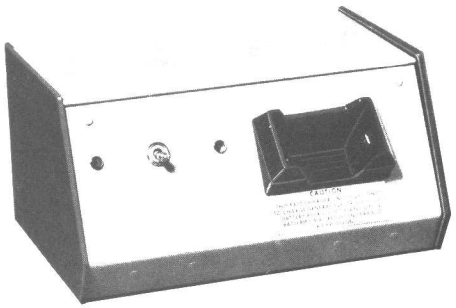
MOBILE RADIO

MAINTENANCE MANUAL

BATTERY CHARGER MODEL 4EP73A10
(Option 4440)

Maintenance Manual LBI-4255C
DF-0069



Fast Charger

EP-73-A

SPECIFICATIONS *

Used With:	PE Model Two-Way FM Radios
Input Voltage:	
4EP73A10	120 VAC ±10%, 50/60 Hz
4EP73A11	220 VAC ±10%, 50/60 Hz
Input Power:	
Not Charging	7 Watts
Trickle Charge	10 Watts
Fast Charge	30 Watts
Charging Times (approximate):	
For 70% Charge	15 minutes
For 100% Charge	8 hours
Charging Current (approximate):	
Trickle Charge	25 milliamperes
Fast Charge	1.4 amperes
Temperature Range:	+5°C to +45°C (+41°F to 113°F)
Dimensions (H x W x D):	5-1/4" x 9-1/2" x 8-1/4"
Weight:	14-1/2 pounds

*These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

GENERAL ELECTRIC

TABLE OF CONTENTS

WARNING

Under no circumstances should any person be permitted to handle any portion of the equipment that is supplied with high voltage, or to connect any external apparatus to the units while the units are supplied with power. KEEP AWAY FROM LIVE CIRCUITS.

DESCRIPTION

General Electric Fast Charger Models 4EP73A10 and 4EP73A11 provide a 70% charge in 15 minutes for the Standard nickel-cadmium battery pack used with MASTR PE Model two-way radios. The fast charger will fully recharge the battery in eight hours.

The fast charger can recharge one battery pack in or out of the radio, and is designed for continuous-duty operation. The charger is equipped with a special circuit to prevent overcharging the nickel-cadmium batteries. When the battery pack is charged to 70% of capacity, the charging circuit automatically switches to trickle charge for the remainder of the charging time. The battery pack may be left on trickle charge indefinitely without damage to the batteries.

OPERATION

Due to the temperature characteristics of nickel-cadmium batteries and safety precautions built into the charger, the fast charge cycle will terminate early at temperature extremes, providing less than 70% charge. For maximum capacity, recharge the battery pack at a room temperature of from 65° to 85° Fahrenheit whenever possible.

WARNING

Fast Charger Models 4EP72A10, 11 are designed for charging GE Battery Pack 19D413522G1 only. Use of any other battery pack or batteries may result in leakage or explosion.

To use the Fast Charger, plug the power cable into a 120 or 220-Volt AC, 50/60 Hz source. Next, turn the OFF-ON switch to the ON position. Then place the radio into the charging insert with the speaker facing up, or place the battery pack into the insert with the flat side facing up. The red FAST CHARGE light will glow when the battery is charging.

The battery is charged to approximately 70% of capacity when the FAST CHARGE light turns OFF and the amber Trickle Charge light turns ON.

The fast charge circuit will not start if the radio (or battery pack) is placed into the charging insert before the power is turned on, or if the power source goes off while the unit is charging. If this should occur, start the charger by lifting the radio or battery pack up off of the bottom of the charging insert for a moment.

CAUTION

If the fast charger will not start charging, the battery pack has been excessively discharged, has a defective cell, or the charger has a blown thermal fuse. A battery pack that has an excessive discharge or a defective cell will cause only the trickle-charge light to turn on. Leave the battery pack on trickle charge until the fast charge cycle starts. If the fast charge cycle does not start within 10 minutes, remove the battery from the fast charger.

CIRCUIT ANALYSIS

References to symbol number mentioned in the following text can be found on the Schematic Diagram, Outline Diagram or Parts List (see Table of Contents).

POWER SUPPLY

Placing OFF-ON switch S501 in the ON position applies 120 or 220 Volts to the primary of step-down transformer T501/T502. The transformer primary is protected by F501/F502.

The AC voltage developed across the Green-Green secondary windings of T501/T502 provides two different outputs. The output of rectifiers CR501 and CR502 is filtered by L501 and C501, and provides the low voltage (high current) battery charging supply. The output of rectifiers CR504 and CR505 is filtered by R501 and C502, and provides the high voltage (low current) transistor supply.

Thermal fuse TF501 mounted on the charging insert is designed to blow at 168°F. The fuse protects the batteries from damage due to overheating while recharging, or from heating up due to a defective cell.

If it becomes necessary to replace the fuse, solder in the new fuse while heat-sinking the fuse lead between the fuse and solder terminal with a pair of long nose pliers. Keep the fuse heatsinked until the solder cools.

CHARGING CIRCUITS

The fast charger consists of the following charging circuits:

- Astable (free-running) multivibrator Q4 and Q5.
- Bistable (flip-flop) multivibrator Q10 and Q11.

- High voltage detector Q12.
- Sensor switch Q2 and DC switch Q3.
- Fast charge shut-off sensing circuit Q6 through Q9 -- includes differential amplifier Q6 and Q7, emitter - follower Q8 and DC amplifier Q9.
- Compound-connected current amplifiers Q1, Q502, Q501.

High Voltage Detector

High voltage detector Q12 resets the charging circuits so that the fast charge cycle can start whenever a battery pack or radio is placed in the charger.

When the battery pack is removed from the charger, the voltage applied to the charging terminals through trickle charge light DS501 rises to approximately +15 Volts. The +15 Volts breaks down zener diode VR3 and turns on high voltage detector Q12. When turned on, the collector of Q12 drops to near ground potential which forward biases diodes CR4, CR5 and CR6. This grounds the base of Q10, resetting the flip-flop (Q10 off, Q11 on), and also grounds the base of Q6 in the sensing circuit and Q5 in the free-running multivibrator, keeping these stages turned off.

Trickle charge light DS501 will glow faintly as long as Q12 remains on, completing the current path to ground.

Fast Charge

Placing a radio or battery pack into the charger turns off Q12, removing the ground to Q5, Q6 through Q9, and Q10. Removing the ground starts the free-running multivibrator (Q4 and Q5) and enables the sensing circuit (Q6 - Q9). The flip-flop remains in the reset condition (Q10 off and Q11 on).

The 300 Hz, square-wave output of the free-running multivibrator alternately turns switching transistor Q3 on and off. This applies a square wave to the base of current amplifier Q1 and to sensing switch Q2.

The positive half-cycles of the square-wave output of Q3 turn on compound-connected current amplifiers Q1, Q502 and Q501, and the negative - going half-cycles turn the amplifiers off. In the sensing switch circuit, the positive half cycles turn PNP transistor Q2 off, while the negative-going half cycles turn the Q2 on.

The charging and sensing cycles are controlled by the actions of the battery, diode CR503, reactor L502 and Q501. A simplified diagram of the charging circuit as well as the charging and sensing waveforms are shown in Figure 1.

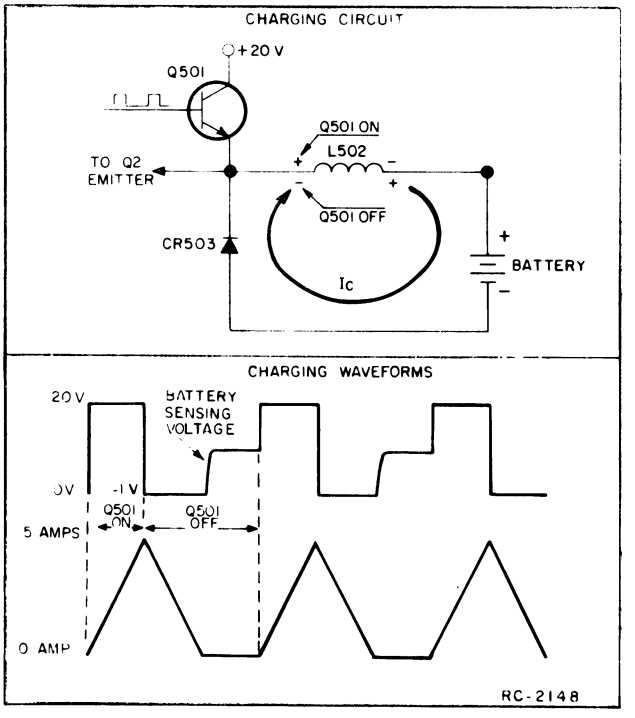


Figure 1 - Charging Circuit and Waveforms

Q501 conducts during the positive portion of the square wave output of Q3, lighting the red charge light and applying current to the charging circuit. The charging current is stored as energy in L502. When Q501 turns off during the negative-going portion of the square wave, the voltage across L502 is reversed in polarity and the energy stored in L502 is applied to the battery through CR503. When all of the energy is released, the voltage across L502 and the current in the circuit drop to zero.

Sensing switch Q2 conducts during the entire "off" cycle of Q501. When the current flow in the charging circuit stops, the battery voltage appears at TB2-4 and is applied through Q2 to the sensing circuit. The charging and sensing cycles are repeated until the battery voltage reaches 70% of capacity.

Trickle Charge

When the voltage at the battery terminals reaches 8.88 Volts (at 77°F) during the sensing cycle, the voltage developed across voltage divider network R10, R12, R13 and thermistor RT501 turns on Q6. This turns off Q7, allowing Q8 and Q9 to turn on. When turned on, the collector of Q9 drops to near ground potential and switches the flip-flop (Q10 on and Q11 off). Turning on Q10 forward biases CR3 and grounds the base of Q5, stopping the free-running multivibrator.

Stopping the multivibrator disables the high current charging circuit and turns off the red Fast charge light. The trickle charge current is applied to the battery through Trickle charge light DS501. The circuit will remain on trickle charge until the battery is removed from the charger.

The setting of potentiometer R12 is critical as it determines the voltage level that turns on Q6 and switches the circuit from fast charge to trickle charge. Instructions for setting R12 are contained in the Adjustment section of this manual. (see Table of Contents).

Low Voltage Detector

The low voltage detector (Q13 and Q14) prevents a battery pack with a shorted cell or one that has been over-discharged from being recharged at the fast charge rate.

In normal operations, Q13 is off and Q14 is on. Placing a battery pack of less than 7.1 Volts into the charger turns off Q14, turning on Q13. When conducting, Q13 grounds the base of Q1 and prevents it from turning on even though the free-running multivibrator is operating. If the battery potential reaches 7.1 Volts, zener diode VR4 breaks down and Q14 turns on (Q13 turns off). This releases the ground on Q1, permitting the fast charge circuit to operate.

If a battery pack has a shorted cell, or if for any reason, the battery pack voltage does not reach 7.1 Volts, the fast charge circuit will not operate.

MAINTENANCE

DISASSEMBLY

The charger is shipped from the factory with a spare indicator lamp, thermal fuse and line fuse.

To gain access to the charger circuitry for changing the indicator light, thermal fuse or servicing, remove the two Phillips-head screws at the top of the front panel and swing the panel open. If desired, the right side panel of the charger can be removed to provide better access to the charging circuitry. To remove the right side panel:

1. Open the front panel as described above.
2. Remove the two 1/4-inch nuts on the inside of the back cover (see Figure 2).
3. Remove the two Phillips-head screws on the bottom as shown and lift off the side panel.

To remove printed wiring board A501:

1. Open the front panel as directed.
2. Remove the two 1/4-inch nuts as shown and lift out the circuit board.

TROUBLESHOOTING

The Troubleshooting Procedure as listed in the Table of Contents is provided to assist the serviceman should a difficult service problem arise. The procedure includes

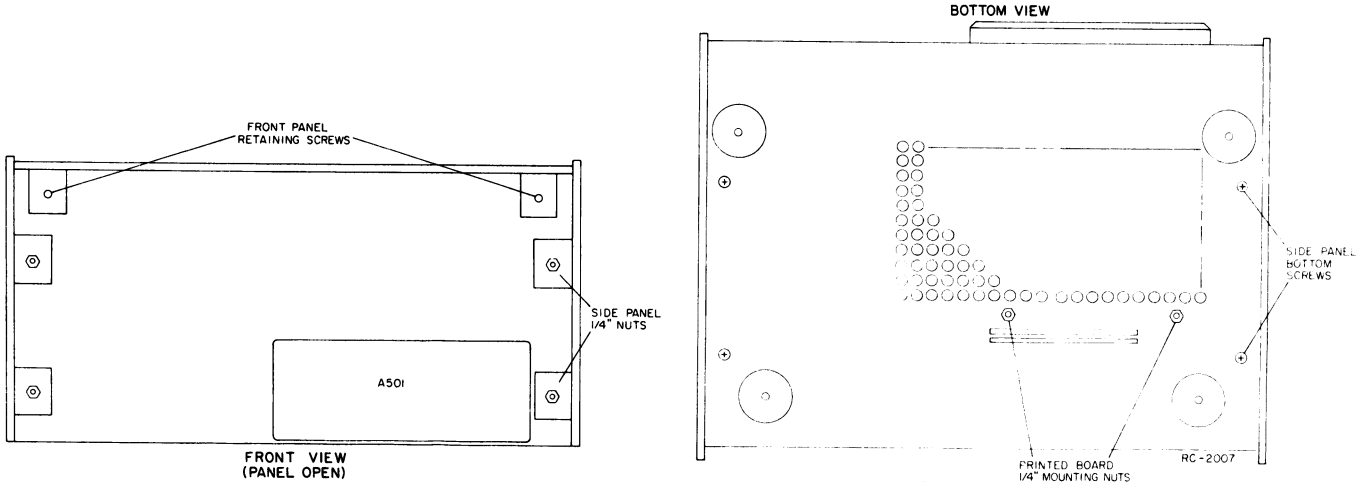


Figure 2 - Disassembly Procedure

DC voltage readings for each of the charging cycles, and waveforms for the charging circuits and free-running multivibrator.

ADJUSTMENT

Potentiometer R12 is set at the factory and will normally require no further adjustment. However, if R10, R12, R13, RT501 or Q6 are replaced, it will be necessary to adjust R12.

PREFERRED METHOD

Calibrator Model 4EX10A10 is designed for use in setting R12 on fast charger.

WARNING

Do not use calibrator Model 4EX10A10 for adjusting R12 on the fast charger when the room temperature exceeds the range of 73°F to 81°F. For temperatures outside of this range, use the Alternate Procedure.

Equipment Required

1. Calibrator Model 4EX10A10.
2. GE Test Set Model 4EX3A10, 11 or equivalent 20,000 ohms-per-Volt meter.

Procedure

1. Unplug the charger power cable. Then open the front panel of the charger as directed in the Disassembly Procedure.
2. Remove the White wire jumper connected between A501-J5 and -J6, and connect this jumper from A501-J8 to -J9. This will ensure that the fast charging circuit is disabled.
3. Connect Test Set Model 4EX3A10 from A501-J5 to ground (-J4).
4. Connect a clip lead from the red jack on the calibrator to positive charger terminal E2. Next, connect a clip lead from the black jack on the calibrator to negative charger terminal E1. Then place the calibrator switch in Position E.
5. Connect the power cable and turn on the charger. Next, adjust R12 for a meter reading of 4.5 Volts DC, ±1.5 Volts.
6. Remove the test equipment and re-connect the White jumper from A501-J5 to -J6.

ALTERNATE METHOD

This procedure must be used if calibrator Model 4EX10A10 is not used.

Equipment Required

1. A 500-ohm potentiometer, a 50-ohm potentiometer and a DC voltmeter accurate to ±.01 Volt. Connect the equipment as shown in Figure 3.
2. GE Test Set Model 4EX3A10 or equivalent 20,000 ohms-per-volt meter.

Procedure

1. Turn the charger off. Then open the front panel of the charger as directed in the Disassembly Procedure.

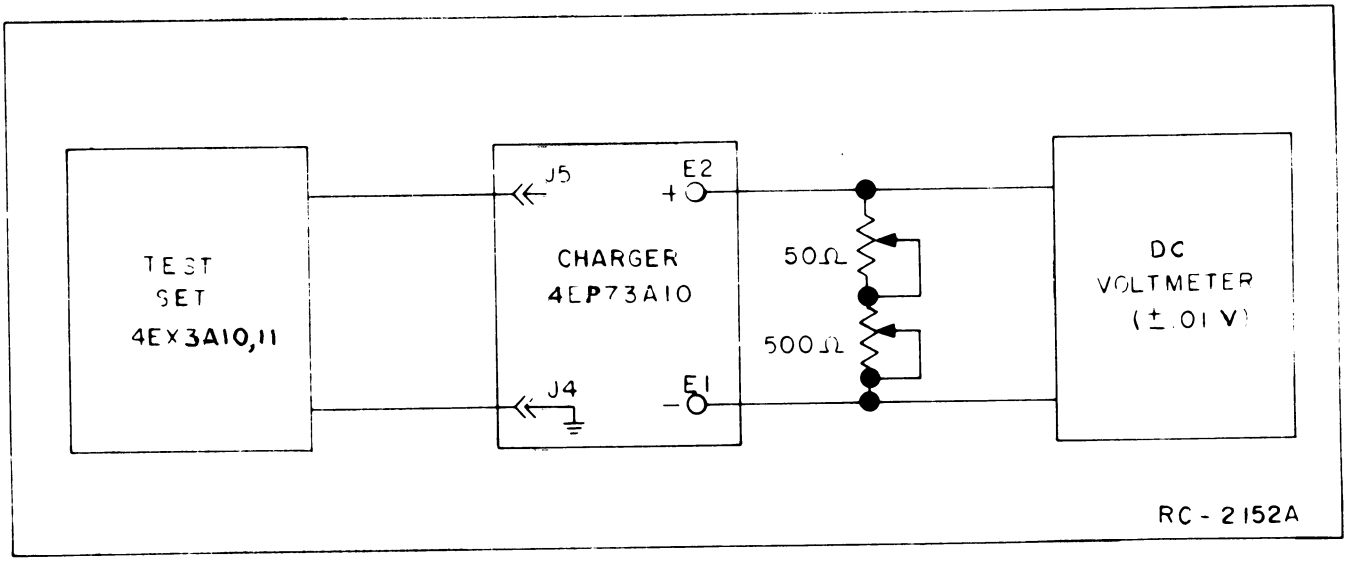
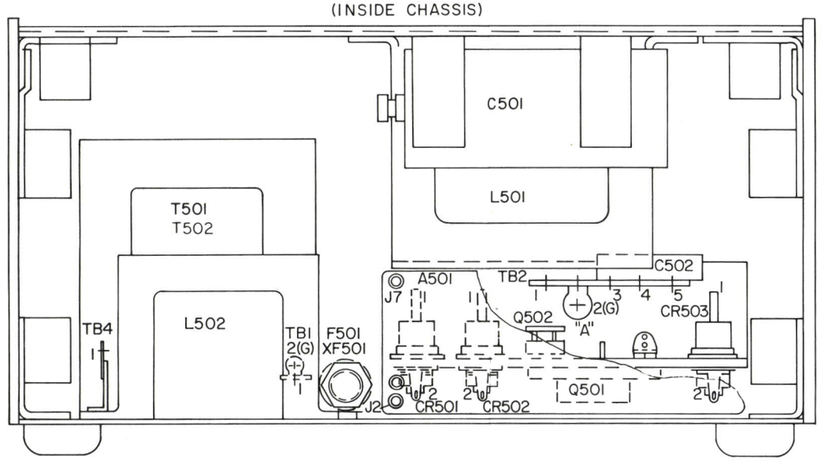
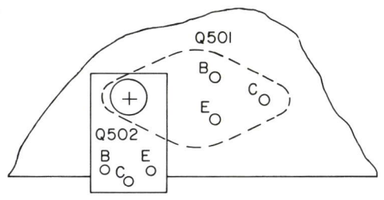


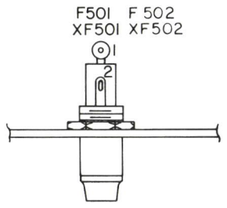
Figure 3 - Test Set-Up

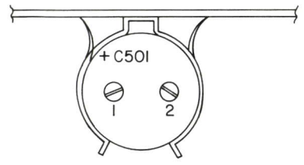
FRONT VIEW
(INSIDE CHASSIS)



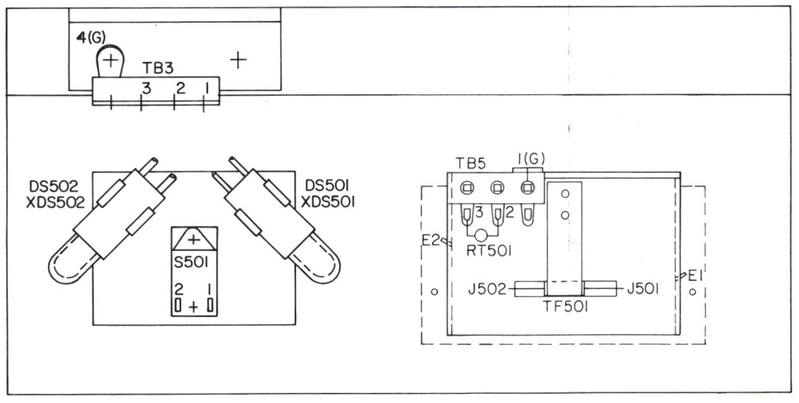


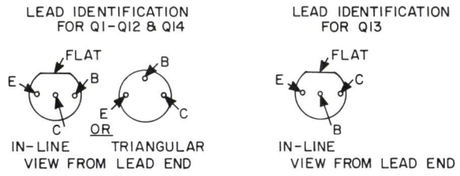
TERMINAL VIEWS





FRONT PANEL
(SHOWN OPEN)

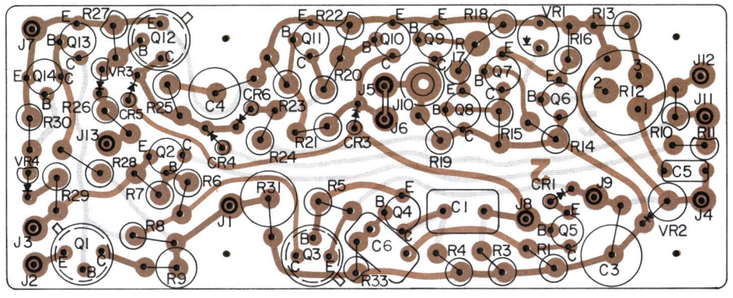


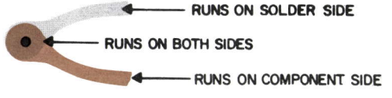


NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMING FACTOR FOR LEAD IDENTIFICATION.

(19D416271, Rev. 1)
(19B216787, Sh. 1, Rev. 2)
(19B216787, Sh. 2, Rev. 2)

CHARGER BOARD
A501





OUTLINE DIAGRAM

BATTERY CHARGER
MODEL 4EP73A10

2. Remove the White wire jumper connected between A501-J5 and -J6, and connect this jumper from A501-J8 to -J9. This will ensure that the fast charging circuit is disabled.

3. Connect Test Set Model 4EX3A10 from A501-J5 to ground (-J4).

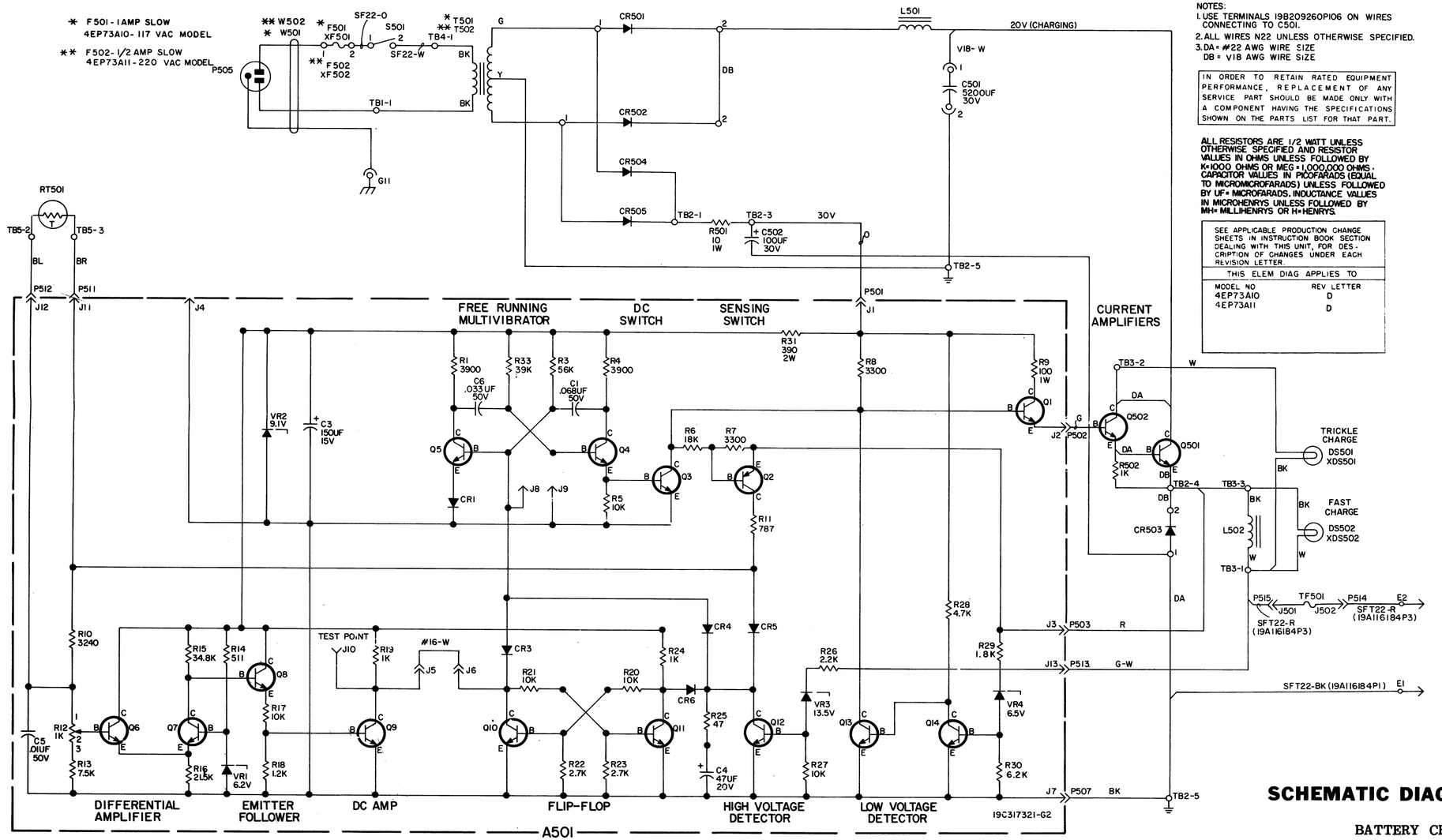
4. Turn on the charger and adjust the potentiometers for the correct voltage according to the room temperature as shown in Figure 4.

5. Next, adjust R12 for a reading on Test Set Model 4EX3A10, 11 of 4.5 Volts DC, ±1.5 Volts.

6. Remove the test equipment and re-connect the White jumper from A501-J5 to -J6.

Room Temperature		Correct Voltage
Centigrade	Fahrenheit	
17°C	63°	9.07
19°C	66°	9.03
21°C	70°	8.98
23°C	73°	8.93
25°C	77°	8.88
27°C	81°	8.83
29°C	84°	8.78
31°C	88°	8.73
33°C	91°	8.69

Figure 4 - Correct Voltage Vs. Temperature



NOTES:
1. USE TERMINALS 19B209260P106 ON WIRES CONNECTING TO C501.
2. ALL WIRES N22 UNLESS OTHERWISE SPECIFIED.
3. DA = #22 AWG WIRE SIZE
   DB = V18 AWG WIRE SIZE

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H= HENRYS.

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
4EP73A10	D
4EP73A11	D

SCHEMATIC DIAGRAM

BATTERY CHARGER
MODEL 4EP73A10

(19D413696, Rev. 12)

PARTS LIST

LBI-4254B

FAST CHARGER
4EP73A10 120 V
4EP73A11 220 V

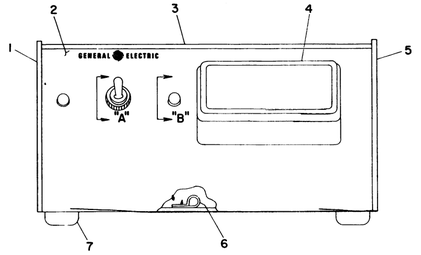
SYMBOL	GE PART NO.	DESCRIPTION
A501		FAST CHARGER BOARD 19C317321G2
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116080P106	Polyester: 0.068 µf ±10%, 50 VDCW.
C3	5496267P12	Tantalum: 150 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C4	5496267P15	Tantalum: 47 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C5	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C6	19A116080P104	Polyester: 0.033 µf ±10%, 50 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A115250P1	Silicon.
CR3 thru CR6	19A115250P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J9	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J10	4029830P2	Jack, test: printed wiring, nylon; sim to Raytheon B8436401-166-G4-red.
J11 thru J13	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q2	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q3	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q4 thru Q11	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q12	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q13*	19A116755P1	Silicon, NPN; sim to Type 2N3947.
		Earlier than REV A:
	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q14*	19A115720P1	Silicon, NPN; sim to Type 2N2222.
		In REV C and earlier:
	19A115362P1	Silicon, NPN; sim to Type 2N2925.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77P392K	Composition: 3900 ohms ±10%, 1/2 w.
R3	3R77P563K	Composition: 56,000 ohms ±10%, 1/2 w.
R4	3R77P392K	Composition: 3900 ohms ±10%, 1/2 w.
R5	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R6	3R77P183K	Composition: 18,000 ohms ±10%, 1/2 w.
R7 and R8	3R77P332K	Composition: 3300 ohms ±10%, 1/2 w.
R9	3R78P101K	Composition: 100 ohms ±10%, 1 w.
R10	19A116278P250	Metal film: 3240 ohms ±2%, 1/2 w.
R11	19A116278P187	Metal film: 787 ohms ±2%, 1/2 w.
R12	5492251P5	Variable, composition: 1000 ohms ±20%, .25 w; sim to Allen Bradley Type F.
R13	19A116278P285	Metal film: 7500 ohms ±2%, 1/2 w.

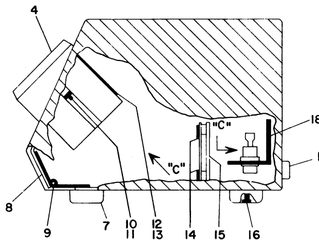
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

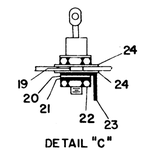
SYMBOL	GE PART NO.	DESCRIPTION
R14	19A116278P169	Metal film: 511 ohms ±2%, 1/2 w.
R15	19A116278P353	Metal film: 34,800 ohms ±2%, 1/2 w.
R16	19A116278P333	Metal film: 21,500 ohms ±2%, 1/2 w.
R17	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R18	3R77P122K	Composition: 1200 ohms ±10%, 1/2 w.
R19	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R20 and R21	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R22 and R23	3R77P272K	Composition: 2700 ohms ±10%, 1/2 w.
R24	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R25	3R77P470K	Composition: 47 ohms ±10%, 1/2 w.
R26	3R77P222K	Composition: 2200 ohms ±10%, 1/2 w.
R27	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R28	3R77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R29*	3R77P182J	Composition: 1800 ohms ±5%, 1/2 w.
		In REV C:
	3R77P432J	Composition: 4300 ohms ±5%, 1/2 w.
		In REV B and earlier:
	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R30*	3R77P322J	Composition: 6200 ohms ±5%, 1/2 w.
		In REV B and C:
	3R77P432J	Composition: 4300 ohms ±5%, 1/2 w.
		In REV A and earlier:
	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R31	3R79P391K	Composition: 390 ohms ±10%, 2 w.
R33	3R77P393J	Composition: 39,000 ohms ±5%, 1/2 w.
		- - - - - - - - - VOLTAGE REGULATORS - - - - - -
VR1	19B200076P1	Silicon, Zener.
VR2	19A115528P3	Silicon, Zener.
VR3	4036887P10	Silicon, Zener.
VR4	4036887P6	Silicon, Zener.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C501	5496520P16	Electrolytic: 5200 µf +100% -10%, 30 VDCW; sim to GE 86F147M.
C502	19A115680P12	Electrolytic: 100 µf +150% -10%, 30 VDCW; sim to Mallory Type TT.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR501 thru CR503	19A115202P1	Silicon.
CR504 and CR505	4037822P1	Silicon.
		- - - - - - - - - INDICATING DEVICES - - - - - - -
DS501	19C307037P6	Lamp, incandescent: 28 v; sim to GE 1819.
DS502	19C307037P16	Lamp, incandescent: 14 v; sim to GE 1488.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1 and E2		(See RC-2217, item 4).
		- - - - - - - - - - - FUSES - - - - - - - - - - -
F501	7487942P5	Slow blowing: 1 amp at 250 v; sim to Bussman MDL-1.
F502	7487942P3	Slow blowing: 1/2 amp at 250 v; sim to Bussman MDL-1/2.

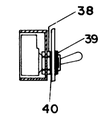
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L501	19B209080P1	Reactor: 12 mh min, 0.3 ohm DC res max, 18 VDC operating.
L502	19A116461P1	Reactor: 0.073 ohm DC res max.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P501 thru P503	4029840P2	Contact, electrical: sim to AMP 42827-2.
P505		(Part of W501)
P507	4029840P2	Contact, electrical: sim to AMP 42827-2.
P511 thru P513	4029840P2	Contact, electrical: sim to AMP 42827-2.
P514 and P515		Includes:
	19A116111P1	Contact, electrical.
	4029840P2	Contact, electrical: sim to AMP 42827-2.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q501	19A115787P1	Silicon, NPN.
Q502	19A116118P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R501	3R78P100K	Composition: 10 ohms ±10%, 1 w.
R502	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
		- - - - - - - - - THERMISTORS - - - - - - - - - -
RT501	19C300048P7	Disc: 5000 ohms ±10%; sim to GE 1D.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S501	5491899P5	Toggle: SPDT, 3 amps at 125 VAC/VDC; sim to Cutler-Hammer 8280K15.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T501	19A116460P1	Power, step-down: Pri: 117 VRMS, 50/60 Hz, Sec: 19 VDC.
T502	19A116460P2	Power, step-down: Pri: 220 VRMS, 50/60 Hz, Sec: 19 VDC.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	7775500P44	Phen: 2 terminals.
TB2	7775500P9	Phen: 5 terminals.
TB3	7775500P6	Phen: 4 terminals.
TB4	7775500P144	Phen: 2 terminals.
TB5	7775500P5	Phen: 3 terminals.
		- - - - - - - - - - - FUSES - - - - - - - - - - -
TF501	19A116393P1	Fuse link, thermal: 1000 VAC, minimum opening temp 60°C, 140°F at 4 amps; sim to Micro Devices 4146A1.
		- - - - - - - - - - CABLES - - - - - - - - - -
W501	19B216947G1	Power: 3 conductor, approx 7 feet long. Includes P505.
W502	19B226362G2	Power: 3 conductor, approx 7 feet long.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS501 and XDS502	4032220P1	Lampholder, miniature: sim to Drake N517.
XF501 and XF502	7115179P1	Fuseholder: 15 amps at 250 v; sim to Bussmann Type HKP.

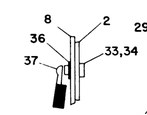
SYMBOL	GE PART NO.	DESCRIPTION
		MECHANICAL PARTS (SEE RC-2217)
1	19C317435G1	Side panel. (left).
2	NP270293	Nameplate.
3	19C317441G2	Support.
4	19C317410G2	Insert. (Includes charging contacts E1 and E2).
5	19C317435G2	Side panel. (right).
6	4029851P18	Cable clamp; sim to Weckesser 1/4-6.
7	4029020P1	Bumper, rubber; sim to Atlantic India Rubber 253.
8	19B216994G1	Front panel.
9	19B216619G1	Hinge.
10		(Not Used).
11		(Not Used).
12	19A127797P1	Strap.
13	19B200525P2	Rivet.
14	4036555P1	Insulator, washer: nylon. (Used with Q1, Q3, and Q12 on A501).
15	19A127832G1	Support. (Mounts A501).
16	19B201074P406	Tap screw, Phillips Pozidriv 3/8.
17	19A115725P2	Strain relief. (Used with W501).
18	19B216943P1	Support. (Mounts CR501-CR503).
19	19A115275P1	Bushing, nylon. (Part of CR501-CR503).
20	M401P9C13	Flatwasher, brass, No. 10. (Part of CR501-CR503).
21	M414P19C13	Lockwasher, No. 10. (Part of CR501-CR503).
22	N210P16C13	Nut: 10-32. (Part of CR501-CR503).
23	4033714P2	Terminal; sim to Zierick 110. (Part of CR501-CR503).
24	19A115276P1	Insulator, mica. (Part of CR501-CR503).
25	19A127515G1	Terminal board. (Used with Q502).
26	19A116023P1	Insulator, plate. (Used with Q502).
27	4036994P1	Terminal, solderless. (Used with Q501).
28	19A115222P1	Bushing, insulator. (Used with Q501).
29	N404P11C13	Lockwasher: No. 4. (Used with Q501 and Q502).
30	N84P9008C13	Screw: No. 4-40 x 1/2. (Used with Q501).
31	N84P9012C13	Screw: No. 4-40 x 3/4. (Used with Q502).
32	19A115221P4	Insulator, plate. (Used with Q502).
33	19B204949P3	Jewel, amber. (Used with DS501).
34	19B204949P1	Jewel, red. (Used with DS502).
35	7141225P2	Nut: 4-40. (Used with Q502).
36	19C307038P6	Nut, push on; sim to Tinnerman C15226SS-010.
37	19A116427P1	Reflector, light; sim to Amatom Electronic 3113. (Used with DS501 and DS502).
38	7115195P2	Hexnut, brass, 15/32-32. (Used with S501).
39	4033394P1	Nut, knurled. (Used with S501).
40	7115130P11	Lockwasher. (Used with S501).

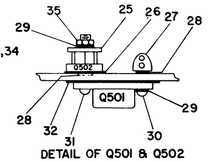












RC-2217

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts effected by these revisions.

Rev. A - To improve reliability. Changed Q13.

Rev. B - To improve reliability of the dead-cell protector circuit. Changed R30.

Rev. C - To improve sensing circuit. Changed R29.

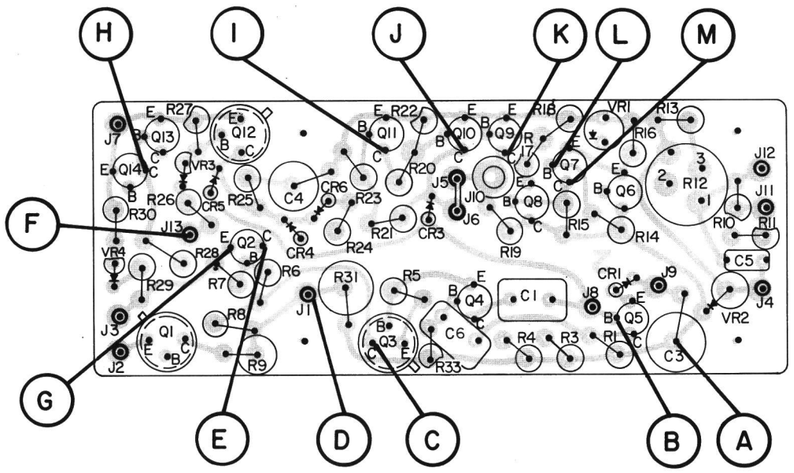
Rev. D - To improve operation. Changed Q14, R29 and R30.

VOLTAGE READINGS

These voltage readings are DC readings measured with GE Type Set 4EX3A10 or equivalent 20,000 ohms-per-volt meter, and measured from the metering point shown to component board ground.

Metering Point	With No Battery	Fast Charge Rate (Red Charge Light On)	Trickle Charge (Amber Charge Light On)
Ⓐ - C3 plus	9 V	8.9 V	9 V
Ⓑ - Q5 base	0.6 V	-0.6 V	0.65 V
Ⓒ - Q3 collector	.05 V	8.9 V	0 V
Ⓓ - J1	30 V	28 V	30 V
Ⓔ - Q2 collector	20 V	1.2 V	8.3 V
Ⓕ - J13	9 V	8.8 V	1.2 V
Ⓖ - Q2 emitter	20 V	8.8 V	8.2 V
Ⓗ - Q14 collector	0.1 V	0.3 V	0.1 V
Ⓘ - Q11 collector	0.2 V	0.15 V	8.2 V
Ⓙ - Q10 collector	8.25 V	8 V	0.2 V
Ⓚ - Q9 collector	8.25 V	8 V	0.2 V
Ⓛ - Q7 base	6 V	6 V	6 V
Ⓜ - Q7 collector	5.5 V	5.5 V	5.5 V
Ⓝ Q501 emitter	30 V	20 V	30 V

CHARGER BOARD
A501



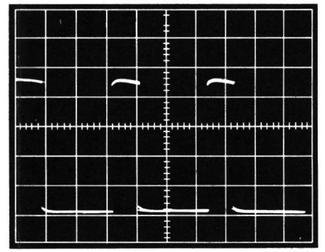
(19D416271, Rev. 0)
(19B216787, Sh. 1, Rev. 2)

WAVEFORMS

These waveforms were taken with the charger in the fast charge cycle. Equipment required:

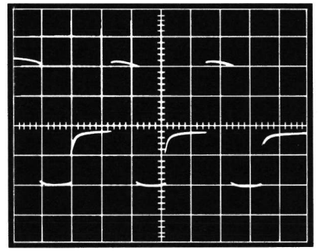
- Oscilloscope - TLS54 or equivalent
- For current waveform only: Tektronic P6042 current probe or equivalent

VOLTAGE AT Q3-COLLECTOR



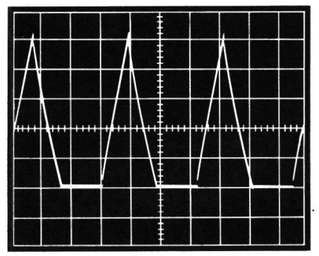
VERT - 5V/DIV
HOR - 1MS/DIV

VOLTAGE AT Q501-EMITTER (TB3-3)



VERT - 5V/DIV
HOR - 1MS/DIV

CURRENT THRU L502



VERT - 1AMP/DIV
HOR - 1MS/DIV

TROUBLESHOOTING PROCEDURE

ORDERING SERVICE PARTS

Each component appearing on the schematic diagram is identified by a symbol number, to simplify locating it in the parts list. Each component is listed by symbol number, followed by its description and GE Part Number.

Service parts may be obtained from Authorized GE Communication Equipment Service Stations or through any GE Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. GE Part Number for component
2. Description of part
3. Model number of equipment
4. Revision letter stamped on unit

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, contact the nearest Radio Communication Equipment Sales Office of the General Electric Company.

DF-0069

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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