DEPARTMENT OF THE ARMY TECHNICAL MANUAL

FIELD AND DEPOT MAINTENANCE MANUAL
POWER SUPPLY PP-2792/A'RN-30D

Headquarters, Department of the Army, Washington 25, D.C.

22 August 1961

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when working on the 250-volt output line and power supply circuits, or on the 28-volt input line connections.

DON'T TAKE CHANCES !

CHAPTER 1
THEORY

1. Scope

a. This manual covers field and depot maintenance for Power Supply PP-2792/ARN-30D (power supply). It includes instructions appropriate to third, fourth, and fifth echelons for troubleshooting, testing, and repairing the power supply, replacing maintenance parts, and repairing specified maintenance parts. It also lists tools, materials, and test equipment for third, fourth, and fifth echelon maintenance.

b. Forward comments on this Publication direct to the Commanding Officer, U. S. Army Sign a 1 Materiel Support Agency, ATTN: SIGMS-PA2D, Fort Monmouth, N. J.

2. Forms and Records

For applicable forms and records, see paragraph 2 of TM 11-5826-215-12 or the operator manual for the equipment with which the power supply is used.

3. Block Diagram Discussion

The power supply converts 28 volts direct current (de) at 2.3 amperes to 250 volts dc when under a 200-milliampere load. The block diagram for this unit is shown in figure 1 and is discussed in *a* through c below. For complete circuit details, refer to the overall schematic diagram (fig. 8).

a. A primary power source applies an input of 28 volts dc to the input filter L101-C103 of the power supply. This filter couples the 28-volt dc input to inverter Q101-Q102, and prevents transients, which might damage transistor Q101 or Q102, from reaching the inverter.

b. The 28-volt dc received by inverter Q101-Q1O2 from input filter L101-C103 is converted to a square-wave ac voltage. This square-wave voltage is applied to rectifier-filter CR101-CR104 and C105.

c. Rectifier-f i 1 t e r CR101-CR104 and C105 rectifies the square-wave, alternating-current (at) input from the inverter circuit to produce a dc level. The dc level is smoothed to provide a relatively ripple-free source of 250-volt dc voltage for application to the high-voltage load of the power supply.

4. Theory of Input Filter

The input filter is a low-pass filter consisting of coil L101 and capacitor C103 that is connected between terminal 1 of connector J101 and the input to the inverter Q101-Q102 circuit (fig. 8). Coil L101 is a filter choke that presents a low-impedence path to dc, but a high-impedence path to high-frequency signals. Conversely, filter capacitor C103 blocks dc but shunts high-frequency signals to ground. The combined action of coil L101 and capacitor C103 prevents switching transients that develop across terminals 1 and 2 (ground) of connector J101 from damaging inverter transistor Q101 or Q102.

5. Theory of Inverter

The inverter is a saturable-core relaxation oscillator circuit that converts the 28 volts dc applied by the input filter L101-C103 to a square-wave ac voltage. This

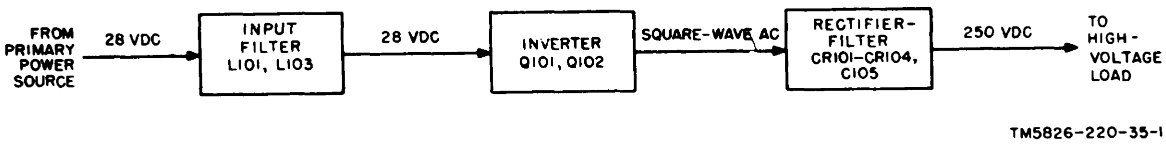


Figure 1. Power supply, block diagram.

square-wave voltage is increased by a step-up transformer before it is applied to rectifier-filter CR101-CR104 and C105.

a. The basic inverter portion of the inverter is shown in the simplified schematic diagram (fig. 2). Assume that at the instant the circuit is energized, a slight imbalance in transistors Q101 and Q102 causes more current to flow in winding 3 than in winding 2 of transformer T101. The increase in current causes flux in the transformer core to begin to change in one direction.

b. The change in flux induces voltages in Windings 1 and 4 and makes them positive at points A and B. Therefore, the base of transistor Q102 becomes negative with respect to its emitter, and the base of transistor Q101 becomes positive with respect to its emitter. Under these conditions, transistor. Q102 is saturated (has low resistance from emitter to collector) and transistor Q101 is effectively cut off (has high resistance from emitter to collector).

c. As transistor Q102 saturates, more and more of the 28-volt input voltage appears across winding 3, and the flux in the core of the transformer increases until saturation of the transformer core occurs. When the core becomes saturated, the flux stops changing. As a result, the voltages induced in windings 1 and 4 drop to zero and cause transistor Q102 to cut off in effect and the current in winding 3 to decrease.

d. The decrease of current in winding 3 causes a decrease of flux in the core of the transformer. This change of flux induces voltages in windings 1 and 4 of transformer T101 that cause points A and B to go negative. As a result, transistor Q102 is effectively cut off, transistor Q101 is saturated, and current increases in transformer T101 winding 2 until the transformer core is saturated in the opposite direction. Up to the point at which the core switches its direction of saturation, the voltages induced in windings 1 and 4 keep transistor Q102 cutoff and transistor Q101 saturated. When the core of the transformer is saturated in the other direction, the switching again takes place,

e. The switching action of the transistors continues, causing current to flow alternately through transformer windings 2 and 3 and inducing an approximately 1,000 -cycle-per-second (cps) square-wave ac voltage in winding 5 of the transformer.

f. In the actual inverter circuit (fig. 8), the transistor bases are at a bias voltage developed across resistor R101 for Q101 and resistor R102 for Q102. In addition, resistor-capacitor networks are connected in the feedback path of each transistor circuit to permit rapid switching of the transistors; resistor R103 and capacitor C101 for transistor Q101 and resistor R104 and capacitor C102 for transistor Q102. Transformer T101 acts as part of the relaxation oscillator circuit and steps up the oscillator output for application to the rectifier-filter.

6. Theory of Rectifier-Filter

a. The rectifier-filter consists of a bridge rectifier, buffer capacitor C104, and filter capacitor C105.

b. The bridge rectifier circuit is made up of crystal diodes CR101 through CR104 (fig. 8). The square-wave output of the inverter (Q101 and Q102) is taken from the secondary (terminals 7 and 6) of transformer T101 and is applied across the bridge circuit. The bridge circuit provides full-wave rectification of the square wave.

c. The output of the bridge rectifier is applied across filter capacitor Cl 05. This capacitor bypasses variations in the rectifier output to ground, thus smoothing the

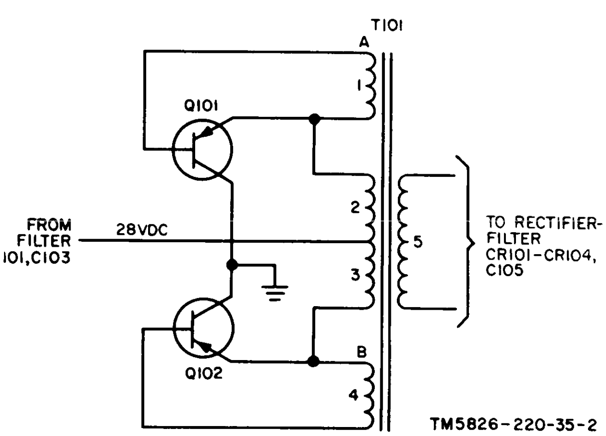


Figure 2. Basic inverter circuit, equivalent schematic diagram.

250-volt dc output appearing across terminals 2 and 3 of connector J101.

d. Buffer capacitor C104 absorbs surges that occur when the current is switched in the primary. The collapse of the magnetic field in the primary is practically instantaneous and causes high voltages to be induced in the secondary. If capacitor C104 were not present, the secondary voltages could cause arcing across the bridge rectifier and/or filter capacitor, thus damaging the crystal diodes or filter capacitor.

CHAPTER 2

TROUBLESHOOTING

Warning; When servicing the power supply, be extremely careful because of the high-voltage output. Always disconnect the power supply from its primary power source except to make voltage and current readings.

7. General Instructions

The field and depot maintenance procedures in this manual supplement the procedures described in the operator and organizational maintenance manual for the equipments which use the power supply. Systematic troubleshooting procedures for the power supply are covered in paragraph 14.

8. Organization of Troubleshooting Procedures

a. General. The first step in servicing a defective power supply is to isolate the fault. Isolation means tracing the fault to a defective part responsible for the abnormal condition. Some faults, such as a burned-out resistor or an arcing transformer, can often be located by sight, smell, and/or hearing. Other faults, however, must be isolated by performing a bench test or by checking resistances. Once the defective part is isolated, the second step in servicing the power supply is to repair the defective part. Power supply repair is described in chapter 3.

b. Isolation Procedures. The procedures listed below will aid in isolating power supply troubles.

(1) *Voltage and resistance measurements.* This equipment is transistorized. Observe all cautions to prevent transistor damage. Make voltage and resistance measurements in the power supply only as specified. When measuring voltages, use tape or sleeving to insulate the entire test probe, except for the extreme tip. A momentary short circuit can ruin a transistor. (For example, if a bias resistor is shorted, excessive current between the emitter and the base can ruin a transistor.) Use resistor and capacitor color codes (fig. 9 and 10) to find the value of the parts.

(2) *Bench tests.* Bench test procedures (para 13) provide a detailed form of performance check of the power supply. When a malfunction is detected during performance of these tests, refer to the troubleshooting chart (para 14c) for probable cause of the symptom observed.

(3) *Troubleshooting chart.* "The trouble symptoms listed in the chart (para 14c) can aid in isolating a trouble to a component part.

(4) *Intermittent troubles. In* all these procedures, the possibility of intermittent troubles should not be overlooked. If present, this type of trouble can often be made to appear by tapping or jarring the power supply. Check the wiring and connections in the unit.

9. Test Equipment Required

The following chart lists test equipment required for troubleshooting the power supply, the associated technical manuals, and the assigned common names:

Test equipment	Tecohnical manual	Common name
Multimeter TS-352/U or equivalent.	TM 11-5527	Multimeter
Multimeter ME-26 B/U or equivalent.	TM 11-6625-200-12	Voltmeter
Power Supply PP-11041/G.	TM 11-5126	Test power source
2, 600-ohm, 50-watt resistor.	None.	Test resistor

Caution: Do not attempt to troubleshoot, remove, or replace power supply parts before reading the specific instructions in this section and in paragraph 16.

10. Troubleshooting Transistor Circuits

Transistors are sensitive to bias voltages; therefore, momentary short circuits, improperly applied voltages, and excessive currents, may ruin a transistor. Special techniques and precautions must be observed when troubleshooting the transistor circuits in the power supply .Before troubleshooting the power supply, read and become familiar with the instructions in this paragraph. Transistors can be ruined by improper or careless handling.

a. Before using any item of test equipment to troubleshoot the transistor circuits, be sure any self-contained power supplies in the test equipment use a power transformer. If the test equipment is the line-connected (transformerless) type, an isolation transformer must be connected between the ac line and the ac input of the test equipment. In some test equipment, the ac input is bypassed to the chassis by capacitors. This places an ac voltage on the chassis which can pass through the unit under test and damage transistors. To eliminate this, connect a common ground lead between the common return of the circuit under test and the test equipment before making any test probe connections.

b. Use a multimeter or voltmeter (para 9) or any 20,000 -ohm-per-volt meter or electronic voltmeter when making voltage tests on the power supply. Meters with lower sensitivities can draw excessive currents from the circuits under test when used on their low-voltage ranges. Never use a meter that has a sensitivity lower than 5,000-ohms-per-volt on the lowest range. When a vacuum-tube voltmeter is used, observe the precautions in a above.

c. When making resistance checks, do not permit e x c ess i v e current to flow through the circuit under test. Current in excess of several milliamperes can damage the transistors in the power supply. Before using any ohmmeter to measure resistance in the transistor circuit, check the current flowing through the external circuit on all ranges of the ohmmeter. The current may be checked by connecting a low internal resistance milliammeter in series with the test leads and observing the current for each of the ohmmeter ranges.

11. Checking for Shorts

Before attempting service of the power supply, make the measurements indicated in the following chart on the RX1 scale of the multimeter to insure that a power supply short does not damage the test power source. If either measurement does indicate a short (O ohm), perform the isolating procedure indicated.

Point of measurement	Isolating procedure
Between pins 1 and 2 of connector J101	If resistance is zero, check continuity between grand and terminal 2 of choke L101, terminal 1 of choke L101, terminal 3 of transformer T101, and terminals 2 and 4 of transformer T101 (fig. 3 and 4), to determine the wire or part that is shorted to ground.
Between pins 1 and 3 of connector J101	If resistance is zero, check continuity between the point of intersection of crystal diodes CR101, CR102, and capacitor C105, at the interescticm of CR101 and CR104, and at the interjection of CR102 and CR103 to determine the wire or part that is shorted to ground.

12. Test Setup

Bench tests of the power supply require connection to a test power source and to various test equipments. The test power source and other test equipments must be connected as shown in figure 5.

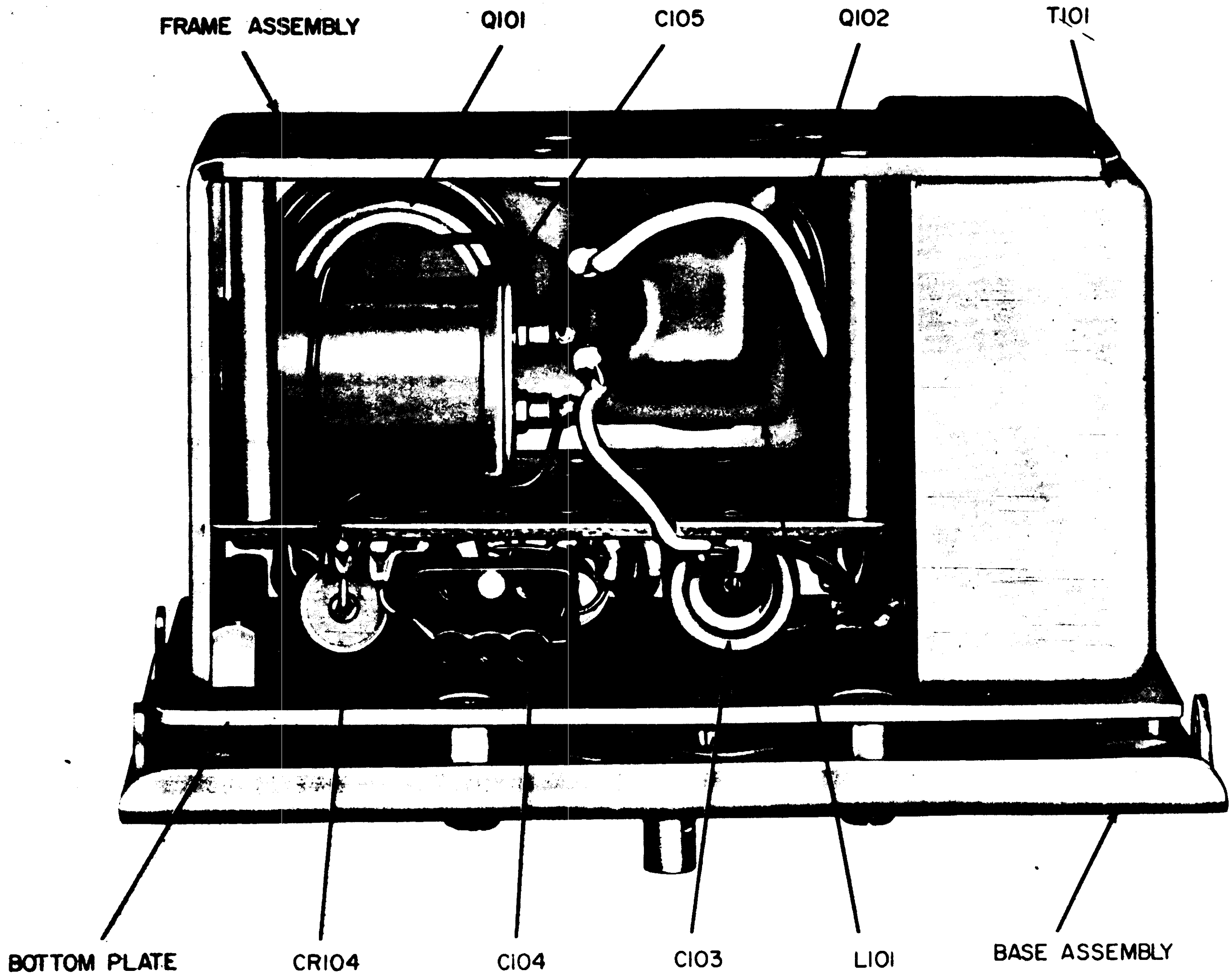


Figure 3. Power supply, parts location.

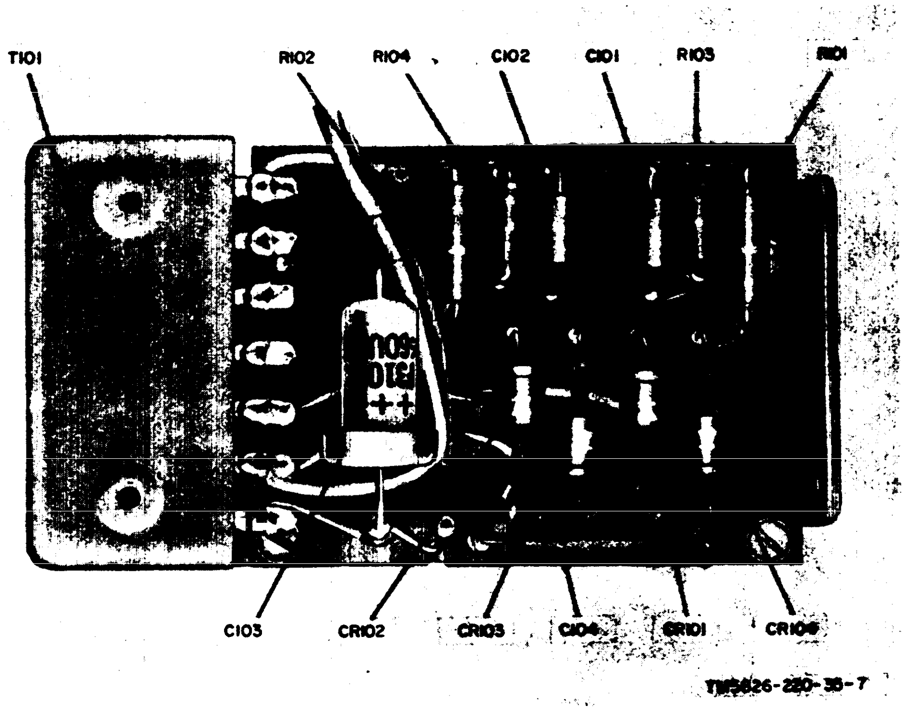


Figure 4. Terminal board, parts location.

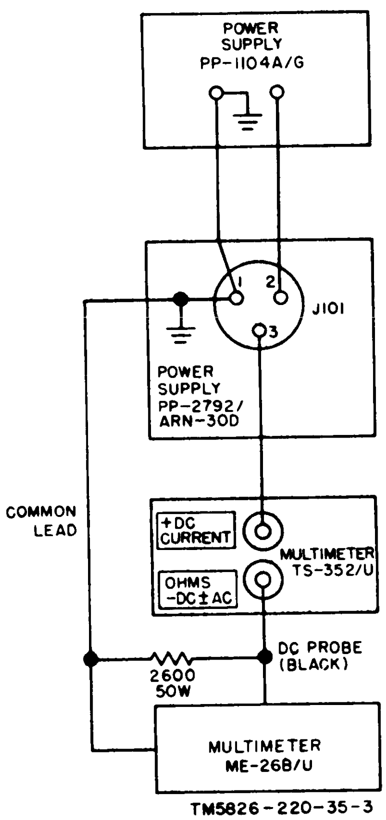


Figure 5. *Bend-test setup.*

13. Bench-Test Procedures

Perform the following bench-test procedures to detect a trouble in power supply performance. When symptoms of trouble are found, refer to the troubleshooting chart (para 14c).

a. Connect the power supply and test equipment as shown in figure 5.

b. Turn on the test power source and adjust it for zero output. The multimeter and voltmeter should read zero.

Caution: Do not Increase the voltage output of the tent power source in the next step past the point at which the current drawn by the power supply is at 1 ampere as indicated on the power source dc ammeter.

c. Raise the output voltage of the test power source until the power supply produces a measurable output at the multimeter and voltmeter.

d. Record the voltage and current of the test power source at which the power supply starts operation in c above. The test power source voltage should be approximately 6 volts and the current, approximlately *0.2 ampere.*

Caution: **Stop the teat prooedure if the test power source current exceeds 1.5 amperes In the following steps.**

e. Raise the output voltage of the test power source until the input to the power supply is 30 volts.

f. Record the current output of the test power source. The test power source current should be approximately 1.3 amperes.

g. Record the current output of the power supply as measured with the multimeter. The current should be approximately 110 milliamperes.

h. Record the voltage output of the power supply as measured with the voltmeter. The voltage should be approximately 300 volts.

14. Isolating Troubles

a. General. Procedures are outlined in the troubleshooting chart (c below) for isolating troubles to the parts of the power supply. Depending upon the nature of the operational or bench test symptoms, one or more of the isolating procedures will be necessary.

b. Use of Chart. The troubleshooting chart (c below) is designed to supplement the bench test procedures (para 13). If no operational symptoms are known, perform the bench tests before using this chart to detect the symptom. Refer to paragraphs 16 through 18 for parts replacement techniques.

c. *Troubleshooting Chart.*

Item	Indication	Probale trouble	Procedure
1	*Power supply draws more than l ampere current from teat power source before producing Output.*	COil L101 shorted to ground. . .	check continuity of terminale 1 and 2 of coil L101 to ground (fig. 3).
		Capacitor C103 defective	Check continuity across capacitor C103 (fig. 4) to detect short to ground.
		Transformer T101 dafective .,	Check *continuity* of transformer T101 windings to ground.
		Transistor Q101 and/or Q102 defective.	Check continuity from terminals 2 and 4 of transformer T101 to ground. *Caution:* When performing the following pro cedure, be careful that meter probes are not connected to the transistor base terminal at any the. Excessive current from base to emitter can burn out a transistor.
2	Power supply draws more than 0.2 ampere of current from test power source to produce an output.	Transistor Q101 and/or Q102 defective.	Measure dc resistance of transistor Q101 by canecting the multimeter common test probe to ground and the muitimeter positive test probe to terminal 2 of transformer T101. Reverse test probes. First resistance measured should be at least 10,000 times larger than second. Measure dc resistance of transistor Q102 by connecting multimeter commm test probe to ground and the multimeter positive test probe to terminal 4 of transformer T101. Reverse test probes. First resistance measured should be at least 10,000 times greater than Second.
3	Power SUPPly requires more than 6 volts input to produce an output.	Defective transformer T101..,	Check the resistance of transformer T101 windings (para 15). Replace the transformer *Caution:* When performing the following procedure, be careful that mneter probes are not connected to the transistor base terminal at any time. Excesive current from base to l nitter can burn out a transistor.
		Defective transistor Q101 and/or Q102	Check front-to-back resistance of trsnsistors Q101 and Q102 (item 2).
		Defective capacitor C103....	Replace capacitor C103.
4	*Power supply draws* more than 1.2-ampere lnput current when operating at rating input ~voltage.	Defective transistor Q101 or Q102.	Replace transistor Q101 and Q102,
		Defective capacitor C103, C104, or C105.	Replace defective capacitor (fig. 3 and 4).

Item	Indication	Probable trouble	Procedure
5	**Power supply produces no output (draws less than 1.3 ampere).**	*Defective* diode CRl0l , CRl02, CRl03, or CRl04.	Measure frost-to-block resistance of diodes CR101, CR102, CR102, and CR104 in turn, by connecting multimeter leads across each diode (fig. 4), recording resistance measured, then reversing multimeter leads, and recording resistance measured again. One resistance reading should be at least 10,000 them greater than the other for each diode; if not,
		Defective transformer T101...	Measure resistance from terminals 6 and 7 of transformer T101 to each other and to ground. If resistance measurements indicate open winding or short to ground, replace transformer T101.
		CoiL L101 Open.	Check resistance of coil L101 (para 15). Replace coil if defective.
			Caution: When performing the following *pro*cedures, be careful that meter probes are not connected to the transistor base termiinal at my time. Excessive current from base to emitter can burn out a transistor.
		Transistor Q101 and/or transistor Q102 defective.	Check front-to-back resistance of transistors Q101 and Q102 (item 2).
6	Power supply output voltage is liner than 300 volts or output current is lower than 100 milliamperes with 30-Volt, 1. 3-ampere input.	Crystal diode CR101, CR102, CRl03, or CR104 defective.	Measure front-to-back resistance of CR101, CR102, CR103, and CR104, in turn (item 5). Replace defective diode.
		Defective transformer T101...	*Measure* continuity of terminal 6 and terminal 7 of transformer T101 to ground. If continuity is measured in either case, replace transformer T101.
		Defective resistor R101 or R102.	Measure resistance of R101 and R102. If either resistor does not produce reading of 2,565 to 2,835 ohms, replace resistor.
		Defective resistor Rl03 or R104.	*Measure resistance* of R103 and R104. If either resistor does not produce reading of 31.5 to 34.5 ohms, replace resistor.
		Defective capacitor C 101 or C102.	Check continuity of capacitors C101 and C102. If either capacitor is open or shorted, replace it.

15. Dc Resistance of Transformer T101 and Coil L101

(fig. 3 and 4)

The dc resistances of transformer T101 windings and of coil L101 in the power supply are listed below:

Transformer or coil	Terminals	Ohms
T101	1-2	Less than 1
	2-3	Less than 1
	3-4	Less than 1
	4-5	Less than 1
	6-7	7.5
L101	1-2	Less than 1

CHAPTER 3

REPAIRS

16. General Parts Replacement Techniques

The parts of the power supply can be reached easily and replaced without special procedures. The following precautions apply specifically to the power supply:

***Caution:* Never remove or replace a transistor or crystal diode while power is applied to the power supply. Surge currents can damage the transistor or diode.**

a. Use a pencil-type soldering iron with a 25-watt maximum capacity. If only ac-operated irons are available, use an isolating transformer. Do not use a soldering gun; damaging voltages can be induced into component parts.

b. When soldering to transistor or crystal diode terminals, solder quickly; whenever possible, use a heat sink (such as a long-nosed pliers) between the soldered point and the main body of the transistor or diode.

c. Observe the polarity of crystal diodes when replacing them. The polarity and location are shown in the wiring diagram (fig. 7)l

d. A transistor or diode should not be replaced in a circuit until determined that no short circuit exist in the power supply (para 11). A short circuit can affect the bias voltage on the transistor or diode and damage the replacement part.

17. Parts Removal

a. Remove the screw in one end of the power supply and the four screws in the top of the power supply cover (TM 11-5826-215-12).

b. Lift off the cover.

c. Clean the top surface of the frame assembly (fig. 3) with a clean cloth.

d. Turn the power supply upside down.

e. Replace a part on the terminal board by removing the four screws that attach the base assembly to the bottom plate and the two screws that fasten the bottom plate to transformer T101.

f. Replace transistor Q101 by removing the two screws that hold capacitor C105 and gent1y pushing the capacitor to one side.

g. Replace transistor Q102 by removing the two screws that hold coil L101 and gently pushing the coil to one side.

h. Remove any given part by using the soldering techniques (para 16). Tag wire leads for identification when replacing a part.

18. Parts Replacement

a. Solder the replacement part in place; use the soldering techniques described in paragraph 16. Use the wiring diagram (fig. 7) and information provided by tags placed on wire leads during removal procedures (para 17) to determine where connections are to be made.

b. Push coil L101 gently into place (fig. 3) and screw it to the top of the frame assembly after replacement of transistor Q102.

c. Push capacitor C105 gently into place (fig. 3) and screw it to the side of the frame assembly during replacement of transistor Q101.

d. Secure the bottom plate to transformer T101 and the base assembly to the bottom plate with the screws provided.

e. Apply a thin coating of Dow-Corning 4 compound to the top surface of the frame assembly.

f. Place the cover (TM 11-5826-215-12) over the power supply and secure it with four screws at the top and one at the side.

g. Seal screws, studs, and nuts that are used without lockwashers with black glyptal enamel, or equivalent.

19. Lubrication

The power supply snapslides (TM 11-5826-215-12) are the only items that require lubrication. Lightly lubricate them with Lubricating oil, general purpose, preservative (PL special).

CHAPTER 4

FOURTH ECHELON TESTING PROCEDURES AND FINAL TESTING

Section I FOURTH ECHELON TESTING PROCEDURES

20. General

a. Testing procedures are prepared for use by Signal Field Maintenance Shops and Signal Service Organizations responsible for fourth echelon maintenance of signal equipment to determine the acceptability of repaired signal equipment. These procedures set forth specific requirements that repaired signal equipment *must* meet before it is returned to the using organization. The testing procedures may also be used as a guide for testjng equipment that has been repaired at third echelon if the proper tools and test equipment are available. A summary of the performance standards is given in paragraph 25.

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

21. Test Equipment, Tools, and Materials

All test equipment, tools, materials, and other equipment required to perform the testing procedures given in this section are listed in the following charts and are authorized under TA-11-17 and TA-ll-100(11-17).

a. Test Equipment.

Nomenclature	Federal stock No.	Technical manual
Power Supply PP-1104A/G	6130-542-6385	TM 11-5126
Multimeter ME-26 B/U	6625-646-8408	TM 11-6625-200-12
Test Set I-199-A		TM 11-2604

b. Tools

Nomenclature	Federal stock No.
Tool Kit TK-114, or	5180-408-1879
Tool Kit TK-87/U and	5180-690-4452
Tool Kit TK-88/U	None

c. *Materials.*

Material	Federal stook No.
Wire, copper, insulated, No. 14 (or larger), hookup.	None
Enamel, glyptal, black or equivalent.	8010-598-5953
Compound, Dow-Corning 4	None

22. Test Facilities

An ac power source of 115 volts ±10, 50 to 60 cycles, 60 watts is required to furnish operating voltages for the test equipment used to test the power supply.

23. Physical Tests and Inspection

a. Materials. Dow-Corning 4 compound, black glyptal enamel.

b. Test Conditions. Remove the four screws from the top of the power supply cover (TM 11-5826-215-12) and the single screw from the end of the power supply cover to remove the cover.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	N/A	N/A	*a.* Inspect the power supply for loose or missing screws, studs, or nuts. *b.* Inspect the connector for looseness and damage.	*a.* Screws, studs, and nuts should be tight; none missing. *b.* No looseness or damage evident.
2	N/A	N/A	*a.* Inspect the cover for damage and condition of finish. *Note.* Touchup painting with black glyptal enamel is recommended in place of refinishing, whenever practicable. *b.* Inspect the screws on frame assembly and base assembly for paint seal. *Note.* Apply a thin coat of Dow-Corning 4 compound to the top surface of the frame assembly before reassembly.	*a.* No damage evident. External surface of cover does not show bare metal. *b.* Screws on frame assembly and base assembly sealed with black glyptal enamel, or equivalent.
3	N/A	N/A	Assemble power supply and secure cover with the screws removed in *b* above.	None.

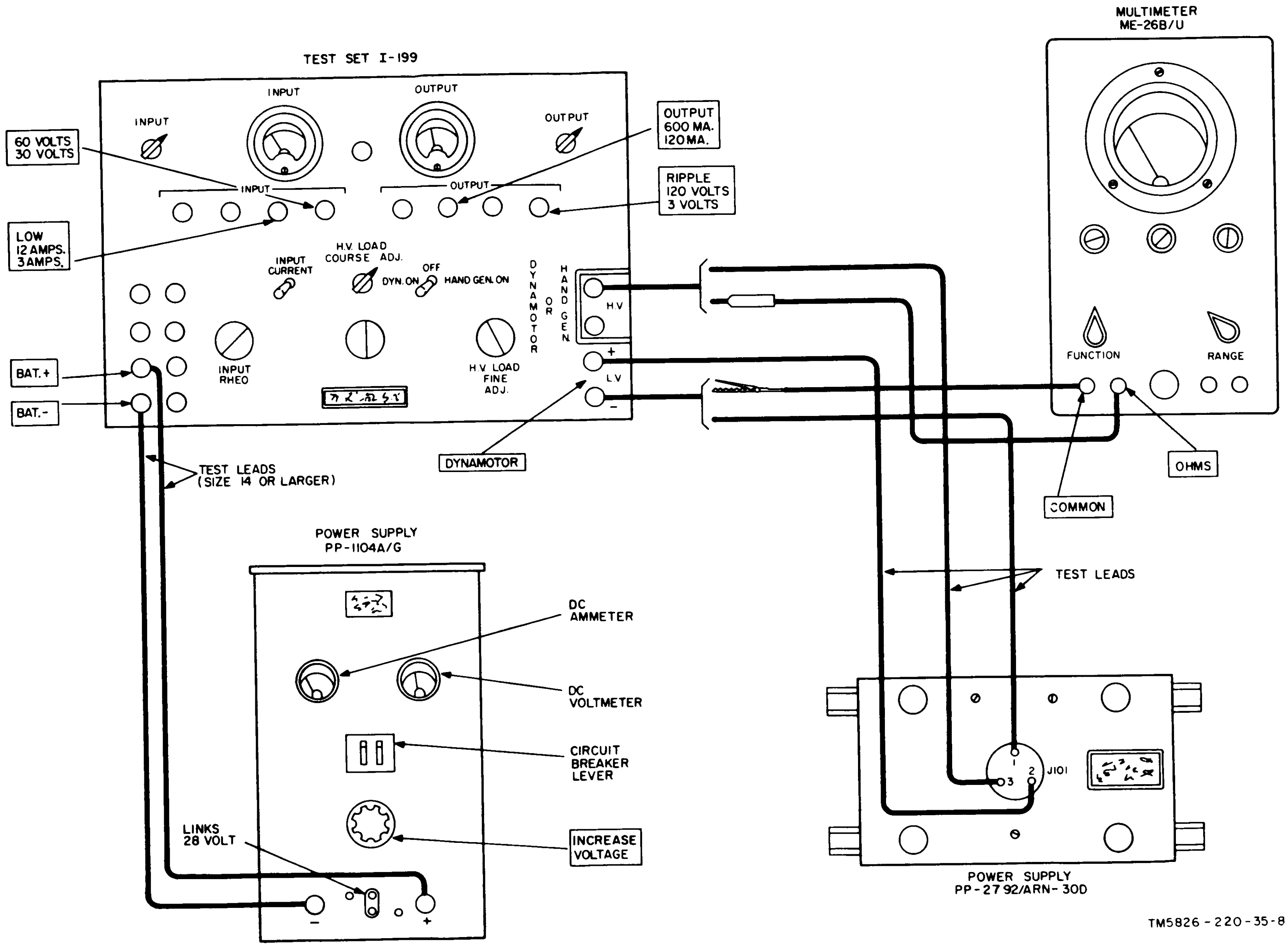


Figure 6. Power supply, performance test setup.

24. Power Supply Performance Tests

a. Test Equipment and Materials.

(1) Power Supply PP-1104A/G.

(2) Multimeter ME-26B/U.

(3) Test Set I-199-A.

b. Test Connections and Conditions. Connect the equipment as shown in figure 6. The test leads connecting Power Supply PP-1104A/G to Test Set I-199-A must be size 14 or larger (smaller wire gage number) and as short as possible.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test Procedure	Performance standard
1	*PP-1104A/G:* Circuit breaker lever: OFF INCREASE VOLTAGE: 1 Links: both across center terminals for 28-volt operation. *ME-26B/U:* FUNCTION: OHMS RANGE: RX10K 100V *I-199-A:* DYN. ON-OFF-HAND GEN. ON: OFF INPUT CURRENT: HIGH INPUT RHEO.: counter-clockwise. INPUT: VOLTS OUTPUT: VOLTS H.V. LOAD COARSE ADJ.: OFF	N/A	*a.* Connect ME-26B/U COMMON clip and OHMS probe to I-199-A DYNAMOTOR OR HAND GEN. H.V. binding posts. *b.* Adjust I-199-A H.V. LOAD COARSE ADJ. and H.V. LOAD FINE ADJ. switches to produce 1,250-ohm reading on ME-26B/U. *c.* Disconnect ME-26B/U from I-199-A. *d.* Connect power supply connector J101 terminals 1 and 3, to I-199-A DYNAMOTOR OR HAND GEN. H.V. binding posts. *e.* Place PP-1104A/G circuit breaker lever to ON, and allow 5-minute warmup before proceeding.	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None.
2	Leave controls in positions last indicated in step 1, except: *ME-26B/U:* FUNCTION: OFF *I-199-A:* DYN. ON-OFF-HAND GEN. ON: DYN. ON. INPUT CURRENT: LOW	N/A	*Caution:* **Stop test and reject power supply under test if current read on PP-1104A/G dc ammeter exceeds 2 amperes during performance of *a* below or exceeds 5 amperes at any time during test.** *a.* Turn I-199-A INPUT RHEO. slowly clockwise, while pressing OUTPUT 300 volts pushbutton and watch PP-1104A/G dc ammeter and I-199-A OUTPUT meter. *b.* Press INPUT 300 VOLTS and record voltage reading on I-199-A INPUT meter when deflection is first observed on I-199-A OUTPUT meter.	*a.* Power supply input current read on PP-1104A/G dc ammeter should not exceed 2 amperes before power supply output voltage can be read at I-199-A OUTPUT meter. *b.* I-199-A INPUT meter reads 5 volts or less when power supply output starts (I-199-A OUTPUT meter deflects).
3	Leave controls in position last indicated in step 2.	N/A	*a.* Turn PP-1104A/G INCREASE VOLTAGE knob to 3. PP-1104A/G dc voltmeter should read 26 volts. *b.* Turn I-199-A INPUT RHEO. slowly clockwise until 26 volts is read on I-199-A INPUT meter. *c.* Place I-199-A OUTPUT switch to MA. *d.* Adjust H.V. LOAD FINE ADJ. switch to produce 200 ma reading on I-199-A OUTPUT meter. *e.* Place I-199-A OUTPUT switch to VOLTS and press OUTPUT 300 VOLTS pushbutton 0. *f.* Press I-199-A OUTPUT RIPPLE 3 VOLTS pushbutton and read OUTPUT meter.	*a.* None. *b.* None. *c.* None. *d.* PP-1104A/G dc ammeter reads 2.3 amperes or less for 200-ma load test. *e.* I-199-A OUTPUT meter reads 245 volts or more for 200-ma load test. *f.* I-199-A OUTPUT meter reads 1 volt or less for 200-ma load test.
4	Same as step 1.	N/A	*a.* Connect ME-26B/U COMMON clip and OHMS probe to I-199-A DYNAMOTOR OR HAND GEN. H.V. binding posts in place of power supply connector J101, terminal 3 connection. *b.* Adjust I-199-A H.V. LOAD COARSE ADJ. and H.V. LOAD FINE ADJ. switches to produce 2,600-ohm reading on ME-26B/U. *c.* Disconnect ME-26B/U from I-199-A. *d.* Connect power supply to I-199-A DYNAMOTOR OR HAND GEN. H.V. binding posts. *e.* Place PP-1104A/G circuit breaker lever to ON, and allow 5-minute warmup before proceeding. *f.* Place I-199-A DYN. ON-OFF-HAND GEN. ON switch to DYN. ON. *g.* Turn PP-1104A/G INCREASE VOLTAGE knob to 3. PP-1104A/G dc voltmeter should read 26 volts. *h.* Press I-199-A INPUT 30 VOLTS pushbutton and turn I-199-A INPUT RHEO. slowly clockwise until 26 volts is read on I-199-A INPUT meter. *i.* Place I-199-A OUTPUT switch to MA and press I-199-A OUTPUT 120 MA pushbutton. *j.* Adjust H.V. LOAD FINE ADJ. switch to produce 100-ma reading on I-199-A OUTPUT meter. *k.* Place I-199-A OUTPUT switch to VOLTS and press OUTPUT 300 VOLTS pushbutton. *l.* Place I-199-A OUTPUT switch to RIPPLE.	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* None. *g.* None. *h.* None. *i.* None. *j.* PP-1104A/G dc ammeter reads 1.3 amperes or less for 100-ma load test. *k.* I-199-A OUTPUT meter reads 250 volts or more for 100-ma load test. *l.* I-199-A OUTPUT meter reads 1 volt or less for 100- ma load test.
5	Leave controls in position last indicated in step 4.	N/A	*a.* Place H.V. LOAD COARSE ADJ. switch in OFF position. *b.* Read PP-1104A/G dc ammeter.	*a.* None. *b.* PP-1104A/G dc ammeter reads 0.2 ampere or less for no-load test.
6	N/A	N/A	Disconnect test equipment.	None.

25. Summary of Test Data

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

Item checked	Test data	Performance standard
Input current to start power supply	--------	2 amperes max
Input voltage to start power supply	--------	5 volts max
Input current for 200-ma load	--------	2.3 amperes max
Output voltage for 200-ma load	--------	245 volts min
Output ripple for 200-ma load	--------	1 volt max
Input current for 100-ma load	--------	1.3 amperes max
Output voltage for 100-ma load	--------	250 volts min
Output ripple for 100-ma load	--------	1 volt max
Input current for no load	--------	0.2 ampere max

Section II. FINAL TESTING

26. Purpose of Final Testing

The tests referred to below are designed to measure the performance capability of a repaired equipment. Equipment that meets the minimum standards stated in the tests will -furnish satisfactory operation, equivalent to that of new equipment.

27. Test Equipment Required for Final Testing

The test equipment required for final testing is the same as that listed for fourth echelon testing procedures (para 21). Refer to the appropriate technical manuals for instructions on the use of the test equipment.

28. Tests

Perform the following tests in the order given.

a. Physical tests and inspection (para 23).

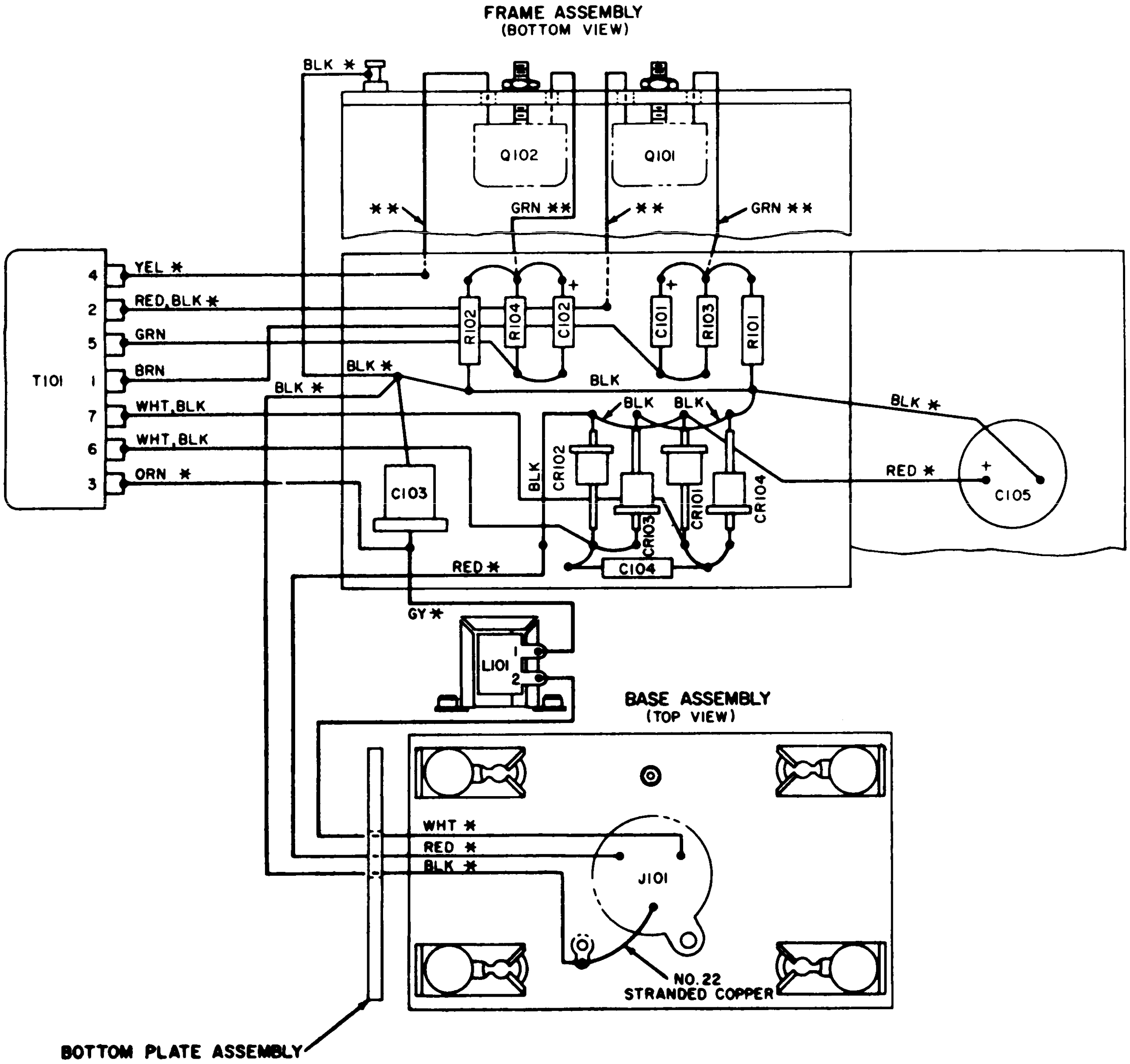
b. Power supply performance tests (para 24).

APPENDIX

REFERENCES

Following is a list of references applicable and available to the field and depot maintenance repairmen of the power supply.

TA-11-17	Signal Field Maintenance Shops.
TA-11-100 (11-17)	Allowances of Signal Corps Expendable Supplies for Signal Field Maintenance Shop, Continental United States.
TM 11-2604	Test Set 1-199 and I-199A.
TM 11-5126	Power Supply PP-l104A/G.
TM 11-5527	Multimeter TS-352/U, TS-352A/U and TS-352B/U.
TM 11-5826-215-12	Operator's and Organizational Maintenance Manual Receiving Set, Radio AN/ARN-30D.
TM 11-5826-215-35	Receiving Set, Radio AN/ARN-30D; Field and Depot Maintenance.
TM 11-6625-200-12	Operation and Organizational Maintenance, Multimeter ME-26B/U.



NOTES:

1. WIRES MARKED WITH A COLOR NOTE ARE NO.24 STRANDED COPPER, TEFLON INSULATED.
2. WIRES MARKED WITH A COLOR NOTE AND AN ASTERISK (*) "ARE NO. 22 STRANDED COPPER, TEFLON INSULATED.
3. WIRES MARKED WITH A DOUBLE ASTERISK (**) ARE FURNISHED WITH THE TRANSISTORS.
4. UNMARKED WIRES ARE NO.24 BARE, SOLID, TINNED COPPER.

TM5826-220-35-6

Figure 7. Power Supply PP-2792/ARN-30D, wiring diagram.

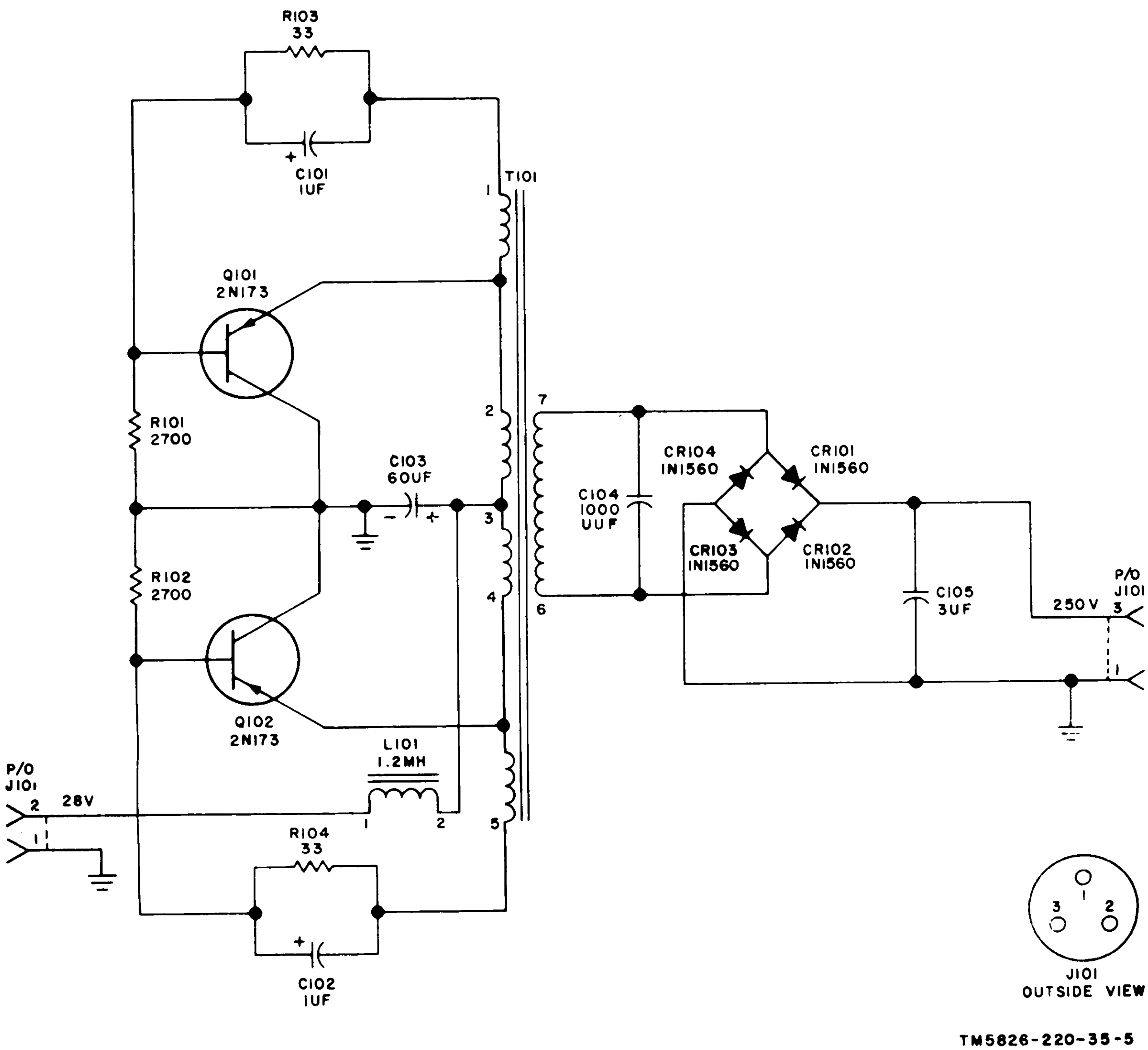
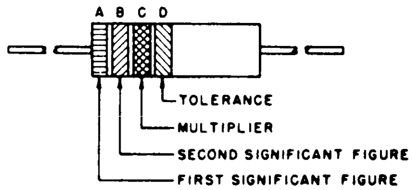


Figure 8. Power Supply PP-2792/ARN-30D, schematic diagram.

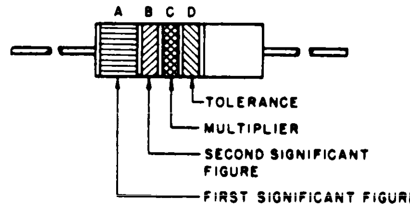
COLOR CODE MARKING FOR MILITARY STANDARD RESISTOR

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS



BAND A— Double Width Signifies Wire-wound Resistor

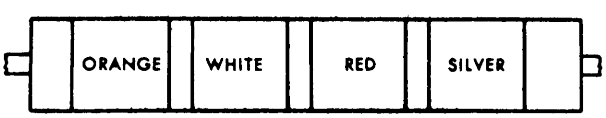
COLOR CODE TABLE

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

BAND

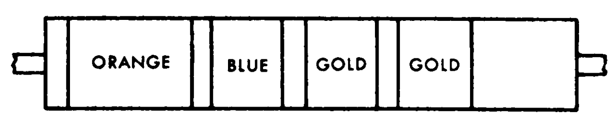
A B C D*



3 9 X100 ± 10%

BAND

A B C D*



3 6 X0.1 ± 5%

NOMINAL RESISTANCE	3,900 Ohms	3.6 Ohms
RESISTANCE TOLERANCE	± 10 percent	± 5 percent

STD-R2

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

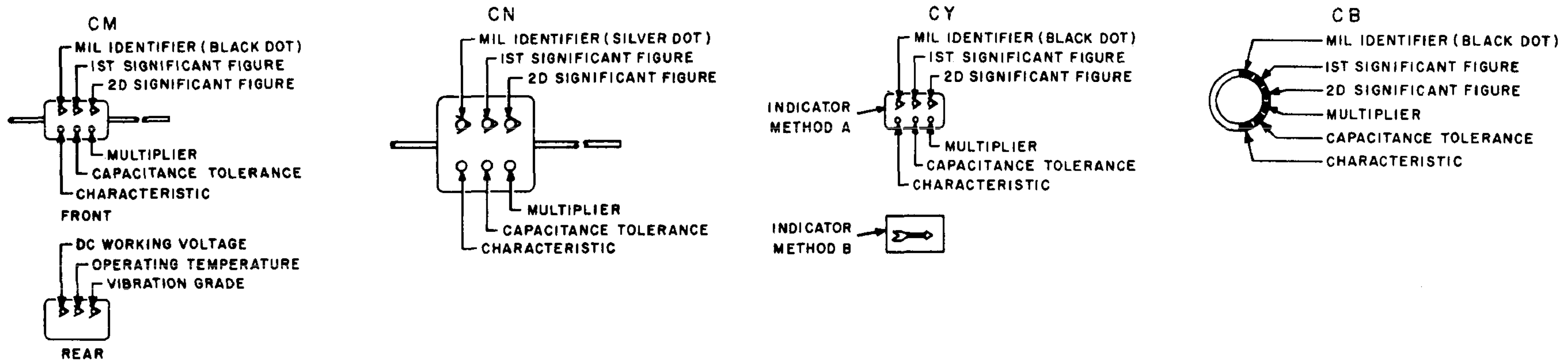
Figure 9. MIL-STD resistor color code marking.

This page left blank intentionally.

GPO 802-892-2

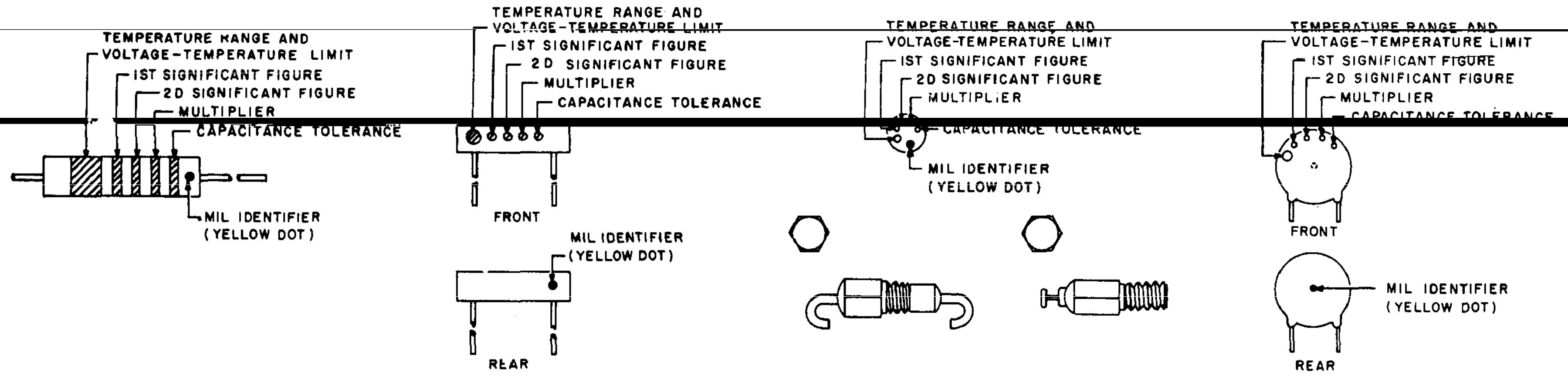
COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

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



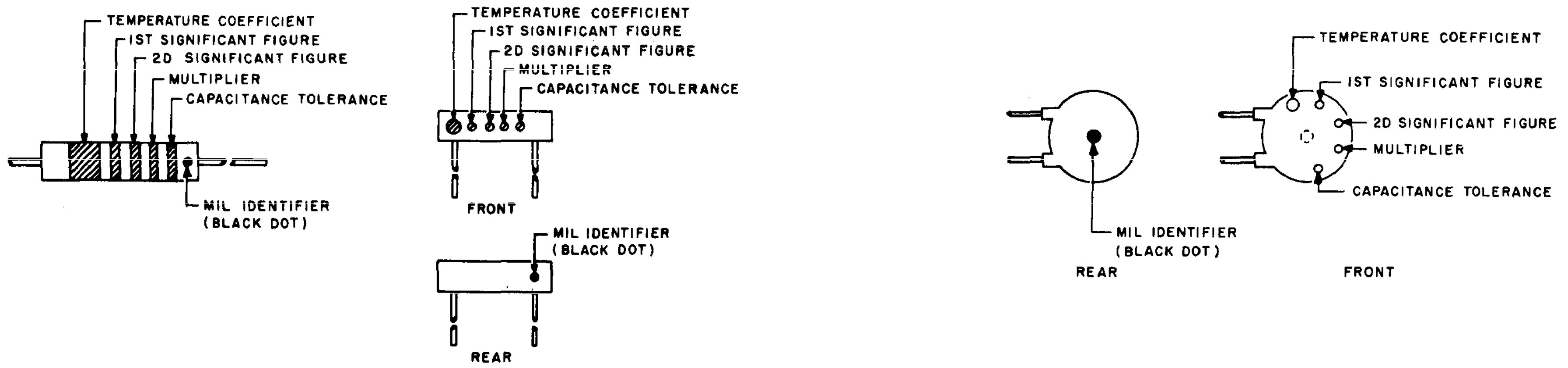
MICA-DIELECTRIC | PAPER-DIELECTRIC | GLASS-DIELECTRIC, GLASS CASE | MICA, BUTTON TYPE

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



AXIAL LEAD | RADIAL LEAD | FEED-THROUGH | STAND-OFF | DISK-TYPE

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



AXIAL LEAD | RADIAL LEAD | DISK-TYPE

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.

STD–C2

Figure 10. MIL-STD capacitor color code marking.

By Order of the Secretary of the Army:

G. H. DECKER
General, *United States Army,*
chief of *Staff.*

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

DASA (6)
USASA (2)
CNGB (1)
Tech Stf, DA (1) except
CSigO (15)
Tech Stf Bd (1)
USCONARC (4)
USAARTYBD (1)
USAARMBD (2)
USAIB (1)
USARADBD (2)
USAABELCTBD (1)
USAAVNBD (1)
USAATBD (1)
ARADCOM (2)
ARADCOM Rgn (2)
OS Maj Comd (2)
OS Base Comd (2)
LOGCOMD (2)
MDW (1)
Armies (2)
Corps (5)
USATC AD (2)
USATC Armor (2)
USATC Engr (2)
USATC FA (2)
USATC Inf (2)
Svc Colleges (2)
Br Svc Sch (2)
GENDEP (2) except
Atlanta GENDEP (None)
Sig Sec, GENDEP (5)
Sig Dep (12)
Ft Monmouth (63)
USASATSA (5)
AFIP (1)
WRAMC (1)
AFSSC (1)
USAEPG (2)
EMC (1)
USACA (2)
USASEA (1)
USA Caribbean Sig Agcy (1)
USA Sig Msl Spt Agcy (12)
USASSA (20)
USASSAMRO (1)
Army Pictorial Cen (2)
USAOMC (3)
USA Trans Tml Comd (1)
Army Tml (1)
POE (1)
OSA (1)
AMS (1)
Sig Fld Maint Shops (2)
JBUSMC (2)
Units org under fol TOE:
(2 cy each UNOINDC)
11–7
11–16
11–57
11–98
11–117
11–155
11–500 (AA–AE) (4)
11–557
11–587
11–592
11–597

NG: None.
USAR: None.
For explanation of abbreviations used, see AR 320–50.

U. S GOVERNMENT PRINTING OFFICE 1963 O -678370
802-892-1