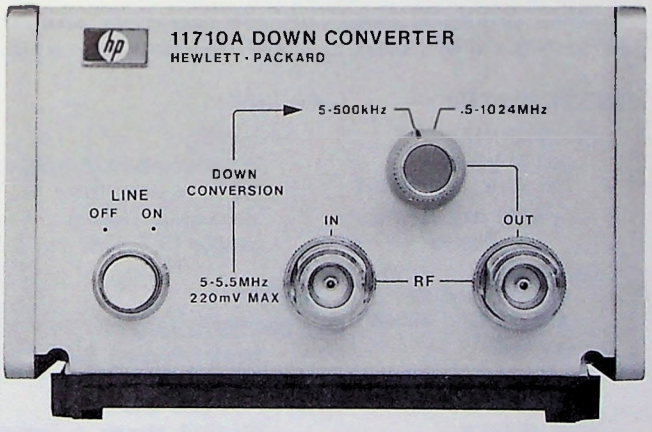
OPERATING AND SERVICE MANUAL

11710A
DOWN CONVERTER



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SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 1627A.

For additional important information about serial numbers, see paragraph on INSTRUMENTS COVERED BY MANUAL.

1501 PAGE MILL ROAD, PALO ALTO, CALIFORNIA, U.S.A.

MANUAL PART NO. 11710-90002
Microfiche Part No. 11710-90003

PRINTED: OCTOBER 1976

MODEL 11710A

POWER CABLE
(For HP Part Number refer to Figure 3)

FUSE 220/240 Vac
(HP 2110-0479)

Figure 1. HP Model 11710A Down Converter and Accessories Supplied

1. GENERAL INFORMATION

2. This Operating and Service Manual contains information required to install, operate, test, adjust, and service the Hewlett-Packard 11710A Down Converter. Figure 1 shows the 11710A and all supplied accessories.

3. SPECIFICATIONS

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

5. Listed on the title page of this manual (below the manual part number) is a Microfiche part number. This number can be used to order 4- x 6-inch microfilm transparencies of the manual. Each microfiche contains up to 96 photo-duplicates of the manual pages. The microfiche package also includes the latest Manual Changes supplement as well as pertinent Service Notes.

6. INSTRUMENTS COVERED BY MANUAL

7. Attached to the instrument is a serial number plate. The serial number is in the form: 0000A00000. It is in two parts; the first four digits and the letter are the serial prefix and the last five digits are the suffix. The prefix is the same for all identical instruments; it changes only when a change is made to the instrument. The suffix however, is assigned sequentially and is different for each instrument. The contents of this manual apply to instruments with the serial number prefix(es) listed under SERIAL NUMBERS on the title page.

8. 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" that explains how to adapt the manual to the newer instrument.

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

10. 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.

11. DESCRIPTION

12. The Hewlett-Packard Model 11710A Down Converter is designed for use as an accessory for the HP Model 8640 Series Signal Generators. Frequency inputs in the range of 5.005 to 5.500 MHz are down converted to the 5 to 500 kHz range by the 11710A. A straight-through selection feature allows the input to be passed unchanged through the 11710A.

Table 1. Specifications

Input:
Down-Conversion Mode: 5.005 to 5.500 MHz at $\leq$0 dBm.
Straight-Through Mode: 0.5 to 1024 MHz.

Down-Converted Output:
Frequency: 5 to 500 kHz
Level Range: 0 to −107 dBm, 50Ω (0.2V to 1 μV).
Level Flatness: ±0.5 dB referred to 100 kHz.
Level Accuracy: ±(1 dB + Input Level Accuracy).
Harmonics: > 35 dBc.
Intermixing Spurious: > 60 dBc.
5 MHz Local Oscillator Feedthrough: < −80 dBm.

Straight-Through Output:
Frequency: 0.5 to 1024 MHz.
Loss: < 1 dB.

General Characteristics:
Power Requirements: 100, 120, 220, 240V, +5, −10%, 48 Hz to 440 Hz, 25 VA maximum.
Weight: Net, 2.2 kg (4 lb 13 oz).
Dimensions:[1] 130 mm wide x 76 mm high x 279 mm deep (5-1/8 inches x 3-1/8 inches x 11 inches).
Operating Temperature Range: 0° to 55°C.

[1] Dimensions are for general information only. If dimensions are required for building special enclosures, contact your local Hewlett-Packard Office.

13. RECOMMENDED TEST EQUIPMENT

14. Test equipment required to test the down converter is listed in Table 2. Equipment other than the recommended models can be used provided the minimum specifications are satisfied.

15. INSTALLATION

16. Initial Inspection

17. Inspect the shipping container for damage. If the shipping container or packaging material is damaged it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is mechanical damage or if the instrument does not pass the performance tests, notify the nearest Hewlett-Packard office. Keep the damaged shipping materials (if any) for the carrier and a Hewlett-Packard representative to inspect. The HP office will arrange for repair or replacement at HP Option without waiting for claim settlement.

18. Power Requirements

19. The 11710A Down Converter requires a power source with an output of 100, 120, 220, or 240V, +5, —10%, 48 to 440 Hz single phase. Power consumption is typically less than 12.5 VA.

20. Line Voltage Selection

21. Figure 2 provides instructions for line voltage and fuse selection. The Line Voltage Selection Card and fuse are factory installed for 120 Vac operation.

Table 2. Recommended Test Equipment

Instrument Type	Minimum Specifications	Suggested Model	Use*
Digital Voltmeter	Range: 0—15 Vdc Accuracy: ±1%	HP 3476A	A, T
Oscilloscope	Frequency Range: ⩽ 5 MHz Sweep: ⩽ 0.1 μs/div	HP 1700B	A, T
Signal Generator	Range: 5 to 5.5 MHz Output: > 0 dBm into 50Ω Drift: < 20 ppm/10 min. Residual FM: < 50 Hz rms in 20 Hz to 15 kHz post-detection noise bandwidth.	HP 8640A or HP 8640B	P, A, T
Spectrum Analyzer:	Range: 0.45—100 MHz Amplitude Calibration: Display Accuracy: ±0.25 dB/dB but not more than 1.5 dB over 70 dB dynamic range Flatness: ±0.1 dB (5 kHz to 5 MHz) IF Gain Step Accuracy: ±0.2 dB Vertical Reference Scale: 10 dB/division log, and linear display calibration Average Noise Level: < —102 dBm with 10 kHz IF bandwidth Spurious Responses: > 60 dB down for inputs for —40 dBm or less Span Width: 0—100 MHz	HP 141T/8552B/8553B	P, T
Frequency Reference	Output Frequency: 100 kHz, 1 MHz, 5 MHz, or 10 MHz Accuracy: ±2 ppm	HP 5326A or HP 8640B (Time Base Output)	A

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

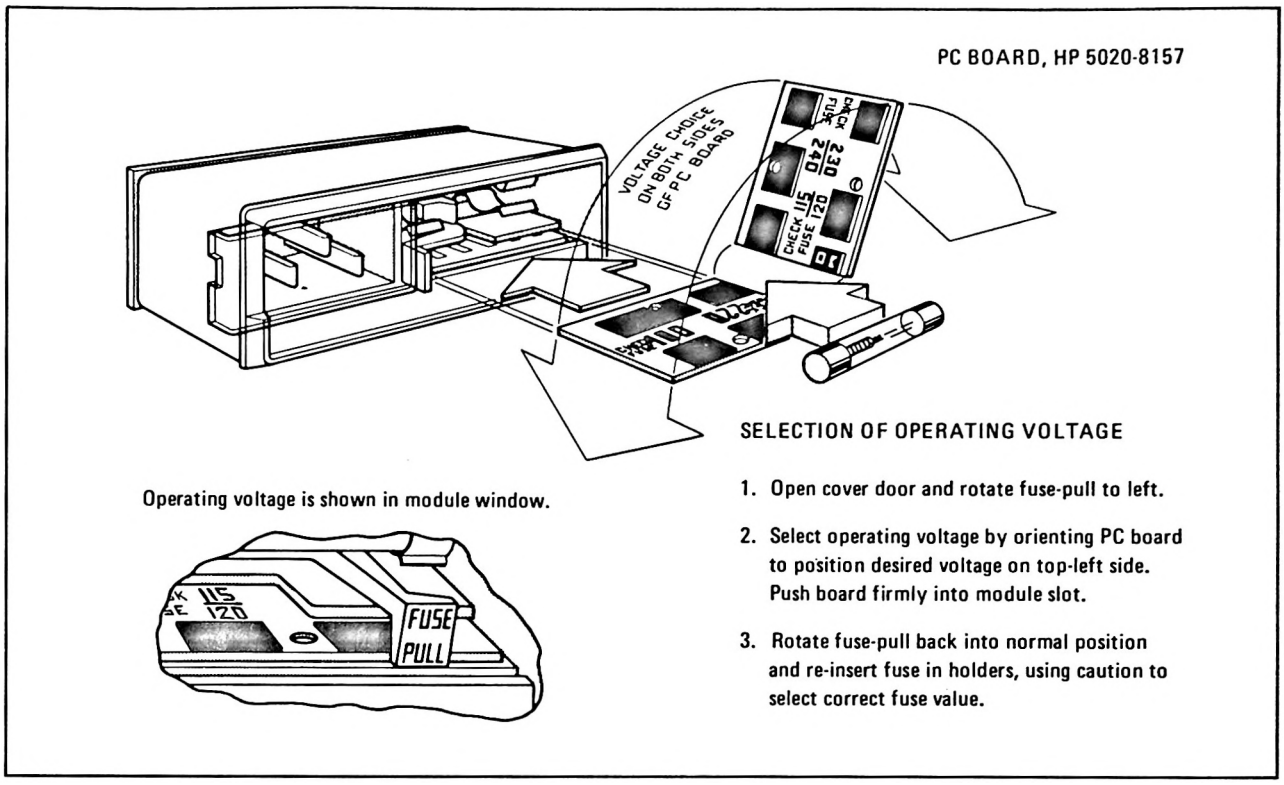


Figure 2. Line Voltage Selection

22. Power Cable

23. In accordance with international safety standards, this instrument is equipped with a three-wire power cable. When connected to an appropriate ac power receptacle, this cable grounds the instrument cabinet. The type of power cable plug shipped with each instrument depends on the country of destination. See Figure 3 for the part numbers of the power cable plugs available.

WARNING

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

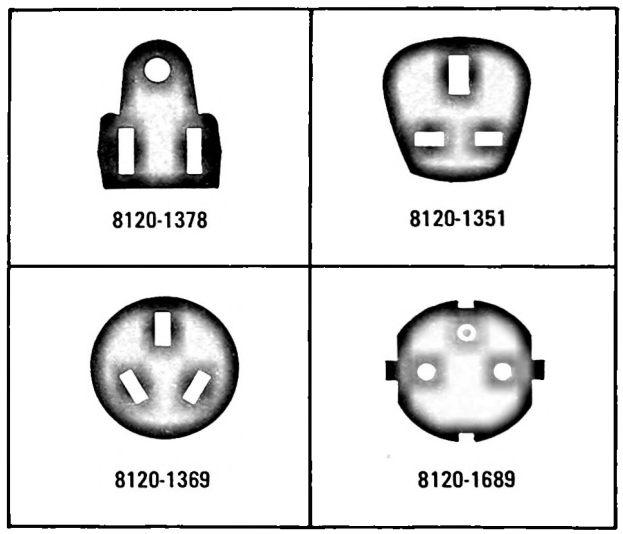


Figure 3. Power Cable HP Part Nos. and Associated Plugs

24. Mating Connectors

25. Signal mating connectors required for the 11710A are type N male connectors.

26. Operating Environment

27. The operating environment should be within the following limitations:

Operating Environment (Cont'd)

Temperature: 0 to 55°C
Humidity: Up to 95% relative
Altitude: Up to 4500 metres (15,000 feet)

28. Bench Operation

29. The instrument is equipped with plastic feet and a tilt stand for use on a bench.

30. Rack Mounting

31. The instrument can be rack mounted by using an adapter frame. The adapter frame is a rack frame that accepts several combinations of sub-modular units. For additional information, address inquiries to your nearest Hewlett-Packard office.

32. STORAGE AND SHIPMENT

33. Environment

34. 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: Up to 95% relative
Altitude: Up to 7630 metres (25,000 feet)

35. Packaging

36. Original Packaging. Containers and materials identical to 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 assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

37. 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.

c. Use a layer of shock-absorbing material 70 to 100 mm (3 to 4 in.) thick 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 assure careful handling.

f. In any correspondence, refer to instrument by model number and full serial number.

38. OPERATION

39. Controls and indicators of the 11710A are explained in Figure 4. To operate the instrument, proceed as follows:

a. Verify that the power transformer primary of the 11710A is matched to the line voltage by the Line Voltage Selection Card.

b. Check the 11710A power fuse for correct rating.

c. Connect the RF IN and OUT connector cables.

CAUTIONS

Do not apply signal levels greater than +23 dBm into either the RF IN or RF OUT jacks.

In the Straight-Through mode, do not apply DC or RF signal levels into the RF OUT jack which exceed the listed reverse power damage level of the RF signal source.

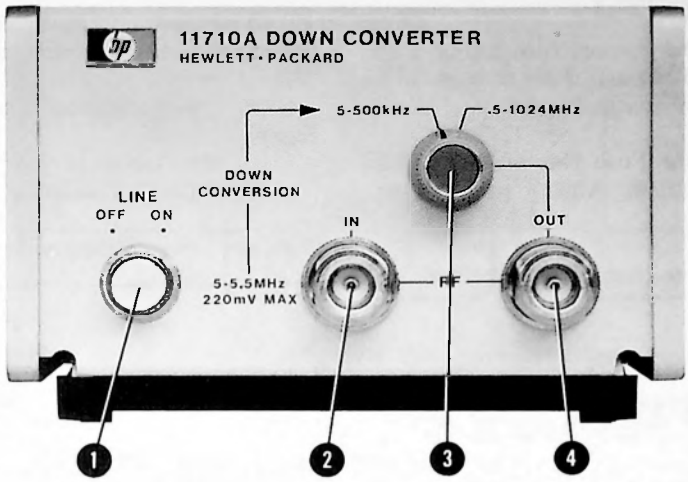
d. Connect the power cable to the power receptacle. Press the LINE switch and release. The switch should remain in, the lamp within the plastic lens should be lighted, and the cursor on the curved portion of the switch should indicate ON.

40. Operator Maintenance

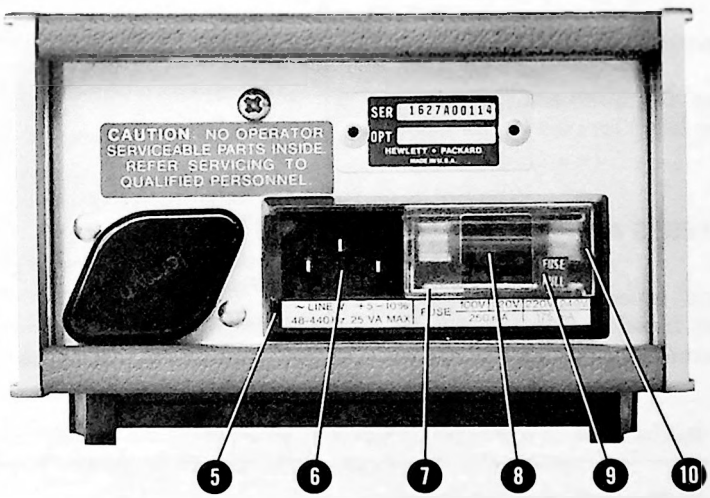
41. Operator maintenance is limited to replacement of the rear panel fuse, the A2F1 Power Supply fuse and the front panel LINE switch lamp.

42. Rear Panel Fuse Replacement. The main ac line fuse is located on the rear panel next to the power cable jack (see Figure 2). To remove the fuse, first remove the line power cable from its jack. Slide the fuse compartment cover to the left, then pull the handle marked FUSE PULL and remove the fuse.

FRONT



REAR



1. **LINE Switch.** Controls primary power. Lights when instrument is on.
2. **RF IN Connector.** Signal input type N female connector
3. **5–500 kHz/.5–1024 MHz Selector Switch.** When set to 5–500 kHz selects down conversion function. When set to .5–1024 MHz selects straight-through function.
4. **RF OUT Connector.** Signal output type N female connector.
5. **Power Module Assembly.**
6. **Receptacle.** Couples transformer primary to line voltage via power cable.
7. **Line Voltage Selection Card.** Matches transformer primary to line voltage. See Figure 2.
8. **Fuse.** A 250 mA fuse is used at 110/120 Vac, 175 mA at 220/240 Vac.
9. **Fuse Pull Handle.** Mechanical interlock; fuse must be removed before extraction of Line Voltage Selection Card.
10. **Window.** Safety interlock; fuse cannot be removed while power cable is connected to power receptacle.

Figure 4. Front and Rear Panel Controls, Connectors, and Indicators

Operator Maintenance (Cont'd)

CAUTION

Be sure to select the correct fuse rating for the selected line voltage. Fuse ratings are listed on the fuse compartment.

43. A2F1 Power Supply Fuse Replacement. To replace power supply fuse A2F1, proceed as follows:

a. Remove power cable from rear of instrument.

b. Remove instrument top cover.

c. Remove board A2 from printed circuit board connector.

d. Replace 1/2A fuse on board.

e. Reinsert board A2 into connector.

f. Replace instrument top cover.

44. LINE Switch Lamp Replacement. Figure 5 shows how to replace the lamp located in the LINE power switch.

45. PERFORMANCE TESTS AND ADJUSTMENTS

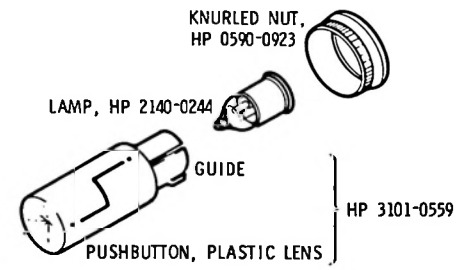
46. Test equipment and accessories required to perform maintenance are listed in Table 2. Equipment other than the recommended models can be used provided the minimum specifications are satisfied.

47. The test and adjustments to be performed are presented in the following order:

a. Performance Test on Down-Converted Signal.

b. Local Oscillator Frequency Adjustment

c. Power Supply Adjustment.



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 5. LINE Switch Lamp Replacement

PERFORMANCE TESTS

48. Performance Tests on Down-Converted Signal

SPECIFICATIONS:
Frequency: 5 to 500 kHz
Level Range: 0 to −107 dBm 50Ω (0.2V to 1 μV)
Level Flatness: ±0.5 dB referred to 100 kHz
Level Accuracy: ±(1 dB + Input Level Accuracy)
Harmonics: > 35 dBc
Intermixing Spurious: > 60 dBc
5 MHz Local Oscillator Feedthrough: <−80 dBm

REFERENCE: Figure 11.

DESCRIPTION: In addition to measuring the parameters specified above, adjustments are made to the output level and 5 MHz balance if needed. All measurements are made by observing the down-converted output on a spectrum analyzer.

PERFORMANCE TESTS

48. Performance Tests on Down-Converted Signal (Cont'd)

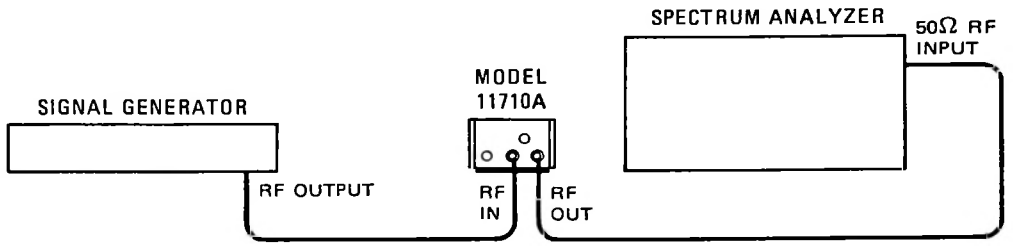


Figure 6. Performance Test Setup

TEST EQUIPMENT:

Signal Generator	HP 8640A, 8640B or 8640M
Spectrum Analyzer	HP 8553B/8552B/141T

PROCEDURE:

a. Connect equipment as shown in Figure 6. Set Down Converter selection switch to .5—1024 MHz.

b. Set signal generator controls as follows:

Frequency	5.100 MHz
Level	0 dBm
AM	Off
FM	Off

c. Set spectrum analyzer controls as follows:

Resolution Bandwidth . . .	1 kHz
Frequency Span	50 kHz/division
Center Frequency	5.1 MHz
Input Attenuation	40 dB
Linear Sensitivity	100 mV/division
Display Smoothing	Minimum (Off)

d. Locate 5.1 MHz signal on spectrum analyzer. Fine adjust linear sensitivity to bring signal to fifth graticule line from bottom.

e. Set Down Converter's selection switch to 5—500 kHz. Tune analyzer center frequency to 250 kHz. The 100 kHz signal should be within ±0.3 divisions of the fifth line (±0.5 dB). If it is not, adjust A1R12 (Gain) to bring signal to reference line.

4.7_____5.3 divisions

f. Tune generator frequency slowly through 5.005 to 5.5 MHz range while observing signal on analyzer display. For observing low frequencies, it may be desirable to adjust analyzer's frequency span and center frequency (but not resolution bandwidth). Signal level should be within ±0.3 divisions of level observed at 100 kHz and ±0.6 divisions of the fifth graticule line over the range to 500 kHz.

Flatness: —0.3 _____ +0.3 divisions
Accuracy: —4.4 _____ +5.6 divisions

PERFORMANCE TESTS

48. Performance Tests on Down-Converted Signal (Cont'd)

PROCEDURE: (Cont'd)

g. Set generator's output level to −87 dBm and frequency to 5.1 MHz. Set spectrum analyzer's frequency span to 5.1 MHz, input attenuation to 0 dB, and linear sensitivity to 2 μV/division.

h. Repeat steps d and e.

i. Set spectrum analyzer's input attenuation to 40 dB and vertical reference level to 0 dBm (log). Set generator's output level to 0 dBm.

j. Adjust spectrum analyzers vertical reference level to bring signal to top graticule line. Tune generator frequency through 5.00 to 5.5 MHz range while observing second and third harmonics on analyzer display. If desired, adjust analyzer's frequency span, center frequency, and resolution bandwidth. Harmonics should be greater than 35 dB below fundamental.

k. Set spectrum analyzer's resolution bandwidth to 10 kHz, frequency tune to 10 MHz, and frequency span to 2 MHz per division. Tune signal generator to 5.5 MHz. All signals except 500 kHz fundamental and its harmonics should be greater than 60 dB below the fundamental.

60 dBc_____

l. Disconnect RF input to Down Converter. Set spectrum analyzer's resolution bandwidth to 3 kHz, frequency tune to 5 MHz, frequency span to 0.2 MHz per division, and input attenuation to 0 dB. Fine tune analyzer to locate 5 MHz signal. Signal level should be less than −80 dBm. If it is not, adjust A1R5 (5 MHz Null) for lowest signal level.

_____−80 dBm

NOTE

If the signal level cannot be adjusted properly in step l, monitor signal at A1TP2 and adjust for lowest signal level. Repeat step l and verify output is within specification.

ADJUSTMENTS

49. Local Oscillator Frequency Adjustment

REFERENCE: Figure 11.

DESCRIPTION: An oscilloscope, triggered by an external reference, is used to set the local oscillator (LO) frequency. If the generator to be used with the Down Converter has a counter readout, the LO is adjusted using the generator's reference. Otherwise, the frequency is adjusted to 5 MHz using a suitable frequency standard.

ADJUSTMENTS

49. Local Oscillator Frequency Adjustment (Cont'd)

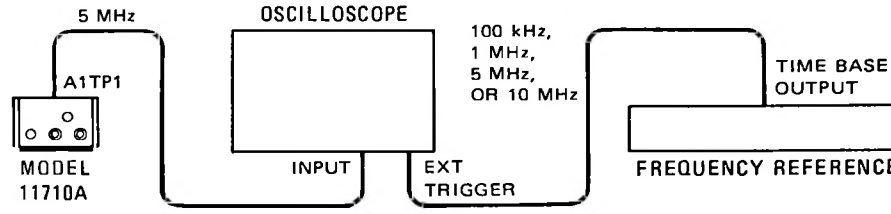


Figure 7. Local Oscillator Frequency Adjustment Test Setup

TEST EQUIPMENT: Oscilloscope . . . . . HP 1700B
Frequency Reference . . . HP 8640B or 5326A

PROCEDURE:

a. Remove top cover. Allow equipment to warm up for two hours.

b. Connect equipment as shown in Figure 7. Set oscilloscope to display 5 MHz LO signal triggered externally from the frequency reference. Set horizontal scale for 0.1 μs per division.

c. Adjust LO frequency adjustment (Xtal Adj) on A1Y1 for a stationary waveform.

NOTE

Movement of the waveform to the right one division per second means that the down converter's frequency is low by 0.1 ppm.

50. Power Supply Adjustment

REFERENCE: Figure 13.

DESCRIPTION: The power supply is adjusted for +12.0 ±0.1 Vdc.

TEST EQUIPMENT: Digital Voltmeter . . . . . HP 3476A

PROCEDURE:

a. Connect voltmeter to + end of A2C5(B+).

b. Adjust A2R9 VOLT ADJ for voltmeter reading of between +11.9 to +12.1 Vdc.

51. REPLACEABLE PARTS

52. Table 3 lists all replaceable parts in reference designator order. Table 4 contains the names and addresses that correspond to the manufacturer's code numbers.

53. ORDERING INFORMATION

54. To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number, indicate the quantity required, and address the order to the nearest Hewlett-Packard office.

55. 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.

56. SERVICE

57. Service instructions consist of principles of operation, troubleshooting, and repairs.

58. Principles of Operation

59. A block diagram of the 11710A Down Converter is shown in Figure 9. Input power is applied to Power Supply A2 through switch S2. Power Supply A2 consists of a voltage rectifier and regulator circuit. This circuit provides the regulated +12 Vdc power.

60. Converter-amplifier A1 down-converts the input signal. Relays K1 and K2, and range switch S1 select the output signal range. To select the down-converted signal, switch S1 is set to the 5—500 kHz position. In this position the +12Vdc is applied to converter-amplifier A1 and relay K2. The closed contacts of K1 connect the output of A1 to the RF OUT connector (J2) via cables W2 and W5. Since relay K1 is not energized when switch S1 is set to the 5—500 kHz position, the open contacts connect the unit RF IN connector (J1) to the input of A1 via cables W3 and W1. The input signal is mixed with the 5 MHz local oscillator and the down-converted signal is then amplified and filtered. Only the difference frequency is allowed to pass through the filter to the output.

61. When range switch S1 is set to the 0.5—1024 MHz position, +12 Vdc is applied to relay K1 but not to converter-amplifier A1 or relay K2. Converter-amplifier A1 is disabled and bypassed and the input signal is routed directly to the output connector via cables W3, W4, and W5.

62. A schematic diagram of converter-amplifier A1 is shown in Figure 11. Note that there are three adjustments: A1Y1 (Xtal Adj), A1R12 (Gain Adj), and A1R5 (5 MHz Null Adj). These adjustments are set as specified in the Performance Test and Adjustment procedures.

63. A schematic diagram of the power supply circuit (A2) is shown in Figure 13. The power supply is a series pass type with Q1 being the series pass transistor. Comparison amplifier A2Q4 and Q5 compares the divided down supply voltage against the reference A2VR2 and drives Q1 through A2Q2 to bring the base voltage of A2Q5 equal to the base voltage of A2Q4. A2Q3 is a current limiting transistor that is normally off. If the supply current is large enough, the voltage drop across A2R5 will turn A2Q3 on. This in turn shuts A2Q2 and Q1 off. A2VR3 and A2Q6 form a crowbar to protect the output from voltages that are too high. If the output exceeds the breakdown voltage of A2VR3, it conducts and fires SCR A2Q6 which shorts the output and initiates current limiting. Variable resistor A2R9 is the output VOLT ADJ control and is set as specified in the Performance Test and Adjustment procedures.

64. Troubleshooting

65. 11710A Down Converter circuits are conventional and are not complicated. Significant circuit stage functions and operation levels are identified in the schematic diagrams. Therefore, troubleshooting can be accomplished by using all the information in the Principles of Operation and the schematics and by conducting the Performance Test and Adjustment procedures. By using this approach, the user can quickly isolate a malfunction to a chassis-mounted or PC board-mounted component.

66. Repair

67. In some instances, repair consists of merely making the required adjustments to bring the instrument up to specification levels. In other cases, repair requires the replacement of malfunctioning component with a known good component. Assembly and chassis component locations for the instrument are shown in Figure 14. Parts locations for PC boards A1 and A2 are shown in Figure 10 and 12, respectively. To gain access to the chassis-mounted components and PC boards, remove the top cover. The side panels and bottom cover are also removable (see Figure 8). The A1 Assembly may be extended by use of the 12-pin extender board located inside the chassis. A 30-pin extender board (HP 08640-60036) useful for extending the A2 Assembly is available from your nearest Hewlett-Packard office.

Table 3. Replaceable Parts

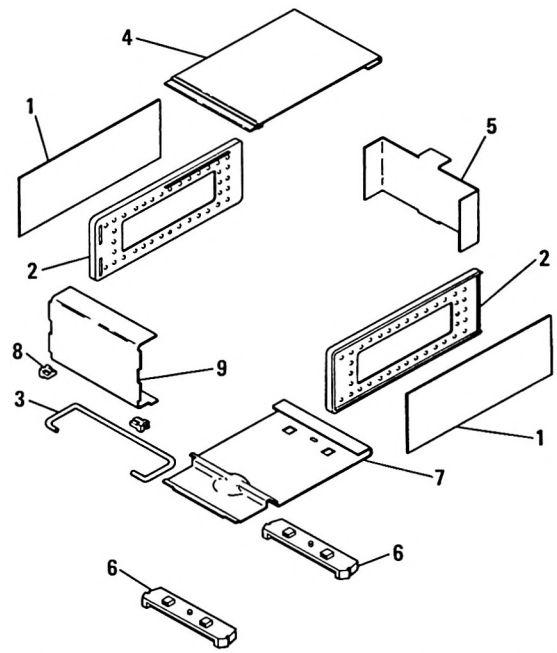
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	11710-60010	1	CONVERTER-AMPLIFIER BOARD ASSEMBLY	28480	11710-60010
A1C1	0160-4084	3	CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1C2	0180-1746	1	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X902082
A1C3	0160-0127	2	CAPACITOR-FXD 1UF +-20% 25WVDC CER	28480	0160-0127
A1C4	0160-3879	1	CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A1C5	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1C6	0180-0228	3	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A1C7	0160-0547	1	CAPACITOR-FXD .04UF +-20% 1000WVAC CER	28480	0160-0547
A1C8	0160-4084		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-4084
A1C9	0180-0228		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A1C10	0180-0491	2	CAPACITOR-FXD 10UF+-20% 25VDC TA	0044K	T368-B-106-M-025-AS
A1C11	0160-0127		CAPACITOR-FXD 1UF +-20% 25WVDC CER	28480	0160-0127
A1C12	0180-0491		CAPACITOR-FXD 10UF+-20% 25VDC TA	0044K	T368-B-106-M-025-AS
A1C13	0160-0572	1	CAPACITOR-FXD 2200PF +-20% 100WVDC CER	28480	0160-0572
A1C14	0160-0155	2	CAPACITOR-FXD 3300PF +-10% 200WVDC POLYE	56289	292P33292
A1C15	0160-0160	1	CAPACITOR-FXD 8200PF +-10% 200WVDC POLYE	56289	292P82292
A1C16	0160-0155		CAPACITOR-FXD 3300PF +-10% 200WVDC POLYE	56289	292P33292
A1J1	1250-0835	2	CONNECTOR-RF SMC M PC 50-OHM	98291	50-051-0000
A1J2	1250-0835		CONNECTOR-RF SMC M PC 50-OHM	98291	50-051-0000
A1L1	9140-0114	1	COIL-MLD 10UH 10% Q=55 .155DX.375LG	99800	1537-36
A1L2	9100-1621	2	COIL-MLD 18UH 10% Q=75 .155DX.375LG	24226	15/182
A1L3	9100-1621		COIL-MLD 18UH 10% Q=75 .155DX.375LG	24226	15/182
A1Q1	1853-0050	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0050
A1Q2	1854-0022	2	TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
	1205-0011	1	HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
A1R1	0757-1060	1	RESISTOR 196 1% .5W F TC=0+-100	19701	MF7C1/2-T0-196R-F
A1R2	0698-7260	3	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A1R3	0698-7236	1	RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A1R4	0698-7260		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A1R5	2100-3054	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3006P-1-503
A1R6	0698-7221	1	RESISTOR 237 1% .05W F TC=0+-100	24546	C3-1/8-T0-237R-G
A1R7	0698-7229	1	RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-G
A1R8	0698-7198	2	RESISTOR 26.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-26R1-G
A1R9	0698-7198		RESISTOR 26.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-26R1-G
A1R10	0698-7260		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A1R11	0698-7234	1	RESISTOR 825 1% .05W F TC=0+-100	24546	C3-1/8-T0-825R-G
A1R12	2100-3109	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	32997	3006P-1-202
A1R13	0698-7205	1	RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-51R1-G
A1R14	0698-7248	1	RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-G
A1R15	0698-7239	1	RESISTOR 1.33K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1331-G
A1R16	0757-0279	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A1R17	0698-3443	1	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A1R18	0757-0416	3	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A1R19	0757-1000	2	RESISTOR 51.1 1% .5W F TC=0+-100	19701	MF7C1/2-T0-51R1-F
A1R20	0757-1000		RESISTOR 51.1 1% .5W F TC=0+-100	19701	MF7C1/2-T0-51R1-F
A1TP1	1251-0600	2	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1TP2	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1U1	1820-0427	1	IC MC 1496 MODULATOR	04713	MC1496G
	1200-0196	1	SOCKET-IC 10-CONT DIP-SLDR-TERMS	91506	8058-1G31
A1VR1	1902-0041	1	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	15818	CD 35622
A1Y1	1813-0063	1	IC XTAL OSC	28480	1813-0063
A2	11710-60002	1	BOARD ASSEMBLY, POWER SUPPLY	28480	11710-60002
A2C1	0150-0024	1	CAPACITOR-FXD .02UF +80-20% 600WVDC CER	71590	DD203-Z5U-+80-20
A2C2	0180-0228		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A2C3	0160-0162	1	CAPACITOR-FXD .022UF +-10% 200WVDC POLYE	56289	292P22392
A2C4	0180-0116	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	1500685X9035B2
A2C5	0180-1819	1	CAPACITOR-FXD 100UF+75-10% 50VDC AL	56289	30D107G050DH2
A2CR1	1901-0159	4	DIODE-PWR RECT 400V 750MA DO-41	04713	SR1358-4
A2CR2	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	04713	SR1358-4
A2CR3	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	04713	SR1358-4
A2CR4	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	04713	SR1358-4
A2CR5	1901-0025	2	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A2CR6	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A2F1	2110-0012	1	FUSE .5A 250V FAST-BLO 1.25X.25 UL IEC	75915	312.500
	2110-0269	1	FUSEHOLDER-CLIP TYPE .25FUSE	28480	2110-0269

Table 3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2Q1	1853-0012	1	TRANSISTOR PNP 2N2904A SI TO-5 PD=600MW	01295	2N2904A
A2Q2	1854-0022		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
A2Q3	1854-0071	3	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A2Q4	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A2Q5	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A2Q6	1884-0012	1	THYRISTOR-SCR JEDEC 2N3528	02735	2N3528
A2R1	0698-3348	1	RESISTOR 4.64K 1% .5W F TC=0+-100	91637	MFF-1/2-10
A2R2	0757-0278	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A2R3	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2R4	0757-0839	1	RESISTOR 10K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-1002-F
A2R5	0811-1666	1	RESISTOR 1 5% 2W PW TC=0+-800	75042	BWH2-1R0-J
A2R6	0757-0817	1	RESISTOR 750 1% .5W F TC=0+-100	19701	MF7C1/2-T0-751-F
A2R7	0698-0083	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A2R8	0698-3440	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A2R9	2100-1758	1	RESISTOR-TRMR 1K 5% WW SIDE-ADJ 1-TURN	GB027	CT-106-4
A2R10	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A2R11	0757-1094	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A2R12	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A2VR1	1902-3036	1	DIODE-ZNR 3.16V 5% DO-7 PD=.4W TC=-.064%	04713	SZ 10939-38
A2VR2	1902-0761	1	DIODE-ZNR 1N821 6.2V 5% DO-7 PD=.25W	04713	1N821
A2VR3	1902-0202	1	DIODE-ZNR 15V 5% DO-15 PD=1W TC=+.057%	28480	1902-0202
A3	0960-0443	1	POWER MODULE ASSEMBLY	28480	0960-0443
A3J1			NSR, P/O A3		
A3P1	5020-8257	1	LINE VOLTAGE SELECTION CARD	28480	5020-8257
			CHASSIS COMPONENTS		
C1	0180-2181	1	CAPACITOR-FXD 1300UF+75-10% 50VDC AL	56289	36D132G050AA2A
CR1	1901-0033	2	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
CR2	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
F1	2110-0004	1	FUSE .25A 250V FAST-BLO 1.25X.25 UL IEC (FOR 100/120V OPERATION)	75915	312.250
F1	2110-0479	1	FUSE .175A 250V FAST-BLO 1.25X.25 UL (FOR 220/240V OPERATION)	75915	312.175
J1			NSR, P/O W3		
J2			NSR, P/O W5		
K1	3106-0009	2	SWITCH, COAXIAL SPDT	74868	315-10053-2
K2	3106-0009		SWITCH, COAXIAL SPDT	74868	315-10053-2
MP1	0340-0486	1	INSULATOR-COVER TO- 3 .33-THK	0011J	A22-2003
MP2	5060-5914	1	BOARD ASSEMBLY, EXTENDER	28480	5060-5914
MP3	11710-00003	1	DECK, MAIN	28480	11710-00003
MP4	11710-00005	1	EXTENDER BOARD BRACKET	28480	11710-00005
MP5	0590-0505	1	NUT, KNURLED 5/8-24 UNEF-2B THREAD	73743	TD-801
MP6	1210-0013	1	CLAMP-CAP 1.375-DIA STL (FOR C1)	56289	4586-97A
MP7	5020-0700	1	SPACER;CABINET	28480	5020-0700
MP8	11710-20006	1	ADHESIVE, INSULATOR (BOTTOM COVER)	28480	11710-20006
Q1	1854-0063	1	TRANSISTOR NPN 2N3055 SI TO-3 PD=115W	28480	1854-0064
	1200-0043	1	INSULATOR-XSTR ALUMINUM	76530	322047
R1	0698-3449	1	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
S1	3100-3389	1	SWITCH-RTRY SPDT-NS .812-CTR-SPCG	28480	3100-3389
S2	3101-1395	1	SWITCH-PB DPDT-DB ALTNG 10.5A 250VAC	00501	53-67280-121/A1H
T1	9100-3915	1	TRANSFORMER, POWER	28480	9100-3915
W1	11710-60004	1	CABLE ASSEMBLY, COAX SWITCH TO MIXER	28480	11710-60004
W2	11710-60003	1	CABLE ASSEMBLY, FILTER TO COAX SWITCH	28480	11710-60003
W3	11710-20003	1	CABLE, RF,IN	28480	11710-20003
W4	11710-20005	1	CABLE, RF INTERCONNECT	28480	11710-20005
W5	11710-20004	1	CABLE, RF OUT	28480	11710-20004
W6	8120-1378	1	CABLE ASSY 18AWG 3-CNDCT JGK-JKT .25-OD	28480	8120-1378
W7	11710-60007	1	CABLE ASSEMBLY, PRIMARY WIRING	28480	11710-60007
XA1	1251-0198	1	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	71785	251-06-30-261
XA2	1251-0159	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	251-15-30-261

Table 4. Code List of Manufacturers

Mfr Code	Manufacturer Name	Address	Zip Code
08027	NEOHM	ENGLAND	
0011J	JERMYN INDUSTRIES		
0044K	KEMET		
00501	ILLUMINATED PRODUCTS INC	ANAHEIM CA	92803
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS TX	75231
02735	RCA CORP SOLID STATE DIV	SOMMERVILLE NJ	08876
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	85008
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW CA	94040
15818	TELEDYNE SEMICONDUCTOR	MOUNTAIN VIEW CA	94040
19701	MEPCO/ELECTRA CORP	MINERAL WELLS TX	76067
20226	GOWANDA ELECTRONICS CORP	GOWANDA NY	14070
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD PA	16701
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE CA	92507
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
71590	CENTRALAB ELEK DIV GLOBE-UNION INC	MILWAUKEE WI	53201
71785	TRW ELEK COMPONENTS CINCH DIV	ELK GROVE VILLAGE IL	60007
73743	FISCHER SPECIAL MFG CO	CINCINNATI OH	45206
74868	NO M/F DESCRIPTION FOR THIS MFG NUMBER		
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA PA	19108
75915	LITTELFUSE INC	DES PLAINES IL	60016
76530	TRW ELEK CMPNT CINCH-MONADNOCK DIV	CITY OF INDUSTRY CA	91747
91506	AUGAT INC	ATTLEBORO MA	02703
91637	DALE ELECTRONICS INC	COLUMBUS NE	68601
98291	SEALECTRO CORP	MAMARONECK NY	10544
99800	AMER PRCN IND INC DELEVAN DIV	AURORA NY	14052



Index Number	Part Number	Description	Quantity
1	5000-8559	SIDE COVER	2
2	5060-0700	FRAME ASSEMBLY	2
3	1490-0031	STAND TILT	1
4	5060-8555	TOP COVER	1
5	11710-00002	PANEL REAR	1
6	5060-0727	FOOT ASSEMBLY	2
7	5000-8571	BOTTOM COVER	1
8	5040-0700	HINGE	2
9	11710-00001	PANEL:FRONT	1

Figure 8. 11710A Cabinet Parts

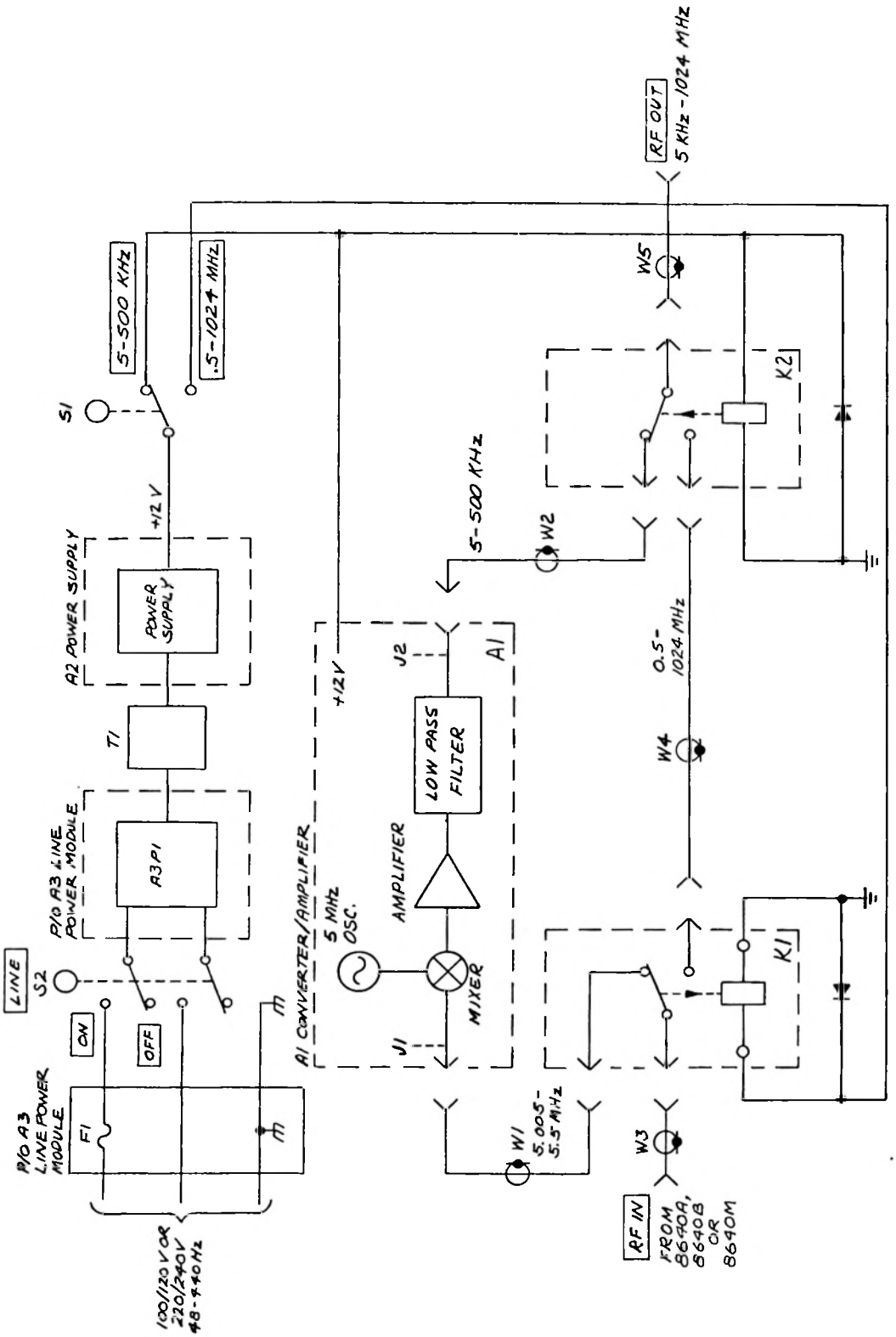


Figure 9. Down Converter – Block Diagram

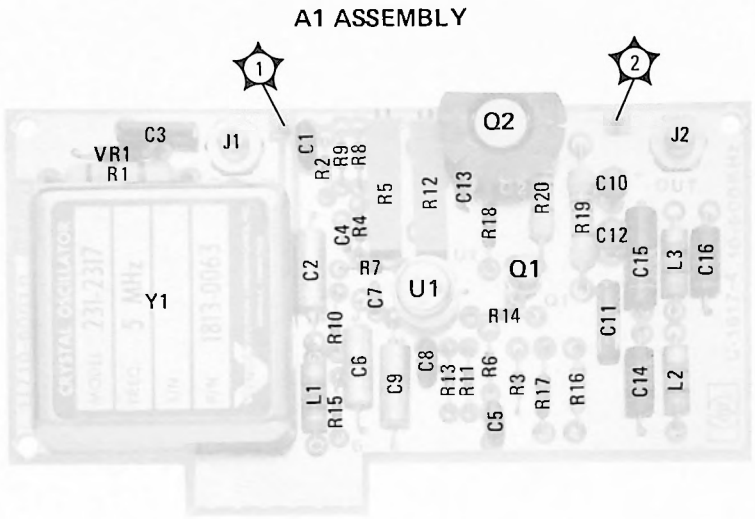
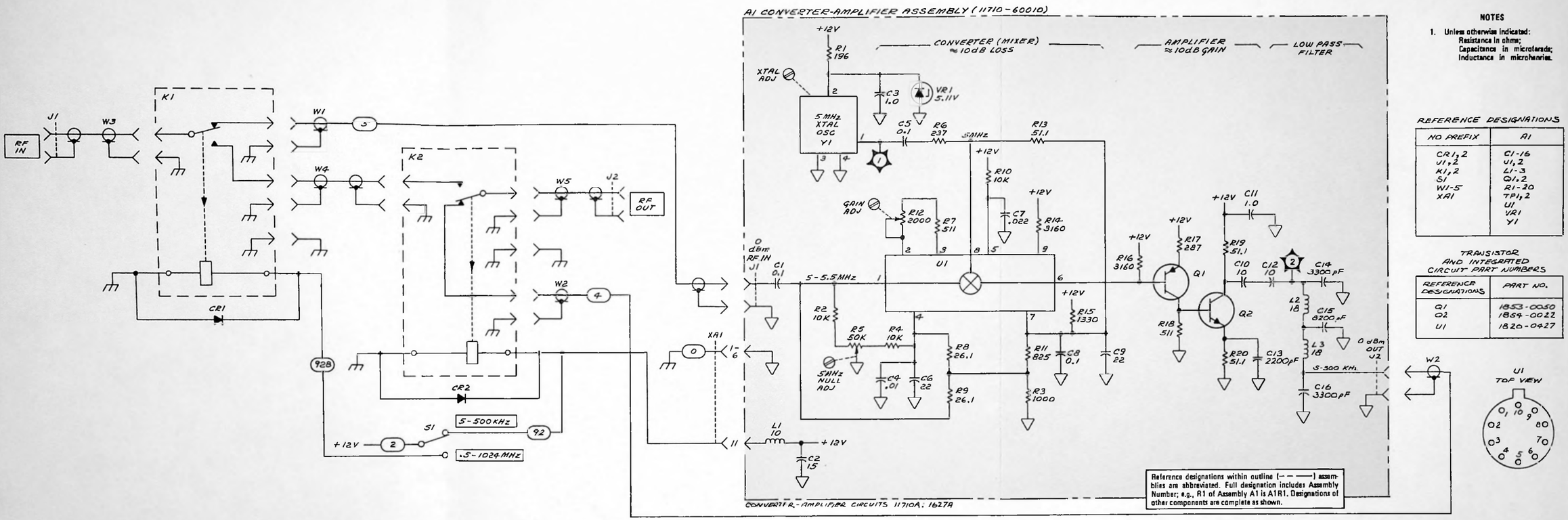


Figure 10. Converter-Amplifier A1 Component Locations



NOTES

1. Unless otherwise indicated:
   Resistance in ohms;
   Capacitance in microfarads;
   Inductance in microhenries.

REFERENCE DESIGNATIONS

NO PREFIX	A1
CR1,2 U1,2 K1,2 S1 W1-5 XA1	C1-16 U1,2 L1-3 Q1,2 R1-20 TP1,2 U1 VR1 Y1

TRANSISTOR AND INTEGRATED CIRCUIT PART NUMBERS

REFERENCE DESIGNATIONS	PART NO.
Q1	1853-0050
Q2	1854-0022
U1	1820-0427

Figure 11. Converter-Amplifier A1 Schematic Diagram

A2 ASSEMBLY

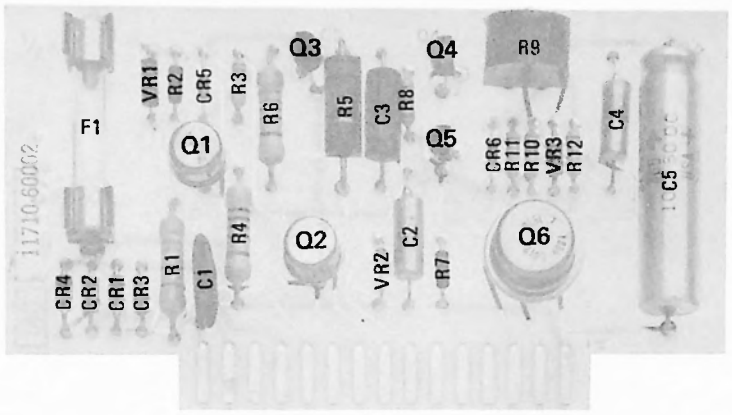
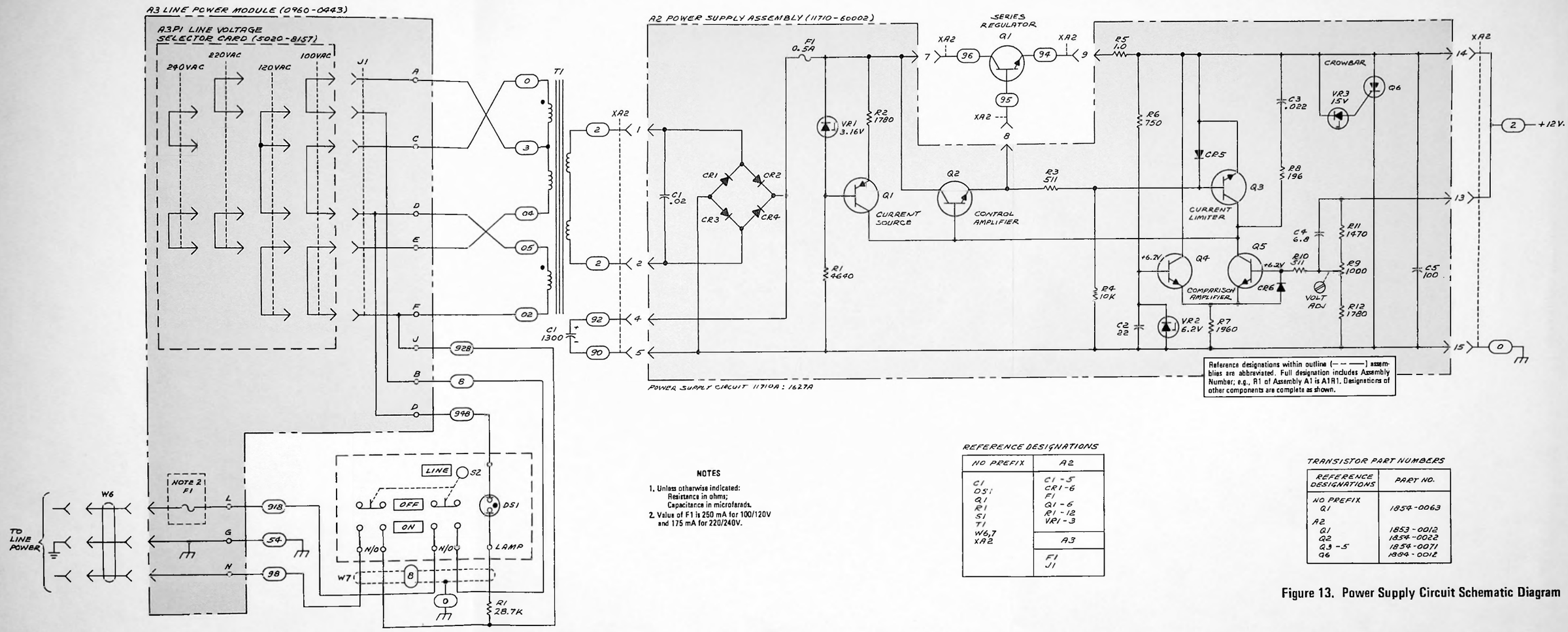


Figure 12. Power Supply A2 Component Locations



POWER SUPPLY CIRCUIT 11710A : 1627A

NOTES

1. Unless otherwise indicated:
   Resistance in ohms;
   Capacitance in microfarads.
2. Value of F1 is 250 mA for 100/120V and 175 mA for 220/240V.

REFERENCE DESIGNATIONS

NO PREFIX	A2
C1 DS1 Q1 R1 S1 T1 W6,7 XA2	C1-5 CR1-6 F1 Q1-6 R1-12 VR1-3
	A3
	F1 J1

TRANSISTOR PART NUMBERS

REFERENCE DESIGNATIONS	PART NO.
NO PREFIX Q1	1854-0063
A2 Q1 Q2 Q3-5 Q6	1853-0012 1854-0022 1854-0071 1884-0012

Figure 13. Power Supply Circuit Schematic Diagram

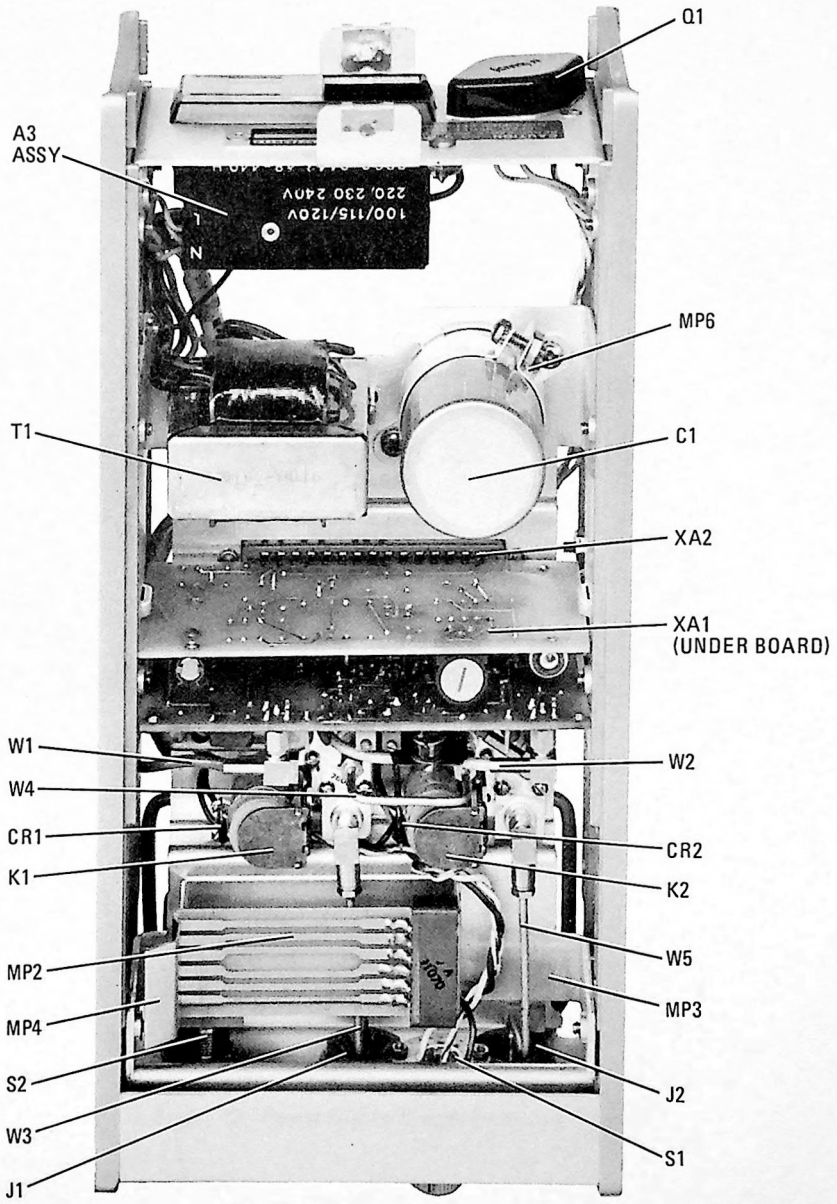


Figure 14. Down-Converter Top Internal View

11710A

HEWLETT hp PACKARD

HP Part No. 11710-90002

Printed in U.S.A.

MANUAL IDENTIFICATION
Model Number: 11710A
Date Printed: October 1976
Part Number: 11710-90002

DOWN CONVERTER

This supplement contains important information for correcting manual errors and for adapting the manual to instruments containing improvements made after the printing of the manual.

To use this supplement:

Make all ERRATA corrections

Make all appropriate serial number related changes indicated in the tables below.

Serial Prefix or Number	Make Manual Changes
►1734A, 1804A	1

Serial Prefix or Number	Make Manual Changes

► NEW ITEM

ERRATA

►Page 1, Table 1:
Under **General Characteristics** replace Power Requirements with the following:
Power Requirements: 100 or 120 volts (+5%,—10%) from 48 to 440 Hz; or 220 or 240 volts (+5%, —10%) from 48 to 66 Hz. 25 V·A maximum.

►Page 2, paragraph 19:
Change the first sentence to read:
The 11710A Down Converter requires a power source with an output of 100 or 120 volts (+5%, —10%) from 48 to 440 Hz; or 220 or 240 volts (+5%, —10%) from 48 to 66 Hz single phase.

►Page 3, Figure 2:
Add the following after the third sentence:

WARNING

To avoid the possibility of hazardous electrical shock, do not operate this instrument at line voltages greater than 126.5 Vac with line frequencies greater than 66 Hz (leakage currents at these line settings may exceed 3.5 mA).

Page 11, Table 3:
A1Q1. For recommended replacement see Change 1.

NOTE

Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

January 16, 1978
2 Pages

HEWLETT hp PACKARD

Printed in U.S.A.

ERRATA (Cont'd)

►Page 12, Table 3:
Add MP9 7120-7032 LABEL, WARNING.

CHANGE 1

Page 11, Table 3:
Change A1Q1 to 1853-0451 TRANSISTOR PNP 2N3799 SI TO-18 PD = 360 MW.

Page 15, Figure 11:
Change the part number for A1Q1 to 1853-0451.