

Errata

Title & Document Type: 8418A Auxiliary Display Holder Operating and Service Manual

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About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual provides the best information we could find. It may be incomplete or contain dated information, and the scan quality may not be ideal. If we find a better copy in the future, we will add it to the Agilent website.

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, life sciences, and chemical analysis businesses are now part of Agilent Technologies. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A. We have made no changes to this manual copy.

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Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.



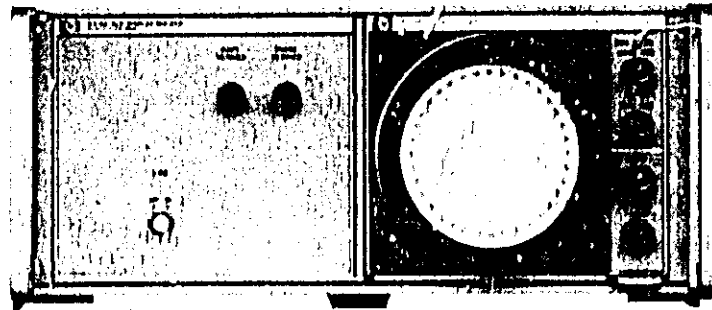
Agilent Technologies

OPERATING AND SERVICE MANUAL

AUXILIARY DISPLAY HOLDER

8418A

Serial Prefix 2022A



MAY 1980



HEWLETT
PACKARD

CERTIFICATION

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

WARRANTY

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

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

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

LIMITATION OF WARRANTY

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

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

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

ASSISTANCE

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

SAFETY CONSIDERATIONS

GENERAL

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation. This product has been designed and tested in accordance with international standards.

SAFETY SYMBOLS



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual (refer to Table of Contents).



Indicates hazardous voltages.



Indicates earth (ground) terminal.

WARNING

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

CAUTION

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

SAFETY EARTH GROUND

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

BEFORE APPLYING POWER

Verify that the product is configured to match the available main power source per the input power configuration instructions provided in this manual.

If this product is to be energized via an autotransformer make sure the common terminal is connected to the neutral (grounded side of mains supply).

SERVICING

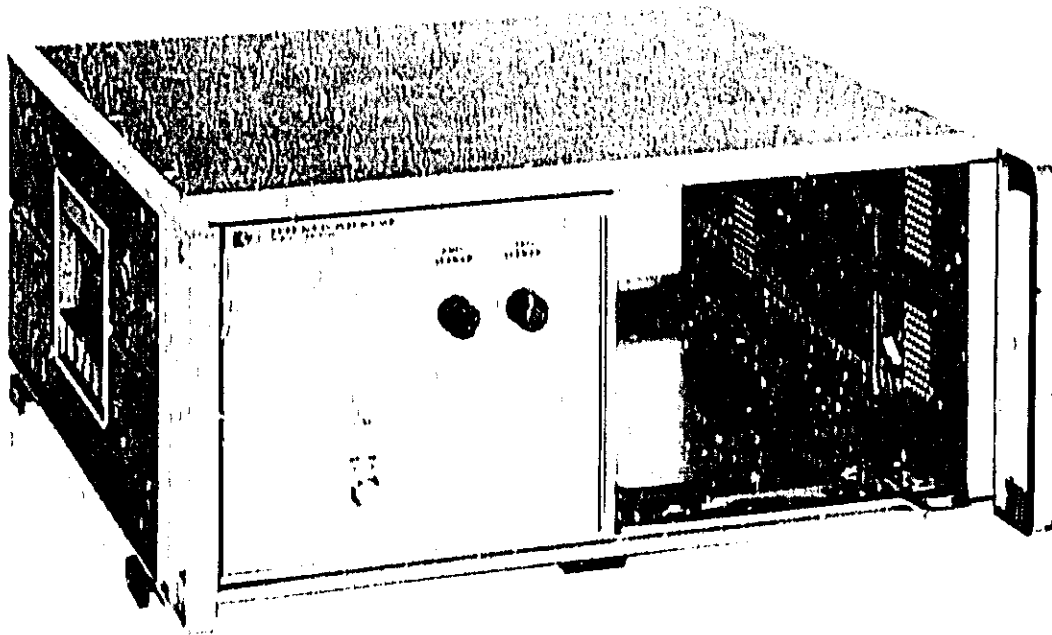
WARNING

Any servicing, adjustment, maintenance, or repair of this product must be performed only by qualified personnel.

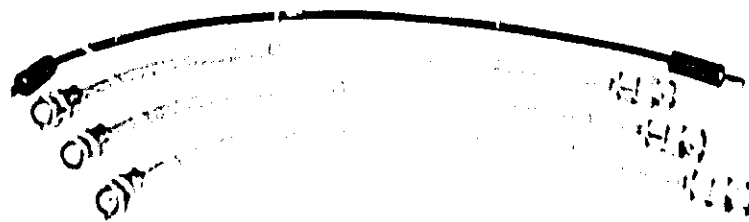
Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged even when disconnected from its power source.

To avoid a fire hazard, only fuses with the required current rating and of the specified type (normal blow, time delay, etc.) are to be used for replacement.



8419A



SERVICE KIT

Figure 1. Equipment Supplied

INTRODUCTION

The Hewlett-Packard Model 8418A Auxiliary Display Holder provides a means of utilizing two different types of phase-amplitude display units simultaneously (i.e., polar and rectangular displays). The Model 8418A contains a power supply and phase and amplitude controls for referencing an auxiliary display unit (8412A, 8413A, or 8414A) to a display indicator in a Standard Model 8410B Network Analyzer, a Model 8410A Option 005 Network Analyzer, or a Model 8407A Option HO3 Network Analyzer.

The Model 8418A carries two-section serial numbers (0000-00000). When the serial prefix (first group of digits) on the title page of this Operating and Service Manual is the same as that on the 8418A, this Manual applies directly to the 8418A. If these numbers differ, yellow change sheets are supplied with the Manual specifying changes required to the Manual to make it directly apply to the instrument.

DESCRIPTION

Referring to the Network Analyzer block diagram in Figure 2, note that additional outputs are necessary for operation with the Model 8418A Auxiliary Display Holder. The additional outputs are furnished on the rear panel of the appropriate Network Analyzer. These additional outputs are marked REF for reference channel output, TEST PHASE for test channel phase reference signal, and TEST AMPL for the test channel amplitude signal. The Network Analyzer additional outputs feed into three BNC jacks on the rear panel of the Model 8418A Auxiliary Display Holder. In addition, there is a single binding-post output marked BLANK which is used for unblanking oscilloscope plug-in display indicators, such as the Model 8412A. The unblanking voltage is also required to enable the Model 8413A PHASE and AMPLITUDE BNC front panel outputs.

ACCESSORIES SUPPLIED

As shown in Figure 1, one single cable (HP Part No. 08418-60006) and three coaxial cables (HP Part No. 08551-6014, each) are furnished as a Service Kit to connect the Model 8418A to the accompanying Network Analyzer.

EQUIPMENT REQUIRED BUT NOT SUPPLIED

Network Analyzer

A Standard Model 8410B, Model 8410A Option 005, or a Model 8407A Option HO3 Network Analyzer is required for the operation of the Model 8418A Auxiliary Display Holder.

Harmonic Frequency Converter

A Model 8411A Harmonic Frequency Converter is needed for the Operation of the Model 8410A/B Network Analyzer.

Display Indicators

Model 8412A Phase-Magnitude Display. This display indicator shows amplitude and/or phase versus frequency traces on a rectangular oscilloscope readout.

Model 8413A Phase-Gain Indicator. This indicator displays either phase or magnitude indication at any one time on a meter-type readout for CW measurements. An auxiliary oscilloscope may be used with the Model 8413A, in which case a swept-frequency display is obtained which is similar to that on a Model 8412A Phase-Magnitude Display Indicator.

Model 8414A Polar Display. This display shows phase and magnitude vectorially on a polar display.

Other Auxiliary Equipment

Other auxiliary equipment, such as transducers and signal sweep-oscillators, is necessary for use of the 8410A/B Network Analyzer. This equipment is listed in the Operating and Service Manual for the appropriate Network Analyzer.

Modification Kit for Model 8410A

If only the Model 8414A is to be used in the Model 8418A Auxiliary Display Holder, a Standard Model 8410A may be used. However, if any display indicator except the Model 8414A is to be used in the 8418A Auxiliary Display Holder, a modified Model 8410A must be used (Option 005). A Modification Kit (K06-8410A) may be installed in a Standard Model 8410A which converts the Standard Model 8410A to a Model 8410A Option 005.

Modification Kit for 8414A

If your 8414A is Serial No. 0749-00215 or below, it must be updated with a Modification Kit (HP Part No. 08414-6022) before it will work in the Model 8418A.

Modification Kit for K03-8410A

If you have a K03-8410A (special 8410A which performs the same function as the 8418A but without amplitude or phase vernier controls), it may be modified to install these controls. A Modification Kit (HP Part No. 08418-60011) is available to install these controls in the Model K03-8410A.

Table 1. Specifications

Accepts and furnishes power for Network Analyzer Display Indicators (Models 8412A, 8413A, or 8414A).

AMPLITUDE

Control: Vernier provides continuous amplitude adjustment over at least a 4 dB range.

PHASE

Control: Vernier provides continuous phase reference adjustment over at least 80°.

Dimensions: 177.8mm H x 450mm W x 483mm D(7" x 17 1/8" x 19").

Power: Approximately 50 watts max. (varies with plug-in).

Weight: net, 11.2 kg (25 lb); shipping, 19.7 kg (44 lb).

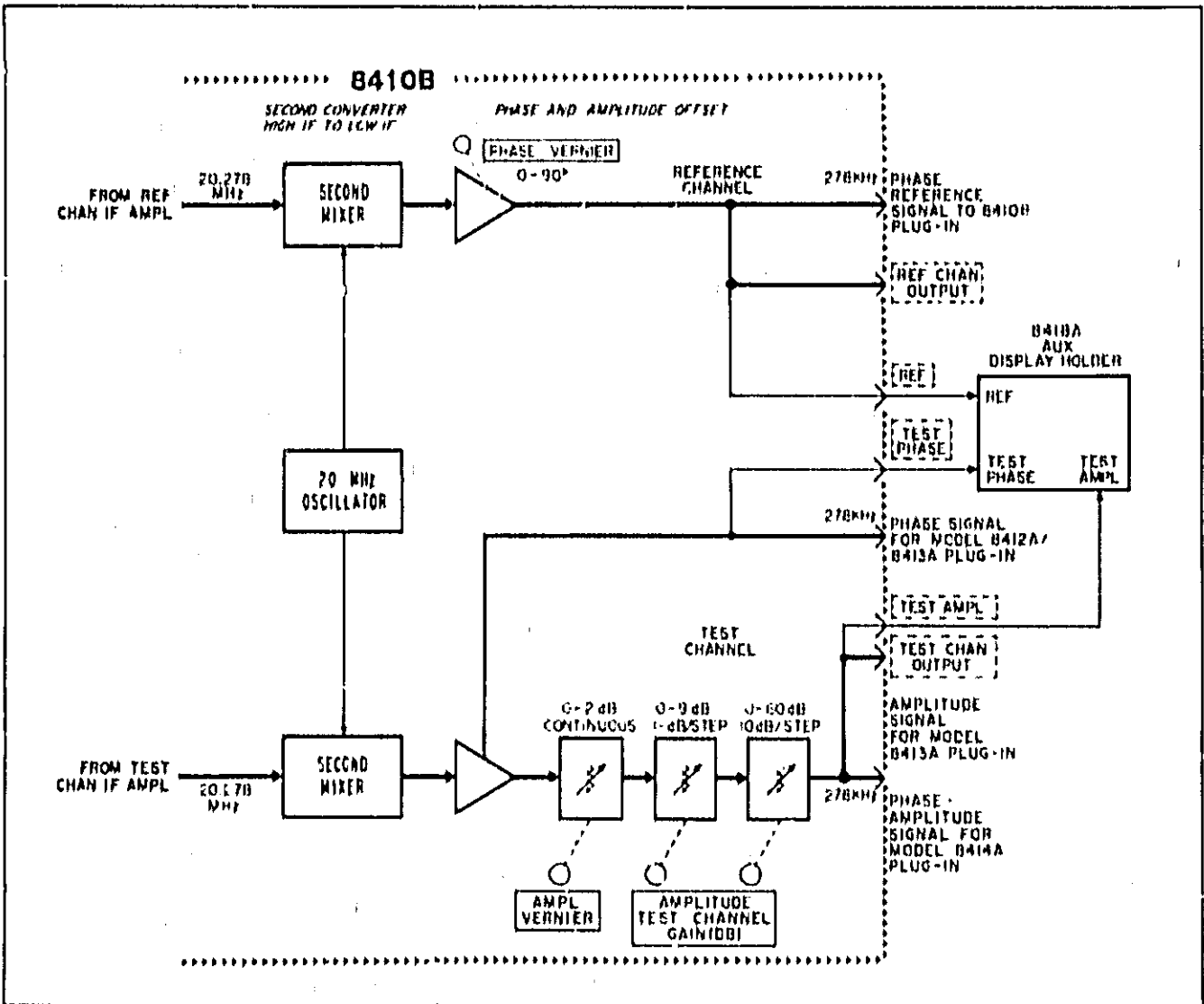


Figure 2. Basic Block Diagram

Table 2. Recommended Test Equipment

The following equipment is recommended to adjust, performance test, and troubleshoot the Model 8418A Auxiliary Display Holder. Other equipment may be used, provided its specifications equal or exceed those shown in the column marked Critical Specifications.			
Instrument	Critical Specifications	Model	Use*
Wide-Range Oscillator	Frequency: 278 kHz Output: 2.5 Vac	HP Model 200C/D	P,T
Electronic Counter	Measure Time Interval Gate Time: 1 μ sec	HP Model 5248L	P,T
Oscilloscope	Frequency: >278 kHz Vert Sens: 10 mV p-p	HP Model 180A/1801A/1820A	P,T
Display Indicator	No substitute will do	HP Model 8414A	P,T
Digital Voltmeter	Resolution: 4-digit Accuracy: 0.05%	HP Model 3439A/3443A	P,T
BNC "T"	Female to female thru Male side-arm	HP Part 1250-0781 (UG-274A/U)	P,T
Variable Voltage Transformer	Range: 102 to 128 Vac Voltmeter Range: 102 to 128 Vac \pm 1V	General Radio W5MT3A Superior Electric UC1M	A
Extender Board	Extends 15-pin connector	HP 5060-0049	T
*P = Performance Tests, A = Adjustments, T = Troubleshooting			

INSTALLATION

Rack-Mounting Kit

A Rack Mounting Kit is available to install the instrument in a 19-inch rack. Rack Mounting Kits may be obtained through your nearest Hewlett-Packard Office by ordering HP Part Number 5060-8741.

Model 8410A/B or 8407A Network Analyzer

Set up Model 8410A/B or 8407A Network Analyzer as instructed in the Operating and Service Manual for the Network Analyzer. Install the Display Indicator desired in the Network Analyzer as instructed in the Operating and Service Manual for the display indicator.

Model 8418A Auxiliary Display Holder

Install the display indicator desired in the Model 8418A Auxiliary Display Holder as instructed in the Operating and Service Manual for the particular

display indicator used. Connect the four cables furnished with the Model 8418A to the similarly labeled connectors on the rear panel of the Model 8410B Network Analyzer, the Model 8410A Option 005 or Model 8407A Option 1103. Connect as follows:

Jack on 8410A/B or 8407A, connect to Jack on 8418A:

Jack on 8410A/B	Jack on 8418A
REF CHAN OUTput	REF input
TEST CHAN OUTput	TEST AMPL. input
TEST PHASE output	TEST PHASE input

For blanking, also connect from BLANK jack on 8410A/B to BLANK jack on 8418A.

OPERATING PRECAUTIONS

Power Requirements

The Model 8418A requires a power source of 100, 120, 220, or 240 Vac, +5% -10%, 50 to 60 Hz,

single phase. Power consumption is approximately 50 watts max. (varies with plug-in).

Line Voltage Selection

Figure 3 provides instructions for line voltage selection and fuse replacement.

CAUTION

To prevent damage to the instrument, make the correct line voltage selection before connecting line power.

Power Cable

In accordance with international safety standards, this instrument is equipped with a three-wire power cable. When connected to an appropriate power line outlet, this cable grounds the instrument cabinet. Table 3 shows the styles of plugs available on power cables supplied with HP instruments. The HP Part Numbers for the plugs are part numbers for complete power cables. The type of power cable/plug shipped depends on the country of destination.

WARNING

BEFORE SWITCHING ON THIS INSTRUMENT, be sure only the specified

power cord is used. The instrument is provided with a 3-wire power cord which grounds the instrument cabinet. This power cord should only be inserted in a socket outlet provided with a protective earth contact. This protective action should not be negated by the use of an extension cord (power cable) without a protective conductor (ground). Grounding one conductor of a two-conductor outlet is not sufficient protection.

The offset pin of the three-prong connector is the grounding pin. When operating the Model 8418A from a two-contact outlet, the protecting feature may be preserved by using a three-prong to two-prong adapter (USA connectors only, HP Stock No. 1251-0048) and connecting the green wire of the adapter to ground.

Network Analyzer Operating Precautions

Be sure to observe the operating precautions in the Operating and Service Manual for the Network Analyzer used. The precautions concerning maximum DC on RF line, and static discharge precautions are necessary.

Signal-Source Requirements

Be sure to observe the requirements in the Operating and Service Manual for the Network Analyzer

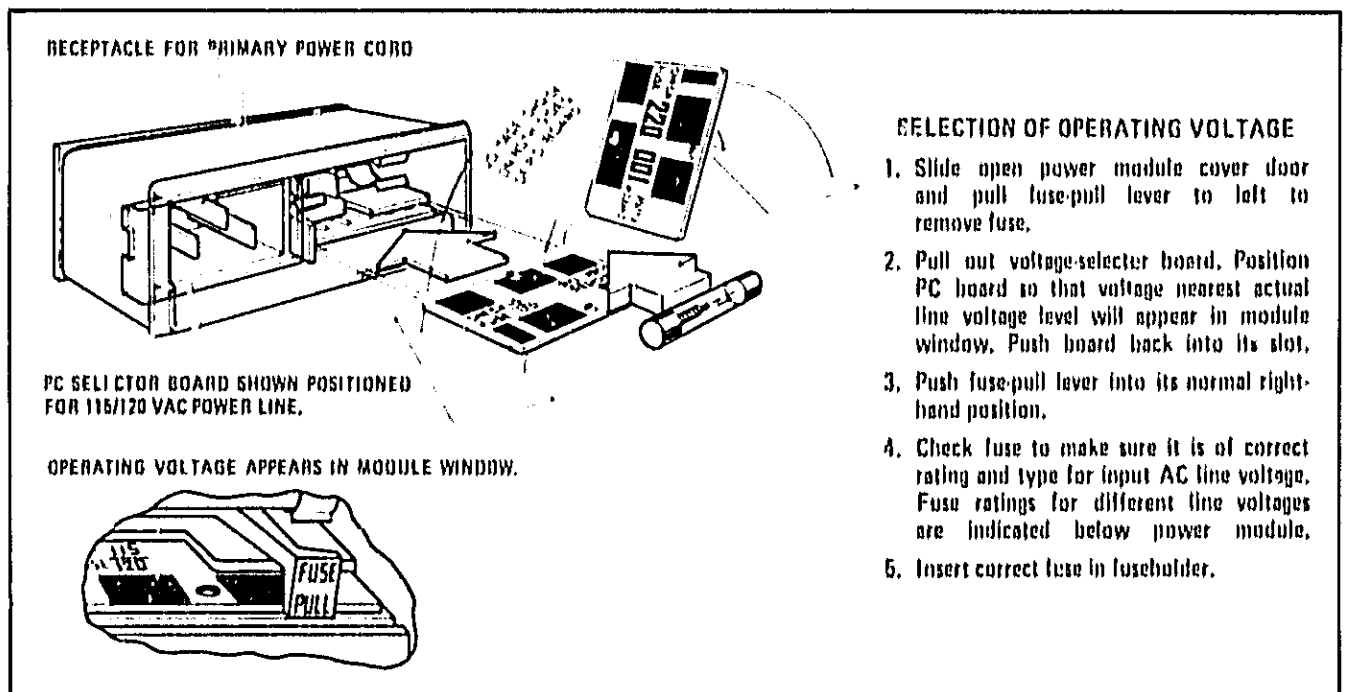
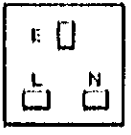

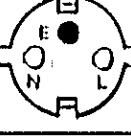
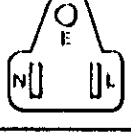

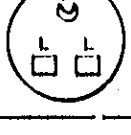
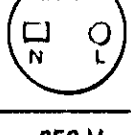



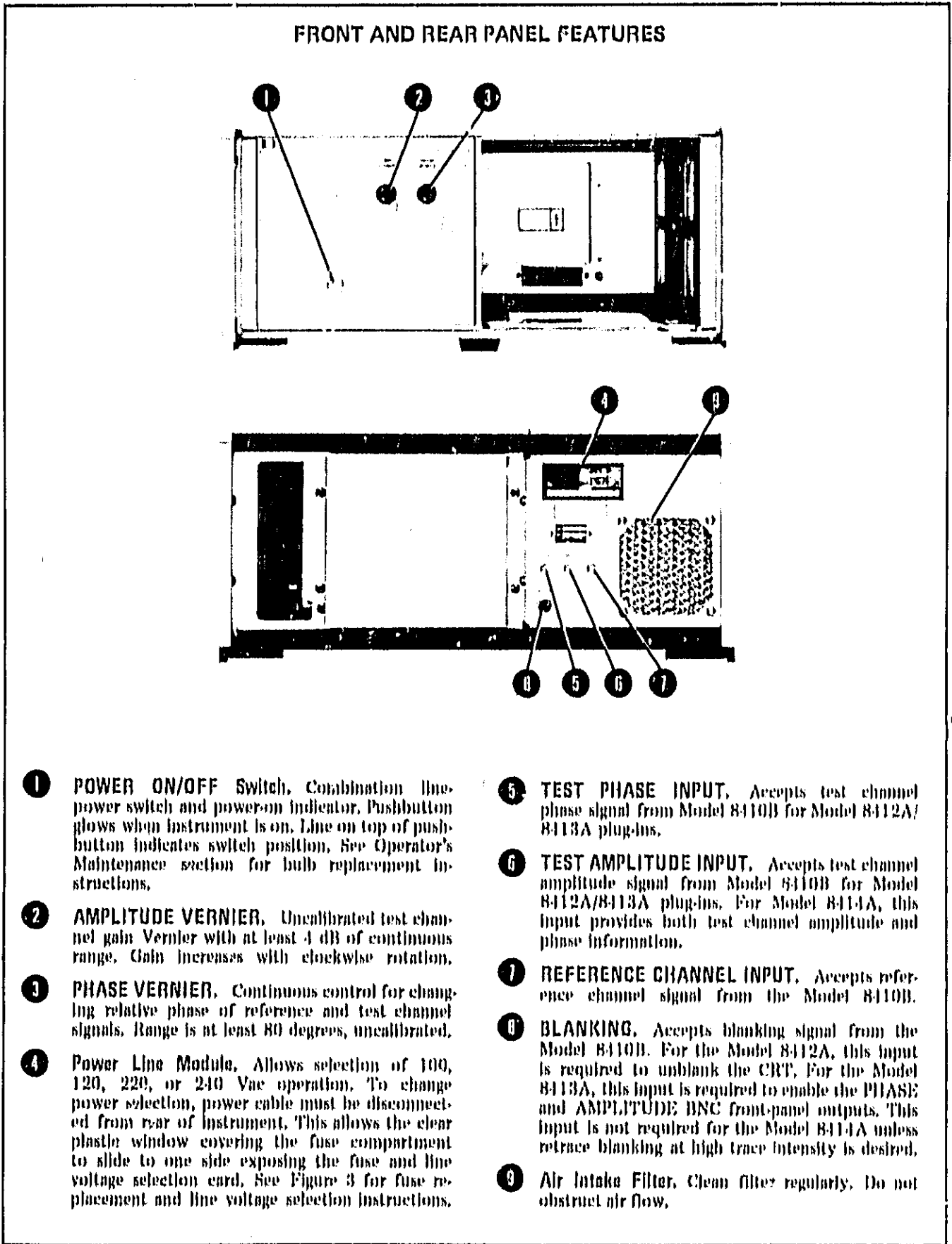
Figure 3. Line Voltage Selection

Table 3. AC Power Cables Available

Plug Type	Cable HP Part Number	C/D	Plug Description	Cable Length (Inches)	Cable Color	For Use In Country
250V 	8120-1351 8120-1703	0 6	Straight *BS1363A 90°	90 90	Mint Gray Mint Gray	United Kingdom, Cyprus, Nigeria, Rhodesia, Singapore
250V 	8120-1369 8120-0696	0 4	Straight *NZSS198/ASC112 90°	79 87	Gray Gray	Australia, New Zealand
250V 	8120-1689 8120-1692	7 2	Straight *CEE7-Y11 90°	79 79	Mint Gray Mint Gray	East and West Europe, Saudi Arabia, Egypt So. Africa, India (unpolarized in many nations)
125V 	8120-1348 8120-1398 8120-1754 8120-1378 8120-1521 8120-1676	5 5 7 1 6 2	Straight *NEMA5-15P 90° Straight *NEMA5-15P Straight *NEMA5-15P 90° Straight *NEMA5-15P	80 80 36 80 80 36	Black Black Black Jade Gray Jade Gray Jade Gray	United States, Canada, Japan (100V or 200V), Mexico, Philippines, Taiwan
250V 	8120-2104	3	Straight *SEV1011 1959-24507 Type 12	79	Gray	Switzerland
250V 	8120-0698	6	Straight *NEMA6-15P			United States, Canada
220V 	8120-1957 8120-2956	2 3	Straight *DICK 107 90°	79 79	Gray Gray	Denmark
250V 	8120-1860	6	Straight *CEE22-V1 (Systems Cabinet use)			

*Part number shown for plug is industry identifier for plug only. Number shown for cable is HP Part Number for complete cable including plug.

E = Earth Ground; L = Line; N = Neutral



- 1 **POWER ON/OFF Switch.** Combination line-power switch and power-on indicator. Pushbutton glows when instrument is on. Line on top of pushbutton indicates switch position. See Operator's Maintenance section for bulb replacement instructions.
- 2 **AMPLITUDE VERNIER.** Uncalibrated test channel gain Vernier with at least 4 dB of continuous range. Gain increases with clockwise rotation.
- 3 **PHASE VERNIER.** Continuous control for changing relative phase of reference and test channel signals. Range is at least 80 degrees, uncalibrated.
- 4 **Power Line Module.** Allows selection of 100, 120, 220, or 240 Vac operation. To change power selection, power cable must be disconnected from rear of instrument. This allows the clear plastic window covering the fuse compartment to slide to one side exposing the fuse and line voltage selection card. See Figure 3 for fuse replacement and line voltage selection instructions.
- 5 **TEST PHASE INPUT.** Accepts test channel phase signal from Model 8410B for Model 8412A/8413A plug-ins.
- 6 **TEST AMPLITUDE INPUT.** Accepts test channel amplitude signal from Model 8410B for Model 8412A/8413A plug-ins. For Model 8413A, this input provides both test channel amplitude and phase information.
- 7 **REFERENCE CHANNEL INPUT.** Accepts reference channel signal from the Model 8410B.
- 8 **BLANKING.** Accepts blanking signal from the Model 8410B. For the Model 8412A, this input is required to unblank the CRT. For the Model 8413A, this input is required to enable the PHASE and AMPLITUDE BNC front-panel outputs. This input is not required for the Model 8414A unless retrace blanking at high trace intensity is desired.
- 9 **Air Intake Filter.** Clean filter regularly. Do not obstruct air flow.

Figure 4. Front and Rear Panel Features

used. The requirements regarding output power, range, stability, signal purity, frequency stability, sweep characteristics, and frequency-related voltage output still apply.

PANEL FEATURES

Front and rear panel features are shown in Figure 4. Numerals on the figure are keyed to the numbered descriptive paragraphs in Figure 4.

OPERATION

Operator's Checks

To check the operation of the Model 8418A Auxiliary Display Holder proceed as follows:

a. Set up the Network Analyzer for either a reflection or transmission measurement.

b. Adjust the AMPL and PHASE VERNIERS on the Network Analyzer to obtain the desired readout indication on the Display Indicator plug-in in the Network Analyzer.

c. Adjust the AMPL VERNIER control on the Model 8418A to get the desired amplitude-reference indication on the Display Indicator plug-in used in the Model 8418A.

d. Then adjust the PHASE VERNIER control on the Model 8418A to get the desired phase-reference indication on the Display Indicator plug-in in the Model 8418A. The controls on the Network Analyzer should be adjusted first, since they affect the indications on the Display Indicator plug-in used in the Model 8418A. Always adjust the controls in this order when using the Model 8418A.

OPERATOR'S MAINTENANCE

Replacing the Fuses. To replace the main power fuse, proceed as follows:

a. Remove the power cord from the Power Line Module.

b. Slide the clear plastic power module cover to one side, exposing the fuse.

c. Pull the FUSE PULL lever outward to eject the fuse.

d. Insert the proper value replacement fuse:

100/120V: Use 0.8 ampere normal-blow fuse, HP Part No. 2110-0336.

220/240V: Use 0.4 ampere normal-blow fuse, HP Part No. 2120-0340.

e. Replace power cord in Power Line Module and turn on 8418A. If a second fuse burns out immediately, consult the Troubleshooting section before replacing the second fuse.

Line-Switch Bulb Replacement. The bulb housed in the LINE switch pushbutton indicates that line power is applied to the Model 8418A. This bulb may be replaced without unscrewing the switch-retaining ring. To replace the bulb, disconnect the power cord and pull the pushbutton straight out. Figure 5 is an exploded view of the pushbutton/bulb assembly. Remove the bulb by grasping the bulb skirt with fingernails or a pair of long-nosed pliers and pulling, while holding the pushbutton.

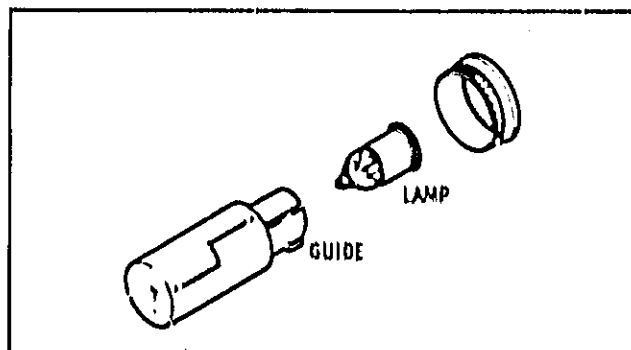


Figure 5. Line Switch Bulb Replacement

The part number for the replacement bulb is HP Part No. 2140-0244. Install a replacement bulb by inserting the bulb into the pushbutton. Then insert the key in the pushbutton assembly into the slot in the switch body. Push the pushbutton assembly in until it seats.

PERFORMANCE TEST

The following procedures are used for testing the electrical performance of the Model 8418A Auxiliary Display Unit for incoming inspection, periodic evaluation, and calibration. Specifications given in Table 1 are the performance standards. If the Auxiliary Display Holder fails to meet any of the performance test specifications, and a circuit malfunction is not suspected, refer to the adjustment procedure. If a malfunction is suspected, refer to troubleshooting procedures. All of these procedures assume that the companion 8410A/B or 8407A system is working properly. If there is any question, perform the operator's check on the Network Analyzer described in the Operating and Service Manual for the particular Network Analyzer (Model 8410A/B or 8407A) used. Equipment recommended for performance testing is listed in Table 2, marked "P".

Model 8418A

ADJUSTMENTS

The following adjustment is not part of the Performance Test but this adjustment must be made before the Performance Test is done.

EQUIPMENT RECOMMENDED FOR ADJUSTMENT AND PERFORMANCE TESTING

Equipment recommended for adjusting and performance testing the Model 8418A is listed in Table 2. Equipment for performance testing is marked "P" in the Use Column, equipment marked "A" is for adjustment and equipment marked "T" is for troubleshooting. Other equipment may be substituted provided its specifications equal or exceed the specifications in the "Critical Specifications" column.

TEST RECORD

Table 5 is a performance test record to be filled in upon Incoming Inspection and to be used for later reference during periodic evaluation of equipment performance.

FACTORY SELECTED COMPONENTS

Certain components (having * values on the schematic) are adjusted at the factory. The values of these components are selected as follows:

Table 4. Factory Selected Components

Selected Component	Selected for
A2C10	PHASE VERNIER range (with 8414A). See Figure 7 for further information.
A2R12	Amplitude adjustment of A2 Phase Vernier Assembly. See Figure 8 for further information.
A3R12	Amplitude Vernier range adjustment.

ADJUSTMENTS

POWER SUPPLY

- a. Remove top cover of 8418A.
- b. Plug the 8418A into a variable voltage ac supply.
- c. Set variable voltage ac supply to 115 Vac output and plug in power cord of 8418A (with 8418A set for 115V input).
- d. With a display indicator plugged in, turn on 8418A.
- e. Connect a digital voltmeter (DVM) to test point A1A1TP2.
- f. Adjust A1A1R22 until the DVM reads -20.00 ± 0.01 Vdc. Vary the ac input voltage to the 8418A from 102 to 128 Vac while watching the DVM. Voltage should not vary more than ± 0.02 volt.
- g. Connect DVM to test point A1A1TP1.
- h. Adjust A1A1R9 until the meter reads $+20.00 \pm 0.01$ Vdc. Vary the ac input voltage to the 8418A from 102 to 128 Vac while watching the DVM. Voltage should not vary more than ± 0.02 volt.

CAUTION

Use ac coupling to measure ripple on the dc voltage. Using dc coupling may damage the oscilloscope.

- i. Use a direct connection probe on an oscilloscope to measure ripple. If high-frequency noise obscures the measurement, install the following filter.

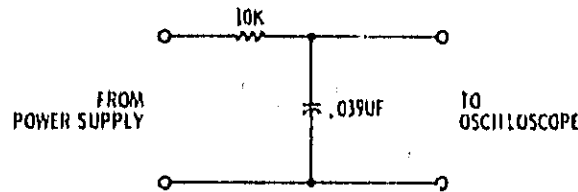


Figure 6. Low-Pass Filter

- j. Measure the peak-to-peak ripple on the -20 V and $+20$ V power supplies as the ac input voltage is varied from 102 to 128 Vac. The ripple should not exceed 0.01V peak-to-peak at any ac input voltage.

WARNING

Be careful! Approximately 500 volts appear on pin 20 of P1. Contact with this high voltage may cause personal injury.

- k. Remove plug-in from 8418A, and use 10:1 divider on oscilloscope to measure the voltage between pin 20 of P1 and ground. This voltage should be 500 ± 50 Vac peak-to-peak, with 115 Vac input to the 8418A.

PERFORMANCE TESTS

PHASE VERNIER VARIATION

SPECIFICATION:

Vernier provides continuous phase reference adjustment over at least 80 degrees.

DESCRIPTION:

A wide-range oscillator is used to provide signals to operate an 8418A. A counter is used to set the exact frequency. The PHASE VERNIER is rotated throughout its range and the variation is noted.

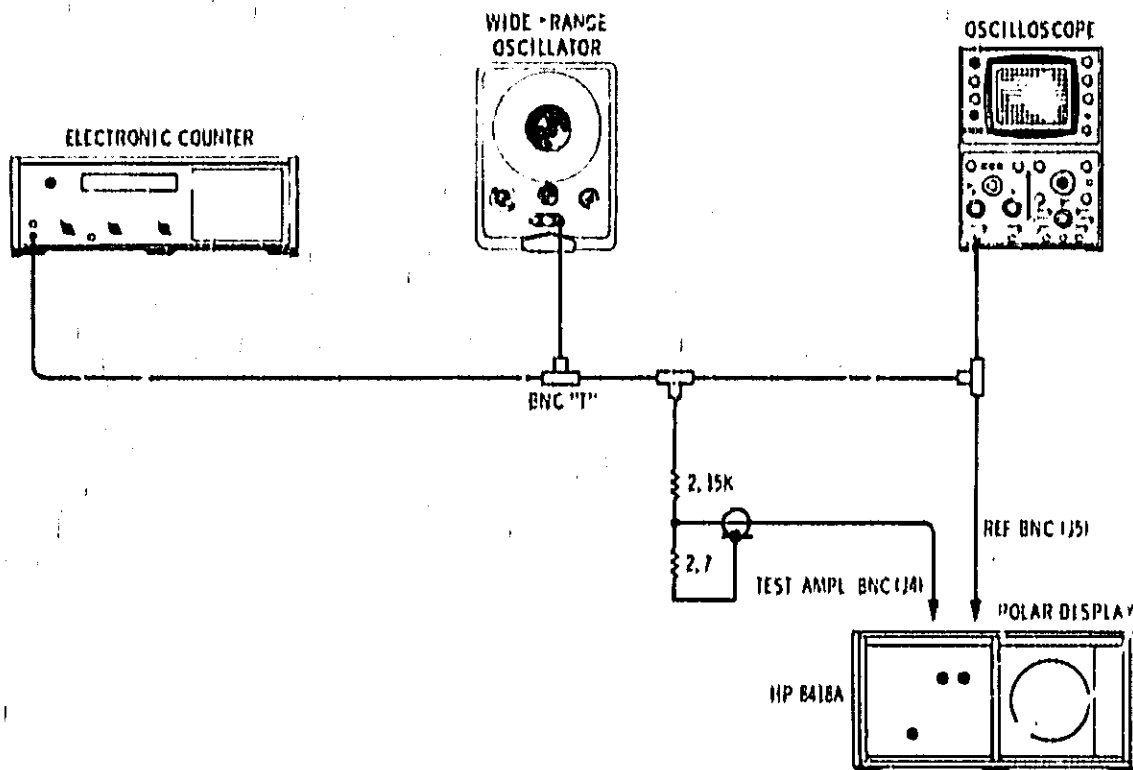


Figure 7. Phase Vernier Variation Test Setup.

EQUIPMENT:

Wide-Range Oscillator	.....	HP 200C/D
BNC "T" (3 required)	.....	HP Part No. 1250-0781 (UG-274A/U)
Electronic Counter	.....	HP 5248L
Oscilloscope	.....	HP 180A/1801A/1820A
Display Indicator (Polar Display)	.....	HP 8414A

PERFORMANCE TESTS

PHASE VERNIER VARIATION (cont'd)

PROCEDURE:

NOTE

This test assumes the power supply voltages have been checked.

- a. Install a Model 8414A Polar Display plug-in in the Model 8418A.
- b. Connect the Model 8418A to the power mains and turn on.
- c. Connect the equipment as shown in Figure 7.
- d. Connect the voltage divider to the 8418A as shown. A voltage divider is necessary to assure correct signal input levels to both the 8418A REF channel input and the 8418A TEST AMPL channel (8414A) input.
- e. Set the wide-range oscillator to approximately 278 kHz and an output of 2.3 ± 0.3 V_{ac} peak-to-peak as measured with an oscilloscope. This level will put approximately 2 mV peak-to-peak into the TEST AMPL jack (J4).
- f. Fine adjust the wide-range oscillator frequency by measuring the period of the frequency and adjusting for a period of 3.6000 ± 0.0010 microseconds.
- g. Push the BEAM CTR pushbutton on the 8414A and center the dot on the CRT to the exact center of the display with the VERT POS and HORIZ POS controls on the 8414A.
- h. Adjust 8418A PHASE VERNIER control from the fully clockwise position to the fully counter-clockwise position while observing the 8414A display. The dot should move from $-45 \pm 5^\circ$ to $+45 \pm 5^\circ$ on the CRT. If not, tune the circuit (A2L1/A2C8/A2C9/A2C10) by padding the value of A2C10 until the proper range is covered.

PERFORMANCE TESTS

TEST CHANNEL GAIN

Phase and Amplitude Variation

SPECIFICATION:

Vernier provides continuous amplitude adjustment over at least 4 dB.

DESCRIPTION:

A wide-range oscillator is used to provide signals to operate an 8418A. A counter is used to set the exact frequency. The voltage is measured as the AMPL VERNIER is varied.

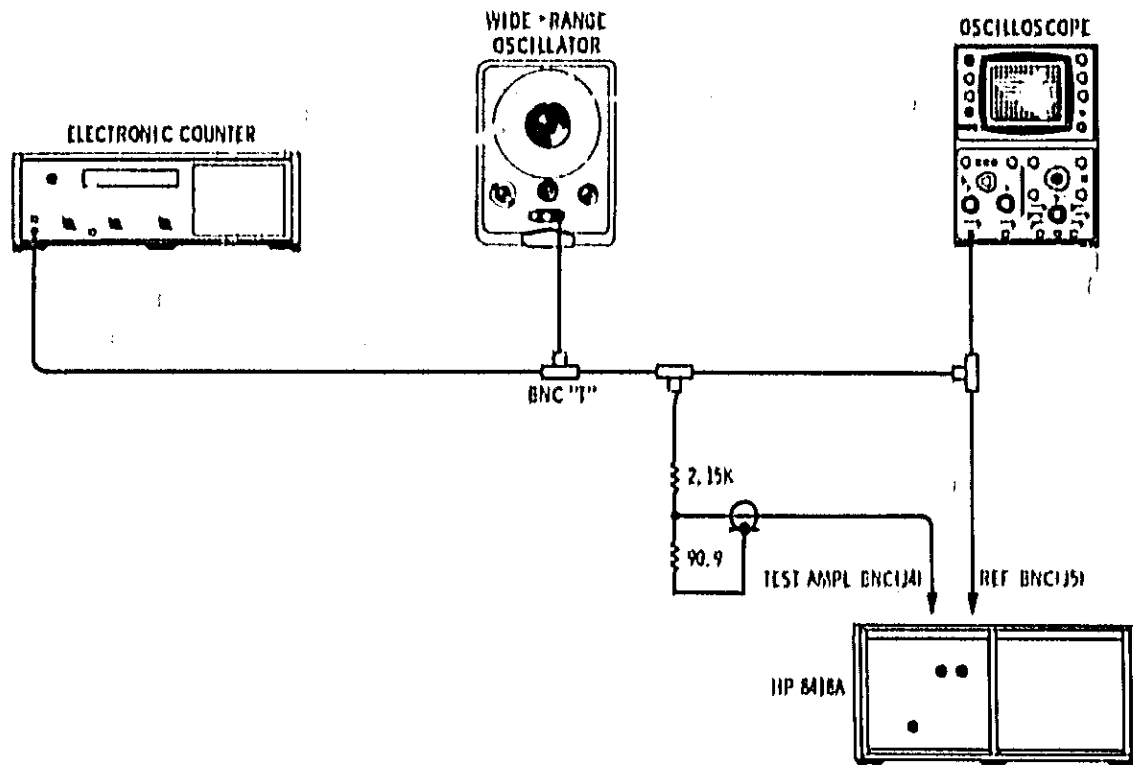


Figure 8. Amplitude Vernier Variation Test Setup.

EQUIPMENT:

Wide-Range Oscillator	HP 200C/D
BNC "T" (3 required)	HP Part No. 1250-0781 (UG-271A/U)
Electronic Counter	HP 5248L
Oscilloscope	HP 180A/1801A/1820A

a. This test will be performed without any plug-in display indicator in the Model 8418A. Plug in the 8418A and turn it on.

b. Connect the equipment as shown in Figure 8. This equipment setup is similar to that of Figure 7 but the value of the resistor nearest ground in the divider stick is different.

PERFORMANCE TESTS

- e. Connect the voltage divider to the 8418A as shown.
- d. Set the wide range oscillator to a frequency having a period of 3.0000 ± 0.0010 microseconds.
- e. Set the wide-range oscillator for an output of approximately 2.5V peak-to-peak at the 8418A REF Channel Input (J5), as measured with a 10:1 divider probe and oscilloscope.
- f. Connect the 10:1 divider probe and oscilloscope to pin 24 of J2 and measure the change of voltage while turning the PHASE VERNIER control over its entire range. Amplitude should not vary more than 0.4V peak-to-peak and average voltage should be within $\pm 0.2V$ peak-to-peak of the REF Channel input voltage. Adjust the value of A2R12 to adjust the amplitude, if necessary.
- g. Connect a direct probe and oscilloscope to TEST AMPL input (J4) to 8418A.
- h. Adjust wide-range oscillator for a reading of 100 mV peak-to-peak on the oscilloscope.
- i. Connect the direct probe and oscilloscope to pin 13 of J2.
- j. Observe the reading on the oscilloscope while turning the AMPL VERNIER over its entire range. The voltage range at pin 13 of J2 should be from < 80 mV peak-to-peak to > 125 mV peak-to-peak. If not, and the previous amplitude adjustment is correct, check the value of the amplitude vernier and associated circuit.

Table 5. Test Record

HP Model 8418A		Date _____		
Auxiliary Display Holder		Tested by _____		
		MIN.	ACTUAL	MAX.
POWER SUPPLY				
-20 Volt Supply		-19.99	_____	-20.01 Vdc
102 to 128 Vac input		-19.98	_____	-20.02 Vdc
+20 Volt Supply		+19.99	_____	+20.01 Vdc
102 to 128 Vac input		+19.98	_____	+20.02 Vdc
PHASE VERNIER VARIATION	CW	-10°	_____	-50°
	CCW	-10°	_____	+50°
TEST CHANNEL GAIN				
Phase Vernier Variation		-0.2	_____	+0.2V p-p
Variation (measured at pin 24 of J2)				
Average (relative to input at J5)		-0.2	_____	+0.2V p-p
Amplitude Vernier Variation		<80 mV	_____	>125 mV p-p

Model 8418A

TROUBLESHOOTING

Equipment recommended for troubleshooting is listed in Table 2, marked "T" for troubleshooting. The Model 8418A Auxiliary Display Holder essentially adds another display indicator to the Network Analyzer system. Since the display indicators are duplicated, they may be substituted for each other to isolate a trouble, see Figure 9.

If the trouble is in the Model 8418A, do the Performance Test given in Figures 7 and 8. This procedure will isolate the trouble to either the Power Supply, the Amplitude Vernier Assembly, or the Phase Vernier Assembly. When troubleshooting the individual circuits, an extender board (HP Part No. 5060-0049) is useful to extend the circuit board assemblies for easy measurement.

If the trouble is in the Phase Vernier Assembly (A2), consult Figure 11 for troubleshooting. This Assembly operates the same as the 8410A/B Reference 278 kHz Amplifier Assembly (A16) with an emitter-follower output stage added.

If the trouble is in the Amplitude Vernier Assembly (A3), consult Figure 13 for troubleshooting. This Assembly consists of a two-stage current amplifier A3Q1 and A3Q2 followed by an emitter-follower output stage A3Q3. The gain of the amplifier is adjusted by varying the emitter impedance of A3Q1 to ground through A3R8, A3C5, and R1 (AMPL VERNIER).

If the trouble is in the Power Supply (A1 or A1A1), consult Figure 15 for troubleshooting. These assemblies operate the same as the 8410A/B A10 and A10A1 Power Supply Assemblies except there is no -11 volt supply.

REPAIR

The printed circuit boards in the 8418A are of the plated-through type consisting of metallic conductors bonded to both sides of insulating material. Soldering can be done from either side of the board with equally good results. Following are recommendations and precautions pertinent to printed circuit repair work.

a. Avoid unnecessary component substitution; it can result in damage to the circuit board and adjacent components.

b. Do not use a high-wattage soldering iron. Excessive heat may lift a conductor or damage the board.

c. Use a suction device (Table 6) or a wooden

toothpick to remove solder from component mounting holes. Do not use a sharp metal object, such as an awl or twist drill, for this purpose. Sharp objects may damage the plated-through conductor.

d. After soldering, remove excess flux from the soldered area and apply a protective coating to prevent contamination and corrosion. See Table 6 for recommendations.

A broken or burned section of conductor can be repaired by bridging the damaged section with a length of tinned copper wire. Allow adequate overlap and remove any varnish from etched conductor before soldering wire in place.

Component Replacement

A general procedure for replacing a component is as follows:

a. Remove defective component from circuit board.

b. Remove solder from mounting holes using a suction desoldering aid (Table 6) or wooden toothpick.

c. Shape leads of replacement component to match mounting hole spacing.

d. Insert component leads into mounting holes and position component as original was positioned. Do not force leads of replacement component into mounting holes. Sharp lead ends may damage plated-through conductor.

Transistor and Diode Replacement

A general procedure for replacing a transistor or diode is as follows:

a. Do not apply excessive heat. See Table 6 for soldering tool specifications.

b. Use a heat sink, such as pliers or hemostat, between transistor or diode body and hot soldering iron.

c. When installing a replacement transistor or diode, ensure sufficient lead length to dissipate heat of soldering by maintaining about the same length of exposed lead as used for original transistor or diode.

PARTS LIST

REPAIR PROCEDURES

General information and procedures for the removal of the A1 Interconnect Board and chassis-mounted components are given in the following paragraphs.

A1 Interconnect Board

To remove the A1 Interconnect Board proceed as follows:

- a. Remove 8418A top, bottom, and left side covers.
- b. Remove A1A1 power supply circuit board assembly.
- c. Remove electrolytic capacitor bracket.
- d. Disconnect push-on connector wires from A1 Interconnect Board Assembly.
- e. Remove transistors Q1 or Q2. Note orientation of the transistors. Unscrew four posi-drive mounting screws from beneath the board.

NOTE

When replacing either transistor, coat both sides of black anodized insulator with a light coating of heat-conducting silicone grease.¹

- f. Disconnect the 15-pin connector from the A1 Interconnect Board.
- g. Remove the two posi-drive screws holding the A1 Board bracket.
- h. Unhook the cable assembly from the A1 Board cable clamp.
- i. The A1 Interconnect Board is now free. Remove it through the top of the instrument.

NOTE

When replacing the A1 Board, make sure all four plastic insulators are inserted in the heat sink recesses before attaching circuit board.

Power Transformer Removal

To remove the power transformer T1, proceed as follows:

- a. Set the 8418A on its side.
- b. Remove four transformer mounting screws.

- e. Pull the crimped terminal connectors off at the components where the transformer wires terminate.

NOTE

Before installing a new transformer, insure that the wires are the same length as on the old transformer. Assembly is the reverse of disassembly.

Blower/Power Supply Heat Sink Removal

To remove the blower/heat sink remove the A1 Interconnect Board and Power Transformer, as instructed in the previous paragraphs, and then proceed as follows:

- a. Remove the four posi-drive mounting screws holding the heat sink on the blower.
- b. Unsolder the two wires going to the blower.
- c. Remove the four blower mounting screws using a 5/16 inch wrench.
- d. Remove the blower from the inside.

NOTE

Assembly is the reverse of disassembly.

REPLACEABLE PARTS

Introduction

Model 8418A parts are listed in Table 7. Parts listed in Table 7 are listed in alpha-numerical order by reference designation together with their HP part numbers and descriptions. Miscellaneous and cabinet parts not indexed by reference designation are listed at the end of the table. The typical manufacturer code numbers are given in Table 9.

Ordering Information

When ordering a replacement part listed in Table 8:

- a. Quote the Hewlett-Packard part number for the part, the part description, and the quantity requested.
- b. Address the order or inquiry to the nearest Hewlett-Packard sales and service office listed at the rear of this Operating Note.

¹Dow Chemical Compound No. 3.

Table 6. Etched Circuit Soldering Equipment

Item	Use	Specification	Item Recommended
Soldering tool	Soldering Unsoldering	Wattage rating: 47-1/2 - 56-1/2 Tip Temp: 850 - 900°	Ungar #776 handle with *Ungar #4037 Heating Unit
Soldering Tip	Soldering Unsoldering	Shape: pointed	*Ungar #PL111
De-soldering aid	To remove molten solder from connection	Suction device	Soldapullit by Eidsyn Co., Arleta, California
Resin (flux) solvent	Remove excess flux from soldered area before application of protective coating	Must not dissolve etched circuit base board material or conductor bonding agent	Freon Acetone Lacquer Thinner Isopropyl Alcohol (100% dry)
Solder	Component replacement Circuit board repair Wiring	Resin (flux) core, high tin content (60/40 tin/lead), 18 gauge (SWG) preferred	
Protective Coating	Contamination, corrosion protection	Good electrical insulation, corrosion-prevention properties	Krylon R ** #1302 Humbrol Protective Coating, Type 1312 by Columbia Technical Corp., Woodside 77, New York
<p>*For working on etched boards: for general purpose work, use Ungar #1237 Heating Unit (37.5W, tip temp of 750 - 800°) and Ungar #PL111 1/8 inch chisel tip.</p> <p>**Krylon, Inc., Norristown, Pennsylvania.</p>			

Table 7. Reference Designators and Abbreviations Used in Parts List

REFERENCE DESIGNATORS			
A	• assembly	F	• fuse
B	• motor	FL	• Filter
BT	• battery	J	• jack
C	• capacitor	K	• relay
CP	• coupler	L	• inductor
CR	• diode	LS	• loud speaker
DL	• delay line	M	• meter
DS	• device signaling (lamp)	MR	• microphone
E	• misc electronic part	MP	• mechanical part
		P	• plug
		Q	• transistor
		R	• resistor
		RT	• thermostat
		S	• switch
		T	• transformer
		TH	• terminal board
		TP	• test point
		U	• integrated circuit
		V	• vacuum tube, neon bulb, photocell, etc.
		VR	• voltage regulator
		W	• cable
		X	• socket
		Y	• crystal
		Z	• tuned cavity, network

ABBREVIATIONS			
A	• amperes	H	• henries
AFC	• automatic frequency control	HDW	• hardware
AMPL	• amplifier	HEX	• hexagonal
BFJ	• beat frequency oscillator	HG	• mercury
BE CU	• beryllium copper	HR	• hours
BH	• binder head	Hz	• Hertz
BP	• bandpass	IF	• intermediate freq
BRS	• brass	IMPQ	• impregnated
BWO	• backward wave oscillator	INCD	• incandescent
		INCL	• (included)
		INS	• (insulated)
		INT	• internal
CCW	• counterclockwise	K	• kilo = 1000
CER	• ceramic	LH	• left hand
CMO	• cabinet mount only	LIN	• linear taper
COEF	• coefficient	LK WASH	• lock washer
COM	• common	LOG	• logarithmic taper
COMP	• composition	LPF	• low pass filter
COMPL	• complete	M	• milli = 10 ⁻³
CONN	• connector	MEG	• meg = 10 ⁶
CP	• cadmium plate	MET FLM	• metal film
CRT	• cathode-ray tube	MET OX	• metallic oxide
CW	• clockwise	MFR	• manufacturer
DEPC	• deposited carbon	MHz	• mega Hertz
DR	• drive	MINAT	• miniature
ELECT	• electrolytic	MOM	• momentary
ENCAP	• encapsulated	MOS	• metallized substrate
EXT	• external	MTG	• mounting
F	• farads	MY	• "mylar"
FLH	• flat head	N	• nano (10 ⁻⁹)
FIL H	• filament head	N/C	• normally closed
FXD	• fixed	NE	• neon
G	• giga (10 ⁹)	NI PL	• nickel plate
GE	• germanium		
GL	• glass		
GRD	• grounded		
		N/O	• normally open
		NOM	• nominal
		NPO	• negative positive zero (zero temperature coefficient)
		NPT	• negative-positive-negative
		NRFR	• not recommended for field replacement
		NSR	• not separately replaceable
		ODD	• order by description
		OIH	• oval head
		OX	• oxide
		P	• peak
		PC	• printed circuit
		PF	• picofarads = 10 ⁻¹² farads
		PH BRZ	• phosphor bronze
		PHL	• Phillips
		PIV	• peak to peak inverse volt.
		PNP	• positive-negative-positive
		P/O	• part of
		POLY	• polystyrene
		PORC	• porcelain
		POS	• position(s)
		POT	• potentiometer
		PP	• peak-to-peak
		PT	• point
		PWV	• peak working voltage
		RECT	• rectifier
		RF	• radio frequency
		RH	• round head or right hand
		RMO	• rack mount only
		RMS	• root-mean square
		RWV	• reverse working voltage
		S-B	• slow blow
		SCR	• screw
		SE	• selenium
		SECT	• section(s)
		SEMICON	• semiconductor
		SI	• silicon
		SIL	• silver
		SL	• slide
		SPG	• spring
		SPL	• special
		SST	• stainless steel
		SR	• split ring
		STL	• steel
		TA	• tantalum
		TD	• time delay
		TGL	• toggle
		THD	• thread
		TJ	• titanium
		TOL	• tolerance
		TRIM	• trimmer
		TWT	• traveling wave tube
		μ	• micro = 10 ⁻⁶
		VAR	• variable
		VDCW	• dc working volts
		W/	• with
		W	• watts
		WIV	• working inverse voltage
		WW	• wirewound
		W/O	• without

Table 8. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	02418-0000	1	BOARD ASSY (INTERCONNECT)	28480	02418-0000
A1L1	0180-2220	2	CIFRD ELECT 1500 UF +75% 10% 35VDCM	56289	0180-2220
A1C1	0180-2229	2	CIFRD ELECT 3000 UF +75% 10% 35VDCM	56289	0180-2229
A1C2	1901-0026	4	DIODE SILICON 0.75A 200PIV	04713	5K125A-M
A1L3	1901-0026	1	DIODE SILICON 0.75A 200PIV	04713	5K125A-M
A1L4	1901-0026	1	DIODE SILICON 0.75A 200PIV	04713	5K125A-M
A1U1	1853-0063	2	16T161 17PM	00133	16T161
	1200-0147	2	INSULATION TRANSDUCER MIXING	71280	1200-0147
A1U7	1853-0063	2	16T161 17PM	00133	16T161
	1200-0147	2	INSULATION TRANSDUCER MIXING	71280	1200-0147
A1U7	08410-0050	1	CABLE ASSY	28480	08410-0050
A1W1	02418-0000	1	BOARD ASSY POWER SUPPLY	28480	02418-0000
A1A1L1	0180-2205	1	CIFRD ELECT 0.50 UF 10% 35VDCM	56289	0180-2205
A1A1L2			NOT ASSIGNED		
A1A1L3	0180-2440	1	CIFRD CER 0.05 UF +80-20% 300VDCM	56289	0180-2440
A1A1L4			NOT ASSIGNED		
A1A1C5	0180-0224	1	CIFRD ELECT 33 UF 10% 35VDCM	28480	0180-0224
A1A1C6			NOT ASSIGNED		
A1A1L7			NOT ASSIGNED		
A1A1C8	0180-0224	1	CIFRD ELECT 33 UF 10% 35VDCM	28480	0180-0224
A1A1L9	0180-0116	2	CIFRD ELECT 1.0 UF 10% 35VDCM	56289	0180-0116
A1A1L10	0180-0116	2	CIFRD ELECT 1.0 UF 10% 35VDCM	56289	0180-0116
A1A1C11	1901-0026	3	DIODE SILICON 100MA/1V	07263	5C6013-CML
A1A1L12	1901-0026	3	DIODE SILICON 100MA/1V	07263	5C6013-CML
A1A1C13	1901-0026	3	DIODE SILICON 100MA/1V	07263	5C6013-CML
A1A1U1	1853-0001	2	16T161 17PM (SELECTED FROM 2H1132)	28480	1853-0001
A1A1U2	1853-0028	4	16T161 17PM (SELECTED FROM 2H3702)	28480	1853-0028
A1A1U3	1853-0028	4	16T161 17PM (SELECTED FROM 2H3702)	28480	1853-0028
A1A1U4	0757-0180	1	RIFRD MET FLM 1.5K OHM 1% 1/2W	28480	0757-0180
A1A1U5	0757-0280	2	RIFRD MET FLM 1K OHM 1% 1/2W	28480	0757-0280
A1A1U6	0757-0442	10	RIFRD MET FLM 10.0K OHM 1% 1/2W	28480	0757-0442
A1A1U7	0757-0194	1	RIFRD MET FLM 21.0K OHM 1% 1/2W	28480	0757-0194
A1A1U8	0811-1552	1	RIFRD WM 0.50 OHM 5% 2W	28480	0811-1552
A1A1U9			NOT ASSIGNED		
A1A1U10	0698-3153	2	RIFRD MET FLM 1.5K OHM 1% 1/2W	28480	0698-3153
A1A1U11	2100-2632	1	RIFRD FLM 100 OHM 10% 1/2W	28480	2100-2632
A1A1U12			NOT ASSIGNED		
A1A1U13	0698-3157	1	RIFRD MET FLM 19.0K OHM 1% 1/2W	28480	0698-3157
A1A1U14	0698-0084	1	RIFRD MET FLM 2.15K OHM 1% 1/2W	28480	0698-0084
A1A1U15	0698-3444	1	RIFRD MET FLM 31.5K OHM 1% 1/2W	28480	0698-3444
A1A1U16	0757-0274	2	RIFRD MET FLM 1.5K OHM 1% 1/2W	28480	0757-0274
A1A1U17	0757-0280	1	RIFRD MET FLM 1K OHM 1% 1/2W	28480	0757-0280
A1A1U18	0811-1552	1	RIFRD WM 0.50 OHM 5% 2W	28480	0811-1552
A1A1U19			NOT ASSIGNED		
A1A1U20	0698-3160	2	RIFRD MET FLM 1.5K OHM 1% 1/2W	28480	0698-3160
A1A1U21	0698-3162	1	RIFRD MET FLM 40.0K OHM 1% 1/2W	28480	0698-3162
A1A1U22	0757-0280	1	RIFRD MET FLM 1K OHM 1% 1/2W	28480	0757-0280
A1A1U23	0757-0280	1	RIFRD MET FLM 1K OHM 1% 1/2W	28480	0757-0280
A1A1U24	2100-1766	1	RIFRD WM 200 OHM 5% TYPE V 2W	28480	2100-1766
A1A1U25			NOT ASSIGNED		
A1A1U26	0698-0083	1	RIFRD MET FLM 1.96K OHM 1% 1/2W	28480	0698-0083
A1A1U27			NOT ASSIGNED		
A1A1U28	0757-0274	1	RIFRD MET FLM 1.5K OHM 1% 1/2W	28480	0757-0274
A1A1U29	0757-1094	1	RIFRD MET FLM 1.47K OHM 1% 1/2W	28480	0757-1094
A1A1U30			NOT ASSIGNED		
A1A1U31	1820-0196	2	VOLTAGE REGULATOR	07263	1820-0196
A1A1U32	1820-0196	2	VOLTAGE REGULATOR	07263	1820-0196
A1	02418-0000	1	BOARD ASSY PHASE VERNIER	28480	02418-0000
A2L1	0180-2229	2	CIFRD MICA 3000 PF 5%	28480	0180-2229
A2L2	0180-2229	2	CIFRD MICA 3000 PF 5%	28480	0180-2229
A2L3	0180-0121	10	CIFRD CER 0.1 UF +80-20% 30VDCM	56289	0180-0121
A2L4	0180-0251	1	CIFRD ELECT 1.0 UF 10% 35VDCM	56289	0180-0251
A2L5	0180-0121	1	CIFRD CER 0.1 UF +80-20% 30VDCM	56289	0180-0121
A2L6	0180-0251	1	CIFRD ELECT 1.0 UF 10% 35VDCM	56289	0180-0251
A2L7	0180-0121	1	CIFRD CER 0.1 UF +80-20% 30VDCM	56289	0180-0121
A2L8	0180-0144	2	CIFRD MICA 8200 PF 1% 300VDCM	28480	0180-0144
A2L9	0180-1076	1	CIFRD CER 470 PF 5% 200VDCM	71280	0180-1076
A2L10	0180-0439	1	CIFRD MICA 430 PF 5% 300 VDCM	28480	0180-0439
A2L11	0180-0291	1	FACTORY SELECTED PART	56289	0180-0291
			CIFRD ELECT 1.0 UF 10% 35VDCM		

Table 8. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			CHASSIS PARTS		
H1	3160-0048	1	PAN/ITERMIAL 100-120V 60-HCHT	2227	32727
	3160-0214	1	FAN GRILL	2440	3160-0214
	09410-0031	1	AIR FILTER FRAME	2440	09410-0031
	09410-0033	1	AIR FILTER	2440	09410-0033
L1	0160-2433	1	CIFRD CER 2 K 0.005 UF FOR 200VAC	2224	2433-000-1000
L2	0160-2436	1	CIFRD CER 10 PF FOR 200VDCM	2227	2436-000-1000-100M
L3	0160-2437	2	CIFRD CER 5000 PF 180-200 2.0VDCM	2227	2437-000-100-500P
L4	0160-2438	2	CIFRD CER 5000 PF 180-200 200VDCM	2227	2438-000-100-500P
L5	0160-2437	2	CIFRD CER 5000 PF 180-200 200VDCM	2227	2437-000-100-500P
L6	0160-2437	1	CIFRD CER 5000 PF 180-200 200VDCM	2227	2437-000-100-500P
L7	2190-0254	1	120V-250V ADJ 115/105 VOLT 1.5VA 1-2-DIGIT	0254	ADJ
F1	2110-0340	1	FUSE 10,4A AT 250V (FOR 230V OPERATION)	2140	MDL 4710
F2	2110-0336	1	FUSE 10,4A AT 250V (FOR 115V OPERATION)	2140	MDL 4710
F3	0210-0254	1	LINE FUSE 1-2P (LITHIUM)	2227	0210-0254
J1	08410-2024	1	NO ASSIGNED	2440	08410-2024
J2	1250-0103	1	CONNECTOR/FEMALE MID	0260	11-221-1020
J3	1250-0107	1	CONNECTOR/FEMALE MID	0260	11-221-1021
J4	1250-0107	2	CONNECTOR/FEMALE MID	0260	11-221-1021
J5	1250-0107	2	CONNECTOR/FEMALE MID	0260	11-221-1021
J6	1510-0087	1	BINDING POST/BLACK	2440	1510-0087
	0340-0100	1	INSULATOR/BINDING POST, GRAY (LANKING)	2440	0340-0100
J7	1250-0829	5	CONNECTOR/F 50-OHM SCREW ON TYPE	4829	50-045-4610
J8	1250-0829	5	CONNECTOR/F 50-OHM SCREW ON TYPE	4829	50-045-4610
J9	1250-0829	1	CONNECTOR/F 50-OHM SCREW ON TYPE	4829	50-045-4610
J10	1250-0829	1	CONNECTOR/F 50-OHM SCREW ON TYPE	4829	50-045-4610
J11	1250-0829	1	CONNECTOR/F 50-OHM SCREW ON TYPE	4829	50-045-4610
L1	4140-0114	2	COIL/F 100 K 10 OH	2440	4140-0114
L2	4140-0114	2	COIL/F 100 K 10 OH	2440	4140-0114
R1	2100-0732	1	RYVAR COMP 500 OHM 10% LIN 2,25W	2440	2100-0732
	0370-0103	2	RESISTOR 50,4K 1% 1/2W 1/4" SHAFT (AMPLIFIER VERNIER)	2440	0370-0103
R2	2100-2458	1	RYVAR COMP 500 OHM 10% SPEC TAP	2440	2100-2458
	0370-0103	1	RESISTOR 50,4K 1% 1/2W 1/4" SHAFT (PHASE VERNIER)	2440	0370-0103
R3	0160-1167	1	RESISTOR 50,4K 1% 1/2W 1/4" SHAFT (PHASE VERNIER)	2440	0160-1167
R4	3101-1957	1	RESISTOR 50,4K 1% 1/2W 1/4" SHAFT (PHASE VERNIER)	0301A	10-121-ADJ
F4	0160-1912	1	TRANSFORMER/POWER	2440	0160-1912
	08410-0014	1	FRONT PANEL/POWER	2440	08410-0014
C1	4120-1248	1	CABLE ASSY/POWER, DETACHABLE	2090	4120-1248
C2			NOT ASSIGNED		
C3	08418-40007	1	CABLE ASSY/REF. INPUT	2440	08418-40007
	1250-0887	4	CONNECTOR/F FOR RG-188/U CABLE	2291	50-028-0119
	1250-1167	4	BODY/F CONNECTOR	4829	4416-59
	1250-1174	4	COVER/F CONNECTOR	4829	5261-27
	1250-1176	4	SLEEVE/F CONNECTOR	4829	6100-47
	4120-1257	1	CABLE/F COAX	2440	4120-1257
C4	08418-40008	1	CABLE ASSY/REF. OUTPUT	2440	08418-40008
	1250-0888	1	CONNECTOR/F FOR RG-188/U CABLE	4829	50-028-0119
	1250-1167	1	BODY/F CONNECTOR	4829	4416-59
	1250-1174	1	COVER/F CONNECTOR	4829	5261-27
	1250-1176	1	SLEEVE/F CONNECTOR	4829	6100-47
	1250-1176	1	SLEEVE/F CONNECTOR	4829	6100-47
	1250-1176	1	SLEEVE/F CONNECTOR	4829	6100-47
	4120-1257	1	CABLE/F COAX	2440	4120-1257
C5	08418-40009	1	CABLE ASSY/TEST AMPLIFIER INPUT	2440	08418-40009
	1250-0888	1	CONNECTOR/F FOR RG-188/U CABLE	4829	50-028-0119
	1250-1167	1	BODY/F CONNECTOR	4829	4416-59
	1250-1174	1	COVER/F CONNECTOR	4829	5261-27
	1250-1176	1	SLEEVE/F CONNECTOR	4829	6100-47
C6	4120-1258	1	CABLE/F COAX	2440	4120-1258
C7	08418-40010	1	CABLE ASSY/TEST AMPLIFIER OUTPUT	2440	08418-40010
	1250-0888	1	CONNECTOR/F FOR RG-188/U CABLE	4829	50-028-0119
	1250-1167	1	BODY/F CONNECTOR	4829	4416-59
	1250-1174	1	COVER/F CONNECTOR	4829	5261-27
	1250-1176	1	SLEEVE/F CONNECTOR	4829	6100-47
	4120-1257	1	CABLE/F COAX	2440	4120-1257
C8	08410-4025	1	CABLE ASSY/AMPLIFIER VERNIER (IN)	2440	08410-4025
C9	08418-40014	1	CABLE/F COAX, TEST PHASE	2440	08418-40014
C10			NOT ASSIGNED		
C11	08410-40011	1	CABLE/F HI/LO (175 VAC)	2440	08410-40011
C12	1251-0160	1	CONNECTOR/F 15 PIN	26510	250-15-10-210
C13	1251-0160	2	CONNECTOR/F 15 PIN	2648C	1251-0160
C14	1251-0160	2	CONNECTOR/F 15 PIN	2648D	1251-0160

Table 8. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			MISCELLANEOUS & CABINET PARTS		
	1490-0030	1	STANDOFF	28480	1490-0030
	5070-0058	1	PLATE (FLUOR ALUMINUM)	28480	5070-0058
	5000-8719	1	COVER (SIDE (RIGHT))	28480	5000-8719
	5000-8717	1	COVER (SIDE (LEFT))	28480	5000-8717
	5070-1978	1	TRIM (LOWER FRAME)	28480	5070-1978
	5070-3281	1	TRIM (NAMEPLATE)	28480	5070-3281
	5070-3286	1	GUIDE (PLUG-IN)	28480	5070-3286
	5070-3977	1	TRIM (UPPER FRAME)	28480	5070-3977
	5070-3287	1	PIN (PIVOT)	28480	5070-3287
	5070-3288	1	EXTRACTOR	28480	5070-3288
	5040-0161	1	LOCK (EXTRACTOR)	28480	5040-0161
	5040-0170	1	GUIDE (PLUG-IN PC BOARD)	28480	5040-0170
	5010-0768	1	COVER ASSY (TOP)	28480	5010-0768
	5060-0767	5	PIVOT ASSY (FN)	28480	5060-0767
	5060-0763	2	HANDLE ASSY (SIDE)	28480	5060-0763
	5060-0715	2	RETAINER (HANDLE ASSY)	28480	5060-0715
	5060-0717	1	COVER ASSY (TOP)	28480	5060-0717
	5060-0737	1	FRAME ASSY (MODIFIED)	28480	5060-0737
	5060-0741	1	KIT (THRACK MOUNT)	28480	5060-0741
	08410-2035	4	FAN STANDOFF (BOLT HEX)	28480	08410-2035
	08410-2029	1	COVER (REAR PANEL)	28480	08410-2029
	08410-2005	1	FRAME (LOWER)	28480	08410-2005
	08410-4001	1	PROTECTOR (FRONT)	28480	08410-4001
	08410-2021	1	BRACKET (FRONT PANEL MOUNT (BOTTOM))	28480	08410-2021
	08410-2022	1	BRACKET (FRONT PANEL MOUNT (TOP))	28480	08410-2022
	08410-2016	1	HEAT SINK (POWER SUPPLY TRANSISTOR)	28480	08410-2016
	08410-0028	1	PANEL (REAR, PLUG-IN FID)	28480	08410-0028
	08410-2027	1	PIN (STOP)	28480	08410-2027
	08410-2007	1	FRAME (UPPER)	28480	08410-2007
	08410-0006	1	COVER (ATTENUATOR)	28480	08410-0006
	08410-0007	1	PANEL (REAR)	28480	08410-0007
	08410-2000	1	HOUSING (IPC)	28480	08410-2000
	08410-0005	1	COVER (BOARD HOUSING)	28480	08410-0005
	08410-0001	1	PANEL (FRONT)	28480	08410-0001
	08410-0006	1	COVER (CONNECTOR HOUSING)	28480	08410-0006
	08410-2000	1	SUB-PANEL (FRONT)	28480	08410-2000
	08410-0010	1	DECK (SLIDING, FOR PLUG-IN)	28480	08410-0010
	08410-0007	1	BRACKET (CAPACITOR SUPPORT)	28480	08410-0007
	08410-0003	1	DECK (VERTICAL)	28480	08410-0003
	08410-0005	1	WIRING HARNESS (SIGNAL)	28480	08410-0005
	08410-2008	1	DIVIDER (FRAME SUPPORT)	28480	08410-2008
	08410-2014	3	CABLE ASSY (13M TRI-SHIELD TERM W/ARC)	28480	08410-2014
	08410-0006	1	CABLE (BANANA PLUG (ACCESSORY))	28480	08410-0006
	5010-0715	1	WATERPROOFING ASSY	28480	5010-0715
	5010-0741	1	KIT (THRACK MOUNT)	28480	5010-0741

See Introduction to this section for ordering information

Table 9. Manufacturer's Code List

MFR NO.	MANUFACTURER NAME	ADDRESS	ZIP CODE
00466	AMTELCO (MTR) 288 PHILLIPS LTD CORP	115 AVILES, SA.	00021
02680	AMPHENOL CORP.	BANARDVIEW, ILL.	62917
06711	ANALOGA SEMICONDUCTOR PROD. INC.	PHOENIX, ARIZ.	85008
07901	FAIRCHILD CAMERA & INST. CORP. SEMICONDUCTOR DIV.	MOUNTAIN VIEW, CALIF.	94039
20305	GENIE REPRODUCER CORP.	NEW ROCHELLE, N.Y.	10602
20480	HEWLETT-PACKARD COMPANY	PALO ALTO, CALIF.	94304
50700	SPRAGUE ELECTRIC CO.	W. ADAMS, MASS.	01907
70401	HELOEN CORP.	CHICAGO, ILL.	60644
71400	NUSSMANN MFG. DIV. MC GRAY-EDISON CO.	ST. LOUIS, MO.	63117
71550	ULINE UNION INC. CENTRAL LAB DIV.	MILWAUKEE, WISC.	53201
71785	CINCH MFG. CO. DIV UNITED CARB FASTENER CORP.	CHICAGO, ILL.	60674
72907	ENTE TECHNOLOGICAL PROD. INC.	ERIE, PA.	16512
75007	INTERNATIONAL RESISTANCE CO. INC.	PHILADELPHIA, PA.	19104
75415	LITTELFUSE INC.	DES PLAINES, ILL.	60018
76530	CINCH MONAQUON MILLS DIV. UNITED CARB FASTENER CORP.	CITY OF INDUSTRY, CALIF.	91704
80131	ELECTRIC INDUSTRIES ASSOCIATION	WASHINGTON D.C.	20540
82877	AUTUMN INC.	WUDDSTOCK, N.Y.	14268
84411	THE CAPACITOR DIV.	OSALLALA, N.Y.	69101
87004	MARCO & DAN INDUSTRIES DIV. UAM ELECTROPHETICS CORP.	ANYHEIM, CALIF.	92504
98741	SPALACTRO CORP.	MANHATTAN, N.Y.	10044

SCHEMATIC DIAGRAMS

Table 10. Schematic Diagram Notes

SCHEMATIC DIAGRAM NOTES

Resistance is in ohms and capacitance is in microfarads unless otherwise noted.

P/O = part of.

*Asterisk denotes a factory-selected value. Value shown is typical. Capacitors may be omitted or resistors jumpered.



Screwdriver adjustment.



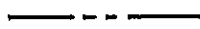
Panel control.



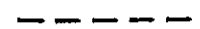
Encloses front panel designations.



Encloses rear panel designation.



Circuit assembly borderline.



Other assembly borderline.



Heavy line with arrows indicates path and direction of main signal.



Heavy dashed line with arrows indicates path and direction of main feedback.



Wiper moves toward CW with clockwise rotation of control as viewed from shaft or knob.



Numbers in stars on circuit assemblies show locations of test points.



Encloses wire color code. Code used (MIL-STD-681) is the same as the resistor color code. First number identifies the base color, second number the wider stripe, and the third number identifies the narrower stripe. E.g., (9-17) denotes white base, yellow wide stripe, violet narrow stripe.



Voltage regulator (breakdown diode).

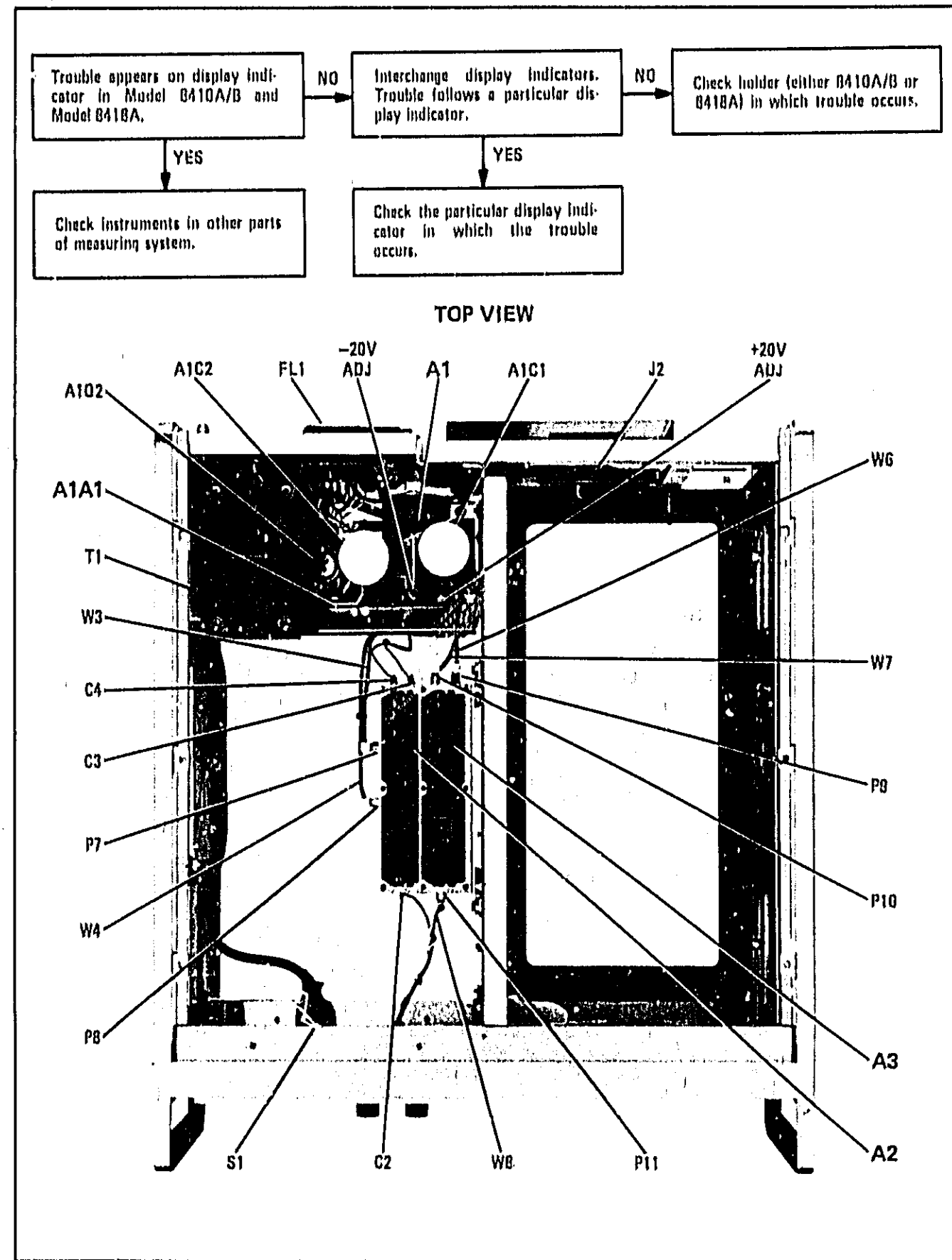


Figure 9. Model 8418A System Troubleshooting and Assembly Identification Diagram

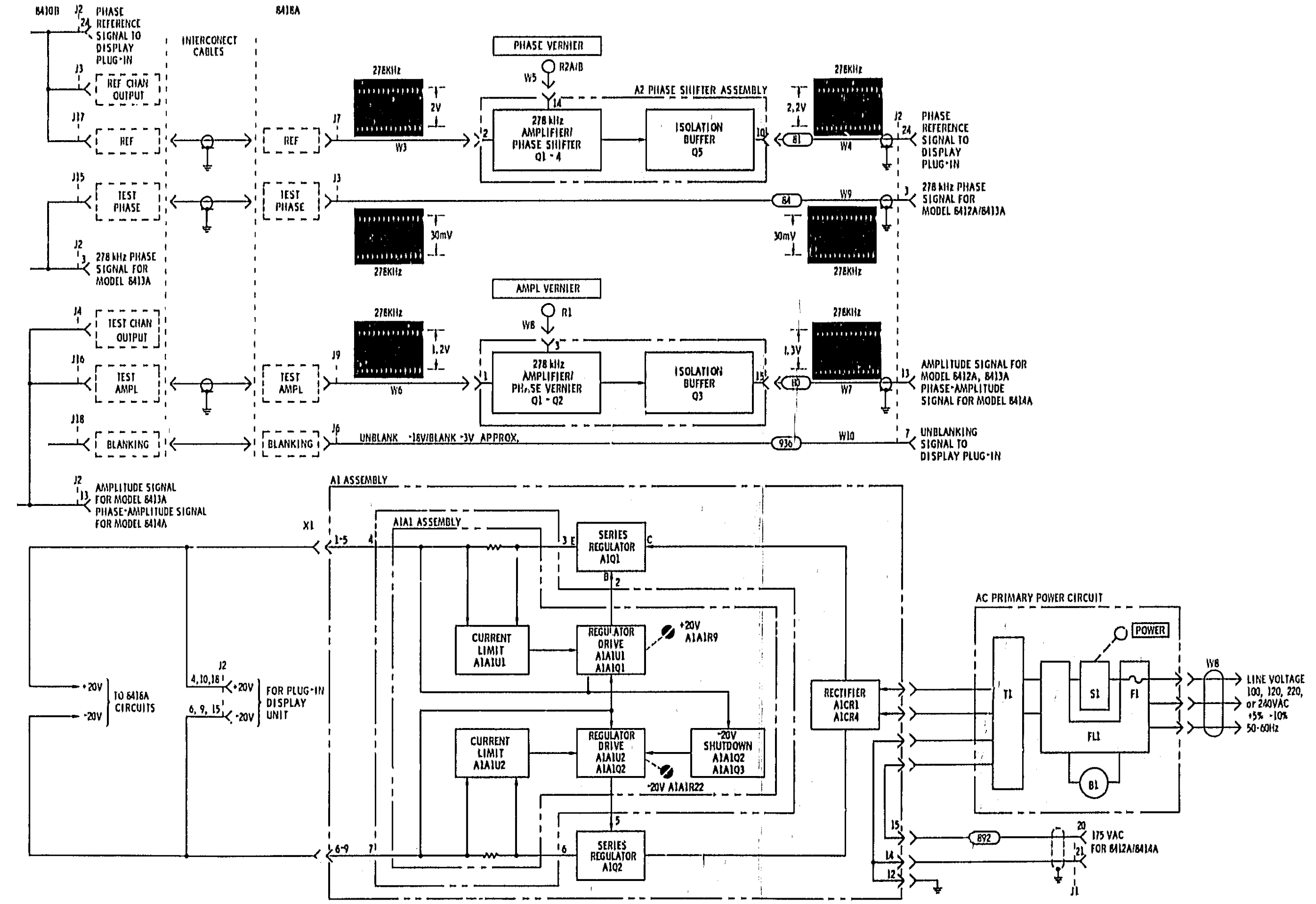


Figure 10. Detailed Block Diagram

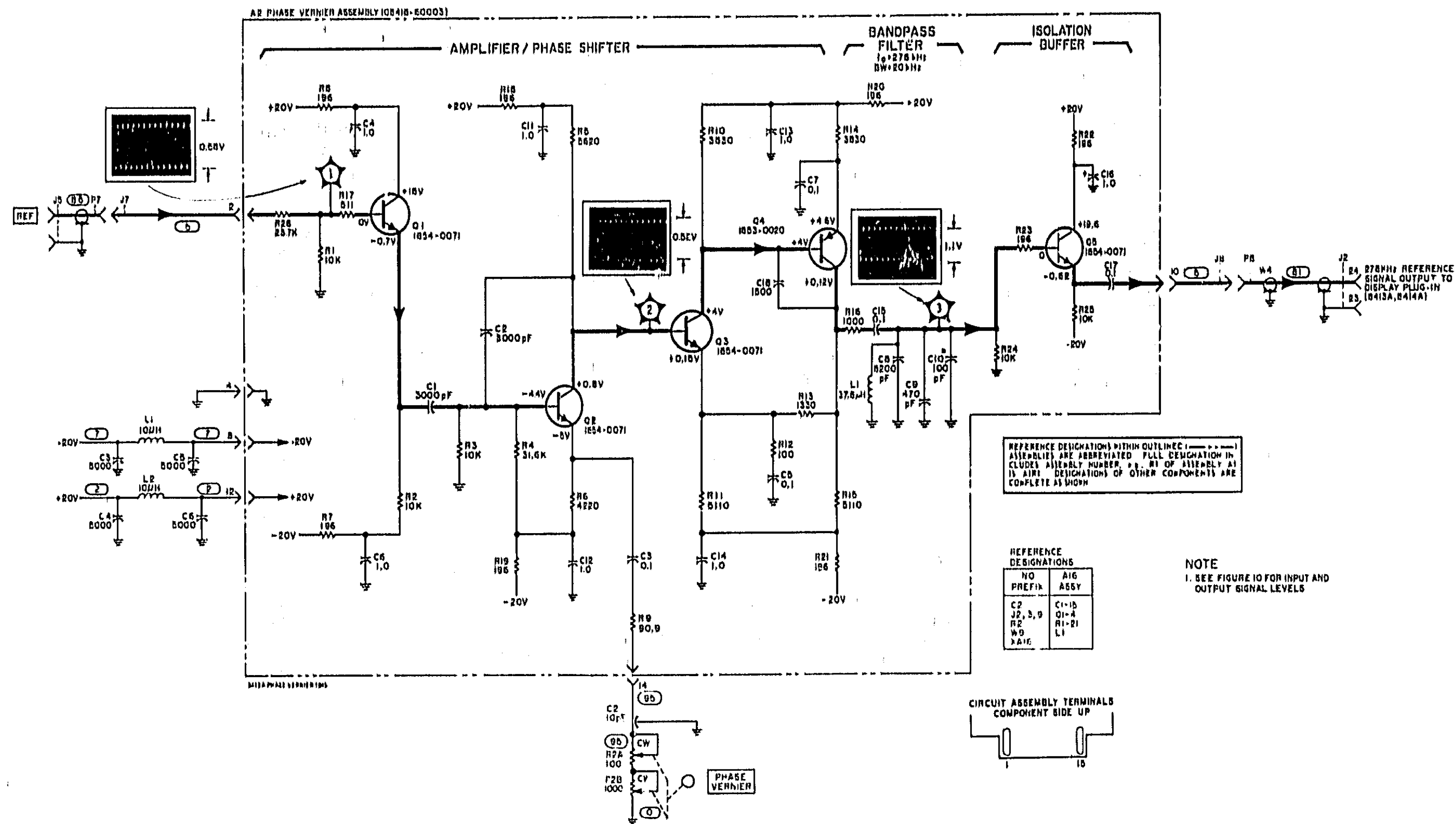


Figure 11. Phase Vernier Assembly (A2) Schematic

Model 8418A

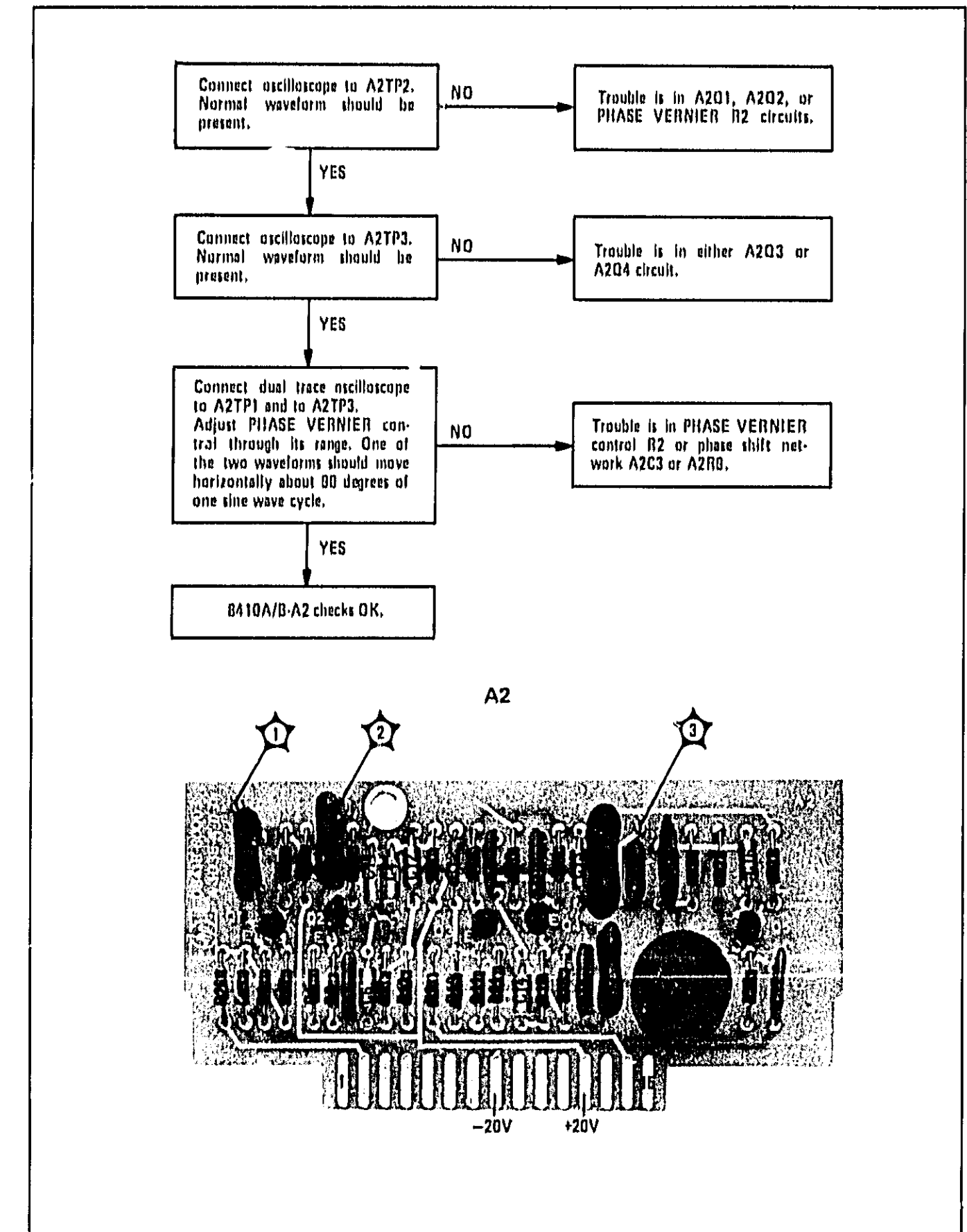


Figure 12. Phase Shifter Amplifier (A2) Troubleshooting and Component Locations

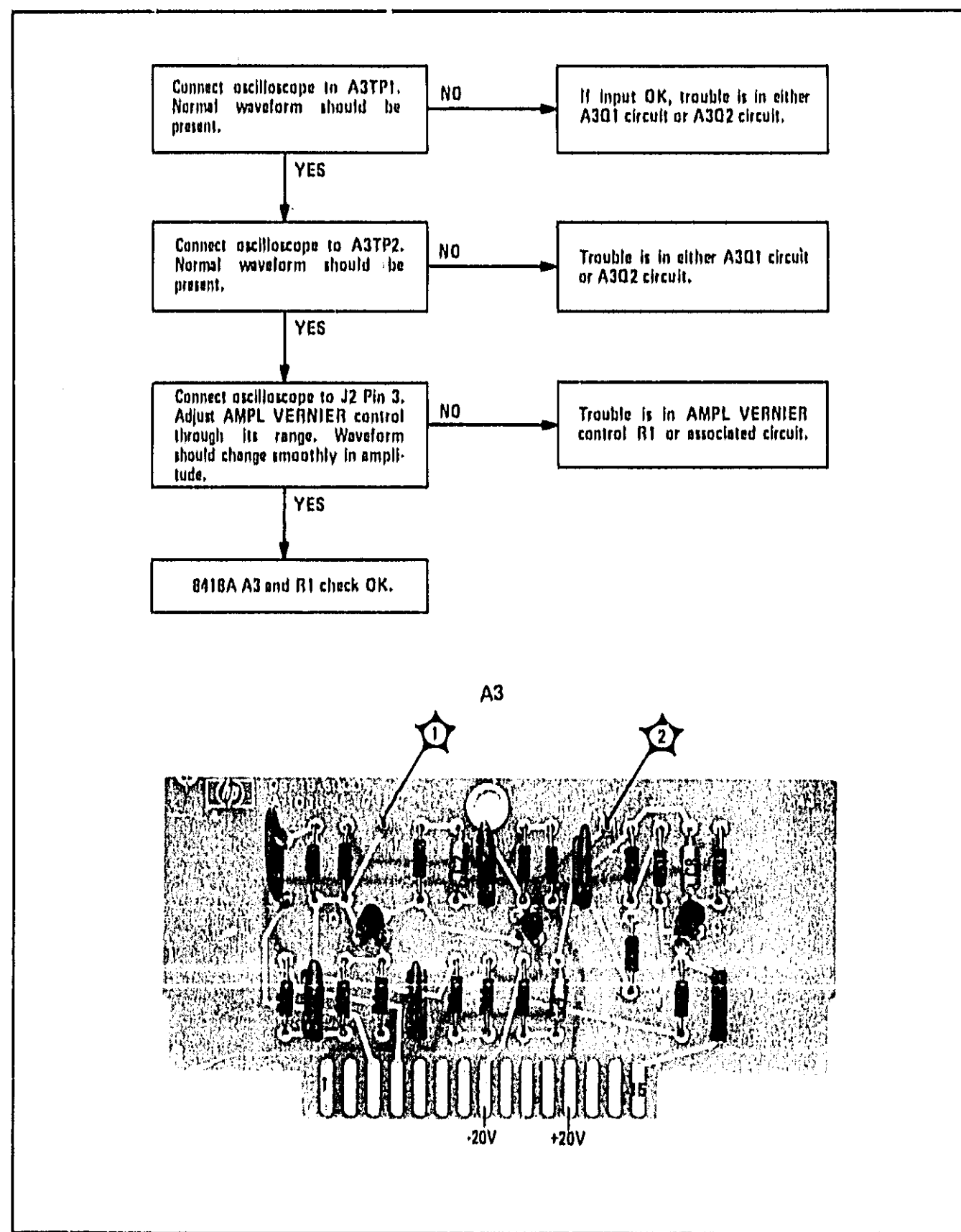


Figure 13. Amplitude Vernier Assembly (A3) Troubleshooting and Component Locations

AMPLITUDE
VERNIER
(A3)

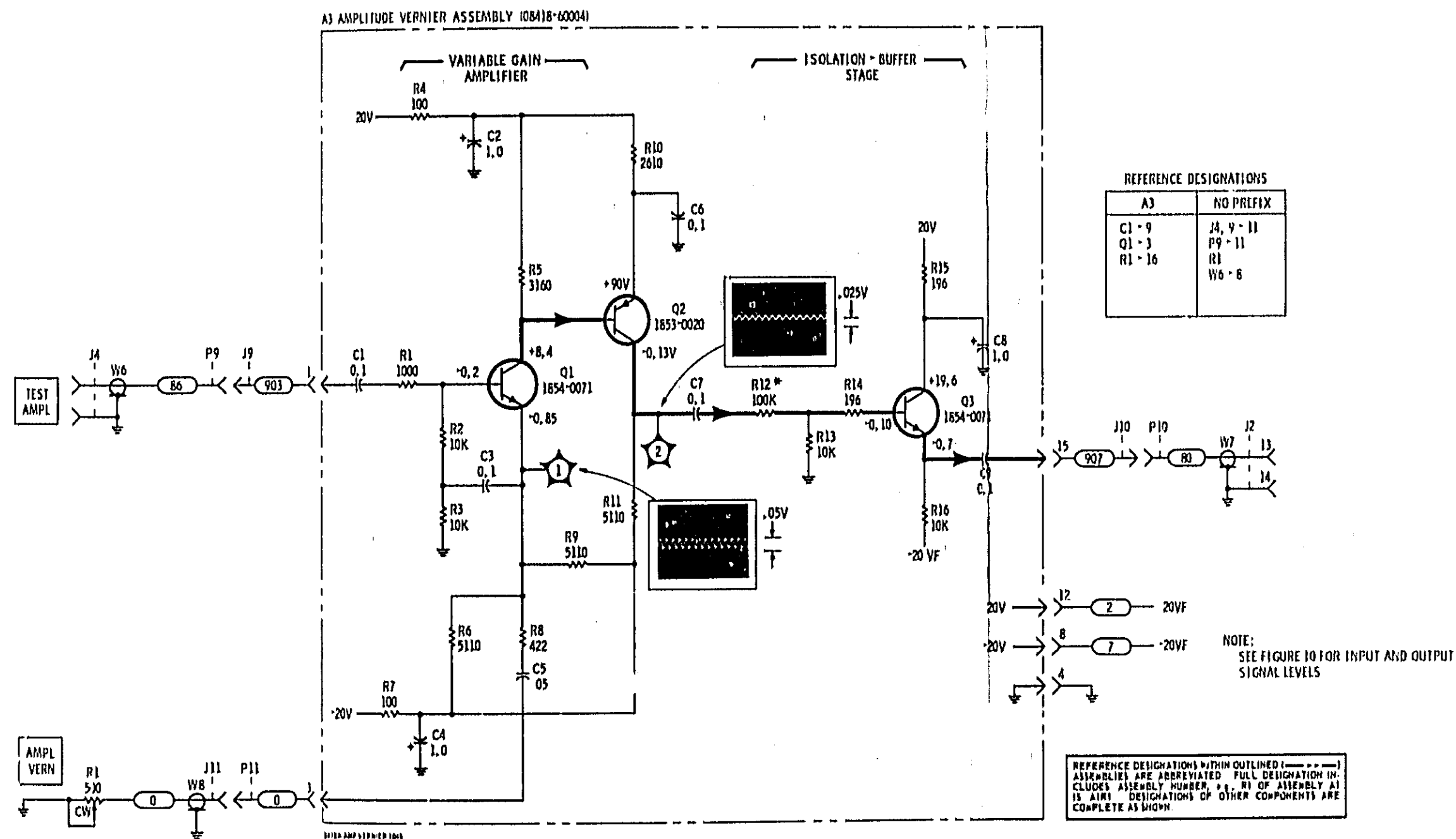


Figure 14. Amplitude Vernier Assembly (A3) Schematic

8418A - A1, A1A1 POWER SUPPLY --20V AND +20V SECTION

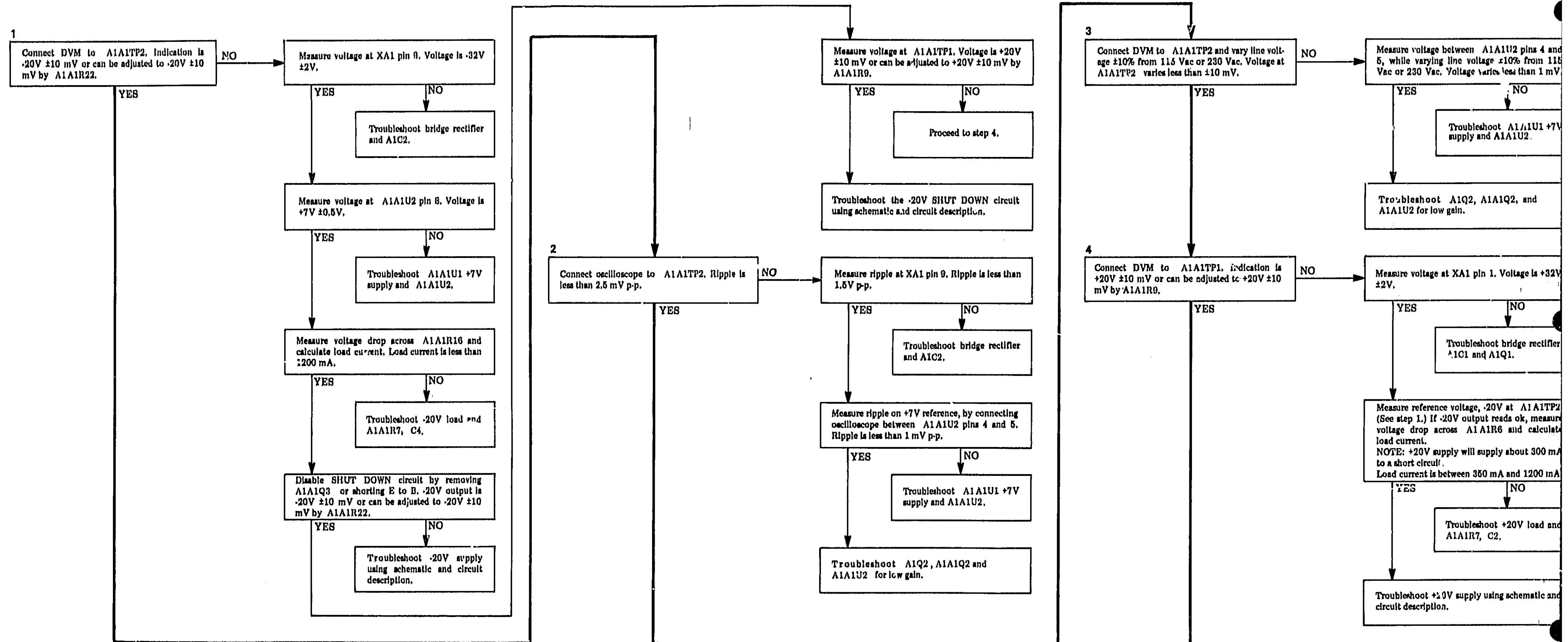
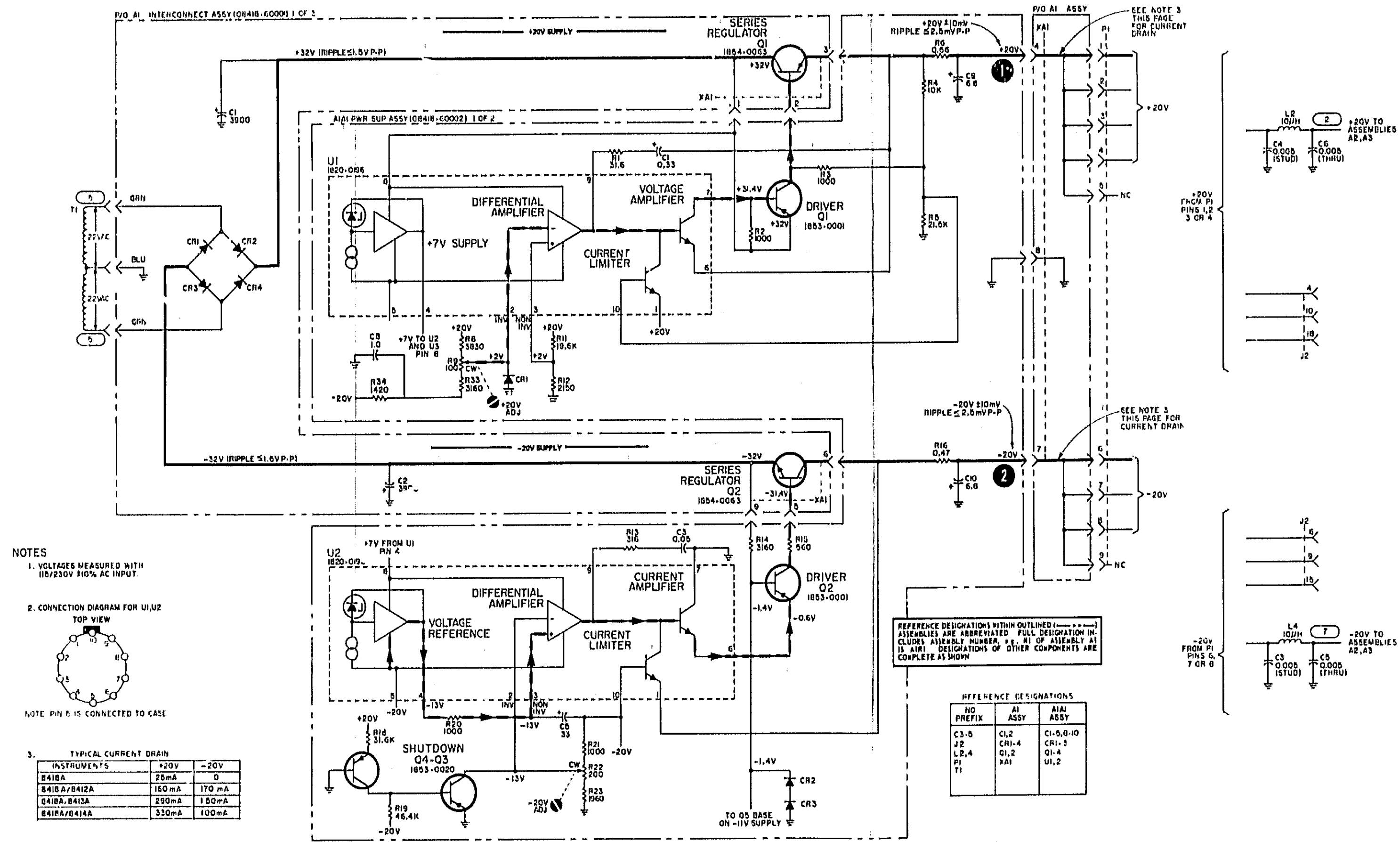
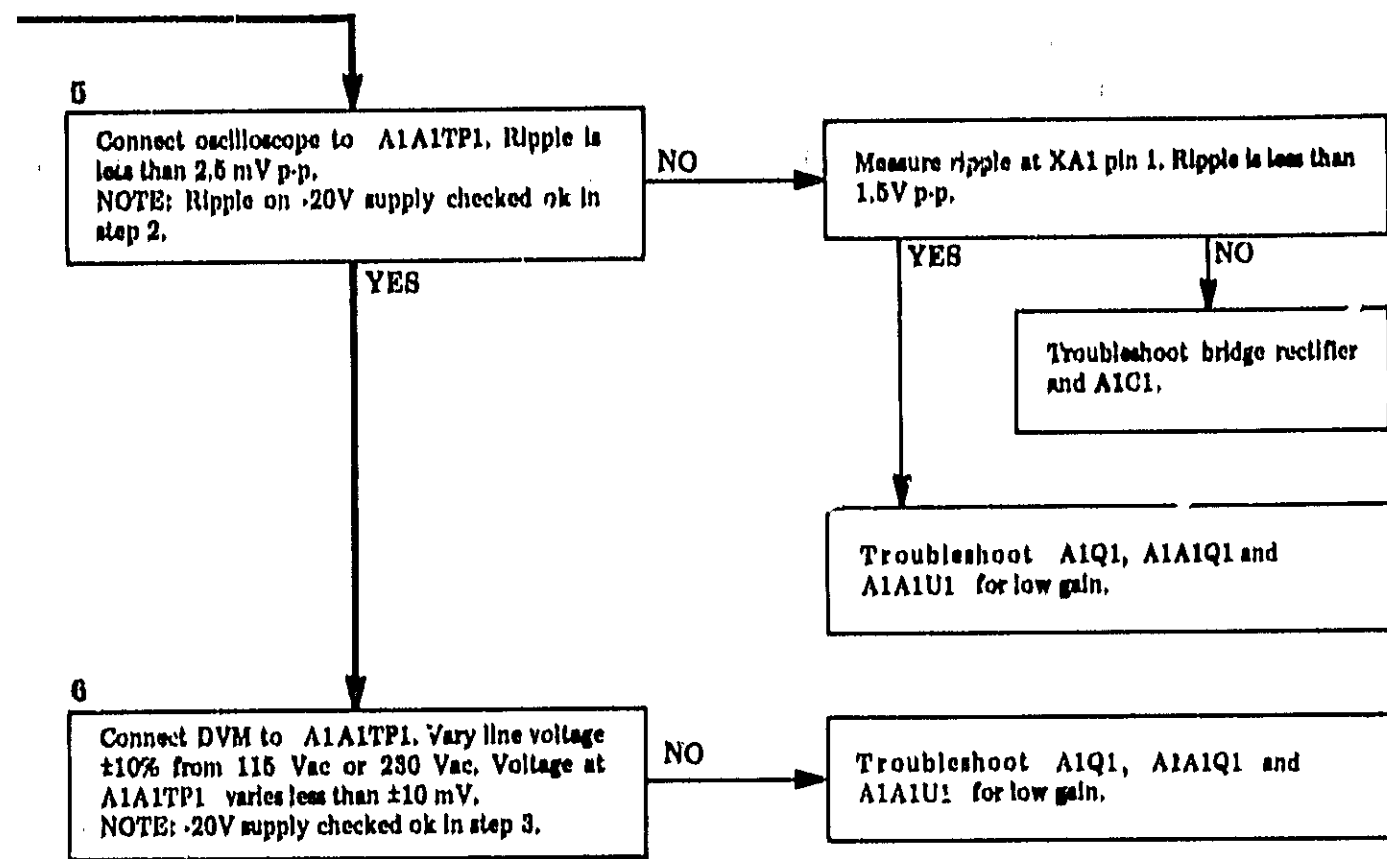


Figure 15. 8418A-A1 A1A1 +20V and -20V Power Supply Troubleshooting



- NOTES**
- VOLTAGES MEASURED WITH 10/250V 10% AC INPUT.
 - CONNECTION DIAGRAM FOR U1,U2 TOP VIEW
-
- NOTE PIN 6 IS CONNECTED TO CASE
- TYPICAL CURRENT DRAIN
- | INSTRUMENTS | +20V | -20V |
|-------------|-------|-------|
| 8418A | 25mA | 0 |
| 8418A/8412A | 160mA | 170mA |
| 8418A,8413A | 290mA | 150mA |
| 8418A/8414A | 350mA | 100mA |

REFERENCE DESIGNATIONS WITHIN OUTLINED (---) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION INCLUDES ASSEMBLY NUMBER, P.C. #1 OF ASSEMBLY AS IS A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE COMPLETE AS SHOWN.

NO PREFIX	A1 ASSY	A1A1 ASSY
C3-5	C1,2	C1-5,8-10
J2	CR1-4	CR1-5
L2,4	Q1,2	Q1-4
P1	XA1	U1,2

Figure 16. Power Supply (A1 and A1A1) Schematic

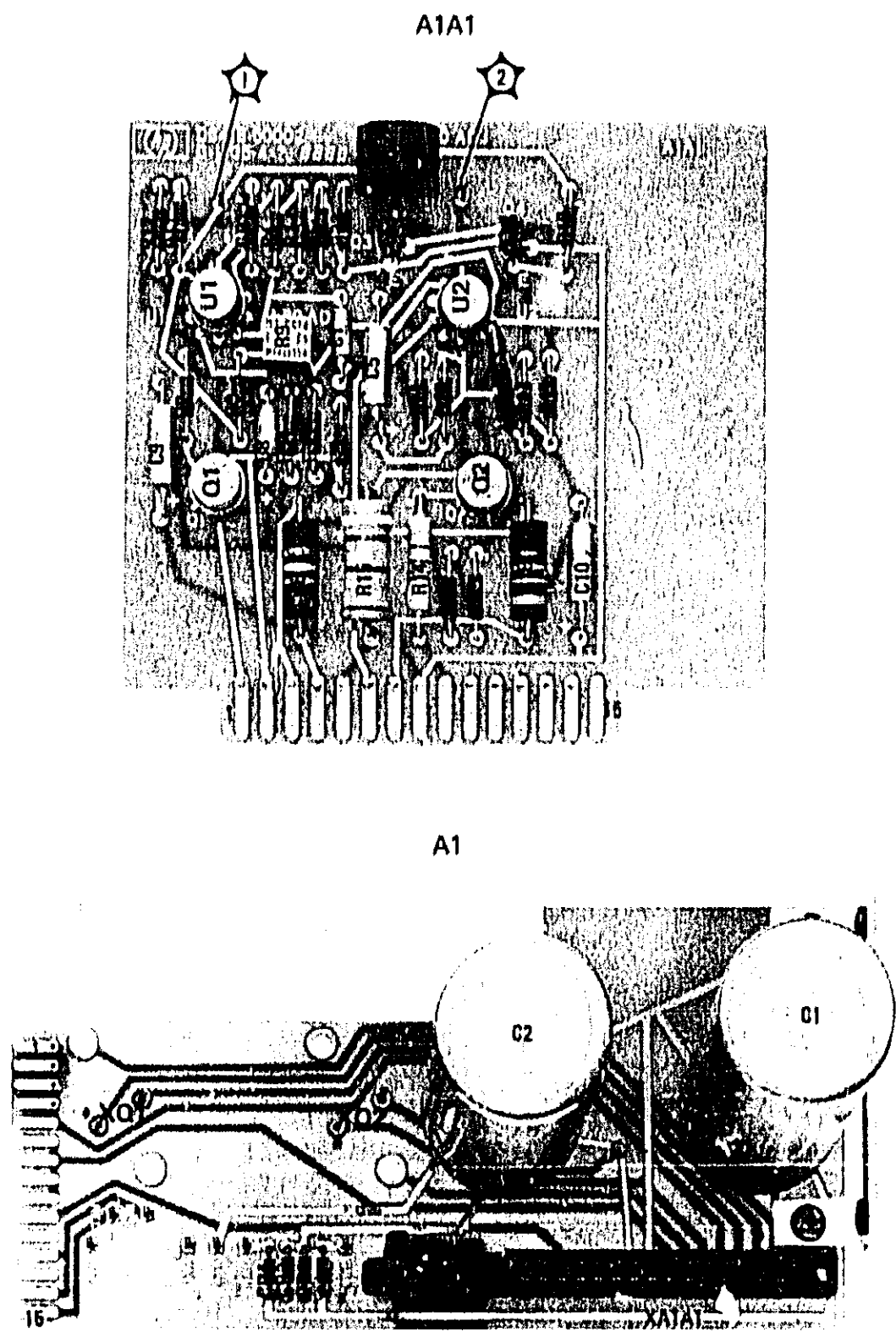


Figure 17. A1A1 and A1 Power Supply Component Identification

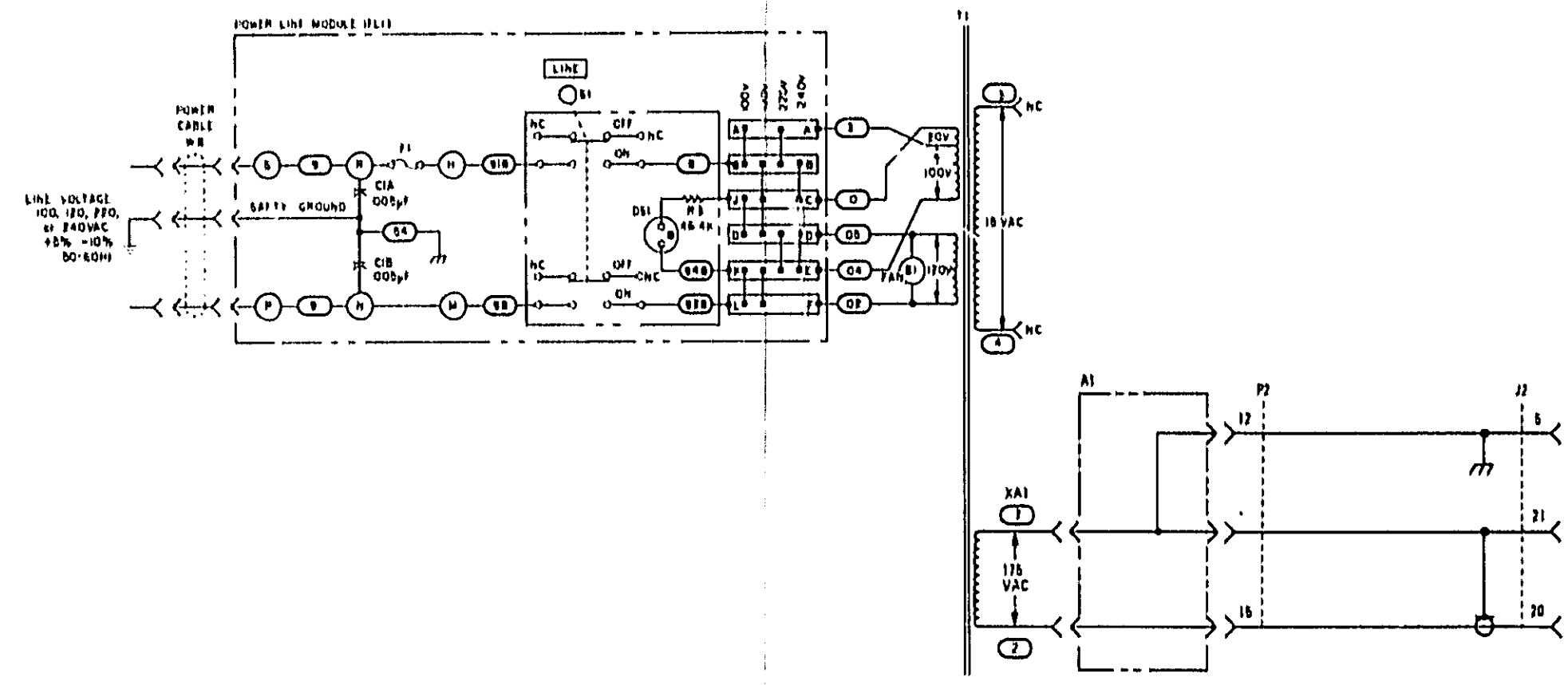


Figure 18. AC Primary Circuit Schematic

POWER SUPPLY COMPONENT IDENTIFICATION
AC PRIMARY CIRCUIT
BOTTOM VIEW

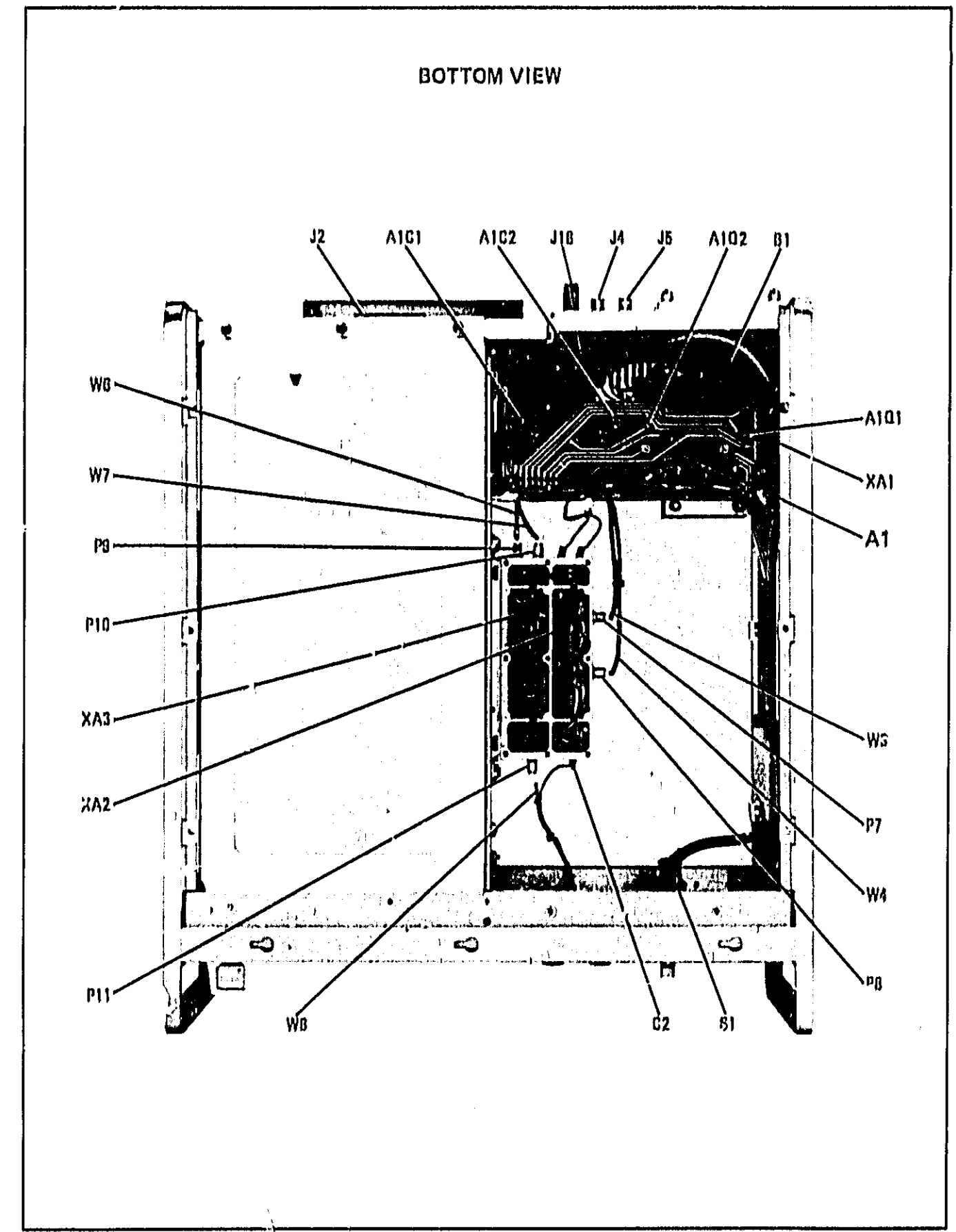


Figure 19. Model 8418A Bottom View