

# Technical Manual

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**MAINTENANCE  
INSTRUCTIONS FOR**

**STROBONAR  
700/770**

# Technical Manual

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August, 1969

## MAINTENANCE INSTRUCTIONS FOR **STROBONAR 700/770**

**Honeywell** PHOTOGRAPHIC PRODUCTS DIVISION  
P. O. BOX 1010 • LITTLETON, COLORADO • 80120

73000636-001A-4C-August, 1969- Printed in U.S.A.

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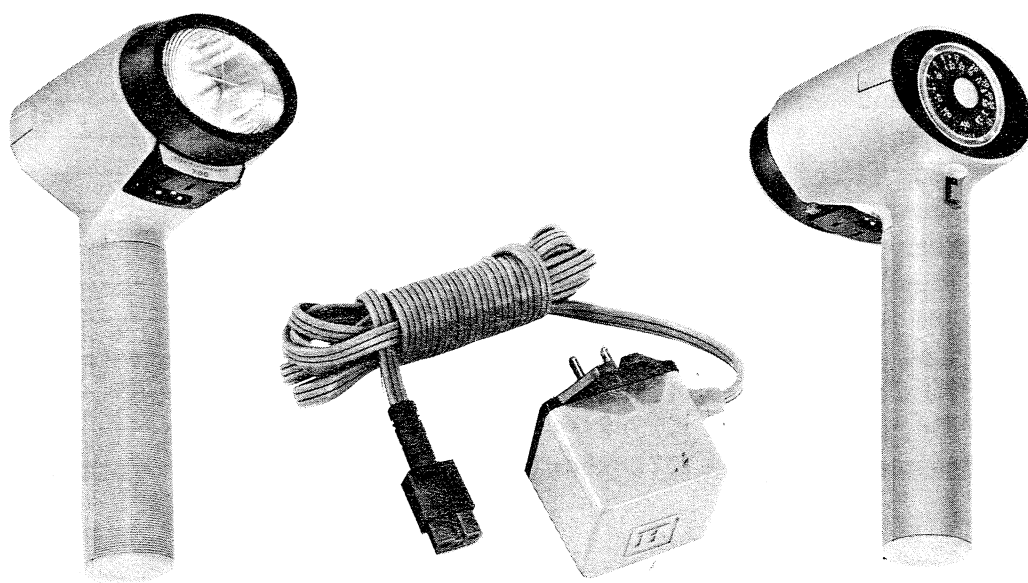


Figure 1-1. Strobonar 700

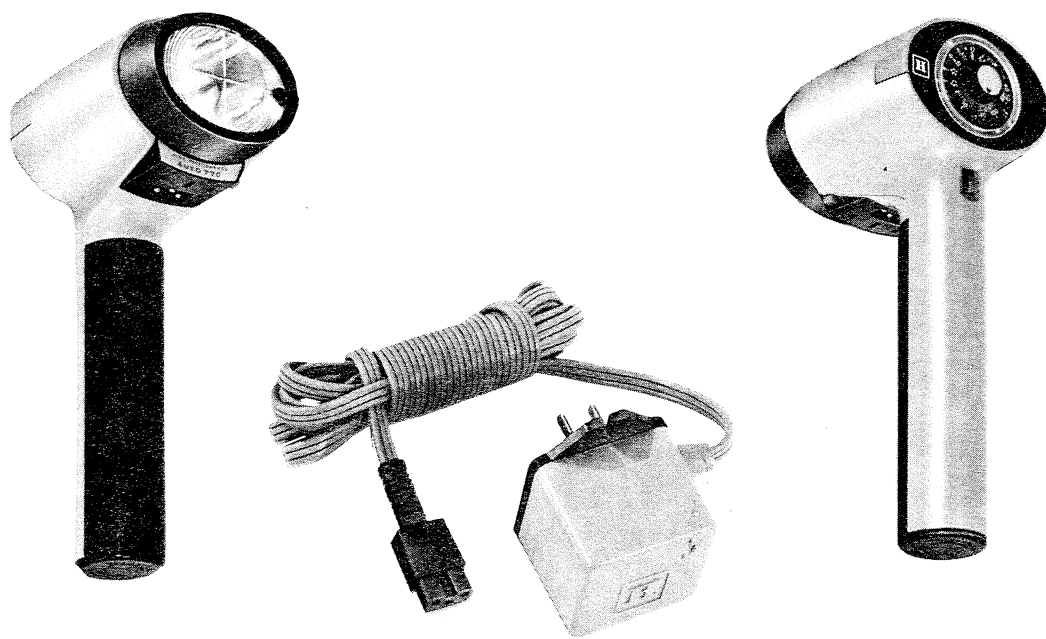


Figure 1-2. Strobonar 770

## SECTION 1

### INTRODUCTION

#### 1-1. PURPOSE

This manual provides maintenance instructions for the Honeywell Strobonar 700 and 770. All statements apply to both the 700 and 770 unless specifically designated for either model. This manual contains information for operational checkout, principles of operation, troubleshooting, disassembly, repair, replacement, and adjustment of the unit. Replaceable parts information for the unit is also provided.

Each model has been modified to improve the circuitry and/or function of components. These modifications have been included in the manual. Examine the unit to determine which modifications exist in that particular Strobonar.

#### 1-2. UNIT DESCRIPTION

The Strobonars (Figures 1-1 and 1-2) are electronic flash units powered by:

- A. An internal rechargeable battery.
- B. An ac convenience outlet through an auxiliary wall transformer which also powers the internal battery charger.
- C. The internal battery and the auxiliary wall transformer simultaneously.

A two-position thumb switch located on the back of the handle turns the battery on or off. The thumb switch must be in the OFF (down) position to charge the battery.

The battery consists of four "Sub-C" Ni-Cad cells located in a replaceable tray at the back of the flash head. The ac power supply (an external wall transformer box) and camera shutter cord plug into the receptacle assembly located under the flash head. A neon (ready) lamp lights to indicate when the unit can be flashed at full power output. Interchangeable filter lenses can be cammed into place in the nose ring over the standard lens.

The Model 770 Strobonar has a quench circuit that can automatically regulate exposures at distances from 2 to 22 feet. This circuit may be used when the unit is charged to at least 80 percent of full power. A knob on the back of the battery tray controls the quench on/off or AUTO/MAN switch.

Study Figures 5-1 through 5-14 to familiarize yourself with the physical make up of the Strobonars.



1-3. SPECIFICATIONS

A.	A-C Power Source:	105 to 129 vac, 50 to 60 Hz
B.	Portable Power Source:	Four "Sub-C" size nickel cadmium rechargeable cells
C.	Weight:	26 ounces, 36 ounces including wall transformer box
D.	Size:	Height, 9.6 inches Head width, 3.6 inches Head length, 4.0 inches
E.	Light Coverage:	Horizontal, $50^{\circ} \pm 2^{\circ}$ Vertical, $50^{\circ} \pm 2^{\circ}$
F.	Effective Exposure time (700):	1 millisecond
G.	Effective Exposure time (770):	1 millisecond, no quench Approximately 15 microseconds, maximum quench
H.	Light output, Center Axis:	90 to 150 lumen-seconds per square foot when measured at 4 feet
I.	Color Temperature:	Approximately noon daylight
J.	Power Switch:	2-position, Battery ON-OFF
K.	Ready Light:	Neon "Full Light" Indicator (Batt)
L.	Battery Charging Time:	18 hours at 117 Vac, 60 Hz
M.	Automatic Operation (770):	7 to 11 lumen seconds per square foot when measured at the center of a 4-foot minimum diameter 18 percent reflectance neutral gray target that is spaced 4 feet from the flash head. 5.50 to 11.0 lumen seconds per square foot when measured at the center of an 8-foot minimum diameter 18 percent reflectance neutral gray target that is spaced 8 feet from the flash head

- N.     Automatic Control (770):     AUTO- Turns quench circuit on  
  MAN - Turns quench circuit off
- O.     Recycle Time:  
          Battery                   15 seconds maximum to full power (ready  
   light) indication with fully charged batteries.
- AC                        5.0 seconds to 80% of cut-off voltage with  
   129 VAC input.
- 7.5 seconds to 80% of cut-off voltage with  
   117 VAC input.
- 18 seconds to 80% of cut-off voltage with  
   105 VAC input.
- Combined Battery       12 seconds or less to full power with fully  
          and AC                   charged batteries and the unit connected  
   to the AC line (through the auxiliary  
   transformer).

## SECTION 2

### PRINCIPLES OF OPERATION

#### 2-1. GENERAL

Strobonars 700 and 770 provide a source of repeating photoflash light. They are operated by either battery current, ac, or combination battery - ac and include a battery charger circuit. The ac operation is provided by an auxiliary wall transformer box that also contains a rectifier. Each type of operation is selected by a two-position thumb switch. However, the wall transformer box must be connected for ac, combination battery - ac, and battery charge operation.

The automatic circuit (quench) is Strobonar 770 regulates exposure in either battery and/or ac operation. It may be used whenever the unit is charged to 80 percent of full power. The AUTO/MAN switch must be in AUTO position to use the quench circuit.

When the two-position thumb switch is set to ON (up), four "Sub-C" size (welded) nickel cadmium rechargeable cells power a transistor-driven flyback oscillator. The oscillator circuit converts the low dc voltage from the cells to high dc voltage which is stored in a storage capacitor. A voltage regulator or cut-off circuit regulates the voltage by controlling the output of the oscillator circuit. Closing the camera shutter contacts or open flash switch S3 enables a trigger circuit which initiates firing the flashtube.

Setting the thumb switch to OFF (down) position with the wall transformer box plugged into the ac line permits ac and battery charge operation of the Strobonars. The storage capacitor is formed while the batteries are charging.

Setting the thumb switch to ON position with the wall transformer box plugged into the ac line permits simultaneous ac and battery operation.

A ready indicator on the back of the Strobonar lights to indicate that the unit is ready to deliver full light output.

#### 2-2. CIRCUIT DESCRIPTION

Circuit description is discussed for the three types of operation: battery, ac, and quench.

##### A. BATTERY OPERATION (See Figures 5-16, 5-17, 5-18)

In battery operation the Strobonars use a transistor-driven flyback oscillator to charge a high-energy storage capacitor (440 to 650 $\mu$ f) to develop anode voltage for the flashtube.

## 1. Oscillator Circuit

The oscillator (Figures 5-16, 5-17, 5-18) circuit consists of transistor Q1, transformer T1, and a feedback circuit C5, R3, R5, and SCR1. The oscillator has two modes of operation: power and idle.

### a. Power Mode

The high-energy storage capacitor C3A is charged during the power mode. Setting switch S1 to ON (up) applies power to the oscillator. The bias voltage across R2 and R3 and the transient across T1 starts conduction of Q1 and SCR1. With SCR1 turned on, Q1 is forward biased. As Q1 conducts, current flows through primary winding N1 of transformer T1 which induces a regenerative feedback voltage in feedback winding N3. The positive feedback to the emitter of Q1 causes Q1 to saturate. Feedback voltage is also coupled through C8 and R14 to the gate terminal of SCR1 which keeps SCR1 turned on during the positive half of each cycle of oscillator operation.

Since Q1 is saturated, the current from battery BT1 increases and stores energy in transformer T1. The rate of current increase is determined by: (1) voltage applied, (2) primary circuit resistance, and (3) primary circuit inductance.

The current from the battery increases to the point where the transistor comes out of saturation. That is, when the current flowing in the primary winding is equal to the current gain of the transistor times the base current. At this point, the voltage across the transistor increases and the rate of change of current through T1 decreases, causing the voltage across T1 to drop. The voltage decrease across the transformer primary is reflected to the feedback winding N3, and Q1 turns off. Transformer T1 then reverses polarity and tries to maintain the primary current flowing. The flyback voltage increases until CR2 conducts, and holds until the current through CR2 goes to zero.

This sequence of operation is repeated for many cycles until C3A charges to the cut-off voltage. A portion of the voltage across C3A is impressed across the neon (ready light) VR1. When the breakdown voltage of VR1 is reached, VR1 conducts causing current to flow through CR14 which produces a back bias voltage (cathode-to-gate) on SCR1. This back bias is sufficient to overcome the forward bias coupled through C8 and R14 and turns off SCR1. Thus, the oscillator switches to the idle mode.

Capacitor C3A charges to the cut-off voltage (435 to 490 volts depending upon the capacitance of the storage capacitor). The cut-off voltage is preset by adjusting potentiometer R6.

In power mode the oscillator oscillates at a frequency between 2 and 4KHz. However, the frequency varies widely from unit to unit.

The following items summarized oscillator operation during power mode:

- 1) SCR1 operates during a portion of each oscillator cycle.
- 2) Impedance of feedback circuit is approximately 35 ohms when SCR1 and Q1 are conducting.
- 3) Base Current of transistor Q1 is high.
- 4) Oscillator operates at a frequency between 2 and 4 KHz.
- 5) Energy is transferred to the storage capacitor C3A.
- 6) Efficiency is high.
- 7) Battery current drain is high.

b. Idle Mode

The oscillator switches to the idle mode when capacitor C3A charges to the full energy or cut-off level which turns off SCR1, as previously discussed under power mode. When SCR1 turns off, the oscillator switches from a power producing circuit to a simple feedback circuit with low power capability. A portion of the feedback circuit, C5 and R5, provide self-bias for the oscillator circuit. The oscillator frequency during the idle mode is 10 to 20 KHz or approximately five times greater than the power mode. Its frequency is controlled primarily by the tuned secondary of T1. When anode voltage decreases to 80 percent of the cut-off voltage, VR1 de-ionizes and removes the back bias from SCR1. Thus, SCR1 turns on, and switch-over from the idle mode to power mode is initiated.

The following items summarize oscillator operation during idle mode:

- 1) SCR1 does not conduct during any portion of an oscillator cycle.

- 2) Impedance of feedback circuit is approximately 1K ohms.
- 3) Base current of transistor Q1 is low.
- 4) Oscillator operates at a frequency between 10 and 20 KHz.
- 5) Energy is not transferred to storage capacitor.
- 6) Battery current drain is low.

## 2. Trigger Circuit

Capacitor C4 charges to the voltage across R9. The charge path is through R10, T1 primary, and R8 to the supply voltage. Closing the camera shutter contacts at J1 or closing switch S3 (open flash button) completes the discharge path for C4. Thus, C4 discharges through primary of T2 and generates a trigger pulse in the secondary of T2. The trigger pulse ionizes the gas in the flashtube FT1. The tube then fires and discharges C3A. At this time, the oscillator switches to power mode, and C3A and C4 recharge.

The recycle time from flash to ready, using fully charged batteries, is 15 seconds maximum. At the completion of recycle, the ready indicator lights and the Strobonar is ready to flash again.

## B. AC OPERATION (See Figures 5-16, 5-17, 5-18)

The auxiliary wall transformer serves as an ac power supply for the Strobonars, and it powers the batter charger which is located in the Strobonars. The wall transformer plugs into a standard 105 to 129 Vac wall outlet and is connected through a three-wire power cord to a plug-in receptacle located under the flash head.

Plugging in the wall transformer applies ac line power to pins A and B of T4. Diode CR18 serves as rectifier. Diode CR20 isolates the power input prongs (located in the Strobonar plug-in receptacle at the bottom of the flash head) from anode voltage. Transformer T4 operates as a step-up auto-transformer. With 105 to 129 Vac applied at points A and B, the voltage between points E and F will be from 280 to 350 Vac, rms.

When pin F of T4 is positive in respect to pin E, current flows through CR20 and CR18 to charge high-energy storage capacitor C3A. On the next half-cycle of ac, pin F is negative in respect to pin E; so CR18 blocks the flow of current. Thus, half-wave rectification of the stepped-up ac line is produced. Anode voltage is between 390 and 490 volts when operating on ac line.

The unit operates on ac when the wall transformer is connected and switch S1 is in OFF position. The unit operates on a combination of battery (oscillator) and ac, if the wall transformer is connected to the Strobunar and switch S1 is set to ON. The ac recycle time to 80 percent of anode cut-off voltage in 7.5 seconds with 117 Vac line applied to the unit.

The ready light usually will not light on ac. The ready light is set to come on during battery operation or simultaneous battery and ac operation. The unit, however, will operate properly if 18 seconds is allowed between flashes.

The trigger circuit functions the same for ac operation as for battery operation.

Pins C and D of the wall transformer supply approximately 11 Vac to the battery charger (diode CR19). The battery charger is energized if the wall transformer is connected to the Strobunar and switch S1 is set to OFF. Charging current is passed through the battery when pin D of T4 is positive in respect to pin C. Charging current with 105 to 129 Vac, 60 Hz applied to the unit is between 80 to 150 ma. The internal battery is fully charged after 18 hours of charging from 117 Vac line.

Storage capacitor C3A is automatically formed while the batteries are charging.

#### C. QUENCH OPERATION (770)

Strobunar 770 (Figure 5-17 and 5-8) has a quench circuit which can automatically regulate exposure at distances of 2 to 22 feet from the subject. The quench circuit may be used on battery and/or ac if the storage capacitor is charged to at least 80 percent of full energy. Using a photo-sensitive SCR as a transducer, the quench circuit detects light reflected from the subject and integrates (sums) its electrical analog. When the integrated electrical analog of light reaches a predetermined level, a xenon-filled quench tube (FT2) connected across the flashtube (FT1) is triggered. When both tubes are ionized, FT2 has less than 1/10 the impedance of FT1, thus shorting FT1 and quenching the light.

Anode voltage is applied through voltage divider network R11, R15, and R17 to the base of Q2. Thus, Q2 saturates and C10 charges to anode voltage. Saturating Q2 shorts the integrating (summing) network C14 and R16, and keeps C14 from charging.

Closing AUTO/MAN switch S2 allows C12 to charge to the voltage across R26 and turns on Zener diode CR10. Diode CR10 provides a regulated 6.2 volts used to bias SCR3. Potentiometer R24 establishes the quench level. When FT1 flashes, anode voltage drops and turns off Q2. The current generated by reflected light from the subject striking photo-sensitive SCR3 is then integrated by C14. When C14 charges to the trigger level of SCR3, SCR3 turns on and

discharges C12 through the primary of quench trigger transformer T3. This provides a trigger pulse for FT2. Quench tube FT2 then fires and shorts out (quenches) the flashtube FT1.

Capacitors C13 and C15 prevent erratic quench operation. Diode CR11 prevents the base of Q2 from going more negative than 0.6 volt in respect to the emitter. Capacitor C10 couples the leading edge of the pulse generated when FT1 fires and insures that Q2 turns off the instant the flashtube fires.



## SECTION 3

### CHECKOUT AND TROUBLESHOOTING

#### 3-1. GENERAL

Insure that all electrical connections are good; that the storage capacitor has been formed; and that the batteries are fully charged before checking or adjusting the Strobonars. The storage capacitor is automatically formed after the batteries have been charged with 117 Vac applied to the Strobonar through the auxiliary wall transformer for two hours. To accelerate forming, flash the unit every two or three minutes.

#### WARNING

Serious shock hazard exists if the terminals of C3A are touched when the storage capacitor is charged. Discharge the storage capacitor through a 100 ohm, 2 watt resistor to insure that unit is safe to work on.

#### 3-2. OPERATIONAL CHECKOUT

##### A. TEST EQUIPMENT

The following test equipment is required for operational check of the units.

Volt-Ohm Meter - Triplett Model 630-NA or equivalent

DC Power Supply - Variable to 500 VDC

Four Ni-Cad "D" cells and associated charger-Honeywell catalog #318.

Isolation Transformer - Triad Type N-53M or equivalent

Light Meter - Honeywell TE 611, EGG Model 580-11, or equivalent.

Quench Calibrator - Honeywell TE 534, used only to calibrate the quench circuit.

The following test equipment, in addition to the equipment listed above, is required to service the unit at the Service Man's Option.

D-C Ammeter (0-1 amp range)

Oscilloscope (0.2 volts/div sensitivity, 50  $\mu$ s/div, sweep).

B. STORAGE CAPACITOR C3A FORMING

Before performing any operational checkout, form C3A for at least one hour at 450 to 490 volts. Flash the unit every two or three minutes to accelerate forming.

C. STORAGE CAPACITOR C3A LEAKAGE CHECK

1. Using a dc power supply, form the capacitor for one hour at 450 to 490 volts with a 1K ohm, one percent resistor in series with the capacitor.

NOTE

Step 2 measures the leakage current of C3A by reading the voltage across the 1K ohm resistor.

2. With 490 volts across C3A, connect voltmeter across the 1K resistor.
3. If the leakage current exceeds 4.9 ma (4.9 volts across the 1K ohm resistor), replace C3.

D. ANODE VOLTAGE CHECKS

Proceed as follows to check anode voltage:

1. Battery Operation
  - a. Remove battery tray as shown in Figure 5-1.
  - b. Connect "D" cells (Catalog #318) to the battery contacts as shown in Figure 5-2.
  - c. Set thumb switch S1 on back of unit to ON.
  - d. Connect voltmeter as shown in Figure 5-2.
  - e. Anode cut-off voltage, for a given value in  $\mu\text{f}$ , should be within  $\pm 10$  volts of the voltage indicated in the chart (Figure 5-3). Value in microfarads is marked on top of capacitor C3. Voltage limits are between 425 and 490 volts, and capacitance between 440 and 650  $\mu\text{f}$ .

## 2. AC Operation

### WARNING

Use an isolation transformer when measuring voltages with the unit operating on ac.

- a. Remove the battery tray as shown in Figure 5-1 to gain access to test point.
- b. Connect the auxiliary wall transformer.
- c. Set thumb switch S1 on the back of the unit to OFF.
- d. Connect voltmeter as shown in Figure 5-2.
- e. The anode voltage should be at least 80% of anode cut-off voltage as indicated in the chart (Figure 5-3).

### E. RECYCLE TIME - BATTERY OPERATION

Check that the recycle time to full power neon indication (cut-off) is not greater than 15 seconds.

### F. RECYCLE TIME - AC OPERATION

Check that recycle time to 80 percent of full power (cut-off) is as follows:

<u>Line Voltage</u>	<u>Recycle Time to 80% of Cut-off Voltage</u>
105 VAC	18 seconds or less
117 VAC (Nominal)	7.5 seconds or less
129 VAC	5 seconds or less

### G. CENTER LIGHT OUTPUT CHECK

Check that the center light output is between 1440 and 2400 beam candle power seconds (90 to 150 lumen seconds per square foot when measured with Strobunar four feet from the diffusing lens of the light meter).

### H. AUTOQUENCH LIGHT OUTPUT CHECK (770)

1. Position the Strobunar four feet from the center of an 18 percent reflectance neutral gray target which has a minimum diameter of four feet. The diffusing lens of the light meter must be at the center of the target.

2. Activate the quench circuit by setting the quench switch to AUTO.
3. Flash the Strobosnar and measure its light output.
4. The light output must be between 7 and 11 lumen seconds per square foot.
5. Repeat steps 1 through 3 using a target which has a minimum diameter of eight feet and with the Strobosnar positioned eight feet from the target.
6. The light output must be between 5.50 and 11 lumen seconds per square foot.
7. If the light output (steps 4 and 6) are not within tolerance, the quench circuit must be calibrated using the Honeywell Quench Calibrator TE 534. If you do not have the Quench Calibrator, exchange the quench circuit Card Assembly for one that has been calibrated by Honeywell.

### 3-3. TROUBLESHOOTING

Take advantage of the material supplied in this manual to help locate troubles or faults in the electronic circuit. Consult the troubleshooting data (Paragraph 3-3,D) when necessary. Use the diagrams in Section 5 when troubleshooting. If necessary, re-read the circuit description in Section 2.

#### A. STEPS IN TROUBLESHOOTING

1. The first step in troubleshooting a defective unit is to determine which area of the circuit contains the fault. Perform a good operational check to determine what the unit is NOT doing. Observe the actions of switches and indicators to help locate the fault. Make a few key voltage measurements. For example, determine if the fault is in the oscillator circuit or trigger circuit.
2. The second step is to locate the defective part responsible for the abnormal operation. Some faults such as burned-out resistors and transformers, arcing, etc., can be located by sight, smell, and hearing. The majority of faults, however, must be located by checking voltage, resistance, capacitance, etc.
3. The third step is to repair the defective unit. A replacement part should occupy the same position as the original part. The lead dressing should be the same as the original.

## B. COMPONENT CHECKS

No attempt is made in the troubleshooting data to describe how to test or check a particular part. The method of checking and testing is left to the technician. However, the technician is reminded of the following:

1. Turn off power and discharge C3A before making resistance measurements.
2. Set ohmmeter to the lowest range when checking continuity.
3. Set ohmmeter to the highest range when checking high resistance.
4. Capacitors which are shorted can be found by resistance measurements.
5. Check the large electrolytic capacitor (C3A) for leakage current. The leakage current must not exceed 4.9 ma with 490 vdc applied across the capacitor. Form capacitor before performing leakage test.
6. A capacitor which is suspected of being open can be checked, by shunting a good capacitor across it, and seeing if this makes the unit operational.

## C. PRECAUTIONS

1. Follow the listed precautions while troubleshooting the Strobonar.
2. Do not connect an oscilloscope or meter across R6, R7, or VR1 when checking or setting cut-off voltage.
3. Use extreme caution against shorting components when making voltage measurements on the circuit board.
4. If the "Sub C" batteries are of questionable condition or if excessive dc testing is required, substitute four Ni-Cad "D" cells.
5. Use an isolation transformer when operating the unit on ac.

## D. TROUBLESHOOTING DATA

1. No Flash - Battery or AC operation
  - a. Insure that all external connections make proper contact.
  - b. Check anode voltage as described in Paragraph 3-2, D. If proper value of anode voltage is present, momentarily connect

a neon tube (Part No. 16756822-001) across the contacts of J1 and observe the following:

1) Neon Blinks

C4, R8, R9, R10 and T2 primary are good. Possible faults that still exist are: T2 secondary open, T2 secondary shorted, faulty connection from T2 to FT1, and faulty FT1.

2) Neon Tube Does Not Blink

a) Check R8, R9, R10 for open.

b) Check C4 and T2 primary for open or short.

c. If no or low anode voltage, check the following:

1) C3A for high leakage current, short, or open.

2) CR2 for short.

3) CR2 for open (battery operation only).

2. Intermittent Flash

Possible causes:

Low anode voltage, low voltage across primary of trigger coil, faulty trigger capacitor C4, defective trigger coil or flashtube FT1.

3. Operates on AC, Not Battery

a. Insure that the batteries are charged.

b. Determine if idle mode is present by listening for high pitch sound from the oscillator circuit.

c. If idle mode is not present, check transformer T1 and switch S1 for continuity.

d. Check Q1 for open or short.

e. Check R2 for open.

4. Operates in Idle Mode Only
  - a. Check R5, R14, and CR14.
  - b. Momentarily short anode of SCR1 to cathode. If the circuit advances to the power mode and remains in the power mode only while SCR1 is shorted (equivalent to being on), momentarily short the gate of SCR1 to the anode through a 47K ohm resistor. If the oscillator circuit advances to the power mode and remains in that condition until cut-off, check C8, R14 and associated connections.
  - c. If the gate-to-anode connection through the 47K ohm resistor must be maintained for the circuit to remain in the power mode, remove SCR1 from the circuit, set up test circuit as shown in Figure 5-4, and check SCR1 as follows:
    - 1) Set potentiometer 1R3 for 0 current on meter 1M1.
    - 2) Close switch 1S2, hold switch 1S1 closed, and increase 1R3 until meter 1M1 reverses and goes in a negative direction. The reading on 1M1 should be 1 to 2 ma.

NOTE

To re-check SCR1, release 1S1 and repeat steps 1 and 2.

5. Operates in Power Mode Only
  - a. Check SCR1 for an anode-to-cathode short. Then determine which component (CR4, R5, C5, or SCR1) is shorted.
  - b. If a short is not detected, remove the gate lead of SCR1. The power mode should not exist. Remove SCR1 and check per Figure 5-4. The reading on 1M1 should be 1 to 2 ma.
6. No Cut-off
  - a. Determine if neon VR1 is firing at proper anode voltage (See Figure 5-3).
  - b. Check R6, R7, and VR1, if VR1 does not fire (regardless of R6 setting).
  - c. If cut-off does not occur with VR1 fired, check SCR1 circuit as described in Step 5, Operates in Power Mode Only.

7. Improper Cut-Off Voltage

If the cut-on voltage is less than 80% of the cut-off voltage, replace VR1.

NOTE

Observe polarity (indicated by green dot) when replacing VR1.

8. No AC Operation

- a. Substitute the wall transformer box with one known to be good.
- b. If the unit is still inoperative, check CR20 and R36, and replace as necessary.
- c. If unit is operative after substitution of the wall transformer, check CR18 and T4.

9. No Battery Charger Operation

Check S1, CR19, and T4 secondary.

10. Quench Circuit (770)

NOTE

If CR11 or CR21 is open, replace Q2 and CR21. Recalibrate the quench circuit if any of the following components are replaced: CR10, C14, R16, R24, and SCR3.

WARNING

Before replacing Q2, check CR11 and CR21. A defective CR11 or CR21 will damage the replaced transistor.

a. Premature or Full Quench

If the voltage across C3A drops sharply (approximately 10  $\mu$ s) when the contacts of J1 are shorted together, the quench tube FT2 is firing before the main flashtube FT1 becomes ionized. Three conditions cause this fault.



- 1) Premature FT2 firing only with S2 open:

Check to determine if the shield around FT2 is disconnected from ground.

- 2) Premature FT2 firing with S2 open or close:

Check to determine if the shield around FT2 is disconnected from ground.

- 3) Premature FT2 firing only with S2 closed:

Quench tube circuit is at fault. Check for the following:

- a) Quench circuit calibration (R24).
- b) Q2 off or open.
- c) C16 shorted.
- d) CR10 shorted.
- e) CR11 shorted.

b. Late Quench (High Light Output)

Check the following:

- 1) Quench circuit calibration (R24).
- 2) CR21 shorted.
- 3) CR10 open.

c. No Quench

Check the following:

- 1) Quench circuit calibration (R24).
- 2) Q2 shorted.
- 3) SCR 3.
- 4) CR21 shorted.
- 5) CR21 open.

6) S2 open.

7) C12 or T2 open or shorted.

8) FT2.

d. Inconsistent or Erratic Quenching

Check the following:

1) C13, C15, C16, and Q2 open.

2) CR11 shorted.

3) Q2.

4) SCR3 and FT2.

5) CR21.

## SECTION 4

### MAINTENANCE

#### 4-1. GENERAL

This section contains procedures for disassembly, cleaning, electrical component removal, reassembly, adjustments, and quench circuit calibration of Strobonars 700 and 770.

#### 4-2. TOOLS AND TEST EQUIPMENT

No special tools are required for maintenance of Strobonars 700 and 770. Phillips screwdrivers, diagonal cutters, long-nose pliers, soldering iron, etc. are adequate to perform all necessary repair and replacement.

#### 4-3. DISASSEMBLY

##### WARNING

Serious shock hazard exists if the terminals of C3A are touched when the storage capacitor is charged. Discharge the C3A through a 100 ohm, 2 watt resistor to insure that the unit is safe to work on.

Disassemble the unit to the extent necessary for operational checkout, troubleshooting and repair. Reassembly is the reverse of disassembly. Disassemble the unit as follows:

- A. Squeeze the two battery tray release buttons as shown in 1, Figure 5-1, and withdraw the battery tray.
- B. Remove the two screws (2, Figure 5-1) that hold the chassis assembly to the housing, and pull the chassis assembly out the front of the housing.
- C. To remove the nose ring assembly from the chassis assembly, remove the three screws (3, Figure 5-1) that hold the nose ring assembly to the chassis. Separate the nose ring from the chassis.
- D. Continue disassembly as required. (See Figures 5-5 through 5-9).

#### 4-4. CLEANING

Remove dust and foreign matter from the unit as follows:

A. MECHANICAL AND ELECTRICAL COMPONENTS

Wipe the large surface areas with a clean, dry, lint-free cloth. Use low pressure compressed air to blow dust from hard-to-reach areas. When using compressed air, always direct the first blast at the floor to remove any moisture from the air line.

B. REFLECTOR AND LENS

To clean the reflector and lens, perform the following procedures:

1. Disassemble unit as described in paragraph 4-2.
2. Wipe the reflector surface with a clean, dry, lint-free cloth.
3. Hold lens by the edges and clean with a brush or lint-free cloth.

4-5. ELECTRICAL COMPONENT REMOVAL

Refer to Figures 5-10 through 5-18 to locate the components to be removed and replaced. When removing or replacing electrical components, observe the following precautions:

- A. Use a heat sink when applying heat to prevent damage to nearby components and the circuit board.
- B. Apply heat sparingly to one lead of the component and lift clear of the adjacent components. Repeat for the other leads.

4-6. ADJUSTMENTS

A. CUT-OFF (FULL POWER)

NOTE

Insure that the storage capacitor C3A is formed and that the batteries are fully charged before adjusting the cut-off voltage.

1. Remove the battery tray as shown in Figure 5-1.
2. Connect "D" cells (Catalog #318) to battery contacts as shown in Figure 5-2.
3. Set thumb switch S1 on back of unit to ON.

4. Connect voltmeter as shown in Figure 5-2.
5. Wait until the neon ready indicator lights and then flash the unit.
6. Repeat step 5 three or four times while observing the voltmeter.
7. Adjust cut-off potentiometer R6 (3, Figure 5-1) for the proper anode cut-off voltage. Anode (oscillator) cut-off voltage for a given value in  $\mu\text{f}$ , should be  $\pm 5$  volts of the voltage indicated in the chart (Figure 5-3). Value in microfards is marked on top of capacitor C3. Voltage limits are between 425 and 490 volts, and capacitance between 440 and 650  $\mu\text{f}$ .
8. After adjusting cut-off voltage, observe that the voltmeter reading decreases gradually until the cut-on voltage is reached. The cut-on voltage should be from 20 to 80 volts below the cut-off voltage. The neon ready light should glow at cut-off and continue to glow until cut-on.
9. Repeat steps 5 through 9 until adjustment is correct.

#### B. QUENCH CALIBRATION

Remove the quench circuit (circuit card number 2) from the unit and calibrate it with a TE534 Quench Calibrator. If you do not have a TE534 Quench Calibrator, exchange the quench circuit card for one that has been calibrated.

#### NOTE

Circuit card Number 2 has been incorporated with circuit card Number 1 on the modified 770 units.

## SECTION 5

### PARTS LIST AND DIAGRAMS

#### 5-1. GENERAL

This section lists all replaceable parts. It contains assembly, waveform, and schematic diagrams. The following explains the column heads used in the parts list.

##### A. INDEX

This column lists the number of each part as shown in the diagrams.

##### B. SCHEMATIC REFERENCE

This column lists the schematic reference designator of electrical parts.

##### C. HONEYWELL PART NUMBER

This column lists the number by which an item may be ordered from Honeywell-Photographic Products Division, Denver, Colorado.

##### D. DESCRIPTION

This column lists the part name and specifications required for identification.

##### E. QUANTITY PER UNIT

This column lists the total quantity of each item used in the unit or assembly.

#### 5-2. ORDERING INFORMATION

When ordering spare or replacement parts, always specify the unit model number, serial number, item description, and Honeywell part number as they appear in the parts list.

#### NOTE

When ordering parts, add an "H" and delete the "-" on all part numbers.

Example:

Part No. as listed: 73000023-004

Order as shown: H73000023004

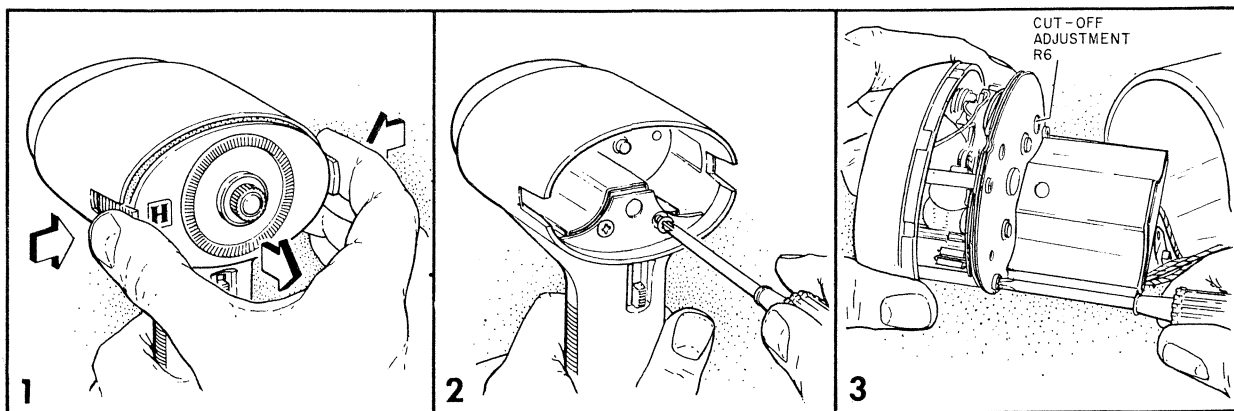


Figure 5-1. Disassembly Procedure

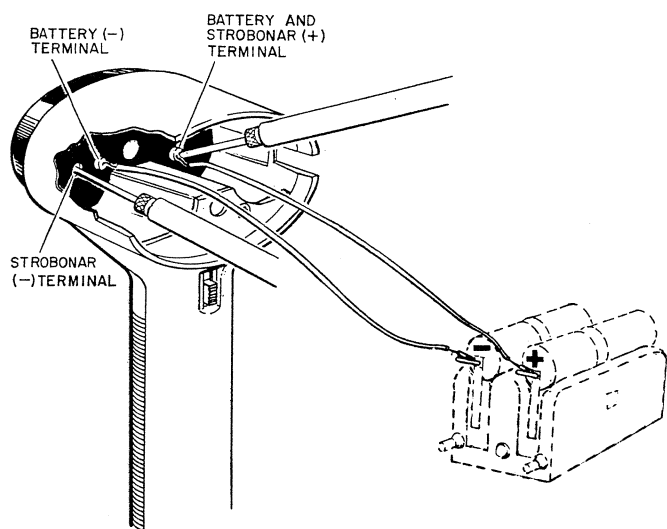


Figure 5-2. Anode Voltage Checks

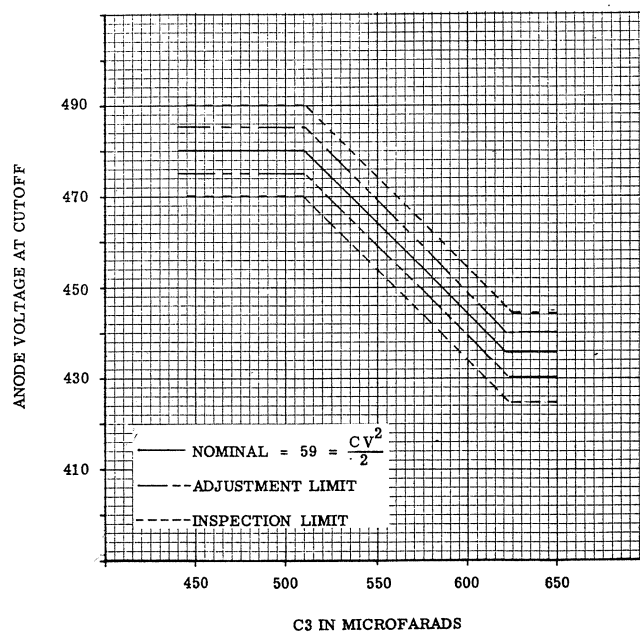


Figure 5-3. Cut-off Voltage VS Capacitance for 59 Watt-Seconds of Stored Energy

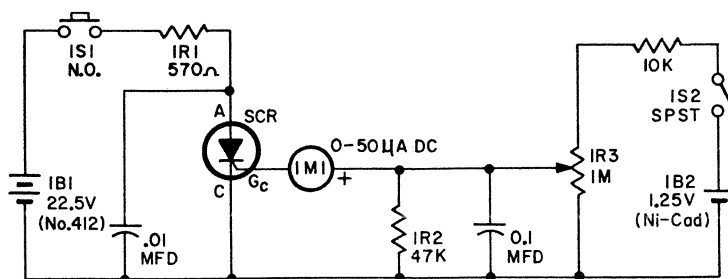


Figure 5-4. SCR Test

Figure 5-1 through 5-4

REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
1		73000023-003	Battery and Tray Assembly (with batteries)		1
1		73000023-004	Battery and Tray Assembly (with batteries)	1	
2		16761246-023	Screw, Flat Head	2	2
3		73001039-003	Cap & Housing Assembly		1
3		73001039-004	Cap & Housing Assembly	1	
4		73000022-003	Decal, Receptacle		1
4		73000022-004	Decal, Receptacle	1	
5		16766479-003	Chassis Assembly		1
5		16766479-004	Chassis Assembly	1	
6		73000595-003	Sleeving	2	2
7*		16766627-001	Bushing, Handle	1	1
8*	C3A	73000929-001	Capacitor, Electrolytic A-450-650 $\mu$ fd, 500 VDC		1
8*	C3A	73000929-002	Capacitor, Electrolytic A-440-650 $\mu$ fd, 500 VDC	1	
9*		16766626-001	Handle Cover	1	
9*		16766626-002	Handle Cover		1
		73000806-001	Insulator, Quench Trigger Lead		1
10*		16759761-002	Housing	1	1

\* Part of item 3.



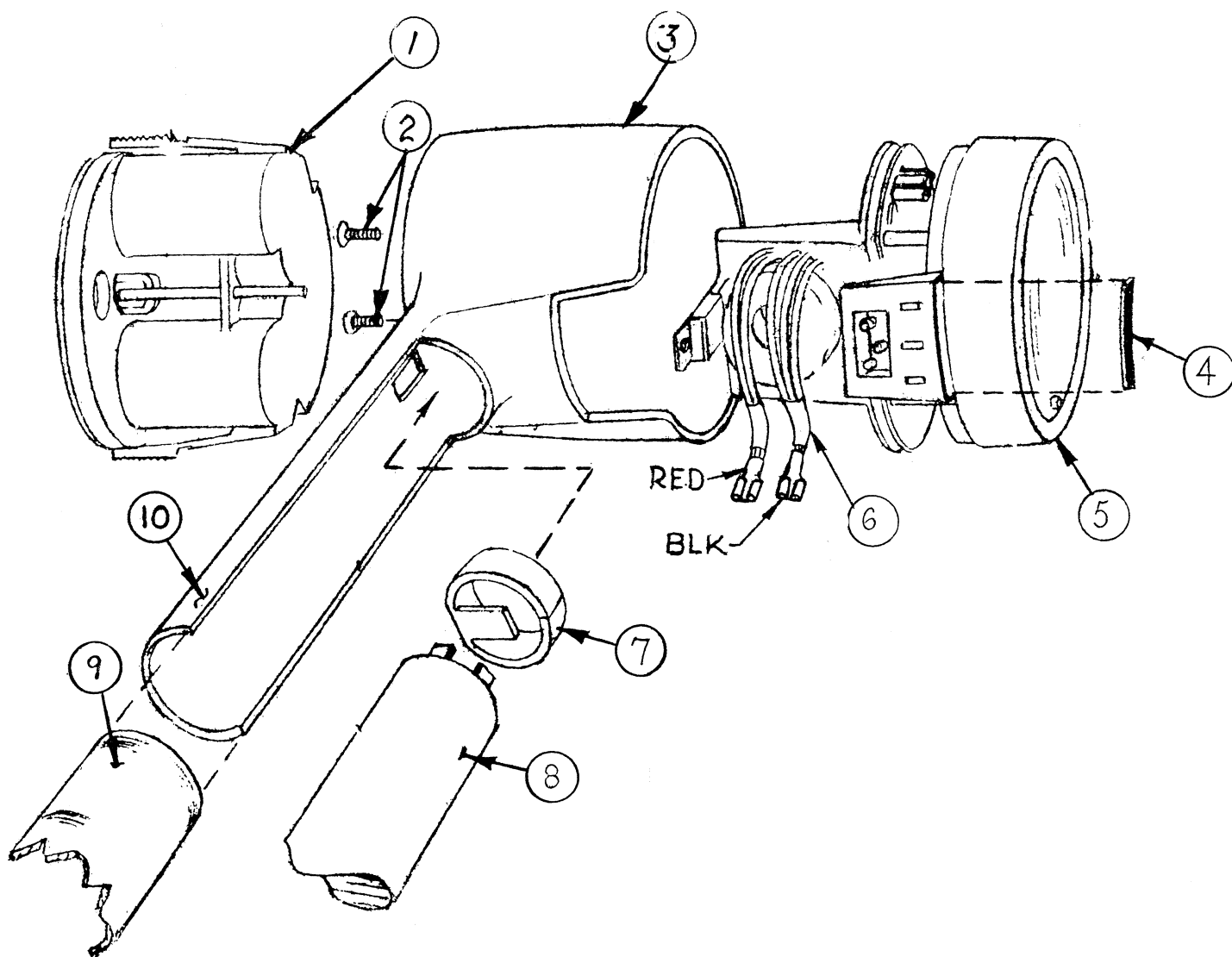
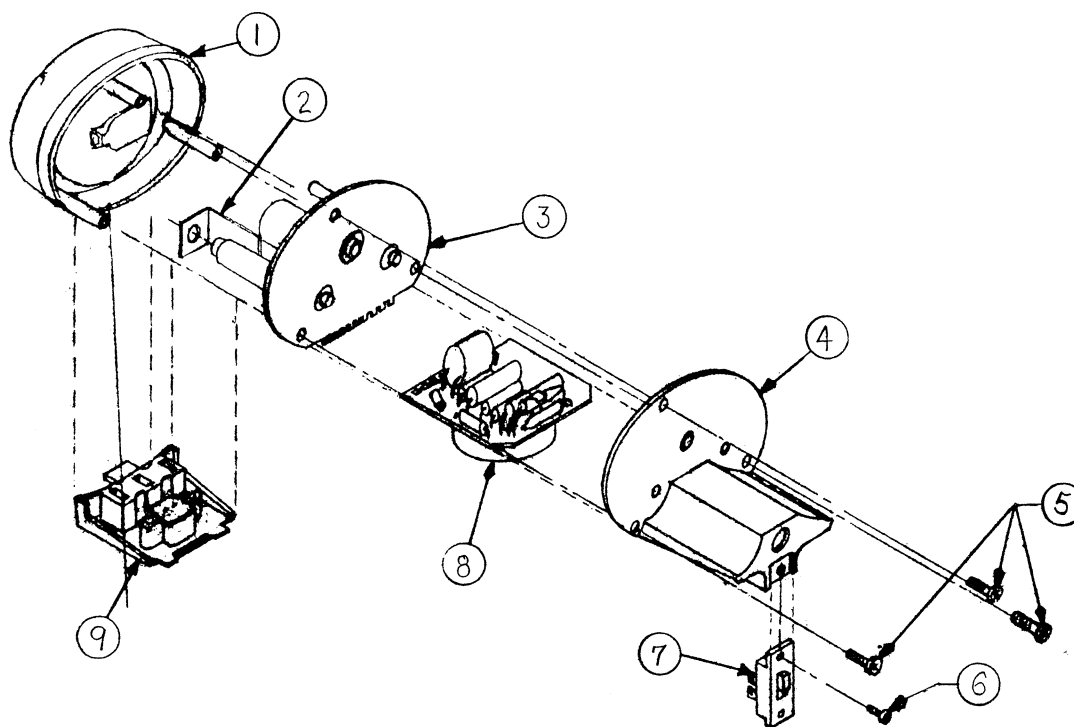
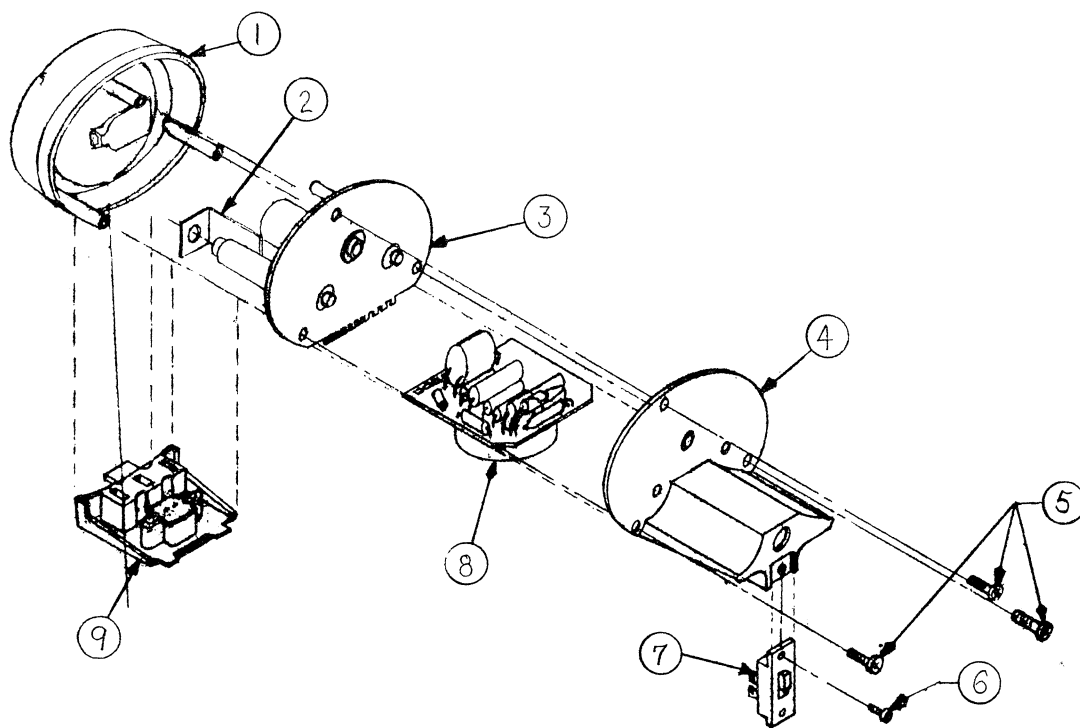


Figure 5-5. Final Unit Assembly



REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
1	S1	16766480-003	Nose Ring Assembly	1	1
1		16766480-004	Nose Ring Assembly		
2		73000605-001	Insulator		1
3		16766354-003	Circuit Assembly Number 1		1
3		16766354-004	Circuit Assembly Number 1	1	
4		16765888-002	Chassis	1	1
5		73000042-026	Screw, Fillister Head	3	3
6		16761246-003	Screw, Flat Head	1	1
7		16755813-002	Switch	1	1
8		16765848-002	Circuit Assembly Number 3	1	1
9		16765383-002	Receptacle Assembly	1	1

Figure 5-6. Chassis Assembly



REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
1	S1	16766480-003	Nose Ring Assembly		1
1		16766480-004	Nose Ring Assembly	1	
2		73000605-001	Insulator		1
3		73001344-003	Circuit Assembly Number 1		1
3		73001344-004	Circuit Assembly Number 1	1	
4		16765888-002	Chassis	1	1
5		73000042-026	Screw, Fillister Head	3	3
6		16761246-003	Screw, Flat Head	1	1
7		16755813-002	Switch	1	1
8		16765848-003	Circuit Assembly Number 3		1
8		16765848-004	Circuit Assembly Number 3	1	
9		16765383-002	Receptacle Assembly	1	1
		73000025-001	Wire, Orange	1	1
		73000025-002	Wire, White	1	1
		73000606-001	Insulator	1	1
		16762589-001	Insulator	1	

Figure 5-6A Chassis Assembly (700/770 Modified)

REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
1	BT-1	16766504-001	Tray	1	1
2		16766615-001	Spring, Snap		1
3		16759851-001	Spring	1	1
4		73000427-005	E-Ring	1	1
5		73000023-003	Battery and Tray Assembly (Includes tray with batteries)		1
5		73000023-004	Battery and Tray Assembly (Includes tray with batteries)	1	
6		16765479-001	Clip, Spring	1	1
7		16738656-001	Spring, Detent	1	1
8		16765473-001	Battery Assembly, Welded (Four Sub "C" batteries welded together)	1	1
9		73000008-001	Decal, Knob		1
9		73000008-002	Decal, Knob	1	
10		73000003-001	Shaft	1	
10		73000004-001	Shaft		1
11		73000472-001	Calculator	1	1
12		16766588-003	Plate, Back		1
12		16766588-004	Plate, Back	1	
13		73000012-003	Battery Tray Assembly (Tray without batteries)		1
13		73000012-004	Battery Tray Assembly (Tray without batteries)	1	

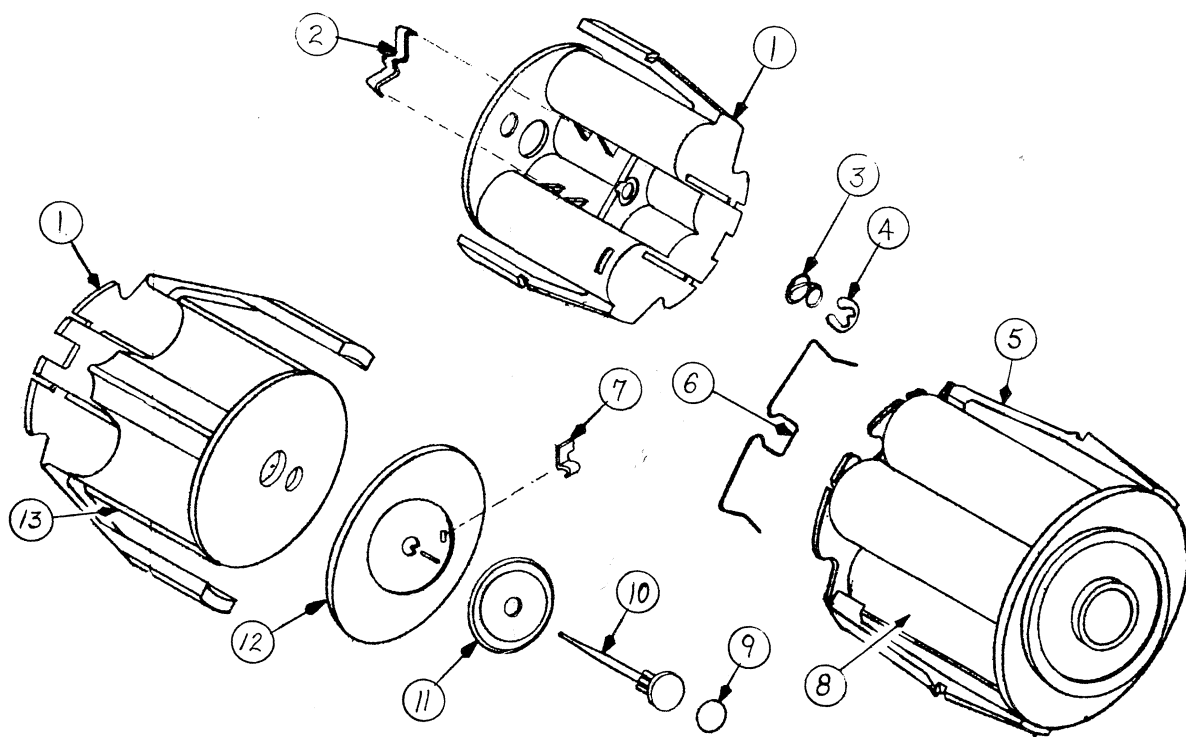
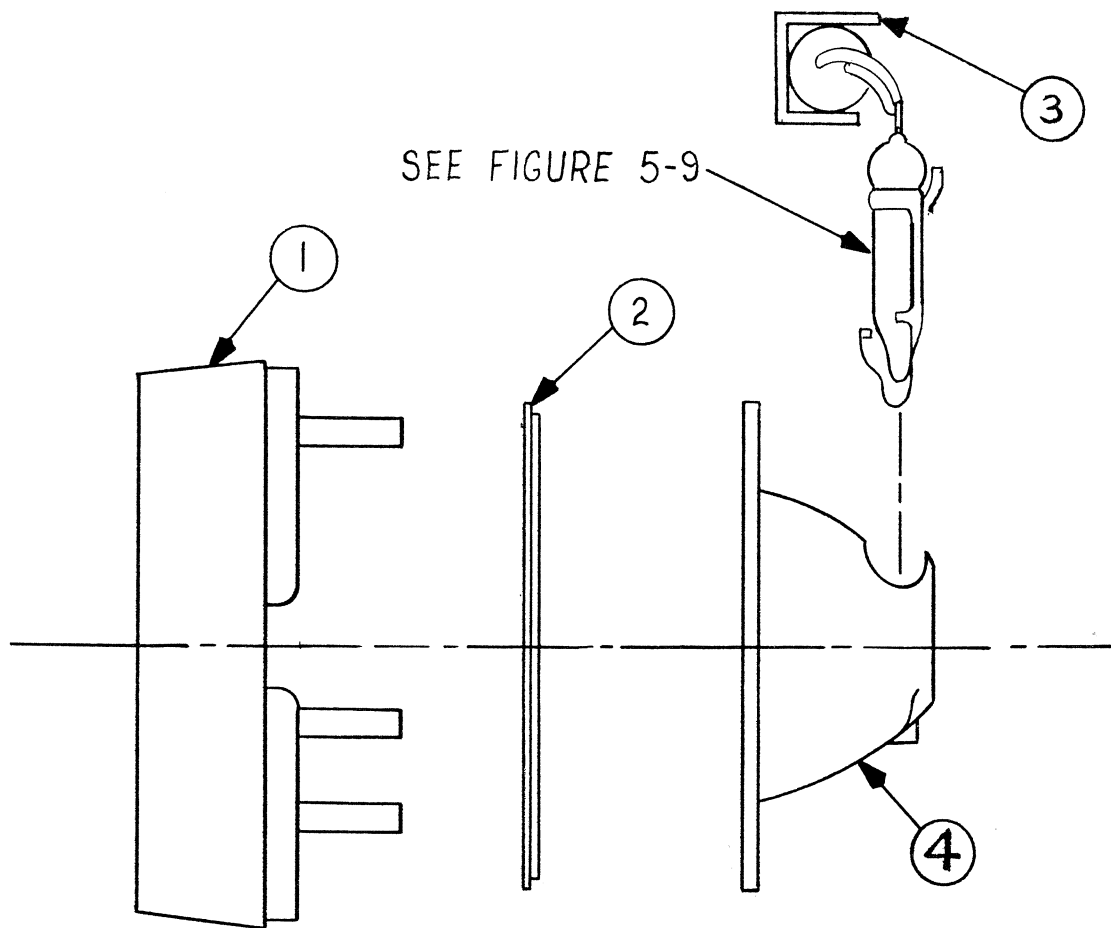
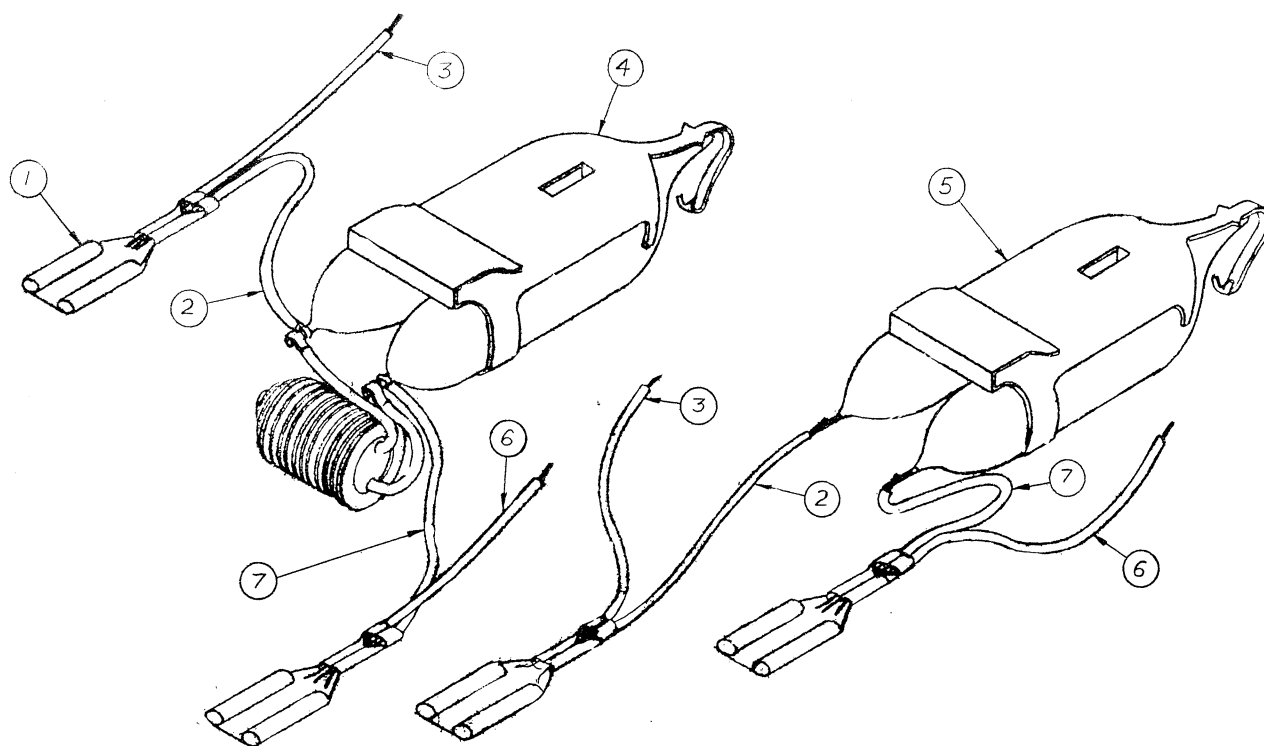


Figure 5-7. Battery and Tray Assembly



REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
1		16766498-001	Reflector Housing	1	1
2		73000020-001	Lens, Strobolar Front		1
2		73000020-002	Lens, Strobolar Front	1	
3		16738785-002	Insulator		1
4		16738069-002	Reflector	1	1

Figure 5-8. Nose Ring Assembly



REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
1		16754482-002	Terminal, Crimp	2	2
2		73000011-003	Wire, Red	1	1
3		73000011-007	Wire, Red	1	1
4	FT1 & FT2	73000095-002	Flash and Quench Tube Assembly		1
5	FT1	16764213-002	Flash Tube Assembly	1	
6		73000011-005	Wire, Black	1	1
7		73000011-001	Wire, Black	1	1

Figure 5-9. Flashtube and Quench Tube Assembly

REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
1	Q1	16756821-002	Transistor, Power	1	1
2		16767140-001	Circuit Card Number 1		1
2		73000116-001	Circuit Card Number 1	1	
3	R5	16767163-001	Rotor Blade		1
4		73000027-001	Wire, Yellow	1	1
5		16759940-053	Resistor, 1.5K, 1/4 Watt, 10%	1	1
6	CR4	16756809-002	Diode, Silicon, 50 PIV	1	1
7	C5	16756825-043	Capacitor, Mylar, 047 $\mu$ fD, 20%	1	1
8	C8	16756863-001	Capacitor, Mylar, 820 pfd	1	1
9	R3	16758183-510	Resistor, 24 ohms, 1/2 watt, 5%	1	1
10	R14	16758183-865	Resistor, 470K, 1/2 Watt, 10%	1	1
11	CR14	16762845-001	Diode, Silicon, 200 PIV	1	1
12	R6	16762587-112	Resistor, Variable, 470K, 1/10 Watt, 20%	1	1
13	R7	16758183-625	Resistor, 1.3 Meg, 1/2 Watt, 5%	1	1
14	R2	16758183-852	Resistor, 47K, 1/2 Watt, 10%	1	1
15		16750431-004	Washer, Star	1	1
16		16750243-008	Rivet (.156) - Used with transistor having case thickness of .03.	1	1
16		16750243-010	Rivet (.219) - Used with transistors having case thickness of .12	1	1
17	SCR1	16757964-001	Rectifier, Controlled - Silicon	1	1
18		73000595-002	Sleeving	1	1
19		16767142-001	Bushing, Coupling		1
20		73000428-001	Rivet, Contact	2	2



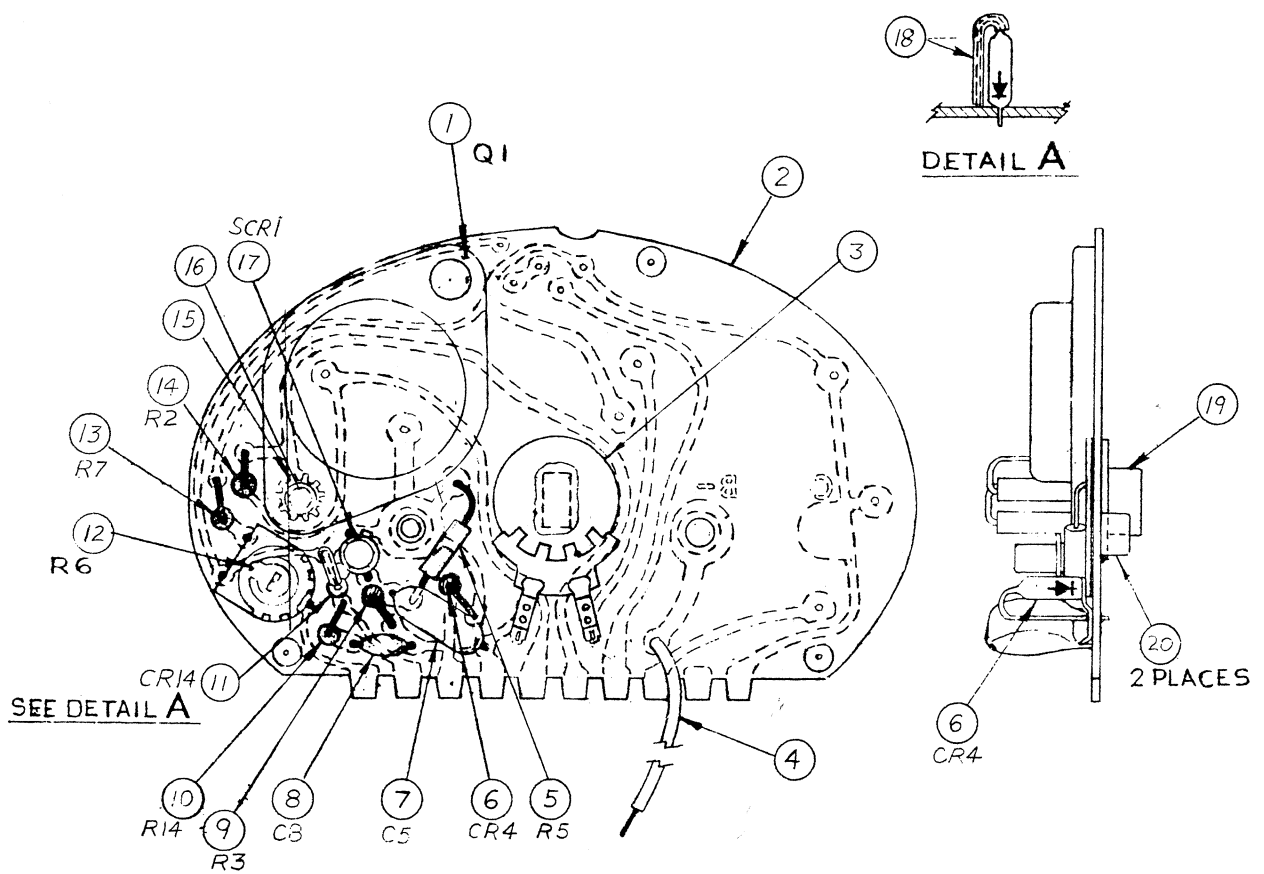


Figure 5-10. Circuit Card Number 1 Assembly (700/770)

REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
1	CR4	73001236-001	Circuit Card Number 1	1	
1		16767140-001	Contact Assembly		1
2		16756809-002	Diode, Silicon, 50 PIV	1	1
3	R5	16759940-053	Resistor, 1.5K, 1/4W, 10%	1	1
4	C5	16756825-043	Capacitor, Mylar, 047 $\mu$ f, 20%	1	1
5	C8	16756863-001	Capacitor, Mylar, 820 pf	1	1
6	R3	16758183-510	Resistor, 24K, 1/2W, 5%	1	1
7	R14	16758183-865	Resistor, 470K, 1/2W, 10%	1	1
8	CR14	16762845-001	Diode, Silicon, 200 PIV	1	1
9	R6	16762587-112	Resistor, Variable, 470K, 1/10W, 20%	1	1
10	SCR1	16757964-001	Rectifier, Controlled-Silicon	1	1
11	R7	16758183-625	Resistor, 1.3 Meg, 1/2W, 5%	1	1
12	R2	16758183-825	Resistor, 47K, 1/2W, 10%	1	1
13		16750431-004	Washer, Star	1	1
14		16750243-008	Rivet (.156) - Used with transistor having case thickness of .03	1	1
15		16750243-010	Rivet (.219) - Used with transistor having case thickness of .12	1	1
16	Q1	73000428-001	Rivet, Contact	2	2
17		16756821-002	Transistor, Power	1	1
18		16767142-001	Bushing, Coupling		1
19	R24	16762587-111	Resistor, Variable, 220K, 1/10W, 20%		1
20	CR21	16756809-002	Same as Index Item 2		1
21	CR10	73000056-001	Diode, Zener, C.2 PIV		1
22	C16	16767873-037	Capacitor, Electrolytic Aluminum, 1 $\mu$ f, 40W VDC		1
23	R16	16758183-847	Resistor, 19K, 1/2W, 5%		1
24	R26	16758183-619	Resistor, .75 Meg, 1/2W, 5%		1
25	C12	73000848-013	Capacitor, .1 $\mu$ f, 100 PIV		1

REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
26	R18	16758183-633	Resistor, 3.0 Meg, 1/2W, 5%		1
27	C14	73000608-017	Capacitor, Mylar, .0022 $\mu$ f, 10%		1
28	T3	73000577-003	Coil, Trigger		1
29	C15	16761824-024	Capacitor, Ceramic, 200 pf, 10%		1
30		73000536-001	Shield, Sensor		1
31		73000498-001	Shroud		1
32	SCR3	73000533-001	Diode, Photo-Silicon Controlled Rectifier, 200 PIV		1
33	Q2	16759913-001	Transistor		1
34	C13	16761824-035	Capacitor, Ceramic, 680 pf, 10%		1
35	CR11	16756809-002	Same as Index Item 20		1
36	R17	16758183-852	Resistor, 47K, 1/2W, 10%		1
37	R15	16758183-636	Resistor, 3.9 Meg, 1/2W, 5%		1
38	C10	16750036-028	Capacitor, Ceramic, .002 $\mu$ f, 600W VDC, 20%		1
39	R11	16758183-636	Same as Index Item 37		1
40		73000027-001	Wire, Yellow	1	1
41		16767163-001	Blade, Rotor		1
42		73000595-001	Sleeving		2
43		73000595-002	Sleeving	1	1

2 Sleeve any two leads of item 32 with item 42.

1 Sleeve anode lead of item 8 with item 43.

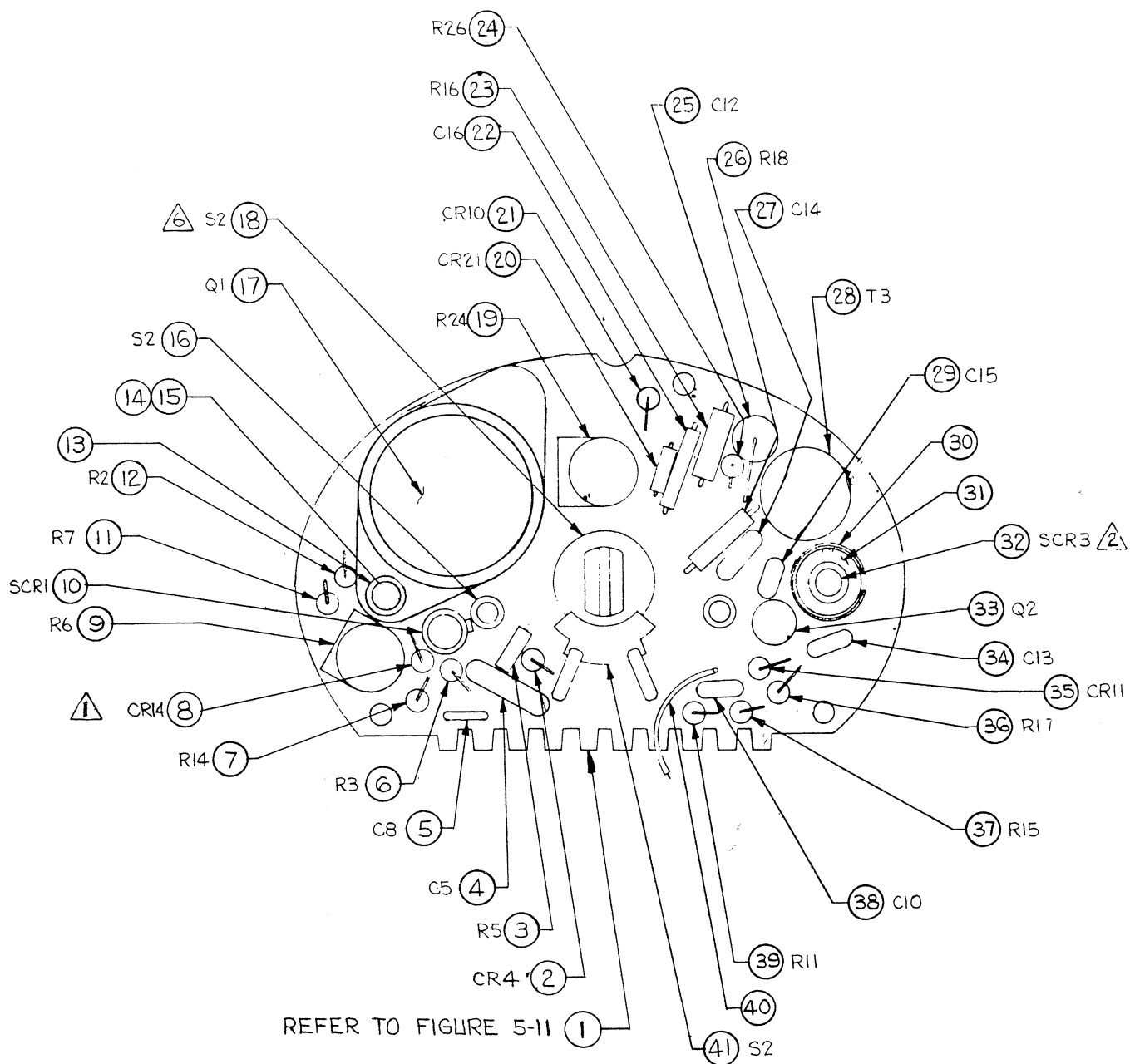
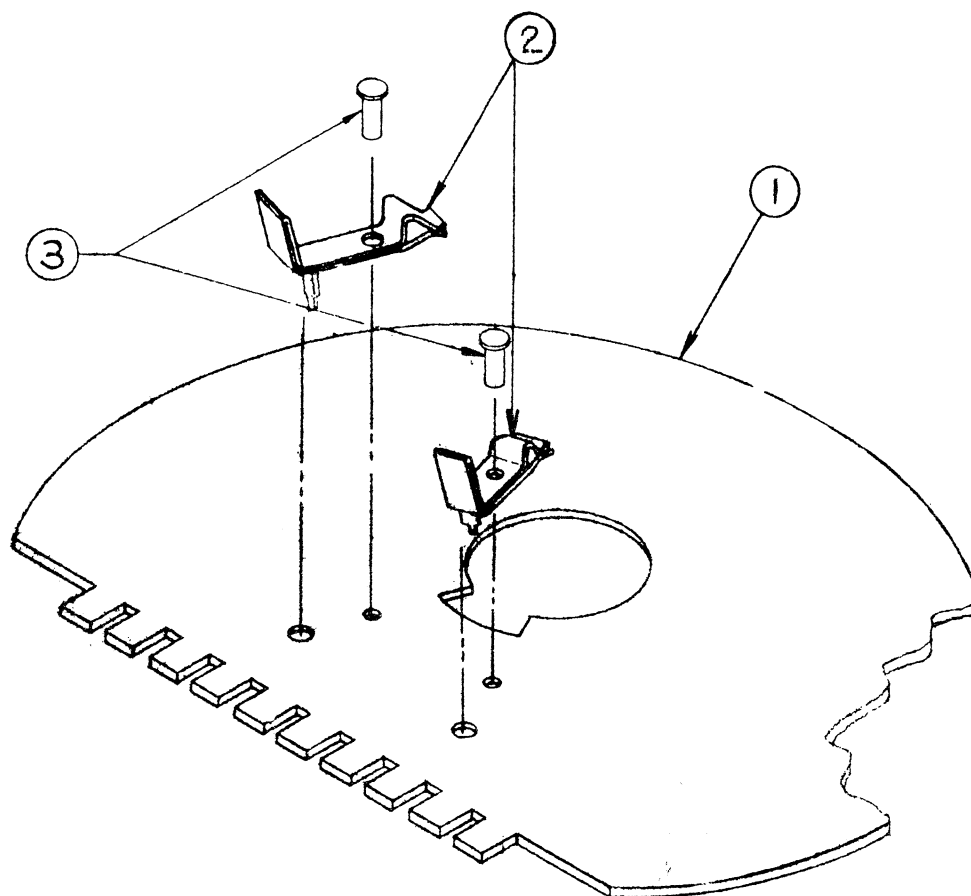


Figure 5-10A. Circuit Card Number 1 Assembly (700/770 Modified)



REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
1		73001236-001	Circuit Card Number 1		1
2		73000114-001	Contact		2
3		73000113-001	Rivet		2

Figure 5-11. Contact Assembly (770 Modified)

REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
1	R24	73000493-001 16762587-111	Circuit Card Number 2 Assembly Resistor, Variable, 220K, 1/10 Watt, 20%		1 1
2	CR10	73000056-001	Diode, Zener, 6.2 Volts		1
3	CR21	16756809-002	Diode, Silicon, 50 PIV		2
4	C16	16757873-037	Capacitor, Electrolytic Aluminum, 1 $\mu$ f, 40 WVDC		1
5	C12	16762474-039	Capacitor, Ceramic, 0.25 $\mu$ f, 20%		1
6	R26	16758183-626	Resistor, 1.5 Meg, 1/2 Watt, 5%		1
7	T3	16738276-001	Coil, Trigger		1
8	SCR3	73000533-001	Diode, Photo-Silicon Control Rectifier, 200 PIV		1
9	C13	73001150-024	Capacitor, Ceramic, 680 pf, 10%		2
10&11	R11,R15	16758183-636	Resistor, 3.9 Meg, 1/2 Watt, 5%		2
12	Q2	16759913-001	Transistor		1
13	C10	16750036-028	Capacitor, Ceramic, .002 $\mu$ f, 1000 WVDC, 20%		1
14	R17	16759940-089	Resistor, 47K, 1/4 Watt, 10%		1
15	CR11	16756809-002	Same as Index Item 3		
16	C15	73001150-017	Capacitor, Ceramic, 200 pf, 10%		
17	R16	16759940-279	Resistor, 10 K, 1/4 Watt, 10%		1
18	C14	73000608-017	Capacitor, Mylar, .0022 $\mu$ f, 10%		1
19	R18	16758183-630	Resistor, 2.2 Meg, 1/2 Watt, 5%		1
20		73000536-001	Shield, Sensor		1
21		73000498-002	Shroud		1
22		73000595-001	Sleeving		2
		73000595-002	Sleeving		1
23		73000117-001	Circuit Card Number 2		1

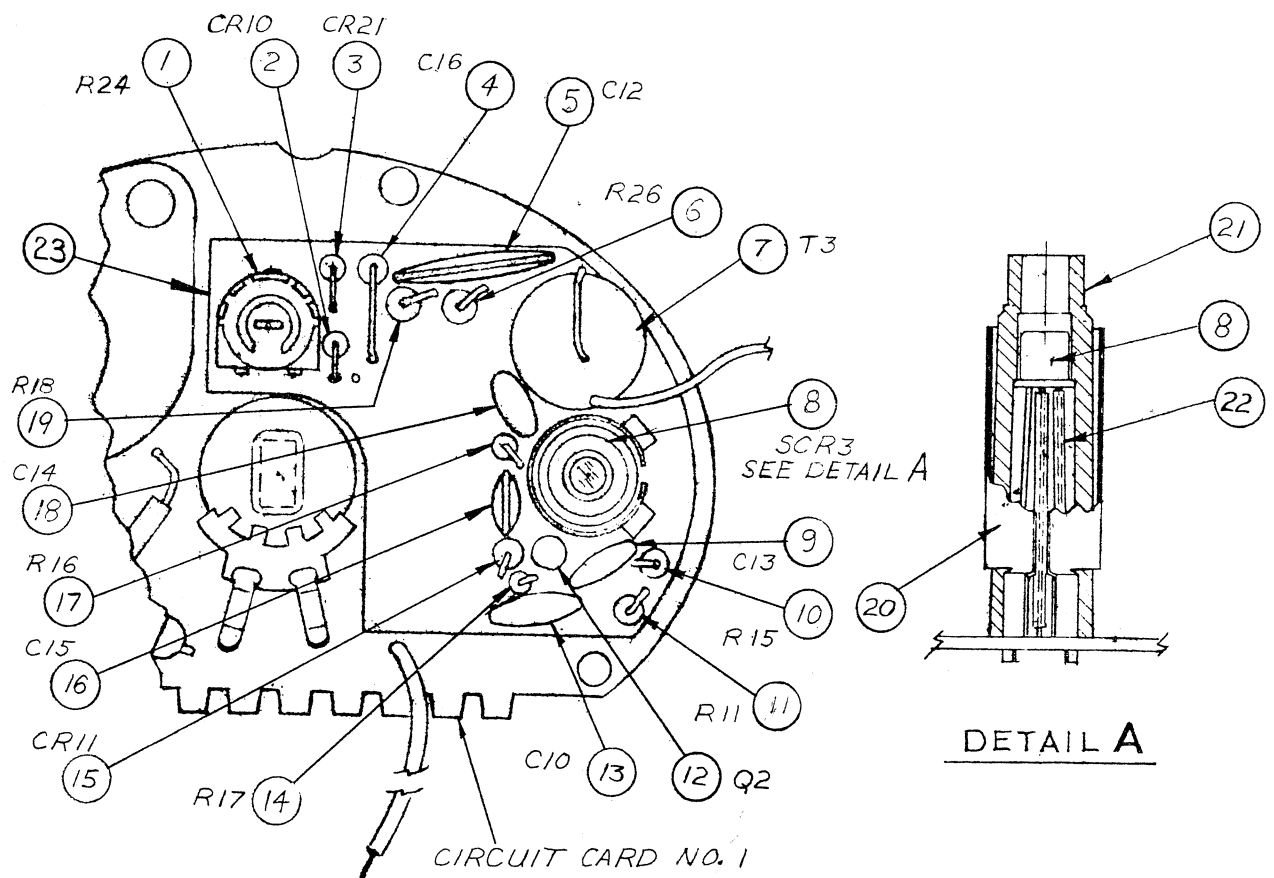
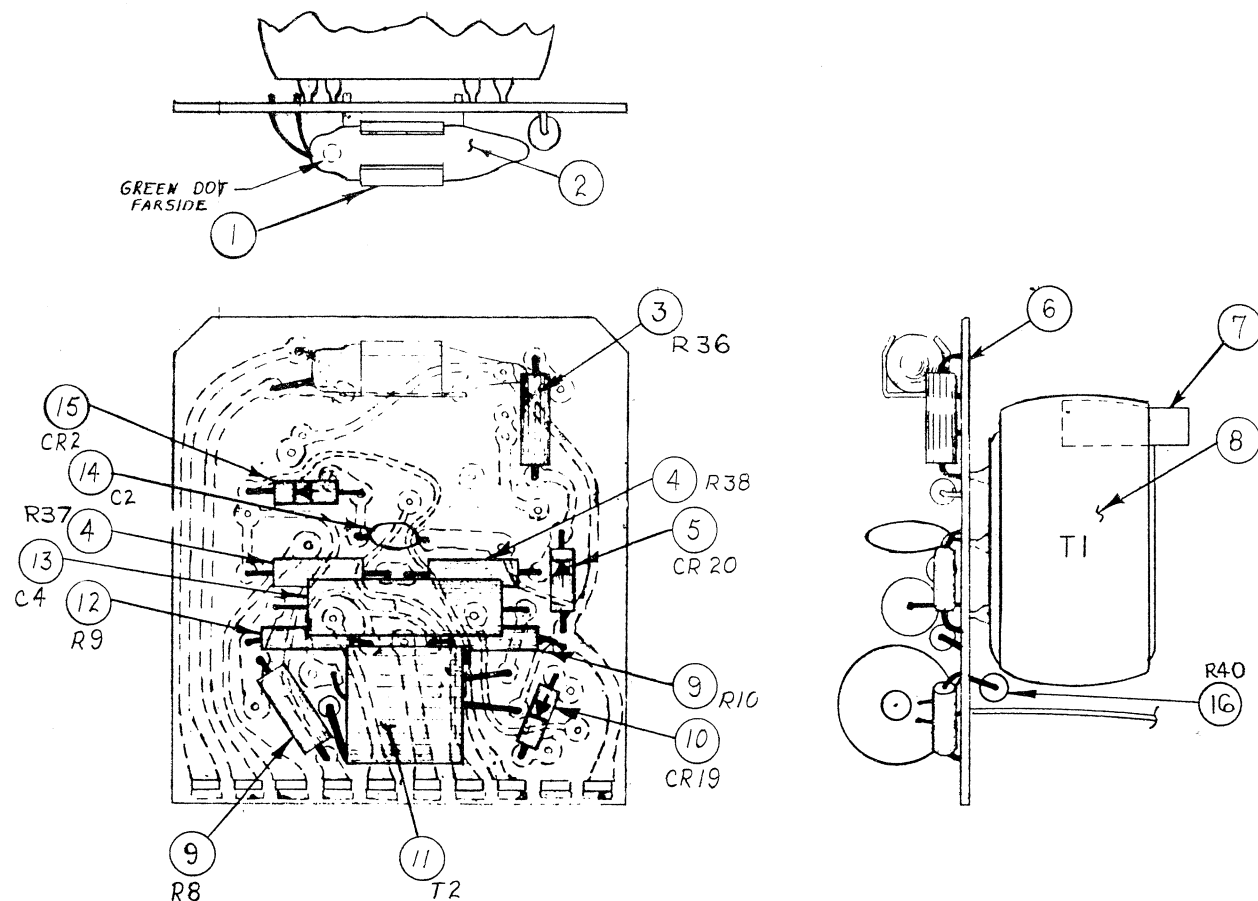


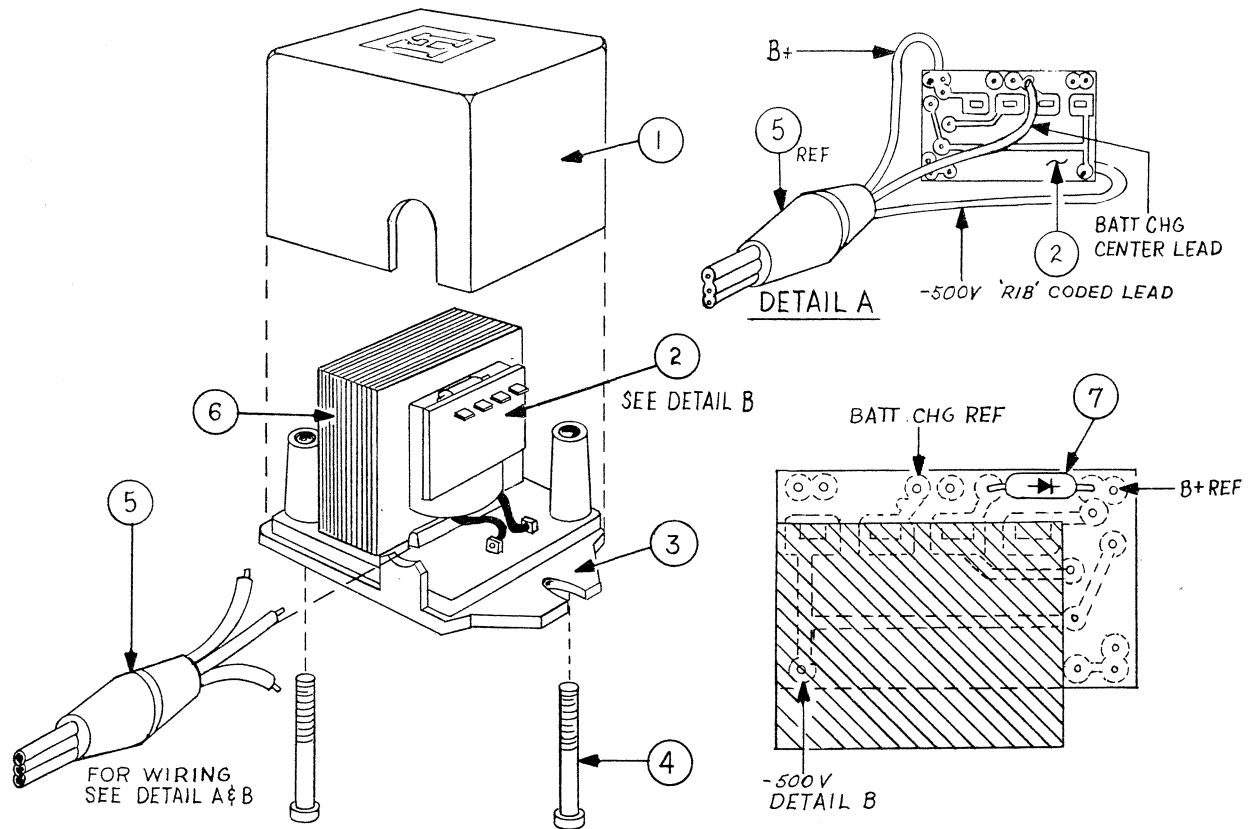
Figure 5-12. Circuit Card Number 2 Assembly (770)



REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
1		73000081-001	Clip, Neon	1	1
2	VR1	16756822-001	Lamp, Neon	1	1
3	R36	73000683-073	Resistor, 100 ohms, 1-1/2 watt, 10%	1	1
4	R37, R38	16758183-866	Resistor, 560K, 1/2 watt, 10%	2	2
5	CR20	16756808-002	Diode, Silicon 600 PIV	1	1
6		73000115-001	Circuit Card Number 3	1	1
7		73000604-001	Insulator, Torid	1	1
8	T1	16757150-001	Transformer	1	1
9	R8, R10	16758183-644	Resistor, 8.2 Meg, 1/2 watt, 5%	2	2
10	CR19	16762845-001	Diode, Silicon, 200 PIV	1	1
11	T2	16763562-001	Coil, Trigger	1	1
12	R9	16758183-648	Resistor, 12 meg, 1/2 watt, 5%	1	1
13	C4	16760006-001	Capacitor, Mylar, .15 $\mu$ f, 20%, 250V	1	1
14	C2	16750036-028	Capacitor, Ceramic, 2000 PF	1	1
15	CR2	16763482-002	Diode, Silicon, 800 PIV	1	1
16	R40	16758183-812	Resistor, 22 ohms, 1/2 watt, 10%	1	1

Figure 5-13. Circuit Card Number 3 Assembly





REF		HONEYWELL PART NUMBER	DESCRIPTION	QTY/UNIT	
INDEX	SCH			700	770
1		16766483-002	Wall Box Assembly	1	1
2		73000346-002	Cover	1	1
3		73000372-002	Circuit Card Assembly	1	1
4		73000345-001	Base Assembly	1	1
5		16756377-023	Screw	2	2
6		16766484-002	Cable Assembly	1	1
7	T4	73000541-001	Transformer	1	1
	CR18	16756808-002	Diode, Silicon, 600 PIV	1	1

Figure 5-14. Wall Box Assembly

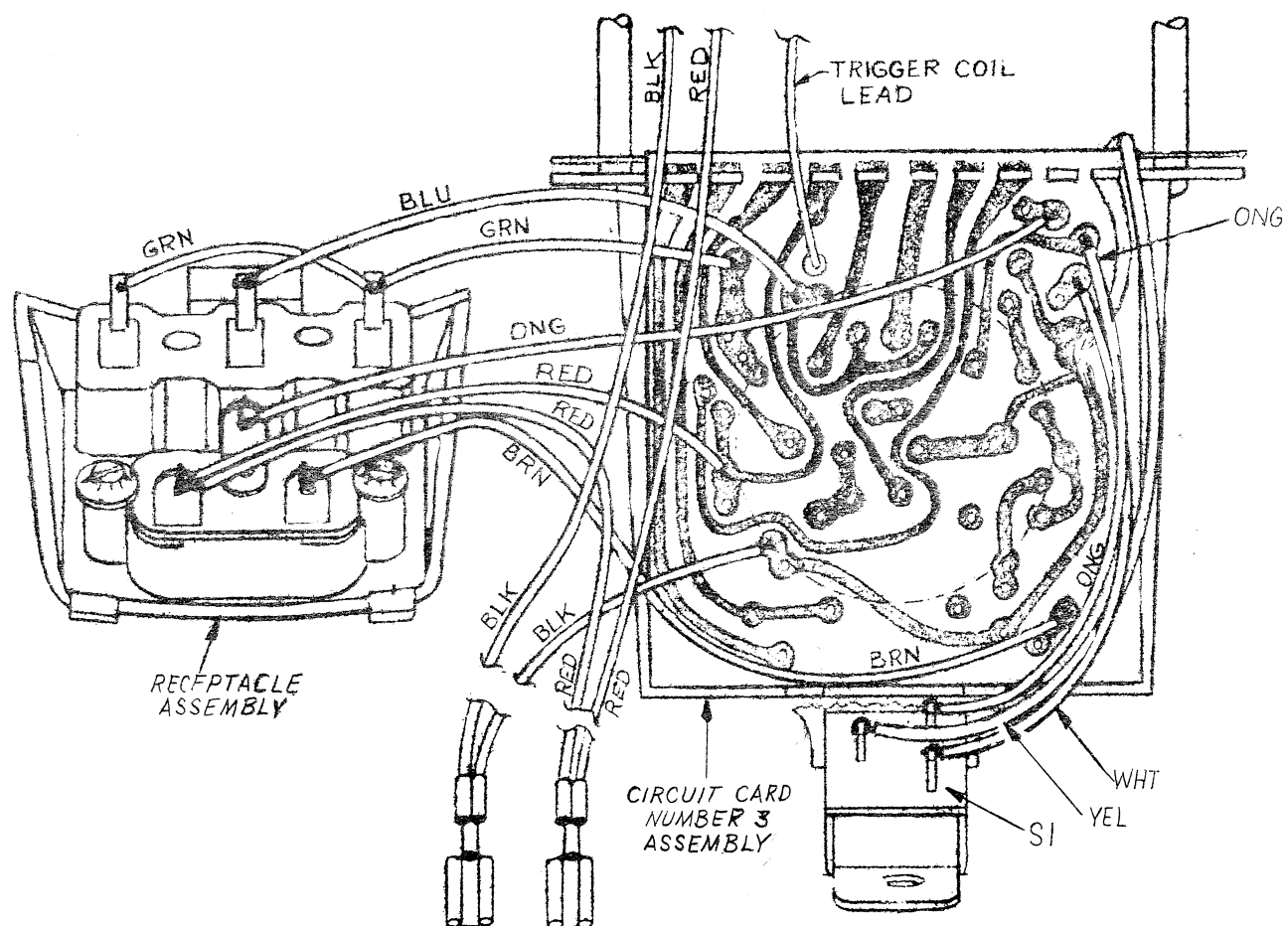


Figure 5-15. Chassis Wiring Diagram





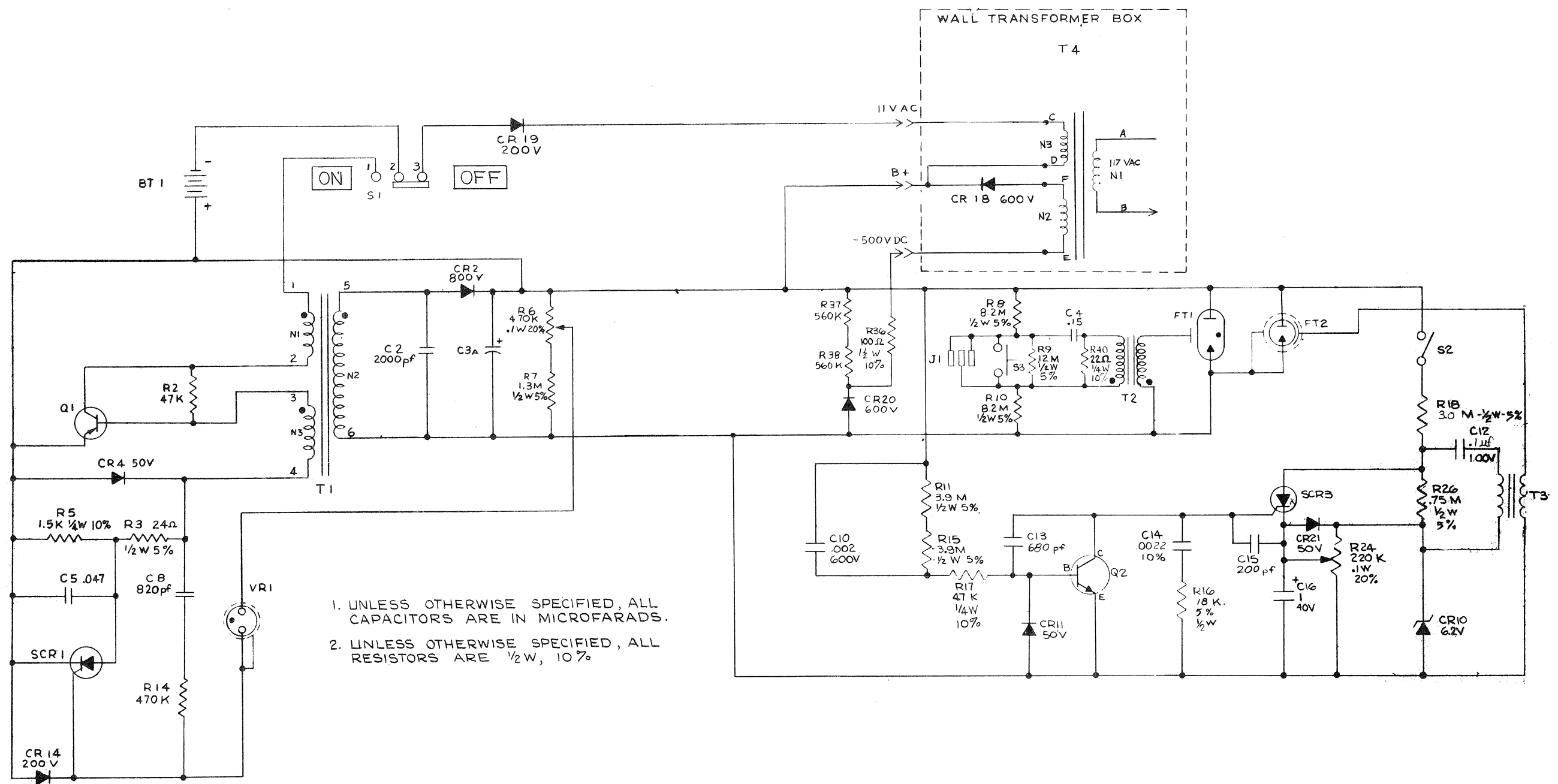


Figure 5-18. Schematic Diagram (770 Modified)