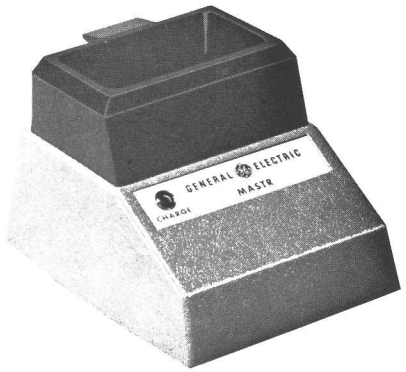
MOBILE RADIO

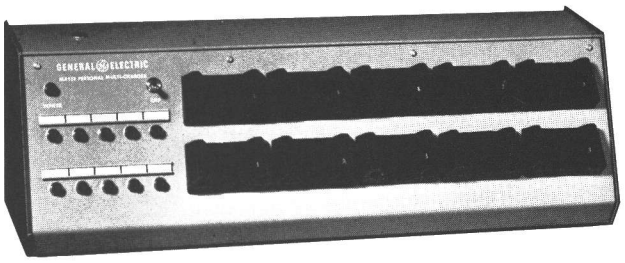
MAINTENANCE MANUAL

BATTERY CHARGERS MODELS 4EP68A10,11 & 4EP71A10-12

Maintenance Manual LBI-4251E
DF-0069



Desk Charger



Multi-Charger

SPECIFICATIONS *

Model Numbers		
Desk Charger	Model 4EP71A10-12	
Multi-Charger	Model 4EP68A10, 11	
Used With	PE Model Two-Way Radios	
Input Voltage	120 VAC 50/60 Hz 220 VAC 50/60 Hz	
Input Power	Desk Charger	Multi-Charger
Charging	3 Watts	20 Watts
Not Charging	1 Watt	8 Watts
Charging Current (per battery pack)		
Standard	66 milliamperes	
Light Duty	20 milliamperes	
Trickle-Charge current (per battery pack)		
Standard	25 milliamperes	
Light Duty	8 milliamperes	
Maximum Charging Time		
100% Charge	16 hours	
70% Charge	6 hours	
Temperature Range	+5°C to +45°C (+41°F to 113°F)	

EP-68-A & EP-71-A

*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

ILLUSTRATIONS

OPTIONS

Description	Model	Power Supply	Accessories	Option No.
Multi-Charger	4EP68A10 4EP68A11	120 VAC 220 VAC		4445 4447
Desk-Charger	4EP71A10 4EP71A11 4EP71A12	120 VAC 120 VAC 220 VAC	Antenna Jack Antenna Jack	4436 4435 4437
Slave Multi-Charger				4446

WARNING

Under no circumstances should any person be permitted to handle any portion of 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 Desk Charger Models 4EP71A10-12 and Multi-Charger Model 4EP68A10, 11 will recharge the nickel-cadmium battery packs used with MASTR PE Model two-way FM radios. The chargers will fully recharge both the Standard and the Light Duty battery packs in less than 16 hours.

The desk charger recharges one radio or battery pack. The multi-charger recharges up to 10 radios or battery packs. Three additional PE slave chargers can be connected to the multi-charger for recharging up to 40 radios or battery packs.

Both of the chargers are equipped with automatic circuitry that prevents the battery pack from overcharging. When the battery pack is charged to approximately 70% of capacity, the charger automatically switches to trickle charge for the remainder of the charging time. The battery pack may be left on trickle charge indefinitely without damage.

INSTALLATION

DESK CHARGER

The desk charger can be located on a desk or table top, or other flat surface. The location should be close to a 117 or 220-Volt AC, 50/60 Hz source. If the radio is to be used while charging, the charger should be located so that it is convenient to the operator.

MULTI-UNIT CHARGER

The multi-charger may be mounted on a table top or shelf, or may be mounted on a wall or other vertical surface that is close to a 120 or 220-Volt, 50/60 Hz source. Two mounting holes 16 inches apart are provided in the back of the charger for wall mounting. Also, a rectangular hole is provided in the bottom of the multi-charger for running the power cable out of the bottom of the charger. It is recommended that the ground prong on the power cable be connected to ground.

To mount the multi-charger on a wall:

1. Make sure that the power cable is disconnected from the 120 or 220-Volt source. Then remove the four Phillips-head screws along the top of the front panel and swing down the panel.

2. Use the charger as a template or measure off the mounting holes and mark the mounting holes.

3. Mount the charger using two 1/4-inch lag screws or #14 wood screws as required.

4. Re-route the power cable through the hole provided in the bottom of the charger.

5. Replace the front cover and plug in the power cable.

SLAVE CHARGER

The slave charger is shipped from the factory with the following accessories:

- Three 40-inch wires for power connections and two rubber grommets for insulation.

- A spacer frame and mounting screws for mounting the slave unit on the top of a wall-mounted multi-charger.

To mount the slave charger on the top of the multi-charger:

1. Make sure that the multi-charger AC power cable is disconnected.

2. Place the spacer frame on the top of the multi-charger. Next, line up the screw holes in the spacer-mounting tabs with the three holes drilled in the back of the multi-charger and secure the spacer with the three screws provided.

3. Remove the plug button in the top of the multi-charger and install one of the rubber grommets in the hole. Install the second rubber grommet in the hole in the bottom of the slave charger.

4. Place the slave charger in the spacer frame on the top of the multi-charger. Then remove the four screws in the front panel of the two chargers and swing open both panels.

5. Make the power and ground connections as shown in the chart and in Figure 1

6. If the multi-charger is wall-mounted, secure the slave charger to the wall using two 1/4-inch lag screws or #14 wood screws as required.

CONNECTIONS CHART

Wire Color	Connect From Multi-Charger (or Slave Unit)	Connect to Slave Unit
Red (+)	TB501-2	TB501-2
Black (-)	TB501-1	TB501-1
Green (GND)	G11	G11

NOTE: The connections shown in this chart also apply for interconnecting the slave chargers.

If the slave unit is not mounted on the top of the multi-charger, install the unit as follows:

1. Make sure that the multi-charger power cable is disconnected. Then remove the four Phillips-head screws along the top of the front panel and swing open the panel.
2. Place the rubber grommets in the appropriate holes.
3. Make the power and ground connections from the multi-charger to the slave unit as shown in Figure 1.

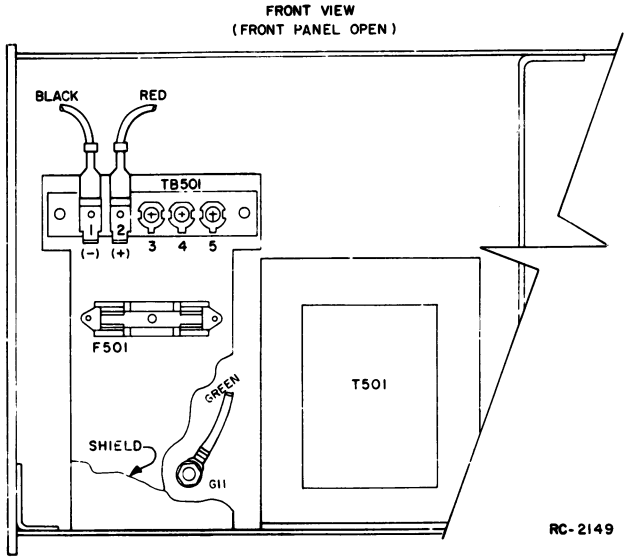


Figure 1 - Power & Ground Connections

OPERATION

Due to the temperature characteristics of nickel-cadmium batteries, they will not take a full charge at temperature extremes. For a maximum charge, recharge the battery pack at room temperatures of from 65° to 85° Fahrenheit whenever possible.

DESK CHARGER

To use the desk charger, plug the power cable into a 120 or 220-Volt AC 50/60 Hz source (see Figure 2). Next place the radio into the charging insert with the speaker facing the front of the charger, or place the battery pack into the insert with the arrow on the yellow label pointing towards the rear of the charger. The red CHARGE light will glow until the circuit switches to the trickle charge mode when the battery is charged to approximately 70% of capacity. Let the battery charge for 16 hours.

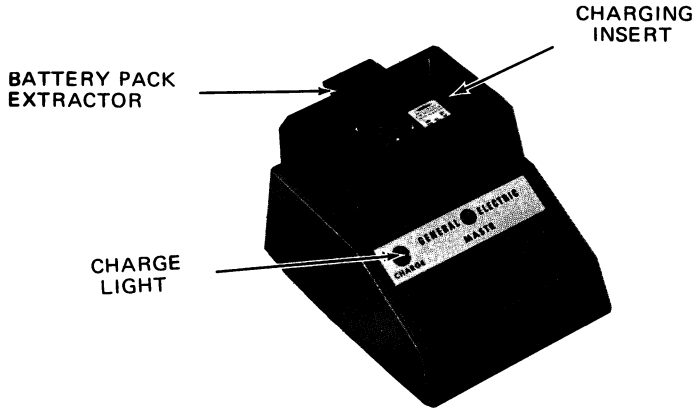


Figure 2 - Desk Charger

The radio may be used to send and receive messages while charging, although it will take longer to fully recharge the battery.

CAUTION

Using the radio with the Charger continuously on trickle charge can result in an excessively discharged battery. To prevent this, remove and replace the radio in the Charger several times a day. This activates the high-rate Charging Circuit keeping the battery charged to a safe level for normal operation.

The charger is equipped with an antenna connector for connecting the radio to an external antenna. Placing the radio into the charging insert automatically connects the radio to the external antenna and disconnects the internal antenna. If the external antenna connection is not desired, the connection can be disabled as shown in Figure 3.

MULTI-CHARGER

To use the multi-charger, plug the power cable into a 120 or 220-Volt AC, 50/60 Hz source (see Figure 4) and turn the OFF-ON switch to the ON position. Next, place the radio(s) into the charging insert(s) with the speaker facing upwards, or place the battery pack(s) into the insert with the arrow on the yellow label pointing upwards. The green CHARGE lights will glow until the

Figure 3 - Disabling the External Antenna Connection

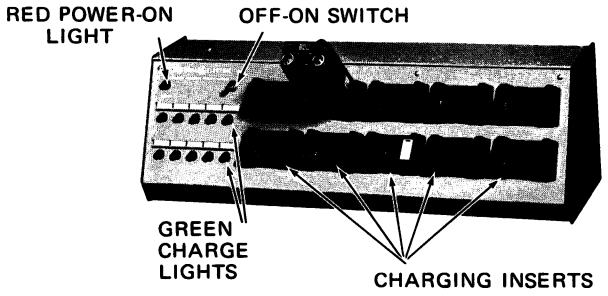


Figure 4 - Multi-Charger

charging circuit switches to trickle charge when the battery is charged to approximately 70% of capacity. Let the batteries charge for 16 hours.

The slave multi-charger operates exactly the same way as the master multi-charger except that the slave unit has no power supply, power-on light or ON-OFF switch.

CIRCUIT ANALYSIS

The desk charger contains a power supply and one charging circuit. The multi-charger contains a power supply and 10 charging circuits. The charging circuits in both chargers are practically identical. References to symbol numbers mentioned in the following text can be found on the applicable Schematic Diagram, Outline Diagram or Parts List (see Table of Contents).

POWER SUPPLY

Placing the OFF-ON switch, on the multi-charger, in the ON position applies 120 or 220-Volts to the primary of step-down transformer T501. The transformer primary is protected by fuse F501.

In the desk charger, the AC voltage developed across the secondary of T501 is rectified by full-wave bridge rectifiers CR7 through CR10. The rectified, filtered output is applied to the charging circuit.

In the multi-charger, the AC voltage in the secondary of T501 is rectified by full-wave rectifiers CR501 and CR502. The rectified, unfiltered output is applied to the charging circuit.

CHARGING CIRCUIT

Placing a radio or battery pack into the charger causes Q4 to conduct, applying the charging current to the battery. When Q4 conducts, Q5 and Q6 also conduct, turning on CHARGE light DS501.

Charging current for the Standard battery pack is applied through contacts E2 and E3. Charging current for the Light Duty battery pack is applied through contack E2 only. Contact E1 provides the ground connection.

While the battery is being charged at the high rate (Q4 conducting), Q1 is off, Q2 is on and Q3 is off. The current is limited by R2 and R7.

When the battery charges up to 70% of capacity, the voltage developed across the voltage reference circuitry (VR1, CR4, R17, CR5, R18 and R19) turns on Q1. This turns off Q2 and turns on Q3. Turning on Q3 removes the base bias to Q4, turning it off. Turning off Q4 also turns off Q5, Q6 and CHARGE light DS501. This "latching" action is assisted by the positive feedback through R12.

Diodes CR2, CR3 and CR6 prevent the battery from discharging into the charging circuit if power is removed from the charger.

When Q1 is on, Q2 is off and Q3 is on, the circuit is "latched" in the trickle charge mode. The trickle-charge current is limited by R3 and R4. The charger remains on trickle charge until the battery is removed from the charger.

The setting of potentiometer R18 determines the voltage level that causes the charger to switch to the trickle-charge mode. Complete instructions for setting R18 are contained in the Adjustment section.

Removing the battery from the charger turns on Q1 and activates the reset circuit consisting of VR2, R13, R14, R15 and C1. When the battery is removed, the

voltage at the cathode of zener diode VR2 rises to approximately 14 volts, breaking down VR2. Even with Q1 conducting, the voltage at the junction of R14 and R15 is sufficient (over 0.7 volt) to charge up C1 and turn on Q2. This turns off Q3 and applies base bias to Q4, re-setting the "latching" portion of the charging circuit.

Placing a battery (or radio) into the charger turns off Q1 and removes the breakdown voltage to VR2. However, capacitor C1 keeps Q2 on (and Q3 off) momentarily so that Q4 immediately starts conducting to re-start the charging cycle.

MAINTENANCE

DISASSEMBLY

To gain access to the desk charger circuitry for servicing, remove the three Phillips-head screws in the bottom of the charger and carefully lift off the housing. The charger must be disassembled to replace the CHARGE light.

To gain access to the multi-charger circuitry, remove the four Phillips-head screws along the top of the front panel, and swing open the panel. It is not necessary to open the front panel to change the indicator lights. To change the bayonet-type lamps, first unscrew the colored lens. Then push in on the lamp bulb, turn it 1/4-turn to the left and lift the lamp out.

TROUBLESHOOTING

Should a difficult service problem arise, the Troubleshooting Procedure listed in the Table of Contents is provided to assist the serviceman. The procedure includes servicing both the desk charger and the multi-charger.

ADJUSTMENT

Potentiometer R18 is adjusted at the factory. However, if either CR4, CR5, VR1, R17, R18, R19 or Q1 is replaced, R18 must be readjusted.

PREFERRED METHOD

Calibrator Model 4EX10A10 is designed for use with the desk charger and multi-charger for properly setting R18.

Set R18 as follows:

1. Remove the desk charger housing or open the front panel of the multi-charger, as directed in the Disassembly Procedure.
2. Connect positive charging terminals E2 and E3 together.
3. Connect a clip lead from the red jack on the calibrator to positive charger terminal E3. Then connect a clip lead from the black jack on the calibrator to negative charger terminal E1.
4. Place the calibrator switch in Position C.
5. Rotate R18 until the CHARGE light turns on. Then carefully adjust R18 until the CHARGE light just turns off.

ALTERNATE METHOD

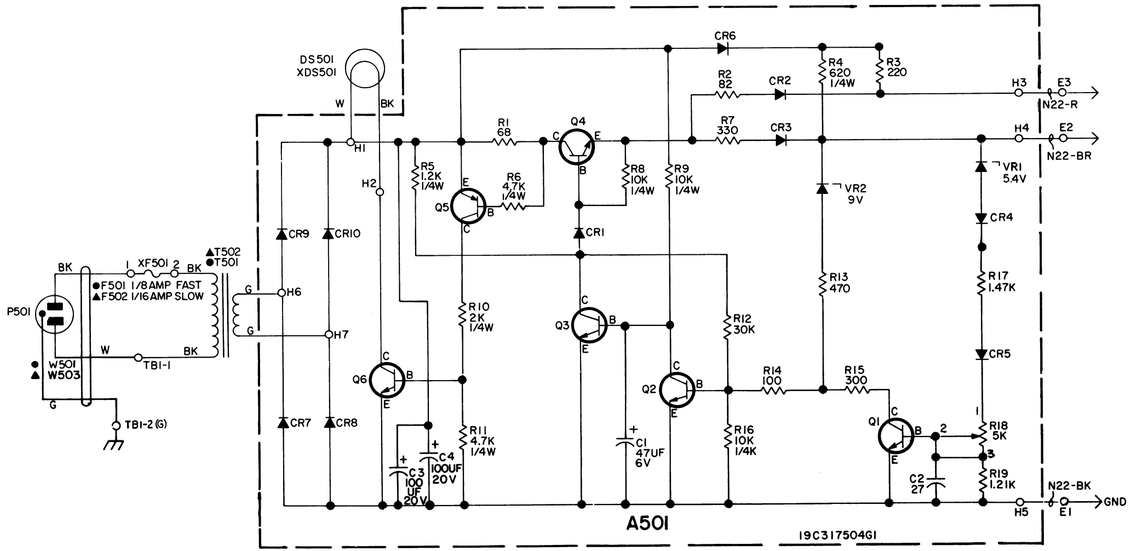
This alternate method of adjusting R18 may be used if Calibrator Model 4EX10A10 is not available. This procedure requires a DC-VTVM that is accurate to .02 Volts, and a fully charged battery pack.

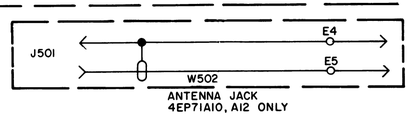
> **CAUTION**
>
> Failure to adjust potentiometer R18 to within .02-Volt may result in an insufficient charge or damage to the battery.

Set R18 as follows:

1. Connect positive charging terminals E2 and E3 together.
2. Connect the positive meter lead to positive charging terminal E3, and the negative meter lead to negative charging terminal E1.
3. Place the battery into the charger. If necessary, rotate R18 until the CHARGE light turns on. Then turn R18 until the light just turns off.
4. Remove and then replace the battery pack in the charger. Note the meter reading at which the CHARGE light turns off. If reading is not approximately 8.45 Volts, adjust R18 slightly.
5. Repeat Step 4 until the CHARGE light turns off when the meter reads approximately 8.45 Volts.

SCHEMATIC DIAGRAM





●4EP71A10,11 CHARGERS (117 VAC)
▲4EP71A12,13 CHARGERS (220 VAC)

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
4EP71A10	C
4EP71A11	C
4EP71A12	B
4EP71A13	B

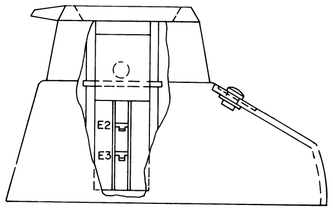
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

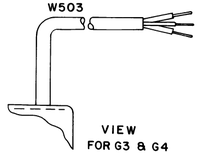
ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR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

(19C317505, Rev. 11)

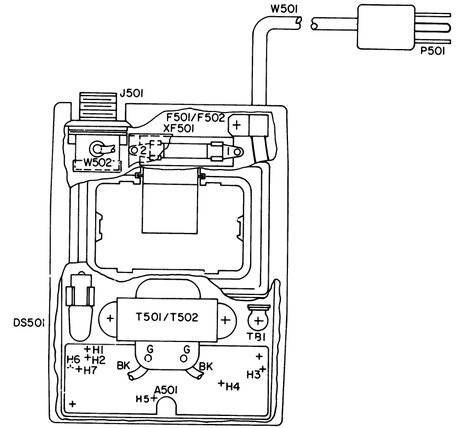
OUTLINE DIAGRAM

RIGHT SIDE VIEW

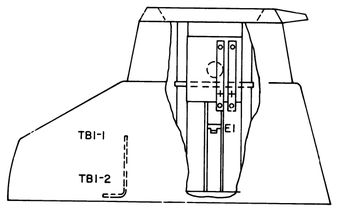




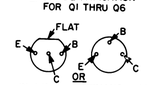
TOP VIEW



LEFT SIDE VIEW

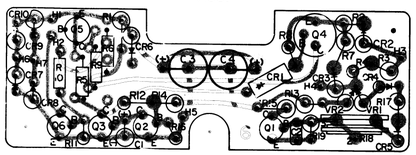


LEAD IDENTIFICATION
FOR Q1 THRU Q6

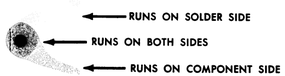


NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

CHARGER BOARD
A501



(19D416254, Rev. 5)
(19C317500, Sh. 1, Rev. 6)
(19C317500, Sh. 2, Rev. 6)



SCHEMATIC & OUTLINE DIAGRAMS

DESK CHARGER MODEL 4EP71A10

PARTS LIST

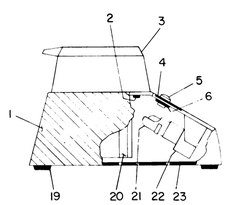
LBI-4252B

DESK CHARGER
4EP71A10-A13

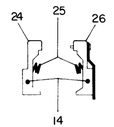
SYMBOL	GE PART NO.	DESCRIPTION
A501		COMPONENT BOARD 19C317504G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C2	19A116114P43	Ceramic: 27 pf ±10%, 100 VDCW; temp coef 0 PPM.
C3* and C4*	5496267P16	Tantalum: 100 µf ±20%, 20 VDCW; sim to Sprague Type 150D. Added by REV A.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR3	4037822P1	Silicon.
CR4 and CR5	19A115250P1	Silicon.
CR6 thru CR10	4037822P1	Silicon.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q2	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q3	19A115330P1	Silicon, NPN.
Q4	19A115300P1	Silicon, NPN; sim to Type 2N3053.
Q5	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q6	19A115330P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P680J	Composition: 68 ohms ±5%, 1/2 w.
R2	3R77P820J	Composition: 82 ohms ±5%, 1/2 w.
R3	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
R4	3R152P621J	Composition: 620 ohms ±5%, 1/4 w.
R5	3R152P122K	Composition: 1200 ohms ±10%, 1/4 w.
R6	3R152P472J	Composition: 4700 ohms ±5%, 1/4 w.
R7	3R77P331J	Composition: 330 ohms ±5%, 1/2 w.
R8 and R9	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R10	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R11	3R152P472K	Composition: 4700 ohms ±10%, 1/4 w.
R12	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R13	3R77P471K	Composition: 470 ohms ±10%, 1/2 w.
R14	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R15	3R77P301J	Composition: 300 ohms ±5%, 1/2 w.
R16	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R17	19A116278P217	Metal film: 1470 ohms ±2%, 1/2 w.
R18	19B209358P105	Variable, carbon film: approx 75 to 5000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R19	19A116278P209	Metal film: 1210 ohms ±2%, 1/2 w.
		- - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	4036887P5	Silicon, Zener.
VR2	4036887P7	Silicon, Zener.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - INDICATING DEVICES - - - - - - -
DS501	19C307037P5	Lamp, incandescent: 28 v; sim to GE 1829.
		- - - - - - - - - - FUSES - - - - - - - - - -
F501	1R16P12	Quick blowing: 1/8 amp at 250 v; sim to Littelfuse 312.125 or Bussmann AGC-1/8.
F502	7487942P6	Slow blowing: 1/16 amp at 250 v; sim to Bussmann MDL-1/16.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J501		(Part of W502).
		- - - - - - - - - - PLUGS - - - - - - - - - -
P501		(Part of W501).
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T501*	19A116444P2	Power, step down: Pri: 117 VRMS, 50/60 Hz, Sec: 12.3 VRMS (no load).
		Earlier than REV A:
	19A116444P1	Power, step down: Pri: 117 VRMS, 50/60 Hz, Sec: 16 VRMS (no load).
T502	19A116444P3	Power, step down: Pri: 220 VRMS, 50/60 Hz, Sec: 12.3 VRMS (no load).
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	7775500P44	Phen: 2 terminals.
		- - - - - - - - - - CABLES - - - - - - - - - -
W501*	19A116740P2	Power: approx 7 feet long, with 3 contact plug (P501).
		In 4EP71A10, 11 REV A and earlier: In 4EP71A12, 13 earlier than REV A:
	4036441P7	Power: approx 7 feet long, with 2 contact plug (P501).
W502	19B216886G2	RF Cable: approx 5 inches long. Includes (J501).
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS501	4032220P1	Lampholder, miniature: sim to Drake N517.
XF501	7141008P1	Fuseholder: 5 amps at 125 v; sim to Littelfuse S-357001.
		MECHANICAL PARTS (SEE RC-2159)
1	19E500910P2	Housing.
2	19B201074P205	Screw, tap: Phillips Pozidriv, 4-40 x 5/16.
3	19D413770P1	Collar.
4	NP270324	Nameplate.
5	19B204949P1	Jewel. (Used with DS501).
6	19C307038P6	Nut, push on: sim to Tinnerman C15226SS-010.
7	19B201074P206	Screw, tap: Phillips Pozidriv, 4-40 x 3/8.
8	19B219105P1	Fuse cover.
9	N404P11C6	Lockwasher: No. 4.
10	7141225P2	Nut: No. 4-40.
11	4029851P5	Clip loop: sim to Weckesser 1/4-4-128.
12	4036555P1	Insulator disc: nylon. (Used with Q4 on A501).
13	19B201074P305	Screw, tap: Phillips Pozidriv, 6-32 x 5/16.
14	19A127849P1	Pin.
15	19B216963P1	Angle.
16	19B219104P1	Block.
17	N108P505C	Screw: No. 2 x 5/16.
18	19B216965P1	Extractor.

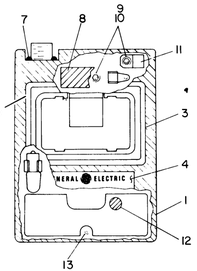
SYMBOL	GE PART NO.	DESCRIPTION
19	19A116417P1	Bumper, plastic: pressure sensitive; sim to Kent 5112.
20	19C317465G1	Sleeve. (Includes charging contacts E1 thru E3).
21	19A116427P1	Reflector, light: sim to Amaton Electronic Hardware 3113.
22	19C301208P8	Insulated sleeving.
23	19C317498G1	Base plate.
24	19C317457P1	Lever.
25	19A127850P1	Spring.
26	19A127860G1	Lever.



BATTERY EXTRACTOR



EXTERNAL ANTENNA CONTACTS



RC-2159A

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 affected by these revisions.

REV. A - 4EP71A10, 11, 12 & 13
To improve AC filtering. Added C3 and C4, and Changed T501.

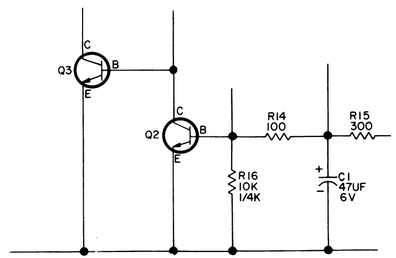
REV. B - 4EP1A10, 11
To incorporate 3-wire cable. Changed W501.

REV. A - 4EP71A12, 13
To incorporate 3-wire cable. Changed W501.

REV. C - 4EP71A10 & 11

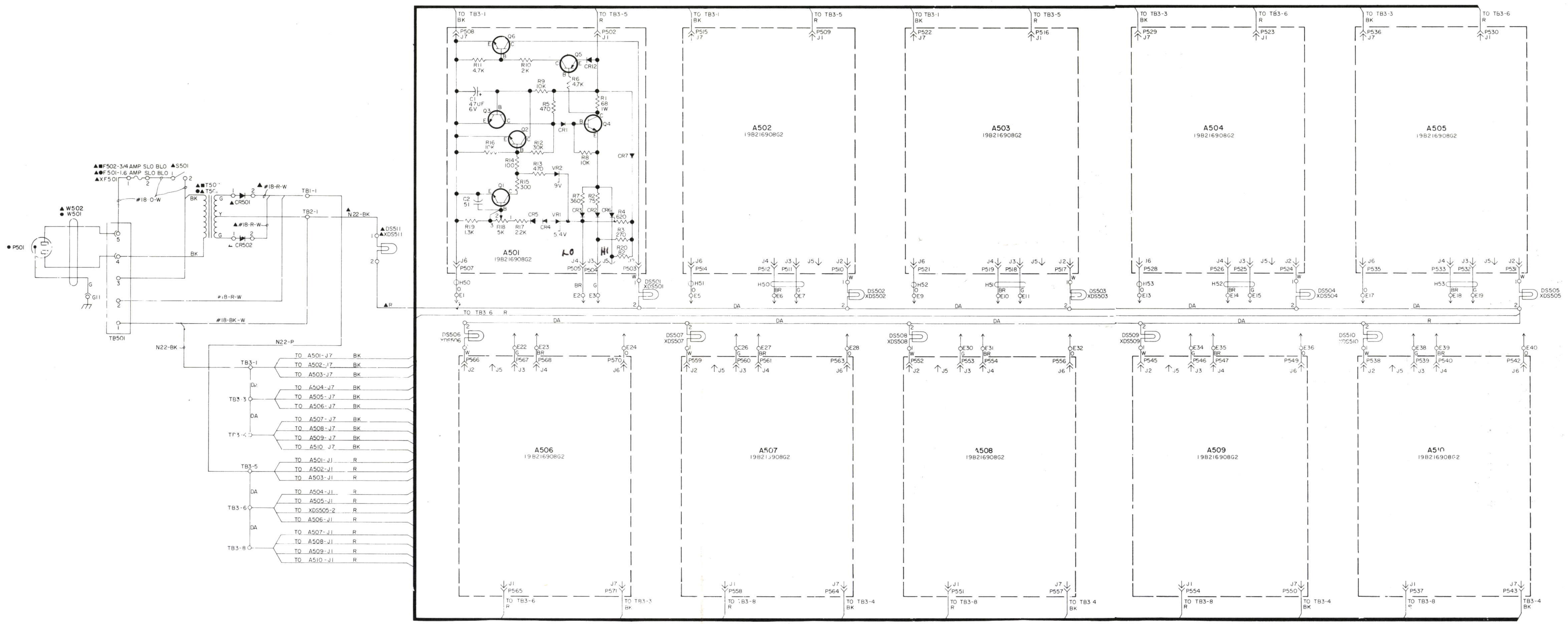
REV. B - 4EP71A12 & 13
To insure proper operation after momentary loss of AC power.
Relocated C1.

Schematic Diagram was:



*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SCHEMATIC DIAGRAM



(19R621346, Rev. 10)

NOTES:
1. COMPONENTS MARKED WITH "▲" ARE PRESENT IN 4EP68A10 AND 4EP68A11 ONLY.
2. COMPONENTS ON A502 THRU A510 ARE THE SAME AS ON A501.
3. ALL WIRING N22 UNLESS OTHERWISE SPECIFIED.
4. COMPONENTS MARKED WITH:
   ● USED IN 4EP68A10 (117VAC MODEL)
   ▲ USED IN 4EP68A11 (220VAC MODEL.

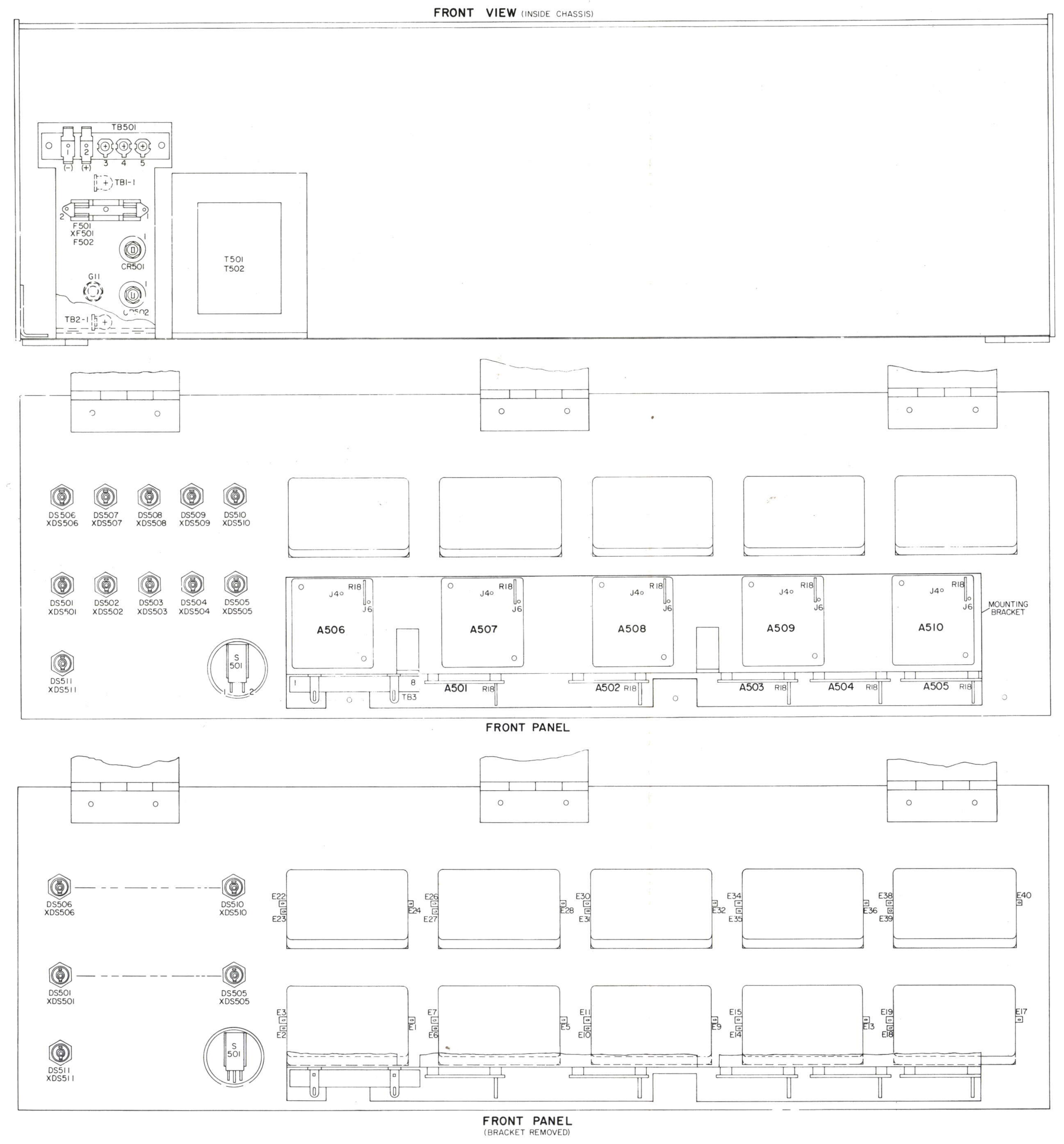
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

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

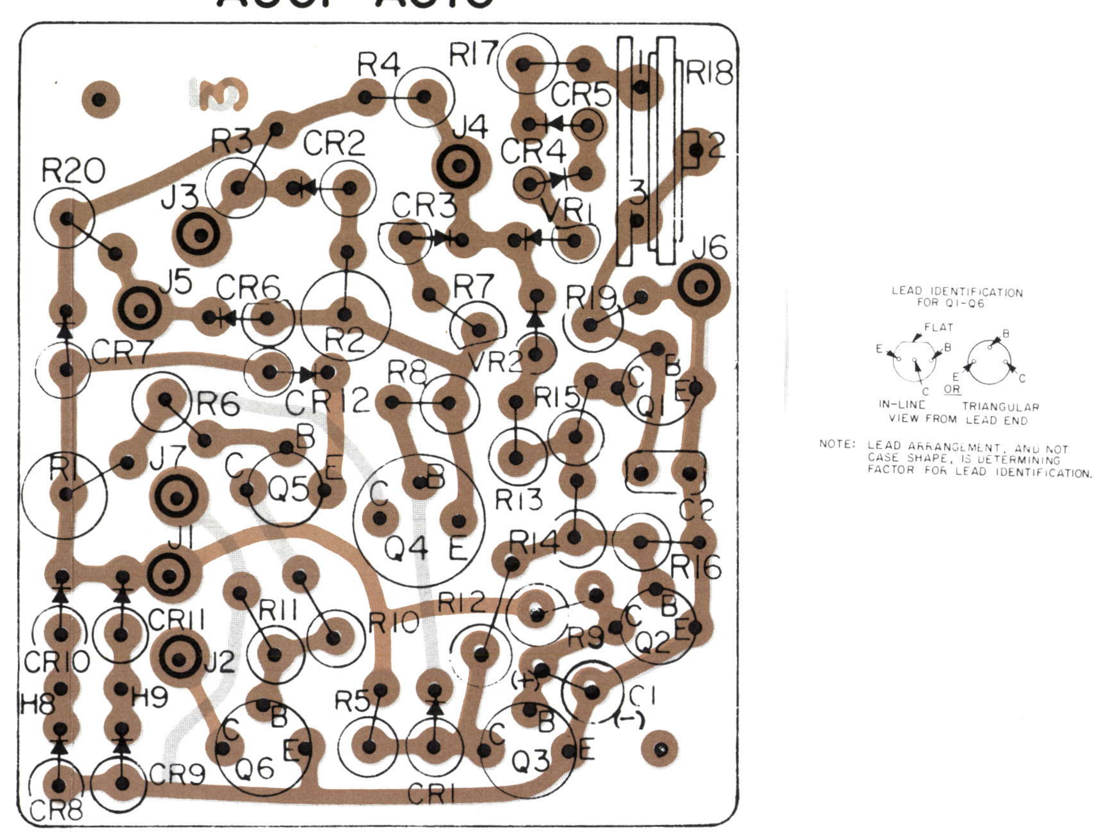
THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
4EP68A10	C
4EP68A11	A
19E500916G2	B

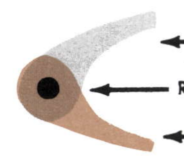
OUTLINE DIAGRAM



(19R621725, Rev. 4)
(19B216902, Sh. 1, Rev. 3)
(19B216902, Sh. 2, Rev. 3)

A501-A510





SCHEMATIC & OUTLINE DIAGRAMS

MULTI-CHARGER MODEL 4EP68A10

Issue 5

PARTS LIST

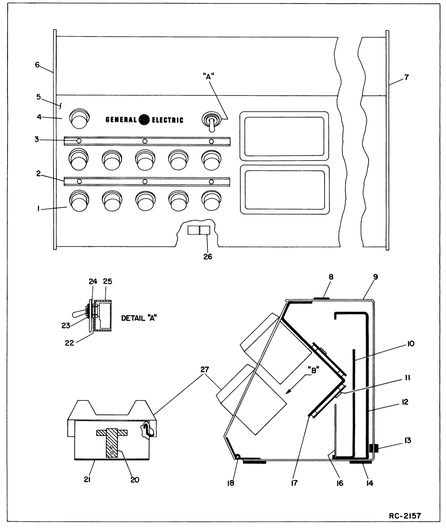
LBI-4252C

MULTI-CHARGER
MODELS 4EP68A10, A11

SYMBOL	GE PART NO.	DESCRIPTION
A501 thru A510		COMPONENT BOARD 19B216908G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C2	19A116114P2054	Ceramic: 51 pf ±5%, 100 VDCW; temp coef -80 PPM.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 thru CR6	19A115250P1	Silicon.
CR7	4037822P1	Silicon.
CR12*	19A115250P1	Silicon. Added by REV B.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J7	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q2	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q3	19A115330P1	Silicon, NPN.
Q4	19A115200P1	Silicon, NPN; sim to Type 2N3053.
Q5	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q6	19A115330P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3B78P68QJ	Composition: 68 ohms ±5%, 1 w.
R2	3B77P75QJ	Composition: 75 ohms ±5%, 1/2 w.
R3	3B77P27lJ	Composition: 270 ohms ±5%, 1/2 w.
R4	3B77P62lJ	Composition: 620 ohms ±5%, 1/2 w.
R5	3B77P47lJ	Composition: 470 ohms ±5%, 1/2 w.
R6	3B77P47lK	Composition: 4700 ohms ±10%, 1/2 w.
R7	3B77P36lJ	Composition: 360 ohms ±5%, 1/2 w.
R8 and R9	3B77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R10	3B77P202J	Composition: 2000 ohms ±5%, 1/2 w.
R11	3B77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R12	3B77P303J	Composition: 30,000 ohms ±5%, 1/2 w.
R13	3B77P471K	Composition: 470 ohms ±10%, 1/2 w.
R14	3B77P101K	Composition: 100 ohms ±10%, 1/2 w.
R15	3B77P301J	Composition: 300 ohms ±5%, 1/2 w.
R16	3B77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R17	3B77P222J	Composition: 2200 ohms ±5%, 1/2 w.
R18	19B209358P105	Variable, carbon film: approx 75 to 5000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R19	3B77P132J	Composition: 1300 ohms ±5%, 1/2 w.
R20	3B77P82GJ	Composition: 82 ohms ±5%, 1/2 w.
		- - - - - - - - VOLTAGE REGULATORS - - - - - -
VR1	4036887P5	Silicon, Zener.
VR2	4036887P7	Silicon, Zener.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR501 and CR502	19A115202P1	Silicon.
		- - - - - - - INDICATING DEVICES - - - - - - - -
DS501 thru DS511	19A115425P1	Lamp, incandescent: 28 v; sim to Drake 2840.
		- - - - - - - - - - FUSES - - - - - - - - - -
F501*	7487942P26	Slow blowing: 1.6 amp at 125 v; sim to Bussman MDL-1.6.
	1B16P8	Earlier than REV A: Quick blowing: 5 amps at 250 v; sim to Littelfuse 312005 or Bussmann MTH-5.
F502	7487942P4	Slow blowing: 3/4 amp at 250 v; sim to Bussmann MDL-3/4.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P501		(Part of W501).
P502 thru P571	4029840P2	Contact, electrical: sim to Amp 42827-2.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S501	5491899P3	Toggle: SPST, 6 amps at 125 VAC/VDC; sim to Cutler-Hammer 8383E3.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T501	19A116218P1	Power, step-down: Pri: 117 VRMS, 50/60 Hz. Sec: 15.25 VRMS each side of CT (no load).
T502	19A116218P2	Power, step-down: Pri: 220 VRMS, 50/60 Hz. Sec: 15.25 VRMS each side of CT (no load).
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1-1 and TB2-1	7775500P44	Phen: 2 terminals.
TB3	7775500P24	Phen: 8 terminals.
TB501	7117710P5	Phen: 5 terminals; sim to Cinch 1775.
		- - - - - - - - - - CABLES - - - - - - - - - -
W501	7491206P3	Power: 3 conductor, 10 amps at 125 VRMS max, approx 7 feet long. Includes (P501).
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS501 thru XDS511	19B201122P2	Lampholder: sim to Drake Mfg 121 Series.
XF501	7141008P1	Fuseholder: 5 amps at 125 v; sim to Littelfuse S-357001.
		HARNESS ASSEMBLY 19B250991G4 (Includes P502, P503, P506-P510, P515-P517, P522-P52, P529-P531, P536-P538, P542, P545, P550-P552, P554, P557-P559, P564-P566, P571, TB2).
		MECHANICAL PARTS (SEE MC-2157)
1	19B201122P14	Lens: green; sim to Drake Mfg. 121A606 green.
2	19A127900P1	Guide.
3	19B200525P4	Rivet, tubular.
4	19B201122P4	Lens: red; sim to Drake Mfg. 121A604 red.
5	19D413555G1	Front Plate.
6	19C317192G1	End Plate. (Left).
7	19C317192G2	End Plate. (Right).
8	8529P16C	Button Plug.

SYMBOL	GE PART NO.	DESCRIPTION
9	19D413322G2	Shell.
10	19B216621G1	Support.
11	4036555P1	Insulator, disc: nylon.
12	19C317287P1	Support.
13	19A115725P2	Bushing, strain relief.
14	19A115890P1	Bumper, rubber.
15	9330P1506P22	Eyelet, metal.
16	19B216754P1	Insulator.
17	19C317411G1	Support.
18	19B216619G1	Hinge.
19		(Not Used).
20	19A127797P1	Contact.
21	19C317491P1	Bottom plate.
22	7115195P2	Nut, hex: No. 15/32-32.
23	4033394P1	Nut, knurled: No. 15/32-32; sim to H.H. Smith 1197.
24	7115130P11	Lockwasher: No. 15/32.
25	19A127616P1	Plastic shell.
26	7763541P3	Clip, spring tension.
27	19C317410G1	Insert. (Includes charging contacts).



MULTI-CHARGER 4EP68A10

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 affected by these revisions.

REV. A - 4EP68A10
To improve fuse performance. Changed F501.

REV. B - To prevent charge lights from turning on under high line voltage conditions. Added CR12.

REV. A - 4EP68A11
To insure proper operation after momentary loss of AC power.
Relocated C1.

Schematic Diagram was:

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

QUICK CHECKS

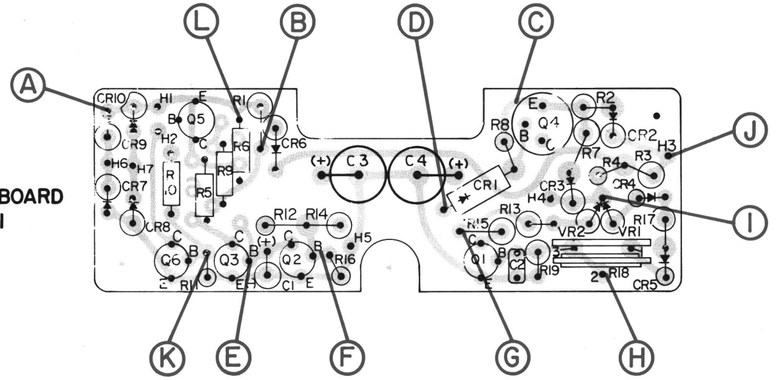
Symptom	Check For:
Battery will not charge at the high rate (CHARGE light won't come on)	1. Open F501 2. Defective Q4 3. Q1 not re-setting charging circuit 4. Open C1, or battery contact damaged
CHARGE light goes off slowly (doesn't switch off quickly)	
Battery pack will not charge at high rate	1. Defective or excessively discharged battery 2. Defective VR1, CR4, CR5 or R18 improperly adjusted
Charger switches to trickle charge too soon	Improper adjustment of R18
Charger remains on high charge rate (CHARGE light remains on)	1. Improper adjustment of R18, or R18 defective 2. Shorted Q1 or open Q2 3. Shorted Q4

VOLTAGE READINGS FOR 4EP71A10

These voltage readings are typical DC readings measured with GE Test Set Model 4EX3A10 or equivalent 20,000 ohms-per-volt meter. Readings are measured from the metering point shown to component board ground and are provided for both the Standard battery pack and the Light Duty battery pack.

Metering Point	With No Battery	HIGH CHARGE RATE (Charge Light On)		TRICKLE CHARGE (Charge Light Off)	
		Standard	Light Duty	Standard	Light Duty
Ⓐ Rectified Output	13.2V	12.55V	13.0V	12.55V	12.7V
Ⓑ Q4 Collector	13.0V	10.3V	12.2V	12.5 V	12.7V
Ⓒ Q4 Emitter	12.0V	10.1V	11.6V	1.0 V	0.4V
Ⓓ Q3 Collector	12.7V	10.9V	12.3V	0.2 V	0.2V
Ⓔ Q3 Base	0V	0V	0V	0.7 V	0.7V
Ⓕ Q2 Base	0.7V	0.7V	0.7V	0V	0V
Ⓖ Junction of R14 & R15	1.0V	0.6V	0.65V	0V	0V
Ⓗ R18-3	0.5V	0.5V	0.35V	0.55V	0.55V
Ⓘ Cathode of VR1	11.0V	8.1V	8.0V	8.4V	8.4V
Ⓙ H3	13.0V	8.1V	13.7V	8.4V	13.4V
Ⓚ Base of Q6	0V	0.5V	0.45V	0V	0V
Ⓛ Base of Q5	13.0V	11.7V	12.1V	12.4V	12.7V

CHARGER BOARD A501



(19D416254, Rev. 5)
(19C317500, Sh. 1, Rev. 6)
(RC-2169)

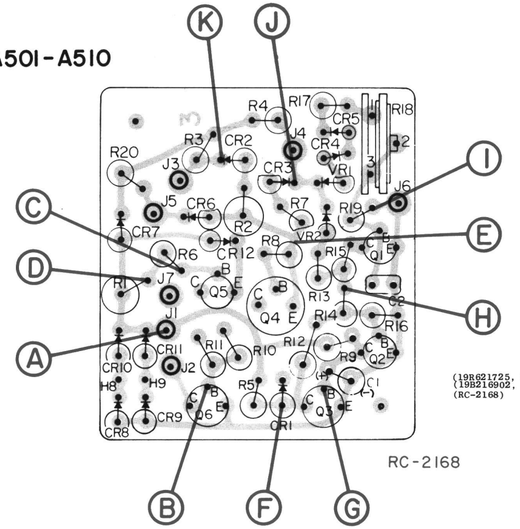
RC-2169

VOLTAGE READINGS FOR 4EP68A10

These voltage readings are typical DC readings measured with GE Test Set Model 4EX3A10 or equivalent 20,000 ohms-per-volt meter. Readings are measured from the metering point shown to component board ground, and are provided for both the Standard battery pack and the Light Duty battery pack.

Metering Point	With No Battery	HIGH CHARGE RATE (Charge Light On)		TRICKLE CHARGE (Charge Light Off)	
		Standard	Light Duty	Standard	Light Duty
Ⓐ Input at J1	13.4V	13.3V	13.3V	13.3V	13.3V
Ⓑ Q6 Base	0.1V	0.5V	0.45V	0V	0V
Ⓒ Q5 Base	13.2V	12.9V	13.0V	13.3V	13.3V
Ⓓ Q4 Collector	13.2V	10.6V	12.5V	13.3V	13.3V
Ⓔ Q4 Emitter	12.5V	10.6V	12.3V	1.5V	2.5V
Ⓕ Q3 Collector	13.2V	11.4V	13.0V	0.2V	0.2V
Ⓖ Q3 Base	0V	0V	0V	0.8V	0.8V
Ⓗ Junction of R14 & R15	0.7V	0.6V	0.6V	0.1V	0V
Ⓘ R18-3	0.5V	0.5V	0.5V	0.5V	0.5V
Ⓙ Cathode of VR1	11.2V	8.55V	8.5V	8.5V	8.5V
Ⓚ Cathode of CR2	13.3V	8.5V	14.0V	8.5V	14.0V

A501-A510



(19R621725, Rev. 4)
(19B216902, Sh. 1, Rev. 3)
(RC-2168)

RC-2168

TROUBLESHOOTING PROCEDURE

DESK CHARGER MODEL 4EP71A10
MULTI-CHARGER MODEL 4EP68A10

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 descriptio 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 parts, 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.

MAINTENANCE MANUAL
LBI-4251

DF-0069

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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