

FLASH TECHNOLOGY 

SN

Airport Acquisition Beacon

FTB 723-1

Equipment Reference Manual
P/N # 7917231

Front Matter

Abstract

This document describes the FTB 723-1 Airport Acquisition Beacon.

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Applicable Specification

This equipment meets or exceeds the requirements established by the Airport Authority Group of Transport Canada in the Equipment Specification, K-407.

Disclaimer

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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 Nor Tamper with 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 — FTB 723-1 Introduction and Operation

System

The system consists of a flashhead, power converter, and interconnecting cable. The flashhead is composed of a 400 millimeter plastic lens on a composite plastic base. The lens encloses the flashtube and other flashhead components. The flashhead is usually mounted on an elevated structure. The power converter provides AC and DC voltages and various control circuits in an outdoor enclosure. It is usually situated at ground level at some distance from the flashhead.

The flashhead and power converter are interconnected electrically, and if not otherwise stated, a separation of up to 100 feet is assumed. It is possible to separate the two by as much as 1000 feet if so specified at the time of purchase. The interconnecting wires may be furnished by the user if the conditions outlined in Section 2 of this manual are met.

Specifications

Light Output

| | | |
|-----------|--------|------------------------------------------------|
| Intensity | High | 12,000 ±25% ECD |
| | Medium | 6,000 ±25% ECD |
| | Low | 3,000 ±25% ECD |
| Rate | | 20 flashes per minute |
| Coverage | | 360 degrees horizontally, 5 degrees vertically |

Electrical

| | |
|--------------------------------|--------------------------------------------|
| Voltage | 120 Volts ± 10%, 60 Hz, ± 1%, single phase |
| VoltAmperes Average | 175 |
| VoltAmperes Peak | 250 |
| Power (20 fpm, high intensity) | 130 Watts at 12,000 ECD |

Mechanical

Flashhead

| | |
|-----------|------------------------------------------------|
| Height | 17 in. (430 mm.) |
| Diameter | 18.25 in. (463 mm.) |
| Weight | 17 lb. (7.7 kg.) |
| Wind Area | .93 ft ² . (.0864 m ² .) |

Power Converter

| | |
|--------|-----------------|
| Height | 24 in. (61 mm.) |
|--------|-----------------|

| | |
|-----------|---------------------------------------------|
| Width | 16 in. (41 mm.) |
| Depth | 10 in. (26 mm.) |
| Weight | 67 lb. (30 kg.) |
| Wind Area | 2.2 ft ² . (.2 m ² .) |

Notes: Dimensions are nominal. See outline drawings in Section 2 of this manual for mounting and clearance details.

Environmental

Meets K-407, Airport Authority Group, Transport Canada

Monitoring

Isolated relay contacts close upon failure; contact rating 1 Ampere at 120 VAC.

Option

Specific flash rates from 15 to 40 flashes per minute are factory installed upon your order, or can be programmed with the handheld programmer (Section 5).

Operation

Capacitive discharge circuitry creates intense pulses of light from a flashtube filled with xenon gas. The light beam covers 360 degrees horizontally and 5 degrees vertically. The lower beam edge is controlled to limit the light directed below the horizon.

Alarm Indication

An internal alarm relay with electrically isolated contacts permits remote status monitoring. This relay remains energized as the beacon flashes, but drops out (de-energizes) if flashing ceases for any reason. Normally, contacts that close upon failure are available for connection to external circuitry. Instead, contacts that open upon failure can be supplied if requested at the time of purchase.

Modes

The beacon has three modes of operating intensity. The only difference between modes is the intensity of the flashes. An intensity control switch mounted on the power converter controls the intensities.

Power On and Flash Rate

Turn the equipment on or off by controlling the primary power source. The equipment flashes at the selected intensity as soon as power is applied. The standard rate is 20 flashes per minute. The rate is controlled by a programming matrix on the internal Timing and Trigger Board, which is the center of control and is programmed by the factory. The Timing and Trigger Board contains indicator lights that can be used for operational checkout and troubleshooting.

Indicators for Board 2687006

Five indicator lights reside on the Timing and Trigger Board. Four are LED lights, and one is a neon lamp. These lights have the functions described in *Table 1-1 Timing and Trigger Board Indicator Lights* on Page 1-2.

Table 1-1 Timing and Trigger Board Indicator Lights

| Light | Description |
|--------------------|-----------------------------------------------------------------------------------|
| LOW (green) | Indicates that the unit is flashing in low mode. [†] |
| HIGH (green) | Indicates that the unit is flashing in high mode. [†] |
| SYNC (red) | Blinks at the specified flash rate. |
| CONF (green) | Glows steadily. Extinguishes if the beacon stops flashing while power is applied. |
| I 1 (trigger neon) | Lights when triggering voltage is present. |

[†] When both the HIGH and LOW LEDs are off, the unit is flashing in medium mode.

Checkout Procedure for Board 2687006

If the equipment operates as described in the following checkout, it is operating correctly. If it does not, consult the troubleshooting tables in *Section 3*.

Check A

Apply power and verify that all of the following responses occur:

- The HIGH LED is illuminated.
- The LOW LED is out.
- The SYNC LED is blinking.
- The CONF LED is illuminated.
- The I 1 TRIG neon lamp is glowing.
- The beacon is flashing.

Check B

Temporarily disconnect the trigger wire at terminal 11 of the Timing and Trigger Board. Apply power to the equipment and verify that the responses are the same as in *Section Check A* on Page 1-2 with the exceptions listed next:

- The beacon does not flash.
- The CONF LED is out (after four flash cycles).

Indicators for Board 2904413

The indicator lights have the functions described in *Table 1-2 Timing and Trigger Board 2904413 Indicator Lights* on Page 1-2.

Table 1-2 Timing and Trigger Board 2904413 Indicator Lights

| Light | Description |
|--------------------|-----------------------------------------------------|
| NITE (green) | Indicates that the unit is flashing in low mode. |
| DAY (green) | Indicates that the unit is flashing in high mode. |
| TWI (green) | Indicates that the unit is flashing in medium mode. |
| ALARM (red) | Indicates system has a problem. |
| I 8 (green) | Indicates an intensity alarm |
| SYNC (green) | Blinks at the specified flash rate. |
| I 9 (trigger neon) | Lights when triggering voltage is present. |

Checkout Procedure for Board 2904413

If the equipment operates as described in the following checkout, it is operating correctly. If it does not, consult the troubleshooting tables in *Section 3*.

Check A

Apply power and verify that all of the following responses occur:

- The DAY LED is illuminated.
- The NITE LED is out.
- The TWI LED is out.
- The SYNC LED is blinking.
- The I 9 TRIG neon lamp is glowing.
- The beacon is flashing.

Check B

Temporarily disconnect the trigger wire at terminal 11 of the Timing and Trigger Board. Apply power to the equipment and verify that the responses are the same as in *Section Check A* on Page 1-3 with the exceptions listed next:

- The beacon does not flash.
- The ALARM LED is on (after four flash cycles).
- The I 8 (intensity) LED is on.

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Section 2 — Outline, Mounting, and Installation

Unpacking

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

Tools

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

- Phillips-head screwdriver, #2
- Medium (# 2 - 3/16"), flat-blade screwdriver
- Medium (# 3 - 5/16"), flat-blade screwdriver
- Medium, slip joint pliers
- 8-in. adjustable wrench
- Hex nut driver or hex socket, 5/16"
- Hex nut driver or hex socket, 7/16"
- Hand tools for electrical wiring

Access

WARNING

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

Power Converter Access

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

Flashhead Access

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 capacitors 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 rim of the lens clears nearby objects during opening and closing.

Mounting

Power Converter Mounting

Mounting and outline dimensions for the power converters are shown in *Figure 2-1*. 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.
- You must use a bonding strap on a bolt through the power converter case leg. Connect the strap to the site grounding system.

FTCA does not furnish mounting hardware unless you order it as part of an installation kit.

Flashhead Mounting

Mounting and outline dimensions for the flashhead are shown in *Figure 2-2*. Protect the flashhead from lightning strikes. The flashhead may be mounted to painted or unpainted surfaces. 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 leg that contains the ground connection.

Leveling

The flashhead must be level for correct vertical beam alignment. Two leveling vials are permanently attached to the flashhead assembly. 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 1/16 inch (1.6 mm) tilts the beam about 1/2 degree.
- Take extreme care to ensure that all four feet rest snugly against a firm mounting surface before tightening the mounting bolts. Failure to do so could result in serious damage to the base when you tighten the bolts.

Installation Wiring

NOTE

Only general information for a typical installation is presented here, and more specific information may be needed for your site. In particular, because the L-810 marker (side-light) lighting components for red nighttime lighting are often purchased from others, and have many variations, only general hook-up information for flash-up and monitoring the red lights is included.

This manual may not contain all the information about installation wiring required for your site. *Consult any installation drawings prepared especially for your site or supplied with the equipment. Site installation drawings should take precedence.*

Also note that FTCA wiring diagrams define minimum requirements recommended for satisfactory equipment

operation. These minimum requirements may not be enough, by themselves, to comply with local electrical codes. *It is the responsibility of the installer to comply with all applicable electrical codes.*

Consider the following wiring: power service, power converter and the flashhead.

All installation wiring should have an insulation rating of 600 volts or higher.

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

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.

National Electric Code guidelines are recommended for all other primary power wiring considerations. Details pertaining to the wiring for control and monitor signals are on the installation wiring diagram. Use the information in *Figure 2-3* for guidelines to external wiring. In case of any difference between the two drawings, you must follow the installation wiring diagram. The power converter may be provided with a short length of service cable to be run to a nearby junction box where connections can be made to distribution wiring. This is a purchasing option.

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. Use a value of 175 volt-amperes to determine wire gauge and to calculate the loading contribution to a system circuit breaker or slow-acting fuse. Use 250 volt-amperes to determine the rating of a fast-acting fuse and to select a system feeder transformer (if used).

NOTE

The flashhead base and power converter enclosure must make good electrical contact with the metal structure on which they are mounted. The power converter case should be grounded to the

site grounding system. Also, connect a ground strap to the leg on the flashhead that has a grounding bar imbedded in it. Failure to ground the equipment could result in interference with normal operation or damage to internal components.

Flashhead Wiring

The wiring between the power converter and flashhead requires five conductors with 600 volts (minimum) insulation. Two of the conductors must be #10 AWG. The other three may be #16 AWG (minimum; for mechanical strength) if you are cabling together individual wires. FTCA recommends using FTCA Part Number 6340 cable for this application.

To ensure reliable operation, FTCA recommends continuous wiring between the power converters and their associated flashheads without intervening junctions or splices.

If you use FTCA Part Number 6340 cable without electrical conduit, you should secure it to the main structure not more than 5 feet (1.5 meters) below the flashhead and at 5-foot (minimum) intervals between the flashhead and power converter.

Securing the Cable

Use the following method for securing the flashhead cable to a skeletal structure:

1. Run the cable along one of the tower legs and wrap one full turn of two-inch Scotchrap™ #50 tape, or the equivalent, around the cable and tower leg at 5-foot (minimum) intervals (1.5 meters). Space the cable one inch away from direct contact with a leg flange or and edge.
2. Wrap three full turns of one-inch Scotchrap Filament #890 tape, or the equivalent, over the Scotchrap #50 tape.

3. Wrap four full turns of two-inch Scotchrap #50 tape, or the equivalent, over the Scotchrap Filament #890 tape.
4. Perform steps 1 through 3 also directly above and below any tower leg flanges that the cable may cross.

Alarm Relay Wiring

The wiring for alarm relay connections in *Figure 2-6* minimizes the possibility of damage caused by high voltage transients.

Installation Checklist

Complete the following steps before applying power to the lights.

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 correctly, allowing adequate clearance for opening the covers. Use the following checks:
 - Ensure that the case is mounted upright, is water tight, and grounded to the site grounding system.
 - Check hardware inside the case to ensure that the 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. Flashhead Mounting

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

5. Power Converter Wiring

Examine the installation drawings and use the following checks:

- Check for proper incoming service voltage.
- Wire each unit according to the instructions.
- In multiple installations, all power converters must be wired to the same electrical phase. Wire all three power converters to one 20-amp. circuit breaker.
- Check all electrical connections for tightness.
- Check all terminal strip connections for tightness.
- Ground the power converter case to the site lightning ground system.
- Wires at TB1-4 and TB1-5 should be daisy-chained as a twisted pair between the master power converter and the slave units. The rate of twist is 12 per foot. If a shielded cable is used, ground the shield. Ensure that TB1-4 is connected to all TB1-4 connections on all units, and TB1-5 is similarly connected.

6. Flashhead Wiring

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

7. Alarm Wiring

- If external alarm detection circuit responds to *closed* contacts, ensure that they are wired to the contacts on TB1 that *close* on alarm.
- If external alarm detection circuit responds to *open* contacts, ensure that they are wired to the contacts on TB1 that *open* on alarm.
- Alarm wiring should be lightning and RFI protected: shielded, grounded shield, and in a conduit.
- If a specific alarm is ganged together from all power converters as one, ensure that the wiring follows local installation instructions.

After completing all the steps listed above, turn on the power and perform an operational checkout from procedures in *Section 3* of this manual.

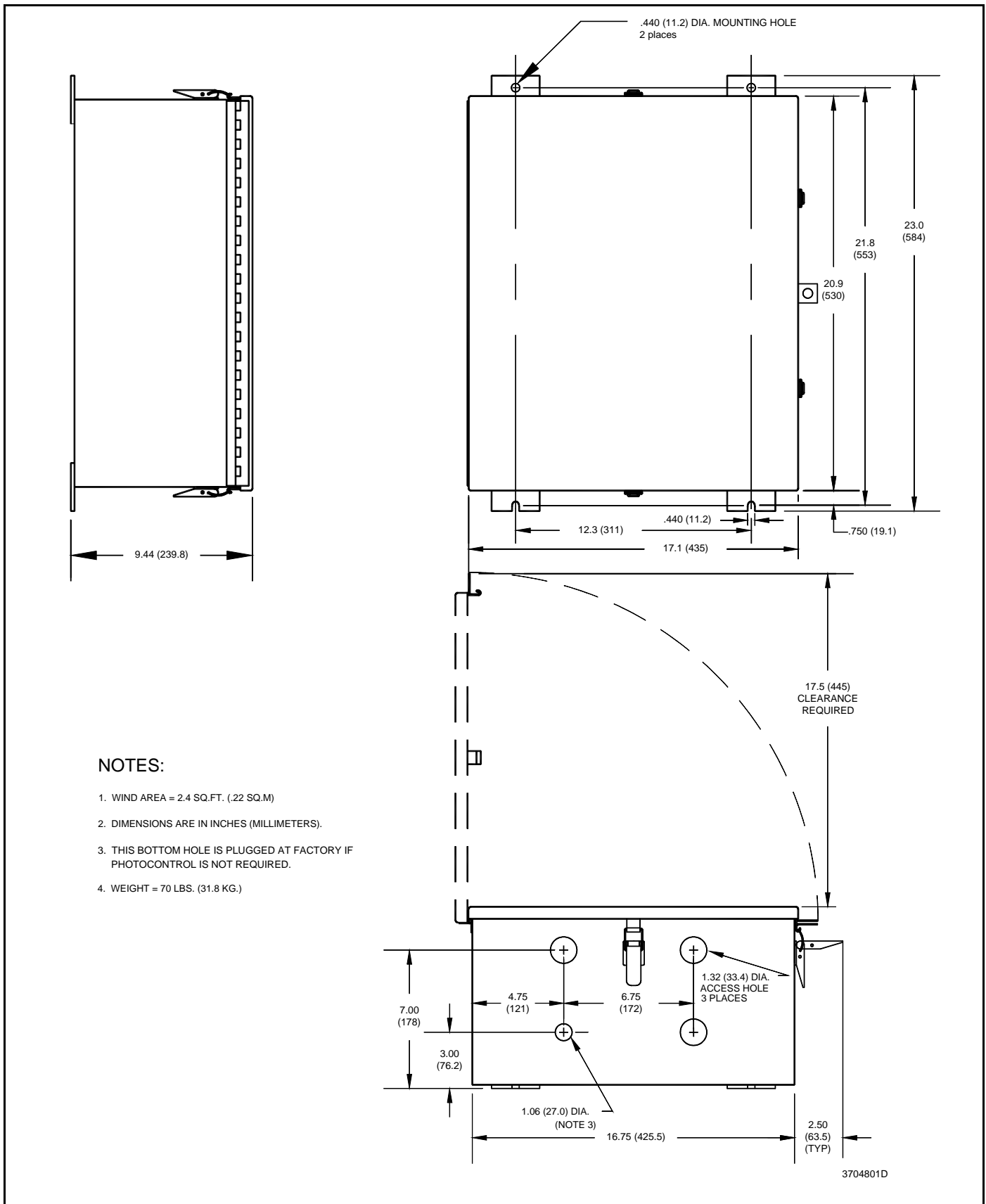
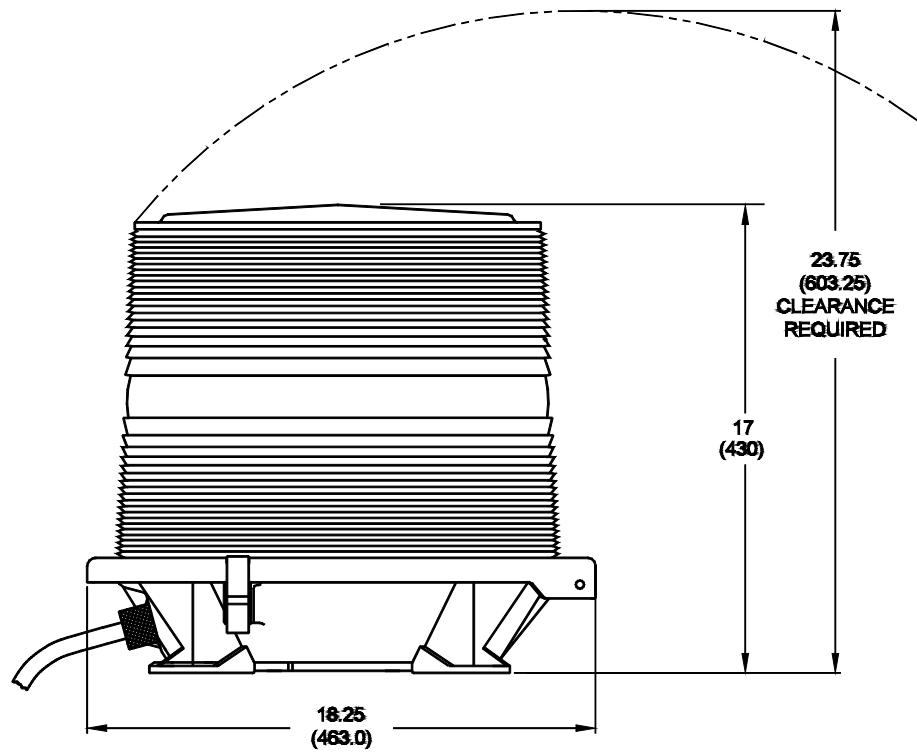
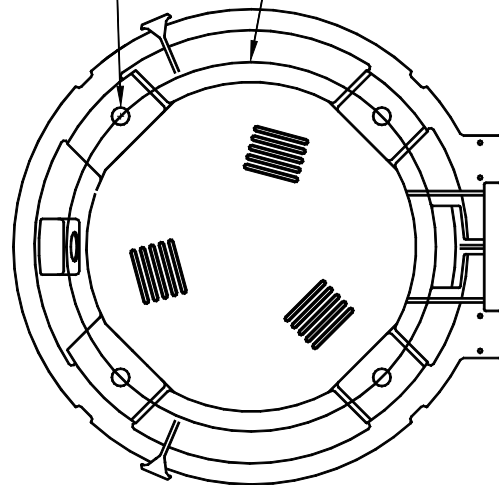


Figure 2-1 Power Converter Mounting and Outline



.625 (15.9) DIA. MOUNTING HOLE
(4 PLACES EQUALLY SPACED)

Ø13.25 BOLT HOLE CIRCLE



NOTES:

1. WEIGHT: 17 LBS (7.7 KG)
2. AERODYNAMIC WIND AREA: .93 FT² (.0864 M²)
3. DIMENSIONS ARE IN INCHES (MILLIMETERS)
4. ACCESS TO THE FLASHHEAD MUST REMAIN UNOBSTRUCTED
5. FLASHHEAD SHOULD HAVE LIGHTNING PROTECTION

fh308

Figure 2-2 Flashhead Mounting and Outline

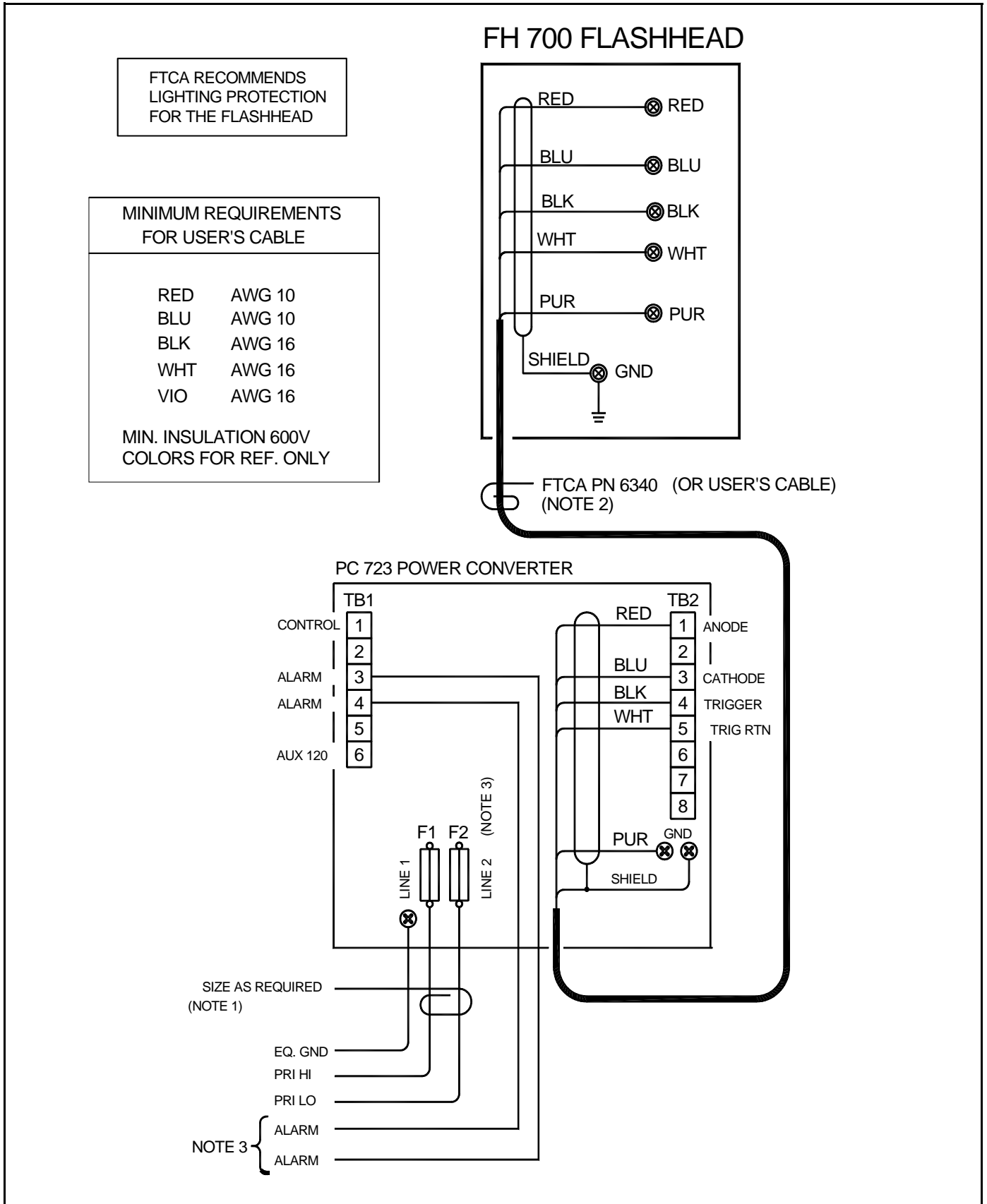


Figure 2-3 Installation Wiring

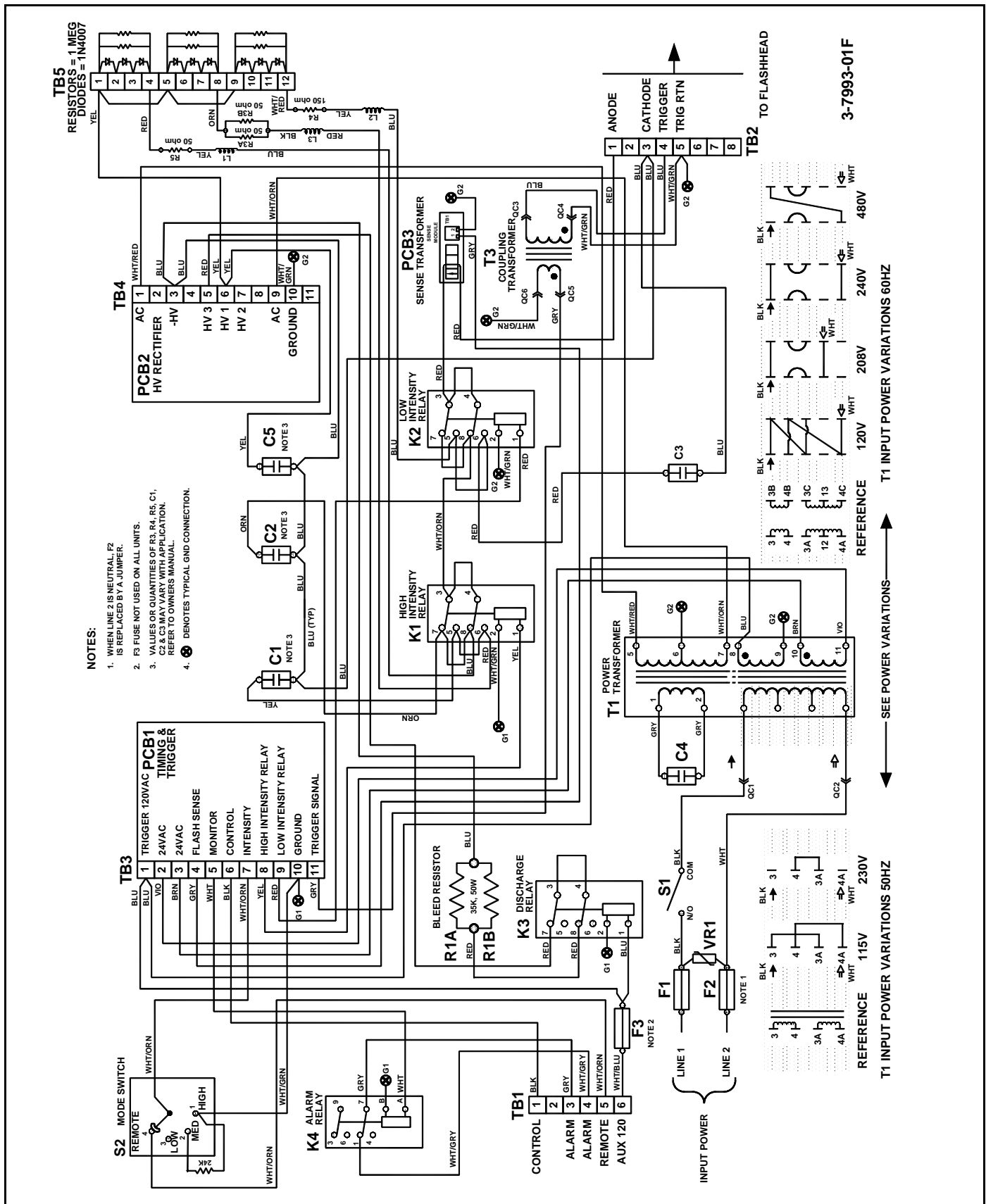
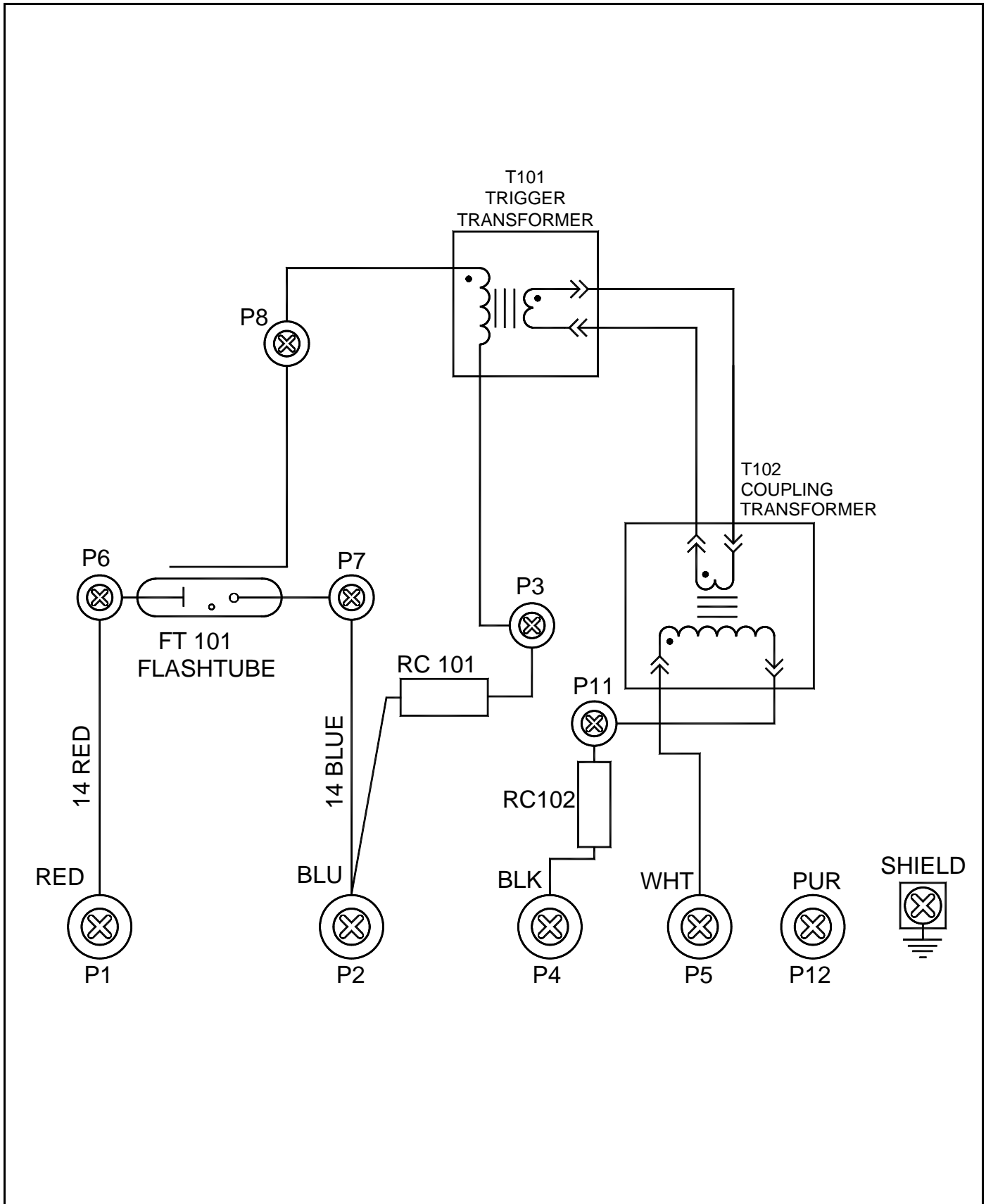
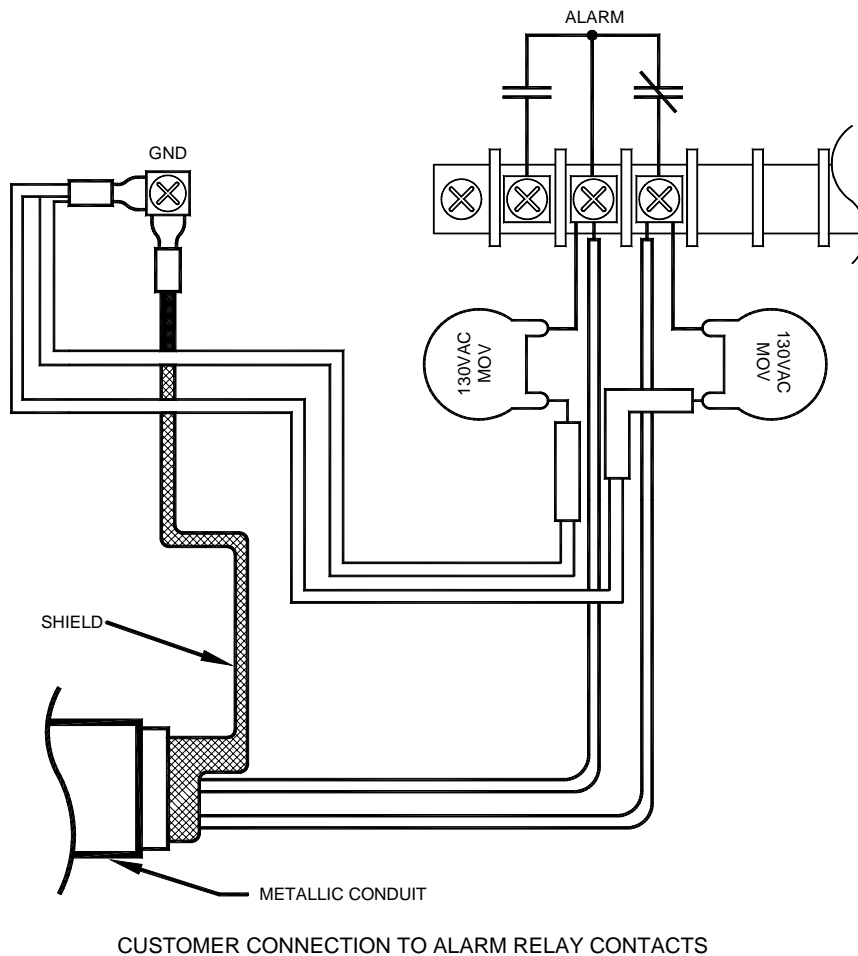


Figure 2-4 Power Converter Internal Wiring



FH3081W

Figure 2-5 Flashhead Internal Wiring



FLASH TECHNOLOGY ALARM RELAY CONTACTS ARE PROTECTED FROM VOLTAGE TRANSIENTS OF UP TO 1000 VOLTS. HOWEVER, WIRED ALARM CONTACTS CAN BE SUBJECTED TO VOLTAGES GREATER THAN 1000 VOLTS BECAUSE OF LIGHTNING. THE FOLLOWING RECOMMENDATIONS MINIMIZE THE POSSIBILITY OF DAMAGE CAUSED BY HIGH VOLTAGE TRANSIENTS ON THE ALARM RELAY CONTACTS OF FLASH TECHNOLOGY POWER CONVERTERS.

THE INSTALLER IS RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE ELECTRICAL CODES.

NOTES:

1. USE SHIELDED CABLE TO ATTACH FLASH TECHNOLOGY ALARM RELAY CONTACTS TO EXTERNAL EQUIPMENT.
2. ATTACH THE SHIELD WIRE TO A GND (GROUND) TERMINAL ON THE FLASH TECHNOLOGY POWER CONVERTER AS SHOWN.
3. WHEN POSSIBLE, ROUTE ALARM CONTACT WIRING IN METALLIC, GROUNDED CONDUIT.
4. FOR ADDITIONAL PROTECTION, ADD MOVs (VARISTORS) FROM EACH ALARM RELAY CONTACT TERMINAL TO A GND TERMINAL AT THE FLASH TECHNOLOGY POWER CONVERTER.

Figure 2-6 Recommended Alarm Wiring

Section 3 — Maintenance and Troubleshooting

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.

Preventive Maintenance

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

1. Verify that moisture has not entered the equipment through gaskets or seals, or collected inside 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 that shows 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 or paper towel.
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.*

Tools and Instruments

The following tools and instruments are recommended for troubleshooting:

- Phillips-head screwdriver
- Phillips-head screwdriver
- Flat blade screwdriver
- Flat blade screwdriver
- Slip-joint pliers
- Adjustable wrench
- Hex nut driver
- Hex nut driver
- Triplet Model 630-NA V-O-M or equivalent

Radio Frequency Interference

The presence of radio frequency interference (RFI) can burn out components, cause a light to flash intermittently, at the wrong rate, or at the wrong intensity. RFI can enter the light by *any* wire to or from the unit. The circuits reject or bypass RFI, but FTCA cannot guarantee complete immunity beforehand. After installation, you may find it necessary to add external filters or use other methods to reduce RFI entering the equipment.

Troubleshooting

The most effective troubleshooting procedure begins with observing the beacon's behavior. This often leads directly to the cause, such as a faulty component or other abnormal condition. *Table 3-1 Major Troubleshooting Symptoms* on Page 3-2 lists many of the symptoms that a malfunctioning beacon may exhibit. *Table 3-2 Fault Locator (Symptoms from Table 5-1)* on Page 3-2 associates these symptoms with component assemblies or conditions, which if defective or abnormal, could cause the beacon to behave as observed. Each item in *Table 3-2* is weighted to indicate the likelihood that it is causing the problem.

For example, assume that the beacon is not flashing at all but some of its circuits are still functioning; that is, fuses are not blown, relays operate, etc. This condition is symptom C in *Table 3-1*. *Table 3-2* indicates that symptom C behavior is most likely caused by the PCB1 Timing and

Trigger Board. The next most likely cause would be the HV Rectifier Board. The third would be the LOW mode capacitor, and so on.

Check out suspected components by following the procedures in *Subsection Component Testing* on Page 3-2.

Table 3-1 Major Troubleshooting Symptoms

| Flash Condition | | | | Comments |
|-----------------|-------|-----|-----|-------------------------------------------|
| Code* | HIGH | MED | LOW | |
| A | NO | NO | NO | All circuits are dead |
| B | NO | NO | NO | Primary line fuse repeatedly blows |
| C | NO | NO | NO | Some circuits functioning |
| D | OK | OK | OK | Very long voltage bleed when power is off |
| E | SKIPS | OK | OK | Flash may be weak also |
| F | OK | OK | NO | Erroneous fail |
| G | OK | OK | NO | |
| H | OK | NO | OK | |
| J | NO | OK | OK | |

* See Table 5-2

Table 3-2 Fault Locator (Symptoms from Table 5-1)

| Probable Cause | | A | B | C | D | E | F | G | H | J |
|--------------------------|----------|---|---|---|---|---|---|---|---|---|
| Capacitor Bank | C5A-C5H | | | 3 | | | | | | |
| Tuning Capacitor | C4 | | | | | 1 | | | | |
| Diodes at TB5-1 | | | | | | | | | 1 | |
| Diodes at TB5-5 | | | | | | | | | | 1 |
| Diodes at TB5-9 | | | | | | | | 1 | | |
| Primary Line Fuse | F1, F2 | 1 | | | | | | | | |
| Flashtube | FT101 | | | 5 | | | | | | |
| Alarm Relay | K4 | | | | | | 3 | | | |
| Choke | L1 | | | | | | | | 3 | |
| Choke | L2 | | | | | | | 3 | | |
| Choke | L3 | | | | | | | | | 3 |
| Timing And Trigger Board | PCB1 | | | 1 | | | 2 | | | |
| HV Rectifier Board | PCB2 | | | 2 | 1 | | | | | |
| Sense Transformer | PCB3 | | | | | | 1 | | | |
| Bleed Resistor | R1 | | | | 2 | | | | | |
| Resistor | R3A, R3B | | | | | | | | | 2 |
| Resistor | R4 | | | | | | | 2 | | |
| Resistor | R5 | | | | | | | | 2 | |
| Interlock Switch | S1 | 2 | | | | | | | | |
| Power Transformer | T1 | 3 | 2 | 4 | | | | | | |
| Trigger Transformer | T101 | | | 6 | | | | | | |
| Suppressor | VR1 | | 1 | | | | | | | |
| Note 1 | | | 3 | | | | | | | |

Note 1: Check for short circuit on the 24VAC or 110VAC circuits.

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 make voltage measurements with the power applied. Thus, *for your safety*, carry out all preliminary steps such

as connecting test leads or circuit jumpers, or disconnecting existing circuit connections with the power off.

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.

C5 — Capacitor Bank

Check the capacitor bank as described in *Subsection Capacitor Testing, General* on Page 3-3. You can check the entire bank at one time by connecting the meter leads to the terminals of one C5 capacitor and disconnecting the *yellow* wire to TB4. The measured resistance across *one*

70 mfd. capacitor should increase from zero to one megohm in approximately 35 seconds.

C3 — Capacitor

Check the capacitor as described in *Subsection Capacitor Testing, General* on Page 3-3. Remove the *red* wire from the capacitor. The measured resistance should increase from zero to over one megohm in less than 10 seconds.

C2 — Capacitor Bank

Check the capacitor as described in *Subsection Capacitor Testing, General* on Page 3-3. Check by connecting the meter leads to the terminals and disconnecting the *orange* wire to K2. The measured resistance across *one* capacitor should increase from zero to over one megohm in less than 10 seconds.

C1 — Capacitor

Check the capacitor as described in *Subsection Capacitor Testing, General* on Page 3-3. C1 consists of two capacitors in series, C1A and C1B. You can check the entire bank at one time by connecting the meter leads to the terminals of one capacitor and disconnecting the *yellow* wire to K1. The measured resistance across the capacitor bank should increase from zero to one megohm in less than 10 seconds.

FT101 — Flashtube

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

K1, K2 — Mode Relays, 24-volt DC Coil

Disconnect one of the coil wires to measure resistance. The resistance should be approximately 290 ohms.

K3 — Bleed Relay, 120-volt AC Coil

Disconnect one of the coil wires to measure resistance. The resistance should be approximately 290 ohms.

K4 — Alarm Relay, 24-volt DC Coil

Disconnect one of the coil wires to measure resistance. The resistance should be approximately 290 ohms.

L1, L2, L3 Chokes

Disconnect one of the coil wires to measure resistance. The resistance should be approximately 12 ohms.

PCB2 — HV Rectifier Board

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

PCB1 — Timing and Trigger Board

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

R1A — Bleed Resistor

The measured resistance of this 50 Watt component should be 35000 ohms.

R3A & R3B

The total resistance of these resistors is 25 ohms.

R4

The resistance of R4 is 150 ohms.

R5

The resistance of R5 is 50 ohms.

T1 — Power Transformer

Prepare to measure this transformer by removing the PCB2 HV Rectifier Board and PCB1 Timing and Trigger Board. Apply power to the unit and measure the following secondary winding voltages:

Table 3-3 Power Transformer Voltage Test

| Test Points | Voltage |
|------------------|-----------------------------|
| TB4-1 to TB4-9 | 900 - 1050 VAC ¹ |
| TB3-1 to chassis | 110 - 120 VDC |
| TB3-2 to TB3-3 | 22- 26 VAC |
| Across C4 | 320-380 VAC |

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

PCB3 — Sense Module

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

T3 — Coupling Transformer

Check the coils for continuity. Check the ferrite cores for cracks. Check the assembly screws for tightness.

T101 — Trigger Transformer

The measured resistance through the trigger coil should be approximately 180 ohms. Check the potted secondary winding for visual evidence of high voltage breakdown.

VR1 — Suppressor

Remove one of the leads of this component from a fuse block terminal. The measured resistance on the x100 Kohm scale should be infinite.

Component Removal and Replacement

Component location diagrams are provided in *Figure 4-1*, and *Figure 4-2* in *Section 4 — Replaceable and Spare Parts*. Electrical wiring diagrams are provided in *Section 2 — Outline, Mounting, and Installation*.

Power converter internal wiring diagrams are provided on the **Information Card** that is supplied with your system. The **Card** is fastened inside the power converter cover.

Note the location and color of all wires that you disconnect. When you replace the wiring after you replace the components, ensure that the wiring conforms exactly to the wiring diagrams found on the **Information Card**.

The general procedure for removing components is a logical one and is as follows:

1. Obtain access to the component in question:
 - a. Disconnect completely or partially the wiring to components first that prevent clear access.
 - b. Completely remove or relocate these components.
3. Disconnect the wiring to the component that you want to replace.
4. Remove this component.
5. Replace everything in the reverse order: first the component, then the wiring, then the components that allowed you access. In some cases, you may have to place some wires on the component before you fasten it in place, then replace the remaining wires.

Most components are relatively easy to access for removal. Only those that are more difficult are described.

Flashhead

The following subsections discuss the removal and replacement of the flashhead components.

FT101 — Flashtube

Refer to *Figure 4-2* for component locations and *Figure 2-5* for internal wiring.

Removal

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

Replacement

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*. Then 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

Refer to *Figure 4-2* for component locations and *Figure 2-5* for internal wiring.

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.
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 primary winding remains hanging in place.
5. Remove the inner half of the core.

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 2-5*.

T102 — Coupling Transformer

Refer to *Figure 4-2* for component locations and *Figure 2-5* for internal wiring.

Removal and replacement are similar to the procedure for the coupling transformer in *Section T3 — Coupling Transformer* on Page 3-6.

Power Converter

The following subsections discuss the removal and replacement of the power converter components. In all cases, replace wire connections to the exact locations from which they were removed.

T1 — Power Transformer

Refer to *Figure 4-1* for locations and, for wiring, refer to the *Information Card* supplied with the power converter.

Removal

1. Disconnect the wiring harness.
2. Loosen, but do not remove, the two Phillips-head screws nearest the bottom of the chassis.
3. Remove the two Phillips-head screws toward the top of the chassis.
4. Lift the transformer up and out.

Replacement

1. Reverse the order of removal.

T3 — Coupling Transformer

Refer to *Figure 4-1* for locations and, for wiring, refer to the *Information Card* supplied with the power converter.

Use the following procedure:

Removal

1. Disconnect the primary and secondary wires at the connectors. *Note the position of these wires.*
2. Remove the screws that hold the transformer to the side of the power converter.
3. Lift the transformer free of the power converter.

Replacement

Replace the transformer in the reverse order of removal. *Connect the disconnected wires to the same wires from which they were removed. Consult the **Information Card** supplied with the power converter for wiring information.*

PCB1 — Timing and Trigger Board

PCB1 is secured by eleven terminal block screws and two corner screws. Refer to *Figure 4-1* for its location.

Removal

Use the following procedure:

1. Loosen, but do not remove, all eleven screws holding PCB1 to TB3.
2. Loosen, but do not remove, the corner support screws.
3. Slide PCB1 away from TB3 and lift it away from the corner support screws as soon as the large ends of the keyhole slot permit.
4. Lift the board away from the chassis.

Replacement

Reverse the removal procedure.

PCB2 — HV Rectifier Board

Use the following procedure:

Removal

The removal procedure is similar to that in *Subsection PCB1 — Timing and Trigger Board* on Page 3-6.

Replacement

The replacement procedure is similar to that in *Subsection PCB1 — Timing and Trigger Board* on Page 3-6.

PCB3 — Sense Module

Note the red wire passing through the coil on PCB3. This wire is a sense wire. It must be replaced with the same connections and orientation to relay K2-3, the coil on PCB3, and terminal block TB2-1 as were present before you removed it. Use the following procedure:

Removal

1. Disconnect the red wire that passes through the coil on PCB3 from K2-3.
2. Remove the black tie-wrap that forms a loop in the wire that passes through the coil on PCB3, and pull the red wire out from the coil on PCB3.
3. Loosen the two screws on the small terminal block on PCB3 and remove the wires.
4. Remove the two screws that hold PCB3 to the chassis and lift out PCB3.

Replacement

Reverse the removal procedure. Ensure that the red wire passes through the coil on PCB3 in the same direction as it did before you removed it.

High Voltage Capacitors

Use the following procedure:

Removal

1. Remove the circuit board bracket for access to the capacitors. Loosen four #10 screws at the outermost corners of the assembly.
2. Lift the bracket upward to clear the screw heads.
3. Let the bracket hang while supported by the harness.
4. Disconnect the wires to capacitors. Note their locations and connections.
5. Remove the hold-down screws.

6. Lift the capacitors away from the chassis.

Replacement

Use the following procedure:

1. Replace the capacitors.
2. Replace the hold-down screws.
3. Replace the harness wires exactly as removed.
4. In some cases, a quick-connect wire terminal does not seat properly on the terminal cluster exactly as it was before removal. Make certain that the connectors are properly and fully seated.
5. Replace the circuit board bracket.

This page is intentionally blank.

Section 4 — Replaceable and Spare Parts

Customer Service

Customer Service: 1-800-821-5825
Telephone: (615) 261-2000
Facsimile: (615) 261-2600
Internet Address: <http://www.flashtechnology.com>

Shipping Address:

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

Storage

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

Returning Equipment

To return equipment to FTCA, contact Customer Service (see the following section) for a Return Material Authorization (RMA) number. Full RMA policy can be found in the back of this manual on pages I-4 and I-5.

Repackaging

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 flashhead *separately* as described in the following subsections.

Power Converter

Package and ship the power converter on its back; that is, with the feet downward against the bottom of the box. Pad the power converter so that the feet 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.

Major Replaceable Parts

Table 4-1 lists the major replaceable parts for the power converter. Table 4-2 lists the major replaceable parts for

the flashhead. Figure 4-1 shows the component locations for the power converter. Figure 4-2 shows the component locations for the FH 708 Flashhead.

Table 4-1 Power Converter Replaceable Parts

| Designation | Description | Part Number |
|--------------|---------------------------------------------------|--------------------|
| C1A | Capacitor, 8 mfd. | 6731201 |
| C1B, C2 | Capacitor, 5 mfd. | 6577502 |
| C3, C4 | Capacitor, 3 mfd. | 6577903 |
| C5A-C5H | Capacitor, 70 mfd. | 6720401 |
| F1 | Fuse [†] | 4900307 |
| K2 | Mode Relay, 24-volt | 8900494 |
| K1, K3 | High Intensity Relay and Discharge Relay, 120 VAC | 8900493 |
| K4 | Alarm Relay, 24 VDC | 4901233 |
| L1, L2 | Choke | 4380900 |
| L3 | Choke | 4381000 |
| PCB1 | Timing and Trigger Board [†] Or | 2687006 2904413 |
| PCB2 | HV Rectifier Board [†] | 2458005 |
| PCB3 | Sense Module | 2811101 |
| R1A | Bleed Resistor, 35K, 50W | 6900541 |
| R3A, R3B, R5 | Burst Resistors, 50 ohms, 50 W | 6900527 |
| R4 | Burst Resistor, 150 ohm, 50W | 6900529 |
| S1 | Interlock Switch | 4901220 |
| S2 | Mode Switch | 4900892 |
| T1 | Power Transformer | 8841501 |
| T3 | Coupling Transformer | 8336701 |
| TB1 | Terminal Block | 8721006 |
| TB2 | Terminal Block | 8721008 |
| TB3, TB4 | Terminal Block | 8721011 |
| VR1 | Suppressor (Varistor) [†] | 8250801 |

[†] Recommended spare parts.

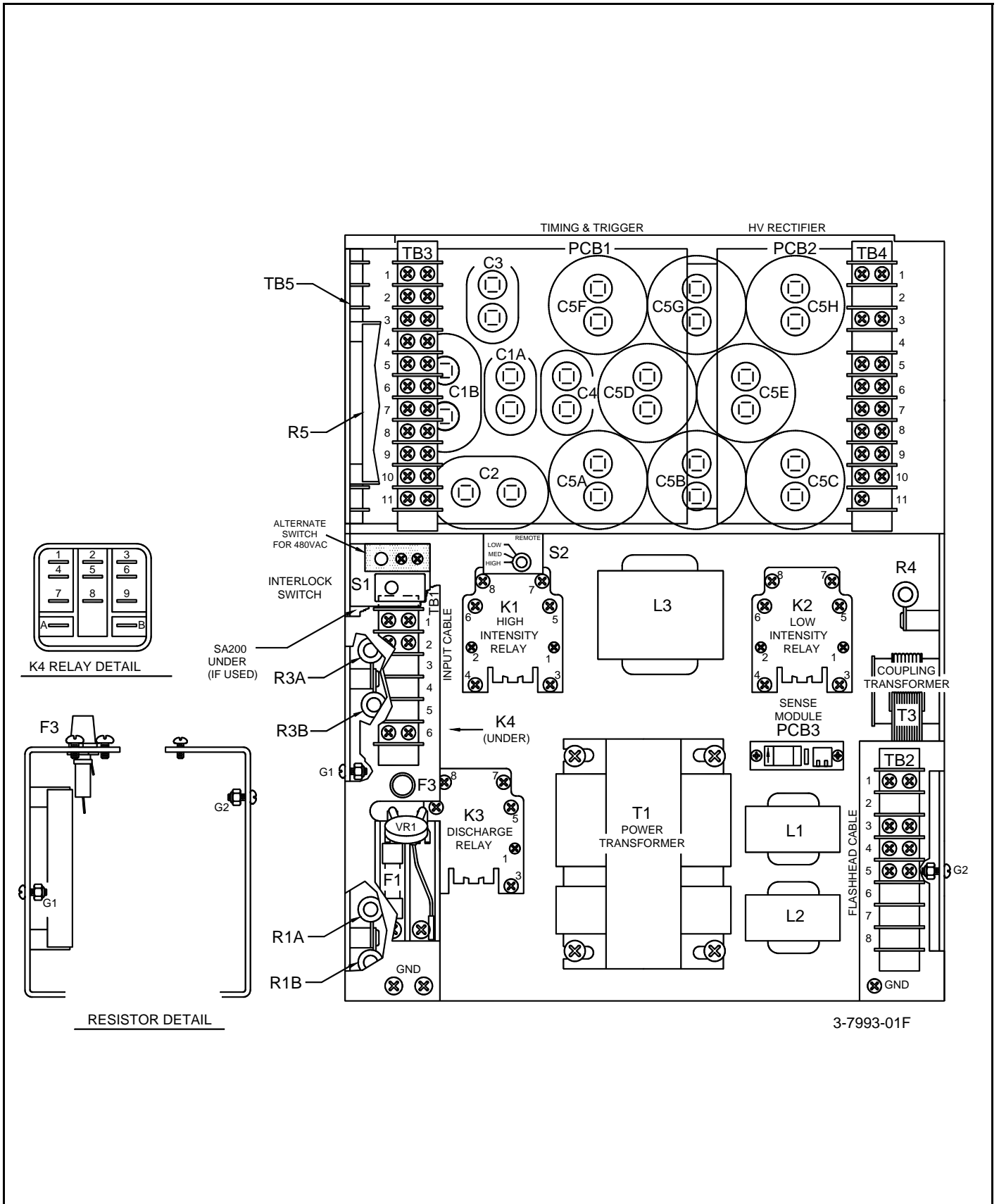
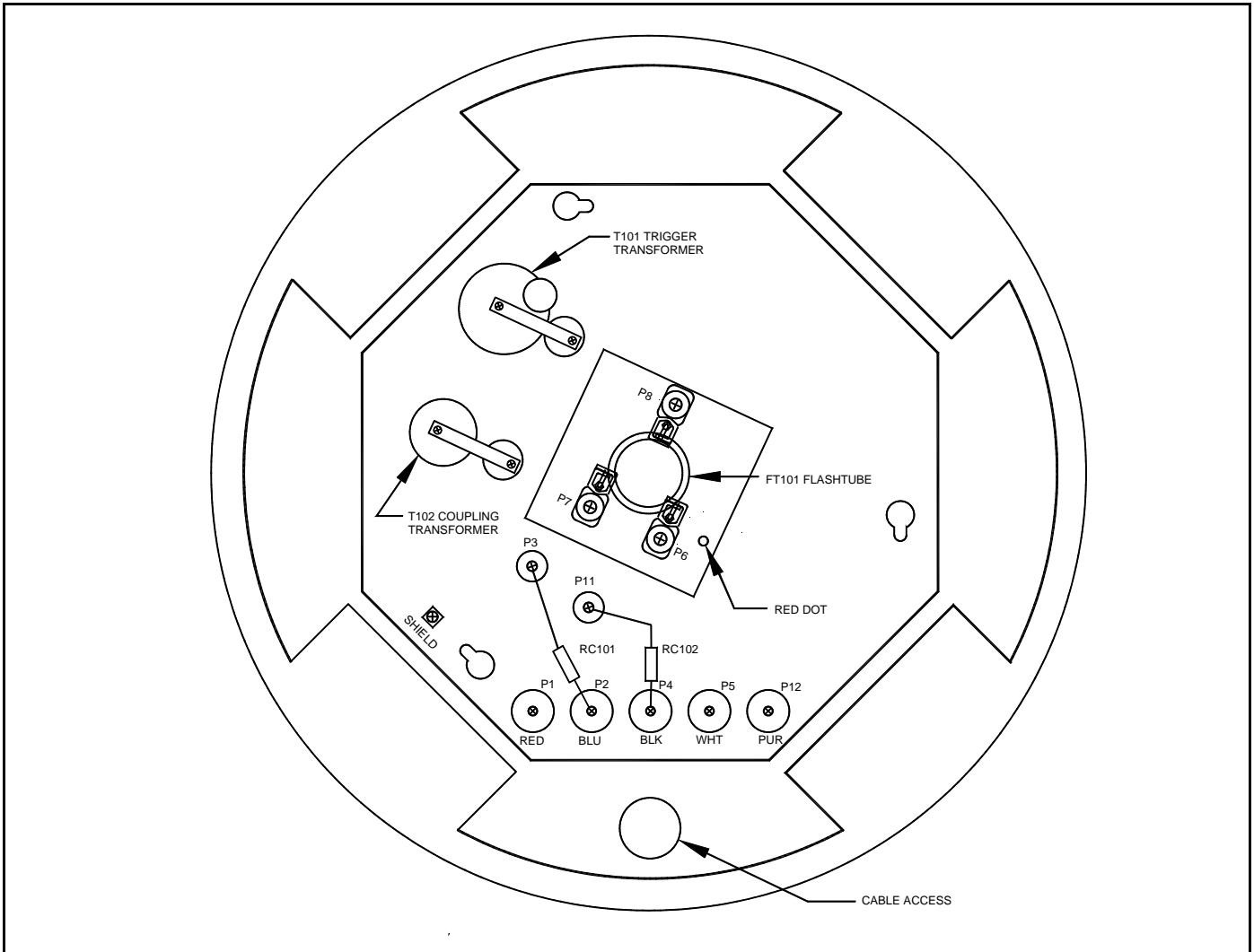


Figure 4-1 Power Converter Component Locations

Table 4-2 Flashhead Replaceable Parts

| Designation | Description | Part Number |
|-------------|------------------------------|-------------|
| FT101 | Flashtube† | 8384329 |
| | Flashtube Mounting Assembly† | 8905338 |
| T102 | Coupling Transformer | 8336701 |
| T101 | Trigger Transformer | 8288201 |

† Recommended spare parts.



FHCL

Figure 4-2 Flashhead Component Locations

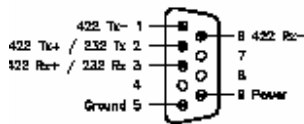
Section 5 — Programming T&T Board P/N 2904413

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

| 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.

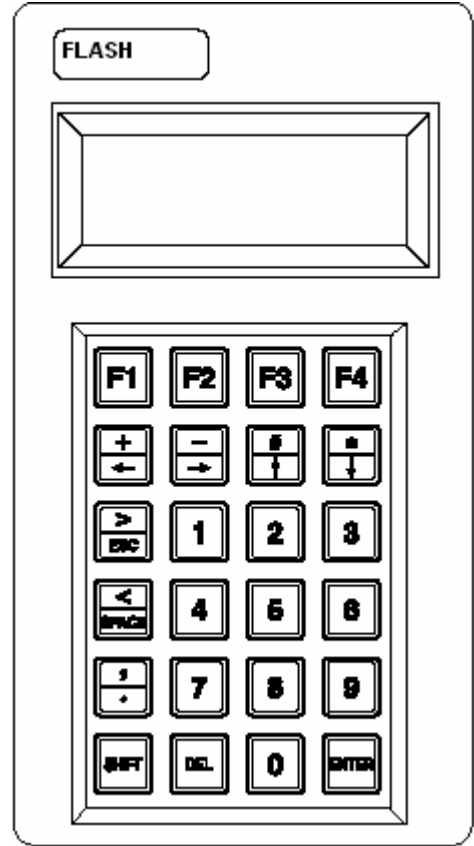


Figure 5-1 FIGURE 5-1 Handheld Programmer

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 (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 Airport Beacon.

If the board you are configuring is not in the Bec mode press 0 and press F1 (OK).

To change the Flash rate press NEXT until the LCD shows:

L1: SETUP

L2: FPM 1-60 2-30

L3: 3-20 4-100 5-120

L4: OK NEXT BACK EXIT

Then press the number corresponding to the desired flash rate and press F1 (OK). The normal flash rate for a airport beacon is 20 fpm.

Flicks should be single and this is the default value for an Omni beacon. It should not be changed. If it is not set to this value do the following:

To change the flicks 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 DAY/HIGH.

F2: MED- Changes the intensity to TWI/Medium.

F3: LOW- Changes the intensity to NITE/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.

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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.