

# FLASH TECHNOLOGY

**FTB 736-5**

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**Heliport Beacon Equipment Reference Manual**

**P/N # 7917365**

# Front Matter

## Abstract

This document briefly describes the FTB 736-5 Heliport Beacon.

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## Parts Replacement

*The use of non-OEM parts or unauthorized modification of this equipment will void the warranty.*

## Warranty

All components are fully warranted, under normal operating conditions, for two years.

## **PERSONNEL HAZARD WARNING**

### **DANGEROUS VOLTAGES**

Dangerous line voltages reside in certain locations in this equipment. Also, this equipment may generate dangerous voltages. Although FTCA has incorporated every practical safety precaution, exercise extreme caution at all times when you expose circuits and components, and when you operate, maintain, or service this equipment.

### **Avoid Touching Live Circuits**

Avoid touching any component or any part of the circuitry while the equipment is operating. Do not change components or make adjustments inside the equipment with power on.

### **Dangerous Voltages Can Persist with Power Disconnected**

Under certain conditions, dangerous voltages can be present because capacitors can retain charges even after the power has been disconnected.

Protect yourself — always turn off the input (primary) power and wait for one minute for storage capacitors to drain their charge. Then check between the red and blue wires on the TB2 terminal block with a voltmeter for any residual charge before touching any circuit element or component.

### **Do Not Depend on Interlocks**

Never depend on interlocks alone to remove unsafe voltages. Always check circuits with a voltmeter. Under no circumstances remove or alter any safety interlock switch.

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# Section 1 — Introduction and Operation

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## System

The FTB 736-5 Heliport Beacon consists of a Flashhead and Power Converter. The flashhead is an electro-optical assembly in which the principal components are a flash-tube and a lens. It is typically installed on a short, level pedestal just to the side of a heliport pad.

The power converter provides controlling circuitry to convert main AC power to the required voltages for internal operation and the discharge energy for the flashhead. It also controls the flash rate.

An optional remote control box (supplied by others) may be used for intensity switching operation. Refer to *Figure 2-4*. The box should contain a three position switch that selects the three flash intensities described as:

- High — Daylight intensity
- Medium — Twilight intensity
- Low — Night intensity

An optional PEC 510 Photocell may be provided by FTCA to automatically control flash intensity in the three steps previously mentioned according to daylight lighting conditions.

## Equipment Specifications

### Physical

Note: Dimensions are nominal.

Power Converter (H x W x Depth, Wgt.):

23 x 17.13 x 9.44 in., 70 lbs.

584.2 x 435.1 x 239.8 mm., 31.8 kg.

Flashhead (H x Diam., Wgt.)

17 x 18.25 in., 17 lbs.

431.8 x 463.6 mm., 7.7 kg.

### Performance Characteristics

Flash Intensity (nominal):

(High) Day Intensity  $2,500 \pm 25\%$  ECD

(Medium) Twilight Intensity  $250 \pm 25\%$  ECD

(Low) Night Intensity  $75 \pm 25\%$  ECD

Beam Spread:

Horizontal:  $360^\circ$  (omnidirectional)

Vertical:  $17^\circ$

Flash Rate:

4 flashes in a 0.5 second interval; 1.5 seconds between flash groups (30 FPM duty cycle).

### Electrical

Single Phase:

120,208, 240, 480 VAC  $\pm 10\%$ , 60 Hz  $\pm 1\%$

230 VAC  $\pm 10\%$ , 50 Hz  $\pm 1\%$

150 volt-amperes average

300 volt-amperes peak

75 watts

### Environmental

Operating temperature:

-55 to +55 degrees Celsius

### Monitoring

Electrically isolated relay contacts, normally open, change state from open to closed to indicate power loss or light failure. Relay contacts are rated at 120 volts, 1 ampere.

### Control

Automatic high intensity operation. Otherwise, optional remote control box or an optional PEC 510 Photocell, both for three light intensity steps.

## Operation

The operation of this equipment is mostly automatic and begins to flash as soon as power is applied. It flashes at high intensity unless controlled by an optional intensity control switch or photocell. Flash intensity can be modified for special situations as described in *Section Mode Control*. The center of operations is the PCB1 Timing and Trigger board. This circuit board contains indicator lights that are useful when you troubleshoot or check the opera-

tion of the power converter. The functions provided by this circuit board and a checkout procedure for the equipment are given in the following text.

**WARNING**

**NOTE:** Read the warning notice on Page iii.

**Mode Control**

The following steps in *Table 1-1 Mode Control* explain how to force the beacon to operate continuously at a fixed flash intensity with an optional intensity control switch:

**Table 1-1 Mode Control**

Intensity	Procedure
High (day intensity)	Turn the intensity control switch to the HIGH position.
Medium (twilight intensity)	Turn the intensity control switch to the MEDIUM position.
Low (night intensity)	Turn the intensity control switch to the LOW position.

**Checking Power Converter**

*Section 1-3 Timing and Trigger Board 2904413 LEDs and Lamp* on Page 1-3 explains how to perform an operational checkout.

The Timing and Trigger Board (PCB1) governs all the functions pertaining to automatic operation. It has four light emitting diode (LED) indicators, and one clear neon

indicator that you can use to monitor equipment operations during checkout and troubleshooting. To monitor operation the following subsections instruct you to observe specified LEDs. The LEDs are mounted at the bottom right of the PCB1. The essential features on PCB1 for troubleshooting are shown in *Figure 1-1 Pictorial of PCB1 2652201/2722101* on Page 1-4 or *Figure 1-2 Pictorial PCB1 2904413* on Page 1-5. PCB1 is located on upper front panel in the power converter. The board is mounted in a way that enables you to see the LED and neon indicators.

**Timing and Trigger Board**

**Indicator Lamps**

Four indicator LEDs and one neon lamp on the PCB1 monitor equipment operation. *Figure 1-1 Pictorial of PCB1 2652201/2722101* on Page 1-4 shows the location of these lamps on the 2652201/2722101 board.

*Table 1-2 Timing and Trigger Board LEDs and Lamp* lists how the LEDs and lamp on PCB1 2652201/2722101 indicate power converter functions.

Four indicator LEDs and one neon lamp on the PCB1 monitor equipment operation. *Figure 1-2 Pictorial PCB1 2904413* on Page 1-5 shows the location of these lamps on the 2904413 board.

*Table 1-3 Timing and Trigger Board 2904413 LEDs and Lamp* lists how the LEDs and lamp on PCB1 indicate power converter functions.

**Table 1-2 Timing and Trigger Board LEDs and Lamp**

LED/Lamp	Name	Color	Function
LOW (night)	I 2	Green	On when the power converter is in night operation. Both I2 and I3 are off for twilight operation.
HIGH (day)	I 3	Green	On when the power converter is in day operation. Both I2 and I3 are off for twilight operation.
SYNC	I 4	Red	Blinks for each sync signal.
CONF (Confirm)	I 5	Green	Blinks to confirm a valid flash was detected.
I 1(NEON)	I 1	Clear	Indicates the presence of flashtube trigger voltage. This lamp may flicker.

**Table 1-3 Timing and Trigger Board 2904413 LEDs and Lamp**

LED/Lamp	Name	Color	Function
LOW (night)	I 4	Green	<i>On</i> when the power converter is in night operation. .
HIGH (day)	I 6	Green	<i>On</i> when the power converter is in day operation. .
MED (Twi)	I 5	Green	<i>On</i> when the power converter is in Twi operation.
SYNC	I 2	Green	<i>Blinks</i> for each sync signal.
NEON	I 9	Clear	Indicates the presence of flashtube trigger voltage. This lamp may flicker.

## Operational Checkout

Use the following steps to checkout the operation, and observe the response of the equipment as indicated. These procedures assume that all installation steps have been completed.

### Checking the Light Operation

Use the following procedure:

1. Turn the system on.
  - a. The flashhead flashes at an intensity indicated by the intensity control in the control box or determined by the photocell. It flashes at high intensity if neither external control is used.
  - b. The Neon lamp is on.
  - c. The SYNC and CONF( LEDs blink. Only SYNC on the 2904413 board
  - d. The HIGH LED is on if the unit is in DAY mode (high intensity).
  - e. The LOW LED is on if the unit is in NIGHT mode (low intensity).
  - f. Both the HIGH LED and LOW LED are off for medium intensity (twilight) operation on

2652201/2722101. The MED LED is on for medium intensity operation on 2904413

- g. If the power does not come on: check F1; the supply line; and all connections.
2. Slowly rotate the intensity control switch in the control box from night, to twilight, to daylight (low, to medium, to high).

Observe the operation of the flashhead.

- a. The intensity of the flashhead should change according to the intensity control switch in the control box. If a photocell is attached, the intensity should be low for night operation, medium for twilight operation, and high for day operation. Otherwise, without external control devices, the unit flashes at day (high) intensity. Observe the flashhead with your eyes at the same level as the flashhead. Observing it at a distance may prevent you from clearly seeing the changes because of the way the light beam is focused by the lens.
- b. If no flash is present or it is erratic, and if all other condition are correct in the power converter: check the flashhead cable and its connections; or change the flashtube for one known to be good; or change the trigger transformer in the flashhead.

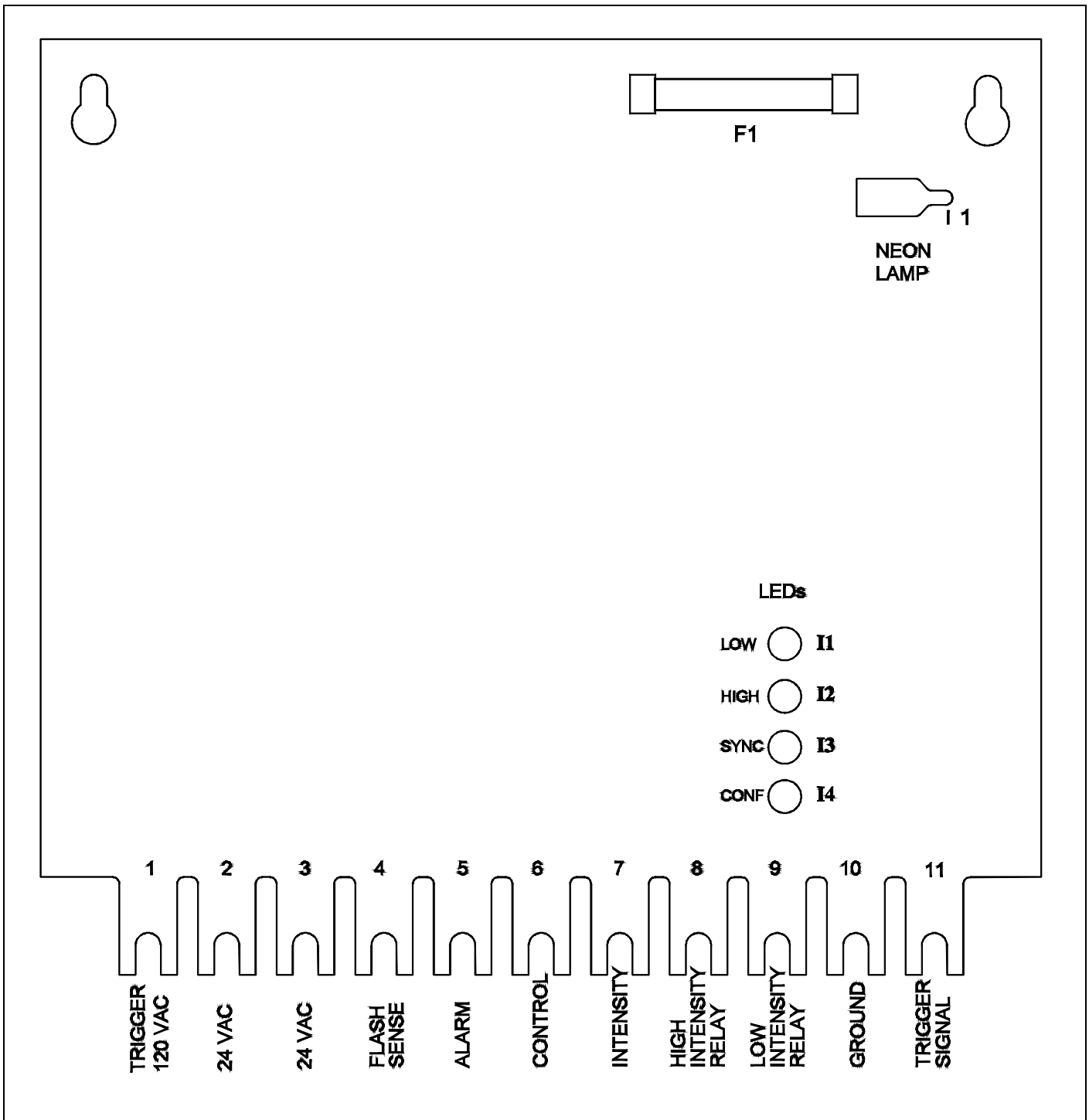


fig11

Figure 1-1 Pictorial of PCB1 2652201/2722101

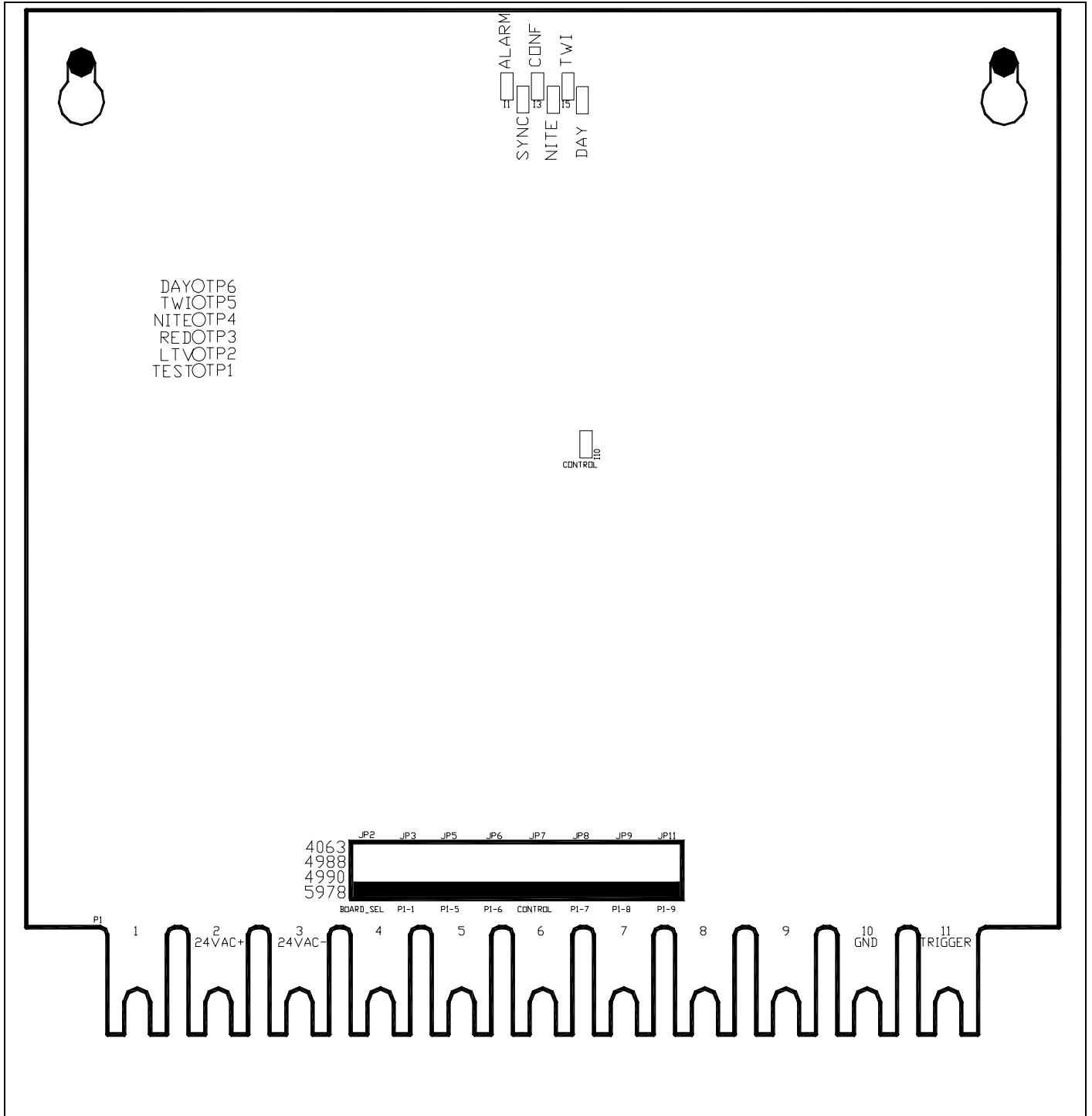


Figure 1-2 Pictorial PCB1 2904413

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## Section 2 — Outline, Mounting, and Installation

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### Unpacking

Inspect shipping cartons for signs of damage before opening. Check package contents against the packing list and inspect each item for visible damage. Damage claims should be reported promptly to the freight handler.

### Tools

Although no special tools are necessary, the following hand tools are suggested for installation:

- #2 Phillips-head screwdriver
- #2 (medium -  $\frac{3}{16}$ "), flat-blade screwdriver
- #3 (medium -  $\frac{5}{16}$ "), flat-blade screwdriver
- Medium, slip joint pliers
- 8" adjustable wrench
- Hex nut driver or hex socket,  $\frac{5}{16}$ "
- Hex nut driver or hex socket,  $\frac{7}{16}$ "
- Hand tools for electrical wiring
- Triplet™ Model 630-NA VOM, or equivalent analog volt-ohm meter, or a digital meter with an averaging function.

### Access

#### **WARNING**

*STOP:* Before proceeding, read the warning on Page iii. Disconnect the primary power before opening the power converter cover.

### **Power Converter**

Latches secure the cover. When you release these, you can swing open the cover for internal access.

### **Flashhead**

#### **WARNING**

The flashhead contains no interlock. Do not open the flashhead unless primary power has been disconnected from the power converter. Wait one minute for storage capaci-

tors to drain down. Open the flashhead and use a voltmeter to ascertain that no high voltage exists between the red and the blue wires. Look for these wires on the ceramic terminal posts.

You may pivot the lens open by disengaging two quick-release latches. Be careful that the lens clears nearby objects during opening and closing.

### Mounting

#### **Power Converter**

Mounting and outline dimensions for the power converter are shown in *Figure 2-1*. FTCA does not furnish mounting hardware unless you order it as part of an installation kit. Use the following guidelines for mounting the power converter:

- Ensure that adequate space exists around the equipment for access during installation, maintenance and servicing.
- Allow space for air flow around the power converter.
- Use a bonding strap when installing a power converter to a painted or non-conducting isolated surface. Connect the strap to the site grounding system.

#### **Flashhead**

Mounting and outline dimensions for the flashhead are shown in *Figure 2-2*. The flashhead must be protected from lightning strikes. The flashhead may be mounted to painted or unpainted surfaces. One of the mounting holes in the base of the flashhead contains a built-in electrical ground connection. Use the following guidelines:

- Use a lightning rod extended above the flashhead to protect it when it is mounted at the uppermost part of the structure.
- Avoid locating a lightning rod where it would prevent tilting the lens open or interfere with access by maintenance or service personnel.

- Use a bonding strap when mounting the flashhead to the structure, and fasten the bonding strap to the flashhead with the mounting bolt that goes through the foot that contains the ground connection.

## Leveling

The flashhead must be level for correct vertical beam alignment. Two leveling vials—aligned with the mounting feet—are permanently attached to the flashhead assembly. Typically, the mounting surface for the flashhead is level and no adjustments are required. When the flashhead is level, bubbles in both leveling vials are centered. For leveling, use the following guidelines:

- If adjustment is necessary, raise the appropriate mounting foot with shims or washers. Raising one foot by  $\frac{1}{16}$  inch (1.6 mm) tilts the beam about  $\frac{1}{2}$  degree.
- Take extreme care to ensure that all four legs rest snugly against a firm mounting surface before tightening the mounting bolts. ***Failure to do so may damage the base when you tighten the bolts.***

## Photocell (Optional)

Mounting and outline dimensions for the photocell are shown in *Figure 2-3*. The photocell uses a male  $\frac{1}{2}$ " NPT for mounting. To mount the photocell, use the following guidelines:

- Locate the photocell where it has an unobstructed view of the polar sky.
- It must not view direct or reflected artificial light.
- The photocell may be supported directly by electrical conduit.
- *Ensure that the installation is watertight*

## Installation

This manual may not contain all the information about installation wiring required for your installation.

### NOTE

If installation drawings prepared specifically for your site disagree with information provided in this manual, the site installation drawings should take precedence. *Consult any site-specific instal-*

*lation wiring diagram supplied with your equipment.*

**Note:** FTCA wiring diagrams define only minimum requirements recommended for satisfactory equipment operation. ***It is the responsibility of the installer to comply with all applicable electrical codes.***

You can find conduit and other distribution wiring details on electrical installation diagrams provided by FTCA or others.

All installation wiring should have an insulation rating of 600 volts. Size power service wiring to satisfy the load demand of the power converters. Read the notes on the installation wiring diagrams supplied both in this manual and with the equipment.

## Power Converter Wiring

The voltage and frequency at which your beacon operates is imprinted on an external ID label and also inside the power converter near the fuse block. Internal fuses are sized according to the operating voltage. F2 is replaced by a jumper when Line 2 is neutral.

The gauge and insulation of the power distribution wires are dependent on the service voltage, the total load, and the length of the run. The voltage drop should not be allowed to exceed 5% at the power converter.

## Flashhead Wiring

Use the guideline shown in *Figure 2-4* or the installation wiring diagram sent with the equipment to interconnect the flashhead and power converter. In case of any difference between the two drawings, you must follow the installation wiring diagram supplied with the equipment.

The flashhead cable must continue directly from the flashhead to the power converter without intervening junctions or splices. You must support it to prevent it from hanging free and not allow it to contact any sharp edges. If it you do not run it through conduit or otherwise protect it, you must secure it to prevent movement by the wind.

## Securing the Flashhead Cable

FTCA recommends the following procedure for securing the flashhead cable to a skeletal structure:

1. Wrap two full turns of two-inch Scotchrap #50 tape, or equivalent alternative, around the cables and tower member at regular intervals along one of the tower legs.
2. Wrap three full turns of one-inch Scotchrap Filament #890 tape, or equivalent alternative, over the Scotchrap #50 tape.
3. Wrap four full turns of two-inch Scotchrap #50 tape, or equivalent alternative, over the Filament #890 tape. Apply the last two turns without tension.
4. In steps 1 through 3 wrap the tape directly above and below tower leg flanges at intervals of approximately five feet.

## Installation Checklist

Complete the following steps before applying power:

- 1. Inspect all equipment for damage.**
- 2. Verify the received equipment against the packing list to ensure completeness.**

- 3. Power Converter Mounting:**

Position and mount each unit allowing adequate clearance for opening the covers. Also, use the following guidelines:

- Ensure that the case is mounted upright.
- Check hardware inside the case to ensure that the chassis mounting screws and nuts are tight.
- Ensure that only the bottom of the case has drain holes and that they are clear.
- Ensure that no holes are punched or drilled on the top surface of the case.
- Ensure that air can flow around the case.
- Mount the power converter away from radio frequency interference (RFI).

- 4. Power Converter Wiring:**

Examine the installation drawings and use the following guidelines:

- Check for proper incoming service voltage.
- Wire each unit according to the instructions.
- Check all electrical connections for tightness.
- Check all terminal strip connections for tightness.
- Ground the power converter to the site grounding system.

- 5. Flashhead Mounting:**

- Ensure that the flashhead lens can be opened without striking other objects.
- Level and aim the flashhead.

- 6. Flashhead Wiring:**

- Ground the flashhead.
- Check the wiring of the flashhead cable to the flashhead.
- Secure the flashhead cable to the tower. Support and tape the cable to prevent its movement by the wind.

- 7. Photocell (optional):**

- Locate photocell where it views unobstructed polar sky with no direct or reflected artificial lighting striking it.
- Mount the photocell vertically on the top end of a vertical length of conduit to prevent water from entering the unit.
- Connect the photocell to the power converter: the black wire to TB1-5 and the white wire to TB1-6.
- Ground the wire shield around the photocell wires, if one is present. Do not ground the shield to the photocell, but ground it at the power converter.
- After running the photocell wires, check for continuity and shorts.

After completing all the steps listed above, turn on the power and perform an operational checkout from procedures in *Section 1*.

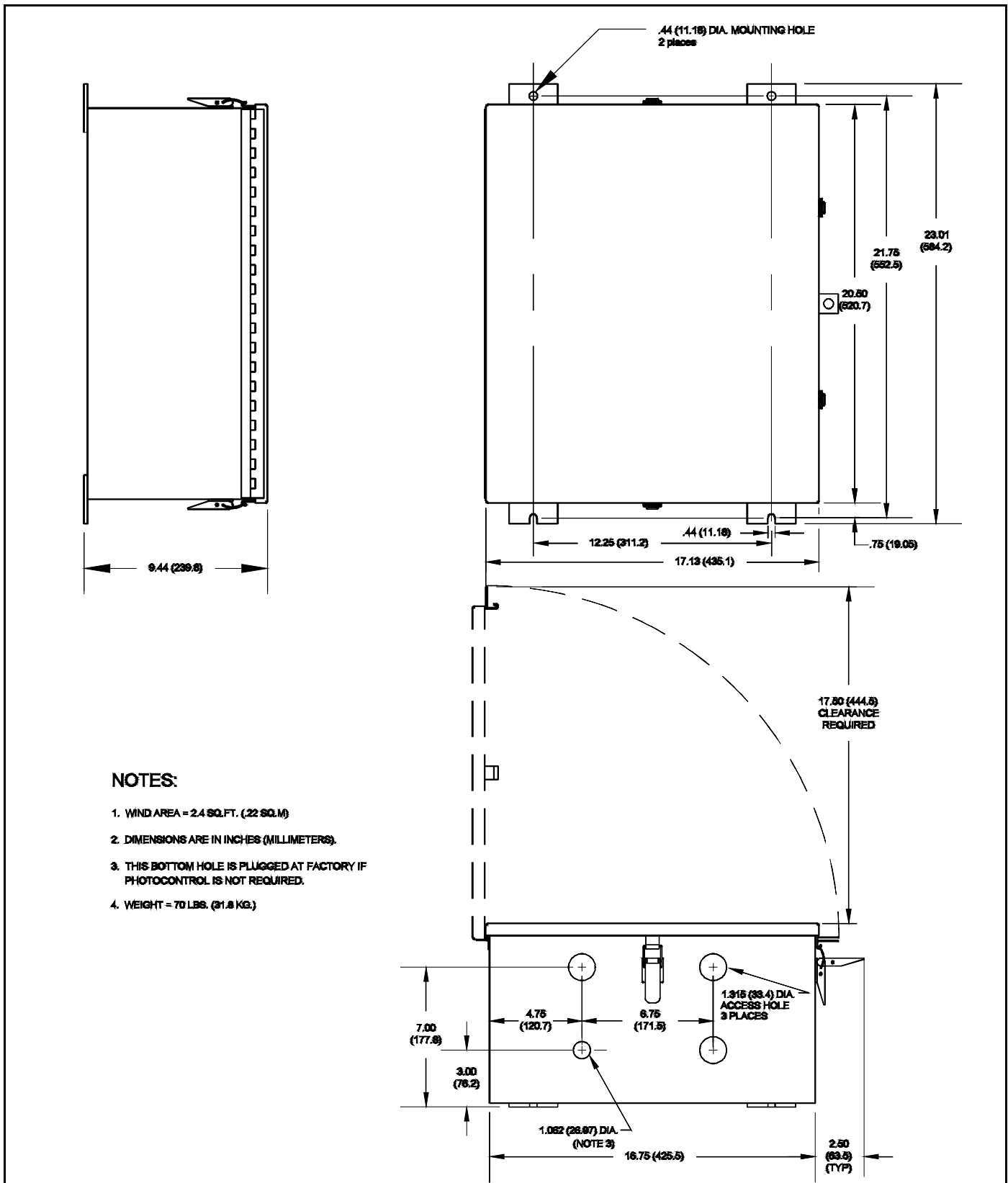
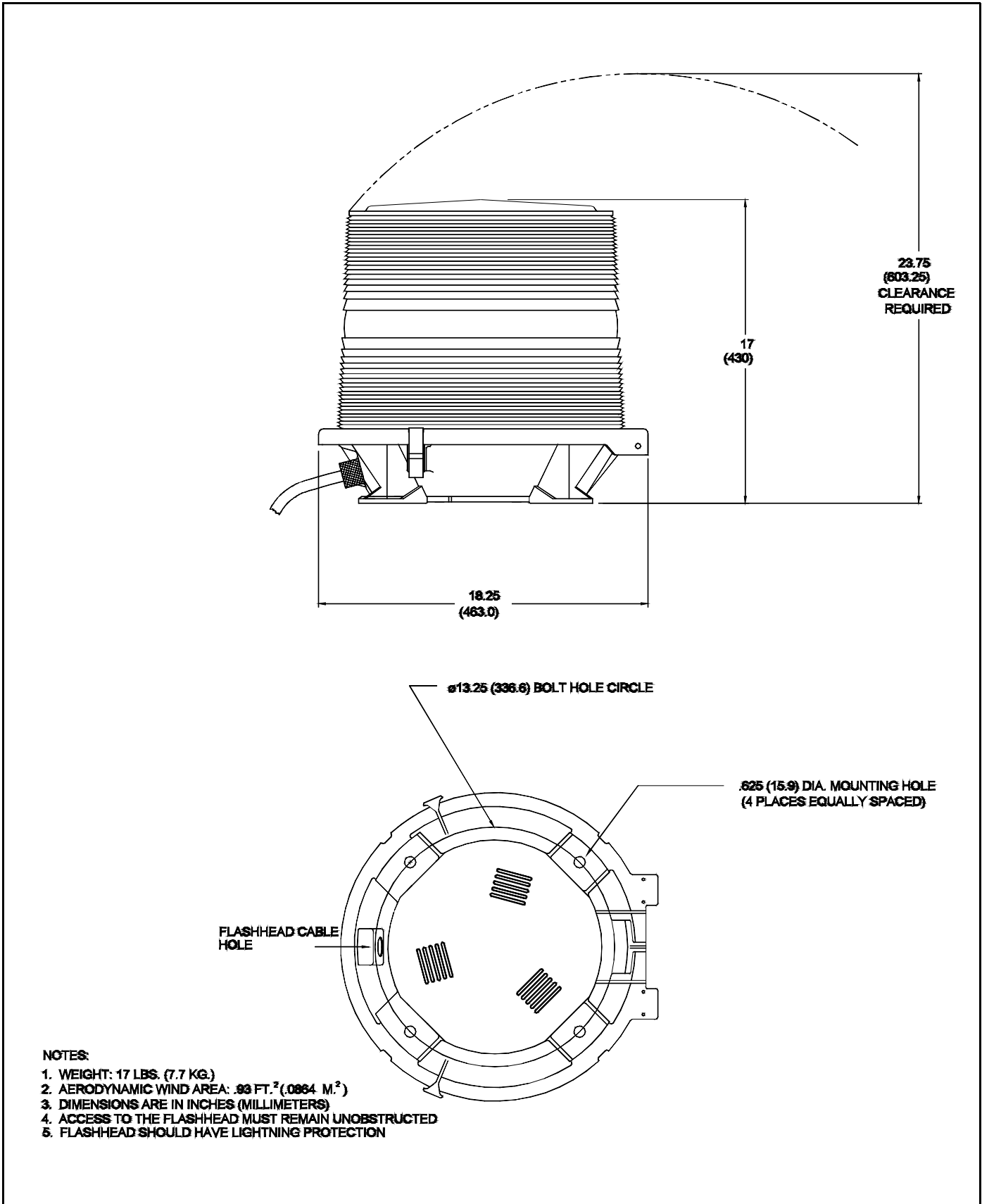


fig21

Figure 2-1 Power Converter Outline and Mounting



**NOTES:**

1. WEIGHT: 17 LBS. (7.7 KG.)
2. AERODYNAMIC WIND AREA: .93 FT.<sup>2</sup> (.0864 M.<sup>2</sup>)
3. DIMENSIONS ARE IN INCHES (MILLIMETERS)
4. ACCESS TO THE FLASHHEAD MUST REMAIN UNOBSTRUCTED
5. FLASHHEAD SHOULD HAVE LIGHTNING PROTECTION

fig22

**Figure 2-2 Flashhead Outline and Mounting**

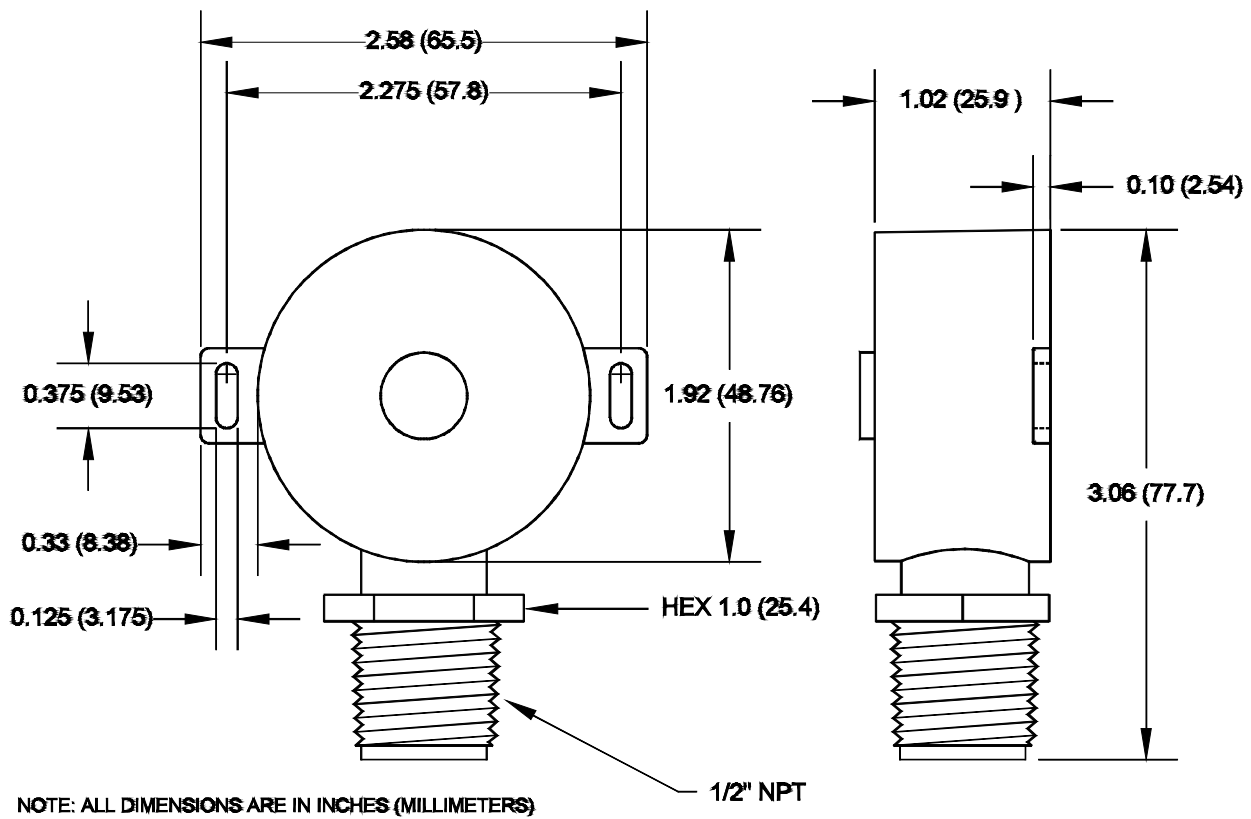


fig23

Figure 2-3 Photocell (optional) Mounting and Outline

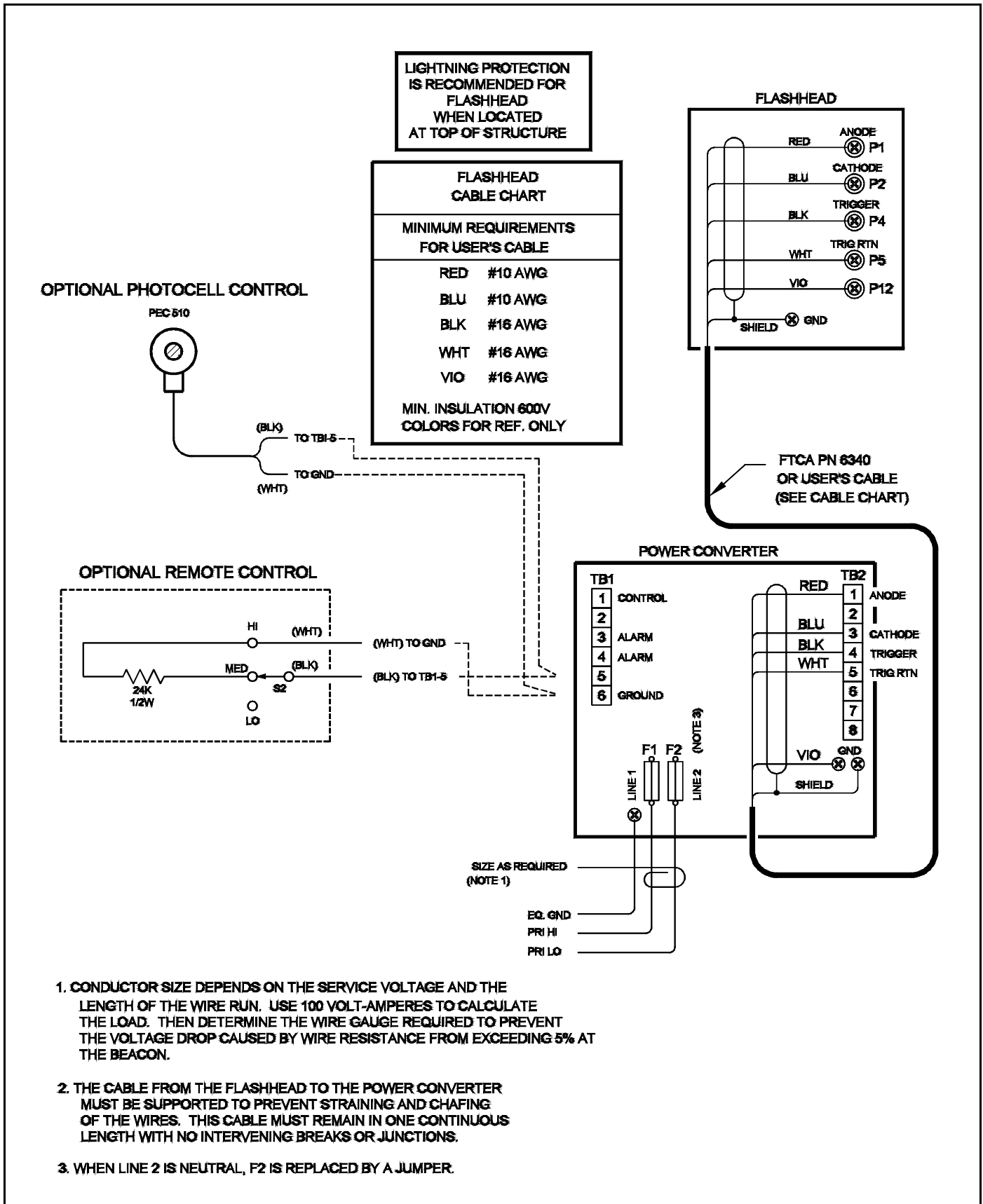
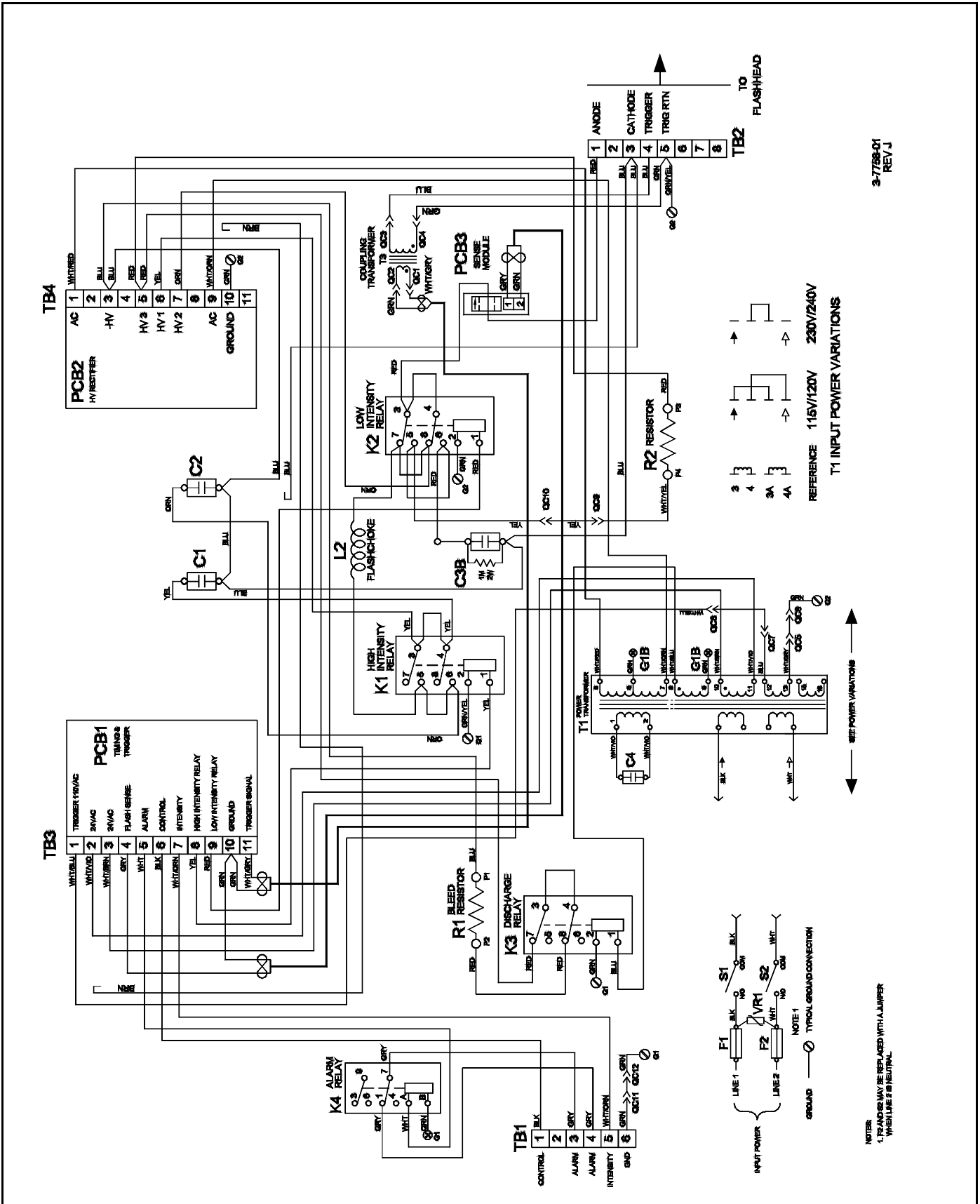


fig24

**Figure 2-4 FTB 736-5 Installation Wiring**



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REV J

Figure 2-5 Power Converter Internal Wiring



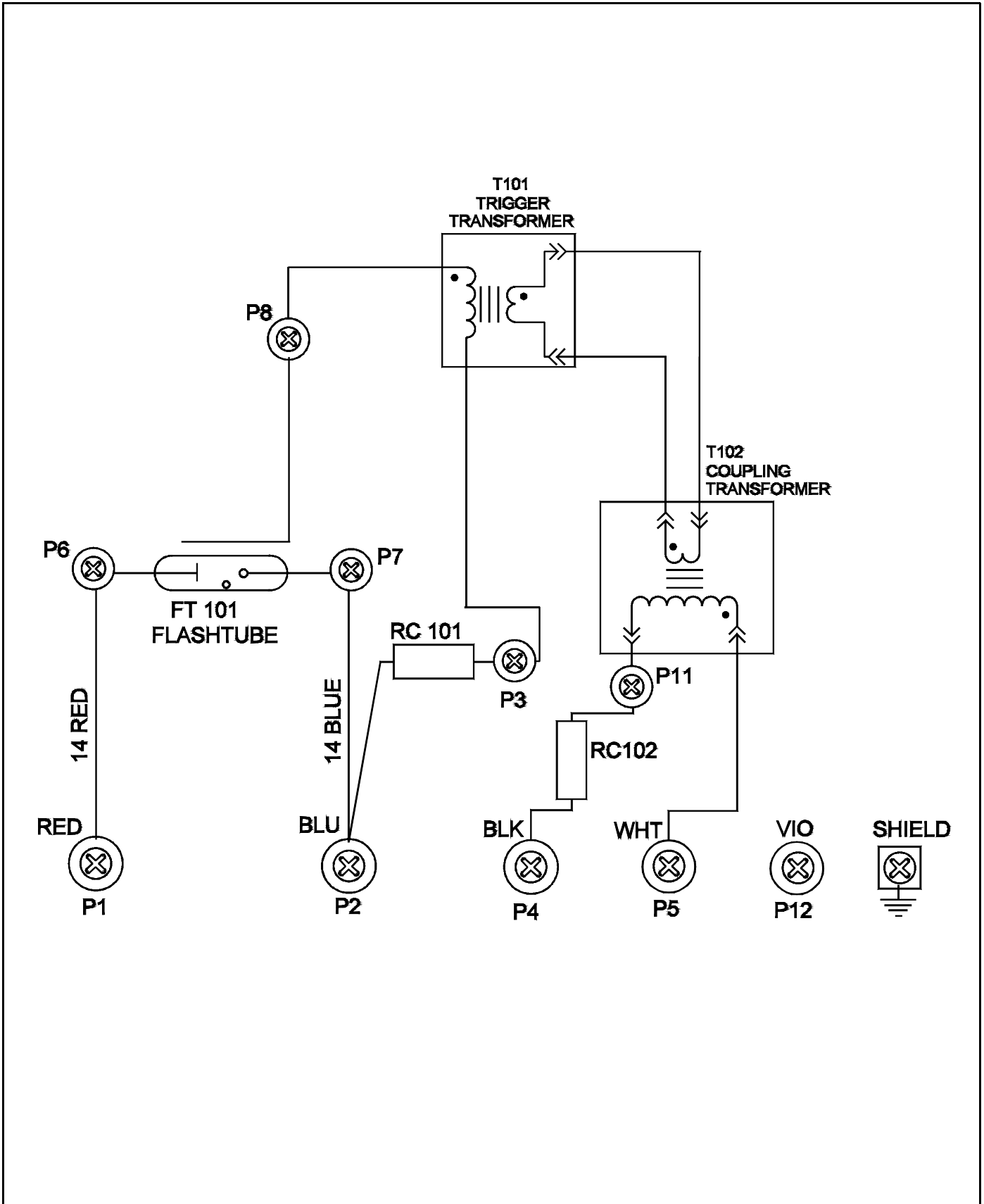


fig26

Figure 2-6 Flashhead Internal Wiring

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## Section 3 — Maintenance and Troubleshooting

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### Safety

#### **Warning**

STOP: Before proceeding—read the warning on Page III.

Work safely, as follows:

1. Remove rings and watches before opening the equipment.
2. Shut off the equipment.
3. Remove the component or connect the test instruments.
4. Replace the component.
5. Turn on the power and test the system.
6. Turn off the power and disconnect the test equipment.

### Preventative Maintenance

Carry out the following inspection and cleaning procedures at least once a year:

1. Verify that moisture has not entered the equipment accidentally through gaskets or seals, or collected as condensation.
2. Verify that all drain holes are clear.
3. Check terminal blocks and relays for evidence of corrosion and electrical arcing. Clean or replace any component showing evidence of high-voltage damage.
4. Check flashtube connections for signs of pitting or arcing. Verify that anode and cathode connections are firmly tightened.
5. Check all electrical connections for tightness and verify the absence of corrosion or electrical arcing.
6. Clean the outside surface of the lens with liquid detergent and water. Wipe it gently with a soft cloth.
7. Clean the inside surface of the lens with an FTCA-approved professional plastic cleaner. Wipe the lens with cheesecloth only. *Do not use regular cloth or paper towels.*

### Storage

No special considerations are required for long-term storage of any major assembly, such as the power converter, flashhead, photocell or any internal component. Circuit boards, when not installed in the equipment, should be kept in antistatic bags or containers.

### RFI Problems

Radio frequency interference (RFI) can cause a light to flash intermittently, at the wrong rate, or at the wrong intensity. RFI can enter the unit by way of *any* wire to or from the unit. For example:

- RFI on primary power wires could cause errors in flash rate and intensity.
- RFI on the photocell line could cause a light to stay at night intensity. RFI would not normally cause a light to stay at day/twilight intensity.
- Strong RFI could burn out PCB1 components.

While FTCA designed circuits to reject or bypass RFI, complete immunity cannot be guaranteed beforehand. It may be necessary after installation to add external filters or use other methods to reduce RFI entering the equipment.

### Component Testing

The following procedures describe how to check most of the major electrical components. Always make resistance measurements with the power turned off. However you must apply power for voltage measurements. However, perform all preliminary steps, such as connecting test leads or circuit jumpers, or disconnecting existing circuit connections, with the power turned off and storage capacitors discharged.

Refer to *Section 4 — Parts Lists* for component layouts.

#### **PERSONNEL HAZARD**

Dangerous voltages are present. Read the warning notice on Page III.

## Capacitor Testing General

Evaluate the condition of a capacitor with an analog volt-ohmmeter operating in the resistance mode. The following method assumes an instrument with a X100 resistance scale.

Place the meter leads across the terminals of an isolated (no electrical connections to other circuits) and fully discharged capacitor, and observe the subsequent needle movement.

If the capacitor is OK, the needle initially indicates zero ohms, but soon begins to rise higher indicated values. A capacitor that is disconnected from other circuitry is defective if it does not exhibit this behavior.

Manually discharge the capacitor before repeating this measurement. *This test may not detect a malfunction that occurs only at high voltage.*

A bank of capacitors connected in parallel may be checked as a single unit. For example, four 70-microfarad capacitors connected in parallel may be checked as a single capacitor of 280 microfarads. The ohmmeter response is 4 times longer for the entire bank than for one 70-microfarad unit. If a short circuit is indicated, the individual capacitors have to be disconnected and checked separately. A shorted capacitor is indicated if the resistance does not rise above zero after several seconds of measurement.

## Power Converter

### C1, C2, C3B — Main Capacitor Bank

The main capacitor bank is an energy storage bank consisting of several capacitors wired in parallel.

To test this bank, remove the PCB2 HV rectifier board and disconnect the large blue and yellow wires from C1 to the external discharge circuits. If the meter indicates a short circuit, you must isolate the individual capacitors and check them one at a time until you locate the defective capacitor.

### C4 — Tuning Capacitor

Remove the lead from one terminal of this 3-mfd capacitor.

### K1, K2, K4 — Relays

Remove one of the coil wires. The coil resistance should measure 470 ohms.

### K3 — Relay

Prepare to measure the resistance of this coil by removing one of the coil wires. The measured resistance across the coil should be approximately 290 ohms.

### L2 — Flash Choke

The measured resistance of this choke should be approximately 0 ohms.

### PCB1 — Timing and Trigger Board

Replace this circuit board with one known to be in good condition.

### PCB2 — HV Rectifier Boards

Replace this circuit board with one known to be in good condition.

### PCB3 — Sense Module

Replace this circuit board with one known to be in good condition.

### R1 — Bleed Resistor

The measured resistance of this component should be 35,000 ohms.

### R2 — Resistor

The measured resistance of this component should be 1000 ohms.

### T1 — Power Transformer

Test this transformer by removing PCB1 and PCB2 HV rectifier boards. Turn power on and measure secondary winding voltages as described:

**Table 3-1 T1 Transformer Voltage Test**

Test Points	Voltage
TB4-1 to TB4-9	900 - 1050 VAC <sup>1</sup>
TB3-1 and chassis ground	110 - 120 VAC
TB3-2 to TB3-3	22- 26 VAC

1. If this AC voltage is substantially less than the specified minimum value, check the C4 tuning capacitor.

### **T3 — Coupling Transformer**

The measured resistance should be approximately 1.5 ohms. Check the ferrite core for cracks. Check the assembly screws for tightness.

### **VR1 — Suppressor Assembly**

Prepare to check this component by removing one of its leads from a fuse block terminal. The measured resistance on the X100K ohm scale should be infinite.

## **Flashhead**

### **FT101 — Flashtube**

A visual inspection tells little about the working condition or performance of a flashtube. A darkened envelop does not necessarily mean the light output would be too low. Do not change the flashtube until you are certain that the problem is not the lack of a discharge potential or a triggering pulse.

### **T101 — Trigger Transformer**

Check for burning or arcing. Check continuity. If you are still in doubt, replace it with one known to be in good condition.

## **Component Removal and Replacement**

### **Power Converter**

Refer to *Figure 4-1 Power Converter Component Locations* on Page 4-3 for component locations and *Figure 2-5 Power Converter Internal Wiring* on Page 2-8 for wiring connections.

#### **Capacitors**

##### *Removal*

To access the capacitors, remove the circuit board assemblies for access to the capacitors. Remove the fuse (or fuses) for this procedure to prevent accidental application of power if the interlock switch is unintentionally pressed. Use the following procedure:

1. Disconnect the wires to the capacitors.
2. Remove the hold-down screws.
3. Lift the capacitors away from the chassis.

#### **K1, K2, K3 — Relays**

##### *Removal*

1. Remove the screws that hold wires to the relay terminals.
2. Remove connecting wires from the relay terminals.
3. Remove the two screws that hold the relay to the baseplate.

##### *Replacement*

1. Reverse the removal procedure.

#### **K4 — Relay**

##### *Removal*

1. Remove the screws that hold TB1 to the bracket.
2. Remove the screw under TB1 that hold K4 to the bracket.
3. Remove the wires from the relay terminals. Note their locations.

##### *Replacement*

1. Reverse the removal procedure.

#### **T1 — Power Transformer**

##### *Removal*

1. Disconnect the connecting wires while noting the terminals to which they are connected.

2. Loosen, but do not remove two Phillips-head screws on the right side of the transformer nearest the chassis bottom.

#### *Replacement*

1. Reverse the order of removal.

### **T3 — Coupling Transformer**

#### *Removal*

1. Disconnect the connections to the harness.
2. Remove the screws that hold the transformer to the baseplate.

#### *Replacement*

1. Reverse the removal procedure.

### **PCB1 — Timing and Trigger Board**

Eleven terminal block screws and two corner support screws support this circuit board.

#### *Removal*

1. Loosen but do not remove all eleven screws holding PCB1 to TB3.
2. Loosen but do not remove the corner support screws on PCB1.
3. Slide PCB1 away from the terminal block and lift it away from the corner supports as soon as the large end of the keyhole slots permit.
4. PCB1 can now be lifted completely away from the chassis.

#### *Replacement*

1. Reverse the order of removal.

### **PCB2 — HV Rectifier Board**

#### *Removal*

Removal is similar to the procedure in *Section PCB1 — Timing and Trigger Board*.

#### *Replacement*

Replacement is similar to the procedure in *Section PCB1 — Timing and Trigger Board*.

### **PCB3 — Sense Module**

#### *Removal*

1. Disconnect the red wire that passes through the coil on PCB3. You may have to cut the black plastic tie-wrap the binds the red wire to the harness.
2. *Carefully note the direction that the wire passes through the coil on PCB3.*
3. Using a small flat-blade screwdriver, loosen the two small screws on the terminal block on PCB3 to remove the grey and green wires.
4. Remove the two screws that hold PCB3 to the baseplate and remove PCB3.

#### *Replacement*

1. Reverse the removal procedure.

## **Flashhead**

Refer to *Figure 4-2 Flashhead Component Locations* on Page 4-4 and *Figure 2-6 Flashhead Internal Wiring* on Page 2-9.

### **FT101 — Flashtube**

#### *Removal*

1. Loosen the three screws (on screw lugs)—this enables you to disengage the flashtube.
2. Carefully lift the flashtube upward from the assembly.

#### *Replacement*

1. Align the pins on the flashtube base with the clamps of the terminal screw lugs, making sure that the *red dot* on the flashtube base coincides with the *red dot marked on the bracket directly under it*.
2. Carefully insert the flashtube and settle it into place, making sure the ceramic base is resting directly on the tops of the screw lugs. Secure the flashhead by tightening the three screws on the screw lugs.

### **T101 — Trigger Transformer**

#### *Removal*

1. At the trigger wire post adjacent to the flashtube, remove the large diameter wire coming from the trigger transformer.
2. At one of the smaller, side-mounted ceramic posts, remove the small wire to the trigger transformer. Do not disconnect the primary winding wires (seven turns of insulated wire).

3. Remove the two 4-40 x 2" phillips head screws holding the transformer assembly to the bracket. Note the orientation of the molded secondary winding with respect to fixed features on the bracket, because it must be reinstalled with this same orientation.
4. Remove the outer half of the core and lift off the molded secondary winding. The seven turns of the primary winding remain hanging in place.
5. Remove the inner half of the core, taking care not to uncoil any turns of the primary winding.

#### *Replacement*

1. Reassemble the primary and secondary windings over the two halves of the core. Attach the core to the bracket using the two long screws.
2. Reattach the electrical wires. Verify that wiring is in accordance with *Figure 2-6 Flashhead Internal Wiring* on Page 2-9.

### **T102 — Coupling Transformer**

Removal and replacement are similar to the procedure for the trigger transformer (T101) in *Section T101 — Trigger Transformer* on Page 3-4.

#### *Replacement*

Replace the wires exactly as you removed them. In some cases, a quick-connect wire terminal does not seat properly if it is not placed on the terminal cluster exactly as it was before removal. This misfit occurs because of interference between insulation on the wire terminal and the insulation surrounding the terminal cluster on the capacitor.

## **Troubleshooting**

The most effective troubleshooting procedure begins with observing the behavior of the beacon. This often leads directly to a faulty component or other abnormal condition. *Table 3-2 Observed Behavior* lists many of the symptoms that a malfunctioning beacon might exhibit. In *Table 3-3 Defective Component Locator Code from Table 5-2* these symptoms are correlated with components, assemblies, or conditions that, if defective or abnormal, could cause the beacon to behave as observed. Each item in *Table 3-3* is listed in the order of its likelihood of causing the failure.

For example, assuming that the beacon does not flash at all but some of its circuits are still operating; that is, fuses are not blown, relays operate, and so forth. This behavior is symptom C in *Table 3-2*. *Table 3-3* indicates that symptom C behavior would most likely be caused by a defective timing and trigger board. The next most likely cause would be a defective rectifier board. The third would be the NITE capacitor, and so forth.

**Table 3-2 Observed Behavior**

Codes	Flash Observed		Comments
	High/Medium	Low	
A	NO	NO	All circuits are dead
B	NO	NO	Repeatedly blows line fuses
C	NO	NO	Some circuits are functioning: LEDs are on, relays operate.
D	OK	NO or Weak	
E	OK	OK	Flash timing erratic: <i>not</i> 4 flashes per .5 seconds with 1.5 seconds between flash cycles
F	Weak	OK	Sometime skips a flash
G	OK	OK	Erroneous FAIL
H	OK	None	No night flash
I	None	OK	No day flash
J	High Only	None	Flash never changes from high.



**Table 3-3 Defective Component Locator Code from Table 5-2**

Item No.	Component	Codes									
		A	B	C	D	E	F	G	H	I	J
C1, C2	DAY capacitor bank			4							
C2	TWI mode capacitor			3	4						
C3B	NIGHT mode capacitor										
C4	Tuning capacitor						1				
F1, F2	Fuse	1									
FT101	Flashtube			6							
K1	High Relay (energized for DAY operation; day and night relays de-energized for TWILIGHT operation)									1	
K2	Low Relay (energized for NIGHT operation; day and night relays de-energized for TWILIGHT operation)								1	1	
K3	Discharge Relay (allows capacitor discharge when power off)										
K4	Alarm Relay; alarm contacts close on alarm (energized for normal operation; de-energized upon alarm)							3			
L2	Flash choke				3						
PCB1	Timing and trigger board			1		1		2	2		3
PCB2	HV rectifier board			2	1						
S1	Interlock switch	3									
T1	Power transformer	4	2	5							
PCB3	Sense module							1			
T101	Trigger transformer			7							
VR1	Suppressor assembly		1								
Optional Switch	Control Box Intensity Switch								2	2	1
Optional PEC 510 Photocell	Photocell										2
Footnote 1						2					
Footnote 2			3								

1. Check for RFI (see *Section RFI Problems* on Page 3-1).
2. Check for a short circuit in the 24 VAC or 110 VAC secondary windings of the power transformer.

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## Section 4 — Parts Lists

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### Customer Service

Customer Service: 1-800-821-5825  
Telephone: (615)-261-2000  
Facsimile: (615)-261-2600

Internet Address:

<http://www.flashtechology.com>

Shipping Address:

Flash Technology Corporation of America  
332 Nichol Mill Lane  
Franklin TN 37067

### Ordering Parts

To order spare or replacement parts, call FTCA Customer Service at 1-800-821-5825.

### Power Converter Parts

*Table 4-1* lists the major replaceable parts for the power converter. Refer to *Figure 4-1*.

### Flashhead Parts

*Table 4-2* lists the major replaceable parts for the flashhead. Refer to *Figure 4-2*.

### Photocell (Optional)

The PEC 510 Photocell, is a single assembly PN 1855001.

### Returning Equipment\*

To return equipment to FTCA, call Technical Support at 1-800-821-5825 for a Return Material Authorization (RMA) number.

### Repackaging

You must return the equipment in a container that provides maximum protection during shipping and handling. If the original cartons and packaging material are no longer available, package the power converter and flash-head *separately* as described in the following subsections.

#### **Power Converter**

Package and ship the power converter on its back; that is, with the mounting plates downward against the bottom of the box. Pad the power converter so that the plates cannot penetrate the box during shipment. Box each power converter separately using a double thickness cardboard container and adequate padding. Do not drop. Use appropriate warning labels on the outside of the container.

#### **Flashhead**

Package and ship the flashhead in an upright position. Box each flashhead separately and use adequate padding. Attach the flashhead base to a plate measuring 20 inches square (e.g., 3/8" plywood). Use a double thickness cardboard (or wood) container that is 20 inches square by about 26 inches high (inside dimensions). Use soft packing or a cardboard collar around the lens to prevent tipping inside the container. Do not drop. Use appropriate warning labels on the outside of the container.

**\*Full RMA policy found at the end of this document.**

**Table 4-1 Power Converter Major Replaceable Parts**

Item	Description	Part Number
C1	Capacitor, 70 mfd.	6720401
C2	Capacitor, 8 mfd.	6731201
C3B	Capacitor, 4 mfd.	6534702
C4	Capacitor, 3 mfd.	6577903
F1	Fuse, 60 Hz Fuse, 50 Hz	4900307 <sup>†</sup> 4900303 <sup>†</sup>
K1, K2	Mode Relays	8900494 <sup>†</sup>
K3	Discharge Relay	8900493 <sup>†</sup>
K4	Alarm Relay	4901233
L2	Flash Choke	4175200
PCB1	Timing and Trigger Board, 60 Hz Timing and Trigger Board, 50 Hz OR Timing and trigger board 50/60 Hz	2652201 <sup>†</sup> 2722101 <sup>†</sup>  2904413 <sup>†</sup>
PCB2	HV Rectifier Board	2458005 <sup>†</sup>
PCB3	Sense Module	2811101
R1	Bleed Resistor 35K, 50W	6900541
R2	Resistor 1K, 50W	6900534
S1	Interlock Switch	4901220
T1	Power Transformer, 60 Hz Power Transformer, 50 Hz	8841201 8842901
T3	Coupling Transformer	8336701
VR1	Suppressor Assembly	6901079 <sup>†</sup>

<sup>†</sup> Recommended as a spare part.

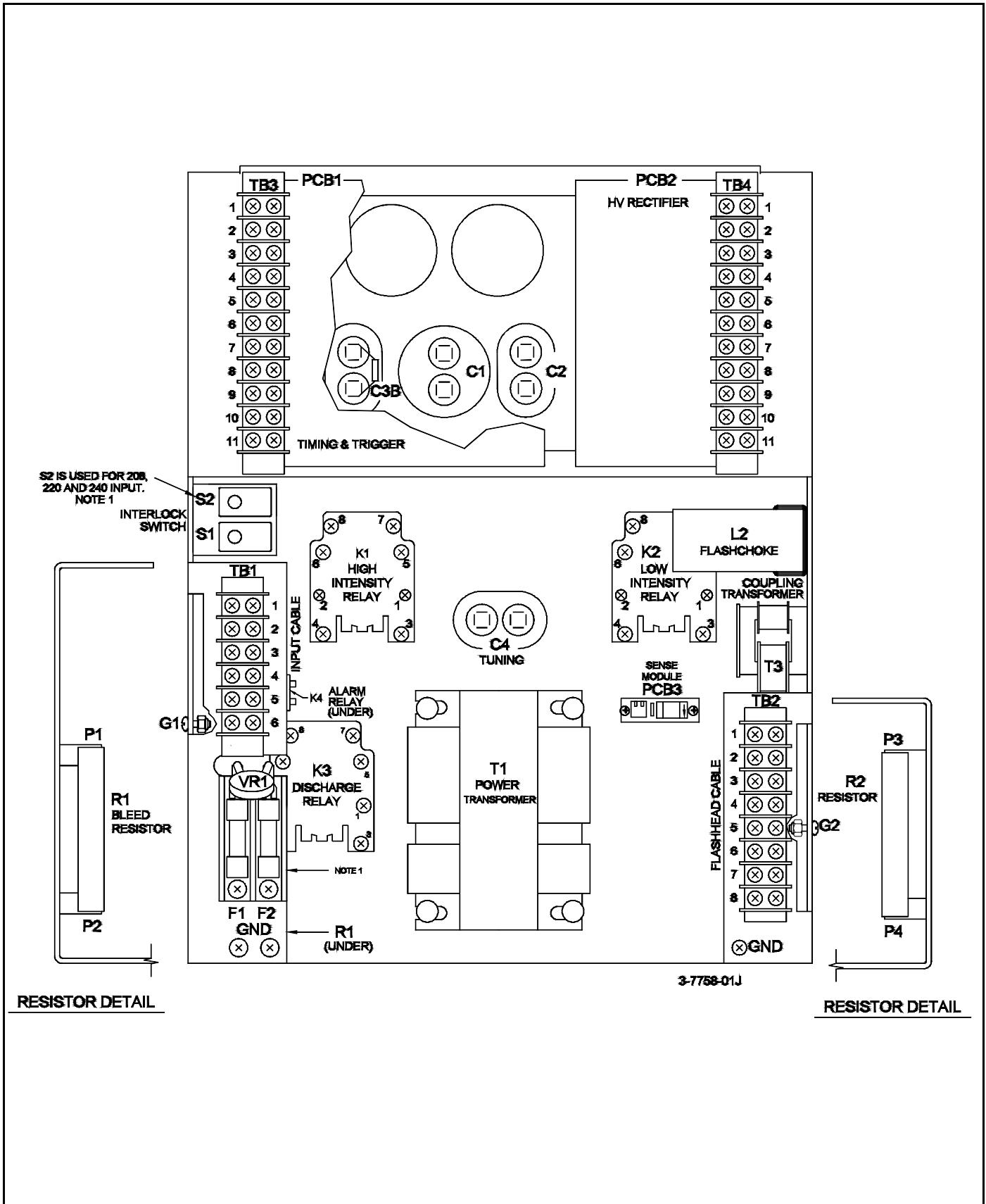
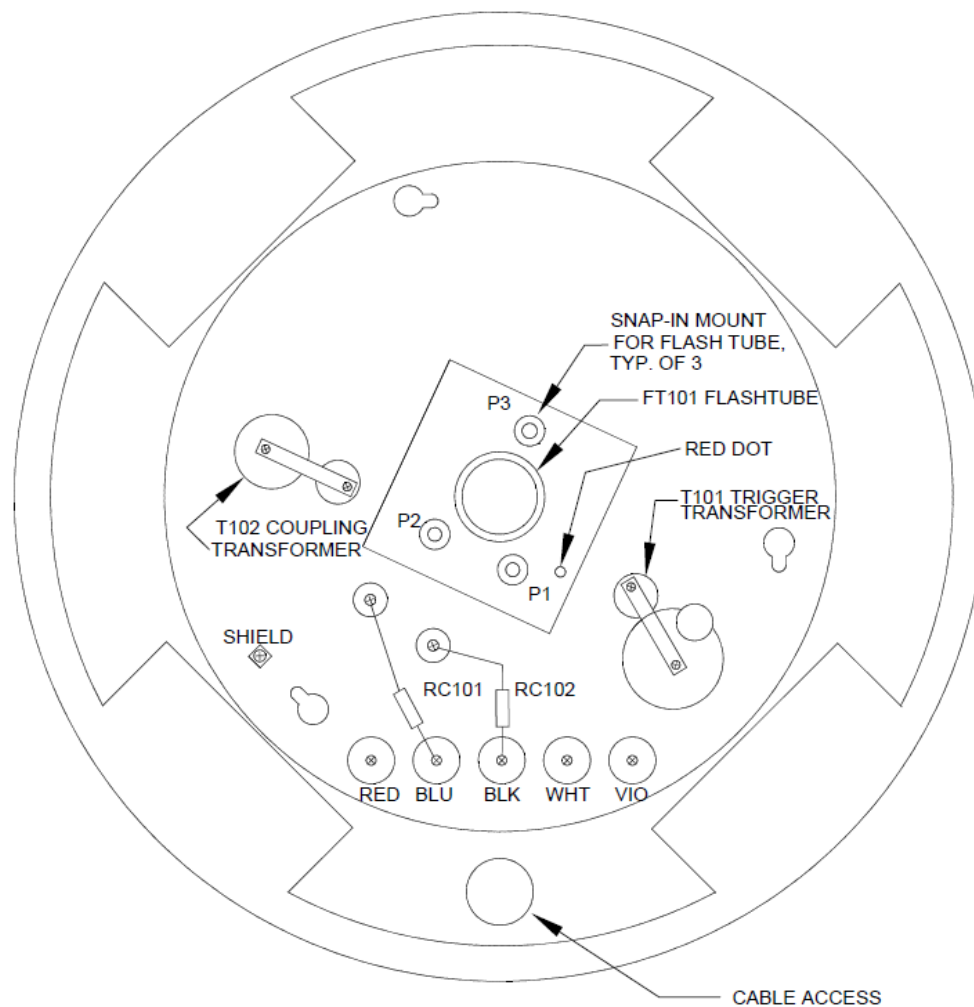


Figure 4-1 Power Converter Component Locations

**Table 4-2 Flashhead Major Replaceable Parts**

Item	Description	Part Number
P1, P2, P3	Tube Socket Assy	1884301
P1, P2, P3	Ceramic Spacer	5900842
FT101	Flashtube	8384329†
RC101	R.C. Network	1403411
RC102	R.C. Network	1403412
T101	Transformer, Trigger	8288201
T102	Transformer, Coupling	8336701
--	Flashtube Assy Plate	8905338

† Recommended as a spare part.



**Figure 4-2 Flashhead Component Locations**

fig42

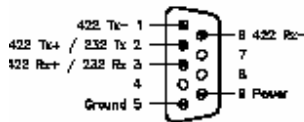
# Section 5 — Programming T&T Board P/N 2904413

## Connecting the Handheld

Table 5-1 shows the connector pin assignments for the handheld. The receive and transmit directions shown in the table are with respect to the handheld. The DB9 connector is located at the top of the handheld programmer.

**Table 5-1 Pin Assignments**

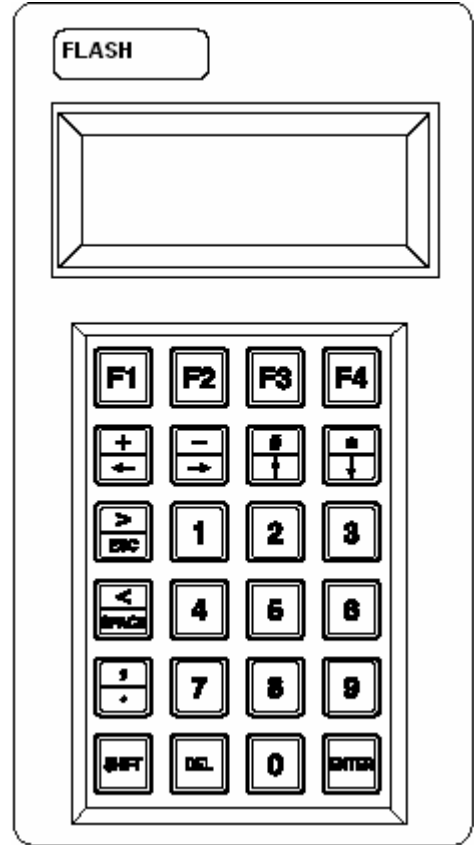
DB9 Female	EIA-232 Function
3	Receive +receive
6	No connection -receive
2	Transmit +transmit
1	No connection -transmit
9	Power
5	Ground



DB9 Female

A 9-pin RS-232 cable is used to connect the handheld to the 9044-01 controller board at connector J2 (9 pin Male connector). Power and ground is provided by this connector.

The same connector J2 on the 9044-01 is also used to connect a computer serial port for the enhanced user interface. This interface is used to set parameters, run production and vendor tests and display general operating information.



**Figure 5-1** FIGURE 5-1 Handheld Programmer

## Using the Programmer

The programmer has a four line LCD display and 24 keys as shown in fig. 5.1.

The following is a general discussion of how the programmer works. See Parameters under the SETUP section below for more details.

In the discussions to follow the 4 line LCD display will be represented as shown:

L1: \*\*\*\*\*

L2: \*\*\*\*\*

L3: \*\*\*\*\*

L4: \*\*\*\*\*

All the messages displayed on the LCD will be in capital letters.

The display does not show the L1: etc. this is used to represent line 1, 2, 3 and 4 on the LCD.

Once the handheld programmer is connected to the 9044-01 and power is applied the 9044-01 will automatically recognize that the terminal is connected to it and will display the sign on message . Only terminals provided by Flash Technology will work with the 9044-01.

The general format of the sign on message is:

L1: FLASH TECHNOLOGY

L2: BOARD 5978

L3: (Blank or further information)

L4: ENTER TO CONTINUE

Once enter is pressed the first menu is displayed as follows:

L1: PRESS A FUNC KEY

L2: F1. SETUP F2. INFO

L3: F3. SHORTTEST

L4: F4. MODE CHANGE

To continue further a function key must be pressed. The function keys are on the top row of the terminal. See fig. 5.1.

F1: Enters the setup menus, used to configure the 9044-01.

F2: Enters the information menu, used to show a limited amount of useful operating info.

F3: Causes the 9044-01 to perform the short test.

F4: Enters the mode change menu, used to manually change the operating mode to(HIGH, MED, and LOW).  
Note: For PN 2904413 DAY equals HIGH, TWI equals MED and NITE equals LOW intensity

Note: The handheld terminal will return to the sign on message from any other menu if no key is pressed within two minutes. The 9044-01 does this to take the serial port out of the handheld terminal mode if the terminal has been removed to allow the serial port to be used for the enhanced user interface. This means that if you remove the handheld terminal and connect a computer to use the enhanced interface you must wait at most two minutes before pressing any key on the computer. You can cycle the power to the 9044-01 for faster access to the computer interface.

## Setup

The setup menu has the following format:

L1: SETUP

L2: 0-1-1

L3:

L4: OK NEXT BACK EXIT

The first line displays the current menu. The second line displays the current setup. The numbers correspond to the selected parameters. The third line is blank. The fourth line displays what functions the keys F1 thru F4 will perform if pressed; the words are spaced to be over the corresponding function key. So, to move to the next menu you would press F2 (NEXT).

F1: OK- is used to enter data.

F2: NEXT- moves to the next item.

F3: BACK- moves to the previous item.

F4: EXIT- exits the setup menu.



## Parameters

Pressing the NEXT or BACK function key from the SETUP menu takes you to the parameters. The general format is:

L1: SETUP

L2: SYSTEM

L3: 0- Bec. 1- Air. 2- Hel

L4: OK NEXT BACK EXIT

The currently selected option will have the cursor under it. For example:

0-Bec 1-Air 2-Hel shows that the currently selected option for the parameter is zero (0) which in this case means Omni Beacon.

If the board your are configuring is not in the Heliport mode press 2 the F1 (OK).

To change the Flash rate press NEXT until the LCD shows: NOTE: Valid flash rate is 30 fpm. This is the default and cannot be changed

L1: SETUP

L2: FPM 1-60 2-30

L3: 3-20 4-100 5-120

L4: OK NEXT BACK EXIT

Flicks default to single and should only be changed if it is not that. To change, press NEXT until the LCD shows:

L1: SETUP

L2: FLICKS

L3: 0-Single 1-Double

L4: OK NEXT BACK EXIT

Then press 0 and press F1 (OK) to change it.

## Info

The info menu has the following format:

L1: INFO

L2: BOARD 5978

L3:

L4: NEXT BACK EXIT

This menu is used to show a limited amount of information about the current 9044-01 operation and configuration.

The first line displays the current menu. The second and third lines display board information. The fourth line displays what functions the keys F2 thru F4 will perform if pressed; the words are spaced to be over the corresponding function key. So, to move to the next item you would press F2 (NEXT).

F2: NEXT- moves to the next item.

F3: BACK- moves to the previous item.

F4: EXIT- exits the setup menu.

Items like energy, trigger voltage, flash rate and operating mode are displayed.

## Mode Change

The mode change menu has the following format:

L1: MODE CONTROL

L2: CURRENT DAY/HIGH

L3:

L4: HIGH MED LOW EXIT

F1: HIGH- Changes the intensity to HIGH.

F2: MED- Changes the intensity to MED.

F3: LOW- Changes the intensity to LOW.

F4: EXIT- exits the mode change menu and returns the mode to automatic.

This menu item is used to manually change the operating modes and functions just like the test jumpers on the board.

## Return Material Authorization (RMA) Policy

**IF A PRODUCT PURCHASED FROM FLASH TECHNOLOGY MUST BE RETURNED FOR ANY REASON (SUBJECT TO THE WARRANTY POLICY), PLEASE FOLLOW THE PROCEDURE BELOW:**

**NOTE:** An RMA number must be requested from Flash Technology prior to shipment of any product. No returned product will be processed without an RMA number. This number will be the only reference necessary for returning and obtaining information on the product's progress. Failure to follow the below procedure may result in additional charges and delays. Avoid unnecessary screening and evaluation by contacting Technical Support prior to returning material.

**1. To initiate an RMA: Call Flash Technology's National Operations Center (NOC) at (800-821-5825) to receive technical assistance and a Service Notification number. The following information is required before a Service Notification number can be generated:**

- Site Name/Number / FCC Registration number/ Call Letters or Airport Designator
- Site Owner (provide all that apply – owner, agent or subcontractor)
- Contractor Name
- Contractor Company
- Point of Contact Information: Name, Phone Number, Email Address, Fax Number and Cell Phone (or alternate phone number)
- Product's Serial Number
- Product's Model Number or part number
- Service Notification Number (if previously given)
- Reason for call, with a full description of the reported issue

**2. The Service Notification number will then serve as a precursor to receiving an RMA number if it is determined that the product or equipment should be returned. To expedite the RMA process please provide:**

- Return shipping method
- Shipping Address
- Bill to Address
- Any additional information to assist in resolving the issue or problem

**3. Product within the Warranty Time Period**

- a. If to be returned for repair;
  - RMA # is generated
  - Once product is received and diagnosed;
    - Covered under warranty – product is repaired or replaced
    - Not covered under warranty – quote is sent to the customer for a bench fee of **\$350 plus parts** for repair
      - If the customer does not want the product repaired, a **\$50 test fee** is charged before being returned
- b. If advance replacement;
  - Purchase order may be required before the advance replacement order is created
  - RMA # is generated and the advance replacement order is created
  - Once product is received and diagnosed;
    - Covered under warranty – credit given back if PO received
    - Not covered under warranty – credit **will not** be applied to PO
  - Flash Technology has sole discretion in determining warranty claims. Flash Technology reserves the right to invoice for parts advanced if the associated failed parts are not returned within 15 days of issue or if product received is diagnosed to be non-warranty.
  - Advance replacements will be shipped ground unless the customer provides alternative shipping methods.

#### 4. Product outside the Warranty Time Period

- a. For Xenon System board repair; a purchase order is required at time of request for a RMA # for a standard **\$350 repair bench fee**
  - RMA # is generated with the PO attached
  - If the board is deemed non-repairable after diagnosis, the customer is notified. If the customer purchases a new board, the repair bench fee is waived. If the customer does not buy a new board, a **\$50 test fee** is charged before being returned or scrapped.
- b. For all other products; no purchase order is required to return the product for diagnosis
  - RMA # is generated
  - Once product is diagnosed, quote is sent to the customer for a bench fee of **\$350 plus parts** for repair
  - Once the purchase order is received, the product will be repaired and returned
    - If the customer does not want the product repaired, a **\$50 test fee** is charged before being returned or scrapped.

#### 5. After receiving the Flash Technology RMA number, please adhere to the following packaging guidelines:

- All returned products should be packaged in a way to prevent damage in transit. Adequate packing should be provided taking into account the method of shipment.  
**Note: Flash Technology will not be responsible for damaged items if product is not returned in appropriate packaging.**

#### 6. All packages should clearly display the RMA number on the outside of all RMA shipping containers. RMA products (exact items and quantity) should be returned to:

Flash Technology  
Attn: RMA #XXX  
332 Nichol Mill Lane  
Franklin, TN 37067

#### 7. All RMA numbers:

- Are valid for 30 days. Products received after 30 days may result in extra screening and delays.
- Must have all required information provided before an RMA number is assigned.

