MOBILE RADIO

MPR Personal Series

RAPID 3 DESK CHARGER COMBINATION 351L3AIX

SPECIFICATIONS *

Combination No.	Input Voltage	AC Input Current	AC Input Power
351L3A1X	(50/60 Hz) 121 VAC	110 Milliamps	8.5 Watts

Used with MPR Personal Series two-way FM radios.

RECHARGE TIME	3 hours
TEMPERATURE RANGE	+5°C to 45°C (+41°F to 113°F)

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

DESK CHARGER 351L3A1X

GENERAL ELECTRIC

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ILLUSTRATIONS

COMBINATION NOMENCLATURE

1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th Digit
PRODUCT LINE	APPLICATION	PACKAGE	INPUT VOLTAGE	CHARGE TIME	VERSION	TYPE	Frequency Range
3 Charger	**5** MPR (700 mAh and 1200 mAh Batt)	**1** DESK	**L** 121 VAC	**3** 3-hour	**A** 1-Charge Socket	**1** Standard	**X** Not Range Sensitive

DESCRIPTION

General Electric Desk Chargers will recharge both 700 mAh and 1200 mAh battery packs used with the MPR Personal Series, FM two-way radios. A fully discharged battery pack will be recharged back to a full charge in 3 hours at a constant current charge rate of C/3 for the 1200 mAh battery pack (420 mA) and C/2 for the 700 mAh battery pack (370 mA).

When a battery pack is inserted into the charging insert of the desk charger, an amber LED indicator labeled "CHARGING", will light, indicating the battery pack is being charged. When the 700 mAh or 1200 mAh battery pack is fully charged, a green LED indicator labeled "READY" will light and the charger will automatically switch to a safe trickle charge rate.

The desk charger uses heat sensors to constantly monitor the temperature of both the battery pack and the charging insert. When a cold battery pack is inserted into the charging insert, the charger will wait until the battery pack has warmed up to within approximately 10^{0}C of ambient. The charger will then, automatically, apply the fast charging rate. When the battery pack overcharges enough to heat the cells 10^{0}C above ambient, the charger will switch from fast charge to trickle charge. The charger also has a memory, set when the charger switches from the fast charging rate to the trickle charge and reset by removing the battery pack from the charging insert, or an AC power failure. If a hot battery is in the charging insert and the memory has not been reset, the charger will remain at the trickle charge rate. If the memory has been reset, the charger will wait until the battery pack has cooled before automatically switching to fast charge. If a fully charged battery pack is removed from the charging insert and then re-inserted, it will charge for approximately 1/2 hour until the cells reheat.

INSTALLATION

The desk charger can be located on a table top or other flat surface. The location should be close to a 121 Volt AC, 50/60 Hz, source.

CAUTION

The desk charger should not be used in a hazardous location.

OPERATION

Temperature characteristics of nickel cadmium batteries, prevent a full charge at temperature extremes. For a maximum charge, recharge the battery pack at room temperatures of 65^{0} to 85^{0} Fahrenheit whenever possible.

WARNING

In this Maintenance Manual, General Electric Chargers are designed for charging GE 700 mAh battery pack 19D429763G1 and 1200 mAh battery pack 19D429777G1 only. Charging any other battery pack or batteries may result in damage to equipment, leakage or explosion.

To use the desk charger, plug the power cable into the applicable 121 Volt AC, 50/60 Hz source (See Figure 1). 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 toward the rear of the charger. The amber LED indicator labeled "CHARGING" will light, indicating the battery is being charged. To charge the battery to 100% capacity, let the battery pack charge for at least 3 hours or until the "READY" indicator is on.

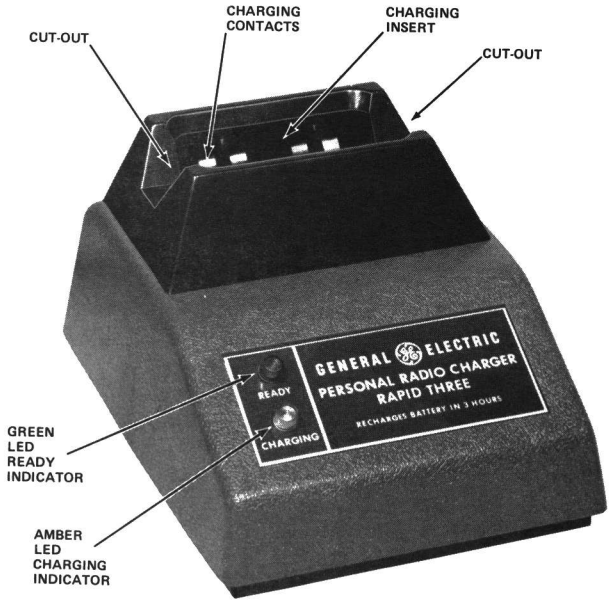


Figure 1 - Desk Charger

A battery pack is removed from the charger by simply reaching into the cut outs provided in the sides of the charging insert, and lifting the battery pack out.

The radio is not useful while being charged in the charger and it is recommended that the unit be turned off prior to charge.

CIRCUIT ANALYSIS

The 3-hour desk charger consists of a power supply, charging circuit and temperature controlled cut-off circuit. The power supply is a fullwave rectifier circuit with an unfiltered output. The unfiltered output of the power supply causes the charging current to flow through silicon controlled rectifier Q2 and series connected resistor R4/R12 at 100 to 120 Hz/second. Resistor R4/R12, R1 & R11 in the charging circuit, determines the high charge rate. The temperature controlled cut-off circuit is contained in thick film hybrid integrated circuit (IC) U1.

Temperature cut-off IC, U1, monitors the temperature of both the charging insert, through thermistor RT801, and the battery pack through a thermistor inside the battery pack. It also fires SCR Q2, turns the "READY" indicator on when the battery pack is fully charged and provides memory to prevent the same battery pack from being recharged at the high rate.

Thermistors RT801 and RT Battery are connected with R6 and R7 to form a bridge circuit (See Figure 2). The outputs of the bridge circuit are connected to terminals 2 and 14 of U1. When a battery pack is in the charging insert and U1 senses the bridge to be in a balanced condition, the high rate of charge is enabled. When the battery pack is removed from the charging insert RT Battery is removed from the bridge circuit causing the bridge to be unbalanced. U1 senses the bridge to be unbalanced, the voltage on U1-14 being much larger than the voltage on U1-2, and the charger memory is reset.

When the battery pack temperature is more than 10°C below ambient, thermistor RT Battery is a high resistance and the voltage on U1-14 is larger than the voltage on U1-2 just as though no battery pack were present. There is no output from U1-6 or U1-5 and SCR Q2 and LED "READY" indicator DS802 remain off. The battery pack charges at a C/10 rate, determined by series resistance CR5, R1, R12/R4, CR8, R10 and DS801, for 700 mAh battery packs: R11 and CR9 are added for the 1200 mAh battery pack; until it is less than 10°C below ambient. At less than 10°C below ambient, the voltage

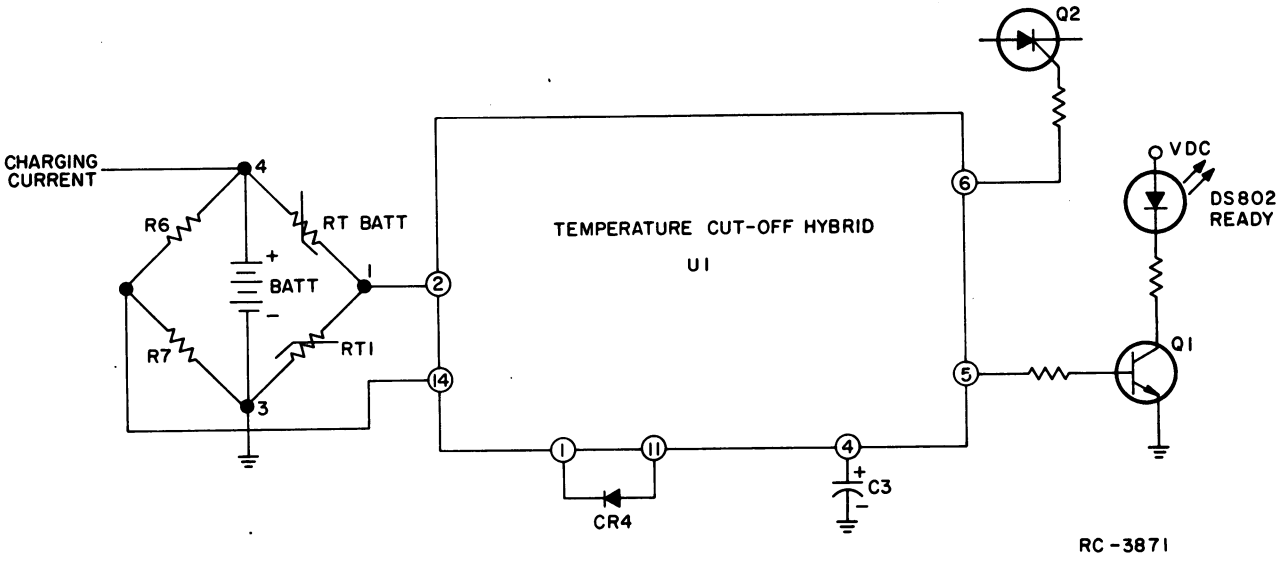


Figure 2 - Simplified Temperature Cut-Off Circuit

at U1-14 and U1-2 are nearly equal and the output at U1-6 goes high to fire Q2 and begin the high charge rate. As the battery pack temperature increases 10°C above ambient during overcharge, the voltage at U1-2 becomes equal to the voltage at U1-14 causing U1-6 to go low. U1-6 going low removes the gating signal from SCR Q2. Q2 cuts off and the charge rate switches from the high rate to the trickle rate. The larger voltage on U1-2 also causes U1-5 to go high. The high output on U1-5 causes transistor Q1 to conduct and DS802 to light. A memory circuit inside of U1 is set so that the same battery pack cannot be recharged at the high charge rate unless it is first removed from the charging insert to reset the memory.

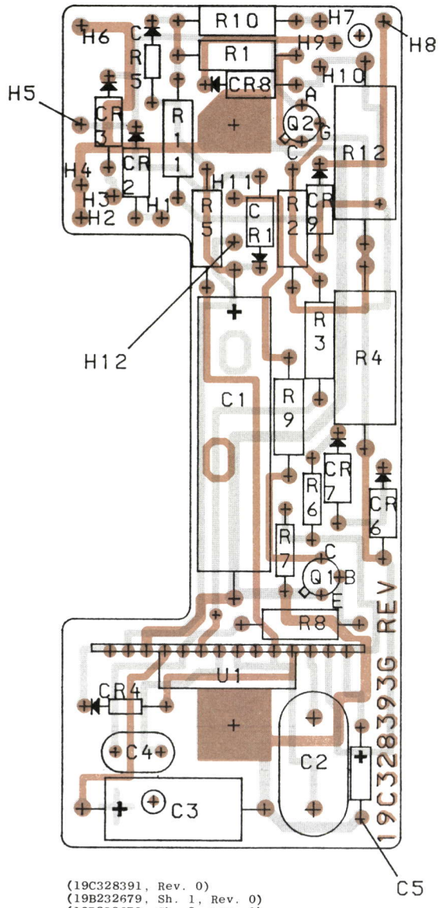
MAINTENANCE

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 LED indicators and fuse.

TROUBLESHOOTING

Should a difficult service problem arise, the Troubleshooting Procedure listed in the Table of Contents is provided to assist the service technician. Also, voltages are provided on the Schematic diagram to further assist the service technician to isolate any problem.



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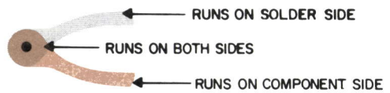
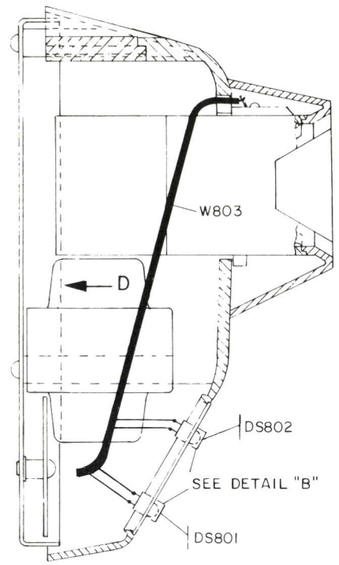
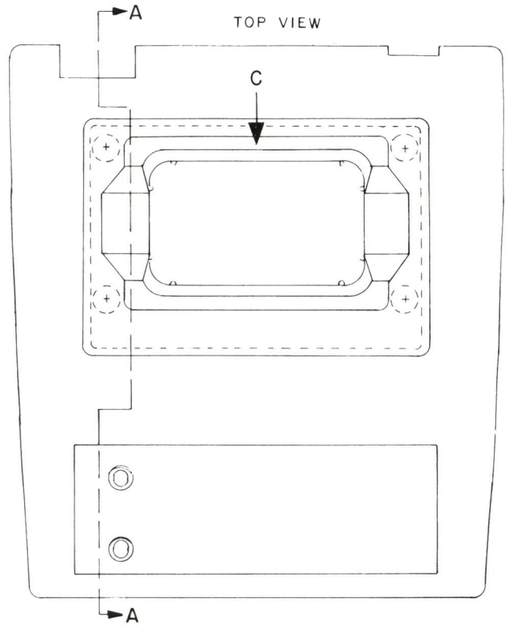
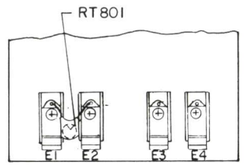
(19B232679, Sh. 1, Rev. 0)
(19B232679, Sh. 2, Rev. 0)





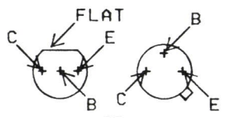
SECT. A-A





VIEW-C
CONTACTS ON SLEEVE

LEAD IDENTIFICATION
FOR Q1

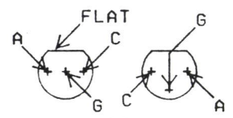


OR

IN-LINE TRIANGULAR
VIEW FROM CASE END

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

LEAD IDENTIFICATION
FOR Q2



OR

IN-LINE TRIANGULAR
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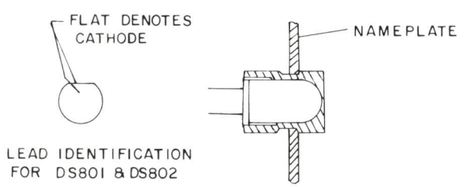
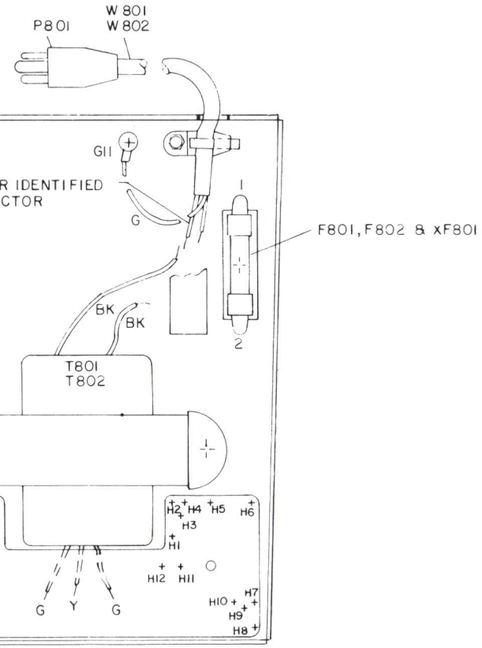


LEAD IDENTIFICATION
FOR DS801 & DS802

DETAIL "B"

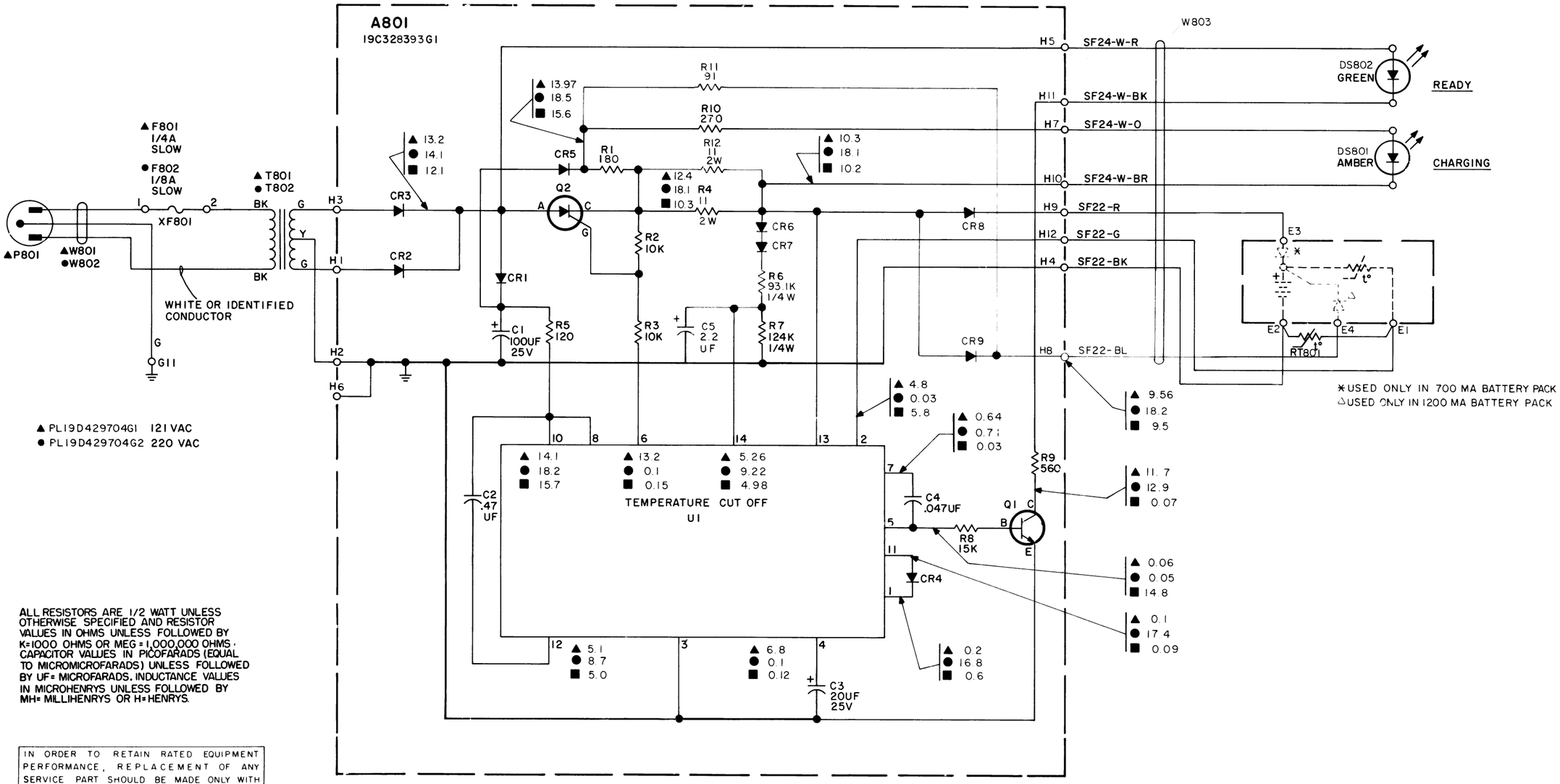


VIEW D

(19D430389, Rev. 0)

OUTLINE DIAGRAM

3 - HOUR CHARGER COMBINATION
351L3A1X



▲ PL19D429704G1 121 VAC
● PL19D429704G2 220 VAC

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.

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.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
PL19C328393G1	
PL19D429704G1	
PL19D429704G2	

▲ 8.7 VDC BATTERY, 121 VAC LINE, NORMAL TEMPERATURE
● NO BATTERY, 121 VAC LINE
■ 8.7 VDC BATTERY, 121 VAC LINE, HIGH TEMPERATURE

(RC-3872)
(19D429559. Rev. 0)

SCHEMATIC DIAGRAM

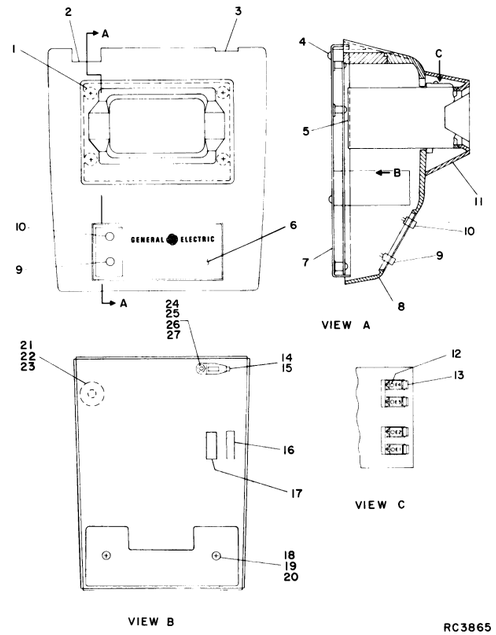
3 - HOUR CHARGER COMBINATION 351L3A1X

PARTS LIST

MPR 3-HOUR DESK CHARGER
351L3A1X AND 351M3A1X
19D429704G1 (RAPID 3)

SYMBOL	GE PART NO.	DESCRIPTION
A801		CHARGER BOARD 19C328393G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A115680P13	Electrolytic: 185 µf +150% -10%, 21 VDCW; sim to Mallory Type TTX.
C2	19A115680P111	Electrolytic: 50 µf +150% -10%, 35 VDCW; sim to Mallory Type TTX.
C3	19A115680P3	Electrolytic: 20 µf +150% -10%, 25 VDCW; sim to Mallory Type TTX.
C4	19A116080P105	Polyester: 0.047 µf ±10%, 50 VDCW.
C5	5491674P13	Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 162D.
		- - - - - - - - DIODES AND RECTIFIERS - - - - -
CR1 thru CR3	4037822P1	Silicon, 1000 mA, 400 PIV.
CR4 and CR5	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR6 thru CR9	4037822P1	Silicon, 1000 mA, 400 PIV.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q2	19A116642P1	Thyristor, silicon controlled: sim to Type 2N5064.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77P181J	Composition: 180 ohms ±5%, 1/2 w.
R2 and R3	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
R4	3R79P110J	Composition: 11 ohms ±5%, 2 w.
R5	3R77P121J	Composition: 120 ohms ±5%, 1/2 w.
R6	19C314256P29312	Metal film: 93.1K ohms ±1%, 1/4 w.
R7	19C314256P21243	Metal film: 124K ohms ±1%, 1/4 w.
R8	3R77P153J	Composition: 15K ohms ±5%, 1/2 w.
R9	3R77P561J	Composition: 560 ohms ±5%, 1/2 w.
R10	3R77P271J	Composition: 270 ohms ±5%, 1/2 w.
R11	3R77P910J	Composition: 91 ohms ±5%, 1/2 w.
R12	3R79P110J	Composition: 11 ohms ±5%, 2 w.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1	19D423164G1	Temp. Hybrid Coil.
		- - - - - - - - - - DIODES - - - - - - - - - -
DS801	19A134354P2	Diode, optoelectronic: yellow; sim to HEW. Packard 5082-4555.
DS802	19A134354P3	Diode, optoelectronic: green; sim to HEW. Packard 5082-4955.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - FUSES - - - - - - - - - -
F801	7487942P1	Slow blowing: 1/4 amp at 250 v; sim to Bussmann MDL-1/4.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P801		(Part of W801).
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT801	19C300048P6	Resistor, thermistor: 50K ohms ±10%; sim to NL Ind. 4D103.
		- - - - - - - - - - TRANSFORMERS - - - - - - - -
T801	19A134178P1	Power, step-down: Pri: 121 VRMS, 50/60 Hz, Sec: 1500 VRMS, 60 Hz.
		- - - - - - - - - - CABLES - - - - - - - - - -
W801	19B232987G1	Power: 3 conductors, approx 6 feet long. (Includes P801 & 19B209260P2 solderless terminal).
W803		CHARGER CABLE 19D429704G3 (Includes DS801, DS802)
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XF801	7141008P1	Fuseholder: 30 amps at 125 v; sim to Bussman 2863.
		MECHANICAL PARTS (SEE RC3865)
1	19A116773P108	Tap screw, Phillips POZIDRIV®: No. 7-19 x 1/2.
2	19C317175P3	Plug.
3	19B227249P1	Grommet.
4	19A116773P106	Tap screw, Phillips POZIDRIV®: No. 7-19 x 3/8.
5	19C328544G1	Sleeve assembly. (Includes items 12 & 13).
6	NP280659	Nameplate. (GENERAL ELECTRIC).
7	19C321499G1	Base assembly. (Includes items 19-24).
8	19E500894P3	Housing.
9	19A134521P3	Lens.
10	19A134521P2	Lens.
11	19D429698P1	Collar.
12	N136P503C	Tap screw, phillips head: No. 2-32 x 3/16.
13	19C327044P1	Contact, spring.
14	19A115185P3	Strap.
15	19A115185P4	Strap buckle: sim to Panduit Corp. TA-1.
16	19A130456G1	Fuse cover.
17	NP279917P10	Nameplate. (Fuse rating).
18	N80P13005C6	Machine screw, phillips: No. 6-32 x 5/16.
19	4035656P37	Spacer, threaded, metallic: No. 6-32 x 1/4.
20	N404P19C13	Lockwasher, internal tooth: No. 10.
21	19A134365P1	Bumper, rubber.
22	19A134366P1	Rivet, tubular.
23	N402P37C6	Flatwasher, steel: No. 6.
24	7141225P3	Hex nut: No. 6-32.
25	N404P13C6	Lockwasher, internal tooth: No. 6.
26	N402P7C6	Flatwasher, narrow: No. 6.
27	4037460P6	Stud, self clinching.



RC3865

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

TROUBLESHOOTING PROCEDURES

The test circuit shown can be used to simulate battery pack conditions and determine if the charger is working properly. Switch S1 simulates battery pack temperature (open-room temperature, closed-hot battery pack). Switch S2 resets charger logic, the same as removing the battery pack from the charging insert.

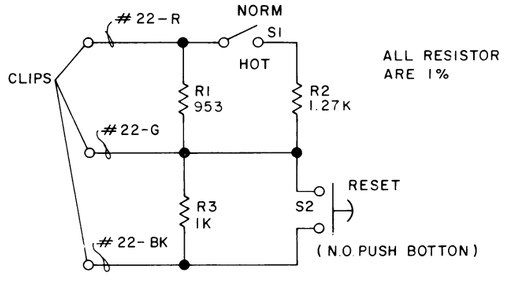
Connect the test circuit as shown on the diagram. Insert a battery pack into the charging insert. Use the logic chart and voltage readings on the diagram to determine the working condition of the charger.

If the charger works properly with the test circuit, but not with the battery pack, check thermistors RT1 and RT Battery. Each should measure approximately 50K ohms at room temperature (25 C).

Other Checks:

1. If a known good battery pack has been charging and the charger fails to shut-off (READY light does not come on) at the end of the charge time, check Q1 and Q2.
2. U1-11 always high, logic will not reset, check C2.
3. U1-6 always low, no high rate of charge, check C3.
4. U1-5 always low, logic will not reset, check C4.
5. No high rate of charge, check for open CR4.

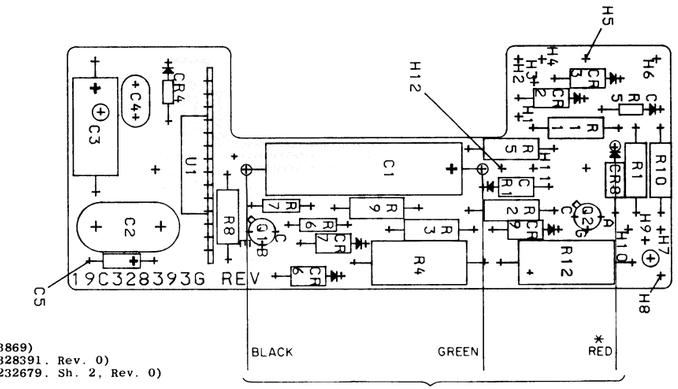
RAPID CHARGER
TEST CIRCUIT



CLIPS SIMILAR TO "THE GRABBER" POMONA ELECTRONICS
MODEL 3925

R1	19C314256P29530
R2	19C314256P21271
R3	19C314256P21001
S1	19A116887P1
S2	7481654 P1

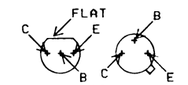
RC-3870



(RC-3869)
(19C328391, Rev. 0)
(19B232679, Sh. 2, Rev. 0)

TEST CIRCUIT CLIP LEADS
* THE RED CLIP LEAD CONNECTION IS FOR THE 700 mAh BATTERY PACK. FOR THE 1200 mAh BATTERY PACK CONNECT THE RED LEAD TO THE CATHODE OF DIODE CR9.

LEAD IDENTIFICATION FOR Q1



OR
IN-LINE TRIANGULAR
VIEW FROM CASE END

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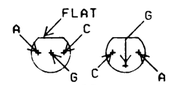
LEAD IDENTIFICATION FOR Q2



OR
IN-LINE TRIANGULAR
VIEW FROM CASE END

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Test Battery Condition	UI Pin				Test CKT Switch Position	
	11	4	6	5	S1	S2
No Battery	High	Low	Low	Low	Norm	Closed
Cold Battery	High	Low	Low	Low	Norm	Closed
Normal Battery Charging	Low	High	High	Low	Norm	Open
Charged Battery	Low	Low	Low	High	Hot	Open
Hot Battery Just Inserted	Low	Low	Low	Low	Hot	Open

Low = Pin Voltage 1.0 Volts
High = Pin Voltage 3.0 Volts

TROUBLESHOOTING PROCEDURE

3 - HOUR CHARGER COMBINATION 351L3A1X