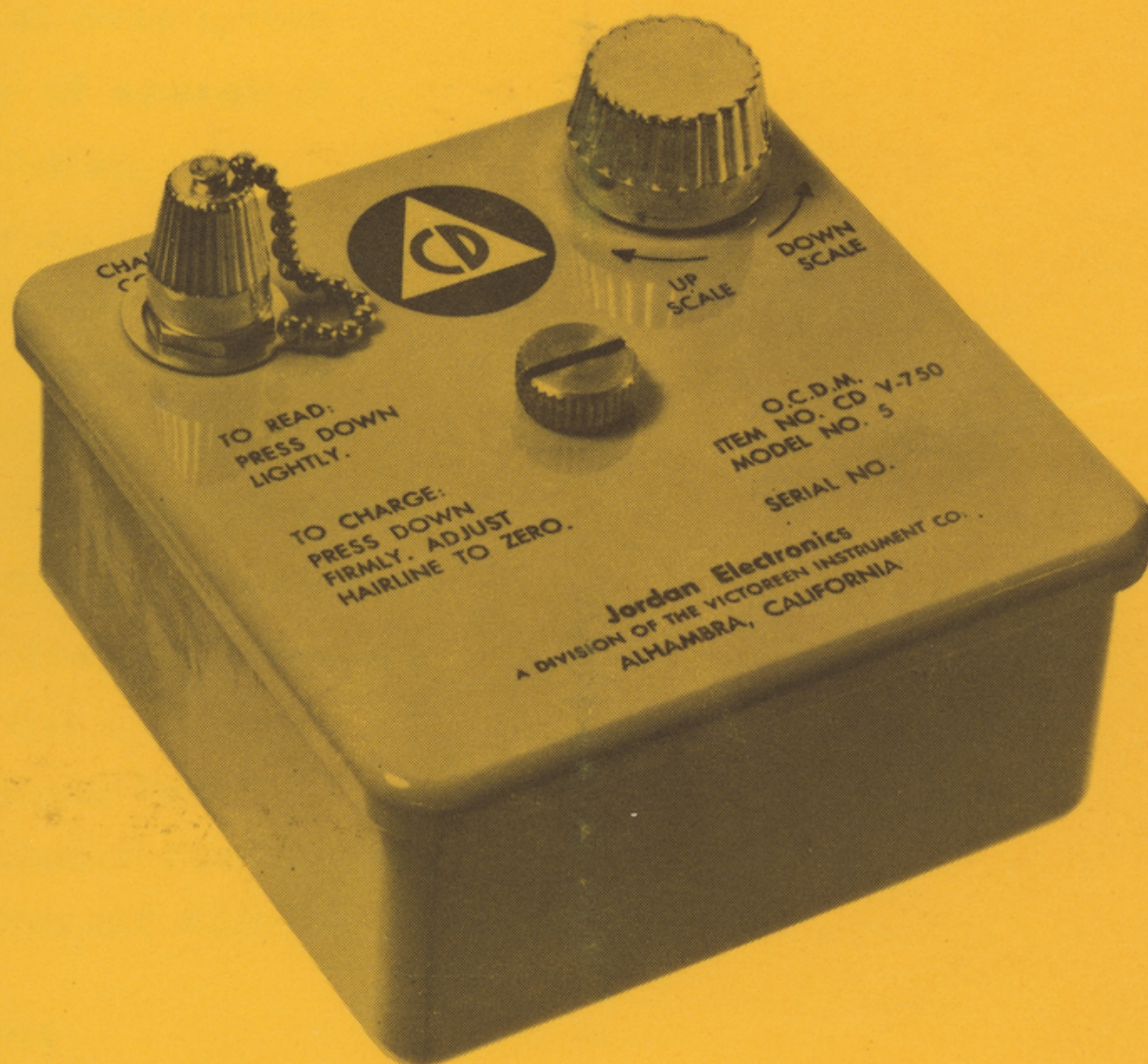


**operating  
and maintenance  
INSTRUCTIONS**



**Radiological Dosimeter Charger  
Jordan Model 750-5**

*OCDM Item No. CD V-750 — Model No. 5a*

**Jordan Electronics**

A DIVISION OF THE VICTOREEN INSTRUMENT COMPANY

ALHAMBRA, CALIFORNIA



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# operating and maintenance instructions

## 1.0 GENERAL DESCRIPTION

The V-750 Radiological Dosimeter Charger supplies the voltage required to charge or "ZERO" quartz fibre dosimeters.

A transistor oscillator converts the direct current from a flashlight battery to alternating current so that the transformer can "step up" the battery voltage (1.5 volts) to the 220 volts required by the dosimeter. A voltage control is used to adjust the output voltage to the exact value required to bring the dosimeter to zero.

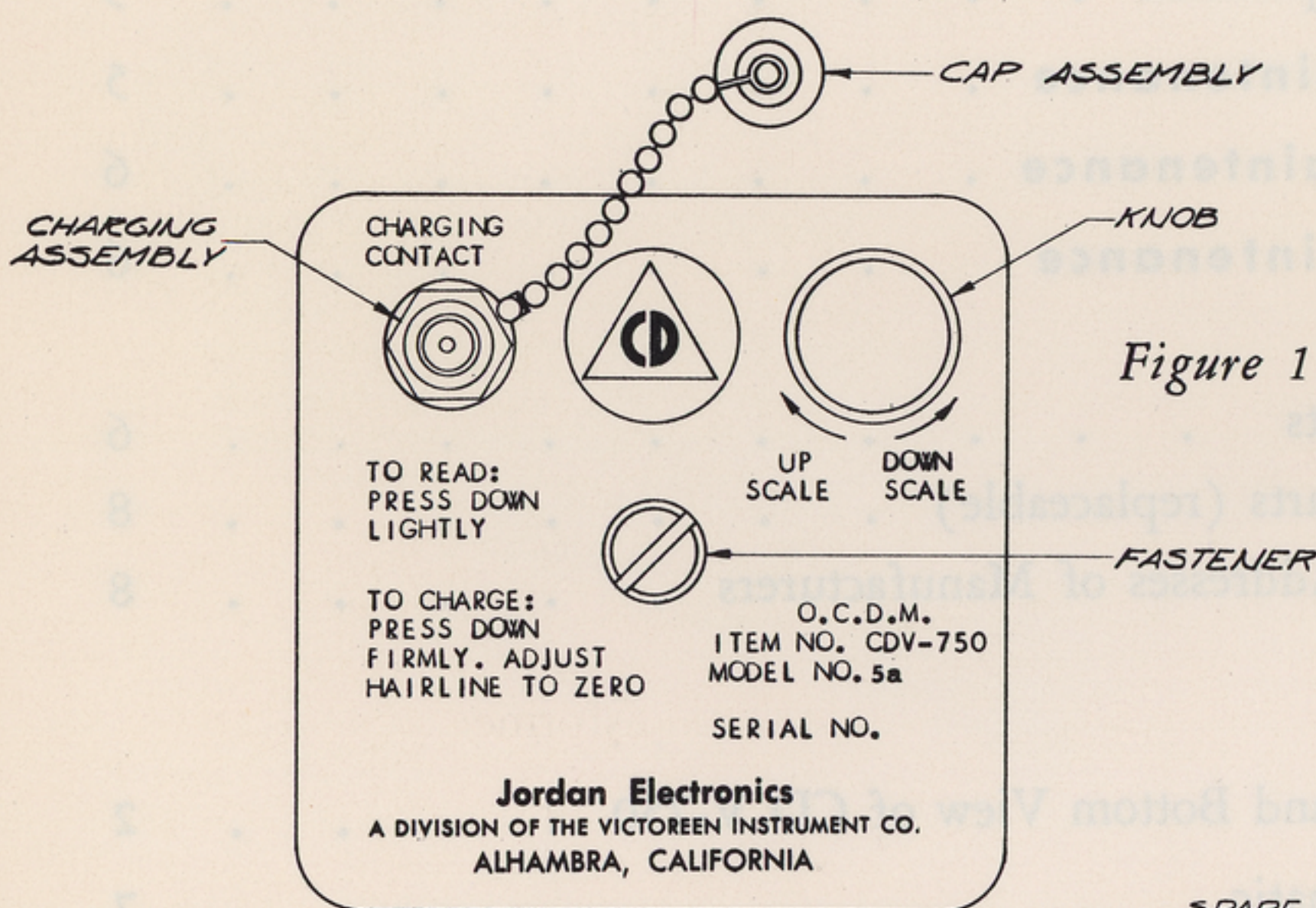


Figure 1 — Top View

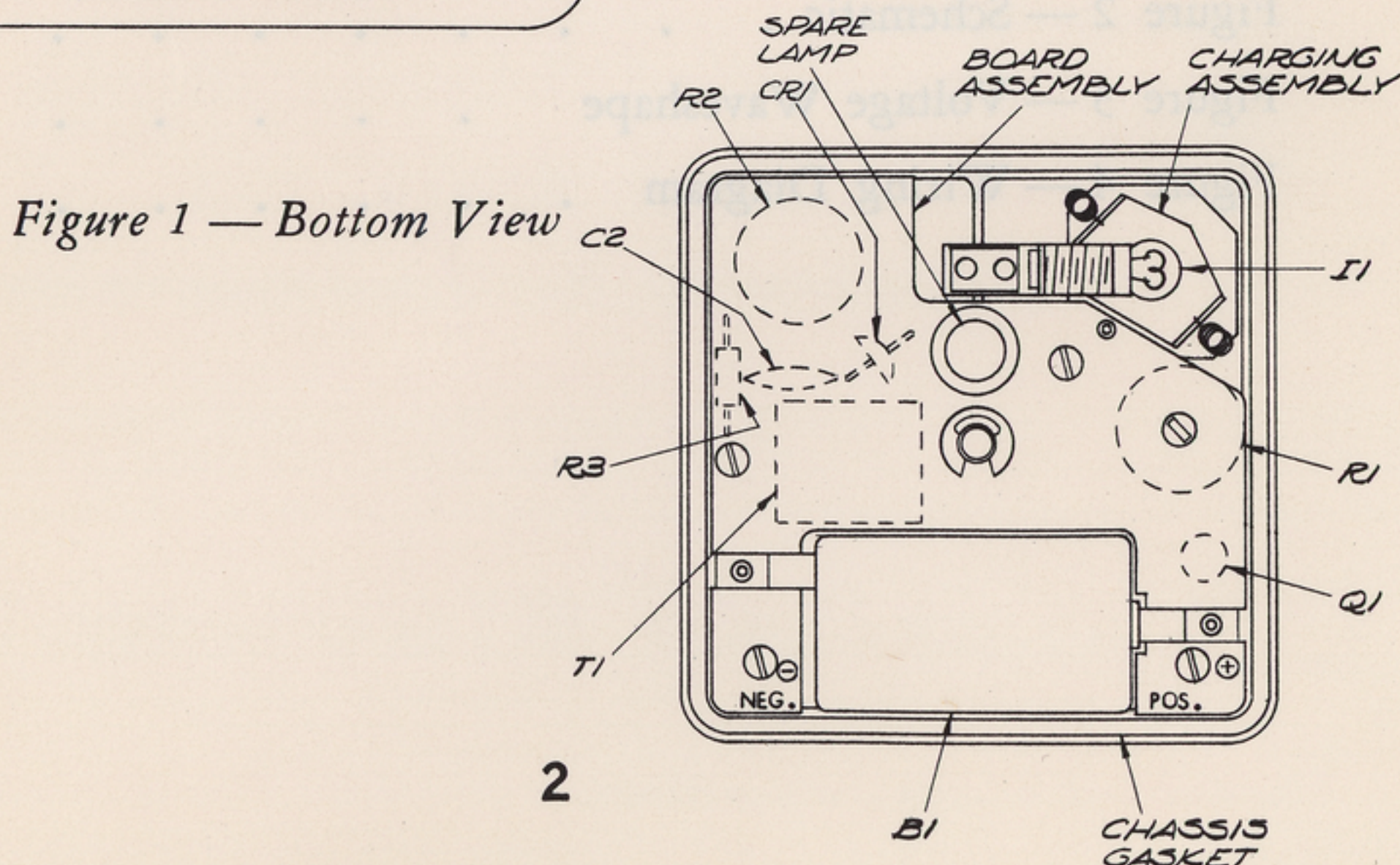


Figure 1 — Bottom View

## 2.0 THEORY OF OPERATION

The operation of the dosimeter charger circuit is governed mainly by the magnetic properties of the iron core of the transformer. The transistor serves as a switch to control the flow of current through the transformer primary winding.

Refer to the circuit schematic Fig. 2, page 7.

The switch  $SW_1$  is closed when the charging pedestal is depressed by the dosimeter. Current flows from the positive (+) electrode of the battery B through the bulb I to provide illumination for the dosimeter scale.

A small current flows from the positive (+) electrode of the battery into the transistor emitter (e) and out of the base (b) through the transformer winding  $N_1$  and then through the lower portion of the potentiometer resistor  $R_1$  back to the negative (-) electrode of the battery B.

The small current flowing out of the base (b) of the transistor allows the flow of a much larger current out of the collector (c). This large current flows through the transformer winding  $N_2$  and back to the negative (-) electrode of the battery B.

The current through  $N_2$  creates a magnetic flux in the transformer core. The increase of flux induces a voltage in  $N_1$  that tends to drive the base (b) of the transistor more negative and causes more base current to flow. This in turn causes more collector current to flow and so on until the transistor becomes "saturated" and no further increase takes place. This action is completed very rapidly.

The voltage induced in the other windings by the current through  $N_2$  depends on the rate of increase of the magnetic flux in the transformer core. When the core becomes fully magnetized, the flux can increase no more and, therefore, the rate of increase drops to zero and transformer action ceases.

When the core becomes magnetized and transformer action ceases, the voltage induced in  $N_1$  and applied to the base of the transistor drops to zero and the transistor collector current stops flowing. Now, with no current flowing through  $N_2$ , the magnetic flux in the transformer drops very rapidly. This rapid reverse change in flux induces a large reverse voltage in the secondary winding  $N_3$  for a short period of time. This completes the cycle and the process repeats itself as long as the switch SW remains closed.

Each high voltage pulse in the secondary  $N_3$  causes current to flow into the capacitor  $C_2$  for a short period of time. The energy of the pulse is stored in the capacitor and the voltage across the capacitor can be "pumped up" by these repetitive high voltage pulses to nearly the peak voltage of the pulses. The rectifier diode  $CR_1$  passes only positive pulses to the capacitor  $C_2$ .

The waveshape seen with an oscilloscope connected to the secondary  $N_3$  is shown on page 7.

The potentiometer resistor  $R_2$  and the fixed resistor  $R_3$  serve as a voltage divider across the capacitor. The potentiometer  $R_2$  is the control used to adjust the voltage applied to the dosimeter at the charging pedestal  $J_1$ .

During the interval between pulses, part of the charge on  $C_2$  leaks off through  $R_2$  and  $R_3$ . Therefore, a fast pulse repetition rate will result in the highest voltage on  $C_2$ . The repetition rate, and thus the voltage on  $C_2$  is controlled by the potentiometer resistor  $R_1$ .  $R_1$  is used as an internal calibration adjustment to obtain the proper voltage range to charge dosimeters.

### 3.0 INSTALLATION

Preparation of the dosimeter charger for operation is quite simple. Remove the case by loosening the case fastener. The knurled head can be turned with the fingers or, if it is too tight, with a coin inserted in the slot.

Install the 'D' cell in the opening provided for it in the printed circuit board. Observe the polarity markings on the battery and the printed circuit. The battery will fit in the holder only one way. **DO NOT** attempt to force it into position.

Replace the case and tighten fastening screw with fingers.

Unscrew the dust cap from the charging contact and the charger is ready for use.

### 4.0 OPERATION

#### 4.1 dosimeter reading

To read a dosimeter, place it on the charging contact and press down lightly to switch on the light. Do not press harder than necessary or the reading will be lost.

#### 4.2 dosimeter charging

To charge a dosimeter, press it down on the charging contact with sufficient force to bring the dosimeter body in contact with the threaded portion of the charging assembly.

This will provide sufficient force to actuate the charging switch in the dosimeter. Now read the dosimeter and adjust the control knob until the dosimeter indicates **ZERO**.

Remove the dosimeter from the charging contact.

### 4.3 emergency operation

When the 'D' cell is nearly discharged and a new one is not available, the dosimeter charger can still be made to operate. Two steps can be taken:

- a. Open the case and, with a small screwdriver, adjust the calibration control  $R_1$  in the direction marked DOWN SCALE. This will increase the charging voltage to compensate for the lost battery voltage.
- b. If step "a" still does not provide sufficient voltage to bring the dosimeter to zero, remove the lamp  $I_1$ . The lamp requires much more current than the charging circuit. The battery may have enough energy to operate the charging circuit, but not the lamp.

Without the lamp it will be necessary to make adjustments in small steps while reading the dosimeter each time with another source of illumination.

## 5.0 OPERATOR'S MAINTENANCE

Operator's maintenance should be limited to replacing the battery, cleaning the contacts and inspecting for visible faults. If the lamp appears dim or does not light, replace the battery. If operation is intermittent, clean the battery contacts.

If the lamp is bright, but the dosimeter cannot be brought to ZERO, try another dosimeter. If none of the dosimeters can be charged, check for contamination on the charging contact insulator or for a short circuit on the charging contact wire inside the charger.

## 6.0 PREVENTIVE MAINTENANCE

The only preventive maintenance required is removal of the battery when the dosimeter charger is to be stored, and cleaning the battery contacts if they appear corroded.

## 7.0 CORRECTIVE MAINTENANCE

When a malfunction cannot be corrected by the steps outlined in Section 5, further steps can be taken by a competent electronic technician.

Reference should be made to the schematic diagram, figure 2 and the wiring diagram, figure 4 on page 7.

Improper adjustment of the internal calibration control  $R_1$  can prevent operation. To adjust  $R_1$ , turn the control knob  $R_2$  full clockwise. Connect the negative lead of 20,000 ohm/V multimeter (Simpson 260 or equal) to the chassis. Set the meter to the 250V DC range. Connect the positive lead to the charging contact wire. Depress the charging pedestal to close the switch.

Starting from the full clockwise position, turn R<sub>1</sub> counter-clockwise until the meter indicates 57 volts.

If no voltage is obtained, replace the transistor. Almost any small PNP transistor will probably work.

If a new transistor doesn't work, remove C<sub>2</sub> and check for shorts with an ohmmeter. Check the rectifier diode CR<sub>1</sub> with an ohmmeter. Set the meter to the RX10 scale. With the meter leads connected one way, it should show a short, and the other way an open. If it shows a short or open both ways, replace it.

Check R<sub>1</sub> and R<sub>2</sub> with an ohmmeter. Check the transformer windings for continuity and interwinding shorts with an ohmmeter.

Inspect the printed circuit for damage and check all connections to it.

Across winding N<sub>3</sub> the waveform should look like the sketch in figure 3, and may be observed on an oscilloscope.

## 8.0 PARTS LIST

### 8.1 electrical parts

| Circuit Symbol  | Description and Function                                   | Mfgr. & Part No.   | Jordan Part No. | Recommended Spares |
|-----------------|--|--------------------|-----------------|--------------------|
| B <sub>1</sub>  | Battery, 'D' Cell  | Everready 950      | BA-0005         | 10                 |
| C <sub>2</sub>  | Capacitor, Ceramic Disc, .01 mf 500V (High Voltage Filter) | RI K500-05         | CC-0014         | 2                  |
| CR <sub>1</sub> | Diode (High voltage Rectifier) 250P.I.V.                   | Intl. RC 66-4195   | QD-0021         | 1                  |
| I <sub>1</sub>  | Lamp (Scale Illumination) I-131                            | GE-131             | EL-0003         | 2                  |
| Q <sub>1</sub>  | Transistor (Oscillator) PNP                                | U.S. TO-12         | QT-0033         | 2                  |
| R <sub>1</sub>  | Potentiometer (Calibrate) 1K ¼W 30%                        | CTS UPM-45 (32007) | RP-0102         | 1                  |
| R <sub>2</sub>  | Potentiometer (Control) 10meg ¼W 20%                       | CTS UP-45 (31998)  | RP-0106         | 2                  |
| R <sub>3</sub>  | Resistor, carbon (voltage divider) 4.7 meg ½W 10%          | IRC GBT ½          | RC 0475         | 2                  |
| T <sub>1</sub>  | Transformer (Oscillator)                                   | JORDAN             | TS-0026         | 1                  |

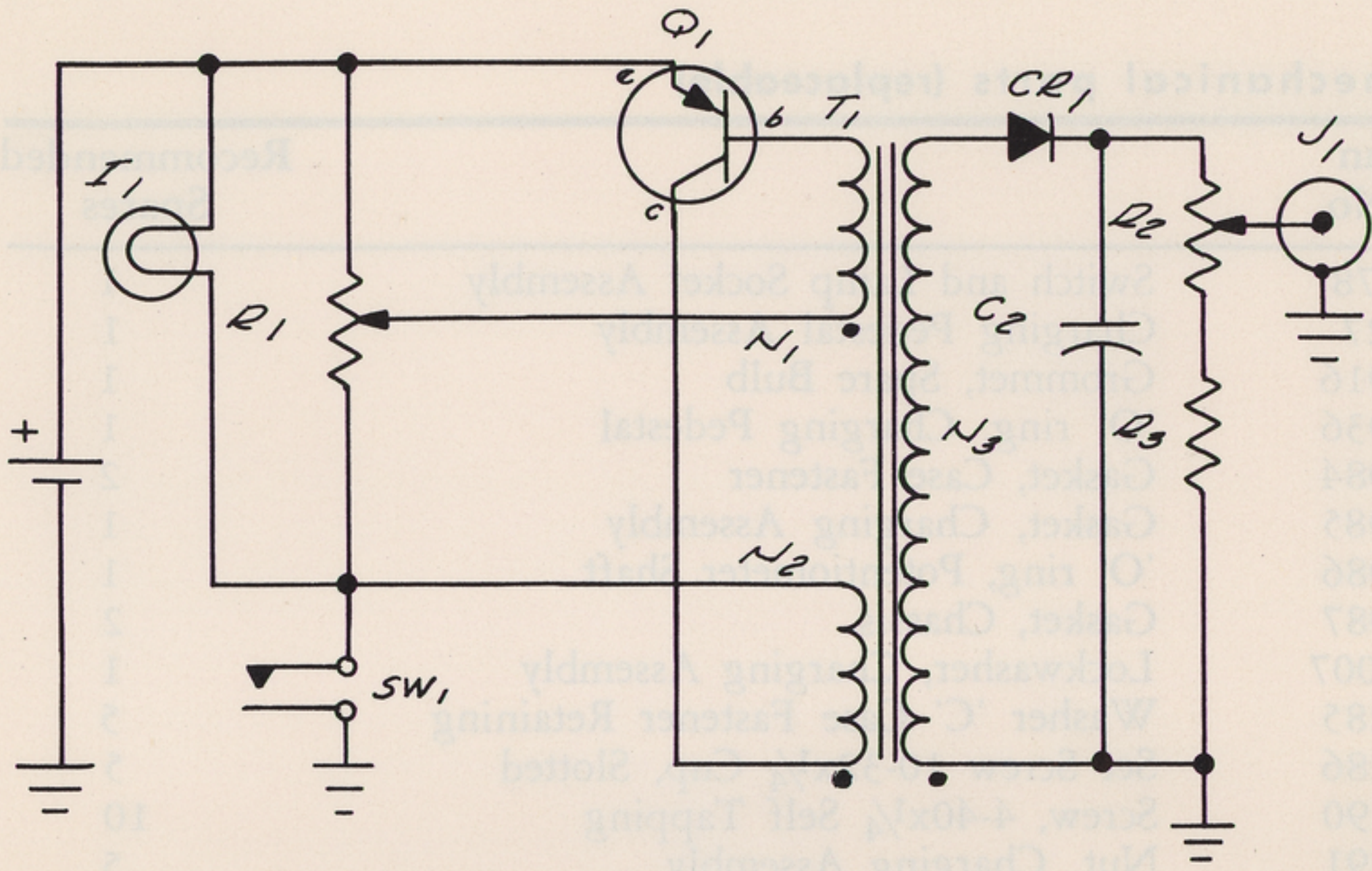


Figure 2 — Schematic

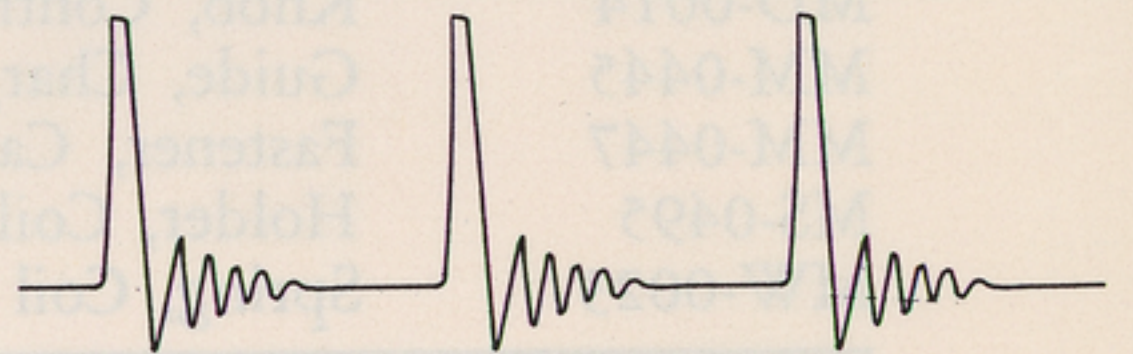


Figure 3 —  
Voltage Waveshape

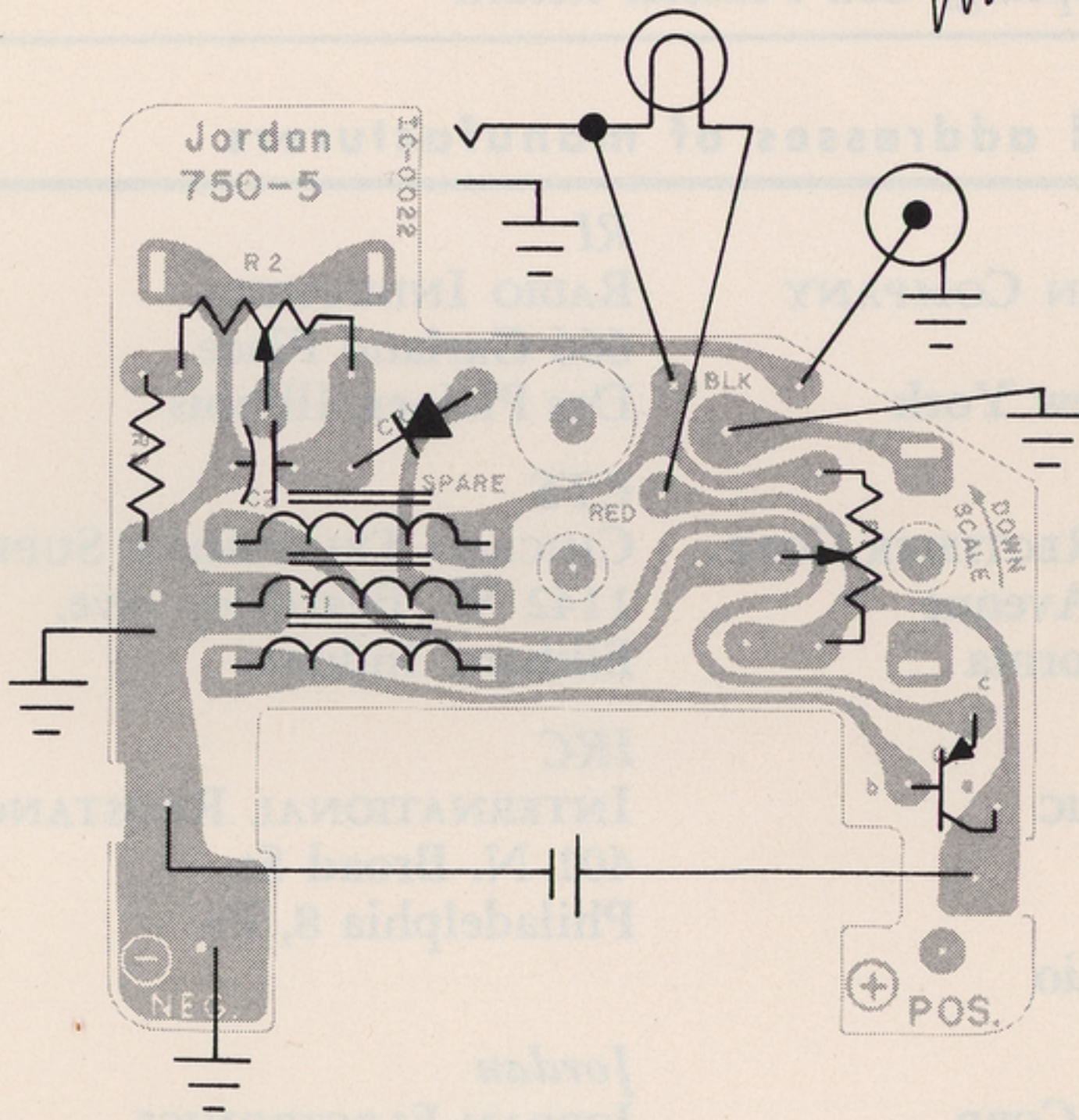


Figure 4 — Wiring Diagram



## 8.2 mechanical parts (replaceable)

| Jordan Part No. |                                    | Recommended Spares |
|-----------------|------------------------------------|--------------------|
| AE-0178         | Switch and Lamp Socket Assembly    | 1                  |
| AI-0027         | Charging Pedestal Assembly         | 1                  |
| HG-0016         | Grommet, Spare Bulb                | 1                  |
| HG-0036         | 'O' ring, Charging Pedestal        | 1                  |
| HG-0084         | Gasket, Case Fastener              | 2                  |
| HG-0085         | Gasket, Charging Assembly          | 1                  |
| HG-0086         | 'O' ring, Potentiometer Shaft      | 1                  |
| HG-0087         | Gasket, Chassis                    | 2                  |
| HW-1007         | Lockwasher, Charging Assembly      | 1                  |
| HX-0285         | Washer 'C' Case Fastener Retaining | 5                  |
| HX-0286         | Set Screw 10-32x1/4 Cup, Slotted   | 5                  |
| HX-0290         | Screw, 4-40x1/4 Self Tapping       | 10                 |
| HX-0291         | Nut, Charging Assembly             | 5                  |
| IC-0022         | Board, Printed Circuit             | 2                  |
| MD-0013         | Chassis                            | 1                  |
| MD-0014         | Knob, Control                      | 1                  |
| MM-0445         | Guide, Charging Pedestal           | 1                  |
| MM-0447         | Fastener, Case                     | 1                  |
| MS-0495         | Holder, Coil Spring                | 1                  |
| MW-0023         | Spring, Coil Pedestal Return       | 5                  |

## 8.3 names and addresses of manufacturers

### *Eveready*

NATIONAL CARBON COMPANY  
30 East 42nd St.  
New York 17, New York

### *Intl. RC*

INTERNATIONAL RECTIFIER CORP.  
1521 East Grand Avenue  
El Segundo, California

### *GE*

GENERAL ELECTRIC  
LAMP DIVISION  
Nela Park  
Cleveland 12, Ohio

### *U.S.*

U. S. TRANSISTOR CORP.  
149 Eileen Way  
Syosset, New York

### *RI*

RADIO INDUSTRIES  
666 Garland Place  
Des Plaines, Illinois

### *CTS*

CHICAGO TELEPHONE SUPPLY CORP.  
1142 W. Beardsley Ave.  
Elkhart, Indiana

### *IRC*

INTERNATIONAL RESISTANCE CO.  
401 N. Broad St.  
Philadelphia 8, Pa.

### *Jordan*

JORDAN ELECTRONICS  
Alhambra, California

