

TECHNICAL MANUAL
OPERATOR'S ORGANIZATIONAL, DIRECT SUPPORT, AND
GENERAL SUPPORT MAINTENANCE MANUAL
INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS

FOR
SPECTRUM ANALYZER IP-1 21 6(P)/GR
(HEWLETT-PACKARD MODEL 141T)
(NSN 6625-00 424 4370)

This copy is a reprint which includes current pages from Change 1.

HEADQUARTERS, DEPARTMENT OF THE ARMY

01 JUNE 1977

WARNING NOTICE

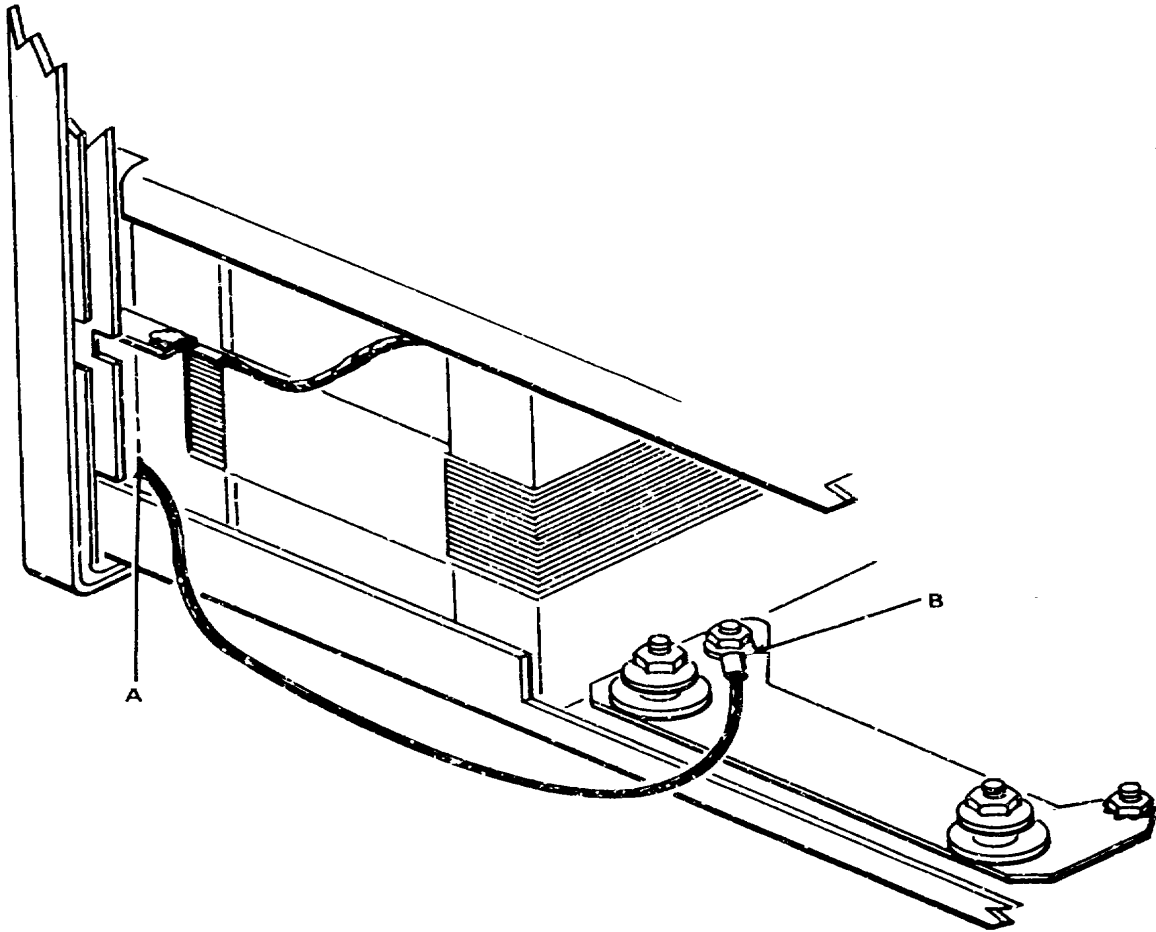
A SHOCK HAZARD MAY EXIST ON THE FAN HOUSING OR ANY METAL PART COMMON TO IT. IF ANY OF THE SERIES REGULATORS, THE TERMINAL SWITCH, OR THE FAN MOTOR ITSELF SHOULD SHORT TO THE FAN HOUSING, A SHOCK HAZARD WOULD EXIST. TO ELIMINATE THE POTENTIAL SHOCK HAZARD, IT IS NECESSARY TO INSTALL A GROUND WIRE FROM THE FAN HOUSING TO THE CHASSIS OF THE INSTRUMENT; PROCEED AS FOLLOWS:

- a. Solder one end of ground wire to the chassis side of R11, as shown at point A of the figure below.
- b. Install a starred washer and a ground lug under existing hardware, as shown at point B.
- c. Solder other end of ground wire to ground lug.

AFTER INSTALLATION OF THE GROUND WIRE, INSURE THE FAN ASSEMBY HAS GOOD CONTINUITY TO GROUND.

Parts required /one each)

Wire, black, 18 awg, 8 inches
Solder lug
External starred washer



CHANGE

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 11 August 1978,

NO. 1

**Operator's, Organizational, Direct Support, And
General Support Maintenance Manual
(Including Repair Parts And Special Tools Lists)
For
SPECTRUM ANALYZER IP- 1216(P)/GR
(HEWLETT-PACKARD MODEL 141T)
(NSN 6625-00-424-4370)**

TM 11-6625-2781-14&P, 1 June 1977, is changed as follows:

1. New or changed material is indicated by a vertical bar in the margin of the page.
2. Remove and insert pages as indicated below:

<i>Remove</i>	<i>Insert</i>
i through 0-2	i through 0-2
6-1 through 6-18.....	None
B-1	B- through B-28
C-1 through C-5.....	C- through C-4

3. File this change sheet in front of the publication for reference purposes.

By Order of the Secretary of the Army:

BERNARD W. ROGERS
*General, United States Army
Chief of Staff*

Official:

J. C. PENNINGTON
*Brigadier General, United States Army
The Adjutant General*

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USA Dep (1)	

NG. None

USAR None

For explanation of abbreviations used see, AR 310-50

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TECHNICAL MANUAL,
}
NO 11-6625-2781-14&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, 1 JUNE 1977

**OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND
GENERAL SUPPORT MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS)
FOR
SPECTRUM ANALYZER IP- 1216(P)/GR
(HEWLETT-PACKARD MODEL 141T)
(NSN 6625-00-424-4370)**

REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA Form 2028-2 (Test) located in the back of the manual. Simply tear out the self-addressed form, fill it out as shown on the sample, fold it where shown, and drop it in the mail.

If there are no blank DA Forms 2028-2 (Test) in the back of your manual, use the standard DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward to the Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-MA-Q, Fort Monmouth, New Jersey 07703.

In either case a reply will be furnished direct to you.

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

GROUND THE INSTRUMENT.

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS.

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE.

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

USE CAUTION WHEN EXPOSING OR HANDLING THE CRT.

Breakage of the cathode-ray tube (CRT) causes a high velocity scattering of glass fragments (implosion). To prevent CRT implosion, avoid rough handling or jarring of the instrument. Handling of the CRT shall be done only by qualified maintenance personnel using approved safety mask and gloves.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT.

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a Hewlett-Packard Sales and Service Officer for service and repair to ensure that safety features are maintained.

DANGEROUS PROCEDURE WARNINGS.

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

WARNING

Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting.

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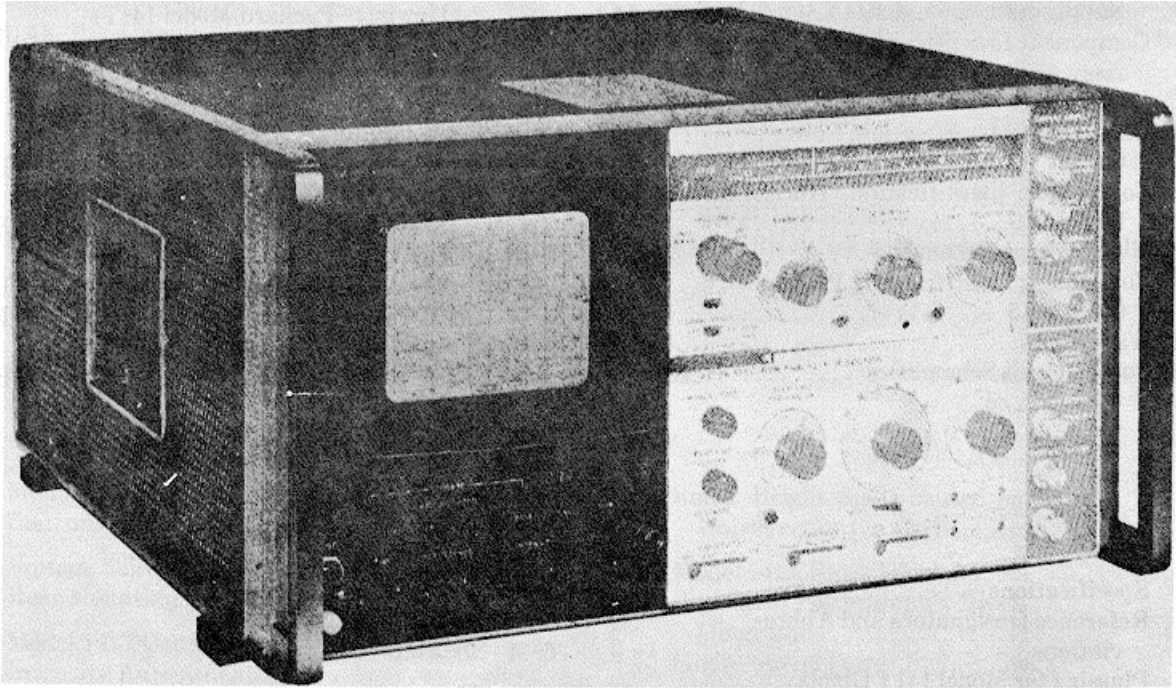
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Figure 1-1. Model 141T Display Section

**SECTION 0
GENERAL**

0-1. SCOPE.

This manual describes Spectrum Analyzer IP-1216(P)/GR (fig. 1-1) and provides instructions for operation and maintenance. Through- out this manual, the IP-a216(P)/GR is referred to as the Hewlett-Packard Model lh1T.

0-2. INDEXES OF PUBLICATIONS.

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

0-3. FORMS AND RECORDS.

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR700-58/NAVSUPINST 4030.29/AFR 71-13/MCO P4030.29A and DSAR 4145.8.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33A/AFR 75-18/MCO P4610.19B and DSAR 4500.15.

0-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

EIR's will be prepared using DA Form 2407, Maintenance Request. Instructions for preparing EIR's are provided in TM 38-750, The Army Maintenance Management System. EIR's should be mailed directly to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-MA,-Q, Fort Monmouth, NJ 07703. A reply will be furnished directly to you.

Change 1 0-1

0-5. ADMINISTRATIVE STORAGE.

Administrative storage of equipment issued to and used by Army activities shall be in accordance with TM 740-90-1.

0-6. DESTRUCTION OF ARMY ELECTRONICS MATERIEL.

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

SECTION I GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. This manual provides operating and service information for the Hewlett-Packard Model 141T Display Section (figure 1-1). The manual is divided into eight sections, each covering a specific topic or aspect of the instrument. All schematics are located at the rear of the manual and can be unfolded and used for reference while reading any part of the manual.

1-3. This section contains a description of the Model 141T. The instrument specifications are listed in table 1-1. Table 1-2 lists and describes the abbreviations used in this manual except Section VI. The parts list is a computer printout and uses computer supplied abbreviations. Table 1-3 contains a list of current plug-ins available for use with the Model 141T.

1-4. DESCRIPTION.

1-5. The Model 141T is designed for use as a display section for the HP Model 141T/8550-series plug-in spectrum analyzer and as an oscilloscope when used with HP Model 1400-series plug-ins. The instrument has variable persistence (duration of trace afterglow) and storage of CRT displays. Persistence is variable from 0.2 second to more than 60 seconds. A display can be stored (at reduced intensity) for more than hours or displayed at normal intensity for up to 1 minute. Stored displays can be erased in 350 milliseconds.

1-6. Variable persistence is especially useful for viewing slow-sweep signals. The persistence of the signals from electrocardiograms or other bio-chemical phenomena can be adjusted to provide a complete trace, yet to fade fast enough to prevent interference with the next trace.. Display persistence of swept frequency and time domain reflectometry measurement readouts can be adjusted to eliminate flicker and still provide high resolution.

1-7. The storage feature of the instrument can be used to store single-shot waveforms and to later view or photograph the phenomena. Comparison of wave forms can be accomplished by storing several display separately and then viewing them simultaneously.

1-8. The instrument accepts all HP Model 1400 series plug-in units. Amplifiers with bandwidths to

20 MHz and sensitivities to 100 microvolts per division are available as well as time domain reflectometry and swept frequency indicator units.

1-9. CATHODE RAY TUBE.

1-10. The Model 141T uses a post-accelerator CRT with a non-glare rectangular faceplate. An internal graticule is located on the same plane as the display to eliminate parallax errors. The tube has a 9-kV accelerating potential, and 8 vertical by 10 horizontal divisions. A type P31 phosphor is used in the standard CRT.

CAUTION

The warranty may be void for instruments having a mutilated serial number tag.

1-11. WARRANTY.

1-12. The instrument (except the CRT) is certified and warranted as stated on the inside front cover of this manual. The CRT is covered by a separate warranty. The CRT warranty and a warranty claim form are located at the rear of this manual. Should the CRT fail within the time specified on the CRT warranty page, complete the warranty claim form and return it with the defective CRT. The procedure for returning a defective CRT is described on the CRT warranty page.

1-13. ASSOCIATED EQUIPMENT.

1-14. Plug-ins available for use with the instrument are listed in table 1-3 and in the Hewlett-Packard Instrumentation Catalog. The instrument is normally operated with an IF section plug-in in the lower compartment and an RF section plug-in in the upper compartment. The instrument can also be used as an oscilloscope with a vertical plug-in in the lower compartment and a time-base plug-in in the upper compartment. Both plug-in compartments are the same size, and the plug-in instruments may be interchanged for any special application. The divider shield that separates the two compartments can be removed and one double sized plug-in installed. Blank plug-in kits, both single and double sized, are available for fabrication of special circuits. See table 4-1 for power supply current limitations.

Table 1-1. Specifications

PLUG-INS

Accepts Model 8050-series IF and RF Section spectrum analyzer plug-ins without the use of a center divider shield

Also, accepts all HP Model 1100-series plug-ins. All plug-ins operate directly into the horizontal and vertical deflection plates. Centaur shield may be removed to provide double-sized compartment for use with a single, dual axis Model 1400-series unit.

CATHODE-RAY TUBE

Type:

Post-accelerator storage tube; 9000s V accelerating potential; aluminized P31 phosphor; etched safety glass face plate.

Graticule:

8 x 10 divisions (approx. 7.1 : 8.9 cm) parallax-free internal graticule. Subdivisions of 0.2 div per major division on major horizontal and vertical axes.

Intensity Modulation:

AC coupled, -20 volt pulse will blank trace of normal intensity, input terminals on rear panel.

PERSISTENCE

Conventional:

Natural persistence of P31 phosphor (about 40 usec).

Variable:

STANDARD Writing Speed Mode: Continuously variable from less than 0.2 second to more than one minute.

ERASE

Manual or optional remote (see Section VII options): Erasure takes approximately 350 msec; scope ready to record immediately after erasure.

WRITING SPEED PHOTOGRAPHIC

Conventional operation (using a HP Model 197A camera with f/1.9 lens and Polaroid' 3000 speed-film): 100 div 'usec.

WRITING SPEED

Storage:

Standard Mode: greater than 20 div/ms. Fast Mode: greater than 1 div/usec.

STORAGE TIME

Standard Writing Speed: more than two hours at reduced brightness (typically four hours). Traces may be viewed at maximum brightness for more than one minute.

Fast Writing Speed. traces may be stored at reduced brightness for more than 15 minutes (typically 30 minutes) or stored at maximum brightness for more than 15 seconds.

Brightness:

100 foot-lamberts in standard mode.

CALIBRATOR

Type:

Line-frequency rectangular signal, approximately 0.5 usec rise time.

Voltage:

Two outputs. 1 volt and 10 volts peak-to-peak $\pm 1\%$ from 15°C to 35°C, $\pm 3\%$, from 0°C to 55°C.

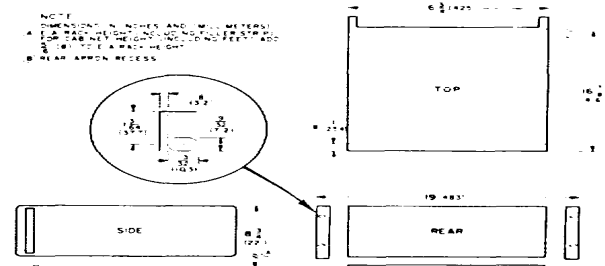
BEAM FINDER

Pressing BEAM FINDER pushbutton brings trace on screen regardless of setting of horizontal, or vertical position controls.

GENERAL

Power Requirements:

100, 120, 220 or 240 volts (+5 to --10%), 48 to 66 Hz (Option H16 48 to 440 Hz), normally less than 285 watts (varies with plug-in units).



Weight:

Net, 40 lbs (18 kg) (without plug-ins). Shipping, 51 lbs. (23 kg).

Model 141t

1-15. INSTRUMENT AND MANUAL IDENTIFICATION.

1-16. This manual applies directly to Model 141T instruments with a serial prefix number as listed on the manual title page. The serial prefix number is the first group of digits in the instrument serial number (figure 1-2). The instrument serial number is

1-17 Check the serial prefix number of the instrument. If the serial prefix number is different from that listed on the title page of this manual, refer to Section VII for instructions to adapt this manual for proper instrument coverage.

1-18. Errors in the manual are listed under errata on an enclosed MANIUAL CHANGES sheet (if any).

1-19. INQUIRIES.

1-20) Refer any questions regarding the manual, the change sheet, or the instrument to the nearest HP Sales /Service Office. Always identify the instrument by model number, complete name, and complete serial number in all correspondence. Refer to the inside rear cover of this manual for a world-wide listing of HP Sales/Service Offices

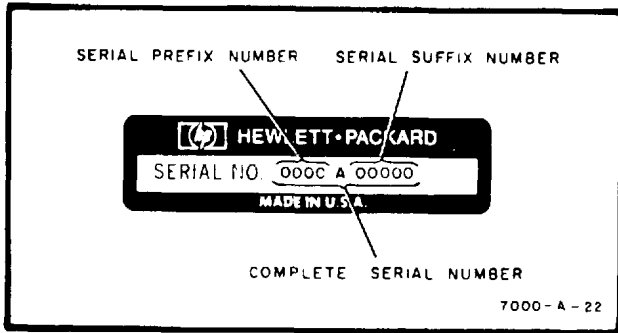


Figure 1-2. Instrument Serial Number

Table 1-2. Reference Designators and Abbreviations

REFERENCE DESIGNATORS							
A	= assembly	E	= misc. electrical part	P	= plug	U	= integrated circuit (unrepairable)
AT	= attenuator, resistive termination	F	= fuse	PS	= power supply	V	= vacuum tube, neon bulb, photocell, etc.
B	= motor, fan	FL	= filter	Q	= transistor	VR	= voltage regulator (diode)
BT	= battery	H	= hardware	R	= resistor	W	= cable
C	= capacitor	J	= Jack	RT	= thermistor	X	= socket
CP	= coupling	K	= relay	S	= switch	Y	= crystal
CR	= diode	L	= inductor	T	= transformer	Z	= network
DL	= delay line	LS	= speaker	TB	= terminal board		
DS	= device signaling (lamp)	M	= meter	TP	= test point		
		MP	= mechanical part				

ABBREVIATIONS							
A	= ampere(s)	FET	= field-effect transistor(s)	n	= nano (10 ⁻⁹)	rfi	= radio frequency interference
ampl	= amplifier(s)	G	= giga (10 ⁹)	nc	= normally closed	rms	= root mean square
assy	= assembly	gnd	= ground(ed)	no.	= normally open	rwv	= reverse working voltage
ampltd	= amplitude	H	= henry(ies)	nPN	= negative-positive-negative	SCR	= silicon controlled rectifier
bd	= board(s)	hr	= hour(s)	ns	= nanosecond	sec	= second(s)
bp	= bandpass	HP	= Hewlett-Packard	p	= pico (10 ⁻¹²)	std	= standard
c	= centi (10 ⁻²)	Hz	= hertz	pc	= printed (etched) circuit(s)	trmr	= trimmer
C	= carbon	if.	= intermediate freq.	pk	= peak	u	= micro (10 ⁻⁶)
ccw	= counterclockwise	intl	= internal	pnp	= positive-negative-positive	usec	= microsecond
coax.	= coaxial	k	= kilo (10 ³)	p/o	= part of	V	= volts
coef	= coefficient	lb	= pound(s)	p-p	= peak-to-peak	var	= variable
com	= common	lpf	= low-pass filter(s)	prgm	= program	w/	= with
CRT	= cathode-ray tube	m	= milli (10 ⁻³)	prv	= peak inverse voltage(s)	w/o	= without
cw	= clockwise	M	= mega (10 ⁶)	ps	= picosecond	wiv	= working inverse voltage
d	= deci (10 ⁻¹)	ms	= millisecond	pwv	= peak working voltage		
dB	= decibel			rf	= radio frequency		
ext	= external						
F	= farad(s)						

FUNCTION	HP MODEL NUMBER	CAPABILITIES												
		Wide Band	Sampling	High Gain Differential	Dual Trace	Four Trace	X-Y	Delayed Sweep	No Drift	High CMR	Algebraic Addition	TDR*	Wide Band TDR	Swept Frequency
VERTICAL PLUG-INS	1400A			x			x							
	1400B			x			x							
	1401A				x		x							
	1402A	x			x		x							
	1403A			x			x							
	1404A	x				x	x							
	1405A	x			x		x							
	1406A			x			x							
	1407A			x			x							
	1408A			x	x		x							
	1410A		x			x	x							
	1411A			x		x	x						x	
	1430A			x									x	
	1431A			x										
1432A			x											
TIME BASE PLUG-INS	1420A	x		x	x					x	x	x		
	1421A	x		x	x				x	x	x	x		
	1422A			x	x				x	x	x	x		
	1423A	x		x	x					x	x	x		
	1424A		x		x							x	x	
	1425A		x		x				x		x	x		
DOUBLE SIZE PLUG-INS	1415A											x		
	1416A												x	
BLANK PLUG-INS	10477A	Single-size for special purpose circuit.												
	10478A	Double-size for special purpose circuit.												
SPECTRUM ANALYZER PLUG-INS	8552A	Fixed or variable scan spectrum analysis.												
	8552B	Spectrum analyzer IF section, 50 Hz bandwidth.												
	8553B/L	Spectrum analyzer IF section, 10 Hz bandwidth.												
	8554B	Spectrum analyzer RF section, 1 kHz to 110 MHz.												
	8554L	Spectrum analyzer RF section, 100 kHz to 1250 MHz.												
	8555A	Spectrum analyzer RF section, 500 kHz to 1250 MHz.												
	8556A	Spectrum analyzer RF section, 10 MHz to 40 GHz.												
		Spectrum analyzer LF section, 20 Hz to 300 kHz.												

Time Domain Reflectometry.

SECTION II

INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains instructions for performing an initial inspection of the Model 141T. Installation procedures and precautions are presented in step-by-step order. The procedures for making a claim for warranty repairs and for repacking the instrument for shipment are also described in this section.

2-3. INITIAL INSPECTION.

2-4. The instrument was inspected mechanically and electrically before shipment. Upon receipt, inspect it for damage that may have occurred in transit. Check for broken knobs, bent or broken connectors, and dents or scratches. If damage is found, refer to the claims paragraph in this section. Retain the packing material for possible future use.

2-5. Check the electrical performance of the instrument immediately after receipt. Refer to Section V for the performance check procedure. The performance check will determine whether or not the instrument is operating within the specifications listed in table 1-1. Initial performance and accuracy of the instrument are certified as stated on the inside front cover of this manual. If the instrument does not operate as specified, refer to the claims paragraph in this section.

2-6. PREPARATION FOR USE.

2-7. The instrument requires a power source of 100-, 120-, 220-, or 240-volt +5 - 10o, single phase, 48 to 440 Hz, that can deliver approximately 400 volt-amperes. A removable jumper board in power module A7, provides selection of the line voltage to be used (figure 2-1).

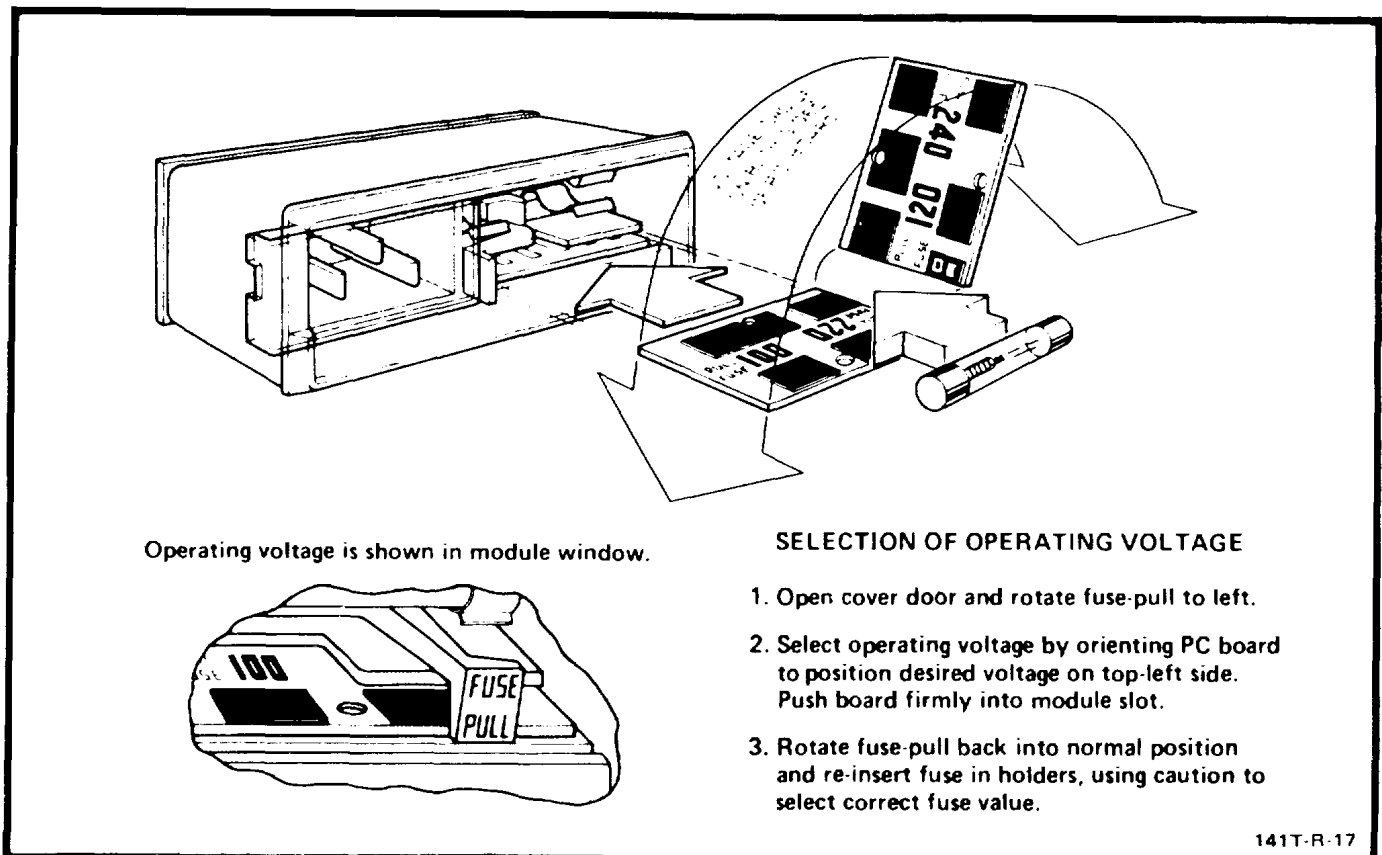


Figure 2-1. Voltage Selection

CAUTION

Before placing the Model 141T in operation, ensure that the operating voltage indicated in the power module window (figure 2-1) agrees with the line voltage being used.

To avoid damaging CRT perform Intensity adjustment (figure 3-2).

2-8. When operating the Model 141T from a 100V or 125V source, replace line fuse with a 4A slow-blow fuse. When operating from a 220V or 240V source, replace line fuse with a 2A slow-blow fuse.

2-9. THREE-CONDUCTOR AC POWER CABLE.

2-10. For the protection of operating personnel Hewlett-Packard Company recommends that the instrument panel and cabinet be grounded. This instrument is equipped with a three-conductor, ac power cable that, when connected to an appropriate receptacle, grounds the instrument through the offset pin. The power jack and mating plug of the power cord meet International Electro-technical Commission (IEC) safety standards.

2-11. INSTRUMENT MOUNTING.

2-12. The instrument is shipped from the factory as a bench instrument with the tilt stand, feet, and

plastic trim in place. Four supports are mounted on the rear panel of the instrument for operation in a vertical position. Top, left side, and bottom panel covers can be removed, giving access to components and adjustments. Allow sufficient space around the cabinet for air circulation.

2-13. A kit for converting the modular cabinet to a rack mount is included. Instructions for making the conversion are given below (figure 2-2).

- a. Detach tilt stand by pressing away from front feet.
- b. Remove plastic feet by pressing metal button and sliding each foot free.
- c. Using thin-bladed tool, remove aluminum trim strips. These strips have adhesive backing, and are located on sides behind front handles.
- d. Attach rack mounting flange, using screws provided in kit, in each space where trim strip was removed. Position large notch of flange at instrument bottom.
- e. Rack mounting kit contains filler strips that should be used as spacers between Model 141t and other equipment mounted in same rack.

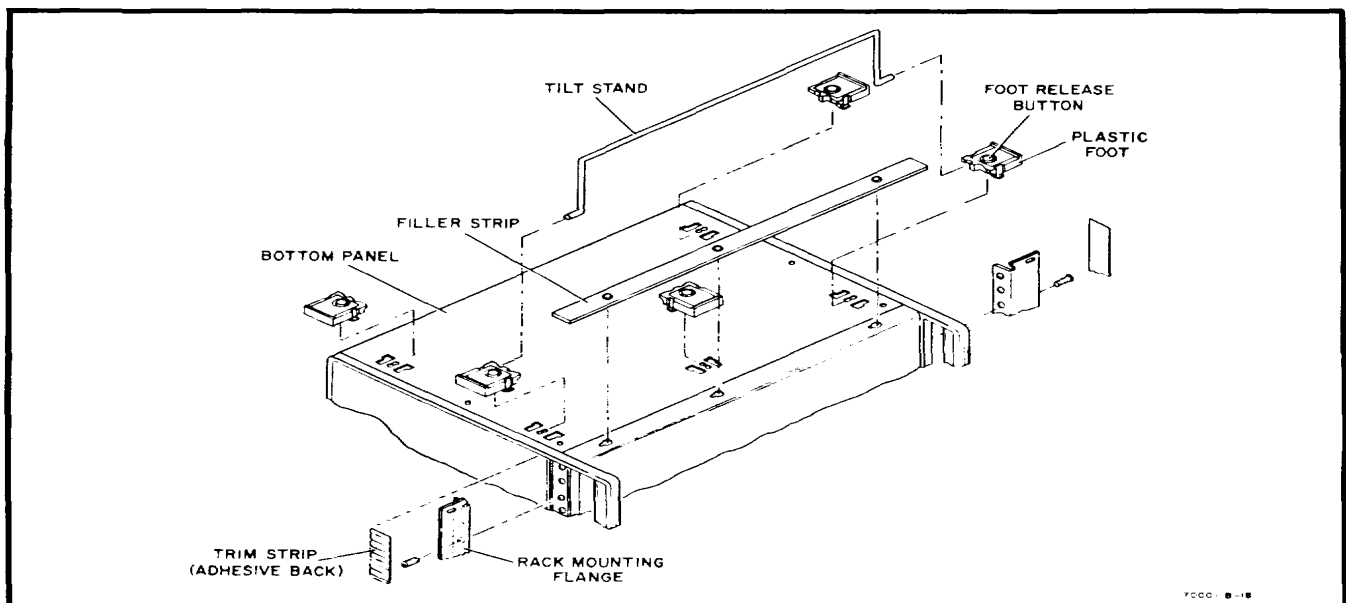


Figure 2-2. Rack Mounting Procedure

Installation

2-14. INSTRUMENT COOLING.

2-15. Forced-air cooling is used to maintain the required operating temperatures within the instrument. The air intake and filter are located on the rear of the instrument. Warm air is exhausted through the side-panel perforations. Allow at least 3 inches of clearance around the top, rear, and both sides of the instrument for cooling.

2-16. The cooling fan does not require lubrication, but the filter should be cleaned often enough to ensure sufficient air flow. A thermal switch is mounted on the fan to protect against over-heating.

2-17. CLAIMS.

2-18. The warranty statement applicable to this instrument is printed inside the front cover of this manual. Refer to the rear of this manual for the CRT warranty statement. If physical damage is found

or if operation is not as specified when the instrument is received, notify the carrier and nearest HP Sales/Service Office immediately (refer to the list in back of this manual for addresses). The HP Sales/ Service Office will arrange for repair or replacement without waiting for settlement of the claim with the carrier.

2-19. REPACKING FOR SHIPMENT.

2-20. If the instrument is to be shipped to a Hewlett-Packard Sales/Service Office for service or repair, attach a tag showing owner (with address), complete instrument serial number, and a description of the service required.

2-21. Use the original shipping carton and packing material. If the original packing material is not available, the Hewlett-Packard Sales/Service Office will provide information and recommendations on materials to be used.

SECTION III**OPERATION****3-1. INTRODUCTION.**

3-2. This section contains front panel control information and considerations for operating the instrument. Controls for operation of power supplies and cathode-ray tube are located on the instrument front panel. All other controls are located on the plug-in units. The instrument includes high and low-voltage power supplies, a calibrator circuit, a CRT, and a pulse circuit for variable persistence and storage operation.

3-3. CONTROLS AND CONNECTORS.

3-4. figure 3-1 identifies the front panel controls and gives a brief functional description of each. The following paragraphs provide detailed descriptions of controls with multiple or complex functions.

3-5. TRACE ALIGN.

3-6. The TRACE ALIGN adjustment compensates for external magnetic fields that affect alignment of the horizontal trace with the graticule. The alignment should be checked when the instrument is moved to a new location and adjustment made when necessary.

3-7. BEAM FINDER.

3-8. A high dc input signal may drive the trace off the CRT screen. When the BEAM FINDER push-button is pressed, the trace will be returned to the screen regardless of the setting of horizontal or vertical POSITION controls. If pressing the BEAM FINDER pushbutton does not return a beam to the viewing area press and hold the BEAM FINDER and gradually adjust the INTENSITY control until a visible trace is obtained and release BEAM FINDER. When used with 8550-series frequency domain plug-ins, the BEAM FINDER has no function.

3-9. FOCUS AND ASTIGMATISM.

3-10. These controls provide uniform focus of the trace over the entire CRT screen. Adjustment is made in the STD WRITING SPEED with a low intensity spot on the CRT screen. FOCUS and ASTIG are adjusted for a round, sharply focused spot.

3-11. Z-AXIS INPUT.

3-12. The Z-AXIS INPUT jack and selector switch are on the rear panel of the instrument (figure 6-3).

To externally modulate the trace intensity, set the switch to EXT, and connect the modulation signal to the terminals. The amplitude of the pulse required to blank the trace depends on the front panel INTENSITY control setting, and is approximately 20 volts positive for normal intensity settings. When not using external modulation, set the switch to INT.

3-13. PLUG-IN UNITS.

3-14. Available plug-ins for the Model 141T are listed in table 1-2. This instrument is normally operated with an RF section plug-in in the upper compartment and IF section plug-in in the lower compartment. The Operating and Service Manuals for the plug-in units contain detailed information for installing plug-ins.

3-15. Arrangement of plug-ins can be selected to suit special applications. For example, a vertical amplifier and time base plug-in can be reversed so that sweep is vertical and signal deflection is horizontal. A vertical plug-in can be used in each compartment to take X-Y measurements.

3-16. Double-sized plug-ins, such as the Model 1415A and Model 1416A, can be inserted into the instrument after removal of the divider shield between lower and upper compartments. Blank plug-ins, both single and double size, are available for customer fabrication of specialized vertical amplifier and time base plug-ins. Refer to table 4-1 for power supply current limitations.

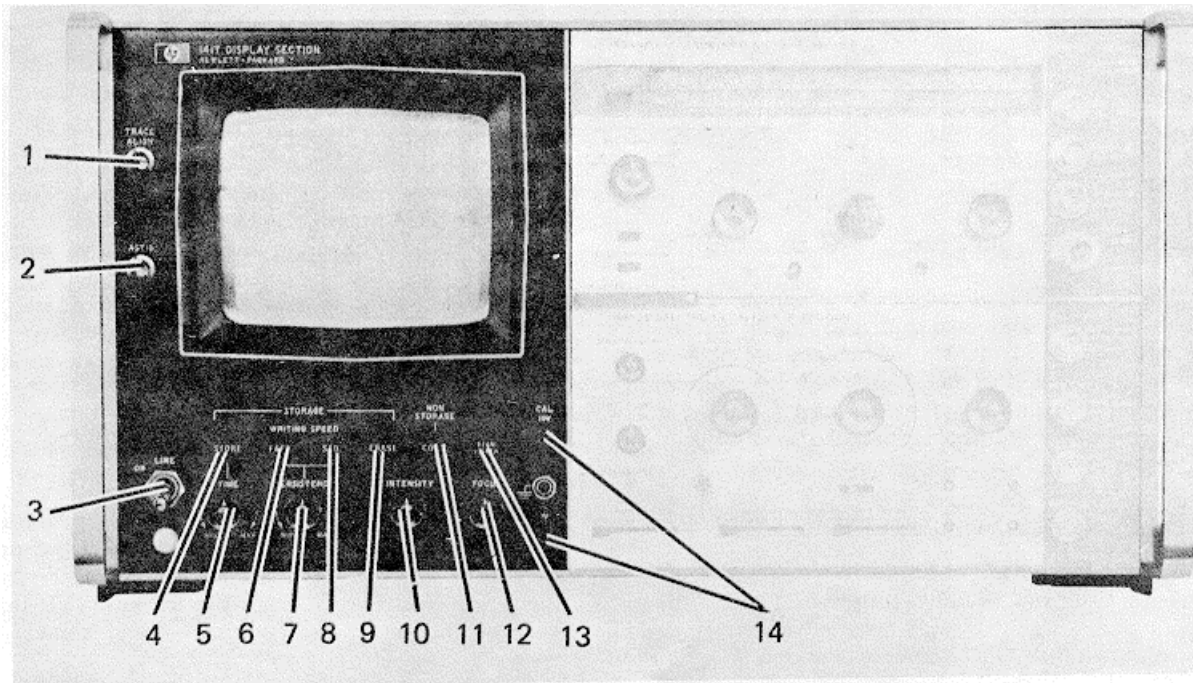
NOTE

For proper operation, the divider shield must be in place when using standard size plug-ins (does not apply to spectrum analyzer plug-ins).

3-17. The Model 141T also accepts Model 1400-series plug-ins for standard oscilloscope use. When standard 1400-series oscilloscope plug-ins are used, plug-in shield (HP Part No. 00140-0601) must also be used. Order the shield from the nearest HP Sales/Service Office.

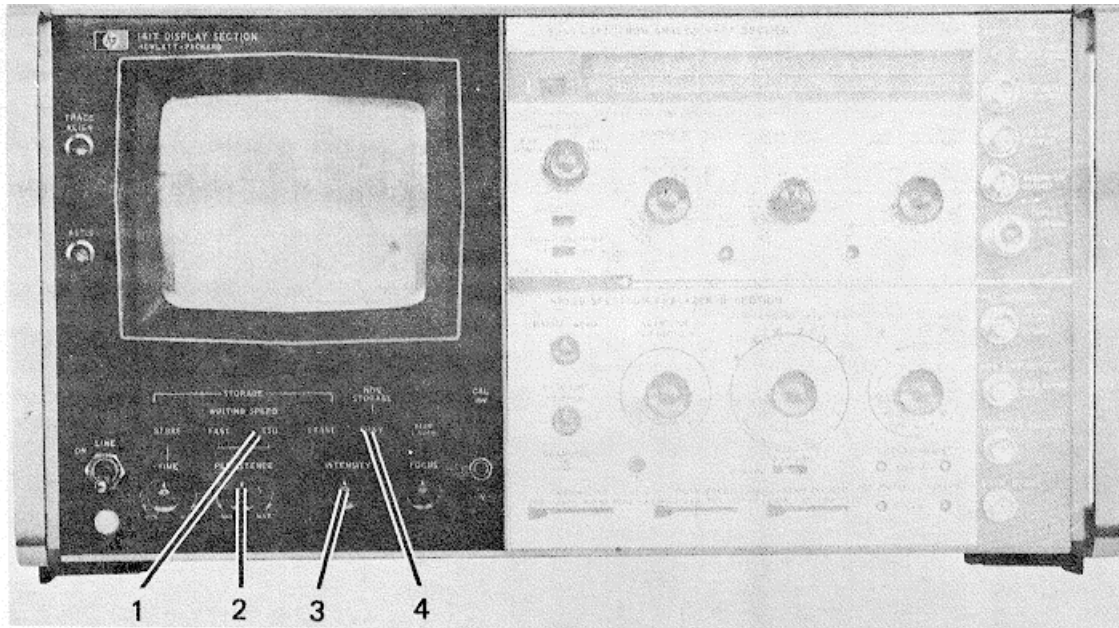
CAUTION

Do not operate instrument above 450C, when using real time plug-ins.



- | | |
|--|---|
| <p>1. TRACE ALIGN: Adjustment to set trace parallel to horizontal graticule lines.</p> <p>2. ASTIG. Adjustment to set roundness of CRT beam.</p> <p>3. LINE: ON position connects ac power to oscilloscope and lights indicator.</p> <p>4. STORE. Retains displayed signal at reduced intensity for viewing at a later time.</p> <p>5. TIME. Control for setting storage time length.</p> <p>6. FAST. Operates CRT at maximum writing speed with variable persistence.</p> <p>7. PERSISTENCE: Controls endurance time of displayed signal.</p> | <p>8. STD: Operates CRT at normal writing speed with variable persistence.</p> <p>9. ERASE': Removes stored or written displays.</p> <p>10. INTENSITY. Control for setting intensity of CRT display.</p> <p>11. CON: Selects operation as standard oscilloscope.</p> <p>12. FOCUS: Control for focusing beam on CRT.</p> <p>13. BEAM FINDER: Returns beam to CRT screen regardless of deflection potentials when used with 400-series time-domain plug-ins. When used with 8550-series frequency-domain plug-ins, the BEAM FINDER pushbutton has no function.</p> <p>11. CAL: 1-volt and 10-volt p-p, calibrated square wave outputs.</p> |
|--|---|

Figure 3-1. Model 141T Controls and Connectors

**VARIABLE PERSISTENCE MODE**

1. Press STD pushbutton.
2. Rotate PERSISTENCE control fully ccw.
3. Adjust INTENSITY to less than that intensity which just eliminates trace blooming.

CONVENTIONAL

1. Press STD pushbutton.
2. Rotate PERSISTENCE control fully ccw.
3. Adjust INTENSITY to less than that intensity which eliminates trace blooming.
4. Press CONV pushbutton. Do not increase INTENSITY.

CAUTION

Trace blooming (figure 3-5) indicates excessive INTENSITY that can damage the CRT. Blooming does not occur in the CONV mode. Do not increase intensity when in CONV mode. Always repeat above procedure each time sweep speed or input signals change.

Figure 3-2. Intensity Adjustment

Operation

3-18. Slight differences in CRT sensitivities, may require readjusting the sensitivity calibration of plug-ins installed in the instrument for the first time, or when moved from one display section mainframe to another. Refer to the Operating and Service Manual of the plug-in for the required adjustment procedure.

3-19. OPERATING CONSIDERATIONS.

3-20. DEFINITIONS.

3-21. The definition of some words and phrases used in this manual may vary slightly from common usage. The definitions of these words and phrase are as follows:

a. Write. To transform an input signal into visible display on the CRT screen.

b. Persistence. The length of time a single sweep-written display remains visible on the CRT screen (intensity and sweep time constant).

c. Store. To retain, at reduced intensity, a display which has been written on the CRT.

d. Erase. To remove all displays and blooms that have been stored or written with persistence on the CRT.

e. Intensity. The brightness of a display as it is written on the CRT screen (persistence and sweep time constant).

f. Bloom. A visible, non-symmetrical expansion of a display written on the CRT screen, figure 3-5.

g. Fade positive. Appears as random green areas on a dark background in MAX PERSISTENCE mode, figure 3-7.

h. Background illumination. A green cloud of illumination visible on the CRT screen, figure 3-7.

i. Sweep time. The time (in seconds, milliseconds, or microseconds) required for the beam to move horizontally one unit of distance (division) across the CRT screen, when writing a display.

j. Fadenegative. A condition in which a portion of the trace or screen begins to dim.

k. Burn. A burn is permanent damage to the CRT phosphor or mesh resulting from excessive intensity being maintained for too long a period. Phosphor burns appear as a discolored area on the CRT screen. Mesh burns appear as spots or traces that are darker than the background illumination in the MAX PERSISTENCE, FAST WRITING SPEED modes.

3-22. CONTROL FUNCTIONS.

CAUTION

Excessive intensity may damage the CRT storage mesh. The INTENSITY setting for any sweep speed should be less than that intensity

which just eliminates any trace blooming with minimum PERSISTENCE setting.

3-23. Persistence and intensity determine the duration of display afterglow. Always set PERSISTENCE and INTENSITY as shown in figure 3-2. The PERSISTENCE control sets the rate that a display is erased; INTENSITY sets the brightness of the trace as it is written. With a given PERSISTENCE setting, the actual duration of trace afterglow may be increased by increasing the INTENSITY. The PERSISTENCE control sets the rate of erasing a written display. The brighter a trace the more time required to erase the display. Conversely, a display of low intensity will erase more rapidly. The same principle applies to a stored display of high and low intensity.

3-24. Pressing STORE pushbutton permits a written display to be stored at reduced intensity in the oscilloscope for comparison, measurement, or photography at a later time. Selection of the STORE configuration disconnects STD, FAST, ERASE, INTENSITY, PERSISTENCE, and CONV functions.

3-25. The TIME control varies the length of time a display is stored. The time ranges from 15 seconds, minimum TIME control setting when writing in FAST speed and transferring to STORE; to over 2 hours, maximum TIME control setting when writing STD speed and transferring to STORE. Light output is inversely proportional to storage time.

3-26. When the STD WRITING SPEED is used, pressing ERASE pushbutton establishes the CRT in a condition for variable persistence display of a signal that later can be stored. Use the minimum INTENSITY and maximum PERSISTENCE required to obtain the desired display. The STD and FAST writing speeds are the only configurations that a variable persistence display can be written.

3-27. When FAST WRITING SPEED is used, pressing ERASE primes the CRT storage surface to allow faster writing on the storage surface. The display however, has reduced contrast and fades positive more rapidly. Contrast and storage time are also reduced.

3-28. Pressing ERASE pushbutton removes stored or written displays from the CRT in either FAST or STD modes. A display that has been stored or written at a high level of INTENSITY may remain

Operation

visible after ERASE pushbutton has been released. It may be necessary to press and release ERASE pushbutton more than once to complete erasure of high intensity displays.

3-29. Selection of CONV operating mode, disables the variable persistence and storage functions and the instrument operates as a conventional, general purpose, oscilloscope. Always adjust INTENSITY in STD mode with minimum PERSISTENCE so the display does not bloom, then switch to CONV. The PERSISTENCE control does not function in CONV mode.

3-30. OPERATING PROCEDURES.

NOTE

After applying power, allow instrument 15 minutes warm up before attempting to make measurements.

3-31. These operating procedures will familiarize the operator with instrument controls and aid in obtaining desired CRT display.

a. To improve persistence uniformity in STD mode adjust A5R45, STD collimator adjust. This will reduce size of useable display area.

b. For variable persistence operation, use minimum INTENSITY and maximum PERSISTENCE compatible with desired display (figure 34).

c. Use WRITING SPEED in FAST mode only for fast sweep time, single-shot displays, or to improve uniformity of trace intensity. FAST WRITING SPEED mode causes more rapid positive fading on CRT and reduced persistence or storage time.

d. To store a display, press STD pushbutton and adjust INTENSITY and PERSISTENCE for desired display and press STORE.

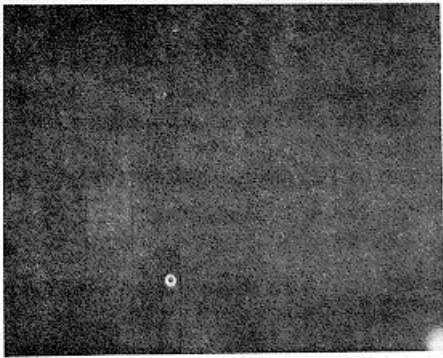


Figure 3-3. Background illumination immediately after erasing with WRITING SPEED in FAST and PERSISTENCE to MAX

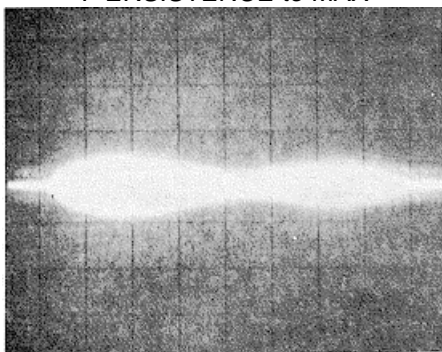


Figure 3-5. Single-shot trace bloom caused by INTENSITY and/or PERSISTENCE set too high

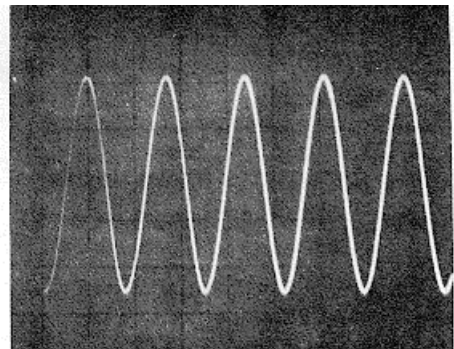


Figure 3-4. Variable persistence with a slow, repetitive sweep

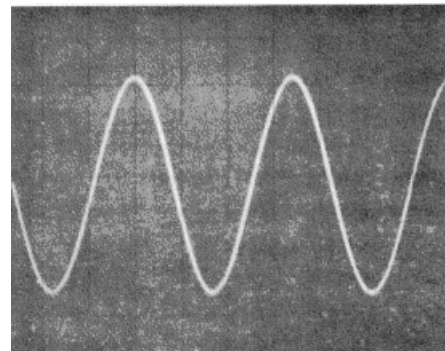


Figure 3-6. Single-shot display with INTENSITY and PERSISTENCE set the same as figure 3-5 and increased amplitude

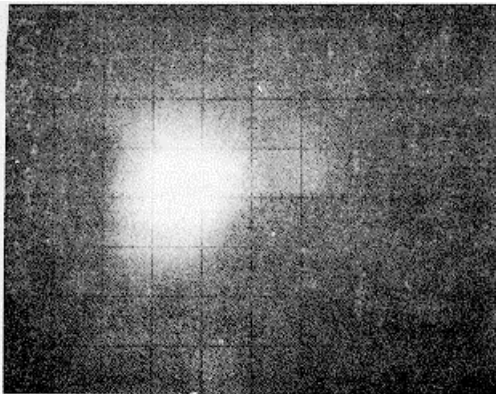


Figure 3-7. Fade positive after 2 to 4 minutes in STD mode.

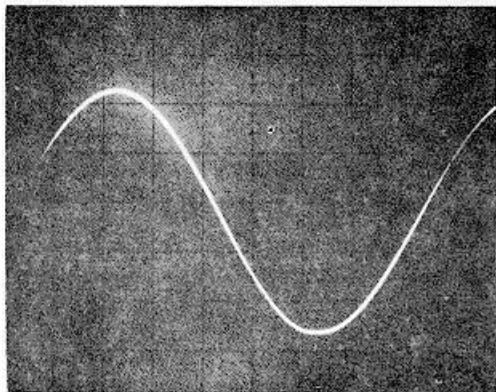


Figure 3-9. Same display as figure 3-8 after three minutes in STD mode

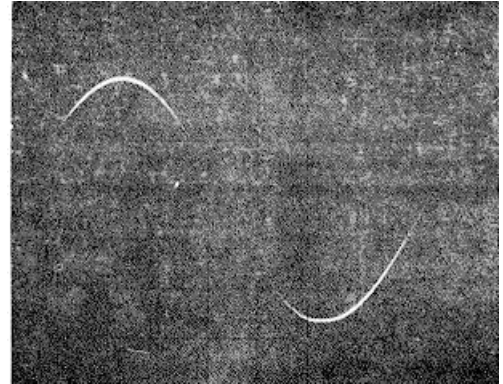


Figure 3-8. Single-shot 20 usec/div display

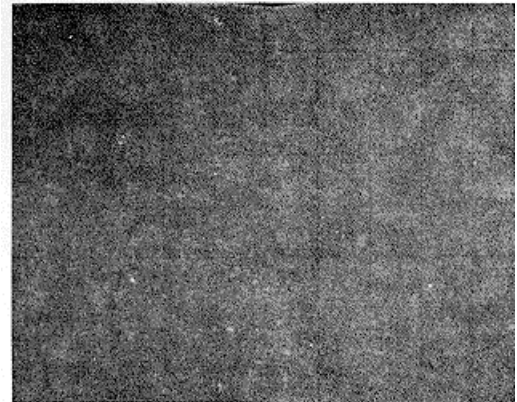


Figure 3-10. Small bright spots caused by minute imperfections in storage mesh

e. To view a stored display, adjust TIME control until stored display has desired brightness

f. To store more than one display, press STD pushbutton, set PERSISTENCE fully cw and INTENSITY as required; allow first display to be written on CRT. Set INTENSITY fully ccw, and connect second signal to be stored. Reset vertical POSITION if second display is not to be superimposed on first. Slowly rotate INTENSITY clockwise until second display appears. Press STORE pushbutton and both displays will be stored.

g. A display stored when instrument power is turned off will remain stored for several days. To observe a stored display, press STORE, set the verti-

cal position control ccw before turning on the instrument. Then adjust the TIME control until the stored display is visible.

h. To erase stored displays, press STD or FAST and rotate the PERSISTENCE control fully ccw, or press ERASE for approximately one second, then release. (First method is not effective when WRITING SPEED is set to FAST).

3-32. SINGLE-SHOT OPERATION.

3-33. To write with persistence or store a single-shot phenomena, trial setting of INTENSITY is the best approach. The amplitude of the phenomena and the sweep-time required to display it will affect the

Operation

persistence. For example, with maximum PERSISTENCE and some settings of INTENSITY, a single-shot straight-line trace may bloom as shown in figure 3-5, while a single-shot signal with amplitude variations of several divisions may not cause blooming (figure 3-6). To determine the best INTENSITY setting, connect a signal which approximates the sweep time and amplitude of the single-shot signal to be written. Set PERSISTENCE fully cw and trigger a single sweep of the test signal. Set the INTENSITY as far cw as possible without causing blooming. Repeat the single sweep signal, erasing the display and setting the INTENSITY after each trace until the desired display is obtained. This setup should give maximum persistence to the single-shot display. After the single-shot signal has been written, the display may be retained by pressing STORE and setting the TIME control to MAX.

3-34. Single-shot signals which require a beam speed faster than 50 microseconds per division can be

written with more brightness by setting the WRITING SPEED to FAST. The screen will be unevenly illuminated after erasing when WRITING SPEED is in FAST, however, the INTENSITY can be set high enough to make the display visible through the illumination. A display, written with WRITING SPEED set to FAST, will be obscured by positive fading more rapidly than a display written with WRITING SPEED set to STD.

3-35. Single-shot signals which require a beam speed between 20 and 200 microseconds per division may have low brightness at some location on the screen. Fire a single-shot test signal with INTENSITY and PERSISTENCE fully cw and WRITING SPEED in STD, and if the center brightness is low, wait for one to three minutes for the low-brightness area to become brighter. Likewise, if the entire display brightness appears below a usable level, or the display is not visible at all, wait for one to five minutes for the display to appear (figures 3-8 and 3-9).

SECTION IV

PRINCIPALS OF OPERATION

4-1. INTRODUCTION.

4-2. This section contains functional descriptions keyed to an overall block diagram of the instrument, and circuit descriptions keyed to simplified block diagrams of circuit groups. The schematics are located in Section VIII.

4-3. OVERALL FUNCTIONAL DESCRIPTION.

4-4. The Model 141T Display Section has five main circuits (figure 4-1): low-voltage power supply, high-voltage power supply, calibrator circuit, pulse circuit, and horizontal and vertical driver circuit. The horizontal and vertical amplifier circuits are in the plug-in units.

4-5. LOW-VOLTAGE POWER SUPPLY.

4-6. The low-voltage power supply operates on 100-, 120-, 220- or 240-volts, single phase, 48-440 Hz. Output voltages are -12.6-, -100-, +100- and +248-volts dc. All outputs are fused and electronically regulated.

Voltages are distributed to the high-voltage power supply, calibrator, pulse circuits, and horizontal and vertical plug-ins. The low voltage transformer supplies 6.3 Vac to the main filament of the CRT and to the calibrator circuit.

4-7. CALIBRATOR.

4-8. The 6.3 Vac is applied to the calibrator circuit where it is shaped into a square wave (of line frequency) and applied to two front-panel connectors, 1V and 10V pk-pk. The 1-volt output is also applied to the vertical and horizontal plug-ins for sensitivity calibration. Accuracy of the calibrating signals is 1%.

4-9. HIGH-VOLTAGE POWER SUPPLY.

4-10. A transistorized oscillator and a step-up transformer are used to generate negative and positive high voltages for the CRT. The negative 2350-volt supply is electronically regulated.

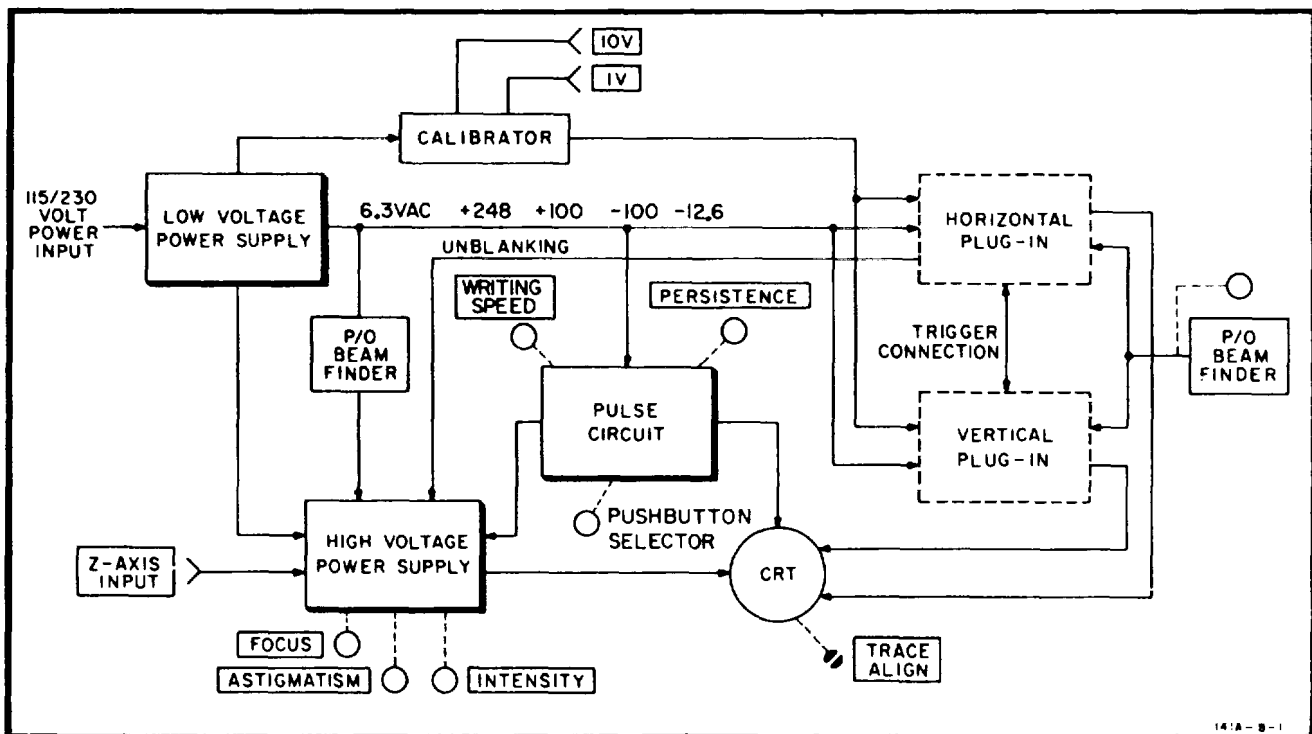


Figure 4-1. Model 141T Block Diagram

Theory

4-11. PULSE CIRCUIT.

4-12. This circuit generates pulses of variable level and rate. These pulses and other dc voltages from the circuit are applied to the storage and persistence elements in the CRT. The low-voltage power supply provides all operating power for the pulse circuit.

4-13. HORIZONTAL DRIVER CIRCUIT.

4-14. The horizontal driver is an impedance converter circuit. The output from the horizontal amplifier circuit in the plug-in unit is applied to the input of the horizontal driver circuit, which in turn drives the horizontal plates of the CRT.

4-15. CIRCUIT DESCRIPTION.

4-16. LOW-VOLTAGE POWER SUPPLY.

4-17. The low-voltage power supply consists of +100-volt supply, -100-volt supply, +248-volt supply and -12.6-volt supply. The +100-volt supply is independent and provides a reference voltage for the -100-volt supply. The +248-volt and -12.6-volt supplies are dependent on the -100-volt supply for reference voltages.

4-18. figure 4-2 is a simplified block diagram of the regulator used in the low-voltage supply. The series regulator acts as a variable resistance in the regulated output. A sensor (or differential amplifier) compares the output voltage with a reference voltage. The driver (emitter follower or amplifier) controls the bias on the series regulator, which effectively controls the series resistance. Any change in output voltage is fed back to the series regulator. The change in series resistance and the resulting voltage drop is opposite to the output voltage change, maintaining the output voltage at a constant level.

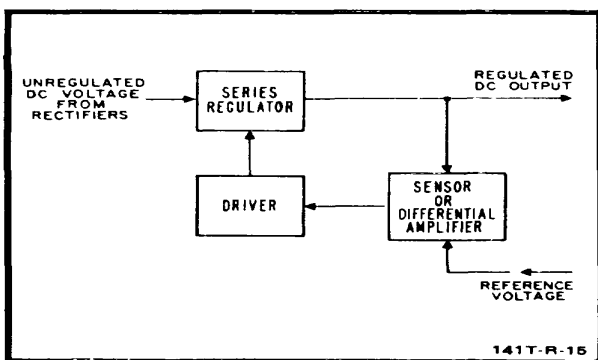


Figure 4-2. Regulated Power Supply Block Diagram

4-19. figure 8-10 is a schematic diagram of the low voltage power supply. The primary winding is wired through a rear panel power module for conversion to 100-, 120-, 220- or 240-Vac operation. Line voltage is

applied to the primary of T1 through an on-off switch, a fuse and a thermal switch. Pilot lamp DS1, lights when power is applied to T1. Two shunt resistors are connected to the +248-volt supply to reduce series regulator power dissipation when high-current plug-ins are used. Each shunt is wired to a rear panel connector. The internal wiring of the plug-in determines whether the shunt is in the circuit or not.

4-20. +100-Volt Supply. The ac voltage from the secondary of T1 is rectified by A1CR5-A1CR8 and partially filtered by C3 and A2R17. The resulting dc voltage is applied through the series regulator Q2, to the output. Differential amplifier A2Q4/A2Q5, compares the voltage across A2V1 with a sample of the output voltage. Any change in output voltage is applied to the base of driver A2Q3, which controls the bias on regulator Q2. Series regulator Q2, compensates for the change in output voltage by changing resistance and restores the output level to normal. The +100-volt output is adjusted by A2R11B and fuse A2F2 provides overload protection.

4-21. -100-Volt Supply. Reference voltage for the -100-volt supply is taken from the output of the +100-volt supply. The reference voltage across A2R31 is compared with a sample of--100-volt output across A2R35. The error voltage sensed by differential amplifier A2Q7/A2Q8 is applied through driver A2Q6, and series regulator Q3. The series regulator brings the -100 volt supply back into proper balance with respect to the +100-volt supply. Ac voltage from T1 is rectified by A1CR9-A1CR12, partially filtered by C4/C5/A2R27, and the resulting dc voltage is applied by the series regulator Q3, to the -100-volt output. Regulation is obtained as in the +100-volt supply. A2R11C adjusts the -100-volt output, and fuse A2F3 provides overload protection.

4-22. +248-Volt Supply. Sensor amplifier A2Q2, in the +248-volt supply senses any variation in the output voltage with respect to -100 volts. The error voltage is amplified by driver A2Q1, which applies corrective bias to series regulator Q1. A2R11A adjusts the +248-volt output and fuse A2F1 provides overload protection. A2CR4 provides temperature compensation for A2Q2, and is normally forward-biased.

4-23. -12.6-Volt Supply. Sensor amplifier A2 Q11 senses any variation of output voltage with respect to -100 volts and applies the error voltage to driver amplifier A2Q9. The driver increases signal current to the level required to control series regulator Q4. The -12.6-volt output is adjusted by A2R47A. Current limiter A2Q10 is a protective circuit for the series regulator and is normally biased off. If an overload occurs across the -12.6-volt output, the base of

Theory

A2(Q10 goes positive by the voltage drop across R11, minus the forward voltage drop across A2CR16, turning A2Q10 on. The collector of A2Q10 is applied through A2Q9 to the base of series regulator Q4, reducing the current flowing through Q4. The current flows through an external overload which limits the current required to keep A2Q10 on. Additional over-load protection is provided by fuse, A12F4.

4-24. CALIBRATOR.

4-25. The calibrator circuit (figure 8-10) consists of three parts: a tunnel diode (square wave generator), a transistor switch, and a calibration network.

4-26. Input to tunnel diode A2CRI9, is applied through A2R5.0. The tunnel diode generates a square wave at line frequency. Transistor switch A2Q12, is off during the time of the positive half-cycle of the square wave (when the voltage at the base is close to zero), and the collector voltage is at a level set by breakdown diode A2VR6 and resistor A2R47B. When the negative-going portion of the square wave is applied to the base of A2Q12, the transistor increases conduction, effectively shorting the collector to ground. The output of the calibrator becomes zero. At the end of the negative input half-cycle (bias of A2Q12 returns to zero) the transistor is turned off, and the output returns to its previous value.

4-27. Tunnel diode bias current is supplied through A2R51. The bias current sets an operating level for the diode which affects the symmetry of the square wave output. Cal adj A2R47R, is used to set the dc

voltage at the collector of A2Q12 to -10 volts when the transistor is off Breakdown diode A2VR6 reduces the output impedance, and provides the temperature compensation for the circuit. Voltage divider A2R;54 , A2R55, reduces the 10-volt output to 1 . Both 10- and 1-volt outputs are available at the front panel of the instrument, and the 1-volt output is available to both plug-ins.

4-28. HIGH-VOLTAGE SUPPLY.

4-29. figure 4-3 is a block diagram of the high-voltage power supply. The output of a regulated transistor oscillator is stepped-up in voltage and applied to a series of high voltage rectifiers. The positive output of the voltage tripler is connected to the post-accelerator of the CRT. The negative output voltages are used in the gun assembly of the CRT and its associated controls. The Z-axis input can be used to apply intensity modulating signals to the CRT.

4-30. figure 8-13 is a schematic diagram of the high-voltage supply and the CRT. Oscillator A2Q12 operates at a frequency of approximately 32 kHz. Any change in the output voltage is applied to A2Q15, which converts the voltage change to a current change. This current change is applied, by emitter follower A2Q14, to the base of the oscillator transistor. The amplitude of oscillations is changed in such a direction as to oppose the original output voltage change. high-voltage adjust A2R6:3 sets the amplitude of oscillation to produce the correct output voltage.

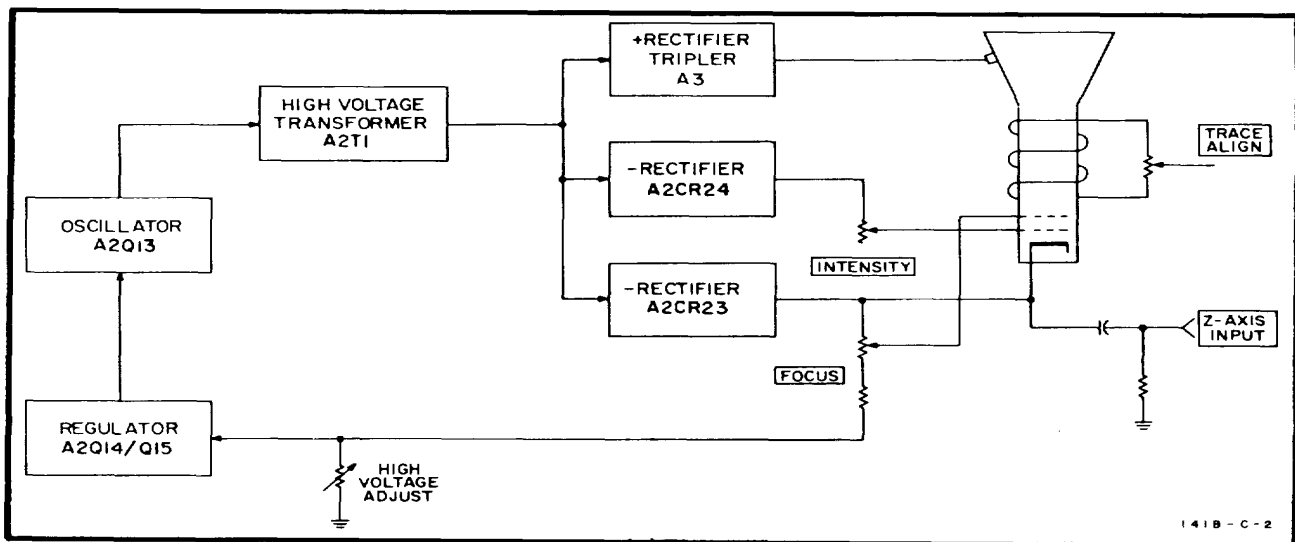


Figure 4-3. High-Voltage Power Supply Block Diagram

Theory

4-31. Two separate negative supplies are used, one for the control grid of the CRT, and one to provide the CRT cathode and focusing voltages. Both supplies use half-wave rectifiers (A2CR23 and A2CR24). The unblanking gate from the horizontal plug-in (pin 1, J2) is applied to the return side of the grid supply, and changes the negative grid voltage by about +50 volts to unblank the trace. A positive pulse of about 20 volts will blank the trace when applied to Z-axis input. When Z-axis input is not used, S4 is set to INT to receive chopped blanking from a dual-trace plug-in.

4-32. The voltage tripler circuit provides the 6.6 kV post-accelerating voltage applies to the CRT.

4-33. The ASTIG adjustment, R8, adjusts the roundness of the spot, and the geometry adjustment, A2-R72, is used to optimize pattern shape.

4-34. STORAGE CRT.

4-35. Refer to figure 8-13 for the schematic diagram of the storage CRT, VI. The CRT contains the conventional electron (writing) gun, deflection plates, post-accelerator, and phosphor screen. In addition, there are two floodguns, a collimator, a collector mesh, and a storage mesh. These added elements make possible the variable persistence and storage functions of the instrument.

4-36. *Flood Guns.* Two flood guns are located on the electron gun, outside of the horizontal deflection plates. Horizontal drivers, A6Q1 and A6Q2, prevent flood gun electrons from flowing through the deflection plates to the output stage of the plug-in. The guns operate continuously when the power switch is ON. An electron cloud, that is emitted by the flood guns, is accelerated toward the CRT screen by collimator and collector mesh voltages. These electrons make stored or persisting display visible. They are also used to erase stored and persisting displays.

4-37 *Collimator.* The collimator is an internal coating along the tapered portion of the CRT. A positive voltage applied to the collimator focuses the flood-gun electrons. The flood-gun electrons are formed into a column perpendicular to, and approximately equal to the width of the CRT screen.

4-38. *Collector Mesh.* The collector mesh is between the flood guns and the storage mesh (closer to the storage mesh). It is always positive with respect to the storage mesh except in the ERASE mode of operation; both are then at the same potential. In addition to accelerating flood gun electrons, the collector mesh also repels positive ions generated by the flood guns.

4-39. *Storage Mesh.* The storage mesh is just behind the CRT screen and is coated with non-conducting material. It is statically held at a slightly positive potential (approximately +3 volts). When the electron beam from the writing gun strikes the mesh coating, secondary electrons are emitted. This secondary emission creates

a pattern of positive potential identical to the movement of the beam. Flood gun electrons are accelerated by this positive potential pattern and strike the phosphor screen, creating a visible display.

4-40. The storage mesh is pulsed with pulses of approximately 10 microseconds duration. These pulses erase the positive pattern on the storage mesh by discharging the mesh coating. Time required for this erasing operation is determined by the pulse repetition rate. The positive pattern on the mesh may also be neutralized manually by connecting the collector and storage meshes (erase). The high positive potential (approximately +156 volts) allows more uniform discharging of the surface. When the storage mesh is disconnected from the collector mesh and returned to +3 volts, the coated surface is at a uniformly equal potential of -9 volts. In both cases, the screen has no illumination. The pattern may be lost by the storage mesh fading positive and allowing the entire screen to be illuminated. This occurs when positive ions from the flood gun raise the surface potential of the storage mesh in random areas sufficiently to allow flood gun electrons to strike the screen.

4-41. PULSE CIRCUIT.

4-42. figure 4-4 is a simplified block diagram of the pulse circuit. The pulse circuit supplies pulses of variable repetition rate to control the operation of the CRT. The pulse timer generates a pulse which triggers the monostable multivibrator. The two outputs of the monostable multivibrator are applied to the flood gun driver and output pulser. The flood gun driver applies pulses to the accelerator of the CRT to control storage time of the display.

4-43. The output pulser applies a positive voltage to the storage mesh of the CRT. The erase timer provides a signal to the monostable multivibrator and output pulser to generate an erase pulse and also triggers the blanking circuit. The blanking circuit energizes a relay in the high voltage supply which applies a blanking voltage to the CRT. The CRT collimator voltage is supplied by a linear amplifier and is controlled by the selection of the writing speed at the front panel.

4-44. STD AND FAST MODES.

S-E.S. Pulse Timer. figure 8-16 is a schematic diagram of the pulse circuit. Setting the front panel PERSISTENCE control, R10, determines the amount of current available from the pulse timer current source, A5Q1. A5C1 charges to a potential which turns A5Q2 on. A5C1 discharges through A5Q2, A5-Q2 turns off, and A5C1 again begins to build a ramp voltage. The repetition rate of this action is controlled by the setting of the front panel PERSISTENCE con-

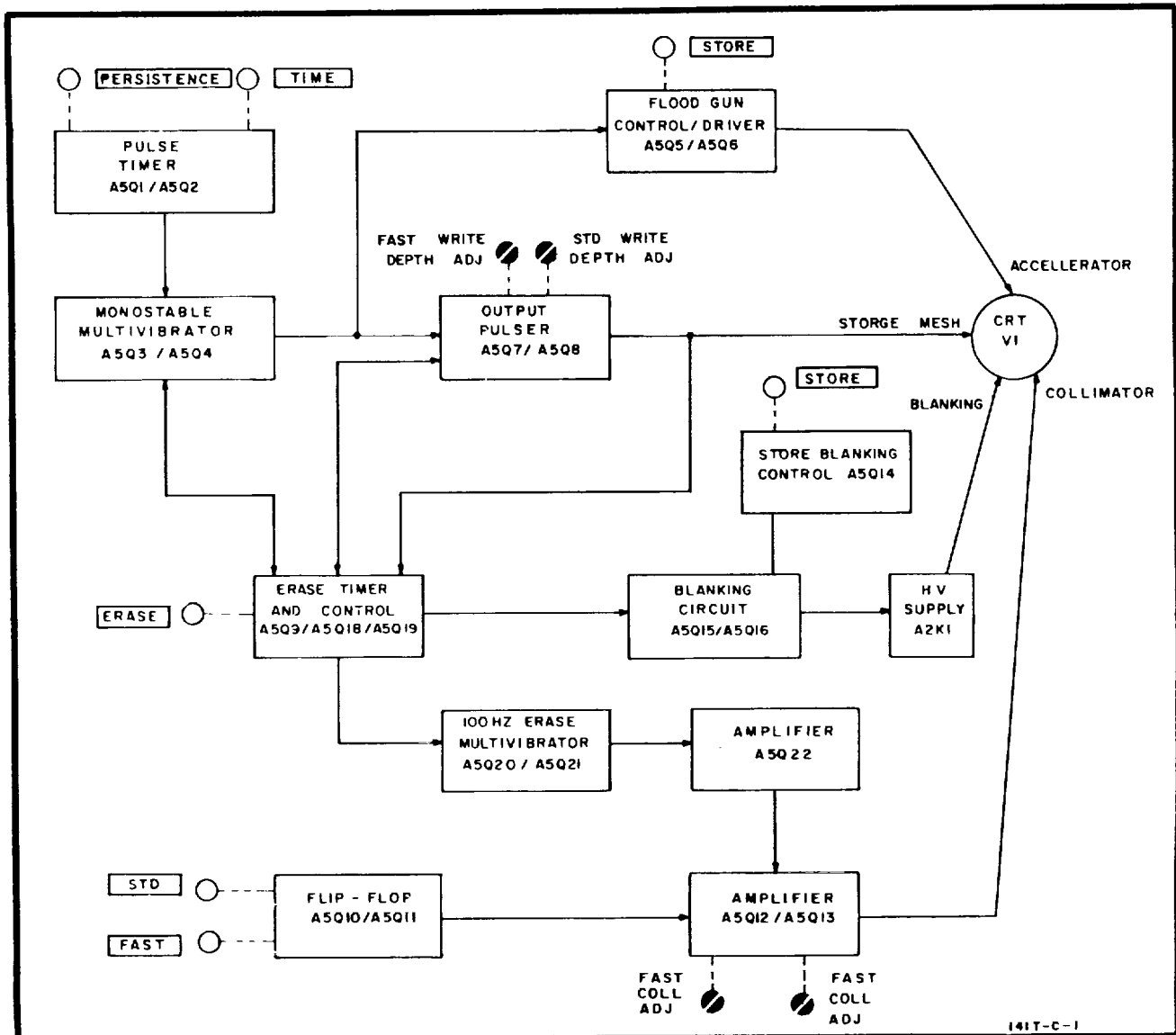


Figure 4-4. Pulse Circuit Block Diagram

trol. The output of A5Q2 is a 0 to 10 kHz pulse with a very sharp spike which is coupled through A5C2 to the monostable multivibrator. This portion of the pulse circuit is active in all modes.

4-46. Monostable Multivibrator. The multivibrator, A5Q3/ASQ4, operating in a monostable state, receives pulses from the pulse timer, and applies a negative-going pulse (approximately 10 usec wide) to A5CR3.

4-47. Output Pulser. The negative-going pulse from the monostable multivibrator allows A5CR7 to become forward biased with a current controlled by the setting of the fast write depth adjustment A5R14A, or the standard write depth adjustment A5R10A, depending on whether FAST or STD mode is being used. This current pulse is amplified and converted to a voltage pulse by

A5Q7/A5Q8 and applied to the storage mesh backing electrode.

4-48. Erase Timer. The erase timer circuits are in a quiescent state during operation in either STD or FAST write modes. When erase timer A5Q9 is turned off, A5CR8 in the erase pulse shaping circuit is back biased. This effectively disconnects the erase timer circuit from the output pulser.

4-49. When operating in the STD mode, at the instant the ERASE pushbutton is pressed, figure 4-5 point A, the following actions take place simultaneously:

Theory

a. The collector mesh potential of +156 volts is applied to the junction of A5R27 and A5R28. This voltage causes A5CR14 to become reverse-biased, which protects A5Q7 and A5Q8.

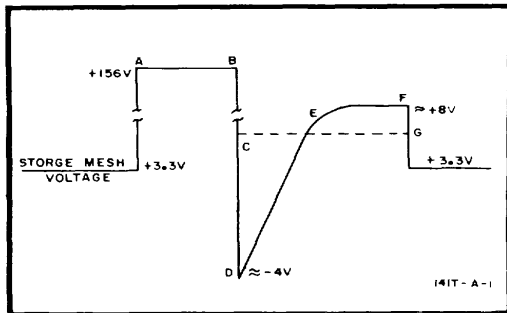
b. The +156 volts applied to A5R27 turns A5Q9 on which charges A5C8 to 0 volts. This action turns on ASQ15 A.-Q16 through A5R53 which blanks the CRT write gun by means of a relay closure on the high voltage power supply board.

c. Zero volts on A5R17 reduces the output of amplifier A5Q7 A5Q8 by approximately -12 volts. ASQ18 turns on, turning A5Q19 off. A5Q3 is turned on by current through A5R7 which allows amplifier A5Q7 A.-Q8 to reach its full output amplitude, less the reduction in amplitude due to the current through A5R17. The result is approximately -4 volts. The erase multivibrator A5Q20/A5Q21 begins to free run at approximately 100 Hz. This signal is amplified through A5Q22 to drive A5Q12 and A5Q13 for an alternating collimation voltage to better erase the CRT.

d. The circuits remain in this state as long as the ERASE pushbutton is pressed.

4-50. When the ERASE pushbutton is released, figure 4-5 point B, the following circuit actions occur simultaneously:

- a. ASQ9 is turned off.
- b. The voltage on A5C8 begins to discharge from approximately 0 volts toward -12.6 volts, figure 4-5 point D.



c. The voltage change across A5R17/A5VR1 causes the output of amplifier A5Q7/A5Q8 to increase from about -4 volts. The increase is in the form of a ramp to the output voltage determined by the standard write depth adjustment A5R10. When A5VR1 is no longer conducting, the ramp stops, figure 4-5 point E.

d. A5Q3 is held in saturation by A5R7. This establishes the output voltage of amplifier A5Q7/A5Q8 at approximately 8 volts.

e. When A5C8 voltage decreases to -12.6 volts, ASQ3 turns off (figure 4-5 point F), and the output

pulsar returns to the quiescent voltage of approximately 3.3 volts. A5Q20 and A5Q21 stop running and the collimator voltage returns to the nominal value.

4-51. Operation of the ERASE pushbutton when in the FAST mode is as described in paragraphs 4-49 and 4-50 except that the storage mesh potential drops less after releasing the ERASE pushbutton and remains constant until A5C8 voltage decreases to -12.6 volts (figure 4-5 points C and B). This action results from the forward-biasing of A5CR29 which prevents current flow through A5CR8 and allows the output of A5Q7 and A5Q8 to go to its maximum level as determined by the fast write depth adjustment.

4-52. At this point, all pulse circuits have returned to the condition they were in prior to pressing the ERASE pushbutton, and pulses from the pulse timer may again be applied to the storage mesh backing electrode.

4-53. PULSE CIRCUIT:STORE MODE.

4-54. *Flood Gun Grid Control.* Pressing the STORE pushbutton removes +156 volts from A5R19 and A5R50. This turns off A5Q5 and pulses from the monostable multivibrator are now coupled through A5C5 to the base of A5Q6. During the 10 usec that A5Q4 output goes positive, A5C5 is charged. When A5Q4 output goes negative, A5CR9 is back biased and A5Q6 turns off. The collector of A5Q6 goes positive until A5C5 is charged and turns A5Q6 back on. This pulse has a duration of approximately 60 usec. This pulse is applied to the flood gun accelerator, which turns the flood gun on for the pulse duration.

4-55. The repetition rate of these positive pulses at the collector of A5Q6 is now determined by the setting of the STORE TIME control, R9, which replaces the PERSISTENCE control when the STORE pushbutton is pressed.

4-56. The write gun is blanked by A5Q16 through the action of A5Q14 and A5Q15.

4-57. PULSE CIRCUIT:CONVENTIONAL MODE.

4-58. When the CONV pushbutton is pressed, a +100-volt potential is removed from A5R25. A5CR15 is forward biased by -100 volts through A5R26, A5-CR14, and R25. This voltage divider sets the storage mesh backing electrode to approximately 29 volts. A5-CR13 is reverse-biased, preventing output pulser signals from passing through. This action produces conventional oscilloscope operation by disabling the variable persistence mode.

Model 141T

4-59. When the oscilloscope is turned off, a display stored on the CRT is protected from unintentional erasure by A5Q17 and the associated circuit.

4-60. TRACE ALIGN.

4-61. The trace align coil L1, is located around the CRT near the screen. Adjustment of TRACE ALIGN R7A/B, changes the magnitude and direction of current through the coil and rotates the trace into alignment with the CRT graticule.

4-62. PLUG-IN KIT FABRICATION.

4-63. The HP Model 10477A and Model 10487A Accessory Plug-ins are blank plug-in units for the instrument. These two units permit the user to design his own special-purpose circuits. Current available from

each of the instrument power supplies is shown in table 4-1. Do not exceed the current capabilities in table 4-1.

Table 4-1. Current Capability

Supply Voltage and J1/J2 pin number		Current Available at each Jack (J1 and J2)
+248 Vdc	9	0-50 ma 50-100ma (pin 2 must be wired to pin 3 in the plug in.)
+248 Vdc	9	
+100 Vdc	2	0-137.5 ma 10-200ma 0-0.9 amps 0-3.25amps
-100 Vdc	6	
-12.6 Vdc	21	
6.3Vac	13-14	

4-7/4-8

SECTION V

PERFORMANCE CHECK AND ADJUSTMENTS

5-1. INTRODUCTION

5-2. This section contains step-by-step procedures for checking the instrument specifications as given in table 1-1 of this manual. A table (performance check record) is provided at the end of the performance check for recording the measurements obtained in the first running of the procedure. This record may be used to compare measurements taken at later dates with the original. The procedures for making all internal adjustments are covered in paragraphs 5-21 through 5-33. A photograph showing the locations of all internal adjustment controls is presented in figure 5-1.

5-3. TEST EQUIPMENT

5-4. Test equipment required for procedures in this section is listed in table 5-1. Test equipment equivalent to that recommended may be substituted, provided it meets the required characteristics listed in the table. For best results, use recently calibrated test equipment. Use a non-metallic screwdriver when making adjustments.

5-5. PERFORMANCE CHECK

5-6. The following subparagraphs describe procedures to determine whether or not the instrument is operating within the specifications of table 1-1. This check can be used as part of an incoming inspection, as a periodic operational test, or to check calibration after repairs or adjustments have been made. Any one of the following checks can be made separately if desired.

5-7. The first time the performance check is made, enter the results on the performance check record at the end of the procedure. Remove the record from the manual and file it for future reference. Be sure to include the instrument serial number on the record for identification.

5-8. PRELIMINARY SETUP

- a Install time base and vertical plug-ins
- b Adjust time base for a free-running 1 msec/div sweep

Table 5-1. Recommended Test Equipment

Instrument		Characteristics Required	Required For
Type	Model		
Voltmeter Calibrator	HP 738BR HO1	Accuracy: 0.1% Output Voltages: 1V,10V	Calibrator Performance Check Calibrator Adjustment
Digital Voltmeter	HP 3439A with HP 3441A Plug-in	Accuracy: 0.1% Voltage Range: $\pm 300V$ Input Impedance: 10.2M Ω	Low Voltage Power Supply Adjustment High Voltage Power Supply Adjustment
Voltage Divider Probe	HP K05 3440A	Accuracy: 1% Division Ratio: 1000:1 Maximum Voltage: 4 KV	High Voltage Power Supply Adjustment
Oscillator	HP 204C	Waveform: Sine Wave Frequency: 80 Hz to 400 kHz	Geometry Adjustment Pulse Circuit Adjustment

- c Set vertical plug-in input switch to off or ground
- d Set Model I -11 T controls as follows:
 INTENSITY..... MIN
 PERSISTENCE..... MIN
 WRITING SPEED STD
- e Turn instrument on and allow a 15 minute warm-up period.

CAUTION

The INTENSITY control should never be set high enough to cause blooming. Excessive intensity can permanently damage the CRT storage mesh.

5-9. BEAM FINDER

NOTE

The BEAM FINDER returns beam to CRT screen regardless of deflection potentials when used with the 1400-series time-domain plug-ins.

When used with the 8550-series frequency-domain plug-ins, the REAM FINDER has no function.

- a Perform preliminary setup (paragraph 5-8)
- b Rotate vertical and horizontal position controls fully cw
- c Press and hold REAM FINDER pushbutton while slowly rotating iNTENSITY cw until a trace becomes visible.
- d BEAM FINDER should return trace to CRT regardless of position of vertical or horizontal controls.
- e Adjust vertical and horizontal position controls until trace is centered on CRT display.
- f Release BEAM FINDER

5-10. Paragraphs 5-11 through 5-14 contain preliminary operational checks of performance characteristics not listed in table 1-1. Because these characteristics are not specified, stated : results are approximate.

5-11. FOCUS AND ASTIG.

5-12. FOCUS and ASTIG controls should give a sharply defined trace when set to approximately midrange positions. Adjust for sharpest trace possible and leave in that position.

5-2

5-13. TRACE ALIGN

- a Perform preliminary setup (paragraph 5-8)
- b Adjust TRACE AI,IGN until trace is parallel to center graticule line. This condition should occur near center of adjustment range.

5-14. CALIBRATOR

- a Perform preliminary setup (paragraph 5-8)
- h Connect voltmeter calibrator to vertical input
- c Set voltmeter calibrator for output of 1V p-p
- d Set vertical amplifier sensitivity to .1 V/div
- e Adjust vertical vernier to display exactly 8 di, isions of vertical deflection.
- f Disconnect voltmeter calibrator
- g Connect Model 141T CAL IV output to vertical input.
- h Observe deflection of 8 ±0.1 division
- i Repeat steps a through g, using 10 volts from the voltmeter calibrator, 1 V/div vertical sensitivity, and CAI, 10V.

5-15. VARIABLE PERSISTENCE

- a Perform preliminary setup (paragraph 5-8)
- b Adjust INTENSITY for normal viewing level
- c Set time base to 2 sec/div and observe that trace line disappears and that spot develops a short tail.
- d Slowly adjust PERSISTENCE cw and note that tail lengthens.
- e. Rotate PERSISTENCE fully cw and turn INTENSITY fully ccw.
- f. Observe that trace remains visible for one minute.

5-16. WRITING SPEED, FAST

- a Perform preliminary setup (paragraph 58)
- b Set PERSISTENCE to MAX
- c Set time base for 1 usec/div sweep
- d Set time base for single sweep

e Press FAST pushbutton and press ERASE. Observe that background appears foggy.

F Repeatedly erase and trigger a single sweep, increasing INTENSITY slightly each time, until trace writes and remains visible for 15 seconds.

5-17. STORE TIME, FAST.

- a Perform preliminary setup (paragraph 5-8).
- b Rotate STORE TIME to MAX.
- c Press ERASE.
- D Trigger a single sweep and immediately press STORE.
- e After 15 minutes rotate STORE TIME to MIN. Trace should still be visible.

5-18. WRITING SPEED, STANDARD.

- a Perform preliminary setup (paragraph 5-8).
- b Press STD.
- c Set time base for 50 usec/div sweep.
- d Repeatedly erase and trigger a single sweep, increasing INTENSITY slightly each time, until trace writes and remains visible for one minute.

5-19. STORE TIME, STANDARD.

- a Perform preliminary setup (paragraph 5-8).
- b Rotate STORE TIME to MAX.
- c Press ERASE.
- d Trigger a single sweep and immediately press STORE.
- e After 2 hours, rotate STORE TIME to MIN. Observe that trace is still visible.

5-20. This completes the Performance Check. If the instrument does not meet specifications, the adjustment procedure which follows should be done. If this does not result in satisfactory performance, refer to Section VIII for maintenance and troubleshooting information.

5-21. ADJUSTMENTS.

5-22. The following paragraphs describe procedures to calibrate the instrument so that it will perform as specified in table 1-1. The entire adjustment procedure can be done in sequence, or any separate adjustment can be calibrated by following the steps out-

lined in the appropriate paragraph. The locations of adjustment controls are shown in figure 5-1, a photograph included at the end of the section on a foldout page

5-23. Use a nonmetallic screwdriver and recently calibrated test equipment with characteristics as specified in table 5-1. After adjustments are complete, check instrument performance by doing the performance check procedure at the beginning of this section. If difficulty is encountered in making any adjustment, refer to Section VIII for troubleshooting procedures.

5-24. PRELIMINARY SETUP.

- a Install plug-ins in both compartments. Proper power supply regulation may not occur without load connected.
- b Remove top, bottom, left side and high voltage deck covers. All internal adjustments are identified in figure 5-1.

WARNING

Voltages present in the power supplies are dangerous.

- c Rotate INTENSITY, PERSISTENCE, and STORE TIME fully ccw.
- d Turn instrument on and allow 15 minutes warm-up period.

5-25. LOW VOLTAGE POWER SUPPLY ADJUSTMENT.

- a Perform preliminary setup (paragraph 5-24).
- b Adjust low voltage regulators as indicated in table 5-2.

NOTE

Because +100-volt supply is a reference for the other mainframe supplies it must be set first. Voltage may be measured on any terminal with wire color shown in table 5-2.

- c Recheck all supplies before proceeding. The +100V supply must be set as near to +100V as possible.

5-26 HIGH VOLTAGE POWER SUPPLY ADJUSTMENT.

- a Perform preliminary setup (paragraph 5-24).
- b Monitor +100 Vdc supply with digital voltmeter using voltage divider probe. Note exact reading

Table 5-2. Low Voltage Power Supply Adjustment

SUPPLY	ADJUST	LIMIT	MEASURE POINT WIRE COLOR
+100V	A2R11B	1V	WHITE/RED
-100V	A2R11C	±1V	VIOLET
+248V	A2R11A	±2.5V	RED
-12.6V	A2R47A	±0.13V	WHITE/VIOLET

- c Multiply value obtained in step b by 23.50.
- d While monitoring high voltage, --2350VM(ITOR POINT (4), set HV adj. A2R63, to obtain voltage reading equal to result obtained in step (-2350 i25V).
- e. This procedure will set high voltage wit 1%, provided +100V supply is set to indicate exam +100V on digital voltmeter.

5-27. INTENSITY LIMIT ADJUST.

NOTE

Method A must be used for Model 141T's with 1400-Series vertical and time-base plug-ins. Method B must be used for Model 141T's with spectrum analyzer plug-ins.

Method A.

- a Turn power off.
- b Remove 1400-Series plug-ins.
- c Short pins 1 and 2 of upper compartment connector, J2, together.

WARNING

Voltages present in the high voltage supply are dangerous.

- d Turn power ON.
- e Set intensity limit A2R65 fully ccw.
- f Set INTENSITY to 11 o'clock position.
- g Press STD pushbutton.
- h Slowly adjust A2R65 cw until a spot is just visible.
- i Turn INTENSITY fully ccw.
- j Turn power off.
- k Remove short from upper compartment connector J2.

- l Replace plug-ins.

Method B.

- a Turn power off.
- b Install spectrum analyzer plug-ins.
- c Set plug-ins for 0.5 ms SCAN mode and AUTO trigger.
- d Turn power ON.
- e Turn intensity limit A2R65 full ccw, extinguishing trace.
- f Set INTENSITY to 11 o'clock position.
- g Press STD pushbutton.
- h Set PERSISTENCE to MIN.
- i Turn A2R65 slowly cw until crest of trace is bright with rest of trace barely visible as shown in figure 5-1A

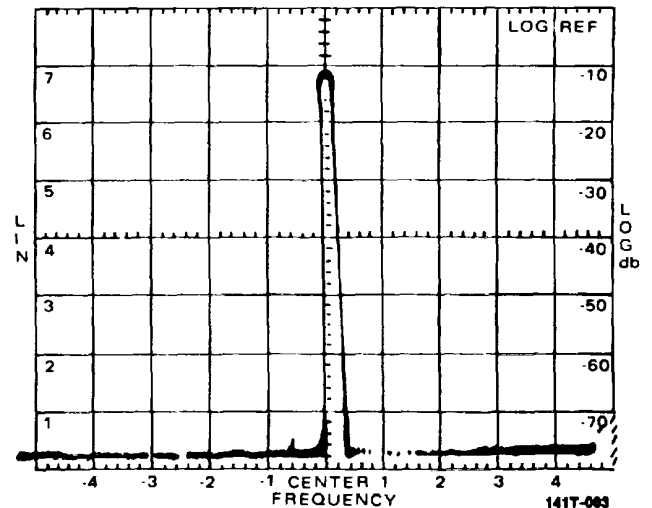


Figure 5-1A. Spectrum Analyzer Intensity Limit Adjust

5-28. GEOMETRY

- a Perform preliminary setup (paragraph 5-24)
- b Set controls as follows:

trigger level auto
 trigger source int (+)
 sweep time 0.5 msec/div
 WRITING SPEED STD
 PERSISTENCE MIN

- c Slowly adjust INTENSITY for normal viewing level.
- d Press ERASE.
- e Press CONV.
- f Adjust TRACE ALIGN and vertical position controls so that trace is parallel to center graticule line
- g Connect 400-kHz oscillator output to vertical amplifier input
- h Adjust vertical deflection factor to obtain slightly under 8 divisions of vertical deflection.

CAUTION

If it is necessary to increase intensity, do so only in STD mode. There is no indication of excessive beam intensity while in the CONV mode and CRT mesh can be burnt.

- i Adjust geometry A2R72 for best compromise between distortion of vertical and horizontal edges of display. Vertical and horizontal controls may be adjusted to permit viewing of edges.
- j Set INTENSITY fully ccw
- k Disconnect oscillator

5-29. CALIBRATOR ADJUSTMENT

- a Perform preliminary setup (paragraph 5- 24)
- b Press STD
- c Connect O1V p-p output of voltmeter calibrator to vertical amplifier input
- d Set vertical amplifier deflection sensitivity to 1 V/div

- e Slowly increase INTENSITY to normal viewing level
- f Adjust vertical amplifier vernier to display exactly 8 divisions of vertical deflection
- g Disconnect voltmeter calibrator
- h Connect Model 141T O1V CAL output to vertical amplifier input
- i Set cal adj A2R47B to obtain exactly 8 divisions of vertical deflection

5-30. PULSE CIRCUIT ADJUSTMENTS

5-31 FAST MODE ADJUSTMENTS

- a Perform preliminary setup (paragraph 5-24)
- b Press FAST pushbutton
- c Turn INTENSITY and PERSISTENCE fully ccw
- d Set time base for single sweep so that sweep will not occur during this portion of procedure
- e Set fast write depth adj A5R14A fully ccw
- f Set fast coll adj A5R14B so that entire flood gun illumination pattern is visible
- g Adjust flood gun grid adj A5R14C to obtain brightest and most uniform illumination
- h Adjust fast coll adj A5R14B so that flood gun illumination just fills graticule
- i Set PERSISTENCE to MAX
- j Press ERASE
- k Adjust fast write depth adj A5R14A slowly cw in small increments, erasing after each step, until a good compromise between no light and saturated brightness is obtained on CRT after ERASE button is pressed.
- l Adjust fast coll adj A5R14B in small increments. Erase and readjust fast write depth adj A5R14A (step k) between increments until uniform fogging is obtained.
- m Set controls as follows:
 - sweep time 0.2 msec/div
 - sweep normal (recurrent)
 - INTENSITY fully cc
 - PERSISTENCE MIN
- n Connect 4 kHz oscillator sine-wave output to vertical amplifier input

Model 141T

o Adjust vertical gain to obtain 8 divisions of vertical deflection

p Adjust INTENSITY for normal viewing level

q Increase vertical gain by a factor of 10. Do not adjust INTENSITY.

r Set time base for single sweep operation

s Set PERSISTENCE to MAX

t Increase INTENSITY gradually while erasing CRT until beam writes evenly, but not to point where beam is always on.

u Press ERASE pushbutton until no trace remains

v Erase, and immediately arm and trigger a single sweep. The resulting waveform should be visible inside a 6 x 8 division rectangle for 15 seconds. If not, rotate fast write depth adj A5R14A clockwise until it is. If CRT still will not hold trace for 15 seconds, return to step g and reduce the illuminated area to no less than a centered 7.6 x 9.5 division rectangle.

w Rotate fast write depth adj A5R14A ccw in small increments. Leave A5R14A at point farthest ccw that permits trace to remain visible for 15 seconds.

5-32. STD MODE ADJUSTMENTS

a Perform preliminary setup (paragraph 5-24)

b Set INTENSITY fully ccw

c Set PERSISTENCE to MIN

d. Set std write depth adj A5R10A fully ccw

e. Press STD pushbutton

f Set time base to single sweep to prevent beam from sweeping

g Press ERASE for one second and release

h Turn std coil adj ASR10B fully ccw and then slowly cw until screen is illuminated to point I n from aluminum ring. Collimator dimples may protrude 3 mm from aluminum ring but in no way may come into graticule area

i Set time base for sweep of 10 msec/div

j Set time base, for recurrent sweep

k Connect 80-Hz oscillator sine-wave output vertical amplifier input

l Adjust vertical gain to obtain 8 divisions vertical deflection

m Adjust INTENSITY for normal viewing level

n Increase vertical gain by factor of 10. Do not adjust INTENSITY'

o Set time base for single sweep operation

p Set PERSISTENCE to MAX

q Increase INTENSITY gradually while erasing CRT until beam writes evenly, but not to the point where beam is always on.

r Press ERASE. If CRT does not erase completely, rotate std write depth adj A5R10A, cw in small increments, pressing ERASE pushbutton each time. Repeat until CRT erases completely.

s. If CRT will not erase completely, rotate flood gun grid adj ASR14C, cw in small increments, repeating FAST MODE and STD MODE adjustment procedures with each flood gun grid adj increments until CRT erases properly.

t. Press ERASE. Immediately arm and trigger a single sweep. The waveform should be visible inside a 7 x 7 division rectangle for 60 seconds without positive fade (screen turning bright green). If trace is not continuous, adjust std write depth adj A5R10A cw in small increments until continuous trace is obtained

5-33. This completes adjustment procedures. If satisfactory operation cannot be obtained, refer to Section VIII for troubleshooting information

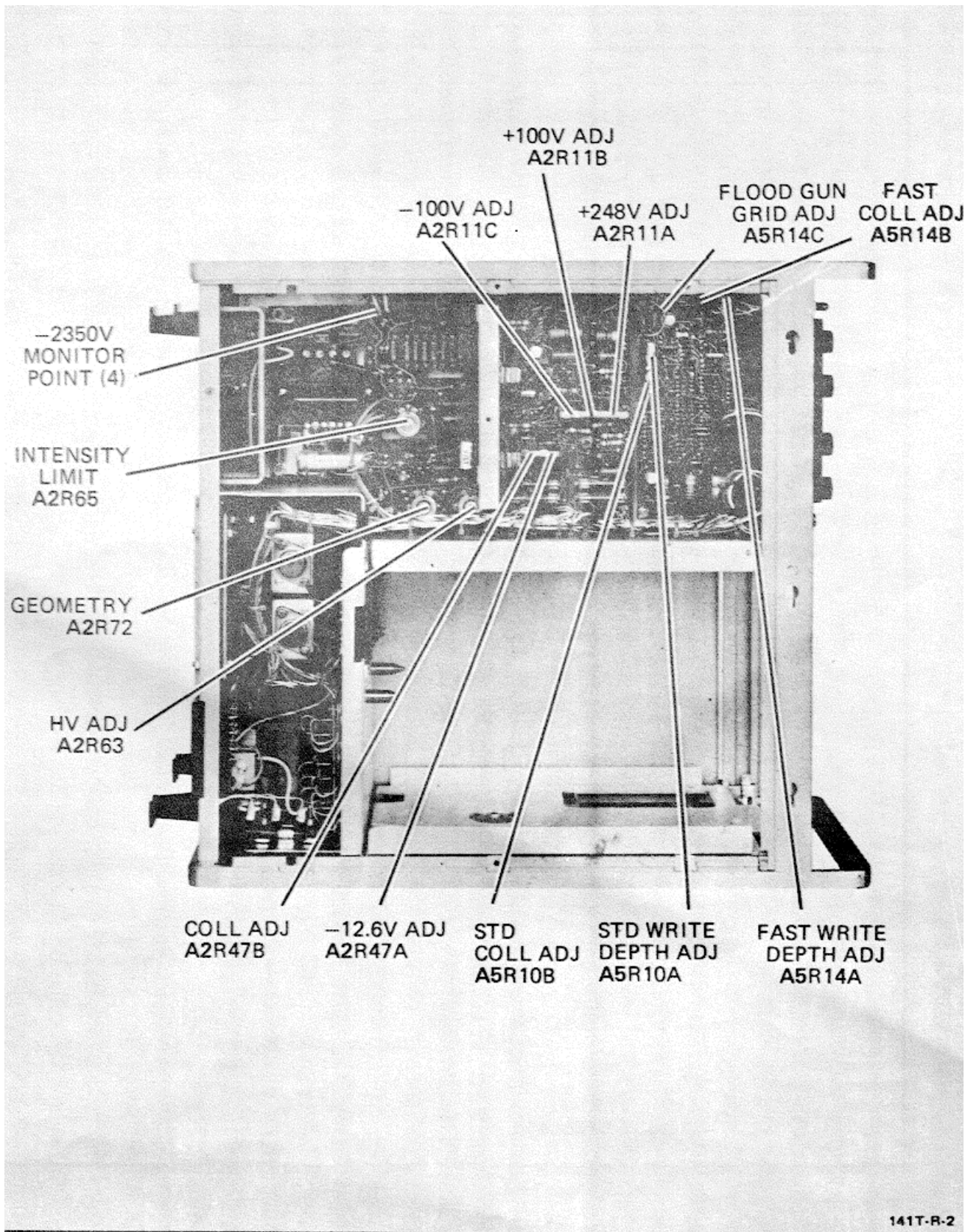


Figure 5-1. Adjustment Location

PERFORMANCE CHECK RECORD
141T

Instrument Serial Number _____

Paragraph Reference	Check	Specification	Measured	
5-9	BEAM FINDER	Returns trace to screen.	YES	NO
5-14	CALIBRATOR	8 divisions ± 0.1 division.	_____ Divisions	
5-15	VARIABLE PERSISTENCE	Spot develops short tail. Trace remains visible for one minute.	YES	NO
5-16	WRITING SPEED, FAST	Trace writes and remains visible for 15 seconds	YES	NO
5-17	STORE TIME, FAST	Trace can be stored for 15 minutes	YES	NO
5-18	WRITING SPEED, STANDARD	Trace writes and remains visible for one minute	YES	NO
5-19	STORE TIME, STANDARD	Trace can be stored for 2 hours	YES	NO

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering replacement parts. The abbreviations used in the parts list are described in table 6-1. Table 6-2 lists the parts in alphanumeric order by reference designator and includes the manufacturer and manufacturer's part number. Table 6-3 contains the lists of manufacturers codes. **Table 6-4 cross-references part numbers to NSN's.**

6-3. ORDERING INFORMATION

6-4 To obtain replacement parts from Hewlett-Packard, address order or inquiry to the nearest Hewlett Packard Sales/Service Office and supply the following information:

- a Instrument model and serial number
- b HP part number of items(s)
- c Quantity of part(s) desired
- d Reference designator of part(s)

6-5. To order a part not listed in the table, provide the following information:

- a Instrument model and serial number
- b Description of the part, including function and location in the instrument.
- c Quantity desired.

Table 6-1. Abbreviations for Replaceable Parts List

A = ampere(s)	GRD = ground(ed)	NPO = negative positive zero (zero temperature coefficient)	RWV = reverse working voltage
ASSY = assembly	H = henry(ies)	NPN = negative-positive-negative	S-B = slow-blow
BD = board(s)	HG = mercury	NSR = not separately replaceable	SCR = silicon controlled rectifier
BH = binder head	HP = Hewlett-Packard	OBD = order by description	SE = selenium
BP = bandpass	HZ = hertz	OH = oval head	SEC = second(s)
C = centi (10 ⁻²)	IF = intermediate freq.	OX = oxide	SECT = section(s)
CAR = carbon	IMPG = impregnated	P = peak	SI = silicon
CCW = counterclockwise	INCD = incandescent	PC = printed (etched) circuit(s)	SIL = silver
CER = ceramic	INCL = include(s)	PF = picofarads	SL = slide
CMO = cabinet mount only	INS = insulation(ed)	PHL = Phillips	SP = single pole
COAX = coaxial	INT = internal	PIV = peak inverse voltage(s)	SPL = special
COEF = coefficient	K = kilo (10 ³)	PNP = positive-negative-positive	ST = single throw
COMP = composition	KG = kilogram	P/O = part of	STD = standard
CONN = connector(s)	LB = pound(s)	PORC = porcelain	TA = tantalum
CRT = cathode-ray tube	LH = left hand	POS = position(s)	TD = time delay
CW = clockwise	LIN = linear taper	POT = potentiometer(s)	TFL = teflon
D = deci (10 ⁻¹)	LOG = logarithmic taper	P-P = peak to-peak	TGL = toggle
DEPC = deposited carbon	LPF = low-pass filter(s)	PRGM = program	THYR = thyristor
DP = double pole	LVR = lever	PS = polystyrene	TI = titanium
DT = double throw	M = milli (10 ⁻³)	PWV = peak working voltage	TNLDIO = tunnel diode(s)
ELECT = electrolytic	MEG = mega (10 ⁶)	RECT = rectifier(s)	TOL = tolerance
ENCAP = encapsulated	MET FILM = metal film	RF = radio frequency	TRIM = trimmer
EXT = external	MET OX = metal oxide	RFI = radio frequency interference	U = micro (10 ⁻⁶)
F = farad(s)	MFR = manufacturer	RH = round head or right hand	V = volts
FET = field-effect transistor(s)	MINAT = miniature	RMO = rack mount only	VAR = variable
FH = flat head	MOM = momentary	RMS = root mean square	VDCW = dc working volt(s)
FIL H = fillister head	MTG = mounting		W = watt(s)
FXD = fixed	MY = mylar		W/ = with
G = giga (10 ⁹)	N = nano (10 ⁻⁹)		WIV = working inverse voltage
GE = germanium	N/C = normally closed		W/O = without
GL = glass	NE = ne. n		WW = wirewound
	N/O = normally open		

TABLE 6-2.Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A0					
A1	00141-66515		DIODE BOARO ASSY	28480	00141- 665t5
A2	00141-66519		POWER SUPPLY 80ARD ASSA	28480	00141- 66519
A3	00141-61101		HICH VOLT AE TRIPLER ASSY	28480	10141- 61101
A4			NOT ASSIGNED		
A5	00141-66520		PULSE CIRCUIT BOARD ASSY	28480	00141- 66520
A6	00141-66502		HORIONTAL DRIVER ASSY	28480	00141- 6650
A7	5060-9421		ASSIYPDWER MODULE	28480	5060- 9421
B1	3160-0252	1	FANITURE AXIAL 115V 50160HZ 16W	92702	WS2107FL-570
C1	0183-0154	1	C:FXD ELE CT 43OIUF .10010: 2508-CW	56289	037361
C2	0180-0012	1	C:FXD ELECT 2X2O UF 45DVDCW	56289	032440
C3	0180-0046	1	C:FXO ELECT 60OUF 520VDCW	56289	032569
C4	0180-0214	1	C:FXD ELECT 275 UF-50-102 20OVDCW	56289	D 36037-DFP
C5	0180-0093	1	C:FXO ELECT 2OUP 1SOVDCW	56289	033193
C6	0180-0213	1	C:FXD ELECT 5000 UP +75-10: 25VDCW	56289	D39556
CAI	1901-0032	2	DIODE:SILICON tN3209	04113	IN3209
CR2	1901-0032		DIODE:SILICON 1N3209	04713	143209
DS1	1450-0419	1	LIGHT:INDICATOR SELETED NE-2H	28480	145041g
J1	1251-0054	2	CONNECTOR; FEMALE 24-CONTACT	28480	1251-0054
J2	1251-0054		CONNECTOR; FEMALE 24-CONTACT	28480	1251-0054
J3	1251-2357	1	SOCKET.3-PIN MALE POWER RECEPTACLE	82389	EAC-301
J4	1251 0202	2	CONNECTOR BANANA JACK	83330	2218
J5	1251 0202		CONNECTOR BANANA JACK	83330	221B
J6	1210 0083		CONNECTOR BNC	0260	31221 1020
J7	1510 00381		BINDINGPOST 28480	50,O38	
J8	1251 2366	1	CONNECTOR RANDPBPOSITIONS	71468	DCM IW8S
J9	1251 2367	1	CONNECTOR R & P.R INSERT POSITION	71468	oCM 8WRP
J10	1251 11286	1	CONNECTOR R& P 12 CONTACT FEMALE	71468	6CM 17W5
JIDE 1	1251 0780	3	INSERT R&P CONNECTOR	08718	DCM 537425001
J11	1251 1221	1	CONNECTOR R & P 12 CONTACT MALE	7178	DCM 17W5P
J11EI	12510179	3	INSERT R&PCONNECTOR	1468	DM 537405001
L1	5060-0435	1	COIL:ALIGNMENT Z AXIS	28480	5060-0435
P1	5060-0736	2	FRAME ASSY	28480	50600736
8P3	00141-60205	1	PANEL:FRONT	28480	00141-6020 5
MP4	5060-0222	2	HANDLE ASSYSH SIDE	28480	5060-0222
IAP6	5060-8735	2	RETAINER HANDLE ASSY:OLIVE GRAY(STDi	28480	50608735
MPB	5060-0767	5	FOOT ASSY:FM	28480	5060-0767
-lfl3	36-a ay4z	1	#TAZO	3.3m	7
MP14	5000-8727	2	SIDE COVER	28480	5000-8727
MP16	5060-8589	1	COVER ASSY:TOP 16LIOLIYE GRAYI	28480	506018589
MP17	5060-8713	1	BOTTOM C,VER ASSY:16L FN(NINT G6R1	A	28480 5060-8713
mPIA	00141-60206	1	PANEL ASSY:REAR	28480	00141-60206
MP22	00140-24710	1	TOP PANEL SUPPORT	28480	0014024710
PP23	0014024711	1	BOTTOM PANEL SUPPORT	28480	0014024711
"P24	00141-67401	1	KNOB:PUSHOUTTON ERASE	28480	00141-67401
MP25	00141-67402	1	K(NO8:PUSHBUTTON FASE	28480	00141-67402
MP26	00141-67403	1	KNOB:PUSHBUTTON CDNV	28480	00141-61403
MP27	00141-67404	1	RCNOB:PUSHBUTTON STORE	28480	00141-67404
MP28	00141-67405	1	KNOB:PUSHBUTTON STANDARD	28480	00141-67405
MP29	00141-67406	1	KNOB:PUSH8UTTON 6EAN	28480	00141-67406
NP34	03600015	2	SOARD0TERMINAL	76530	332-14-03411
MP37	1200-0037	1	SDCKET:CRT 14-CONTACT	28480	12000037
MP38	1200 0044 3	4	INSULATOR TSTR MOUNTING (TO 31 INCLUDES SOCKET TRANSISTOR	71785	213011
	I		NSULATOR BUSHING, NYLON	26365	9 74 307
NP42	1200-0088	4	INSULATOR:00C:E	71785	293201
MP46	1200-0408	1	COVER:CRT SOCKET	28480	1200-0408
MP47	5020-0476	1	BEZEL:CRT	28480	5020-0476
MP48	5040-0440	1	CDVER:CRT SOCKET	28480	50400440
MP49	5040 0501	1	SHIELD;LIGHT	28480	50600053
MP50	5060-0428	1	FLTER ASSV:AIR	28480	50600428
MP56	0011.000104	1	GUSSET-SIDE	28480	0014000104
MP58	0014001201	1	BRACRET:LATCH	28480	0014001201
MP59	0014001206	2	BRACKET:FAN	28480	00140-01206
MP61	0014001208	4	BRACKET:PANEL	28480	0014001208
MP57			NOT ASSIGNED		
MP65	00140-01209	2	BRACKET:GUSSET	28480	00140-0120g
MP67	001401OZLO	2	BRACKET-TRANSISTOR	Includes	MP38 28480
	0014001210				
MP69	0014024103	4	SUPPORT:PANEL BRACKET	28480	001424703

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TABLE Replaceable Parts(Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
HP73	M00140-29902	1	PAL:EXT:UOED	28480	00140-Z9902
MP74	00141-00102	1	DECK:VERTICAL	28480	00141-00102
HP75	00141-00103	1	GUSSET:CENTER	28480	00141-00103
HP76	00141-00104	1	DECK:IMAN	28480	00141-00104
MP77	00141-01207	1	8RACKET:OIOOE	28480	00141-01207
PT78	1400-0068	3	CLIP:FUSE	75915	104002
KP79	00141-01203	1	8RACKET:CAPACITDR	28480	00141-01203
MP88	00141-01204	1	BRACKET:RESISTDR	28480	00141-01204
MP89	00141-01208	1	8RACKET:RESISTOR	28480	UU141-01208
MP90	00141-04101	1	COVER:C&PACITOR	28480	00141-04101
MP91	00141-04104	1	COVER HIGH VOLTAGE BOARD	28480	00141-04104
MP93	00140-60602	1	SHIELDASSY CRT	28480	0014060602
MP94	0014161206	1	8RACKETASSY CRT	28480	0014161206
MP95	0018001218	2	8RACKET COIL	28480	001218 012
MP99	160B-1 IOB	2	GUIDE PLUG IN	28480	161B-11 0 B
KPIOS	1200-0050	10	CONTACT:CRT SOCKET	72825	9553-1
PII6	1410-0052	2	8USHNhg:POTENTIOMETER	28480	1410-0052
KP117	5040-0709	1	TRIM:PLASTIC HANDLE	28480	5040-0709
HP118	5040-0710	1	TRIMHPLASTIC HANDLE	28480	5040-0710
HP119	1490-0030	1	STNOD:TILT	28480	1490 -0030
P120	1520-0042	4	MOUNT:SHOCK	00000	080D
8PZ11	5040-0421	Z	INSULATOR COVER:POTENTIOMETER	28480	5040-0421
HP124	5000-0053	2	PLATE:FLUTED ALUMINUM	28480	5000-0053
P125IZ	00141-21001	4	FEET:REAR LONG	28480	00141-21001
MP126	50008015	1	SHIELD FAN,	28480	5008015
D01	18530252	1	TSTR SI PNP	04713	SJ1798
O2	1854-0294	3	TSTR:SI NPN	04713	SJ-1318
O3	1854-0294		TSTR:SI NPN	04713	SJ-1318
O4	1854-0294		TSTR:SI NPN	04713	SJ-1318
RI	0687-3331	1	R:FXD COKP 33K OHM Iu4 112W	01121	E8 3331
R2	0815-0031	1	R:FXD WW (2X1200)2400 OHM 5S108	28480	0815-0031
R3	0811-2030	2	RSFXD WW 14 OHM 5SIOW	28480	0811-2030
R4	0811-2030		RIFXO Hw 14 OHM	SS IOw	Z8480 0811-2030
R5	2100-2962	1	R:VAR COKP 1.5 EGOHM 30S LIN 12W	28480	20100-o2962
R6	2100-0374	1	RSVAR COMP G5EGOHM 30S LIN 112u	28480	2100-044
R7	2100-0445	1	RIVAR COMP CANCELED ZK OHN 30S LIN 1/2W	28480	2100-03 7 5
R8	2100-0015	1	R:VAR CIIP 500K OHM LIN 1/4	28480	2100-0015
R9	2100-2897	2	RVAR CERNET I NECOH201Z0	LIN Z2	28480 2100-
R10	2100-2897		R:VAR CERMET 1 MEGOHK 20	LIN Z2	28480 2100-2897
R11	0811 2994 4	1	R FXDWWDQ27OHMS3%5W	28480	0811 2994
S1	3101-0056	1	SWITCH TOGGLE DPDT	27191	8926K316
S3	3103-0009		SWITCHITHERNAL SPST	01295	20700L1-205
S4	3101-0011	1	SWITCHTSLIDE DPDT	82389	111-1013
S1	9100-3285	1	TRANSFORMERSPOWER	28480	9100 -3285
T82	0360-0015		BUARODTERNINAL	76530	332-14-0,-011
T83	0360-0012	1	STRIP:TERMIIAL, LUG TYPE	06540	628-13
VI	5083B2587	1	CATHOWE RAY STORAGE TUBE	28480	50832587
W1	8120-1538	1	CABLE ASSY:PDER 7.5 FT	28480	812-1538
V2	00141 61632	1	CAOLEIMAIN	28480	00141 61632
W3	00141-61624	1	CABLE:TWIN LEAO AS4Y	28480	00141-61624
W4	001L41-61625	1	CABLE:Twin LEAD ASSY	28480	00141-61625
85	00141-61622	1	CABLE:COAXPXO MAIN CABLE	284a80	00141-61622
H6	00141-61623	1	CABLE:COAX, PZO MAIN CABLE	28480	00141-61623
o10	00141-61627	1	CABLE ASSY	28480	00141-61627
U1	5Q10-0521	1	CABLE ASSY	2849)1	5060-0521
WIIMP1	UbiO1	2	HING RE IAININGFOR 0 188' DIASHAFT	79136	510018-C MD
WIIMP2	0014023101	2	PIN GUIDE	28480	00140-23101
W12	50#18b	1	FLEX CIRCUIT (HVI	28480	5060 1686
MP92	00141-04105		SIDE COVER:HIGH VOLT BOARD	28480	00141-04105
MP97	00140-24712		SUPPORT:CRT SHIELD	28480	00140-24712
MP127	1400-0651		FOOT:MDUNTING	28480	1400-0651

Model 141T

TABLE Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
Al	00141-66515	1	DIODE GUARD ASSY	28480	00141-685
Alci	0150-0052	8	CSFXD CER 0.05 UF 203 400V)CW DIODE 80AAO ASSY	56289 11	33C17A OI-hl
Aldl	0150-0082	8			
A1Cz	0150-0052		CZFXD CER 0.05 UF 20: 400VOCW	56289 3317	7CI
AICS	01-0052		rCPXD CEI0.05 UF 201 600VOCW	5629 33C117	
ALCRI	1901-0028	13	OJ00E3SILICOD 0.75£ .03PIV	04T13	S113589
AtCR2	1:0011-.0110:		0100E:SILICON 0.75£ 40.PIV	04713	S 51358-9
AIC:3	1901-0028		:O O::SILICDN 0.75£ 403P1V	04713	SR1358-9
AIC14	1901-028		OZOOESILICON 0.75£ 403PIV	04713	S11359
AIdS	1901-002:		DIODESILICON 0.75£ 403PIV	04713	SR1515-9
C 4	1901-002		DIEIILCO 0.7 O V	1	3-
AIIC.	61901-00 2		DIDEISILICON 0.75£ 400PIV	0713	1358-9
AIIII	1901-0028		DIOOEISSILICON D.15£ 403P1V	04713	1R1358-9
AI R9L	1901-0021		IO0ESILICON 0.15£ 400PIV	04713	513589
AICRIO	1901-0024		DIDOI1EILICON 0.75£ 403PIV	06713	Sil355-9
ALCISL	1901-00		OOOE100SILICON O.TSA 400PIV	04713	511358-9
AICRI2	1901-0028		DIODESSILICON 0.75A 403P1V	04713	151358-9
A2	00141-6519	1	POWER SUPPLY BOARD £1S1	28480	00141-66519
1C1	L0160-016	6	C:FX0 AT 0.1 UF LOX 200VOCL	56289	192P7104920T
512	0160-0168		CIPXO N9Y 0.11 UP 103 20OVOCW	56289	9P09-T
12C3	0160-0168		C:SFX NY 0.1 IW 101 LOXVDCW	56289	192P10492-PTS
514	LBO-0100	2	CZPX D ELECT 4.7 UP LOX 35VDCW	56289	159OD4 7SX903592-BY
ZC5	01500082		C3PX D CEN 0.05 UF 202 400VOCW	56289	33C17A
E216	OL61 Ot*8		CBFXO PI 0.11 U 103 2O3VDCW	56289	192P1D492-PTS
51c7	0180-0100		C:FXD ELECT 4.7 UF LOS 35VOCW	56289	1500475X 903552-DY1
AZES	0160-0157	1	CIFXD MY 0.0067 UP 103 ZOOVDCW	56289	192P47292-T1
12C	9010-0097	1	CSPXD TANT47 UF law 35VDCW	56289	1250046X903SS2-3YS
21c10	auld-0138	1	C FXD ELECT 100UF100-1j	40VDW	28480
5111	Obu-0230	1	CIPFOXIOLECT 1.0 UP! 203 60PV	4W	2
2112	015000032		CPFXD CER 0.05 UP 203 SOOVDCW	56289	33C17
12C13	01£00151	5	CPIFD CEI 4700 PF +80-203 4OOVDC01	71590	DAO4-040OCD
5114	0160-0151		CFIXD CER 4700 PP -80-203 400OVDCW	71590	D 1045-040CO
5115	0160-0151		CXFD CE1 4700 PF +80-003 400OVDCw	71590	A04,040OCD
E2c16	0160-0907	a	CPFXD CER 0.01 UF .80-203 SOOvocu	14655	THSOR123Z-1
12C17	ODI*0907		CIPID CEPT 0.01 UP #-20X SO00OVDCV	1465S	T1150R123Z-I
Azca	0160-0151		CIFXD CIER 4700 PF +80-20 4OOOVDCW	71590	D 066-040ICO
E1A 9	OL160-0151		CBPX D CERT 4700 PP +80-203 400OVDCW	71590	A048-040CD0
E2120	0160-3448	1	C FXD CER 1IOOPF 10% 100(OVDCW5 6	289	C067B251F102KS25 CD
A2C21	0160 3443		C FXD CER 0 I IF 'OVDCW	72982	8131 5C 651 Ud 7
A2CR2	1901-0040	30	IOODEISILNCOO 50 KA 30 WV	07263	FDP010s
A21R3	1901-0040		DIODESILICON 50 PA 30 WV	07263	FDCIOSI
E2C14	1901-0096	1	DIOEISILICON IZOV	01295	Lr-sas
AZCR5	1910-0016	2	DIODESGE 40 WIV	28450	19100016
E2C18	L901-0026	2	OIOOE:SILICON 0.75£ 203P1V	04713	511358-9
E2C110	1901-0040		DIDDE2SILICON So PA 30 WV	07263	P01088
12CRI	L1901-0040		DIODFSILICON So N£ A0 WV	07263 PFDY18	
A12C13	1901-0040		DIODESSILICON 50 MA 30 WV	07263	FDGI089
A2C114	1901-0040		OZOOESSILICON 50 PA 30 WV	07263	FDGIO0
2C1k15	1901-0026		CIODESILICON 0.75£ 200PIV	06713	SR1358-5
A2CR16	1901-002S	1	DIDDESILICOP IOOMA/1v	07263	2387
A?1C1R	1910-0016		OIODEIGE 60 WIV	28480	1910-0016
AZRI5	19010040-		ODOOEID SILICON 50 PA	30 WV	07263 FDGILI
E12Ck9	2912-000'	1	DIODE TUNNEL:GERMANIUM	03508	IN3718 SPEC
AZCR121	1901-0040		DIDERSILICON 50 PA 30 WV	07263	FOGIOSI
E51822	1901-009	1	DIDOOESILICON 50PIV	28480	1901-0049
A2C123	1901-0341	2	DIODEOSI 1000 PIV SOOM	28480	1901-0341
A2CR24	1901-0341		DIODEO SI 7000 PIV SOOM	28480	1901-0341
1ZCRZS	1901-0040		DIODE:SILICON 50 sA 30 WV	07'63	FDG0188
ZCR126	1901-0436	2	DIODE3SILICON	1600 PIV	28480 1901-0636
A2CR2	1901-0436		OIDOE:ISILICON 1600 Ply	28480	1901-0436
A2CR21	1901-0029		D1IOOE:SILICON 600 PIV	28480	1901-0029
A2FI	2110-0067	1	FUSE:0.30A	250Y	28480 2110-0067
A2F2	2110-0033	1	FUSE:0.75£	250W	75915 F02GR750A
A2F3	2110-0012	1	FUSE:0.5 AMP 250V	75915	312.500
A2F4	2110-0003	1	FUSE:CARTRIDGE 3 AMP 3 A6	75915	312003
A2KLI	0490-0191	1	COIL.RELAY 600 OHM NOV12V DC	71707	u-2P Ws10 0
A2L1	9140-0171	1	COIL:ID 40 UN 103 1	82142	10608-1
A.L2	9140-0210	1	COIL PXD RF 100 UH 5%	71895	1537 76
AgtPI	0340-0451	1	WASHER:INSULATED TRANIS	TOR	04713 143 5260OP03
A2MP2	21D-0269	a	CLIP:FUSE 0.2H50- D£	91506	600-532C1

Model 141T

TABLE 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2MP3	5040-0401	2	SUPPORT, CAPACITOR	28480	5040-0401
A2M(P4	510410-0430	1	MOUNT TRANSFORMER BOTTOM	28480	5040-0430
A2MP6	0120-01101	1	NEAT SMIN:TENSIE&STOR	28480	0120N01101
AZ:P4	5040-0402	1	MOUNT TRANSFORMER TOP	28480	5040-0402
A201	1854-0005		TSTR,SI	80131	2840131
A202	1853-0036	1	ISTYIRS npn	80131	2N3906
A203	1853-0022	1	TSTR:SI MP-	07263	S17843
A203	1854-0087	1	TST4S MPN	80131	213417
A205	1854-0071	20	TSTRSSI HFHNSLECTEO F1OM 3N37041	28450	1854-0071
A205	1854-0022		TSTR:SI MPME	07263	517843
A207	1854-0071		TSTRSSI NPN(SLECTEO FROM ZN3704)	28480	1854-0071
A20	1854-0071		MU STRSSI NPN(SF8ECTED FROM 213104)	28480	1854-0071
A206	504-0302		TSTR,SI	07263	S17843
A209	1854-0039		T TSTRSSI MPH	80131	2N3053
A2010	1854-0021		TSTR:SI NPN P	80131	313904
A2011	1854-0071		TSTR:SI HPNISEIECTEO FROM 3N3104)	28480	1854-0071
A2012	1850-0299	1	TSTR:NPN F	80131	1TR*964
A2012	1853-0089	1	TSTR:SI NPN	80131	214918
A2014	1853-0034	1	TSTR:S1 PHP(SEIECTEO F0213251)	28480	1853-0034
A2015	1855-0057	1	TSTR:SI FEI N-CHAN NEL	28480	1855-0057
A281	0687-1041	1	RTFXD COMP 100% OHM 101 113'	01121	ES 1041
A282	0164-0033	1	RSFXD MET ox 33 GM 51 23	28480	0764-0033
A2R3	0761-0007	1	R:FXO MET OX 27K OHM1 5 1W	284280	0761-0007
A2R4	064-102	1	RFCOP 10010 1	C 21	
A285	0683-1015	1	R2 Fxl COI F 100 OHM 53X 1/4W 218	41C8	1015
A286	0757-0044	2	R:FXD MET FIN 33.2% OHM 13112W	28480	0757-0044
AZR1	0757-0401	5	R:FXO MET FIN 100 OHM 13 I/SW	28480	0057-0401
A2R8	0757-0243	2	RIFXO MET FIN 3.01% OHM 13 1/8W	28480	0757-0273
A289	0757-0467	2	R:F%0 MET FIN 100% OHM IO 1/8W	28480	0757-0465
A2810	0757-0370	2	R:FXD MET FLM 49.9% OHM 1.03 1/cs	28480	0751-0370
A2111	2100-1589	1	RIVAR COMP 7K/3%I5/ OHM 20 LIN 1/4W -	28480	2100-1589
A2R12	0757-0361	2	R:FXD MET FLN LOOK 04HM I 113'	28480	0751-0367
A2R13	0757-0401		RSFXO MET FIN 100 OHM 13 I/SW	28480	0761-0401
A2814	0766-0033	1	R:FXD MET FIN 2000 OHM 23 3W	28480	0766-0033
E2815	0757-0434	1	RSFXO MET FIN 3.65% OHM 13 1BW	28480	0757-0434
A2R16	0761-0006	1	R:FXD MET OX 100K O4M 53 1W	28480	0761-0006
A2817	0681-5631	4	R:FXO COMP 56K OHM 103 1/21	01121	18 5631
A2R19	0684-1021		RSFXO COMP 1000 OHM 101 1/411	01121	CO 7031
A2820	0757-0 399 P2		RSFXO MIT FIN 52.5 OHM 13 1/8W	28480	0757-0399
A2821	0684-0621	1	R:FXD COMP 5.6 OHM 10IE 1/4	01121	CO 5621
A2822	0757-0764	2	RFXID FIN 33.2% OHM It 1V/S	28480	0757-0764
A2123	0157-0388	3	R:FXD PIN 50.1 OHM 13 118W	28480	0157-0388
A2823	0757-0388	3	RFXD FLNI 30.1 4.2O 13 I/SW	28480	0757-0436
E2826	0051-7046	3	R:FXO MET FLN 22.1% OHM 1.03 111W	28480	0757-0846
A2827	078-5671 04	3	:FX COMP 56% OHM 103 1/2W	01121	EB 5631
A2828	0681-5631		RSFXO COMP 56K OHM 103112W	01121	W 8 5631
A2829	0687-1521		RZFXO COMP 1000 OHM 103 112W	01121	Co 1021
AZA29	0156-0199		RIFXO MET FIN 82.5 OHM 10 1/4W	28480	0757-0399
A2A31	0757-0390		R FXO MET FLM 49 9K OHM I 0% 112W	28480	0757-0370
A2R32	0757-0702	1	RSFXO MET FL* 68.1% OHM 13 1/4W	28480	0757-0112
E2833	0757-0388		RTFXD FIN 30.1 OHM I3 I/8W	28480	0757-0388
E2834	0751-0436		RFFXD MET FIN 4.32% OHM 13 1/8W	28480	0151-0046
			ANO A2R11 MUST SE REPLACEO		
			AS A SET FOR PROPER RESULTS		
E28(36	0757-0764		R:FXO FIN 33.2% OHM 13 114W	28480	0757-0764
A2838	0727-0431		8IFXo DEPC 2.69K OHM 13 113	28480	0727-0431
A2839	0757-0846		RIFXD MIE FIN 22.1% OHM 1.01 1/I	28180	0E5R-0826
A2R40	0681-2221	1	R:FXD COMP 2200 OHM 109 1/3'	01121	E8 2271
A2R41	0687-4131	1	IRFKO COMP 471 OHM 103 113'	01121	18 4731
A243	0157-0846		RI-FXO MET FIN 22.1% O 1.03 2W-	28480	0757-0846
A2R44	0757-0190	1	8:FXO MET FIN 20K OHM 13 1/2W	28480	0757-0190
A2845	0757-0480	3	8:FXD FIN 432K (H)M It 118W	28480	0151-0380
A2846	0757-0388		R:FXO FIN 30.1 OHM I; 118W	28480	0157-0388
A2R47	2100-1588	1	RIVAR CIJMP 2 X 1.5% OHM 303 LIN If4W	28480	2100-1588
A2848	0757-0273		R:FXD MET FIN 3.01% OHM 13 11/W	28460	0751-021
A2849	0811-1146	1	R3FXD WW 0.36 OHM SX 2W	28480	0811-1746
AZR50	075S-0421	1	R:FXD MET FIN 825 OHM 13 I/SW	28480	0757-0421
A2851	0757-0428	1	RIFXO MET, FIM 1.62K UHM It 1/8W	28480	0751-0428
A2852	0761-0075	1	RIFXO MET OX 16K OHM 51 1W	28480	0761-0075
E2R54	0698-3555	1	R:FXD MET FIN 4.437% OHM 0.53 113'	28480	0698-3555
A2855	0698-3554	1	RIFXO MET FIN 493 OHM 3.53 1/2W	28480	0698-3554
A2856	0684-3331	1	R/FXW COMP 33% OHM 103 1/S	01121	CS 3331
A2851	0158-0054	1	RIFXO MET OX 330 OHM 51 1/3'	288	0158-0054
R2P58	06 8 4- 1 0 2	1	R2FXO COMP 1000 DNA 10	1 / 4 W -6-5	
E2858	068-1021		RIFXO COMP 1000 OM 103 114	01121	CS 1021

Model 141T

TABLE 6-2 Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1261	OTT-0845	2	RTPXD PIN 1.18 NPGMOH IN IIZV2U480	0721-	0845
A4142	0717-07	1	R:FXD FLM 900K OHM % 112W	28480	0757MQO57
A121:63	2100-0096	1	I\$VA 1NEGOM 3004LIN II	2840	2100-0096
A2R£4	06:-1539	1	RIFXD COMP I5K OHM 53	1141	01121CB1535
A2145	216-2108	1	18161CONE 1. INEON 103tLINW	28480	2100-2108
A 2	069£	1	FLPI 13NGEOHG	SN 1w	28480 06956660
AZ	670171-0344	2	NET FIL 1.00 NEIOHN 13	114W	28480 017-0344
Az0	0741-04	1	RSFXD MET 20K OH M	111	28480 0004
A21	0757-839	1	FIPID MET FIL 1DK OHIN 1(2w	25480	15-0439
AT110	0151-0168	1	:PFXD PIN 41.51 OHMIN 1(4	28480	0757-0168
£2111	0715-0454	1	MET PIN 33.21OHM 13 11/S W	8481	0157-0454
A2:72	2100-0095	1	18VAR CORP IOCK OHM 303 LIN 1i5w	28480	21001-095
£2 73	0121-0845	1	PID FLIN 1.18 NESMIN 13 12W	25480	0127-0845
A2:74	a68-33	8	FXD FLIN 2.49 NEOHNX It 1IZW	28480	06983553
AZ17 TS	98-3513		PIN 2.49 NEOOHN 13 I/W	28480	06983553
£2116	0698-3553		PIN 2.49 NEGONN 18 i:	2U480	069835553
A2476	0698-353		IPFXD FLN 2.49 NEOOHN 13 1(2W	25480	06983553
A2*74	0696:-353		RIFXO FLP2.49 NNGOHN I2 112W	25480	06983553
Aaa?9	565-3593		IRXO FIN 2.49 NEGWN It 1121	2840	0698-3553
£2180	069-3553		IRPXD FIN 2.49 NEWM IIN 12W	28480	0698-353
£2181	0698-3553		MIPID PNFL 2.49 NEGONGH	18 1IZU	28480 0698-3553
£2R&2	0751-0344		MET FIN 1.00 NEGHN III	1141	28480 057-03,44
£2881	0151-0432	1	:IPID NET FLN 27." OHM 1N 18I/	28480	0151-0452
A2P&4	01DS04065		RIFD MET FLAIN00K OHM 11 1(81	28480	0757-0465
£2885	Ob8-2221	4	IPIXD 2200 ONPI 109 114V	01121	CO 2221
AZA&6	06986286	1	IPIXD COMP 100 NEGONN ION 1/41	20480	0698-6286
A2TI	00141-61102	1	T1ANSFORNMR ASSY	28480	00141-61102
A2VI	194-I 013	1	ELECTRON TUE8Z.0 *- IV	14276	18211
£21v	2140-0014	3	LNPIGLOW 0.5 NILLIANP T-12 88	n11744	4A*(NM96)
£213	2140-014		LAIMPILDW 0.8 NLIHAM T-2 *UL8	11744	4A&(%E-961
£214	214L0-004		M PIIPGLOIN (3 NILLIAMP S T-2 SI	111744	44AB8-96)
£2111	1902-1202	1	DIODE DIREKDOWN80.61V 28	28480	1902-3402
£2112	1902-0034	1	DIODEIS.161 ION	28480	1902-0034
A21118	1902-3104	2	D010DS8REAKDOWI 5.62V St	04113	SZ10993110
£2V14	1902-3385	2	01008 AREAK0011869.81 23	28480	1902-3385
£2111	1902-3388		DIODE 01008A DOWE69.8V Z	28480	1902-3385
A1ZV	1902-0064	1	DIODE	28480	1902-0064
A3	00141-61103	1	HIGH VOLTAGE TRIPLIR ASSY	80	0114161103
A3MP2	0018147101	2	GASKET- SIDE	28480	0018147101
A3MP3	00181-47102	1	GASKET CENTER	28480	0018147102
AS	01)141120	1	PULSE CIRCUIT BOARD ASSY	2890	0041-M20
A5CI	01000118	1	C. FXD MY 0 0058 UF 10% 20VDVCW	528215	192P56292-PTS
A4			NOT ASSIGNED		
ASC1	0140-t 158	1	CIPID MY 0.0056 UP 103 ZOOVDCW	56289	192P56292-TS
ASC2	01682212	1	CIPID MICA 560 PP 5N 300V01W	28480	0160-212
ASC3	014G0020	1	C: FXD MICA 47 PF 5% SOOVDCW	14655	RDMI15E47WSC
ASC4	01401-0 I		C&FXO NICA 330 PP F3	28480	01400207
SCS	o-01680151	1	CIFPX MY 0.001 UP 103	56289	192P10292TS
ASC&	O1682262 IL	1	CIFXD CER 16 PF S3 100DCW	12982	301-080 CORO 160I
ASC7	O1682146	1	CIPIL CEI 0.02 UP *-#-20N 1000VDCW	91418	1£
ASCO	0160-228	1	CISXD ELECT 22 UP 103 151101	56289	1500226N9015B2-DYS
ASCIO	0180-0376	1	CIPID 0.41 UP 108 3IVDCW	56289	1500741X9031A2-DYS
ASCII	01680160		CIFID MY 0.1 UP I1N 200VDCU	56289	192P104928TS
AC12	010 168		CIPID NV 01 UP 10I O\$OOVDCU	56289	192F104928TS
ASC13	o10001o	1	C: FXO ELECT 2.2 UF 20% 2C1DCW	58215	1D00225X0120A2-DYS
ASC14	01000157	1	c: PXD MY 4700 PF 10I 200VDCW	58299	129P47202PTS
AOCI 5	0101735	2	C: FXD ELECT22 UF 10%20C	28480W	01801735
A2R44	010W1735		C: FXD ELECT 2 UF 10171DVcB	2848	018D-1735
ASC17	010		C: FXD CER 0.05 UF 20% AMDCW	521281	33C7A
SC11	noi9 4		DIOD&1SSII[LON 50 IP 30 W V	07263	1011088
ASCIK2	1901- 0		DIODE:SILICON 50 30 WV	07263	FP11108
ASCRI	19010040		DIODESSILICON 50 PA 30 WV	07263	POF108
ASCPA	1901-0040		DIOEISILICON 50 *A 30 WV	07263	P06108'
ASCIS	L1901000		DIODESILICON 50 PA 30 WV	OT1263	P61088
£ICM	1901-0040		DD0ESSLILICON 50 PA 30 WV	01263	FOI08
ASCIKT	19010040		OIODESILICON 50 N£ 30 WV	01263	P061088
£IC8	19010040		DIOEISILICON 50 PA 30 WV	07263	P061088
AISC	19010040		DIODESILICON 50 MA 3J WV	07263	FOP1088
£ICRIC	t11 o010		I003ISILIC.ON 50 MA 30 WV		07263 POIOGG
ASCILI	941-Q040		DIODESILICON m 30 WV	07263	P061088
ASCRIZ	1901-0035		0I0D3:ILICON 181111		01263 FD3369
ASC113	1901-0013		DIODEOSILICON loom 181W1		01263 P03 369
£SCR14	180-0038		OIGSSI LICON *.15£ 480PIV 104113		513559

Model 141T

TABLE 6-2 Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
ASCR16	1901-040		OIOOEISILICON 50 MA 30 WV	07263	FOG1088
ASCR1:			NOT ASSIGNED		
ASCII	t19010040		IOOETSILICOM 50 P	30 WV	07263 FOG188
A C is	1901-0040		OIOE:SILICON 50 K	30 WV	01263 F0GL08
ASCRG	19010E0,,		OIODE:SILICON 50 M£ 30 WV	07263	P0G108
ACSC20	1901-0040		OIOEISILICON 50 al 30 WV	01263	FDG1088
ASC 21	1901-040		DIODE:SILICON 50 KA 30 WV	07263	P0G10L8
ASCR22	1901-0040		DIOOESSILICON 50 MA 30 WV	07263	FOGLOSS
ASCR23	19501-040		DIODEASILICON 50 MA 30 WV	07263	FD6108
SCR24	190L-01040		IODE:SILICON 50 M30 WV	07263	FDP6088
SC5125	1501-0040		DIODESSILICON 50 MP 30 YWV	07263	P0610
ASCR26	1 010414	1	OIOE8:SI 3£ 400PRRV	04713	SR1846-12
SCRZ7	1901-0033		DIODESISLICONOONA0 law*	07263	F03369
SCR24	1901-0040		DIGGESILICON SM 30 WV	01263	FOG1088
ASCA29	19010D040		DIOOE:SILICON 50O L 30 WV	07263	FOG1088
ASLI	9100-1630	1	COILICHOKE 51.0 U) St	28480	100-1630
A501	1653-0020	1	TSTRISI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A502	155-311	1	TSTRSUINJECTION SI	047113	84894
A503	1 400711		ISTR3SI MPISELECTED FRON OM:3704)	28440	toC0071
A504	18540071		TSTR:SI HPN(SELECTED FFROM 237041	28480	18510071
ASGS	1854-0071		TSTRISI NPNISELECTED FROM 2N3704)	28480	1is-0071
AS*6	1854-0350	3	TSTR:SI NPN	28480	1854-0358
£507	1850358		T3TRSK NPN	28480	1850358
ASO8	1454-03S\$		TISTRISI N	28480	1854-0358
A509	18541-001		TSTR:SI MPN(SELECTED FROM 2Z3N304	28480	1854-0071
£5010	1854-0071		TSTRISI HPM(SELECTED FROM 2:3704)	28480	1854-0071
A5011	3454-0071		TSTRSSI MPL(SELECTED FFROM Z37041	28480	1854-0071
A5012	1854-0071		TSTRSSI NPN(SELECTED FFROM Z3701)	28480	1854-0071
'5013	1954-0234	1	TSTRS1 MPN	80131	2N3440
£5014	1854-0071		TST81s1 MPN(SELECTED FROM 2N37041	28480	1854-0011
A501!	1£54-0011		TSTRISINH(SELECTEO RON1 2:3704)	28480	1854-0071
A5016	18540071		T3TR:SI MPN(SELECIED FROM 2N37041	28480	1854-0071
A5017	154-0071		TSTRSSI HPMSELECTED FROM 2:3704)	28480	1854-0071
A5018	1854-0071		TSTR:SI MPM(SELECTED FROM 2:3704)	20480	1854-0071
AS019	154-0071 O		TSTSI HPNH(SELECTED FFROM 23704)	28480	18540071
A5020	1L54-0071		TSTR:SI MPH(SELECTED FROM 2N37041	28480	1854-0071
£50211	154-0071		TS181S1 KPI(SELECTED PROO 2N37041	28480	1854-0071
A5022	is540071		TSTRs81NPNISELECTID FROM 2N37041	28480	18540071
ASR1	0757-0473	3	R:FXDET FLPL221K O HM 13 SL8	28480	075 7-0473
ASR2	0684-1051	5	R:FXD C01PEMGIOHM 13 I/41	01121	CI 1051
£583	0694-1021		RSFXD COMP 1000 OHM IO 1/4W	01121	CB 1021
A515	0664-2221		RSFXD FJO2210000OMPPI / DI	28480	1854-0071
ASR4	0757-04001	2	RTFXD IM	28480	1854-0071
A506	0684-4731	1	R:FXD COMP 47K O HM Los IO4W	01121	CD 4731
£5R7	0684-2231	3	RTPXD COP 22k OHM IOU 1/4W	01121	CO 2231
£588	0698-31S	1	R:PFXD MET FLN 4.6K OHM 13 L18W	28480	0698-3155
£5859	0757-0430	1	RSPXD MET FLI 2.21K OM 13 I18W	28480	0157-0430
S1R10	2100-0424	1	RIVAR COMP 2 X 50K OHM208 LIN 1/4W	28480	21000424
A811S	0757-0469	1	RSPXD FLN L150 OHHM I I18W	28450	0757-0469
A5012	0757-0473		RPFXD MET FLPI 221K OHM 13 I/8W	28480	0757-0473
A5R13	0757-0481	2	RIFXD MET FLN 475K DHM 1g 10W	28480	0757-0481
£58114	2&00-0963	1	R:VER COMP 3 X 100K OM203 LIN1141	28480	2100-0983
ASRIS	0684-2221		RIPXD COMP 2200 OHM 103 1/41	01121	CD 2221
AS&14	0757-0466	1	RPFXD MET FLN 110K OHM13 11SW	284800	757-0466
381a	06"-1431		RFXD COP 18k OHM 103 1/4W	01121 CO	1831
ASR18	0684-1061	3	RIPFXCOMP 10 NEGOHM 103 1/4w	01121	CB 1061
ASR19	0664-474	1	2RIFX) COMP 47*K OWM IO1/41	01121	CB 4741
AN20	0698-0051		RIPFXO FLPN 5k OHM13 118W	28480	069-4009
AM21	07511-0476	2	IP))D MET FLN 301K OHM Is I/SW	28480	011-0476
ASR22	07-57-456	1	RSDMIOET PLIN 43.5OHM 13 I/ SW	25480	0137-0456
ASR23	07571124	1	R XIP))D ET FLN 200K OHM 13 1/2W	28480	0757-0128
ASR24	0684-l001		RIFXD COMP 10 M4E&OHM103 1/4W	01121	Ca L011
£5825	0757-0850	3	RPFXD MET FLPI39.ZOM 1.03 112W	284IK	01517-085
A260	757-0367		RSIFXD MET FLM 100OK OHM13 12W	284	0757-0367
ASR27	0757-0481		RIPFXD MET FLN 415K OHM13 118W	2848C	0157-0481
ASO28	0684-2221		RIFXDCOMP 2200 OHM 103 1/41	01121	CB 2221
ASR29	0654d 611	1	RIPXD CGWW 560 OHM 103 14W	01121	Ca 5611
ASM30	0757-0793	1	RIPFXD FLN 825k OHM 1.0I/41	28480	0757-0793
A5R31	0684-2241	1	R:FXD COMP 22Ok OHM IO1(41	01121	CA 2241
ASA32	0684-1031	4	RPFXD COMP 10k OHM 103 14W	01121	CO 1031
ASA33	0684-101		RIFXD COM1P 11LEGON0 1/4,	0112L	Cs 1051
A5834	0684-1031		RIFXD CORP 10K OHM103 L14W	01121	CI 1031
ASR35	0684-1031		R:FXO COOP 10k OHM103 1/4W	01121	CB 1031
ASO36	0684-1031		RIP)) COMP 1Ik OHML3O 1(4W	01121 CB	1031

Model 141T

TABLE 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
43	0684 1		RFXO COP 4700 OHM 101 1r 01121	CO	4721
A5R44	0757-0480		R:FXO FCO432 EGOHM IS 18W	28480	0757-0480
A5R46	0757-0791	1	RIFXD FLH 619K OHM 1.01 1/4W	28480	0757-0791
A5R47	0757-0476		R8FXD MET FLN 301K OHM K3 118W	28480	0757-0476
A5R48	0761-083	1	RZFXD MET OX 68K OHM 51 1W	28480	0761-0083
A5849	06844721		R:FXO COMP 4700 OHM 10141W	01121	CB 4721
A5R50	06844741		R:RXD COMP 470K OHM 110 1/4W	01121	CO 4741
A5R51	0684 -1-1 I		R:FXO COMP ILECOHH 1I 1/4W	01121	CO 1051
A5152	0684-1*1	5	R:FXO COMP IOOK OHM IOa1/41W	0112t	CS 1041
A5R53	0684-1041		RIFXD COMP 100K OHM Los 1/4W	01121	CB 1041
A5_54	0684-1061		R:FXD COMP 10ECOHM 10 1/4W	01121	CB 1061
A5855	0684-2731	1	R:RXD COMP 27K OHM IOI/41	01121	CB 2731
A5R56	0684-1041		R:FXO COMP IOOK OHIOX 1/4W	01121	CB 1041
A5857	0684-2211	1	R:FXD CORP 220 OHM IOI 114X	01121	C 2211
A5R58	0684-8231	1	RIFXD COMP 82K OHM 103 1/4H	01121	Ca 8231
A5R59	0684-1051		R:FXD COMP IMEGOHM 13 I14W	01121	CB 1051
A5R60	0684-1U11		R:FXD CORP 180 OHM IOS I14V	01121	CB 1811
A5R61	0698-3647	1	RZFXD MET OX 15K OHM 53 2W	28480	0698-3647
A5862	0684-1041		R:FXD COMP LOOK OHM 100 1/4W	01121	Ca 1041
A5R65	0684-1041		RZIFXD COMP IOOK OHM 1011/4W	01121	CB 1041
A5R66	0684-2231		R:FXO COP 22K OHM IOO1/4W	01121	C8 2231
45567	06844721		R:FXD COWP 4700 OHM IO1/4W	01121	CO 4721
ASR68	0684-6831	2	RFXO COHP 68K OHM 101/4W	01121	C8 6831
A5R69	0684-4721		RPFXD COMP 4700 OHM IO1/41W	01121	C8 4721
A5R70	0684-3321	2	RIFXD COP 3300 OHM IO1/4W	01121	CB 3321
ASR71	06844831		R:FXD COMP 68K OHM IOS 1/4W	01121	CB 6831
A5K72	069844721		RIFXD COMP 4700 OHM 101 1/4Z	01121	Ca 4721
A5R73	0684-3321		RIFXO COMP 3300 OH Loa 1/4W	01121	CB 3321
A5R74	0684-2231		R:FXD COWMP 22K OHM IOIO 1X4	01121	Ca 2231
A5R75	0684-4721		RIFXD COMP 4700 OHM 10 1/4W	01121	C8 4721
A5R716	0683-1555	1	RIFXD COMP 1.5 MEGOHM 5S 1/4W	01121	CB 1555
ASR77	0684-1021		R:FXD COMP 1000 Ohm IO1/4w	01121	CB 1021
A5R80	0684-1021		RIFXD COMP 1000 OHM IO1/41	01121	CB 1021
A5R	06883 5635	1	R FXD 56K OHM 5X 1/4W	01121	CB 5635
ASI	3101-1259	1	SWITCH 6 SECTIONS	2B480	3101-1258
A5VR1	7902-3104	1	DIODE BREAKDOWN 5.62V 5%	04713	SZ10939 110
A5VR2	1902-0597		DIODE BREAKDOWN 56 2V 5% 1W	28480	1902-0697
A6	00141-6502	1	HORIZONTAL DRIVER ASSY	28480	00141-66502
A6C1	0150-0052		C3FXD CER 0.05 UF 203 400VOCW	56289	33C17E
*6C2	0150-0052		CSFXD CER1 0.05 UF 20 400VOVDCW	56289	33C17A
A601	1853-0038	2	TSTRS SI PNP	28480	1853-0038
A602	1853-0038		TSTRS SI PNP	28480	1853-0038
*6R1	0757-0401		A:FXO MET FLN 100 OHM 18HW	28480	0757-0401
A6R2	0757-0401		R:FXO MET FLX 100 OHM 11 18W	28480	0757-0401
A6R3	0757-0150		RIFXD MET FLN 39.2K OHM 1.01 1/2W	28480	0757-0850
A684	0757-0850		RSFXID ET FLI39.2K OHM I.03 11ZW	28480	0757-0850
A6R5	0757-0401		R8FXD MET FLI100 OHM 13 18W	28480	0757-0401
A7	0960-0443	1	ASSYPOWER MODULE	28480	0960-0443
A7E1	5020-8122	1	LINE VOILTAE SELECTION CARD	28480	5020-8122
A7FI			FUSE CARTRIDGE4AMP125V/SLOWBLOW 1220V OR 240V OPERATION ONLY)	71400	MOX-4
A7F1	21100303	1	FUSE CARTRIDGE 2 AMP 250V SLOW BLOW	71400	MDX-24
A7F1	2110-0014		FUSE:SIDW-BIDW 4 AMP 125V 75915 313004		

Table 6-3. List of Manufacturers' Codes

MFR NO	MANUFACTURER NAME	ADDRESS	ZIP CODE
00000	U.S.A. COM40N	ANY SUPPLIER OF U.S.A	
01121	ALLEN BRADLEY CO.	MILWAUKFE. WIS.	53204
01295	TEXAS INSTRUMFNTS INC. SEMICONDLCTOR COMPONEFTS DIV.	DALLAS. TEX.	75231
03508	GE CO. SEMICONDUCTOR PROO. DEPT.	SYRACUSE. N.Y.	13201
04713	MOTOROLA SEMICONDUCTOR PROD.INC.	PHOENIX. RIZ.	85008
06540	AMATOM ELFCT. HARDWARE CO. INC.	NEW ROCHELLE, N.Y.	10801
07263	FAIRCHILD CAMERA & INST. CORP. SEMICONDUCTOR DIV.	MOUNTAIN VIEW,. CACIF.	9404D
14655	COIRLN OWLIER ELIEC OIV.FEDERAL PA:IEIC. CO.	NO TAIR. *J.	CLFS
0 a18	NOD RIF DESCRIPTION FOR THIS MFG NUMBER		
26365	GRIES REPRODUCER CIRP.	NEW ROCHELLE. N.Y.	10802
27191	CUTLER-HAMMER IN;. POWER DIST. E CONTROL DIV.	MILWAUKEE. WISC.	53216
28480	HENLETT-PACKARD CO. CORPORATE HO	YOUR NEAREST HP 3FICE	
56289	SPRAGUE ELECTRIC CO.	N. ADAMS, MASS.	0L247
5841T	SUPERIOR ELECTRIC CO. THE	BRISTOL. CONN.	06010
71400	RUSSMANN MFG. DIV. MC GRAW-EDISON CO.	ST. LOUIS. MI.	63017
71468	ITT CANNON ELECT. INC.	LOS LNGELES, CALIF.	90031
71590	GLOBE UNION INC. CENTRAILA DIV.	MILWAUKEE. WISC.	53201
71707	COTO COIL CO. INC.	PROVIDENCE. R. I.	02905
71744	CHICAGO MINIATURE LAMP WORKS	CHICAGO. ILL.	60640
71785	CINCH MFG. CO. DIV TRW INC.	ELK GROVE VILLAGE. ILL	
72825	ERY HUGH H. INC.	PHILADELPHIA. PA.	19144
72982	ERIE TECHNOLOGICAL PROD. INC.	ERIE. PA.	16512
74276	SIGNALITE INC.	9EPTJNE. N. J.	07753
75915	LITTELFUSE INC.	DES PLAINES, ILL.	60016
76530	CINCH MONADNOCK HILLS DIV. TRW INC.	CITY OF INDUSTRY, CALIF.	91746
*2142	IRCO SPEER ELECT. COHP	D U	8310
*2389	SVITCHCRAFT INC.	CHICIGO. ILL	60630
83330	SMITH HERMAN H. INC.	BROOKLYN. N.Y.	11207
91418	RAOIO MATERIALS CO.	CHICAGO. ILL.	60646
91586	AUGAT INC.	ATTLE9ORO, MASS.	02703
92102	IHC MAGNETICS CORP.	WESTSURY. L.I.. 9.Y.	11590
95340	GOROOS CORP	BLOOMFIELO. N. J.	07003
97464	INOUSTRIAL RETAINING RINC CO	IRVINGTO9. N. J.	07111

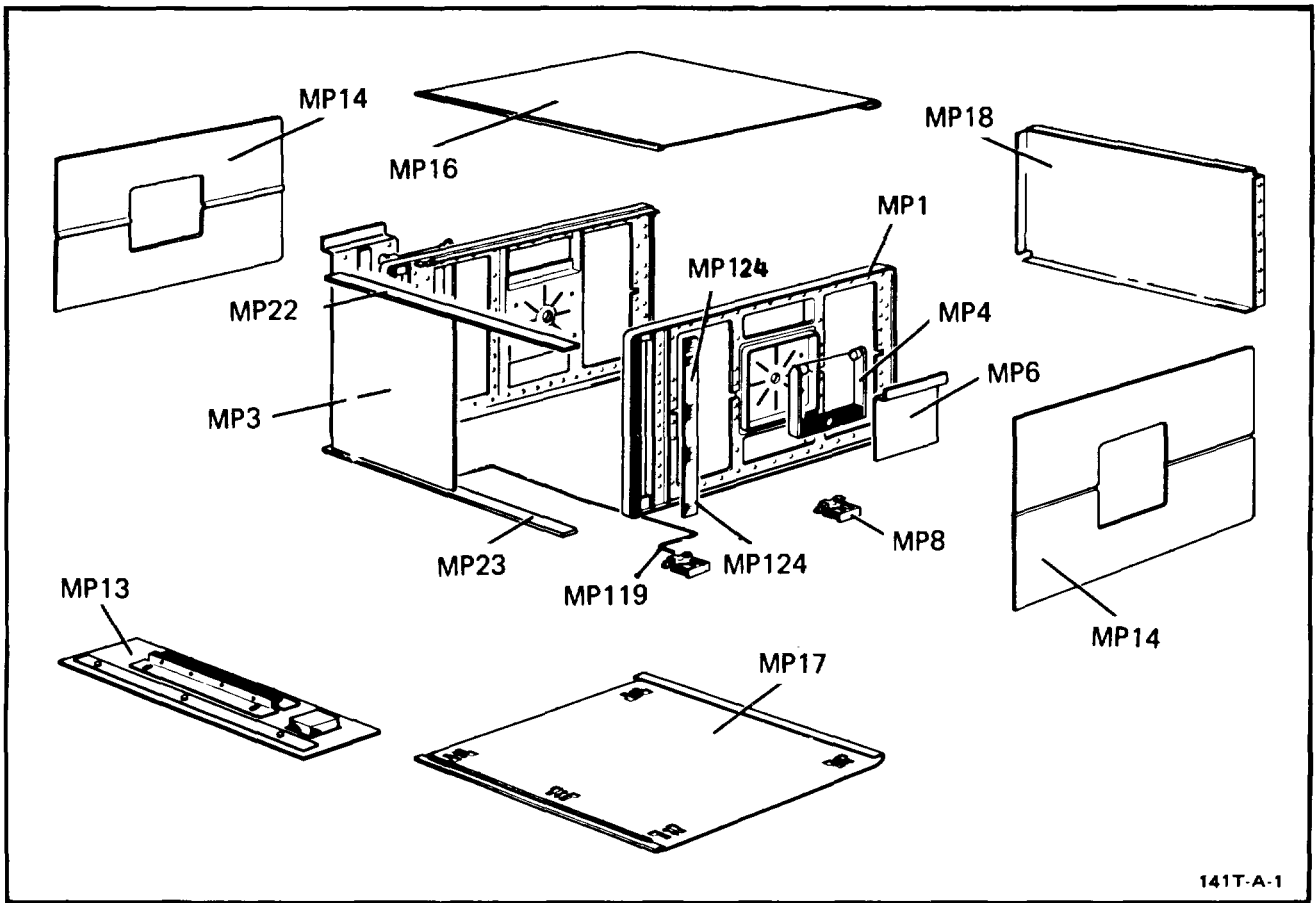


Figure 6-1. Cabinet Parts, Exploded View

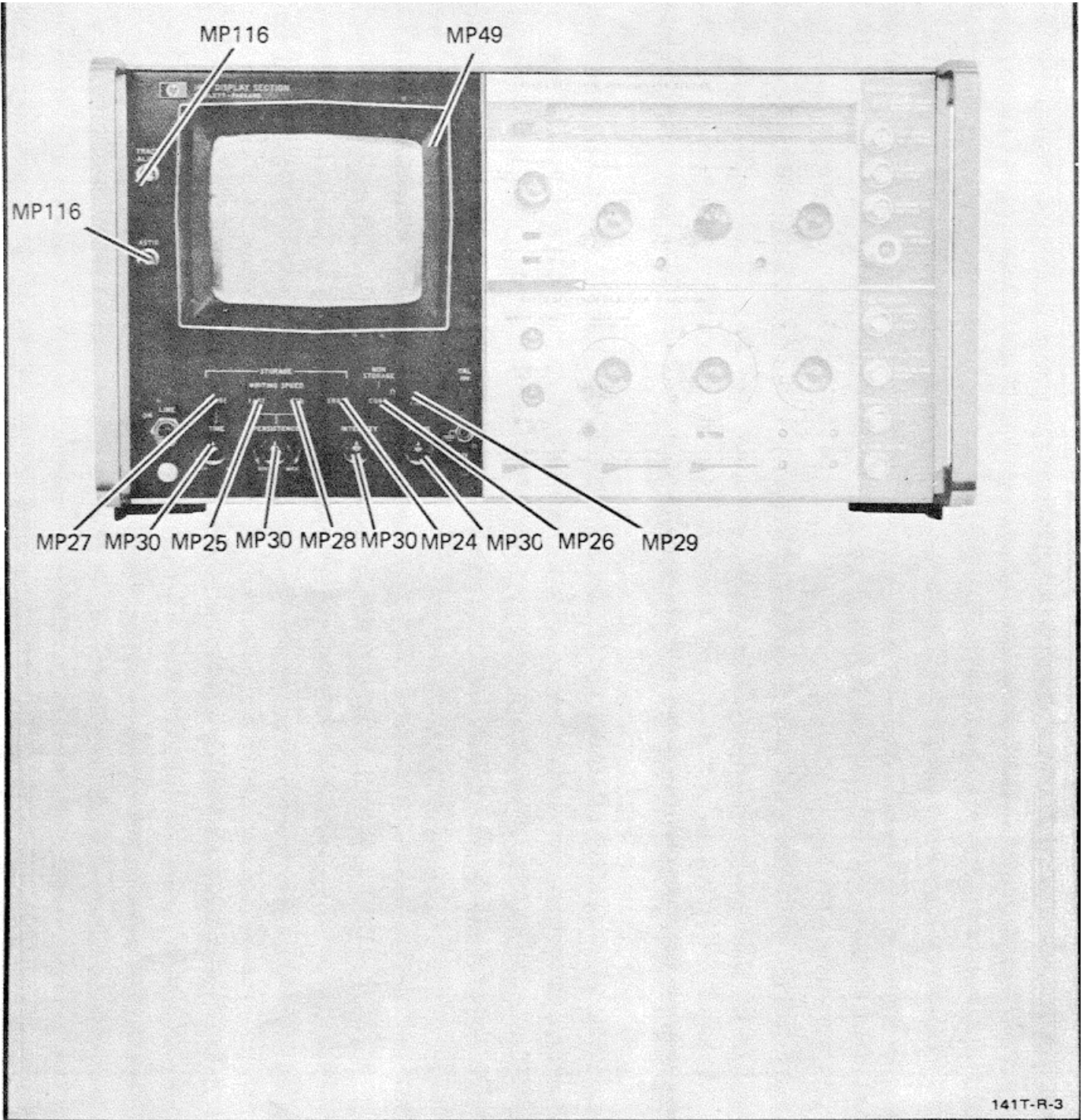


Figure 6-2. Mechanical Parts, Front View

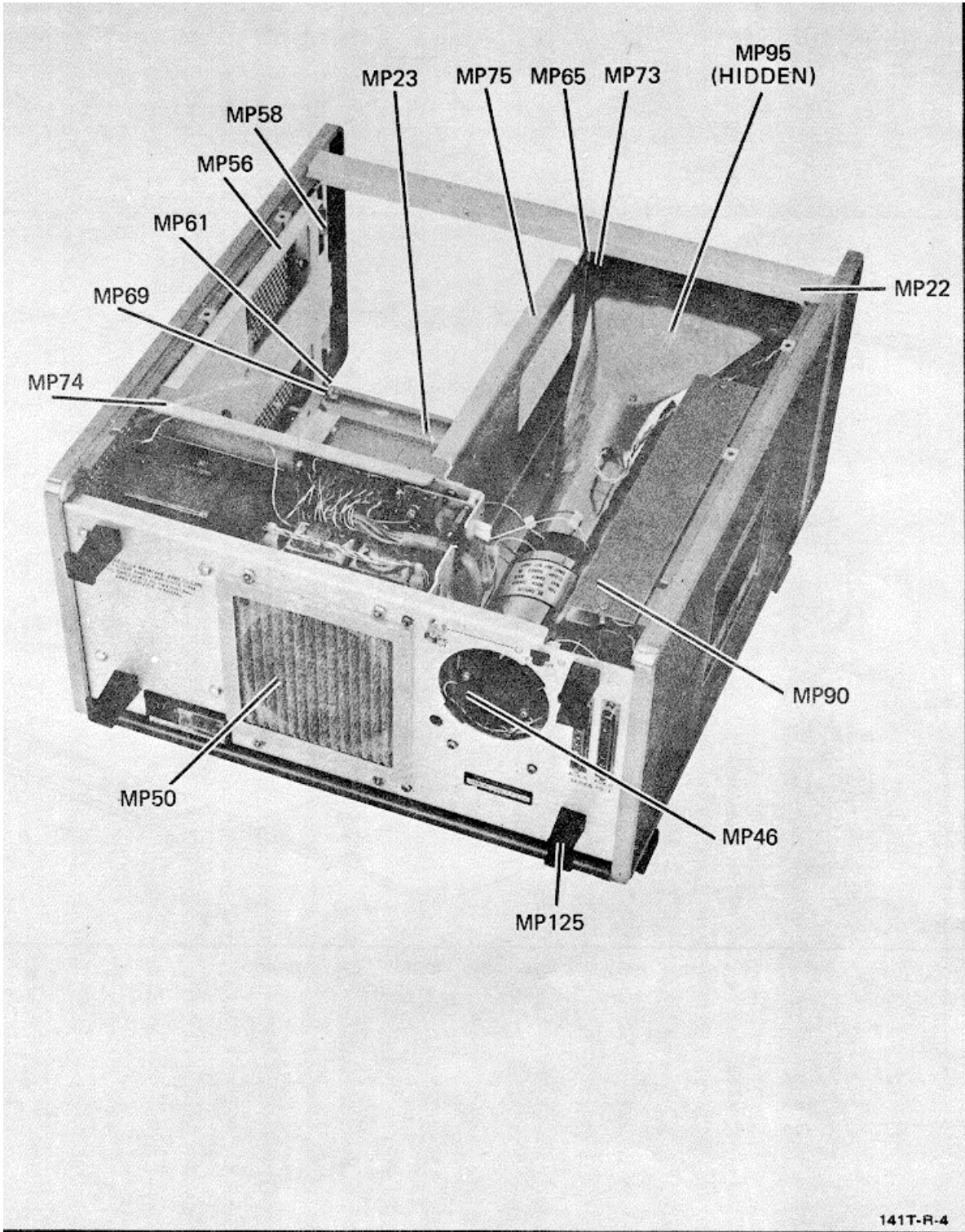


Figure 6-3. Mechanical Parts, Rear View

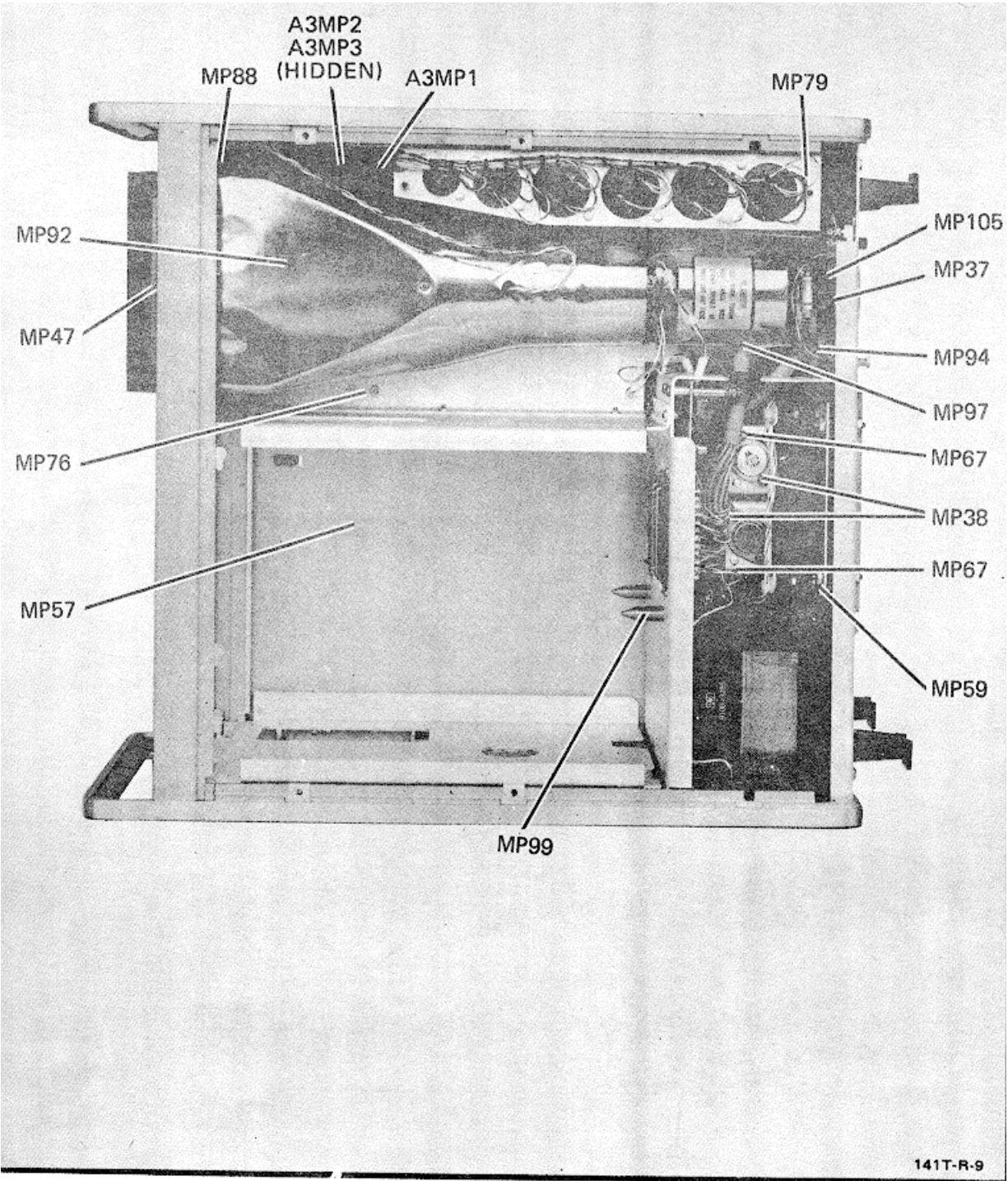


Figure 6-4. Mechanical Parts, Top View

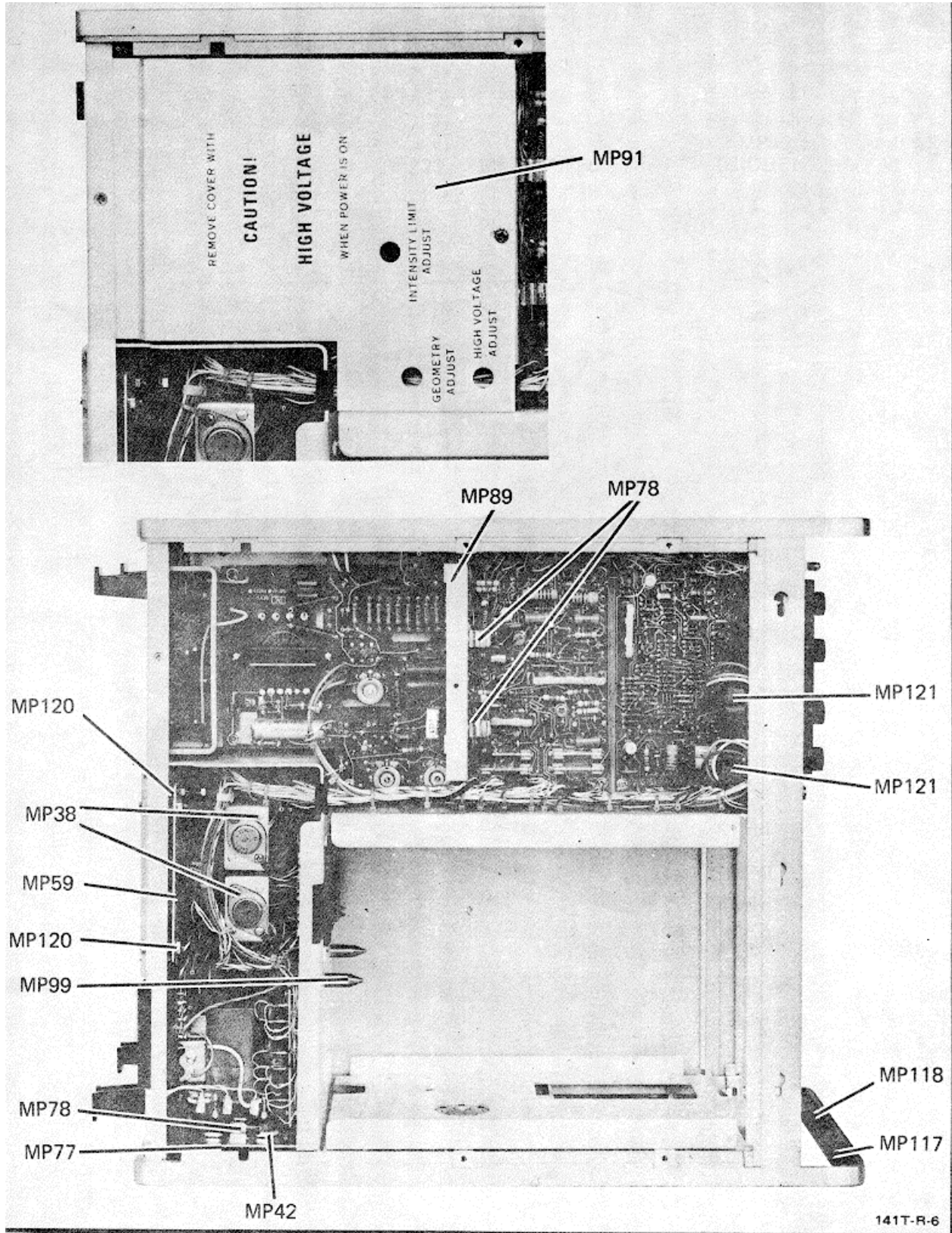


Figure 6-5. Mechanical Parts, Bottom View

**TABLE 6-4 PART NUMBER-NATIONAL STOCK NUMBER
CROSS REFERENCE INDEX**

PART NUMBER	FSCM	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	NATIONAL STOCK NUMBER
CB1015	01121	5905-00-102-5294	RCR07GLOLJS	81349	5905-00-141-1183
CB1021	01121	5905-00-194-7894	RCR07G102JS	81349	5905-00-110-7620
CB1031	01121	5905-00-755-2613	RCR07G103JS	81349	5905-00-106-3666
CB0041	01121	5905-00-853-3629	RCR07G104JS	81349	5905-00-110-0388
CB1051	01121	5905-00-498-6044	RCR07G105JS	81349	5905-00-116-8554
CB1535	01121	5905-00-726-9666	RCR07G153JS	81349	5905-00-116-8555
CB1555	01121	5905-00-841-8307	RCR07G155JS	81349	5905-00-111-1684
CB1831	01121	5905-00-498-6048			
CB2211	01121	5905-00-721-0131	RCR07G221JS	81349	5905-00-135-3973
CB2221	01121	5905-00-726-6433	RCR07G222JS	81349	5905-00-105-7764
CB2231	01121	5905-00-498-6053			
CB2241	01121	5905-00-407-2152			
CB2731	01121	5905-00-119-3504	RCR07G273JS	81349	5905-00-076-9664
CB3321	01121	5905-00-070-9144	RCR07332JS	81349	5905-00-126-6683
CB3331	01121	5905-00-726-6436	RCR07G33JS	81349	5905-00-118-4559
CB4721	01121	5905-00-809-8029	RCR07G472JS	81349	5905-00-114-0711
CB4731	01121	5905-00-985-5609	RCR07G473JS	81349	5905-00-141-0717
CB4741	01121	5905-00-999-6659	RCR07G474JS	81349	5905-00-105-7767
CB5611	01121	5905-00-726-6441	RCR07G561JS	81349	5905-00-105-7768
CB5621	01121	5905-00-726-6834	RCR07G562JS	81349	5905-00-141-0744
CB5635	01121	5905-00-577-9599	RCR07G563JS	81349	5905-00-106-1357
CB6831	01121	5905-00-686-3362	RCR07G683JS	81349	5905-00-119-3505
CB8231	01121	5905-00-752-3158	RCR07G823JS	81349	5905-00-435-6374
DA045-040CD	71590	5910-00-985-1261			
DCM17W5P	71785	5935-00-009-1317			
DCM17W5S	71468	5935-00-995-0079			
DCM8W8P	71468	5935-00-727-2247			
DCM8W8S	71468	5935-00-275-7823			
DM53740-5001	71468	5999-00-878-4714			
EDM53742-5001	71468	5999-00-995-1392			
D32440	56289	5910-00-087-3521			
D32569	56289	5910-00-984-7592			
D33193	56289	5910-00-927-7547			
D37361	56289	5910-00-023-2352			
D39556	56289	5910-00-925-6531			
EAC-301	82389	5935-00-233-6728			
EB1041	01121	5905-00-192-3987	RCR20G104JS	81349	5905-00-104-8336
EB2221	01121	5905-00-539-3212	RCR20G222JS	81348	5905-00-141-1168
EB3331	01121	5905-00-228-0093	RCR20G333JS	81349	5905-00-104-8330
EB4731	01121	5905-00-539-3210	RCR20G473JS	81349	5905-00-141-0596
EB5631	01121	5905-00-752-7345	RCR20G563JS	81349	5905-00-114-5441
FDG1088	07263	5961-00-928-7939			
FD3369	07263	5961-00-821-0710			
F02GR750A	75915	5920-00-835-3339	F02GR750A	81349	5920-00-296-0446
JN10-199LA1	56289	5910-00-789-7937			
KH4147	70903	5995-00-995-9822			
KH7171	70903	6150-00-192-7462			
MDX2A	71400	5920-00-611-6679			
MDX4	71400	5920-00-284-7466			
MU4894	04713	5961-00-197-0252	CMLOED470G03	81349	5910-00-069-0362
RDM15E470J5C	14655	5910-00-912-5115			
SJ1318	04713	5961-00-902-3436			
SJ1798	04713	5961-00-424-9411			
SR1358-8	04713	5961-00-060-8638			
SR1358-9	04713	5961-00-951-1505			
SZ10939-11	04713	5961-00-494-8988	JAN1N752A	81349	5961-00-995-2310
S17843	07263	5961-00-917-0660			
TA	91418	5910-00-481-8507			

**TABLE 6-4 PART NUMBER-NATIONAL STOCK NUMBER
CROSS REFERENCE INDEX**

PART NUMBER	FSCM	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	NATIONAL STOCK NUMBER
TM50R123Z1	14655	5910-00-931-0029			
UG888	01295	5961-00-904-0296			
U12P	71707	5950-00-910-9938			
Z82R7	74276	5960-00-167-7875			
00140-01210	28480	5999-00-520-5291			
00141-61101	28480	6625-00-450-7243			
00141-61102	28480	5950-00-180-4179			
00141-66513	28480	6625-00-439-1082			
00141-67401	28480	5355-00-108-1059			
00141-67402	28480	5355-00-083-7774			
00141-67403	28480	5355-00-083-7775			
00141-67404	28480	5355-00-083-7776			
00141-67405	28480	5355-00-083-7777			
00141-67406	28480	5355-00-422-2337			
01200-01101	28480	5999-00-162-8932			
01200-44703	28480	5999-00-195-6718			
0140-0207	28480	5910-00-940-3184			
0160-2212	28480	5910-00-009-3195			
0180-0138	28480	5910-00-067-8305			
0370-00814	28480	5355-00-809-9329			
0698-3155	28480	5905-00-976-3418			
0698-3553	28480	5905-00-920-5289			
0698-3554	28480	5905-00-975-7140			
0698-3555	28480	5905-00-920-5295			
0698-3647	28480	5905-00-221-8309			
O698-4009	28480	5905-00-758-6975			
0698-6666	28480	5905-00-494-5067			
0811-1746	28480	5905-00-444-6291			
0811-2030	28480	5905-00-496-3412			
0815-0031	28480	5905-00-942-3530			
0727-0431	28480	5905-00-909-3427			
0757-0044	28480	5905-00-931-9908			
0757-0128	28480	5905-00-830-6715			
0757-0190	28480	5905-00-917-0575			
0757-0273	28480	5905-00-193-4294			
0757-0344	28480	5905-00-269-2629			
0757-0367	28480	5905-00-930-7956			
0757-0370	28480	5905-00-920-5301			
0757-0388	28480	5905-00-929-2528			
0757-0399	28480	5905-00-995-7774			
0757-0401	28480	5905-00-981-7529			
0757-0421	28480	5905-00-891-4219			
0757-0428	28480	5905-00-998-1794			
0757-0430	28480	5905-00-858-9207			
0757-0434	28480	5905-00-998-1793			
0757-0436	28480	5905-00-858-6792			
0757-0452	28480	5905-00-056-0552			
0757-0454	28480	5905-00-891-2811			
0757-0456	28480	5905-00-877-5769			
0757-0465	28480	5905-00-904-4412			
0757-0466	28480	5905-00-118-7906			
0757-0473	28480	5905-00-994-8480			
0757-0476	28480	5905-00-857-0125			
0757-0480	28480	5905-00-056-0426			
0757-0481	28480	5905-00-056-0447			
0757-0768	28480	5905-00-056-0448			
0757-0772	28480	5905-00-927-2878			
0757-0839	28480	5905-00-931-9909			

**TABLE 6-4 PART NUMBER-NATIONAL STOCK NUMBER
CROSS REFERENCE INDEX**

PART NUMBER	FSCM	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	NATIONAL STOCK NUMBER
0757-0846	28480	5905-00-927-2881			
0758-0054	28480	5905-00-917-6889			
0761-0006	28480	5905-00-998-1800			
0761-0007	28480	5905-00-917-5670			
0761-0083	28480	5905-00-104-5819			
0766-0033	28480	5905-00-494-5081			
IN3209	04713	5961-00-059-5285			
LN3718SPEC	03508	5961-00-917-9637			
104002	75915	5999-00-279-7999			
10608-1	06560	5950-00-943-6630	9140-0171	28480	5950-0943-6630
LLA1242A	82389	5930-00-406-8746			
1200-0037	28480	5935-00-069-1566			
1200-0408	28480	5935-00-408-3767			
1251-0054	28480	5935-00-089-7482			
1410-0052	28480	5985-00-061-2906			
1450-0419	28480	6210-00-451-6217			
1510-0038	28480	5940-00-935-3515			
1537-76	71895	5950-00-073-9426			
160BLLOB	28480	5315-00-908-9399			
1853-0020	28480	5961-00-904-2540			
1853-0034	28480	5961-00-987-4700			
1853-0038	28480	5961-00-111-0455			
1854-0071	28480	5961-00-137-4608			
1855-0057	28480	5961-00-137-0999			
1901-0029	28480	5961-00-950-0537			
1901O-00O049	28480	5961-00-911-9675			
1901-0341	28480	5961-00-105-6622			
1901-0436	28480	5961-00-920-5302			
1902-0034	28480	5961-00-904-0295			
1902-0064	28480	5961-00-904-0297	JAN1N755A	81349	5961-00-879-3091
1902-0597	28480	5961-00-459-8636			
1902-3385	28480	5961-00-928-3159			
1902-3402	28480	5961-00-089-1038			
1910-0016	28480	5961-00-954-9182			
192P10292-PTS	56289	5910-00-911-9331	192P10252	56289	5910-00-965-9728
192P10492PTS	56289	5910-00-917-0668	192P10452	56289	5900-OO-984-2845
192P22292PTS	56289	5910-00-879-7210			
192P47292PTS	56289	5910-00-961-9591			
192P56292PTS	56289	5910-00-497-7598			
2113053	80131	5961-00-985-9073			
2N3417	80131	5961-00-937-3768			
2N3440	80131	5961-00-942-4004	JAN2N3440	81349	5961-00-726-7836
213904	80131	5961-00-892-8706			
2N3906	80131	5961-00-931-0372			
2N4918	80131	5961-00-728-6941			
2N708	80131	5961-OO-866-4810			
2N964	80131	5961-00-989-3608	JAN2N964	81349	5961-00-226-8581
20700L10-205	01295	5930-00-925-6455			
2100-0015	28480	5905-00-755-0749			
2100-0095	28480	5905-00-771-5956			
21OO0-0096	28480	5905-0-882-4360			
2100-0374	28480	5905-00-908-7242			
2100-0424	28480	5905-00-918-7479			
2100-0445	28480	5905-00-908-7238			
2100-0983	28480	5905-00-189-6699			
2100-1588	28480	5905-00-927-8507			
2100-1589	28480	5905-00-928-1025			

**TABLE 6-4. PART NUMBER- NATIONAL STOCK NUMBER
CROSS REFERENCE INDEX**

PART NUMBER	FSCM	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	NATIONAL STOCK NUMBER
2100-2897	28480	5905-00-180-4183			
2100-2962	28480	5905-00-180-4184			
2110-0067	28480	5920-00-148-2856	AGC1-3	71400	5920-00-556-9946
221B	83330	5935-00-089-7483			
293011	71789	5999-00-949-6571		76530	
293201	71785	5970-00-034-4060			
3101-1259	28480	5930-00-008-7043			
312.500	75915	5920-00-280-8344	F02A250V1-2A	81349	
312003	75915	5920-00-878-5573			
31-221-1020	02660	5935-00-804-5144			
3160-0218	28480	4140-00-470-3590			
332-14-03-011	76530	5940-00-280-0665	332-14-08-042	71785	5940-00-192-9962
36037-DEP	56289	5910-00-925-6532			
5020-0476	28480	6695-00-135-2489			
5040-0401	28480	5910-00-908-9414			
5040-0402	28480	5950-00-532-1149			
5040-0430	28480	5950-00-532-1150			
5040-0444	28480	6210-00-469-7962			
5040-0447	28480	5340-00-494-7440			
5060-0222	28480	5340-00-435-5340			
506-0-428	28480	4130-00-904-8733			
5060-0435	28480	5950-00-790-4110			
5060-0752	28480	5340-00-470-0833			
5060-0765	28480	5340-00-470-0834			
5060-0767	28480	6625-00-903-0348			
5083.2572	28480	5960-00-403-4617			
5100-18CMD	79136	5365-00-721-8187			
6008-32CN	91506	5999-00-333-9620			
8906K368	27191	5930-00-034-1295			
8926K316	27191	5930-00-655-1582			
9100-0184	28480	5950-00-919-4502			
9100-1630	28480	5950-00-431-3198			
9553-1	72825	5935-00-930-8228			

SECTION VII
MANUAL CHANGES AND OPTIONS

7-1. INTRODUCTION

7-2. This section contains information required to backdate or update this manual for a specific instrument. Description of special options and standard options are also in this section

7-3. MANUAL CHANGES

7-4. This manual applies directly to the instrument having the same serial prefix shown on the manual title page. If the serial prefix of the instrument is not the same as the one on the title page, find your serial prefix in table 7-1 and make the changes to the manual that are listed for that serial prefix. When making changes listed in table 7-1, make the change with the highest number first. Example: if backdating changes 1, 2, and 3 are required for your serial prefix, do change 3 first, then change 2, and finally change 1. If the serial prefix of the instrument is not listed either in the title page or in table 7-1, refer to an enclosed MANUAL CHANGES sheet for updating information. Also, if a MANUAL CHANGES sheet is supplied, make all indicated ERRATA corrections

Table 7-1. Manual Changes

Serial Prefix	Make Changes
950--, 973- 1047A	11 through 1 11 through 2
1112A	11 through 3
1113A	11 through 4
1141A	11 through 5
1145A	11 through 6
1147A	11 through 7
1218A	11 through 8
1223A, 1232A	11 through 9
1250A, 1315A, 1320A, 1337A	11 and 10 11

CHANGE 1

Paragraph 4-18,
Sentence 5: Change R11 to A2R42
A2: Change to HP Part Number 00141-66514, Qty 1; POWER SUPPLY BOARD ASSY; Mfr. Code 28480; Mfr. Part No 00141-66514

Add: A2R42; HP Part Number 0811-1746; Qty 1;
R: FXD WW 0.36 OHM 5% 2W; Mfr. Code 28480;
Mfr. Part Number 08111746.

Figures 8-8, 8-10,

Add: R42 (between R3 and R46 on A2 assembly photo).

Add: R42 (0.36 ohms) between the anode of A2CR16 and the base of A2Q10.

CHANGE 2

Table 6-2,

MP18: Change to HP Part Number 00141.60202.

FLI: Change to HP Part Number 91002818; Qty 1; FILTER: LINE 115/230 VAC; Mfr. Code 56289; Mfr. Part Number JN10-1991A1.

J3: Change to HP Part Number 1251-0148, Qty 1;
J: NSR P/O FL1; Mfr. Code 87930; Mfr. Part Number 1065-1.

S4: Change to HP Part Number 31010011; Qty 1;
SWITCH: SLIDE DPDT; Mfr. Code 82389; Mfr. Part Number IIA-1013.

W1: Change to HP Part Number 81200078; Qty 1;
CABLE ASSY: CORD SET (7.5'); Mfr. Code 70903; Mfr. Part Number KH-4147.

CHANGE 3

Table 6-2,

Delete: J10, J10E1, J111, J11E1

Delete: W11, W IMPI, WIIMP2

Section VIII,

Delete Auxilliary B portion of figure 87

CHANGE 4

Table 6-2,

MP3: Change to HP Part Number 0014100212; Qty 1; PANEL: FRONT; Mfr. Code 28480; Mfr. Part Number 00141-00212

MP6: Change to HP Part Number 50600765; Qty 2;
RETAINER: HANDLE ASSY; Mfr. Code 28480; Mfr. Part Number 5060-0765.

MP13: Change to HP Part Number 50600777; Qty 2;
KIT: RACK MOUNT; Mfr. Code 28480; Mfr. Part Number 50600777.

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MP14: Change to HP Part Number 50000747; Qty 2;
COVER: SIDE; Mfr. Code 28480; Mfr. Part Number
5000-0747.

MP16: Change to HP Part Number 50600740; Qty
1; COVER ASSY: TOP; Mfr. Code 28480; Mfr. Part
Number 50600740.

MP17: Change to HP Part Number 50600752; Qty 1;
COVER ASSY: BOTTOM; Mfr. Code 28480; Mfr. Part
Number 50600752.

MP22: Change to HP Part Number 0014124701; Qty 1;
SUPPORT: TOP PANEL; Mfr. Code 28480; Mfr. Part
Number 00141-24701.

MP23: Change to HP Part Number 0014124702; Qty 1;
SUPPORT: BOTTOM PANEL; Mfr. Code 28480; Mfr.
Part Number 00141-24702.

MP49: Change to HP Part Number 50400444; Qty 1;
SHIELD: LIGHT Mfr. Code 28480; Mfr. Part Number
50400444.

CHANGE 5

Table 6-2,

A2: Change to HP Part Number 0014166518; Qty 1;
POWER SUPPLY BOARD ASSY; Mfr. Code 28480;
Mfr. Part Number 00141-66518.

B1: Change to HP Part Number 3160-0218; Qty 1;
FAN: TUBEAXIAL 50/60 HZ; Mfr Code 28480; Mfr. Part
Number 31600218.

Delete: A2R86
Figures 8-8, 8-12,
Delete: R86
Figure 8-13,
Delete: A2R86

CHANGE 6

Table 6-2,

MP125: Change to HP Part Number 50400447; Qty 4;
FEET: REAR LONG; Mfr. Code 18480; Mfr. Part
Number 50600447.

CHANGE 7

Table 6-2,

A5: Change to HP Part Number 0014166513; Qty 1;
PULSE CIRCUIT BOARD ASSY; Mfr. Code 28480;
Mfr. Part Number 00141-66513.

V1: Change to HP Part Number 50839095; Qty 1;
CATHODE RAY STORAGE TUBE; Mfr. Code 28480;
Mfr. Part Number 5083- 9095

A5: Change to HP Part Number 0014166513; Qty 1;
PULSE CIRCUIT BOARD ASSY; Mfr. Code 28480; Mfr.
Part Number 00141-66513.

Add: A5C9; HP Part Number 0160-0154; Qty 1; C: FXD
MICA MY 0.0022 UF O'Y oi 200 VDCW; Mfr Code
56289; Mfr. Part Number 192P22292-PTS.

Delete: A5C14, A5C15, A5C16, A5C17

Delete: A5CR28, A5CR29

Delete: A5Q18, A5Q19, A5Q20, A5Q21, A5Q22

A5R7: Change to HP Part Number 06841041; Qty 5; R:
FXD COMP 100K OHM 10% 1/4W; Mfr. Code 01121;
Mfr. Part Number CB 1041.

Add: A5R39; HP Part Number 0684-1061; Qty 1; R:
FXD COMP 10 MEGOHM 10% 1/4W; Mfr. Code 01121;
Mfr. Part Number CB 1061.

Add: A5R40; HP Part Number 0684-4731; Qty 1; R:
FXD COMP 47K OHM 10% 1/4W; Mfr. Code 01121;
Mfr Part Number CB 4731.

Delete: A5R65, A5R67, A5R68, A5R70, A5R71, A5R72,
A5R73, A5R74, A5R75, A5R76, A5R77, A 5R80.

Figure 8-14,

Replace figure 8-14 with figure 7-1 @ @ @

Figure 8-16,

Replace figure 8-16 with figure 7-2 @ @ @

CHANGE 8

Table 1-1,

Change Power Requirements to: 115 or 230 volts, (, 50
to 60 Hz, normally less than 285 watts (varies with plug-
in units).

Paragraph 2-7,

Replace with the following: The instrument requires a
power source of either 115 or 230 volts ac, 110' (, single
phase, 50 to 60 Hz, which can deliver approximately 300
watts. A rear panel switch provides selection of the line
voltage to be used.

CAUTION

Before placing this instrument in operation, be sure to set
the rear panel switch to agree with the line voltage being
used. Refer to figure 3-2, Proper Intensity Adjustment, to
avoid damaging CRT

Morel 141T

Paragraph 2-7a,

Add the following paragraph (2-7a) after paragraph 2-7: When operating from a 230-volt source, set the rear panel switch to 230, and replace line fuse FI with a 2-amp slow-blow type. The fuse is accessible by removing the bottom cover of the instrument

Figure 2-1,

Delete figure 2-1

Paragraph 4-5,

Change first sentence to read: The low voltage supply uses 115 or 230 volts ac (rear Panel switch), single phase, 50-60 Hz

Table 6-2,

Delete: A7

Add: FI; HP Part Number 2110-0014; Qty 1;
FUSE: CARTRIDGE 4 AMP 125V SLOW BLOW; Mfr. Code 71400; Mfr. Part Number MDX-4

Add: F1; HP Part Number 2110-0303; Qty 1;
FUSE: CARTRIDGE 2 AMP 250V SLOW BLOW; Mfr. Code 71400; Mfr. Part Number MDX-2A

Add: FLI; HP Part Number 9100-3173; Qty 1;
FILTER: LINE 230 VAC 10% 5060 Hz; Mfr. Code 56289; Mfr. Part Number JN10-2270A

Add: J3; HP Part Number 1251-2357; Qty 1;
CONNECTOR: POWER 3 PIN MALE; Mfr. Code 82389; Mfr. Part Number EAC-301

MP18: Change to HP Part Number 0014160203; Qty 1;
PANEL ASSY: REAR; Mfr Code 28480; Mfr. Part Number 0014160203

Add: S2; HP Part Number 3101-1234; Qty 1;
SWITCH: SLIDE 115/230V DPDT; Mfr. Code 82389; Mfr. Part Number 111A-1242A

T1: Change to HP Part Number 9100-0184; Qty 1;
TRANSFORMER: POWER; Mfr.

Code 28480; Mfr. Part Number 91000184

W1: Change to HP Part Number 81201545; Qty 1;
CABLE ASSY: AC POWER CORD 7.5 FT; Mfr. Code 70903; Mfr.

Part Number KH 7171

W2: Change to HP Part Number 00141-61621; Qty 1; CABLE: MAIN; Mfr. Code 28480; Mfr. Part Number 0014161621
Delete: A2C20
Delete: A7, A7E1, A7F1

Figure 8-10,

Replace power input (line voltage) section with figure 7-3

Delete: C20 (between CR17 plate and ground)

CHANGE 9

Table 6-2,

MP97: Change to HP Part Number 01200-44703
CHANGE 10

Table C2,

Add: A5CR15; HP Part Number 1901-0033; Qty 1;
DIODE: SILICON 100 MA 180 WV; Mfr. Code 07263; Mfr. Part Number FD3369

Delete: A5R81

Figure 8-16,

Replace A5R81 with A5CR15

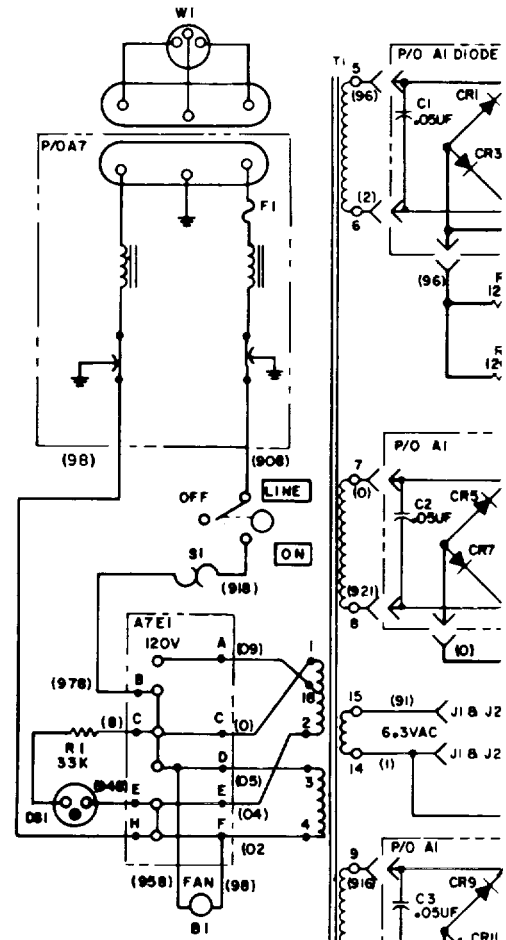
CHANGE 11

Table 6-2,

S1: Change to HP Part No. 3101-0030; Qty 1;
SWITCH TOGGLE SPST ON NONE OFF; Mfr. Code 27191, Mfr. Part Number 8906K368

Figure 8-10,

Modify the input ac power circuit according to figure '7-1A below.



7-5. SPECIAL OPTIONS

7-6. Most customer special application requirements and/or specifications can be met by factory modification of a standard instrument. A standard instrument modified in this way will carry a special option number, such as Model 0000A/Option CO1

7-7. An operating and service manual and a manual insert are provided with each special option instrument. The operating and service manual contains information about the standard instrument. The manual insert for the special option describes the factory modifications required to produce the special option instrument. Amend the operating and service manual by changing it to include all manual insert information (and MANUAL CHANGES sheet information, if applicable). When these changes are made, the operating and service manual will apply to the special option instrument.

7-8. If you have ordered a special option instrument and the manual insert is missing, notify the nearest Hewlett-Packard Sales/Service Office. Be sure to give a full description of the instrument, including the complete serial number and special option number

7-9. STANDARD OPTIONS

7-10. Standard options are modifications installed on HP instruments at the factory and are available on request. Contact the nearest Hewlett-Packard Sales/Service Office for information concerning standard options.

7-11. Standard options presently available are described in the following paragraphs.

7-14. ADDITIONAL MANUAL COIXGES

7-15. If the aerial prefix of the instrument is 1615A, make the following change to the manual.

Table 6-2,

- MP59: Change HP Part No. and Mfr Part No to 00141-01209**
- MP74: Change HP Part No. and Mfr part No to 00141-00105**
- MP120: Change HP Part No. and Mfr Part No to 1520-0094**

7-12. DELETED

7-13. Option 009 provides for a remote erase function through a BNC connector on the rear panel. Complete wiring information is shown in figure 7-4 and replaceable parts are listed in table 7-3.

Table 7-2. DELETED

Table 7-3. Option 009 Replaceable Parts

HP Part No.	Description
000141-61628	Cable: remote erase
00141-66517	Remote ERASE board
1250-0083	Connector: BNC female
1901-0040	Diode
0490-0199	Switch: relay
0490-0191	Coil: relay

SECTION VIII SCHEMATICS AND TROUBLESHOOTING

8-1. INTRODUCTION

8-2. This section contains schematics, repair/replacement and troubleshooting information, component-location and component-identification illustrations, and waveforms for Model 141T. Tables 8-1 and 8-2 provide guides to locating possible high voltage supply problems. Table 8-3 defines symbols and conventions used on the schematics. Disassembly procedures for removing the CRT and cooling fan for repair and replacement are also contained in this section

8-3. SCHEMATICS

8-4. Schematics are printed on foldout pages for easy reference to the text and figures in other sections.

8-5 The schematics are drawn to show the electronic function of the circuits. Any one schematic may include all or part of several different physical assemblies 8-5. The schematics are numbered in sequence with a bold number in a box at the lower right-hand corner of each page. These numbers are used to cross reference signal connections between schematics. At each circuit breaking point, a notation is made of the signal name and a number (in bold type). This number indicates the associated schematic which shows the source or destination of the signal. To find the source or destination of any point on a given schematic, turn to the schematic referred to by number and find the name of the signal in question

8-6. A table on each schematic lists all components shown on the schematic by reference designation. Component reference designators which have been deleted from the schematic are listed below the table

8-7. All components within the shaded areas of a schematic are physically located on circuit boards. Components not physically located on a circuit board are shown in the unshaded areas of the schematic

8-8. RFFFRFNCE DESIGNATIONS

8-9. The unit system of reference designations used in this manual is in accordance with the provisions of USA Standard Y32.16-1968, Reference Designations for Electrical and Electronics Parts and Equipments, dated March 1, 1968. Minor variations from the standard, due to design and manufacturing practices, may be noted

8-10. Each electrical component is assigned a class letter and number. This letter-number combination is the basic reference designation. Components which are not part of an assembly have only the basic reference designation. Components which are part of an assembly have, in addition to the basic designation, a prefix designation indicating the assembly of which the component is a part (resistor R23 on assembly A1 is called A1R23).

8-11. Assemblies are numbered consecutively. If an assembly reference designation is assigned and later deleted, that number is not reused.

8-12. COMPONENT LOCATIONS

8-13. Locations of components on assemblies and subassemblies are illustrated in photos adjacent to the schematics. Since the schematics are drawn to show function, portions of a particular assembly may appear on several different schematics. The component-location photo is printed next to the schematic that shows most of the circuitry on the assembly. Components located on the chassis are identified in figures 8-2 through 8-5. The locations of all adjustments are shown in Section V. Cabinet parts and other mechanical parts are shown in drawings located in Section VI.

8-14.PREVENTIVE MAINTENANCE

8-15. DELETED

8-16. DELETED

8-17. FILTER MAINTENANCE

8-18. This instrument uses a wire-mesh air filter over the cooling blower. If the filter becomes clogged with dirt, the blower will not provide adequate cooling for the instrument. Check the filter periodically and clean it when necessary. To clean, remove the filter and use a warm soap and water solution. Rinse the filter in clear water and allow it to dry before reinstalling.

8-19. ELECTRICAL MAINTENANCE

8-20. Do the electrical adjustments in Section V once every 6 months and after repair or component replacement.

8-21. REPAIR AND REPLACEMENT

8-22. The following paragraphs provide information for repair, removal and replacement of assemblies, subassemblies, and components in the Model 141T. Special servicing instructions for the circuit boards are covered under paragraphs 8-33 through 8-35. Section VI provides a detailed parts list for use in ordering replacement parts.

8-23. INSTRUMENT REPAIR

8-24. Chassis-mounted components are identified in figures 8-2 through 8-5. Components on circuit boards are identified in figures near the applicable schematic (also see table 8-3).

8-25. figure 6-1 is an exploded view drawing of the instrument frame. All parts are keyed to table 6-2 by reference designators. Other mechanical parts are identified in figures 6-2 through 6-5.

8-26. CRT REMOVAL AND REPLACEMENT

8-27. Remove the CRT as follows:

WARNING

To prevent personal injury, wear a face mask or goggles when handling the CRT. Wear protective gloves and handle the CRT carefully.

- a. Remove top and left side cover of instrument

9-2

- b. Remove bezel and discharge post-accelerator lead and CRT connection to chassis ground
- c. Remove flexible three conductor CRT lead (W12, figure 8-2) from connector block
- d. Disconnect clip-on leads from CRT neck
- e. Loosen clamp at CRT socket
- f. Carefully remove socket from CRT base

CAUTION

Use care since neck pins can damage the trace alignment coil.

- g. Place one hand on CRT face, and use other hand to slide CRT forward and out of instrument.

8-28. To install a CRT, reverse the above procedure. Insure that connector block and neck leads are connected before turning power on. After the CRT is installed, do performance checks and geometry adjustment procedure in Section V.

8-29. FAN REMOVAL AND REPLACEMENT

8-30. Use the following procedure for removing, and reverse the procedure for replacing the cooling fan.

- a. Remove top and bottom covers of instrument
- b. Disconnect white-gray and white-green-gray wires from fan terminals
- c. Remove all transistor heat sinks from fan assembly and push out of way
- d. Remove four fan mounting nuts on rear panel of instrument
- e. Lift out fan assembly

8-31. SEMICONDUCTOR REPLACEMENT

8-32. figure 8-1 is included to help identify the leads in the common shapes and sizes of semiconductor devices. When removing a semiconductor, use long nosed pliers as a heat sink between the device and the soldering iron. When replacing a semiconductor, ensure sufficient lead length to dissipate the soldering heat by using the same length of exposed lead as was used for the original part

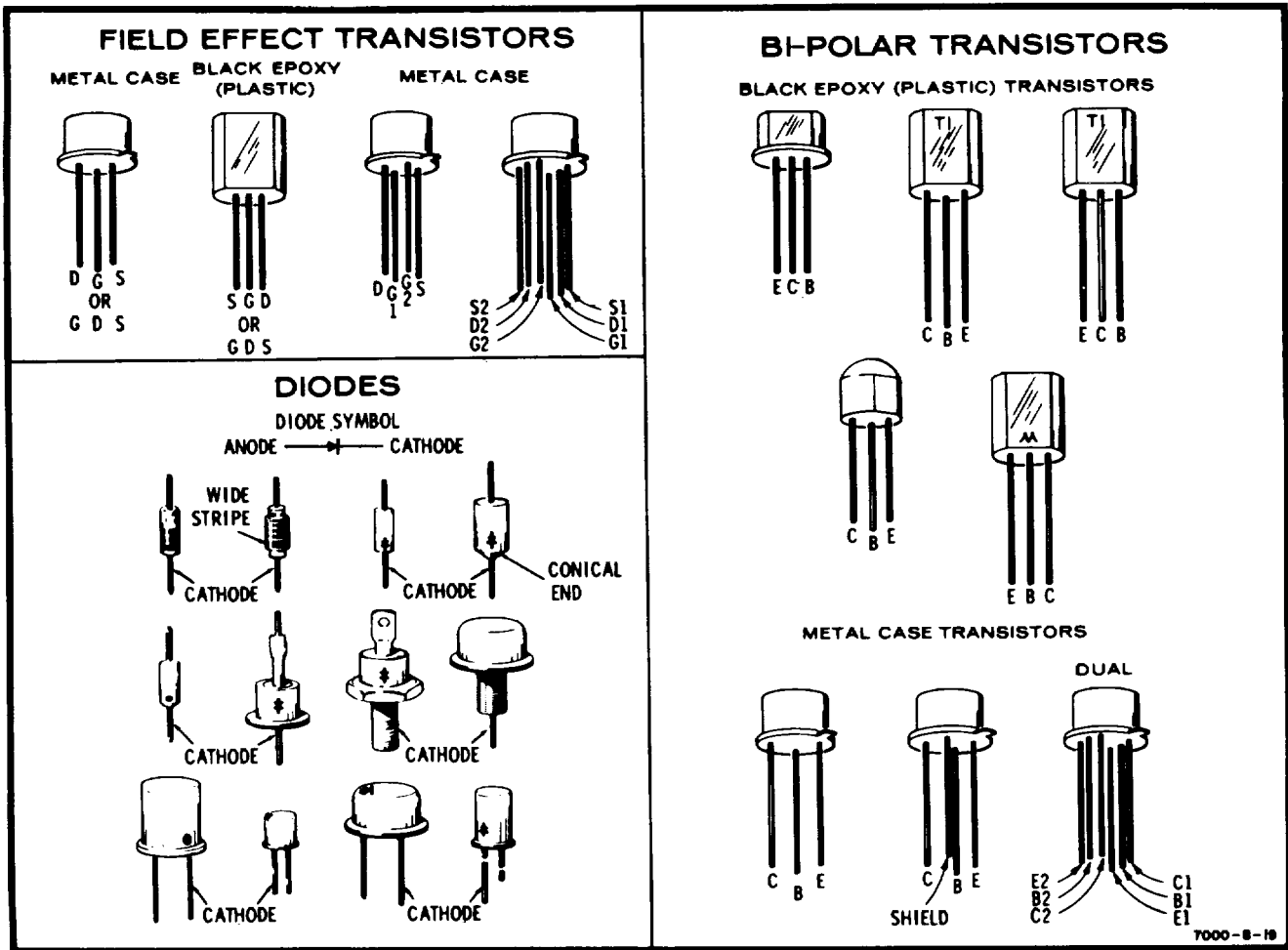


Figure 8-1. Semiconductor Terminal Identification

8-33. SERVICING CIRCUIT BOARDS

8-34. This instrument uses circuit boards with plated-through component holes. This allows components to be removed or replaced by unsoldering or soldering from either side of the board. When removing large components, such as potentiometers, rotate the soldering iron tip from lead to lead while applying pressure to the part to lift it from the board. HP Service Note M-20E contains additional information on the repair of circuit boards. Important considerations are as follows:

- a. Do not apply excessive heat
- b. Apply heat to component leads and remove component with straight pull away from board
- c. Do not force replacement leads into holes

8-35. If the metal conductor lifts from the board, it can be cemented back with a quick-drying acetate base cement having good insulating properties. If the metal conductor is broken, solder a wire to the conductor to bridge the break.

8-36. OVERALL TROUBLESHOOTING

8-37. The most important prerequisite for successful troubleshooting is understanding how the instrument is designed to operate and correct use of front panel controls. Improper control settings or circuit connections can cause apparent malfunctions. Read Section III (operating procedures) for an explanation of controls and connectors and general operating considerations. Read Section IV (principles of operation) for explanations of circuit theory.

8-38. Troubleshooting is much easier if more than one symptom of a trouble is evident. Observe the instrument and note all indications of faulty operation. If symptoms indicate more than one trouble, treat each problem individually and locate one trouble

Model 141T

at a time. Don't waste time making random checks. Instead, follow the logical procedure presented here, and refer to other areas of information in this manual as necessary.

8-39. FRONT PANEL CONTROLS

8-40. Equipment troubles are frequently caused simply by improper front panel control settings. Refer to the operating procedures in Section III for a complete explanation of each control's function along with typical operating instructions if in doubt. Possibly the intensity control on the oscilloscope front panel is not turned up, or the level control on the time base plug-in is misadjusted. Use the controls as a guide to help isolate a trouble to a specific area.

8-41. VISUAL CHECKS

8-42. After localizing the trouble to a specific area of the instrument, make a visual check of that area. Check for burned or broken components, loose wires or circuit board connections, faulty switch contacts, or any similar condition suggesting a source of trouble. If everything appears normal, proceed to the next step.

8-43. WAVEFORMS AND VOLTAGES

8-44. Allow the instrument to warm-up for about fifteen minutes before making any measurements. Note the conditions for measuring waveforms and dc voltages. These conditions are stated in the detailed troubleshooting procedures or listed adjacent to each schematic and must be followed to obtain proper readings. Waveform measurement points (7) with a number enclosed are placed on the schematics along main signal paths. The numbers inside the measurement point symbols () are keyed to corresponding waveforms adjacent to each schematic. Waveforms can be used to measure gain or pin-point a defective stage. Use a probe with a needle tip to avoid creating a short circuit. Dc voltages are shown on the schematics near active components such as transistors. As an aid to locating measurement points, note a small dot etched on the circuit boards near the emitter of transistors, source of field effect transistors, cathode of diodes, and positive lead of electrolytic capacitors.

8-45. FINAL CHECKS

8-46. Review the theory of operation in Section IV to learn how the circuit should operate. With the aid of this information, it will be easier to discover why a defective circuit is inoperative. Finally make resistance checks to uncover the faulty component. If it appears necessary to calibrate the instrument, refer to Section V for the proper procedures.

8-47. DETAILED TROUBLESHOOTING

WARNING

Voltages present in the power supplies are dangerous.

8-48. LOW-VOLTAGE SUPPLY

8-49. The series regulator transistors are located on the fan assembly. Each is easily replaced by removing the two screws and pulling the transistor from its socket. All other low voltage power supply transistors are located on the power supply board.

8-50. Dc voltages shown on the low voltage schematic diagram were measured to ground, with Model 1402A and 1421A plug-ins installed. Voltages may vary slightly when other plug-ins are used. Correct voltages for points not marked are generally obvious by being connected (directly or indirectly) to a supply output. Transistor base voltage in most cases should not measurably differ from emitter voltage when measured with respect to ground. Voltage drops across breakdown diodes are indicated on the schematic.

8-51. Excessive ripple in line frequency is usually caused by a faulty input filter or regulator circuit. Compare the ripple voltages at the rectifier outputs with values given on the schematic. For ripple above the specified value, check C1, C3, C4 or C6. Line frequency ripple above specified value at these points indicates an open rectifier or low-gain amplifier transistors. Maximum ripple on supply outputs (at 115 Vac with maximum load on supply) is: 10 mV at +248V; 7 mV at +100V and -100V; and 2 mV at -12.6V.

8-52. If the -12.6, -100 or +248 volt supply should be accidentally shorted to ground, the fuse for that particular supply will blow. This cuts off current in the supply and protects the transistors.

8-53. The -12.6 volt supply is fused and employs a current limiter, A2Q10, for protection against brief shortings of the output to ground. The supply should function normally upon removal of the short, provided the fuse has not blown.

8-54. Trouble in the +100 volt supply can be reflected in the operation of all other low voltage power supply outputs. If the +100 volt supply is incorrect, proper circuit repair may eliminate the trouble. If the +100 volt supply is correct, follow these steps in their given order:

- a. Check -100 volt supply. The +248 volt and -12.6 volt supplies are referenced to this supply. A fault in --100 volt supply can cause malfunction of

Table 8-1. Troubleshooting High-Voltage Supply, No Voltage

Procedure	Indication	Conclusion
1. Check A2Q13, A2L1, and the associated transformer primary for open circuits or shorts. Replace any defective components		
2. Check voltage at emitter of A2014.	Voltage is not more negative than -2 volts	Check A2014 and A2Q15
3. Check voltage at emitter of A2Q13	Voltage is not approximately -0.6 volts	Check A2Q13
4. Check A2T1 and rectifier load circuit for opens or shorts. Then lift one lead of A2C13, A2C14, A2C15, A216, AX17, AX18, and turn instrument on again	Oscillations occur. Oscillations do not occur.	Replace capacitor leads one at a time until oscillations stop The capacitor that stops oscillations is defective Trouble probably with transformer A2T1

Table 8-2. Troubleshooting High-Voltage Supply, Incorrect Voltage

Procedure	Indication	Conclusion
1. Voltage too high a. Lift one lead of A2R58 b. Replace A2R58 lead, and lift one lead of A2R56. c. Replace A2R56 lead, and compare voltages at gate and source of A2Q15.	Output drops to zero Output remains at incorrect value Output drops. Output remains at incorrect value Voltages are within 1 volt of being the same.	Check A2Q15 A2013 or A2Q14 is leaky Replace A2R56 with a resistor of approx. twice the present value Proceed to step 1.c. Trouble probably in divider network A2R61, A2R62, A2R63, R6, A2R73 thru A2R81
2. Voltage too low a. Compare voltages at gate and source of A2Q15. b. Check voltage at emitter of A2Q14. c. Steps a and b do not correct fault.	Gate voltage more negative. Gate voltage more positive. Voltage approx. -12 volts Voltage remains too low.	Trouble probably in divider network A2R61, A2R62, R6, A2R73 thru A2R81 Check A2Q14 and A2Q15 Replace A2R57 with a 560 ohm resistor Perform troubleshooting procedure of Table 8-1

Model 141T

either of other two supplies. If -100 volt supply is incorrect, proper circuit repair may eliminate trouble in +2,18 volt or --12.6 volt supply. If--100 volt supply is correct, proceed to next step.

b. The +248 volt supply is referenced to -100 volt supply. If trouble here has not been eliminated by checking -100 volt supply, trouble lies in this circuit and can be located by making proper circuit and component checks as described in paragraph 8-50.

c. A trouble that appeared to be in the -12.6 volt supply may have been eliminated by above procedures. If not, it will be necessary at this point to make thorough voltage and component checks of the supply.

8-55. HIGH-VOLTAGE SUPPLY

8-56. If one high-voltage supply output is zero but other outputs are normal, one of the rectifiers is likely at fault. Normal dc voltages are given on the high voltage schematic.

8-57. If there is no high-voltage output, observe the waveforms at the collector of A2Q14 (blue wire) If an approximately 30 kHz, 20-volt peak-to-peak sine wave appears for short intervals, the trouble is probably a defective component in the rectifier filter divider networks. If no waveform appears. use table 8-1.

8-58. If the high-voltage output is incorrect and cannot be adjusted to the correct value, use table 8-2.

8-59. If the -2350 volt supply seems to be operating properly, the 6.6 kV post-accelerator potential may be checked as follows:

- a. Remove top and left side instrument cover
- b. Remove high voltage connector block, A3MP1, figure 6-4.
- c. Remove high voltage connector block cover and rubber insulation
- d. Check 6.6 kV at high voltage lead pin connection

8-60. PULSE CIRCUIT

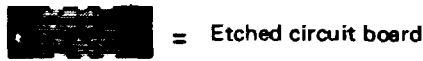
8-61. A good knowledge of the operating procedures and an understanding of the principles of operation of the instrument are helpful when troubleshooting the pulse circuit. Refer to Section III for operating procedures and Section IV for principles of operation. Always perform the preliminary set up procedure given in Section V, Performance Check, if the instrument is not operating properly.

8-62. All dc voltages from the low-voltage supply are used in the pulse circuit. When a malfunction occurs, check all voltages connected to the pulse circuit board. If all low voltages are correct, check the high voltages at the high-voltage circuit board. These checks will, by elimination, isolate the trouble N to one general circuit. If both supplies are correct, check the waveforms at test points shown on schematic diagram, figure 8-16.

8-63. Check dc voltages to isolate defective components in a stage where an improper, or no, waveform is present. Conditions for measurements and waveforms for test points are given in figure 8-15

Table 8-3. Schematic Diagram Notes

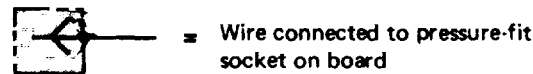
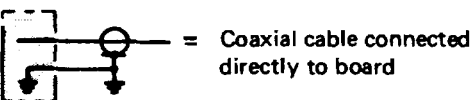
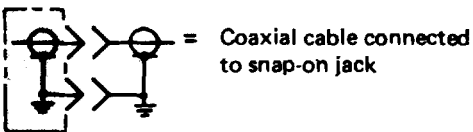
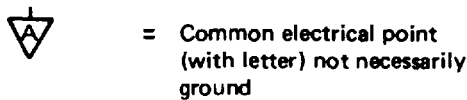
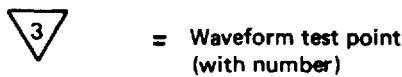
Refer to MIL-STD -15-1A for schematic symbols not listed in this table.



P/O = Part of

CW = Clockwise end of variable resistor

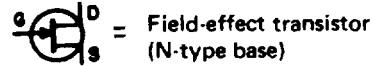
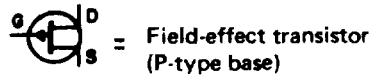
NC = No connection



———— = Main signal path

———— = Primary feedback path

———— = Secondary feedback path



Unless otherwise indicated:
resistance in ohms
capacitance in picofarads
inductance in microhenries

(925) = Wire colors are given by numbers in parentheses using the resistor color code [(925) is wht-red-grn]

- | | |
|------------|------------|
| 0 - Black | 5 - Green |
| 1 - Brown | 6 - Blue |
| 2 - Red | 7 - Violet |
| 3 - Orange | 8 - Gray |
| 4 - Yellow | 9 - White |

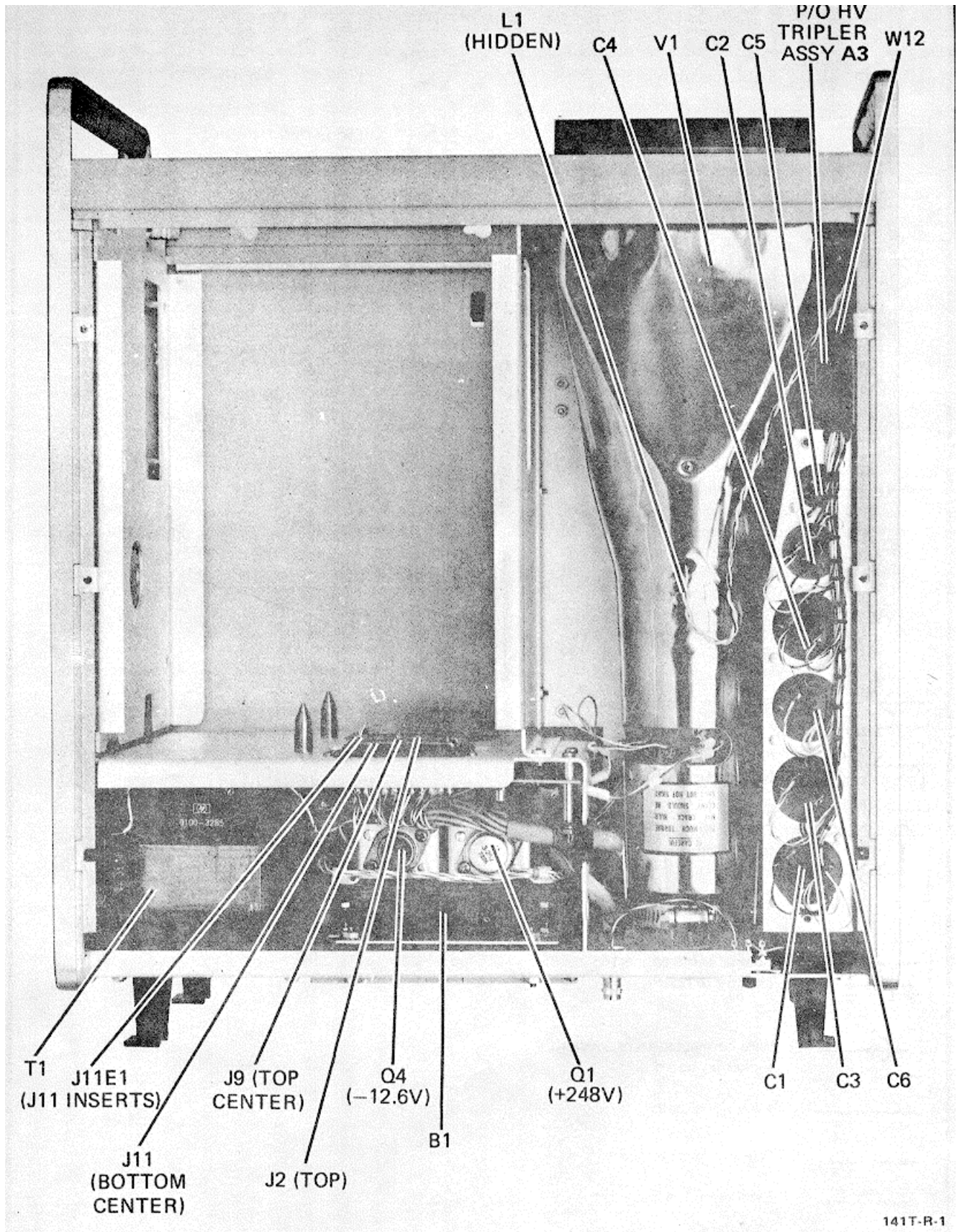


Figure 8-2. Component Location, Top View

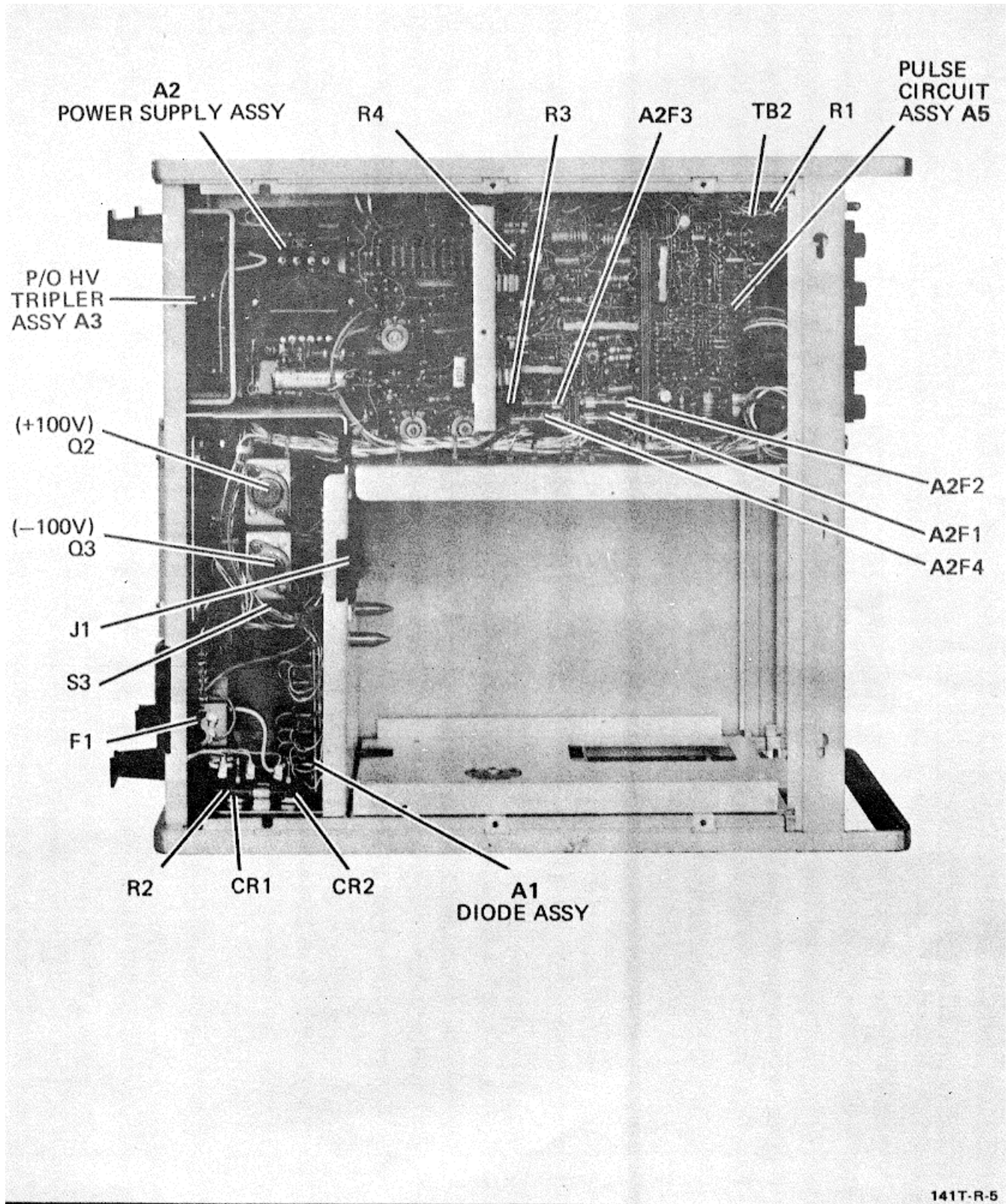


Figure 8-3. Component Location, Bottom View

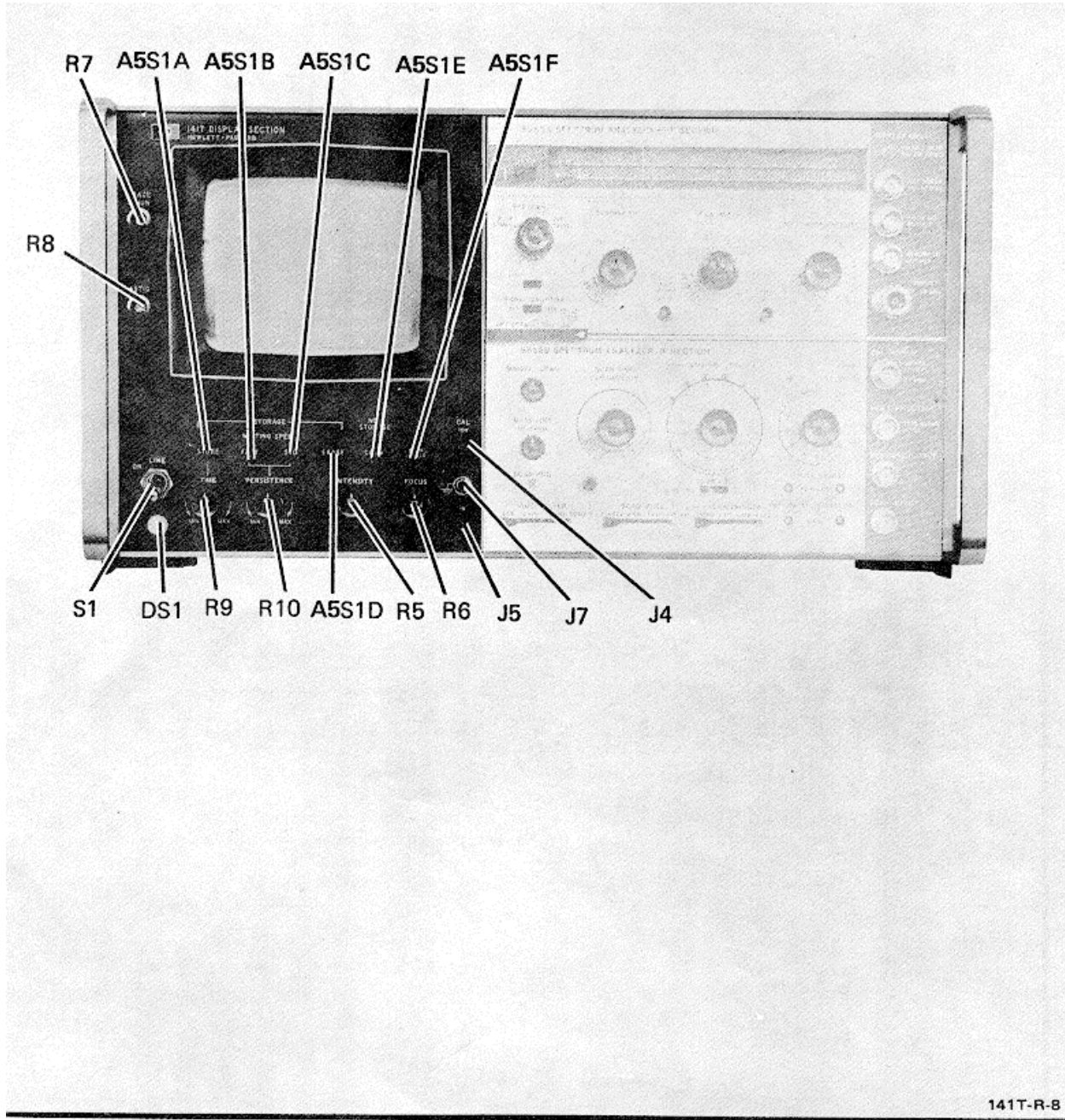


Figure 8-4. Component Location, Front View

Model 141T

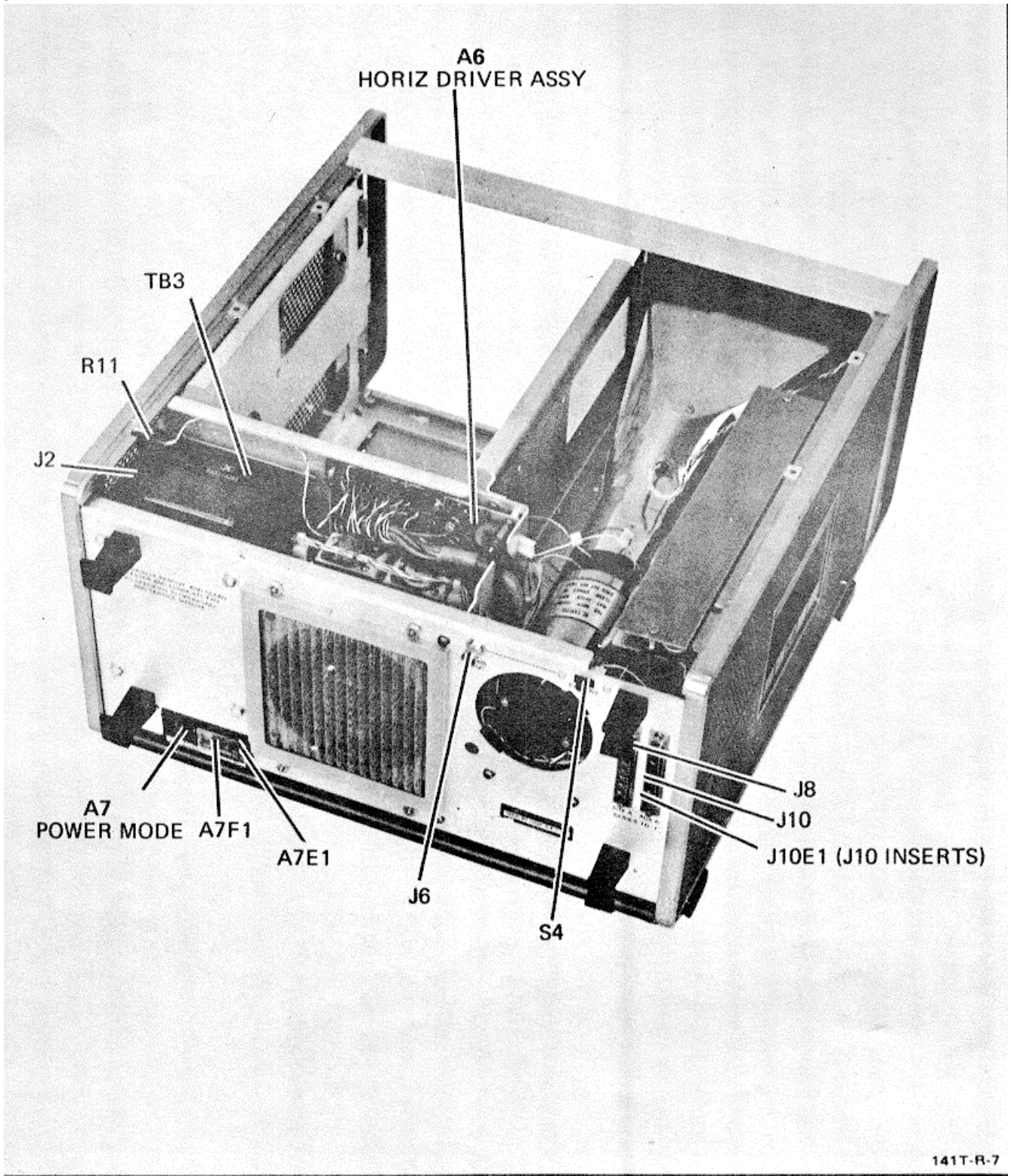


Figure 8-5. Component Location, Rear View

8-11/8-12

APPENDIX A

REFERENCES

- DA Pam 310-4 Index of Technical Manuals, Technical Bulletins,
Supply Manuals (Types 7, 8, and 9), Supply
Bulletins, and Lubrication Orders.
- DA Pam 310-7 US Army Equipment Index of Modification Work
Orders.
- TM 38-750 The Army Maintenance Management System (TAMMS).
- TM 750-244-2 Procedures for Destruction of Electronics
Materiel to Prevent Enemy Use (Electronics
Command).

APPENDIX B

ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
REPAIR AND SPECIAL TOOLS LISTS.
(INCLUDING DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS)

Section I. INTRODUCTION

B-1. Scope

This appendix lists spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE), and other special support equipment required for performance of general support maintenance of the Spectrum Analyzer IP-1216(P)/GR (Hewlett-Packard Model 141T). It authorizes the requisitioning and issue of spares and repair parts as indicated by the source and maintenance codes.

B-2. General

This Repair Parts and Special Tools List is divided into the following sections:

a. Section II. Repair Parts List. A list of spares and repair parts authorized for use in the performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in numeric sequence, with the parts in each group listed in figure and item number sequence.

b. Section III. Special Tools List. Not applicable.

c. Section IV. National Stock Number and Part Number Index. A list, in National item identification number (NIIN) sequence, of all National stock numbers (NSN) appearing in the listings, followed by a list, in alphanumeric sequence, of all part numbers appearing in the listings. National stock numbers and part numbers are cross-referenced to each illustrate figure and item number appearance.

B-3. Explanation of Columns

a. Illustration. This column is divided as follows:

(1) Figure number. Indicates the figure number of the illustration on which the item is shown.

(2) Item number. The number used to identify item called out in the illustration.

b. Source, Maintenance, and Recoverability (SMR) Codes.

(1) Source code. Source codes indicate the manner of acquiring support items for maintenance, repair, or overhaul of end items. Source codes are entered in the first and second positions of the Uniform SMR Code format as follows:

<i>Code</i>	<i>Definition</i>
PA	- Item procured and stocked for anticipated or known usage.
PB	- Item procured and stocked for insurance purpose because essentially dictates that a minimum quantity be available in the supply system.
XD	- A support item that is not stocked. When required, item will be procured through normal supply channels.

NOTE

Cannibalization or salvage may be used as a source of supply for any items source coded above except those coded XA and air craft support items as restricted by AR 700-42.

(2) Maintenance code. Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the Uniform SMR Code format as follows:

(a). The maintenance code entered in the third position will indicate the lowest maintenance level authorized to remove, replace, and use the support item. The maintenance code entered in the third position will indicate one of the following levels of maintenance:

Code	Application/Explanation
H	- Support item is removed, replaced, used at the general support level.
D	- Support items that are removed, replaced, used at depot, mobile depot, specialized repair activity only.

(b) The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair (i.e., all authorized maintenance functions). This position will contain one of the following maintenance codes:

Code	Application/Explanation
Z	- nonrepairable. No repair is authorized.
D	- The lowest maintenance level capable of complete repair of the support item is the depot level.

(3) Recoverability code. Recoverability codes are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the Uniform SMR Code Format as follows:

Recoverability Codes	Definition
Z	- Nonrepairable item. When unserviceable, condemn and dispose at the level indicated in position 3.
L	- Repairable item. Repair, condemnation, and disposal not authorized below depot/specialized repair activity level.

c. National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

d. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

NOTE

When a stock-numbered item is requisitioned, the repair part received may have a different part number than the part being replaced.

e. *Federal Supply Code for Manufacturer (FSCM)*. The FSCM is a 5-digit numeric code listed in SB 708-42 which is used to identify the manufacturer, distributor, or Government agency, etc.

f. *Description*. Indicates the Federal item name and, if required, a minimum description to identify the item.

g. *Unit of Measure (U/M)*. Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr, etc). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

h. *Quantity Incorporated in Unit*. Indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group, subfunctional group, or an assembly.

B-4. Special Information

National stock numbers (NSN's) that are missing from P source coded items have been applied for and will be added to the TM by future change/revision when they are entered in the Army Master Data File (AMDF). Until the NSN's are established and published, submit exception requisitions to: Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-MM, Fort Monmouth, New Jersey 07703 for the part required to support your equipment.

B-5. How to Locate Repair Parts

a. When National stock number or part number is unknown.

(1) First. Using the table of contents, determine the functional group within which the item belongs.

This is necessary since illustrations are prepared for functional groups and listings are divided into the same groups.

(2) Second. Find the illustration covering the functional group to which the item belongs.

(3) Third. Identify the item on the illustration and note the illustration figure and item number of the item.

(4) Fourth. Using the Repair Parts Listing, find the figure and item number noted on the illustration.

b. When National stock number or part number is known.

(1) *First.* Using the Index of National Stock Numbers and Part Numbers, find the pertinent National stock number or part number. This index is in NIIN sequence followed by a list of part numbers in alphanumeric sequence, cross-referenced to the Illustration figure number and item number.

(2) *Second.* After finding the figure and item number, locate the figure and item number in the repair parts list.

B-6. Abbreviations

Not applicable.

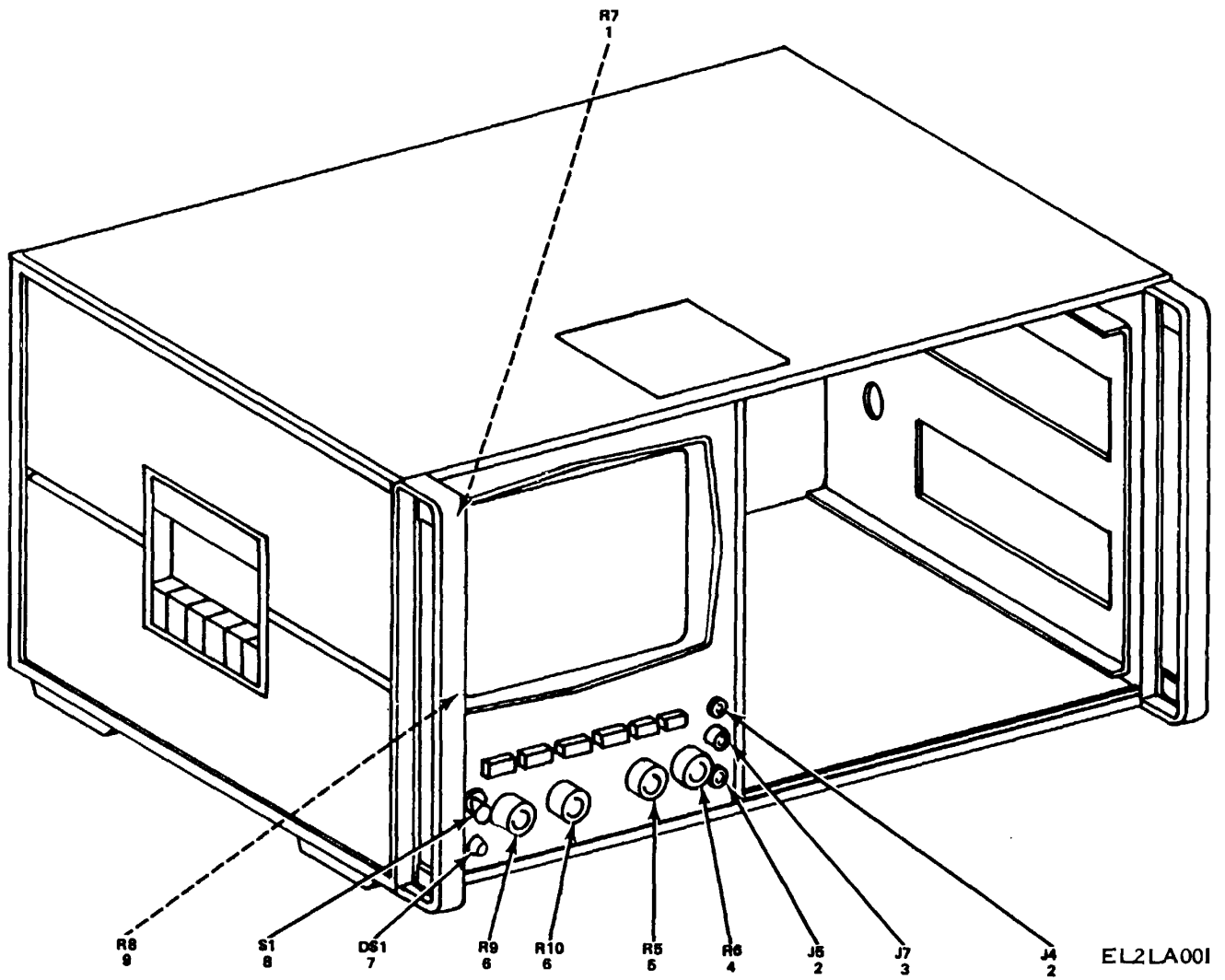


Figure B-1. Spectrum Analyzer IP-1216(P)/GR (Hewlett-Packard Model 141T) (Sheet 1 of 5)

Change 1 B-4

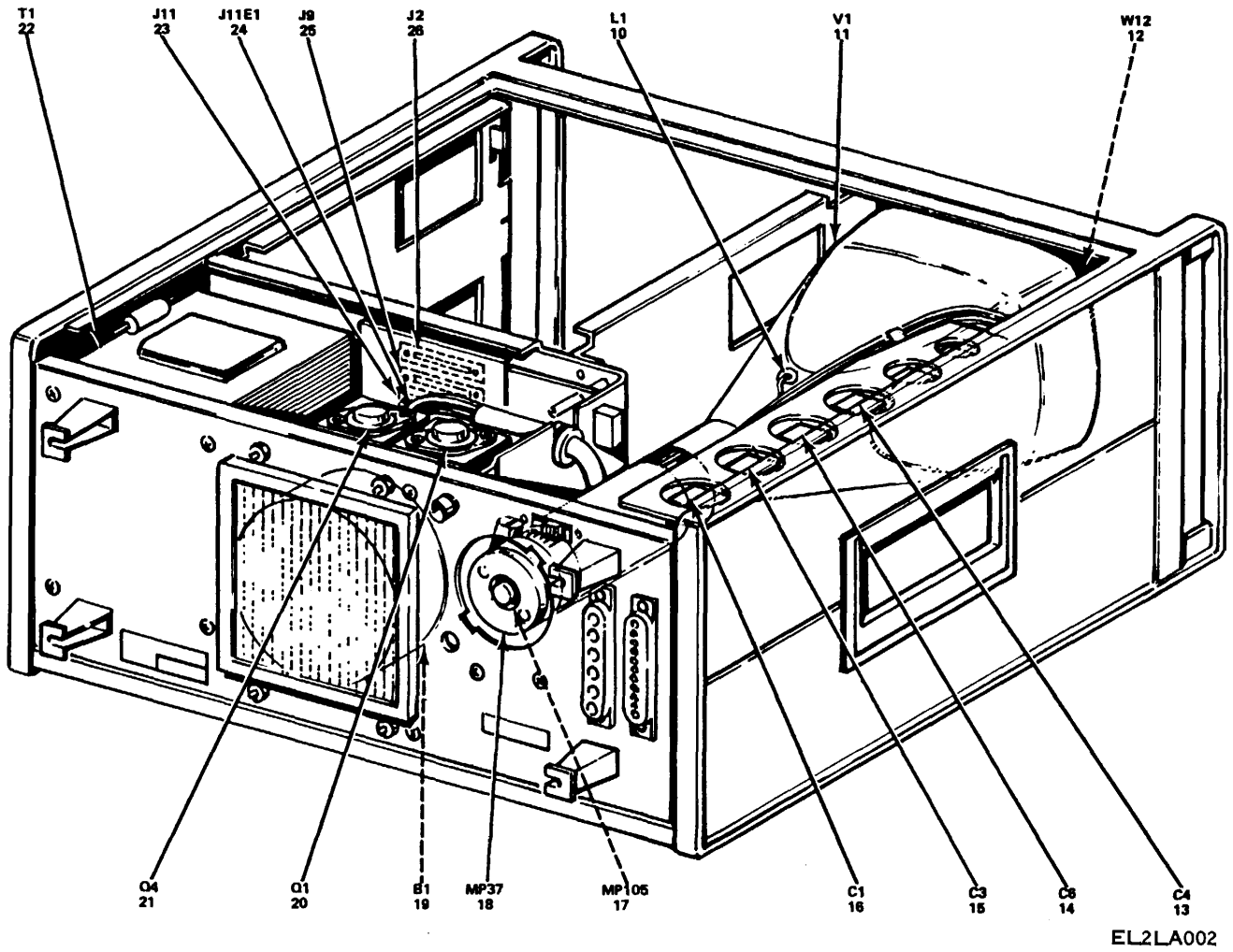


Figure B-1. Spectrum Analyzer IP-1216(P)/GR (Hewlett-Packard Model 141T) (Sheet 2 of 5).

Change 1 B-5

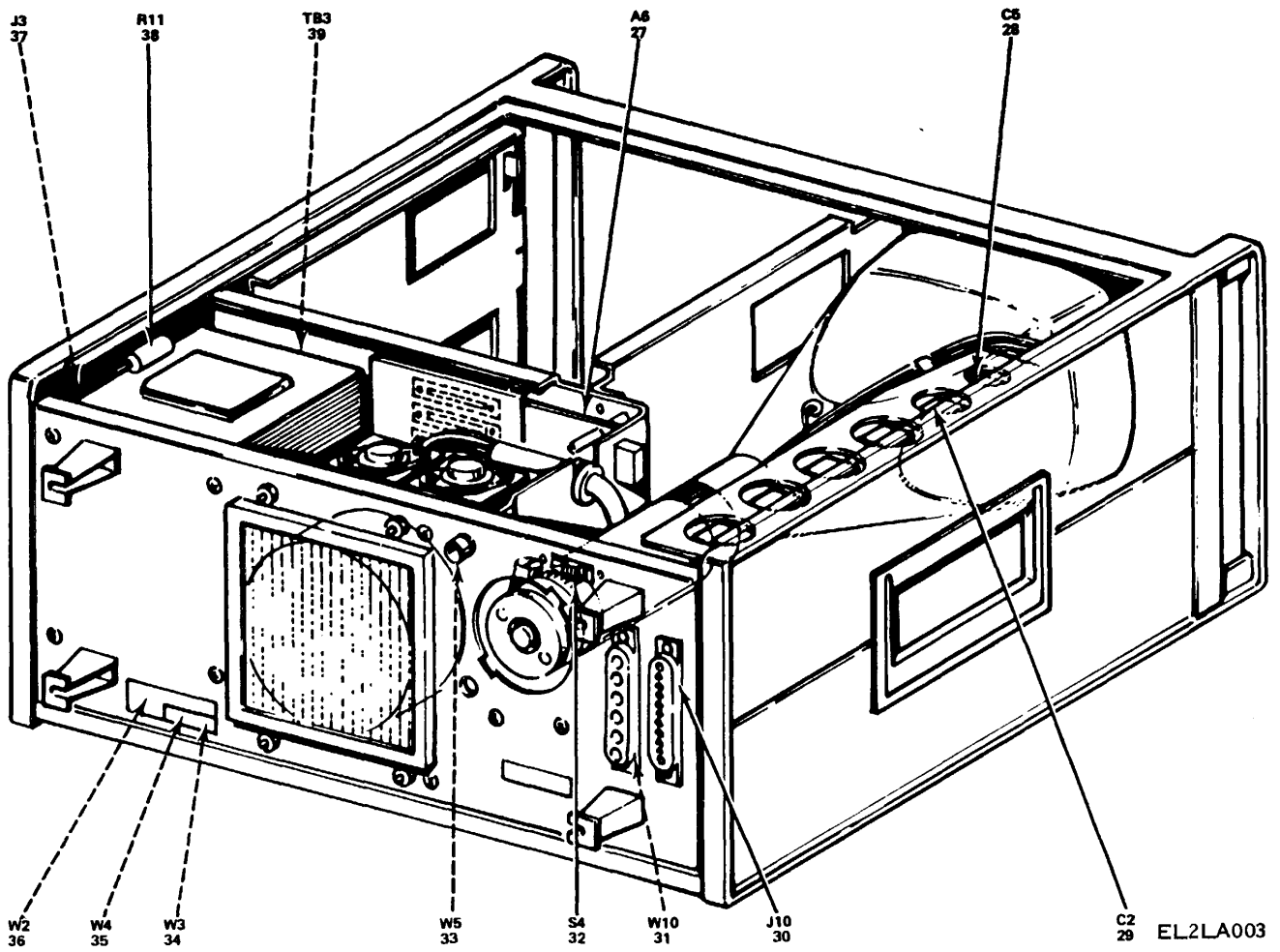


Figure B-1. Spectrum Analyzer TP-1216(P)/GR (Hewlett-Packard Model 141T) (Sheet 3 of 5).

Change 1 B-6

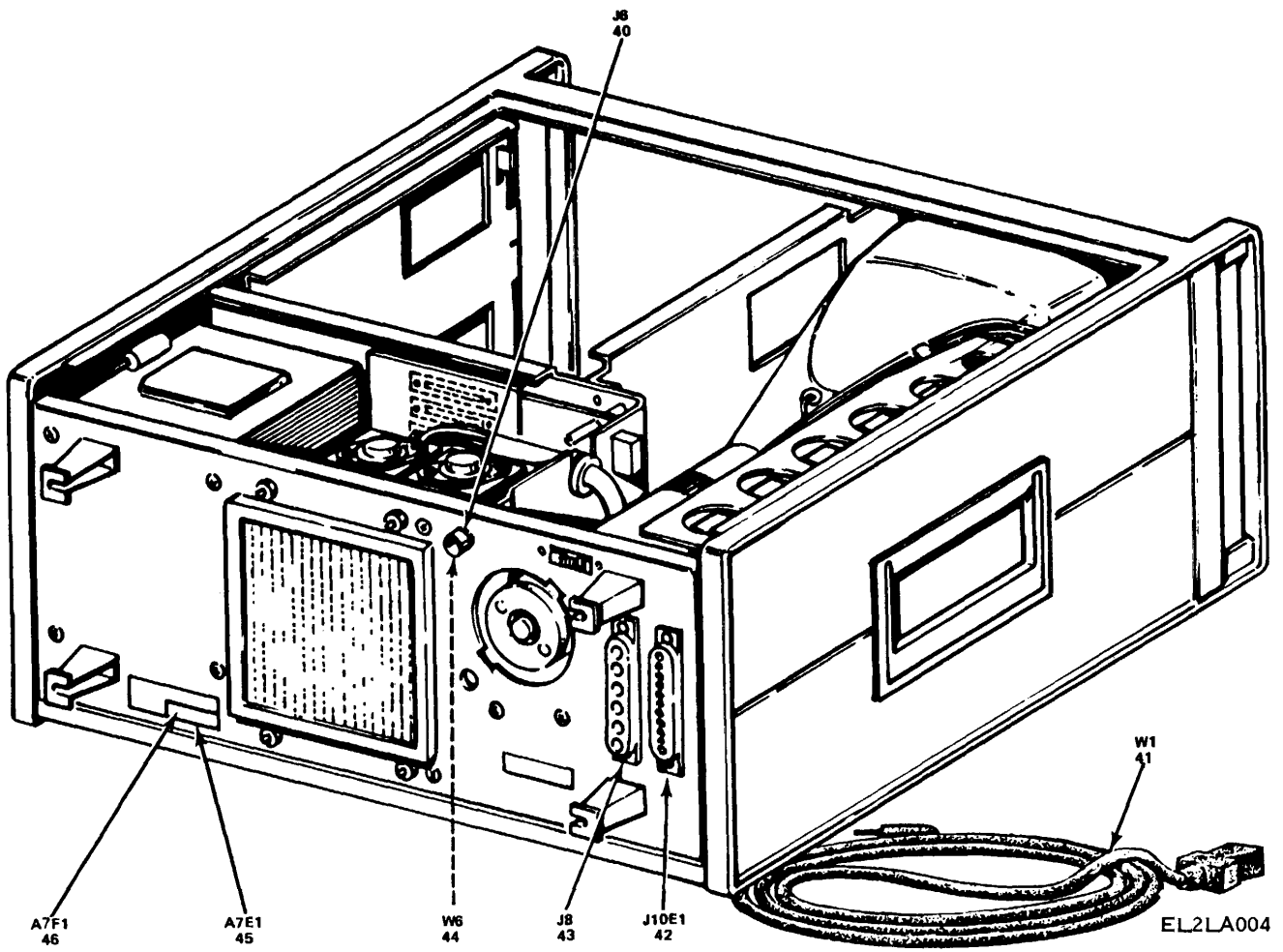
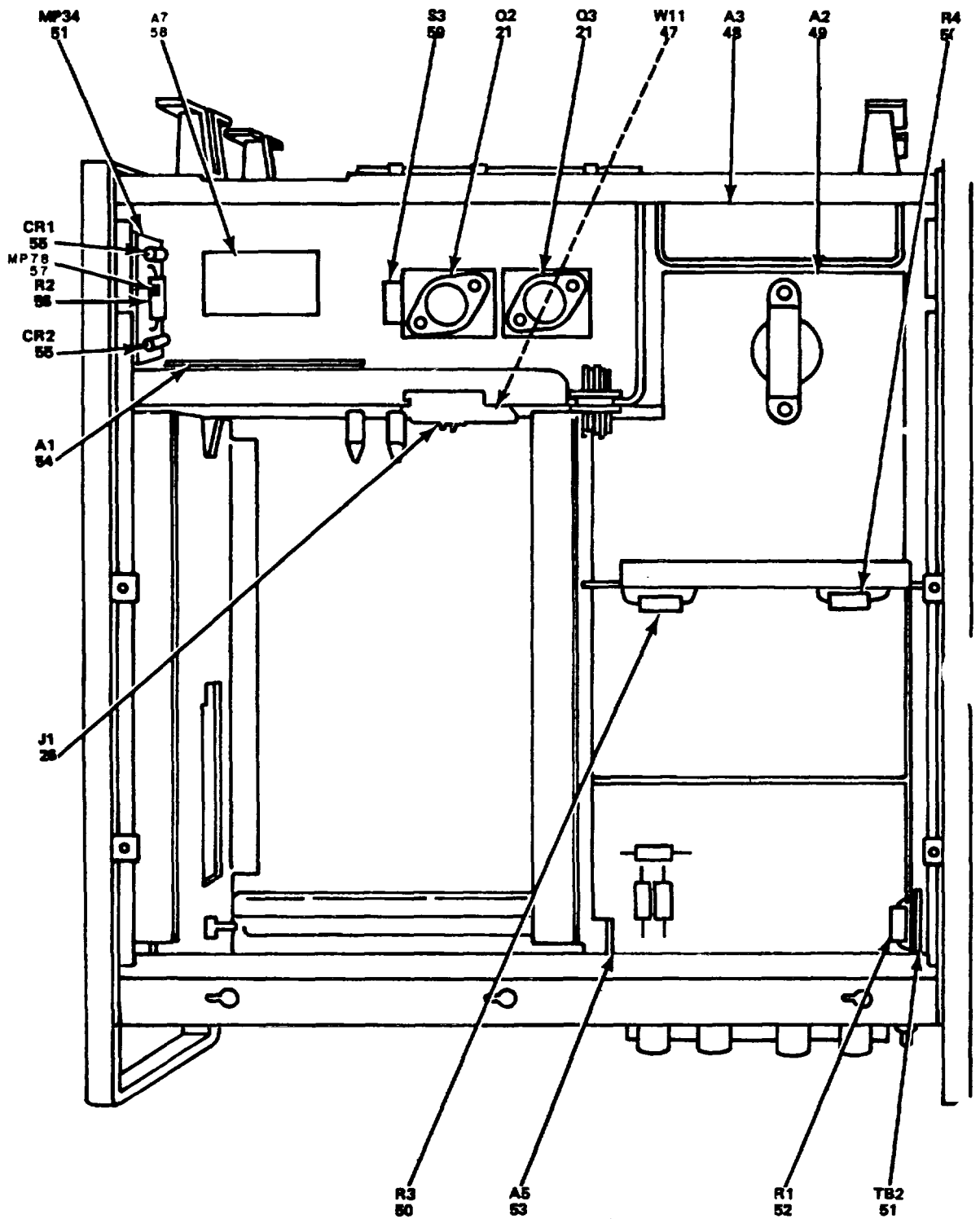


Figure B-1. Spectrum Analyzer IP-1216(P)/GR (Hewlett--packard Model 141T) (Sheet 4 of 5).

Change 1 B-7



EL2LA005

Figure B-1. Spectrum Analyzer IP-1216(P)/GR (Hewlett-Packard Model 141T) (Sheet 5 of 5)

Change 1 B-8

SECTION II

TM 11-6625-2781-14&P

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION USABLE ON CODE	U/M	QTY INC IN UNIT
						GROUP 00 SPECTRUM ANALYZER IP-126b(PI/GR(HEWLETT-PACKARD MODEL 14ST)		
B-1	1	PAHZZ	5905-00-908-7238	2100-045	28480	RESISTIR,VARIAI LE..... EA	1	
B-1	2	PAHZZ	5935-00-189-7483	221 8	83330	CONNECTOR.ELEC..... EA	2	
B-1	3	XDHZZ	5940-00-935-3515	1510-0038	28480	POST.ATNDING..... EA	1	
B-1	4	PAHZZ	5905-0034-1295	3100-0340	28480	RESISTOR,VARIATBLE..... EA	1	
B-1	5	PAHZZ	5905-00-180-184	2100-2962	28480	RESISTMR,ELEC..... EA	1	
B-1	6	PAHZZ	5905-080 0-41t83	2100-2397	28480	RESISTO,VARIABLE..... EA	1	
B-1	7	PAHZZ	610-00-451-6217	1450-0419	28480	LIGHTRINDICATOR..... EA	1	
B-1	8	PAHZZ	5930-00-034-1295	3101-0030	28480	SWITCH,TDGCLE..... EA	1	
B-1	9	PAHZZ	5905-00-7 55-0749	Z100-0015	28450	RESISTX R,VARIAB LE..... FA	1	
B-1	10	PAHZZ	5950-00-790-4110	5060-0435	28480	COIL,RADIO FREO..... EA	1	
B-1	11	PAHZZ	5960-01-047-9224	5083-2587	28480	ELECTRON TUE..... EA	1	
B-1	12	PAHZZ		5060-1686	28480	FLE CIRCUIT..... EA	1	
B-1	13	PAHZZ	5910-00-925-6532	0180-0214	28480	CAPACITOR.FIKED..... EA	1	
B-1	14	PAHZZ	5910-00-925-6531	0180-0213	28480	CAPACITOR,FIXED..... EA	1	
B-1	15	PAHZZ	5910-00-904-T592	0180-0046	28480	CAPACITOR,FIKED..... EA	4	
B-1	16	PAHZZ	5910-00-023-2352	0180-0154	28480	CAPACITOR,FIKED..... EA	1	
B-1	17	PAHZZ	5935-00-930-8228	1200-0050	28480	CONNECTOR.ELEC..... EA	10	
B-1	18	P8HZZ	5935-00-089-1566	1200-0037	28480	SOCKET.PLUG-IN..... EA	1	
B-1	19	PAHZZ		WS2107FL570	92702	FAN.TU8EAXIAL..... EA	1	
B-1	20	PAHZZ	5961-00424-9411	1853-0252	28400	TRANSISTOR..... EA	1	
B-1	21	PAHZZ	5961-00-902-3436	1854-0294	28480	TRANSISTOR..... EA	3	
B-1	22	PAHZZ	5950-01-037-6247	9100-3285	28480	TRANSFORRER,POWER..... EA	1	
B-1	23	PAHZZ	5935-00-009-1317	DCMI7WSP	71185	CONNECTOR.RECEPTACLE..... EA	1	
B-1	24	PAHZZ	5999-00-988-7308	DOM53740-500-1	71468	CONTACT,ELECTRIC..... EA	3	
B-1	25	PAHZZ	5935-00-727-2247	DCMSW8P	71468	CONNECTOR 800Y..... EA	1	
B-1	26	PAHZZ	5935-00-089-7482	1251-0054	28480	CONNECTOR,ELEC..... EA	2	
B-1	27	PAHOL	6625-00-6 38604	00141-66502	28480	CIRCUIT CARD SSEMBLY..... EA	1	
B-1	28	PAHZZ	5910-00-927-7547	0180-0093	28480	CAPACITOR.FIXEDO..... EA	1	
B-1	29	PAHZZ	5910-0-087-3521	0D10-0012	28480	CAPACETOR,FIXED..... EA	1	
B-1	30	PAHZZ	5935-00-995-0079	DCHI7WSS	714681	CONNECTOR,RECEPTACLE..... EA	1	
B-1	31	PAHZZ	6625-00-422-3571	00141-61627	28480	CABLE ASSEN8LY,SPECIAL PURPOSE.ELECTRICAL..... EA	1	
B-1	32	PAHZZ		11A1013	82329	SWITCH,SLIOE..... EA	1	
B-1	33	PAHZZ		00141-61622	28480	CABLE ASSEMBLY,ADIO FREQUENCY... EA	1	
B-1	34	PAHZZ		00141-61624	28480	CABLE ASSFK8LV,SPECIAL PURPOSE,ELECTRICAL..... EA	1	
B-1	35	PAHZZ		00141-61625	28480	CABLE ASSE8MLY.SPECIAL PURPOSE,ELECTRICAL..... EA	1	
B-1	36	PAHZZ		00141-61631	28480	CABLE ASSEIMBLY.SPECIAL PURPOSE.ELECTRICAL..... EA	1	
B-1	37	PAHZZ	5935-00-233-672	EAC301	82389	CONNECTOR,RECEPTACLE..... EA	1	
B-1	38	PAHZ	5905-00-009-1312	0811-2994	128480	RESISTOR,FIXED..... EA	1	

SECTION II

TM 11-6625-2781-14&P

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6) DESCRIPTION	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	USABLE ON CODE	U/M	QTY INC IN UNIT
B-1	39	PAHZZ		62113	06540	TERMINAL &OARD.....	EA 1	
B-1	40	PAHZZ	5935-00-804-5144	31-221-1020	02660	CONNECTORIRECEPTACLE.....	EA 1	
B-1	41	PAHZZ	6150-01-027-5874	812-1530	28480	CABLE ASSEN8LY,POWER.....	EA 1	
B-1	42	PAHZZ	5999-00-995-1392	DN53742-S001	71468	CONTACT.ELECTRIC.....	EA 3	
B-1	43	PAHZZ	5935-00-275-7823	DCMNBS5	71468	CONNECTOR BODY	EA 1	
B-1	44	PAHZZ		00141-61623	28480	CABLE ASSEMBLY.RAOD FREQUENCY.	EA 1	
B-1	45	PAHZZ	6625-03-027-3660	5020-8122	28480	TERMINAL BOARD.....	EA 1	
B-1	46	PAHZZ	5920-00-284-7466	NOX4	71400	FUSE.CARTRIDGE SELECT (120V)	EA 1	
B-1	46	PAHZZ	5920-01-033-4890	2110-0303	28480	FUSE,CARTRIDGE SELECT (220V)	EA 1	
B-1	47	PAHZZ	6625-00-435-4181	5060-0521	28480	CABLE ASSENMBLY,SPECIAL PURPOSE.ELECTRICAL.....	EA 1	
B-1	48	PAHZ	6625-00-450-7243	00141-61101	28480	HIGH VOLTAGE TRIPLER ASSEMBLY.....	EA 1	
B-1	49	PAHDL	6625-00-45-9249	00141-66519	28480	CIRCUIT CARD ASSEMBLY.....	EA 1	
B-1	50	PAH22	5905-00-496-3412	0811-2030	28480	RESISTOR, FIXED.....	EA 2	
B-1	51	PAHZZ	5940-00-177-9847	0360-0015	28480	TERMINAL 80ARD	EA 2	
B-1	52	PAHZZ	5905-00-104-8330	RCR20G333JS	81349	RESISTMO,FIXEO	EA 1	
B-1	53	PAHDL	6625-00-439-1082	00141-66520	28480	CIRCUIT CARD ASSEMBLY.....	EA 1	
B-1	54	PAHDL	6625-00-439-1086	00141-66515	28480	CIRCUIT CARD ASSEMBLY	EA 1	
B-1	55	PAHZZ	5961-00-229-6882	N3209	04713	SEHICONDUCTOR DEVICE.010DE.....	EA 2	
B-1	56	PAHZZ	5905-0-942-3530	0815-0031	28480	RESISTOI.PIXED	EA 1	
B-1	57	PAHZZ	5999-00-279-7999	104002	75915	CLIP.ELECTRICAL	EA 3	
B-1	58	PAHDL		0960-0443	28480	CIRCUIT CARD ASSEMBLY (A7).....	EA 1	
B-1	59	PAHZZ	59300-92-6455	3103-0009	28480	SWITCH,THERMOSTAT.....	EA 1	
Change 1 B-10/(B-11 Blank)								

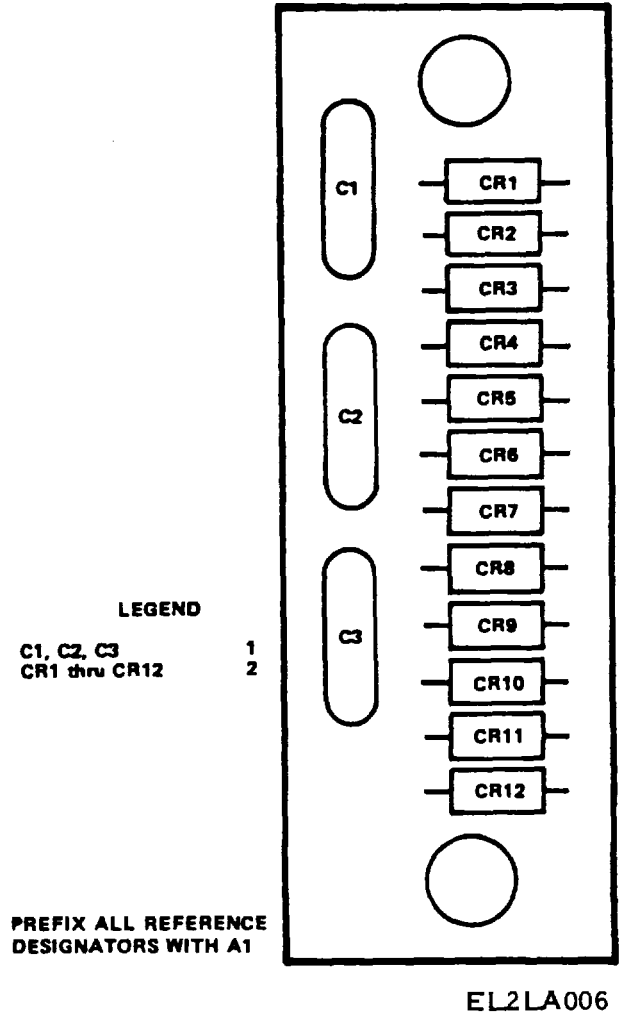


Figure B-2. Circuit Card Assembly, Diode.

Change 1 B-12

SECTION II

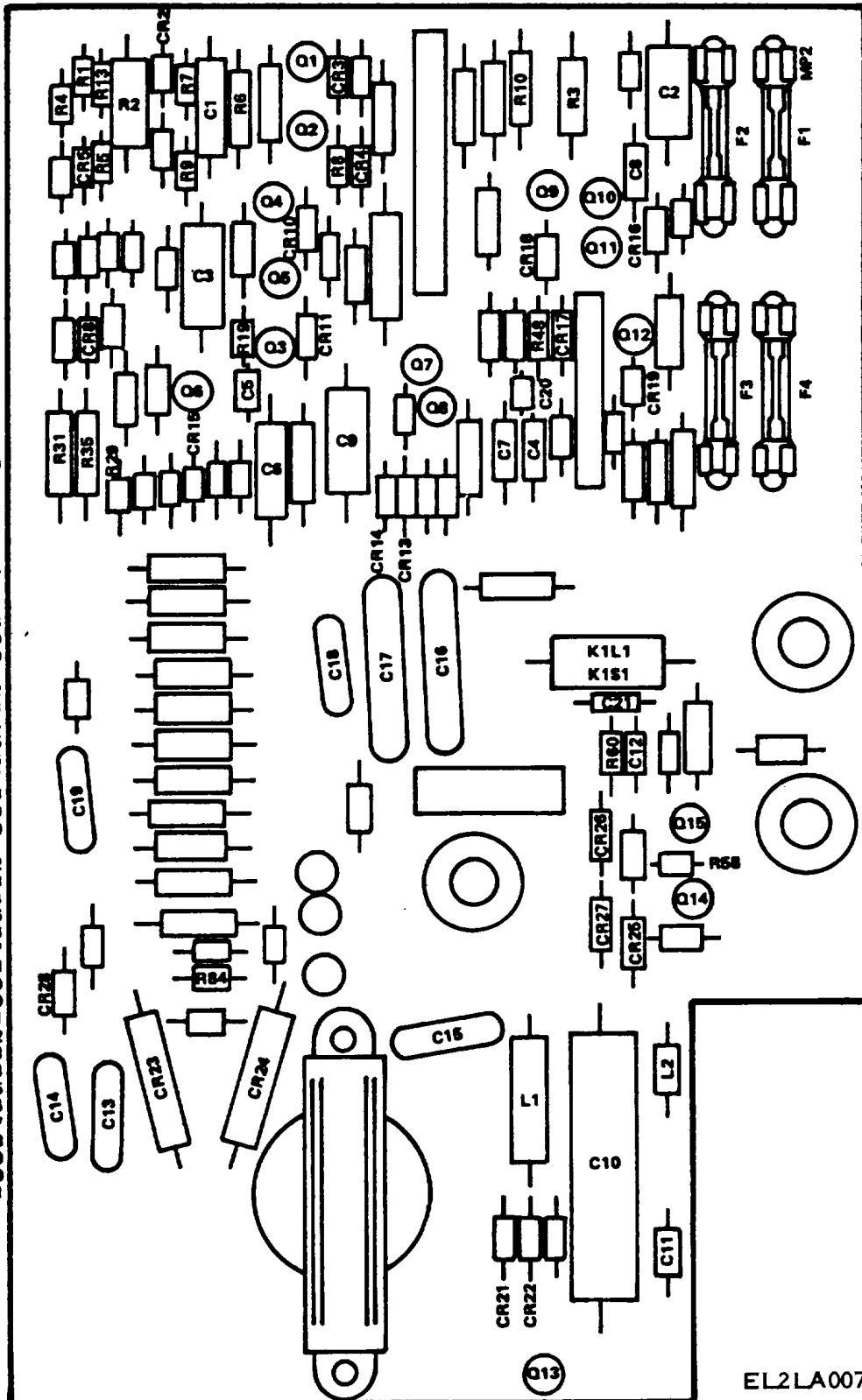
TM 11-6625-2781-14&P

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION USABLE ON CODE	U/M	QTY INC IN UNIT
B-2	1	XDOZZ	59IO-00-797-4909	0150-0052	28480	GROUP 01 CIRCUIT CARD ASSEMBLY.DIWE.AL		
B-2	2	XDOZZ	5961-00-951-1505	SR1358-9	04113	CAPACITOR.FIXEO..... EA 3 SEMICONDUCTOR..... EA 12		
<p>Change 1 B-13(B-14 Blank)</p>								

LEGEND

- 1 C1,C2,C3,C6
- 2 C4,C7
- 3 C5,C12
- 4 C8
- 5 C9
- 6 C10
- 7 C11
- 8 C13,C14,C15,C18,C19
- 9 C16,C17
- 10 C20
- 11 C21
- 12 CR2,CR3,CR10,CR11,CR13,
- 13 CR14,CR18,CR21,CR25
- 14 CR4
- 15 CR5,CR17
- 16 CR8,CR15
- 17 CR18
- 18 CR19
- 19 CR22
- 20 CR23,CR24
- 21 CR26,CR27
- 22 CR28
- 23 F1
- 24 F2
- 25 F3
- 26 F4
- 27 K1L1
- 28 K1S1
- 29 L1
- 30 L2
- 31 MP2
- 32 Q1
- 33 Q2,Q6
- 34 Q4
- 35 Q5,Q7,Q8,Q11
- 36 Q8
- 37 Q10
- 38 Q12
- 39 Q13
- 40 Q14
- 41 Q15
- 42 R1
- 43 R2
- 44 R3
- 45 R4,R19,R29,R58,R60
- 46 R5
- 47 R6,R36
- 48 R7,R13
- 49 R8,R48
- 50 R9,R84
- 51 R10,R31

PREFIX ALL REFERENCE DESIGNATORS WITH A2

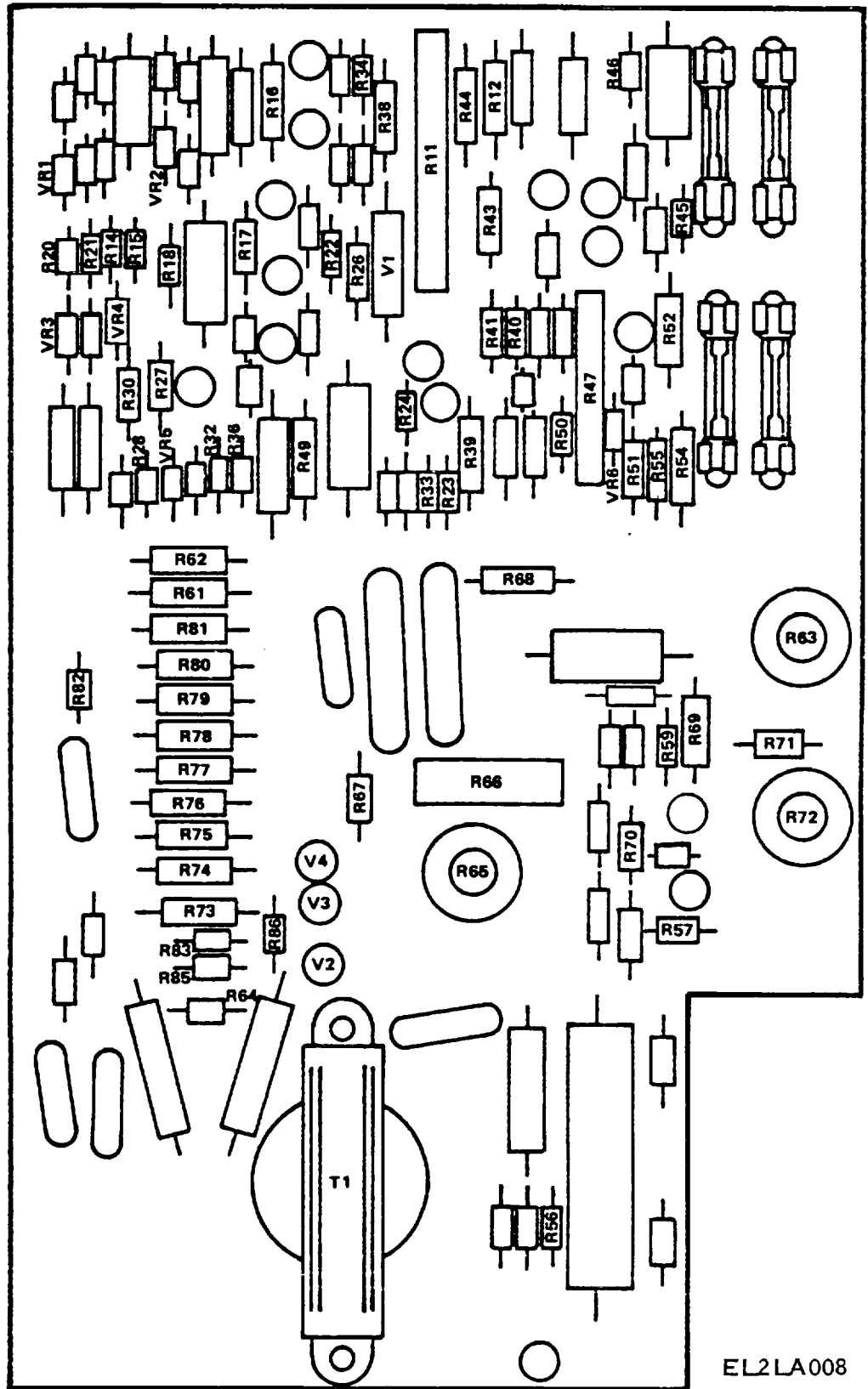


EL2LA007

Figure B-3. Circuit Card Assembly, Power Supply (Sheet 1 of 2).

- R11
- R12
- R14
- R15
- R16
- R17, R18, R27, R28
- R20, R30
- R21
- R22, R36
- R23, R33, R46
- R24, R34
- R26, R39, R43
- R32
- R38
- R40
- R41
- R44
- R45
- R47
- R49
- R50
- R51
- R52
- R54
- R55
- R56
- R57
- R59
- R61, R73
- R62
- R63
- R64
- R65
- R66
- R67, R82
- R68
- R69
- R70
- R71
- R72
- R74 thru R81
- R83
- R85
- R86
- T1
- V1
- V2, V3, V4
- VR1
- VR2
- VR3
- VR4, VR5
- VR6

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PREFIX ALL REFERENCE DESIGNATORS WITH A2

EL2 LA008

Figure B-3. Circuit Card Assembly, Power Supply (Sheet 2 of 2).

SECTION II

TM 11-6625-2781-14&P

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6) DESCRIPTION	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	USABLE ON CODE	U/M	QTY INC IN UNIT
						GROUP 02 CIRCUIT CARD ASSEMBLY, POWER SUPPLY,A2		
B-3	1	XDDZZ	5910-00-917-0668	192P10492PTS	56289	CAPACITOR, FIXED	EA	4
B-3	2	XDDZZ		150D475K903582DY S	56189	CAPACITOR, FIED, ELECTROLYTIC	EA	2
B-3	3	XODZZ	5910-00-797-4909	0150-0052	28480	CAPACITOR, FIXED	EA	2
B-3	4	XDDZZ	5910-00-961-9591	192P47292PTS	56289	CAPACITOR, FIXED	EA	1
B-3	5	XDDZZ		1500476I 9035520Y S	56289	CAPACITOR, FIXED, ELECTROLYTIC	EA	1
B-3	6	PADZZ	5910-00-067-8305	0180-0138	28480	CAPACITOR, FIXEO	EA	1
B-3	7	XDDZZ		150D0105XOOSA2DY S	56289	CAPACITOR, FIXED, ELECTROLYTIC	EA	1
B-3		XDDZZ	5910-00-985-1261	0163-0151	23480	CAPACITOR, FIXED	EA	5
B-3	9	XDDZZ	5910-00-931-0029	0160-0907	284680	CAPACITOR, FIXEO	EA	2
B-3	10	XDDZZ	5910-00-444-0589	0160-0407	28480	CAPACITOR, FIXED	EA	1
B-3	11	XDOZZ		S131-050-651-104 Z		CAPACITOR, FIXED, CERAMIC DIELECTRIC	EA	1
B-3	12	XDDZZ	5961-00-92-7939	FDG1088	34148	SEMICONDUCTOR	EA	9
B-3	13	XDDZZ	5961-00-904-0296	1901-0096	28480	SEMICONDUCTOR	EA	1
B-3	14	XDDZZ	5961-00-954-9182	1910-0016	28460	SEMICONDUWCTOR	EA	2
B-3	15	XDDZZ	5961-00-060-8638	SR1358-8	04713	SEAICONDUCTOR	EA	2
B-3	16	XDDZZ		FD2387	07263	SEMICONDUCTOR DEVICE, OIODE	EA	1
B-3	17	XDDZZ	5961-0-917-9637	1912-0006	286480	SEMICONDUCTOR	EA	1
B-3	18	XDDZZ	5961-00-911-9275	1901-0049	28480	SEMICONDUCTOR	EA	1
B-3	19	XDDZZ	5961-0-L106622	1901-0341	28480	SEMICONDUCTOR	EA	2
B-3	20	XDDZZ	5961-0-9205302	1901-0436	28480	SEMICONDUCTOR	EA	2
B-3	21	XDDZZ	5961-00-950-0531	1901-0029	28480	SEMICONDUCTOR	EA	1
B-3	22	XDDZZ	5920-00-556-9946	2110-0067	28480	FUSE, CARTRIDGE	EA	1
B-3	23	XDDZZ	5920-00-254-9494	3L12-750	75915	FUSE, CARTRIOGE	EA	1
B-3	24	XDDZZ		312-500	75915	FUSE, CARTRIDGGE	EA	1
B-3	25	XDDZZ	5920-00-O1-6652	312003	759151	FUSE, CARTRIDGE	EA	1
B-3	26	XDDZZ	5950-00-910-9938	0490-0191	24801	COIL	EA	1
B-3	27	XDDZZ	5930-00-483-4003	0490-019	28460	SWITCN, REED	EA	1
B-3	28	XDDZZ	5950-00-946630	9140-0171	28460	COIL, RADIO FREQUENCY	EA	1
B-3	29	XDZZ	5950-O-073-9426	1537-16	71895	COIL, RADIO FREQUENCY	EA	1
B-3	30	XDDZZ	5999-00-333-9620	2110-0269	26460	CLIP, ELECIRTCAL	EA	8
B-3	31	XDDZZ	5961-00-866-4810	2N708	80131	TRANSISTOR	EA	1
B-3	31	XDDZZ	5961-0-931-0372	2N3906	80131	TRANSISTOR	EA	1
B-3	32	XDDZZ	5961-0-917-0660	1854-0022	26480	TRANSISTOR	EA	2
B-3	34	XDDZZ	5961-00-937-3768	2N3417	80131	TRANSISTOR	EA	1
B-3	35	XDDZZ	5961-00-137-4608	1854-0071	28460	TRANSISTOR	EA	4
B-3	36	XDDZZ	5961-0-985-9073	2N3053	80131	TRANSISTOR	EA	1

SECTION II

TM 11-6625-2781-14&P

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6) DESCRIPTION	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	USABLE ON CODE	U/M	QTY INC IN UNIT
B-3	37	XDDZZ	5961-00-892-8706	2N3I904	80131	TRANSISTOR	EA	1
B-3	38	XDDZZ	5961-00-988-3608	2N964	80131	TRANSISTOR	EA	1
B-3	39	XDDZZ	5961-00-410-8882	2N4918	04713	TRANSISTOR	EA	1
B-3	40	XDDZZ	5961-00-987-4700	1853-0034	28480	TOTANSISTOR	EA	1
B-3	41	XDDZZ	5961-00-137-0999	1855-0057	28480	TRANSISTOR	EA	1
B-3	42	XDDZZ	5905-00-192-3987	E81041	01121	RESISTOR,FIKED,CONP	EA	1
B-3	43	XDDZZ	5905-00-056-0446	0764-0033	28480	RESISTOR,FIKED	EA	1
B-3	44	XDDZZ	5905-00-917-5670	0761-0007	28480	RESISTOR,FIXED	EA	1
B-3	45	XDDZZ	5905-00-194-7894	CBZ1021	01121	RESISTOR,FIXED	EA	5
B-3	46	XDDZZ	5905-00-102-5294	CB1015	01121	RESISTOR,FIXED	EA	1
B-3	47	XDDZZ	5905-00-931-9908	0757-0044	28480	RESISTOR,FXED	EA	2
B-3	48	XDDZZ	5905-00-981-7529	0757-0401	2S480	RESISTOR.FIXTEO	EA	2
B-3	49	XDDZZ	5905-00-193-4294	0757-0273	28480	RESISTOR,FIXEO	EA	2
B-3	50	XDDZZ	5905-00-904-4412	0757-0465	28480	RESISTOR,FIKTD	EA	2
B-3	51	XDDZZ	5905-00-920-5301	0757-0370	28480	RESISTOR,FIKED	EA	2
B-3	52	XDDZZ	5905-00-928-1025	2100-1589	28480	RESISTOR,VARIABLE	EA	1
B-3	53	XDDZZ	5905-00-930-796	0757-0367	28480	RESISTOR,FIXEO	EA	1
B-3	54	XDDZZ	5905-00-494-5081	0766-0033	28480	RESISTO.FIKED	EA	1
B-3	55	XDDZZ	5905-00-998-1793	0757-0434	28480	RESISTOR.FIXED	EA	1
B-3	56	XDDZZ	5905-00-998-1800	0761-0006	28480	RESISTOR.FIXED	EA	1
B-3	57	XDDZZ	5905-00-752-7345	E85631	01121	RESISTOR.FIXED	EA	4
B-3	58	XDDZZ	5905-00-929-7774	01757-0399	28480	RESISTOR.FIXED	EA	2
B-3	59	XDDZZ	5905-00-141-0744	RCR7G562JS5	81349	RESISTOR.FIXED	EA	1
B-3	60	XDDZZ		0757-0764	28480	RESISTOR,FIXED FILM	EA	1
B-3	61	XDDZZ	5905-00-929-2525	0757-0388	28480	RESISTOR,FIXED	EA	3
B-3	62	XDDZZ	5905-00-855-6792	0757-0436	28480	RESISTOR,FIXED	EA	2
B-3	63	XDDZZ	5905-00-927-2881	01757-0846	28480	RESISTOR,FIXED	EA	3
B-3	64	XDDZZ	5905-00-927-2878	0757-0772	28480	RESISTOR,FIXED	EA	1
B-3	65	XDDZZ	5905-00-909-3427	0727-0431	28480	RESISTOR,FIXED	EA	1
B-3	66	XDDZZ	5905-00-141-1168	RCR20G222JS	81349	RESISTOR.FIXEDO	EA	1
B-3	67	XDDZZ	5905-00-141-0596	RCR20G473JS	81349	RESISTOR.FIKED	EA	1
B-3	68	XDDZZ	5905-00-917-0575	075T-0190	28480	RESISTOR,FIKED	EA	1
B-3	69	XDDZZ	5905-00-056-0426	0757-0480	28480	RESISTOR,FIXFD	EA	1
B-3	70	XDDZZ	5905-00-927-8507	2100-1588	28480	RESISTOR.VARIA8LE	EA	1
B-3	71	XDDZZ	5905-00-444-6291	0811-1746	28480	RESISTOR.FIXEO,WIRE WOUND	EA	1
B-3	72	XDDZZ	5905-00-891-4219	0757-0421	28480	RESISTOR,FIKED	EA	1
B-3	73	XDDZZ	5905-00-998-1794	0757-0428	28480	RESISTOR,FIXED	EA	1
B-3	74	XDDZZ		0761-0075	28480	RESISTOR,FIXEO,FILM	EA	1
B-3	75	XDDZZ	5905-00-920-5295	0698-3555	28480	RESISTOR,FIXED	EA	1
B-3	76	XDDZZ	5905-00-975-7140	0698-3554	28480	RESISTOR,FIKED.FILN	EA	1

Change 1 B-18

SECTION II

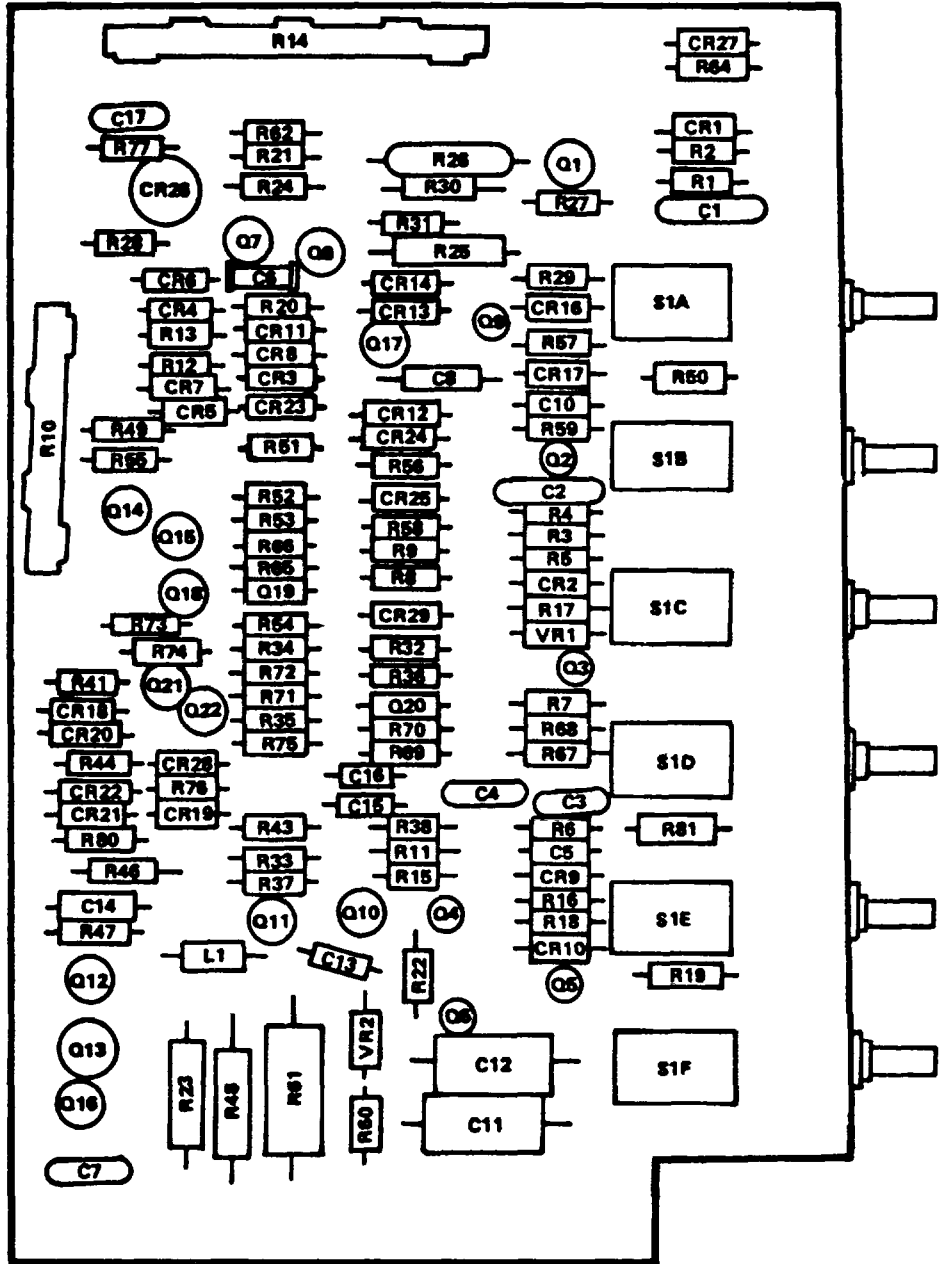
TM 11-6625-2781-14&P

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION USABLE ON CODE	U/M	QTY INC IN UNIT
B-3	77	XDDZZ	5905-00-726-6436	C83331	01121	RESISTOR, FIXEO	EA	1
B-3	78	XDDZZ	5905-00-917-6S89	0758-0054	28480	RESISTOR, FIXED	EA	1
B-3	79	XDDZZ	5905-00-410-7871	C81241	01121	RESISTOR, FIKED	EA	1
B-3	80	XDDZZ		0727-0845	28480	REISISTOR, FIXED.FILM	EA	2
B-3	81	XDOZZ	5905-00-444-6307	0721-0269	28480	RESISTORI, FIXEO	EA	1
B-3	82	XDDZZ	5905-00-802-4360	2100-0096	28480	RESISTOR, VARIABLE	EA	1
B-3	83	XDDZZ	5905-00-904-5689	CB1535	01121	RESISTOR, FIKED	EA	1
B-3	84	XDOZZ	5905-00-175-8651	2100-2108	28480	RESISTOR, VARIABLE	EA	1
B-3	85	XDDZZ	5905-00-549-5067	0698-6666	28480	RESISOR., FIXED	EA	1
B-3	86	XDDZZ	5905-00-269-2629	0757-0344	28480	RESISTOR, FIXED	EA	2
B-3	87	XDDZZ		0761-0004	28480	RESISTOR, FIXEOD.FILM	EA	1
B-3	88	XDDZZ	5905-00-931-9909	0757-0832	28480	RESISTOR, FIXED	EA	2
B-3	89	XDDZZ	5905-00-056-0448	0757-0768	28480	RIES11STOR, FIXED	EA	1
B-3	90	XDDZZ	5905-00-891-2811	0157-0454	28480	RESISTOR, FIXED	EA	1
B-3	91	XDDZZ	5905-00-171-5956	2100-0095	28480	RESISTOR, VARIABLE	EA	1
B-3	92	XDDZZ	5905-00-920-5289	0698-3553	28480	RESISTOR, FIKED	EA	8
B-3	93	XDDZZ	5905-00-056-0552	07T1-0452	28480	IIESISTDR, FIXEDO	EA	1
B-3	94	XDDZZ	5905-00-105-7764	RCR07G222JS	81349	RESISTOR, FIXED	EA	1
B-3	95	XDOZZ		0698-6Z86	28480	RESISTOR, FIXED COMPOSITION	EA	1
B-3	96	XDDZZ	5950-00-180-4179	00141-61102	28480	TRANSFORMER, ELEC	EA	1
B-3	97	XDDZZ	5960-00-167-7875	1940-0013	28480	ELECTIRONTUBE	EA	1
B-3	98	XDDZZ		2190-0014	28480	LAMP, GLOW	EA	3
B-3	99	XDDZZ	5961-00-089-1038	1902-3402	28480	SENICNONUCTOR	EA	1
B-3	100	XDDZZ	5961-00-904-0295	1902-0034	28480	SEMICONDUCTOR	EA	1
B-3	101	XDDZZ	5961-00-995-2310	1932-3104	28480	SEPICONDUCTOR	EA	1
B-3	102	XDDZZ	5961-00-928-3159	1902-3385	28480	SEMICONOUCTOR	EA	2
B-3	103	XDDZZ	5961-00-904-0297	1902-0064	28480	SEMICONOUCTOR	EA	11

Change 1 B-19

LEGEND

C1	1
C2	2
C3	3
C4	4
C5	5
C6	6
C7	7
C8	8
C10	9
C11,C12	10
C13	11
C14	12
C15,C16	13
C17	14
CR1 thru CR11,CR16	15
thru CR25,CR28,CR29	16
CR12,CR13,CR27	17
CR14	18
CR26	19
L1	20
Q1	21
Q2	22
Q3,Q4,Q5,Q8 thru Q12,	23
Q14 thru Q22	24
Q6,Q7,Q8	25
Q13	26
R1,R12,R64	27
R2,R33,R37,R51,R59	28
R3,R77,R80	29
R4,R60	30
R5,R15,R28	31
R6	32
R7,R65,R74	33
R8	34
R9	35
R10	36
R11	37
R13,R27	38
R14	39
R16	40
R17	41
R18,R24,R54	42
R19,R50	43
R20	44
R21,R47	45
R22	46
R23	47
R25	48
R26	49
R29	50
R30	51
R31	52
R32,R34,R35,R36	53
R38,R43,R49,R67,R69,	54
R72,R75	55
R41,R44	56
R46	57
R48	58
R52,R53,R56,R62,R65	59
R55	60
R57	61
R58	62
R61	63
R68,R71	64
R70,R73	65
R76	66
R81	67
S1	68
VR1	69
VR2	70



PREFIX ALL REFERENCE DESIGNATORS WITH A5

EL2LA009

Figure B-4. Circuit Card Assembly, Pulse.

SECTION II

TM 11-6625-2781-14&P

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION USABLE ON CODE	U/M	QTY INC IN UNIT
B-4	1	DDZZ	5910-00-497-7598	192P56292PTS	56289	CAPACITOR, FIXED	EA	1
B-4	2	XDDZZ	5910-00-009-3195	0160-2212	28480	CAPACITOR, FIXED	EA	1
B-4	3	XODZZ	5910-00-406-9675	0160-2307	28480	CAPACITOR, FIXED	EA	1
B-4	4	KDDZZ	5910-00-940-3184	0140-0207	28480	CAPACITOR, FIXED	EA	1
B-4	5	XDDZZ	5110-00-965-9728	192P10292PTS	56289	CAPACITOR, FIXED	FA	1
B-4	6	KDDZZ		301-OCOGCD0160J	72982	CAPACITOR, FIXED, CERAMIC DIELECTRIC	EA	1
B-4	7	DD2	5910-00-481-8507	0160-2146	28480	CAPACITOR, ELEC	EA	1
B-4	8	XODZZ		150226X9015820DYS	56289	CAPACITOR, FIXED, ELECTROLYTIC	EA	1
B-4	9	XDDZZ		150D474X90352DYS	56289	CAPACITOR, FIXED, ELECTROLYTIC	EA	1
B-4	10	XDDZZ	5910-00-917-0668	192P10492PTS	56289	CAPACITOR, FIXED	EA	2
B-4	11	XDDZZ		1500225X02042DYS	56289	CAPACITOR, FIXED, ELECTROLYTIC	EA	1
B-4	12	2DDZZ	5910-00-961-9591	192P47292PTS	56289	CAPACITOR, FIXED	EA	1
B-4	13	KDDZZ	5910-00-430-6016	0180-1735	28480	CAPACITOR, FIXED	EA	2
B-4	14	XDZ0Z	5961-00-797-4909	S0150-0052	28480	CAPACITOR, FIXED	EA	1
B-4	15	XDDZZ	5961-00-9Z8-7939	PFDGIOB	34148	SEMICONDUCTOR	EA	23
B-4	16	XDZZ	5961-00-821-0710	FD3369	34148	SEMICONDUCTOR	EA	3
B-4	17	XDD1Z1	5961-00-951-1505	Sr1358-9	04713	SEMICONDUCTOR	EA	1
B-4	18	XDDZZ		SR1846-1i2	04713	SEMICONDUCTOR	EA	1
B-4	19	KDDZZ	5950-00-431-3198	9100-1630	28480	COIL, ELECTRICAL	EA	1
B-4	20	XDOZZ	5961-00-904-254	1853-0020	28480	TRANSISTOR	EA	1
B-4	21	XDDZZ	5961-00-197-0252	4U4894	04713	TRANSISTOR	EA	1
B-4	22	XDDZZ	5961-00-137-4608	1854-0071	28480	TRANSISTOR	EA	16
B-4	23	XDDZZ		1854-0358	28480	TRANSISTOR	EA	3
B-4	24	XDDZZ	5961-00-942-4004	2N3440	80131	TRANSISTOR	EA	1
B-4	25	XDDZZ	5905-00-994-8480	0757-0473	28480	RESISTOR, FIXED	EA	3
B-4	26	XDZZ	5905-00-498-6044	C81051	01121	RESISTOR, FIXED	EA	2
B-4	27	DDZZ	5295-00-194-7894	C81021	01121	RESISTOR, FIXED	EA	1
B-4	28	XD0ZZ		CR1811	01121	RESISTOR, FIXED, COMPOSITION	EA	2
B-4	29	X5D0Z	5905-00-105-7764	RCR07C222J5	81349	RESISTOR, FIXED	EA	3
B-4	30	XDOZZ	5905-00-141-0717	C84731	01121	RESISTOR, FIXED	EA	1
B-4	31	XDOZZ	5905-00-498-6053	C82231	01121	RESISTOR, FIXED	EA	3
B-4	32	XDDZZ	5905-00-917-6341	0698-3155	28480	RESISTOR, FIXED	EA	1
B-4	33	KDOZZ	5905-00-858-9207	0757-0430	28480	RESISTOR, FIXED	EA	1
B-4	34	KDDZZ	5905-00-918-7479	2100-0424	28480	RESISTOR NETWORK	EA	1
B-4	35	XDD2	5905-00-709-6996	0757-0469	28480	RESISTOR, FIXED	EA	1
B-4	36	XODZZ	5905-00-056-0447	0757-0481	28480	RESISTOR, FIXED	EA	2
B-4	37	XDDZZ	5905-00-189-6699	2100-0983	28480	RESISTOR, VARIABLE	EA	1

SECTION II

TM 11-6625-2781-14&P

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6) DESCRIPTION	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	USABLE ON CODE	U/M	QTY INC IN UNIT
B-4	38	XDDZZ	5905-00-118-7906	0757-0466	28480	RESISTOR, FIXED	EA	1
B-4	39	XDDZZ	5905-00-498-6048	C81831	01121	RESISTOR, FIXED	EA	1
B-4	40	XDDZZ	5905-00-497-5613	C01061	01121	RESISTOR, FIXED	EA	3
B-4	41	XDDZZ	5905-00-990-6659	C84741	01121	RESISTOR, FIXED	EA	2
B-4	42	XDDZZ	5905-00-758-6915	0698-4009	28480	RESISTOR, FIXED	EA	1
B-4	43	XDDZZ	5905-00-857-0125	0757-0476	28480	RESISTOR, FIXFD	EA	2
B-4	44	XDDZZ	5905-00-877-5769	0757-0456	28480	RESISTOR, FIXED	EA	1
B-4	45	XDDZZ	5905-00-830-6715	0757-0128	28480	RESISTOT, FIXED	EA	1
B-4	46	XDDZZ		0757-0850	28480	RESISTOR, FIXED, FILM	EA	1
B-4	47	XDDZZ	5905-00-930-7956	0757-0367	28480	RESISTOR, FIXED	EA	1
B-4	48	XDDZZ	5905-00-105-7768	RCR07G56LJS	81349	RESISTOR, FIXED	EA	1
B-4	49	XDDZZ		RCR07G6823JS	81349	RESISTOR, FIXED, FILM	EA	1
B-4	50	XDDZZ	5905-00-407-2152	C822411	01121	RESISTOR, FIXED	EA	1
B-4	51	XDDZZ	5905-00-755-2613	C81031	01121	RESISTOR, FIKED	EA	4
B-4	52	XDDZZ	5905-00-809-8029	C84721	0112L	RESISTOR, FIXED	EA	7
B-4	53	XDDZZ	5905-00-560-0426	0757-0480	28480	RESISTOR, FIXED	EA	2
B-4	54	XDDZZ		0757-0791	28480	RESISTOR, FIXED, FILM	EA	1
B-4	55	XDDZZ	5905-00-104-5819	0761-0083	28480	RESISTOR, FIXED	EA	1
B-4	56	XDDZZ	5905-00-110-0388	C81041	01121	RESISTOR, FIXED	EA	5
B-4	57	XDDZZ	5905-00-119-3504	RCR07G273JS	81349	RESISTOR, FIXED	EA	1
B-4	58	XDDZZ	5905-00-721-0131	C82211	01121	RESISTOR, FIXED	EA	1
B-4	59	XDDZZ		C88231	01121	RESISTOR, FIXED, COMPOSITION	EA	1
B-4	60	XDDZZ	5905-00-221-8309	0698-3647	28480	RESISTOR, FIXED	EA	1
B-4	61	XDDZZ	5905-00-119-3505	RCR07G683JS	81349	RESISTOR, FIXED	EA	2
B-4	62	XDDZZ	5905-00-126-6683	C8332	01121	RESISTOR, FIKED	EA	2
B-R	63	XDDZZ	5005-00-111-1684	RCR07G155JS	81349	RESISTOR, FIKED	EA	1
B-4	64	XDDZZ	5905-00-913-9415	CR5635	01121	RESISTOR, FIXFD	EA	1
B-4	65	XDDZZ	5961-00-995-2310	1902-3104	28480	SEMICDNOUCTOR	EA	1
B-4	66	XDDZZ	5961-00-459-8636	1902-0597	28480	SEMICONDUCTOR	EA	1
Change 1 B-22/(B-23 Blank)								

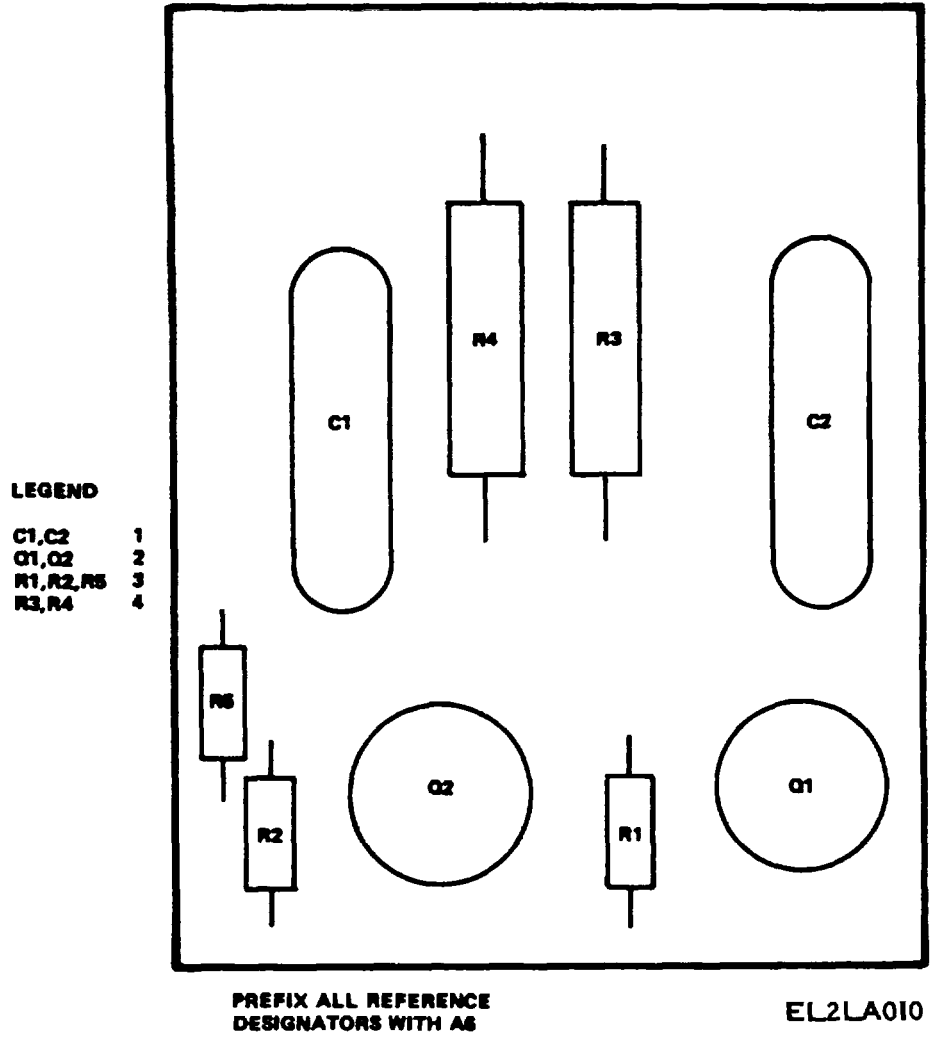


Figure B-5. Circuit Card Assembly, Horizontal Driver.

Change 1 B-24

SECTION II

TM 11-6625-2781-14&P

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION USABLE ON CODE	U/M	QTY INC IN UNIT
						GROUP 04 CIRCUIT CARD ASSEMBLY, HORIZONTAL DRIVER, A6		
B-5	1	XDDZZ	5910-00-797-4909	0150-0052	28480	CAPACITOR, FIXED	EA	2
B-5	2	XDDZZ	5961-00-111-0455	1853-0038	28480	TRANSISTOR	EA	2
B-5	3	XDDZZ	5905-00-981-7529	0757-0401	Z8480	RESISTOR, FIXED	EA	3
B-5	4	XDDZZ		0757-0850	Z8480	RESISTOR, FIXED, FILM	EA	2

SECTION IV

TM 11-6625-2781-14&P

NATIONAL STOCK NUMBER AND PART NUMBER INDEX

NOTE: LATEST NATIONAL STOCK NUMBER AND PART NUMBER ASSIGNMENTS ARE INCLUDED AT END OF INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
5930-00-008-7043	B-4	65	5905-00-944-5081	B-3	54
5905-00-009-1312	B-1	38	5905-00-496-3412	B-1	50
5935-00-009-1317	B-1	23	5905-00-497-5613	B-4	40
5910-00-009-3195	B-4	2	5910-00-497-7598	B-4	1
5920-00-010-6652	B-3	25	5905-00-498-6044	B-4	26
5910-00-023-2352	B-1	16	5905-00-498-6048	B-4	39
5930-00-034-1295	B-1	8	5905-00-498-6053	B-4	31
5905-00-056-0426	B-3	69	5920-00-556-9946	B-3	22
5905-00-056-0426	B-4	53	6625-00-613-8604	B-1	27
5905-00-056-0446	B-3	43	5905-00-709-6996	B-4	35
5905-00-056-0447	B-4	36	5905-00-721-0131	B-4	58
5905-00-056-0448	B-3	89	5905-00-726-6436	B-3	77
5905-00-056-0552	B-3	93	5935-00-727-2247	B-1	25
5961-00-060-8638	B-3	15	5905-00-752-7345	B-3	57
5910-00-067-8305	B-3	6	5905-00-755-0749	B-4	9
5950-00-073-9426	B-3	29	5905-00-755-2613	B-4	51
5910-00-007-3521	B-1	29	5905-00-758-6975	B-4	42
5961-00-089-1038	B-3	99	5905-00-711-5956	B-3	91
5935-00-069-1566	B-1	18	5950-00-190-4110	B-1	10
5935-00-089-7482	B-1	26	5910-00-197-4909	B-2	1
5935-00-089-7483	B-1	2	5910-00-797-4909	B-3	3
5905-00-102-5294	B-3	46	5910-00-797-4909	B-4	14
5905-00-104-5819	B-4	55	5910-00-797-4909	B-5	1
5905-00-104-8330	B-1	52	5935-00-804-5144	B-1	40
5961-00-105-6622	B-3	19	5905-00-809-8029	B-4	52
5905-00-105-7764	B-3	94	5961-00-821-0710	B-4	16
5905-00-105-7764	B-4	29	5905-00-830-6715	B-4	45
5905-00-105-7768	B-4	48	5905-00-657-0125	B-3	43
5905-00-110-0388	B-4	56	5905-00-858-6792	B-3	62
5961-00-111-0455	B-5	7	5905-00-858-9207	B-4	33
5905-00-111-1684	B-4	63	5961-00-866-48L0	B-3	31
5905-00-118-7906	B-4	38	5905-00-877-5769	B-4	44
5905-00-119-3504	B-4	57	5905-00-882-4360	B-3	82
5905-00-119-3505	B-4	61	5905-00-891-2811	B-3	90
5905-00-126-6683	B-4	62	5905-00-891-4219	B-3	72
5905-00-137-0999	B-3	41	5961-00-802-8706	B-3	37
5961-00-137-4608	B-3	35	5961-00-902-3436	B-1	21
5961-00-137-4608	B-4	22	5961-00-904-0295	B-3	100
5905-00-141-0596	B-3	67	5961-00-904-0296	B-3	13
5905-00-141-0717	B-4	30	5961-00-904-0297	B-3	103
5905-00-141-0744	B-3	59	5961-00-904-2540	B-4	20
5905-00-141-1168	B-3	66	5905-00-904-4412	B-3	50
5960-00-167-7875	B-3	97	5905-00-904-5689	B-3	83
5905-00-175-8651	B-3	84	5905-00-908-7238	B-1	1
5940-00-177-9847	B-1	51	5905-00-908-7242	B-1	4
5953-00-180-4179	B-3	96	5905-00-909-3427	B-3	65
5905-00-180-4183	B-1	6	5950-00-910-9938	B-3	26
5905-00-180-4184	B-1	5	5960-00-911-9275	B-3	18
5905-00-189-6699	B-4	37	5905-00-913-9415	B-4	64
5905-00-192-3987	B-3	42	5905-00-917-0575	B-3	68
5905-00-193-4294	B-3	49	5961-00-917-0660	B-3	33
5905-00-194-7894	B-3	45	5910-00-917-0668	B-3	1
5905-00-194-7894	B-4	27	5910-00-917-0668	B-4	10
5961-00-197-0252	B-4	21	5905-00-917-5670	B-3	44
5905-00-221-8309	B-4	60	5905-00-917-6889	B-3	78
5961-00-221-6882	B-1	55	5961-00-917-9637	B-3	17
5935-00-233-6728	B-1	37	5905-00-918-7479	B-4	34
5905-00-269-2629	B-3	86	5905-00-920-5289	B-3	92
5935-00-215-7823	B-1	43	5905-00-920-5295	B-3	75
5999-00-219-7999	B-1	57	5905-00-920-5301	B-3	51
5120-00-284-7466	B-1	46	5961-00-920-5302	B-3	20
5920-00-84-9494	B-3	23	5930-00-925-6455	B-1	59
5999-00-333-9620	B-3	30	5910-00-925-6531	B-1	14
5910-00-406-9675	B-4	3	5910-00-925-6532	B-1	13
5905-00-407-2152	B-4	50	5905-00-927-2878	B-3	64
5905-00-410-7872	B-3	79	5905-00-927-2681	B-3	63
5961-00-410-8882	B-3	39	5910-00-927-7547	B-1	28
5961-00-424-9411	B-1	20	5905-00-927-8507	B-3	70
5910-00-430-6016	B-4	13	5905-00-928-1025	B-3	52
5950-00-431-3198	B-4	19	5961-00-928-3159	B-3	102
6625-00-439-1086	B-1	54	5961-00-928-7939	B-3	12
5910-00-444-0589	B-3	10	5961-00-928-7939	B-4	15
5905-00-444-L291	B-3	71	5905-00-929-2528	B-3	61
5905-00-444-6307	B-3	81	5905-00-929-7774	B-3	58
6625-00-450-7243	B-1	48	5905-00-930-7956	B-3	53
6625-00-452-9249	B-1	49	5905-00-930-7956	B-4	47
5961-00-459-8636	B-4	67	5935-00-930-8228	B-1	17
5010-00-481-6507	B-4	7	5910-00-931-0329	B-3	9
5930-00-463-4003	B-3	27	5961-00-931-0372	B-3	32
5905-00-494-5067	B-3	85	5905-00-931-9908	B-3	47

SECTION IV

TM 11-6625-2781-14&P

NATIONAL STOCK NUMBER AND PART NUMBER INDEX

STOCK NUMBER	FIGURE NO.	ITEM NO.	STOCK NUMBER	FIGURE	ITEM NO.
5905-00-937-9909	B-3	88	5905-00-981-7529	B-5	3
5940-00-935-3515	B-7	3	5910-00-984-7592	B-1	15
5961-00-937-3768	B-3	34	5910-00-985-1261	B-3	8
5910-00-940-3184	B-4	4	5961-00-985-9073	B-3	36
5905-00-942-3533	B-1	56	5961-00-987-4700	B-3	40
5961-00-942-4004	B-4	24	5999-00-988-7308	B-1	24
5950-00-943-6630	B-3	28	5961-00-989-3608	B-3	38
5961-00-950-0537	B-3	21	5905-00-990-6659	B-4	41
5961-00-951-1505	B-2	2	5905-00-994-6460	B-4	25
5961-00-951-1505	B-4	11	5935-00-995-0079	B-1	30
5961-00-954-9182	B-3	14	5999-00-995-1392	B-1	42
5910-00-961-9591	B-3	4	5961-00-995-2310	B-3	101
5910-00-961-1591	B-4	12	5961-00-995-2310	B-4	66
5910-00-965-9728	B-4	5	5905-00-998-1793	B-3	55
5905-00-975-7140	B-3	76	5905-00-998-1794	B-3	73
5905-00-916-3418	B-4	32	5905-00-998-1800	B-3	56
5905-00-981-7529	B-3	48	5950-01-037-6247	B-1	22

Part Number	FSCM	Fig. No.	Item. No.	Part Number	FSCM	Fig. No.	Item No.
CB1015	01121	B-3	46	00141-61627	28480	B-1	31
CB1021	01121	B-3	45	00141-61631	28480	B-1	36
CB1021	01121	B-4	27	00141-66502	28480	B-1	21
CB1031	01121	B-4	51	00141-66515	28480	B-1	54
CB1041	01121	B-4	56	00141-66519	28480	B-11	49
CB1051	01121	B-4	26	00141-66520	28480	B-1	53
CB1061	01121	B-4	40	0140-0207	28480	B-4	4
CB1241	01121	B-3	19	0150-0052	28480	B-2	1
CB1535	01121	B-3	83	0153-0052	28480	B-3	3
CB1811	01121	B-4	28	0150-0052	28480	B-4	14
CB1831	01121	B-4	39	0150-0052	28480	B-5	1
CB2211	01121	B-4	58	O160-0151	28480	B-3	8
CB2231	01121	B-4	31	O160-0407	28480	B-3	10
CB2241	01121	B-4	50	0160-0907	28480	B-3	9
CB3321	01121	B-4	62	0160-2146	28480	B-4	7
CB3331	01121	B-3	17	0L60-2212	28480	B-4	2
CB4771	01121	B-4	52	0160-2307	28480	B-4	3
CB4173	01121	B-4	30	0180-0012	28480	B-1	29
CB4741	01121	B-4	41	0180-0046	28480	B-1	15
CB5635	01121	B-4	64	0180-0093	28480	B-1	28
CB8231	01121	B-4	55	0180-0138	28480	B-3	6
DCM17W5P	71785	B-1	23	0180-0154	28480	B-1	16
DCM17W5S	71468	B-1	30	0180-0213	28480	B-1	14
DCM8W8P	71468	B-1	25	0180-0214	28480	B-1	13
DCM8W8S	71468	B-1	43	0180-1735	28480	B-4	13
DM53740-500-1	71468	B-1	24	0360-0015	28480	B-1	51
DM53742-5001	71468	B-1	42	0490-0189	28480	B-3	27
EAC300	82389	B-1	31	0490-0191	28480	B-3	26
EB1041	01121	B-3	42	0690-3155	28480	B-4	32
FB5631	01121	B-3	57	0698-3553	28480	B-3	92
FDG1088	34148	B-3	12	0698-3554	28480	B-3	76
FDG1088	34148	B-4	15	0698-3555	28480	B-3	75
FD2387	07263	B-3	16	0698-3647	28480	B-4	60
FD3369	34148	B-4	16	0698-4009	28480	B-4	42
MDX4	71400	B-1	46	0698-6286	28480	B-3	95
HU4894	04713	B-4	21	0698-6666	28480	B-3	85
RCR07G155JS	81349	B-4	63	0727-0269	28480	B-3	81
RCR07G2Z2JS	81349	B-3	94	0727-0431	28480	B-3	65
RCR07G222JS	81349	B-4	2Y	0727-0845	28480	B-3	80
RCR07G273JS	81349	B-4	57	0757-0044	28480	B-3	47
RCR07GS61JS	81349	B-4	48	0757-0128	28480	B-4	45
RCP07G562JS	81349	B-3	59	0751-0190	28480	B-3	68
RCR07G683JS	81349	B-4	61	0757-0273	28480	B-3	49
RCR07G823JS	81349	B-4	49	0757-0344	28480	B-3	86

NATIONAL STOCK NUMBER AND PART NUMBER INDEX

Part Number	FSCM	Fig. No.	Item No.	Part Number	FSCM	Fig. No.	Item No.
RCR20G222JS	81349	B-3	66	0757-0361	28480	B-3	53
RCR20G333J5	81349	B-1	52	0757-0367	28480	B-4	47
RCR20G473JS	81349	B-3	67	0757-0370	28480	B-3	51
SR1358-8	04713	B-3	15	0757-0388	28480	B-3	61
SR1358-9	04713	B-2	2	0757-0399	28480	B-3	58
SR135--9	04713	B-4	17	0757-0401	28480	B-3	46
SR1846-12	04713	B-4	18	0757-0401	28480	B-5	3
WS2107FL570	92702	B-1	19	0757-0421	28480	B-3	72
00141-61101	28480	B-1	48	0757-0428	28480	B-3	73
00141-61102	28480	B-3	96	0757-0430	28480	B-4	33
00141-61622	28480	B-1	33	0757-0434	28480	B-3	55
00141-61623	28480	B-1	44	0757-0436	28480	B-3	62
00141-61624	28480	B-1	34	0757-0452	28480	B-3	93
00141-61625	28480	B-1	35	0757-0454	26480	B-3	90
0757-0456	28480	B-4	44	1902-0064	28480	B-3	103
0757-0465	28480	B-3	50	1902-0597	28480	B-4	67
0157-0466	28480	B-4	38	1902-3104	28480	B-3	101
0751-0469	28480	B-4	35	1902-3104	28480	B-4	66
0757-0473	28480	B-4	25	1902-3385	28480	B-3	102
0757-0476	28480	B-4	43	1902-3402	28480	B-3	99
0757-0480	28480	B-3	69	1910-0016	28480	B-3	14
0757-0480	28480	B-4	53	1912-0006	28480	B-3	17
0757-0481	28480	B-4	36	192P10292PTS	56289	B-4	5
0757-0764	284d0	B-3	60	192P10492PTS	56289	B-3	1
0757-0768	28480	B-3	89	192P10492PTS	56289	B-4	10
0757-0772	28480	B-3	64	192P47292PTS	56289	B-3	4
0757-0791	28480	B-4	54	192P47292PTS	56289	B-4	12
0757-0e39	28480	B-3	68	192P56292PTS	56289	B-4	1
0757-0846	28480	B-3	63	1940-0013	28480	B-3	97
0757-0850	28480	B-4	46	2N3053	80131	B-3	36
0757-0850	28480	B-5	4	2N3417	80131	B-3	34
0758-0054	28480	B-3	78	2N3440	80131	B-4	24
0761-0004	28480	B-3	87	2N3904	80131	B-3	37
0761-0006	28480	B-3	56	2N3906	80131	B-3	32
0761-0007	28480	B-3	44	2N4918	04713	B-3	39
0761-0075	28480	B-3	74	2N708	80131	B-3	31
0761-0083	28480	B-4	55	2N964	80131	B-3	38
0164-0033	28480	B-3	43	2100-0015	28480	B-1	9
0166-0033	28480	B-3	54	2100-0095	28480	B-3	91
0811-1746	28480	B-3	71	2100-0096	28480	B-3	82
0811-2033	28480	B-1	50	2100-0374	28480	B-1	4
0811-2994	28480	B-1	38	2100-0424	28480	B-4	34
0815-0031	28480	B-1	56	2100-0445	28480	B-1	1
1N3209	04713	B-1	55	2100-0983	28480	B-4	37
104002	15915	B-1	51	2100-1588	26480	B-3	70
11A1013	82329	B-1	32	2100-1589	28480	B-3	52
1200-0031	2840d	B-1	18	2100-2108	28480	B-3	84
1200-0050	28480	B-1	17	2100-2897	28480	B-1	6
1251-0054	28480	B-1	26	2100-2962	28480	B-1	5
1450-0419	28480	B-1	7	2110-0067	28480	B-3	22
150D105X0050A2DYS	56289	B-3	7	2110-0289	28480	B-3	30
150D225X0020A2DYS	56289	B-4	11	2110-0303	28480	B-1	46
150D226X001582DYS	56289	B-4	8	2190-0014	28480	B-3	98
150D474X9015B2DYS	56289	B-4	9	221-	83330	B-1	2
150D475X9035B2DYS	56289	B-3	2	301-000C0G0160J	72982	B-4	6
150D476X9035S2DYS	56289	B-3	5	31-221-1020	02660	B-1	40
1510-0038	28480	B-1	3	3101-0033	28480	B-1	8
1537-76	71895	B-3	29	3131-1259	28480	B-4	65
1853-0020	28480	B-4	20	3103-0009	28480	B-1	59
1853-0034	28480	B-3	40	312-500	75915	B-3	24
1853-0038	28480	B-5	2	312-750	75915	B-3	23
1853-0252	28480	B-1	20	312-003	75915	B-3	25
1854-0022	28480	B-3	33	5020-8122	28480	B-1	45
1854-0071	28480	B-3	35	5060-0435	28480	B-1	10
1854-0071	28480	B-4	22	5060-3521	28430	B-1	47
1654-0294	28480	B-1	21	5060-1686	28480	B-1	12

Part Number	FSCM	Fig. No.	Item. No.	Part Number	FSCM	Fig. No.	Item No.
1854-0358	28480	B-4	23	5083-2587	26480	B-1	11
1855-0057	28480	B-3	41	628-13	06540	B-1	39
1901-0029	28480	B-3	21	8120-1538	28480	B-1	41
1901-0049	28480	B-3	18	8131-050-651-104Z	72982	B-3	11
1901-0096	28480	B-3	13	9100-1630	28480	B-4	19
1901-0341	28480	B-3	19	9100-3285	28460	B-1	22
1901-0436	2d480	B-3	20	9140-0171	28480	B-3	28
1902-0034	28480	B-3	100				

LATEST NATIONAL STOCK NUMBER ASSIGMENTS

LATEST PART NUMBER ASSIGNMENT

STOCK NUMBER	FIGURE NO.	ITEM NO.
6625-00-422-3571	B-1	31
6625-00-435-4181	B-1	47
6625-00-439-1082	B-1	53
6210-00-451-6217	B-1	7
6625-01-027-3660	B-1	45
6150-01-027-5874	B-1	41
5920-01-033-4890	B-1	46
5960-01-047-9224	B-1	11

	FIGURE NO.	ITEM NO.
0960-0443	28480	B-1
		58

Change 1 B-28

APPENDIX C MAINTENANCE ALLOCATION

Section I. INTRODUCTION

C-1. General

This appendix provides a summary of the maintenance operations for Spectrum Analyzer IP-1216(P)/GR (Hewlett-Packard Model 141T). It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

C-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipment's used in precision measurement. Consists of comparisons of two

instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

i. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

C-3. Column Entries

a. *Column 1, Group Number.* Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. *Column 2, Component/Assembly.* Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. *Column 3, Maintenance Functions.* Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. *Column 4, Maintenance Category.* Column 4 specifies, by the listing of a "worktime" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "worktime" figures will be shown for each category. The number of task-hours specified by the "worktime" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/ quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C - Operator/Crew
O - Organizational
F - Direct Support
H - General Support
D - Depot

e. *Column 5, Tools and Equipment.* Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. *Column 6, Remarks.* (Not applicable).

C-4. Tool and Test Equipment Requirements

a. *Tool or Test Equipment Reference Code.* The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

i. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. *Nomenclature.* This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. *National/NATO Stock Number.* This column lists the National/NATO stock number of the specific tool or test equipment.

e. *Tool Number.* this column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

C-5. Remarks (Sect. IV)

(Not applicable).

SECTION II MAINTENANCE ALLOCATION CHART
FOR

SPECTRUM ANALYZER IP-1216(P)/GR
(HEWLETT-PACKARD MODEL 141T)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS	
			UNIT		INTERMEDIATE		DEPOT			
			C	O	F	H	D			
00	SPECTM ANALYZER P-1216(P)/GR (RLET-PACKARD MODEL 141T) (NSN 662s-00-424-4370)	Inspect Test Service Adjust Repair Overhaul	0.5					2.0	7 1 thru 7 1 thru 7 1 thru 7 1 thru 7 1 thru 7	
01	CIRCUIT CARD ASSEMBLY DIODE, AI	Inspect Replace Repair						0.5	7 7 1 thru 7	
02	CIRCIT CARD ASSEWBLY POWER SUPPLY, A2	Inspect Replace Repair						1.0	7 7 1 thru 7	
03	CIRCUNIT CARD ASSEMBLY, PULSE, A5	Inspect Replace Repair						0.5	7 7 1 thru 7	
04	CIRCUIT CARD ASSEMBLY, HORIZORTAL DRIVER, A6	Inspect Replace Repair						0.5	7 7 1 thru 7	

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR AN/GRC-240

(1) TOOL OR TEST EQUIPMENT REF CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL/NATO STOCK NUMBER	(5) TOOL NUMBER
2	H, D	VOLTMEE, ELECTRONIC AN/UM-15	6625-00-973-3986	
3	H. D	GENERATOR, SIGNAL AN/URM-127	6625-00-783-5965	
4	H, D	OSCILLOSCOPE, AN/USM-281C	6625-00-106-9622	
5	H, D	TRANSISTOR TEST SET TS-1836C/U	6625-00-159-2263	
6	H, D	WILTIMETER ME-26D/U	6625-00-913-9781	
7	C, H, D	TOOLS AND TEST EQUIPMNT USED BY THE TECHNICIAN FOR ASSIGNED MISSION.		

SECTION III		Change 1 C-4	TM 11-6625-2781-14&P	
TOOL AND TEST EQUIPMENT REQUIREMENTS FOR SPECTRUM ANALYZER IP-1216(P)/GR				

(1) TOOL OR TEST EQUIPMENT REF CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL/NATO STOCK NUMBER	(5) TOOL NUMBER
1.	H,D	TEST SET, ELECTRICAL METER TS 682		
2.	H,D	VOLTMETER, ELECTRONIC AN/UP-145	6625-00-973-3986	
3.	H,D	GEERATOR, SIGNAL AN/URM-127	6625-00-783-5965	
4.	H,D	OSCILLOSCOPR, AN/USM-281C	6625-00-106-9622	
5.	H,D	TRANSISTOR TEST SET - TS 1836 C/u	6625-00-159-2263	
6.	R,D	MULTIMRTER - ME 26 D/U	6625-00-913-9781	
7.	C,H,D	TOOLS AND TEST EQUIPMET USED BY THE REPAIRMA FOR HIS/HER ASSIGNED MISSION.		
C-5				

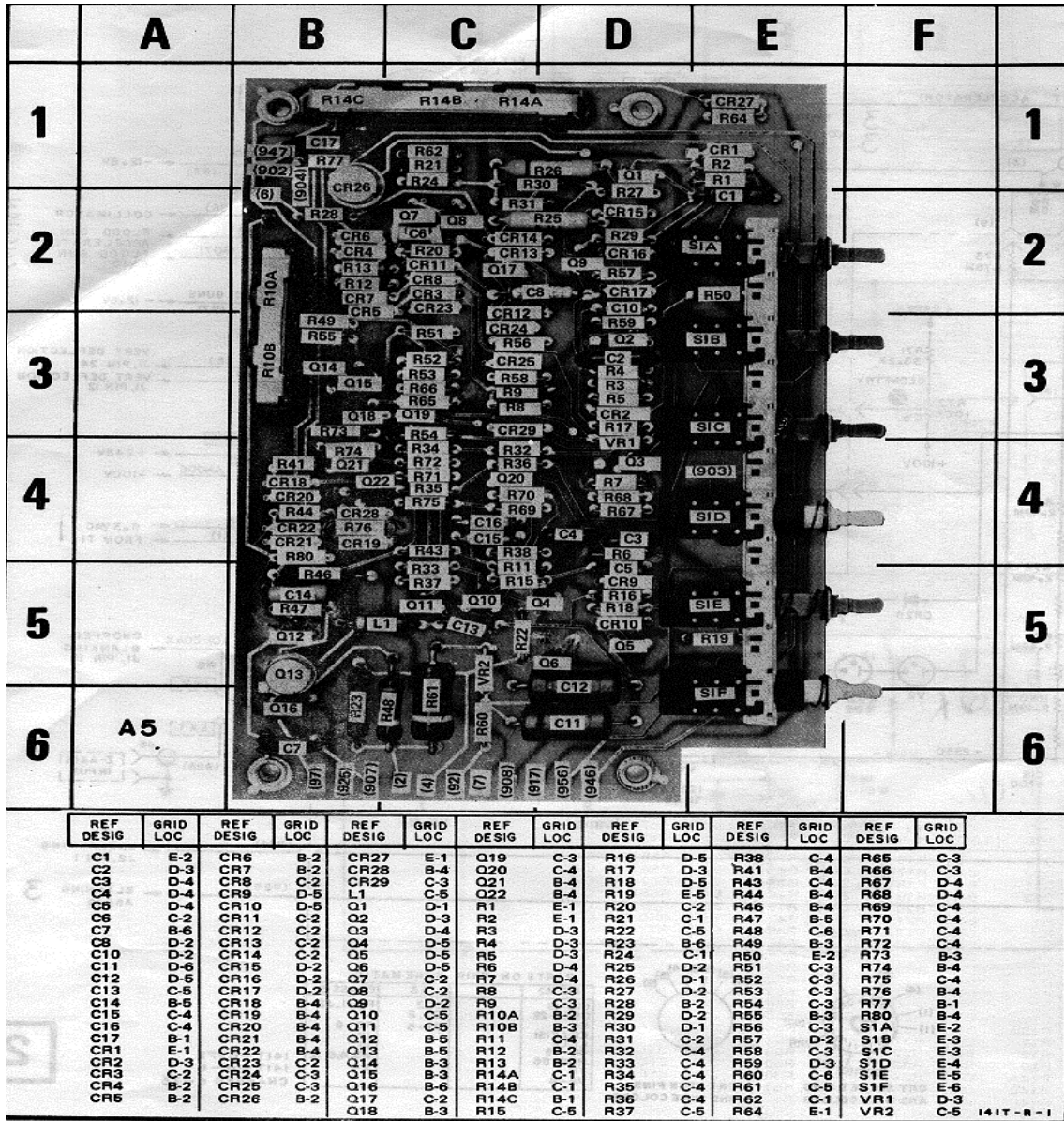


Figure 7-1. Component Identification Pulse Circuit A5

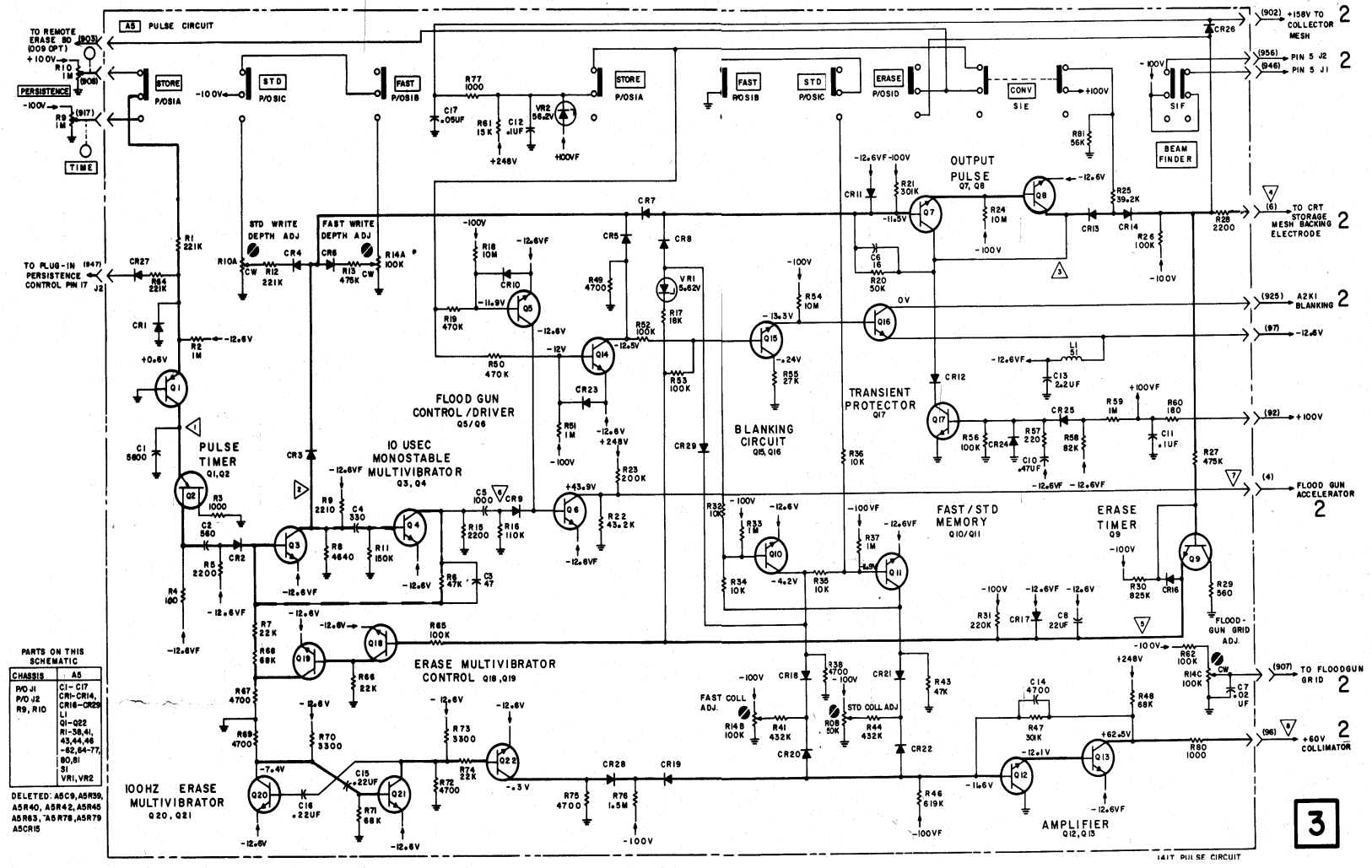


Figure 7-2. Pulse Circuit Schematic

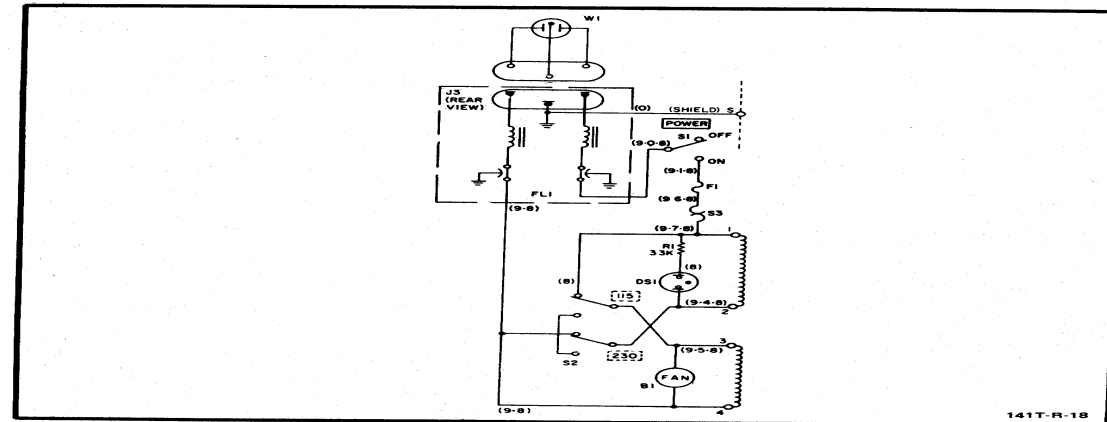


Figure 7-3. Line Voltage Schematic

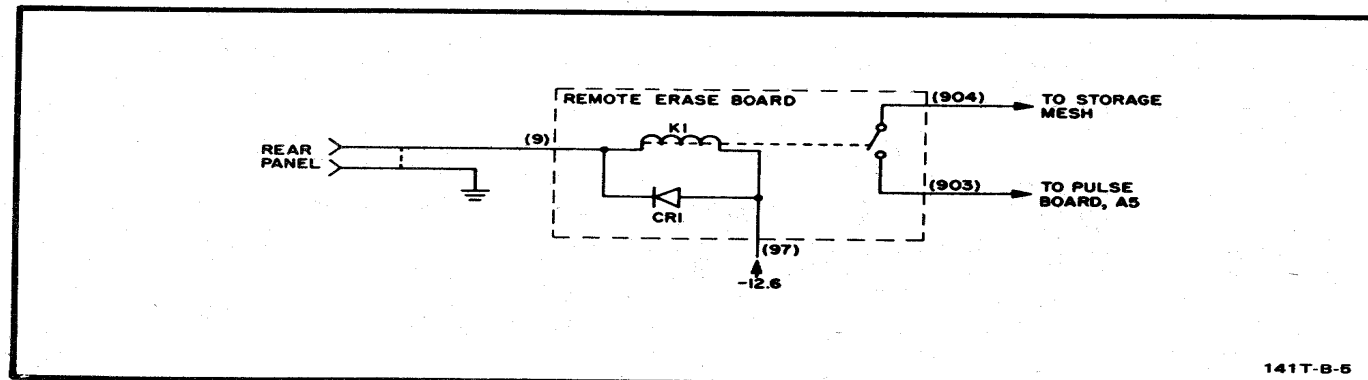


Figure 7-4. Option 009 Schematic Diagram

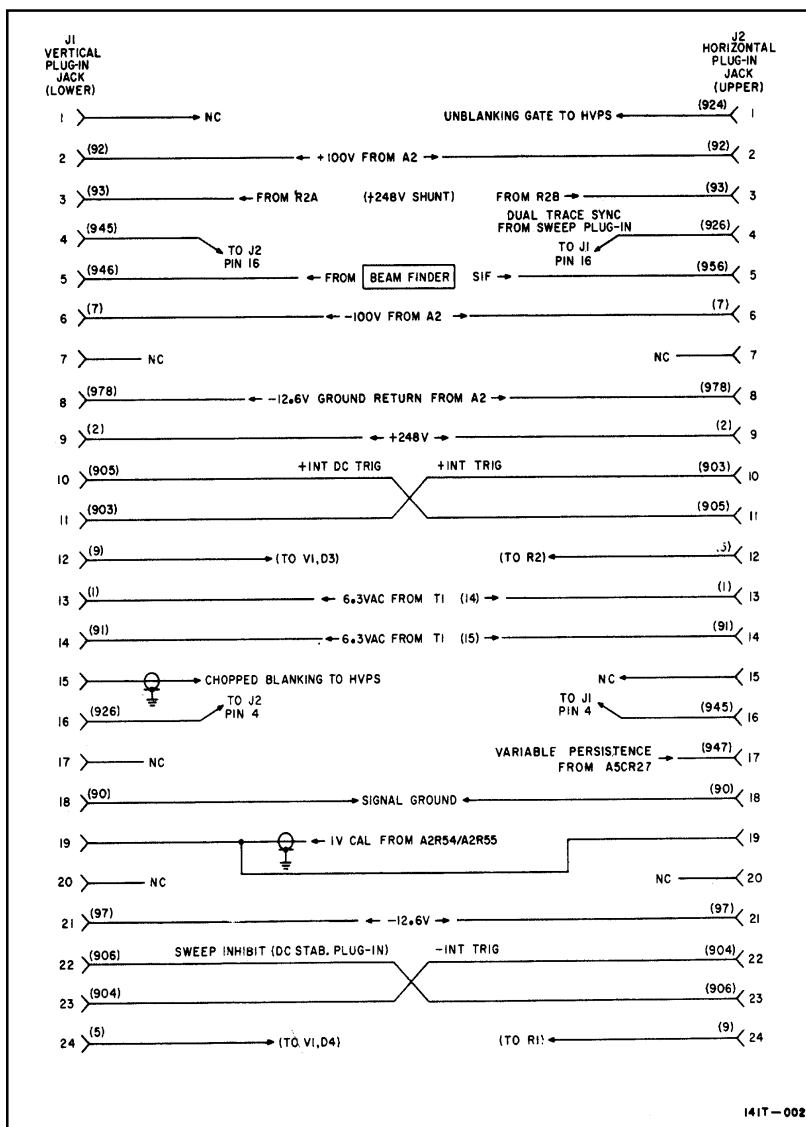


Figure 8-6. Plug-in Jack Connections

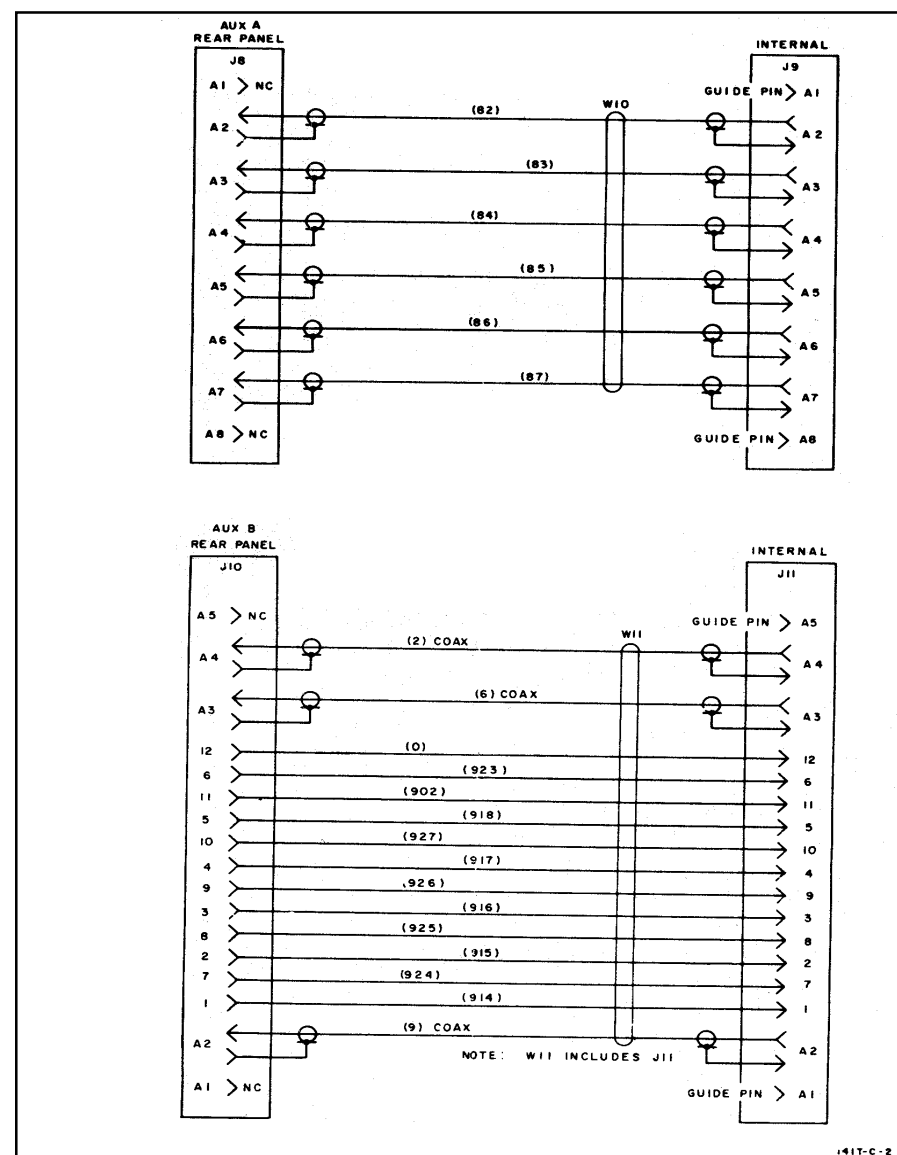
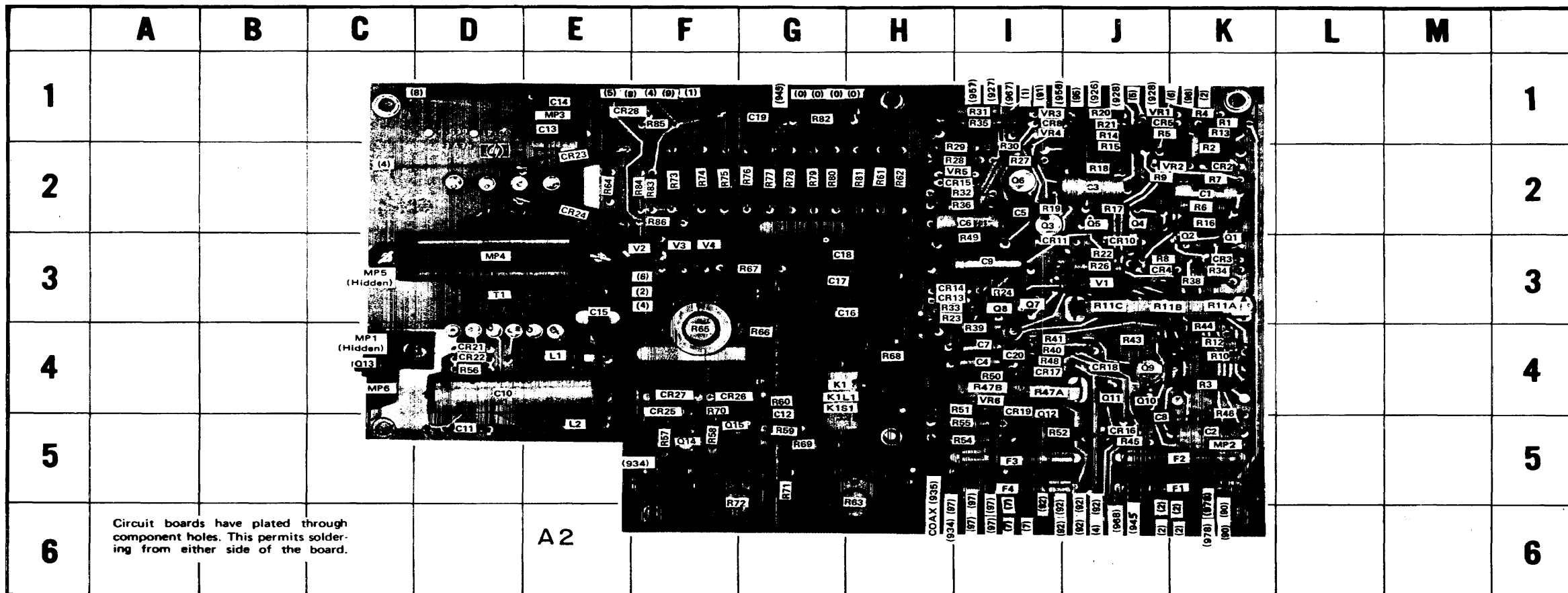


Figure 8-7. Auxiliary A and Auxiliary B Wiring Diagram



Circuit boards have plated through component holes. This permits soldering from either side of the board.

A2

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	
C1	K-2	C17	G-3	CR18	J-4	K1L1	G-4	Q8	I-2	R6	K-2	R19	I-2	R35	I-1	R51	I-4	R67	G-3	R83	F-2	
C2	K-5	C18	G-3	CR19	I-4	K1S1	G-4	Q7	I-3	R7	K-2	R20	J-1	R36	I-2	R52	I-6	R68	H-4	R84	F-2	
C3	J-2	C19	G-1	CR21	D-4	L1	E-4	Q8	I-3	R8	J-3	R21	J-1	R38	K-3	R54	I-5	R70	F-4	R85	F-1	
C4	I-4	C20	I-4	CR22	D-4	L2	E-5	Q9	J-4	R9	J-2	R22	J-3	R39	I-4	R55	I-5	R71	G-5	R86	F-2	
C5	I-2	CR2	K-2	CR23	E-2	MP1	C-4	Q10	J-4	R10	K-4	R23	I-3	R40	I-4	R56	D-4	R72	F-5	T1	D-3	
C6	I-2	CR3	K-3	CR24	E-2	MP2	K-5	Q11	J-4	R11A	K-3	R24	I-3	R41	I-4	R57	F-5	R73	F-2	V1	J-3	
C7	I-4	CR4	J-3	CR25	F-4	MP3	E-1	Q12	I-4	R11B	K-3	R26	J-3	R43	J-4	R58	F-5	R74	F-2	V2	F-3	
C8	J-5	CR5	J-1	CR26	F-4	MP4	D-3	Q13	C-4	R11C	J-3	R27	I-2	R44	K-4	R59	G-5	R75	F-2	V3	F-3	
C9	I-3	CR8	I-1	CR27	F-4	MP5	C-3	Q14	F-5	R12	K-4	R28	I-2	R45	J-5	R60	G-4	R76	G-3	V4	F-3	
C10	D-4	CR10	J-3	CR28	E-1	MP6	C-4	Q15	F-5	R13	K-1	R29	I-2	R46	K-4	R61	H-2	R77	G-2	VR1	J-1	
C11	D-5	CR11	I-3	F1	K-5	Q1	K-3	R1	K-1	R14	J-1	R30	I-2	R47A	E-4	R62	H-2	R78	G-2	VR2	K-2	
C12	G-5	CR13	I-3	F2	K-5	Q2	K-3	R2	K-2	R15	J-2	R31	I-1	R47B	E-4	R63	H-6	R79	G-2	VR3	I-1	
C13	E-1	CR14	I-3	F3	I-5	Q3	I-2	R3	K-4	R16	K-2	R32	I-2	R48	I-4	R64	E-2	R80	G-2	VR4	I-1	
C14	E-1	CR15	I-2	F4	I-5	Q4	J-2	R4	K-1	R17	J-2	R33	I-3	R49	I-3	R65	F-4	R81	H-2	VR5	I-2	
C15	E-3	CR16	J-5	K1	G-4	Q5	J-2	R5	J-1	R18	J-2	R34	K-4	R50	I-4	R66	G-4	R82	G-1	VR6	I-4	
C16	G-3	CR17	I-4																			

141T-B-1A
CHANGED 6-75

Figure 8-8. Component Identification, Power Supply A2

Model 141T

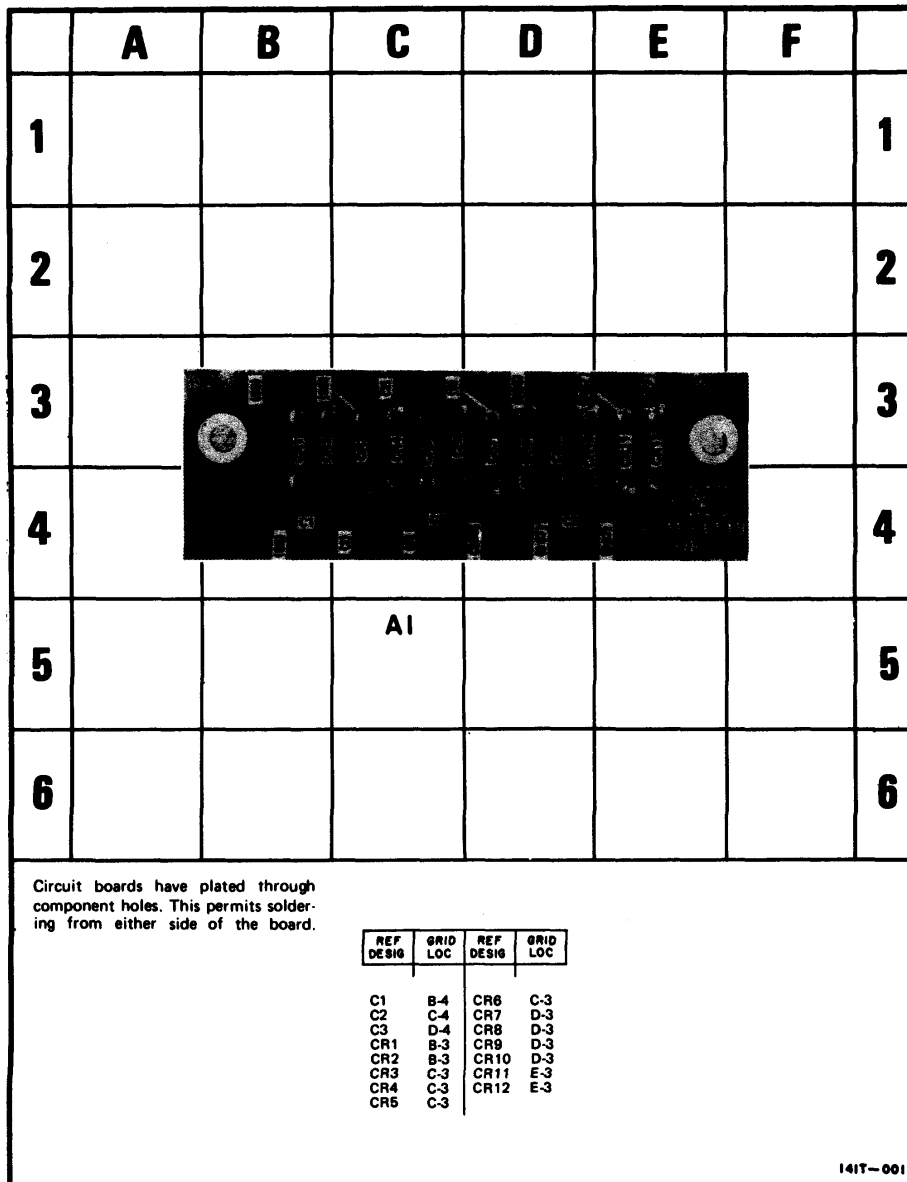
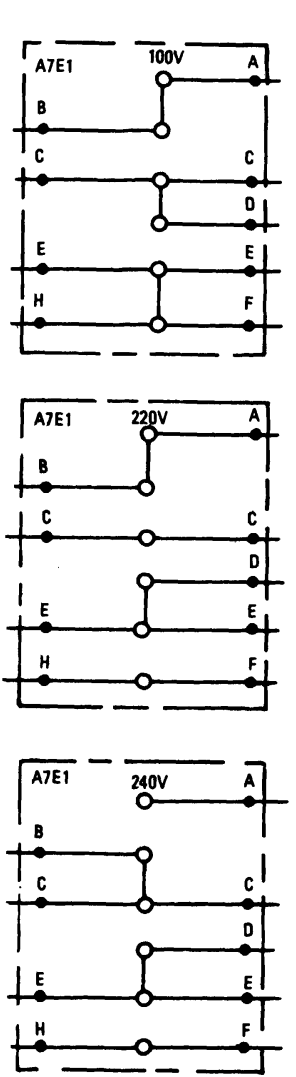


Figure 8-9. Component Identification, Diode Assy A1



100V, 220V, and 240V Input Power Connections

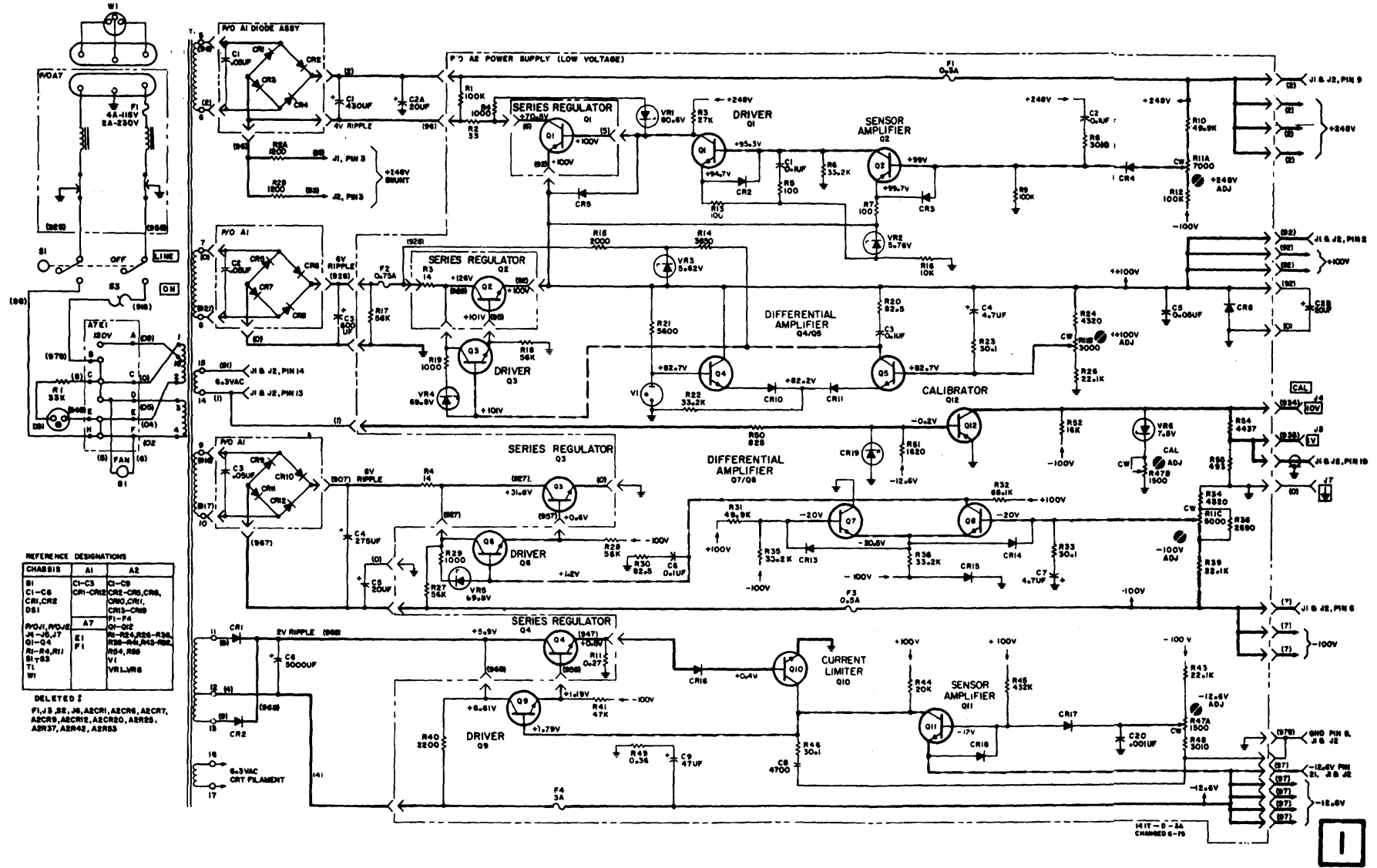


Figure 8-10. Low Voltage Schematic
8-15

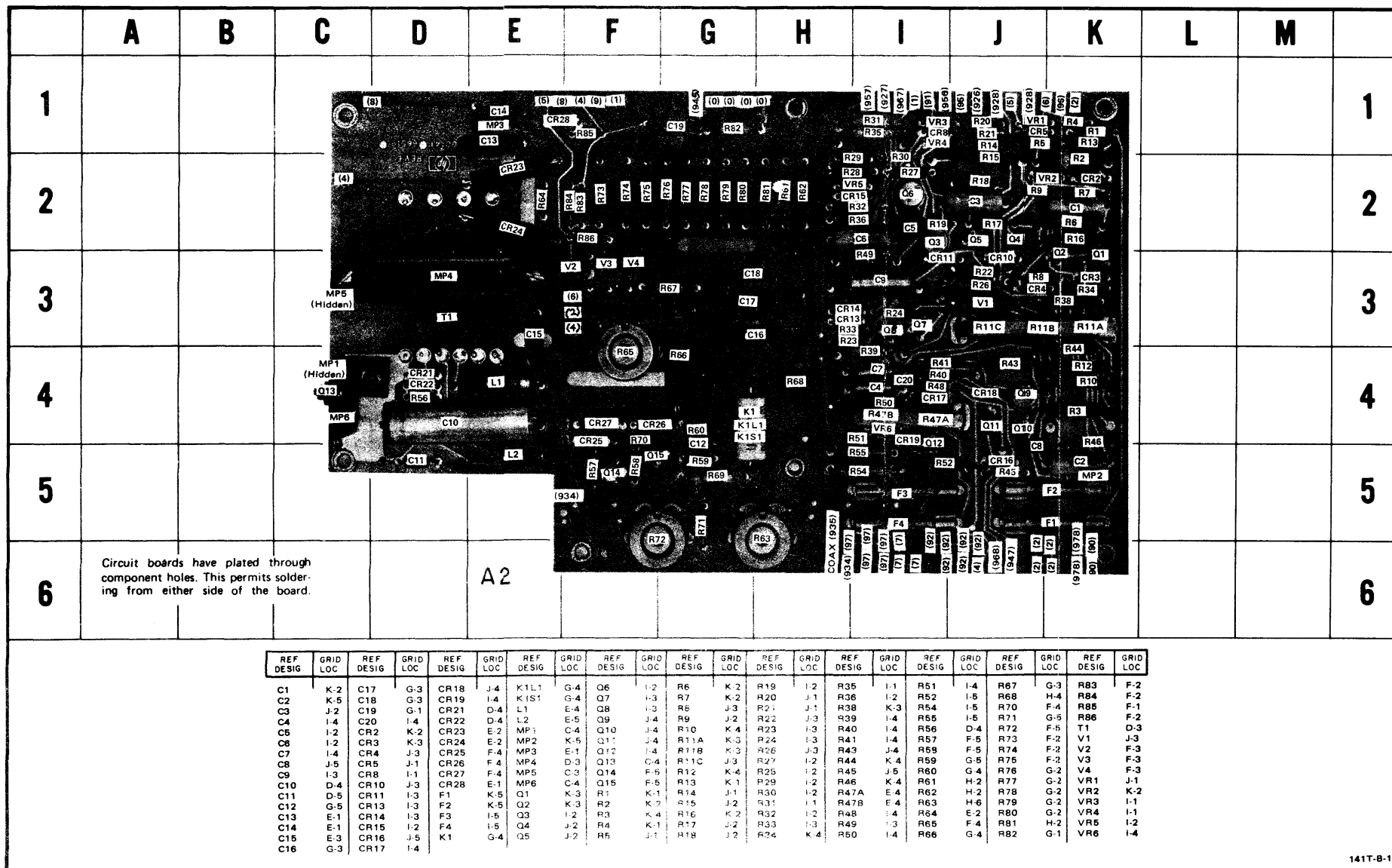


Figure 8-11. Component Identification, Power Supply A2

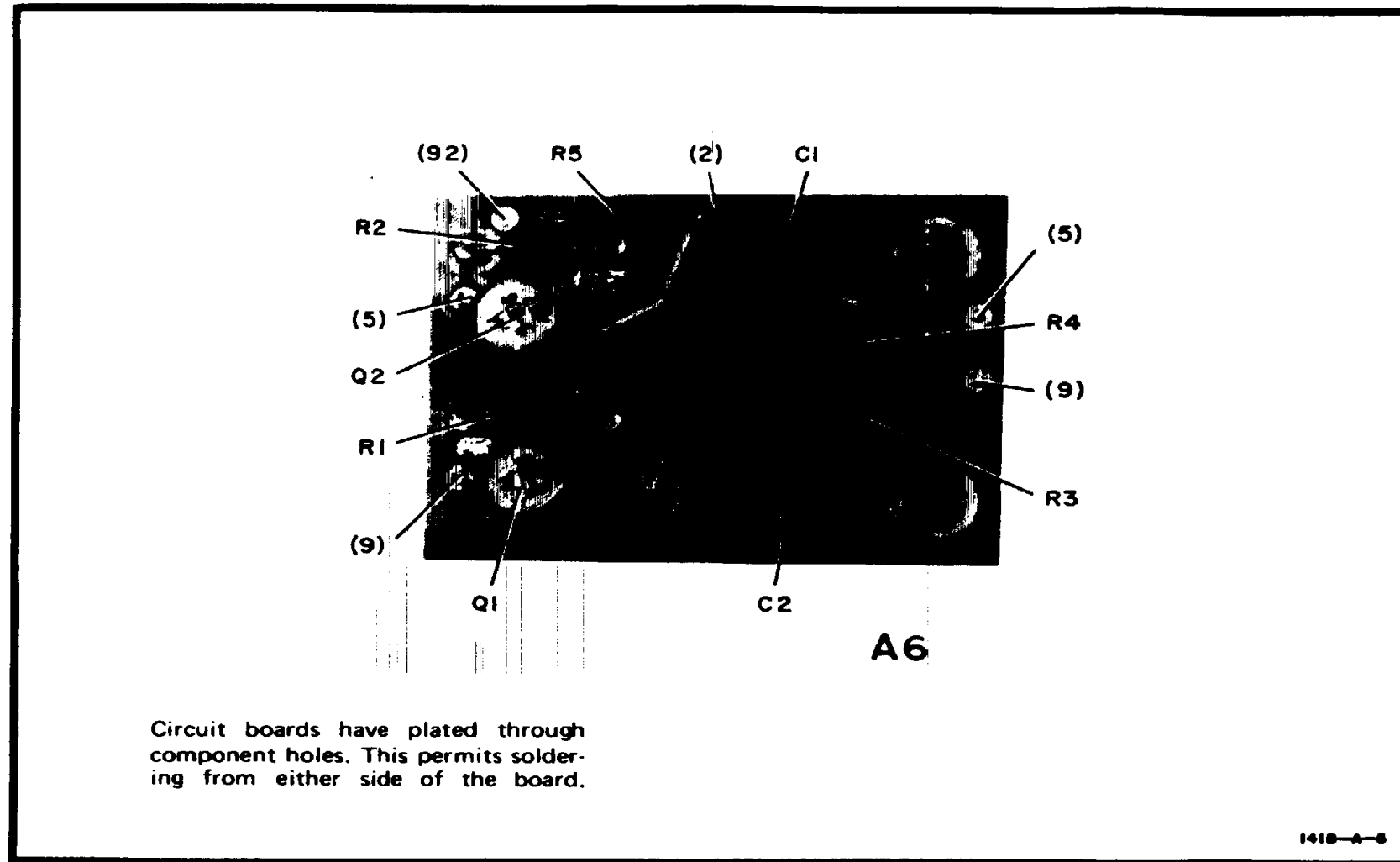


Figure 8-12. Component Identification, Horizontal Driver A6

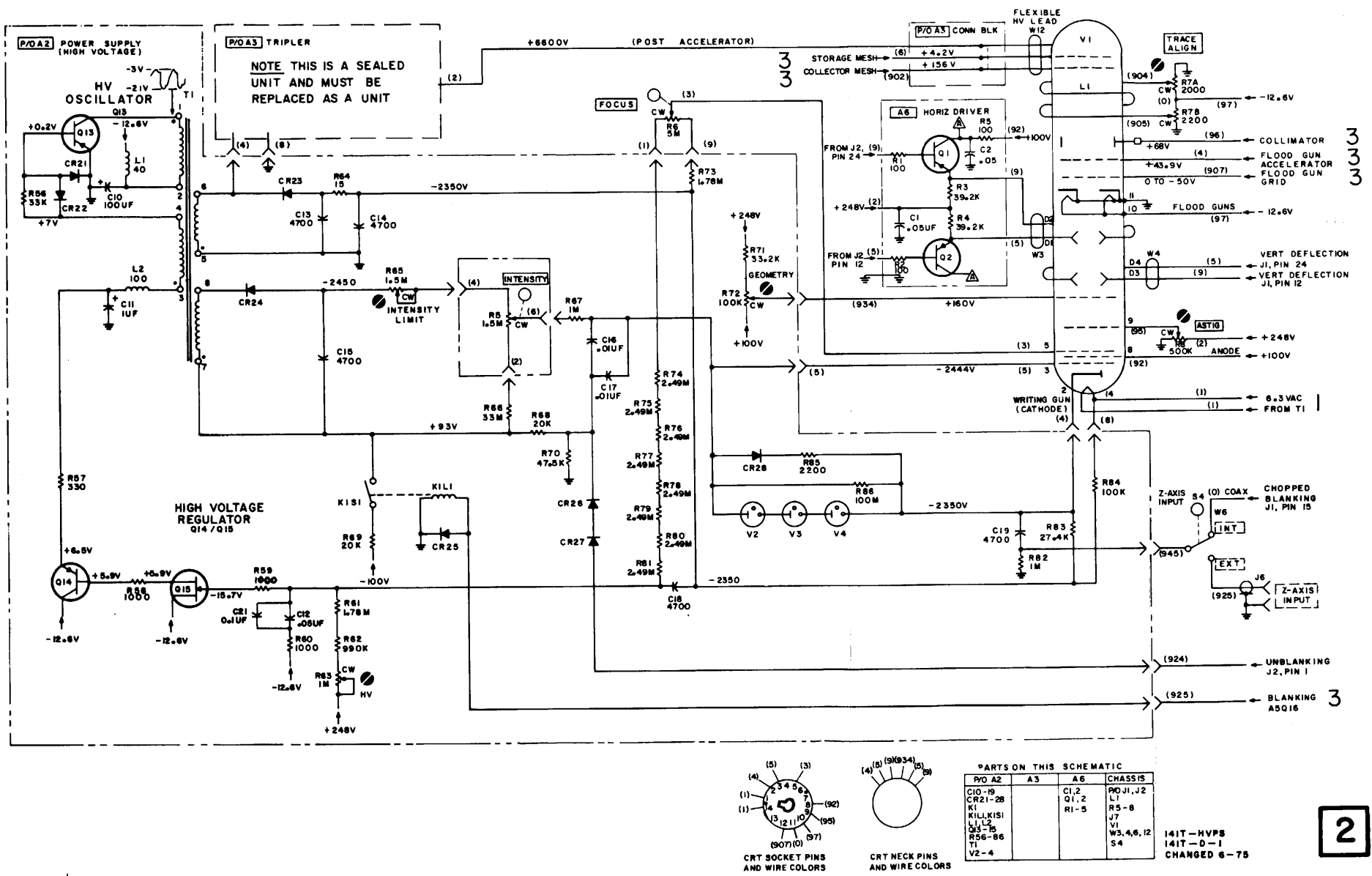


Figure 8-13. High Voltage Schematic 8-17

2

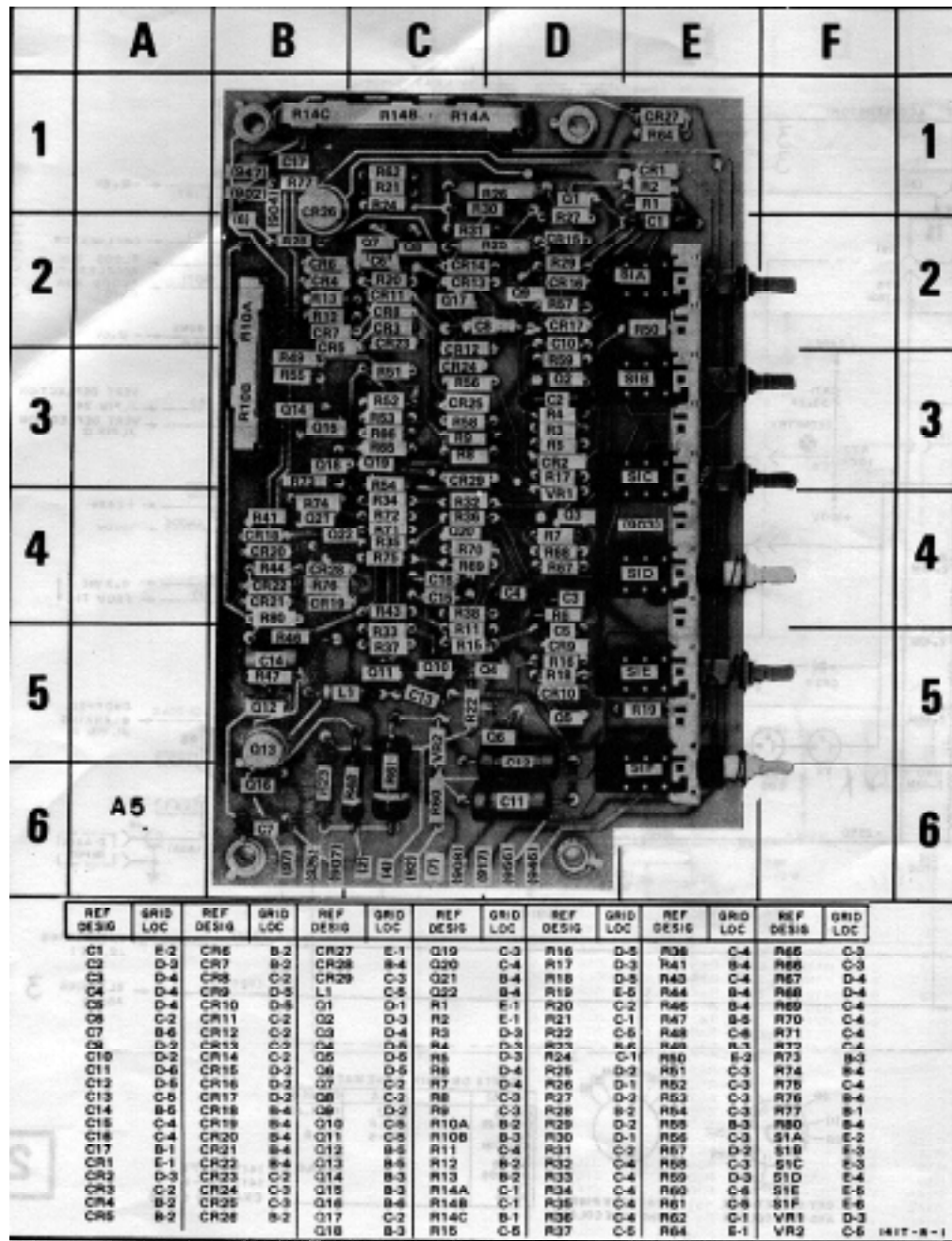


Figure 8-14. Component Identification, Pulse Circuit A5

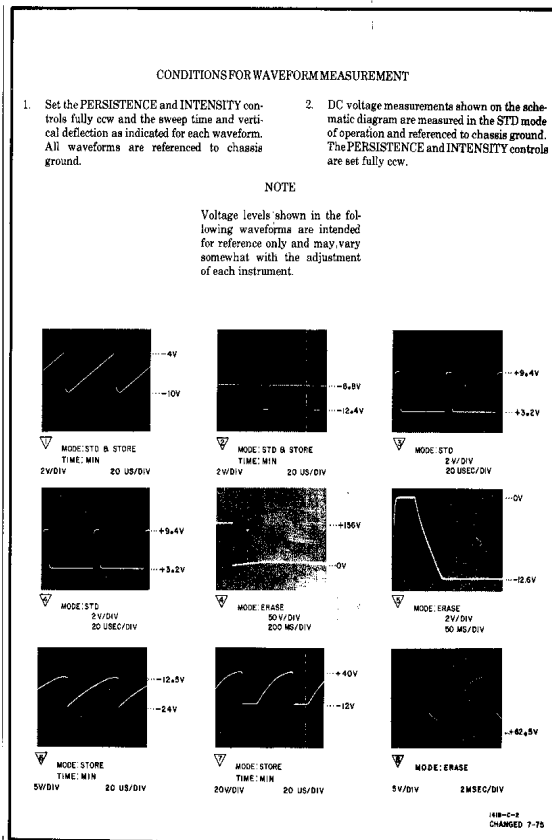


Figure 8-15. Waveforms

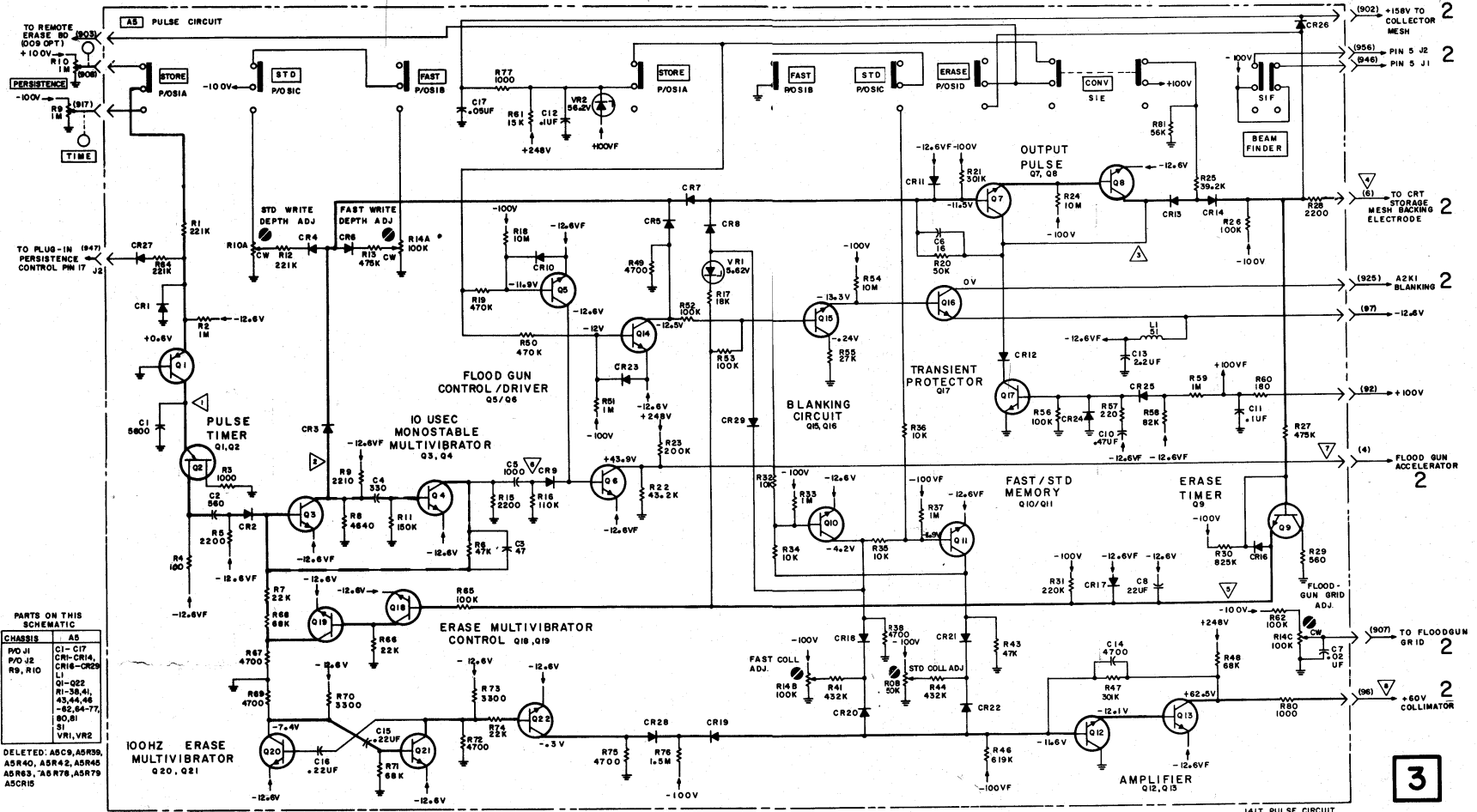


Figure 8-16. Pulse Circuit Schematic

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BERNARD W. ROGERS
General, United States Army
Chief of Staff

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Sig Dep (2)
Ft Richardson (ECOM Ofc)(1)
Sig FLDMS (1)
Units org under fol TOE: (1)
29-134
29-136

NG: None

USAR: None

For explanation of abbreviations used see, AR 310-50

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THE METRIC SYSTEM AND EQUIVALENTS

WEIGHT MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
 1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
 1 Kilogram = 1000 Grams = 2.2 lb.
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

TEMPERATURE

$5/9(^{\circ}\text{F} - 32) = ^{\circ}\text{C}$
 212° Fahrenheit is equivalent to 100° Celsius
 90° Fahrenheit is equivalent to 32.2° Celsius
 32° Fahrenheit is equivalent to 0° Celsius
 $9/5^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
its	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
ometers per Liter	Miles per Gallon	2.354
ometers per Hour	Miles per Hour	0.621



PIN: 032076-001