TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

CHARGER, BATTERY PP-4127B/U

(NSN 6130-00-782-6983)

HEADQUARTERS, DEPARTMENT OF THE ARMY

7 OCTOBER 1977

WARNING

High voltages and currents exist in This equipment. Serious injury or death may result from contact with the output terminals. Reenergize the equipment before connecting or disconnecting the battery to be charged, and before performing any maintenance.

All maintenance and maintenance facilities must conform to TB 385-4, Safety Precautions for Maintenance of Electrical/Electronic Equipment.

DO NOT TAKE CHANCES!

TECHNICAL MANUAL
No. 11-6130-381-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC 7 *October 1977*

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REPORTING OF ERRORS

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

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

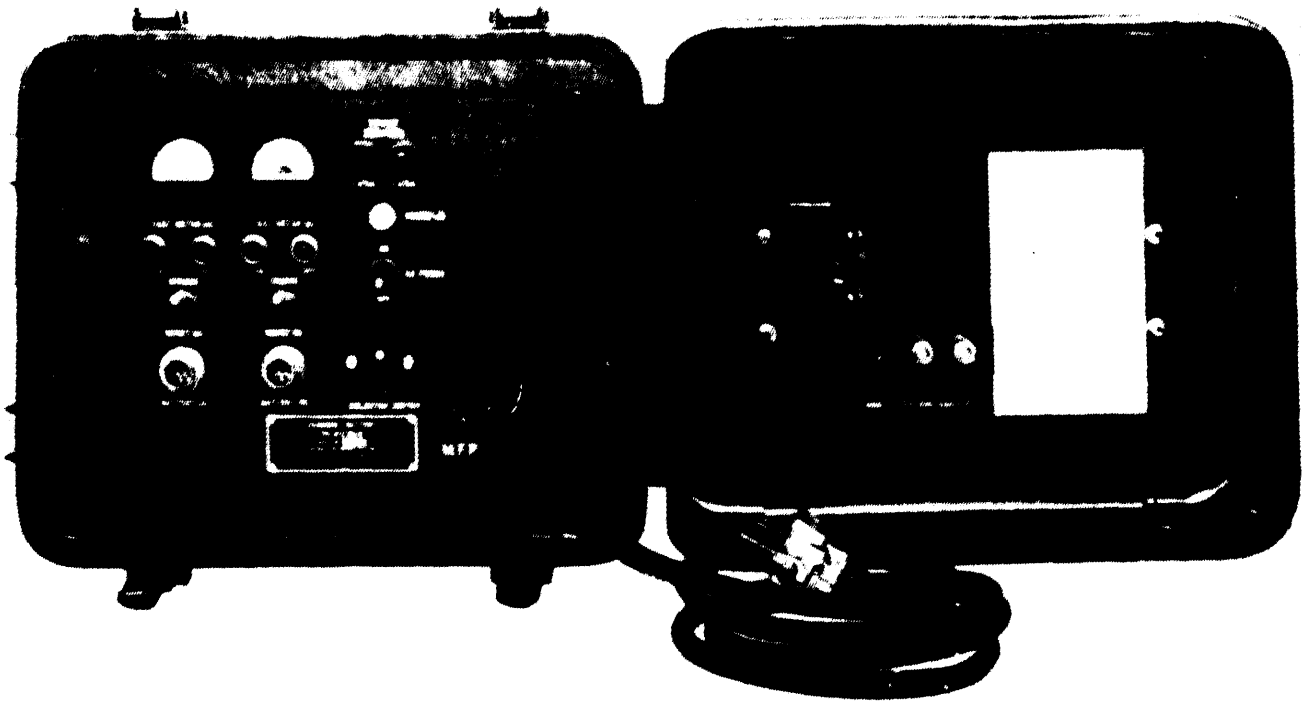
In either case a reply will be furnished direct to you.

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

This manual describes Charger, Battery PP-4127B/U (fig. 1-1) and provides instructions for packaging, unpacking, operation, as well as operator, organizational, direct and general support maintenance instructions. Included herein are procedure for operating, cleaning, inspecting the equipment, troubleshooting, testing, repair as well as tools, materials, and test equipment required for the various echelons of maintenance. In addition, a functional analysis of the equipment is provided. Hereinafter Charger, Battery PP-4127B/U is referred to as the battery charger.



FL4DE001

Figure 1-1. Charger, Battery PP-4127B/U, cover open.

1-2. Indexes of Publications

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

b. DA Pant 310-7. Refer to the latest issue of DA Pam 310-7 to determine whether there are modification work orders (MWO'S) pertaining to the equipment.

1-3. Forms and Records

u. *Report of Maintenance and Unsatisfwtory Equipment.* Maintenance forms, records, and reports which are to be used by maintenance

personnel at all maintenance levels are Iisted in and prescribed by TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST 4030.29/AFR 71-13/MCO P4030.29A, and DSAR 4145.8.

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

1-4. Reporting Equipment Improvement Recommendations (EIR)

EIR will be prepared wing DA Form 2407 (Maintenance Request). Instructions for preparing EIR's are provided in TM 38-750. EIR's should be mailed direct to Canada, U.S. Army Electronics Command, ATTN: DRSEL-MA-Q, Fort Monmouth, N.J. 07703. A reply will be furnished direct to you.

1-5. Administrative Storage

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

1-6. Destruction of Army Electronics Materiel

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

Section II. DESCRIPTION AND DATA

1-7. Purpose and Use

(Fig. 1-1 and 1-2)

The battery charger circuitry converts 115-volt or 230-volt alternating current (ac) at 600 or 400 Hz to 6 amperes of constant direct current (de) for charging Battery Assembly BB-63 ( )/PPS-5 (hereinafter referred to as the battery). The battery chargar includes an automatic voltage-sensing and cutoff circuit for each battery being charged. When each battery is fully charged, the voltage-sensing and cutoff circuit automatically removes the charging current from the battery.

Figure 1-2. Charger, Battery PP-4127B/U, cover closed

1-8. Description of Equipment

battery charger (fig. 1-1) is a self-contained, portable unit housed in a metal, waterproofed, hermetically sealed transit case. A two way pressure relief valve (fig. 1-2) at the center of the tint of the transit case prevents any excessive pressure buildup inside or outside the transit case. A gasket and wire mesh provide a water seal between the front panel and the transit case (fig. 3-1). The dimensions of the transit case are 13 3/4 inches long, 12 3/4 inches high, and 10 1/4 inches wide. Operating controls and indicators for the battery charger are mounted on the front panel. No carrying handles are also located on the front panel. The hinged cover of the transit case stores the 8-foot long input power cable as well as the 230 vac conversion assembly for the battery charger. The power cable is terminated in a heavy-duty, three-wire, connector plug. All the spare parts for the battery charger are included in the field maintenance kit for Radar Set AN/PPS-5.

1-9. Technical Data

Input power:	
voltage	115 *or* 230 volts ±10 percent; 60 or UMl Hz± 5 percent.
Phase	Single.
Currant (maximum)	2.5 amperes (full load 115 volts ac), or 1.3 amperes (full load, 230 volts ac).
Power consumption	Full load, two batteries being charged: approximately 220 watts maximum.

Battery charger output power for each battery being charged:	
Voltage	To 8.130.1 volts, then cuts off.
Current	6.00 to ±0.46 amperes dc.
Weight	42 pounds.
Ambient operating temperature range	-40°F (-40°C) to ±125°F (+51.5°C).

1-10. Items Comprising an Operable Battery Charger

The battery charger itself comprises an operable equipment.

CHAPTER 2

OPERATION

Section 1. SERVICE UPON RECEIPT

2-1. Unpacking

a. Packaging Data. The method of packaging the battery charger for shipment is shown in figure 2-1. When packed for shipment the exterior dimensions of the corrugated carton are 16-5/16 by 14-5 /16 by 14-5/8 inches and has a volume of 1.98 cubic feet.

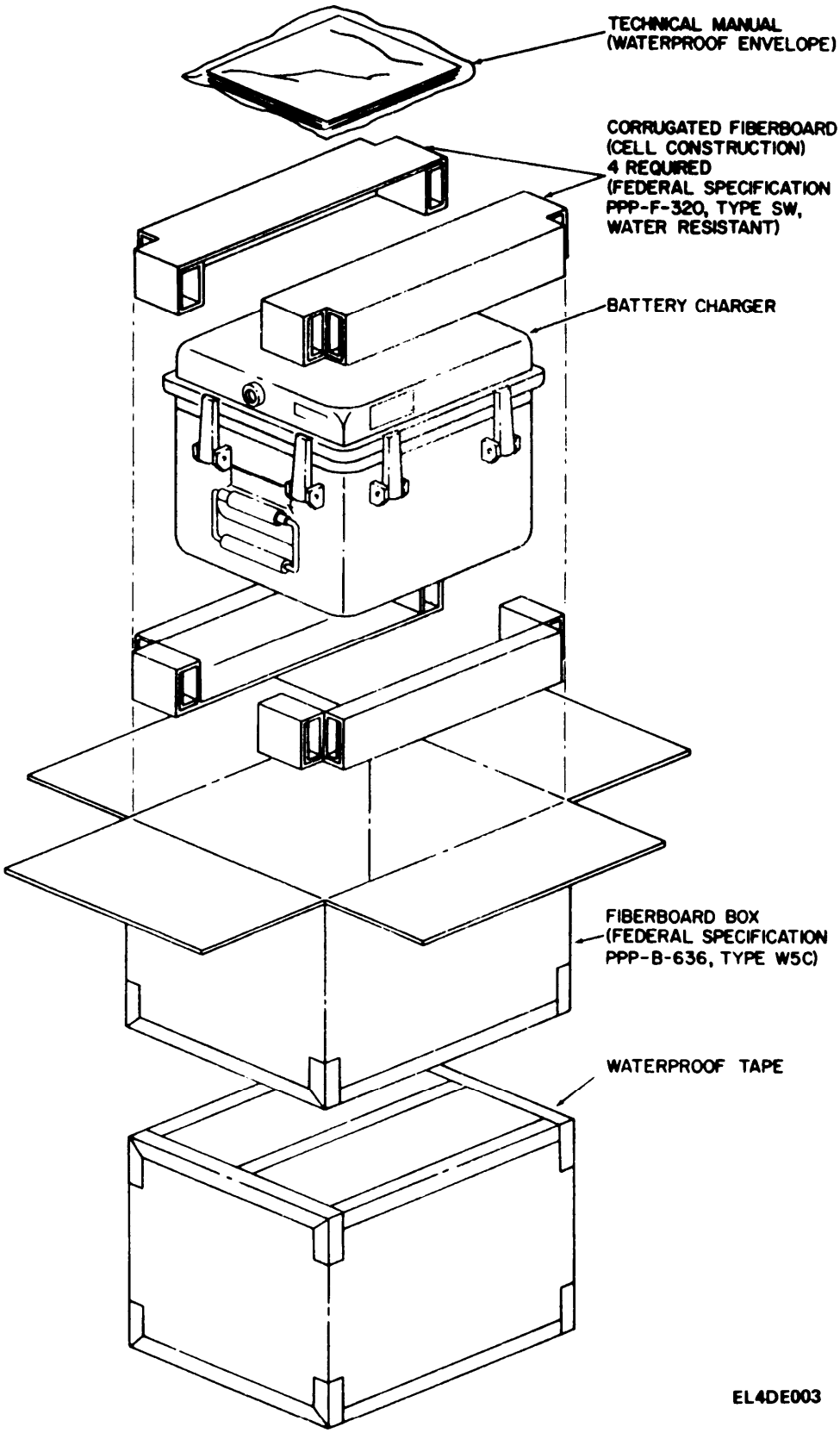


Figure 2-1. Typical packaging.

b. Removing Contents.

(1) Slit the tape that seals the carton, be careful not to damage the technical manual, which is located below the top flaps.

(2) Open the flaps and remove the waterproof envelope that contains the technical manual.

(3) Remove the corrugated fiberboard supports. Be careful not to scratch or damage the surfaces of the equipment.

(4) Remove the equipment.

2-2. **Checking Unpacked Equipment**

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage **on** DD Form 6 (para 1-3).

b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with paragraph 1-3. The equipment should be placed in service even though a minor assembly or part that does not affect proper functioning is missing.

c. Check to see whether the equipment has been modified. (Equipment which has been modified will have the MWO number of the front panel near the nomenclature plate.) Check also to see whether all currently applicable MWO's have been applied. (Current MWO'S applicable to the equipment are listed in DA Pam 310-7.)

d. For dimensions, weights, and volume of packaged items, see SB 700-20.

Section II. CONTROLS, INDICATORS, CONNECTORS, AND OPERATING INSTRUCTIONS

2-3. Battery Charger Controls, Indicators, and Connectors

(fig. 2-2)

The operating controls, indication and connectors on the front panel are listed in the following chart along with a description of their respective functions.

Control indicator, connector, a circuit breaker	Function
SELECTOR SWITCH (protected by a switch guard	Connects internal ciruitry of battery charger for 115-Vac operation (whom switch guard ie eat to expose 116V) or for 230-Vac operation (when switch guard is set to expose 230v).
AC POWER switch	Connects 115 volt or 230-volt ac C power to battery charger when set to ON; disconnects ac power when set to OFF.
POWER ON indicator light	The indicator light illuminates when battery charger is energized.
TEST METER (A)	Indicates amount of charging current to battery connected to BATTERY (A) connector.
CHARGE ON and OFF indicator lights (located beneath TEST METER (A)).	ON light illuminates (green) to indicate current flow through BATTERY {A) connector OFF light Uluminates (blue) when current is not flowing through BATTERY (A) connector
RESET (A) switch	Two Position switch, springloaded to off (up) position. when momentarily held in the down position, perits charging current to fow and energixe battery A charging control circuit. Also, when momentarily held down, shunts TEST METER (A) to prevent any damage to that might be caused by current eurgee. When switch ie rekaeed, TEST METER (A) indicates charging current.
BATTERY (A) connector	Providm connection in battery for charging.
TEST METER (B)	Indkdee mmunt of Charging current to battery connected to BATTERY (B) connector.
CHARGE ON and OFF indicator lights (Iocated beneath TEST METER (B)).	ON light illuminate (green) to indicate current flow through BATTERY (B connector. OFF light illuminatee (blue) when no current is flowing through BATTERY (B) connector.
RESET (B) switch	Two-position ewitch, springloaded to off (up) position. When momentarily held in the down position, permits charging current to flow and energize battery B charging control circuit. Also when momentarily held down, shunts TEST METER (B) to permit any damage to meter that might be caused by current surges. When switch is released, TEST METER (B) indicates charging Current.
BATTERY (B) connector	Provides connection to battery for charging.
CIRCUIT BREAKERS 11/2A (2)	DiSconnects primary input power from battery charger when current exceeds 1 1/2 ampere. When momentarily held in the down position, resets circuit breaker to on.
AC POWER INPUT db and connector.	Connects battery charger to primary input power source.

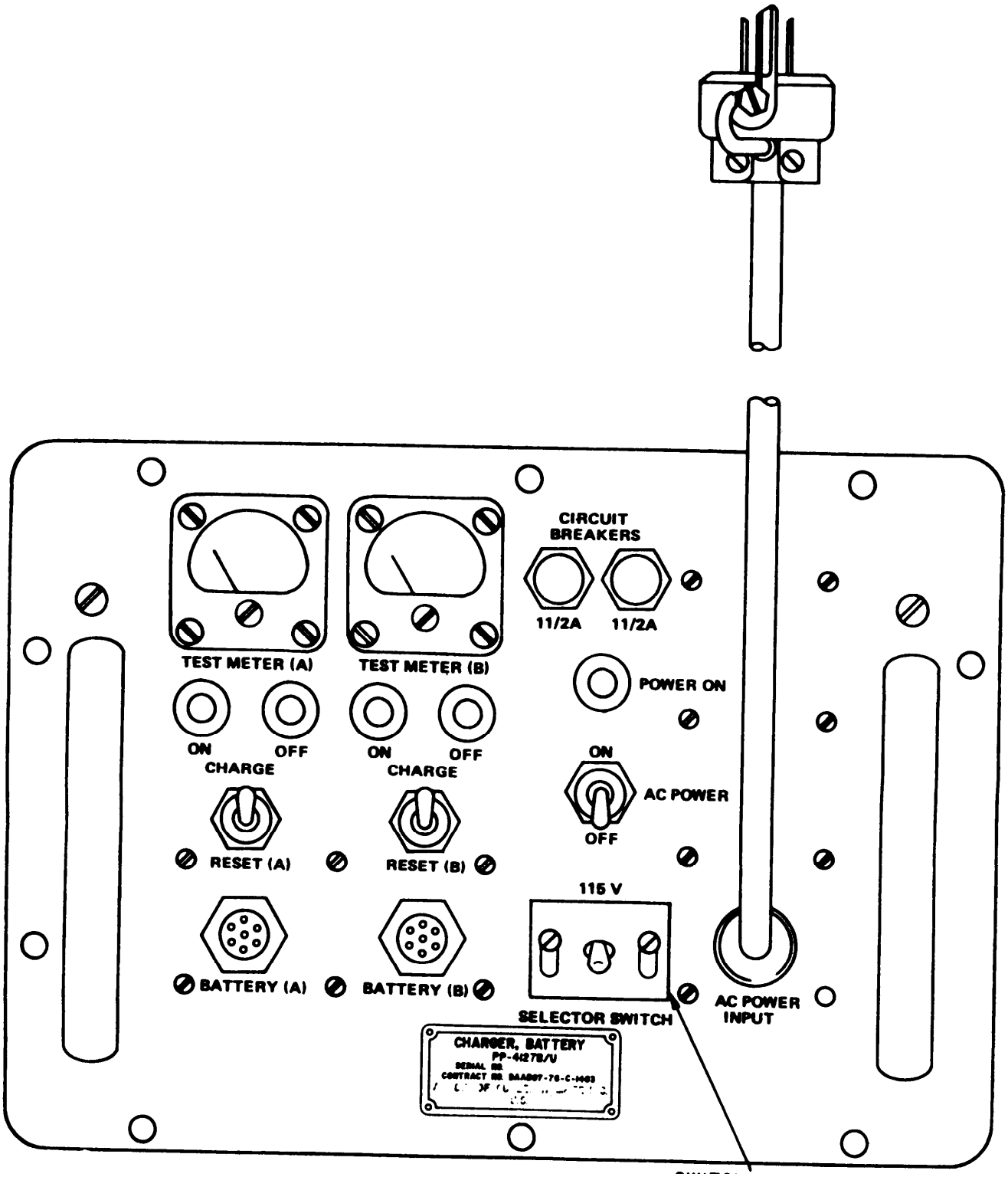


Figure 2-2. Battery charger, controls and indicators.

2-4. Preliminary settings (fig. *2-2)*

Two screws lock the SELECTOR SWITCH in either the 115 V or the 230 V position. Loosen the two screws to set the SELECTOR SWITCH in the up position for 230-volt operation or in the down position for 115-volt operatipn. Tighten the screws to lock the switch in position. In the up position,

230 V will be visible; in the down position, 115 V will be visible.

NOTE

If a portable generator set is used to supply the operating voltage for the battery charger, damage to the battery charger circuitry may result if the input voltage and frequency are not within the required ranges (para 1-9). The output voltage and frequency of the general or set. should be checked and, if necessary adjusted before the battery charger is connetted to the power source.

2-5. 230 Vac Conversion Assembly Connections (fig. 2-3)

Connections	Function
GRD connector binding post (black)	Provides a safety ground connection.
230 VAC binding peat (red)	Prvides a means for connecting 115 vat, 400 Hz or 230 vac 60 or 400 Hz power,
Connector J6301	Provides a means for connecting AC POWER INPUT cable to a 115 vat, 400 Hz *or* 230 vac power source at binding posts.

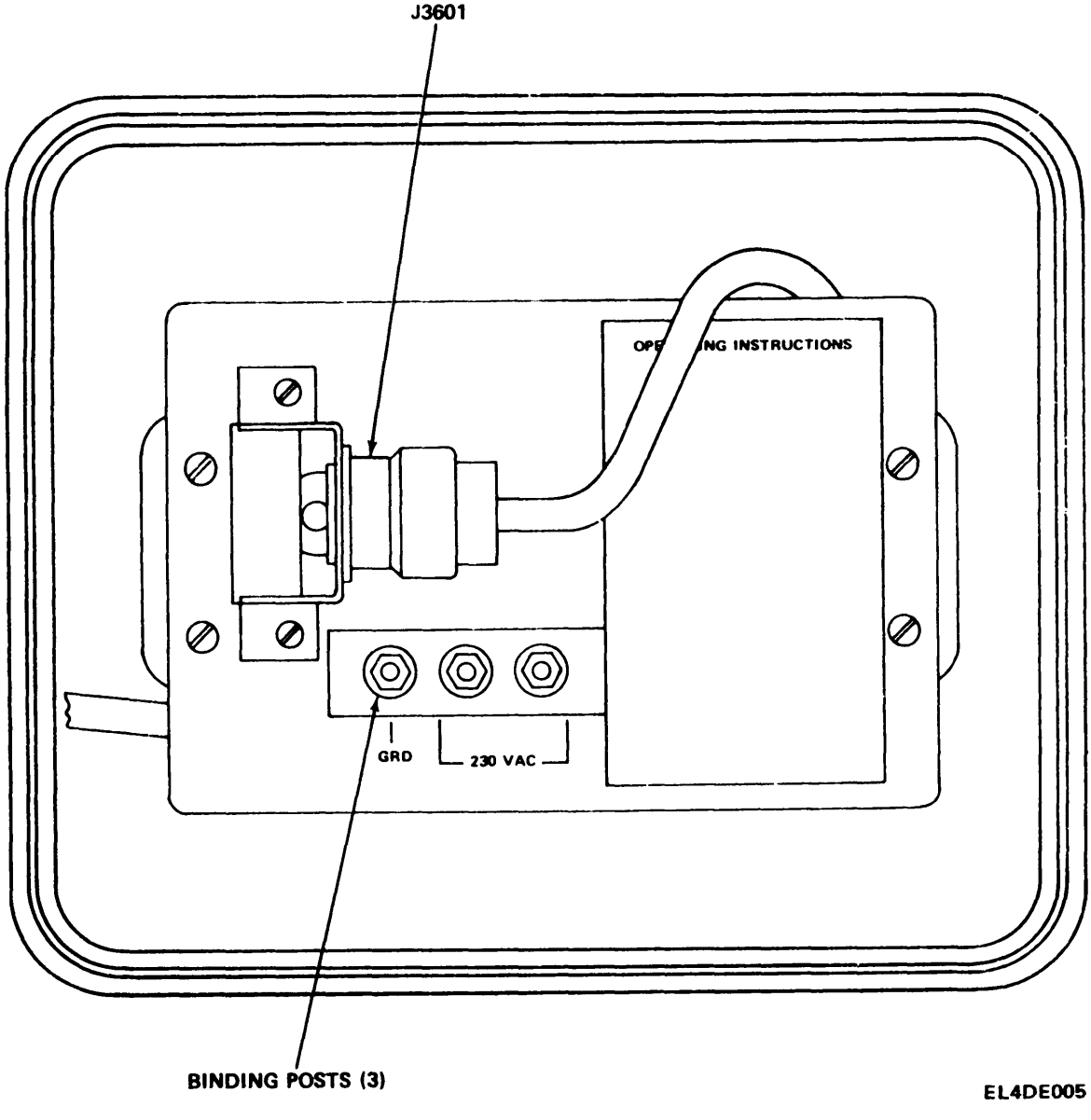


Figure 2-3. 230 vac conversion assembly, connections

2-6. Battery Charging Procedures

a Starting *Procedure*.

(1) Press the button on the pressure relief valve.

(2) Release the cover latches, and open the cover of the battery charger. Figure 1-1 shows the equipment in its normal operating condition for charging batteries.

(3) Set the AC POWER switch to OFF.

CAUTION

Before operating the battery charger, be sure that the SELECTOR SWITCH is set to the correct input ac supply voltage position (115 V is visible above the switch guard for 115-volt ac operation or *230* V is visible below the switch guard for 230-volt ac operation as specified in paragraph *2-4).* Failure to set the SELECTOR switch to the appropriate voltage setting will result in equipment damage when power is turned on.

(4) For 115-volt, 60 Hz operation, connect the AC POWER INPUT cable connector directly to the input power source receptacle. For 115-volt, 400 Hz or 230-volt operation, connect the AC POWER INPUT cable connector to receptacle J6301 of the 230 vac conversion assembly located in the case cover (fig. 2-3). Connect any three-wire flexible insulated cable (14 gauge or "larger) between the 230-volt power source and the binding posts of the conversion assembly.

CAUTION

Be sure to connect GRD binding post of the 230 vac conversion assembly to a suitable ground at the power source to avoid damage to the equipment.

(5) If two batteries are to be charged, connect the cable of one battery to BATTERY (A) connector and the other cable of the other battery to BATTERY (B) connector. If only one battery is to be charged, connect the cable from the battery to either the BATTERY (A) or BATTERY (B) connector, and use the corresponding controls and indicators.

b. Charging Operating Procedure.

NOTE

This procedure describes the charging of one battery that is connected to the BATTERY (A) connector. The procedure is identical with a battery connected to the BATTERY (B) connector, except that BATT'ERY (B) controls and indicators will be used.

(1) Set the AC POWER switch to ON, and check to see that the POWER ON indicator light and the CHARGE OFF indicator light beneath TEST METER (A) illuminate

(2) Push the RESET (A) switch down and hold it depressed for about *4* seconds to start the battery charging. Check to see that the battery A CHARGE ON indicator light illuminate, and that TEST METER (A) indicates approximately 6 amperes. The battery is now being charged at approximated y 6 amperes. The battery will continue to be charged at approximately 6 amperes until the battery charging voltage reaches 8.1 ±0. 1 volts. If the voltage-sensing circuit cuts off the battery-charging current immediately after release of the RESET (A) switch, depress the RESET (A) switch again and hold it down for *4* seconds, or more. If the battery-charging current is again cut off, the battery is at full charge and the battery charger will not provide any additional charge .

(3) When the battery is fully charged, the battery A CHARGE OFF indicator light will illuminate as the CHARGE ON indicator light extinguishes; TEST METER (A) will also indicate zero ampere at this time.

NOTE

If the battery charger and the input power source are left unattended for long periods of time and the input power source fails, the green CHARGE ON indicator lights will be out. When power is restored, the blue CHARGE OFF indicator lights will be on, indicating that batteries are fully charged when they actually are not. Press the RESET (A) (B) switches and hold them down for 4 seconds, or more. If the blue CHARGE OFF indicator lights illuminate when the RESET (A) and RESET (B) switches are released, batteries are fully charged. If the green CHARGE ON indicator lights illumina, batteries require more charging. Continue the charging process until the charging current automatically cuts off.

c. *Stopping Procedure.*

(1) Set the AC POWER switch to OFF.

(2) Disconnect the cable connector of the battery being charged from the battery charger.

(3) Disconnect the AC POWER INPUT cable connector plug from the input power source receptacle and secure the able and connector in the rover of the battery charger.

(4) Disconnect, if used, all wiring to the 230 vac conversion assembly.

(5) Close and latch the cover of the battery charger.

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

3-1. Scope of Maintenance

The maintenance duties assigned to operator and organizational repair personnel of the equipment are listed below together with a reference to the paragraphs covering the specific maintenance functions.

a Operator preventive maintenance checks and services (table 3-1, para. *3-5).*

b. Organizational preventive maintenance checks and services - monthly (table 3-2, para. 3-5).

c. Organizational preventive maintenance checks and services - quarterly (table 3-3, para. 3-5).

d. cleaning (para. 3-6).

e. Touch-up painting (para 3-7).

f. Troubleshooting (para. 3-8 and 3-9).

g. Replacement of repair parts (para 3-10).

3-2. Repair Parts

No repair parts are authorized for operator maintenance. The repair parts authorized for organizational maintenance are listed in the Repair Parts and Special Tools List (RPSTL), TM 11-6130-381-20P.

3-3. Tools, Test Equipment, and Materials

a. Tools. The tools required for organizational maintenance are contained in Electronic Equipment Tool Kit TK-101 /G.

b. Test Equipment. The test equipment required for organizational maintenance is Multimeter AN/URM-105.

c. Materials. The materials required for organizational maintenance are as follows:

(1) Soft, lint-free cloth

(2) Lint-free brush

(3) Artists paint brush

(4) Trichloroethane.

(5) EPOXy Polyamide paint per MIL-C-22750, semi-gloss olive drab per Fed Std-595, color 24087

(6) Paint thinner per MIL-T-19544, as required

(7) Sandpaper No. 000

3-4. Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of the battery charger to prevent the occurence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. *Systematic Care.* The procedures given in paragraphs 3-6 through 3-10 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services charts (tables 3-1 through 3-3) outline functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in a combat-serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the chart indicates what to check, how to check, and the normal indications. The References column lists the paragraphs or manuals that contain detailed repair or replacement procedures. If the defect cannot be remedied by performing the corrective actions listed, higher category of maintenance or repair is required. Records and reports of them checks and and services must be made in accordance with the requirements set forth in TM *38-750.*

3-5. Preventive Maintenance Checks and Serv. ice Periods

Preventive maintenance checks and services of the equipment are required before and during operation, weekly, monthly, and quarterly.

a. Table 3-1 specifies checks and services that must be accomplished before and during operation (or at least once a week if the equipment is maintained in a standby condition).

b. Tables 3-2 and 3-3 specify additional *checks* and services that must be performed on a monthly and quarterly basis, respectively.

Table 3-1. Operator Preventive Maintenance Checks and Services

NOTE: Within designated interval, these checks are to be performed in the order listed.

B - Before D - During

Item No.	Interval		Item to be Inspected	Procedure	Equipment will be reported Not Ready (Red) if:
	B	D			
1	X		Battery Charger	Check to see equipment is complete.	
2	X		Battery Charger	Clean exterior surfaces including meter glasses.	
3	X		Meters	Check for cracked glass or bent pointers.	Glass cracked. Pointer bent.
4	X		Connectors and cable	Check tightness of connectors. Cable free of cracks or fraying.	Loose connector. Cable badly frayed.
5	X		Controls	Check that each control action is free of binding and there is no looseness.	Controls stick or are loose.
6	X		Metal surfaces	Clean and touchup paint.	
7	X		Operation	Check operation in accordance with operating procedures (para 2-6).	Improper operation.

Table 3-2. Organizational Preventive Maintenance Checks and Services-Monthly

Item No.	Item to be inspected	Procedure	Equipment will be reported Not Ready (Red) if:
1	Power cable	*a.* With AC POWER switch in ON position, check continuity of cable between pins of P6001.	No continuity.
		b. With AC Power switch in OFF position, check continuity of cable between pins of P6001.	Reading of 2000K ohms is not measured.
2	Binding posts	Check that binding posts are not broken or stripped.	Broken or stripped binding posts.

Table 3-3. Organizational Preventive Maintenance Checks and Services-Quarterly

Item No.	Item to be inspected	Procedure	Equipment will be reported Not Ready (Red) if:
1	Publications	See that all publications are complete, serviceable, and current in accordance with DA Pam 310-4.	
2	Modifications	Check DA Pam 310-7 to determine whether new applicable MWO's have been published and applied to equipment.	URGENT MWO's not applied.
3	Spare parts	Check spare parts levels in accordance with TM 11-6130-381-20P.	

3-6. Cleaning

Inspect the exterior of the equipment; exterior surfaces should be free of dust, dirt, grease, and fungus.

a Remove dust and loose dirt with a clean soft cloth.

WARNING

The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT USE NEAR AN OPEN FLAME! Trichloroethane is not flammable, but exposure to an open flame or hot metal surface causes highly toxic phosgene gas to form.

b. Remove grease, fungus, and ground-in dirt from the case; use a cloth dampened (not wet) with trichloroethane.

c. Remove dust or dirt from the BATTERY (A), BATTERY (B), and 230 vac conversion assembly connectors with a brush.

CAUTION

Do not press on the meter (glasses) when cleaning; meters may be damaged.

d. Clean the control panels and meters with a soft clean cloth or brush. If necessary. dampen the cloth with water; mild soap may be used for more effective cleaning.

3-7. Touchup Painting Instructions

a *Rustproofing.* When the finish on the battery charger has become badly scarred or damaged, rust and corrosion can be prevented by touching up the bate surfaces. Use No. 000 sandpaper to clean the surface down to the bare metal. Obtain a bright, smooth finish.

b. Painting. Remove and corrosion from metal surfaces by lightly sanding with fine sandpaper. Utilizing a brush, apply two thin coats of paint on the bare metal to protect it from further corrosion. Reduce the viscosity of the paint to *a* suitable consistency by adding epoxy thinner, per MIL-T-19544. Use one part thinner to two parts admixed paint to obtain the proper viscosity for brush application. Refer to the applicable cleaning and refinishing practices specified in TB 43-0118 and SB 11-573 for supplies available for painting and preservation.

3-8. General Troubleshooting Information

CAUTION

When troubleshooting the battery charger, be sure that the AC POWER INPUT cable connector is connected *to* a polarized, three-pin socket so that the chassis is grounded to the 115-volt input power source. Use the 230 vac conversion assembly for 115 volt, 400 Hz or 230-volt operation ensuring the GRD binding peat is connected to a suitable ground.

Troubleshooting the battery charger at the organizational level is based on an operational check. To troubleshoot the battery charger, perform the operation functions until an abnormal indication or result is observed (para 2-6); then perform checks and corrective actions indicated in the troubleshooting chart. If the corrective measures indicated do not result in the correction of the trouble, higher maintenance category repai.r is required.

3-9. Organizational Troubleshooting Chart

Item No.	Trouble symptom	Probable trouble	Checks and corrective measures
1	POWER ON indicator light does not illuminate when AC POWER switch is set to ON.	*a.* Defective indicator	*a.* Replace Indicator lamp (para 3-10).
		b. Defective AC POWER INPUT cable or cable connector.	*b.* Check continuity of cable and connector; repair or replace as required.
		c. CIRCUIT BREAKERS tripped.	*c.* Depress CIRCUIT BREAKERS.
		d. Defective internal circuits.	*d.* Higher maintenance category repair is required.
2	Appropriate indicator light does not illuminate as required.	Defective indicator lamp	Replace indicator lamp para 3-10
3	Test METER (A) or TEST METER (B) does not indicate charging current.	Meter is defective	Higher maintenance category repair is required.

3-10. Replacement of Repair Parts (fig. 3-1)

a. Replacement *of Indicator Lamps. Proceed as* follows

NOTE

Be sure that the O-ring underneath the lens is not misplaced when removing the lens and lamp.

(1) Turn the indicator lamp light lens counterdockwise to unscrew it. The indicator lamp will remain in the lens, and the O-ring should remain on the indicator light socket.

(2) Grasp the flange of the indicator lamp with fingernails and pull the indicator lamp out from the lens.

(3) Insert the new indicator lamp into the lens.

(4) Install the O-ring over the threaded portion of the indicator light socket. Replace the Wing if damaged.

(5) Install the lens and lamp; the the lens clockwise until it is screwed onto the indicator light socket

b. Replacement of Plug Connector *P60001.* Replacement of plug connector P8001 is power cable wires and removing the wire. The wires are then secured to their respective pins on the replacement connector.

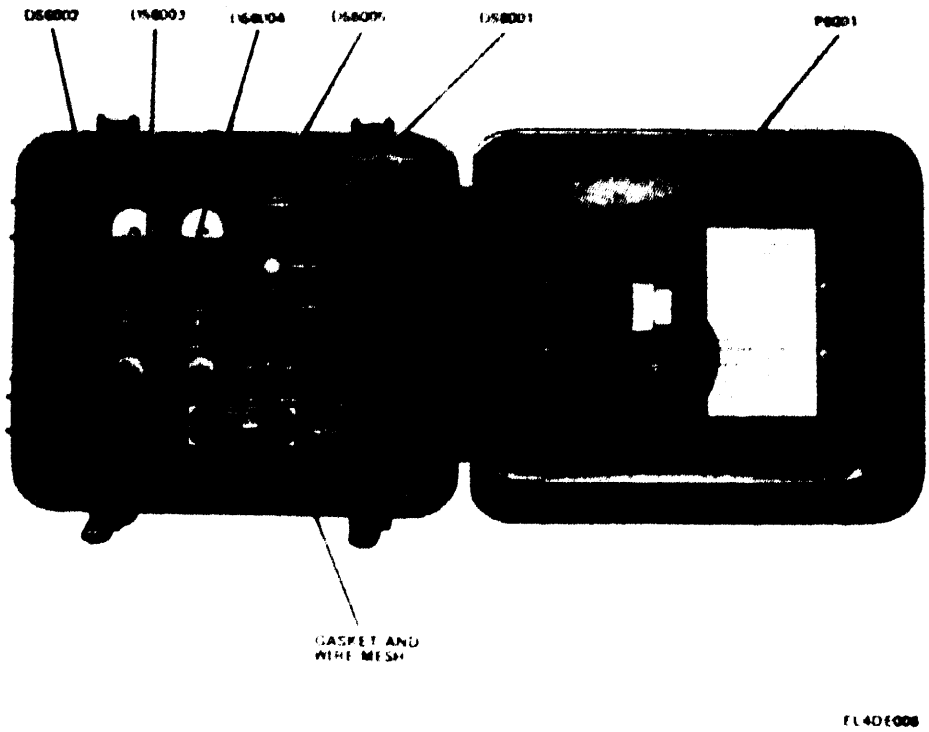


Figure 3-1. Battery charger component locations, front panel

CHAPTER 4

FUNCTIONING OF EQUIPMENT

4-1. Basic Ac Phase-Controlled Current Regulator

a. Figure 4-1 is a simplified schematic diagram of a basic ac phase-controlled current regulator. The voltage for the charging current to the battery is supplied by the bridge circuit, made up *of* CR6006, CR6007, and silicon-controlkd rectifiers Q6001 and Q6002. Inductor L6001 filters the charging current to the battery, and CR6005 is a commutating diode that provides a current path between L6001 and the battery when silicone-controlled rectifiers Q6001 and Q6002 are not conducting. Resistor R6009 (fig FO-1) removes inductive transients from L6001. The dc current through the battery is controlled by varying the conduction time of Q6001 and Q6002. Figure 4-2 shows the voltage waveform at the cathodes of rectifiers Q6001 and Q6002 with respect to T6001. The dc component of the voltage is proportional to the conducting angle. The dc current in the charging path is determined by the differece between the sum of the dc component of the rectified voltage and the battery voltage, divided by the resistance in the charging path. As the battery voltage changes (or the ac line voltage changes), the conduction angle of the silicon controlled rectifier is varied so that a constant current is maintained through the battery.

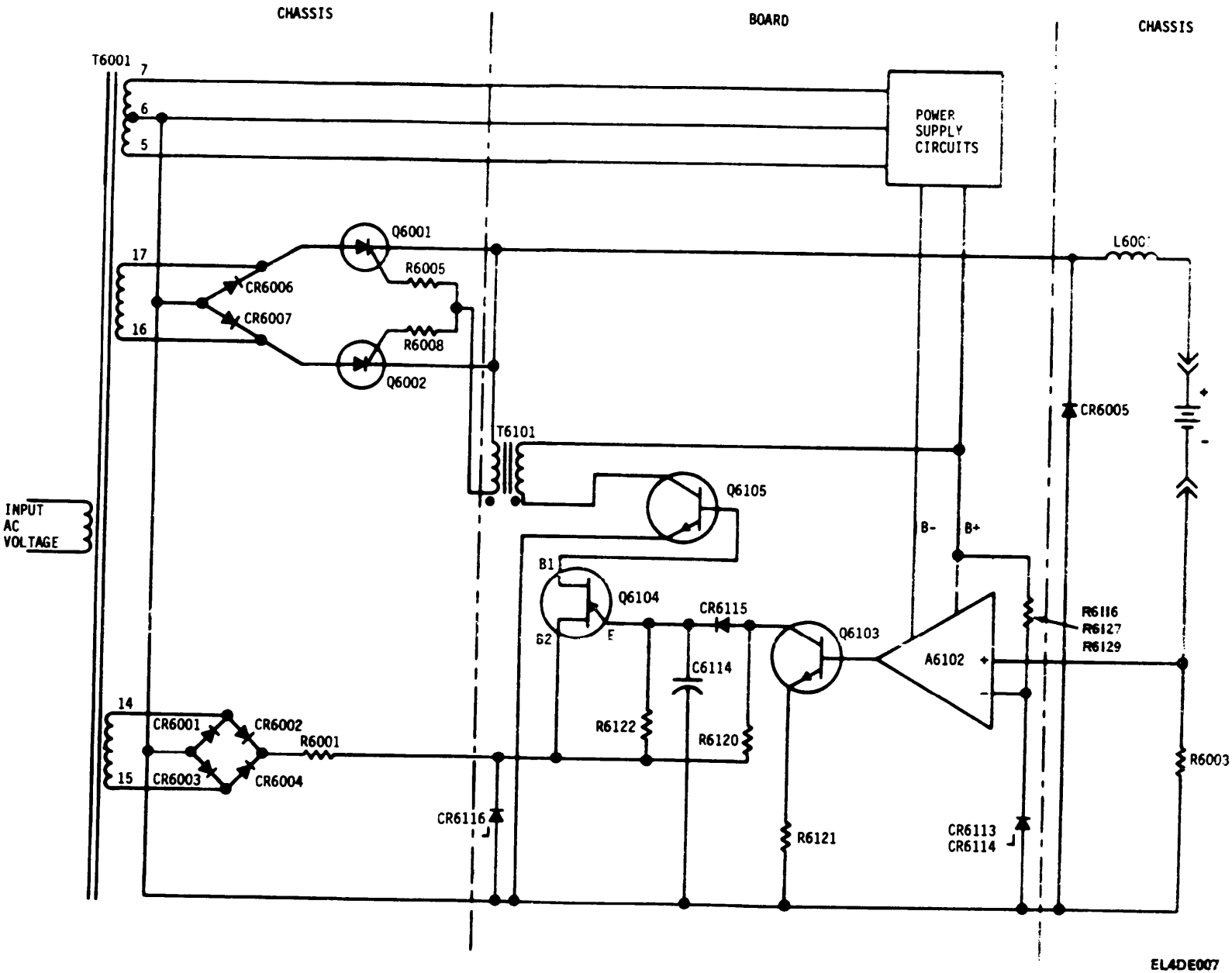


Figure 4-1. Basic ac phase-controlled current regulator, simplified schematic diagram.

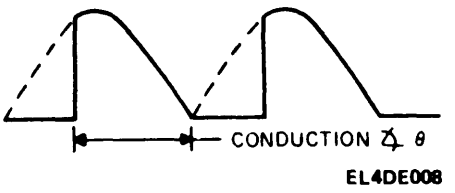


Figure 4-2. Voltage at cathode of silicon-controlled rectifier.

b. Bridge rectifiers CR6001 through CR6004, resistor R6001, Zener diode CR6116, and RF filter capacitors C6001 and C6002 (fig. FO-1) provide a clipped sine wave voltage (B, fig. 6-2) that is in phase with the charging path ac voltage. This clipped sine wave is used as a positive voltage supply for a multivibrator circuit that consists of R6122 and C61 14, and unijunction transistor (UJT) Q6104. The UJT has three terminals: the emitter, base (B1), and base (B2). Between B1 and B2, the UJT has the characteristics of an ordinary resistance. The emitter is reverse-biased until the emitter -base voltage is greater than the emitter peak voltage (Vp). The emitter peak voltage (V_p) is dependent on the B 1 to B2 voltage (V b), and is approximately equal to 0.6 V_{bb}. When the emitter voltage (Ve) exceeds the emitter peak Voltage **Vp),** the UJT turns on and the resistance between the emitter and B1 is very low, allowing emitter current to flow. Voltage divider R6123 and R6124 (fig. FO-1) provide the Q6104 B1 to B2 bias voltage.

c. Figure 4-3 shows a basic UJT multivibrator circuit. Capacitor C6114 is charged to the potential at resistor R6122 until the emitter voltage (Ve) reaches the emitter peak Voltage (VP). At this time, the UJT turns on and discharges C6114 through RLOAD. When the emitter voltage falls to approximately 2 volts, conduction ceases and the cycle is repeated.

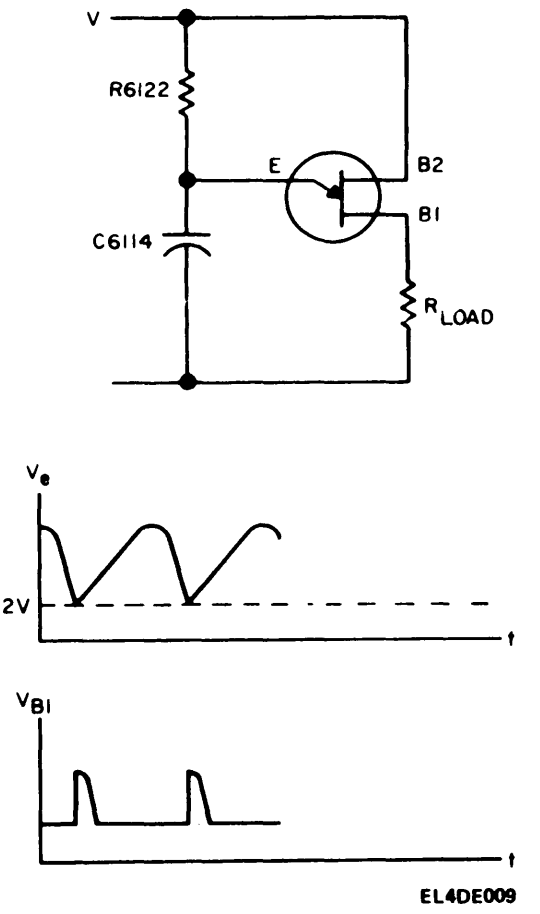


Figure 4-3. Basic UJT miltivibrator circuit.

d. In the ac phase-controlled circuit (fig. 4-1), the clipped sine wave voltage is used as the supply voltage for the UJT multivibrator. The voltage across R6003 is proportional to the current flowing through the battery, and is compared to a reference voltage and amplified in differential comparator A6102. The output of A6102 is coupled to capacitor C6114 in the multivibrator circuit,

through the collector of Q6103 and CR6116, so that the beginning of the charging cycle in the UJT emitter circuit is controlled by a pedestal voltage derived from the current flow in the battery-charging path.

e. Figure 4-4 shows waveforms in the trigger circuit. At the beginning of each cycle, the clipped sine wave rises to its maximum voltage, and C6114 is brought rapidly to the pedestal voltage by the collector circuit of Q6103 and CR6115 (fig. 4-1). Capacitor C6114 continued to charge toward the UJT B1 to B2 voltage (V_{bb}), through R6122 and CR61 15, until it reaches the emitter peak voltage (VP), and whereupon the UJT fired. The trigger is then coupled to the silicon-controlled rectifier (SCR) goes through pulse transformer T6101, firing the SCR whose anode-to-cathode voltage is positive. Diode CR6129 (fig. FO-1) clamps the base of the trigger pulse. The other SCR anode circuit is reversed by bias due to the bridge arrangement and, therefore, does not conduct.

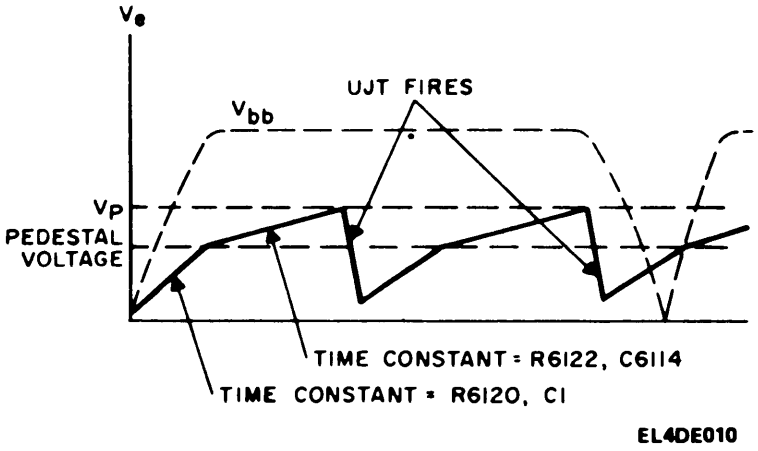


Figure 4-4. Trigger circuit waveforms.

f. The time at which the UJT fires is controlled by the pedestal voltage. As the pedestal voltage increases, the time required for the capacitor voltage to reach the emitter peak voltage (VP) is decreased; as the pedestal voltage decreases, the time is increased. Changes in current flow in the battery-charging path are felt at R6003 and produce an error signal at the input of differential comparator A6102 that causes a corresponding change in the pedestal voltage. This, in turn, changes the firing angle of Q600l and Q6002, and reduces the error signal and maintains a constant current flow in the battery-charging path. Resistors R6005 and R6006 provide trigger isolation.

4-2. Detailed Circuit Description

a. Input Power Ciircuit (fig. FO-1). The input power circuit comsists of the ac power input cable and connector P6001, filter FL6001, capacitor C6003 and C6004, power interlock switch S6006, bleeder resistors R6011 and R6012, AC POWER switch S6001, SELECTOR SWITCH S6002, CIRCUIT BREAKER CB6001 and CB6002, POWER ON indicator light DS6001, and power transformer T6001. Power interlock switch S6005 is actuated when the chassis is installed in its case, and interrupts one leg of the input ac power when the chassis is removed from its case. SELECTOR SWITCH S6002 has a switch guard that must be loosened to set the SELECTOR SWITCH S6002 to 115 V (switch guard pushed down), or 230 V (switch guard pushed Up). For ll5-volt ac input power operation, when SELECTOR SWITCH S6002 is set to 115V, the two primary windings of transformer T6001 are connected in parallel. For 230-volt ac input power operation, when SELECTOR SWITCH S6002 is set to 230 V, the two primary windings of transformer ml are connected in series. POWER ON indicator light DS6001 is connected screws one set of the primary windings of the transformer and illuminates to indicate the presence of input power when AC POWER switch S6001 is set to ON, and power interlock switch S6005 is actuated. CIRCUIT BREAKERS CB6001 and CB6002 provide circuit protection in the event *of* short circuit or overloads. Although the chassis is grounded to the input power source ground, the internal circuity of the battery charger is referenced to the negative terminal of the battery being charged for a floating ground. The returns of all internal power sources are referenced to this floating ground. Resistors R6011 and R6012 are safety bleed resistor for filter FL6001 and capacitors C6003 and C6004. Electmagnetic interference suppression of the input power line is

provided by dual section filter FL6001 and capacitors C6003 and C6004.

b. *Charging Voltage Circuit* (fig. FO-1). *Secondary* winding terminals 16 and 17 of transformer T6001 provide the voltage for the charging circuits of both batteries. The bridge circuit, oomprised of CR6006, CR6007, and Q6001 and Q6002, provides the charging voltage for battery A; CR6006, CR6007, and Q6003 and Q6004 provide the charging voltage for battery B. Capacitor C6005 suppresses SCR switch transients. Control of the charging current is achieved by controlling the conduction time of Q6001 and Q6002 for battery A, and Q2003 and Q6004 for battery B. Inductor L6001 and filter FL6003 filter the charging current to battery A; inductor L6002 and filter FL6005 filter the charging current to battery B. TEST METER (A) M6001 is connected in the charging current path for battery A; TEST METER (B) M6002 is connected in the charging current path for battery B. Meters provide indications" of the charging current flowing through their respective batteries. BATTERY (A) connector J6001, on the front panel of the battery charger, provides the means of connecting the battery A cable connector to the battery charger. The charging voltage is applied to the positive terminal of battery A through pin 4 of J6001, and the negative terminal of the battery is connected to pin 2 of J6001. BATTERY (B) connector J6002 provides means of connecting BATTERY (B) cable connector to the battery charger. The charging voltage is applied to the positive terminal of battery B through pin 4 of J6002, and negative terminal of the battery is connected to pin 2 of J6002.

c. Charging Current Control Circuit.

(1) secondary terminals 14 and 16 of transformer T6001 and CR6001, through CR6004, provide the full-wave rectified sine wave for both charging current control circuits. This sine wave is in phase with the charging voltage circuit ac voltage. For the battery A control circuit, the sine wave is applied as the power supply voltage to the UJT multivibrator Q6104 circuit through the contacts (pins 4 and 6) of battery A voltage cutoff relay K6101. The battery A sine wave is clipped by the combination of R6001, CR6116, C6001, and C6002.

(2) Transformer T6001 secondary terminals 5 and 7 provide an output that is fed to the printed circuit board, where it is rectified, filtered, and regulated by CR6108 through CR6111, filter capacitors C6107 through C6110 and resistors R6125 and R6126. This power supply provides +10 volts at the cathode of Zenor diode CR6112, and -10 volts at the anode of Zenor diode CR6113. Zenor diode CR6114 is used to provide a reference voltage supply that is divided to approximately 0.3 volt by resistors R6128 and R6129.

(3) A portion of the voltage at R6003 (which is connected between the negative terminal of battery A and the internal power supplied return) is picked off by the voltage divider consisting of R6112, R6113, and R6114. The voltage picked off by the wiper arm of potentiometer R6113 is compared" resistively by resistors R6115 and R6116 with the voltage at the junction of resistors R6128 and R6129 (the reference 0.3 volt at operational amplifier A6102). This comparison voltage is indicative of the current flowing through battery A. Capacitor. C6111 bypasses the ripple in the charging voltage. The gain of operational amplifier A6102 is determined by feedback network R6117, R6118, and CR6127. Capacitor C6112 and C6113, and resistor R6119 are used to frequency compensate amplifier A6102. Capacitor C6123 filters the negative supply voltage from CR6113 applied to A6102. The output of A6102 is applied to the base of transistor Q6103 for further amplification. Resistor R6120 is the collector load resistor for Q6103; resistor R6121 limits the emitter current. The amplified output is then applied to the UJT trigger circuit from the collector of Q6103 through CR6115. When UJT Q6104 fires, the B1 output is amplified in Q6105 and coupled to the gates of silicon-controlled rectifiers (SCR) Q6001 and Q6002 of the battery charging voltage circuit by pulse transform T6101. Battery B charging current control circuit operates in the same way as the battery A control circuit; it uses the circuit made up of A6103, Q6106, Q6107, Q6108, and pulse transformer T6102 to control Q6003 and Q6004 gates in the battery B charging voltage circuit.

d. Charging Voltage-Sensing and Cutoff Circuit. Transformer T6001 secondary winding *terminals* 8 and 10 provide an output to the printed circuit board, where it is rectified, filtered, and regulated by a power supply which consists of CR6101 through CR6104 and associated circuitry. (This secondary winding also provides an ac voltage for the operation of the CHARGE ON and OFF indicator lights.) The power supply contains two filtering Circuits. The first consists of Capacitor C6101, C6102, and resistor R6101, which provides +10 volts at the cathode of CR6105. The second power supply filter consists of capacitor C6103, C6104, and resistor R6107, which provides -6 volts at the anode of CR6106. Both filtering circuits provide for operation of the battery charging voltage sensing and cutoff circuitry. Zener diodes CR6106 and CR6107 and resistor R6102 provide a 6-voIt reference voltage that is divided down to approximately 3 volts by

resistors R6103 and R6104. This is applied to terminal 3 of amplifier A6101 through the filter, which consists of resistor R6105 and capacitor C6105. The positive terminal of battery A is connected to potentiometer R6109 through pin 5 of J6001. Resistors R6108, R6109, and R6110 form a voltage divider network that supplies a portion of the battery voltage to the wiper arm of potentiometer R6109. This voltage is filtered by resistor R6111 and capacitor C6131 and applied to terminal 4 of amplifier A6101. Potentiometer R6109 is set so that the sensing circuitry will detect when the battery is charged to 8.1 ±. 1 volts. When the voltage picked off by R6109 exceeds the reference voltage at R6104 (indicating that the battery voltage has reached its fully charged state), the output of differential comparator A6101 (pin 7) becomes positive, and causes transistor Q6101 to conduct. Capacitor C6133 and resistor R6106 filter the voltage applied to transistor Q6101 to prevent transient voltage from triggering Q6101. Capacitor C6101 filters transient voltages from Q6101 when relay K6101 contacts are switched. The latching coil of relay K6101 is connected in the collector circuit of Q6101 so that, when current flows in Q6101, the latching coil is energized. When relay K6101 is energized, the sine wave power supply to UJT multivibrator Q6104 is interrupted (terminals 3 and 5 of K6101). This prevents the multivibrator circuit from producing an output to turn on gates of Q6001 and Q6002 in the battery charging voltage circuit. This action removes the charging voltage from battery A; when the gates are shut off, no rectification for battery charging takes place. A second set of contacts of relay K6101 controls the operation of the battery A CHARGE ON and OFF indicator lights, When relay K6101 is energized, the ac voltage at terminal 6 of relay K6101 is disconnected from the CHARGE ON indicator light and applied to the CHARGE OFF indicator light. RESET (A) switch S6003 controls the resetting of relay K6101 once it is energized by the sensing of a fully charged battery. When the RESET (A) switch is momentarily held in its down position, the reset coil of relay K6101 is energized, the relay K6101 is reset so that the clipped sine wave power supply is again connected to the UJT multivibrator circuit. This condition brings the battery charging currrent control circuit back into operation. At the same time, the CHARGE OFF indicator light extinguishes, and the CHARGE ON indicator light illuminates. Operation of the charging voltage-sensing and cutoff circuit for battery B is the same as for battery A. The battery B current has its own power supply circuit, which consists of CR6120 through CR6123 and associated circuitry. The battery B voltage is applied to potentiometer R6154, differential comparator A6104 controls the operation of Q6109 and relay K6103, and relay K6103 controls the application of the battery B clipped sine wave power supply to UJT multivibrator Q1607 of the battery B charging current control circuit.

e. Input Frequency Compensating Circuit. A frequency detecting circuit, which controls the operation of relay K6102, automatically adjusts the time constants in the UJT emitter circuits of both charging current control circuits for 60 Hz input power frequency. The time constants of the UJT circuits are preset for 400 Hz operation. The resistor-capacitor (rc) network, R6130 and C6117 and transistor Q6102, forms the frequency detecting circuit. When the input line frequency is 400 Hz, the voltage output of the rc network is not great enough to exceed the threshold voltage of the base-emitter circuit of Q6102 in series with diode CR6117. Transistor Q6102 does not conduct. The coil of relay K6102 is connected in the collector circuit of Q6102. When the input line frequency is 60 Hz, the voltage output of the rc network exceeds the threshold voltage and Q6102 conduts. The detected current is amplified in the collector circuit of Q6102 and energizes relay K6102. Capacitor C6132 filters and smooths the current through the relay coil. When relay K6102 is energized, relay K6102 contacts place capacitor C6115 in parallel with C6114 (battery A control circuit) and capacitor C6122 in parallel with C6121 (battery B control circuit). This added capacitance adjusts the time constants in the UJT multivibrator emitter circuits for 60 Hz operation.

f. Output Filtering Circuit. Electromagnetic interference filters are provided at the channel A and channel B output connectors J6001 and J6002, respectively. Filters FL6003, FL6004, FL6007, and FL6008 filter the channel A change and sense circuits while filters FL6005, FL6006, FL6009, and FL6010 similarly filter the channel B circuits.

4-3 Adapter Circuitry

a. Mounted in the cover of the battery charger case is a 230 vac conversion assembly which is basically an adapter. This assembly provides a female mating connector J6301 for the three-prong male power plug P6001 and is wired to binding posts E6301, E6302, and E6303 (fig. 4-5 and FO-1). The adapter provides connection of the battery charger to any source of 115- or 230-voIt ac power requiring binding post connections.

b. The 230 vac conversion assembly serves as the power cable storage spool and power plug storage receptacle whenever the battery charger is not in use.

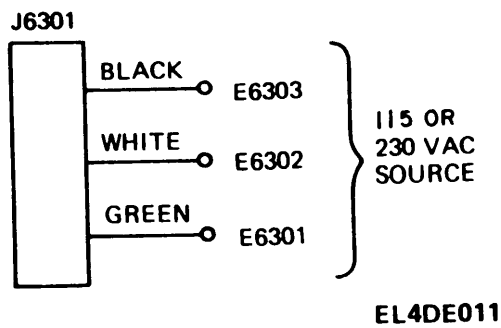


Figure 4-5. 230 vac conversion assembly, schematic diagram.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

5-1. Scope of Direct Support Maintenance

a. Direct support maintenance of the battery charger consists of the following:

(1) Troubleshooting (Section II)

(2) Maintenance (Section III)

(3) Testing (Section IV)

b. Direct support maintenance functions for the battery charger are authorized by the Maintenance Allocation Chart (MAC) in appendix B. Repair parts authorized at the direct support maintenance level are listed in the Repair Parts and Special Tools List (RPSTL), TM 11-6130-381-34P.

c. This chapter provides detailed instructions, including step by step procedures and illustrations to assist cognizant maintenance personnel in performing the following fault isolation, maintenance and test functions.

(1) A troubleshooting chart is provided to enable fault isolation to a replaceable subassembly or chassis/panel mounted part.

(2) Maintenance procedures in section III provide instructions to enable maintenance personnel to replace a defective subassembly or part isolated by inspection, test or troubleshooting.

(3) Test procedures in section IV provide instructions for checking that the repaired unit is functioning properly.

(4) If the control circuit card assembly and/or the battery charger subassembly is found to be defective, they are to be forwarded to general support maintenance for repair and further testing in accordance with the requirements set forth in TM 38-750.

5-2. Tools, Equipment and Material

a. *Tools*. The tools required to maintain the battery charger at the direct support level are listed in appendix B, section III.

b. Test Equipment. The test equipment required to maintain the battery charger at the direct support level are listed in appendix B, section III.

c. *Materials*. The material required to maintain the battery charger at the direct support level are as follows:

(1) Silicone grease, Dow Corning, part no. FS3451-2, or equivalent.

(2) Anti-seize compound *Per* MIL-T-5542.

(3) Silicone grease, Dow Corning, compound no. 5 or equivalent.

(4) Adhesive RTV162 and primer SS4155 General Electric.

(5) Adhesive 1177 and primer I007P, United Shoe Machine Corp.

(6) Primer (grade N, form R) and sealing compound (grade EV) per MIL-S-22473.

Section II. TROUBLESHOOTING

5-3. General

WARNING

When servicing the battery charger, be extremely careful of the high voltages. Serious injury or death may result from contact with the output terminals. Reenergize the equipment, and disconnect it from the input power source prior to performing any maintenance.

Troubleshooting at the direct support level includes all techniques given for organizational maintenance in addition to the techniques stipulated herein. Procedures for fault isolation are contained in paragraphs 5-4 and 5-5. The initial phase in servicing a defective battery charger is to sectionalize the fault. Sectionalization means tracing the fault to a major circuit group of the equipment, such as the input power circuit, the control circuit card assembly, the battery charger subassembly or the 230 vac conversion assembly. Determination of the circuit group at fault is accomplished as follows:

a. Visual Inspection. The purpose of Visual inspection is to locate faults without testing or measuring circuits. All meter readings, or other visual indications, should be observed and an atttempt made to sectionalize the fault to a particular circuit group.

b. Operational Tests. An operational test frequently indicates the general location of trouble. In many instances, the test will help to determine

the exact nature of the fault. The operating procedures (para 2-6), with the normally expected indications called out in the procedures, provide good operational checks. If an abnormal indication or result is observed during the operational check; then perform checks and corrective actions enumerated in the troubleshooting chart (para 5-4). If the corrective measures indicated do not resolve the problem, a higher maintenance repair activity is required.

NOTE

The troubleshooting chart lists symptoms of common troubles and give (or reference) corrective measures. Such a chart cannot include all the trouble symptoms that may occur; repair personnel should use the chart as a guide in analyzing symptoms that may not be listed.

CAUTION

Before using any ohmmeter to test transistors or transistor circuits, check the open circuit voltage across the ohmmeter test leads. Do not use the ohmmeter if the open circuit voltage exceeds 1.5 volts. Also, since the RX1 range normally connects the ohmmeter internal battery directly across the test leads, the comparatively high current (50 milliamperes or more) may damage the transistor under test. As a general rule, the RX1 range of any ohmmeter should not be used when testing low-powered transistors.

c. *Iso/ation.* After the fault has been localized by using the troubleshooting chart, voltage and resistance measurements and waveform checks should be made to isolate the defective component. A deviation of any appreciable amount from the indications of paragraph 5-5 indicates a faulty part .

d. Resistor, Capacitor, and Inductor Color Code Ciagram. A color code diagram for resistors, capacitors, and inductors (fig. FO-2) provide pertinent resistance, voltage rating, and tolerance information.

e. *Component Locations.* Figures 5-1 through 5-3 show component locations of parts, subassemblies, and assemblies of the battery charger.

NOTE

When making resistance checks, be careful of the test lead polarity. If the resistance reading is low, always reverse the test leads because of the diode action through a transistor. If a normal resistance is read after the kids are reversed, the stage is operating correctly.

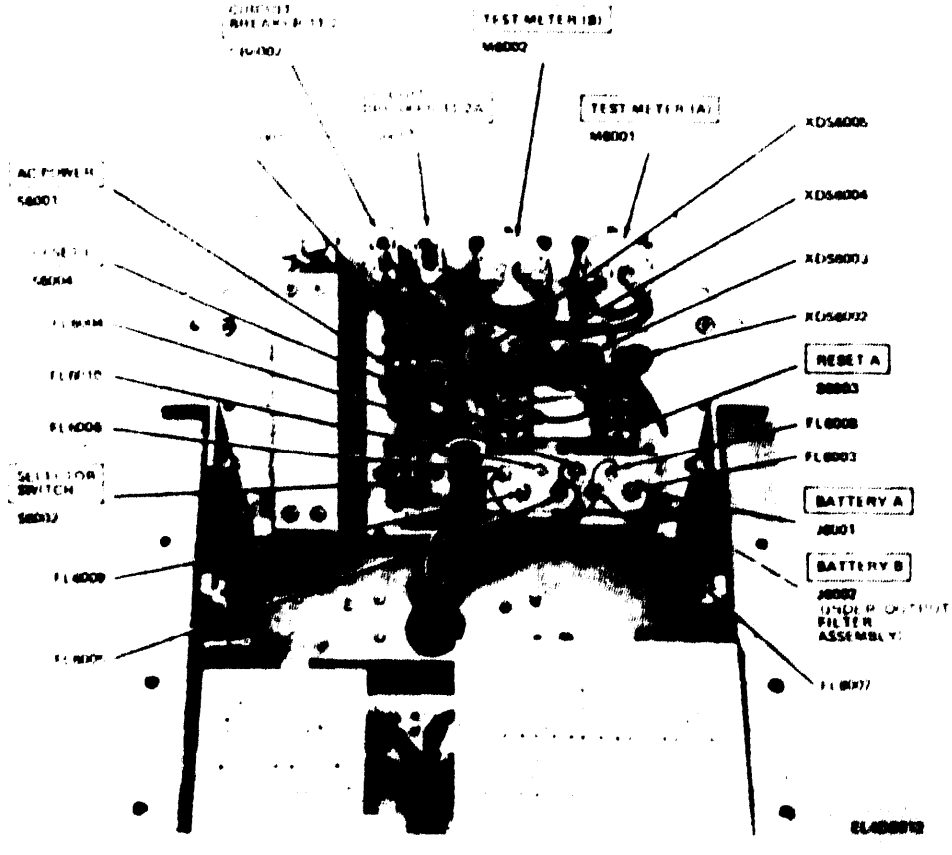


Figure 5-1. Battery charger component locations, rear of front panel.

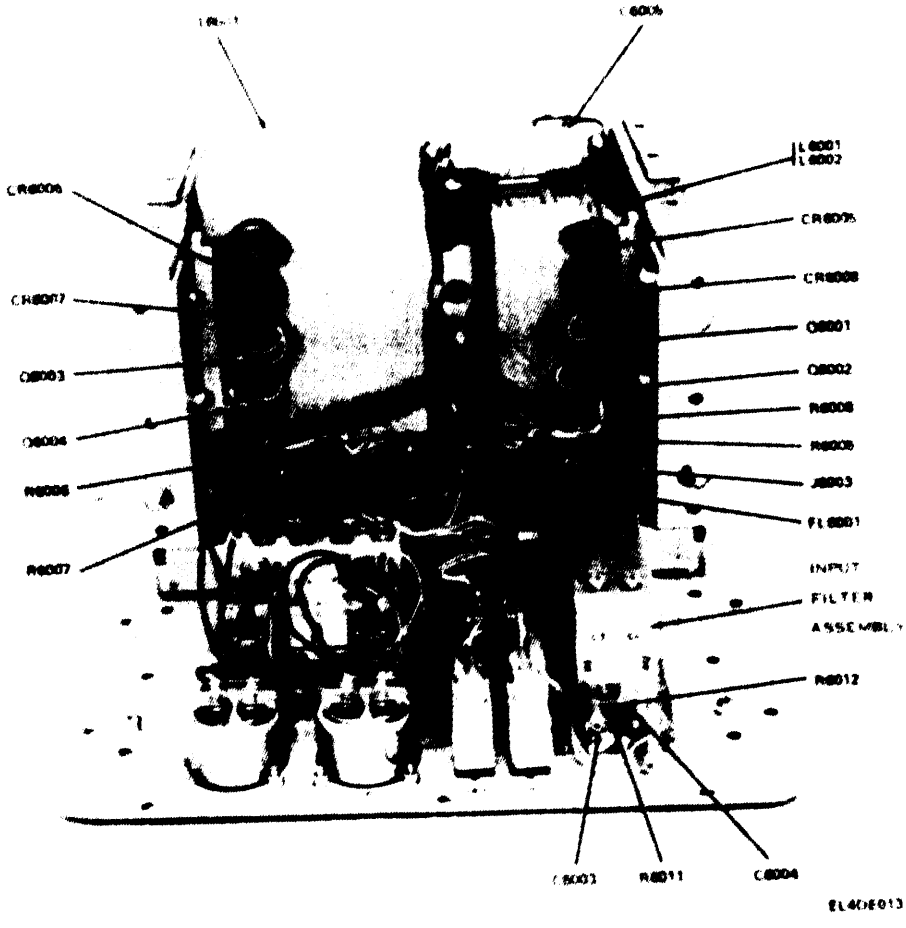


Figure 5-2. Battery charger component locations, interior view

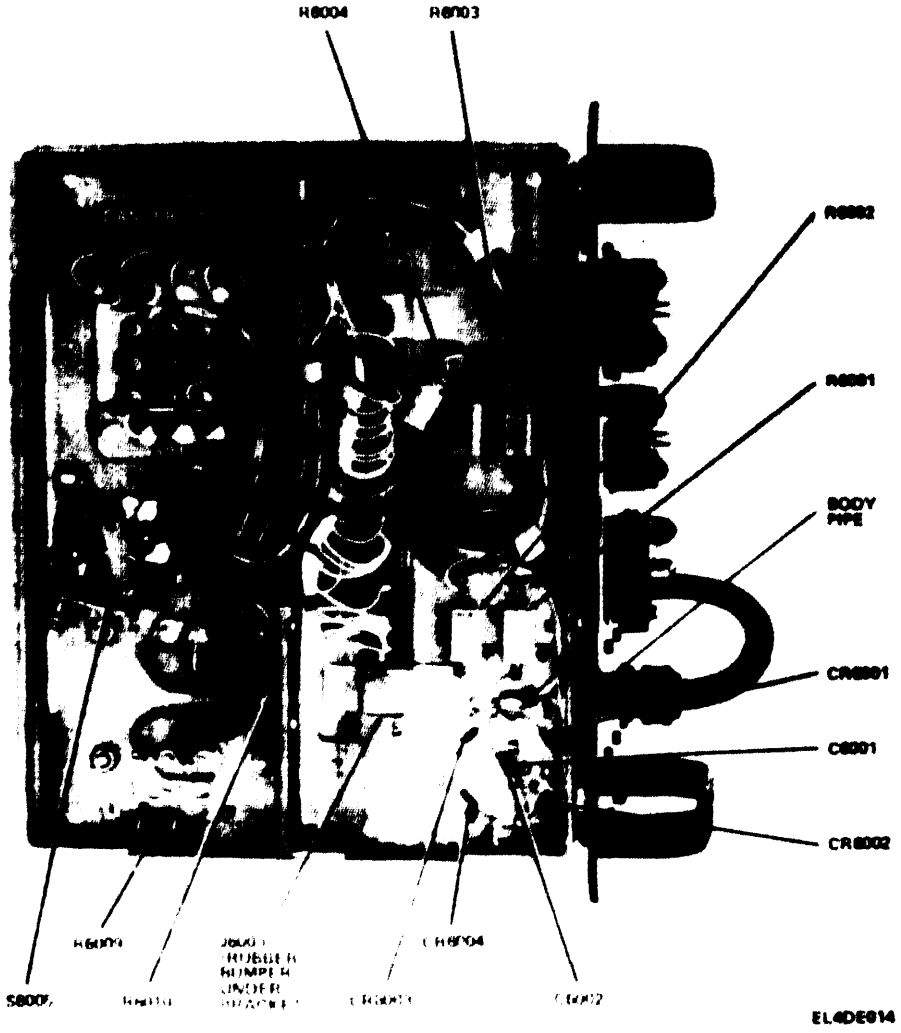


Figure 5-3. Battery charger component locations, bottom of chassis.

5-4. Troubleshooting Chart for Direct Support Maintenance

a. *Battery Charger Subassembly*

Item No.	Trouble symptom	Probable trouble	Checks and corrective measures
1	**POWER ON indicator light does not illuminate when AC POWER switch is set to ON.**	*a.* Defective AC POWER INPUT cable or connector.	*a.* **Check continuity of cable and connector; repair or replace as required.**
		b. Defective power interlock switch, AC POWER switch, or SELECTOR switch.	*b.* **Check switches, replace if defective.**
		c. CIRCUIT BREAKERS tripped.	*c.* **Depress CIRCUIT BREAKERS. Check circuit breakers and power transformer; repair or replace as required.**

Item No.	Trouble symptom	Probable trouble	Checks and corrective measures
2	Appropriate indicator light dose not illuminate as required.	*Defective* RESET (A) or RESET (B) switch .	Check switch and replace if defective
3	CHARGE ON indicator light illuminates but TEST METER (A) or TEST METER (B) does not indicate charging currant .	a. Meter is defective.	a. Check meter and replace if defective.
		b. Defective diodes CR6001 through CR6004.	b. Check waveform at junction *of R6001 and R6002 (A*, fig. 5-4) if waveform is not obtained, check diodes replace if defective.
		c. Defective diode CR6006, or CR6007, or rectifiers Q6001 and Q6002 (battery A) or Q6003 and Q6004 (battery B).	c. Check waveform (B fig. 5-4) at L6001-1 or L6002-3, and at gate terminals of Q6001 and Q6002 (battery A) (C, fig. 5-4), or Q6003 and Q6004 (battery B). If waveform is not obtained, check diodes CR6006 or cR6007, rectifiers Q6001 through Q6004 or inductors L6001 and L6003. Replace if defective.
		d. Control circuit card assembly.	d. Replace circuit board. If problem is corrected, send defective board to next higher level of maintenance for repair.
		e. Defective chassis mountad resistor.	e. Check in accordance with paragraph 5-5.

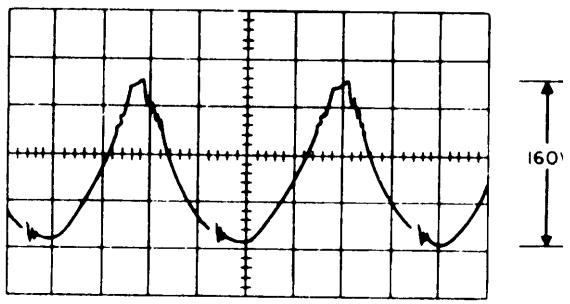
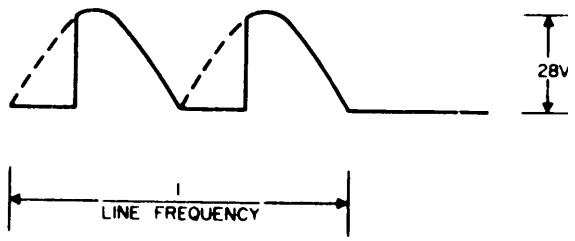
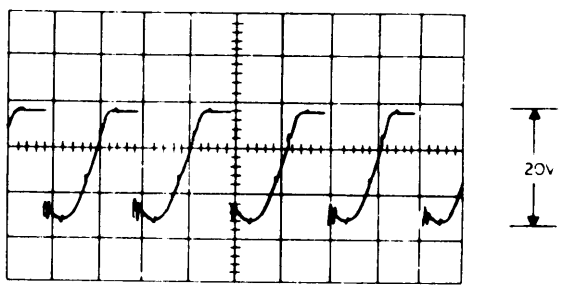
VOLTAGE POINT	REFERENCE POINT	OPERATING CONDITION	WAVEFORM
JUNCTION OF R6001 AND R6002	T6001-6	POWER ON BATTERY CHARGING	A 
L6001-1 OR L6002 3	T6001 6	POWER ON BATTERY CHARGING	B 
GATE OF 06001, 06002, 06003, OR Q0004	T6001-6	POWER ON BATTERY CHARGING	: 

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Figure 5-4. *Waveforms, troubleshooting at direct support.*

b. 230 Vac Conversion Assembly

Item No.	Trouble symptom	Probable trouble	Checks and corrective measures
1	POWER ON indicator light on battery tiger front panel does not illuminate when AC POWER switch is set to On while using the 230 vac conversion assembly.	Defective receptacle, binding poet, or jumper wire.	Check continuity from receptacle to binding poet-a. Replace recepticle binding post or jumpers if defective.

5-5. Dc Resistance of Chasis Mounted Components

NOTE

Perform the resistance measumments of steps a., *b.*, and c., with power disconnected, the battery charger subassembly removed from the case (para 5-7), and the control circuit card assembly removed from the battery charger subassembly (para 5-9).

a. Check the resistance of the following components. The measured values must be in accordance with the specified values. (Refer to figures 5-2 and 5-3 for parts location.)

Component	Resistance (ohms)
R6001	**4220**
R6002	**4220**
R6003	**0.1**
R6004	**0.1**
R6006	**20**
R6006	**20**
R6007	**20**
R6008	**20**

b. Perform the resistance measurements at J6003 on the battery charger chassis in accordance with the following chart. The readings obtained must be in accordance with the specified values.

Test prods		Resistance (ohms)
Negative	Positive	
D	C	1.6
D	B	1.6
D	H	100
D	F	100
D	J	Infinity
D	A	Infinity
R	T	1.6
R	v	1.6
R	K	Infinity
R	z	Infinity
R	N	Infinity
s	R	3.6
***R**	L	Infinity
R	E	Less than 1
R	x	Less than l
M	R	3.5
HH	KK	1,5
HH	JJ	1.6
HH	FF	100
HH	c c	100
HH	Y	Infinity
HH	LL	Infinity

*If resistance reading is observed, reverse meter leads.

c. Check that the resistance across P6001 (black to white), with the interlock switch (S6005) depressed and AC POWER switch set to ON, is 1.2 ohms (SELECTOR SWITCH set at 115V) and 4.0 ohms (SELECTOR switch set at 230V).

Section III. MAINTENANCE

5-6. General

a. Procedures contained in this section are for those subassemblies and parts of the battery charger designated for direct support maintenance. These procedures include dismantling instructions, parts replacement techniques, precautions to be observed during replacement, application of materials utilized to accomplish replacement, and reassembly instructions. Refer to the parts location diagrams (fig. 5-1 through 5-3) and schematic diagram (fig. FO-1) as required to accomplish the maintenance tasks contained herein. Upon replacement of any faulty subassembly or part, test the battery charger is accordance with the procedures of Section IV of this chapter.

6. Upon removal of the battery charger subassembly from its case (para 5-7), the front panel detached from the chassis (para 5-8), and the control circuit card assembly removed from its socket connector (para 5-9), all parts designatad for direct support of the battery charger are easily accessible for repair or replacement. Refer to Paragraph 5-10 to gain access to the 230-volt conversion assembly.

5-7. Removal of Battery Charger Subassembly

Remove the battery charger subassembly from its case as follows:

a. Press the pressure relief valve button.

b. Unlatch the six latches and open the cover of the case.

c. Turn the case on its side so that the front panel of the battery charger and the 230 vac conversion assembly are accessible for removal.

d. Uncoil the input power cable from inside the cover of the case.

e. Remove the ten mounting screws from the front panel.

f. Grasp the handles on the front panel of the battery charger subassembly and carefully pull the chassis out of the case.

5-8. Detaching Battery Charger Front Panel

NOTE

Because of the front panel-to-chassis cabling, the front panel cannot be completely disconnected from the chassis without disconnecting the cabling terminations: however to reach the com-

ponents, detach the front panel from the chassis and pull the panel as far away from the chassis as the cabling will allow by removing the six seal screws that attach the front panel to the two chassis angle brackets (using an off-set screwdriver). The front panel of the battery charger is separated from the chassis for access to the components of the printed circuit board when it is installed in the chassis (for troubleshooting purposes), or components mounted on the front panel (for troubleshooting, repair, or replacement).

Detach the front panel from the chassis as follows:

a. Remove the battery charger chassis from its case (para 5-7).

b. Using an off-set screwdriver, remove the six seal screws (three located in line with each handle) that attach the front panel to the angle brackets.

c. Carefully pull the top of the front panel forward and down as far as the panel-to-chassis cabling will allow without damaging the cable (fig. 5-2).

d. All components on the chassis, at the back of the front panel, and on the printed circuit board will be accessible.

5-9. Removal of Control Circuit Card Assembly

a. Remove subassembly from its case (para 5-7) .

b. Remove the two thumb screws which secure the retaining bar of the control circuit card assembly (fig. FO-3) to the chassis. Slowly pull the retaining bar up, loosening the control circuit card assembly from J6003. Be careful not to damage the components of the printed circuit board.

5-10. Removal of 230 Vac Conversion Assembly

Remove conversion assembly from the cover as follows:

a. Press the pressure relief valve button.

b. Unlatch the six latches and open the cover of the case.

c. Uncoil the input power cable from inside the cover of the case.

d. Remove the four mounting screws and flat washers and lift out the assembly.

5-11. Parts Replacement Techniques

The majority of parts comprising the battery C- can be reached and replaced easily without special procedure. The following procedure provide general replacement instruction and special instructions for those items utilizing specific materials when replacement is required Refer to figure 5-1 through 5-3 for location of parts.

a. Remove and install components that are soldered with a pencil-type soldering iron having a 25-watt maximum capacity. The battery charger is transistorized; if the soldering iron must be used with ac voltage, use an isolating transformer between the soldering iron and the line. Do not we a soldering gun; damaging voltages can be induced in the circuit components.

b. Before a part is unsoldered, note the position of the leads. If a part, such as a transformer or switch, has a number of connections tag each of the leads to ensure proper connections when replacing the part. Be careful not to damage other leads by pulling or pushing them out of the way.

c. When soldering transistor leads, solder quickly wherever wiring permits, use a heat Sink (such as a long-nosed pliers) between the soldered joint and the transistor. Use the same length and dress of transistor leads as used originally.

d. Make well soldered connections; a carelessly soldered joint may create a new trouble, and is one of the most difficult troubles to isolate. Be careful not to allow drops of solder to fall into the equipment; this action may cause short circuits.

e. When replacing circuit breakers CB6001 or CB6002, switch S6005, or transformer T6001, the following terminals must be coated with non-acidic adhesive such as Silastic RTV 162 and primer SS4155 (General Electric) or equivalent:

Parr	*Terminal(s)*
CB6001	A, B
CB6002	A, B
S6005	C, N. O., N.C.
T6001	1 through 4, 14 and 15

f. When removing stud mounted diodes CR6005 through CR6008 or rectifiers Q6001 through Q6004, be careful not to damage the mica washers and centering bushings or burr the contacting surfaces. Replace my damaged mica washers and centering bushings. Apply silicon grease, compound No. 5 (Dow Corning) or equivalent, to the mica washers prior to installation. Place smooth aide of metal washers against the mica when replacing the devices.

g. If robber bumpers supporting J6003 require replacement, note position of bumpers prior to removal. Apply primer 1007P and adhesive 1177 (United Shoe Machine Corp.), or equivalent, to three contacting surfaces of the replacement bumper and cement in place.

h. If the knurled gland nut is removed from the body pipe mounted to the front panel during repair of the "AC POWER CORD" coat the threads upon replacement with primer (grade N, form R) and sealing compound (grade EV) per MIL-S-22473.

i. 1f handles on front panel have to be replaced, place a fillet of adhesive against washer and around screw securing handles upon installation so as to provide an adequate water seal. Use non-acidic adhesive Silastic RTV 162 and primer SS4155 (General Electric), or equivalent, for the sealing operation.

j. If the pressure relief valve requires replacement, check the sealing surface on the case for nicks and burr's. Smooth the sealing surfaces and touch up with paint (para. 3-11) if required before installing the new pressure relief valve.

5-12. Attaching Battery Charger Front Panel

Attach the front panel to the chassis as follows:

a. Carefully push the front panel back to the chassis: be careful not to crimp or damage the cabling.

NOTE

Coat all rubber "O" rings with silicone grease before installing screws, replace any damaged O rings, and check for burrs on the metal contacting surfaces.

b. Align the screw holes of the front panel with the captive nuts on the angle bracket, and install the seal screws located above each handle first; do not tighten them all the way. Install the remaining four seal screws. When all six (6) screws are in place, tighten them securely.

5-13. Installation of Control Circuit Card Assembly

a. To install the printed circuit board in the chassis, turn the card assembly so that the component side faces toward toward front panel. Carefully insert the card assembly connector as far as it will go into socket connector J6003 (fig. 5-2) in the chassis.

b. Tighten the two thumb screws (FO-3) that attach the retaining bar to the chassis.

5-14. Installation of Battery Charger Subassembly

Install the battery charger subassembly into the case as follows:

CAUTION

Prior to installation of the battery charger subassembly, inspect the gasket and wire mesh in the case on which the front panel is sealed. Gasket and wire mesh is utilized to satisfy electromagnetic interference (EM I) requirements and prevent water seepage. If the gasket or wire mesh is damaged, forward the case to the next higher echelon of maintenance for repair.

a. Using silicone grease FS3451-2 (Dow Coming), or equivalent, coat the gaskets in cover of case and between the panel of the battery charger subassembly and case. Do not apply grease to wire mesh attached to the panel gasket.

b. Apply a thin uniform coating of anti-seize compound, per MIL-T-5542, on shanks of three guide pins on inside of case. Carefully slide the chassis into the case making sure bushings in chassis align with guide pins in case.

c. Align screw holes in case with the holes in the front panel of the battery charger subassembly.

CAUTION

Inspect seal washers for damage prior to installation. Replace if found defective. Seal washers are utilized to prevent water seepage. Water seepage would damage equipment if seal washers were defective and not replaced.

d. Install the ten screws and seal washers around the perimeter of the front panel. Replace any damaged seal washers and coat all seal washers with silicon grease before installing.

e. Tighten the screws by going around the perimeter taking up the slack gradually.

f. Coil the imput power cable into the cover of the case.

g. Close the cover of the case and latch the six cover latches on the case.

5-15. Installation of 230 Vac Conversion Assembly

Install the conversion assembly in the cover as follows:

a. Insert the conversion assembly into the cover.

b. Align the screw holes of the panel with the mounting bracket.

c. Install the four screws and flat washers.

Section IV. DIRECT SUPPORT TESTING PROCEDURES

5-16. GeneraI

a. This section provides instructions for direct support personnel to determine the operational readiness of a battery charger that has been repaired. These instructions take the form of physical tests and inspections as well as operational tests. The performance standards specified for these tests must be successfully obtained before a unit can be considered serviceable.

b. The tests contained herein are provided in the following paragraphs:

Test	*Paragraph*
Physical Tests and Inspection	5-18
operational Check	5-19

c. If the battery charger fails to meet any of the performance standards, refer to the troubleshooting procedure in section II.

5-17. Use of Charts

a. Paragraphs 5-18 and 5-19 each contain charts having the following columns:

(1) *Step No.* This column provides sequential numbering of the steps to be performed.

(2) *Control settings.* This column specifies the settings of the various switches which are necessary for testing.

(3) *Test procedures.* This column contains instructions for the various performance tests.

(4) *Performance standards.* This column provides the indications that would normally be obtained from an operational unit.

b. To use the performance test chart, start with step number 1, setup the control settings, perform the test procedure, and compare the observation made with the performance standard(s). If the performance standard is met, proceed to the next step. Continue this procedure until all steps have been accomplished, or until an incorrect observation is noted. If a wrong result is obeserved, recheck all control settings for the step and repeat the step that failed. If the test result is still incorrect, refer to the applicable troubleshooting procedure in section II of this chapter.

5-18. Physical Inspection Chart

Step no.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	None	Controls may be in any position.	*a.* Inspect case, chassis, and conversion assembly for damage, missing parts, and condition of paint. NOTE Touchup painting is recommended instead of refinishing whenever practical; screwheads, binding posts, receptacles, and other plated parts will not be painted or polished with abrasives.	*a.* No damage evident or parts missing. External surfaces to be painted do not show bare metal. Panel lettering is legible.
			b. Inspect front panel for loose or missing screws.	*b.* All screws and seal washers are tight; none are missing.
			c. Inspect connectors, plug, meters, and handles for looseness or damage.	*c.* No loose parts or damage.
			d. Inspect rubber boots.	*d.* Boots are tight.
			e. Inspect rubber seals, gaskets and O-rings for proper seating.	*e.* Gaskets and seals are securely fastened and properly seated.
2	None	Controls may be in any position.	*a.* Operate RESET (A), and RESET (B) switches.	*a.* These spring-loaded switches return to their neutral position after being depressed.
			b. Loosen two screws and operate SELECTOR SWITCH.	*b.* Switch operates properly.
			c. Operate AC POWER switch.	*c.* Switch operates properly.

5-19. Operational Checks Chart (fig. 2-2).

Step no.	Control settings: Test Equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	None	AC POWER switch: OFF. SELECTOR SWITCH: 115V.	*a.* Connect AC POWER INPUT cable to a 115V, 60 Hz or 400 Hz power source.	*a.* None

Step no.	Control settings		Test procedure	Performance standard
	Test Equipment	Equipment under test		
		CIRCUIT BREAKERS: IN	*b.* Set AC POWER switch to ON.	*b.* POWER ON indicator lamps light, and the two CHARGE OFF indicator lamps light.
			c. Depress RESET (A) switch for four seconds and release.	*c.* CHARGE ON indicator lamp lights and CHARGE OFF indicator lamp extinguishes.
			d. Depress RESET (B) switch for four seconds and release.	*d.* CHARGE ON indicator lamp illuminates and CHARGE OFF indicator lamp extinguishes.
			e. Set AC POWER switch to OFF.	*e.* POWER ON indicator lamp and the two CHARGE ON indicator lamps extinguish.
			f. Disconnect AC POWER input cable from power source.	*f.* None.

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

6-1. Scope of General Support Maintenance

a. General support maintenance of the battery charger consists of the following:

(1) Troubleshooting (Section II)

(2) Maintenance (Section III)

(3) Testing (Section IV)

b. General support maintenance functions for the battery charger are authorized by the Maintenance Allocation Chart (MAC) in Appendix B. Repair parts authorized at the general Support maintenance level are listed in the Repair Parts and Special Tools List (RPSTL). TM 11-6130-381-34P.

c. This chapter provides maintenance instructions over and above those provided for organizational and direct support personnel to restore the battery charger to an operable condition. These procedures encompass the following:

(1) A troubleshooting chart to enable fault isolation to a replaceable subasaernbly, to a chassis/panel mounted part, a, a piece part on the control circuit card assembly.

(2) Repair of the battery charger subassembly including the wiring harmess and the control circuit card assembly.

(3) Adjustment procedures for the battery charger.

(4) Performance tests of the battery charger and adjustment procedure as required.

Procedures utilized at direct and organizational maintenance are not duplicated unless deemed necessary in this chapter but are referenced as required.

6-2. Tools, Equipment and Material

a. Tools. The tools required to maintain the battery charger at the general support level are listed in appendix B, section III.

b. Test Equipment. The teat equipment required to maintain the battery charger at the general support level are listed in appendix B, section III.

c. Materials. The material required to maintain the battery charger at the general support level are as follows:

(1) Polyurethane coating, Conathane CE-1164 per MIL-I-46058.

(2) Dry inert gas for purging when storing coating for reuse (Mitrogen or Freon 12)

(3) Solvent, Dow Chemical Co, Chlorothene VG per Federal Specification O-T-620, Type I.

(4) Chemical stripper such as SNAP (Martin Paint Co), DMF (Dimethylformamide) or equivalent.

(5) No. 3 camel hair brush or equivalent.

(6) Non-absorbent probe.

(7) Kimwipers, No. 1300 or equivalent.

(8) Source of heat: Pam PPS 100A/PRC-150, soldering iron or equivalent 340°F (171°C) to 360°F (182°C).

(9) Adhesive/sealant, RTV 118, General Electric Corp.

(10) Alligator clips.

(11) Female connector, Deutsch Model DS 07-7S-308.

(12) Four 12-inch lengths of AWG No. 14 insulated Wire.

(13) Solder, 60 percent tin, per Federal Specification QQ-S-571.

(14) Nylon tape, type P, class 2 per MIL-T-713.

(15) Tywraps per MIL-S-23190.

(16) Varnish per MIL-V-173.

Section II. TROUBLESHOOTING

6-3. General Instructions

WARNING

When servicing the battery charger, be extremely careful of the high voltages. Serious injury or death may result from contact with the output terminals. Reenergize the equipment and disconnect it from the input power source prior to performing any maintenance

Troubleshooting at the general support level in-

eludes all techniques given for organizational and direct support maintenance, and any special or additional techniques required to isolate a defective part. If one channel is malfunctioning, check the comparable circuits in the other channel if possible. Refer to the component location diagrams of figures 5-1 through 5-3, schematic diagram of figure FO-1, the color code diagram of figure FO-2, the parts location diagram of the control circuit card assembly of figure FO-3 and the wiring harness diagram of figure FO-4 to aid in fault isolation.

6-4. Organization of Troubleshooting Procedures

a. *General.* Troubleshooting procedures for the battery charger am contained in paragraphs 6-5 through 6-8. The first step in servicing a defective battery charger is to sectionalize the fault. Sectionalization means tracing the fault to a major circuit group of the charger such as the input power circuit, the battery A or battery B charging voltage circuit, the battery . A or battery B charging current control circuit on the battery A or battery B charging voltage-sensing and cutoff circuit. The second step is to localize the circuit. Localization means tracing the fault to a defective stage of the circuit group responsible for the abnormal condition. The third step is isolation. Isolation means locating the defective component or part in the circuit stage. Some defective parts, such as burned resistors and arcing or shorted transformers, can often be located by sight, smell, and hearing; however, most defective parts must be isolated by checking voltages and resistances.

b. Sectionalization. The battery charger circuitry is divided into two identical circuits, one for battery A and one for battery B. Some circuits, such as the input power circuit and the frequency compensating circuit, are common to both charging circuits. The first step in tracing trouble is to determine the circuit group at fault as follows

(1) *Visual Inspection.* The purpose of visual inspection is to locate faults without testing or measuring circuits. All meter readings, or other visual indications, should be observed and an attempt made to sectionalize the fault to a particular circuit group.

(2) *Operational Tests.* An operational test frequently indicates the general location of trouble. In many instances, the test will help to determine the exact nature of the fault. The operating procedures (para 2-6) with the normally expected indications called out in the procedures provide good operational tests.

c. Localization. Localization procedures should be performed after the trouble has been sectionalized. The troubleshooting chart (para 6-5) should be used in localizing the trouble to a suspected stage. The troubleshooting chart lists symptoms of common troubles and give (or refererence) corrective measures. Such a chart cannot include all the trouble symptoms that may occur; maintenance personnel should use the chart as a guide in analyzing symptoms that may not be listed.

CAUTION

Before using any ohmmeter to test transistors or transistor circuits, check the open circuit voltage across the ohmmeter test leads. Do not use the ohmmeter if the open circuit voltage exceeds 1.5 volts. Also, since the RX1 range normally connects the ohmmeter internal battery directly across the test leads, the comparatively high current (50 mA or more) may damage the transistor under test. As a general rule, the RS1 range of any ohmmeter should not be used when testing low-powered transistors.

d. Isolation. After the fault has been localized to a stage by using the troubleshooting chart, voltage and resistance readings (para 6-7 and 6-8) will indicate a faulty part. The voltage checks will isolate the trouble to a group of parts, such as resistors, capacitors, and diodes; a resistance check will determine which part or component is defective. Waveform data and analysis (para 6-6) are also given for the battery charger.

NOTE

When making resistance checks, be careful of the test lead polarity. If the resistance reading is low, always reverse the test leads because of the diode action through a transistor. If a normal resistance is mad after the leads are reversed, the stage is operating correctly.

e. Unijunction Transistors. If unijunction transistor Q6104 or Q6107 is suspected of being faulty, substitute a known good replacement rather than use the elaborate test setups required to check them.

f. Test Cab/e. Fabricate a test cable as shown in figure 6-1. Use a female connector (Deutsch Model DS07-7S-306) that mates to BATTERY (A) and BATTERY (B) connectors, and four 12-inch lenghts of AWG No. 14 insulated wire terminating in alligater clips. Tag each wire with the pin number of the connector it is attached to.

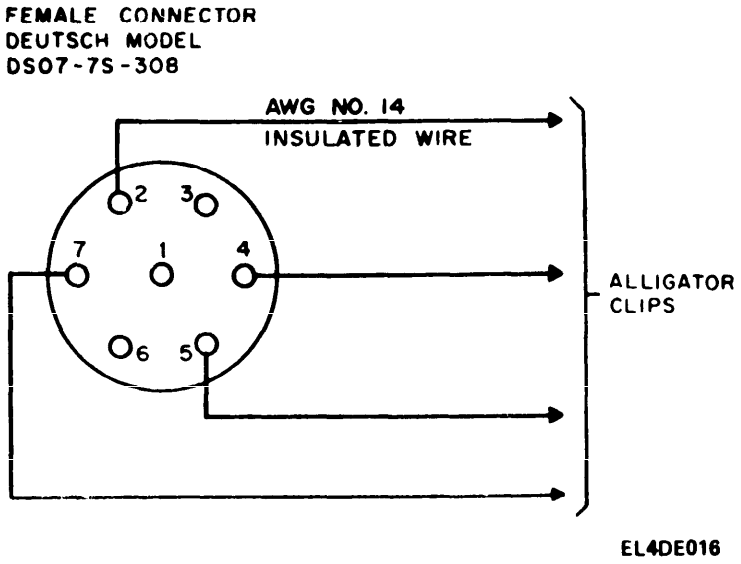


Figure 6-1. Test cable construction diagram.

6-5. General Support Troubleshooting Chart

a. Before troubleshooting the battery charger, remove the battery charger subassembly from its case (para 5-7) so that all components are accessible. Connect the battery charger to the input power source. Actuate the input power interlock switch S6005 (fig. 5-3) and connect two service batteries (which have been partially charged) to the BATTERY (A) and BATTERY (B) connectors.

b. Battery Charger Troubleshooting Chart.

Item no.	Trouble symptom	Probable trouble	Checks and Corrective Measures
1	POWER ON indicator light does not illuminate when AC POWER switch is set to ON.	*a.* AC power is not applied to battery charger.	*a.* Check for input voltage
		b. Defective power interlock switch, AC POWER switch, or SELECTOR SWITCH.	*b.* Check switches; replace if defective.
		c. CIRCUIT BREAKERS tripped.	*c.* Check CIRCUIT BREAKERS; reset if tripped.
2	CHARGE ON indicator light illuminates and no output current.	*a.* Defective diodes CR6001 through CR6004.	*a.* Check waveform at junction of R6001 and R6002 (fig. 6-2, A). If waveform is not obtained, check diodes; replace if defective.
		b. Defective power supply diodes CR6108 through CR6111.	*b.* Check diodes; replace if defective.
		c. Defective UJT Q6104 (battery A) or Q6107 (battery B).	*c* Check waveforms (fig. 6-2, D) at cathode of CR6115 or CR6118; across CR6116 or CR6119 (fig. 6-2, B); at gate terminals of Q6001 and Q6002 or Q6003 and Q6004 (fig. 6-2, F). If waveforms are not obtained, check UJT's Q6104 and Q6107; replace if defective.
		d. Defective amplifier Q6105 (battery A) or Q6106 (battery B).	*d.* Check transistor; replace if defective.
		e. Defective diode CR6006 or CR6007, and rectifier Q6001 and Q6002	*e.* Check waveform (fig. 6-2, C) at L6001-1 or L6002-3 and at gate terminals of Q6001 and Q6002

Item no.	Trouble symptom	Probable trouble	Checks and Corrective measures
		(battery A) or Q6003 and Q6004 (battery B).	(battery A) or Q6003 and Q6004 (battery B). If waveform is not obtained, check diodes or transistor, replace if defective.
3	CHARGE ON or OFF indicator lights do not illuminate or extinguish as required.	*a.* Defective lamp.	*a.* Check lamp; replace if defective
		b. Defective transistors Q6101 (battery A) or Q6109 (battery B).	*b.* Check transistor, replace defective.
		c. Defective relay K6101 (battery A) or K6103 (battery B).	*c.* Check relay; replace if defective.
		d. Defective RESET (A) or RESET (B) switch.	*d.* Check switch; replace if defective.
4	Output current not regulated to 6±0.48 amperes.	*a.* Potentiometer R6113 (battery A) or R6132 (battery B) not adjusted properly.	*a.* Adjust potentiometer (para 6-14).
		b. Defective component in control circuitry: CR6108 through CR6114; A6102, Q6103, Q6104 (battery A) or A6103, Q6106, Q6107 (battery B), Q6102; or K6102.	*b.* Check waveforms (fig. 6-2, D) at junction of CR6115 and R6122 or CR6118, R6143, C6121; across CR6116 or CR6109; at gate terminals of rectifier Q6001 and Q6002 or Q6003 and Q6004. If waveforms are not obtained, check components; replace if defective.
5	Charging current cuts off when charging voltage is less than 8.0 volts and does not cut off when charging voltage is greater than 8.2 volts.	*a.* Potentiometer R6109 (battery A) or R6154 (battery B) not adjusted properly.	*a.* Adjust potentiometer (para 6-15).
		b. Defective component in control circuitry: CR6101 through CR6107, A6101, Q6101, K6101 (battery A); or CR6120 through CR6126, A6104, Q6109, K6103 (battery B).	*b.* Check component; replace defective.

6-6. Waveform Analysis

a. Waveforms may be observed at various points in the circuitry of the battery charger with Oscilloscope AN/USM-281C. The normal waveforms obtained are shown in figure 6-2 utilizing a battery as the load. By the comparison of the observed waveform with the normal waveform, troubles may be located.

b. Before comparing the waveforms with the normal waveforms, carefully duplicate the conditions under which the normal waveforms were obtained. If an observed waveform does not closely resemble the normal waveform, trouble is indicated.

c. A departure from the normal waveform indicates trouble between the point at which the waveform is observed to be normal and the point at which the waveform is observed to be abnormal, or, it may indicate a defective component in the circuitry immediately preceding the point at which the waveform was checked. A voltage or resistance check of the stage preceding the test point may isolate the defective component.

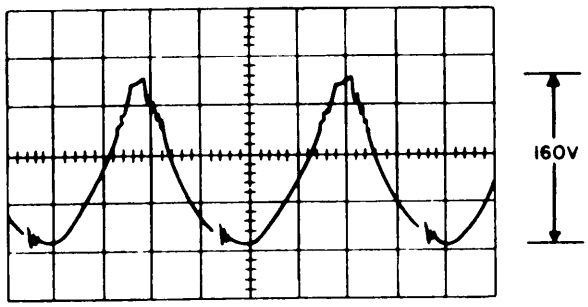
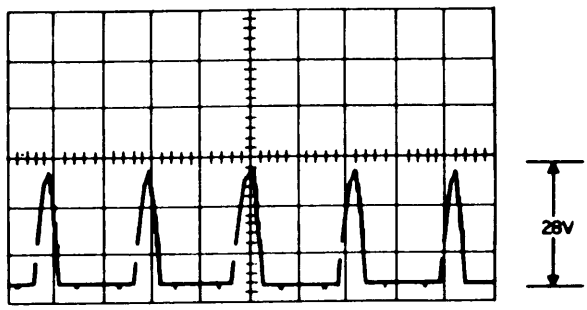
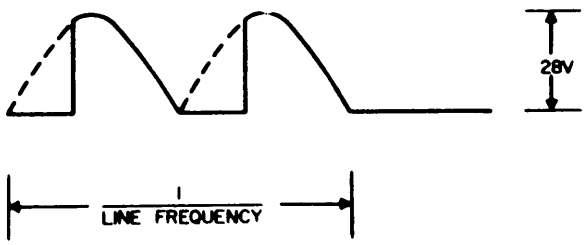
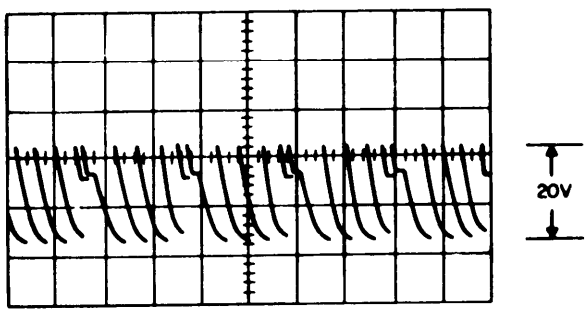
VOLTAGE POINT	REFERENCE MINT	OPERATING CONDITION	WAVEFORM
JUNCTION OF R6001 AND R6002	T6001-6	POWER ON BATTERY CHARGING	A 
ACROSS CR6116 OR CR6119		POWER ON BATTERY CHARGING	B 
L6001-I OR L6002-3	T6001-6	POWER ON BATTERY CHARGING	C 
JuNCTION OF C6115, R6122, CR6115 OR CR6118, R6143, C6121	P6101-R	POWER ON BATTERY CHARGING	D 

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Figure 6-2 ① Waveforms, troubleshooting at genaral support (sheet 1 of 2).

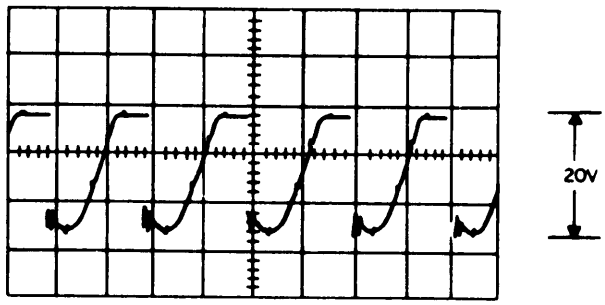
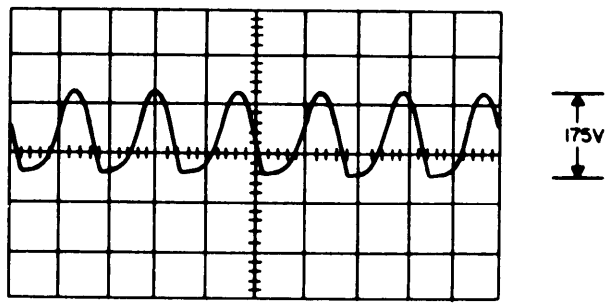
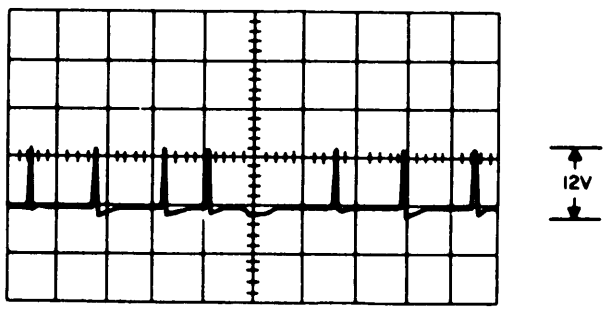
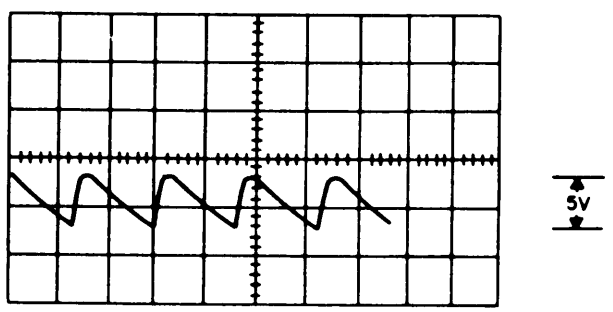
VOLTAGE POINT	REFERENCE POINT	OPERATING CONDITION	WAVEFORM
GATE OF Q6001, Q6002, Q6003, OR Q6004	T6001-6	POWER ON BATTERY CHARGING	F 
JUNCTION OF C6117, R6130, BASE Q6102	P6101-R	POWER ON BATTERY CHARGING	G 
COLLECTOR Q6105	P6101-R	POWER ON BATTERY CHARGING	H 
JUNCTION C6132 AND COLLECTOR OF Q6102	P6101-R	POWER ON BATTERY CHARGING	I 

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Figure 6-2 ② . Waveforms, Troubleshooting at general support (sheet 2 of 2).

6-7. Dc Resistance Readings of Control Circuit Card Assembly

The resistance readings given in the chart below are made at the pins of P6101 with the control circuit card assembly removed from the chassis. The resistance measurements are provided as an aid in troubleshooting and are approximate values.

Meter Leads		Resistance (ohms)
Neg. at pin:	Pos. at pin:	
D	A	7.5 k
D	B	11 k
D	C	11 k
*D	F	Less than 1
*D	H	Infinity
D	J	3.5 k
R	E	200
R	K	120 k
R	L	Infinity
R	M	Infinity
R	N	Infinity
	P	Not used
R	S	Infinity
R	T	7 k
	U	Not used
R	V	75 k
	W	Not used
R	X	200
HH	Y	20 k
HH	Z	Infinity
	AA	Not used
	BB	Not used
HH	CC	Infinity
	DD	Not used
	EE	Not used
HH	FF	11 k
HH	JJ	11 k
HH	KK	11 k
HH	LL	11 k

*If resistance between D and F is infinity, the resistance between D and H must be less than 1 ohm.

6-8. Battery Charger Voltage Measurements

Perform voltage measurements on the control circuit card assembly utilizing Electronic Voltmeter ME-202 ( )/U and the chart below. Note that some voltages are taken while the battery charger is generating charging current. The voltage checks are provided as an aid in troubleshooting and are approximate values. These measurements must be made utilizing a battery as the load.

Meter leads		Indication (volts dc)	Test condition
Neg. at pin:	Pos. at pin:		
P6101-D	Junction of P6101-A and R6108	+6.10	No charging current.
P6101-D	Junction of R6108 and R6109	+2.3	No charging current.
P6101-D	Junction of C6105, R6104, and R6105	+2.1	No charging current.
P6101-D	A6101-4	-4.4	No charging current.
P6101-D	A6101-2	+2.1	No charging current.
P6101-D	A6101-7	-0.42	No charging current.
P6101-R	Junction of R6113 and R6115	*a.* +0.2	*a.* No charging current.
		b. +0.3	*b.* Charging current for battery A.
P6101-R	A6102-3	*a.* 0	*a.* Charging current for battery A.
		b. −0.2	*b.* No charging current.
P6101-R	A6102-7	−10.0	No charging current.
P6101-R	A6102-4	*a.* -8	*a.* No charging current.
		b. -10.0	*b.* Charging current for battery A.
P6101-R	A6102-2	*a.* -0.2	*a.* No charging current.
		b. 0	*b.* Charging current for battery A.
P6101-R	A6102-6	-0.52	No charging current.
P6101-R	Collector of Q6102	+3.0	No charging current.

Section III. MAINTENANCE

6-9. General

Maintenance of the battery charger at the general support level consists primarily of repair and adjustment. To gain access to subassemblies or parts for repair or replacement refer to the removal and installation procedures contained in section III of chapter 5. Unless otherwise indicated parts or subassemblies can be reached and replaced easily without special procedures. See the parts location diagrams (fig. 5-1, 5-2 and 5-3) and the schematic diagram (fig. FO-1) to aid in repair or replacement. Prior to final reassembly of the battery charger, after repair has been accomplished, perform the adjustment procedures provided as required.

6-10. Repair of Control Circuit Card Assembly

Remove the control circuit card assembly from the battery charger per the instructions of paragraph 5-9. Repair involves reworking the conformally coated control circuit card assembly due to surface cracks or broken wires (as indicated by visual inspection) and replacement of defective parts (as indicated by the troubleshooting procedures of paragraph 6-5). See figure FO-3 for the parts location diagram.

CAUTION

All chemicals prescribed in the following instructions must be used in an open well ventilated area. Do not use in presence of open flame or sparks. Avoid prolonged contact with skin; wash with soap and water if contact occurs.

NOTE

Prior to performing steps a or *b* below, throughly stir or shake the container of conformal coating. Upon completion of the coating procedure, purge the conformal coating container of air to permit storage and later use of the remaining coating material.

a. Removal of Coating from Flat Areas and Recoating

(1) Using a camel's hair brush, dab a chemical stripper (SNAP, DMF or equivalent) over defective area.

(2) Allow approximately 3 minutes for coating to loosen. Rub the area, applying additional stripping material as required with a camel's hair brush, until the coating has become gummy and loose .

(3) Pick away the loosend coating with suitable nonabsorbent probes.

(4) Clean and flush the area with Chlorothene V.G. (Federal Specification 0-T-620, Type I).

(5) Dry the area thoroughly.

(6) Using a camel's hair brush, recoat the reworked area, blending it into the existing coating with conformal coating Conathane CE 1164 per MIL-J-46058.

(7) Allow the assembly to air dry at room temperature until it is no longer tacky. This should take approximately 1 hour. The coating will cure hard overnight, and obtain full properties in 5 to 7 days.

b. Removal of Defective Components and Recoating

(1) Apply a suitable heat source [340°F (17° C) to 36°F (182°C) soldering iron or equivalent] to fillets of defective coated component. Burn away a sufficient amount of conformal coating to allow part to be easily pried from the board. Use a chemical stripper (SNAP DMF or equivalent to remove coatings from solder connections.

(2) Upon removal of defective part, use a chemical stripper to clear an area for the replacement part.

(3) Flush and clean the reworked area with Chlorothene V.G. (Federal Specification O-T-620, Type 1). Dry the area thoroughly.

CAUTION

Diodes CR6001 through CR6004, CR6007 through CR6011, CR6014, CR6015, CR6017, CR6018, CR6020 through CR6023, and CR6026 through CR6030 are to be protected with cushioning material prior to application of conformal coating.

(4) Apply adhesive/sealant RTV 118 to any of the aforementioned diodes if replacement is required.

(5) Upon installation of new part, apply the conformal coating over the new part and reworked area, blending it into the existing coating using a camel's hair brush.

(6) Allow the assembly to air dry at room temperature until it is no longer tacky. This should take approximately 1 hour. The coating will cure hard overnight, and obtain full properties in 5 to 7 days.

c. *Inspection Criteria for Reworked Board.* Inspect cured board to ensure none of the following conditions exists.

(1) Surface cracks or breaks and cracks extending to the component or inserts.

(2) Improper blending of reapplied coating.

(3) Improper curing or drying, as indicated by surface tackiness.

(4) Lack of adhesion, as indicated by lifting and blisters.

d. Testing. Test the control circuit card assembly in accordance with the procedure in paragraph 6-11.

e. *Installation.* Install the control circuit card assembly in accordance with the procedure in paragraph 5-13.

6-11. Testing of Control Circuit Card Assembly

Test the control circuit card assembly in accordance with the procedure of paragraph 6-17 through 6-19 except use Charger, Battery PP-4127( )/U (NSN 6130-00-782-6983) as the test fixture.

6-12. Repair of Wiring Assembly

Figure FO-4 depicts point-to-point wiring information between front panel mounted components and chassis mounted components of the battery charger subassembly. The chart accompanying the wiring diagram denotes each wire comprising the harness by an identifying number, from and to information. wire color and size. Comply with the following instructions when repairing the harness:

a. Gain access to the wiring by removing the battery charger subassembly in accordance with the procedure of paragraph 5-7.

b. Replace a damaged lead with the same length of wire removed.

c. Use soft solder, 60 percent tin, in accordance with Federal Specification QQ-S-571 for all soldering operations.

d. Use nylon tape, type P, class 2 per MIL-T-713 or tywraps per MIL-S-23190 when lacing wires. Use varnish per MIL-V-173 on all knots.

e. Install battery charger subassembly per the instructions of paragraph 5-14.

6-13. Battery Charger Adjustments

Paragraphs 6-14 and 6-15 provide instructions to adjust the changing current circuitry and voltage sensing and cutoff circuitry of the battery charger. These procedures are to be performed after all repairs have been accomplished.

6-14. Charging Current Adjustment (fig. 6-3)

Perform the procedures given below to adjust the charging current to 6 ±0.48 amperes.

a. Test Equipment Required.

(1) Test cable (para 6-4*f*).

(2) Resistor, variable 0- to 7.5-ohm, 1000-watt.

b. Procedure.

NOTE

This procedure is provided to adjust R6113 (fig. FO-3) of the battery A charging current control circuit. If R6132 of the battery B charging current control circuit is to be adjusted, substitute the battery B controls, indicators and connector for those called out in this procedure.

(1) Remove the battery charger subassembly from the case (para 5-7) to reach the adjustment potentiometers at the top of the control circuit card assembly retaining bar.

(2) Set up the equipment as shown in figure 6-3. For this adjustment procedure, set the 0- to 7.5-ohm, 1,000-watt variable resistor for 1.5 ohm.

(3) Connect the AC POWER INPUT connector to a 115- or 230-volt, 60- or 400-Hz input source.

(4) Set the SELECTOR SWITCH to 115 V or 230 V, depending on the input source used.

(5) Engage power interlock switch S6005 down (fig. 5-2) and set the AC POWER switch to ON. Check to see that the POWER ON and CHARGE OFF indicator lights illuminate.

(6) Hold the RESET (A) switch down for approximately 4 seconds; then release it. Check to see that the CHARGE OFF indicator light extinguishes as the CHARGE ON indicator light illuminates.

(7) Adjust R6113 (marked R13 on the top of the control circuit card assembly retaining bar) until the TEST METER (A) indicates 6 ±0.48 amperes.

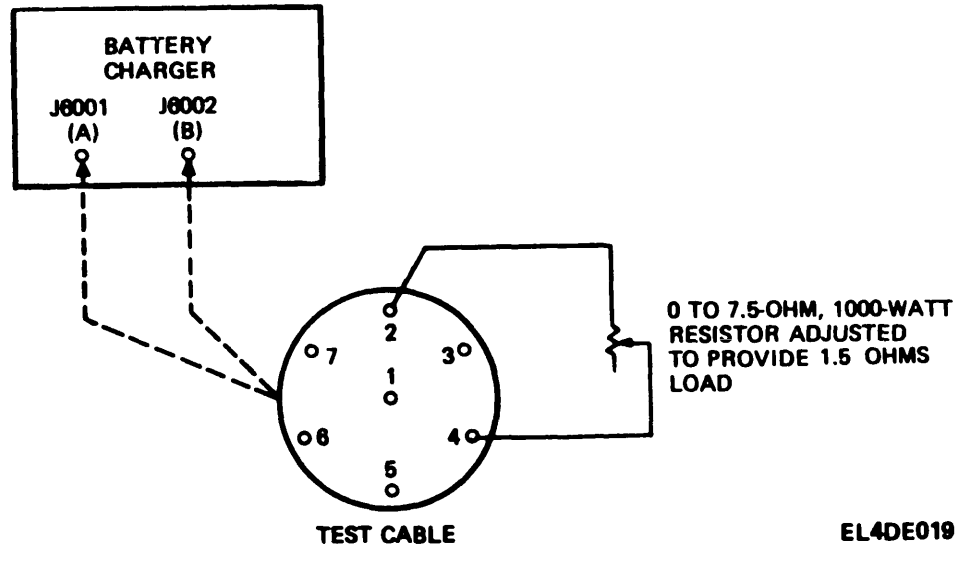

Figure 6-3. Test setup for adjusting battery charging current.

6-15. Charging Voltage-Sensing and Cutoff Circuit Adjustment (fig. 6-4)

Potentiometers R6109 (battery A) and R6154 (battery B) of the battery charger should be adjusted so that the battery charging current is automatically cutoff when the battery charger voltage reaches 8.1 ±0.1 volts.

a. Test Equipment Required.

(1) Power Supply PP-3940A/G (power supply).

(2) Voltmeter, Electronic ME-202( )/U (electronic voltmeter).

(3) Test cable (para 6-4 *f*).

b. Procedure.

NOTE

This procedure is provided to adjust R6109 (fig. FO-3) of the battery A charging voltage-sensing and cutoff circuit. If R61S4 of the battery B charging voltage-sensing and cutoff circuit is to be adjusted, substitute the battery B controls, indicators, and connector for those called out in this procedure.

(1) Remove the battery charger subassembly from its case (para 5-7) to reach the adjustment Potentiometers at the top of the control circuit card assembly retaining bar.

(2) Connect the test equipment as shown in figure 6-4

(3) Adjust the output of the power supply to approximately 7.5 volts, as measured with the electronic voltmeter.

(4) Connect the AC POWER INPUT cable to a 115 or 230-volt, 60- or 400-Hz input source.

(5) Set the SELECTOR SWITCH to 115 V or 230 V, depending on the input source wed.

(6) Engage power interlock switch S6006 (fig. 5-2) down and set the AC POWER Switch to ON. Check to see that the POWER ON and CHARGE OFF indicator lights illuminate.

(7) Hold the RESET (A) switch down for approximately 4 seconds; then release it.

(8) Adjust the power supply output to 8.1 volts .

(9) Adjust potentiometer R6109 (marked R9 on the control circuit cud assembly retaining bar) until the CHARGE OFF indicator light illuminates, as the CHARGE ON indicator light extinguishes.

(10) Recheck the setting of R6109 by adjusting the power supply output to 7.5 volts, and check to see that the CHARGE ON indicator light illuminate and the CHARGE OFF indicator light extinguishes as the RESET (A) switch is actuated; then slowly increase the power supply output voltage, and check to see that the cutoff circuitry operates when the power supply output is 8.1 ± 0.1 volts. This condition may require several touchup adjustments; repeat the procedures given in (8), (9), and (10) above as required, to obtain the correct setting.

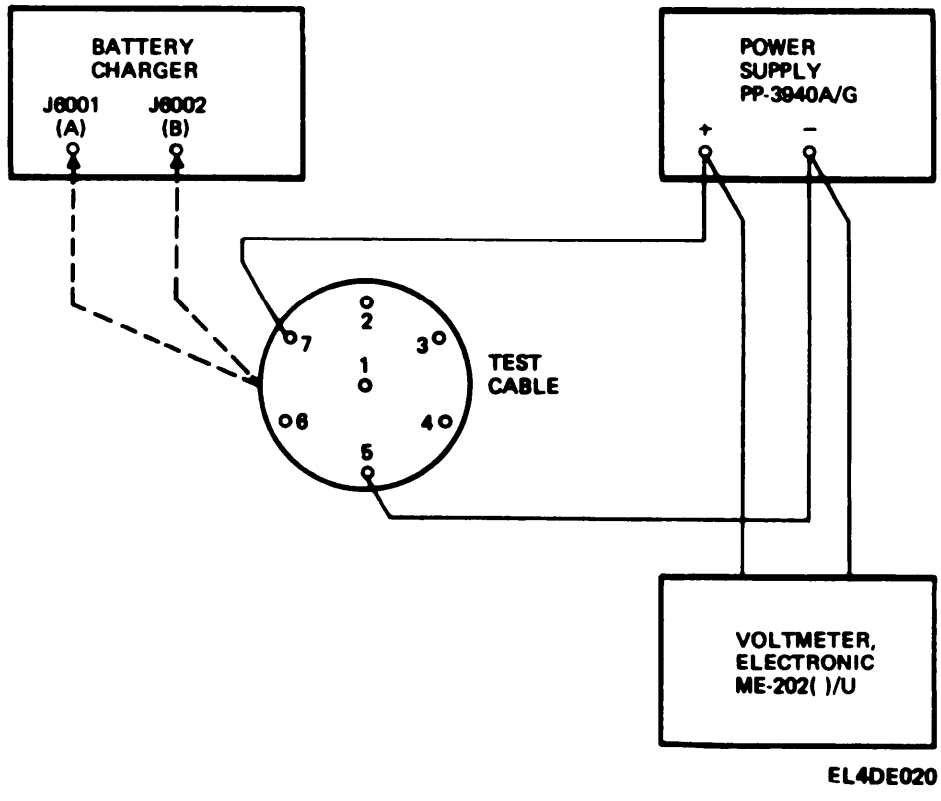

Figure 6-4. Test setup for adjusting charging voltage-sensing and cutoff circuit.

Section IV. GENERAL SUPPORT TESTING PROCEDURES

6-16. General

a. This section provides test procedures for use by general support maintenance personnel to determine the acceptability of the repaired battery charger. These procedures set forth performance standards that repaired equipment must meet before it is returned to the using organization.

b. Refer to paragraph 5-17 for use of the performance test charts. The various performance tests contained herein are referenced in the following paragraphs.

Test	Paragraph
Physical Inspection Chart	5-18
Operational Checks Chart	5-19
Charging Current Test 115 Vac, 60 or 400 Hz	6-17
Charging Current Test 230 Vac, 60 or 400 Hz	6-18
Charging Voltage Cutoff Test	6-19

c. If the battery charger fails to pass any of the performance tests, refer to the troubleshooting procedure in section II of this chapter.

6-17. Charging Current Test, 115 Vac, 60 or 400 Hz Input

a. Test Equipment and Material.

(1) Multimeter ME-452/U

(2) Test cable (para 6-4*f*)

(3) Variable resistor, 0 to 7.5 ohms, 1000 W

b. Test Connections and Conditions. Connect the equipment as shown in figure 6-5. Adjust variable resistor (0 to 7.5 ohm) for a 1.5-ohm load resistance.

c. Procedure.

Step no.	Control Settings: Test equipment	Control Settings: Equipment under test	Test procedure	Performance standard
1	ME-452/U Function: AMPS	AC POWER switch: OFF SELECTOR switch: 115 V	*a.* Connect AC POWER INPUT cable to 115-volt, 60 or 400 Hz power source.	*a.* None.
			b. Set AC POWER switch to ON.	*b.* POWER ON and both CHARGE OFF indicator lights illuminate.
			c. Depress RESET (A) switch for 4 seconds; observe indication on ME-452/U and TEST METER (A). Check that CHARGE ON indicator light illuminates.	*c.* CHARGE ON indicator light illuminates and ME-452/U indicates 6 ±0.48 amperes. TEST METER (A) indicates within 8 percent of the indication on ME-452/U.
			d. Set AC POWER switch to OFF.	*d.* POWER ON CHARGE ON and CHARGE OFF indicator lights extinguish.
			e. Connect test cable to BATTERY (B) connector.	*e.* None.
			f. Set AC POWER switch to ON.	*f.* POWER ON and CHARGE OFF indicator lights illuminate.
			g. Depress RESET (B) switch for 4 seconds; observe indication on ME-452/U and TEST METER (B). Check that CHARGE ON indicator light illuminates.	*g.* CHARGE ON indicator lights illuminates and ME-452/U indicates 6 ±0.48 amperes. TEST METER (B) indicates within 8 percent of the indication on ME-452/U.
			h. Set AC POWER switch to OFF.	*h.* POWER ON, CHARGE OFF, and CHARGE ON indicator lights extinguish. lights extinguish.
			i. Disconnect AC POWER INPUT cable from power source, and disconnect remainder of equipment.	*i.* None

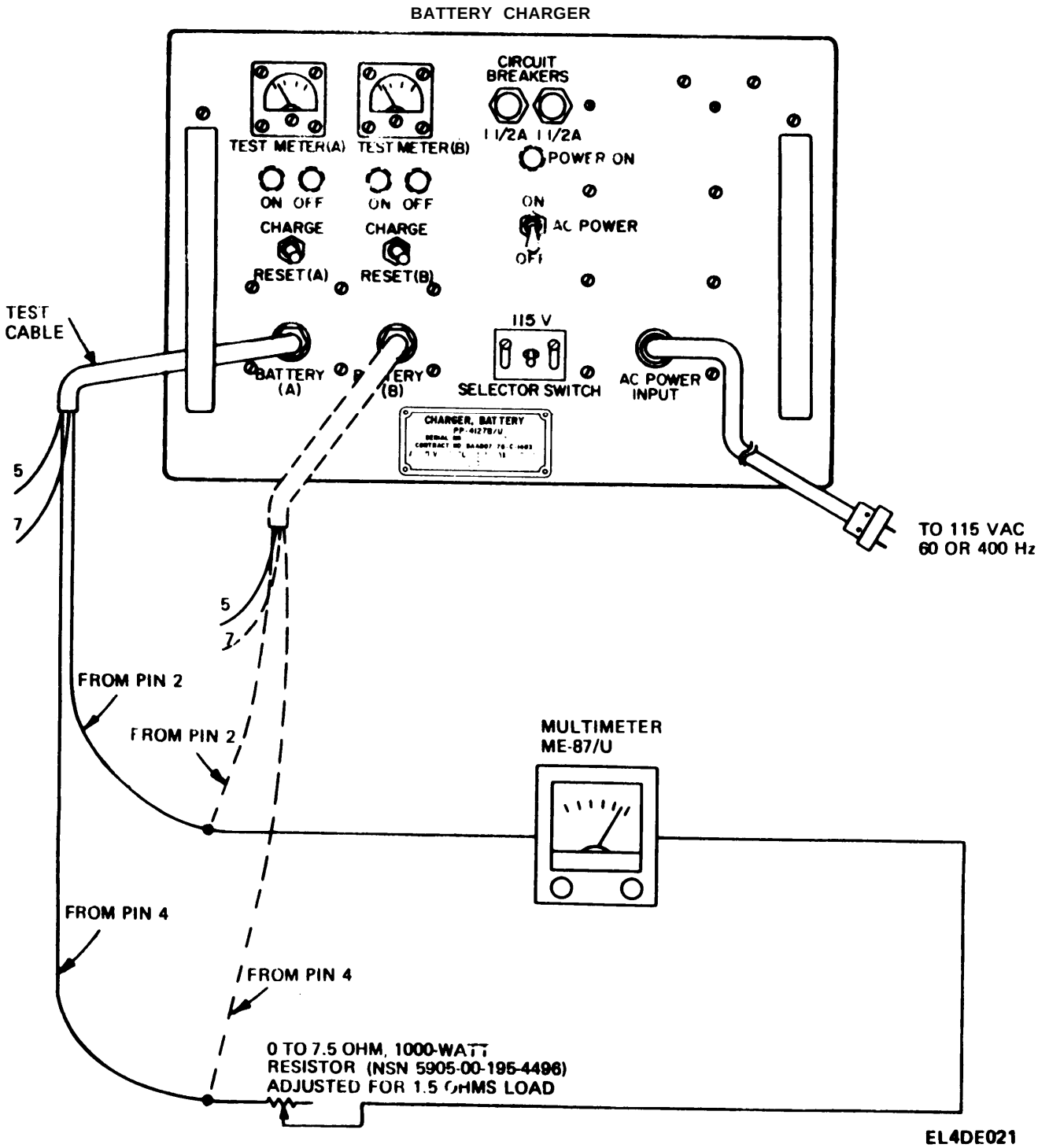

Figure 6-5. Changing c urrent test, 115 volts ac, 60 or 400 Hz.

6-18. **Charging Current Test, 230 Vac, 60 or 400 Hz Input**

a. Test Equipment and Material.

(1) Multimeter ME-452/U
(2) Test cable (para 6-4f)
(3) Variable resistor, 0 to 7.5 ohms, 1000 watts.

b. Test Connections and Conditions. Connect the equipment as shown in figure 6-6. Adjust variable resistor (0 to 7.5 ohm) for a 1.5 ohm load resistance

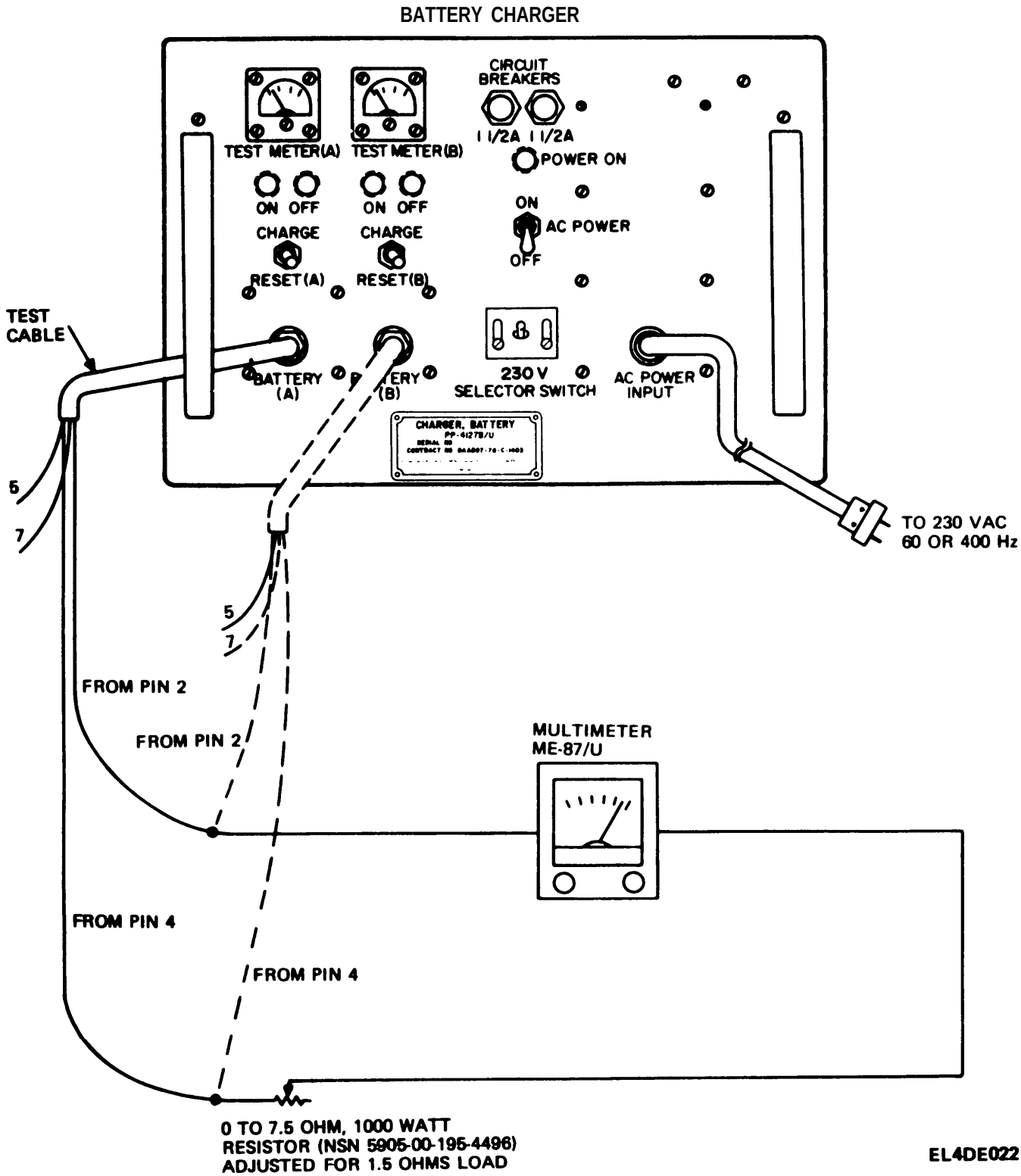

Figure 6-6. Charging current test, 290 volts ac, 60 or 400 Hz.

c. Procedure.

Step no.	Control Settings: Test equipment	Control Settings: Equipment under Test	Test procedure	Performance standard
1	ME-452/U Function: AMPS	AC POWER switch: OFF SELECTION SWITCH: 230 V	*a.* Connect AC POWER INPUT cable to a 230-volt, 60 or 400) Hz power source. 230 vac conversion assembly required. *b.* Set AC POWER switch to ON. c.Depress RESET (A), switch for 4 seconds; observe ME-452/U, TEST METER (A), and CHARGE ON indicator light. *d.* Set AC POWER switch to 0FF. *e.* Connect test cable to BATTERY (B) connector. *f.* Set AC POWER switch to ON. *g.* Depress RESET {B) switch for 4 seconds; observe ME-452/U, TEST METER (B) and CHARGE ON indicator light. *h.* Set AC POWER switch to OFF. i. Disconnect AC POWER INPUT cable from power source and disconnect remainder of equipment.	*a.* None. *b.* POWER ON and CHARGE OFF indicator light illuminate. *c.* CHARGE ON indicator light illuminates and ME-452/U indicates 6 ±0.48 amperes. TEST METER (A) indicates within 8 percent of indicates on ME-462/U. *d.* POWER ON, CHARGE ON and CHARGE OFF indicator lights extinguish. *e*. None. *f.* POWER ON and CHARGE OFF indicator lights illuminate. *g.* CHARGE ON indicator light illuminates and ME-452/U indicates 6 ±0.48 amperes. TEST METER (B) indicates within 8 percent of indication on ME-452/U. *h.* POWER ON, CHARGE OFF and CHARGE ON indicator lights extinguish. *i.* None.

6-19. Charging Voltage Cuttoff Test

a. Test Equipment and Material.

(1) Power Supply PP-3940A/G
(2) Electronic Voltmeter ME-202( )/U
(3) Test cable (para 6-4f)

b. Test Connections and Conditions. Connect the equipment as shown in figure 6-7.

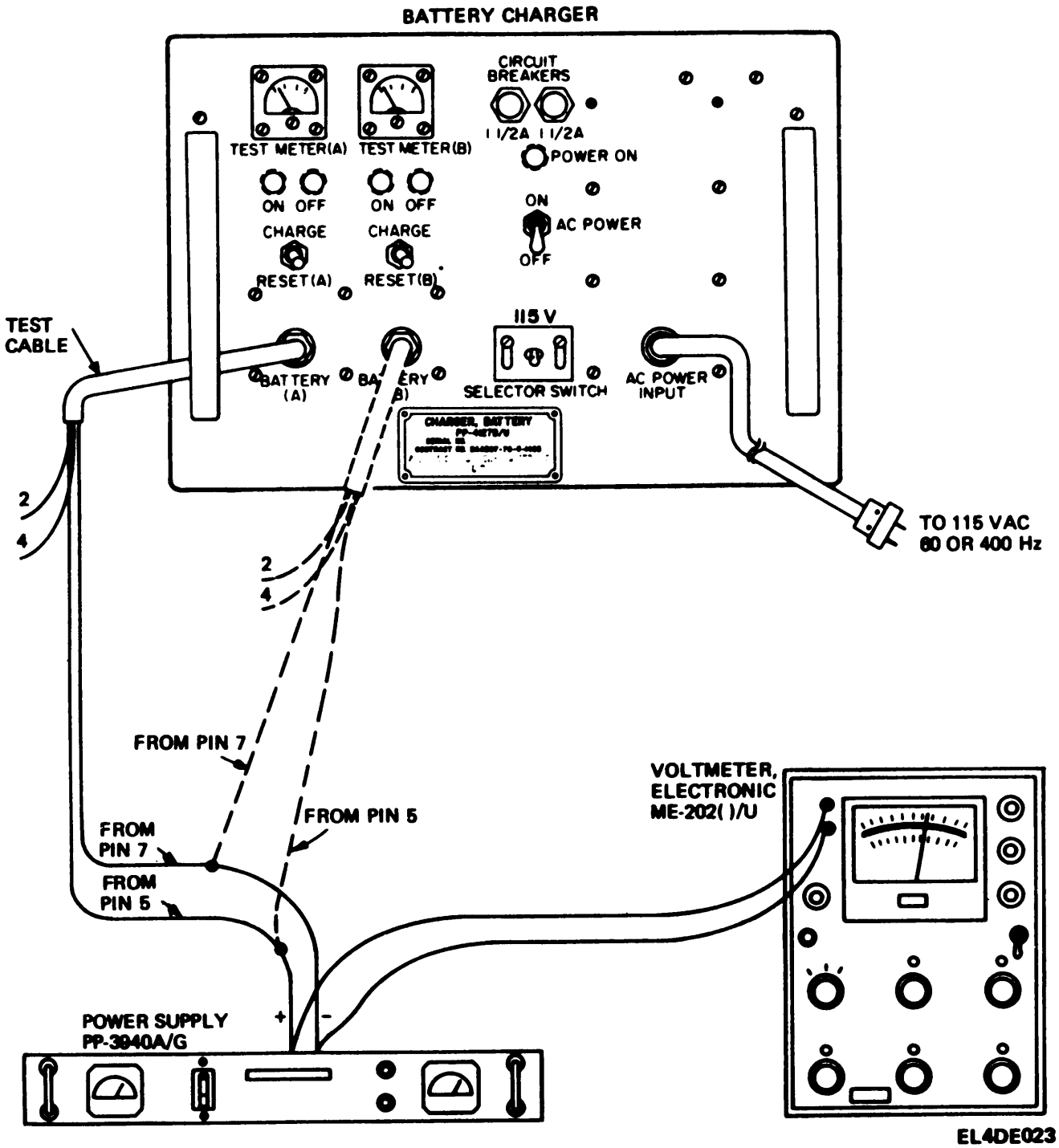

Figure 6-7. Charging voltage cutoff test.

c. Procedure.

Step no.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
1	PP-3940A/G COARSE ADJ: Fully counter-clockwise. FINE ADJ: FULLY counterclockwise ME-202( )/U VOLTS RANGE: 50 NULL: VTVM.	AC POWER switch: OFF Selector ewitch: 115 V	*a.* Connect AC POWER INPUT cable to a 115-volt, 60 or 400 Hz power source. *b.* Set AC POWER switch to ON. *c.* Depress RESET (A) switch for 4 seconds *d.* Adjust COARSE ADJ and FINE.ADJ controls on PP-3940A/G until CHARGE ON indicator light extinguishes and CHARGE OFF indicator light illuminate; observe indication on ME-202( )/U. *e.* Set AC POWER switch to OFF.	*a.* None. *b.* POWER ON and CHARGE OFF indicator lights illuminate. *c.* CHARGE ON indicator light illuminates. *d.* ME-202( )/U indicates between 8.0 and 8.2 volts when CHARGE ON indicator light extinguishes. *e.* POWER ON and CHARGE OFF indicator lights extinguish.
2	PP-2940A/G COARSE ADJ: Fully counter-clockwise FINE ADJ: Fully counterwise ME-202( )/U VOLT RANGE: 50 NULL: VTVM	AC POWER switch: OFF SELECTOR switch: 115 V	*a.* Connect test cable to BATTERY (B) connector. *b.* Set AC POWER switch to ON. *c.* Depress RESET (B) switch for 4 seconds. *d.* Adjust COARSE ADJ and FINE ADJ controls on PP-3940A/G until CHARGE ON indicator light extinguishes and CHARGE OFF indicator light, illuminate; observe indication on ME-202 ( )/U *e.* Set AC POWER switch to OFF. *f.* Disconnect AC POWER INPUT cable horn power source, l nd disconnect remainder of equipment.	*a.* None *b.* POWER ON and charge Off indicator lights illuminate. *c.* CHARGE ON indicator light illuminates. *d.* ME-202( )/U indicates between 8.0 and 8.2 volts when CHARGE ON indicator light extinguishes. *e.* POWER ON and CHARGE OFF indicator lights extinguish. *f.* None.

APPENDIX A

REFERENCES

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7,8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	US Army Equipment Index of Modification Work Orders.
SB 11-573	Painting and Preservation Supplies Available for Field Use of Electronics Command Equipment
TBS43-1118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern.
TM 11-5043-12	Operator's and organizational Maintenance Manual: Analyzers ZM-3 U and ZM-3A/U.
TM 11-6130-247 -14-1	Operator, Organizational, Direct Support, and General Support Maintenance Manual: Power Supply PP-3940A/G.
TM 11-6130-381-20P	Organizational Maintenance Repair Parts and Special Tools List: Charger, Battery PP-4127B/U.
TM 11-6130-381-34P	Direct Support and General Support Maintenance Repair Parts and Special Tools List: Charger, Battery PP-4127B/U.
TM 11-6625-203-12	Operator and organizational Maintenance Manual: Multimeter AN/URM-105 and AN/URM-105C Including Multimeter ME-77 U and ME-77C/U.
TM 11-6625-539-15-1 -2	Operator, Organizational, Direct Support, General Support. and Depot Maintenance Manual Including Repair Parts and Special Tools I.ists. Test Set, Transistor TS-1836A/U and TS-1836B/U.
TM 11-6625-654-14	Operator's, Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools Lists (including Depot Maintenance Repair Parts and Special Tools Lists) for Multimeter AN/USM-223.
TM 11-6625-2658-14	Operator's, Organizational, Direct Support, and General Support Maintenance Manual: Oscilloscope AN/USM-281C (NSN 6625-00-106-9622) .
TM 1l-6625-2724-12	Operator's and Organizational Maintenance Manual: Voltmeter, Electronic ME-202C/U (NSN 6625-00-972-4046).
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 740-90-1	Administrative Storage of Equipment.
TM 750-244-2	Procedure for Destruction of Electronics Material to Prevent Enemy Use (Electronics Command).

APPENDIX D

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

D-1. General

This appendix provides a summary of the maintenance operations for PP-4127B/U. It authorizes categories of maintenance for specific maintenance functions on reparable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

D-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

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

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

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

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

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

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

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

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

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

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

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

D-3. Column Entries

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

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

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

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "worktime" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance.

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

C–Operator/Crew
O–Ogranizational
F–Direct Support
H– General Support
D–Depot

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

f. Column 6, Remarks. Column 6 contains an alphabetic code which lends to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

D-4. Tool and Test Equipment Requirements (Sec. III)

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

b. Maintenance Category. The codes in this column indicate the Maintanance category allocated the tool or test equipment.

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

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

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

D-5. Remarks (Sec. IV)

a. Reference Code. This code refers to the appropriate item in section II, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in section II.

(Next printed page is D-3)

SECTION II. MAINTENANCE ALLOCATION CHART

FOR

CHARGER, BATTERY FF-4127B/U

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
00	CHARGER, BATTERY FF-4127B/U	Inspect	0.1						A
		Service	0.1						A
		Test		0.1				2	B
		Repair		0.2				1	C
		Test			1.0			4 thru 8	D
		Adjust			0.2			3	E
		Repair			2.0			3,13,14	D
		Test				1.0		4 thru 12	
		Repair				1.0		3,13,14	
		Overhaul					48	3 thru 14	
01	CONTROL BOARD ASSEMBLY	Replace			0.2			3	
		Test				0.7		4 thru 12	
		Repair				1.0		3	

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

CHARGER, BATTERY PP-4127B/U

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	O	TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	5180-00-064-5178	
2	O	MULTIMETER, AN/URM-105	6625-00-581-2036	
3	F,H,D	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	5180-00-610-8177	
4	F,H,D	MULTIMETER AN/USM-223/U (RS TS-352B/U)	6625-00-999-7465	
5	F,H,D	OSCILLOSCOPE AN/USM-281C (RS AN/USM-140)	6625-00-228-2201	
6	F,H,D	POWER SUPPLY PP-3940A/G	6130-00-460-2148	
7	F,H,D	TEST SET, SEMICONDUCTOR DEVICE TS-1836(*)/U	6625-00-159-2263	
8	F,H,D	VOLTMETER ELECTRONIC ME-202(*)/U	6625-00-709-0288	
9	H,D	MULTIMETER ME-452/U (RS ME-87/U)	6625-00-519-2493	
10	F,H,D	TEST SET, CAPACITOR ZM-3(*)/U	6625-00-229-1060	
11	H,D	RESISTOR, VARIABLE 0-7½ Ω, 100QW	5905-00-195-4496	
12	H,D	TRANSFORMER, VARIABLE POWER TF-510/U	6120-00-054-7794	
13	F,H,D	TOOL, INSERTION: 11139; M15513, SM-B-609917	5120-00-858-1455	
14	F,H,D	TOOL, REMOVAL: 11139; M15515-20, SM-B-609918	5120-00-522-8601	

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SECTION IV. REMARKS

REFERENCE CODE	REMARKS
A	Exterior
B	Continuity of power cables
C	Power plug, knobs, lamps, lens
D	All except control ckt. board
E	Variable resistors

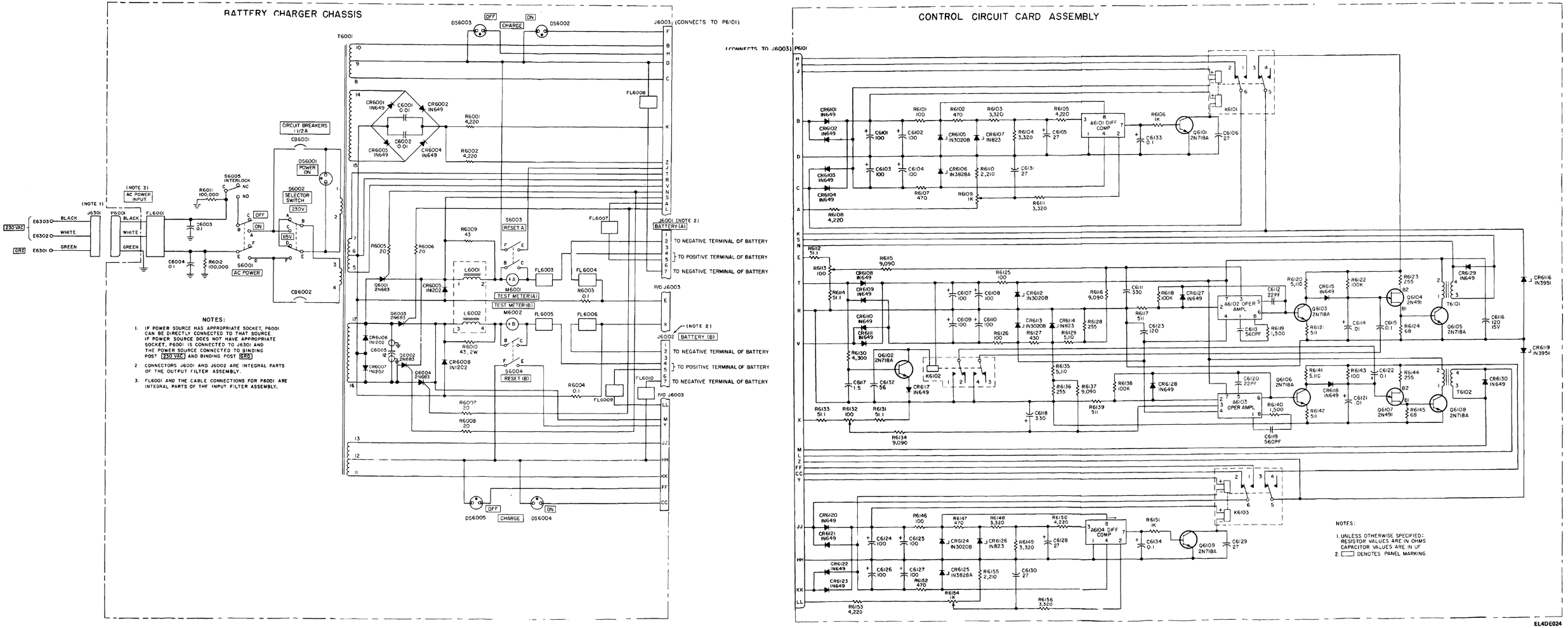
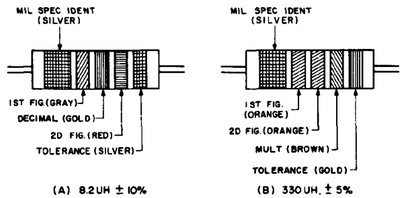


Figure FO-1. Battery charger, schematic diagram.



COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES. AT A, AN EXAMPLE OF OF THE CODING FOR AN 8.2UH CHOKE IS GIVEN. AT B, THE COLOR BANDS FOR A 330 UH INDUCTOR ARE ILLUSTRATED.

TABLE 2
COLOR CODING FOR TUBULAR ENCAPSULATED R.F CHOKES.

COLOR	SIGNI-FICANT FIGURE	MULTIPLIER	INDUCTANCE TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	1
RED	2	100	2
ORANGE	3	1,000	3
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE			20
SILVER			10
GOLD	DECIMAL POINT		5

MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL.

B. COLOR CODE MARKING FOR MILITARY STANDARD INDUCTORS.

CAPACITORS, FIXED, VARIOUS-DIELECTRICS, STYLES CM, CN, CY, AND CB.

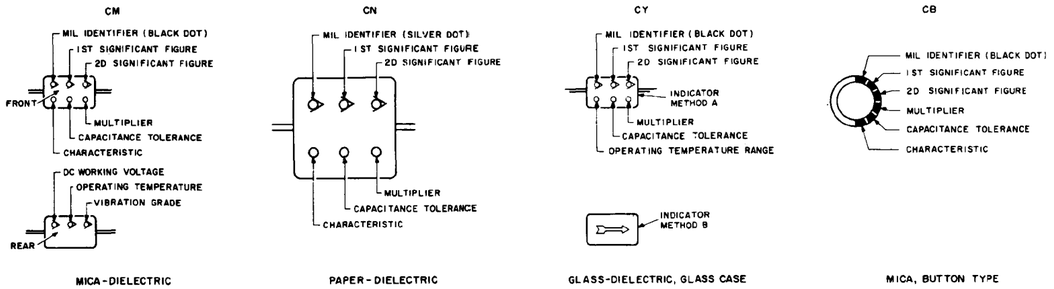


TABLE 3 — FOR USE WITH STYLES CM, CN, CY AND CB.

COLOR	MIL ID	1ST SIG FIG.	2D SIG FIG.	MULTIPLIER	CAPACITANCE TOLERANCE				CHARACTERISTIC			2 DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CB	CM	CY, CM	CM
BLACK	CM, CY CB	0	0	1			±20%	±20%		A			-55°$_{TO}$+70°C	10-55 HZ
BROWN		1	1	10					B	E	B			
RED		2	2	100	±2%		±2%	±2%	C				-55°$_{TO}$+85°C	
ORANGE		3	3	1,000		±30%			D		D	300		
YELLOW		4	4	10,000					E				-55°$_{TO}$+125°C	10-2,000HZ
GREEN		5	5		±5%				F			500		
BLUE		6	6										-55°$_{TO}$+150°C	
PURPLE (VIOLET)		7	7											
GRAY		8	8											
WHITE		9	9											
GOLD				0.1			±5%	±5%						
SILVER	CN			0.01	±10%	±10%	±10%	±10%						

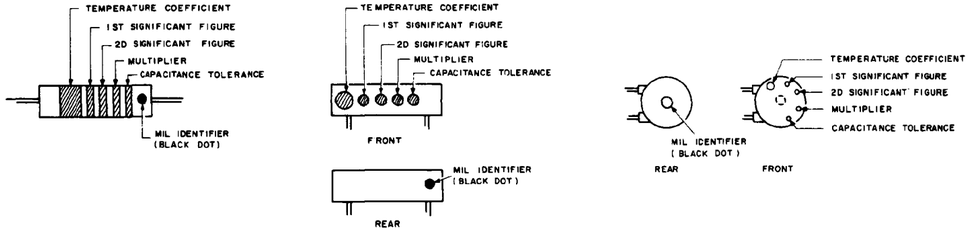


TABLE 4 — TEMPERATURE COMPENSATING, STYLE CC.

COLOR	TEMPERATURE COEFFICIENT[4]	1ST SIG FIG.	2D SIG FIG.	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS	
BLACK	0	0	0	1		±2.0 UUF	CC
BROWN	-30	1	1	10	±1%		
RED	-80	2	2	100	±2%	±0.25 UUF	
ORANGE	-150	3	3	1,000			
YELLOW	-220	4	4				
GREEN	-330	5	5		±5%	±0.5 UUF	
BLUE	-470	6	6				
PURPLE (VIOLET)	-750	7	7				
GRAY		8	8	0.01*			
WHITE		9	9	0.1*	±10%		
GOLD	+100			0.1		±1.0 UUF	
SILVER				0.01			

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-25D, MIL-C-11272B, AND MIL-C-10950C RESPECTIVELY.
3. LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL-C-11015D.
4. TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE.

* OPTIONAL CODING WHERE METALLIC PIGMENTS ARE UNDESIRABLE.

C. COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS.

EL4DE025

Figure FO-2. MIL-STD resistor, inductor, and capacitor color code markings.

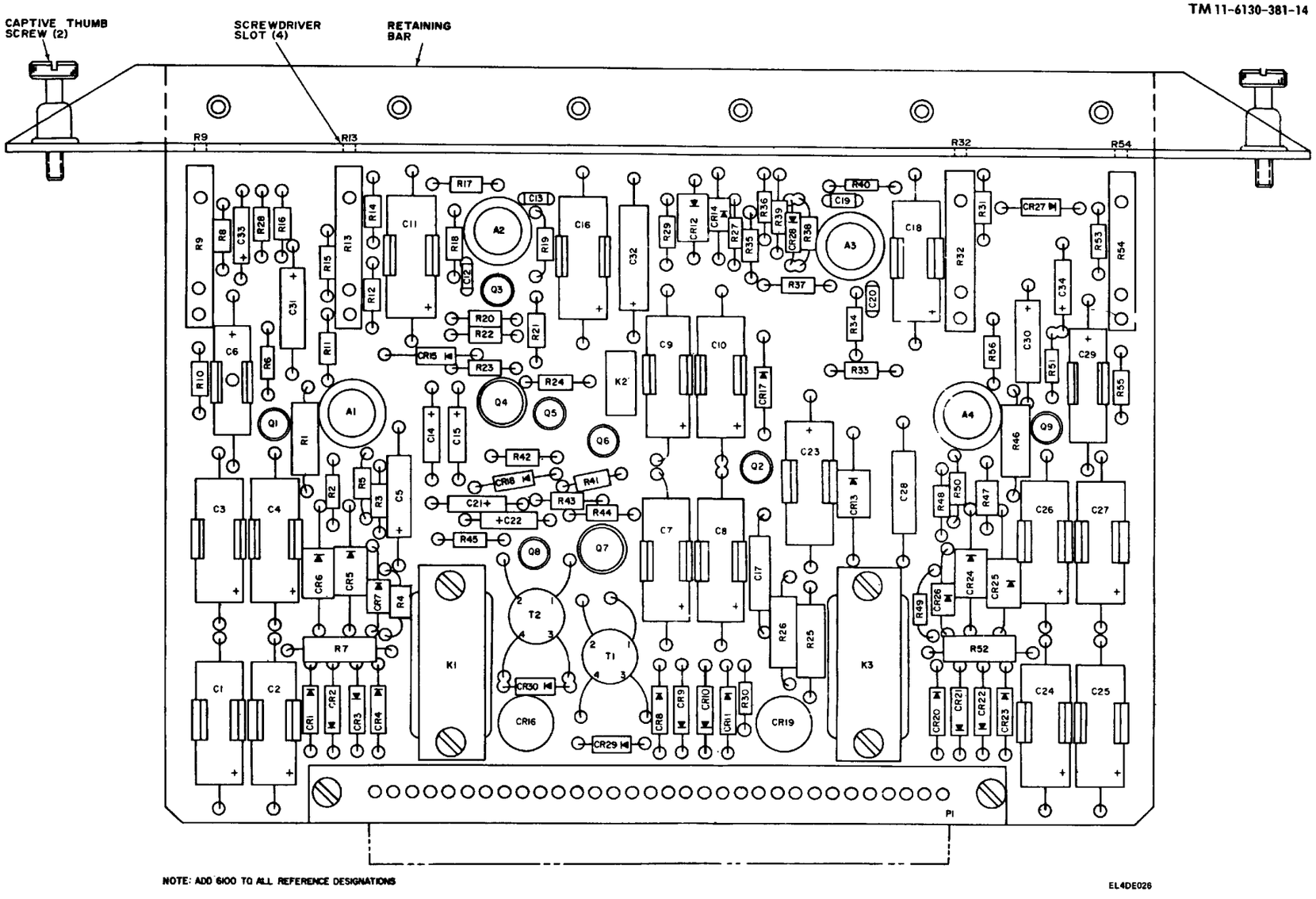


Figure FO 5. Control circuit card assembly, parts location diagram.

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Ft Richardson (ECOM Ofc) (2)
AD (1) except
SAAD (30)
LBAD (14)
TOAD (14)
SHAD (3)
USA Dep (1)
Sig Sec USA Dep (1)
Sig Dep (1)
MAAG (1)
USARMIS (1)
USAERDAA (1)
USAERDAWN (1)
Sig FLDMS (1)
Units org under fol TOE: 1 ea.
7
7-15
7-16
7-35
7-36
7-45
7-46
7-100
7-157
11-97
11-98
11-117
11-127
11-500(AA-AC)
17
17-15
17-16
17-17
17-35
17-36
17-51
17-56
17-57
17-75
17-76
17-77
17-95
17-96
17-99
17-100
17-105
17-106
17-107
17-127
29-56
29-134
29-136
37
37-100
57
57-100
67
67-42

ARNG & USAR: None
For explanation of abbreviations used, see AR 310-50.

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PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.
2-25	2-28		
3-10	3-3		3-1
5-6	5-8		
		F03	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°.

REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 20 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. + 24 VDC is the input voltage.

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