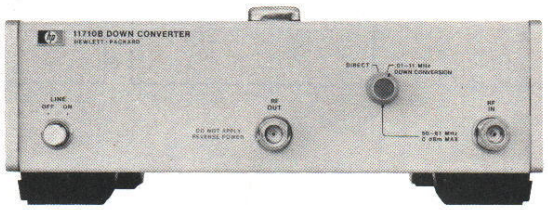
OPERATING AND SERVICE MANUAL

11710B
DOWN CONVERTER



HEWLETT
PACKARD

MANUAL CHANGES

DOWN CONVERTER

MANUAL IDENTIFICATION
Model Number: 11710B
Date Printed: Aug. 1977
Part Number: 11710-90005

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

To use this supplement, first, make all ERRATA corrections and then all appropriate serial number related changes indicated in the tables below.

SERIAL PREFIX OR NUMBER	MAKE MANUAL CHANGES
1848A	1
1925A	1-2
2050A	1-3
2322A	1-4

SERIAL PREFIX OR NUMBER	MAKE MANUAL CHANGES

>> NEW ITEM

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.

Printed in U.S.A.

HEWLETT PACKARD

02 October 1987
3 Pages Text
2 Pages Illustrations

ERRATA

Title Page:
Under SERIAL NUMBERS, change the first sentence to read:
This manual applies directly to instruments with serial prefixes 1701A and 1803A.

Page 2, Table 1:
Under GENERAL, 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 3, Power Requirements:
Change the first sentence to read:
The 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 4, Figure 2:
In the top, right-hand portion of the figure, delete the following:
PC BOARD, A5TB1 HP 5020-8157.
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:
Change C8, C10, C12 and C13, to 0180-2617 CAPACITOR-FXD 6.8 UF ±10% 35 VDC TA.
A2CR1, CR2, CR3, and CR4: Upon failure, replace these parts with the new parts listed in Change 3.

>> Page 12, Table 3:
Add A2R13 8159-0005 CD0 RESISTOR-ZERO OHMS 22 AWG LEAD DIA 28480 8159-0005.

>> Page 12, Table 3:
Change MP1 to 0340-1119 CD6 INSULATOR COVER TO-3.

Page 13, Table 3:
Add MP35 7120-7032 LABEL, WARNING.
Delete A5TB1 5020-8157 1 LINE VOLTAGE SELECTOR BOARD 28480 5020-8157.

Page 14, Table 3:
Under W9 add 0362-0265 (CD7) CONNECTOR-SGL CONT SKT 1.14-MM-BSC-SZ.

Page 19, Figure 13:
Reverse the two pin numbers at the inputs of A3A1U3C.
Reverse the direction of the relay arrows on both K1 and K2.
Replace the appropriate section of the schematic around S1 with the attached partial schematic labeled P/O Figure 13. (P/O ERRATA).

CHANGE 1

Page 14, Table 3:
Change R1 to 0698-3162 CD0 RESISTOR 46.4K 1% .125W F TC=0±100.
Page 21, Service Sheet 2 (schematic):
Change R1 to 46.4k.

CHANGE 2

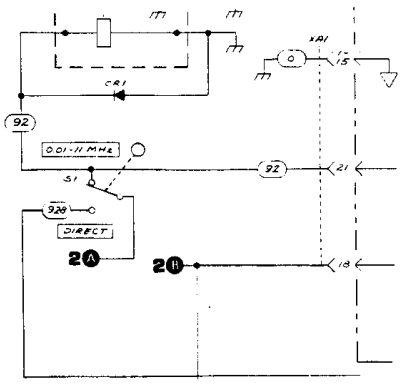
Page 11, Table 3:
Change A1C9 to 0180-2133 CD6 CAPACITOR-FXD .18 UF ±10% 35 VDC TA.
Page 19/20, Service Sheet 1 (schematic):
Change A1C9 TO 0.18 uF.

CHANGE 3

Page 11, Table 3:
Change A2CR1, CR2, CR3, and CR4 to 1901-0328 CD8 DIODE-PWR RECT 400V 1A 6US 01973 A14D.

CHANGE 4

Page 12, Table 3:
Replace A2Q6 with 1884-0244 CD9 THYRISTOR-SCR VRRM=400, and 1205-0361 CD3 HEAT SINK SGL TO-5/TO-39-CS.



P/O Figure 13. Converter-Amplifier and Time Base Divider Schematic Diagram. (P/O ERRATA).

HEWLETT PACKARD

OPERATING AND SERVICE MANUAL

11710B
DOWN CONVERTER

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 1701A.

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

E. 24001 MISSION AVE., TAF C-34, SPOKANE, WASHINGTON, U.S.A. 99220

MANUAL PART NO. 11710-90005
Microfiche Part No. 11710-90006

PRINTED: AUGUST 1977

MODEL 11710B

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

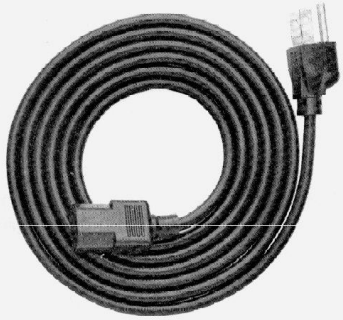


Figure 1. HP Model 11710B Down Converter and Accessory Supplied

GENERAL INFORMATION

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

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 10 x 15 cm (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.

Specifications

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

Safety Considerations

The HP Model 11710B is a Safety Class I instrument (provided with a protective earth terminal). This instrument and all related documentation must be reviewed for familiarization with safety markings and instructions before operation. Safety information pertinent to the task at hand (installation, operation, performance testing, adjustments, or service) is found throughout this manual.

Instruments Covered By Manual

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 together with the prefix letter, 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.

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

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

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

Description

The Hewlett-Packard Model 11710B Down Converter is designed for use with the HP Model 8654 and 8640 series Signal Generators. Frequency inputs in the range of 50.01 to 61 MHz are down-converted to the 10 kHz to 11 MHz range by the Down Converter and the modulation and output level calibration of the signal generator are retained. A straight-through selection feature allows the input to be passed unconverted through the Down Converter. In addition, a selectable 1 or 5 MHz time base output can be used as an external reference signal.

Option 001

The Option 001 Combining Kit consists of two combining rails and a semi-rigid coaxial cable with type N connectors. It is designed to securely attach the Down Converter to an HP Model 8654A or 8654B Signal Generator, making a single, portable package.

Equipment Available

Accessories and equipment may be ordered or information about them may be obtained by contacting your nearest Hewlett-Packard office. Refer to the HP model number.

RF Signal Source 10–520 MHz. The 8654 series signal generators are RF signal sources suitable for down conversion using the Down Converter. The 8654A provides FM and calibrated AM. The 8654B provides both calibrated FM and AM. Digital frequency readout and phase lock of the 8654 series generators are provided by the HP Model 8655A

Table 1. Specifications

INPUT

Down-Converted Mode: 50.01 to 61 MHz at ≤0 dBm
Straight-Through Mode: 0.01 to 1100 MHz (dc coupled)

OUTPUT

Down-Converted
- Frequency Range: 10 kHz to 11 MHz
- Level Range: 0 dBm to −107 dBm
- Level Flatness: RF source flatness ±(0.5 dB referred to 4 MHz)
- Total Level Accuracy: ±(1 dB + input level accuracy)
- Harmonics: > 35 dB below the carrier (dBc)
- Intermixing Spurious: >60 dBc
- 50 MHz Local Oscillator Feedthrough: <−100 dBm

Straight-Through
- Frequency Range: 0.01 to 1100 MHz (dc coupled)
- Loss: < 1 dB

INTERNAL REFERENCE (after 2 h warm-up and calibration at 25°C)

Drift Rate
- Time: < 0.05 ppm/h; < 2 ppm/90 days
- Temperature: ±2 ppm from 15° to 35°C; ±10 ppm from 0° to 55°C
- Line Voltage: ±0.1 ppm (+5% to −10% line voltage change)

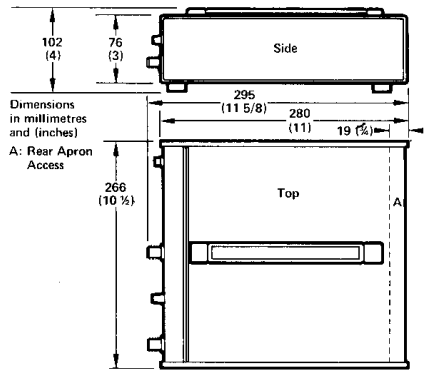
Supplemental Characteristics[1]
- Typical Overall Accuracy (within 3 months of calibration and from 15° to 35°C): ± 2 ppm
- Time Base Output: 1 MHz or 5 MHz selectable, nominally >0.5V peak-to-peak into 500 ohms. This will drive an 8640B or 8655A External Time Base input.

GENERAL

Operating Temperature Range: 0° to 55°C
Power Requirements: 100, 120, 220, 240 volts (+5, −10%); 48 to 440 Hz; 25 V·A maximum

Weight: Net, 3.06 kg (6 pounds, 12 ounces)

Dimensions[2]:



[1] Supplemental Characteristics are intended to provide information useful in applying the instrument by giving typical or nominal, but non-warranted, performance parameters.

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

Synchronizer/Counter. An 8654/8655A/11710B combination will provide phase-locked signals from 10 kHz to 520 MHz with AM, FM, and digital frequency readout. All calibrated signal generator features, including output level, are retained on the down-converted range.

RF Signal Source 500 kHz–512 MHz. The 8640 series signal genrators are RF signal sources covering the range of 500 kHz to 512 MHz (extendable to 1024 MHz) and are suitable for down conversion with the Down Converter. All models provide calibrated AM and FM, and the 8640B and 8640M include digital frequency readout and phase lock. The time base output of the Down Converter is compatible with the external time base input of the 8640B providing maximum output frequency accuracy. All calibrated signal generator features, including output level, are retained on the down-converted range.

External Attenuator. The HP Model 355D Step Attenuator is suitable as an external attenuator for use with the Down Converter. Providing attenuation in 10 dB steps to 120 dB, the 355D allows generation of low level signals which retain the noise and local oscillator feedthrough performance of higher output levels.

Warranty

The Down Converter is warranted and certified as indicated on the inner front cover of this manual. For further information, contact your nearest Hewlett-Packard Sales and Service office; addresses are provided on the inner front cover of this manual.

Recommended Test Equipment

Test equipment required to test and maintain the Down Converter is listed in Table 2. Equipment other than the recommended models can be used provided the minimum specifications are satisfied.

INSTALLATION

Initial Inspection

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.

Power Requirements

The Down Converter requires a power source with an output of 100, 120, 220, or 240V, +5 to −10%, 48 to 440 Hz single phase. Power consumption is typically less than 25 V·A.

Line Voltage Selection

Figure 2 provides instructions for line voltage and fuse selection.

CAUTION

Before the instrument is switched on, it must be set to the voltage of the power source, or damage to the instrument may result.

Table 2. Recommended Test Equipment

Instrument Type	Minimum Specifications	Suggested Model	Use*
Digital Voltmeter	Range: 0 to 15 Vdc Accuracy: ±1%	HP 3476A	A, T
Frequency Reference	Frequency: 100 kHz, 1 MHz, 5 MHz, or 10 MHz Accuracy: $<10^{-7}$ (preferred)	Suitable House Standard	A
Oscilloscope	Frequency Range: > 50 MHz Sweep: ≤0.1 μs/div	HP 1707B	A, T
Signal Generator	Range: 50 to 61 MHz Output: > 0 dBm into 50Ω Drift: < (1 kHz plus 20 ppm)/10 min. Residual FM: <0.5 ppm in 50 Hz to 15 kHz post-detection noise bandwidth	HP 8654A	P, A, T
Spectrum Analyzer	Range: 10 kHz to 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 (10 kHz to 11 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 that are −40 dBm or less Span Width: 0 to 100 MHz	HP 141T/8552B/8553B	P, T

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

Power Cable

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.

Mating Connectors

Mating connectors used with the Down Converter should be either 50 ohm type BNC male or type N male connectors that are compatible with US MIL-C-39012.

Operating Environment

The operating environment should be within the following limits:

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

Bench Operation

The Down Converter cabinet is equipped with plastic feet and foldaway tilt stands for convenience in bench operation. (The plastic feet are shaped to ensure self-aligning of the instruments when stacked). The tilt stands raise the front of the instrument for easier viewing of the control panel.

Rack Mounting

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

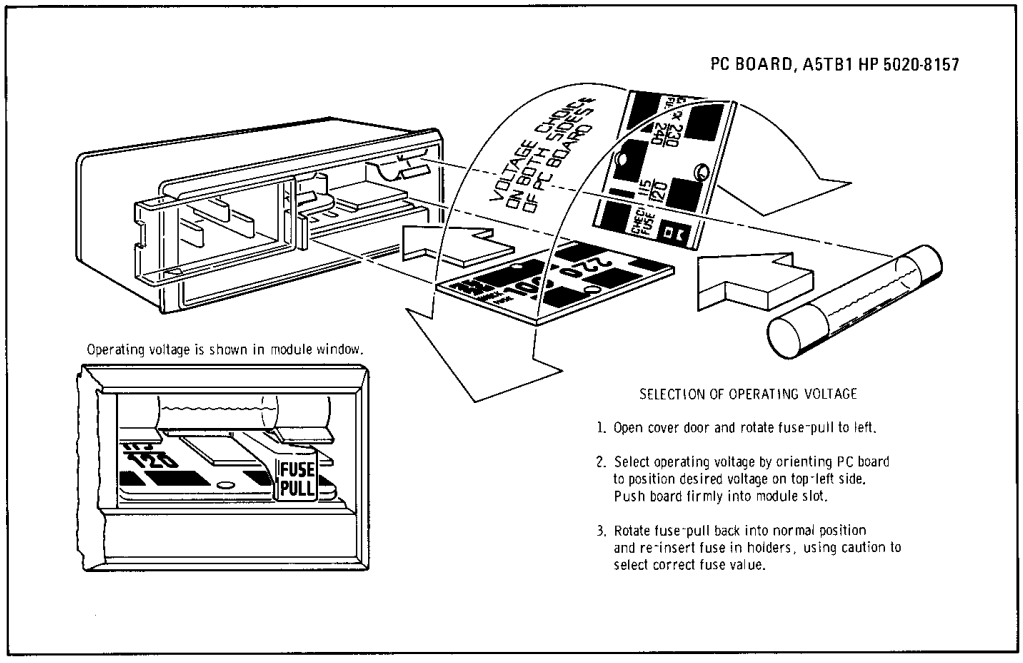


Figure 2. Line Voltage Selection

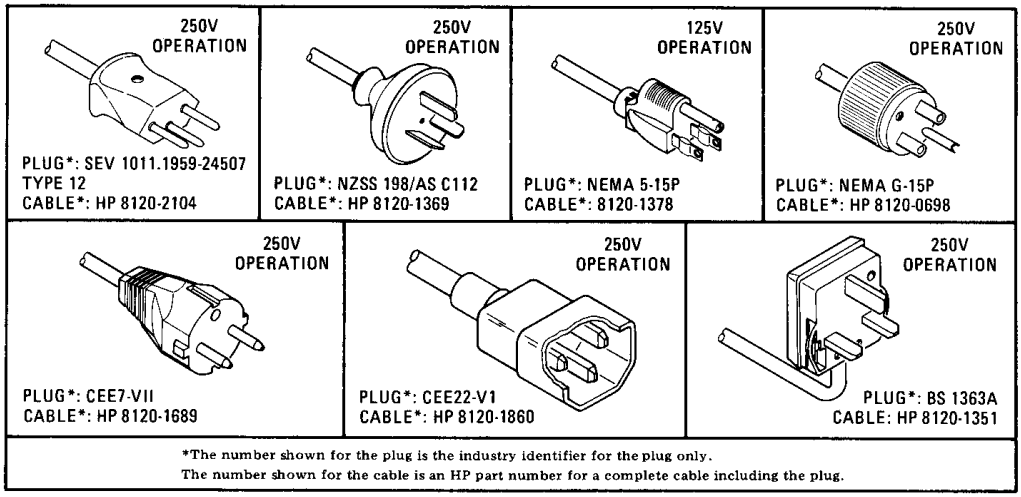


Figure 3. Power Cable HP Part Numbers and Associated Plugs

STORAGE AND SHIPMENT

Environment

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: up to 7630 metres (25 000 feet)

Packaging

Containers and materials identical to those used in factory packaging are best used for repackaging. These containers are available through Hewlett-Packard offices. The following general instructions should be used for repackaging.

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 75 to 100 mm (3 to 4 inches) 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.

OPERATION

WARNING

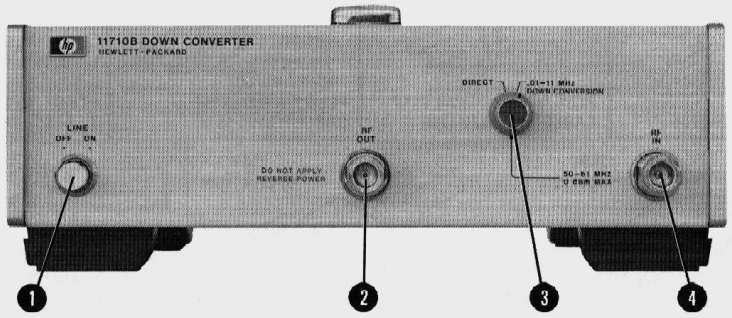
Before the instrument is switched on, all protective earth terminals, extension cords, auto-transformers, and devices connected to it should be connected to a protective earth grounded socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in personal injury.

Panel Features

Controls, connectors, and indicators of the Down Converter are explained in Figure 4. To operate the instrument, proceed as follows:

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

FRONT



REAR

1 LINE Switch. Controls primary power. Lights when instrument is on.

2 RF OUT Connector. Signal output, type N female connector.

CAUTION

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

In the DIRECT 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.

3 DIRECT/DOWN CONVERSION Selector Switch. When set to DIRECT, selects straight-through function. When set to .01—11 MHz DOWN CONVERSION, selects down conversion function. The frequency at the output of the Down Converter is the signal generator's output frequency less 50 MHz.

4 RF IN Connector. Signal input, type N female connector. Refer to cautions under item 2 above.

5 TIME BASE OUT. Output for internal reference oscillator.

6 TIME BASE 5 MHz/1 MHz Selector Switch. Selects 1 or 5 MHz time base output frequency.

7 Line Power Module Assembly. Couples transformer primary to line voltage via power cable. Both the fuse and line voltage selection card are contained behind transparent safety interlock window. For line voltage selection and fuse replacement, refer to Figure 2.

8 Instruction Manual Symbol. For line voltage selection and fuse replacement, refer to Figure 2.

9 Fuse. A 250 mA (fast-blo) fuse is used at 110/120 Vac; 175 mA at 220/240 Vac. Refer to Figure 2.

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

b. Check the Down Converter power fuse for correct rating.

c. Connect the RF IN and OUT connector cables.

CAUTIONS

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

In the DIRECT 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.

e. To pass the signal generator's output straight-through, set the DIRECT/DOWN CONVERSION selector switch to DIRECT. To down convert, set selector switch to .01—11 MHz DOWN CONVERSION, and tune signal generator between 50.01 and 61 MHz. The frequency at the output of the Down Converter is the signal generator's output frequency less 50 MHz.

For improved noise and local oscillator feedthrough performance at low output levels, an external attenuator such as the HP Model 355D can be inserted at the Down Converter's RF OUT jack. Use an RF input level of 0 dBm.

For optimum oscillator stability, the instrument is factory-wired to leave the local oscillator (LO) running at all times. Typically, LO feedthrough is less than —110 dBm in the straight-through mode. To reduce LO feedthrough in this mode, the internal crystal oscillator can be wired to be switched off when the DIRECT/DOWN CONVERSION selector switch is set to DIRECT. However, the crystal will require time to stabilize when the instrument is switched to the DOWN CONVERSION mode, and the time base output is lost in the DIRECT mode. Refer to Instrument Modifications paragraph on page 16.

Operator Maintenance

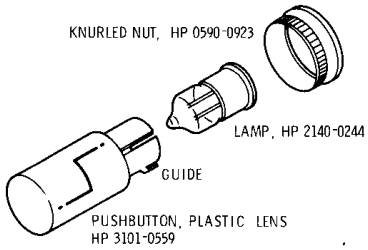
Operator maintenance is limited to replacement of the rear panel fuse and the front panel LINE switch lamp.

Rear Panel Fuse Replacement. The main ac line fuse is located on the rear panel next to the power cable jack. For fuse replacement instructions, refer to Figure 2.

WARNING

Be sure to select the correct fuse rating for the selected line voltage. Do not use repaired fuses or short-circuited fuseholders. To do so could cause a shock or fire hazard. Fuse ratings are listed on the fuse compartment.

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



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 AND ADJUSTMENTS

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

The tests and adjustments are presented in the following order:

a. Performance Test and Adjustments on Down-Converted Signal.

b. Local Oscillator Frequency Adjustment.

c. Power Supply Adjustment.

WARNING

Maintenance described herein is performed with power supplied to the instrument, and 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.

PERFORMANCE TESTS AND ADJUSTMENTS

Performance Tests and Adjustments on Down-Converted Signal

SPECIFICATIONS: Frequency: 10 kHz to 11 MHz
Level Flatness: RF source flatness ±(0.5 dB referred to 4 MHz)
Total Level Accuracy: ± (1 dB + Input Level Accuracy)
Harmonics: > 35 dBc
Intermixing Spurious: > 60 dBc
50 MHz Local Oscillator Feedthrough: <−100 dBm

REFERENCE: Figure 13

DESCRIPTION: In addition to measuring the parameters specified above, an adjustment can be made to the output level if needed. All measurements are made by observing the down-converted output on a spectrum analyzer.

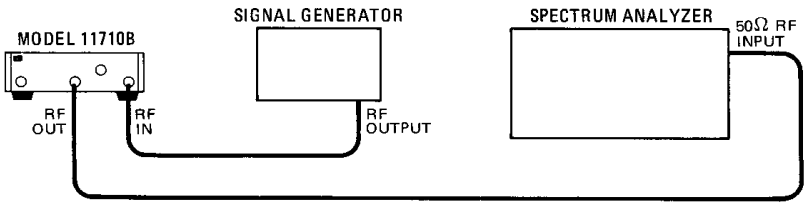


Figure 6. Down-Converted Signal Test Setup

TEST EQUIPMENT:
Signal Generator . . . . . HP 8654A
Spectrum Analyzer . . . . . HP 141T/8552B/8553B

PROCEDURE:

a. Connect equipment as shown in Figure 6. Set Down-Converter selection switch to DIRECT.

b. Set signal generator controls as follows:

Frequency . . . . . 54.0 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 . . . . 54 MHz
Input Attenuation . . . . 40 dB
Linear Sensitivity . . . . 100 mV/division
Display Smoothing . . . . Minimum (Off)

PERFORMANCE TESTS AND ADJUSTMENTS

Performance Tests and Adjustments on Down-Converted Signal (Cont'd)

d. Locate 54 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 0.01—11 MHz. Tune analyzer center frequency to 4 MHz. The 4 MHz 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 50.01 to 61.00 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 4 MHz and ±0.6 divisions of the fifth graticule line over the range to 11 MHz.

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

NOTE

If the Down Converter's flatness appears out of specification limits, check the flatness of the RF source over the range of 50—61 MHz.

Two factory selected components affect output amplifier flatness. For more information, refer to Repair, on page 17.

g. Set spectrum analyzer's vertical reference level to 0 dBm (log). Adjust spectrum analyzer's vertical reference level to bring signal to top graticule line. Tune generator frequency through 50 to 61 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 more than 35 dB below fundamental (dBc).

35 dBc _____

h. Set spectrum analyzer's resolution bandwidth to 3 kHz, frequency tune to 50 MHz, and frequency span to 10 MHz per division. Tune signal generator to 61 MHz. All signals except 11 MHz fundamental and its harmonics should be greater than 60dB below fundamental (dBc).

60 dBc_____

i. Disconnect RF input to Down Converter. Set spectrum analyzer's center frequency to 50 MHz, frequency span to 0.2 MHz per division, and input attenuation to 0 dB. 50 MHz signal level should be less than —100 dBm.

_____ 100 dBm

Local Oscillator Frequency Adjustment

REFERENCE: Figure 13

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.

PERFORMANCE TESTS AND ADJUSTMENTS

Local Oscillator Frequency Adjustment (Cont'd)

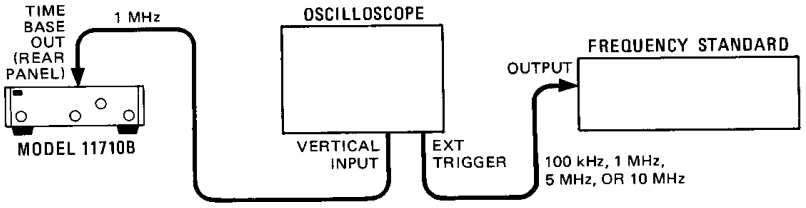


Figure 7. Local Oscillator Frequency Adjustment Test Setup

TEST EQUIPMENT: Oscilloscope . . . . . HP 1707B
Frequency Reference . . . . . HP 5326A

PROCEDURE:

a. Set rear panel TIME BASE selector switch to 1 MHz.

b. Connect equipment as shown in Figure 7. Set oscilloscope to display 1 MHz TIME BASE OUT 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.

Power Supply Adjustment

REFERENCE: Figure 15

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

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

PROCEDURE:

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

b. The voltmeter should read between +11.9 and +12.1 Vdc. If it does not, adjust A2R9, VOLT ADJ, to bring the reading into the above limits.

NOTE

If the power supply voltage is adjusted, the Local Oscillator Frequency Adjustment must be performed.

REPLACEABLE PARTS

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.

Ordering Information

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.

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 3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	11710-60012	1	DOWN CONVERTER BOARD ASSEMBLY	28480	11710-60012
A1C1	0160-4084	2	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1C2	0180-2619	5	CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	196D226X9015KA1
A1C3	0160-0127	1	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A1C4	0140-0197	2	CAPACITOR-FXD 180PF +-5% 300VDC MICA0+70	72136	DM15F181J0300WV1CR
A1C5	0160-3451	4	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-3451
A1C6	0160-2208	1	CAPACITOR-FXD 330PF +-5% 300VDC MICA0+70	28480	0160-2208
A1C7	0140-0197		CAPACITOR-FXD 180PF +-5% 300VDC MICA0+70	72136	DM15F181J0300WV1CR
A1C8	0180-2619		CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	196D226X9015KA1
A1C9	0180-1735	1	CAPACITOR-FXD .22UF+-10% 35VDC TA	0420J	150D224X9035A2
A1C10	0180-2619		CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	196D226X9015KA1
A1C11	0140-0200	1	CAPACITOR-FXD 390PF +-5% 300VDC MICA0+70	72136	DM15F391J0300WV1CR
A1C12	0180-2619		CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	196D226X9015KA1
A1C13	0180-2619		CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	196D226X9015KA1
A1C14	0160-3451		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-3451
A1C15	0160-3451		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-3451
A1E1	0955-0095	1	MIXER, DOUBLE BALANCED SRA-1	28480	0955-0095
A1J1	1250-0835	3	CONNECTOR-RF SMC M PC 50-OHM	0331F	37JR104-2
A1J2	1250-0835		CONNECTOR-RF SMC M PC 50-OHM	0331F	37JR104-2
A1J3	1250-0835		CONNECTOR-RF SMC M PC 50-OHM	0331F	37JR104-2
A1L1	9140-0114	2	COIL-MLD 10UH 10% Q=55 .155DX.375LG	0217B	15-4445-2K
A1L2	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	0217B	15-4445-2K
A1L3	9100-2257	2	COIL-MLD 820NH 10% Q=32 .095DX.25LG	0217B	09-4426-5K
A1L4	9100-2257		COIL-MLD 820NH 10% Q=32 .095DX.25LG	0217B	09-4426-5K
A1MP1	7100-0647	1	CAN, RECTANGULAR	28480	7100-0647
A1MP2	1251-3172	1	CONNECTOR, SINGLE CONTACT (FOR E1)	0136J	2-331677-9
A1Q1	1854-0019	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A1Q2	1854-0013	1	TRANSISTOR NPN 2N2218A SI TO-5 PD=800MW	0203G	2N2218A
	1200-0173	2	INSULATOR-XSTR DAP-GL	28480	1200-0173
A1Q3	1855-0081	1	TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169M	2N5245
	1200-0173		INSULATOR-XSTR DAP-GL	28480	1200-0173
A1Q4	1854-0247	1	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A1R1	0757-0180	2	RESISTOR 31.6 1% .125W F TC=0+-100	01609	CC
A1R2	0698-3431	1	RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A1R3	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	01609	CC
A1R4	0698-3444	1	RESISTOR 316 1% .125W F TC=0+-100	0329B	C4-1/8-T0-316R-F
A1R5	0757-0465	1	RESISTOR 100K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1003-F
A1R6	0757-0458	2	RESISTOR 51.1K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-5112-F
A1R7	0698-0083	2	RESISTOR 1.96K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1961-F
A1R8	2100-2583	1	RESISTOR-TRMR 10 20% C SIDE-ADJ 1-TRN	0365A	ET50X100
A1R9	0757-0394	2	RESISTOR 51.1 1% .125W F TC=0+-100	0329B	C4-1/8-T0-51R1-F
A1R10	0757-0399	1	RESISTOR 82.5 1% .125W F TC=0+-100	0329B	C4-1/8-T0-82R5-F
A1R11	0698-3439	1	RESISTOR 178 1% .125W F TC=0+-100	0329B	C4-1/8-T0-178R-F
A1R12	0757-0346	1	RESISTOR 10 1% .125W F TC=0+-100	0329B	C4-1/8-T0-10R0-F
A1R13	0698-3442	1	RESISTOR 237 1% .125W F TC=0+-100	0329B	C4-1/8-T0-237R-F
A1R14	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	0329B	C4-1/8-T0-51R1-F
A1R15	0698-3432	1	RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A1R16	0698-3438	1	RESISTOR 147 1% .125W F TC=0+-100	0329B	C4-1/8-T0-147R-F
A1R17	0698-3440	2	RESISTOR 196 1% .125W F TC=0+-100	0329B	C4-1/8-T0-196R-F
A1R18			NOT ASSIGNED		
A1R19	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-5112-F
A1R20	0698-3445	1	RESISTOR 348 1% .125W F TC=0+-100	0329B	C4-1/8-T0-348R-F
A1TP1	1251-0600	1	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1Y1	1813-0090	1	CRYSTAL OSCILLATOR	28480	1813-0090
A2	11710-60002	1	POWER SUPPLY BOARD ASSEMBLY	28480	11710-60002
A2C1	0150-0024	1	CAPACITOR-FXD .02UF +80-20% 600VDC CER	28480	0150-0024
A2C2	0180-0226	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	150D226X9015B2
A2C3	0160-0162	1	CAPACITOR-FXD .022UF +-10% 200VDC POLYE	0420J	292P22392
A2C4	0180-0116	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	0420J	150D685X9035B2
A2C5	0180-1819	1	CAPACITOR-FXD 100UF+75-10% 50VDC AL	0420J	30D107G050DD2
A2CR1	1901-0159	4	DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A2CR2	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A2CR3	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A2CR4	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	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	0470C	312.500

Table 3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2MP1	2110-0269	2	FUSEHOLDER-CLIP TYPE .250-FUSE	28480	2110-0269
A2MP2	11710-00004	1	LABEL, I.D.	28480	11710-00004
A2Q1	1853-0012	1	TRANSISTOR PNP 2N2904A SI TO-39 PD=600MW	0169M	2N2904A
A2Q2	1854-0022	1	TRANSISTOR NPN SI TO-39 PD=700MW	02213	817843
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 2N3528 TO-8 VRRM=200	0192A	2N3528
A2R1	0698-3348	1	RESISTOR 4.64K 1% .5W F TC=0+-100	05520	CMF-65-2
A2R2	0757-0278	2	RESISTOR 1.78K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1781-F
A2R3	0757-0416	3	RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A2R4	0757-0839	1	RESISTOR 10K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-1002-F
A2R5	0811-1666	1	RESISTOR 1 5% 2W PW TC=0+-800	04678	BWH2-1R0-J
A2R6	0757-0817	1	RESISTOR 750 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-751-F
A2R7	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A2R8	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A2R9	2100-1758	1	RESISTOR-TRMR 1K 5% 4W SIDE-ADJ 1-TRN	03740	3345W-W50-102
A2R10	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A2R11	0757-1094	1	RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A2R12	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1781-F
A2VR1	1902-3036	1	DIODE-ZNR 3.16V 5% DO-7 PD=.4W TC=-.064%	02036	BZ 10939-36
A2VR2	1902-0761	1	DIODE-ZNR 1N821 6.2V 5% DO-7 PD=.25W	02036	1N821
A2VR3	1902-0202	1	DIODE-ZNR 15V 5% DO-15 PD=1W TC=+.057%	28480	1902-0202
A3	11710-60009	1	50 MHZ DIVIDER ASSEMBLY	28480	11710-60009
A3C1	0160-4082	2	CAPACITOR-FDTHRU 1000PF 20% 200V CER	28480	0160-4082
A3C2	0160-4082		CAPACITOR-FDTHRU 1000PF 20% 200V CER	28480	0160-4082
A3J1	1250-0829	2	CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	0576I	50-045-4610
	2190-0124	4	WASHER-LK INTL T NO. 10 .195-IN-ID	0331F	LW101-30
A3J2	1250-0829		CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	0576I	50-045-4610
	2190-0124		WASHER-LK INTL T NO. 10 .195-IN-ID	0331F	LW101-30
A3MP1	11710-20009	1	HOUSING, 50 MHZ DIVIDER	28480	11710-20009
A3MP2	2200-0103		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A3A1	11710-60013	1	DIVIDER BOARD ASSEMBLY	28480	11710-60013
A3A1C1	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A1C2	0180-2206	1	CAPACITOR-FXD 60UF+-10% 6VDC TA	04201	150D606X9006B2
A3A1C3	0160-3451		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-3451
A3A1Q1	1854-0039	1	TRANSISTOR NPN 2N3053B SI TO-39 PD=1W	02036	2N3053
	0340-0834	1	INSULATOR-XSTR POLYI	28480	0340-0834
	1205-0011	1	HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
A3A1R1	0757-0417	1	RESISTOR 562 1% .125W F TC=0+-100	03298	C4-1/8-T0-562R-F
A3A1R2	0698-3434	1	RESISTOR 34.8 1% .125W F TC=0+-100	03298	C4-1/8-T0-34R8-F
A3A1R3	0757-0436	2	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A3A1R4	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A3A1R5	0757-0274	1	RESISTOR 1.21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A3A1R6	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A3A1U1	1820-0751	1	IC CNTR TTL DECD ASYNCHRO NEG-EDGE-TRIG	0169M	SN74196N
A3A1U2	1820-1251	1	IC CNTR TTL LS DECD ASYNCHRO	0169M	SN74LS196N
A3A1U3	1820-1197	1	IC GATE TTL LS NAND QUAD 2-INP	0169M	SN74LS00N
A3A1VR1	1902-3104	1	DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.016%	02036	BZ 10939-110
A4	11710-60008	1	12 MHZ LOW PASS FILTER ASSEMBLY	28480	11710-60008
A4MP1	11710-80001	1	COVER, BOTTOM	28480	11710-80001
A4MP2	11710-80002	1	CAN, LPF	28480	11710-80002
A4MP3	11710-00010	1	LABEL, 12 MHZ LPF	28480	11710-00010
A4MP4	2190-0124		WASHER-LK INTL T NO. 10 .195-IN-ID (FOR J1, J2)	0331F	LW101-30
A4MP5	2950-0078	2	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK (FOR J1, J2)	0331F	MN100-11
A4MP6	11710-00011	1	PC INSULATOR	28480	11710-00011
A4A1	11710-60014	1	LOW PASS FILTER BOARD ASSEMBLY	28480	11710-60014
A4A1C1	0140-0194	2	CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A4A1C2	0160-0939	2	CAPACITOR-FXD 430PF +-5% 300VDC MICA0+70	28480	0160-0939
A4A1C3	0160-0939		CAPACITOR-FXD 430PF +-5% 300VDC MICA0+70	28480	0160-0939
A4A1C4	0140-0194		CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A4A1J1	1250-1220	2	CONNECTOR-RF SMC M PC 50-OHM	0576I	50-051-0109
A4A1J2	1250-1220		CONNECTOR-RF SMC M PC 50-OHM	0576I	50-051-0109

Table 3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A1L1	9140-0141	2	COIL-MLD 680NH 10% Q=33 .095DX.25LG	02178	09-4426-4K
A4A1L2	9140-0158	1	COIL-MLD 1UH 10% Q=32 .095DX.25LG	02178	09-4426-6K
A4A1L3	9140-0141		COIL-MLD 680NH 10% Q=33 .095DX.25LG	02178	09-4426-4K
A5	0960-0443	1	LINE POWER MODULE ASSEMBLY	28480	0960-0443
A5T81	5020-8157	1	LINE VOLTAGE SELECTOR BOARD	28480	5020-8157
			CHASSIS PARTS		
C1	0180-2181	1	CAPACITOR-FXD 1300UF+75-10% 50VDC AL	01458	839-7471-02
	0360-0452	2	TERMINAL-SLDR LUG PL-MTG FOR-#10-8CR	78963	540
	2190-0034	2	WASHER-LK HLCL NO. 10 .194-IN-ID	28480	2190-0034
	2680-0129	2	SCREW-MACH 10-32 .312-IN-LG PAN-HD-POZI	28480	2680-0129
CR1	1901-0033	4	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 115V OPERATION)	04706	312.250
	2110-0479	1	FUSE .175A 250V FAST-BLO 1.25X.25 UL (FOR 220V OPERATION)	04706	312.175
K1	3106-0009	2	SWITCH, COAXIAL SPDT	74868	315-10053-2
K2	3106-0009		SWITCH, COAXIAL SPDT	74868	315-10053-2
MP1	5000-8559	2	COVER:SIDE 3 X 11	28480	5000-8559
	2360-0180	16	SCREW-MACH 6-32 .188-IN-LG 82 DEG	28480	2360-0180
MP2	5060-0700	2	SIDE CASTING	28480	5060-0700
MP3	5040-7201	4	FOOT(STANDARD)	28480	5040-7201
MP4	08654-00037	1	COVER, TOP	28480	08654-00037
MP5	08654-00024	1	COVER, BOTTOM	28480	08654-00024
MP6	11710-00006	1	PANEL, FRONT (B)	28480	11710-00006
MP7	11710-00008	1	PANEL, REAR	28480	11710-00008
MP8	1440-0076	1	HANDLE-POLYP 7.75-LG	12136	1775-354 COLOR Y31061
MP9	0370-1099	1	KNOB-BASE-PTR 1/2 JGK .25-IN-ID	28480	0370-1099
MP10	1460-1345	2	TILT STAND SST	28480	1460-1345
MP11	1440-0077	2	RETAINER-HANDLE STL	12136	346
MP12	1210-0013	1	CLAMP-CAP 1.375-DIA STL	0420J	4586-97A
	2360-0115	2	SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI	28480	2360-0115
	2360-0121	1	SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI	28480	2360-0121
	0360-0001	4	TERMINAL-SLDR LUG LK-MTG FOR-#6-8CR	78452	920
MP13	1250-1471	1	CAP-COAX TO FIT F-BNC NON-SMTG 2.5-CH	28480	1250-1471
MP14	7120-3528	1	LABEL-WARNING .6-IN-WD 1.8-IN-LG VINYL	28480	7120-3528
MP15	7120-3984	1	LABEL-INFORMATION .21-IN-WD 2.33-IN-LG	28480	7120-3984
MP16	7120-4163	1	LABEL-WARNING .5-IN-WD 1-IN-LG AL	28480	7120-4163
MP17	7120-4627	1	LABEL-WARNING .595-IN-WD 1.796-IN-LG	28480	7120-4627
MP18	1400-0024	1	CLAMP-CABLE .25-DIA .5-WD NYL (FOR A9)	28520	3324
MP19	5001-0135	1	WRENCH:COMB	28480	5001-0135
MP20	11710-00007	1	DECK	28480	11710-00007
MP21	11710-00009	2	BRACKET, TOP COVER SUPPORT	28480	11710-00009
MP22	11710-20006	1	INSULATOR, ADHESIVE	28480	11710-20006
MP23	11710-20015	3	SPACER, CABINET	28480	11710-20015
MP24	11710-60019	1	BOARD ASSEMBLY, EXTENDER	28480	11710-60019
MP25	0590-0052	6	NUT-BHMET-J 6-32-THD .5-WD STL	0482M	C-8020-632-248
MP26	2360-0180		SCREW-MACH 6-32 .188-IN-LG 82 DEG	28480	2360-0180
MP27	2360-0194	6	SCREW-MACH 6-32 .312-IN-LG 100 DEG	28480	2360-0194
MP28	2200-0103		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
MP29	2360-0116		SCREW-MACH 6-32 .312-IN-LG 82 DEG	28480	2360-0116
MP30	2200-0171	6	SCREW-MACH 4-40 .75-IN-LG 82 DEG (FOR A3)	28480	2200-0171
MP31	5040-0170	2	GUIDE:PLUG-IN PC BOARD (FOR A1, A2)	28480	5040-0170
	2200-0103	14	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
MP32	0360-0042	3	TERMINAL-SLDR LUG PL-MTG FOR-#8-8CR	28480	0360-0042
	2360-0116	18	SCREW-MACH 6-32 .312-IN-LG 82 DEG	28480	2360-0116
	0360-0001		TERMINAL-SLDR LUG LK-MTG FOR-#6-8CR	78452	920
MP33	2190-0034	1	WASHER-LK HLCL NO.10.194-IN-ID	28480	2190-0034
MP34	2860-0129	1	SCREW-MACH 10-32.312-IN-LG PAN-HD-POZI	28480	2680-0129
Q1	1854-0063	1	TRANSISTOR NPN 2N3055 SI TO-3 PD=115W	28480	1854-0063
	1200-0043	1	INSULATOR-XSTR ALUMINUM	04713	322047
	0340-0486	1	INSULATOR-COVER NYLON	00248	A22-2003
	0624-0267	2	SCREW-TPG 6-20 .625-IN-LG PAN-HD-POZI	28480	0624-0267
	3050-0016	2	WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0016
	2190-0018	2	WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018

See introduction to this section for ordering information

Table 3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
R1	0698-3449	1	RESISTOR 28.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2872-F
S1	3100-3389	1	SWITCH-RTRY 8POT-NS .812-CTR-8PCG	28480	3100-3389
	2190-0016	1	WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
	2950-0043	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0043
S2	3101-1395	1	SWITCH-PB DPDT-DB ALTNG 10.5A 250VAC	0100M	53-67280-121/A1M
	0590-0923	1	NUT-KNRLD-R 1/2-32-THD .125-IN-THK	28480	0590-0923
	2140-0244	1	LAMP-GLOW A1M 135/105VDC 1.2MA T-2-BULB	28480	2140-0244
	3101-0559	1	CAP-PB TRL WHITE;ZIG-ZAG 90-DEG TO	28480	3101-0559
S3	3101-0163	1	SWITCH-TGL SUBMIN SPDT NS 5A 115VAC	02398	Z-11
	0360-0040	1	TERMINAL-SLDR LUG LK-MTG FOR-#1/4-8CR	0460D	1958
T1	9100-3915	1	TRANSFORMER, POWER	28480	9100-3915
	3050-0001	1	WASHER-FL MTLC NO. 8 .172-IN-ID	28480	3050-0001
	2190-0017	2	WASHER-LK MTLC NO. 8 .168-IN-ID	28480	2190-0017
	2580-0004	2	NUT-HEX-DBL-CHAM 8-32-THD .125-IN-THK	28480	2580-0004
W1	11710-20003	1	CABLE ASSEMBLY, RF INPUT	28480	11710-20003
	0590-0505	2	NUT, KNURLED 5/8-24 UNEF-2B THREAD	7374C	TD-801
W2	11710-20018	1	CABLE ASSEMBLY, INTERCONNECTING	28480	11710-20018
W3	11710-60016	1	CABLE ASSEMBLY, GREEN	28480	11710-60016
W4	11710-60003	1	CABLE ASSEMBLY, YELLOW	28480	11710-60003
W5	11710-60015	1	CABLE ASSEMBLY, RED	28480	11710-60015
W6	11710-60017	1	CABLE ASSEMBLY, BLUE	28480	11710-60017
	2190-0102	1	WASHER-LK INTL T 15/32 IN .472-IN-ID	78189	1922-01
	0590-1011	1	NUT-KNRLD-R 15/32-32-THD .12-IN-THK	28480	0590-1011
W7	11710-20017	1	CABLE ASSEMBLY, LOW PASS FILTER	28480	11710-20017
W8	11710-20004	1	CABLE ASSEMBLY, RF OUTPUT	28480	11710-20004
	0590-0505		NUT, KNURLED 5/8-24 UNEF-2B THREAD	7374C	TD-801
W9	11710-60007	1	CABLE ASSEMBLY, PRIMARY WIRING	28480	11710-60007
W10	8120-1378	1	CABLE ASSY 18AWG 3-CNDCT JGK-JKT .25-OD	28480	8120-1378
			OPTION 001 COMBINING KIT		
MP35	08655-20029	2	RAIL COMBINING	28480	08655-20029
MP36	2360-0119	8	SCREW-MACH 6-32 .438-IN-LG PAN-MD-POZI	28480	2360-0119
MP37	7120-5359	1	LABEL-INFORMATION .8-IN-WD 2.85-IN-LG	28480	7120-5359
W11	11710-20020	1	CABLE ASSEMBLY, INTERCONNECTING	28480	11710-20020

Table 4. Code List of Manufacturers

Mfr Code	Manufacturer Name	Address		Zip Code
0024E	JERMYN INDUSTRIES			
0100M	ILLUMINATED PRODUCTS INC	ANAHEIM	CA	92800
0138J	AMP INC	HARRISBURG	PA	17101
01458	SANGAMO ELEC CO S CAROLINA DIV	PICKENS	SC	29671
0160G	ALLEN-BRADLEY CO	MILWAUKEE	WI	53200
0169M	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS	TX	75200
0192A	RCA CORP SOLID STATE DIV	SOMERVILLE	NJ	08876
03888	KDI PYROFILM CORP	WHIPPANY	NJ	07981
0203G	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX	AZ	85000
02178	AIRCO SPEER ELEK DIV AIR RDCN CO	NOGALES	AZ	85621
0223G	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW	CA	94040
02398	C AND K COMPONENTS INC	WATERTOWN	MA	02172
12136	PHILADELPHIA HANDLE CO INC	CAMDEN	NJ	08103
0299E	MEPCO/ELECTRA CORP	MINERAL WELLS	TX	76067
0329B	CORNING GLASS WORKS (BRADFORD)	BRADFORD	PA	16701
0331F	SPECIALTY CONNECTOR CO INC	INDIANAPOLIS	IN	46200
28480	HP DIV 00 CORPORATE	PALO ALTO	CA	94304
28520	HEYMAN MFG CO	KENILWORTH	NJ	07033
0365A	MEPCO/ELECTRA CORP	SAN DIEGO	CA	92106
3740D	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE	CA	92501
0420J	SPRAGUE ELECTRIC CO	NORTH ADAMS	MA	01247
72136	ELECTRO MOTIVE CORP SUB IEC	WILLIMANTIC	CT	06226
0460D	FEDERAL SCREW PRODUCTS CO	CHICAGO	IL	60600
04678	TRW INC PHILADELPHIA DIV	PHILADELPHIA	PA	19100
0470C	LITTELFUSE INC	DES PLAINES	IL	60016
0473G	TRW ELEK CMPNT CINCH-MONADNOCK DIV	CITY OF IND	CA	94100
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF	ELGIN	IL	60120
78452	EVERLOCK CHICAGO INC	CHICAGO	IL	60622
0482H	TINNERMAN PRODUCTS INC	CLEVELAND	OH	44129
79963	ZIERICK MFG CO	MT KISCO	NY	10549
05520	DALE ELECTRONICS INC	COLUMBUS	NE	68601
05761	SEALECTRO CORP	MAMARONECK	NY	10543

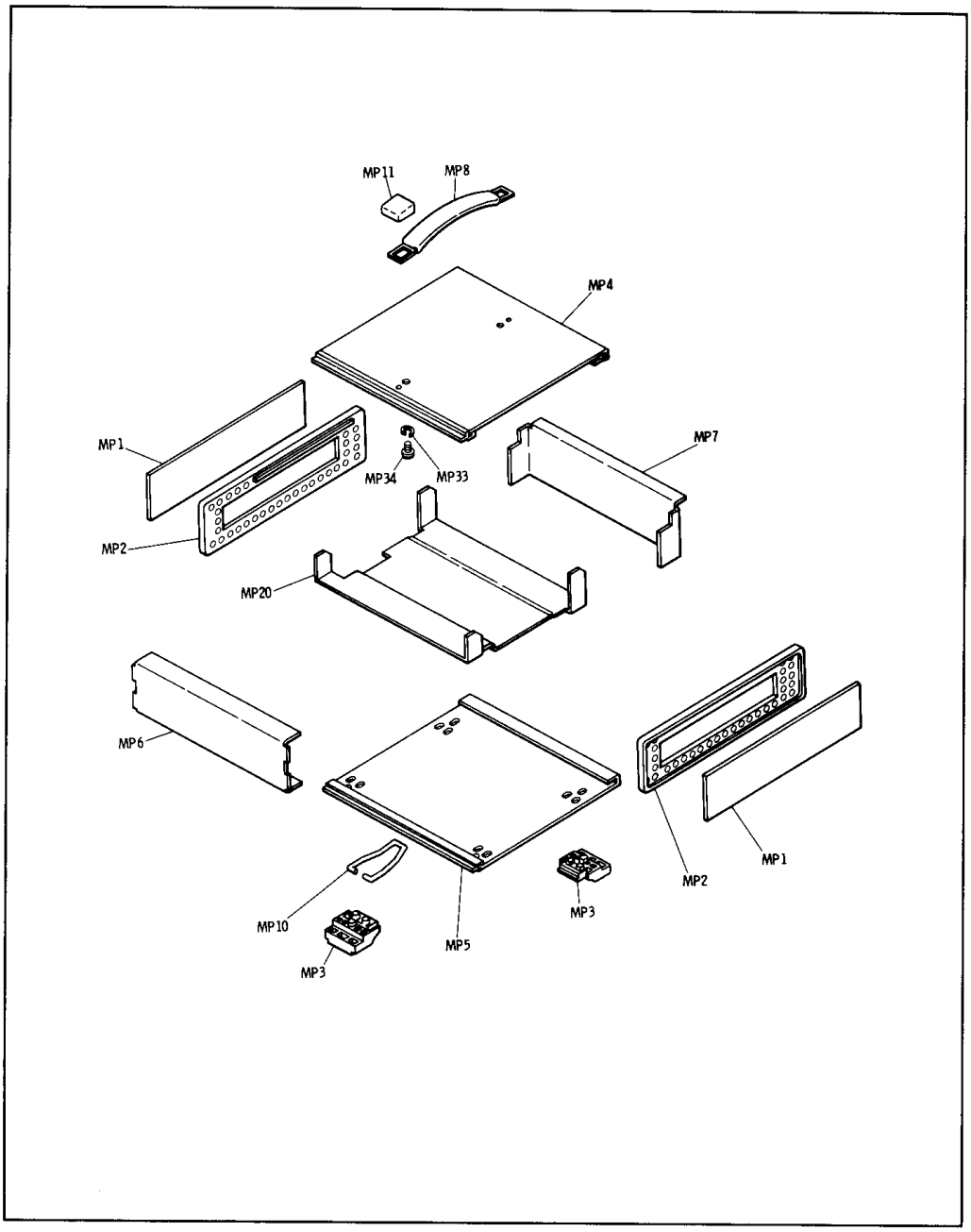


Figure 8. 11710B Cabinet Parts

SERVICE

Service instructions consist of principles of operation, instrument modifications, troubleshooting, and repairs.

Principles of Operation

A block diagram of the 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.

Converter-Amplifier A1 down-converts the input signal. Relays K1 and K2, and selector switch S1 select the output signal range. To select the down-converted signal, switch S1 is set to the .01—11 MHz DOWN CONVERSION position. In this position the +12 Vdc is applied to Converter-Amplifier A1 and relay K2. (Unless modified, +12 Vdc is always present at the 50 MHz local oscillator.) The closed contacts of K2 connect the output of A1 to the RF OUT connector (J2) via cables W9 and W8. Since relay K1 is not energized when switch S1 is set to the DOWN CONVERSION position, the closed contacts connect the unit RF IN connector (J1) to the input of A1 via cables W1 and W3. The input signal is mixed with the 50 MHz local oscillator and the down-converted signal is then filtered, amplified, and filtered again. Only the difference frequency passes through the filters to the output.

When range switch S1 is set to the DIRECT 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 W1, W2, and W8.

A schematic diagram of Converter-Amplifier A1 is shown in Figure 13. Note that there are two adjustments: A1Y1 (Xtal Adj) and A1R8 (Gain Adj). These adjustments are set as specified in the Performance Test and Adjustment procedures.

In addition to providing the 50 MHz signal required for down conversion, the output of crystal oscillator Y1 is also buffered and divided to provide a time base reference output. Q3 and Q4 on the A1 Converter-Amplifier form a high input impedance buffer amplifier. The buffer output drives the 50 MHz Divider A3, which produces the rear panel TIME BASE OUT signal. A1U1 is a decade divider whose output toggles a divide-by-five, A1U2. Logic gating formed by A1U3 selects either the 5 MHz output from A1U1 or the 1 MHz output of A1U1 according to the position of the TIME BASE selector switch, S3. Transistor Q1, with reference diode VR1, forms a simple voltage regulator which derives +5V, required by the TTL circuits, from the +12V supply.

A schematic diagram of the +12V Power Supply A2 is shown in Figure 15. 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.

Instrument Modifications

For optimum oscillator stability, the instrument is factory-wired to leave the local oscillator (LO) running at all times. Typically, LO feedthrough is less than —110 dBm in the straight-through mode. To reduce LO feedthrough in this mode, the internal crystal oscillator can be wired to be switched off when the DIRECT/DOWN CONVERSION selector switch is set to DIRECT. However, the crystal will require time to stabilize when the instrument is switched to the DOWN CONVERSION mode, and the time base output is lost in the DIRECT mode.

To modify the Down Converter, proceed as follows:

a. Remove power cable from A5 Line Power Module.

b. Remove instrument bottom cover.

c. Unsolder red wire from pin 13 of the A2 Power Supply Assembly edge connector, XA2.

d. Connect and solder the same red wire to pin 21 of the A1 Converter-Amplifier Assembly edge connector, XA1.

e. Reinstall instrument bottom cover.

Troubleshooting

The 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.

WARNINGS

Maintenance described herein is performed with power supplied to the instrument, and 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.

Before any repair is completed, ensure that all safety features are intact and functioning and that all parts requiring protective grounding are so grounded.

Repair

In some instances, repair consists of merely making the required adjustments or component selections to bring the instrument up to specification levels. In other cases, repair requires the replacement of a malfunctioning component with a known good component. Assembly and chassis component locations for the instrument are shown in Figure 16. Parts locations for PC boards, A4, A3, A1, and A2 are shown in Figures 10, 11, 12, and 14, 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). Both A1 and A2 may be extended by use of the 30-pin extender board located inside the chassis. In addition, all SMC RF connectors may be loosened using the combination wrench also located inside the instrument.

A2F1 Power Supply Fuse Replacement. To replace power supply fuse A2F1 (fast-blo), 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.

Factory Selected Components. The Down Converter contains components selected at the factory for best instrument performance. These factory selected components are designated by an asterisk (*) on the schematic diagram where they appear. The basis of selection and the effect and range of values of these components are given below.

a. A1C9 Selection. If the output amplifier's response is out of specification limits (either peaking or roll-off) at the low frequency end, selection of A1C9 may improve the amplifier flatness. The range of values is from 0.15 μF to 0.33 μF. Decreasing A1C9 increases amplifier peaking; increasing A1C9 rolls the amplifier response off.

b. A1C11 Selection. If the output amplifier's response is out of specification limits (either peaking or roll-off) at the high frequency end, selection of A1C11 may improve the amplifier flatness. The range of values is from 360 pF to 410 pF. Decreasing A1C11 increases amplifier roll-off; increasing A1C11 peaks the amplifier's response.

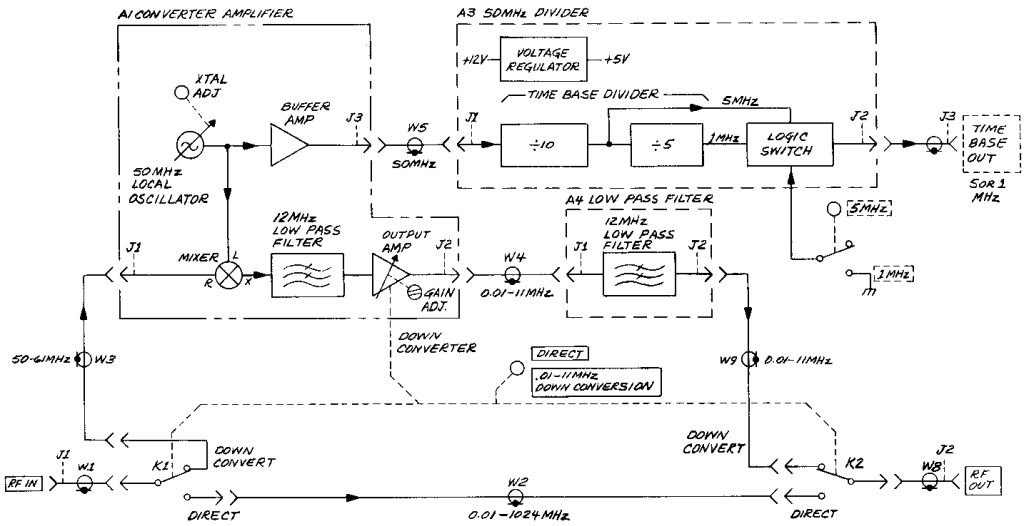


Figure 9. Down Converter — Block Diagram

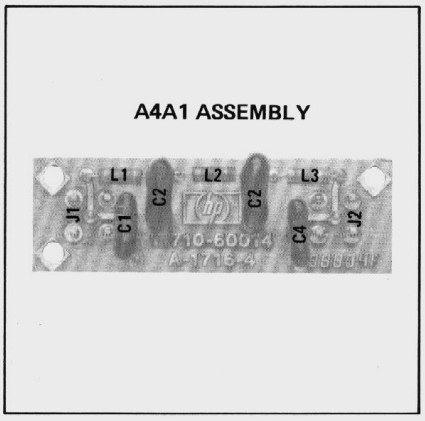


Figure 10. A4A1 Low Pass Filter Board Assembly Component Locations

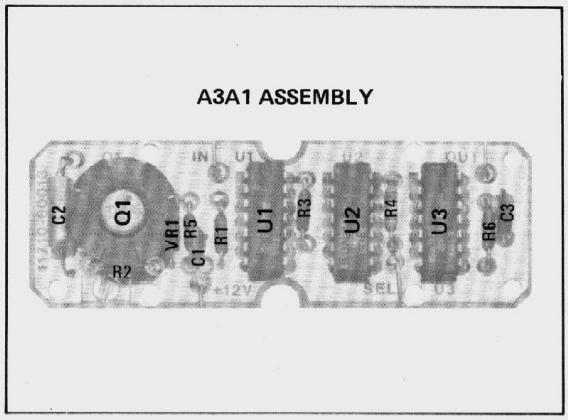


Figure 11. A3A1 50 MHz Divider Board Assembly Component Locations

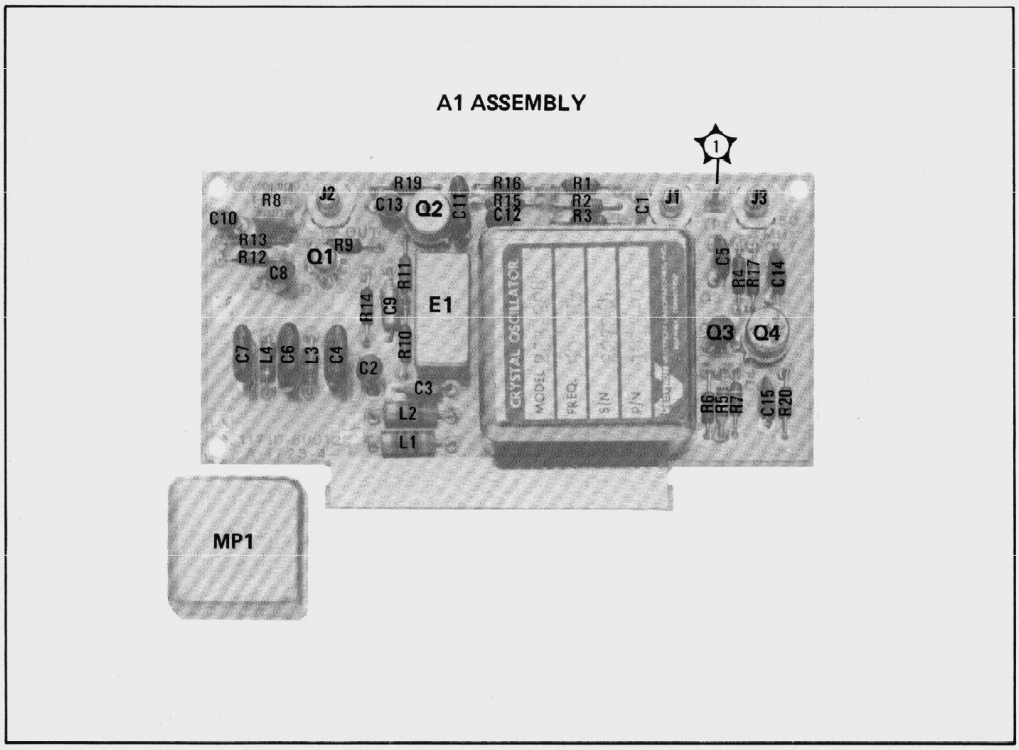
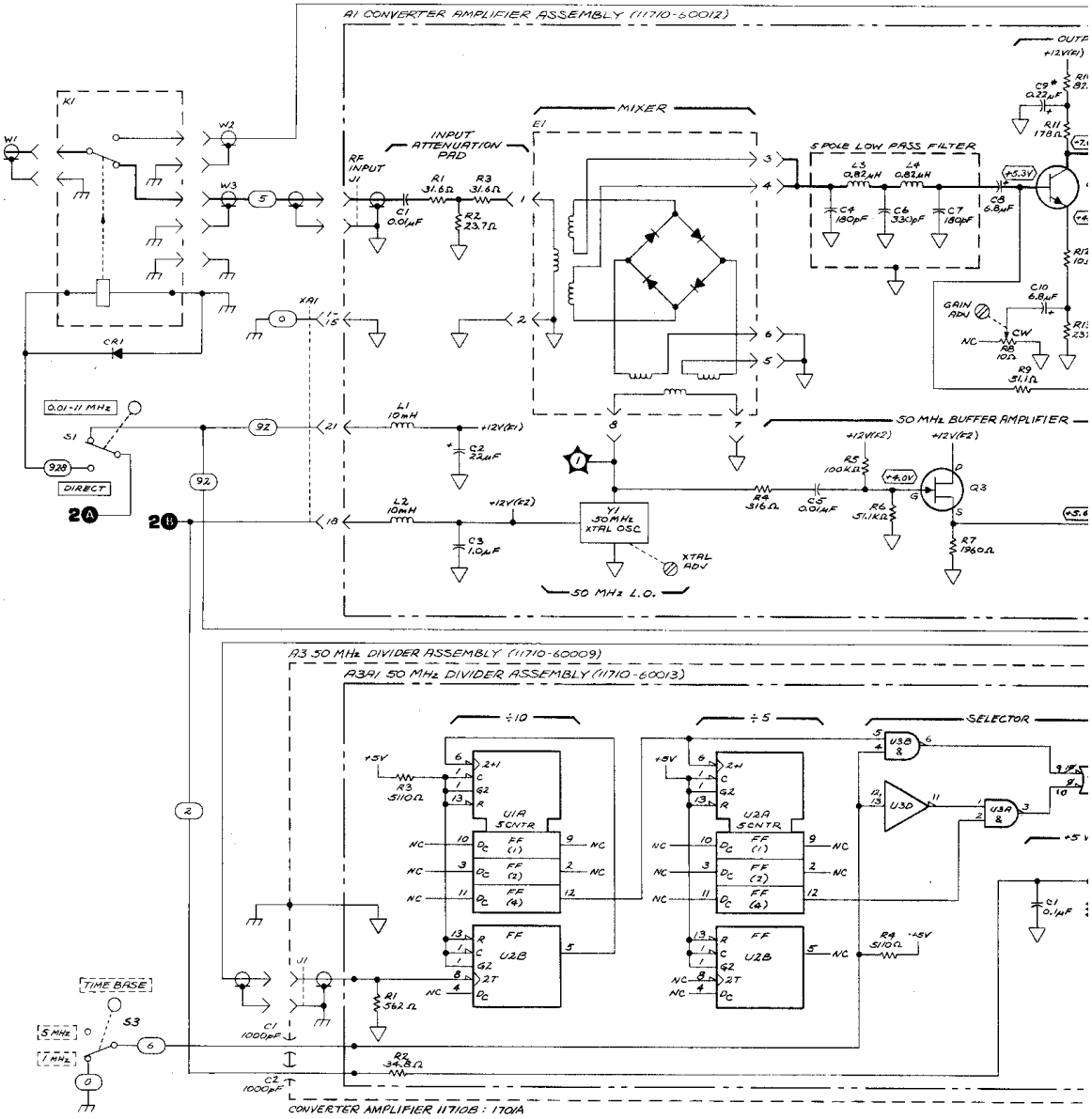
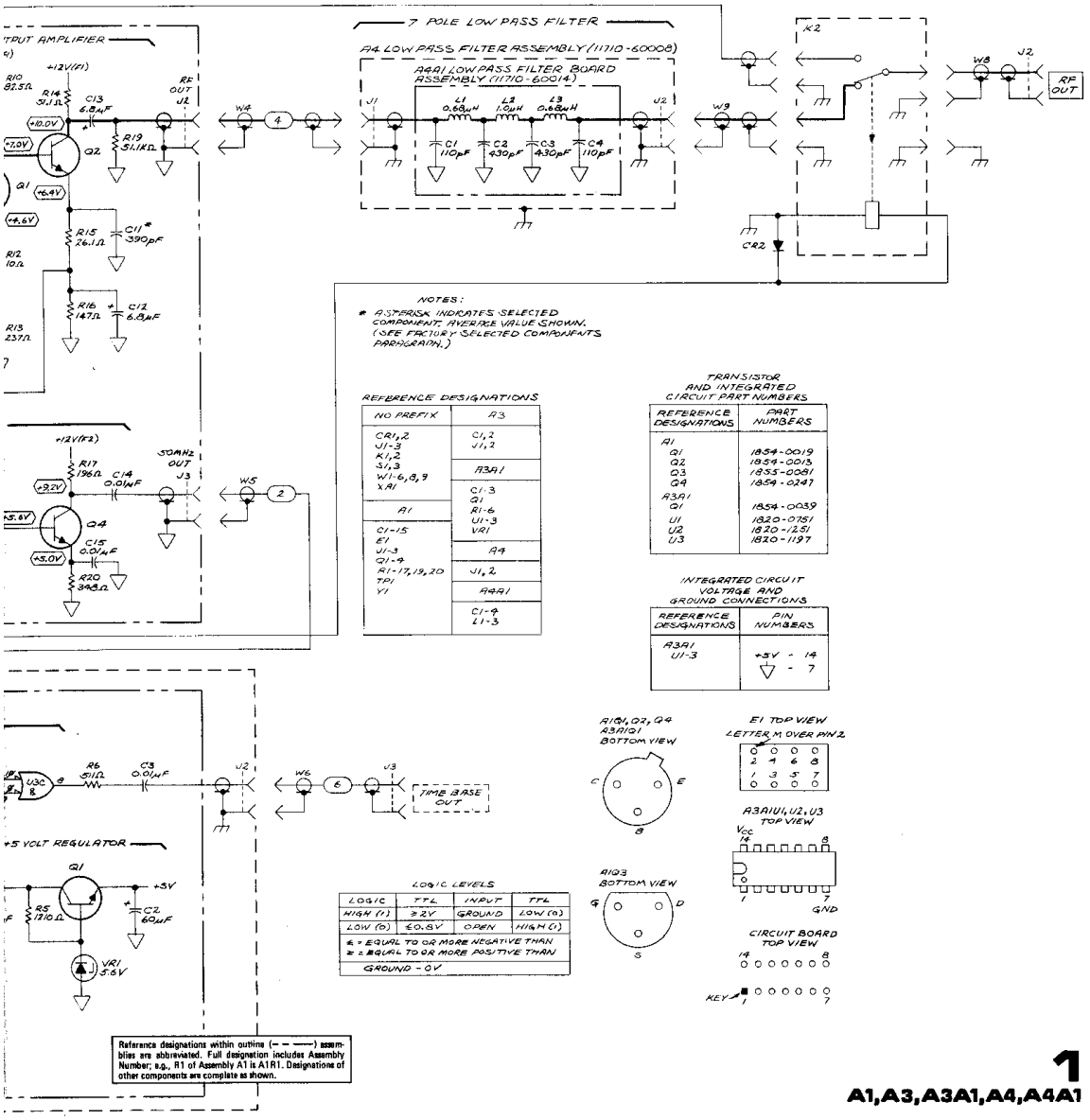


Figure 12. A1 Converter-Amplifier Assembly Component Locations


A1 CONVERTER AMPLIFIER ASSEMBLY (11710-60012)
MIXER
INPUT ATTENUATION PAD
5 POLE LOW PASS FILTER
50 MHz BUFFER AMPLIFIER
50 MHz L.O.
0.01-11 MHz
DIRECT
XTAL ADJ
GAIN ADJ
A3 50 MHz DIVIDER ASSEMBLY (11710-60009)
A3A1 50 MHz DIVIDER ASSEMBLY (11710-60013)
÷10
÷5
SELECTOR
TIME BASE
5 MHz
7 MHz
CONVERTER AMPLIFIER 11710B : 170IA



REFERENCE DESIGNATIONS	
NO PREFIX	A3
CR1,2 J1-3 K1,2 S1,3 W1-6,8,9 XA1	C1,2 J1,2
	A3A1
A1	C1-3 Q1 R1-6 U1-3 VR1
C1-15 E1 U1-3 Q1-9 R1-17,19,20 TP1 Y1	A4
	J1,2
	A4A1
	C1-4 L1-3

TRANSISTOR AND INTEGRATED CIRCUIT PART NUMBERS	
REFERENCE DESIGNATIONS	PART NUMBERS
A1	
Q1	1854-0019
Q2	1854-0015
Q3	1855-0081
Q4	1854-0247
A3A1	
Q1	1854-0039
U1	1820-0751
U2	1820-1251
U3	1820-1197

INTEGRATED CIRCUIT VOLTAGE AND GROUND CONNECTIONS	
REFERENCE DESIGNATIONS	PIN NUMBERS
A3A1 U1-3	+5V - 14 ▽ - 7

LOGIC LEVELS			
LOGIC	TTL	INPUT	TTL
HIGH (1)	≥ 2V	GROUND	LOW (0)
LOW (0)	≤ 0.8V	OPEN	HIGH (1)
≤ = EQUAL TO OR MORE NEGATIVE THAN ≥ = EQUAL TO OR MORE POSITIVE THAN			
GROUND = 0V			

Reference designations within outline (— — —) assemblies are abbreviated. Full designation includes Assembly Number; e.g., R1 of Assembly A1 is A1R1. Designations of other components are complete as shown.

1
A1,A3,A3A1,A4,A4A1

Figure 13. Converter-Amplifier and Time Base Divider Schematic Diagram

A2 ASSEMBLY

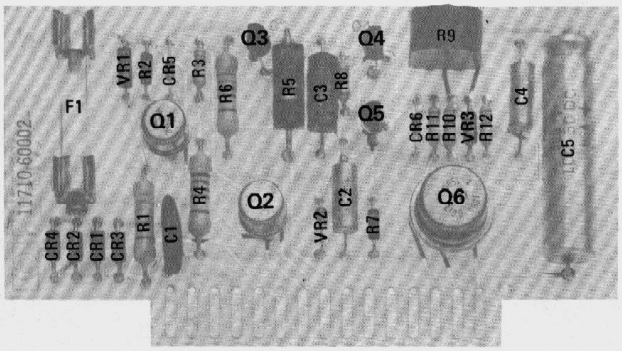
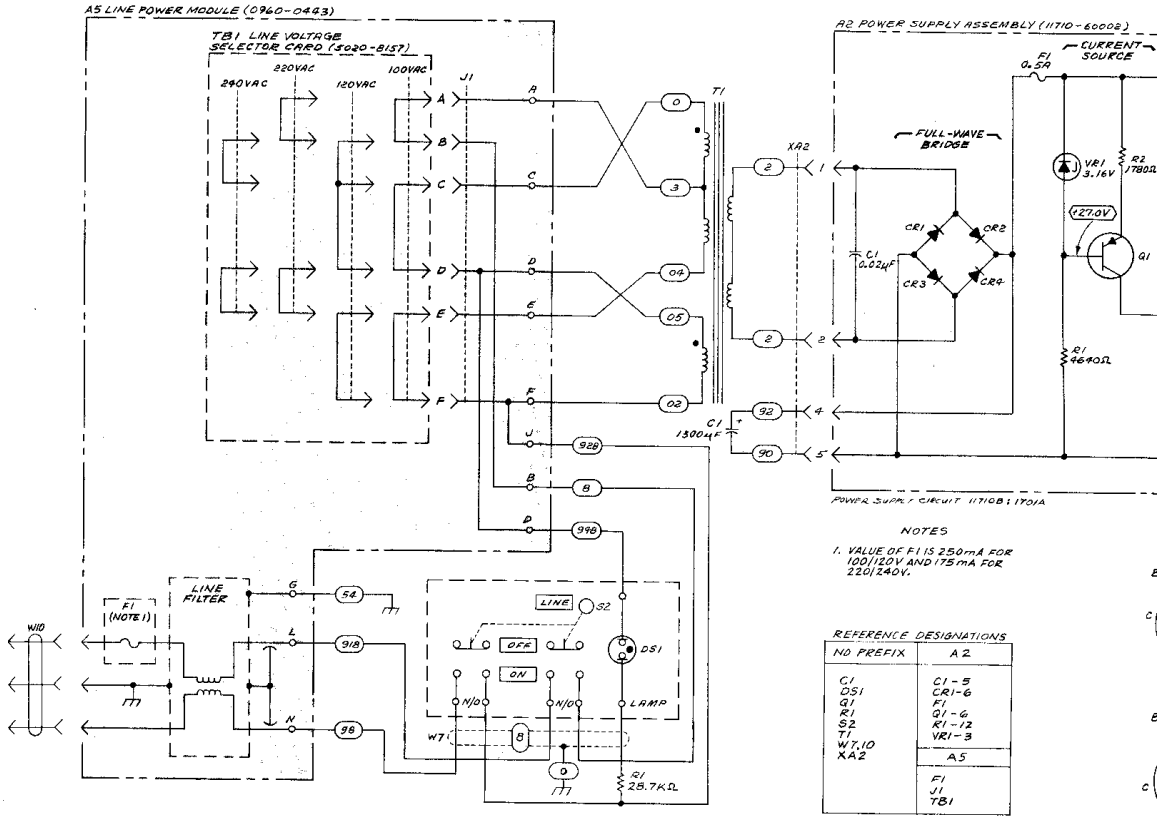


Figure 14. A2 Power Supply Component Locations


A5 LINE POWER MODULE (0960-0443)
TB1 LINE VOLTAGE SELECTOR CARD (13020-8157)
220VAC
240VAC
120VAC
100VAC
J1
A
B
C
D
E
F
T1
0
3
04
05
02
A2 POWER SUPPLY ASSEMBLY (11710-60002)
CURRENT SOURCE
F1 0.5A
FULL-WAVE BRIDGE
XA2
2
1
2
2
92
4
90
5
CR1
CR2
CR3
CR4
C1 0.02μF
C1 1300μF
VR1 3.16V
R2 178Ω
127.0V
Q1
R1 464Ω
POWER SUPPLY CIRCUIT 11710B; 1701A
928
8
998
W10
F1 (NOTE 1)
LINE FILTER
T77
G
L
N
54
918
98
LINE
S2
OFF
ON
DS1
N/O
N/O
LAMP
W7
8
0
R1 28.7KΩ
NOTES
1. VALUE OF F1 IS 250mA FOR 100/120V AND 175mA FOR 220/240V.
REFERENCE DESIGNATIONS
NO PREFIX
C1
DS1
Q1
R1
S2
T1
W7,10
XA2
A2
C1-5
CR1-6
F1
Q1-6
R1-12
VR1-3
A5
F1
J1
TB1

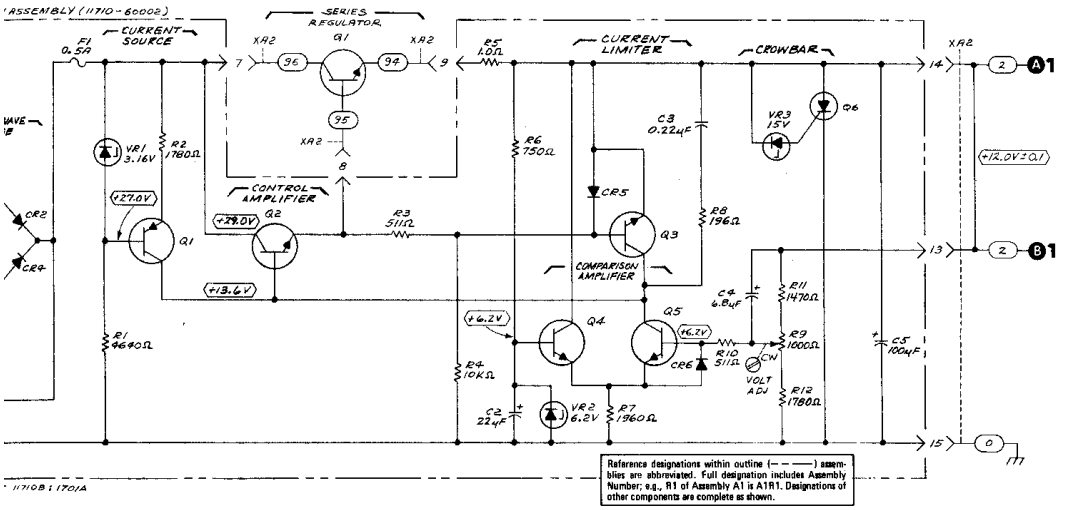


Figure 15. Power Supply Circuit Schematic Diagram

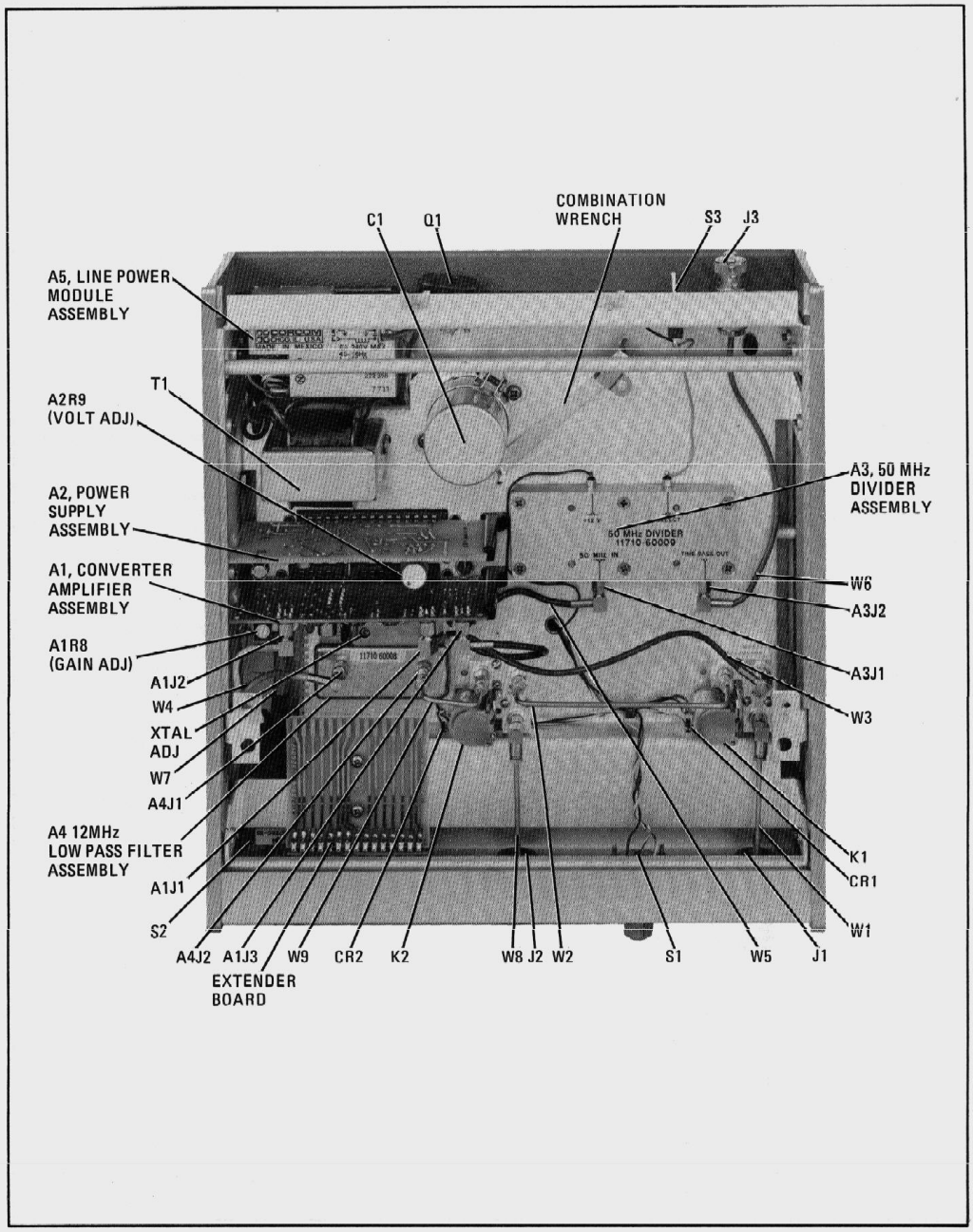


Figure 16. Down Converter Top Internal View