TM 11-6625-617-45

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

GS AND DEPOT
MAINTENANCE MANUAL INCLUDING
REPAIR PARTS AND SPECIAL TOOLS LIST

POWER SUPPLY PP-3514/U

HEADQUARTERS, DEPARTMENT OF THE ARMY

9 NOVEMBER 1965

WARNING

Be careful when working on the inside of the equipment. Disconnect the power cable from the unit. Serious injury or death may result from contact with the 115- or 230-volt terminals.

DON'T TAKE CHANCES!

*TM 11-6625-617-45

TECHNICAL MANUAL
No. 11-6625-617-45

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C. 20315, 9 *November* 1965

POWER SUPPLY PP-3514/U

*** This manual supersedes TM 11-6625-617-45, 24 February 1965.**

CHAPTER 1
FUNCTIONING OF EQUIPMENT

1-1. Scope

a. This manual contains general support and depot maintenance instructions for Power Supply PP-3514/U. It includes instructions appropriate for troubleshooting, testing, aligning, and repairing the equipment. It also lists tools, material, and test equipment required for general support and depot maintenance. Functional analysis is covered in paragraph 1-3.

b. The complete technical manual for this equipment includes TM 11-6625-617-12.

c. The direct reporting of errors, omissions, and recommendations for improving this equipment manual by the individual user is authorized and encouraged. DA Form 2028 will be used for reporting these improvements. This form may be completed by using pencil, pen, or typewriter. DA Forms 2028 will be completed by the individual using the manual and forwarded direct to Commanding General, U. S. Army Electronics Command, ATTN: AMSEL-MR-(NMP)-MA, Fort Monmouth, New Jersey 07703.

Note: **For applicable forms and records, refer to TM 11-6625-617-12.**

1-2. Index of Equipment Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to this equipment. Department of the the Army Pamphlet No. 310-4 is an index of current technical manuals, technical bulletins, supply manuals (types 7, 8, and 9), supply bulletins, lubrication orders, and modification work orders that are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc) and the latest changes to and revisions of each equipment publication.

1-3. Block Diagram (fig. 1-1)

Power Supply PP-31514/U is a direct-current (dc) power supply used to supply power to other equipment. The signal paths are shown the block diagram and discussed in a through g below. Refer to the overall schematic diagram (fig. 7-3) for complete circuit detail

a. Transformer. The secondary of transformer T1 supplies alternating-current (ac) power to the power supply. The primary may be connected to 115 volts ac or 230 volts ac changing the jumpers on the primary.

b. Rectifiers. The power supply rectifiers provide approximately 43 volts dc to the regulater and -20 volts dc to the emitter follower and amplifier circuits.

c. Regulator. Regulator Q1 acts as a variable series resistance to control the voltage of the power supply output. The front panel VOLTAGE ADJUST control selects the voltage level.

d. Emitter Follower. Emitter follower Q4 supplies a constant reference voltage to the amplifiers.

e. Amplifiers. Amplifiers Q2 and Q3 amplify any change between the output voltage and the reference voltage to the constant voltage of the emitter follower. This voltage is applied to the regulator as a controlling voltage which maintains the output of the regulator at a constant value.

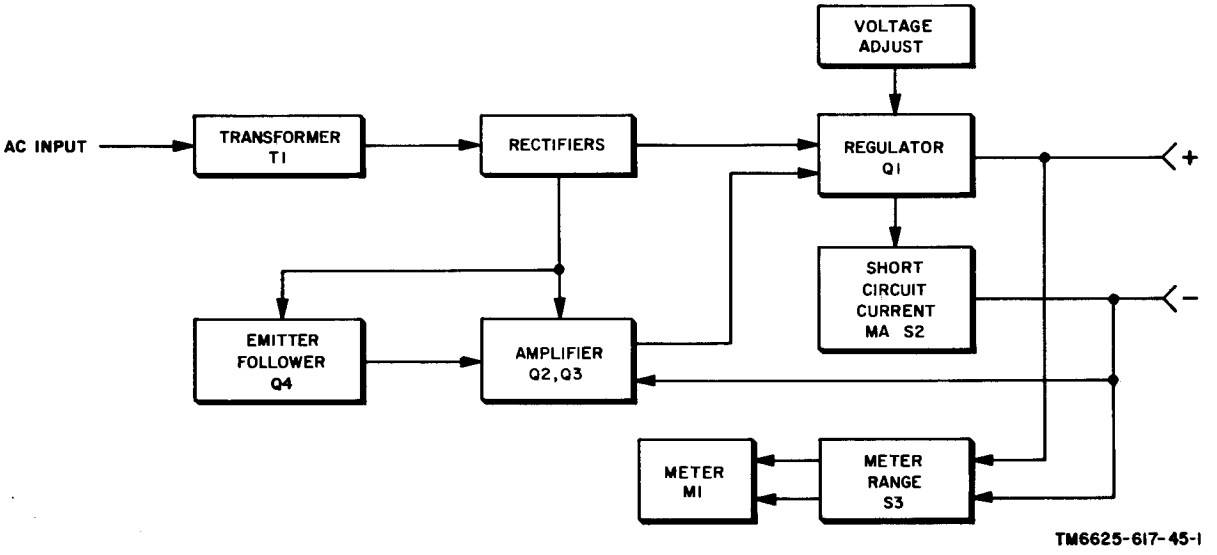


Figure 1-1. *Power Supply PP-3514/U, block diagram.*

f. SHORT CIRCUIT CURRENT MA Switch S2. SHORT CIRCUIT CURRENT MA switch S2 limits the output current to the indicated maximum by selecting the resistance that applies the correct value of sensing voltage to the circuit for operation at the load current selected.

g. *METER RANGE Switch S3.* METER RANGE switch S3 selects the meter range to dicate the dc voltage or current supplied to the load.

1-4. Power Supply Stage Analysis (fig. 7-3)

a. General. The power supply converts 115 or 230 volts ac to a regulated dc output of 0 to 30 volts. The current output from the power supply is 0 to 150 milliamperes (ma), regulated. Front panel controls adjust the voltage and current outputs to the desired levels. The panel meter, M1, measures the output voltage or current.

b. Transformer.

(1) The transformer T1 primary is composed of two windings connected in parallel for 115 volts ac input or in series for 230 volts ac input. Two jumpers are used on the primary side of the transformer for 115-volt ac operation and are connected to transformer terminals 1 and 6, and 2 and 7. One jumper is used for 230-volt ac operation and is connected to transformer terminals 2 and 6. Alternating-current power is applied to the transformer primary windings, through fuse F1 and front panel switch S1, when S1 is set to the ON position. The ON indicator light, DS1, is connected in series with current-limiting resistor R1 across one of the transformer primary windings, and lights red when switch S1 is set to the ON position.

(2) The transformer secondary consists of two windings; one winding supplies ac power to the main power supply, and the other winding supplies ac power to the auxiliary power supply. Both secondary windings are center tapped.

c. Main Power Supply. The ac voltage from transformer terminals 3, 4, and 5 is rectified by diodes CR1 and CR2, and filtered by capacitor C2. The rf bypass capacitor, C1, connected across transformer terminals 3 and 5, elim-

inates noise introduced by the powerline. The main power supply furnishes approximately + 43 volts dc.

d. Auxiliary Power Supply. The ac voltage from transformer terminals 8, 9, and 10 is rectified by diodes CR3 and CR4 and filtered by capacitors C3, C4, and C5 and resistors R2, and R3. This rectified voltage is applied to amplifier transistors Q2 and Q3, and emitter follower transistor Q4, and is also used to bias the base of regulator transistor Q1. The auxiliary power supply furnishes approximately -20.4 volts dc.

e. Regulator. The regulator circuit provides voltage and current regulation to maintain the power supply output voltage and current at a constant level as set by the front panel controls.

(1) *Voltage regulator.* The voltage regulator circuit consists of transistor Q1, capacitor C7, diode CR6, and resistors R4, R5, R7, R8, and R16 through R21. The collector of Q1 is connected to the negative side of the main power supply dc output. The base of Q1 is biased by resistor R4, and the emitter is biased by resistors R7 and R8 (short-circuit current adjust). The output voltage is set by VOLTAGE ADJUST resistor R19 from the front panel. Capacitor C7 bypasses R19 to provide a constant maximum ac feedback to the amplifiers from the power supply dc output. Resistor R20 presents a constant current source to the junction of resistors R18 and R19 and, hence, to the base of Q3.

(a) When a change occurs causing the power supply output voltage to rise, part of the electron flow through resistor R18 to the base of Q3 is diverted through resistor R19. This reduces the base-to-emitter current flow of Q3 which, in turn, reduces the collector to-emitter current flow. Reduced collector-to-emitter current flow through Q3 decreases the current through R17. Less voltage is dropped across R17, and the voltage between R16 and R17 becomes more negative. More current flows through R16 to the base of Q2. The base-to-emitter current flow of Q2 increases. This causes a much greater increase in the collector-to-emitter current flow through Q2. More current flows through resistor R6 to the collector of Q2, and the voltage drop across R6 increases. The voltage between R5 and R6 becomes less negative, and less current flows through R5 to the base of regulator Q1. The base-to-emitter current flow through Q1 decreases. The collector-to-emitter resistance of Q1 increases, and more voltage is dropped across Q1. The increased voltage drop across Q1 compensates for the initial rise in the power supply output voltage, thereby maintaining the output voltage at a constant level.

(b) When a change occurs causing the power supply output voltage to decrease, less current flows through resistor R19, and more current flows through resistor R18 to the base of Q3. The base-to-emitter current and the collector-to-emitter currents through Q3 increase. More current flows through R17 to the collector of Q3, and the voltage between R16 and R17 goes in a positive direction. Less current flows through R16 to the base of Q2. The base-to-emitter current and the collector-to-emitter current through Q2 decrease, and less current flows through resistor R6 to the collector of Q2. Less voltage is dropped across R6, and the voltage between R5 and R6 becomes more negative. More current flows through R5 to the base of regulator Q1. The base-to-emitter current flow of Q1 increases, and the collector-to-emitter resistance decreases. Less voltage is dropped across Q1, and the power supply output voltage in-

creases to compensate for the initial output voltage reduction.

(c) Diode CR6 prevents a large output surge voltage when VOLTAGE ADJUST resistor R19 is set to a low value and the power supply is turned off. When the power supply is turned off, Q4 stops conducting. The output voltage rises toward + 40 volts dc because of the low resistance path provided by R19. More current flows through R21, and the voltage drop across R21 increases. The voltage between R20, R21, and CR6 becomes positive. Diode CR6, now forward biased, starts conducting. More current flows through resistor R4 when CR6 conducts, and more voltage is dropped across R4. This applies a positive-going voltage to the base of regulator Q1, which stops conducting, thus preventing a large output surge voltage.

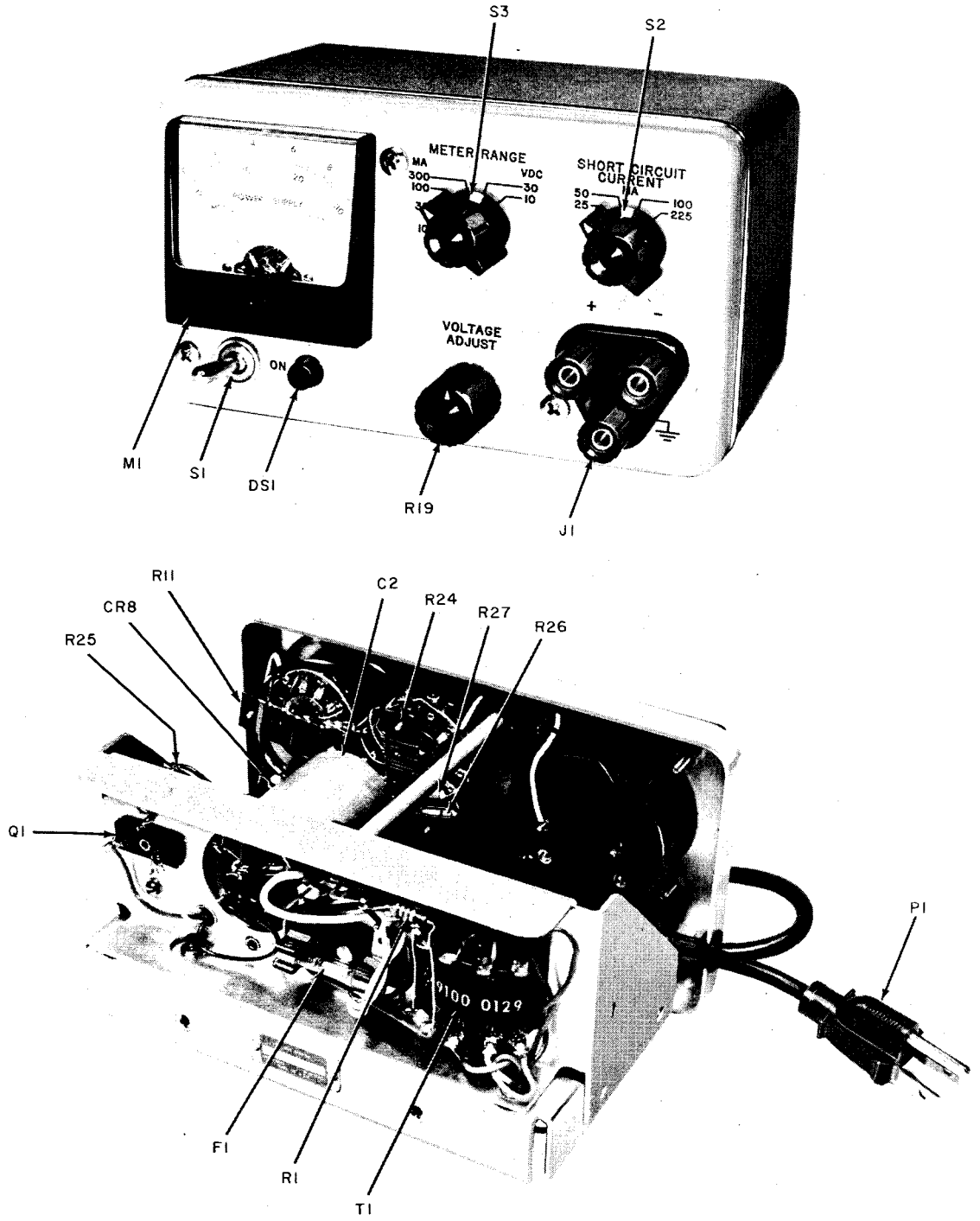
(2) *Current regulator.* The current-regulating circuit consists of capacitors C8, C9, and C11; diodes CR5 and CR8; regulator Q1; resistors R6, R7, R8, and R11; and SHORT CIRCUIT CURRENT MA switch S2, which is controlled from the front panel. Switch S2 selects the resistance of R11 necessary to limit the output current to the value selected. As the load current increases, more current flows through R11, and more voltage is dropped across R11. The voltage between R11 and R7 becomes more negative. More current flows through resistor R7 and R8. The increased voltage drop across R8 increases the negative voltage applied to the cathode of diode CR5. The increased forward bias of CR5 causes more electrons to flow through CR5 and resistor R10. More voltage is dropped across R10, and the voltage at the base of Q2 becomes more negative. The base-to-emitter current and the collector-to-emitter current of Q2 increase. More current flows through R6 to the collector of Q2, and less current flows through R5 to the base of Q1. The base-to-emitter current and the collector-to-emitter current of Q1 decrease. This limits the output current to the value selected by SHORT CIRCUIT CURRENT MA switch S2. Capacitors C8 and C9 supply peak currents of a very short duration above the setting of SHORT CIRCUIT CURRENT MA switch S2 when the power supply is connected to an external pulse-type circuit. Capacitor C8 is in parallel with C9 to compensate for the increased series resistance of C9 at temperatures of 0°C. or below. Capacitor C11 is connected across the output terminals and provides a low internal impedance at high frequencies. Diode CR8 is connected across the output terminals to allow a path for surge voltages of reverse polarity on the output terminals. This prevents damage to the circuits of the power supply.

f. Emitter Follower. The emitter follower circuit consists of transistor Q4 diode CR7, and resistors R22 and R23. The emitter follower samples the voltage at the negative output terminal and applies it across reverse-biased diode CR7. Diode CR7 maintains a constant voltage across itself, and establishes a constant reference voltage between the negative output terminal and the base of Q4. Emitter follower Q4 repeats this reference voltage at the emitter, less a constant internal base to emitter voltage drop of approximately 0.2 volt. The voltalge at the emitter is insensitive to normal current. variations due to the low source impedance. The collector of Q4 is biased by resistor R22, and the base is biased by R23.

g. Amplifier. The amplifier circuit consists of transistors Q2 and Q3, capacitors C6 and C10, and resistors R6, R9, R10, R15, R17, and R18. The base of Q2 is biased by resistor R,10, and the collector by R6. The collector of Q3 is biased by resistor R17, and the base by R18. Capacitor C10 bypasses resistor R18 at high frequencies to increase the gain of Q3. Amplif ier Q3 compares the reference voltage of emitter

follower Q4 to the voltage of the positive output terminal. Amplifier Q2 controls the conductance of regulator Q1 by varying the voltage applied to the base of Q1. Capacitor C6 and resistor R15 provide a negative ac feedback path around amplifier Q3, to cancel any ac transient components and improve the frequency response. Resistor R9 isolates the emitters of Q2 and Q3 from the auxiliary power supply.

h. Meter and S3 Circuit. METER RANGE switch S3 is used to select the meter range to indicate the output voltage or current. With S3 in the 10 VDC position, the meter is connected in series with resistor R27 and across the output terminals. With S3 in the 30 VDC position, the meter is connected in series with R26 and across the output terminals. With S3 in the MA positions, the meter is connected in series with resistors R24A, R24B, R24C, and/or R24D and in series with the negative output terminal. The internal impedance of the power supply is increased with S3 in any MA position. Switch S3 should be in one of the VDC positions for a minimum internal impedante at the output terminals. The meter is in series with variable resistor R25 in all positions of S3. Resistor R25 is used to calibrate panel meter M1.



REAR VIEW (COVER REMOVED)

TM6625-617-45-2①

Figure 1-2①. *Power Supply PP-3514/U, parts location, top view.*

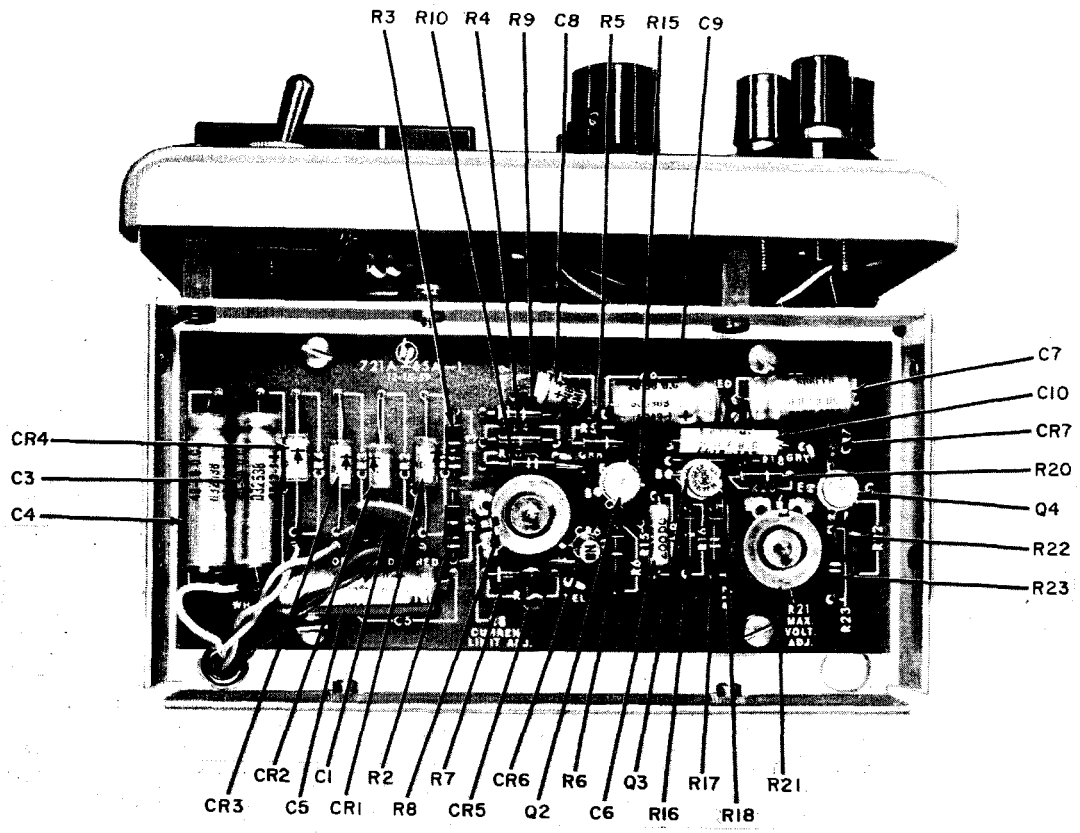


Figure 1-2②. Power Supply PP-3514/U, parts location, bottom view.

CHAPTER 2
TROUBLESHOOTING

Section I. GENERAL TROUBLESHOOTING TECHNIQUES

2-1. General Instructions

Troubleshooting at general support and depot maintenance levels includes all the techniques outlined for organizational maintenancse, and any special or additional techniques required to isolate a defective part. Paragraphs 2-4, 2-5, and 2-6 provide troubleshooting procedures to be used at the general support level.

2-2. Organization of Troubleshooting Procedures

a. General. The first step in servicing a detective power supply is to localize the fault. Localizing means tracing the fault to a defective stage or circuit responsible for the abnormal condition. The second step is isolation. Isolation means locating the defective part or parts. Some defective parts, such as burned resistors, arcing, and shorted transformers, can be located by sight. smell, and hearing. Most defective parts must be isolated by voltage measurements.

b. Localization. Power Supply PP-3514/U is composed of one unit. The first stop in tracing trouble is to localize the trouble to a stage or circuit, and then to isolate the trouble in that stage or circuit by voltage measurements.

(1) *Voltage measurements.* This equipment is transistorized. Observe all precautions given to prevent transistor damage. Make voltage measurements in this equipment only as specified. When measuring voltages, use tape or sleeving to insulate the entire test prod except the extreme tip. A momentary short circuit can ruin a transistor. Use resistor and capacitor color codes (fig. 7-1 and 7-2) to find the values of the components. Use the schematic diagram (fig. 7-3) to find the normal voltage readings, and compare them with the readings taken.

(2) *Troubleshooting chart.* The trouble symptoms listed in the chart (para *2-5d)* will aid in localizing trouble to a component part.

(3) *Intermittent troubles.* The possibility of intermittent troubles should not be overlooked. This type of trouble, if present, often can be made to appear by tapping or jarring the equipment. Check the wiring and connections of the PP-3514/U.

2-3. Test Equipment Required

The following chart lists the test equipment required for troubleshooting Power Supply PP-3514/U, and the associated technical manuals and assigned common names.

Test equipment	Technical manual	Common name
Multimeter ME-26B/U	TM 11-6625-200-12	Multimeter
Voltmeter, Meter ME-30C/U	TM 11-6625-320-12	Voltmeter

Section II. TROUBLESHOOTING POWER SUPPLY PP-3514/U

Caution: **Do not attempt removal or replacement of parts before reading the instructions n paragraph 3-1.**

2-4. Test Setup

Bench tests of the power supply require connections to an ac power source and various test equipment. The ac power source must be connected to the power supply for all dynamic-ervicing procedures; the test equipment connections vary from test to test. Remove the power supply from its case. Connect the test equipment as specified for each particular test.

2-5. Localizing Troubles

a. General. The procedures given in the troubleshooting chart *(d* below) are outlined for localizing troubles to a stage within the power supply. The parts locations are indicated

in figures 1-2(1) and 1-2(2). The voltage measurements are shown in the overall schematic diagram (fig. 7-3). One or more of the localizing procedures will be necessary, depending on the nature of the operational symptoms. Use voltage measurements to isolate the trouble to a particular part when trouble has been localized to a particular stage.

b. Use of Chart. The troubleshooting chart is designed to supplement the operational check detailed in TM 11-6625-517-12. If previous operational checks have resulted in reference to a particular item in this chart, go direct to the referenced item. If no operational symptoms are known, refer to TM 11-6625-617-12.

c. Condition to Tests. All checks outlined in the chart are to be conducted with the power supply connected to an ac power source as described in paragraph 2-4.

d. Troubleshooting Chart.

Note: Perform the operations in the daily preventive maintenance checks and services chart (11-6625-617-12 before using this chart. unless troubl has already been localized.

Step	Symptom	Probable trouble	Correction
1	No output, and fuse F1 blows	Transf T1 defective, or capacitor C1 shorted.	Replace transformer T1 or capac itor C1.
2	No output, and fuse F1 does not blow.	Capacitor C8, C9, or C11 de fective.	Replace capacitor C8, C9, or C1
3	Unstable or varying output voltage.	Reference diode CR7 defective.	Replace diode CR7.
4	Poor voltage or current regulation.	Defective Q1. Q2, Q3, Q4, CR1, CR2, CR3, CR4, or CR7.	Check voltages at transistor te minals; refer to paragraph 2-6
5	High noise or ripple on dc output (approximately 30 mv, 50 to 150 kc).	Defective capacitor C6 or C10.	Replace capacitor C6 or C10.
6	Microphonics.....	Noisy resistor R19 (VOLTAGE ADJUST control).	Replace resistor R19.
7	Output voltage does not vary smoothly when VOLTAGE ADJUST control is adjusted.	Defective resistor R19	Replace resistor R19.
8	Meter M1 will not indicate on any MA position of METER RANGE switch S3.	Defective METER RANGE switch S3.	Replace METER RANGE swit S3.
9	Meter M1 will not indicate	Defective meter or resistor R25.	Measure voltage at meter term nals. If voltage is present, r place meter. If there is voltage replace resistor R25.

2-6. Isolating Trouble

a. When trouble has been localized to a stage, either through operational checks or some other means, isolate the defective part by voltage measurements at the transistor terminals *(c* below) and other points related to the stage in question (fig. 7-3).

Caution: **Do not make any resistance measurements on the power supply. The multimeter battery can destroy the transistors by causing excessive current flow through them. In some instances 0.1 volt applied between the base and emitter in the reverse direction can destroy a surface barrier transistor.**

b. Use the schematic diagram (fig. 7-3) to trace circuits and isolate the faulty component.

c. The transistor terminal voltage readings below were made on an average unit. A measurement that differs widely from those in the table can, when used with the schematic diagram, often isolate the trouble to a specific part.

Note: The voltages measured at the emitter a base terminals of replaced transistors may vary 15 20 percent from the voltages listed below. Collect voltages should not vary more than 10 percent. Bi (difference in voltage from emitter to base) should r main approximately the same.

Voltage measured to negative output terminal			
Transistor	Emitter	Collector	Base
Q1 (PNP) 2N375	−0.77	−26.5	−0.91
Q2 (PNP) 2N508	0	−1.9	−0.18
Q3 (PNP) 2N508	0	−0.56	−0.09
Q4 (PNP) 2N508	−6.9	−12.1	−7.05

CHAPTER 3
REPAIRS AND ALIGNMENT

Section I. REPAIRS

3-1. General Parts Replacement Techniques

Most of the parts of Power Supply PP-3514/U can be reached and replaced without special procedures. The following precautions apply specifically to this power supply.

a. Use a pencil-type iron with a 25-watt maximum capacity. This power supply is transistorized. If the iron must be used with ac, use an isolating transformer between the iron and the line. *Do not use a soldering gun; damaging voltages can be induced in components.*

b. When soldering transistor leads, solder quickly; wherever wiring permits, use a heat sink (such as long-nosed pliers) between the soldered joint and the transistor. Use approximately the same length and dress of transistor leads as used originally. In replacing transistor Q1, be careful to note how the nylon bushings are installed in the mounting holes. They must be reinstalled properly since the case of the transistor is not at chassis potential.

3-2. Replacement of METER RANGE Switch S3 (fig. 1-2①)

a. Removal.

(1) Remove the chassis from the case.

(2) Remove the knob from the front panel METER RANGE switch.

(3) Remove the nut and washer on the switch shaft.

(4) Unsolder the leads from the switch and remove the switch.

b. Replacement.

(1) Install the replacement switch in the chassis and solder the leads as shown in figure 3-1.

(2) Replace the nut and washer on the switch shaft.

(3) Replace front panel METER RANGE switch knob and replace the chassis in the case.

3-3. Replacement of SHORT CIRCUIT CURRENT MA Switch S2 (fig. 1-2①)

a. Removal

(1) Remove the chassis from the case.

(2) Remove the knob from the front panel SHORT CIRCUIT CURRENT MA switch.

(3) Remove the nut and washer from the swiTch shaft.

(4) Unsolder the leads from the switch and remove the switch.

b. Replacement.

(1) Install the switch in the chassis and solder the leads as shown in figure 3A.1.

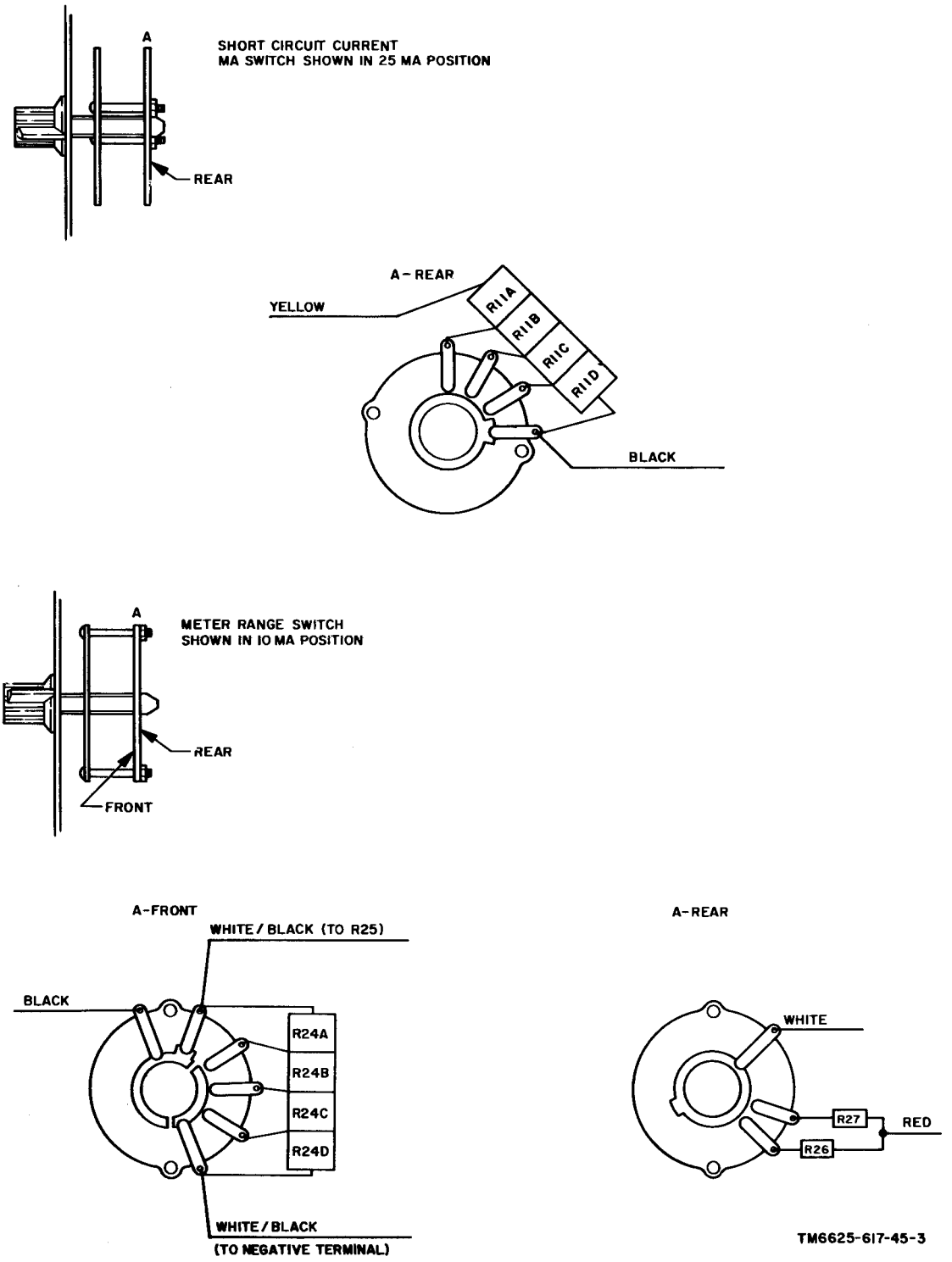


Figure 3-1. *Power supply switch wiring diagrams.*

(2) Replace the nut and washer on the switch shaft.

(3) Replace the front panel SHORT CIRCUIT CURRENT MA switch knob and replace the chassis in the case.

3-4. Replacement of Transformer T1 (fig.1-2①)

a. Removal.

(1) Remove the chassis from the case.

(2) Unsolder the leads to the transformer.

(3) Remove the three screws on the f ront panel and pull the front panel away from the deck.

(4) Remove the bolts that hold the transformer, and remove the transformer.

b. Replacement.

(1) Install the replacement transformer in the chassis and reinstall the bolts that hold it to the chassis.

(2) Reinstall the front panel and the three front panel screws.

(3) Solder the leads to the transformer as shown in figure 3-2.

(4) Solder the jumpers between, transformer terminals 1 and 6, and 2 and 7 for 115-volt operation, or between 2 and 6 for 230-volt operation.

(5) Replace the chassis in the case.

Section II. ADJUSTMENTS

3-5. Adjustment of Meter Pointer (fig. 1-2①)

When the power supply has been repaired, adjust the meter pointer to maintain meter accuracy as follows:

a. Set switch S1 to off.

b. Rotate the adjusting screw on the meter clockwise until the pointer moves upscale and then starts downscale toward 0.

c. Continue clockwise rotation until the pointer is exactly on 0.

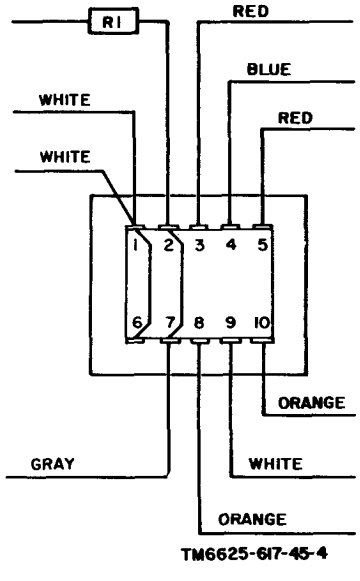


Figure 3-2. Transformer wiring diagram.

d. If the pointer passes 0, continue clockwise until it is again approaching 0 from the upscale side.

3-6. Test Equipment and Special Tools Required for Alignment

The following chart lists the test equipment required for aligning Power Supply PP-3514/U, and the associated technical manuals and assigned common names.

Test equipment	Technical manual	Common name
Multimeter TS-352/U	TM-11-5527	Multimeter
Resistor, 1,000 ohms		Resistor

3-7. Adjustment of Meter M1

a. Meter adjust resistor R25 (fig.1.2①) adjusts the resistance in series with the meter so that the meter indicates accurately on all ranges.

b. To adjust R25, proceed as follows:

(1) Remove the PP-3514/U from the case.

(2) Connect the PP-3514/U to Multimeter TS-352/U and 1,000 ohms in series (fig. 4-2).

(3) Set METER RANGE switch S3 to 10 MA and rotate the VOLTAGE ADJUST control fully counterclockwise.

(4) Set the power switch to ON.

(5) Adjust the VOLTAGE ADJUST con-

trol until the multimeter indicates exactly 10 ma.

(6) Adjust R25 until the PP-3514/U meter indicates exactly 10 ma.

Note: **Accuracy of the meter on the other ranges depends on the accuracy of the resistors on the METER RANGE switch assembly.**

(7) Replace the PP-3514/U in the case.

3-8. Adjustment of Maximum Output Voltage

a. Maximum output voltage adjustment R21 (fig. 1-2②) adjusts the output of the power supply to a maximum of 31 volts dc.

b. To adjust R21, proceed as follows:

(1) Remove the PP-3514/U from the case.
(2) set METER RANGE switch S3 to 30 VDC.
(3) Adjust the VOLTAIGE ADJUST control fully clockwise.
(4) Set the PP-3514/U power switch to ON.
(5) Adjust R21 until the PP-3514/U meter indicates 31 volts.
(6) Reseal R21 with Duco cement.
(7) Replace the PP-3514/U in the case.

3-9. Adjustment of Shon-Circuit Current

a. Short-circuit current adjustment R8 (fig. 1-2②) adjusts the maximum output of the power supply to 230 ma.

b. To adjust R8, proceed as follows:

(1) Remove the PP-3514 U from the case
(2) Set the SHORT CIRCUIT CURRENT MA switch to 225 MA and adjust the VOLTAGE ADJUST control fully clockwise.
(3) Short the output terminals together (use an insulated jumper or wire).
(4) Set the PP-3514/U power switch ON.
(5) Adjust R8 for a meter indication 230 ma.

Note: **The equipment is slightly te perature sensitive; after it has warmed for 2 minutes, the maximum current ava able will be approximately 225 ma.**

(6) Reseal R8 with Duco cement.
(7) Replace the PP-3514/U in the case.

CHAPTER 4
GENERAL SUPPORT TESTING PROCEDURES

4-1. General

a. Testing procedures are prepared for use by Signal Field Maintenance Shops and Signal Service Organizations responsible for general support maintenance of electronic equipment to determine the acceptability of repaired equipment These procedures set forth specific requirements that repaired equipment must meet before it is returned to the using organization. These procedures may also be used as a guide for testing equipment that has been repaired at the direct support level if the proper tools and test equipment are available. A summary of the performance standards is given in paragraph 4-8.

b. Comply with the instructions preceding each chart before proceeding to the chart. Perform each step in sequence. Do not vary the sequence. For each step, perform all the actions required in the *Control settings* columns; then perform each specific test procedure and verify it against its performance standard.

4-2. Test Equipment and Other Materials

All test equipment and other equipment required to perform the testing procedures given in this section are listed in the following chart and are authorized under TA 11-17, Signal Field Maintenance Shops, and TA 11-100(11-17), Allowances of Signal Corps Expendable Supplies for Signal Field Maintenance Shop, Continental United States.

a. Test Equipment.

Nomenclature	Federal stock No.	Technical manual
Multimeter TS-352/U	6625-242-5023	TM 11-5527
Multimeter ME-26 B/U	6625-542-2607	TM 11-6625-200-12

b. Other Equipment.

(1) Switch, toggle, SPST.
(2) Battery, 45-volt.
(3) Resistor, 1,000-ohm.
(4) Resistor, 1,500-ohm.
(5) Potentiometer, 5,000-ohm.
(6) Resistor, 200-ohm.

4-3. Physical Tests and Inspections

a. Test Equipment and Materials. None required.

b. Test Connections and Conditions. No connections necessary.

c. Procedure.

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Procedure	Performance standard
1	None.	Controls may be in any position.	*a*. Inspect case and chassis for damage, missing parts, and condition of paint. **Note:** Touchup painting is recommended instead of refinishing whenever practicable. Screwheads, binding posts, receptacles, and other plated parts will not be painted or polished with abrasive.	a. No damage evident; external surfaces intended to be painted will not show bare metal. Panel lettering will be legible.
			b. Inspect all controls and mechanical assemblies for loose or missing screws, bolts, and nuts.	b. Screws, bolts, and nuts will be tight; none missing.
			c. Inspect all connectors, sockets, receptacles, fuseholders, and meter for looseness, damage, or missing parts.	c. No loose parts or damage. No missing parts.

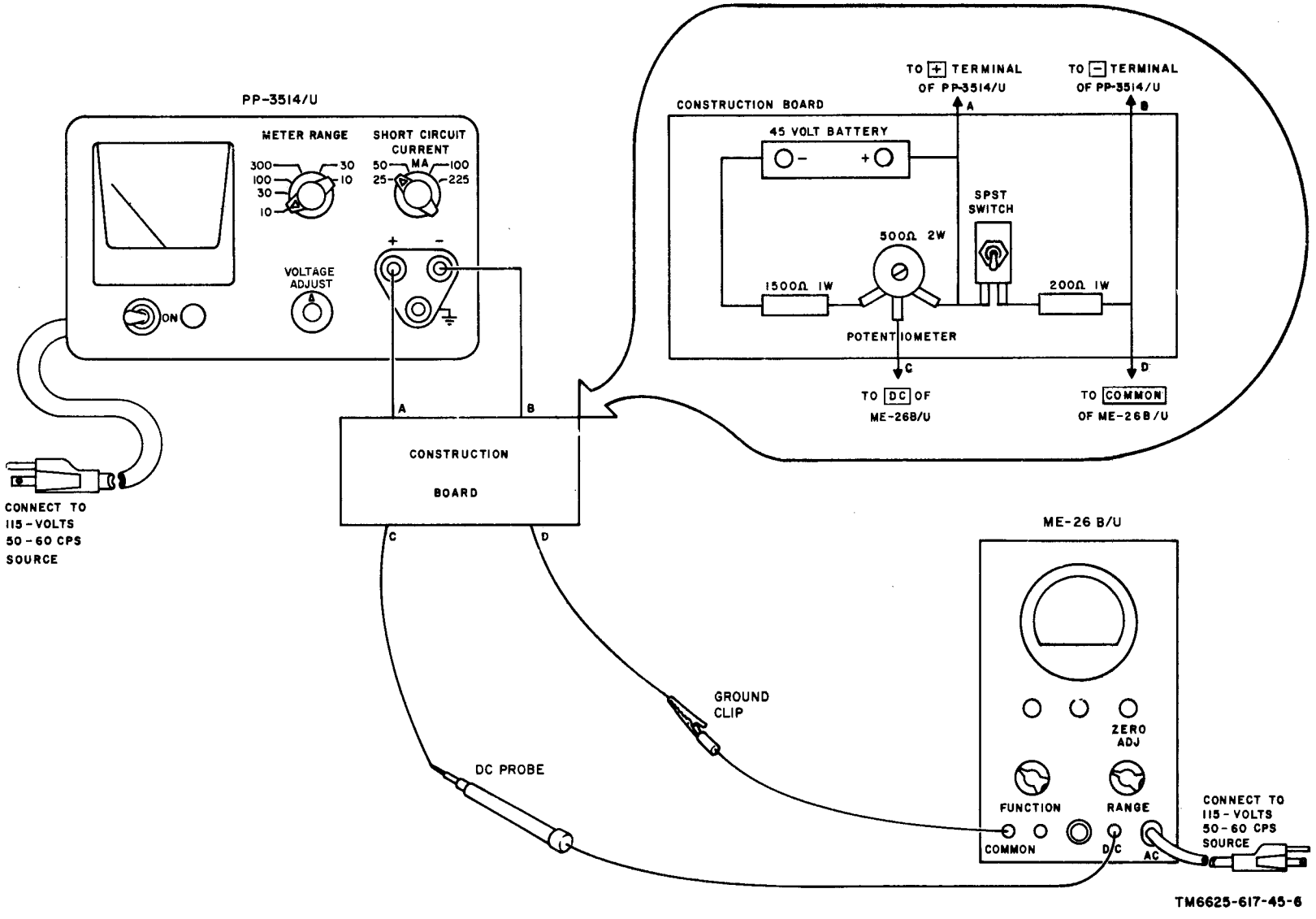


Figure 4-1. Voltage regulation test connections.

4-4. Voltage Regulation Teat

a. Test Equipment and Material.

(1) Multimeter ME-26B/U.
(2) Battery, 45 volts.
(3) Resistor, potentiometer, 5,000 ohms.
(4) Resistor, carbon, 1,500 ohms.
(5) Resistor, carbon, 200 ohms.
(6) Switch toggle, SPST.

b. Test Connections and Condition. Construct the circuit illustrated in the upper right-hand corner of figure 4-1. Do not connect the test equipment to the *construction board* until told to do so.

c. Procedure.

Step No.	Control settings		Procedure	Performance standard
	Test equipment	Equipment under test		
1	*ME-26B/U* FUNCTION : (Allow 5 minutes for warmup). RANGE : 1V. COMMON CLIP: Connect to tip of DC probe. ZERO ADJ : Position meter pointer to 0. COMMON CLIP: Disconnect from DC probe. FUNCTION : 30V. *CONSTRUCTION BOARD* Connect to PP-3514/U and ME-26B/U. SWITCH: Open.	SHORT CIRCUIT CURRENT : 225 MA. METER RANGE: 30 VDC. Power switch: ON.	*a.* Adjust VOLTAGE ADJUST control to indicate 30 volts on panel meter. *b.* Adjust 5,000-ohm potentiometer until ME-26B/U indicates 0.	*a.* None. *b.* None.
2	*ME-26B/U* RANGE : 1V.	Leave controls in positions indicated in Step 1.	Carefully adjust 5,000-ohm potentiometer until ME-26 B/U indicates 0.5 volt.	None.
3	*CONSTRUCTION BOARD* SWITCH : Closed.	Leave controls in positions indicated in Step 1.	Observe PP-3514/U meter indication.	Voltage must not vary more than 0.09 volt between no load and full load (200 ohms).

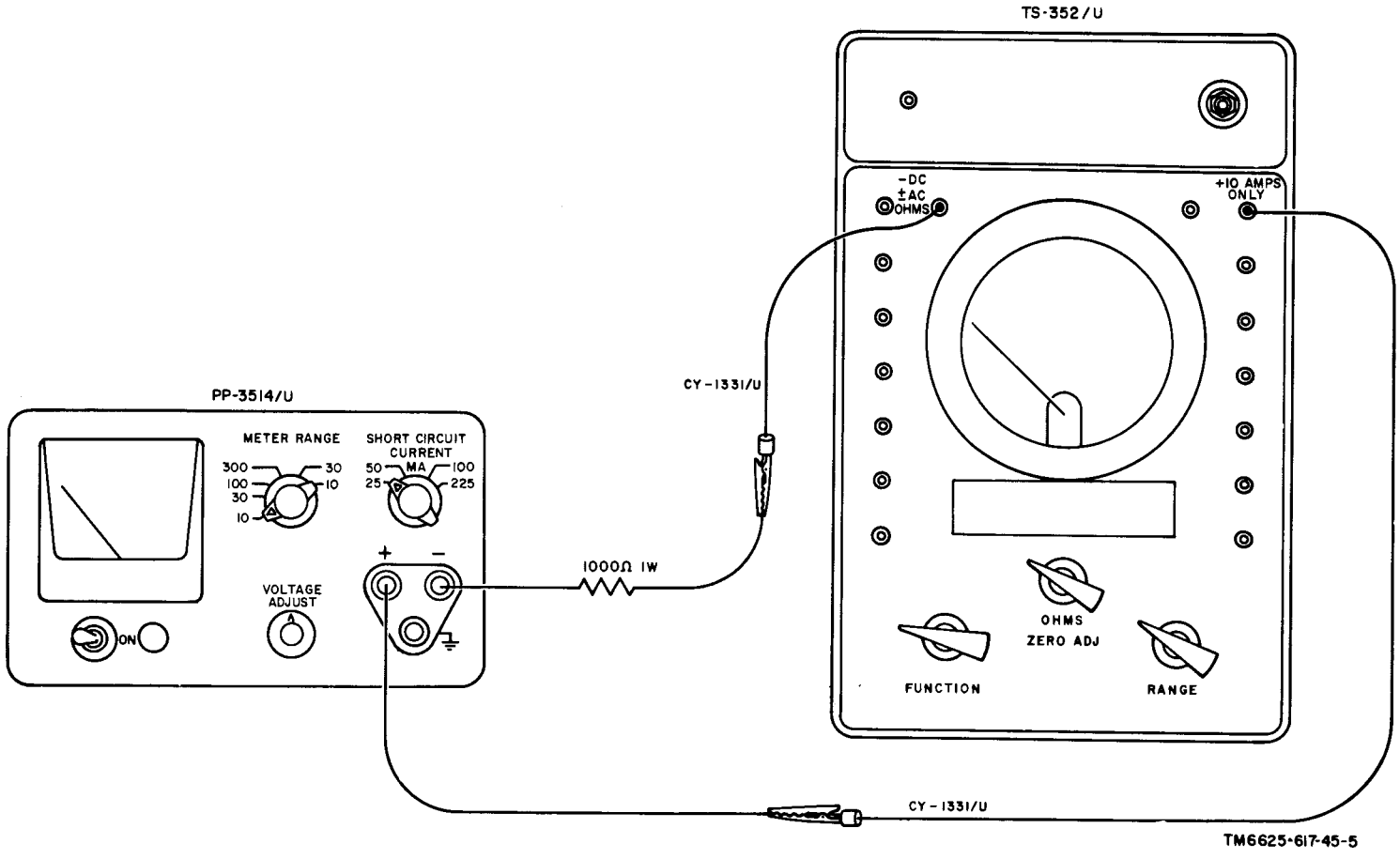


Figure 4-2. Meter calibration test connections.

4-5. Meter Calibration Test

a. Test Equipment and Material.
(1) Multimeter TS-352/U.
(2) 1,000 ohm resistor.

b. Test Connections and Conditions. Connect the equipment as shown in figure 4-2.

c. Procedure. The following procedure is applicable to Power Supply PP-3514/U.

Step No.	Control settings		Procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS-352/U* Function: DC CURRENT.	VOLTAGE ADJUST Fully counterclockwise. METER RANGE : 30 VDC. SHORT CIRCUIT CURRENT : 25 MA. Power switch: ON.	Adjust PP-3514/U VOLTAGE ADJUST until multimeter indicates 10 ma.	None.
2	Leave controls as indicated in Step 1.	METER RANGE : 10 MA.	Observe PP-3514/U meter.	Meter on PP-3514/U must indicate 10 ma $\pm$ 0.3.

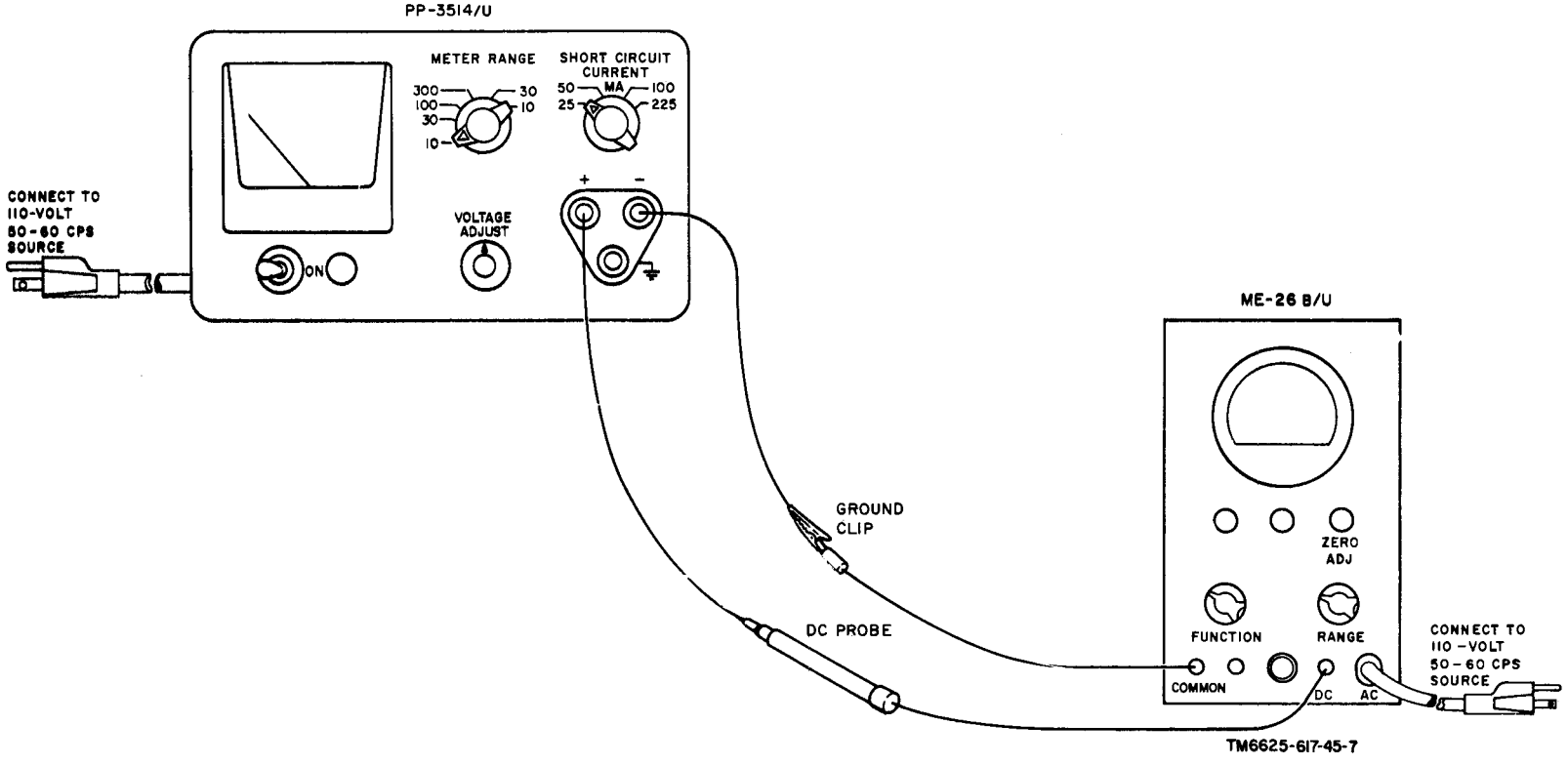


Figure 4-3. *Maximum output voltage, test connections.*

4-6. Maximum Output Voltage Test

a. Test Equipment & Materials. Multimeter ME-26B/U.

b. Test Connections and Conditions. Connect the equipment as shown in f igure 4-3.

c. *Procedure.* The following procedure is applicable to Power Supply PP-3514/U.

Step No.	Control settings		Procedure	Performance standard
	Test equipment	Equipment under test		
1	*ME-26B/U* FUNCTION : +. RANGE : 100v.	Power switch: ON. VOLTAGE ADJUST : Fully clockwise. SHORT CIRCUIT CURRENT: 225 MA. METER RANGE : 30 VDC.	Observe voltage indicated on meter of ME-26B/U.	ME-26 B/U must indicate from 30.5 to 32 volts dc.

4-7. Maximum Output Current Test

a. Test Equipment and Materials. None.

b. Test Connections and Conditions. None.

c. Procedure. The following procedure is applicable to Power Supply PP-3514/U.

Step No.	Control settings			Performance standard
	Test equipment	Equipment under test		
1	None.	METER RANGE : 300 MA. SHORT CIRCUIT CURRENT : 225 MA. VOLTAGE ADJUST: Fully counterclockwise.	Short-circuit output terminals and set power switch to ON.	Meter must indicate 325 330 MA.

4-8. Test Data Summary

Personnel may find it convenient to arrange the checklist in a manner similar to that shown below:

1.	Voltmeter regulation test	Voltage must not vary more than 0.09 volt dc (no load to full load).
2.	Meter calibration test	10 ma dc ± 0.3.
3.	Maximum output voltage test	30.5 to 32 volts dc.
4.	Maximum output current test	325 to 330 ma dc.

CHAPTER 5
DEPOT MAINTENANCE

5-1. Depot Rebuild Operations

Complete rebuild of Power Supply PP-3514/U and/or its individual components may be accomplished by depot maintenance facilities when authorized. Rebuild action will include all repairs, rebuild, and replacement operations necessary to make the equipment suitable for return to DA supply system stocks for reissue to using organizations as equipment equivlent to new material. Detailed procedures for accomplishing the repairs and adjustments established in the preceding sections of this manual, and such additional repair or rebuild operations as deemed necessary, will be established by the facility performing the work.

5-2. General Parts Replacement Techniques

a. Before removing a part in the PP-3514/U, note the position of the part and its leads. Install replacement parts in the same positions as the originals to avoid undesired coupling, spurious oscillations, and decrease in gain.

b. For the procedures to replace METER RANGE switch S3, SHORT CIRCUIT CURRENT MA switch S2, or transformer T1, refer to paragraphs 3-2, 3-3, and 3-4.

c. When replacing power transistor Q1, note how the nylon bushings are installed in the mounting holes and make sure that they are reinstalled correctly on the replacement transistor. Check the replacement transistor for burrs, which may cut through the anodized surface of the mounting plate. Check the surface of the mounting plate; if it is damaged, the maximum voltage at which the power supply may be operated off ground potential may be reduced.

CHAPTER 6
DEPOT INSPECTION STANDARDS

6-1. Applicability of Depot Inspection Standards

The tests outlined in this chapter are designed to measure the performance capability of a repaired equipment. Equipment that is to be returned to stock should meet the standards given in these tests.

6-2. Applicable References

a. Repair Standards. Applicable procedures of the Anmy depots performing this test, and its general standards for repaired electronic equipment, form a part of the requirements for testing this equipment.

b. Technical Publications. The following technical publications are applicable to this equipment:

Equipment and subject	*Publication*
Operator and Organization Maintenance Manual: Power Supply PP-3514/U	TM 11-6625-617-12

c. Modification Work Orders. Perform all modification work orders (MWO) applicable to this equipment before making the test specified. DA Pam 310-4 lists all available MWO'S.

6-3. Test Facilities Required

The following items are required for depot testing:

Item	Technical manual	Common name
Resistor, 1,000-ohm, 2-watt.		Resistor
Battery, 45 volt . .		"B" Battery
Variable resistor, 1,500-ohm.		Potentiometer
Toggle switch (3 ea)		Toggle switch
Resistor, 66.7-ohm (3 ea).		Resistor
Oscillator, Hewlett Packard 200CD.		Oscillator
Voltmeter, Meter ME-30C/U (2 ea).	TM 11-6625-320-12	Voltmeter
Multimeter ME-26B/U	TM 11-6625-200-12	Multimeter
Variable Voltage Transformer, Hewlett Packard K04-0980A.		Variac
Primary Circuit Hi-pot, Hewlett Packard K09-0980B.		Hi-pot test s
Resistor, 1,500-ohm		Resistor
Multimeter TS-352/U		Multimeter

6-4. Initial Checks and Connections

Before setting the PP-3514/U power switch to ON, perform the following procedures.

a. Power Cord Ground Check. Plug the PP-3514/U into the hi-pot test set. Check continuity of the ground cord by attaching a ground lead from the hi-pot test set to the chassis of the PP-3514/U. The hi-pot CHASSIS GROUND lamp must light.

b. Primary Circuit Check. Connect the ground clip of the hi-pot test set to the PP-3514/U chassis ground. Set the hi-pot test set Potential to 1,500 AC. Press the hi-pot pushbutton switch for 5 seconds. The leakage current (disregarding any dc charging surge must not exceed 0.5 milliampere for 5 seconds.

c. Mechanical Zero Adjust. Rotate the adjusting screw on the panel meter clockwise until the pointer moves upscale and then start downscale toward 0. Continue the clockwise rotation until the pointer is exactly on 0. If the pointer passes 0, continue clockwise until it is again approaching 0 from the upscale side.

d. Insulation Resistance Check. Measure the resistance between ground and the positive terminal of the PP-3514/U. The resistance must be greater than 500 megohms.

6-5. Maximum Voltage Adjustment Test

Connect the voltmeter across the output terminals of the PP-3514/U. Turn the PP-3514/U VOLTAGE ADJUST control fully clockwise Set the SHORT CIRCUIT CURRENT MA switch to 225 MA and the METER RANGE

switch to 300 MA. Adjust R21 for a 30.5- to 30.7-volt reading on the voltmeter.

6-6. Short-Circuit Current Adjustment Test

Set the PP-3514/U SHORT CIRCUIT CURRENT MA switch to the 225 position, connect a roper wire across the output terminals, and bate the VOLTAGE ADJUST control fully clockwise. Adjust R8 for a 230-ma reading on the PP-3514/U panel meter.

6-7. Panel Meter Calibration Adjustment

Before performing this procedure, adjust the panel meter mechanical zero as specified in paragraph 6-4. The meter is calibrated by connecting multimeter TS-352/U across the PP-3514/U output terminals in series with a 1,000-ohm resistor. Rotate the PP-3514/U VOLT. AGE ADJUST control until the TS-352/U indicates 10 ma. Set the METER RANGE switch to 10 MA and adjust R25 until the PP-3514/U panel meter indicates 10 ma.

6-8 Voltage Regulation and Ripple Test

Connect the equipment as shown in f igure 6-1:

a. Set the ME-26B/ U to the 30-volt range.

b. Adjust the variable voltage transformer for a 115+volt output

c. Adjust the PP-3514/U VOLTAGE ADJUST control for a 30-volt output.

d. Adjust the 1,500-ohm potentiometer until battery potential is 30 volts. The battery potential is 30 volts when the ME-26B/U indicates 0 volt.

e. Set the ME-26B/U to the 1-volt range and adjust the 1,500-ohm potentiometer until the ME-26B/U indicates approximately half scale.

f. Close the toggle switch; this places a 200-ohm load across the output terminals of the PP-3514/U. The voltage as indicated on the ME-26B/U should not change more than 0.3 percent at the 30-volt output from the PP-3514/U .

g. Repeat the procedures given in a through *f* above at 20 volts and 10 volts. Close one toggle switch in parallel with one 66.7-ohm resistor for the 20-volt check, and close the other toggle switch (both toggle switches closed) for the 10-volt check.

h. Repeat the instructions given in a through *g* above with the variable voltage transformer first set at 103 volts, and then set at 127volts.

i. Adjust the output of the variable voltage transformer to 115 volts.

j. Adjust the PP-3514/U VOLTAGE ADJUST control for a 30-volt output, and close the series TOGGLE SWITCH.

k. Adjust the variable voltage transformer from 103 volts to 127 volts. The output voltage of the PP-3514/U should not vary more than 0.3 percent as indicated on the ME-26B/U. At voltage below 15 volts, regulation should be within ± 15 millivolts

l. Set the ME-30A/U to the 0.001 range and measure the ripple. The ripple plus noise should not exceed 0.15 millivolt.

6-9. Ac Internal Impedance Check

Connect the equipment as shown in figure 6-2. This check is made by applying 10 ma alternating current through the PP-3514/U and measuring the voltage drop across the output terminals.

a. Set the controls on the equipment as shown in figure 6-2.

b. Close the series TOGGLE SWITCH and adjust the PP3514/U VOLTAGE ADJUST control until the PP-3514/U panel meter indicates 30 volts.

c. Adjust audio oscillator 200CD until ME-30A/U No. 2 indicates 10 volts. This is equal to 10 ma.

d. Observe the meter indication of ME-30C/U No. 1.

e. Calculate the internal impedance, using the formula:

$$z_{int} = \frac{E\#1}{I_{ac}}.$$

z_{int} is the internal impedance, E#1 is the voltage indicated on ME-30C/U No. 1, and I_{ac} is the 10 volts (equal to 10 ma) indicated on ME-30C/U No. 2. The internal impedance should be less than 0.2 ohm.

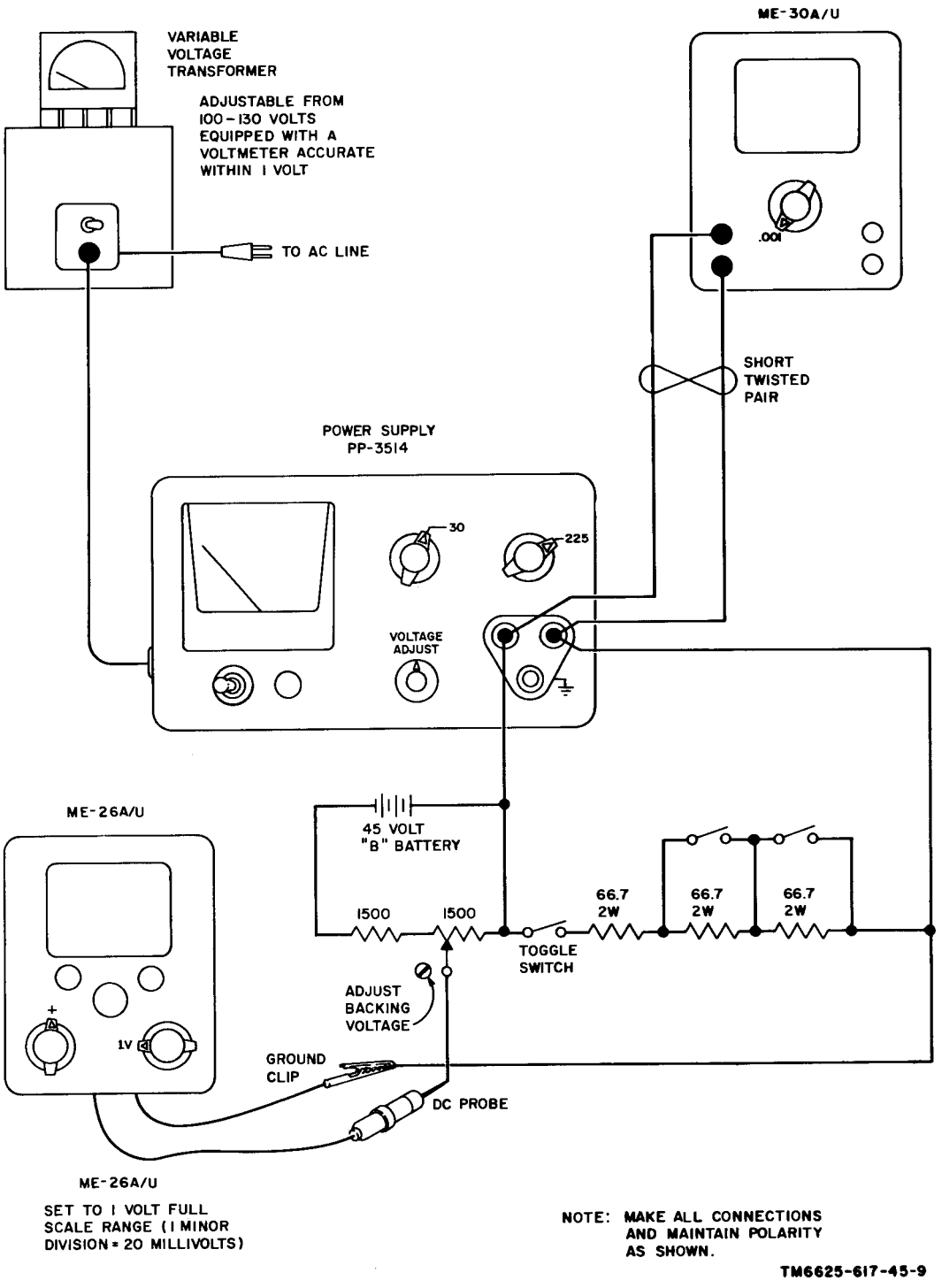


Figure 6-1. *Regulation and ripple check, final testing.*

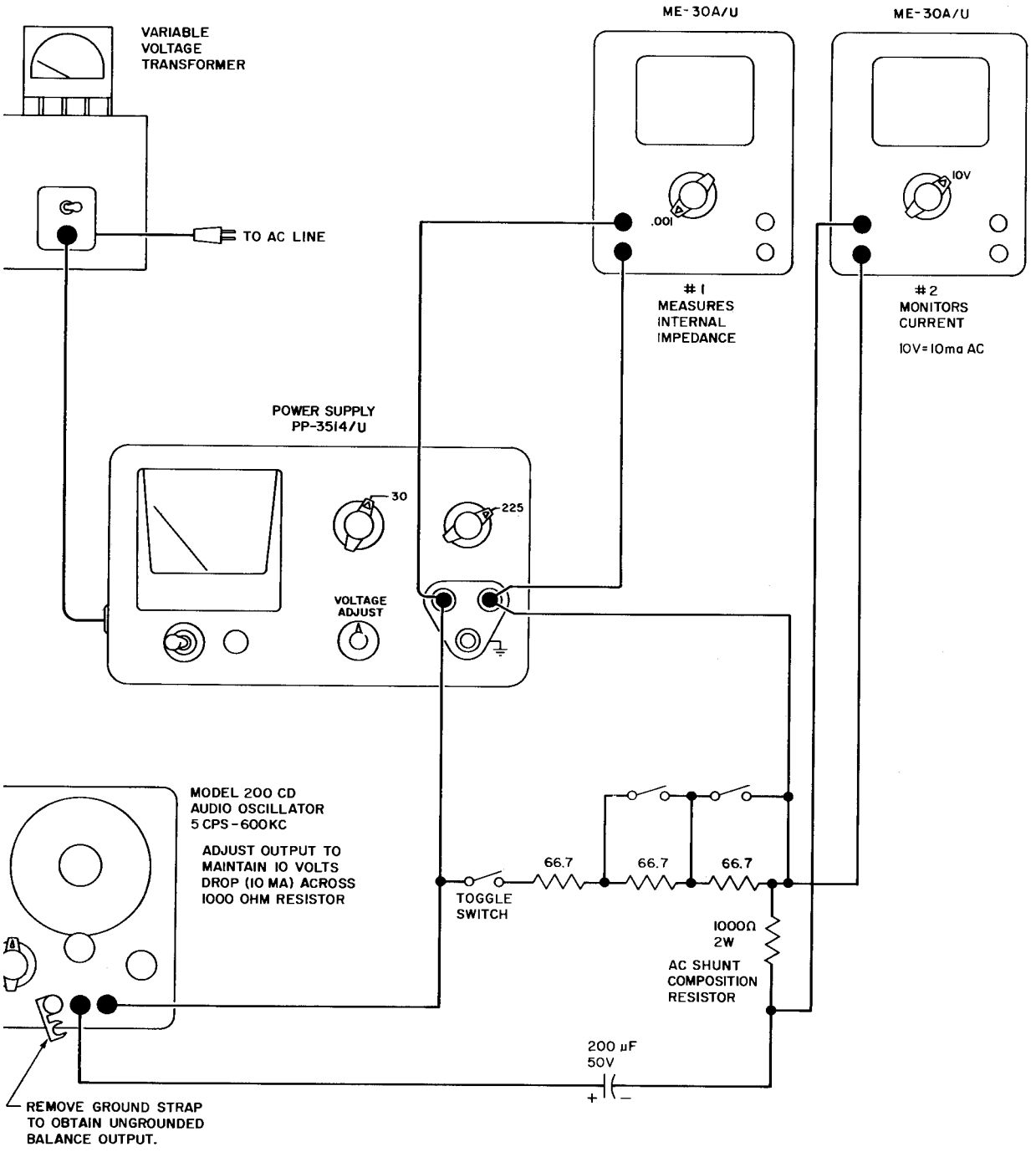


Figure 6-2. Internal impedance check, final testing.

APPENDIX I
REFERENCES

Following is a list of applicable references available to the general support and depot maintenance repairmen of Power Supply PP-3514/U.

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders.
TA 11-17	Signal Field Maintenance Shops.
TA 11-100(11-17)	Allowances of Signal Corps Expendable Supplies for Signal Field Maintenance Shops.
TM 11-5527	Multimeters TS-352/U, TS-352A/U, and TS-352B/U.
T'M 11-6625-200-12	Operator and Organizational Maintenance Manual: Multimeters ME-26A/U, ME-26B/U, and ME-26C/U.
TM 11-6625-320-12	Operator and Organizational Maintenance Manual: Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U and ME-30C/U.
TM 11-6625-617-12	Operator and Organizational Maintenance Manual: Power Supply PP-3514/U.

APPENDIX II
GS AND DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

A2-1. General

This appendix lists the quantities of repair parts for general support and depot maintenance, and is a basis for requisitioning authorized parts. It is also a guide for depot mainteance in establishing initial levels of spare parts.

b. Columns are as follows:

(1) *Source, maintenance, and recoverability code.* Source, maintenance, and recoverability codes indicate the technical service responsible for supply, the categories where an item is stocked and where an item is installed or repaired, and whether an item is repairable or salvageable. The source code column is divided into four parts.

(a) Column A. This column indicates the materiel code and designates the area of responsibility for supply. AR 310-1 defines the basic numbers used to identify the materiel code. If the part is Signal materiel responsibility, the column is left blank.

(b) Column B. This column indicates the point within the maintenance system where the part is available. "P1" indicates that the repair part is a low mortality part; procured by technical services, stocked only in and supplied from technical service *key* depots, and authorized for installation at indicated maintenance categories. "A" applies to assemblies which are not procured or stocked as such but are made up of two or more units, each of which carry individual stock numbers and descriptions and are stocked and can be assembled by units at indicated maintenance categories. Code "X2" applies to repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain from salvage. If not obtainable from salvage, such parts will be requisitioned with supporting justification through normal supply channels.

(c) Column C. This column indicates the lowest maintenance category authorized to install the part.

"O"—Organizational maintenance (operator and organizational).
"H"—General support maintenance.
"D"—Depot maintenance.

(d) Column D. Not used.

(2) *Federal stock number.* This column lists the 11-digit Federal stock number.

(3) *Designation by model.* Not used.

(4) *Description.* Nomenclature or the standard item name and brief identifying data for each item are listed in this column. When requisitioning, enter the nomenclature and description.

(5) *Unit of issue.* The unit of issue is each unless otherwise indicated and is the supply term by which the individual item is counted for procurement, storage, requisitioning, allowances, and issue purposes.

(6) *Expendability.* Nonexpendable items are indicated by NX. Expendable items are not annotated.

(7) *Quantity incorporated in unit.* This column lists the quantity of each part found in a given assembly, component, or equipment.

(8) *Direct support. No* parts authorized for stockage.

(9) *General support.* The numbers in this column indicate quantities of repair parts authorized for initial stockage for use in general support maintenance. The quantities are based on 100 equipments to be maintained for a 15-day period.

(10) *Depot.* The numbers in this column -indicate quantities of repair parts authorized for depot maintenance and for initial stockage for maintenance, and for supply support to lower categories. The entries are based on the

quantity required for rebuild of 100 equipments.

(11) *Illustration.* The "Item No." column lists the reference designations that appear on the part in the equipment. These same designations are also used on any illustrations of the equipment. The numbers in the "Figure No." column refer to the illustrations where the part is shown.

A2-2. Parts for Maintenance

When this equipment is used by signal service organizations organic to theater headquarters or communication zones to provide theater communications, those repair parts authorized up to and including general support are authorized for stockage by the organization operating this equipment.

A2-3. Requisitioning Information

a. The allowance factors are based on 100 equipments. In order to determine the number of parts authorized for initial stockage for the specific number of equipments supported, the following formula will be used and carried out to two decimal places.

$$\text{Specific number of equipments supported} \times \frac{\text{allowance factor}}{100} = \text{Number of part authorized for initial stockage}$$

b. Fractional values obtained from above computation will be rounded to whole numbers as follows:

(1) When the total number of parts authorized is less than 0.5, the quantity authorized will be zero.

(2) When the total number of parts authorized is between 0.5 and 1.0, the quantity authorized will be one.

(3) For all values above one, fractional values below 0.5 will revert to the next lower whole number and fractional value 0.5 and above will advance to the next higher whole number.

c. The quantities determined in accordance with the above computation represent the in: tial stockage for a 15-day period.

SECTION II. FUNCTIONAL PARTS LIST

SOURCE CODE				FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY IN UNIT	DIRECT SUPPORT	GENERAL SUPPORT	DEPOT	ILLUSTRATION	
													FIGURE NO.	ITEM NO.
A	B	C	D	6625-445-6933		POWER SUPPLY PP-3514/U: Electronic type, Full wave rectification, output data: 30 vdc, 150 ma, oper power reqt, 115/230 vac, 50/60 cps, single ph, 7 in lg x 5-1/4 in d x 4-3/8 in h; Hewlett-Packard part No. 721A								
	X2	D				BODY, CABINET: Hewlett-Packard part No. 721A-44A1			1					
	X2	D				BUSHING: Hewlett-Packard part No. 210-6300			2					
	X2	D				BUSHING, STRAIN RELIEF: Heyman part No. SR5P1			1					
	P1	H				CABLE ASSEMBLY, POWER, ELECTRICAL: 3 conductor; Balden Mfg part No. KH-4006			1		0.7	3.0	1-2(1)	P1
	P1	H				CAPACITOR, FIXED, CERAMIC, DIELECTRIC: 50,000 uuf ±20%, 400 vdc w; Metropolitan Telcom part No. 20X503MC4			1		0.7	3.0	1-2(2)	C1
	P1	H				CAPACITOR, FIXED, ELECTROLYTIC: 4 uf +20% -15%, 60 vdc w; Fansteel part No. PP4B60A2			1		0.7	3.0	1-2(2)	C8
	P1	H				CAPACITOR, FIXED, ELECTROLYTIC: .040 uf -15% +100% 50 VDC W; Spraque part No. D32538			3		1.3	9.0	1-2(2)	C3,C4,C5
	P1	H				CAPACITOR, FIXED, ELECTROLYCTIC: .020 uf, 50vdc w; Sprague part No. D33909			2		0.7	6.0	1-2(2)	C7,C9
	P1	H				CAPACITOR, FIXED, ELECTROLYTIC: 500 uf, 75 vdc w, 2.296 in lg x 1.546 in dia; Sprague part No. D32443			1		0.7	3.0	1-2(2)	C2
	P1	H				CAPACITOR, FIXED, PLASTIC, DIELECTRIC: 22 uuf ±20% 200 vdc w; Sprague part No. 192P22302A			1		0.7	3.0	1-2(2)	C6
	P1	H				CAPACITOR, FIXED, PLASTIC, DIELECTRIC: 4,700 uuf ±10%, 400 vdc w; Hewlett-Packard part No. 0170-0021			1		0.7	3.0	1-2(2)	C10
	P1	H				CAPACITOR, FIXED, PLASTIC, DIELECTRIC: 100,000 uuf ±5%, 200 vdc w; Hewett-Packard part No. 0170-0019			1		0.7	3.0	7-3	C11

SOURCE CODE				FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY IN UNIT	DIRECT SUPPORT	GENERAL SUPPORT	DEPOT	ILLUSTRATION	
6													FIGURE NO.	ITEM NO.
A	B	C	D			PP-3514/U (continued)								
	X2	D				CASE ASSEMBLY: Hewlett-Packard part No. 721A-44			1					
	A	H				CIRCUIT BOARD, ASSEMBLY: Hewlett-Packard Part No. 721A-65A			1					
	X2	D				CLAMP, ELECTRICAL: Commercial Plastics Part No. CP742-5			1					
	X2	D				DECK, BOTTOM: Hewlett-Packard part No. 721A-1B			1					
	X2	D				DECK, REAR: Hewlett-Packard part No. 721A-1R			1					
	X2	D				FOOT, RUBBER : Hewlett-Packard part No. 0404-0002			8					
	P1	O		5920-281-0205		FUSE, CARTRIDGE: 1/8 amp, 250 v; MIL type FO2GR125B			1		4.6	50.0	1-2(1)	F1
						NOTE: The following fuse is required When the Power Supply is converted from 115 to 230 volt operation.								
	P1	O		5920-227-9142		FUSE, CARTRIDGE: ¼ amp, 125 v; Littlefuse Part No. 313-250			1		4.6	50.0	1-2(1)	F1
	P1	H		5920-548-3244		FUSEHOLDER: 250 v, 20 amp; Bussman part No. 4406			1		0.5	2.0	1-2(1)	
	X2	D				GROMMET, RUBBER: Small Parts part No. 375			1					
	X2	D				INSULATOR, PLATE: Hewlett-Packard part No. 0340-0086			1					
	X2	D				INSULATOR, PLATE: Hewlett-Packard part No. 0340-0088			1					
	X2	D				INSULATOR, PLATE: Monadnock part No. 294457			1					
	P1	O		5355-764-2355		KNOB: Hewlett-Packard part No. 0370-0026			1		0.5	2.0	1-2(1)	

SOURCE CODE				FEDERAL STOCK NUMBER	DESIGNATION BY MODEL						DESCRIPTION	UNIT OF ISSUE	EXP	QTY IN UNIT	DIRECT SUPPORT	GENERAL SUPPORT	DEPOT	ILLUSTRATION	
																		FIGURE NO.	ITEM NO.
A	B	C	D								PP-3514/U (continued)								
	P1			5355-767-9444							KNOB: Hewlett-Packard part No. 0370-0077			2		0.8	4.0	1-2(1)	
	P1			6210-965-1523							LIGHT, INDICATOR: Sloan Co. part No. 858R			1		0.7	3.0	1-2(1)	DS1
	X2										NUT, KNURLED: A-H & H No. 20994NV			1					
	X2										NUT, PLAIN, HEXAGON: Federal Screw Prod Part No. 9002			6					
	P1										NUT, PLAIN, HEXAGON: Jewlett-Packard part No. 2260-0001			2					
	X2										NUT, PLAIN, HEXAGON: Hewlett-Packard part No. 2260-0001			2					
	X2										NUT, PLAIN, HEXAGON: Hewlett-Packard part No. 2820-0001			3					
	X2										NUT, SHEET SPRING: Tinnerman part No. C12008-014-4			1					
	X2										PANEL, FRONT: Hewlett-Packard part No. 721A-2			1				1-2(2)	
	X2										PLATE, IDENTIFICATION: Hewlett-Packard Part No. 7122-0208			1					
	X2										PLATE, MOUNTING: Spaulding part No. 56137			1					
	P1			5940-082-4638							POST, BINDING: Black; Hewlett-Packed part No. 1510-0006			1		0.5	2.0	1-2(1)	Part of J1
	P1			5940-764-5245							POST, BINDING: Red; Hewlett-Packard part No. 1510-01007			2		0.8	4.0	1-2(1)	Part of J1
	P1			5905-758-9117							RESISTOR ASSEMBLY, VARIABLE: 100 ohms; Hewlett-Packard part No. 5080-0617			1		0.9	5.0	1-2(1)	R25
	P1			5905-252-4018							RESISTOR, FIXED, COMPOSITION: 47 ohms ±5%, ½ w; MIL type RC20GF470J			1		0.7	3.0	1-2(2)	R7
	P1			5905-299-1541							RESISTOR, FIXED, COMPOSITION: 150 ohms ±5%, ½ w; MIL type RC2OGF151J			2		1.0	6.0	1-2(2)	R5,R20

SOURCE CODE				FEDERAL STOCK NUMBER	DESIGNATION BY MODEL						DESCRIPTION	UNIT OF ISSUE	EXP	QTY IN UNIT	DIRECT SUPPORT	GENERAL SUPPORT	DEPOT	ILLUSTRATION	
																		FIGURE NO.	ITEM NO.
A	B	C	D								PP-3514/U (continued)								
	P1	H		5905-171-1997							RESISTOR, FIXED, COMPOSITION: 330 ohms ±10%, ½ w; MIL type RC20GF331K			3		1.3	9.0	1-2(2)	R2,R3, R9
	P1	H		5905-195-6800							RESISTOR, FIXED, COM,POSITION: 560ohms ±5%, ½ w; MIL type RC20GF561J			3		1.3	9.0	1-2(2)	R15,R18, R22
	P1	H		5905-195-6791							RESISTOR, FIXED, COMPOSISTION: 680 ohms ±5%, ½ w; MIL type RC 20GF686J			2		1.0	6.0	1-2(2)	R4,R6
	P1	H		5905-539-3204							RESISTOR, FIXED, COMPOSITION: 1,000 ohms ±10%, ½ w; Ohmite part No. L1DL0			1		0.7	3.0	1-2(2)	R16
	P1	H		5905-185-8510							RESISTOR, FIXED, COMPOSITION: 10,000 ohms ±5%, ½ w; MIL type RC20GF103J			1		0.7	3.0	1-2(2)	R17
	P1	H		5905-279-3502							RESISTOR, FIXED, COMPOSITION: 12,000 ohms ±5%, ½ w; MIL type RC20GF123J			1		0.7	3.0	1-2(2)	R23
	P1	H		5905-279-2616							RESISTOR, FIXED, COMPOSITION: 15,000 ohms ±5%, ½ w; MIL type RC20GF153J			1		0.7	3.0	1-2(2)	R10
	P1	H		5905-171-1998							RESISTOR, FIXED, COMPOSITION: 33,000 ohms ±5%, ½ w; MIL type RC20GF333J			1		0.7	3.0	7-3	R1
	P1	H		5905-064-0555							RESISTOR, FIXED, FILM: 9,900 ohms, ½ w ±1%; MIL type RN65D1002F			1		0.7	3.0	1-2(1)	R27
	P1	H		5905-857-5620							RESISTOR, FIXED, 29,900 ohms ½ w ±1%; MIL type RN65D3012F			1		0.7	3.0	1-2(1)	R26
	P1	H		5905-351-1450							RESISTOR, FIXED, WIRE WOUND: Tapped, 5, 7.3, 13.1, and 31.9 ohms, ½ w; Hewlett-Packed part No. 721A-26A			1		0.7	3.0	1-2(1)	R11A, R11B, R11C
	P1	H		5905-351-1450							RESISTOR, FIXED, WIRE WOUND: 11.111 ohms, ½ w, ±0.2%; Hewlett-Packard part No. 721A-26B			1		0.7	3.0	1-2(1)	R24A, R24B, R24C, R24D
	P1	H		5905-771-5957							RESISTOR, VARIABLE, COMPOSITION: 2,000 Ohms ±30% 1/3 w; Hewlett-Packard part No. 210-133			1		0.9	5.0	1-2(2)	R21

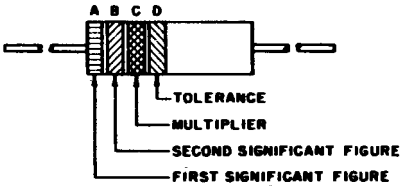
SOURCE CODE				FEDERAL STOCK NUMBER	DESIGNATION BY MODEL						DESCRIPTION	UNIT OF ISSUE	EXP	QTY IN UNIT	DIRECT SUPPORT	GENERAL SUPPORT	DEPOT	ILLUSTRATION	
																		FIGURE NO.	ITEM NO.
A	B	C	D								PP-3514/U (continued)								
	P1	H		5905-502-4571							RESISTOR, VARIABLE: 5,000ohms ±20%, 2 w; Hewlett-Packard part No. 210-15			1		0.9	5.0	1-2(1)	R19
	P1	H		5905-879-5362							RESISTOR, VARIABLE: 5,000 ohms ±30%; Chicago Telephone of California part No. UPE-70			1		0.9	5.0	1-2(2)	R8
	X2	D									RIVET: Chicago Rivet part No. R4008-1-81N			2					
	X2	H									RIVET: Chicago Rivet part No. R4012-5-16 IN			1					
	X2	H									RIVET: Chicago Rivet part No. R4013-3-16 IN			10					
	X2	D									RIVET: Chicago Rivet part No. 0361-0002			8					
	X2	D									SCREW, ASSEMBLY WASHER: Harper part No. 8-32BY3-8 IN			6					
	X2	D									SCREW, MACHINE: Harper part No. 8-32BY3-8IN			2					
	X2	H									SCREW, MACHINE: Harper part No. 6-32BY5-16IN			5					
	X2	H									SCREW, MACHINE: Hewlett-Packard part No. 2200-0013			2					
	X2	H									SCREW, MACHINE: ANS type AN51504-8			2					
	P1	H		5960-728-3264							SEMICONDUCTOR DEVICE, DIODE: RCA part No. 34531			5		1.9	15.0	1-2(1), 1-2(2)	CR1 thru CR4,CR8
	P1	H		5960-564-6460							SEMICONDUCTOR DEVICE, DIODE: Hewlett-Packard part No. 1901-0077			2		1.0	6.0	1-2(2)	CR5,CR6
	P1	H		5960-728-3265							SEMICONDUCTOR DEVICE, DIODE: Hewlett-Packard part No. 1902-0190			1		0.7	3.0	1-2(2)	CR7
	X2	D									SETSCREW: MIL type MS51022-21			4					
	X2	D									SETSCREW: MIL type MS51022-26			2					
	P1	H		5935-763-1304							SOCKET, SEMICONDUCTOR DEVICE: Industrial Electronic Hardware part No. M7PB			1		0.5	2.0		
	X2	D									SUPPORT, DECK: Hewlett-Packard part No. 721A-47A			1					

SOURCE CODE				FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY IN UNIT	DIRECT SUPPORT	GENERAL SUPPORT	DEPOT	ILLUSTRATION	
													FIGURE NO.	ITEM NO.
A	B	C	D			PP-3514/U (continued)								
	X2	D				Support, deck: Hewlett-Packard part No. 721A-47C			2					
	A	H				SWITCH ASSEMBLY: Hewlett-Packard part No. 721A-19A			1					
	A	H				SWITCH ASSEMBLY: Hewlett-Packard part No. 721A-19B			1					
	P1	H		5930-020-6838		SWITCH, ROTARY: 4 position; Oak Mfg part No. 188648-K1			1		0.7	3.0	1-2(1)	S2
	P1	H		5930-757-4317		SWITCH, ROTARY: 6 positions; Oak Mfg part No. 188649-K1			1		0.7	3.0	1-2(1)	S3
	P1	H		5930-729-8375		SWITCH, TOGGLE: Spst; A. H. &H part No. 80994H			1		0.7	3.0	1-2(1)	S1
	X2	D				TERMINAL BOARD: Hewlett-Packard part No. 0360-0261			1					
	X2	D				TERMINAL, LUG: Federal Screw Prod part No. 910			2					
	X2	D				TERMINAL, LUG: Zierick part No. 9			1					
	P1	H		5950-080-6553		TRANSFORMER, POWER, STEP-DOWN: Hewlett-Packard part No. 9100-0129			1		0.7	3.0	1-2(1)	T1
	P1	H		5960-728-3261		TRANSISTOR: RCA part No. CP2366			3		1.3	9.0	1-2(2)	Q2 thru Q4
	P1	H		5960-728-3263		TRANSISTOR: Motorola part No. SP556			1		0.7	3.0	1-2(1)	Q1
	X2	D				TRIM: Hewlett-Packard part No. 6990-0002			1					
	P1	H		6625-811-9906		VOLTMETER: Doc, 0-10 and 0-30 v; Simpson part No. 1227C			1		0.7	3.0	1-2(1)	M1
	X2	H				WASHER, FLAT: Hewlett-Packard part No. 3050-0067			3					
	X2	H				WASHER, FLAT: Marwedel part No. 6S			7					

SOURCE CODE				FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY IN UNIT	DIRECT SUPPORT	GENERAL SUPPORT	DEPOT	ILLUSTRATION	
													FIGURE NO.	ITEM NO.
A	B	C	D			PP-3514/U (continued)								
	X2	H				WASHER, LOCK: Hewlett-Packard part No. 2190-0003			6					
	X2	H				WASHER, LOCK: MIL type MS35335-71			2					
	X2	H				WASHER, LOCK MIL type MS35333-87			3					
	X2	H				WASHER, LOCK: Shakeproof part No. 1920-02-00-2480			3					
	X2	H				WASHER, LOCK: Shakeproof part No. 4010-18-00			1					

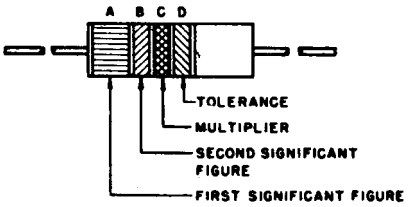
COLOR CODE MARKING MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A - Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

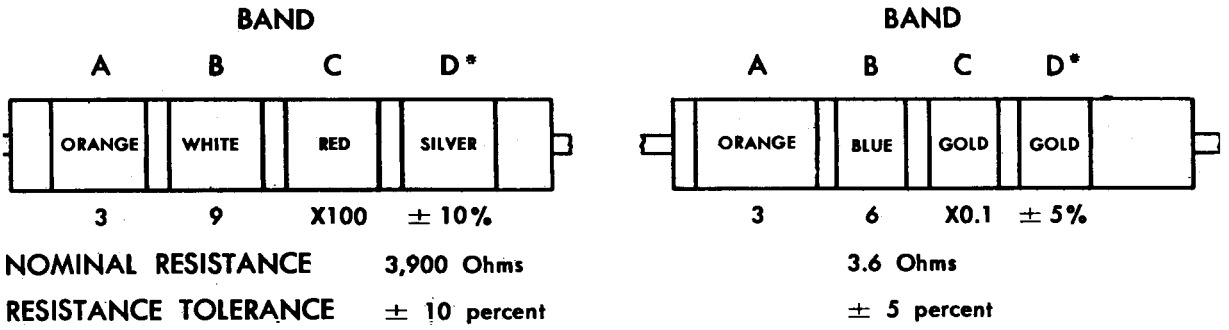


BAND A - Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING

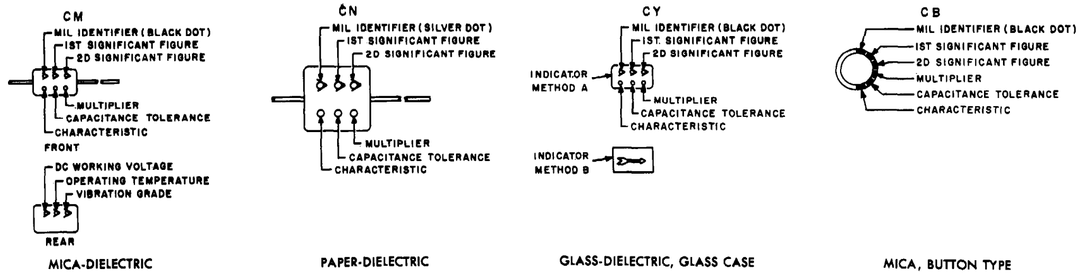


*If Band D is omitted, the resistor tolerance is ±20%, and the resistor is not Mil-Std.

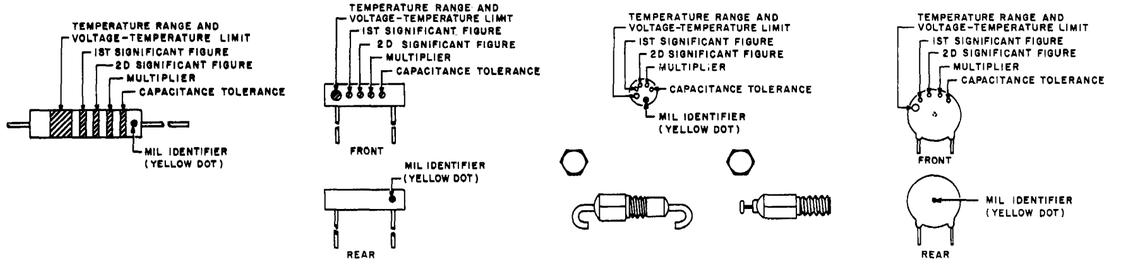
Figure 7-1. Color-code marking for MIL-STD resistors.

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK



GROUP III Capacitors, Fixed, Ceramic-Dieletric (Temperature Compensating) Style CC

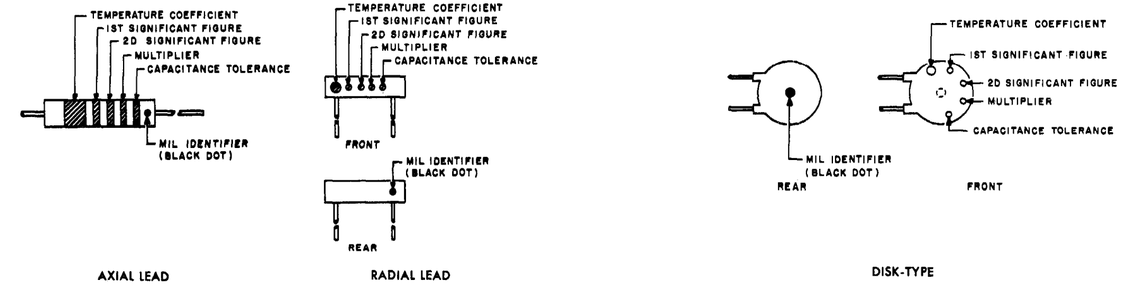


Figure 7-2. Color-code marking for MIL-STD capacitors.

COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A				−55° to +70°C	10–55 cps
BROWN		1	1	10					B	E		B			
RED		2	2	100	± 2%		± 2%	± 2%	C		C			−55° to +85°C	
ORANGE		3	3	1,000		± 30%			D			D	300		
YELLOW		4	4	10,000					E					−55° to +125°C	10–2,000 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											−55° to +150°C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0.1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%							

TABLE II – For use with Group II, General Purpose, Style CK

COLOR	TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letters indicate the Characteristics designated in applicable specifications: MIL-C-5, MIL-C-91, MIL-C-11272, and MIL-C-10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL-C-11015.
4. Temperature coefficient in parts per million per degree centigrade.

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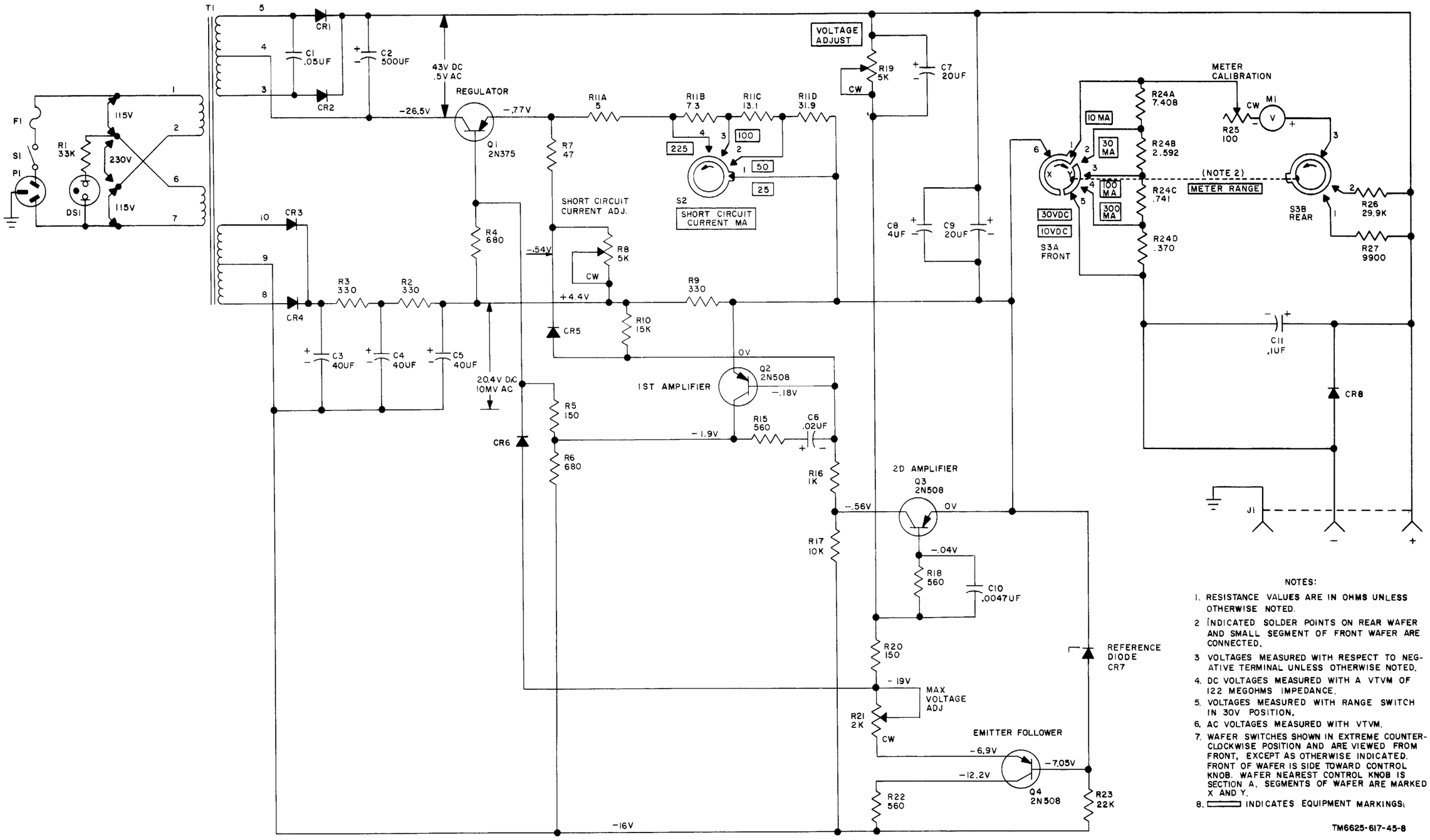

NOTES:

1. RESISTANCE VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.
2. INDICATED SOLDER POINTS ON REAR WAFER AND SMALL SEGMENT OF FRONT WAFER ARE CONNECTED.
3. VOLTAGES MEASURED WITH RESPECT TO NEGATIVE TERMINAL UNLESS OTHERWISE NOTED.
4. DC VOLTAGES MEASURED WITH A VTVM OF 122 MEGOHMS IMPEDANCE.
5. VOLTAGES MEASURED WITH RANGE SWITCH IN 30V POSITION.
6. AC VOLTAGES MEASURED WITH VTVM.
7. WAFER SWITCHES SHOWN IN EXTREME COUNTERCLOCKWISE POSITION AND ARE VIEWED FROM FRONT, EXCEPT AS OTHERWISE INDICATED. FRONT OF WAFER IS SIDE TOWARD CONTROL KNOB. WAFER NEAREST CONTROL KNOB IS SECTION A. SEGMENTS OF WAFER ARE MARKED X AND Y.
8. ▭ INDICATES EQUIPMENT MARKINGS.

TM6625-617-45-8

Figure 7-3. Power Supply PP-3514/U, schematic diagram.

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Chief of Staff.

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J. C. LAMBERT,
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Ft Huachuca (1)
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WSMR (1)
SHAD (3)
SAAD (6)
TOAD (6)
FTWOAD (5)
LEAD (7)
NAAD (5)
SVAD (5)
CHAD (1)
LBAD (6)
Gen Dep (1)
Sig Sec, Gen Dep (4)
Sig Dep (6)
Sig Fld Maint Shops (1)
Units org under fol TOE:
11-155 (2)
11-157 (2)
11-158 (2)
11-587 (2)
11-592 (2)
11-597 (2)

NG: State AG (3).

USAR: None.

For explanation of abbreviations used see AR 320-50.

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