fine voltage control for maximum power level indication on Power Meter.
6. Adjust Preselector FREQ OFFSET control for maximum power level indication on Power Meter.

NOTE

Indicated power meter level should correspond with the insertion loss indicated on Preselector calibration label. Typically, it is 4 dB below the level established in step 2 above.

7. Note and record level indicated on Power Meter.

   ____________dBm

8. Remove 10 dB Attenuator from Signal Generator to Preselector path and install in Preselector to Power Sensor path.
9. Note and record level indicated on Power Meter.

   ____________dBm

10. Record compression loss; difference between levels recorded in steps 9 and 7 above. Compression should be less than 1 dB.

    ____________ dB

Table 4-1. Performance Test Record

Hewlett-Packard Model 8445B
Preselector

Tests Performed By: ____________

Serial No.: ____________

Date: ____________

Para. No.	Test	Minimum	Actual	Maximum
4-17	OUT-OF-BAND REJECTION			
	4. Reference Frequency		____GHz	
	7. Measurement Frequency		____GHz	
	12. Out-of-Band Rejection	70 dB	____dB	
4-18	LOW-PASS FILTER INSERTION LOSS			
	3. Reference Level		____dBm	
	6. Insertion Loss		____dB	2.5 dB
	8. 2050 MHz Insertion Loss	50 dB	____dB	
4-19	YIG FILTER INSERTION LOSS			
	1. Reference Frequency		4 GHz	
	9. Reference Signal Level		____dBm	
	14. Preselector Signal Level		____dBm	
	16. Insertion Loss		____dB	8 dB
	17. Reference Frequency		____GHz	
	Reference Signal Level		____dBm	
	Preselector Signal Level		____dBm	
	Insertion Loss		____dB	____
4-20	LIMITING LEVEL			
	1. Reference Frequency		1.8 GHz	
	7. Reference Level		____dBm	
	9. Measurement Level		____dBm	
	10. Compression Loss		____dB	1 dB

SECTION V
ADJUSTMENTS

5-1. INTRODUCTION

5-2. This section describes the adjustments used to restore the 8445B to its peak operating condition after a repair, or to compensate for changes resulting from component aging. In addition to the adjustment procedures, this section contains illustrations showing the adjustment test setups and the locations of the adjustment controls and test points.

5-3. EQUIPMENT REQUIRED

5-4. Each adjustment procedure includes a list of the test equipment needed to accomplish it. Minimum specifications for the test equipment are given in Table 1-4. If you must substitute other test equipment for the recommended equipment, make sure it meets these specifications.

5-5. INTERNAL ADJUSTMENTS

5-6. All of the 8445B internal adjustment controls and factory-selected components are listed in Table 5-1 by reference designator, schematic diagram name, and function.

5-7. ADJUSTMENT PROCEDURES

5-8. The procedures in this section are given in the order in which they should be performed. Data acquired during these procedures should be recorded in the spaces provided. Comparison of the initial data with data taken during subsequent adjustments can be useful for preventive maintenance and troubleshooting.

5-9. ADJUSTMENT LOCATIONS

5-10. Locations of the adjustments referred to in the adjustment procedures are shown in Figures 5-5 and 5-6. Test points are identified on the circuit boards by their abbreviated reference designators (e.g., TP1, TP2, etc.).

WARNING

When the ac power cable is connected, ac line voltage is present on the fuse and terminals of the rear-panel power module, and on the LINE ON-OFF switch regardless of whether the LINE switch is ON or OFF.

When the LINE switch is ON, the ac line voltage is also present on the Line Voltage Selector Card in the power module, and on the ac power transformer terminals. Contact with any of these terminals points, can cause personal injury or death.

Table 5-1. Adjustment Controls

Reference Designator	Schematic Diagram Name	Function
A1R34	NULL	Nulls YIG drive Harmonic Number Amplifier A1U1.
A1R35	NULL	Nulls YIG drive Summing Amplifier A1U2.
A1R36	ADJ 5 .550 GHz IF	Sets dc offset of .550 GHz IF input to A1U2.
A1R37	ADJ 4 2.05 GHz IF	Sets dc offset of 2.05 GHz IF input to A1U2.
A1R38*	NULL	Nulls DPM drive Harmonic Number Amplifier A1U3.
A1R39*	NULL	Nulls DPM drive Summing Amplifier A1U4.
A1R40*	.550 GHz IF	Sets dc offset of .550 GHz IF input to A1U4.
A1R41*	2.05 GHz IF	Sets dc offset of 2.05 GHz IF input to A1U4.
A1R42	NULL	Nulls YIG drive n = + or – Amplifier A1U5.
A1R46*	NULL	Nulls DPM drive n = + or – Amplifier A1U6.
A1S1	OPR-TEST	Switches YIG drive input from 8555A Sweep + Tune (OPR) to 8555A chassis ground.
A1S2*	OPR-TEST	Switches DPM drive input from 8555A Tune (OPR) to 8555A chassis ground.
A2R5	+19.5V ADJ	Adjusts output level of +19.5V power supply.
A3R7	COARSE FREQ OFFSET	Adjusts range of dc offset on output of YIG Driver Summing Amplifier A3U1. Fine adjustment is made with front-panel FREQ OFFSET control. Used with TRACKING controls to set YIG filter on frequency.
A3R13		Fixed resistor selected for coarse adjustment of YIG current range. Typical value is 26.1 ohms.
A3R21	COARSE TRACKING	Used with front-panel TRACKING control and FREQ OFFSET controls to set YIG filter on frequency.
A3R24	16 GHz ADJ	Vernier adjustment of breakdown point of breakdown diode A3VR2.
A3R29	18 GHz ADJ	Vernier adjustment of breakdown point of breakdown point of breakdown diode A3VR3.
A7A2R6*	GAIN	Adjusts DPM high indication.
A7A2R7*	OFFSET	Adjusts DPM low indication.

*Present only in Preselectors equipped with Option 003 (Digital Panel Meter)

ADJUSTMENTS

5-11. POWER SUPPLIES ADJUSTMENT

REFERENCE

Service Sheets 4 and 6

DESCRIPTION

Power supplies in the Preselector provide regulated outputs of +19.5, +28, and −23 volts, and an unregulated output of +40 volts. Only the +19.5 volt supply is adjustable. These checks verify proper operation of the power supplies.

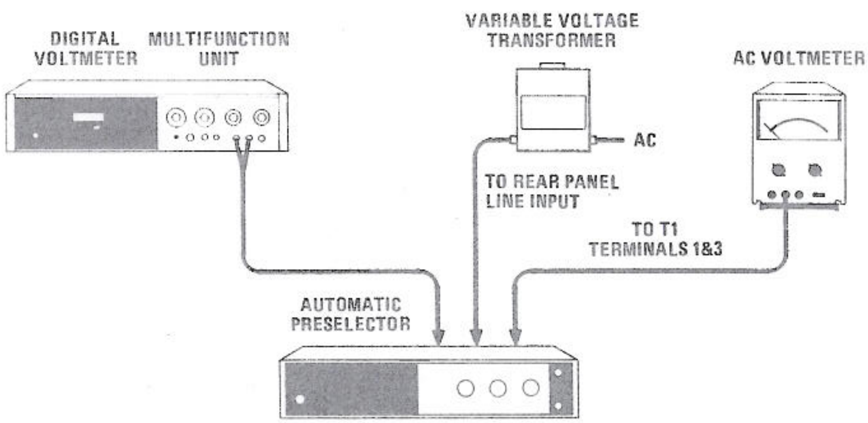


Figure 5-1. Power Supply Adjustment Test Setup

EQUIPMENT:

Digital Voltmeter with Multifunction Unit . . . . HP 3480B/3484A
Ac Voltmeter . . . . HP 427A
Variable Voltage Transformer . . . . General Radio W5MT3A

1. Connect test setup as indicated in Figure 5-1. Make sure the line voltage Power Module printed circuit card is set for the nominal voltage value closest to the existing line voltage (paragraphs 2-7 to 2-9).

Nominal voltage used______VAC

2. With power line switch OFF, connect the variable voltage transformer between power line and Preselector. Adjust ac input to Preselector to the nominal line voltage value, as indicated on ac voltmeter.

3. Turn power line switch and voltmeter ON. Allow 30 minutes for instruments to stabilize.

5-11. POWER SUPPLIES ADJUSTMENT (Cont'd)

4. Remove Preselector top cover and connect the dc digital voltmeter test leads to −19.5V test point A2PT1, and to common ground point A3TP2.

5. Adjust A2R5 (+19.5V ADJ) for 19.500 Vdc on the dc digital voltmeter.

6. With the variable voltage transformer increase the ac line voltage to the Preselector 5%. Record any dc voltage variation (should not exceed 20 mVdc).

Change noted______Vdc

7. Decrease the ac input 10% below the nominal line voltage level and record any change (should not exceed 20 mVdc).

Change noted______Vdc

8. Adjust to nominal ac line voltage input. Measure and record the three other power supply levels at the test points listed:

   a. +40 ±2V at pin 4 (−, white/green wire) on YIG TEK YIGs, or at the − pin on VARIAN YIGs).

   __________Vdc

   b. +28V ±1.4V at white-wire connection on the 2-terminal tie-point adjacent to the YIG (YIG heater supply not used with VARIAN YIGs).

   __________Vdc

   c. −23V ±1.2V at test point A2TP7 (IC bias).

   __________Vdc

9. If dc supplies are out of tolerance, refer to Power Supply Assembly A2 Decription and Troubleshooting in Section VIII.

5-12. YIG OR YIG/DPM PREDRIVER ADJUSTMENT

REFERENCE

Service Sheets 2, 3, and 4.

ADJUSTMENTS

5-12. YIG OR YIG/DPM PREDRIVER ADJUSTMENT (Cont'd)

DESCRIPTION

With the Preselector connected to the Spectrum Analyzer, Predriver Assembly A6 is checked and adjusted for an output voltage that tracks the tuned frequency of the Spectrum Analyzer. All operational amplifiers are adjusted for balance and checked for correct gain. Voltage offset is adjusted to correspond to the 550 MHz or 2050 MHz IF of the Spectrum Analyzer.

NOTE

Instruction in *<u>italics and underlined</u>* apply to Option 003 (DPM) instruments only.

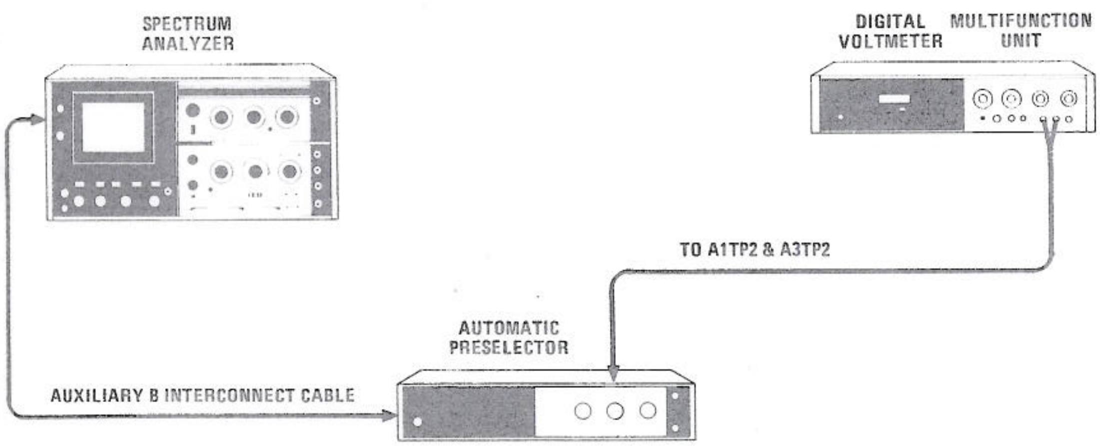


Figure 5-2. Pre-driver Adjustment Test Setup

EQUIPMENT:

Spectrum Analyzer .... HP 8555A/8552A/141T
Digital Voltmeter with Multifunction Unit .... HP 3480B/3484A

1. Connect test setup as shown in Figure 5-2.
2. Apply power to both Preselector and Spectrum Analyzer. Allow at least 30 minutes for equipment to stabilize.

ADJUSTMENTS

5-12. YIG OR YIG/DPM PREDRIVER ADJUSTMENT (Cont'd)

3. Set Spectrum Analyzer controls as follows:

BAND	n=2–
SCAN WIDTH	ZERO
INPUT ATTENUATION	10 dB
SCAN TIME PER DIVISION	10 MILLISECONDS
SCAN MODE	INT
SCAN TRIGGER	AUTO
LOG/LINEAR	10 dB LOG
LOG REFERENCE LEVEL	–10 dBm

NOTE

All dc voltages are measured with respect to common ground test point, A3TP2.

4. Set switch A1S1 *and A1S2* to TEST position.

5. Set switch A3S1 to TEST position.

6. Set the voltage at the following test points (in specified order) with the indicated potentiometer to the limits shown.

Test Point	Adjust	Limits
A1TP2	A1R34	0.00 ±0.20 mV
A1TP5	A1R42	0.00 ±0.20 mV
A1TP7	A1R35	0.00 ±0.20 mV
A1TP4	A1R38	0.00 ±0.20 mV
A1TP6	A1R46	0.00 ±0.20 mV
A1TP8	A1R39	0.00 ±0.20 mV

7. Set A3S1 to OPR.

8. Adjust A1R37 *and A1R4* to obtain +2.000V at A1TP7 *and A1TP8 respectively.*

9. Set Spectrum Analyzer to BAND n=2+ and verify voltage at A1TP7 *and A1TP8*. Voltage should be –2.000 ±0.002V

-1.998______–2.002V

ADJUSTMENTS

5-12. YIG OR YIG/DPM PREDRIVER ADJUSTMENT (Cont'd)

10. Set to BAND n = 1 + /IF = .550 GHz. Adjust A1R36 *and A1R40* to obtain −536.6 mV at A1TP7 *and A1TP8 respectively*.

11. Set to BAND n = 1 − /IF = .550 GHz and verify voltage at A1TP7 *and A1TP8*. Voltage should be +536.6 ±2.0 mV.

    +534.6______+538.6 mV

12. Set A1S1 *and A1S2* to OPR, A3S1 to TEST, and Spectrum Analyzer to BAND n = 1 − /IF = .550 GHz.

13. Adjust Spectrum Analyzer FREQUENCY for −3.000V at A1TP7 in Preselector.

14. Check voltage at A1TP7 versus BAND setting.

Band	A1TP7 Voltage	
	Lower Limit	Upper Limit
n=1+/IF=.550 GHz	−3.002V	−2.998
n=1−/IF=2.05 GHz	−3.002V	−2.998
n=1+/IF=2.05 GHz	−3.002V	−2.998
n=2−/IF=2.05 GHz	−6.003V	−5.997
n=2+/IF=2.05 GHz	−6.003V	−5.997
n=3−/IF=2.05 GHz	−9.004V	−8.996
n=3+/IF=2.05 GHz	−9.004V	−8.996
n=4−/IF=2.05 GHz	−12.005V	−11.995
n=4+/IF=2.05 GHz	−12.005V	−11.995

15. *Set to BAND N= 1−/IF = .550 GHz and adjust FREQUENCY control for ×3.000V at A1TP8.*

16. *Check voltage at A1TP8 versus BAND setting. Use same limits as in step 14.*

17. Set A3S1 to OPR.

5-13. YIG DRIVER ADJUSTMENT

REFERENCE

Service Sheets 4 and 5.

DESCRIPTION

The YIG Driver is adjusted for linear frequency tracking with voltage. Coarse Tracking and Coarse Offset controls are adjusted for proper YIG Driver tuning sensitivity. The YIG linearity correction breakpoints are adjusted to compensate for saturation in the YIG core at the higher frequencies.

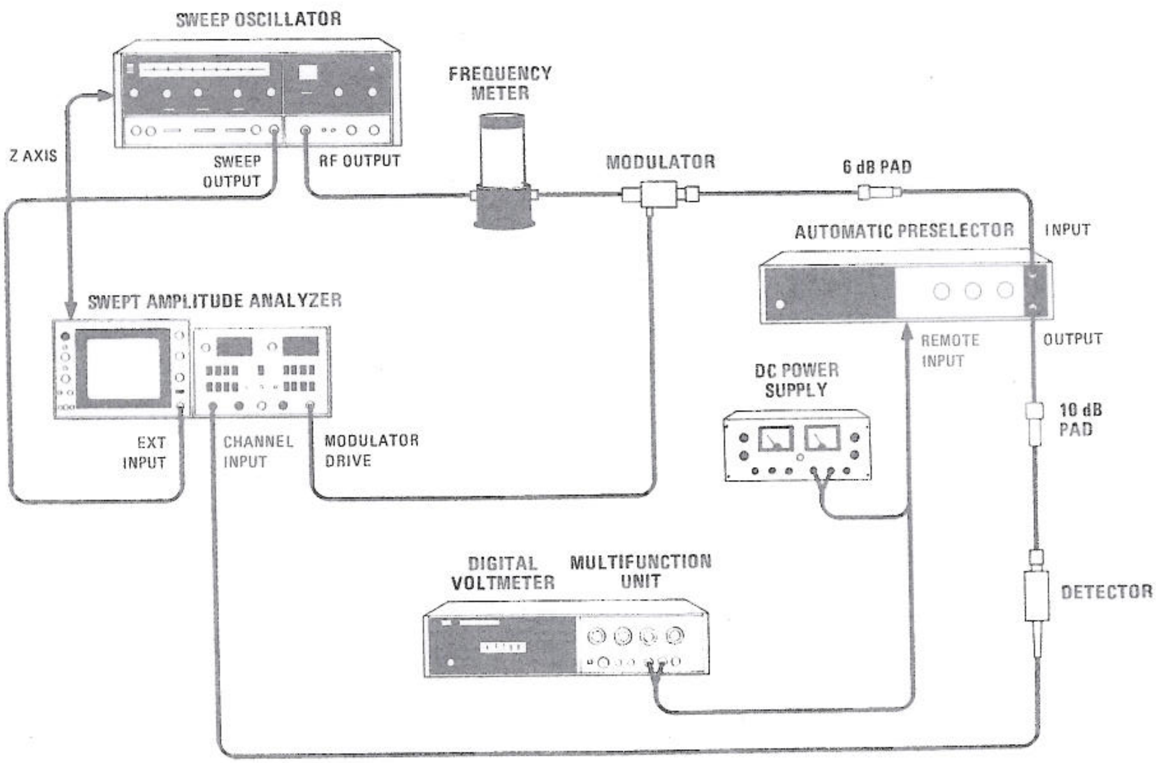


Figure 5-3. YIG Driver Adjustment Test Setup

EQUIPMENT:

Sweep Oscillator (2 – 18 GHz) . . . . HP 8620A/86290A
Swept Amplitude Analyzer (2 – 18 GHz) . . . . HP 8755A/180D
Dc Power Supply . . . . HP 6205B
Frequency Meter . . . . HP 536A
Frequency Meter . . . . HP 537A
Frequency Meter . . . . HP P532A
Digital Voltmeter with 3484A Multifunction Unit . . . . HP 3480B
Detector (2 – 18 GHz) . . . . HP 11664A
Modulator (2 – 18 GHz) . . . . HP 11665B
Coaxial Attenuator, 6 dB . . . . HP 8491B Option 006
Coaxial Attenuator, 10 dB . . . . HP 8491B Option 010

ADJUSTMENTS

5-13. YIG DRIVER ADJUSTMENT (Cont'd)

1. Connect test setup as shown in Figure 5-3. Apply power and allow at least 30 minutes for equipment to stabilize.

NOTE

Perform the Power Supply and Predriver Adjustments before performing the YIG Driver Adjustments.

2. Set the Preselector for remote operation and center the front panel FREQ OFFSET control, R1.
3. Center the front panel TRACKING potentiometer, R2.
4. Adjust power supply for +1.951 Vdc ±1 mVdc at A3TP4 (equivalent to +2.000 Vdc at REMOTE input).
5. Set sweep oscillator to 2 GHz with a 0.2 GHz ΔF sweep and set frequency meter to 2 GHz.
6. Adjust Coarse Freq Offset control A3R7 to center frequency meter dip in the YIG filter passband.
7. Adjust power supply for +13.66 Vdc ±0.01 Vdc at A3TP4 (equivalent to +14.00 Vdc at REMOTE input).
8. Set the sweep oscillator for 14 GHz with a 0.05 GHz ΔF sweep, and set frequency meter to 14 GHz.
9. Adjust Coarse Tracking control A3R21 to center the frequency meter dip in the YIG filter passband. if A3R21 has insufficient range, select values of A3R13 until the required A3R21 adjustment can be made.
10. Since the Coarse Tracking and Coarse Freq Offset adjustments interact, repeat steps 5 through 9.
11. Set power supply for +15.61 Vdc ±0.01 Vdc at A3TP4 (equivalent to +16.00 Vdc at REMOTE input).
12. Set sweep oscillator to 16 GHz with a 0.5 GHz ΔF sweep and set frequency meter to 16 GHz.
13. Adjust 16 GHz Adjust A3R24 to center frequency meter dip in the YIG filter passband.
14. Set power supply for +17.56 Vdc ±0.01 Vdc at A3TP4 (equivalent to +18.00 Vdc at REMOTE input).
15. Set sweep oscillator and frequency meter to 18 GHz.
16. Adjust 18 GHz Adjust A3R29 control to center frequency meter dip in the YIG filter passband.

ADJUSTMENTS

5-14. DIGITAL PANEL METER ADJUSTMENT (Option 003)

REFERENCE

Service Sheets 3 and 7

DESCRIPTION

The digital panel meter is first adjusted to indicate zero when the 8555A Spectrum Analyzer is adjusted to zero frequency, and then to indicate 18450 when the 8555A is set to 18.450 GHz.

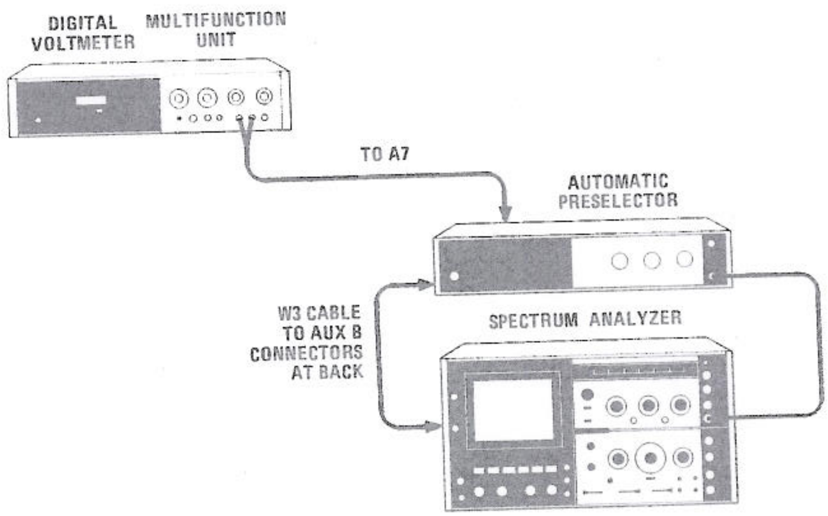


Figure 5-4. Digital Panel Meter Adjustment Test Setup

EQUIPMENT:

Digital Voltmeter (5 digit) . . . . HP 3480B/3484A

NOTE

Before adjusting the digital panel meter circuits, make sure the 8555A Spectrum Analyzer has been adjusted in accordance with the adjustment procedures in the 8555A Operation and Service Manual.

1. Connect the equipment as shown in Figure 5-4. After turning on the LINE power to the instruments, allow 30 minutes for the circuits to stabilize.

2. Remove the top cover from the 8445B Preselector.

3. Connect the + lead of the multifunction digital voltmeter to the standoff on DPM Driver Board A7A2 to which the white-blue (96) wire is connected. Connect the − lead to the standoff on A7A2 to which the violet (7) wire is connected (violet wire is signal ground).

ADJUSTMENTS

5-14. DIGITAL PANEL METER ADJUSTMENT (Option 003) (Cont'd)

4. If the Preselector is equipped with Option 002 (front-panel MANUAL TUNE controls), set the MODE switch to AUTO.

5. Set the Spectrum Analyzer to BAND n=1−/IF=2.05 GHz. Adjust the Spectrum Analyzer Frequency control to obtain a reading of 0.000 Vdc on the multifunction digital voltmeter.

6. Adjust DPM Offset potentiometer R7 on DPM Driver Board A7A2 for a front-panel CENTER FREQUENCY indication of 00000 ±1 count.

7. Set the Spectrum Analyzer to BAND n=4+. Set the FREQUENCY to 18.450 GHz. Adjust Spectrum Analyzer FREQUENCY control for a reading of 18.000 Vdc ±0.001 Vdc on the multifunction digital voltmeter.

8. Adjust DPM Gain potentiometer R6 on DPM Driver Board A7A2 for a front-panel CENTER FREQUENCY indication of 18.450 ±1 count.

9. Repeat steps 5 through 8 until the DPM CENTER FREQUENCY readout is within ±1 count of the actual YIG center frequency. If you have trouble making these adjustments, it may be because the DPM adjustments on YIG/DPM Predriver Board A1 have not been done correctly (see paragraph 5-2). The correct adjustment of the DPM Gain and Offset controls is essentially a compromise between the exact setting at the high end of the frequency range and the exact setting at the low end of the range. You may have to do the DPM adjustments several times to obtain an acceptable DPM readout.

5-15. INSERTION LOSS CHART FOR REPLACEMENT YIG

DESCRIPTION

After a replacement YIG filter is installed in a Preselector, a corrected Insertion Loss Chart should be developed for the new YIG filter. Use the following procedure:

1. Set up the YIG FILTER INSERTION LOSS TEST for a frequency of 4 GHz as described in paragraph 4-19. Record the loss in dB in the proper blank below.

2. Repeat the same test, inserting insertion loss values, for the additional frequencies listed.

3. Send a copy of the data, including Option number of instrument, if any, to your local Hewlett-Packard office. Arrangements will be made with the factory to produce a replacement front panel Insertion Loss Chart. (The Insertion Loss Chart curve for the original YIG filter was developed from data taken at these same frequencies.)

ADJUSTMENTS

5-15. INSERTION LOSS CHART FOR REPLACEMENT YIG (Cont'd)

Table 5-2. Insertion Loss Table

Frequency (GHz)	Loss (dB)	Frequency (GHz)	Loss (dB)
1.8	______	10	______
2	______	12	______
3	______	14	______
4	______	16	______
6	______	18	______
8	______		______

TOP VIEW

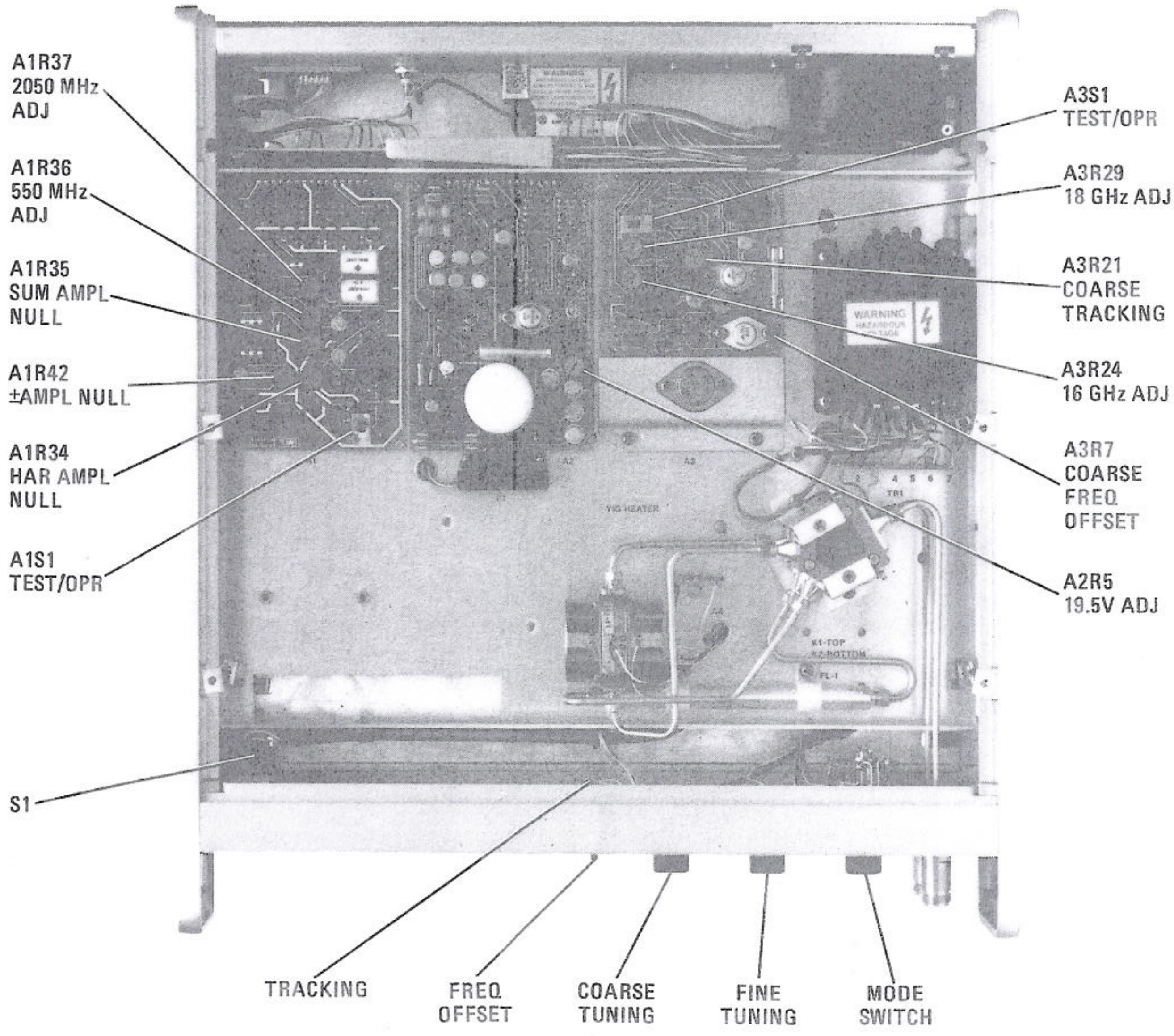


Figure 5-5. Adjustment Control Locations for Standard and Option 002 Preselector

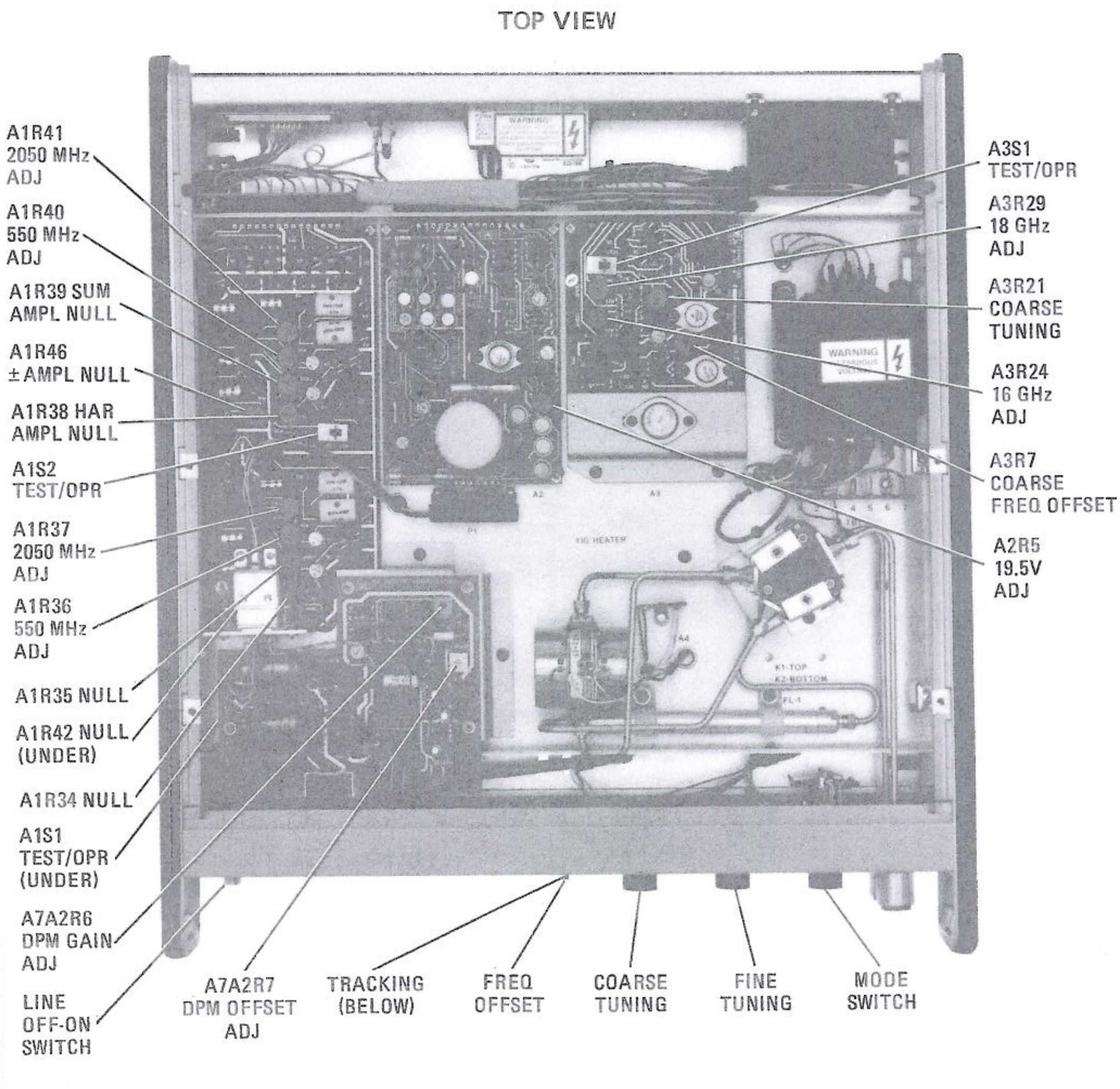


Figure 5-6. Adjustment Control Locations for Preselector with Option 003 DPM

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering parts. Table 6-1 includes a list of reference designations and a list of abbreviations used in the parts list. Table 6-2 lists names and addresses that correspond to the manufacturer code numbers in the parts list. Table 6-3 lists all replaceable parts in alpha-numerical order by reference designation.

6-3. REPLACEABLE PARTS LIST

6-4. Table 6-3, the list of replaceable parts, is organized as follows:

1. Electrical assemblies and their components in alpha-numerical order by reference designation.
2. Miscellaneous parts, at end of list for each major assembly.
3. Chassis-mounted parts, in alph-numerical order by reference designation, at end of parts list.

6-5. The following information is listed for each part:

1. The Hewlett-Packard part number.
2. The part number check digit (CD).
3. The total quantity (Qty) in the instrument. This quantity is given only once, at the first appearance of the part in the list.
4. The description of the part.
5. A typical manufacturer of the part in a five-digit code.
6. The manufacturer part number.

6-6. ORDERING INFORMATION

6-7. To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number (with 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.

6-8. 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.

Table 6-1. Reference Designations and Abbreviations (1 of 3)

REFERENCE DESIGNATIONS

A . . . . . Assembly
AT . . . . . Attenuator, Isolator, Limiter, Termination
B . . . . . Fan, Motor
BT . . . . . Battery
C . . . . . Capacitor
CP . . . . . Coupler
CR . . . . . Diode, Diode Thyristor, Step Recovery Diode (SCR), Varactor
DC . . . . . Directional Coupler
DL . . . . . Delay Line
DS . . . . . Annunciator, Lamp, Light Emitting Diode (LED), Signaling Device (Audible or Visible)
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 . . . . . Silicon Controlled Rectifier (SCR), Transistor, 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 . . . . . Breakdown Diode (Zener), Voltage Regulator
W . . . . . Cable, Transmission Path, Wire
X . . . . . Socket
Y . . . . . Crystal Unit (Piezoelectric, Quartz)
Z . . . . . Tuned Cavity, Tuned Circuit

ABBREVIATIONS

A

A . . . . . Across Flats, Acrylic, Air (Dry Method), Ampere
AL . . . . . Aluminum
ALY . . . . . Alloy
ASSY . . . . . Assembly
AWG . . . . . American Wire Gage

B

BD . . . . . Board, Bundle
BDG . . . . . Binding
BSHG . . . . . Bushing

C

CA . . . . . Cable, Calcium
CBL . . . . . Cable
CC . . . . . Carbon Composition, Cubic Centimeter
CER . . . . . Ceramic
CFM . . . . . Cubic Feet Per Minute
CHAM . . . . . Chamfer
COND . . . . . Condition, Conductor
CONT . . . . . Contact, Continuous, Control, Controller
CRP . . . . . Crepe, Crimp
CTR . . . . . Center
CUP-PT . . . . . Cup Point

D

DBL . . . . . Double
DC . . . . . Direct Current, Double Contact
DEG . . . . . Degree
DIP . . . . . Dual In-Line Package
DIP-SLDR . . . . . Dip Solder
DO . . . . . Package Type Designation
DPDT . . . . . Double Pole Double Throw

E

EXT . . . . . Extended, Extension, External, Extinguish

F

F . . . . . Fahrenheit, Farad, Female, Film (Resistor), Fixed, Flange, Flint, Fluorine, Frequency
FEM . . . . . Female
FHD . . . . . Flat Head
FL . . . . . Flash, Flat, Fluid
FLAT-PT . . . . . Flat Point
FLG . . . . . Flange
FM . . . . . Flange, Male Connection; Foam, Frequency Modulation
FT . . . . . Current Gain Bandwidth Product (Transition Frequency); Feet, Foot
FXD . . . . . Fixed

G

GEN-PRP . . . . . General Purpose

H

HD . . . . . Hand, Hard, Head, Heavy Duty
HEX . . . . . Hexadecimal, Hexagon, Hexagonal
HLCL . . . . . Helical
HZ . . . . . Hertz

I

IC . . . . . Collector Current, Integrated Circuit
ID . . . . . Identification, Inside Diameter
IN . . . . . Inch, Indium
INTL . . . . . Internal, International

Table 6-1. Reference Designations and Abbreviations (2 of 3)

J

J-FET .... Junction Field Effect Transistor
JFET .... Junction Field Effect Transistor

K

K .... Kelvin, Key, Kilo, Kilohm, Potassium

L

L .... Inductance, Left, Length, Liquid, Locking Threaded, Long, Low
LAM .... Laminated, Lamination, Light Amber
LG .... Length, Long
LIN .... Linear, Linear Taper, Linearity
LK .... Link, Lock

M

M .... Male, Maximum, Mega, Mil, Milli, Mode, Momentary, Mounting Hole Centers, Mounting Hole Diameter
MA .... Milliampere
MACH .... Machined
MINTR .... Miniature
MO .... Metal Oxide, Millounce, Molybdenum
MOD .... Model, Modified, Modular, Modulated, Modulator
MTG .... Mounting
MTLC .... Metallic

N

NO .... Normally Open, Number
NPN .... Negative Positive Negative (Transi tor)
NS .... Nanosecond, Non-Shorting, Nose
NYL .... Nylon (Polyamide)

O

OD .... Olive Drab, Outside Diameter
OPT .... Optical, Option, Optional

P

PB .... Lead (Metal), Push Button
PC .... Picocoulomb, Piece, Printed Circuit
PD .... Pad, Palladium, Pitch Diameter, Power Dissipation
PF .... Picofarad; Pipe, Female Connection; Power Factor
PHD .... Pan Head
PHEN .... Bakelite (Phenolic)
PNP .... Positive Negative Positive (Transistor)
P/O .... Part Of
POLYETH .... Polyethylene
PWR .... Power
PWW .... Precision Wirewound

Q

QDISC .... Quick Disconnect

R

RBN .... Ribbon
RCPL .... Receptacle
REC .... Recess, Recessed, Recommended
RECT .... Rectangle, Rectangular, Rectifier
RGLTR .... Regulator
RTRY .... Rotary

S

SEG .... Sealing
SGL .... Single
SI .... Silicon, Square Inch
SL .... Slide, Slow
SLDR .... Solder
SLT .... Slate, Slot, Slotted
SM .... Machine Screw, Samarium, Seam, Small, Square Meter, Sub Modular, Subminiature
SPCG .... Spacing
SPDT .... Single Pole Double Throw
SST .... Stainless Steel
STD .... Standard
STL .... Steel

T

T .... Tab Width, Taper, Teeth, Temperature, Tera, Tesla, Thermoplastic (Insulation), Thickness, Time, Timed, Tooth, Turns Ratio, Typical
TA .... Ambient Temperature, Tantalum
TAB .... Tabulated
TBAX .... Tube Axial
TC .... Thermoplastic
TERM .... Terminal, Termination
THD .... Thread, Threaded
THK .... Thick
TO .... Package Type Designation, Troy Ounce
TRMR .... Trimmer

U

UF .... Microfarad
UCD .... Microcandela
UF .... Microfarad
UH .... Microhenry
UL .... Microliter, Underwriters' Laboratories, Inc.

V

V .... Vanadium, Variable, Violet, Volt, Voltage
VAC .... Vacuum; Volts, Alternating Current
VAR .... Variable
VDC .... Volts, Direct Current

W

W .... Watt, Wattage, White, Wide, Width, Wire
WD .... Width, Wood
WDTH .... Width
WSHR .... Washer
WW .... Wire Wound

X

XSTR .... Transistor

Y

YIG .... Yttrium-Iron-Garnet

Z

Z MAX .... Maximum Impedance
ZNR .... Zener

Table 6-1. Reference Designations and Abbreviations (3 of 3)

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. Code List of Manufacturers

Manufacturer Number	Manufacturer Name	Address	Zip Code
00000	ANY SATISFACTORY SUPPLIER		
01121	ALLEN-BRADLEY CO	MILWAUKEE, WI	53204
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS, TX	75222
0192B	RCA CORP SOLID STATE DIV	SOMERVILLE, NJ	08876
02111	SPECTROL ELECTRONICS CORP	CITY OF IND, CA	91745
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX, AZ	85062
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW, CA	94042
20940	MICRO-OHM CORP	EL MONTE, CA	91731
24046	TRANSITRON ELECTRONIC CORP	WAKEFIELD, MA	01880
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD, PA	16701
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA, CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO, CA	94304
30983	MEPCO/ELECTRA CORP	SAN DIEGO, CA	92121
37942	MALLORY P R AND CO INC	INDIANAPOLIS, IN	46206
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS, MA	01247
72136	ELECTRO MOTIVE CORP SUB IEC	WILLIMANTIC, CT	06226
91637	DALE ELECTRONICS INC	COLUMBUS, NE	68601

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				A1 WITHOUT OPTION 003		
A1	08445-60101	7	1	YIG PREDRIVER ASSEMBLY (DELETE FOR OPTION 003)	28480	08445-60101
A1C1	0180-0197	8	4	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1C2	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1C3	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1C4	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1CR1	1901-0025	2	9	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR2	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR3	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR4	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR5	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR6	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR7	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR8	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR9	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1K1	0490-0367	1	2	RELAY-REED 2A 500MA 18VDC-COIL 10VA	28480	0490-0367
A1K2	0490-0367	1		RELAY-REED 2A 500MA 18VDC-COIL 10VA	28480	0490-0367
A1K3				NOT ASSIGNED		
A1K4				NOT ASSIGNED		
A1K5	0490-0760	8	2	RELAY-REED 1A 100MA 12VDC-COIL 3VA	28480	0490-0760
A1K6				NOT ASSIGNED		
A1K7	0490-0760	8		RELAY-REED 1A 100MA 12VDC-COIL 3VA	28480	0490-0760
A1K8	0490-0760	8		RELAY-REED 1A 100MA 12VDC-COIL 3VA	28480	0490-0760
A1Q1	1854-0071	7	8	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q2	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q3	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q4	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q5	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q6	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q7				NOT ASSIGNED		
A1Q8				NOT ASSIGNED		
A1Q9	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q10	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1R1	0757-0458	7	4	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1R2	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1R3	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1R4	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1R5	0757-0401	0	4	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1R6	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A1R7	0811-3007	4	6	RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R8	0698-3157	3	5	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1R9	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A1R10	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1R11	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R12	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R13	0757-0441	8	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A1R14	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1R15	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R16	0811-3008	5	4	RESISTOR 8K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-8001-T
A1R17	0811-3008	5		RESISTOR 8K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-8001-T
A1R18	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1R19	0811-3008	5		RESISTOR 8K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-8001-T
A1R20	0811-3009	6	1	RESISTOR 44K 1% .2W PWW TC=0+-10	14140	1350-1/8-E-4402-F
A1R21	0811-3008	5		RESISTOR 8K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-8001-T
A1R22	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1R23	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1R24	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R25	0811-3112	2	1	RESISTOR 117.5K 1% 1W PWW TC=0+-10	14140	1172-1-117R5-F
A1R26	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1R27	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A1R28	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1R29	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R30	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1R31	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1R32				NOT ASSIGNED		
A1R33				NOT ASSIGNED		
A1R34	2100-1776	5	4	RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776
A1R35	2100-1776	5		RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776
A1R36	2100-1776	5		RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776
A1R37	2100-1774	3	1	RESISTOR-TRMR 2K 5% WW TOP-ADJ 1-TRN	28480	2100-1774
A1R38-A1R41				NOT ASSIGNED		
A1R42	2100-1776	5		RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776

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

Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1S1	3101-1162	6	1	SWITCH-SL SPDT MINTR .5A 125VAC/DC PC	28480	3101-1162
A1TP1	0360-1514	7	4	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1TP2	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1TP3				NOT ASSIGNED		
A1TP4				NOT ASSIGNED		
A1TP5	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1TP6				NOT ASSIGNED		
A1TP7	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1U1	1826-0261	8	3	IC OP AMP LOW-NOISE TO-99 (PREFERRED REPLACEMENT)	28480	1826-0261
A1U2	1826-0261	8		IC OP AMP LOW-NOISE TO-99 (PREFERRED REPLACEMENT)	28480	1826-0261
A1U3				NOT ASSIGNED		
A1U4				NOT ASSIGNED		
A1U5	1826-0261	8		IC OP AMP LOW-NOISE TO-99 (PREFERRED REPLACEMENT)	28480	1826-0261
A1VR1	1902-0041	4	2	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A1VR2	1902-0184	6	2	DIODE-ZNR 16.2V 5% DO-35 PD=.4W	28480	1902-0184
A1VR3	1902-0041	4		DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A1VR4	1902-0184	6		DIODE-ZNR 16.2V 5% DO-35 PD=.4W	28480	1902-0184

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

Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				A1 OPTION 003 ONLY		
A1	08445-60102	8	1	PREDRIVER ASSEMBLY (OPT. 003 ONLY)	28480	08445-60102
A1C1	0180-0197	8	4	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1C2	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1C3	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1C4	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1CR1	1901-0025	2	11	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR2	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR3	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR4	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR5	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR6	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR7	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR8	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR9	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR10	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1CR11	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1K1	0490-0367	1	4	RELAY-REED 2A 500MA 18VDC-COIL 10VA	28480	0490-0367
A1K2	0490-0367	1		RELAY-REED 2A 500MA 18VDC-COIL 10VA	28480	0490-0367
A1K3	0490-0367	1		RELAY-REED 2A 500MA 18VDC-COIL 10VA	28480	0490-0367
A1K4	0490-0367	1		RELAY-REED 2A 500MA 18VDC-COIL 10VA	28480	0490-0367
A1K5	0490-0760	8	7	RELAY-REED 1A 100MA 12VDC-COIL 3VA	28480	0490-0760
A1K6	0490-0760	8		RELAY-REED 1A 100MA 12VDC-COIL 3VA	28480	0490-0760
A1K7	0490-0760	8		RELAY-REED 1A 100MA 12VDC-COIL 3VA	28480	0490-0760
A1K8	0490-0760	8		RELAY-REED 1A 100MA 12VDC-COIL 3VA	28480	0490-0760
A1K9	0490-0760	8		RELAY-REED 1A 100MA 12VDC-COIL 3VA	28480	0490-0760
A1K10	0490-0760	8		RELAY-REED 1A 100MA 12VDC-COIL 3VA	28480	0490-0760
A1K11	0490-0760	8		RELAY-REED 1A 100MA 12VDC-COIL 3VA	28480	0490-0760
A1Q1	1854-0071	7	10	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q2	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q3	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q4	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q5	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q6	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q7	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q8	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q9	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q10	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1R1	0757-0458	7	5	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1R2	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1R3	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1R4	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1R5	0757-0401	0	8	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1R6	0757-0447	4	2	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A1R7	0811-3007	4	13	RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R8	0698-3157	3	6	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1R9	0757-0440	7	2	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A1R10	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1R11	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R12	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R13	0757-0441	8	2	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A1R14	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1R15	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R16	0811-3008	5	8	RESISTOR 8K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-8001-T
A1R17	0811-3008	5		RESISTOR 8K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-8001-T
A1R18	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1R19	0811-3008	5		RESISTOR 8K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-8001-T
A1R20	0811-3009	6	2	RESISTOR 44K 1% .2W PWW TC=0+-10	14140	1350-1/8-E-4402-F
A1R21	0811-3008	5		RESISTOR 8K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-8001-T
A1R22	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1R23	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1R24	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R25	0811-3112	2	2	RESISTOR 117.5K 1% 1W PWW TC=0+-10	14140	1172-1-117R5-F
A1R26	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1R27	0698-3155	1	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A1R28	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1R29	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R30	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1R31	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1R32	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1R33	0757-0447	4		RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A1R34	2100-1776	5	8	RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776
A1R35	2100-1776	5		RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776

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

Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1R36	2100-1776	5		RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776
A1R37	2100-1774	3	2	RESISTOR-TRMR 2K 5% WW TOP-ADJ 1-TRN	28480	2100-1774
A1R38	2100-1776	5		RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776
A1R39	2100-1776	5		RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776
A1R40	2100-1776	5		RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776
A1R41	2100-1774	3		RESISTOR-TRMR 2K 5% WW TOP-ADJ 1-TRN	28480	2100-1774
A1R42	2100-1776	5		RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776
A1R43	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R44	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R45	0698-3160	8	1	RESISTOR 31.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A1R46	2100-1776	5		RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776
A1R47	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A1R48	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1R49	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R50	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R51	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A1R52	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1R53	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R54	0811-3008	5		RESISTOR 8K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-8001-T
A1R55	0811-3008	5		RESISTOR 8K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-8001-T
A1R56	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1R57	0811-3009	6		RESISTOR 44K 1% .2W PWW TC=0+-10	14140	1350-1/8-E-4402-F
A1R58	0811-3008	5		RESISTOR 8K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-8001-T
A1R59	0811-3008	5		RESISTOR 8K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-8001-T
A1R60	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1R61	0811-3112	2		RESISTOR 117.5K 1% 1W PWW TC=0+-10	14140	1172-1-117R5-F
A1R62	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R63	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A1R64	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A1R65	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A1R66	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1R67	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1S1	3101-1162	6	2	SWITCH-SL SPDT MINTR .5A 125VAC/DC PC	28480	3101-1162
A1S2	3101-1162	6		SWITCH-SL SPDT MINTR .5A 125VAC/DC PC	28480	3101-1162
A1TP1	0360-1514	7	9	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1TP2	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1TP3	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1TP4	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1TP5	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1TP6	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1TP7	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1TP8	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1TP9	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A1U1	1826-0261	8	5	IC OP AMP LOW-NOISE TO-99 (PREFERRED REPLACEMENT)	28480	1826-0261
A1U2	1826-0261	8		IC OP AMP LOW-NOISE TO-99 (PREFERRED REPLACEMENT)	28480	1826-0261
A1U3	1826-0261	8		IC OP AMP LOW-NOISE TO-99 (PREFERRED REPLACEMENT)	28480	1826-0261
A1U4	1826-0261	8		IC OP AMP LOW-NOISE TO-99 (PREFERRED REPLACEMENT)	28480	1826-0261
A1U5	1826-0261	8		IC OP AMP LOW-NOISE TO-99 (PREFERRED REPLACEMENT)	28480	1826-0261
A1U6	1826-0013	8	1	IC OP AMP LOW-NOISE TO-99	06665	SSS741CJ
A1VR1	1902-0041	4	4	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A1VR2	1902-0184	6	4	DIODE-ZNR 16.2V 5% DO-35 PD=.4W	28480	1902-0184
A1VR3	1902-0041	4		DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A1VR4	1902-0184	6		DIODE-ZNR 16.2V 5% DO-35 PD=.4W	28480	1902-0184
A1VR5	1902-0041	4		DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A1VR6	1902-0184	6		DIODE-ZNR 16.2V 5% DO-35 PD=.4W	28480	1902-0184
A1VR7	1902-0041	4		DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A1VR8	1902-0184	6		DIODE-ZNR 16.2V 5% DO-35 PD=.4W	28480	1902-0184

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

Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2	08445-60114	2	1	POWER SUPPLY ASSEMBLY	28480	08445-60114
A2C1	0160-2055	9	3	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C2	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A2C3	0180-1819	3	1	CAPACITOR-FXD 100UF+75-10% 50VDC AL	56289	30D107G050DH2
A2C4	0180-2181	4	1	CAPACITOR-FXD 1300UF+75-10% 50VDC AL	00853	539-7471-02
A2C5	0160-3459	9	1	CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459
A2C6	0160-3466	8	1	CAPACITOR-FXD 100PF +-10% 1KVDC CER	28480	0160-3466
A2C7	0180-0197	8	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2C8	0180-2141	6	1	CAPACITOR-FXD 3.3UF+-10% 50VDC TA	56289	150D335X9050B2
A2CR1	1901-0025	2	6	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A2CR2	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A2CR3	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A2CR4	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A2CR5	1901-0040	1	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2CR6	1901-0200	5	4	DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A2CR7	1901-0200	5		DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A2CR8	1901-0200	5		DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A2CR9	1901-0200	5		DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A2CR10	1901-0159	3	4	DIODE-PWR RECT 400V 750MA DO-41	28480	1901-0159
A2CR11	1901-0159	3		DIODE-PWR RECT 400V 750MA DO-41	28480	1901-0159
A2CR12	1901-0159	3		DIODE-PWR RECT 400V 750MA DO-41	28480	1901-0159
A2CR13	1901-0159	3		DIODE-PWR RECT 400V 750MA DO-41	28480	1901-0159
A2F1	2110-0012	1	2	FUSE .5A 250V NTD 1.25X.25 UL	28480	2110-0012
A2F2	2110-0027	6	1	FUSE .125A 250V NTD 1.25X.25 UL	28480	2110-0027
A2MP1	1205-0011	0	1	HEAT SINK TO-5/TO-39-CS	28480	1205-0011
A2MP2	1205-0085	8	1	HEAT SINK TO-66-CS	28480	1205-0085
A2MP3	2110-0269	0	5	FUSEHOLDER-CLIP TYPE 5A .25D-FUSE	28480	2110-0269
A2Q1	1854-0072	8	2	TRANSISTOR NPN 2N3054 SI TO-66 PD=25W	01928	2N3054
A2Q2	1854-0022	8	4	TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
A2Q3	1853-0012	4	4	TRANSISTOR PNP 2N2904A SI TO-39 PD=600MW	01295	2N2904A
A2Q4	1854-0022	8		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
A2Q5	1854-0022	8		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
A2Q6	1853-0012	4		TRANSISTOR PNP 2N2904A SI TO-39 PD=600MW	01295	2N2904A
A2Q7	1853-0012	4		TRANSISTOR PNP 2N2904A SI TO-39 PD=600MW	01295	2N2904A
A2Q8	1853-0012	4		TRANSISTOR PNP 2N2904A SI TO-39 PD=600MW	01295	2N2904A
A2Q9	1854-0039	7	1	TRANSISTOR NPN 2N3053S SI TO-39 PD=1W	01928	2N3053S
A2Q10	1853-0020	4	4	TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A2Q11	1854-0071	7	2	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A2R1	0698-3260	9	4	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A2R2	0757-0442	9	8	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2R3	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A2R4	0757-0458	7	6	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2R5	2100-1774	3	1	RESISTOR-TRMR 2K 5% WW TOP-ADJ 1-TRN	28480	2100-1774
A2R6	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2R7	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A2R8	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2R9	0757-0465	6	2	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A2R10	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2R11	0757-0466	7	1	RESISTOR 110K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1103-F
A2R12	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A2R13	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A2R14	0764-0016	8	1	RESISTOR 1K 5% 2W MO TC=0+-200	28480	0764-0016
A2R15	0698-3637	4	2	RESISTOR 820 5% 2W MO TC=0+-200	28480	0698-3637
A2R16	0698-3136	8	2	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A2R17	0698-3156	2	1	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A2R18	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A2R19	0698-3637	4		RESISTOR 820 5% 2W MO TC=0+-200	28480	0698-3637
A2R20-A2R23				NOT ASSIGNED		
A2R24	0764-0033	9	1	RESISTOR 33 5% 2W MO TC=0+-200	28480	0764-0033
A2R25	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A2R26	0757-0439	4	1	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A2R27	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A2R28	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2R29	0683-0275	9	2	RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A2R30				NOT ASSIGNED		
A2R31	0811-3007	4	3	RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A2R32	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A2R33	0698-3241	6	1	RESISTOR 250 .25% .125W F TC=0+-50	28480	0698-3241

See introduction to this section for ordering information
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Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2R34	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2R35	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2R36	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2TP1	0360-1514	7	19	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A2TP2	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A2TP3	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A2TP4	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A2TP5	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A2TP6	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A2TP7	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A2U1	1820-0196	6	1	IC 723 V RGLTR TO-100	04713	MC1723CG
A2U2	1826-0261	8	3	IC OP AMP LOW-NOISE TO-99 (PREFERRED REPLACEMENT)	28480	1826-0261
A2U3	1826-0261	8		IC OP AMP LOW-NOISE TO-99 (PREFERRED REPLACEMENT)	28480	1826-0261
A2VR1- A2VR3				NOT ASSIGNED		
A2VR4	1902-0025	4	1	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A2VR5	1902-3256	9	1	DIODE-ZNR 23.7V 5% DO-35 PD=.4W	28480	1902-3256
A2VR6	1902-3279	6	2	DIODE-ZNR 28.7V 5% DO-35 PD=.4W	28480	1902-3279
A2VR7	1902-3048	7	1	DIODE-ZNR 3.48V 5% DO-35 PD=.4W	28480	1902-3048
A2VR8	1902-3268	3	2	DIODE-ZNR 26.1V 5% DO-35 PD=.4W	28480	1902-3268
A2VR9	1902-3268	3		DIODE-ZNR 26.1V 5% DO-35 PD=.4W	28480	1902-3268
A3	08445-60103	9	1	YIG DRIVER ASSEMBLY	28480	08445-60103
A3C1	0160-3094	8	1	CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A3C2	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3C3	0160-3455	5	1	CAPACITOR-FXD 470PF +-10% 1KVDC CER	28480	0160-3455
A3C4	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A3CR1	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A3CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3CR3	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A3F1	2110-0094	9	1	FUSE 1.25A 250V NTD 1.25X.25 UL IEC	28480	2110-0094
A3K1	0490-0894	9	1	RELAY 2C 36VDC-COIL 2A 30VDC	28480	0490-0894
A3MP1	0340-0162	7	1	INSULATOR-XSTR ALUMINUM	28480	0340-0162
A3MP2	1200-0043	8	1	INSULATOR-XSTR ALUMINUM	28480	1200-0043
A3MP3	1200-0081	4	1	INSULATOR-FLG-BSHG NYLON	28480	1200-0081
A3MP4	2110-0269	0		FUSEHOLDER-CLIP TYPE 5A .250-FUSE	28480	2110-0269
A3MP5	08445-00003	2	1	HEAT SINK, DRIVER	28480	08445-00003
A3Q1	1854-0022	8		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
A3Q2	1853-0020	4		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A3Q3	1854-0237	7	1	TRANSISTOR NPN SI TO-66 PD=20W FT=10MHZ	28480	1854-0237
A3Q4	1854-0217	3	1	TRANSISTOR NPN 2N3442 SI TO-3 PD=117W	01928	2N3442
A3Q5	1853-0020	4		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A3Q6	1853-0020	4		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A3Q7	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A3Q8	1854-0072	8		TRANSISTOR NPN 2N3054 SI TO-66 PD=25W	01928	2N3054
A3R1	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A3R2	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A3R3	0757-0460	1	2	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A3R4	0757-0460	1		RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A3R5	0698-3161	9	1	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A3R6	0757-0398	4	1	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A3R7	2100-1776	5	1	RESISTOR-TRMR 10K 5% WW TOP-ADJ 1-TRN	28480	2100-1776
A3R8	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A3R9	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3R10	0757-0442	9		RESISYOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3R11	0811-1362	0	1	RESISTOR 1K .01% .25W PWW TC=0+-5	28480	0811-1362
A3R12	0811-3243	0	1	RESISTOR 2.675 .1% 2.5W PWW TC=0+-3	28480	0811-3243
A3R13*	0698-3432	7	1	RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A3R14	0698-3163	1	1	RESISTOR 611 1% .125W F TC=0+-100	24546	C4-1/8-T0-6110-F
A3R15	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3R16	0811-3007	4		RESISTOR 10K .01% .2W PWW TC=0+-1	14140	1350-1/32-A-1002-T
A3R17	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A3R18	0698-3441	8	1	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A3R19	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A3R20	0698-3449	6	1	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A3R21	2100-1772	1	1	RESISTOR-TRMR 500 5% WW TOP-ADJ 1-TRN	28480	2100-1772
A3R22	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A3R23	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A3R24	2100-1777	6	2	RESISTOR-TRMR 20K 5% WW TOP-ADJ 1-TRN	28480	2100-1777
A3R25- A3R28				NOT ASSIGNED		

See introduction to this section for ordering information
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Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3R29	2100-1777	6		RESISTOR-TRMR 20K 5% WW TOP-ADJ 1-TRN	28480	2100-1777
A3S1	3101-1162	6	1	SWITCH-SL SPDT MINTR .5A 125VAC/DC PC	28480	3101-1162
A3TP1	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A3TP2	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A3TP3	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A3TP4	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A3U1	1826-0261	8		IC OP AMP LOW-NOISE TO-99 (PREFERRED REPLACEMENT)	28480	1826-0261
A3VR1	1902-0685	2	1	DIODE-ZNR 9V 2% DO-7 PD=.5W TC=+.001%	28480	1902-0685
A3VR2	1902-3203	6	1	DIODE-ZNR 14.7V 5% DO-35 PD=.4W	28480	1902-3203
A3VR3	1902-0184	6	1	DIODE-ZNR 16.2V 5% DO-35 PD=.4W	28480	1902-0184
A3VR4	1902-3182	0	1	DIODE-ZNR 12.1V 5% DO-35 PD=.4W	28480	1902-3182
A3VR5	1902-0175	5	1	DIODE-ZNR 100V 5% DO-15 PD=1W TC=+.083%	28480	1902-0175
A3VR6	1902-3279	6		DIODE-ZNR 28.7V 5% DO-35 PD=.4W	28480	1902-3279
A4	0960-0358	7	1	YIG FILTER ASSEMBLY	28480	0960-0358
A5	08445-60104	0	1	MOTHERBOARD ASSEMBLY	28480	08445-60104
A5R1	0698-3453	2	1	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A5XA1	1251-1886	6	3	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-1886
A5XA2	1251-1886	6		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-1886
A5XA3	1251-1886	6		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-1886
A6	0960-0443	1	1	POWER MODULE ASSEMBLY (PREFERRED REPL.)	28480	0960-0443
A6F1	2110-0001	8	1	FUSE 1A 250V NTD 1.25X.25 UL (FOR 100/120VAC OPERATION)	75915	312001
A6F1	2110-0012	1		FUSE .5A 250V NTD 1.25X.25 UL (FOR 220/240VAC OPERATION)	28480	2110-0012
A6J1	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A6J2	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A6J3	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A6J4	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A6J5	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A6J6	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A6J7	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A6J8	0360-1514	7		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514

See introduction to this section for ordering information
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Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7			1	DIGITAL PANEL METER ASSEMBLY (FOR OPTION 003)		
A7A1	08445-60038	9	1	DPM DISPLAY BOARD ASSEMBLY	28480	08445-60038
A7A1DS1	1990-0693	7	5	DISPLAY-NUM-SEG 1-CHAR .3-H	28480	1DS1-3533
A7A1DS2	1990-0693	7		DISPLAY-NUM-SEG 1-CHAR .3-H	28480	1DS1-3533
A7A1DS3	1990-0693	7		DISPLAY-NUM-SEG 1-CHAR .3-H	28480	1DS1-3533
A7A1DS4	1990-0693	7		DISPLAY-NUM-SEG 1-CHAR .3-H	28480	1DS1-3533
A7A1DS5	1990-0693	7		DISPLAY-NUM-SEG 1-CHAR .3-H	28480	1DS1-3533
A7A1J1	1200-0507	9	3	SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0507
A7A1Q1	1854-0071	7	6	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A1Q2	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A1Q3	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A1Q4	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A1Q5	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A1XDS1	1200-0834	5	5	SOCKET-IC 10-CONT DIP DIP-SLDR	28480	1200-0834
A7A1XDS2	1200-0834	5		SOCKET-IC 10-CONT DIP DIP-SLDR	28480	1200-0834
A7A1XDS3	1200-0834	5		SOCKET-IC 10-CONT DIP DIP-SLDR	28480	1200-0834
A7A1XDS4	1200-0834	5		SOCKET-IC 10-CONT DIP DIP-SLDR	28480	1200-0834
A7A1XDS5	1200-0834	5		SOCKET-IC 10-CONT DIP DIP-SLDR	28480	1200-0834
				DPM DISPLAY MISC PARTS		
	08445-20039	6	1	WINDOW-DIGITAL DISPLAY (ALSO LISTED AS MP257)	28480	08445-20039
	0380-0093	7	2	STANDOFF-HEX .5-IN-LG 6-32THD .25-IN-A/F	00000	ORDER BY DESCRIPTION
	2360-0013	1	2	SCREW-MACM 6-32 1-IN-LG RD-HD-SLT	00000	ORDER BY DESCRIPTION
A7A2	08445-60037	8	1	DPM DRIVER BOARD ASSEMBLY	28480	08445-60037
A7A2C1	0160-2220	0	1	CAPACITOR-FXD 1200PF +-5% 300VDC MICA	28480	0160-2220
A7A2C2	0160-3402	2	1	CAPACITOR-FXD 1UF +-5% 50VDC MET-POLYC	28480	0160-3402
A7A2C3	0140-0200	0	1	CAPACITOR-FXD 390PF +-5% 300VDC MICA	72136	DM15F391J0300WV1CR
A7A2C4	0160-3914	1	2	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-3914
A7A2C5	0160-3914	1		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-3914
A7A2C6	0160-3661	5	1	CAPACITOR-FXD .1UF +-5% 50VDC MET-POLYC	28480	0160-3661
A7A2C7	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A2C8	0180-2501	2	2	CAPACITOR-FXD 680UF+50-10% 25VDC AL	28480	0180-2501
A7A2C9	0180-0553	0	2	CAPACITOR-FXD 22UF+-20% 25VDC TA	28480	0180-0553
A7A2C10	0180-2501	2		CAPACITOR-FXD 680UF+50-10% 25VDC AL	28480	0180-2501
A7A2C11	0180-0553	0		CAPACITOR-FXD 22UF+-20% 25VDC TA	28480	0180-0553
A7A2C12	0180-2500	1	1	CAPACITOR-FXD 1500UF+50-10% 16VDC AL	37942	TT152U016G1C3P
A7A2C13	0180-0552	9	2	CAPACITOR-FXD 220UF+-20% 10VDC TA	28480	0180-0552
A7A2C14	0180-0552	9		CAPACITOR-FXD 220UF+-20% 10VDC TA	28480	0180-0552
A7A2CR1	1901-0050	3	1	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A7A2CR2	1901-0028	5	6	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A2CR3	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A2CR4	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A2CR5	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A2CR6	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A2CR7	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A2E1	1251-0600	0	12	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2E2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2E3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2E4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2E5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2E6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2E7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2E8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2J1	1200-0507	9		SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0507
A7A2L1	9100-1636	3	1	INDUCTORRF-CH-MLD 110UH 5% .166DX.385LG	28480	9100-1636
A7A2L2	9140-0178	0	1	INDUCTORRF-CH-MLD 12UH 10% .166DX.385LG	28480	9140-0178
A7A2MP1	1205-0050	7	2	HEAT SINK TO-5/TO-39-CS	28480	1205-0050
A7A2MP2	1205-0050	7		HEAT SINK TO-5/TO-39-CS	28480	1205-0050
A7A2MP3	1205-0309	9	1	HEAT SINK SGL TO-220-CS	28480	1205-0309
A7A2Q1	1854-0404	0	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7A2Q2	1853-0281	9	1	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A7A2Q3	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A2Q4	1855-0420	2	1	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A7A2Q5	1853-0314	9	1	TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A

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

Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A2Q6	1854-0637	1	1	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A7A2R1	0811-0696	1	1	RESISTOR 91K 1% .125W PWW TC=0+-5	28480	0811-0696
A7A2R2	0811-0640	5	1	RESISTOR 100K .01% .125W PWW TC=0+-10	28480	0811-0640
A7A2R3	0757-0460	1	1	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A7A2R4	0698-3162	0	1	RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A7A2R5	0698-3155	1	3	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A7A2R6	2100-3210	6	1	RESISTOR-TRMR 10K 10% C TOP-ADJ 1-TRN	28480	2100-3210
A7A2R7	2100-3214	0	1	RESISTOR-TRMR 100K 10% C TOP-ADJ 1-TRN	28480	2100-3214
A7A2R8	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7A2R9	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7A2R10	0757-0274	5	1	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
A7A2R11	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A2R12	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A7A2R13	0698-3136	8	1	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A7A2R14	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R15	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A7A2R16	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A7A2R17				NOT ASSIGNED		
A7A2R18	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A7A2R19	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A7A2R20	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A7A2R21	0811-1185	5	1	RESISTOR 10K .01% .05W PWW TC=0+-10	20940	140-1/20-1002-T
A7A2R22	0811-0569	7	1	RESISTOR 1.1421K .01% .05W PWW TC=0+-10	20940	140-1/8-D-1142R1-T
A7A2R23	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A7A2R24	0757-0421	4	2	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A7A2R25	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R26	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A7A2R27	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A7A2TP1	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2U1	1820-1903	5	1	IC DRVR TTL DSPL DRVR	07263	9368PC
A7A2U2	1810-0347	8	2	NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A7A2U3	1810-0347	8		NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A7A2U4	1826-0587	1	1	IC CONV 18-DIP-P	17856	LD121CJ
A7A2U5	1826-0588	2	1	IC CONV 16-DIP-P	17856	LD120CJ
A7A2U6	1826-0122	0	1	IC 7805 V RGLTR TO-220	07263	7805UC
A7A2U7	1826-0261	8	1	IC OP AMP LOW-NOISE TO-99	28480	1826-0261
A7A2VR1	1902-0625	0	1	DIODE-ZNR 1N829 6.2V 5% DO-7 PD=.25W	04713	1N829
A7A2VR2	1902-3149	9	1	DIODE-ZNR 9.09V 5% DO-35 PD=.4W	28480	1902-3149
A7A2VR3	1902-3193	3	2	DIODE-ZNR 13.3V 5% DO-35 PD=.4W	28480	1902-3193
A7A2VR4	1902-3193	3		DIODE-ZNR 13.3V 5% DO-35 PD=.4W	28480	1902-3193
A7A2XU4	1200-0539	7	1	SOCKET-IC 18-CONT DIP DIP-SLDR	28480	1200-0539
A7A2XU5	1200-0507	9		SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0507
				DPM DRIVER MISC PARTS		
	08445-00056	5	1	SUBCHASSIS-DPM DRIVER MOUNTING BRACKET	28480	08445-00056
	0520-0129	8	2	SCREW-MACH 2-56 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2190-0014	1	2	WASHER-LK INTL T NO. 2 .089-IN-ID	28480	2190-0014
	2200-0103	2	5	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2360-0115	4	2	SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2510-0046	9	2	SCREW-MACH 8-32 .375-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
A7W1	08445-60040	3	1	CABLE:DPM DRIVER/DISPLAY	28480	08445-60040
A7W1	08445-60041	4	1	WIRING HARNESS-DPM DRIVER INPUT	28480	08445-60041
	1251-0143	6	1	CONNECTOR 14-PIN F MICRO RIBBON	28480	1251-0143

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

Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				CHASSIS PARTS		
B1	3160-0088	7	1	FAN-TBAX 35-CFM 115V 50/60-HZ 1.5KV-DIEL	28480	3160-0088
C1	0160-3451	1	2	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-3451
C2	0160-3451	1		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-3451
FL1	0960-0159	6	1	FILTER-LOW PASS 0-1.8 GHZ (DELETE FOR OPTION 004)	28480	0960-0159
J1	1250-0914	7	2	CONNECTOR-RF APC-N FEM UNMTD 50-OHM	28480	1250-0914
J1	1250-0909	0	2	CONNECTOR-RF APC-7 HERMAPHR UNMTD 50-OHM (FOR OPTION 001 ONLY)	28480	1250-0909
J1	1250-0915	8	2	CONTACT-RF CONN SER APC-N FEMALE	02660	131-149
J1	1250-0816	8		CONTACT-RF CONN CONTACT ASSY (FOR OPTION 001 ONLY)	02660	131-1054
J2	1250-0914	7		CONNECTOR-RF APC-N FEM UNMTD 50-OHM	28480	1250-0914
J2	1250-0909	0		CONNECTOR-RF APC-7 HERMAPHR UNMTD 50-OHM (FOR OPTION 001 ONLY)	28480	1250-0909
J2	1250-0915	8		CONTACT-RF CONN SER APC-N FEMALE	02660	131-149
	1250-0816	8	2	CONTACT-RF CONN CONTACT ASSY (FOR OPTION 001 ONLY)	02660	131-1054
J3				NOT ASSIGNED		
J4	1250-0118	3	1	CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM	28480	1250-0118
J5	1251-2214	6	1	CONNECTOR 17-PIN M D SERIES	28480	1251-2214
K1	08445-60011	8	2	SWITCH,PRECISION, COAXIAL (DELETE FOR OPTION 004)	28480	08445-60011
K2	08445-60011	8		SWITCH,PRECISION, COAXIAL (DELETE FOR OPTION 004)	28480	08445-60011
MP1	2510-0101	7	4	SCREW-MACH 8-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP2	2510-0101	7		SCREW-MACH 8-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP3	2190-0017	4	8	WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
MP4	2190-0017	4		WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
MP5	1251-0218	6	2	LOCK-SUBMIN D CONN	28480	1251-0218
MP6	1251-0218	6		LOCK-SUBMIN D CONN	28480	1251-0218
MP7	5040-0345	7	2	INSULATOR:CONNECTOR	28480	5040-0345
MP8	5040-0345	7		INSULATOR:CONNECTOR	28480	5040-0345
MP9	2190-0016	3	1	WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
MP10	2950-0001	8	7	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP11	0360-1190	5	1	TERMINAL-SLDR LUG PL-MTG FOR-#3/8-SCR	28480	0360-1190
MP12	2950-0001	8		NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP13	2200-0153	2	2	SCREW-MACH 4-40 .875-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP14	2200-0153	2		SCREW-MACH 4-40 .875-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP15	2190-0018	5	10	WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
MP16	2190-0018	5		WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
MP17	3050-0105	6	6	WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0105
MP18	3050-0105	6		WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0105
MP19	2510-0101	7		SCREW-MACH 8-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP20	2510-0101	7		SCREW-MACH 8-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP21	2190-0017	4		WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
MP22	2190-0017	4		WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
MP23	3150-0224	2	1	FILTER-AIR EXP-AL 3-WD 3.938-LG	28480	3150-0224
MP24	2510-0048	1	16	SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP25	08445-00021	4	1	BAFFLE,AIR	28480	08445-00021
MP26	2360-0121	2	4	SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP27	2360-0121	2		SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP28	2360-0121	2		SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP29	2360-0121	2		SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP30	3050-0066	8	12	WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
MP31	3050-0066	8		WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
MP32	3050-0066	8		WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
MP33	3050-0066	8		WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
MP34	2190-0018	5		WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
MP35	2190-0018	5		WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
MP36	2190-0018	5		WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
MP37	2190-0018	5		WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
MP38	2420-0003	7	19	NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP39	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP40	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP41	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP42	2360-0192	7	13	SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP43	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP44	2510-0103	9	4	SCREW-MACH 8-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP45	2510-0103	9		SCREW-MACH 8-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION

See introduction to this section for ordering information
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Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
MP46	3050-0066	8		WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
MP47	3050-0066	8		WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
MP48	2190-0017	4		WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
MP49	2190-0017	4		WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
MP50	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP51	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP52	2200-0109	8	2	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP53	2200-0109	8		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP54	2190-0004	9	2	WASHER-LK INTL T NO. 4 .115-IN-ID	28480	2190-0004
MP55	2190-0004	9		WASHER-LK INTL T NO. 4 .115-IN-ID	28480	2190-0004
MP56	2260-0001	5	2	NUT-HEX-DBL-CHAM 4-40-THD .094-IN-THK	28480	2260-0001
MP57	2260-0001	5		NUT-HEX-DBL-CHAM 4-40-THD .094-IN-THK	28480	2260-0001
MP58	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP59	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP60	2510-0103	9		SCREW-MACH 8-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP61	2510-0103	9		SCREW-MACH 8-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP62	3050-0066	8		WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
MP63	3050-0066	8		WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
MP64	2190-0017	4		WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
MP65	2190-0017	4		WASHER-LK HLCL NO. 8 .168-IN-ID	28480	2190-0017
MP66	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP67	2360-0115	4	7	SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP68	0360-0001	5	1	TERMINAL-SLDR LUG LK-MTG FOR-#6-SCR	28480	0360-0001
MP69	0510-0075	2	8	NUT-SHMET-U-TP 6-32-THD .5-WD STL	28480	0510-0075
MP70	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP71	2360-0196	1	4	SCREW-MACH 6-32 .375-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP72	2360-0196	1		SCREW-MACH 6-32 .375-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP73	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP74	0510-0075	2		NUT-SHMET-U-TP 6-32-THD .5-WD STL	28480	0510-0075
MP75	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP76	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP77	08443-00021	2	1	BRACKET, FRONT PANEL	28480	08443-00021
MP78	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP79	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP80	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP81	2190-0104	0	2	WASHER-LK INTL T 7/16 IN .439-IN-ID	28480	2190-0104
MP82	2950-0132	6	2	NUT-HEX-DBL-CHAM 7/16-28-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP83	2190-0022	1	3	WASHER-LK INTL T 3/8 IN .384-IN-ID	28480	2190-0022
MP84	2950-0001	8		NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP85	1400-0025	0	2	CLAMP-CABLE .5-DIA .5-WD NYL	28480	1400-0025
MP86	1400-0025	0		CLAMP-CABLE .5-DIA .5-WD NYL	28480	1400-0025
MP87	2360-0197	2	4	SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP88	2360-0197	2		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP89	2190-0018	5		WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
MP90	2190-0018	5		WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
MP91	3050-0056	6	10	WASHER-FL LAM NO. 2 .094-IN-ID	28480	3050-0056
MP92	3050-0056	6		WASHER-FL LAM NO. 2 .094-IN-ID	28480	3050-0056
MP93	2190-0022	1		WASHER-LK INTL T 3/8 IN .384-IN-ID	28480	2190-0022
MP94	2950-0001	8		NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP95	2950-0001	8		NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP96	2190-0022	1		WASHER-LK INTL T 3/8 IN .384-IN-ID	28480	2190-0022
MP97	2950-0001	8		NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP98	2950-0001	8		NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP99	2360-0115	4		SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP100	2360-0115	4		SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP101	2190-0027	6	4	WASHER-LK INTL T 1/4 IN .256-IN-ID	28480	2190-0027
MP102	2190-0027	6		WASHER-LK INTL T 1/4 IN .256-IN-ID	28480	2190-0027
MP103	2950-0006	3	2	NUT-HEX-DBL-CHAM 1/4-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP104	2190-0027	6		WASHER-LK INTL T 1/4 IN .256-IN-ID	28480	2190-0027
MP105	2190-0027	6		WASHER-LK INTL T 1/4 IN .256-IN-ID	28480	2190-0027
MP106	2950-0006	3		NUT-HEX-DBL-CHAM 1/4-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP107	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP108	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP109	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP110	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP111	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP112	0510-0075	2		NUT-SHMET-U-TP 6-32-THD .5-WD STL	28480	0510-0075
MP113	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP114	2360-0117	6	17	SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP115	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP116	2190-0007	2	13	WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP117	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP118	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP119	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP120	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION

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

Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
MP121	2200-0147	4	4	SCREW-MACH 4-40 .5-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP122	2200-0147	4		SCREW-MACH 4-40 .5-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP123	2190-0119	7	4	WASHER-FL MTLC 15/32 IN .48-IN-ID	28480	2190-0119
MP124	2190-0119	7		WASHER-FL MTLC 15/32 IN .48-IN-ID	28480	2190-0119
MP125	3050-0105	6		WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0105
MP126	3050-0105	6		WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0105
MP127	0510-0075	2		NUT-SHMET-U-TP 6-32-THD .5-WD STL	28480	0510-0075
MP128	0510-0048	9	1	THREADED INSERT-EXP 6-32 .222-LG SST	28480	0510-0048
MP129	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP130	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP131	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP132	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP133	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP134	2360-0115	4		SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP135	2360-0115	4		SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP136	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP137	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP138	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP139	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP140	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP141	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP142	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP143	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP144	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP145	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP146	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP147	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP148	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP149	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP150	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP151	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP152	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP153	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP154	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP155	2200-0147	4		SCREW-MACH 4-40 .5-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP156	2200-0147	4		SCREW-MACH 4-40 .5-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP157	2190-0119	7		WASHER-FL MTLC 15/32 IN .48-IN-ID	28480	2190-0119
MP158	2190-0119	7		WASHER-FL MTLC 15/32 IN .48-IN-ID	28480	2190-0119
MP159	3050-0105	6		WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0105
MP160	3050-0105	6		WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0105
MP161	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP162	2360-0192	7		SCREW-MACH 6-32 .25-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP163	1400-0017	0	2	CLAMP-CABLE .312-DIA .375-WD NYL	28480	1400-0017
MP164	1400-0017	0		CLAMP-CABLE .312-DIA .375-WD NYL	28480	1400-0017
MP165	2360-0197	2		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP166	2360-0197	2		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP167	3050-0056	6		WASHER-FL LAM NO. 2 .094-IN-ID	28480	3050-0056
MP168	3050-0056	6		WASHER-FL LAM NO. 2 .094-IN-ID	28480	3050-0056
MP169	3050-0056	6		WASHER-FL LAM NO. 2 .094-IN-ID	28480	3050-0056
MP170	3050-0056	6		WASHER-FL LAM NO. 2 .094-IN-ID	28480	3050-0056
MP171	2190-0018	5		WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
MP172	2190-0018	5		WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
MP173	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP174	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP175	2360-0203	1	4	SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP176	2360-0203	1		SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP177	2360-0203	1		SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP178	2360-0203	1		SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP179	3050-0056	6		WASHER-FL LAM NO. 2 .094-IN-ID	28480	3050-0056
MP180	3050-0056	6		WASHER-FL LAM NO. 2 .094-IN-ID	28480	3050-0056
MP181	3050-0056	6		WASHER-FL LAM NO. 2 .094-IN-ID	28480	3050-0056
MP182	3050-0056	6		WASHER-FL LAM NO. 2 .094-IN-ID	28480	3050-0056
MP183	3050-0066	8		WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
MP184	3050-0066	8		WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
MP185	3050-0066	8		WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
MP186	3050-0066	8		WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0066
MP187	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP188	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP189	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP190	2420-0003	7		NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP191	0510-0075	2		NUT-SHMET-U-TP 6-32-THD .5-WD STL	28480	0510-0075
MP192	1400-0092	1	4	STRAP-CABLE .25-DIA POLYETH	28480	1400-0092
MP193	1400-0092	1		STRAP-CABLE .25-DIA POLYETH	28480	1400-0092
MP194	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP195	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION

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

Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
MP196	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP197	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP198	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP199	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP200	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP201	2190-0007	2		WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
MP202	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP203	2510-0048	1		SCREW-MACH 8-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP204	0510-0075	2		NUT-SHMET-U-TP 6-32-THD .5-WD STL	28480	0510-0075
MP205	1400-0092	1		STRAP-CABLE .25-DIA POLYETH	28480	1400-0092
MP206	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP207	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP208	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP209	2360-0117	6		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP210	1400-0092	1		STRAP-CABLE .25-DIA POLYETH	28480	1400-0092
MP211	1400-0249	0	5	CABLE TIE .062-.625-DIA .091-WD NYL	28480	1400-0249
MP212	1400-0249	0		CABLE TIE .062-.625-DIA .091-WD NYL	28480	1400-0249
MP213	1400-0249	0		CABLE TIE .062-.625-DIA .091-WD NYL	28480	1400-0249
MP214	2360-0115	4		SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP215	2360-0115	4		SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
MP216	2190-0104	0		WASHER-LK INTL T 7/16 IN .439-IN-ID	28480	2190-0104
MP217	2950-0132	6		NUT-HEX-DBL-CHAM 7/16-28-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
MP218	0510-0075	2		NUT-SHMET-U-TP 6-32-THD .5-WD STL	28480	0510-0075
MP219	2360-0196	1		SCREW-MACH 6-32 .375-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP220	2360-0196	1		SCREW-MACH 6-32 .375-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
MP221	0510-0075	2		NUT-SHMET-U-TP 6-32-THD .5-WD STL	28480	0510-0075
MP222	1400-0093	2	1	STRAP-CABLE .438-DIA POLYETH	28480	1400-0093
MP223	1400-0249	0		CABLE TIE .062-.625-DIA .091-WD NYL	28480	1400-0249
MP224	1400-0249	0		CABLE TIE .062-.625-DIA .091-WD NYL	28480	1400-0249
MP225	08445-20004	5	1	KNOB, KNURLED	28480	08445-20004
MP226	3030-0332	9	2	SCREW-SET 2-56 .094-IN-LG CUP-PT SST	00000	ORDER BY DESCRIPTION
MP227	3030-0332	9		SCREW-SET 2-56 .094-IN-LG CUP-PT SST	00000	ORDER BY DESCRIPTION
MP228	08445-00041	8	1	DIAL-KNOB, "MODE"	28480	08445-00041
MP229	3030-0145	2	6	SCREW-SET 6-32 .125-IN-LG FLAT-PT ALY	00000	ORDER BY DESCRIPTION
MP230	3030-0145	2		SCREW-SET 6-32 .125-IN-LG FLAT-PT ALY	00000	ORDER BY DESCRIPTION
MP231	08445-00040	7	1	DIAL-KNOB, "FINE"	28480	08445-00040
MP232	3030-0145	2		SCREW-SET 6-32 .125-IN-LG FLAT-PT ALY	00000	ORDER BY DESCRIPTION
MP233	3030-0145	2		SCREW-SET 6-32 .125-IN-LG FLAT-PT ALY	00000	ORDER BY DESCRIPTION
MP234	08445-00039	4	1	DIAL-KNOB, "COARSE"	28480	08445-00039
MP235	3030-0145	2		SCREW-SET 6-32 .125-IN-LG FLAT-PT ALY	00000	ORDER BY DESCRIPTION
MP236	3030-0145	2		SCREW-SET 6-32 .125-IN-LG FLAT-PT ALY	00000	ORDER BY DESCRIPTION
MP237	08445-00059	8	1	SUB-PANEL, FRONT	28480	08445-00059
MP238	2360-0184	7	8	SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP239	2360-0184	7		SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP240	2360-0184	7		SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP241	2360-0184	7		SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP242	2360-0184	7		SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP243	2360-0184	7		SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP244	2360-0184	7		SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP245	2360-0184	7		SCREW-MACH 6-32 .438-IN-LG 82 DEG	00000	ORDER BY DESCRIPTION
MP246	08445-00026	9	1	TOP COVER ASSEMBLY	28480	08445-00026
MP247	08445-00108	8	1	PANEL, REAR	28480	08445-00108
MP248	5000-8595	1	2	COVER, SIDE, OLIVE GRAY	28480	5000-8595
MP249	5000-8595	1		COVER, SIDE, OLIVE GRAY	28480	5000-8595
MP250	08445-00027	0	1	BOTTOM COVER ASSEMBLY, MOD	28480	08445-00027
MP251	5060-0767	9	5	FOOT ASSY:FM	28480	5060-0767
MP252	5060-0767	9		FOOT ASSY:FM	28480	5060-0767
MP253	5060-0767	9		FOOT ASSY:FM	28480	5060-0767
MP254	5060-0767	9		FOOT ASSY:FM	28480	5060-0767
MP255	5060-0767	9		FOOT ASSY:FM	28480	5060-0767
MP256	1490-0030	6	1	TILT STAND 3-IN-W 13.75-IN-OA-LG SST	28480	1490-0030
MP257	08445-20039	6	1	WINDOW, DIGITAL (FOR OPTION 003 ONLY)	28480	08445-20039
MP258	08445-00104	4	1	PANEL, FRONT (DELETE FOR OPT. 002 & 003)	28480	08445-00104
MP259	08445-00102	2	1	PANEL, FRONT (FOR OPT. 002 ONLY)	28480	08445-00102
MP260	08445-00055	4	1	PANEL, FRONT (FOR OPT. 003 ONLY)	28480	08445-00055
MP261	08445-00058	7	1	PANEL, FRONT(FOR OPT 002 & 003 COMBINED)	28480	08445-00058
MP262	5020-6850	9	1	TRIM:PANEL, MINT GRAY	28480	5020-6850
MP263	5060-0730	6	2	FRAME ASSY:3 X 16	28480	5060-0730
MP264	5060-0730	6		FRAME ASSY:3 X 16	28480	5060-0730
MP265	5000-0050	7	2	TRIM:SIDES	28480	5000-0050
MP266	5000-0050	7		TRIM:SIDES	28480	5000-0050
MP267	5020-6851	0	1	TRIM:PANEL, MINT GRAY	28480	5020-6851
MP268	08445-00106	6	1	PLATE, CONNECTOR	28480	08445-00106
MP269	08443-40005	6	1	TRIM STRIP	28480	08443-40005
MP270	08445-00020	3	1	DECK	28480	08445-00020

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

Table 6-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
R1	2100-3105	8	2	RESISTOR-VAR CONTROL CCP 100 10% LIN	28480	2100-3105
R2	2100-3105	8		RESISTOR-VAR CONTROL CCP 100 10% LIN	28480	2100-3105
R3	0757-0459	8	1	RESISTOR 56.2K 1% .125W F TC=0+-100 (PART OF W10)	24546	C4-1/8-T0-5622-F
R4	2100-3128	5	2	RESISTOR-VAR CONTROL WW 10K 10% LIN (FOR OPTION 002 ONLY)	28480	2100-3128
R5	2100-3128	5		RESISTOR-VAR CONTROL WW 10K 10% LIN (FOR OPTION 002 ONLY)	28480	2100-3128
S1	3101-1957	7	1	SWITCH-PB DPST-NO ALTNG 10.5A 250VAC (INCLUDES DS1, MP29)	28480	3101-1957
S2	3100-3229	8	1	SWITCH-ROTARY 1.250 STRUT CTR SPCG; 4 (FOR OPTION 002 ONLY)	28480	3100-3229
T1	9100-0545	1	1	TRANSFORMER, POWER	28480	9100-0545
TB1	0360-1667	1	1	TERMINAL STRIP 7-TERM PHEN 2.65-IN-L	28480	0360-1667
TB2	0360-1665	9	1	TERMINAL STRIP 3-TERM PHEN 1.13-IN-L	28480	0360-1665
W1	11670L	7	1	CABLE ASSY, RF RIGID INTERCONNECT (STD) (DELETE FOR OPTION 001)	28480	11670L
W1	11670M	9	1	CABLE ASSY, APC-7 CONNECTOR (FOR OPT 001	28480	11670M
W2	8120-1378	1	1	CABLE ASSY 18AWG 3-CNDCT JGK-JKT	28480	8120-1378
W3	08445-60007	2	1	CABLE ASSY, INTERCONNECT	28480	08445-60007
W4	08445-20110	4	2	CABLE ASSY, RF INPUT (DELETE FOR OPTION 004)	28480	08445-20110
W5	08445-20110	4		CABLE ASSY, RF OUTPUT (DELETE FOR OPTION 004)	28480	08445-20110
W6	08445-20111	5	1	CABLE ASSY, LOW PASS FILTER INPUT (DELETE FOR OPTION 004)	28480	08445-20111
W7	08445-20112	6	1	CABLE ASSY, LOW PASS FILTER OUTPUT (DELETE FOR OPTION 004)	28480	08445-20112
W8	08445-20108	0	1	CABLE ASSY, YIG INPUT	28480	08445-20108
W9	08445-20109	1	1	CABLE ASSY, YIG OUTPUT	28480	08445-20109
W10	08445-60108	4	1	AC POWER DISTRIBUTION WIRING HARNESS	28480	08445-60108
W10P1	0362-0063	3		CONNECTOR-SGL CONT QDISC-FEM	28480	0362-0063
W10P2	0362-0063	3	9	CONNECTOR-SGL CONT QDISC-FEM	28480	0362-0063
W10P3	0362-0063	3		CONNECTOR-SGL CONT QDISC-FEM	28480	0362-0063
W10P4	0362-0063	3		CONNECTOR-SGL CONT QDISC-FEM	28480	0362-0063
W10P5	0362-0063	3		CONNECTOR-SGL CONT QDISC-FEM	28480	0362-0063
W10P6	0362-0063	3		CONNECTOR-SGL CONT QDISC-FEM	28480	0362-0063
W10P7	0362-0063	3		CONNECTOR-SGL CONT QDISC-FEM	28480	0362-0063
W10P8	0362-0063	3		CONNECTOR-SGL CONT QDISC-FEM	28480	0362-0063
W10P9	0362-0063	3		CONNECTOR-SGL CONT QDISC-FEM	28480.	0362-0063
W11	08445-60105	1	1	CABLE ASSY, DIGITAL DISPLAY(OPT 003 ONLY	28480	08445-60105
W11P1	1251-0142	5	1	CONNECTOR 14-PIN M MICRO RIBBON	28480	1251-0142
W12	08445-60111	9	1	CABLE ASSY, POWER SUPPLY	28480	08445-60111
W12P1	1251-0158	3	1	CONNECTOR-PC EDGE 6-CONT/ROW 1-ROW	28480	1251-0158
W13	08445-60110	8	1	WIRING HARNESS, CONTROL INPUTS	28480	08445-60110
W14	08445-60112	0	1	WIRING HARNESS, MANUAL TUNE CONTROL (OPTION 002 ONLY)	28480	08445-60112
W14P2	1251-0135	6	1	CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-0135
W15	08445-60109	5	1	WIRING HARNESS, MAIN INTERCONNECT	28480	08445-60109

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

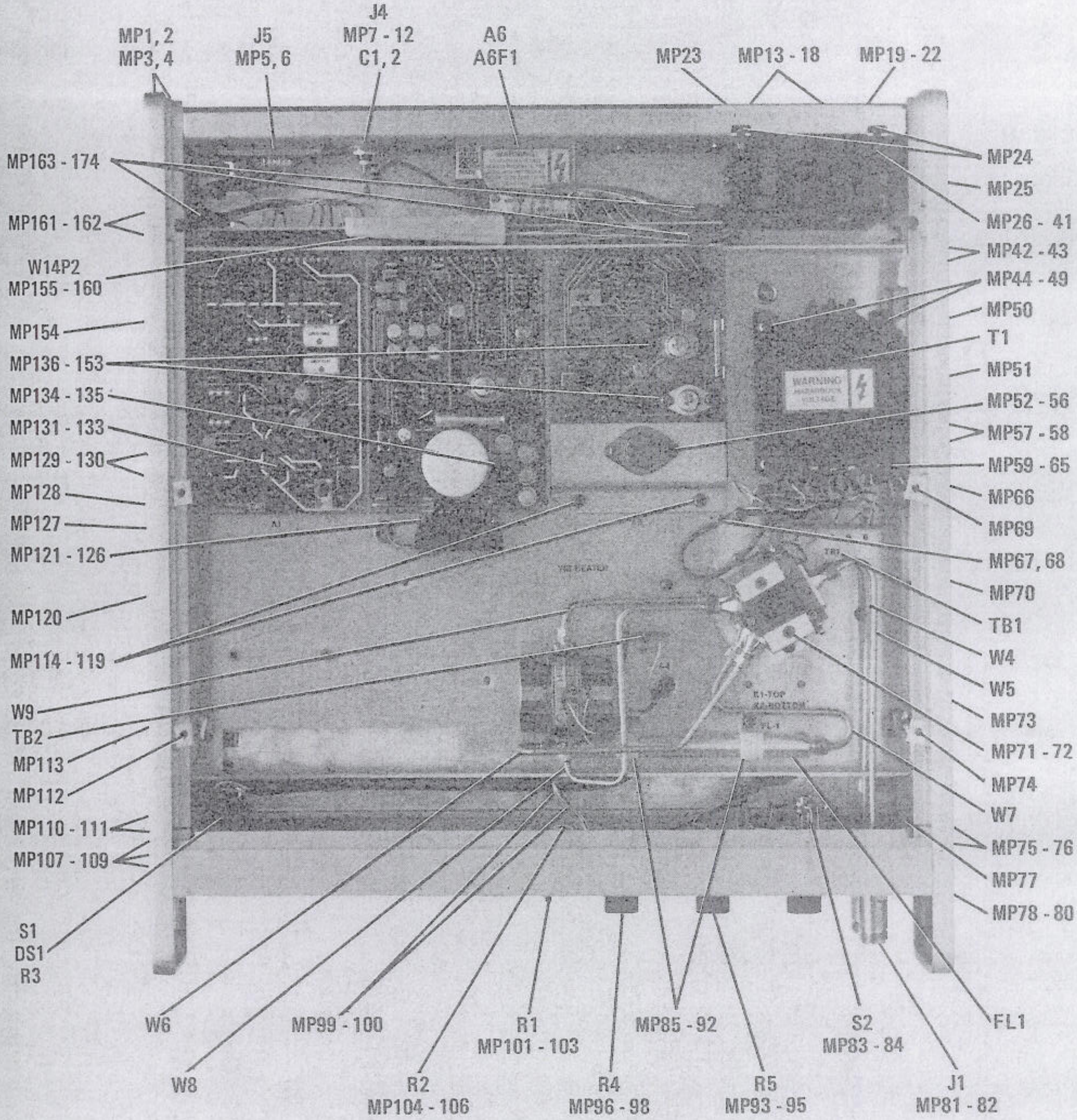


Figure 6-1. Mechanical Parts Identifiable From Top of Chassis

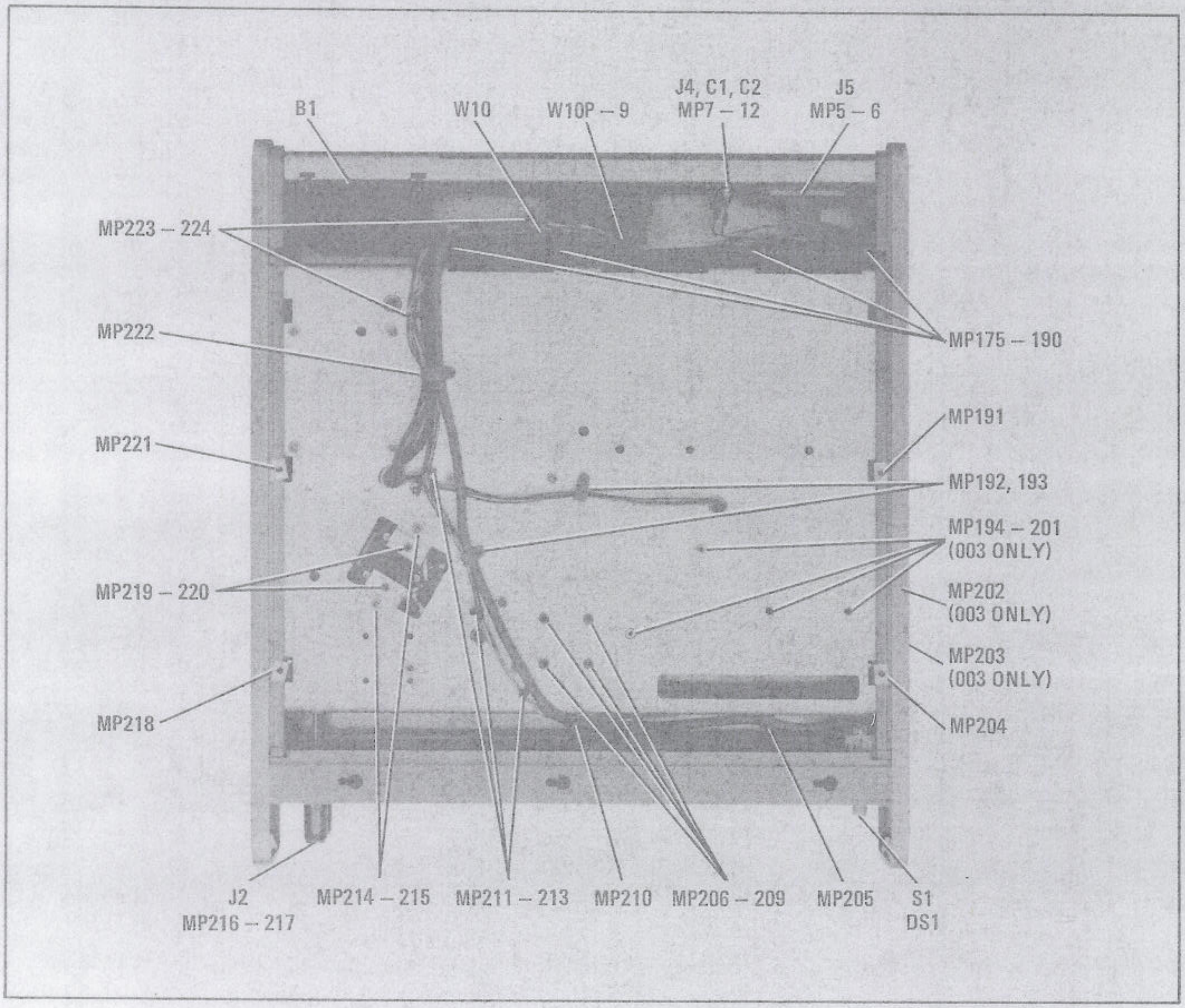


Figure 6-2. Mechanical Parts Identifiable From Bottom of Chassis

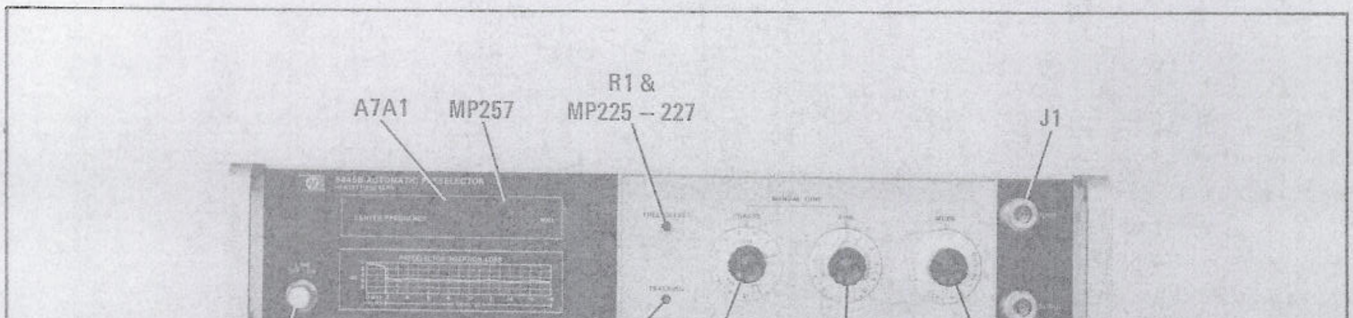


Figure 6-3. Mechanical Parts Visible on Front Panel

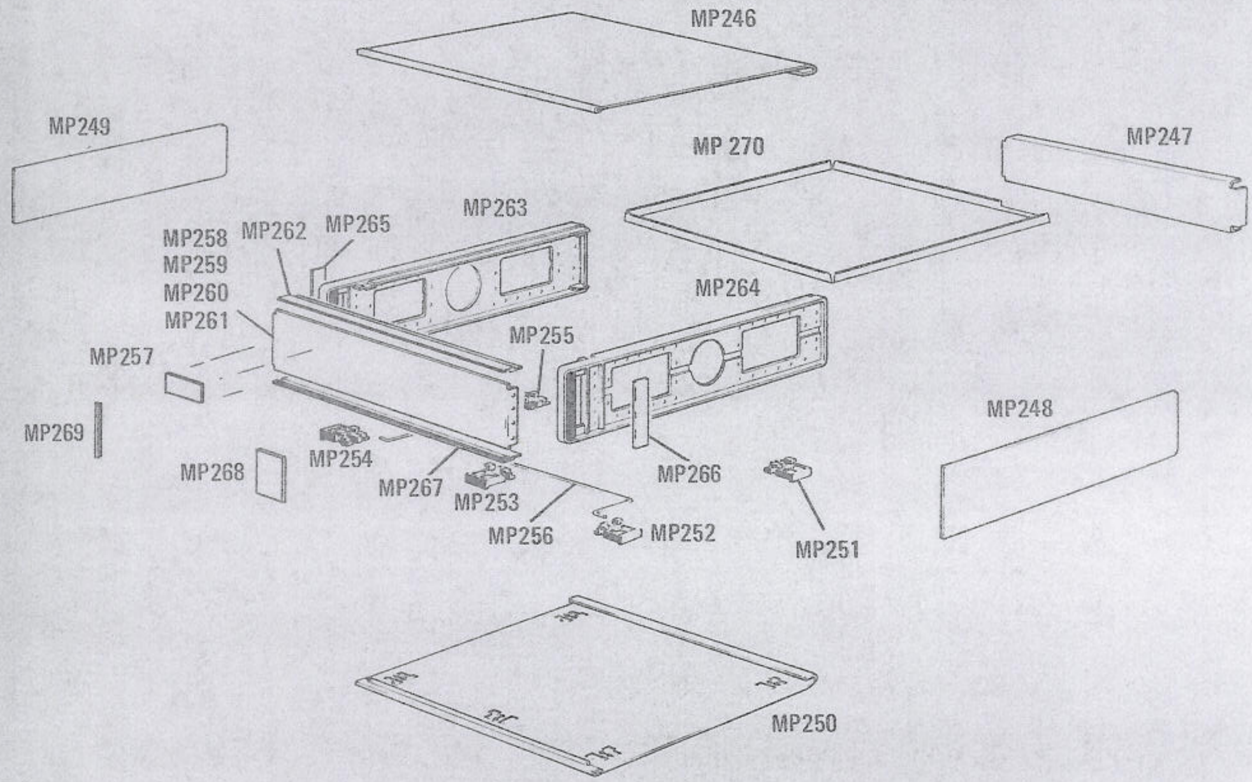


Figure 6-4. Cabinet Parts

SECTION VII
MANUAL BACKDATING CHANGES

7-1. INTRODUCTION

7-2. This section contains information for adapting this manual to earlier 8445B Preselectors. If the serial number prefix of your Preselector appears on the title page of this manual, the contents of the manual are directly applicable to your instrument. If, however, your Preselector has a lower serial number prefix than what is shown on the title page, you must adapt this manual to your instrument by changing it as indicated in this section.

7-3. To adapt this manual to your instrument, refer to Table 7-1 and make all the manual changes listed opposite your instrument serial number. Make the changes in the sequence in which they are given.

7-4. If your instrument serial number is not listed on the title page of this manual, or in Table 7-1 below, it may be documented in a yellow MANUAL CHANGES supplement. For additional important information about serial number coverage, refer to INSTRUMENTS COVERED BY MANUAL in Section I.

NOTE

In instruments with serial numbers listed in Table 7-1 above, some parts have part numbers that are different from those listed in the Replaceable Parts list (Table 6-3) of this manual. Unless otherwise indicated by the "change" instructions in this section, however, the listed parts are the recommended replacement parts.

Table 7-1. Manual Change Requirements by Serial Number

Serial Number, Prefix or Complete Number	Make Manual Changes:
1704A	A
1442A00921 through prefix 1630A	A, B
1326A to 1404A00920	A, B, C
1318A	A, B, C, D
1251A and below	A, B, C, D, E

7-5. MANUAL CHANGE INSTRUCTIONS

CHANGE A

Page 6-12, Table 6-3:
Delete A7, DIGITAL PANEL METER (OPT. 003), and rest of A7 portion of list.
Substitute Table 7-2 for A7 portion of Table 6-3 deleted above.

CHANGE A (Cont'd)

Pages 8-38 and 8-39, Service Sheet 7:
Replace Service Sheet 7 with Figures 7-2 through 7-6 of this section.

NOTE

The Option 003 Digital Panel Meter (DPM) shown on Service Sheet 7 of this manual replaces the earlier 8445B DPM, a modified Model 34740A Display. The modified 34740A Display is no longer manufactured for use in the 8445B Automatic Preselector.

CHANGE B

Page 8-37, Figure 8-16, Service Sheet 6:
Change LINE ON-OFF switch wiring as shown in Figure 7-1 below.

NOTE

The HP part number of the ac LINE ON-OFF switch used in 8445B instruments, up to and including serial number prefix 1630A, is 3101-1395. The switch with part number 3101-1957, as listed in the Replaceable Parts list (Table 6-3) and shown schematically in Figure 8-16, is used in later 8445B instruments and is the recommended replacement for the LINE ON-OFF switch in all 8445B instruments. The two switches have slightly different wire connections.

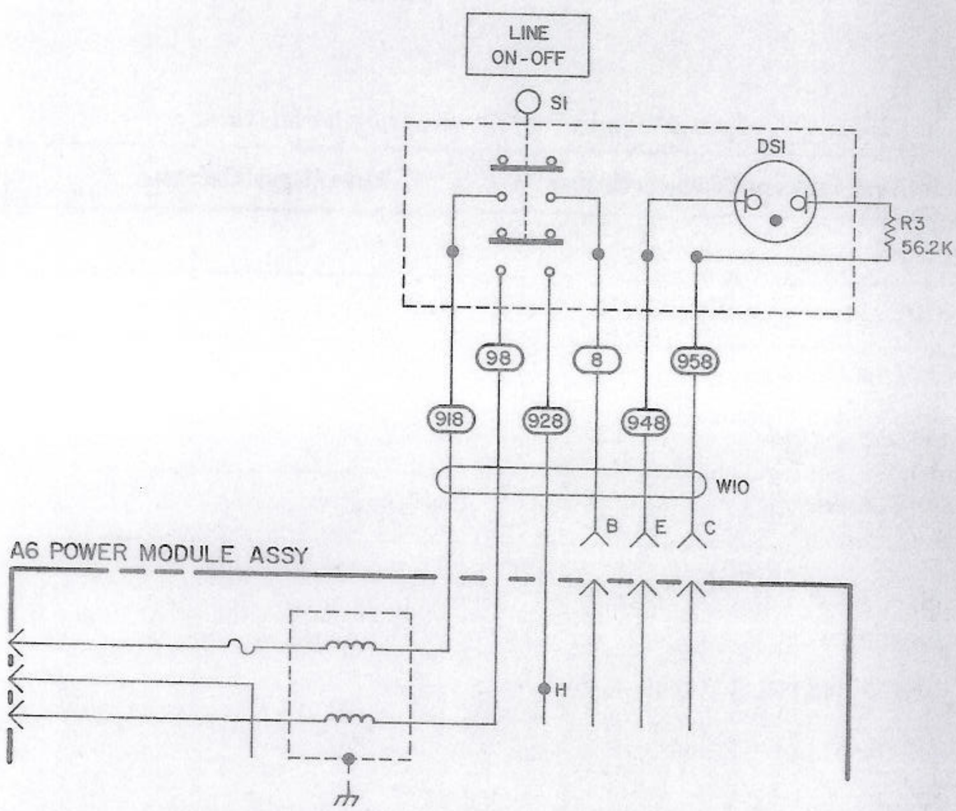


Figure 7-1. Partial Schematic Change, LINE Power Switch Wiring, for Service Sheet 6 (Change B)

CHANGE C

Page 6-5, Table 6-3:
Delete A1C1 through A1C4.

Page 6-6, Table 6-3:
Delete A2C7, A2C8, and A2R36.

Page 6-10, Table 6-3:
Delete A2R36 and A3C4.

Page 8-29, Figure 8-7, Service Sheet 2:
Replace Figure 8-7 with Figure 7-7 of this section.

Page 8-29, Figure 8-8, Service Sheet 2:
Delete capacitors C1 through C4.

Page 8-31, Figure 8-9, Service Sheet 3:
Replace Figure 8-9 with Figure 7-8 of this section.

Page 8-33, Figure 8-11, Service Sheet 4:
Replace Figure 8-11 with Figure 7-9 of this section.

Page 8-33, Figure 8-12, Service Sheet 4:
Delete capacitor C4.

Page 8-35, Figure 8-13, Service Sheet 5:
Replace Figure 8-13 with Figure 7-10 of this section.

Page 8-35, Figure 8-14, Service Sheet 5:
Delete capacitor C7.

Page 8-37, Figure 8-15, Service Sheet 6:
Replace Figure 8-15 with Figure 7-11 of this section.

Page 8-37, Figure 8-16, Service Sheet 6:
Connect a line directly from the junction of R25 and VR5 to the base of Q10, deleting R36 and C8.

CHANGE D

Page 6-18, Table 6-3:
Delete TB2.

Page 8-33, Figure 8-12, Service Sheet 4:
Delete terminal strip TB2 as shown in partial schematic, Figure 7-13.

CHANGE E

Page 5-5, Paragraph 5-13:
Insert paragraph 7-6, REMOTE CONTROL AMPLIFIER ADJUSTMENT, of this section immediately before paragraph 5-13 in Adjustments section.

CHANGE E (Cont'd)

Page 6-9, Table 6-3:
Delete A2R31, A2R33, and A2R34.
Change A2R15 to HP Part Number 1810-0037, RESISTOR ARRAY, 1K OHM 2% 1W EACH, 28480, 1810-0037.
Add:
A2R20, 2100-1767, RESISTOR, VAR, WW 10 OHM 5% TYPE H 1W, 28480, 2100-1767.
A2R21, 2100-1767, RESISTOR, VAR, WW 10 OHM 5% TYPE H 1W, 28480, 2100-1767.
A2R22, 0698-3241, RESISTOR, FXD, FLM 250 OHM 0.2% 1/8W, 28480, 0698-3241.
A2R23, 2100-1776, RESISTOR, VAR, WW 10K OHM 5% TYPE H 1W, 28480, 2100-1776.

Page 6-10, Table 6-3:
Delete A2R34.

Page 8-35, Figure 8-14, Service Sheet 5:
Change the schematic diagram as shown in the partial schematic in Figure 7-14.

Table 7-2. Replaceable Parts (Change A)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7	08445-60107	3	1	DIGITAL PANEL METER ASSY (OPT. 003)	28480	08445-60107
A7A1	08445-60113	1	1	DIGITAL PANEL METER (HP MODEL 34740A DISPLAY)	28480	08445-60113
A7A1A1	34740-66511	8	1	BOARD ASSEMBLY-MAIN	28480	34740-66511
A7A1A1C6	0160-2204	0	2	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A7A1A1C7	0160-2204	0		CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A7A1A1C8	0160-0362	7	1	CAPACITOR-FXD 510PF +-5% 300VDC MICA	28480	0160-0362
A7A1A1C9	0140-0199	6	1	CAPACITOR-FXD 240PF +-5% 300VDC MICA	72136	DM15F241J0300WV1CR
A7A1A1C10	0180-1701	2	1	CAPACITOR-FXD 6.8UF+-20% 6VDC TA	56289	150D685X0006A2
A7A1A1C11	0150-0093	0	4	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A7A1A1C12	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A7A1A1C13	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A7A1A1C14	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A7A1A1C15	0160-0207	9	2	CAPACITOR-FXD .01UF +-5% 200VDC POLYE	28480	0160-0207
A7A1A1C16	0160-0207	9		CAPACITOR-FXD .01UF +-5% 200VDC POLYE	28480	0160-0207
A7A1A1C17	0150-0084	9	1	CAPACITOR-FXD .1UF +80-20% 100VDC CER	28480	0150-0084
A7A1A1C20	0180-2501	2	2	CAPACITOR-FXD 680UF+50-10% 25VDC AL	28480	0180-2501
A7A1A1C21	0180-2501	2		CAPACITOR-FXD 680UF+50-10% 25VDC AL	28480	0180-2501
A7A1A1C22	0180-2500	1	2	CAPACITOR-FXD 1500UF+50-10% 16VDC AL	37942	TT152U016G1C3P
A7A1A1C23	0180-2500	1		CAPACITOR-FXD 1500UF+50-10% 16VDC AL	37942	TT152U016G1C3P
A7A1A1C24	0180-0228	6	2	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A7A1A1C25	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A7A1A1C26	0160-0182	9	1	CAPACITOR-FXD 47PF +-5% 300VDC MICA	28480	0160-0182
A7A1A1CR2	1901-0040	1	16	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR8	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR11	1902-0048	1	2	DIODE-ZNR 6.81V 5% DO-35 PD=.4W	28480	1902-0048
A7A1A1CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR14	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR15	1902-0048	1		DIODE-ZNR 6.81V 5% DO-35 PD=.4W	28480	1902-0048
A7A1A1CR16	1901-0028	5	7	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A1A1CR17	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A1A1CR18	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A1A1CR19	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A1A1CR20	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A1A1CR21	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A1A1CR22	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A7A1A1CR23	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR24	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR25	1902-3191	1	2	DIODE-ZNR 13V 2% DO-35 PD=.4W TC=+.06%	28480	1902-3191
A7A1A1CR26	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR27	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A1A1CR28	1902-3191	1		DIODE-ZNR 13V 2% DO-35 PD=.4W TC=+.06%	28480	1902-3191
A7A1A1CR29	1902-0049	2	2	DIODE-ZNR 6.19V 5% DO-35 PD=.4W	28480	1902-0049
A7A1A1CR30	1902-3073	8	2	DIODE-ZNR 4.32V 5% DO-35 PD=.4W	28480	1902-3073
A7A1A1CR31	1902-0680	7	2	DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.4W	24046	1N827
A7A1A1CR32	1902-0049	2		DIODE-ZNR 6.19V 5% DO-35 PD=.4W	28480	1902-0049
A7A1A1CR33	1902-3073	8		DIODE-ZNR 4.32V 5% DO-35 PD=.4W	28480	1902-3073
A7A1A1CR34	1902-0680	7		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.4W	24046	1N827
A7A1A1Q12	1853-0020	4	7	TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A7A1A1Q13	1853-0020	4		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A7A1A1Q14	1853-0020	4		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A7A1A1Q15	1853-0020	4		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A7A1A1Q16	1853-0020	4		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A7A1A1Q17	1854-0071	7	5	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A1A1Q18	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A1A1Q19	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A1A1Q30	1853-0020	4		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A7A1A1Q31	1854-0022	8	1	TRANSISTOR NPN SI TO-39 PD=700MW	07263	817843
A7A1A1Q32	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A1A1Q33	1853-0051	1	1	TRANSISTOR PNP 2N4037 SI TO-5 PD=1W	01928	2N4037
A7A1A1Q34	1855-0062	8	2	TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0062
A7A1A1Q35	1853-0020	4		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A7A1A1Q36	1855-0062	8		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0062

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

Table 7-2. Replaceable Parts (Change A) (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A1A1Q37	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A1A1R12	2100-2522	1	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	30983	ET50X103
A7A1A1R13	1810-0134	1	1	NETWORK-RES 6-SIP56.0K OHM X 5	91637	CSP06C07-563J
A7A1A1R14	0683-5631	1	1		28480	0683-5631
A7A1A1R15	1810-0135	2	2	NETWORK-RES 6-SIP10.0K OHM X 5	28480	1810-0135
A7A1A1R16	1810-0135	2		NETWORK-RES 6-SIP10.0K OHM X 5	28480	1810-0135
A7A1A1R17	0684-1031	9	7	RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
A7A1A1R18	0684-1031	9		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
A7A1A1R19	0684-1031	9		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
A7A1A1R20	0684-1031	9		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
A7A1A1R21	0684-1031	9		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
A7A1A1R22	0757-0283	6	3	RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A7A1A1R23	2100-2413	9	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	30983	ET50X201
A7A1A1R24	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7A1A1R25	0684-1011	5	2	RESISTOR 100 10% .25W FC TC=-400/+500	01121	CB1011
A7A1A1R26	0757-0472	5	1	RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A7A1A1R27	0684-1011	5		RESISTOR 100 10% .25W FC TC=-400/+500	01121	CB1011
A7A1A1R28	0684-5621	1	1	RESISTOR 5.6K 10% .25W FC TC=-400/+700	01121	CB5621
A7A1A1R29	0684-2231	3	1	RESISTOR 22K 10% .25W FC TC=-400/+800	01121	CB2231
A7A1A1R30	0698-4479	4	2	RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A7A1A1R31	0684-1031	9		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
A7A1A1R32	1810-0143	2	1	NETWORK-RES 4-SIP3.3K OHM X 3	91637	CSP04C07-332K
A7A1A1R33	0698-4479	4		RESISTOR 14K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1402-F
A7A1A1R34	0684-1031	9		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
A7A1A1R35	0684-3321	4	2	RESISTOR 3.3K 10% .25W FC TC=-400/+700	01121	CB3321
A7A1A1R36	1810-0139	6	3	NETWORK-RES 5-SIP22.0K OHM X 4	91637	CSP05C07-223J
A7A1A1R37	1810-0139	6		NETWORK-RES 5-SIP22.0K OHM X 4	91637	CSP05C07-223J
A7A1A1R38	1810-0140	9	1	NETWORK-RES 4-SIP22.0K OHM X 3	91637	CSP04C07-223J
A7A1A1R39	0684-3311	2	4	RESISTOR 330 10% .25W FC TC=-400/+600	01121	CB3311
A7A1A1R40	0684-3311	2		RESISTOR 330 10% .25W FC TC=-400/+600	01121	CB3311
A7A1A1R41	0684-3311	2		RESISTOR 330 10% .25W FC TC=-400/+600	01121	CB3311
A7A1A1R42	0684-3311	2		RESISTOR 330 10% .25W FC TC=-400/+600	01121	CB3311
A7A1A1R43	1810-0139	6		NETWORK-RES 5-SIP22.0K OHM X 4	91637	CSP05C07-223J
A7A1A1R47	0684-1021	7	1	RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
A7A1A1R48	0684-4721	0	2	RESISTOR 4.7K 10% .25W FC TC=-400/+700	01121	CB4721
A7A1A1R49	0698-4443	2	2	RESISTOR 4.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4531-F
A7A1A1R50	0698-4391	9	2	RESISTOR 69.8 1% .125W F TC=0+-100	24546	C4-1/8-T0-69R8-F
A7A1A1R51	0684-4721	0		RESISTOR 4.7K 10% .25W FC TC=-400/+700	01121	CB4721
A7A1A1R52	0698-4443	2		RESISTOR 4.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4531-F
A7A1A1R53	0698-4391	9		RESISTOR 69.8 1% .125W F TC=0+-100	24546	C4-1/8-T0-69R8-F
A7A1A1R54	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A7A1A1R55	0698-3178	8	2	RESISTOR 487 1% .125W F TC=0+-100	24546	C4-1/8-T0-487R-F
A7A1A1R56	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A7A1A1R57	0698-3178	8		RESISTOR 487 1% .125W F TC=0+-100	24546	C4-1/8-T0-487R-F
A7A1A1R58	2100-3154	7	2	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A7A1A1R59	2100-3154	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A7A1A1R60	1810-0130	7	1	NETWORK-RES 14-DIP MULTI-VALUE	28480	1810-0130
A7A1A1R61	0684-3321	4		RESISTOR 3.3K 10% .25W FC TC=-400/+700	01121	CB3321
A7A1A1S1	3101-1723	5	1	SWITCH-PB 4PDT .45A 115VAC	28480	3101-1723
A7A1A1U4	1820-0586	8	1	IC INV TTL L HEX 1-INP	01295	SN74L04N
A7A1A1U5	1820-0511	9	1	IC GATE TTL AND QUAD 2-INP	01295	SN7408N
A7A1A1U6	1820-0661	0	1	IC GATE TTL OR QUAD 2-INP	01295	SN7432N
A7A1A1U7	1820-0583	5	5	IC GATE TTL L NAND QUAD 2-INP	01295	SN74L00N
A7A1A1U8	1820-0596	0	3	IC FF TTL L D-TYPE POS-EDGE-TRIG	27014	DM74L74N
A7A1A1U9	1820-0798	4	1	IC CNTR PMOS DECD	28480	1820-0798
A7A1A1U10	1820-0583	5		IC GATE TTL L NAND QUAD 2-INP	01295	SN74L00N
A7A1A1U11	1820-0585	7	2	IC GATE TTL L NAND QUAD 2-INP	01295	SN74L03N
A7A1A1U12	1820-0668	7	1	IC BFR TTL NON-INV HEX 1-INP	01295	SN7407N
A7A1A1U13	1820-0567	5	1	IC MV TTL DUAL	04713	MC4024P
A7A1A1U14	1820-0583	5		IC GATE TTL L NAND QUAD 2-INP	01295	SN74L00N
A7A1A1U15	1820-0585	7		IC GATE TTL L NAND QUAD 2-INP	01295	SN74L03N
A7A1A1U16	1820-0596	0		IC FF TTL L D-TYPE POS-EDGE-TRIG	27014	DM74L74N
A7A1A1U17	1820-0583	5		IC GATE TTL L NAND QUAD 2-INP	01295	SN74L00N
A7A1A1U18	1820-0583	5		IC GATE TTL L NAND QUAD 2-INP	01295	SN74L00N
A7A1A1U19	1820-0584	6	1	IC GATE TTL L NOR QUAD 2-INP	01295	SN74L02N
A7A1A1U20	1820-0596	0		IC FF TTL L D-TYPE POS-EDGE-TRIG	27014	DM74L74N
A7A1A1U23	1820-0203	6	1	IC OP AMP GP TO-99	01928	CA741CT
A7A1A1U24	1820-0321	9	1	IC COMPARATOR GP TO-99	01295	SN72710L
A7A1A1U25	1820-0430	1	1	IC 309 V RGLTR TO-3	07263	LM309K
A7A1A1Y1	0410-0467	4	1	CRYSTAL-QUARTZ (OPTION 060)	28480	0410-0467
	0410-0468	5	1	CRYSTAL-QUARTZ (OPTION 050)	28480	0410-0468

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

Table 7-2. Replaceable Parts (Change A) (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A1A2	34740-66512	9	1	DISPLAY ASSEMBLY	28480	34740-66512
A7A1A2C18	0180-1701	2	1	CAPACITOR-FXD 6.8UF+-20% 6VDC TA	56289	150D685X0006A2
A7A1A2C19	0160-0156	7	1	CAPACITOR-FXD 3900PF +-10% 200VDC POLYE	28480	0160-0156
A7A1A2Q20	1854-0071	7	2	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A1A2Q21	1854-0215	1	9	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A7A1A2Q22	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A7A1A2Q23	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A7A1A2Q24	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A7A1A2Q25	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A7A1A2Q26	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A7A1A2Q27	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A7A1A2Q28	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A7A1A2Q29	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A7A1A2R44	0684-4721	0	1	RESISTOR 4.7K 10% .25W FC TC=-400/+700	01121	CB4721
A7A1A2R45	0684-8201	9	2	RESISTOR 82 10% .25W FC TC=-400/+500	01121	CB8201
A7A1A2R46	0684-8201	9		RESISTOR 82 10% .25W FC TC=-400/+500	01121	CB8201
A7A1A2U1	1820-0635	8	1	IC SCNR TTL	28480	1820-0635
A7A1A2U2	1820-0571	1	1	IC TTL ROM CHAR GEN STAT	28480	1820-0571
A7A1A2U3	1820-0661	0	1	IC GATE TTL OR QUAD 2-INP	01295	SN7432N
A7A1A2U26	1990-0405	9	1	DISPLAY-AN-DOT MAT 1-CHAR .185-H	28480	5082-7300, +- SIGN
A7A1A2U27	1990-0408	2	1	DISPLAY-NUM-DOT MAT 4.5-CHAR .273-H	28480	1990-0408
A7A1A3	34740-66503	8	1	AMPLIFIER ASSEMBLY	28480	34740-66503
A7A1A3C1	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A7A1A3C2	0160-3183	6	1	CAPACITOR-FXD .47UF +-20% 50VDC	28480	0160-3183
A7A1A3C3	0160-2641	9	1	CAPACITOR-FXD .1UF +-10% 400VDC POLYP	56289	275P1049R5
A7A1A3C4	0150-0093	0	2	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A7A1A3C5	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A7A1A3CR1	1902-0041	4	1	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A7A1A3Q1	1855-0412	2	6	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0412
A7A1A3Q2	1855-0412	2		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0412
A7A1A3Q3	1855-0412	2		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0412
A7A1A3Q4	1855-0412	2		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0412
A7A1A3Q5	1855-0308	5	2	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0308
A7A1A3Q6	1854-0071	7		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7A1A3Q7	1855-0093	5	1	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0093
A7A1A3Q8	1855-0308	5		TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0308
A7A1A3Q10	1855-0412	2		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0412
A7A1A3Q11	1855-0412	2		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0412
A7A1A3R1	0698-4485	2	2	RESISTOR 23.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2322-F
A7A1A3R2	0684-4711	8	1	RESISTOR 470 10% .25W FC TC=-400/+600	01121	CB4711
A7A1A3R3	0698-4485	2		RESISTOR 23.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2322-F
A7A1A3R4	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7A1A3R5	0684-2731	8	1	RESISTOR 27K 10% .25W FC TC=-400/+800	01121	CB2731
A7A1A3R6	0698-4501	3	1	RESISTOR 59K 1% .125W F TC=0+-100 (OPTION 060)	24546	C4-1/8-T0-5902-F
A7A1A3R6	0698-4495	4	1	RESISTOR 37.4K 1% .125W F TC=0+-100 (OPTION 050)	24546	C4-1/8-T0-3742-F
A7A1A3R7	0698-3157	3	1	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A7A1A3R8	0698-4494	3	2	RESISTOR 35.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3572-F
A7A1A3R9	0698-4494	3		RESISTOR 35.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3572-F
A7A1A3R10	0684-1031	9	1	RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
A7A1A3R11	0684-5631	3	1	RESISTOR 56K 10% .25W FC TC=-400/+800	01121	CB5631
A7A1A3U21	1820-0203	6	2	IC OP AMP GP TO-99	01928	CA741CT
A7A1A3U22	1820-0203	6		IC OP AMP GP TO-99	01928	CA741CT

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

Table 7-2. Replaceable Parts (Change A) (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				A7A1 MISCELLANEOUS PART		
	5040-7001	6	1	CATCH RIGHT SLIDE	28480	5040-7001
	5040-6000	3	1	CATCH LEFT SLIDE	28480	5040-6000
	0340-0782	7	1	INSULATOR-XSTR KAPTON	28480	0340-0782
	0340-0783	8	2	INSULATOR-FLG-BSHG NYLON	28480	0340-0783
	0370-2159	9	3	PB-PWR,KNOB,HOT STAMP WHT FIN	28480	0370-2159
	05300-20010	3	1	CASE	28480	05300-20010
	05300-40003	6	4	SUPPORT-BOARD	28480	05300-40003
	05300-40004	7	4	GUIDE-SLIDE	28480	05300-40004
	1400-0083	0	1	FUSEHOLDER-EXTR POST 15A 250 V	28480	1400-0083
	2110-0004	1	1	FUSE .25A 250V NTD 1.25X.25 UL	28480	2110-0004
	2110-0027	8	1	FUSE .125A 250V NTD 1.25X.25 UL	28480	2110-0027
	34740-60201	1	1	PANEL ASSEMBLY-REAR	28480	34740-60201
	4040-0920	3	1	PANEL-FRONT	28480	4040-0920
	7120-2931	3	1	NAMEPLATE	28480	7120-2931
	8120-1348	5	1	CABLE ASSY 18AWG 3-CNDCT BLK-JKT	28480	8120-1348
	0380-0338	3	1	STANDOFF-CAPTIVE 4-40 X 0.312-IN	28480	0380-0338
	0380-0776	3	1	STANDOFF-SWAG TYPE 1-IN-LG 0.250	28480	0380-0776
	1251-0291	5	1	CONNECTOR 14-PIN M MICRO RIBBON	28480	1251-0291
	1251-2357	8	1	CONNECTOR-AC PWR HP-9 MALE FLG-MTG	28480	1251-2357
	3101-1609	6	1	SWITCH-SL 2-DPDT STD 1.5A 250VAC	28480	3101-1609

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

Table 7-2. Replaceable Parts (Change A) (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A2	08445-60101	7	1	BOARD ASSEMBLY-JUMPER	28480	08445-60101
	2200-0768	5	2	SCREW-MACH 4-40 X .625-IN-LG BDG-HD-SLOT	00000	ORDER BY DESCRIPTION
A7J1	1251-0143	6	1	CONNECTOR 14-PIN F MICRO RIBBON	28480	1251-0143
A7R1	0811-0569	7	1	RESISTOR 1.1421K .01% .05W PWW TC=0+-10	20940	140-1/8-D-1142R1-T
A7R2	0811-1185	5	1	RESISTOR 10K .01% .05W PWW TC=0+-10	20940	140-1/20-1002-T
A7U1	1820-0430	1	1	IC 309 V RGLTR TO-3	07263	LM309K
				A7 MISCELLANEOUS HARDWARE		
	08445-00110	2	1	BRACKET-MOUNTING	28480	08445-00110
	0340-0037	5	1	TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0037
	0340-0039	7	1	TERMINAL BUSHING - TEFLON; MOUNTS IN	28480	0340-0039
	0340-0783	8	1	INSULATOR-FLG-BSHG NYLON	28480	0340-0783
	0360-0016	2	1	TERMINAL-SLDR LUG LK-MTG FOR-#4-SCR	28480	0360-0016
	0362-0192	9	1	CONNECTOR-SGL CONT QDISC-FEM	28480	0362-0192
	0403-0026	6	1	GLIDE NYLON FITS 0.192 HOLD 0.156HI	28480	0403-0026
	0520-0129	8	1	SCREW-MACH 2-56 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	1200-0043	8	1	INSULATOR-XSTR ALUMINUM	28480	1200-0043
	1200-0063	2	1	CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1200-0063
	2190-0003	8	1	WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
	2190-0014	1	1	WASHER-LK INTL T NO. 2 .089-IN-ID	28480	2190-0014
	2200-0103	2	1	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0143	0	1	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2260-0001	5	3	NUT-HEX-DBL-CHAM 4-40-THD .094-IN-THK	28480	2260-0001
	3050-0026	0	1	WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0026

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

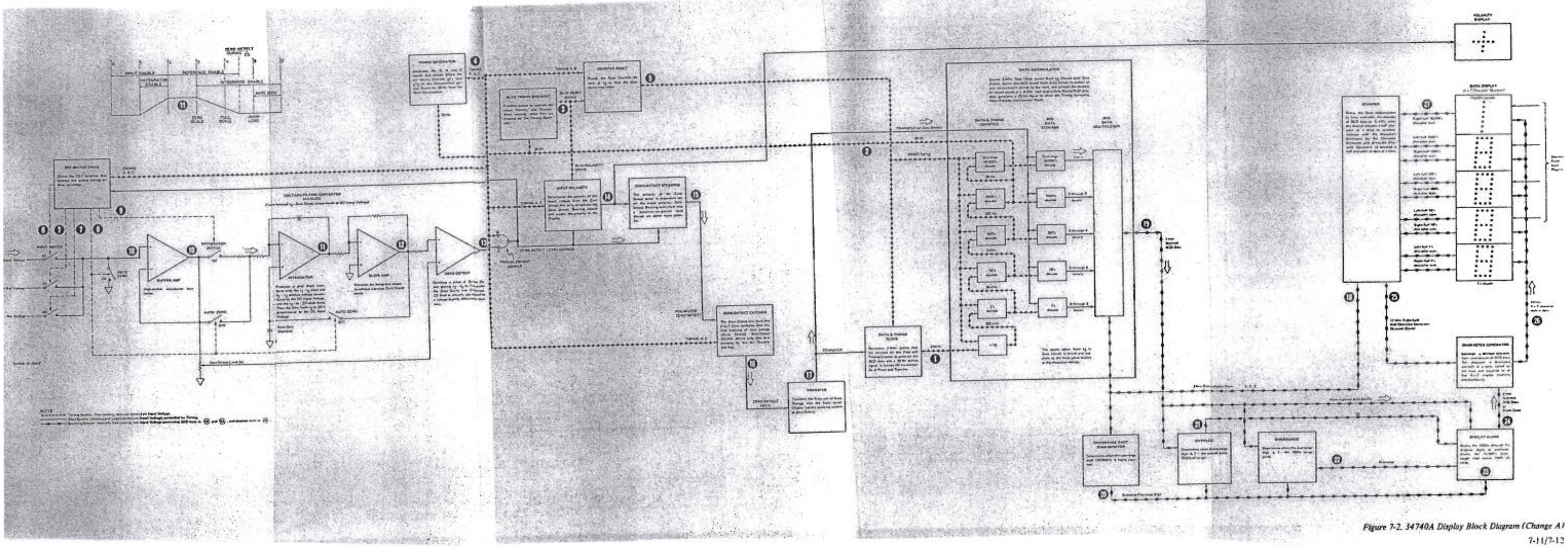
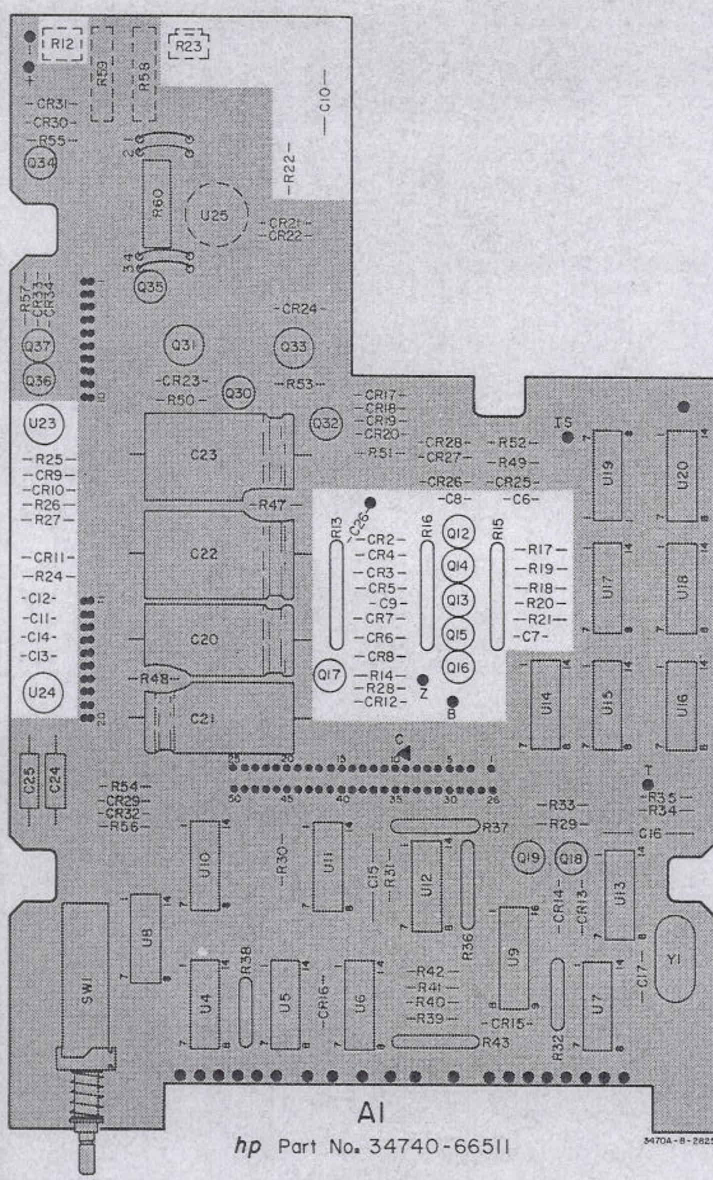
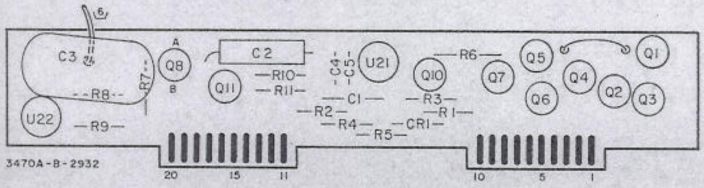


Figure 7-2. 34740A Display Block Diagram (Change A)



A1
hp Part No. 34740-66511

3470A-B-2825 A



3470A-B-2932

A3
hp Part No. 34740-66503

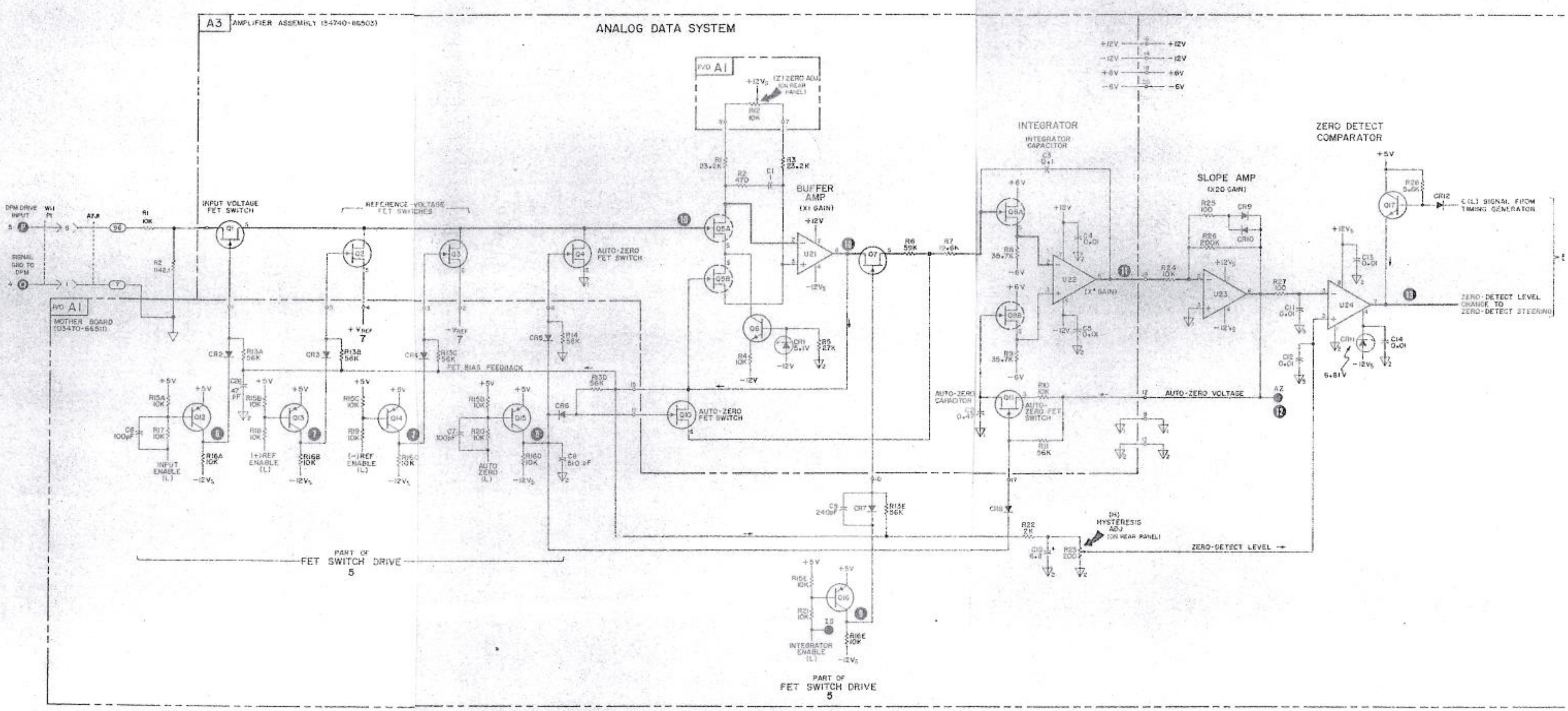
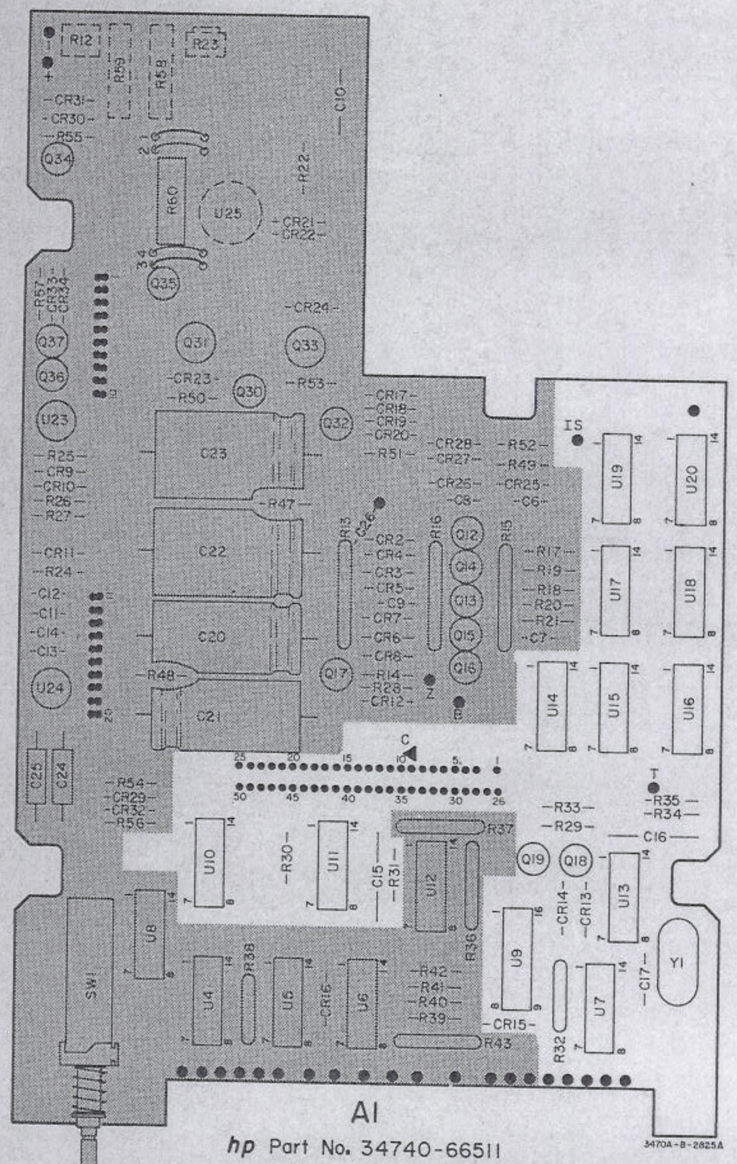


Figure 7-3. 34740A Display Amplifiers Modified for 8445B DPM, Schematic Diagram (Change A



A1

hp Part No. 34740-66511

3470A-B-2825A

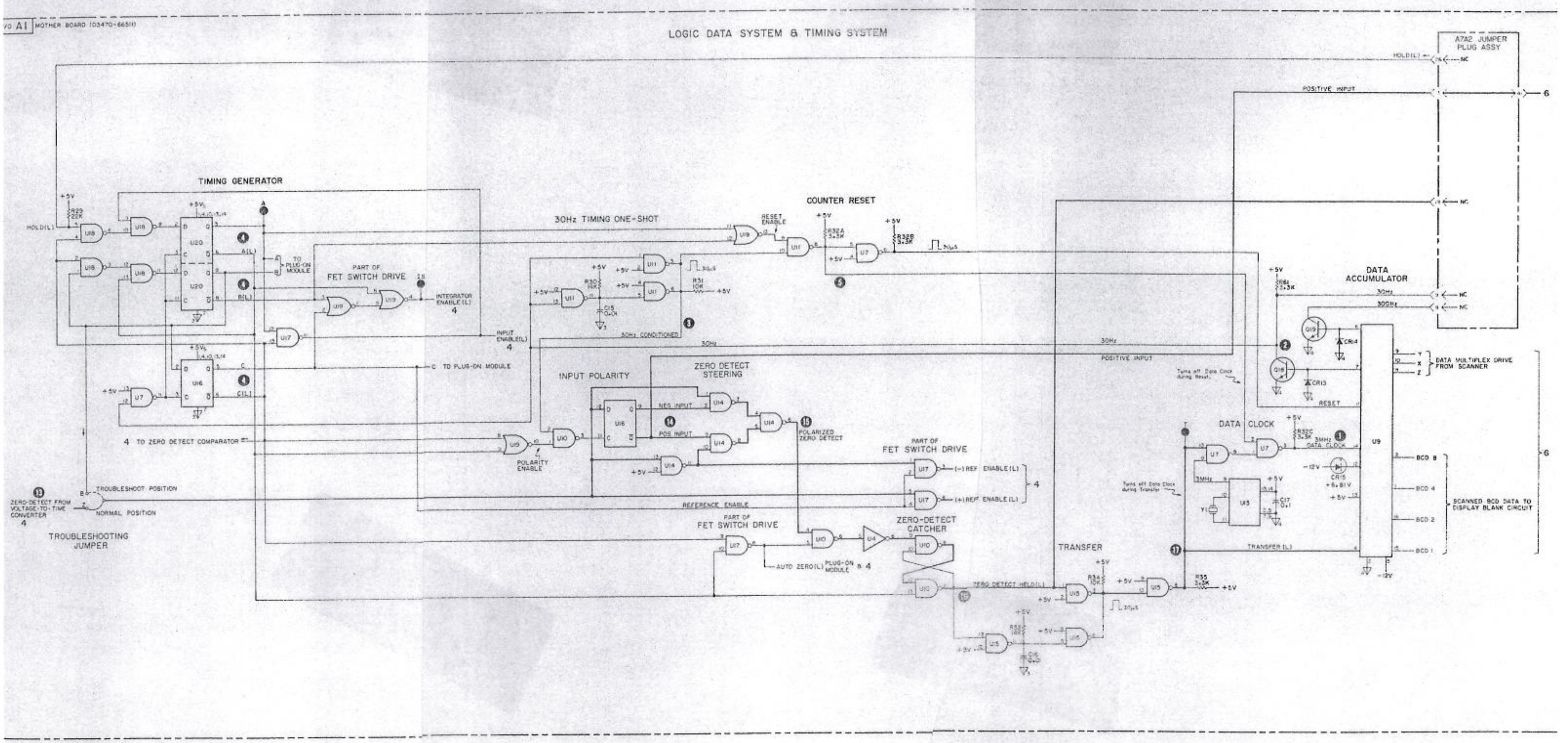
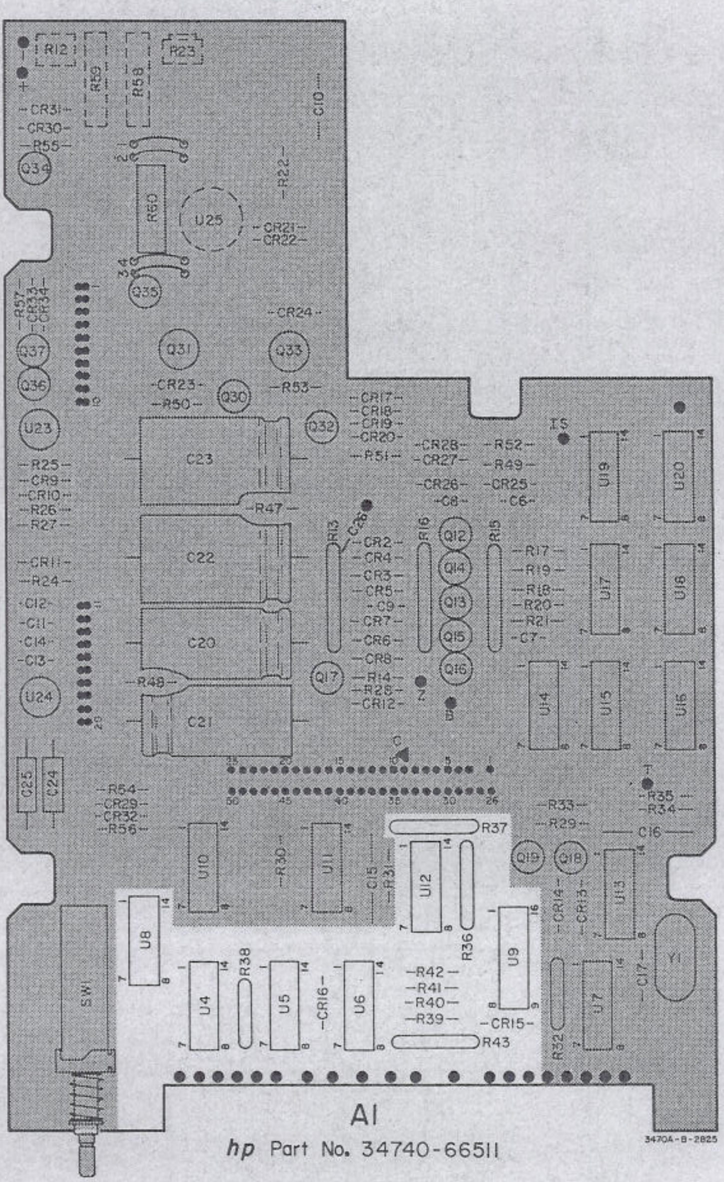
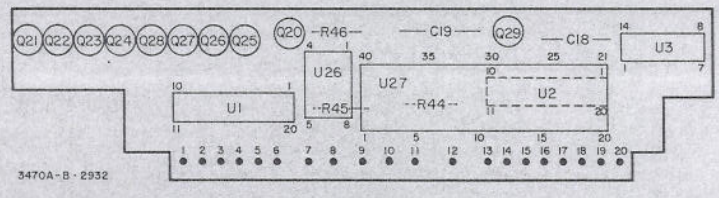


Figure 7-4. 34740A Display Timing Logic Modified for 8445B DPM, Schematic Diagram (Change A



A1
hp Part No. 34740-66511



A2
hp Part No. 34740-66512

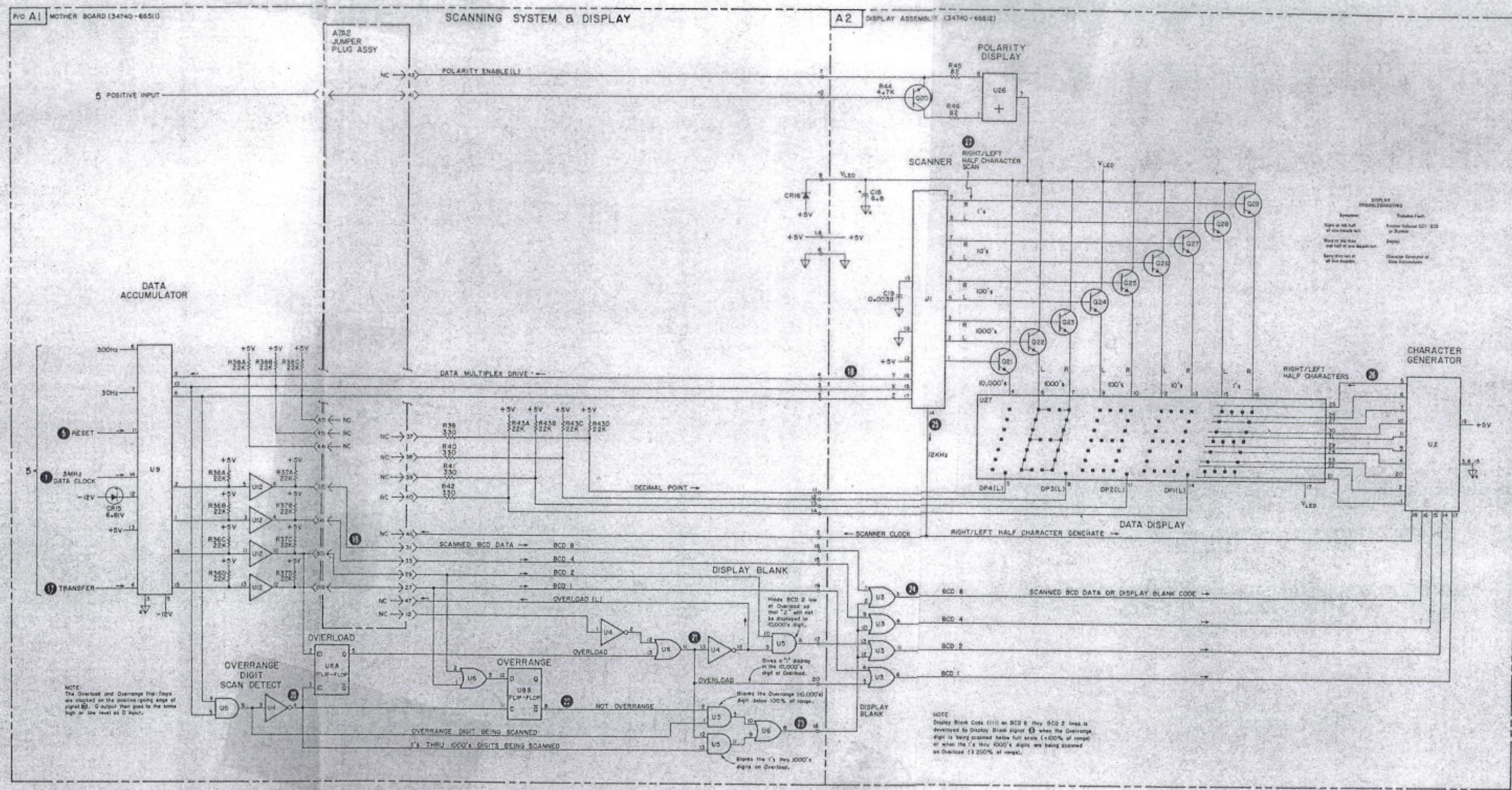
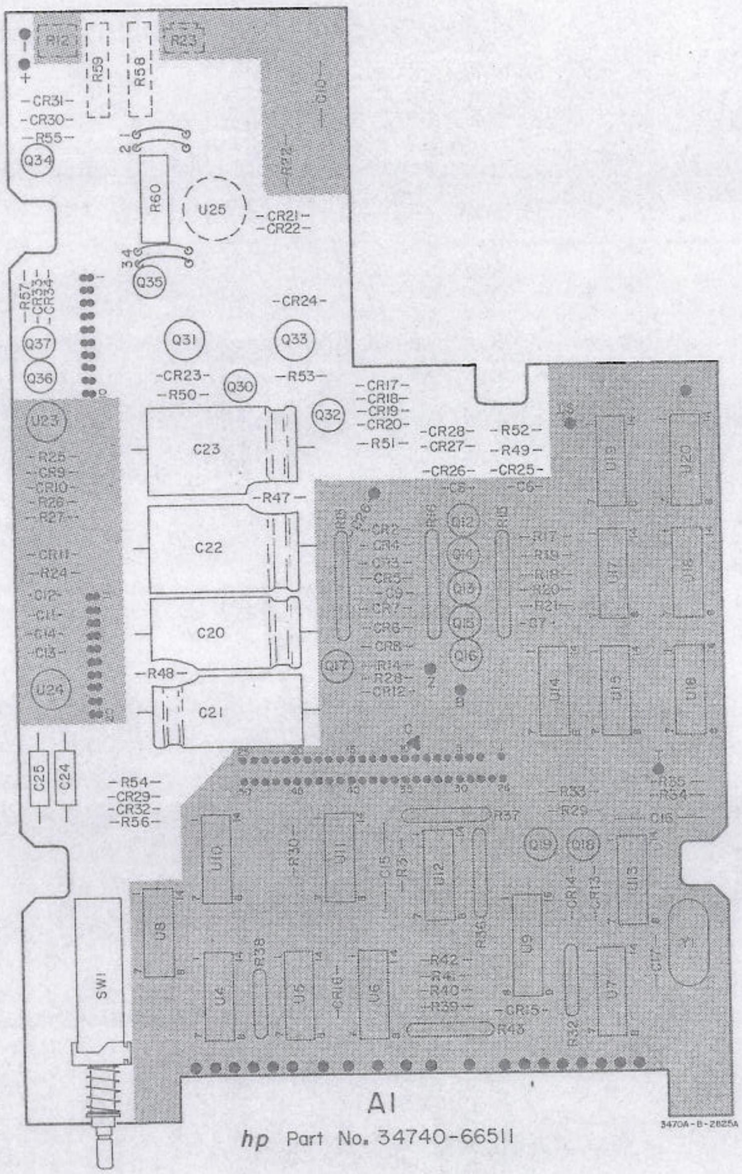


Figure 7-5. 34740A Display Scanning Logic Modified for 8445B DPM, Schematic Diagram (Change A)



A1

hp Part No. 34740-66511

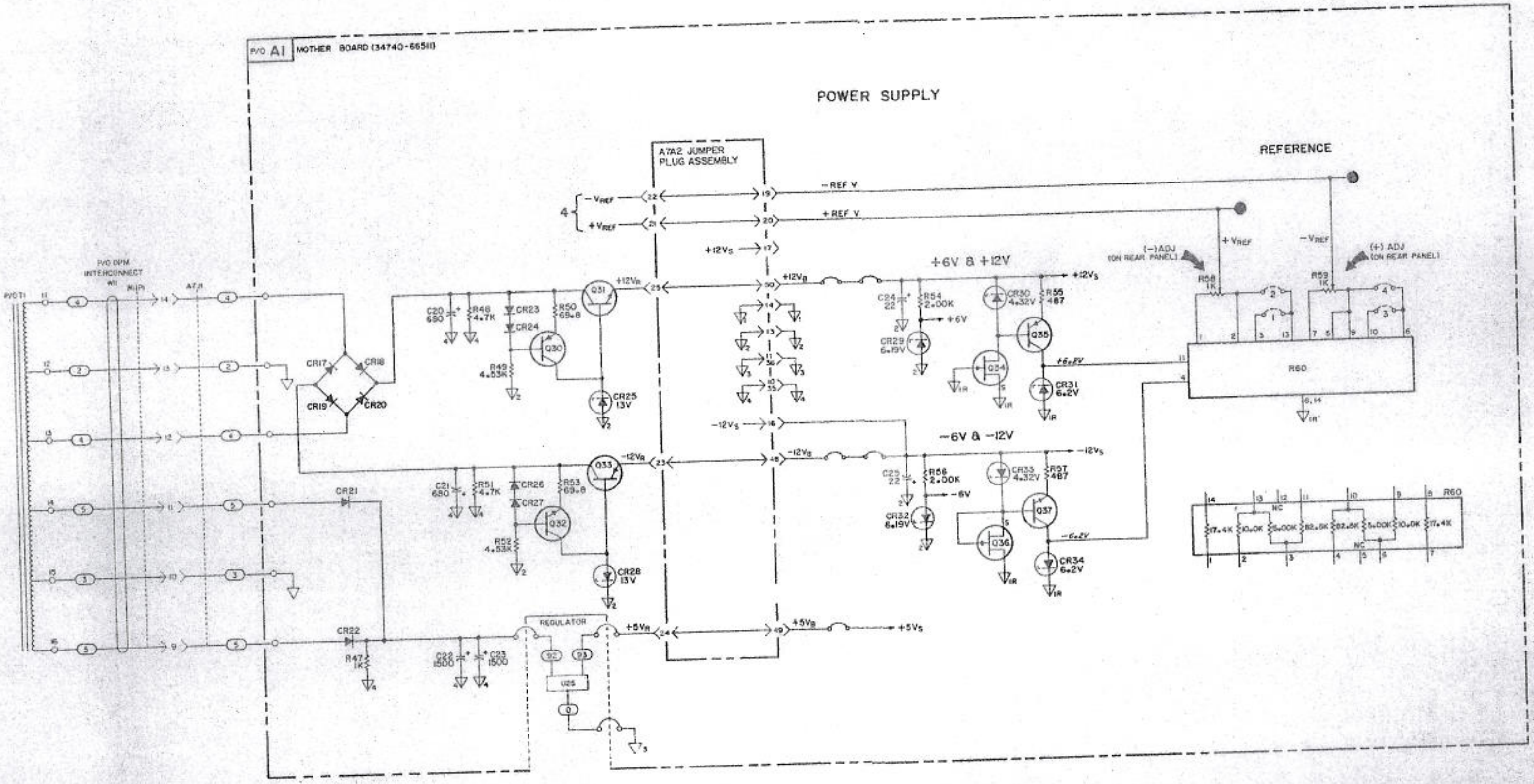


Figure 7-6. 34740A Display Power Supply Modified for 8445B DPM, Schematic Diagram (Change A)

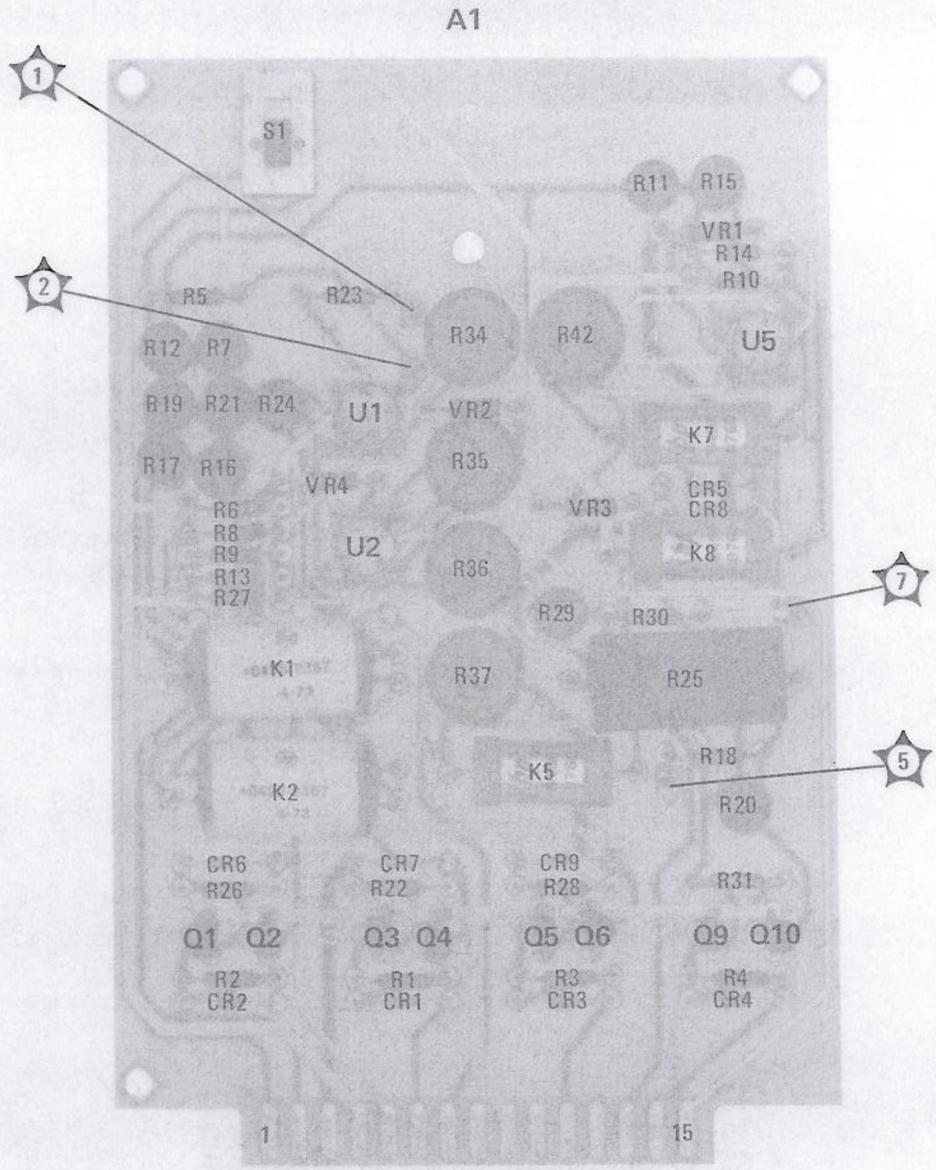


Figure 7-7. A1 YIG Predriver Assembly Parts Locations (Figure 8-7) (Change C)

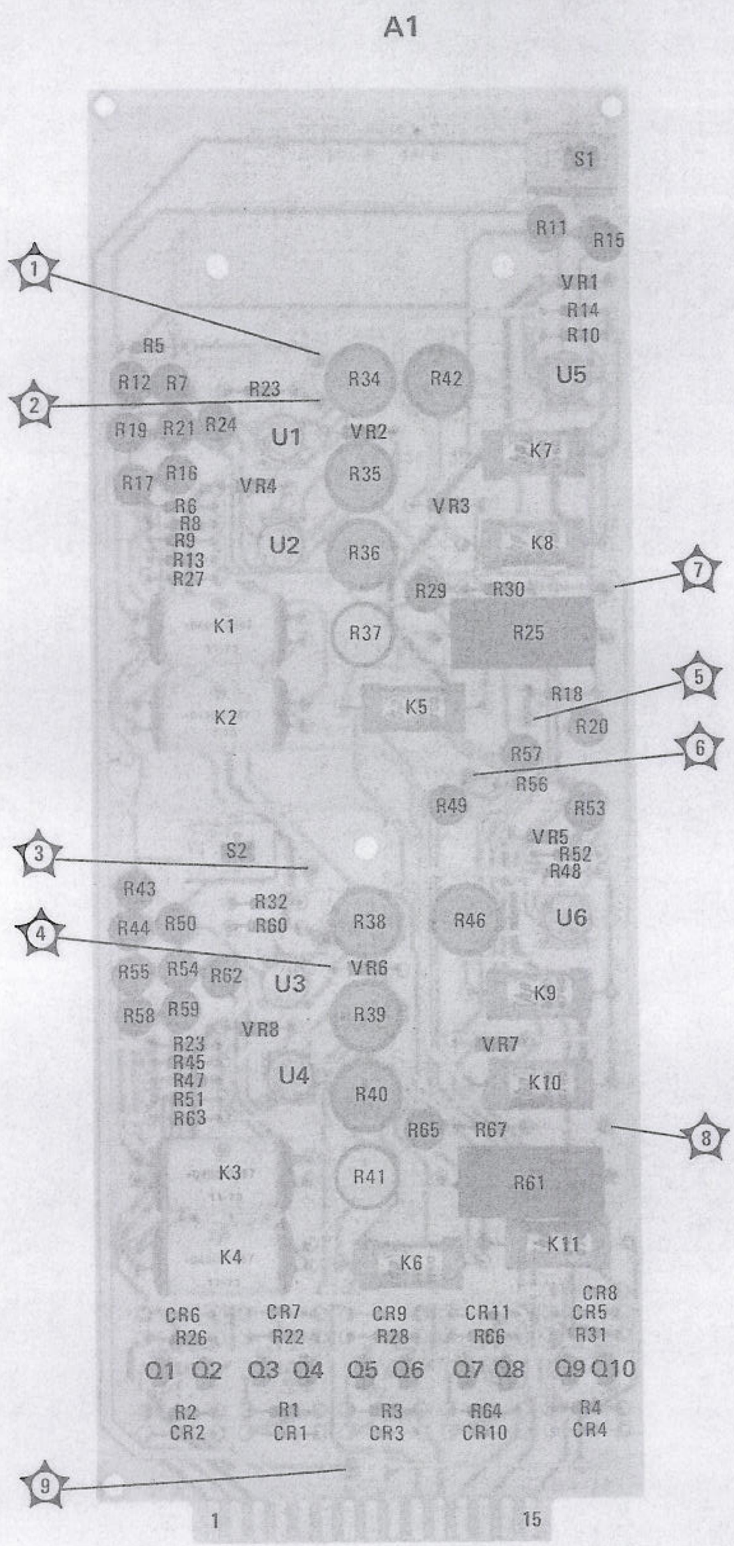


Figure 7-8. A1 Option 003 YIG/DPM Predriver Assembly Parts Locations (Figure 8-9) (Change C)

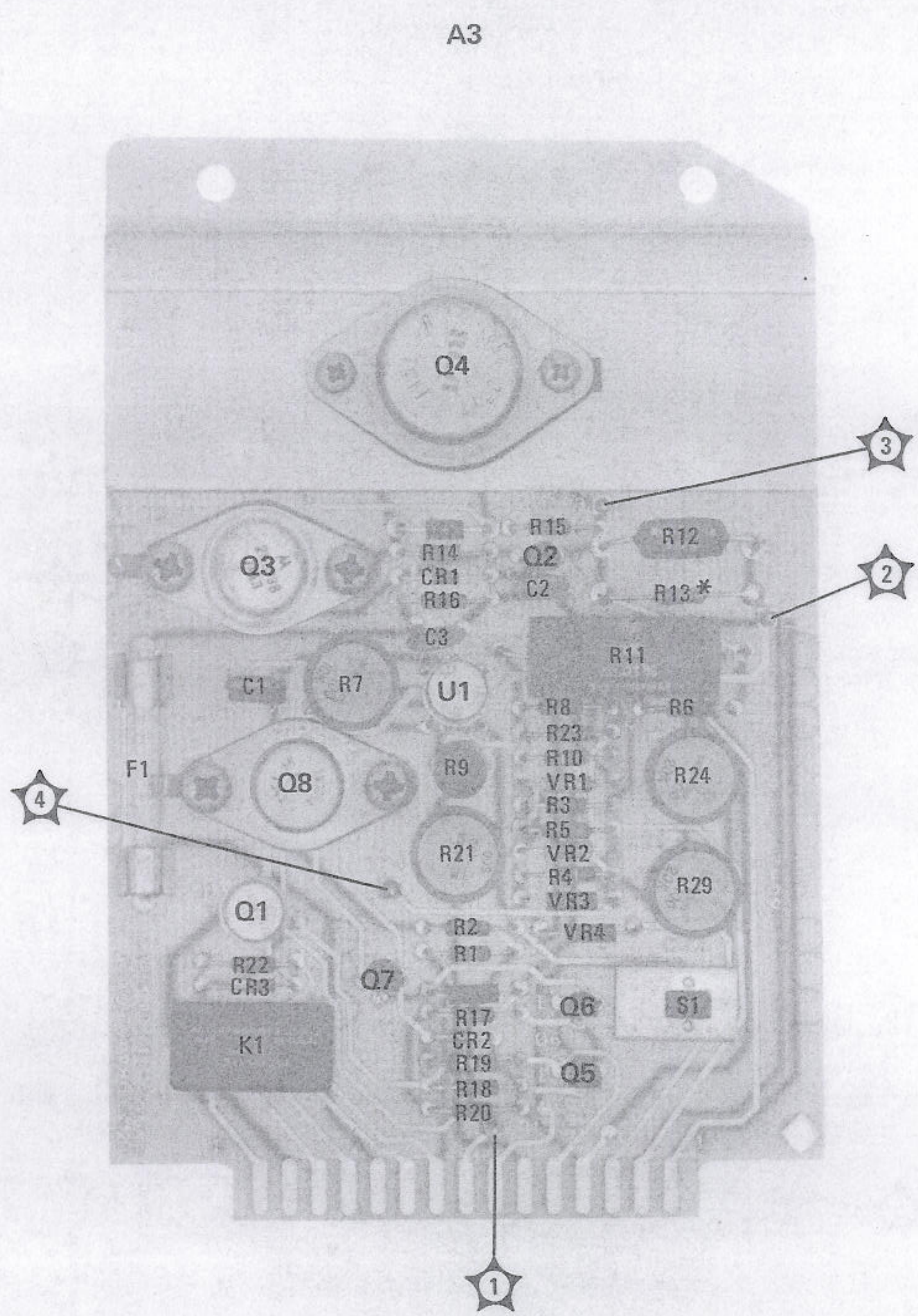


Figure 7-9. A3 YIG Driver Assembly Parts Locations (Figure 8-11) (Change C)

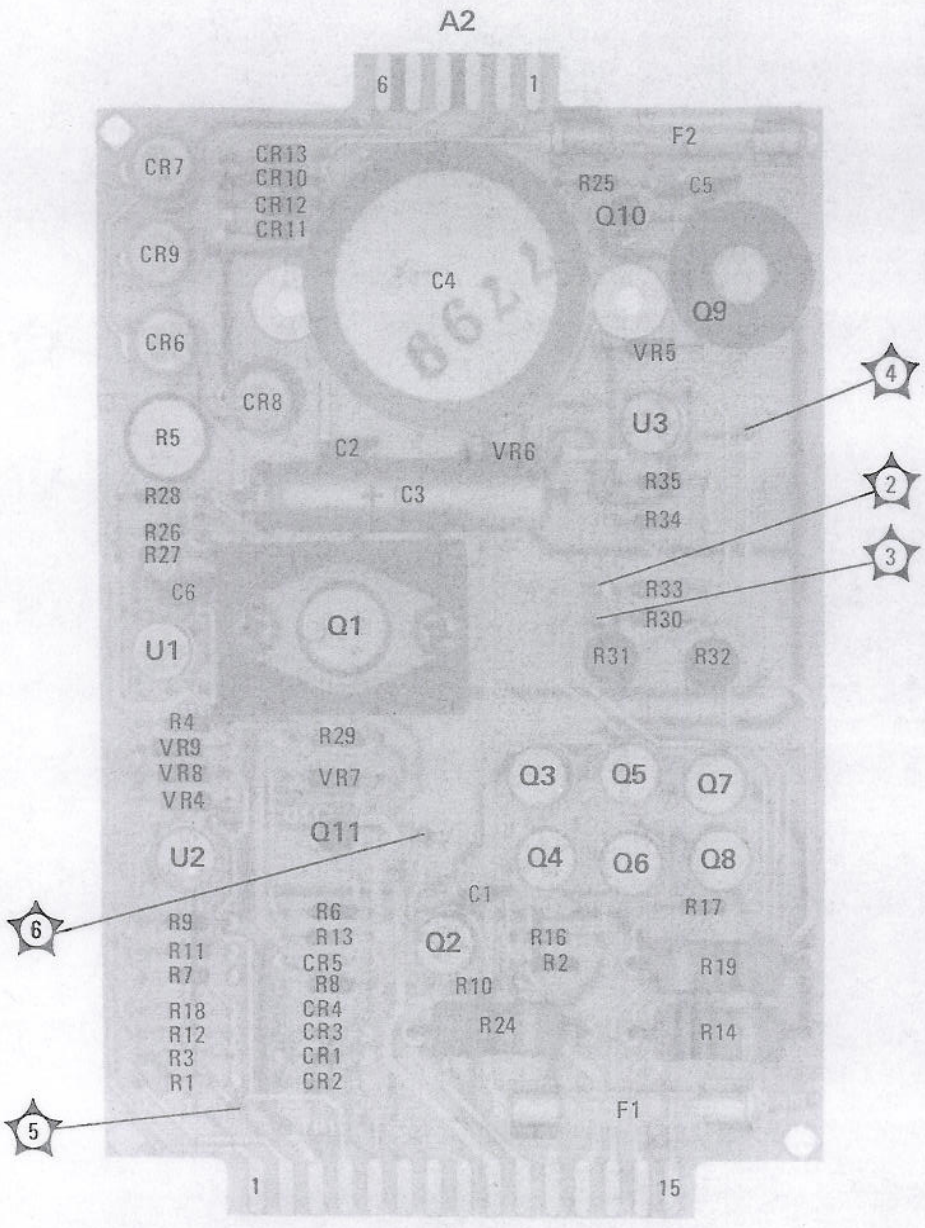


Figure 7-10. A2 Power Supply Assembly Amplifiers and Switch Driver Circuits Parts Locations (Figure 8-13) (Change C)

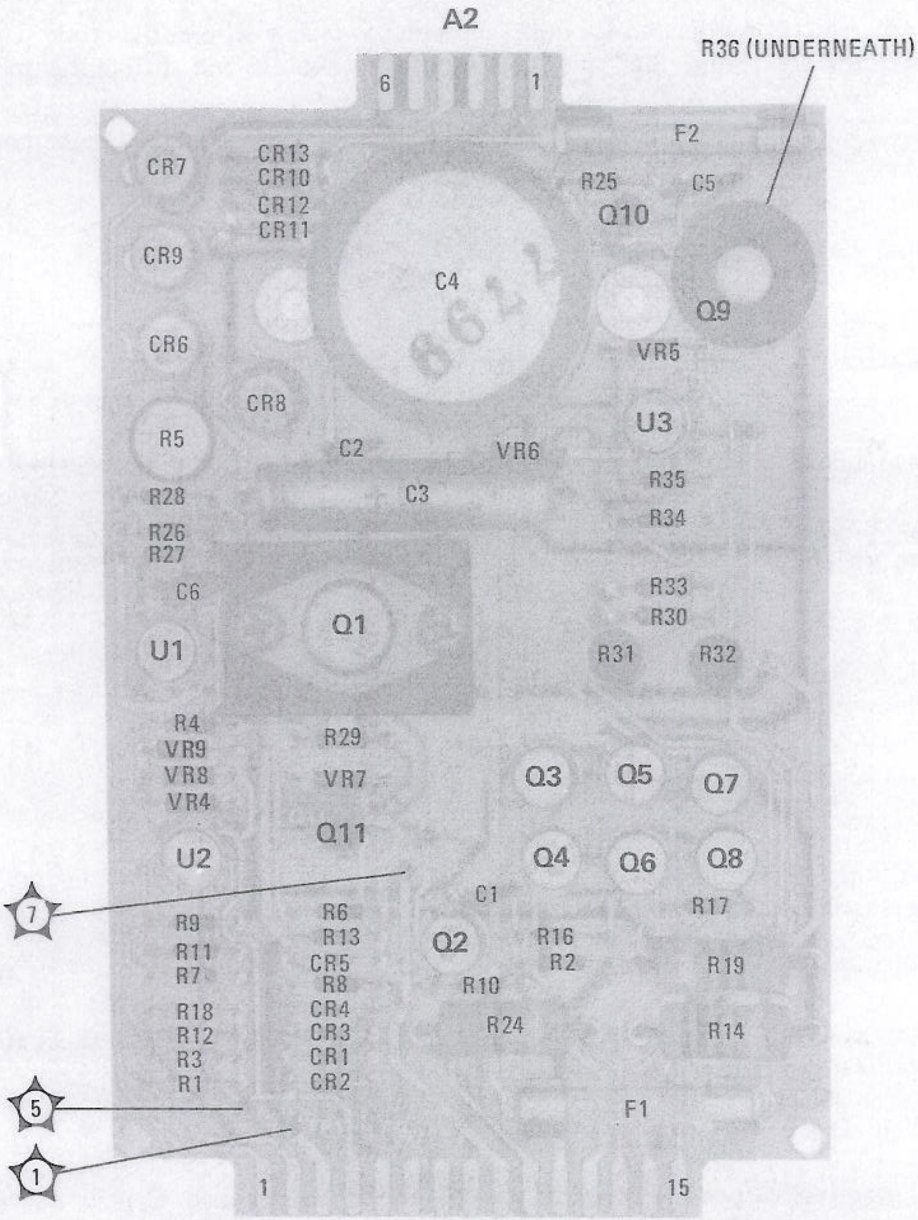


Figure 7-11. A2 Power Supply Assembly Supply Voltage Circuits Parts Locations (Figure 8-15) (Change C)

7-6. REMOTE AMPLIFIER ADJUSTMENT (Change E)

REFERENCE:

Service Sheet 5.

DESCRIPTION:

The remote amplifier A2U3 is adjusted for null, common-mode and differential-mode. The adjustments are repeated until settings are found that satisfy null, common-mode and differential-mode requirements.

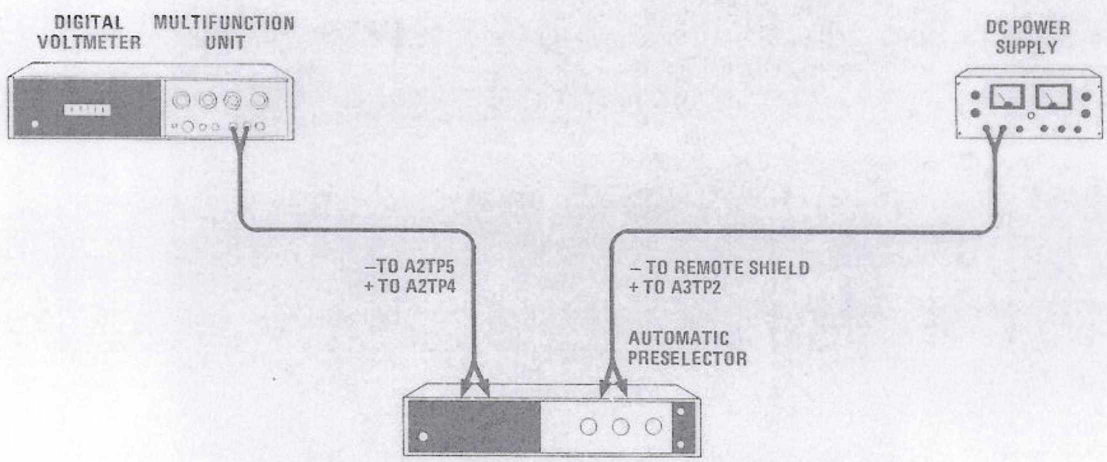


Figure 7-12. Remote Amplifier Adjustment Test Setup

EQUIPMENT:

Power Supply (0 to 10 Vdc)	HP 6205B
Coaxial Cable (BNC to alligator clips)	HP 10501A
Four foot test leads with alligator clips (2 each)	
Digital Voltmeter with Multifunction Unit	HP 3480B/3484A

1. With test setup as indicated in Figure 7-12, apply power to Preselector and allow at least 30 minutes for equipment to stabilize.
2. Connect "+" terminal of power supply to A2TP2.
3. Connect "–" terminal of power supply to REMOTE connector shield. Ground the negative terminal of the power supply with the shorting bar.
4. Connect "+" terminal of digital voltmeter to A2TP4.
5. Connect "–" terminal of digital voltmeter to A2TP5.
6. Set power supply output voltage to zero and connect REMOTE connector center conductor to "–" terminal of power supply. (REMOTE center pin and shield now shorted together.)
7. Adjust A2R23 NULL for zero indication on digital voltmeter. Remove short across REMOTE Center pin and shield.

8. Common-mode adjustment:

   a. Set power supply output voltage to 10 volts.

   b. Note error voltage indicated by voltmeter.

   c. Alternately adjust A2R20 and A2R21 for a zero indication on voltmeter. Remove about half the error voltage with each potentiometer.

9. Differential-mode adjustment:

   a. Set power supply output voltage to zero.

   b. Connect REMOTE connector center conductor to "+" terminal of power supply.

   c. Connect "–" terminal of digital voltmeter to A2TP2.

   d. Adjust A2R23 NULL for zero indication on voltmeter.

   e. Set Power Supply output voltage to 10 volts.

   f. Alternately adjust A2R20 and A2R21 for zero indication on voltmeter, removing about half the error voltage with each potentiometer.

10. Repeat steps 2 through 9 until settings are found which simultaneously satisfy all modes within a tolerance of ±1.0 millivolts.

11. Note and record digital voltmeter indication for each mode.

Common-mode________mV
Differential-mode________mV

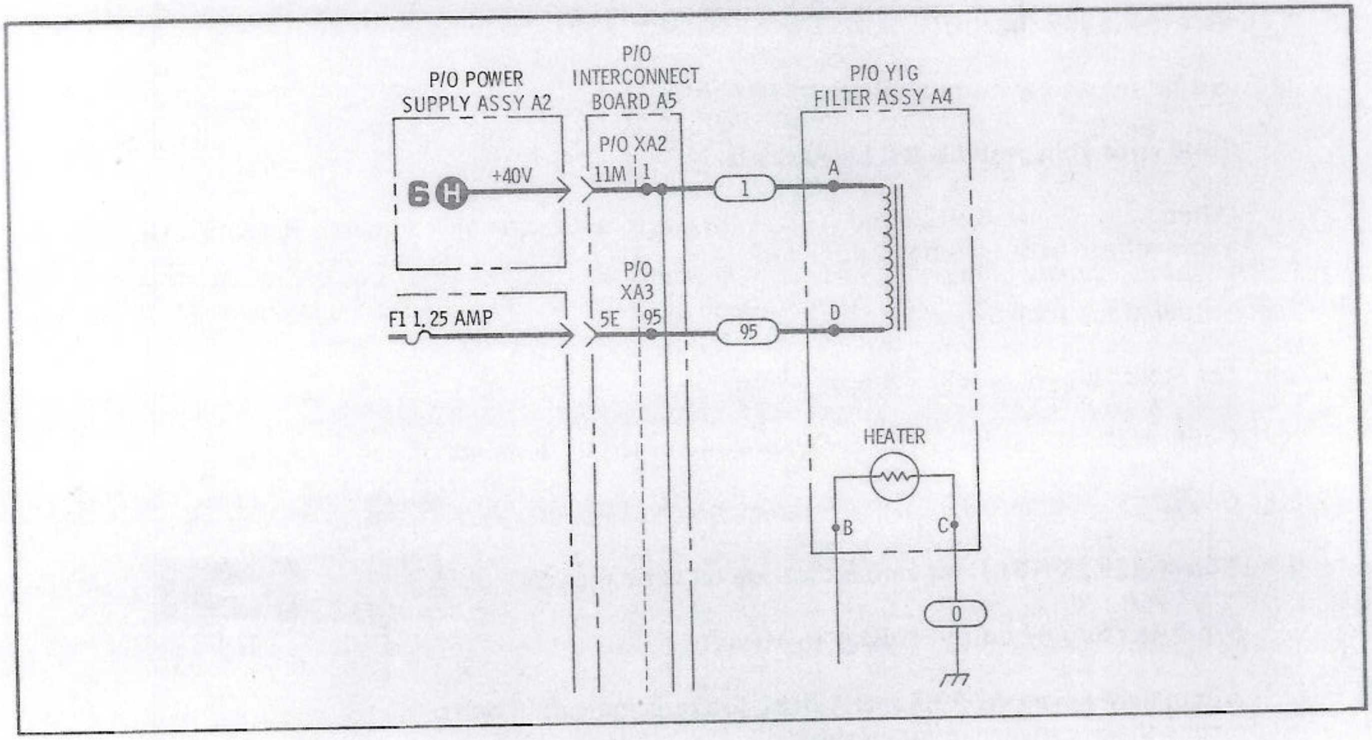


Figure 7-13. Partial Schematic Correction for Service Sheet 4 (P/O Change D)

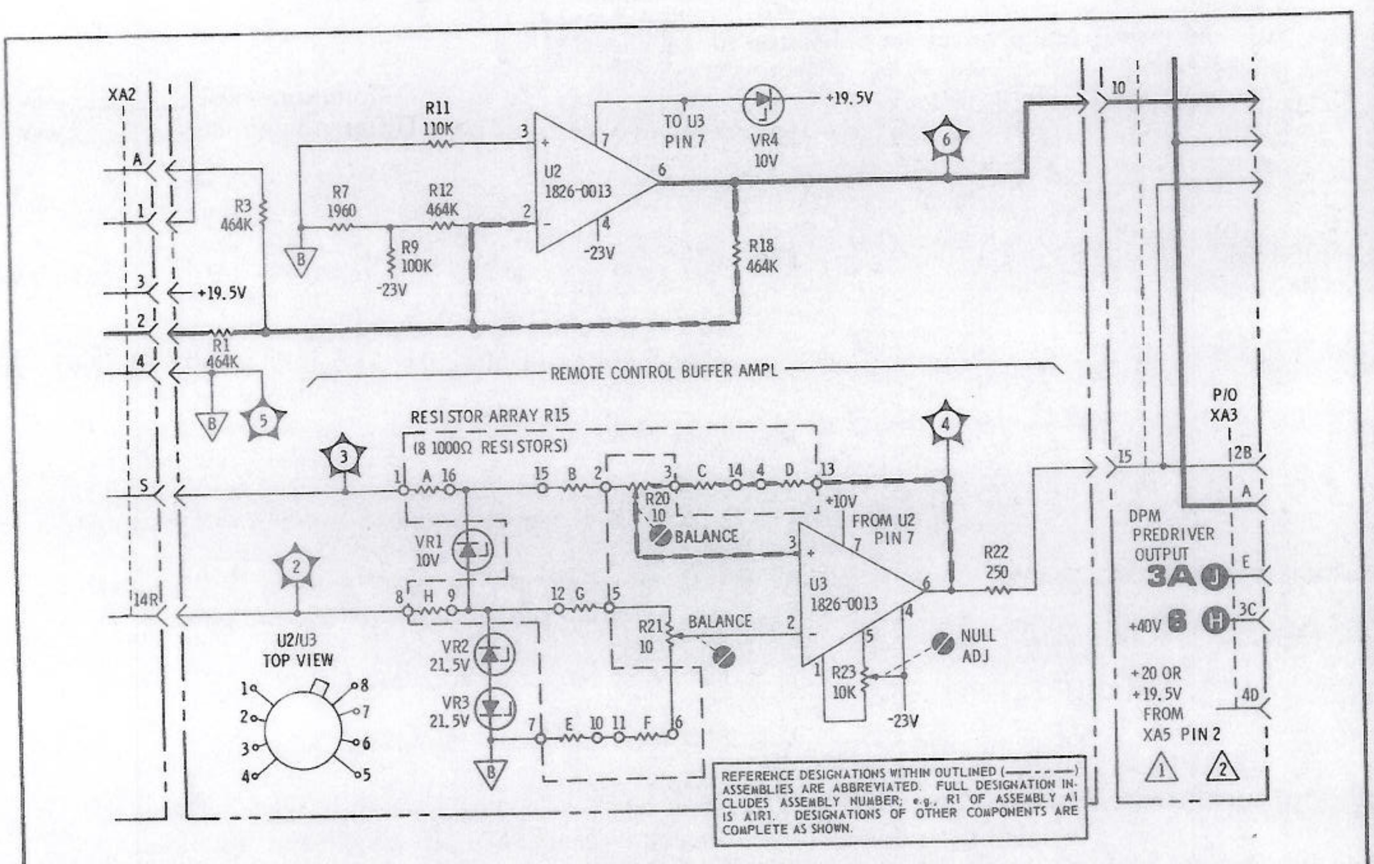


Figure 7-14. Partial Schematic Correction for Service Sheet 5 (P/O Change E)

SECTION VIII
SERVICE

8-1. INTRODUCTION

8-2. This section provides instructions for troubleshooting and repairing the Hewlett-Packard 8445B Automatic Preselector. It includes general servicing hints and information, block diagrams of the instrument and its optional circuitry, circuit descriptions, parts identification illustrations, and schematic diagrams.

WARNING

Maintenance described in this section is performed with power supplied to the instrument and with protective covers removed. Such maintenance should be performed only by service-trained personnel who are aware of the hazards involved. Where maintenance can be performed without power applied, the power should be removed. When any repair is completed, be sure that all safety features are intact and functioning and that all necessary parts are connected to their protective grounds.

8-3. SERVICE INFORMATION INDEX

8-4. Specific kinds of maintenance, the four 8445B instrument configurations (by option numbers), and the instrument's main assemblies are listed in Table 8-1, with the pertinent paragraphs, figures, and service sheets. Service Sheets are foldout pages containing schematic or wiring diagrams, and with illustrations which show the locations of parts on the printed circuit board assemblies. In most cases, each service sheet applies to a particular one (or specific part of one) of the instrument's assemblies and is complete on one foldout page. In some instances, however, a service sheet may include two or more foldout pages. Service sheet numbers are printed in large bold-faced numerals in the lower right-hand corner of the page. Symbols and terminology used on the schematic diagrams are explained in Table 8-2, Schematic Diagram Notes.

8-5. TEST EQUIPMENT

8-6. Test instruments and accessories used to maintain the Preselector are listed in Table 1-5. If the listed instrument is not available, another instrument that meets the required minimum specifications may be substituted.

8-7. GENERAL TROUBLESHOOTING

8-8. Troubleshooting to the assembly level is accomplished by referring to the simplified systems block diagrams and the overall block diagram, and by checking for the voltages given for the various system test points. Once the problem is isolated to a particular assembly, the circuit description, troubleshooting information, and schematic diagrams(s) for the suspect assembly are used to locate the faulty component.

8-9. Before pursuing any troubleshooting in the 8445B Automatic Preselector, you should first make sure the problem is not in the Spectrum Analyzer, or is not caused by a faulty connection between the Spectrum Analyzer and the Preselector, or between the Spectrum Analyzer plug-in sections. To determine that the problem is actually in the Preselector, proceed as follows:

1. Turn off the ac power to the Spectrum Analyzer and the Preselector.

2. Remove the IF and RF Sections from the Spectrum Analyzer mainframe or Display Section, decouple them from each other, then recouple them carefully.

3. Plug the IF and RF Sections firmly into the mainframe or Display section and lock them into position.

4. Disconnect the rear-panel interconnect cable from both the Spectrum analyzer and the Preselector; then reconnect it carefully and lock the cable plugs into the instrument receptacles

Table 8-1. Service Information Index

Subject	Location
General Troubleshooting	Paragraph 8-7
Mechanical Parts Maintenance and Repair	Paragraphs 8-15 through 8-21
Transistors and Diodes Operation and Testing	Paragraph 8-23
Operational Amplifiers Operation and Testing	Paragraph 8-28
Standard 8445B	Paragraph 8-32, Figure 8-4, Figure 8-6 (Service Sheet 1)
8445B With Front-Panel Controls (Option 002)	Paragraph 8-43, Figure 8-5, Figure 8-6 (Service Sheet 1)
8445B With Low-Pass Filter Deleted (Option 004)	Paragraph 8-39, Figure 8-4, Figure 8-5, Figure 8-6 (Service Sheet 1)
YIG Predriver Board Assembly A1	Paragraph 8-48, Service Sheet 2
DPM Predriver Part of Assembly A1 (Option 003)	Paragraph 8-58, Service Sheet 3
YIG Driver Board Assembly A3	Paragraph 8-63, Service Sheet 4
Power Supply Board Assembly A2 Control and Switching Circuits	Paragraph 8-74, Service Sheet 5
Power Supply Board Assembly A2 DC Supplies	Paragraph 8-87, Service Sheet 6
Digital Panel Meter Assembly A7	Paragraph 8-96, Service Sheet 7
Motherboard Assembly A5 and Wiring Harnesses	Service Sheet 8

Table 8-2. Schematic Diagram Notes

SCHEMATIC DIAGRAM NOTES

Refer to ANSI Y32.2

R, C, L	Resistance is in ohms, capacitance is in microfarads, and inductance in millihenries unless otherwise noted.
P/O	Part Of
*	Asterisk, on component denotes a factory-selected value. Value shown is typical. Capacitors may be omitted or resistors jumpered.
	Screwdriver adjustment .
○	Panel control.
	Encloses front panel designation.
	Encloses rear panel designation.
	Circuit assembly borderline.
	Other assembly borderline.
	Heavy line with arrows indicates path and direction of main signal.
	Heavy dashed line with arrows indicates path and direction of main feedback.
CW	Wiper moves toward CW with clockwise rotation of control as viewed from shaft or knob.
1	Numbered test point. Measurement terminal provided.
A	Lettered Test Point. No measurement terminal provided.
	Encloses wire color code. Code used (MIL-STD-681) is the same as the resistor color code. First number identifies the base color, second number the wider stripe, and the third number identifies the narrower stripe, e.g. 947 denotes white base, yellow wide stripe, violet narrow stripe.
n=1±*	n = harmonic number 1 = 1st LO fundamental ± = 1st LO above or below 1st IF * = 550 MHz 1st IF; no asterisk = 2050 MHz 1st IF.
A 3	Letter = off page connection. Number = Service Sheet location for off page connection.
	Chassis ground
	Assembly ground

5. Check the power module voltage selector card at the 8445B rear panel to make sure the voltage selection matches the ac source voltage.

6. Turn on the Spectrum Analyzer and Preselector power and determine whether or not the system is now functioning properly.

7. If the system is still malfunctioning, check the operation of the Spectrum Analyzer without the Preselector connected to it. If the Spectrum Analyzer operates properly, go ahead with the Preselector troubleshooting.

8-10. Signal Input for Troubleshooting.

8-11. The Preselector can be checked with the 8555A 2nd LO OUTPUT (1.5 GHz) and its harmonics. You can also use a 1.0 GHz-per-volt signal (dc) applied to the Preselector rear-panel REMOTE input connector. Or, if your Preselector is equipped with front-panel MANUAL TUNE controls (Option 002), you can use them to tune the instrument instead of tuning it with a dc input to the REMOTE input connector.

8-12. Test Point Voltages

8-13. A check of the test point voltages is frequently a quick method of isolating a failure to a single board assembly. Voltage measurements are done with the 8445B's two internal OPR-TEST switches (one is on Predriver Board Assembly A1, the other on YIG Driver Board Assembly A3) set to OPR, the 8555A Band switch lever set to BAND n=2−, and the 8445B MODE switch (Option 002 instruments) set to AUTO. measure the test point voltages with a dc voltmeter. The approximate values for various conditions are shown in Table 8-3.

8-14. GENERAL MAINTENANCE

8-15. Rigid Cables

8-16. When you have to loosen or remove one of the rigid RF cables, be very careful not to bend it. Bending one of these cables can change its electrical characteristics.

8-17. Cleaning Switches

8-18. Front-panel and board-mounted switches can be cleaned without removing them. The recommended cleaning agent is isopropl alcohol (HP Part Number 8500-0755). Spray the cleaning agent into the switch and rotate or slide it several times. Continue operating the switch until the cleaning agent is evaporated.

8-19. Repairs on Circuit Boards

8-20. Component mounting holes on the 8445B circuit boards are plated through to both sides of the board. Because of this, you can solder, or unsolder, from either side. Table 8-4 lists the tools and materials recommended for making repairs on etched circuit boards.

CAUTION

Do not use a high-wattage soldering iron on the etched circuit boards. Excessive heat can lift the printed wiring or burn the board. Also avoid using sharp metal objects to clean solder from plated-through component mounting holes. You may damage the plating and cause an open circuit. Use a suction device or a toothpick for solder removal.

8-21. Air Filter

8-22. Frequently inspect the air filter at the rear of the instrument, and always clean it before the air flow becomes restricted. To clean the filter, wash it thoroughly in warm water and detergent. Allow the filter to dry before putting it back in the instrument.

8-23. Transistors and Diodes

8-24. Transistor In-Circuit Testing. The common causes of transistor failure are internal short circuits and open circuits. In transistor circuit testing, the most important consideration is the transistor base-to-emitter junction. Figure 8-1A shows the biasing required to cause conduction

Table 8-3. Test Point Voltages

Test Point	Voltage and Conditions
A1TP1	–5.0 to –10.0V as 8555A LO is tuned from 2.05 to 4.1 GHz
A1TP2	+3.8 to +7.8V as 8555A LO is tuned from 2.05 to 4.1 GHz
A1TP3	(Option 003 only) –6.3 to –15V as 8555A LO is tuned from 2.05 to 4.1 GHz
A1TP4	(Option 003 only) +3.8 to +7.8V as 8555A LO is tuned from 2.05 to 4.1 GHz
A1TP5	–9V on n = X– bands, +9V on n = X+ bands
A1TP6	(Option 003 only) –9V on n = X– bands, +9V on n = X+ bands
A1TP7	–1.7 to –5.8V as 8555A LO is tuned from 2.05 to 4.1 GHz
A1TP8	(Option 003 only) –1.7 to –5.8V as 8555A LO is tuned from 2.05 to 4.1 GHz
A2TP1	+19.5V
A2TP2 to A2TP3	The remote control voltage level
A2TP4	–1.95V with +2.0V applied to REMOTE input connector
A2TP5	Ground point
A2TP6	(Option 002 only) –1.95V with MANUAL TUNE COARSE set to 2.0 GHz
A2TP7	–23V
A2TPE	Changes from about +29V to about +8V when switching to BAND n = 1–/IF = 2.05 GHz
A2TPF	Changes from about +2V to about +34V when switching to BAND n = 1–/IF = 2.05 GHz
A2TPG	About +35V at 0 GHz, about +31V at 18 GHz
A3TP1	+19.5V
A3TP2	Reference ground point
A3TP3	About +0.01V at 0 GHz, about +1.7V at 18 GHz
A3TP4	–1.7 to –5.8V as 8555A is tuned from 2.05 to 4.1 GHz
A3TPF	About +35V at 0 GHz, about +28V at 18 GHz
TB2-9	(white wire +28V for YIG heater. (NOTE: Not all YIGs used in 8445B instruments require heater current.)

and cut-off in NPN and PNP transistors. The voltage drop across a forward-biased, emitter-base junction varies with transistor collector current. For example, a germanium transistor has a typical forward-bias, base-emitter voltage of 0.2 – 0.3 volt when collector current is 1 – 10 mA, and 0.4 – 0.5 volt when collector current is 10 – 100 mA. In contrast, forward-bias voltage for silicon transistors is about twice that for germanium types; about 0.5 – 0.6 volt when collector current is low, and about 0.8 – 0.9 volt when collector current is high.

8-25. Figure 8-1B shows simplified versions of the three basic transistor circuits and gives the characteristics of each. When examining a transistor stage, first determine if the emitter-base junction is biased for conduction (forward-biased) by measuring the voltage difference between the emitter and base. When using an electronic voltmeter, do not measure directly between the emitter and base; there may be sufficient loop current between the voltmeter leads to damage the transistor. Instead, measure each voltage separately with respect to a common point (e.g., chassis). If the emitter-base junction is forward-biased, check for amplifier action by short-circuiting the base to the emitter while observing the collector voltage. The short circuit eliminates base-emitter bias and should cause the transistor to stop conducting (cut off). Collector voltage should then change and approach the supply voltage. Any difference is due to leakage current through the transistor and, in general, the smaller this current the better the transistor. If the collector voltage does not change, the transistor has either an emitter-collector short circuit or emitter-base open circuit.

8-26. Transistor and Diode Markings. Figure 8-2 shows diode and transistor marking methods. In addition, the emitter lead for

Table 8-4. Etched Circuit Soldering Equipment

Item	Use	Specification	Item Recommended
Soldering	Soldering Unsoldering	Wattage rating: 47½–56½ Tip Temp: 850–900 degrees	Ungar No. 776 handle with *Ungar No. 4037 Heating Unit
Soldering* tip	Soldering Unsoldering	*Shape: pointed	*Ungar No. PL111
De-soldering aid	To remove molten solder from connection	Suction device	Soldapult by Edsyn Co., Arleta, California
Resin (flux)	Remove excess flux from soldered area before application of protective coating	Must not dissolve etched base board material or conductor bonding agent	Freon, Aceton, Lacquer Thinner, Isopropyl Alcohol (100% dry)
Solder	Component replacement Circuit board repair Wiring	Resin (flux) core, high tin content (60/40 tin/lead), 18 gauge (SWG) preferred	
Protective coating	Contamination, corrosion protection	Good electrical insulation, corrosion-prevention properties	Silicone Resin such as GE DRI-FILM** 88

*For working on etched boards; for general purpose work, use Ungar No. 1237 Heating Unit (37.5W, tip temperature of 750–800 degrees) and Ungar No. PL113, 1/8 inch chisel tip.

**General Electric Co., Silicone Products Dept., Waterford, New York, U.S.A.

a bipolar transistor is identified on the printed circuit board by connecting it to a square rather than a round pad.

8-27. Printed Circuit Board Markings. On the printed circuit board, a square pad is etched around one pin of some components to facilitate identification of the component terminals. The square pad indicates the following:

a. The cathode of a diode

b. Emitter of a transistor

c. Source terminal of an FET

d. Pin one of an integrated circuit

e. Pin one of an integrated circuit socket

f. Pin one of a cable connector

8-28. Operational Amplifiers

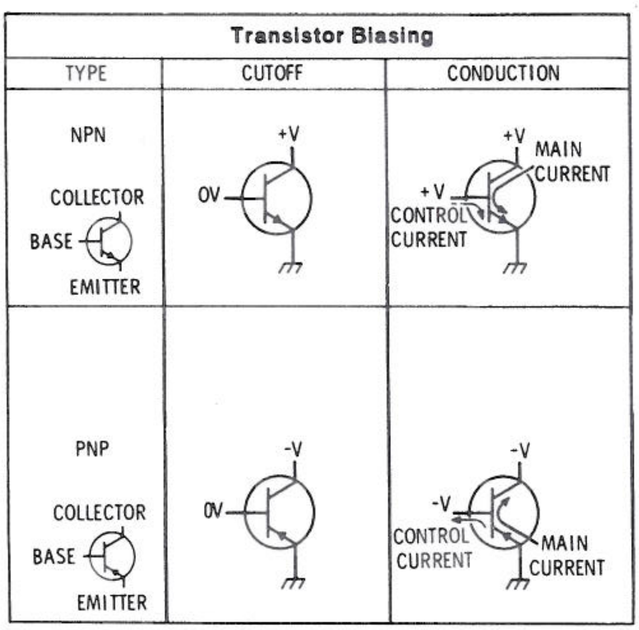
8-29. Operational Amplifier Function. Operational amplifiers are used to provide such functions as summing amplifiers, offset amplifiers, buffers and power supplies. The particular function is determined by the external circuit connections. Equivalent circuit and logic diagrams for type 741 operational amplifiers are contained in Figure 8-3. Circuit A is a non-inverting buffer amplifier with a gain of 1. Circuit B is a non-inverting amplifier with gain determined by the resistance of R1 and R2. Circuit C is an inverting amplifier with gain determined by R1 and R2. Circuit D contains the functional circuitry and pin connection information along with an operational amplifier review.

NOTE

In Circuit D, it is assumed that the amplifier has high gain, low output impedance and high input impedance.

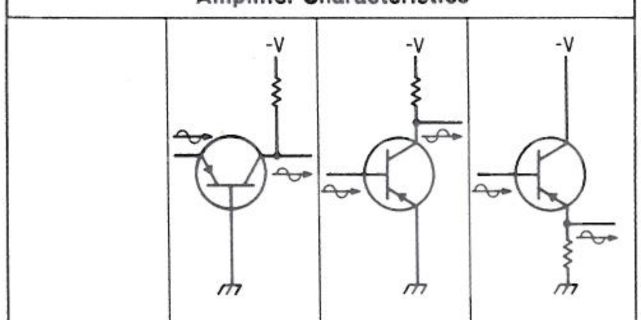
8-30. Operational Amplifier Troubleshooting. When operational amplifiers are suspected, one quick check is case temperature, which should not be hot to the touch. If the output voltage approaches or equals either the negative or positive bias supply values the device should be suspected. Measure and record the voltage level at both the − (inverting) terminal pin 2 and the + (non-inverting) terminal pin 3. The levels should not differ by more than about 10 mV. If the voltage levels are not within about 10 mV, check the external circuitry and components. if the external circuitry (input signal, operating voltages, feedback resistors) appears normal, replace the operational amplifier.

A



B

Amplifier Characteristics



CHARACTERISTIC	COMMON BASE	COMMON EMITTER	COMMON COLLECTOR
Input Impedance	30Ω - 50Ω	500Ω - 1500Ω	20KΩ - 500KΩ
Output Impedance	300KΩ - 500KΩ	30KΩ - 50KΩ	50Ω - 1000Ω
Voltage Gain	500 - 1500	300 - 1000	<1
Current Gain	<1	25 - 50	25 - 50
Power Gain	20 dB - 30 dB	25 dB - 40 dB	10 dB - 20 dB (Emitter Follower)

Figure 8-1. Transistor Characteristics and Biasing

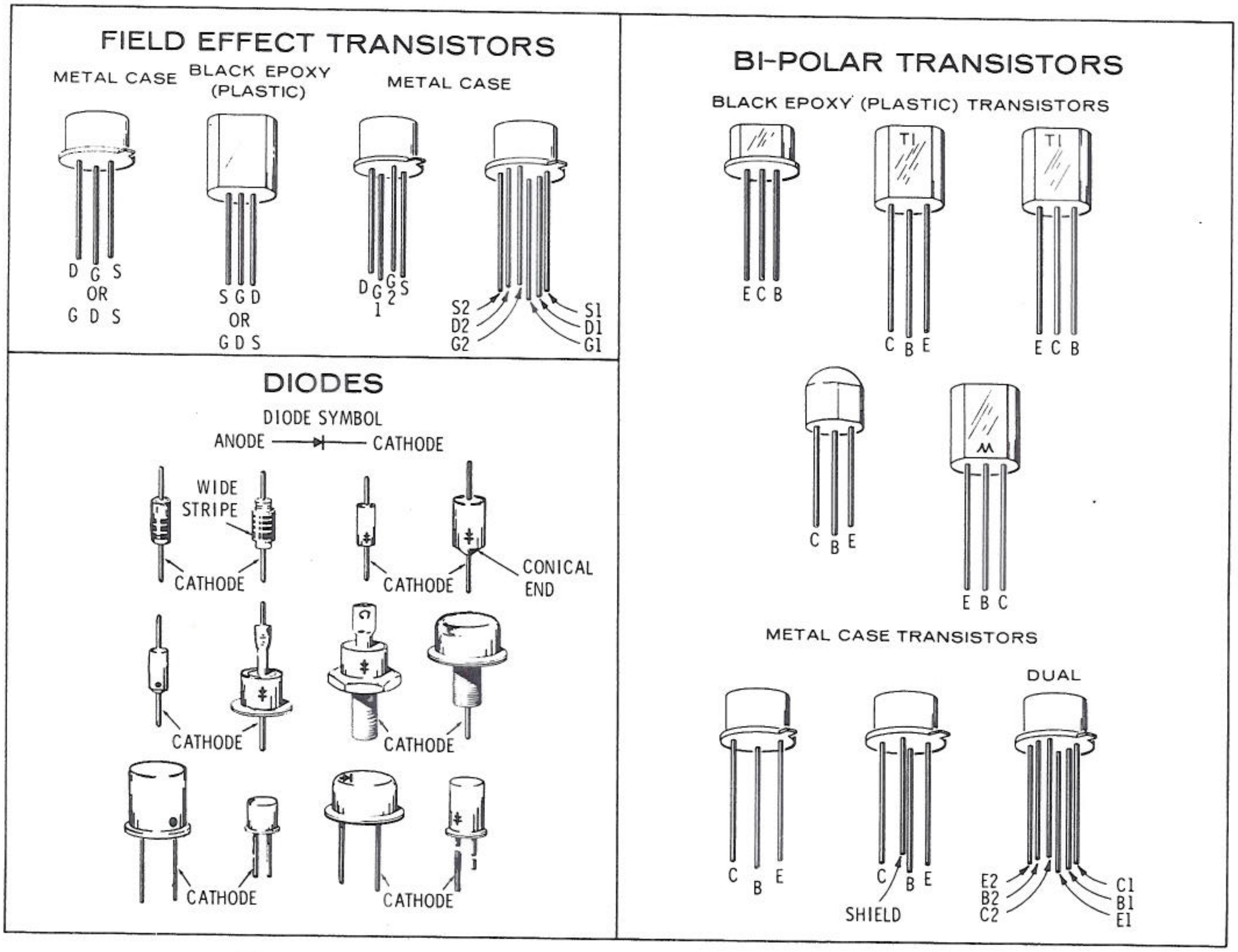


Figure 8-2. Examples of Diode and Transistor Marking Methods

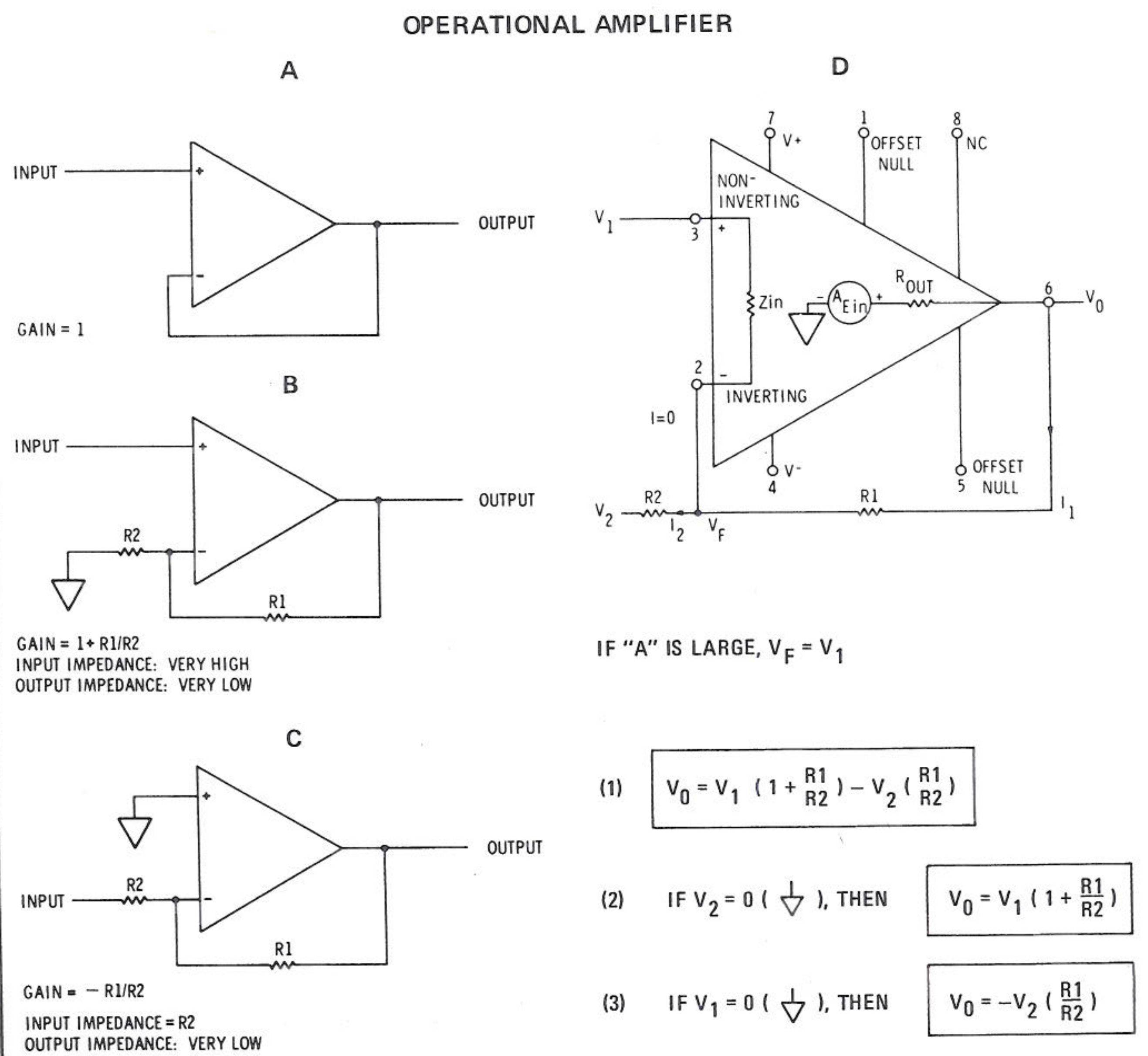


Figure 8-3. Operational Amplifier Equivalent Circuit

8-31. AUTOMATIC PRESELECTOR SYSTEMS

8-32. Standard Preselectors

8-33. The shaded blocks in Figure 8-4 represent a simplified block diagram of a standard (no options) Model 8445B Automatic Preselector. The YIG filter can be used as a stand-alone 1.8 to 18 GHz narrow bandpass filter by applying an external tuning voltage of +1.8 to +18 volts to the Preselector rear-panel REMOTE BNC connector, J4. The center frequency of the nominally 30 MHz-wide filter will follow the remote tuning voltage according to a 1 GHz/V relationship. The tuned resonant effect of the YIG filter is controlled by the value of dc current fed to its tuning coil (electromagnet). Tuning sensitivity is approximately 26 mA/GHz. In the standard 8445B, remote operation is selected automatically if the 8445B is not connected to an 8555A RF Section.

8-34. When operating as a preselector for an 8555A RF Section Spectrum Analyzer, the RF OUTPUT of the 8445B is connected to the INPUT of the 8555A by rigid cable W1.

8-35. The YIG Pre-Driver uses input voltages from the 8555A Spectrum Analyzer System and produces an output voltage that is proportional to the frequency to which the analyzer is tuned. The analyzer provides a Sweep + Tune voltage that is representative of the frequency of the YIG oscillator in the analyzer. This voltage varies linearly from −5.000 volts for a LO frequency of 2.050 GHz to −10.000 volts for a LO frequency of 4.100 GHz. The Sweep + Tune voltage is applied to a harmonic number amplifier in the Preselector. The gain of the harmonic amplifier is controlled by Band Code signals "A" and "B" from the analyzer. Band Code bits "A" and "B" represent the frequency bands n = 1 through n = 4. The output from the harmonic number amplifier is a voltage representative of LO harmonic frequency. The frequency-to-voltage ratio is 1.025 GHz/Volt. The output from the harmonic amplifier is applied to a summing amplifier where it is combined with the IF offset voltage.

8-36. Band Code bit "E" from the analyzer is applied to the n = + or − mixing offset amplifier in the Preselector. The + or − mixing offset amplifier provides an offset voltage to match the mixing mode in the analyzer. The output from the offset amplifier is applied through a 2.05 GHz IF or 550 MHz IF offset network to the summing amplifier. The IF offset is a resistive network controlled by Band Code bit "D" from the analyzer. The output is a voltage proportional to the analyzer's 1st IF offset. The frequency-to-voltage ratio is 1.025 GHz/Volt. The Summing Amplifier combines the output of the Harmonic Number Amplifier with the output from the 2.05 GHz/550 MHz IF Offset Network to produce an output voltage level to the YIG Driver that is proportional to the frequency to which the analyzer is tuned. The Summing Amplifier has unity gain (−1) with an output voltage level proportional to frequency by a ratio of 1.025 GHz/volt.

8-37. Standard 8445B models utilize Band Code bits A, B, D, and E from the 8555A to automatically switch the LP filter in place of the tunable YIG filter in the Preselector RF signal line when the 0 − 2.0 GHz band is selected.

8-38. The front panel FREQ OFFSET adjustment is used to trim the YIG filter magnet current to correct for slight variations in filter frequency. The screwdriver TRACKING adjustment is used to set the Preselector tracking properly on low and high frequency bands. (See Paragraph 5-13.)

8-39. Option 004 Preselectors

8-40. When Option 004 is ordered, the 1.8 GHz low-pass filter and the coaxial switching relays are deleted. The Coaxial Switch Control and Driver circuits are left on the A2 Power Supply assembly for possible future use.

8-41. Option 003 Preselectors

8-42. When Option 003 is ordered, the standard A1 Predriver, shown shaded in Figure 8-4, is replaced with one containing both the shaded and unshaded circuits. In addition, a complete digital panel meter circuit is mounted behind a window on the front panel of the Preselector. The 8555A supplies a −7.5V to −15V Tune voltage from its YIG-tuned LO Driver. This voltage is processed in a manner similar to the Sweep + Tune voltage in the standard 8445B, except that the output of the DPM section Summing Amplifier converts the Tune voltage to a 1.025 GHz/V level fed to the DPM. The digital panel meter is a voltmeter with a resistive voltage divider input to convert the 1.025 GHz/V to a 1 GHz/V level. When the 8555A is tuned to a frequency of 3 GHz, for example, the Summing Amplifier output is 3 x 0.976 or 2.927V, resulting in a display reading of 3.000 GHz. If the Preselector is tracking properly, the frequency being displayed is also the center frequency of the YIG filter pass band.

8-43. Option 002 Preselectors

8-44. Option 002 adds a MODE switch with AUTOmatic, REMOTE, LOW-PASS, and MANUAL positions, plus COARSE and FINE manual tuning controls on the front panel of the Preselector (unshaded circuitry of Figure 8-5). In the AUTO position the Preselector operates as a standard instrument. In the REMOTE position, the YIG filter is tuned by a 1 GHz/V voltage input to the REMOTE BNC connecctor on the rear panel of the Preselector. In the LOW-PASS position, the 1.8 GHz low-pass filter is connected in place of the YIG filter in the Preselector RF line. In the MANUAL position, the YIG filter can be used as a stand-alone 1.8 to 18 GHz filter, which is tuned manually with the COARSE and FINE manual tuning controls to any selected frequency in this band.

8-45. Preselectors with Options 002 and 003

8-46. The 8445B Automatic Preselector may incorporate both Options 002 and 003. In this case the unshaded DPM circuits of Figure 8-4 would be added to the circuits shown in Figure 8-5. Figure 8-6, the overall block diagram, shows a combination Option 002/Option 003 Preselector.

8-47. CIRCUIT DESCRIPTIONS AND TROUBLESHOOTING

NOTE

All troubleshooting described in this section is done with the 8445B connected to a fully operational spectrum analyzer (HP 8555A/8552/140).

8-48. YIG Predriver Assembly A1 (See Service Sheet 2)

8-49. The YIG Pre-driver converts the Sweep + Tune voltage from the 8555A to a voltage that is proportional to the frequency to which the spectrum analyzer RF Section is tuned.

8-50. Harmonic Number Amplifier. The Harmonic Number Amplifier, A1U1, multiplies the Sweep + Tune voltage from the RF Section by a factor of −0.4n, where "n" is the BAND number selected on the RF Section panel (Table 8-5). The Sweep + Tune voltage is proportional to the 1st LO YIG-tuned oscillator voltage in the 8555A RF Section. This voltage varies linearly from −5.000 Vdc ±5 mV with the 1st LO at 2.05 GHz, to −10.000 Vdc ±55 mV with the 1st LO at 4.1 GHz. Precision resistors in the Harmonic Number Amplifier circuit are switched by relays to set the gain of the circuit relative to the harmonic mixing number of the 8555A band that is selected.

8-51. n = + or − Amplifier. A +9 Vdc reference voltage from YIG Driver Assembly A3 is applied to the input of the n = ± Amplifier. The function of this circuit is controlled by relays K7 and K8 to provide either a +9 Vdc output level for the plus mixing bands of the 8555A, or −9 Vdc for the minus mixing bands. Relays K7 and K8 are controlled by Band Code "bit" E from the spectrum analyzer RF Section.

8-52. IF = .550 GHz/2.05 GHz Network. When bands are changed on the 8555A RF Section, either .550 GHz or 2.05 GHz is used as the 1st IF. The IF = .500 GHz/2.05 GHz offset network alters the input to the Summing Amplifier to compensate for the IF change. This is accomplished by Band Code "bit" D and relay K5. Precise level corrections for an IF of 2.05 GHz are made by adjusting R37, ADJ 4. Adjustment of R36, ADJ 5, corrects for improper input level to the Summing Amplifier for an IF of .550 GHz.

8-53. Summing Amplifier. Summing Amplifier A1U2 combines the output from the Harmonic Number Amplifier with the Output from the IF = .550 GHz/2.05 GHz Network to produce a voltage proportional to the band and frequency to which the analyzer RF Section is tuned. The output from the Summing Amplifier is applied to YIG Driver Assembly A3.

8-54. Logic Decoders/Relay Driver. Transistors A1Q1 through Q8 and their associated relays operate as logic decoders of Band Code "bits" from the 8555A. Band Code signals of either +20 or −12 Vdc from the analyzer RF Section switch precision resistors in the circuits of the Harmonic Number Amplifier to control the output polarity of the n = + Amplifier, and to offset the input to the Summing Amplifier by the IF = .550 GHz/2.05 GHz Network.

NOTE

If, after performing the troubleshooting procedures for a particular circuit, you determine that the operational amplifier is functioning normally but the testpoint voltages are incorrect, do the YIG Predriver Adjustment described in Section V.

8-55. Harmonic Number Amplifier Troubleshooting

- Set switch S1 on Predriver Board Assembly A1 to TEST and measure the voltage at TP2. It should be 0 Vdc ±1 mV. Set switch S1 back to OPR.
- Connect a voltmeter to TP1 on the Predriver Board. Select spectrum analyzer BAND=1−/IF=.550 GHz. Set SCAN WIDTH to ZERO.
- Adjust the spectrum analyzer FREQUENCY control for an indicated level of −5.0 Vdc ±1 mV at TP1.
- Check the voltage level at TP2. It should be +2.0 Vdc ±2 mV.
- With the voltmeter connected to TP2, select spectrum analyzer bands n=2±, then n=3±, then n=4±.Voltages at TP2 for these selections should be +4.0 Vdc ±3 mV for n=2±; +6.0 Vdc±4mV for n=3±; and +8.0 Vdc ±5 mV for n=4±.
- The harmonic number amplifier (A1U1) has a gain of −0.4n, with "n" controlled by the logic decoder/relay drivers (see Table 8-5). If it appears to be operating improperly, check it with the Operational Amplifier Troubleshooting Procedure in paragraph 8-30.

8-56. n = + or − Amplifier Troubleshooting

- On YIG Driver Board Assembly A3, set switch S1 to TEST. Then check the voltage level at testpoint TP5 on YIG Predriver Board Assembly A1. The level should be 0 Vdc ±1 mV.
- Reset switch A3S1 to OPR. On the spectrum analyzer RF section, select BAND n=1−/IF=.550 GHz. Check the voltage level at testpoint TP5 on YIG Predriver Board Assembly A1. It should be −9.0 Vdc ±0.3V.
- With the voltmeter still connected to testpoint A1TP5, set spectrum analyzer for BAND n=1+/RF=.550 GHz. The voltage level at A1TP5 should be +9.0 Vdc±0.3V.
- Switch the spectrum analyzer from BAND n=− through BAND n=4+. Voltage at A1TP5 should be +9.0 Vdc±0.3V on all n=+ bands, and −9.0 Vdc±0.3V on all n=− bands.
- The n=+ or − amplifier, A1U5, has a gain of 1 for all band selections. Its output polarity is controlled by Band Code "bit" E, which alternately switches relays K7 and K8 as bands are progressively selected (see Table 8-5). If A1U5 appears to be operating improperly, check it with the Operational Amplifier Troubleshooting Procedure in paragraph 8-30.

8-57. IF=.550 GHz/2.05 GHz Network Summing Amplifier Troubleshooting

- Set the OPR/TEST switches (S1) on Predriver Board Assembly A1 and YIG Driver Board Assembly A3 to TEST. Check the voltage level at testpoint TP7 on Predriver Board A1. It should be 0 Vdc±1mV.
- Reset both OPR/TEST switches to OPR. On the spectrum analyzer, select BAND n=1−/IF=.550 GHz. Set SCAN WIDTH to ZERO.
- Adjust spectrum analyzer FREQUENCY for a voltage level of −5.000 Vdc at testpoint TP1 on Driver Board A1. Then measure the voltage level at testpoint TP7 on Driver Board A1. The voltage at TP7 should be −1.463 Vdc±2mV.

- Select BAND n=1+/IF=.550 GHz and again check the voltage at A1TP7. It should be −2.536 Vdc±2mV.
- With the voltmeter still connected to A1TP7, select BAND n=2−. The voltage at A1TP7 should be −2.000±2mV.
- Select BAND n=2+ and check the voltage at A1TP7. It should be −6.000 Vdc±3 mV.
- The 550 MHz and 2.05 GHz IF offset is controlled by Band Code "bit" D (see table 8-5). If the summing amplifier (A1U2) seems to be operating improperly, check it with the Operational Amplifier Troubleshooting Procedure in paragraph 8-30.

Table 8-5. Relay Operations by Band Code Bits

Analyzer Harmonic Number	Band Code "Bits"				Relay	Relay	Relay	Relay	Relay
	A	B	D	E	A1K1	A1K2	A1K5	A1K7	A1K8
n = 1−*	0	0	1	0	closed	closed	open	open	closed
n = 1+*	0	0	1	1	closed	closed	open	closed	open
n = 1−	0	0	0	0	closed	closed	closed	open	closed
n = 1+	0	0	0	1	closed	closed	closed	closed	open
n = 2−	1	0	0	0	closed	open	closed	open	closed
n = 2+	1	0	0	1	closed	open	closed	closed	open
n = 3−	0	1	0	0	open	closed	closed	open	closed
n = 3+	0	1	0	1	open	closed	closed	closed	open
n = 4−	1	1	0	0	open	open	closed	open	closed
n = 4+	1	1	0	1	open	open	closed	closed	open
Band Code "Bits" 1 = +20 Vdc 0 = −12Vdc									

8-58. DPM Predriver Part of Assembly A1 (OPTION 003 Only) (See Service Sheet 3)

8-59. The additional circuits of the Digital Panel Meter Predriver part of the Option 003 Predriver Assembly are similar to the circuits on the standard Predriver Assembly shown on Service Sheet 2. The longer Option 003 Predriver Assembly contains both the YIG Predriver circuits, which are on the front of the board, and the DPM Predriver circuits, which are to the rear of the board.

8-60. Except for the input voltage level to the A1 Option 003 Assembly, the Harmonic Number Amplifier, the n = ± Amplifier, the IF = .550 GHz/2.05 GHz Network, and the Summing Amplifier of the DPM Predriver operate the same as the YIG Predriver circuits of Service Sheet 2. The −7.5 to −15V levels for the DPM Predriver originate in the Tune Buffer Amplifier of the 8555A.

8-61. The Band Code Logic "C" feeds a 0 or −12V "bit" to Q7 on all bands involving frequencies of 0 to 18 GHz, allowing Q8 to energize K11. With K11 contacts closed, the 0 to −18.00 Vdc output (for 0−18.45 GHz) from the DPM Predriver is fed to the DPM, giving a digital display of the frequency the 8555A RF Section is receiving.

8-62. DPM Predriver Troubleshooting. A problem in the DPM Predriver circuitry affects only the digital display. To locate the source of a DPM Predriver malfunction, proceed as follows:

- Set the spectrum analyzer for BAND n = 1 − /IF = .550 GHz and tune the FREQUENCY to zero GHz.
- Connect a voltmeter between testpoint TP3 on Predriver Board A1 and TP2 (ground) on YIG Driver Board A3. The voltage at A1TP3 should be −7.5 volts. Next, tune the spectrum analyzer FREQUENCY to 2 GHz and note the voltage at A1TP3. It should be −15 volts. If you cannot obtain these voltages, the problem is most likely in the spectrum analyzer RF Section (8555A/B) or in the cabling between the spectrum analyzer and the 8445B. If the testpoint voltages are correct, continue with the steps below.
- With the spectrum analyzer still set for BAND n = 1 − /IF = .550 GHz, tune the FREQUENCY to zero GHz. Then check the voltage at testpoint TP8 on Predriver Board A1 (use A3TP2 as the ground connection). The voltage at A1TP8 should be zero volts.
- With the voltmeter still connected acros A1TP8 and A3TP2, set the spectrum analyzer for BAND n = 4 + . Set the FREQUENCY to 18.450 GHz. You should now read 18 volts on the voltmeter. If you do not get a reading of 18 volts, the problem is in the DPM Predriver circuitry. The appropriate troubleshooting procedure for this circuitry is the same as for the YIG Predriver circuits (see YIG Predriver Assembly A1 Circuit Description and Troubleshooting).
- If the testpoint voltages are correct and the DPM is malfunctioning, the problem is most likely in DPM Assembly A7 or in the cable that connects to the DPM input receptable.
- If the display voltage is present at A1TP8 but not at the DPM input, or if relay K11 does not open or close, check for Band Code C voltages while switching between BAND n = 4+ and BAND n = 6. Check for an open or shorted Q7, Q8, or K11 relay coil.

8-63. YIG Driver Assembly A3 (See Service Sheet 4)

8-64. The YIG Driver Board Assembly controls the current which tunes the YIG filter over its frequency range of 1.8 to 18 GHz. In addition to the YIG-tuning circuitry (summing and driver amplifiers), it contains the +9 volts IF Offset Supply for the n = ± amplifiers on Predriver Board Assembly A1, and a +28 volts supply for use with YIG filters which have internal heaters. The Automatic Switching Control circuit shown on Service Sheet 5 is also on the YIG Driver Assembly.

8-65. +9 Volt IF Offset Supply. Resistor A3R2 and the 9 volt breakdown diode VR1 form a simple regulated +9 volt power supply. The +9 volt source is utilized by n = ± Amplifier A1U2 to provide an IF frequency offset. Switch S1 is provided for test and adjustment purposes.

8-66. YIG Driver. The YIG Driver circuit includes a Summing Amplifier and a YIG Current Driver Amplifier. The voltage to the Summing Amplifier from the YIG Predriver is a negative voltage of 1.025 GHz/V. This linear voltage/frequency input, in conjunction with the FREQ OFFSET control, the TRACKING controls, and two breakpoint controls, process the YIG magnet current to produce an overall linear voltage/frequency response of the YIG filter. The YIG frequency/coil current relationship is approximately 25.7 MHz/mA.

8-67. The YIG magnet current flows through R12 and R13, Q4, and the magnet coil. Negative tuning voltages from the predriver are inverted to positive by U1 and control the conduction of Q4. The YIG current Q4 allows to flow is partially controlled by the gain of U1. This is basically the ratio of R11 to R9, or approximately 9:1. The panel FREQ OFFSET control feeds a small positive bias to the inverting input of U1, and is used as a manual control for compensation of the YIG current. It is used to set the YIG on frequency at 2 GHz when checking tracking.

8-68. The internal Coarse Tracking and the front-panel TRACKING controls help to determine the gain of U1 and also the slope of the YIG magnet current. With TRACKING at zero, the Coarse Tracking is adjusted to tune the YIG on frequency at 14 GHz. In normal operation the FREQ OFFSET is used to tune the YIG at 2 GHz, and the panel TRACKING control is adjusted to tune the YIG to frequency at 8 GHz. Any further trimming that may be necessary is accomplished with the front-panel FREQ OFFSET control.

8-69. Linearity Correction. The current of the YIG magnet is essentially linear from 1.8 GHz at 70 mA, to 18 GHz at 700 mA (25.7 MHz/mA). However, above approximately 14 GHz the magnet core starts to saturate. To correct for this, as the input voltage approaches the 14.7V zener voltage of VR2, the zener conducts, shunting R3 and R8 across the U1 input impedances R21 and R9, increasing the gain of U1 and therefore the YIG current. Another similar breakpoint is developed when the input voltage approaches the zener voltage of VR3. The result is a linear input voltage/frequency response for the YIG filter. The 16 and 18 GHz ADJ resistors R24 and R29 are vernier adjustments of the VR breakdown voltage point.

8-70. +28 Volt YIG Heater Supply. The YIG filters used in the 8445B are mnufactured by a number of different manufacturers. Some of the YIGs have internal heaters and others do not. When a YIG with an internal heater is used, the +28 volts power supply produces the required heater current. In this supply the unregulated +40 volts source is regulated to approximately 0.7 volt less than the breakdown voltage of breakdown diode VR6. The +28 volts supply is present on all YIG Driver Assemblies regardless of the type of YIG installed in the instrument.

8-71. +9 Volts IF Offset Supply Troubleshooting

- Check the voltage at testpoint TP1 (A3TP1) on YIG Driver Assembly A3. It should be +19.5 volts. (The +9 volts is derived from the +19.5 volts produced on Power Supply Board Assembly A2.)
- Set the OPR/TEST switch (A3S1) on the YIG Driver Board Assembly to TEST and measure the voltage at the junction of A3R2 and A3VR1 (shown as testpoint K on schematic). It should be +9 volts. If it is not, check resistor A3R2 and breakdown diode A3VR1. If 9 volts is present, check the OPR/TEST switch (A3S1) and the wiring between the YIG Driver Board and the Predriver Board.

8-72. YIG Driver Section Troubleshooting

- Set the spectrum analyzer controls as follows:

BAND	n=1/−IF=.550 GHz
FREQUENCY	1.5 GHz
SCAN WIDTH	ZERO
SCAN TIME	10 MILLISECONDS
SCAN MODE	INT
SCAN TRIGGER	LINE

- Check fuse F1 (A3F1) on YIG Driver Assembly A3. If it is open, check fuse F2 (A2F2) on Power Supply Board Assembly A2. (If A2F2 is open, there is no −23 volts negative bias applied to summing amplifier A3U1. This causes A3U1 to overdrive the driver amplifier transistors and results in excessive current through fuse A3F1.)
- If fuse A2F2 is not open, replace A3F1 and see if it burns out again. If it does, check transistors Q2, Q3, and Q4, and operational amplifier U1.

- If fuse A3F1 is not open, check the voltage at the collector of A3Q4 (shown as testpoint F on schematic). It should be about +37 volts (this voltage is unregulated and varies with the ac line voltage and YIG frequency).

- Set the spectrum analyzer to BAND n=4+ and tune the FREQUENCY to 18 GHz. The voltage at the collector of A3Q4 (testpoint F) should now be approximately +30 volts. If no voltage change occurred between 1.5 GHz and 18 GHz, check the levels of the inputs to A3U1 at U1 pins 2 and 3. The difference between the two pins, when each of them is measured relative to common ground, should not exceed 25mV (normal difference is about 10mV). Note that this difference is affected by the setting of Coarse Frequency Offset potentiometer R7.

- If the difference between pins 2 and 3 of U1 is greater than 25mV, check it again with U1 isolated from the driver transistors (remove fuse F1 and connect a jumper between pin 6 of U1 and testpoint TP3 to short the base-collector junction of Q2). If the voltage difference between U1 pins 2 and 3 is still greater than 25mV, try adjusting Coarse Frequency Offset potentiometer R7.

- If adjusting R7 has little or no effect on the voltage difference between U1 pins 2 and 3, replace U1.

- If it does appear to be functioning normally (i.e., it responds to adjustments of R7), check for an open or shorted transistor or diode in the driver amplifier circuit. (Normally, a shorted driver amplifier transistor or diode will cause fuse F1 to open.)

Linearity Correction Breakpoints Check

- Connect a digital voltmeter to test point TP1 on YIG Driver Board A3.

- On the spectrum analyzer set BAND n=4+ and SCAN WIDTH to ZERO. Tune FREQUENCY from 14 to 15 GHz while observing the voltage indication on the digital voltmeter. Between 14 and 15 GHz the voltage at TP1 should start to increase, indicating a breakdown of the diode.

- Connect the digital voltmeter to the junction of VR3 and R4 (shown on schematic as testpoint H). Then tune the spectrum analyzer FREQUENCY from 15 to 17 GHz. The voltmeter should indicate a breakdown of the diode between 16 and 17 GHz. The procedure for making breakpoint tracking adjustments is given in Section V under YIG Driver Adjustments.

8-73. +28 Volts Heater Supply Troubleshooting

- When the 8445B is operating with a YIG filter that uses the +28 volts YIG heater power, the voltage drop across resistor R19 (A3R19) on the YIG Driver Assembly is approximately 1 volt. With the heater circuit open, the voltage across R19 should be less than 0.1 volt.

- Under normal operating conditions, the voltage across R20 is approximately 1 volt less than the voltage across VR6, and the voltage across R18 is 0.6 volt.

8-74. Power Supply Assembly A2 Control and Switching Circuits (See Service Sheet 5)

8-75. Coaxial Switch Driver. The Coaxial Switch Driver circuitry on Assembly A2 provides a polarized control voltage for the two input-output coaxial relays so they connect either the YIG Filter or the Low-Pass Filter to the front panel ports. The coaxial relays are the polar latching type. When driven in one direction they latch until driven in the other direction. The driven direction depends on the relative voltage levels across the coils.

8-76. Depending on whether the base of A2Q2 is forward biased or not, the emitter of A2Q4 will either rise to nearly +40 volts, or drop to a low positive potential. Transistor A2Q8 acts as an inverter, lowering the positive potential of the emitter of A2Q5 when the emitter of A2Q4 rises. It raises the positive potential of the A2Q5 emitter when the A2Q4 emitter lowers.

8-77. At any given time the tops of the relay coils are either more positive than the bottoms, or less positive, resulting in either upward or downward current flow in the coils. Reversal of current direction reverses the relay contacts. When testpoint E is highly positive the relays are in the YIG Filter position. If any of the four A, B, E, or E Band Code "bits" is positive ("1" or +20V), the relays are driven to the YIG Filter position. If all four "bits" are negative (0 or −12V), or if there are no "bits," A2Q2 is either reverse or zero biased and the relays reverse, connecting the Low-Pass Filter to the front panel ports.

8-78. Manual Control Buffer Amplifier. Manual Control Buffer Amplifier A2U2 is not operative in Standard Models. With Option 002, manual controls are added. If the front panel MODE switch S2 is in the MANUAL position, the base of A2Q6 is grounded through A2R16, forward biasing A2Q6 and driving the coaxial relays into the YIG Filter position. The COARSE and FINE controls feed the required −1.025 GHz/V to the YIG Driver to tune the YIG filter. The manual COARSE and FINE potentiometers together control dc bias voltages to amplifier A2U2 to produce the necessary −1.025 GHz/V required to tune the YIG filter manually.

8-79. The COARSE tune control is calibrated in frequency from 0 to 20 GHz. The FINE tune control is calibrated from −500 to +500 MHz. The resistive networks composed of A2R7, A2R11, and A2R12 provide a voltage offset that is equal to 500 MHz. With the FINE control centered (0 MHz), the resulting voltage offset corrects the input voltage so that the frequency calibration of the COARSE tune control reads correctly. Operational amplifier A2U2 is an inverting amplifier with unity gain.

8-80. Remote Control Buffer Amplifier. Remote control of the YIG Filter tuning is possible when the spectrum analyzer is either off, disconnected from the Preselector, or if the Preselector has Option 002 and the front panel switch is set to REMOTE. The remote control buffer amplifier produces a voltage at its output equal to the voltage difference applied across the floating BNC remote input connector, divided by 1.025. A2U3 and its associated circuitry form a standard unity-gain differential amplifier. The output of A2U3 is routed to the automatic switching control (see below) or through the MODE switch to the input of YIG Driver Assembly A3.

8-81. Automatic Switching Control. In standard Preselectors, the A3Q1/K1 Automatic Switching Control relay connects the YIG Driver input to either the YIG Predriver output or to the Remote Control output. For the standard 8445B, relay driver A3Q1 is provided +20 volts from the 8555A RF Section through interconnect cable W3. The +20 volts turns on A3Q1 and energizes relay A3K1. With A3K1 energized, the Predriver output is routed through contacts 5 and 3 and through the interconnect wiring to the YIG Driver input. If the +20 volts is removed from A3Q1 by either turning off the 8555A or disconnected Auxiliary B interconnect cable W3, relay A3K1 de-energizes and the Remote Amplifier output is fed to the YIG Driver input through relay contacts 1 and 6.

8-82. In Option 003 Preselectors, A3K1 connects the DPM Predriver output to the DPM drive circuitry as long as A3K1 is energized. In Option 003/non-Option 002 Preselectors the jumper between TP1 terminals 5 and 7 feeds the DPM. In Option 003 Preselectors that also have Option 002, this jumper is removed to allow the DPM Predriver output to feed through the MODE switch to the DPM.

8-83. Coaxial Switch Driver Troubleshooting.

- On the spectrum analyzer set the controls as follows:

BAND	n=1–/IF=.550 GHz
FREQUENCY	1.5 GHz
SCAN WIDTH	ZERO
SCAN TIME	10 MILLISECONDS
SCAN MODE	INT
SCAN TRIGGER	LINE

- On 8445B Preselector with Option 002 (front panel controls), set MODE switch to AUTO.
- Connect a digital voltmeter to the common point of Band Code input diodes CR1, CR2, CR3, and CR4 (this point is shown as test point A on the schematic).
- With the BAND shift lever on the spectrum analyzer, select all the bands from n=1–/IF=.550 GHz through n=4+ and note the voltmeter indication for each band. The voltmeter should indicate +19.5 volts for all bands except n=1–/IF=2.05 GHz. For BAND n=1–/IF=2.05 GHz, the indication should be approximately zero.
- Refer to the schematic diagram on service sheet 5 and check the voltage levels at test points B, C, D, and E for BAND n=1–/IF=2.05 GHz, and for BAND n=1+/IF=550 MHz. Use the transistor cases of Q2, Q3, and Q4 for test points B, C, and D respectively. Compare the levels you obtain with the typical values shown below.

Test Point	Voltage Level	
	BAND n = 1–/IF = 2.05 GHz	BAND n = 1+/IF = .550 GHz
B	40V	0V
C	2.7V	39V
D	40V	1.2V
E	3.5V	40V

8-84. Manual Control Buffer Amplifier Troubleshooting (Option 002 only)

- Check operational amplifier A2U2 for unity dc gain.
- Make sure A2U2 is inverting the input by comparing the input at A2U2 pin 2 with the output at test point A2TP6.
- If the manual control buffer amplifier appears to be operating improperly, check it with the Operational Amplifier Troubleshooting Procedure.

8-85. Remote Control Buffer Amplifier Troubleshooting

- Connect +10 volts from a dc power supply to the REMOTE input connector on the Preselector rear panel, + to the center conductor, – to BNC shield. Note that the REMOTE input connector is floating (i.e., its shield side is **not** grounded).

- Check the voltage output of operational amplifier A2U3 at test point A2TP4. It should be −9.76 volts (10 volts input divided by 1.025). If it is not, check the resistors and capacitors that make up the input circuit to A2U3. If operational amplifier A2U3 seems to be operating improperly, check it with the Operational Amplifier Troubleshooting Procedure.

8-86. Automatic Switching Control Troubleshooting

- Automatic switching control transistor A3Q1 (on YIG Driver Assembly A3) is held at saturation by a +20 or +19.5 volts dc input to its base through fixed resistor A3R22. In instruments that do **not** have Option 002, A3Q1 conducts constantly whenever the 8445B power is on.

- In instruments equipped with Option 002 (front panel MANUAL TUNE and MODE controls), A3Q1 conducts only when the spectrum analyzer is turned on and connected to the 8445B. Turning the spectrum analyzer off or disconnecting the interconnect cable turns A3Q1 off.

- When A3Q1 is off, the voltage across it (emitter-to-collector) is approximately 38 volts. When A3Q1 is on, the voltage across it is about 0.1 volt.

8-87. Power Supply Assembly A2 DC Supplies (See Service Sheet 6)

8-88. +40 VDC Supply. In the +40 Vdc supply, 27.7 Vrms from the secondary of power transformer T1 is rectified in a full-wave bridge rectifier composed of diodes CR6 through CR9. Capacitor C4 filters the bridge output, providing a +40 volts unregulated dc source.

8-89. +19.5 VDC Supply. The +19.5 Vdc supply regulates the +40 Vdc source to provide a +19.5 Vdc source. The circuit consists primarily of a voltage regulator IC which controls an NPN transistor connected as a series regulator. A small resistance, R29, in series with the series regulator transistor provides instantaneous current limiting.

8-90. The output voltage level is adjusted to +19.5 volts with reference level adjust potentiometer R5. If the output voltage attempts to rise above this level, or if the current becomes excessive, the change is detected by the circuitry in U1 which responds by pulling the base of Q1 less positive. This causes Q1 to conduct less and restore the output to normal. If the output decreases, U1 causes Q1 to conduct more to re-establish the normal output.

8-91. Breakdown diodes VR8 and VR9 provide over-voltage protection by limiting the maximum output to their breakdown value of 26.1 volts. Overload protection is provided by fuse F1.

8-92. −23 VDC Supply. In the −23 Vdc supply, 27.7 Vrms from the secondary of power transformer T1 is rectified and regulated to supply a −23 volts source. The 27.7 Vrms input to this circuit is rectified in a full-wave bridge rectifier consisting of diodes CR10 through CR13 to produce −40 Vdc. This voltage is then regulated in a series regulator comprising transistors Q9 and Q10 to provide the −23 Vdc source. Breakdown diode VR5 provides the reference voltage for the regulator. Overload protection for this circuit is provided by fuse F2, and over-voltage protection by breakdown diode VR6.

8-93. +40 Volts Supply Troubleshooting

- Disconnect the cable (W3) that connects between the spectrum analyzer and the 8445B. If the 8445B has Option 002 front-panel controls, set the MODE switch to AUTO. Turn off the 8445B LINE power.

- Disconnect the ac power cable from the 8445B and remove its top cover.

- Remove fuse A2F1 to isolate the +40 volts supply from the +19.5 volts supply. (If fuse A2F1 is open, check the +19.5 volts supply.)

- Remove Predriver Board Assembly A1 and YIG Driver Board Assembly A3 from the Preselector.

- Refer to the Power Supply schematic diagram on Service Sheet 6. On the Power Supply Board (A2), measure the resistance between test point G (+40 volts end of A2F1) and test point TP5. It should be approximately 50K ohms.

- Remove the Power Supply Board and check the diodes in the 40 volts bridge rectifier (CR6 through CR9) and capacitor C4 for shorts or opens.

- Plug the Power Supply Board back into the Preselector, reconnect the ac power cable, and turn on the 8445B LINE power.

- Refer to the Power Supply schematic diagram on Service Sheet 6 and make a quick check of the unloaded voltage between test point G and test point TP5, then turn off the 8445B ac LINE power. The voltage should be approximately 55 volts.

- If the voltage measured above is low, restore the ac power and check the ac voltage across the transformer secondary (brown and gray wires). It should be 27.7 volts rms.

- Turn off the ac LINE power and put fuse A2F1 back into its fuseholder.

- Plug YIG Driver Assembly A3 into the Preselector, turn on the Preselector ac LINE power, and measure the dc voltage between test points G and TP5 on the Power Supply Board. It should be approximately 34 volts. If it is not, check for an open or short on the A3 board.

- Turn off the ac LINE power, plug Predrive Board Assembly A1 back into the Preselector, turn on the LINE power, and again measure the dc voltage between test points G and TP5 on the Power Supply Board. The voltage should again be approximately 34 volts. If it is not, check for an oen or short on the A1 board.

8-94. +19.5 Volts Supply Troubleshooting

- First check fuse F1 on Power Supply Board A2. Next, measure the voltage between test points G and TP5 on the Power Supply Board (see schematic diagram on Service Sheet 6). The voltage should be about +38 volts.

- Turn off the 8445B LINE power, disconnect the interconnect cable (W3) between the Spectrum Analyzer and the 8445B, and remove the Power Supply Board Assembly.

- Check for a short on the +19.5 volt line external to the power supply (connect an ohmmeter between ground and pin 3 of Motherboard socket XA2). Typical resistance is 1200 ohms.

- Check breakdown diodes VR8 and VR9 on the Power Supply Assembly for shorts.

- Plug the Power Supply Board Assembly back into the 8445B, turn on the LINE power, and measure the voltage across breakdown diode A2VR7. It should be 3.48 volts.

- Check for a voltage drop of about 0.2 volt acros A2R29.

- At voltage regulator A2U1, measure the voltage from pin 2 to ground and then from pin 3 to ground. The two voltages should be equal (±3 mV).

8-95. – 23 Volts Supply Troubleshooting

- If fuse F2 on Power Supply Assembly A2 is open, the problem is probably a short on the A2 board or in the external –23 volts wiring. Turn off the 8445B ac LINE power and remove board assemblies A1, A2, and A3.
- On A2, connect an ohmmeter between –23V test point TP7 and ground test point TP5 to see if the –23 volts output is shorted to ground on the board.
- If a short on the board is indicated by the ohmmeter check, unsolder one end of VR6 and see if it is shorted.
- If you cannot find a short on the A2 board, check for a short on the external –23 volts line by connecting an ohmmeter between ground and pin 9 or K of Motherboard socket XA2 (the socket for Power Supply Assembly A2). Typical resistance between A5XA2-9,K and ground is 4000 ohms.
- If A2F2 is not open, but the –23 volts output is absent or low, check the ac voltage across the yellow and green wires of the power transformer secondary. The correct voltage is 27.7 volts rms.
- If the transformer voltage output is correct, turn off the 8445B ac LINE power, remove the Power Supply Board Assembly (A2), and check the bridge rectifier diodes (CR10 through CR13) for shorts or opens.
- Next check breakdown diode VR5, transistors Q9 and Q10, capacitors C3, C5, and C8, and resistors R25 and R36 for shorts or opens.
- Plug the A2 board back-into the 8445B, turn on the ac LINE power, and measure the voltages across A2VR5 (23.7V) and A2VR6 (28.7V).

8-96. Digital Panel Meter Assembly A7 (Option 003) (See Service Sheet 7)

8-97. The Digital Panel Meter (DPM) Assembly electronics are contained on two printed circuit boards: DPM Display Board Assembly A7A1 and DPM Driver Board Assembly A7A2. DPM Driver Board A7A2 is mounted on an aluminum subchassis (driver board mounting bracket), which in turn mounts on the main deck of the 8445B. A 16-conductor ribbon cable connects the Driver Board to the DPM Display Board, which is mounted on the special Option 003 front panel assembly by means of aluminum standoffs.

8-98. There are eight inputs to the DPM Assembly, six from power transformeer T1, and the DPM signal and signal-ground inputs from the DPM section of the special Option 003 Predriver Board Assembly (A1). These inputs are fed through DPM Wiring Harness W11 (Option 003 only) to a 14-contact receptable attached to the DPM subchassis. An eight-wire harness, A7W2, soldered to the receptacle contacts, carries the inputs to the DPM Driver Board. Each of the eight wires in this harness has a crimp connector on its loose end which slips over a particular one of eight standoffs on the Driver Board.

8-99. Analog processor IC U5 and digital processor IC U4 are each one-half of an analog-to-digital converter, in which analog comparator circuits in U5 control counter logic in U4. To accomplish the analog-to-digital conversion, U5 and U4 interact on three control lines: the M/Z (measure/zero logic) line, the COMP (comparator) line, and the U/D (up/down) line. The conversion produces two kinds of outputs from U4. The first comprises five sequential four-line BCD outputs, which are fed to BCD-to-seven segment converter U1. The second consists of five sequential digit strobe drives, which are fed to transistors Q1 through Q5 on the Display Board.

8-100. The input signal applied across connector pins 7 and 14 of the DPM Driver Board Assembly is a dc level of 0 to −18 volts, representing a YIG center frequency of 0 to 18.45 GHz (a 1.025 volts change) of the input level represents a frequency change of 1.0 GHz). This 0 to −18 volts signal is divided by precision resistors R21 and R22, providing a 0 to −1.8449 volts signal across pins 15 and 2 of the analog processor IC, U5.

8-101. Principles of Operation. The circuits on DPM Driver Board A7A2 translate the level of the input from Predriver Board A1 into signals that light the appropriate segments on the five frequency readout numeric displays on DPM Display Board A7A1.

8-102. During the period the DPM drive input is being converted, the BCD output circuitry in U4 is shut off. Once the conversion in U5 and U4 is complete, four-line BCD is sent to U1 where it is converted to a seven-line (segment) drive. This seven-line output from U1 is fed in parallel to all five of the numeric display ICs on the Display Board. Coincident with the BCD-to-seven segment conversion, U4 supplies a digit strobe drive (D1, D2, D3, D4, or D5) which, by turning on one of the Display Board transistors, activates one of the numeric display ICs.

8-103. The BCD and digit strobe outputs from U4 are timed by the clock oscillator input (approximately 225 kHz) applied to U4 at pin 8. This timing is such that the BCD applicable to a particular one of the five numeric ICs occurs coincidently with the digit strobe that activates that numeric IC. Although the numeric ICs are on only one at a time, they are switched on and off so rapidly they all appear to be on simultaneously.

8-104. Transistor Q2 on the DPM Driver Board inverts the sign bit from U4 pin 13 so that the numeric display shows a positive number even though the DPM input signal (YIG filter tuning voltage) is negative. Transistor Q1 serves as an image frequency detector. If the YIG tuning voltage polarity reverses, Q1 turns on the minus sign (segment g) of the numeric display IC that represents the most significant digit. A lighted minus sign tells the operator of the 8445B that the displayed frequency is an image frequency.

8-105. Digital Panel Meter Troubleshooting

8-106. Any time you have a problem with the DPM, no matter what its nature, you should first check the outputs of the dc power supplies on DPM Driver Board Assembly A7A2. The dc voltages at the power supply test points should be as follows:

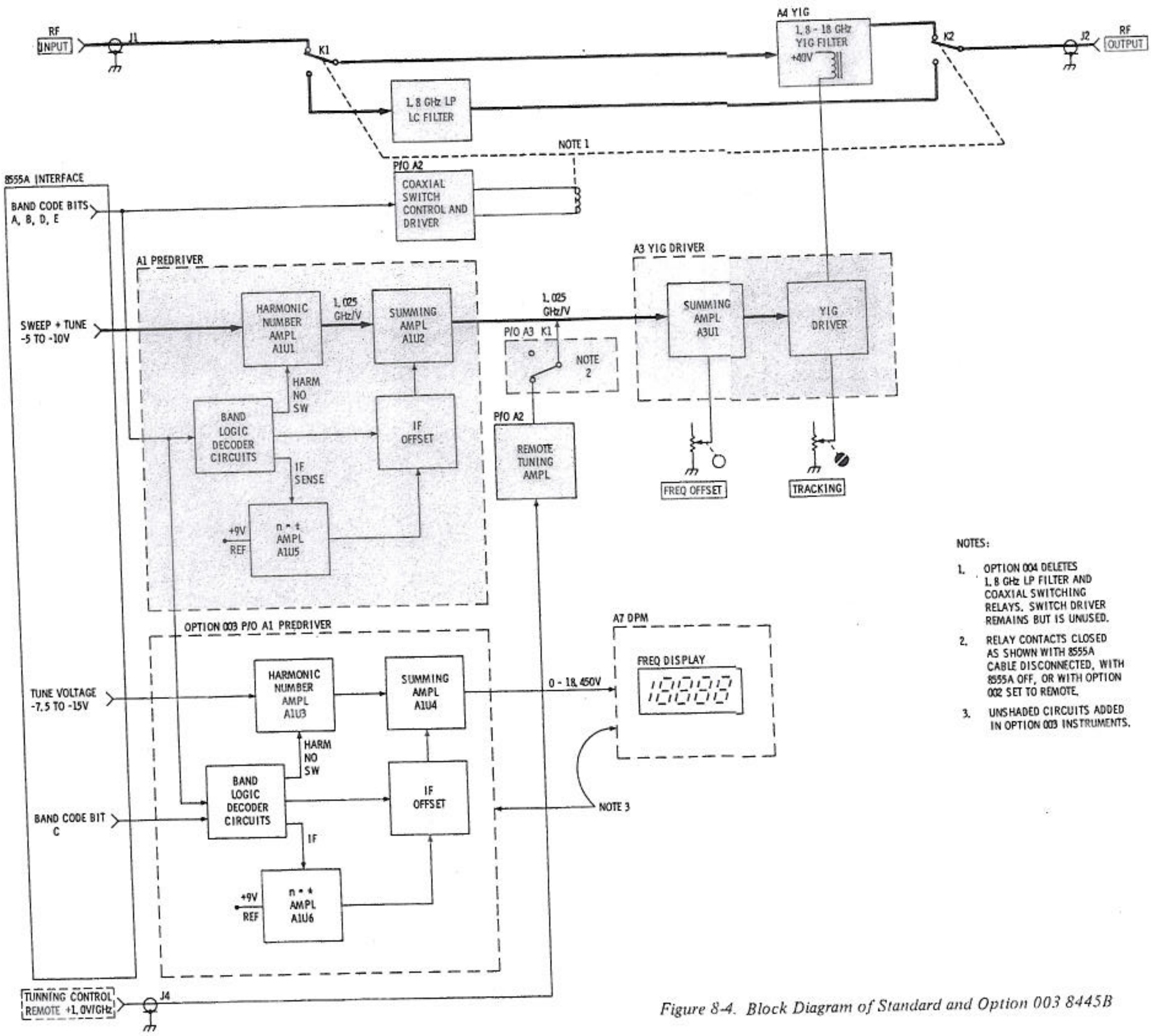
Test Point TP2:	+12.6 ± 1.0V
Test Point TP3:	−12.6 ± 1.0V
Test Point TP4:	+5 ± 0.25V

8-107. Next, make sure there is an input from the spectrum analyzer by checking for it at test point TP1. The signal at TP1 is a ramp, increasing from zero volts to −18 volts as the spectrum analyzer frequency is increased from 0 to 18.450 GHz. The dc level at TP1 should be 0.9756 X the spectrum analyzer frequency (as observed at the spectrum analyzer). If the TP1 dc voltage is not correct for the spectrum analyzer frequency at which it was measured, the spectrum analyzer may be out of adjustment. If the TP1 voltage is incorrect for the reading on the DPM display, the DPM requires readjustment (see paragraph 5-14 for DPM adjustment procedures).

8-108. To diagnose malfunctions that are not traceable to the power supplies or the signal input from the spectrum analyzer, refer to the troubleshooting table below.

8445B Digital Panel Meter Troubleshooting

Symptom	Probable Cause
Display is completely blanked.	1. Failure of clock oscillator Q4. Check clock output at drain terminal of Q4. (A failure of the clock oscillator output stops the conversion process in U4.) 2. Failure of the BCD-to-7 segment latch, U1. Check the seven output and four input lines of U1 for signs of activity. If you can detect no activity on the U1 input lines, the problem could be in U4 or U5. (U4 and U5 interact. An apparent failure in one of these ICs may actually originate in the other.)
Display shows just one abnormally bright digit.	1. Failure of clock oscillator Q4 output to U4 pin 8.
Display ICs all show the same number – usually zero – regardless of the spectrum analyzer frequency.	1. Reference circuit (U7, VR1, VR2) output failure, or change in output level. 2. Failure of analog processor U5.
Incorrect display frequency reading.	1. Reference circuit (U7) failure. 2. Gain trimmer R6 or Offset trimmer R7 needs adjustment (See paragraph 5-14). 3. Input from spectrum analyzer at incorrect level. Check level at test point TP1. (Correct input level is –0.9756 volts per GHz.)
A segment on one display IC fails to light.	1. Display IC is defective.
The same segment on every display IC fails to light.	1. Segment drive from BCD-to-7 segment latch U1 has failed. (Segment drives are paralleled to all five display ICs.)
One display IC fails to light.	1. Defective display IC. 2. Switching transistor for unlighted display IC has failed. 3. Digital drive from U4 to associated switching transistor has failed.
Far left display IC fails to show minus sign when spectrum analyzer frequency is negative.	1. Failure of Q1 or Q2.



NOTES:

1. OPTION 004 DELETES 1.8 GHz LP FILTER AND COAXIAL SWITCHING RELAYS. SWITCH DRIVER REMAINS BUT IS UNUSED.
2. RELAY CONTACTS CLOSED AS SHOWN WITH 8555A CABLE DISCONNECTED, WITH 8555A OFF, OR WITH OPTION 002 SET TO REMOTE.
3. UNSHADED CIRCUITS ADDED IN OPTION 003 INSTRUMENTS.

Figure 8-4. Block Diagram of Standard and Option 003 8445B

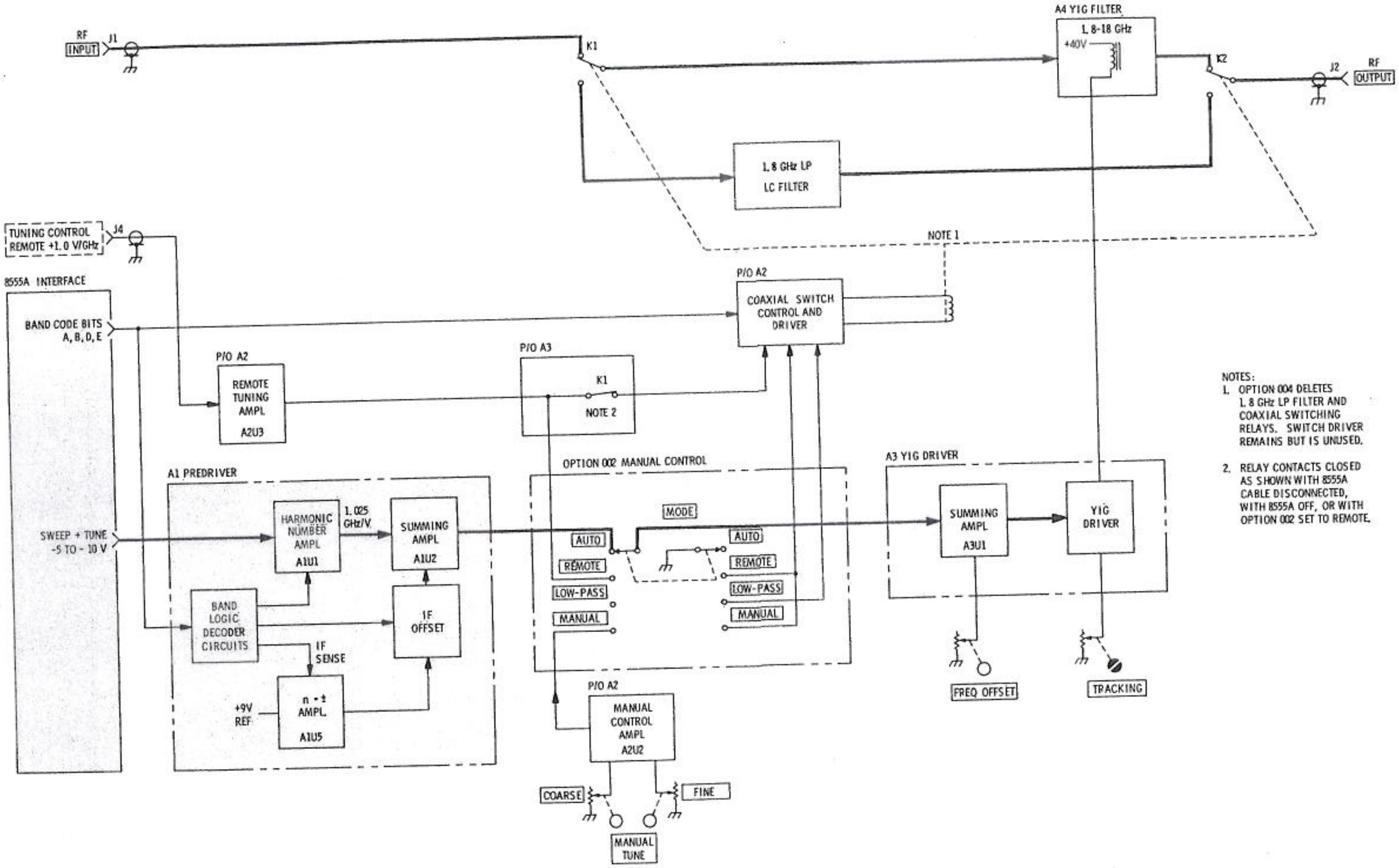
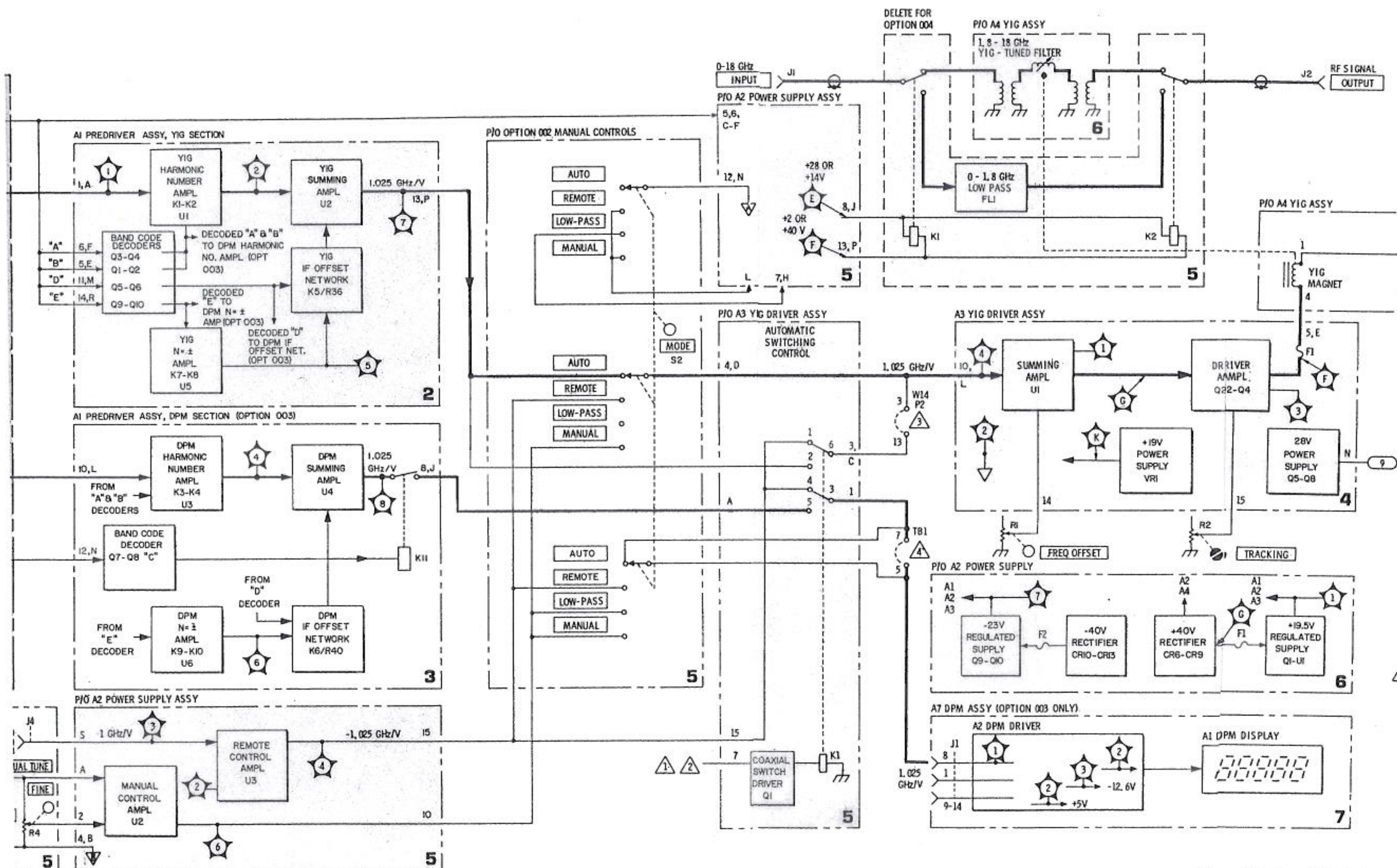


Figure 8-5. Block Diagram of Option 002 8445B



NOTES

1. +20V FROM 8555A FOF OPERATION WHEN OI NOT SUPPLIED
2. +19.5V FROM A2 SUP REMOTE OPERATION V
3. 4. JUMPERS OPEN FOR C INSTRUMENTS ONLY
5. A5 IS MOTHERBOA
6. A6 IS POWER MOD
7. NO HEATER USED W

Figure 8-6. Overall Block Diagram Showing Options 00

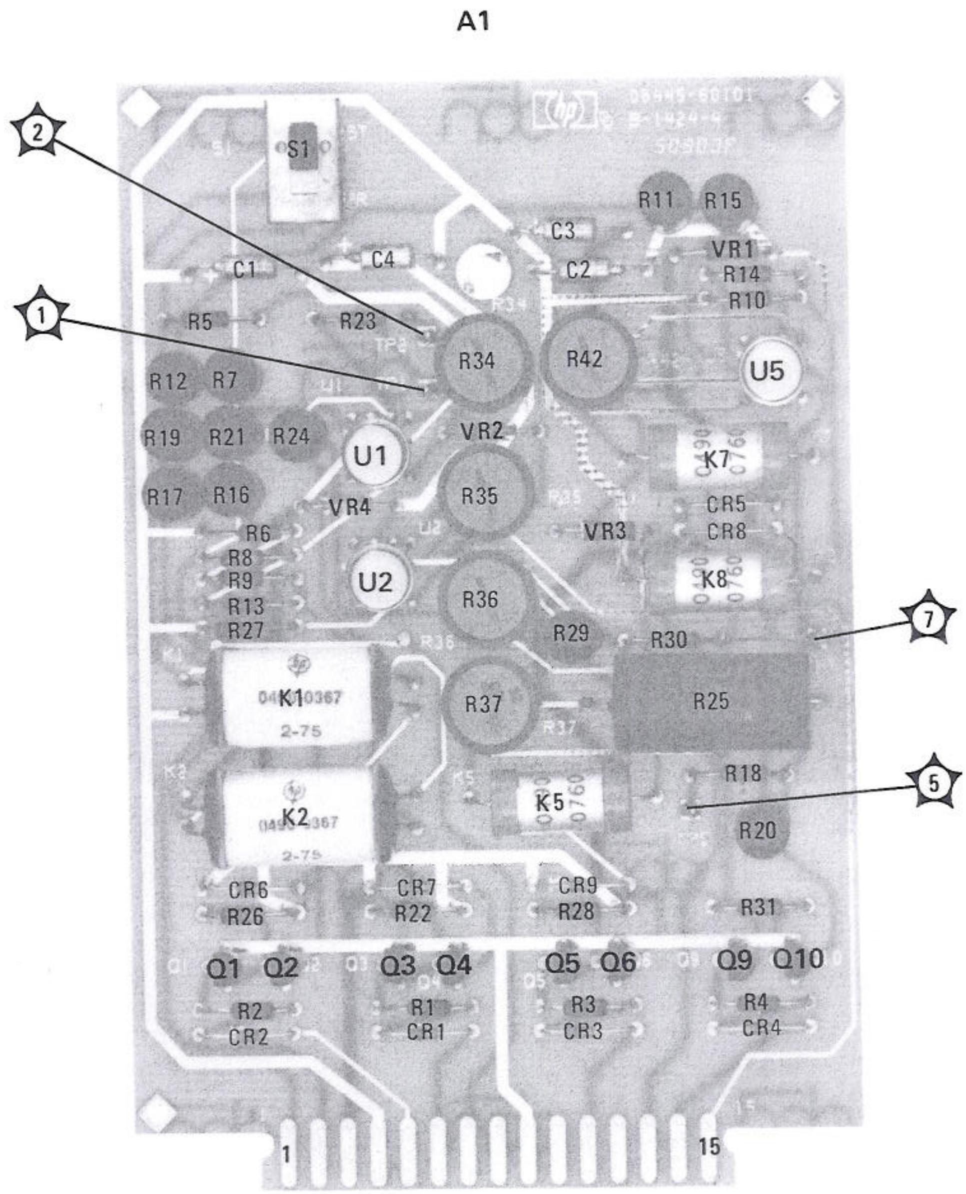


Figure 8-7. A1 YIG Predriver Assembly Parts Locations

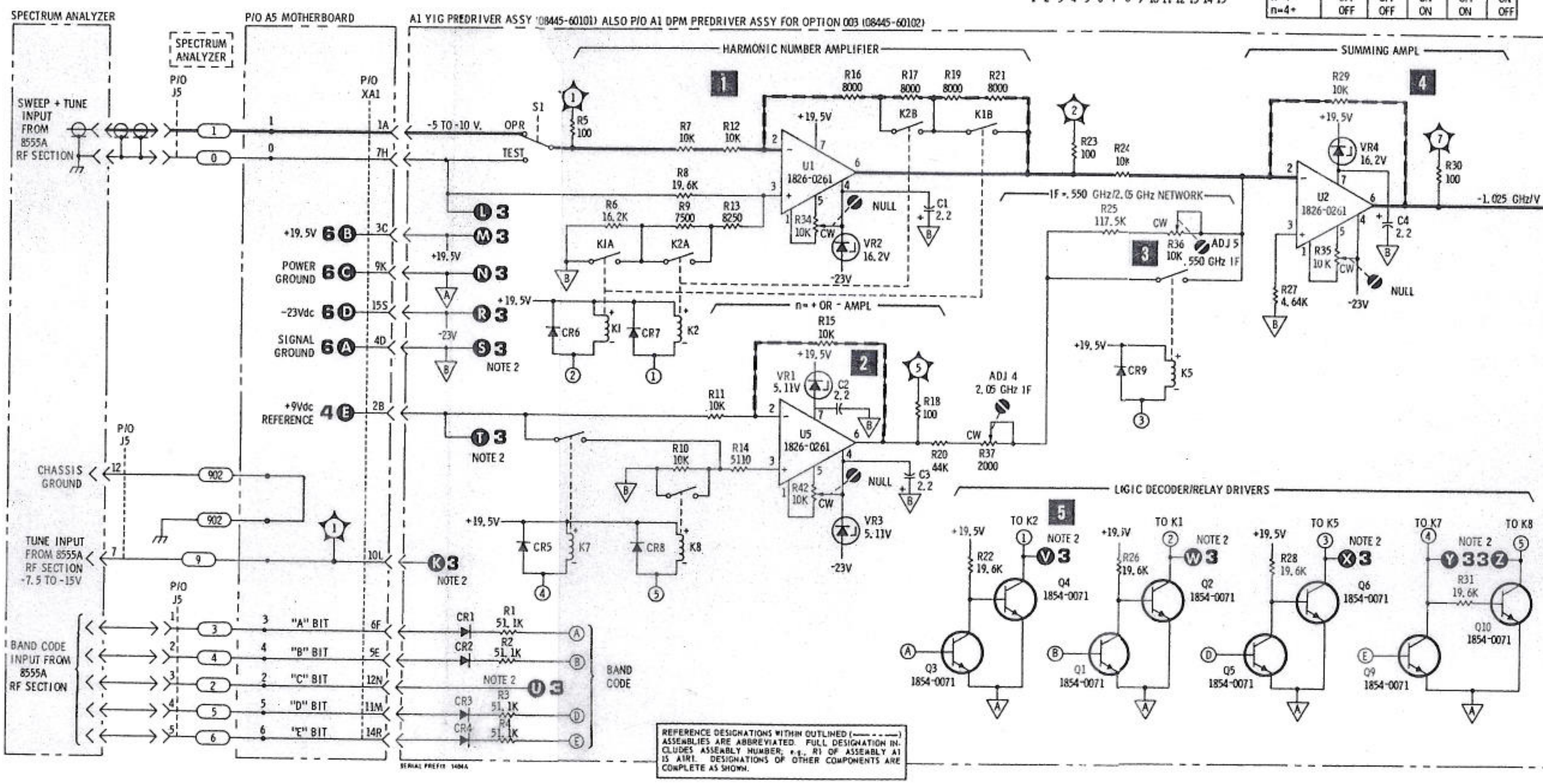
BAND	K2	K1	K5	K7	K8
n=1-*	ON	ON	OFF	OFF	ON
n=1+*	ON	ON	OFF	OFF	OFF
n=1-	ON	ON	ON	OFF	ON
n=1+	ON	ON	ON	ON	OFF
n=2-	OFF	ON	ON	OFF	ON
n=2+	OFF	ON	ON	ON	OFF
n=3-	ON	OFF	ON	OFF	ON
n=3+	ON	OFF	ON	ON	OFF
n=4-	OFF	OFF	ON	OFF	ON
n=4+	OFF	OFF	ON	ON	OFF

HARMONIC NUMBER	BAND CODE A	B	D	E
n=1-*	0	0	1	0
n=1+*	0	0	1	1
n=1-	0	0	0	0
n=1+	0	0	0	1
n=2-	1	0	0	0
n=2+	1	0	0	1
n=3-	0	1	0	0
n=3+	0	1	0	1
n=4-	1	1	0	0
n=4+	1	1	0	1
1 = + 20V	0 = OPEN			

XA5 BOTTOM VIEW

A B C D E F H J K L M N P R S

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15



REFERENCE DESIGNATORS

A1	A5
CR1-9 K1,2,5,7,8 Q1-6,9,10 R1-31, 34-37,42 S1 TP1,2,5,7 U1,2,5 VR1-4	XA1 NO PREFIX J5

NOTES:

1. SEE SCHEMATIC DIAGRAM NOTES, TABLE 8-2
2. THE OFF PAGE CONNECTIONS TO SERVICE SHEET 3 ARE APPLICABLE ONLY IF THE INSTRUMENT HAS OPTION 003.

A POWER GROUND

B SIGNAL GROUND

2 A1

Figure 8-8. A1 YIG Predriver, Schematic Diagram

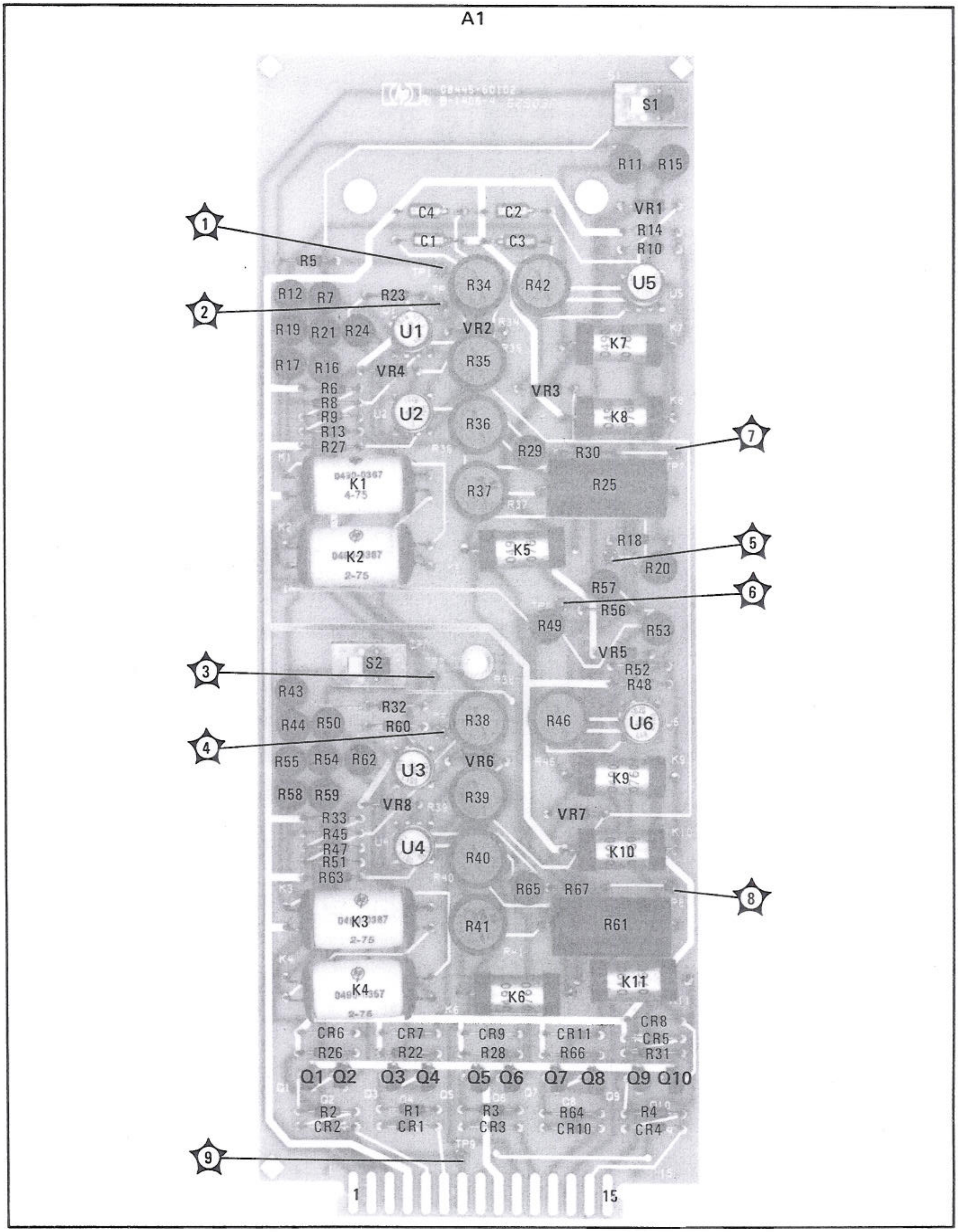


Figure 8-9. A1 Option 003 YIG/DPM Predriver Assembly Parts Locations

BAND	K4	K3	K6	K9	K10	K11
n=1-*	ON	ON	OFF	OFF	ON	ON
n=1+*	ON	ON	OFF	ON	OFF	ON
n=1-	ON	ON	ON	OFF	ON	ON
n=1+	ON	ON	ON	ON	OFF	ON
n=2-	OFF	ON	ON	OFF	ON	ON
n=2+	OFF	ON	ON	ON	OFF	ON
n=3-	ON	OFF	ON	OFF	ON	ON
n=3+	ON	OFF	ON	ON	OFF	ON
n=4-	OFF	OFF	ON	OFF	ON	ON
n=4+	OFF	OFF	ON	ON	OFF	ON

HARMONIC NUMBER	BAND CODE C
n 1-*	0
n 1+*	0
n 1-	0
n 1+	0
n 2-	0
n 2+	0
n 3-	0
n 3+	0
n 4-	0
n 4+	0
1 = 20V	0 = OPEN

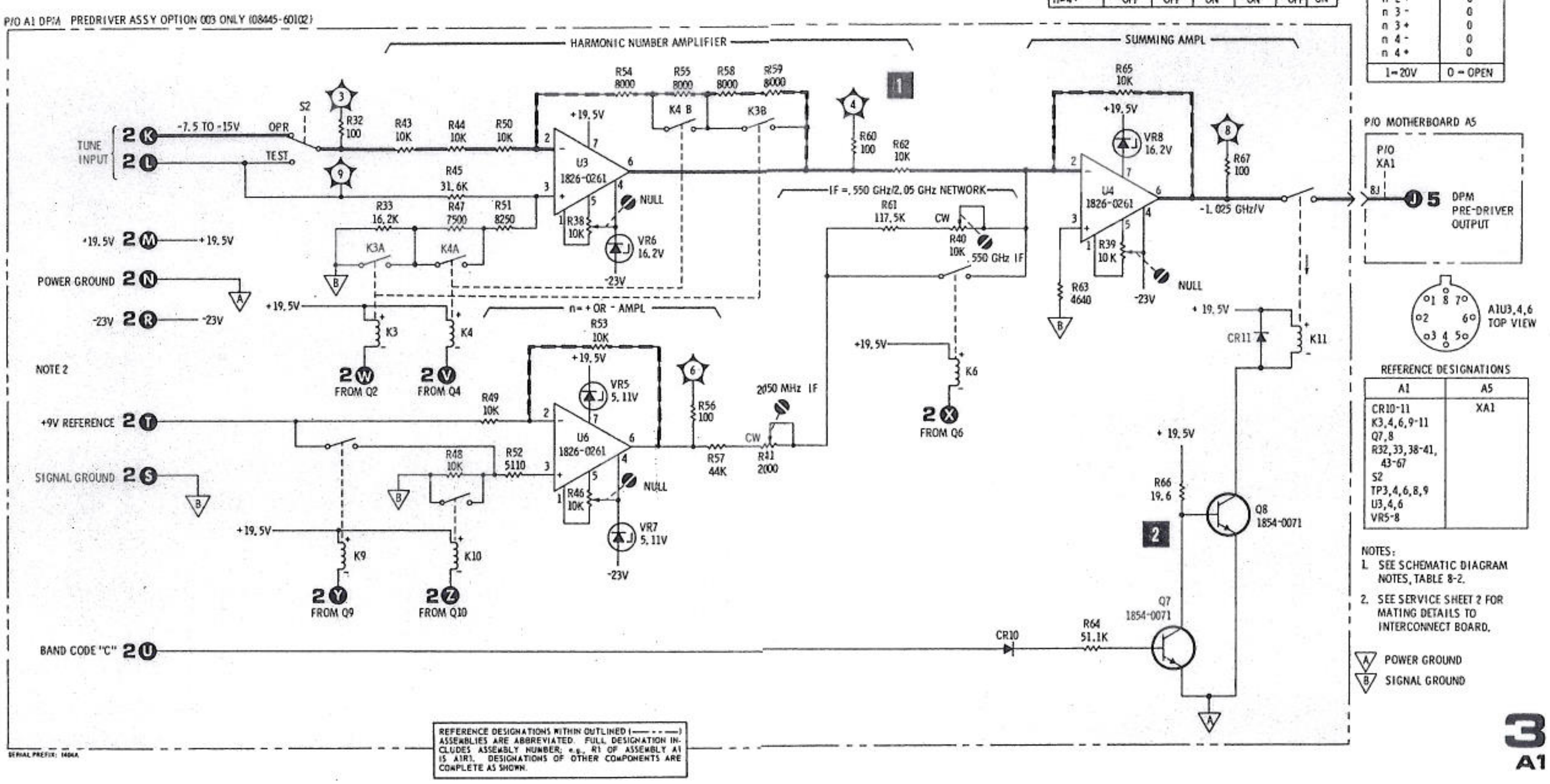


Figure 8-10. A1 DPM (Option 003) Predriver Circuits, Schematic Diagram

A3

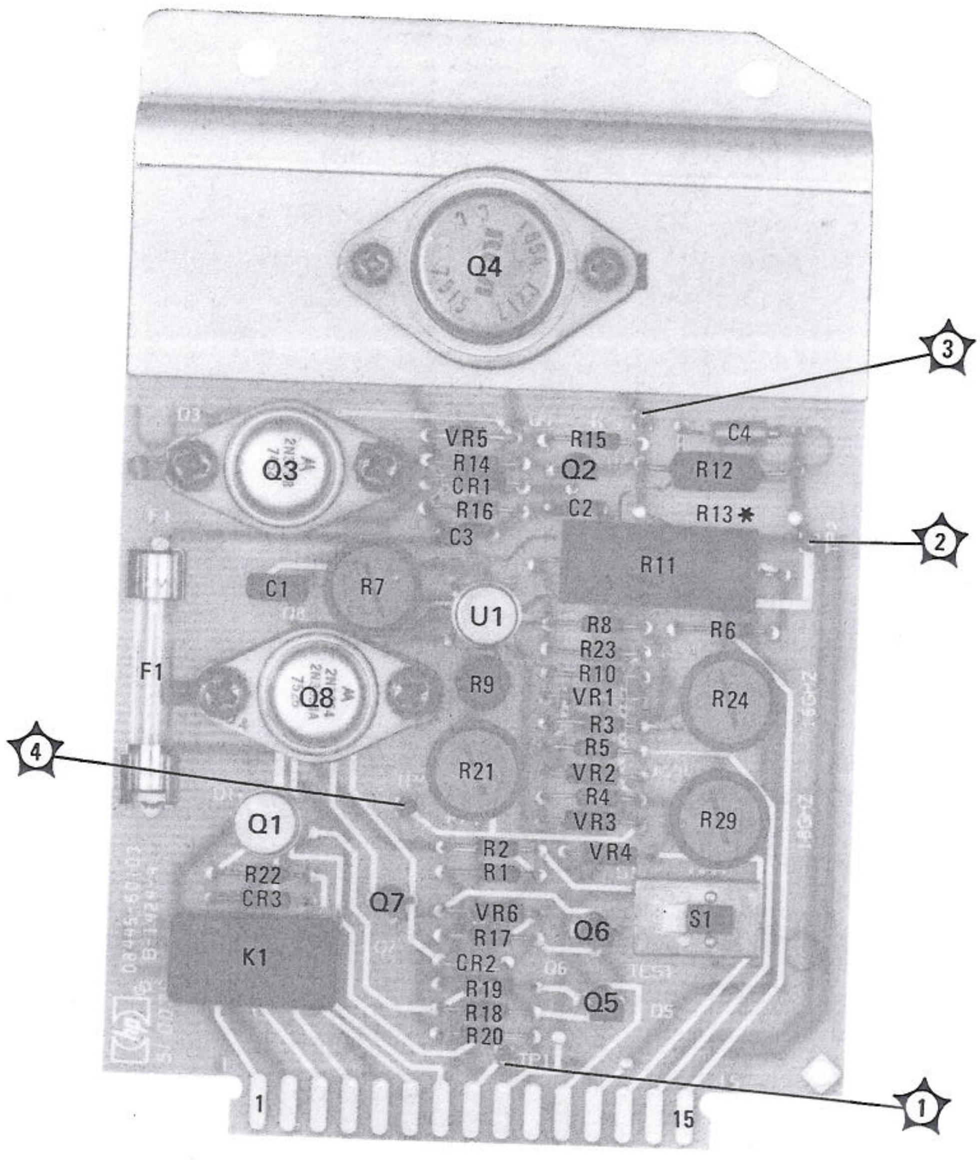


Figure 8-11. A3 YIG Driver Assembly Parts Locations

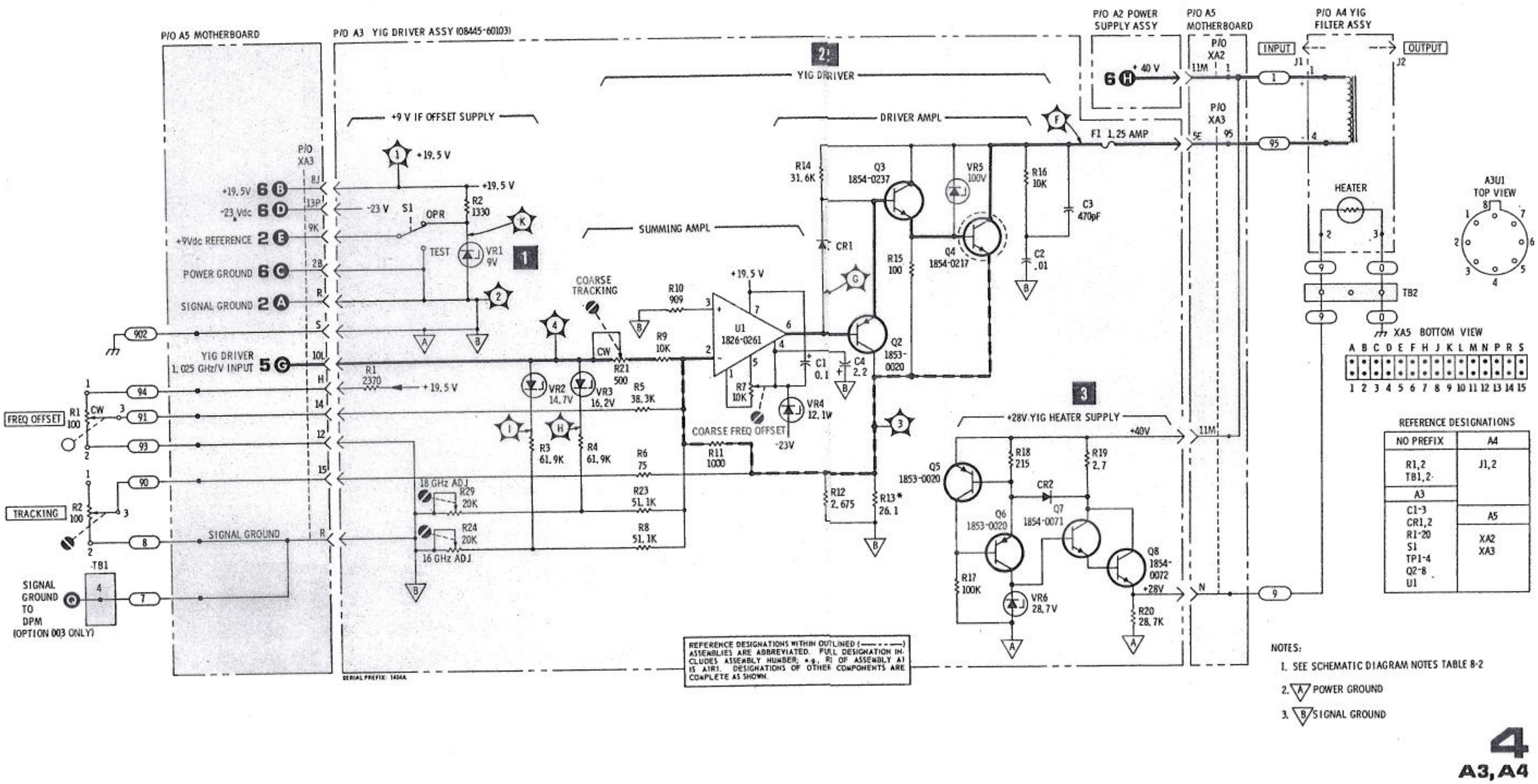


Figure 8-12. A3 YIG Driver Assembly DC Supplies and Amplifiers Circuits, Schematic Diagram

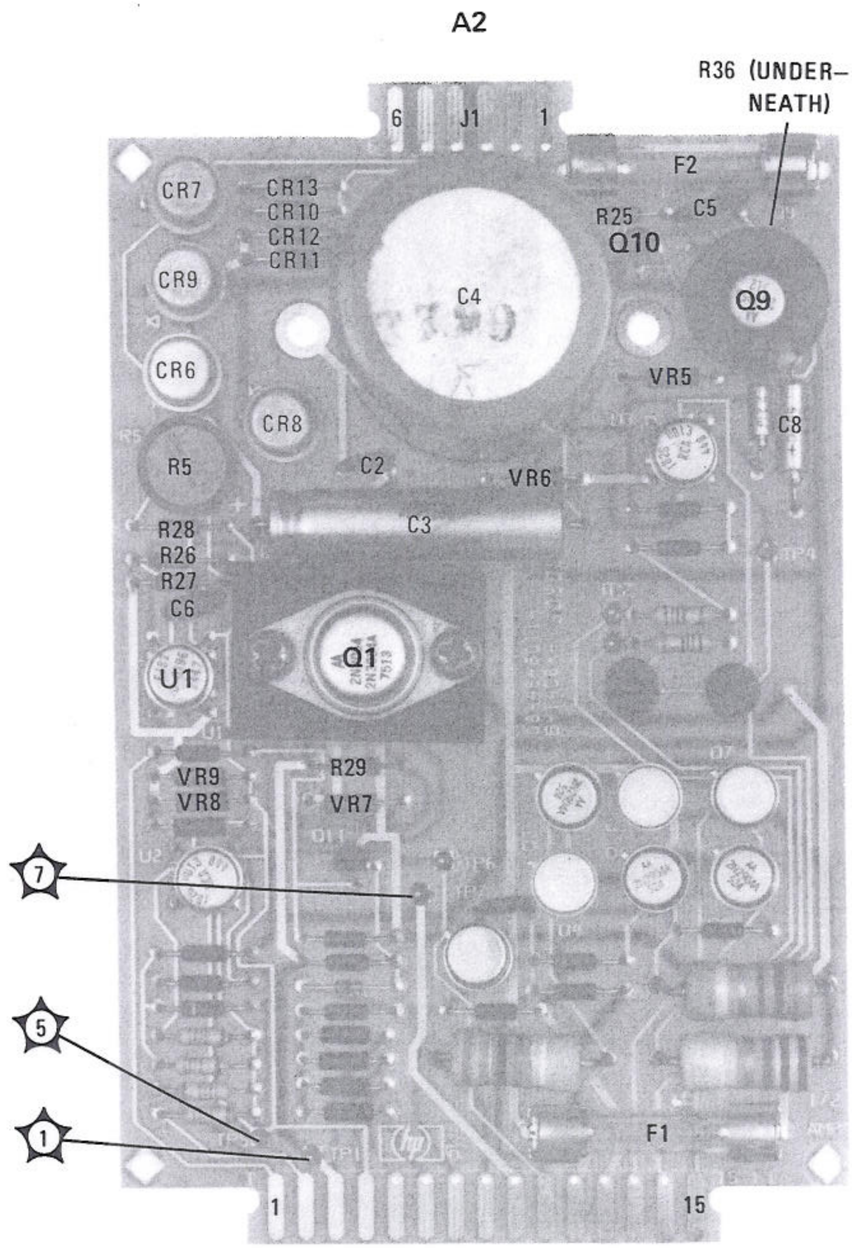


Figure 8-13. A2 Power Supply Assembly Amplifiers and Switch Driver Circuits Parts Locations

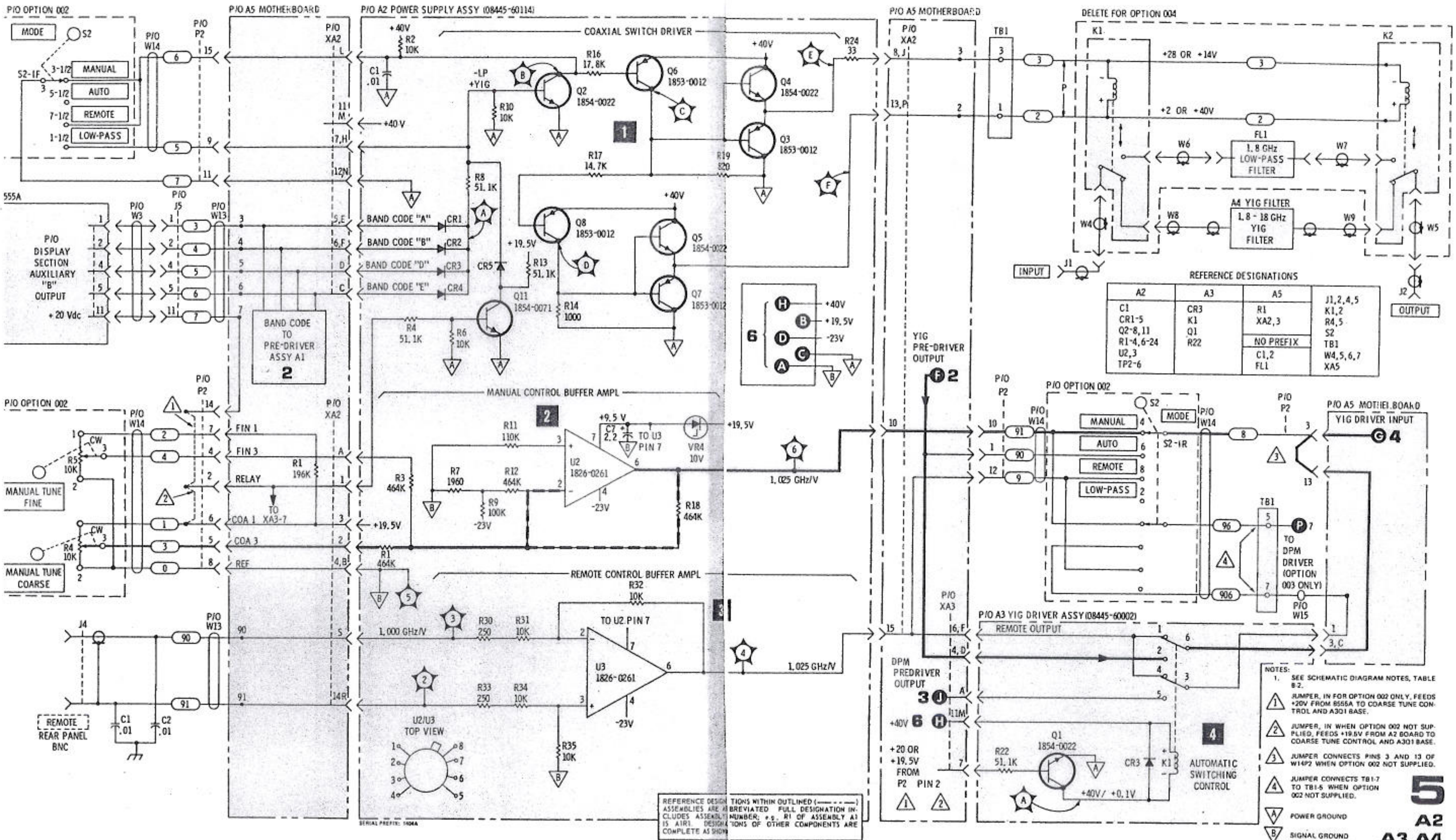


Figure 8-14. A2 Power Supply Assembly Amplifiers and Switch Driver Circuits, Schematic Diagram

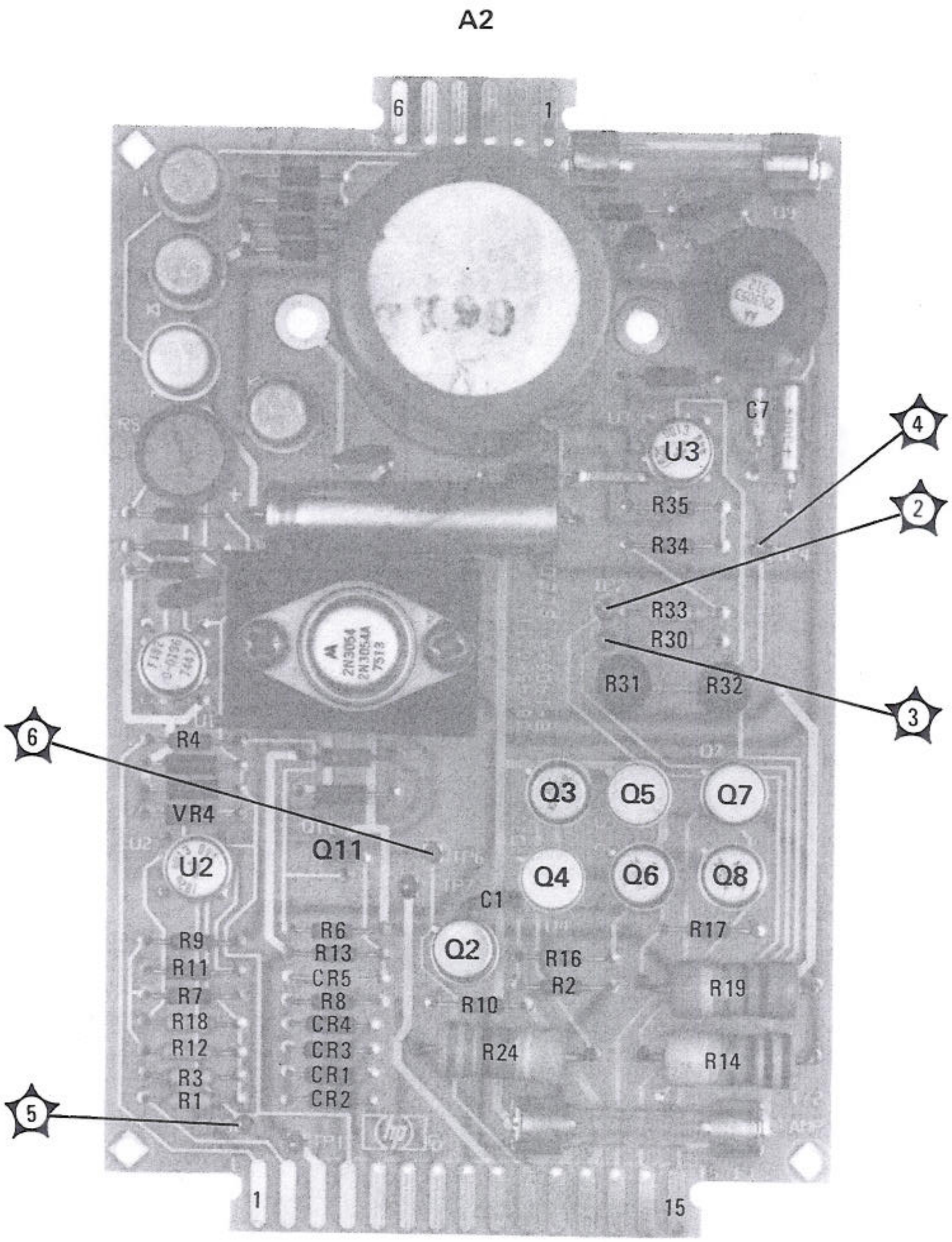
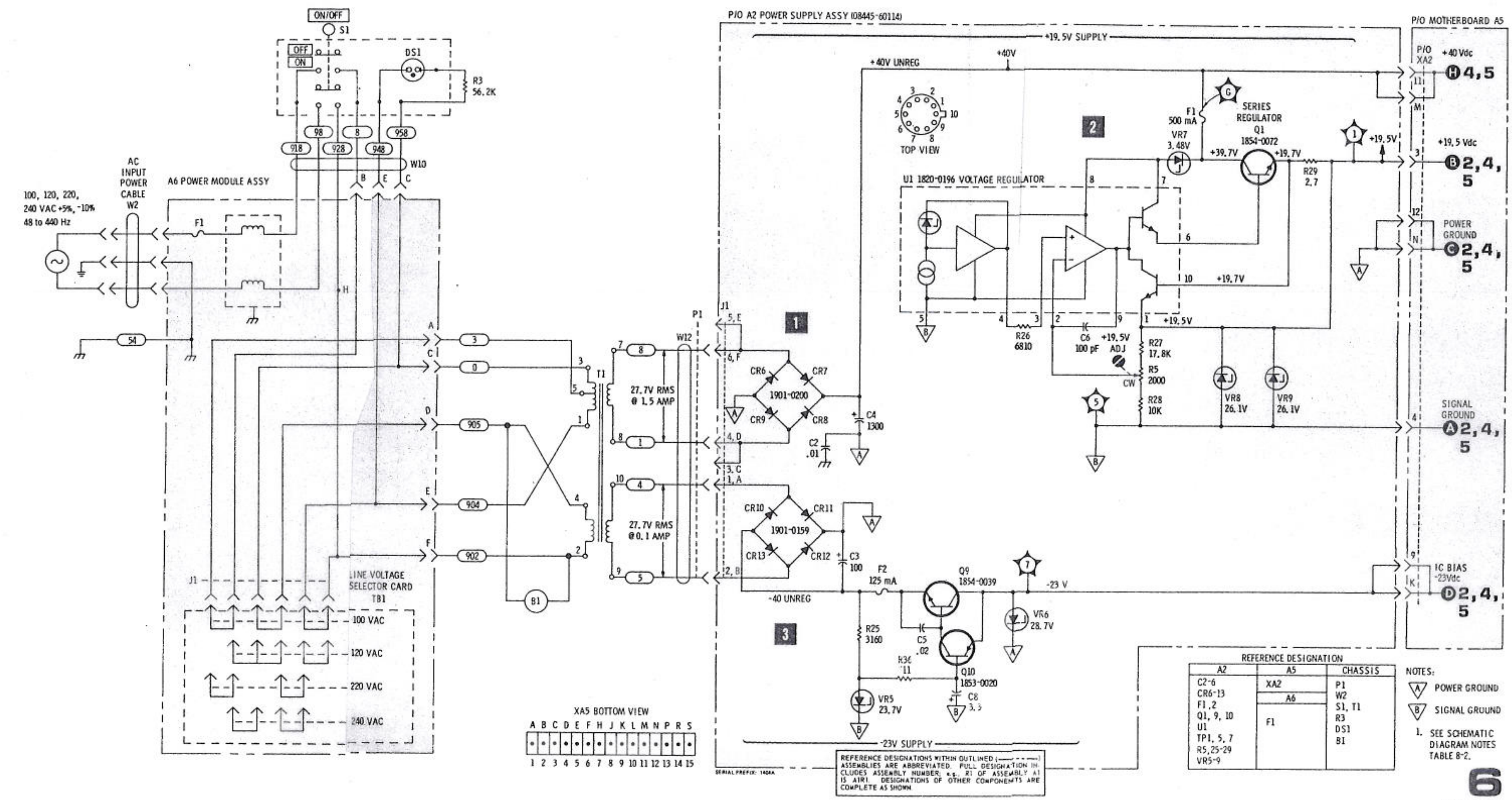


Figure 8-15. A2 Power Supply Assembly Supply Voltage Circuits Parts Locations



REFERENCE DESIGNATION

A2	A5	CHASSIS
C2-6 CR6-13 F1,2 Q1, 9, 10 U1 TP1, 5, 7 R5, 25-29 VR5-9	XA2 A6 F1	P1 W2 S1, T1 R3 DS1 B1

6
A2,A6

A7A1

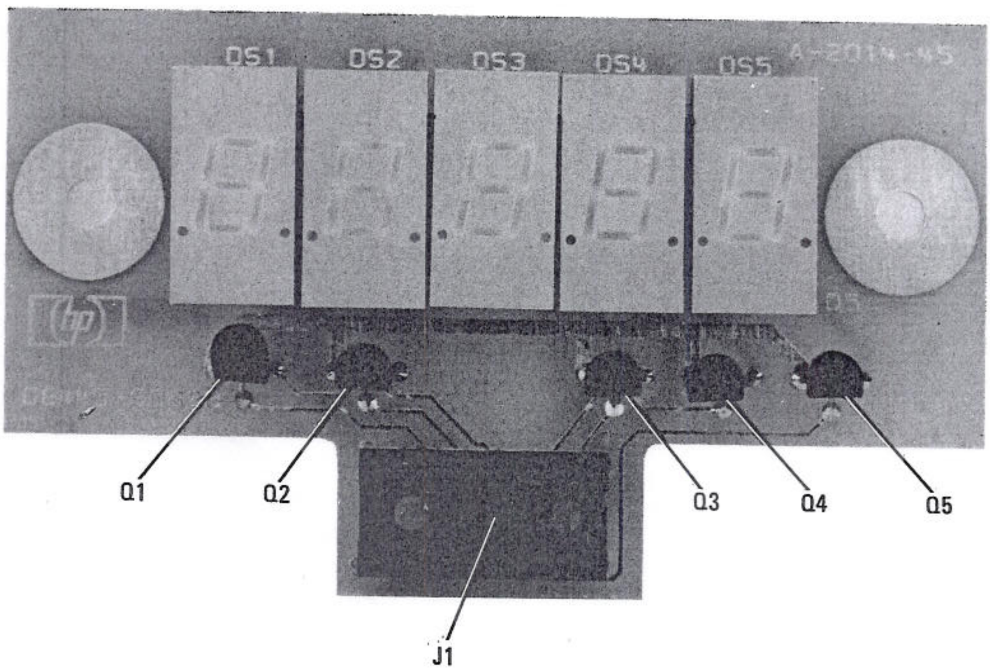
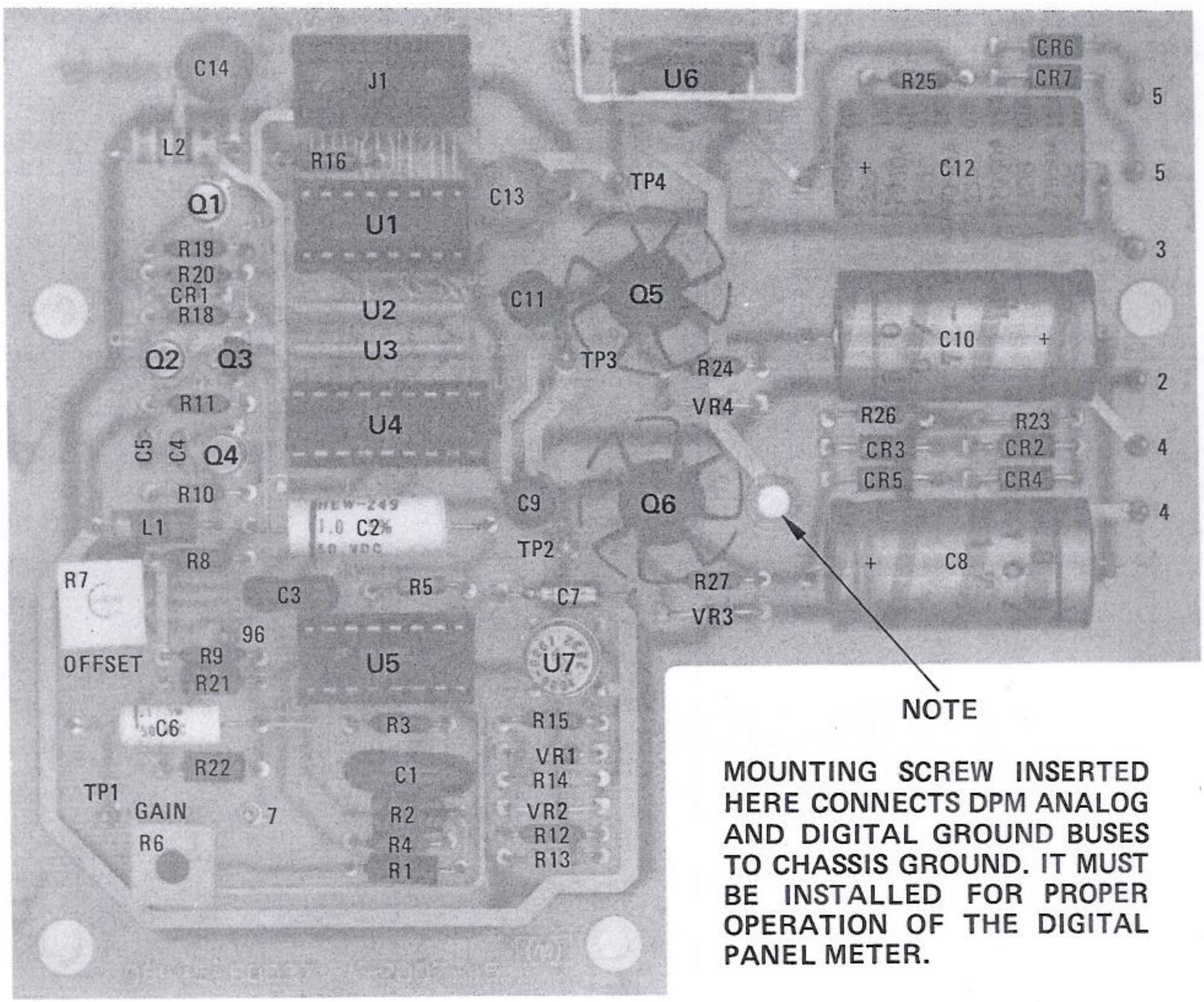


Figure 8-17. A7A1 DPM Display Board Assembly Parts Locations

A7A2



NOTE

MOUNTING SCREW INSERTED HERE CONNECTS DPM ANALOG AND DIGITAL GROUND BUSES TO CHASSIS GROUND. IT MUST BE INSTALLED FOR PROPER OPERATION OF THE DIGITAL PANEL METER.

Figure 8-18. A7A2 DPM Driver Board Assembly Parts Locations

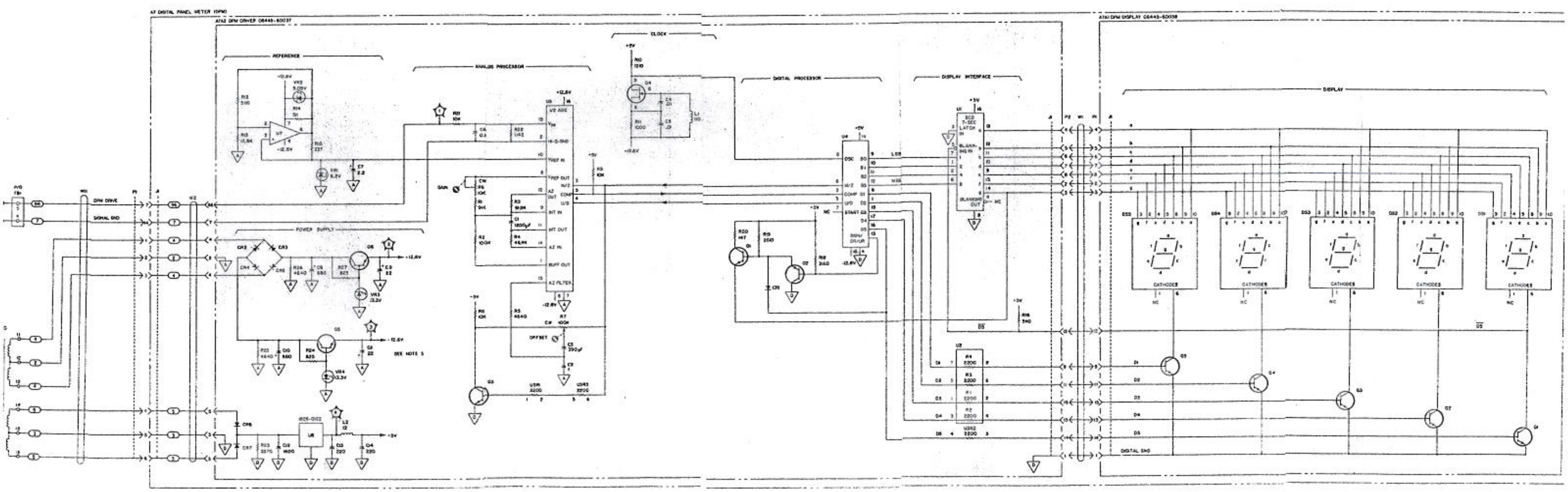
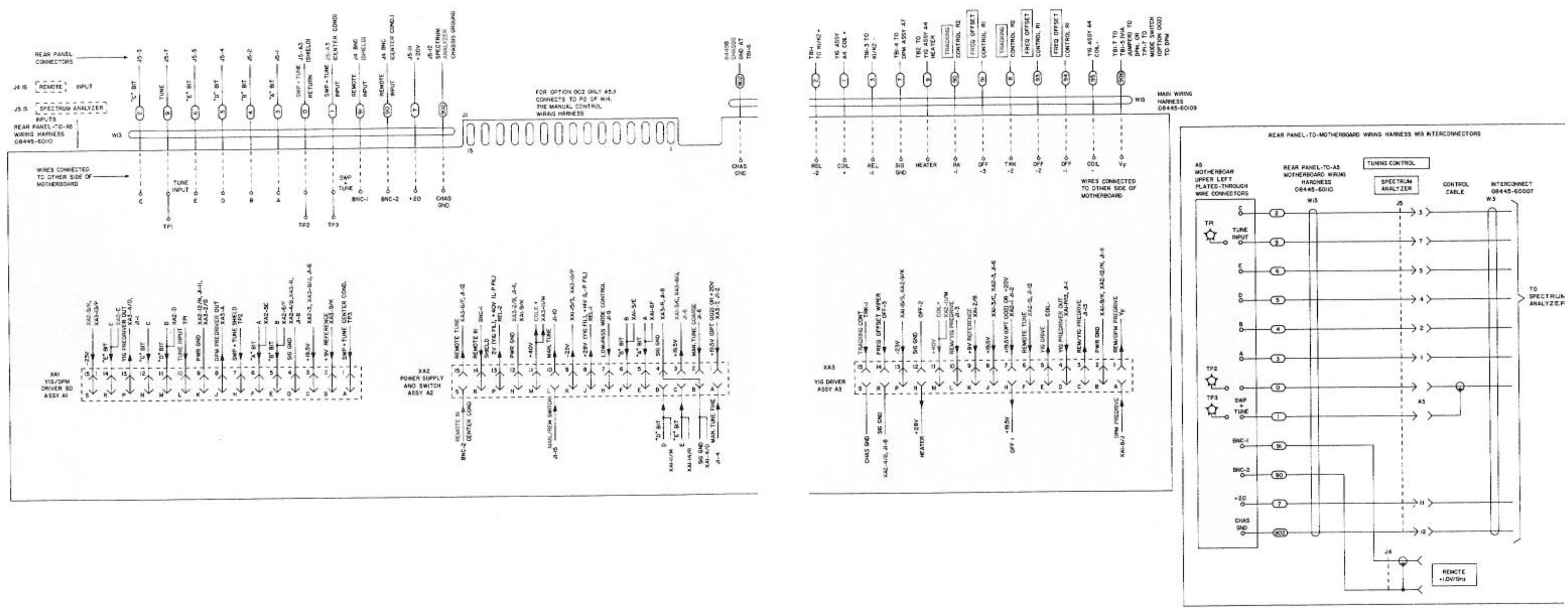
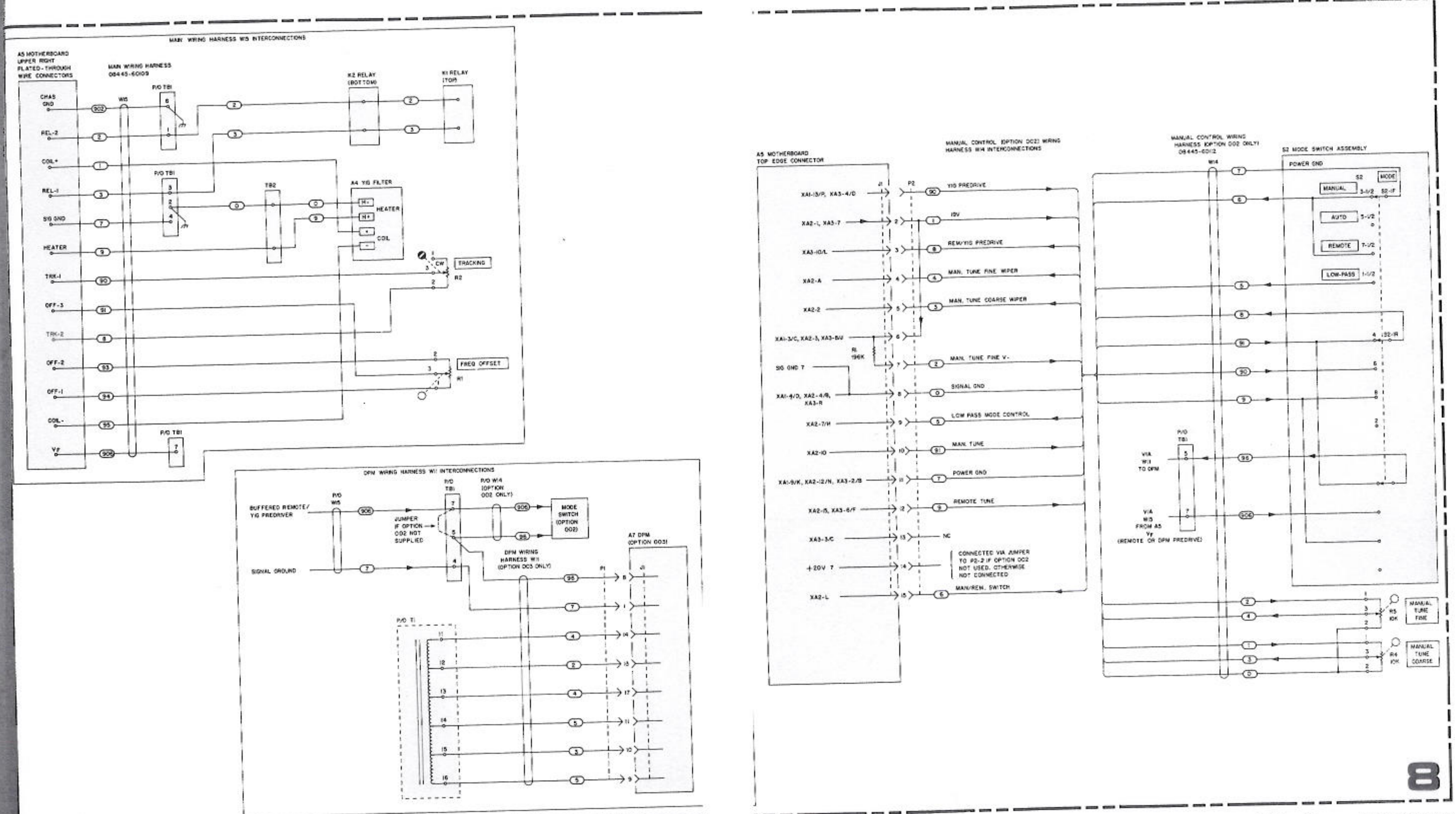


Figure 8-19. A7 DPM


REAR PANEL CONNECTORS
WIRES CONNECTED TO OTHER SIDE OF MOTHERBOARD
FOR OPTION 002 ONLY A5J1 CONNECTS TO P2 OF W14, THE MANUAL CONTROL WIRING HARNESS
XA1 YIG/DPM DRIVER BD ASSY A1
XA2 POWER SUPPLY AND SWITCH ASSY A2
XA3 YIG DRIVER ASSY A3
MAIN WIRING HARNESS 08445-60109
REAR PANEL-TO-MOTHERBOARD WIRING HARNESS W13 INTERCONNECTORS
A5 MOTHERBOAR UPPER LEFT PLATED-THROUGH WIRE CONNECTORS
REAR PANEL-TO-A5 MOTHERBOARD WIRING HARDNESS 08445-60110
TUNING CONTROL
SPECTRUM ANALYZER
CONTROL CABLE
INTERCONNECT 08445-60007
TO SPECTRUM ANALYZER
REMOTE +1.0V/GHz



8

Figure 8-20. A5 Motherboard Assembly and Wiring Harnesses Wiring Diagrams

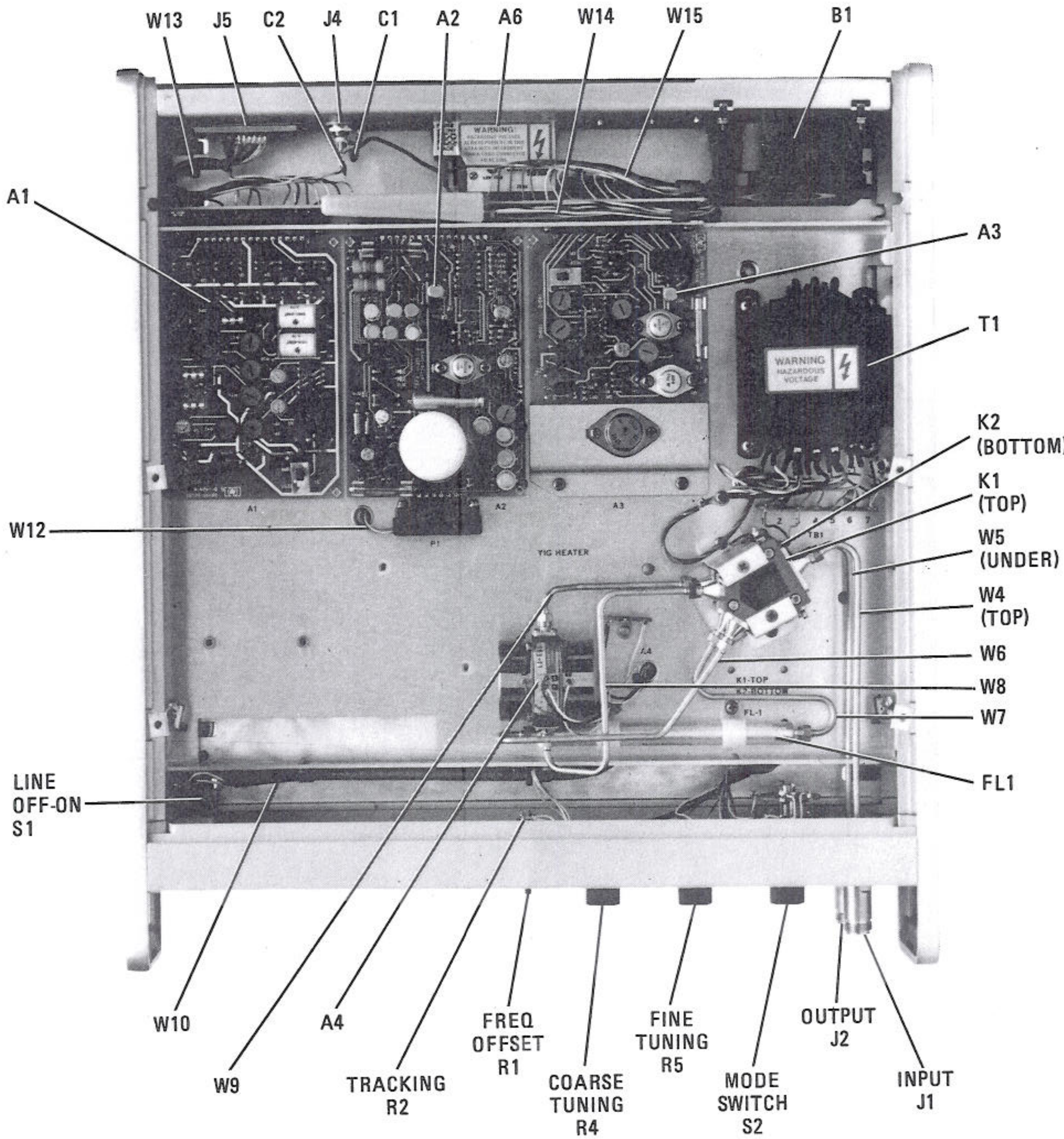


Figure 8-21. Assembly Locations in Standard and Option 002 Preselectors

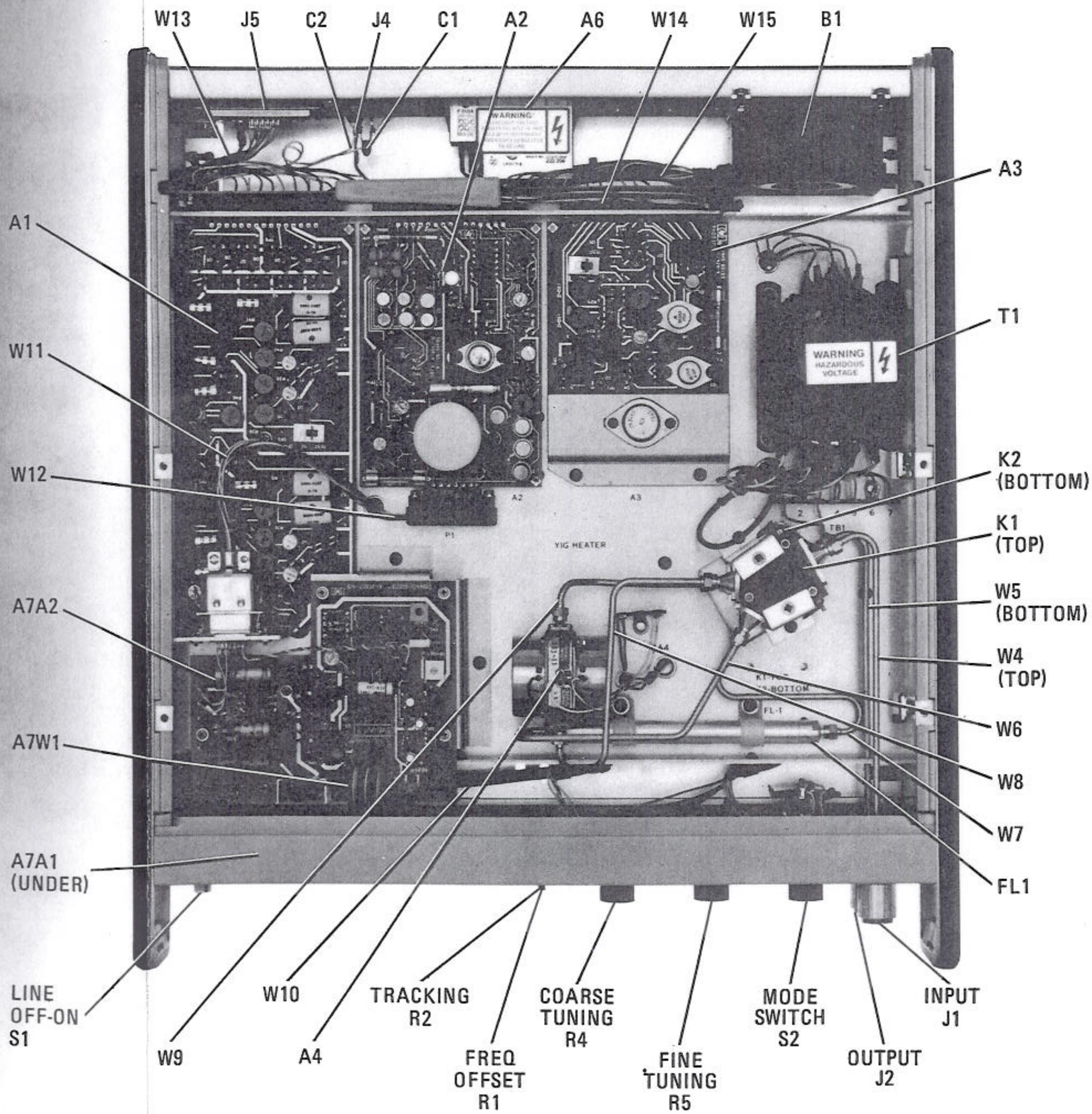


Figure 8-22. Option 003 8445B Assembly Locations

APPENDIX A

MODIFICATION OF OLDER MODEL 8555A SPECTRUM ANALYZER RF SECTIONS

HP 8555A RF Sections with serial number prefixes 1232A and earlier require a wiring modification before they will operate with the HP Model 8445B Option 003 Preselector. The DPM readout driver in the 8445B requires an input signal from the A4 YIG Driver Assembly in the 8555A.

This modification consists of adding a jumper wire on the plug-in A4 assembly plus adding a wire between A4 output connector and the rear panel P5 Auxiliary "B" connector.

PROCEDURE

1. Remove top and bottom covers from the 8555A.
2. Remove the A4, A5, and A6 board assemblies so that A4 can be modified and easy access to connector P5 can be obtained.
3. Connect an insulated 3 inch jumper wire between A4U7 pin 6 and pin 8 on the A4 board connector. Refer to Figure A-1.
4. Connect an insulated 4 inch wire between A10XA4 pin 8 (on interconnect board) and rear panel Preselector connector P5 pin 7. Refer to Figure A-2.
5. This completes the modification. Replace all board assemblies and top and bottom covers.

ELECTRICAL CHECK

1. With 8555A installed into Display Section, turn on power.
2. Center LO feedthru signal on CRT display.
3. With a dc voltmeter measure the voltage at AUXILIARY "B" on rear panel connector P5 pin 7. Voltage should be -7.50 ± 0.05V.
4. With frequency dial at 1400 MHz on the LO scale, voltage at P5-7 should be -15.00 ± 0.05V.

Change your 8555A Operation and Service Manual per the partial schematic of the A4 assembly shown in Figure A-3.

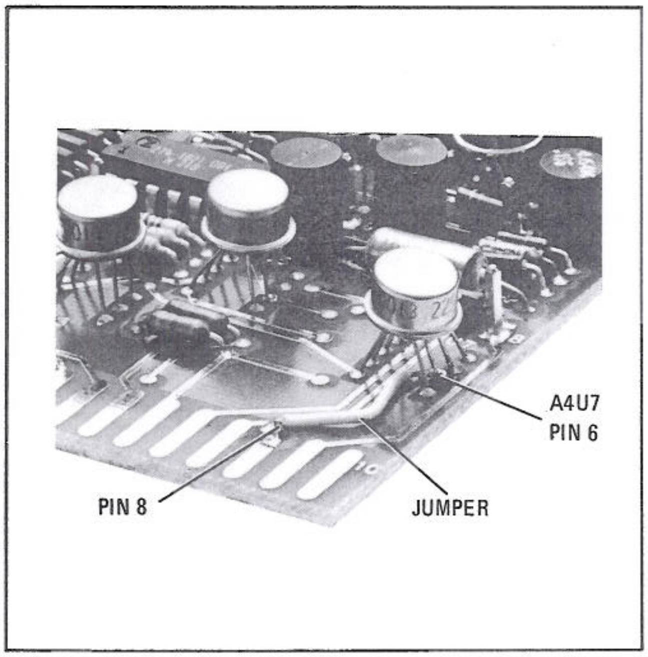


Figure A-1. Modified A4 Board

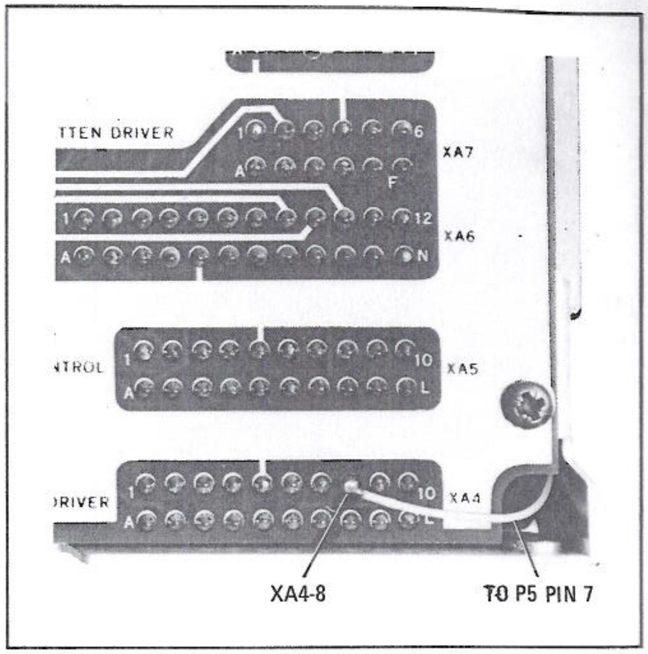


Figure A-2. Connection to A10XA4-8

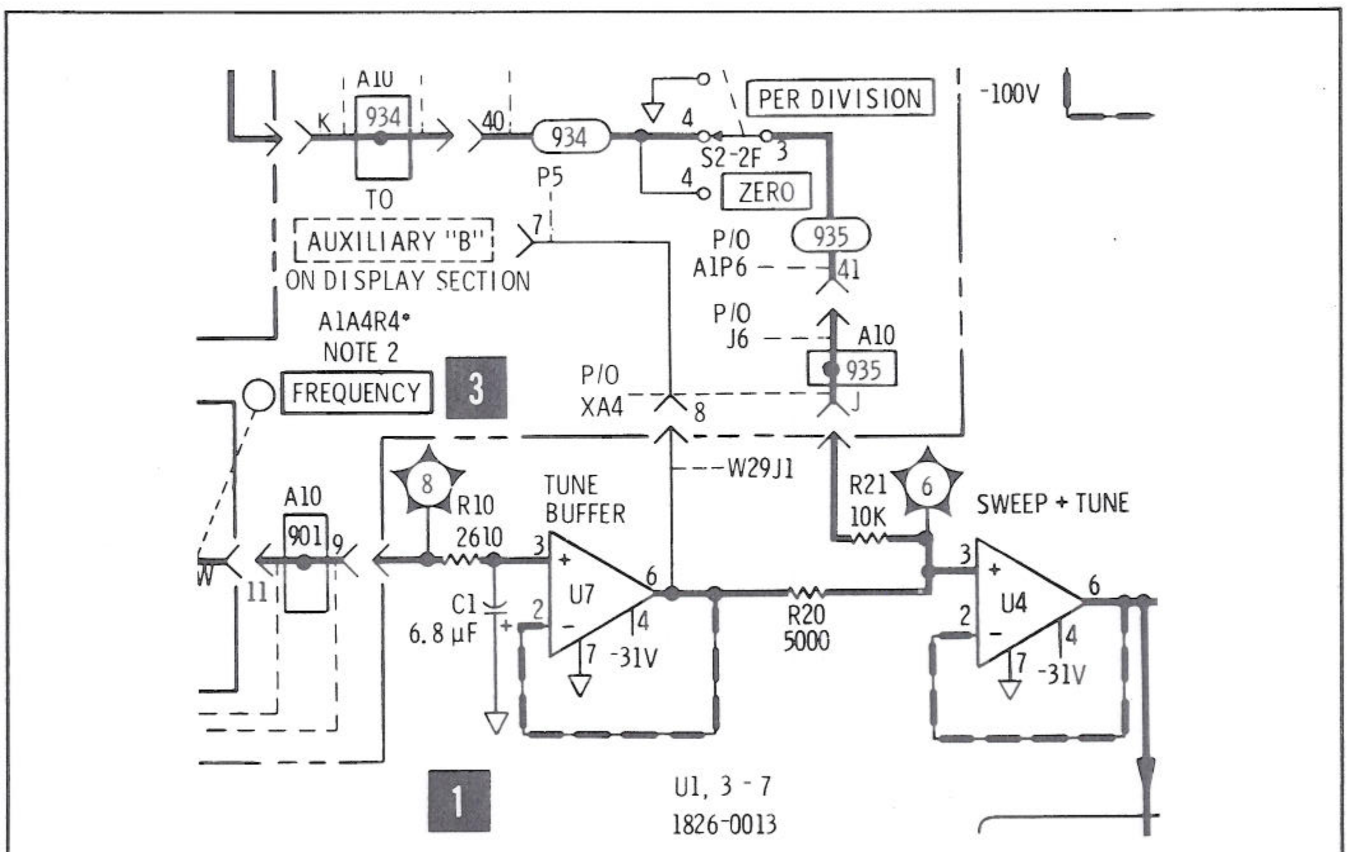


Figure A-3. Partial Schematic of Modified A4 Assembly

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