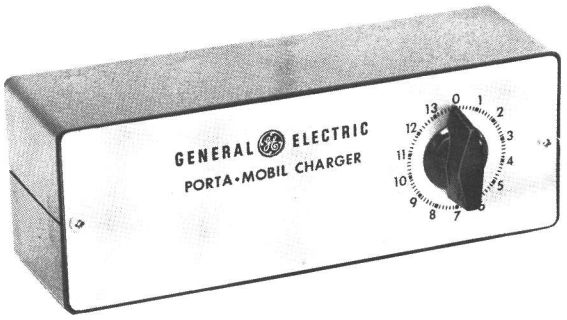
MOBILE RADIO

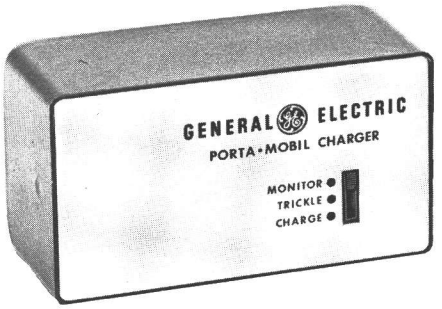
MAINTENANCE MANUAL

PORTA-MOBIL EXTERNAL CHARGER

Models 4EP60A10-13



Models 4EP60A11, 13



Models 4EP60A10, 12

SPECIFICATIONS *

Dimensions (H x W x D)	
Models 4EP60A10, 12	3.04" x 5.64" x 2.80"
Models 4EP60A11, 13	3.04" x 8.64" x 2.80"
Input Voltage	
Models 4EP60A10, 11	117 VAC ±10% at 50/60 Hz
Models 4EP60A12, 13	234 VAC ±10% at 50/60 Hz
Charge Current	
Models 4EP60A10, 12	60 mA ±10% (Trickle) 100 mA ±10% (Monitor) 450 mA ±10% (Charge)
Models 4EP60A11, 13	60 mA ±10% (Timer Off) 450 mA ±10% (Timer On)
Temperature Range	Charger will operate at -30°C to +65°C. However, a nickel-cadmium battery should be charged within the temperature range of +10°C to +40°C.

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

EP-60-A

GENERAL ELECTRIC

TABLE OF CONTENTS

ILLUSTRATIONS

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

The Porta-Mobil External Charges Modesl 4EP60A10 thru 13 are designed for use with Porta-Mobil Rechargeable Power Supplies, and are capable of delivering a full charge to the battery in 14 hours. The chargers use constant-current charging, thus preventing "thermal runaway". An indicator lamp on the front of the charger (located behind the GE Monogram) lights while the battery is being charged. A hand-up button on the bottom of the Model 4EP60A10 & 12 charges allows them to be attached to the Porta-Mobil for charging or transporting.

Models 4EP60A10, (117 VAC) and 4EP60A12 (234 VAC) are three-rate chargers. Charging rates of 60, 100 and 450 milliamps are selected by a 3-position slide switch on the front of the charger. This permits selection of a charging rate which is related to the duty cycle of the Porta-Mobil Two-Way Radio.

Models 4EP60A11 (117 VAC) and 4EP60A13 (234 VAC) are two-rate chargers and are equipped with a 0-14 hour timer. While the charger timer is operating, full-charge (450 mA) is provided to the battery. After the timed cycle is completed, the charger reverts to trickle charge (60 mA).

All models of these chargers are compatible with the following power supplies. Note that some early model power supplies require modification before the charger can be used.

Model No.	Rev. No.	Modification Kit Required
4EP44A10	C	19A122614-G1*
4EP44A11	B & earlier	19A122614-G1*
4EP44A11	C & later	None
4EP44B10	0	19A122614-G1*
4EP44B10	A & later	None
4EP65A10		None
4EP65B10		*Available for Field Installation as Option 5587.

OPERATION

Proper charging techniques greatly increase the operating efficiency and life of the Porta-Mobil Rechargeable batteries. It is especially important to avoid habitual overcharge, for the surplus energy is converted to heat and may result in premature battery failure. For best results, charge the battery within the temperature range of +10° to +40°C (50° to 104°F).

Battery capacity is specified in ampere-hours (AH). Load in Amperes x Discharge period in hours = Power delivered in ampere-hours. (For example, a 4 AH battery will deliver 1 ampere to a load for 4 hours.) To maximize battery life, the charge cycle should be adapted to the discharge cycle. Charge the battery for 1.4 ampere-hours for each ampere-hour taken from the battery.

Charging Procedure

1. Connect AC power to the charger (117 VAC for Models 4EP60A10 & 11 or 234 VAC for Models 4EP60A12 & 13).

2. Plug P2 of the charger into the charging jack on the Porta-Mobil power supply.

3. Select charger operation as follows:

   a. For Models 4EP60A10 & 12 - Select the desired charging rate with S1 on the front of the charger.

      - TRICKLE - 60 milliamps
      - MONITOR - 100 milliamps
      - CHARGE - 450 milliamps

   b. For Models 4EP60A11 & 13 - Set the timer for desired charge time. While the timer is on, 450 milliamps of charge current is supplied to the battery. When the timer turns off, the charger reverts to a 60 milliamp trickle charge.

4. The indicator lamp on the front of the charger glows while the battery is charging.

CAUTION

Do not charge a 4 ampere-hour battery at 450 milliamps for longer than the recommended maximum of 14 hours. To do so may damage the battery.

CIRCUIT ANALYSIS

The charger circuits consist of a full-wave rectifier, current limiter, charge selector switch or timer, and charge indicator light. The different charge rates are set by changing the resistnace in the emitter circuit of the current limiter transistor.

Since battery cells tend to warm up during charge with resultant decrease in internal resistance, a constant current

source is required to prevent thermal runaway during the charge cycle. The current limiting circuit consists of Q1, R1, VR1 and the "charge rate" resistors selected by S1 (3-rate chargers) or S2 (timed chargers). Refer to Figure 1.

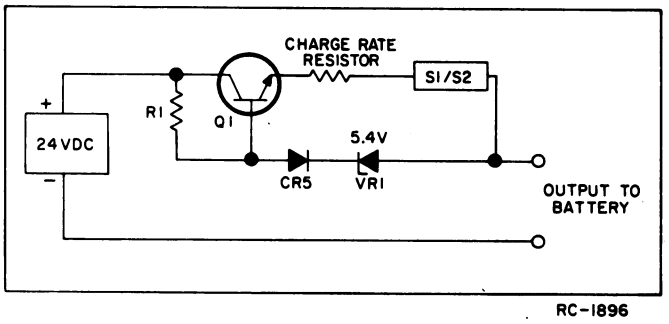


Figure 1 - Simplified Diagram of Current Limiter

When the internal resistance of the battery starts to decrease, current through Q1 starts to increase. This increases the voltage drop across the "charge rate" resistor. If the voltage drop across the "charge rate" resistor and the collector-base junction of Q1 exceeds 5.4 Volts, zener diode VR1 conducts through CR5 and R1. This places a reverse bias on the base of Q1, which conducts less to keep the external charge current at the selected rate. CR5 prevents the battery from discharging through the charger circuits while the charger is off.

MAINTENANCE

DISASSEMBLY

To gain access to the inside of the charger, use the following procedure.

Timed Charger (Models 4EP60A11 & 13)

1. Disconnect the AC power.
2. Remove the two screws on the front of the charger and lift chassis from the housing.

3-Rate Chqrger (Models 4EP60A10 & 12)

1. Disconnect the AC power.
2. Remove the two upper rubber feet on the back of the charger and lift chassis from the housing.

TROUBLESHOOTING

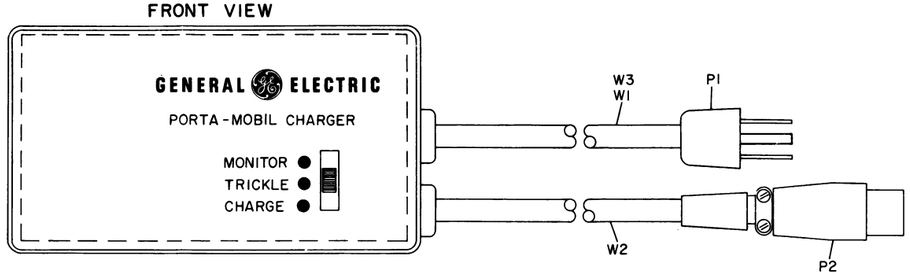
Troubleshooting and servicing procedures are outlined on the following charg. Also refer to the appropriate Outline and Schematic Diagrams

TROUBLESHOOTING PROCEDURE

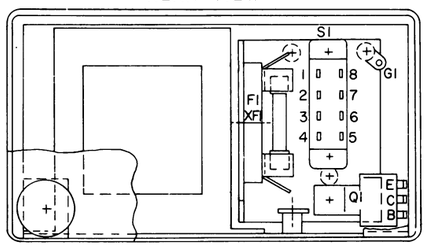
SYMPTOM	PROCEDURE
Charge light does not come on.	Check the following: 1. Connection to external charge circuit. 2. Lamp bulb. 3. Fuse 4. Q1 for open junction
Charge rates too high or low	Check the following: 1. Q1 for collector-to-emitter short. 2. VR1 for short or open 3. Diodes CR1-4 for shorts or opens. 4. Transformer primary and secondary windings.

MODELS 4EP60A10 & 12

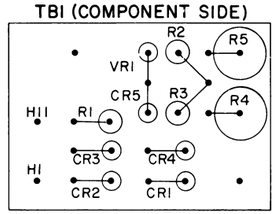
FRONT VIEW



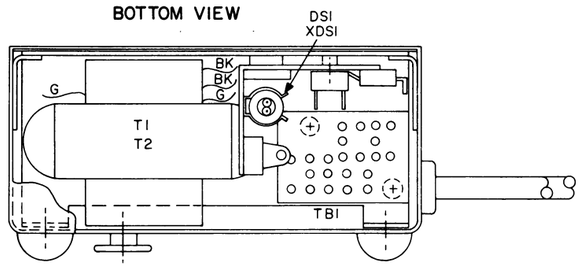
REAR VIEW



TBI (COMPONENT SIDE)



BOTTOM VIEW



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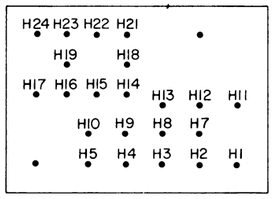
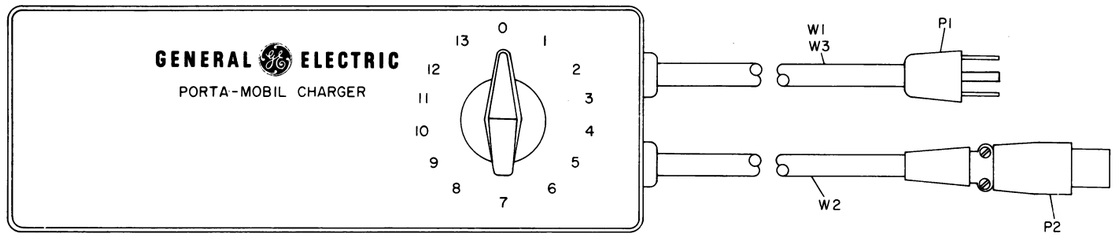


(19C317335, Rev. 2)

MODELS 4EP60A11 & 13

FRONT VIEW



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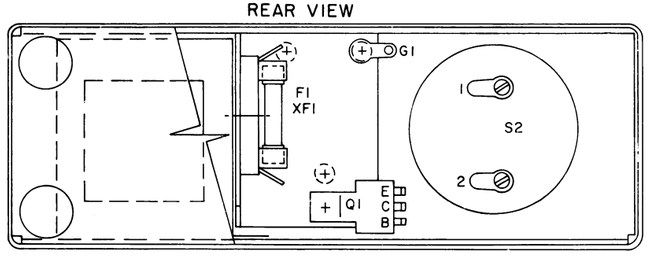

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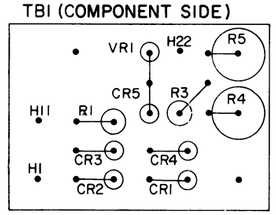
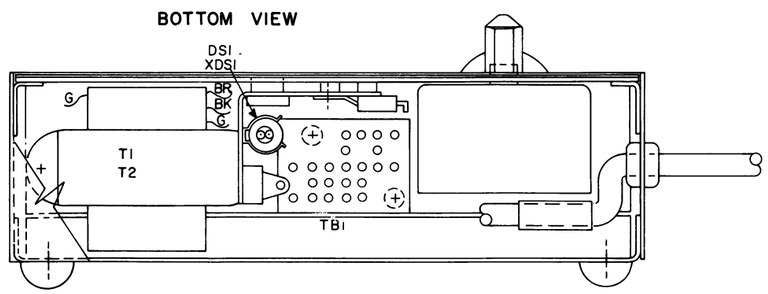
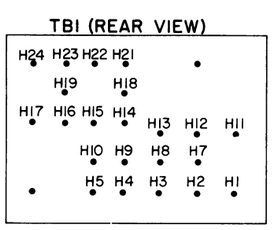


BOTTOM VIEW



TBI (REAR VIEW)

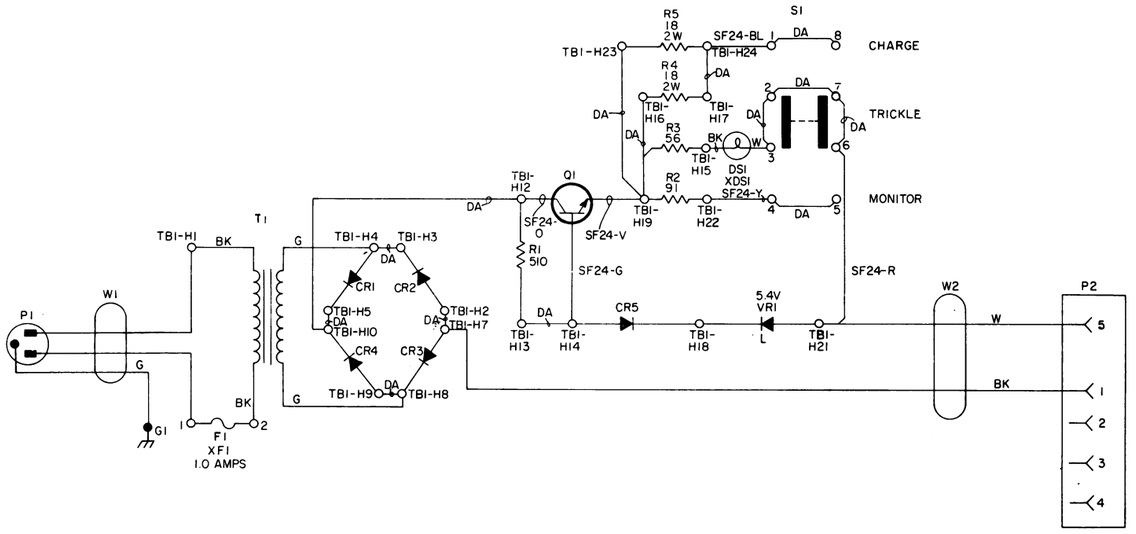


(19C317334, Rev. 2)

OUTLINE DIAGRAM

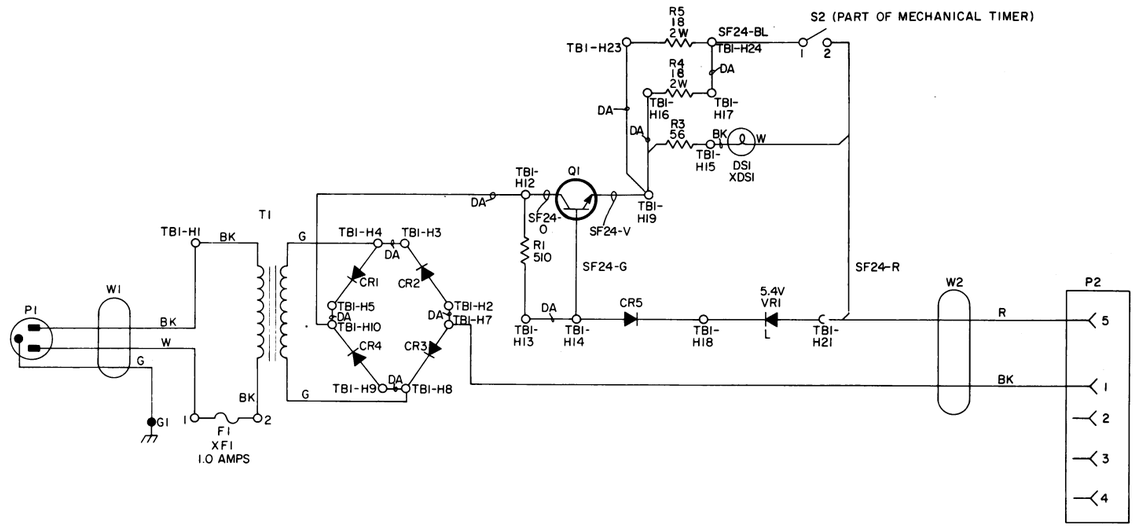
PORTA.MOBIL EXTERNAL CHARGERS
MODELS 4EP60A10-13

MODEL 4EP60A10



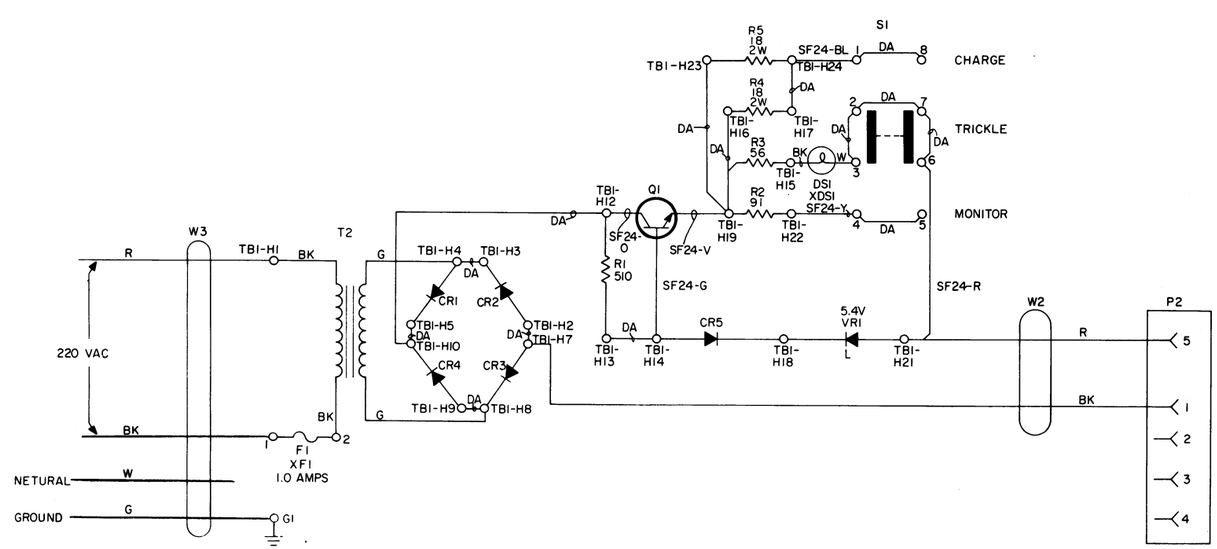
(19C311984, Rev. 6)

MODEL 4EP60A11



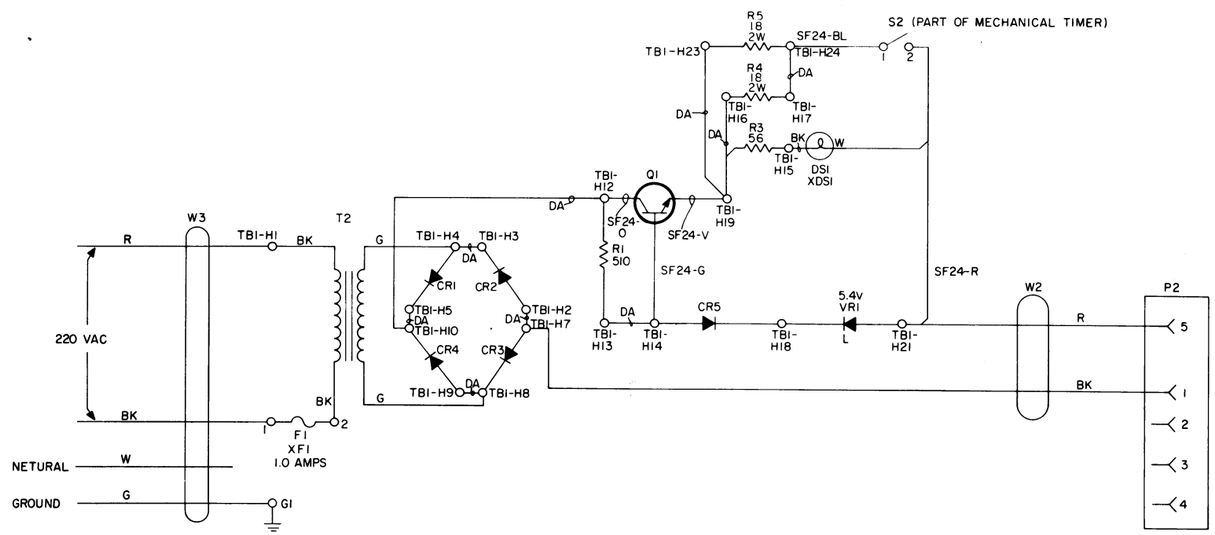
(19C317118, Rev. 3)

MODEL 4EP60A12



(19C317074, Rev. 2)

MODEL 4EP60A13



(19C317117, Rev. 2)

SCHEMATIC DIAGRAM

PORTA.MOBIL EXTERNAL CHARGERS
MODELS 4EP60A10-13

PARTS LIST

LBI-4061C

PORTA-MOBIL EXTERNAL CHARGERS
4EP60A10 117 VAC
4EP60A11 220 VAC
4EP60A12 117 VAC TIMED
4EP60A13 220 VAC TIMED

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 thru CR4	4037822P1	Silicon.
CR5	19A115250P1	Silicon.
		- - - - - - - - - INDICATORS - - - - - - - -
DS1	19C307037P13	Lamp, incandescent: 2 v; sim to GE 49.
		- - - - - - - - - - FUSES - - - - - - - - - -
F1	1R16P3	Quick blowing: 1 amp at 250 v; sim to Littelfuse 312001 or Bussmann AGC-1.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A116203P2	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77P511J	Composition: 510 ohms ±5%, 1/2 w.
R2	3R77P910J	Composition: 91 ohms ±5%, 1/2 w.
R3	3R77P560J	Composition: 56 ohms ±5%, 1/2 w.
R4 and R5	3R79P180J	Composition: 18 ohms ±5%, 2 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P5	Slide: 2 pole, 3 position, 3 amps at 125 VAC; sim to Switchcraft 46313L-P.C.
S2	19B209242P1	Timer, switch rating: 15 amps at 125 VAC; sim to M.H. Rhodes 91076.
		- - - - - - - - - TRANSFORMERS - - - - - - - -
T1	19B209188P1	Power, step-down: Pri: 117 v, 50/60 Hz, Sec: 25.2 v, 1 amp.
T2	19B209188P2	Power, step-down: Pri: 220 v, 50/60 Hz, Sec: 25.2 v, 1 amp.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	19B216379P1	Terminal board.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	4036887P5	Silicon, Zener.
		- - - - - - - - - - CABLES - - - - - - - - -
W1*	19A116740P2	Power: 2 pole, 3 wire grounding, approx 8 feet long.
		Earlier than REV A:
	4029085P2	Cable assembly.
W2	19B205579P2	Cable assembly.
P2	4034405P5	Plug: 5 sockets; sim to Cannon XLR-5-11C.
W3	19B216544P1	Cable assembly.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1	4032220P1	Lampholder, miniature: sim to Drake N517.
XF1	7141008P1	Fuseholder: 5 amps at 125 v; sim to Littelfuse E-3570Q1.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	7141414G2	Charger mounting bracket.
	19A127203P1	Mounting button, aluminum. (Located on charger).
	19A116023P2	Insulator, plate. (Used with Q1).
	4032248P1	Clip, spring tension. (Secures XDS1).
	NP257872	Nameplate, faceplate (Used with 4EP60A10, 12).
	NP257913	Nameplate, faceplate (Used with 4EP60A11, 13).
	19B205216P1	Jewel-monogram. (Used with DS1).
	5490407P6	Grommet, rubber. (Used with W1 and W2).
	4037559P5	Bumper, rubber. (Quantity 4).
	7142162P96	Spacer. (Located between Fuseswitch support and housing).
	7142162P18	Spacer. (Located between TB1 and housing).
	19A115492P1	Knob, push-on. (Used with S2).

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 - 4EP60A10, 11

To incorporate three-wire power cable.
Changed W1.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

INSTALLATION INSTRUCTIONS FOR MODIFICATION KIT 19A122614-G1

OPTION 5587

Modification Kit 19A122614-G1 must be used in Porta-Mobil Rechargeable Power Supplies Models 4EP44A10 (Rev. C), 4EP44A11 (Rev. B & earlier), and 4EP44B10 (Rev. A & earlier) to make these power supplies compatible with Porta-Mobil Chargers. Check the power supply model & revision letter and select the appropriate modification procedure for that model and revision.

NOTE

Modification Kit 19A122614-G1 can be applied to Model 4EP44A10 Power Supplies earlier than Rev. C if they have been modified according to Datafile Bulletin 0058-1.

MODIFICATIONS

Disconnect battery lead at J502 before performing the following steps.

Models 4EP44A10 (Rev. C) and 4EP44A11 (no revision)

1. Unsolder W-G and BK wires from TB10-1. Remove #4-40 x 5/16" mounting hardware from TB10. Keep the mounting hardware and discard TB10.
2. Mount new terminal board (TB50) in place of TB10, using mounting hardware removed in step 1. Solder W-G and BK wires removed in step 1 to TB50-4.
3. Install a diode (CR1) between J503-2 & J503-4. Sleeve leads using sleeving in kit.
4. Install a diode (CR2) between TB50-1 & TB50-3.
5. Solder #22 W-BK-O lead supplied with kit to J503-5. Route other end of the wire through H1 and solder to TB50-3. Spot tie wire to W501.
6. Solder #22 W-G-O lead supplied with kit between H6 (at J502) and TB50-1.
7. Mark nameplate with option number 5587.

Model 4EP44B10 (no revision)

1. Remove #4-40 x 1/4" screw (see Modification Diagram) and use to mount terminal board (TB50) supplied with kit.
2. Install a diode (CR1) between J503-2 & J503-4. Sleeve leads with sleeving supplied in kit.
3. Install a diode (CR2) between TB50-1 and TB50-3.
4. Install resistor R1 between TB50-1 & TB50-4.
5. Solder #22 W-BK-O lead supplied with kit to J503-5. Route other end of the wire through H1 and solder to TB50-4. Spot tie wire to W501.
6. Solder #22 W-G-O lead supplied with kit between H6 (at J502) and TB50-3.
7. Mark nameplate with option number 5587.

Model 4EP44A11 (Rev. A & B)

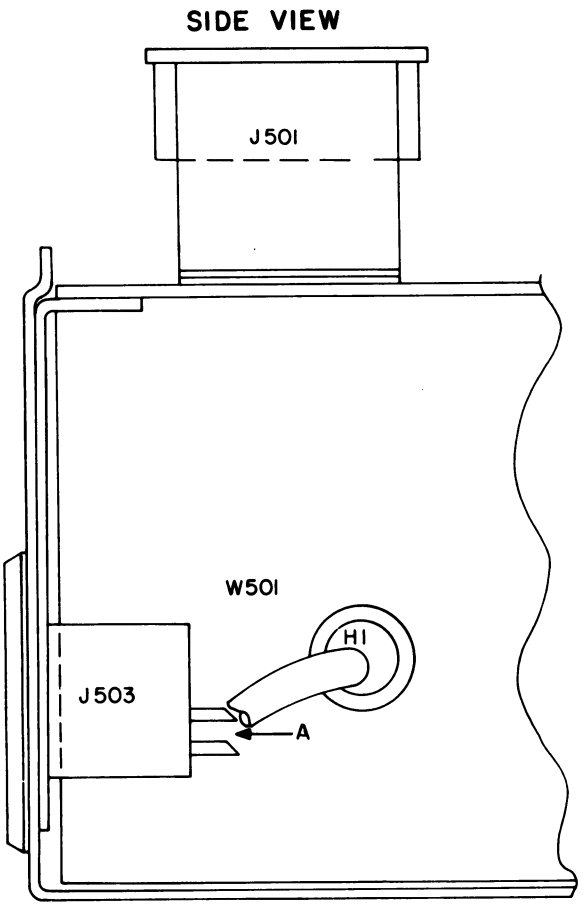
1. Install a diode (CR1) between J503-2 & J503-4. Sleeve leads using sleeving in kit.
2. Install a diode (CR2) between TB10-1 & TB10-3.
3. Mark nameplate with option number 5587.

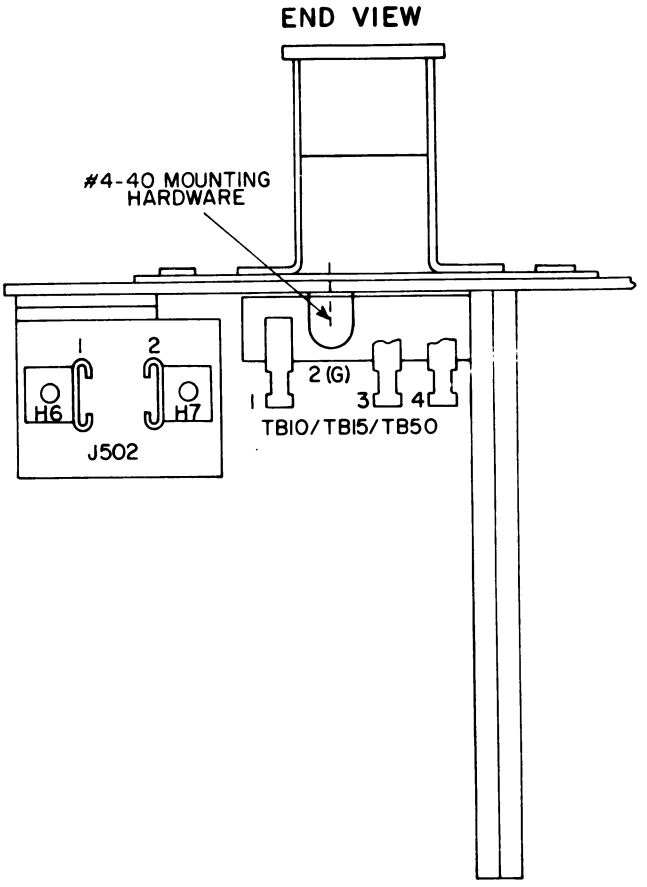
Model 4EP44B10 (Rev. A)

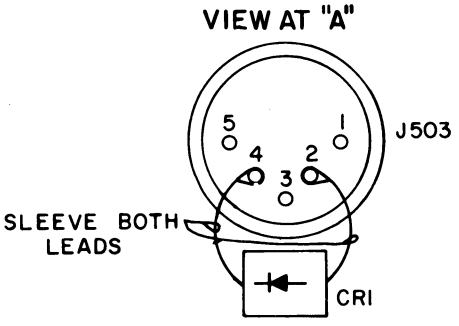
1. Install a diode (CR1) between J503-2 & J503-4. Sleeve both leads with sleeving supplied in kit.
2. Install a diode (CR2) between TB15-1 & TB15-3.
3. Install resistor R1 between TB15-1 & TB15-4.
4. Mark nameplate with option number 5587.

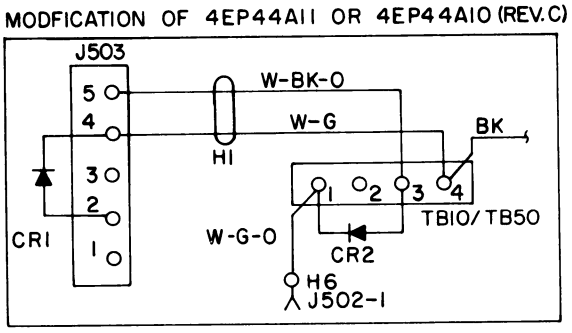
PARTS LIST
MODIFICATION KIT 19A122614-G1

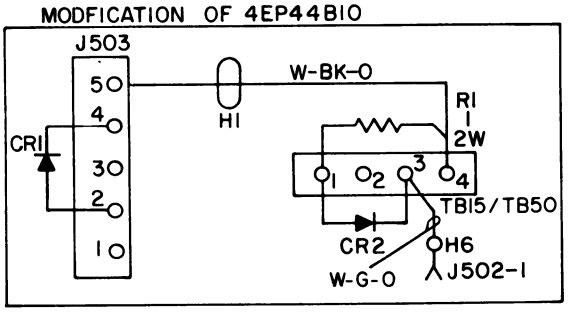
Symbol	GE Part No.	Description
CR1 & CR2	19A115823-P1	Diode: Silicon
R1	19B209022-P15	Resistor: Wirewound, 1 ohm ±5%, 2 W.
TB50	7487424-P5	Terminal Board: Miniature, phenolic, 3-term.











RC-1467

INSTALLATION DIAGRAM

MODIFICATION KIT 19A122614-G1
(OPTION 5587)

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.

MAINTENANCE MANUAL

LBI-4060

DF-0058

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

GENERAL ELECTRIC

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