FLASH TECHNOLOGY
A Dielectric Company

SN

Approach Lighting System

FTS 800-4A

Equipment Reference Manual
P/N 7918004A

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Front Matter

Abstract

This manual describes the *Installation, Maintenance,* and *Operation* of the FTS 800-4A Approach Lighting System (ALS).

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Trademark Acknowledgments

Applicable Specification

This equipment meets or exceeds requirements for an FAA Type L-849 Style A and E light in Advisory Circular 150/5345-51.

Disclaimer

Warranty

Flash Technology Corporation of America warrants all components, under normal operating conditions, for two years.

Parts Replacement

The use of parts not supplied by FTCA or unauthorized modification of this equipment voids the warranty and could invalidate the assurance of complying with FAA requirements.

Pub. No. 0594-800A-0007

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.

Table of Contents

Table of Contents (cont'd)

List of Figures

List of Tables

Section 1 — Introduction and Operation

System

FTS 800-4A Lighting Systems are white, flashing, unidirectional systems for runway approach lighting applications. These systems meet or exceed requirements of Federal Aviation Administration (FAA) Advisory Circular 150/5345-51 for Type L-849 Style A, C, and E Lighting Units for three-intensity, white, sequential flashing lights for use in approach lighting systems (ALS). In ALS applications, the lights are aligned with the center line of the runway and flash sequentially toward the landing threshold.

System Components

An FTS 800-4A System consists of two or more Lighting Units and an FTC 183 System Controller. A flashhead and a power converter comprise each Lighting Unit. The flashhead and power converter may be comounted on the same pedestal, or separately mounted.

The flashhead consists of a sealed-beam flashlamp in a protective housing. The flashhead uses a xenon flashtube. Each light beam covers a minimum of 10 degrees vertically and 30 degrees horizontally.

The power converter is a separate cabinet containing the circuitry necessary to convert main input power to the voltages needed to operate the flashhead and other internal circuits. It contains the PCB1 Timing and Trigger Board, which controls the operation of the flashhead.

The external FTC 183 Controller is housed in its own separate enclosure. You can locate the Controller any practical distance from the rest of the system. The controller interfaces with the power converters. Systems with more than 25 lights in a 50 Hz system, or more than 28 lights in a 60 Hz system require a second controller.

Specifications

Physical:

Power Converter (H x W x D):	
	12.25 x 20.00 x 14.00; 21 lbs.
	311.15 x 508.00 x 355.60; 9.53 kg.
Comounted Assembly (H x W x D)	
	24.50 x 25 x 14.00 in., 25 lbs.
	622.30 x 635 x 355.60 mm, 11.34 kg.
Flashhead (H x W x D)	8.90 x 6 in., 4 lbs.
	226.06 x 152 mm, 1.82 kg.

Heights include dimensions of the units only and do not include the distance from the bottom of each unit to the ground.

Performance Characteristics:

Application	L-849
Power Requirements:	
Voltage and Frequency (factory set):	
	120, 240, 480 VAC, 60 Hz
	230 VAC, 50 Hz
Volt-Amperes	200 VA peak
Power at 120 fpm	175 Watts high intensity
	65 Watts medium intensity
	30 Watts low intensity
Power at 60 fpm	100 Watts high intensity
	45 Watts medium intensity
	25 Watts low intensity
Flash Intensity — Three levels:	
High Intensity	15,000 ±25% ECD
Medium Intensity	1,500 ±25% ECD
Low Intensity	300 ±25% ECD
Flash Rate	120 flashes per minute
Flash Coverage:	
Horizontal	30 degrees (minimum)
Vertical	10 degrees (minimum)
Control Interface:	FTC 183 external controller
Monitoring and Environmental:	
	FAA Advisory Circular AC 150/5345-51 compliance

Options and Variations

Call Customer Service at 1-800-821-5828 for options and variations.

Operation

The center of operations of each power converter is the Timing and Trigger Board (PCB1).

Lighting Unit Operation

The controller connects to the power converters in the Lighting Units. See *Figure 2-2*. See the FTC 183 Controller Manual for more information.

The controller distributes a flash signal to all units in a system. Each Power Converter has internal circuitry to fix the instant at which it flashes. The interval is based on the position of the light in the sequential system. The flash signal from the controller also contains flash intensity information.

The monitor lines transmit a signal back to the System Controller indicating to the controller that the Lighting Unit has either flashed or not flashed its light, allowing the controller to indicate the result on the front panel.

Except for Lighting Unit intensity, the remaining operation is entirely automatic. Once the system is properly wired, it begins to operate when power is applied.

Lighting Unit Intensity

The intensity levels of the Lighting Units depends on the switch setting of the System Controller. To manually change the intensity of the lights, you must change the settings on the manual intensity switch, labeled CONTROL, on the System Controller: **L** is the low intensity setting; **M** is the medium intensity setting; **H** is the high intensity setting; **FLASH INHIBIT** turns off the strobes, *but the units are still powered;* and **REMOTE** allows control of system intensity by a remote device.

Setup of the PC 800-4A Light

PERSONNEL HAZARD WARNING

Read the warning on Page iii.

When replacing PCB1, the replacement board must be configured to match the original board.Use the handheld programmer to configure the light and confirm number (see chapter 5) or provide this information to the factory when requesting a replacement.

Programming for Lighting Unit Position

See Chapter 5 Programming T&T Board P/N 2904411
Note: if you programm a replacement board be sure to write the light and confirm numbers on the board in the white space provided.

PCB1 is configured by the factory or by using the handheld programmer (p/n 5903775; kit p/n 1903776). Light number determines where the light will flash in the sequential system. Number one (1) flashes first then number two (2) and so on. In a 50 Hz. system there are 50 positions and in a 60 Hz. system there are 60. However, a 50 Hz. system controller will only monitor 25 lights and a 60 Hz. controller will only monitor 28 lights. If more lights are needed, use a second, synchronized controller and seperate monitor line.

Confirm number determines where in the sequence the light sends its flash confirm signal to the system controller monitoring the lights. This number should be the same as the light number set above. it is not required that they be the same, it is only required that each light have a unique confirm number. Lights that flash simultaneously, (REIL A,B) must be assigned seperated confirm numbers.For example if REIL lights A and B both flash at position 5, A should be assigned confirm number 5 and B should be assigned confirm number 6. Usually REIL lights are assigned the last flash sequence position in the system.

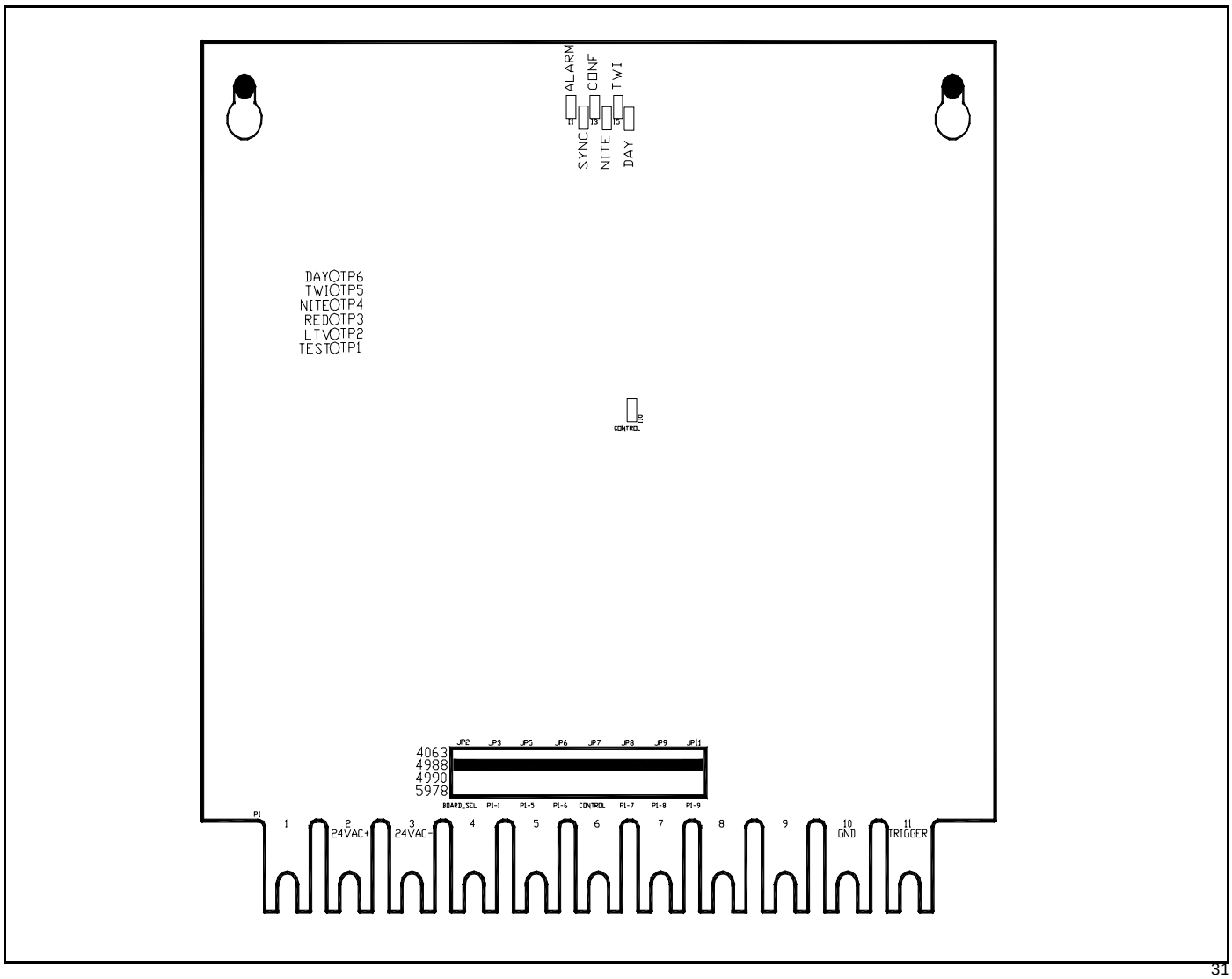
NOTE: The units come factory configured for flash sequence position and monitor address.

Indicator Lamps

Seven indicator LEDs and one neon lamp on PCB1 monitor equipment operation. A name imprinted on PCB1 adjacent to the lamp or LED identifies it. *Figure 1-1* shows the location of these indicators on the board.

Table 1-1 PCB1 Board LEDs and Lamps

LED/Lamp	Name	Color	Indication
ALARM	I 1	Red	Main alarm, follows alarm relay.
SYNC	I 2	Grn	A valid sync signal was received on the CONTROL terminal (PIn 6).
CONF	I 3	Grn	A flash confirmation signal is present on the MONITOR terminal (Pin 5).
DAY	I 4	Grn	DAY mode operation (high intensity) is active.
TWI	I 5	Grn	TWILIGHT mode operation (medium intensity) is active.
NITE	I 6	Grn	NIGHT mode operation (low intensity) is active
NEON Lamp	I 9	Clear	120 VAC trigger voltage. This lamp may flicker.
CONTROL	I 10	Grn	Flashes on and off when communications with controller is active



31

Figure 1-1 PCB1 Timing and Trigger Board Pictoral

Section 2 — Outline, Mounting, and Installation

The information in this section describes a typical installation only.

NOTE

This section may not contain all installation information that may apply to your airport. Consult installation drawings prepared specifically for your airport and those supplied with the equipment. Site installation drawings take precedence over drawings in this manual.

ATTENTION

Each carton contains one light. The position at which the light is to be installed is marked on the carton and on an ID label on the outside of the power converter.

Unpacking

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

Tools

No special tools are necessary. The following hand tools are suggested for installation and maintenance:

- #2 Phillips-head screwdriver
- 9- or 12-inch (# 2 - $^{3}/_{16}$"), flat-blade screwdriver
- 9- or 12-inch (# 3 - $^{5}/_{16}$"), flat-blade screwdriver
- Medium, slip joint pliers
- 8-in. adjustable wrench
- Long-nose pliers
- Set of combination wrenches
- Assorted nut-drivers or sockets ($^{1}/_{4}$", $^{5}/_{16}$", $^{3}/_{8}$", $^{7}/_{16}$")
- Universal terminal crimping tool
- Spanner wrench for 2-inch conduit locking nut
- Triplett™ Model 630-NA or equivalent analog voltmeter, or a digital meter with an averaging function

Access

Screws in a bezel ring retain the flashtube in the flashhead.

Wing-handle fasteners attach the power converter cover to its base plate.

System Configurations

The main configuration for ElectroFlash FTS 800-4A systems is:

- A number of approach lights (ALS), also referred to as Runway Alignment Indicator Lights or RAIL lights. Each light consists of a flashhead and a power converter.
- An FTC 183 System Controller.

Each system configuration uses one FTC 183 Controller. See *Figure 2-2* for more information.

The factory numbers Lighting Units to indicate their position. A label on the outside of the power converter identifies each light. This is particularly important in a system of sequentially flashing lights. The sequential lights are labeled numerically in the order of the flashing sequence. Light Number 1 is installed farthest from the runway threshold, and the highest numbered light is closest to the runway threshold.

Mounting

Each lighting unit consists of a power converter and a flash head. They may be mounted together as a single unit. *Figure 2-3* shows a comounted assembly. Frangible couplings suitable for a comounted assembly are available from FTCA.

Mount separately mounted flashheads according to the requirements of individual installations. The bracket on the flashhead has a 2” NPT threaded hole for mounting on a pipe support.

Wiring

Figure 2-2 provides wiring guidelines for the Lighting Units in the system. This figure is for reference only and may not exactly agree with details in your installation. Always follow instructions in the Installation Wiring Diagram supplied with your equipment.

CAUTION

This equipment is power phase sensitive. L1 and L2 must be wired to F1 and F2 in a consistent manner throughout the entire lighting system.

Note that the wiring diagrams define minimum requirements and may not comply with all applicable electrical codes. It is your responsibility to comply with all prevailing electrical codes.

Use the following wiring guidelines:

- FTCA recommends 600V insulation on all wires that interconnect the system.
- Determine the wire gauge by considering service voltage, length of the wire run, and total load (number of lighting units). Use a value of 200 VA per Lighting Unit and do not permit the voltage drop caused by wire resistance to exceed 5% at any light. The FTC 183 Controller adds 25 watts to the total load.
- Use the value of 200 volt-amperes to determine the circuit breaker or the slow-acting fuse rating at the service disconnect box.
- Wire the primary power of the system through an external circuit breaker and power switch (see *Figure 2-1*).
- Control and monitor wires from the controller connect to the lighting units. Wire control lines to all Lighting Units in the system by using two #14 AWG (minimum) conductors *twisted together at 6 turns per foot.*
- FTCA recommends a counterpoise consisting of solid copper.
- FTCA does not recommend grounding to the counterpoise for lightning protection.
- Ground all cases to a grounding rod. FTCA provides a grounding lug on each power converter base.

For more information, see *Figure 2-2*.

Installation Checklist

Complete the following steps before applying power:

1. **Equipment Damage:**

   Inspect all equipment for damage.

2. **Required Equipment:**

   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.

   – Check hardware inside the case to ensure that the chassis mounting screws and nuts are tight.

   – Mount the power converter away from radio frequency interference (RFI).

4. **Power Converter Installation:**

   Examine the installation drawings and use the following guidelines:

   – Check for proper incoming service power.

   – Wire each unit according to the instructions.

   – Ground the power converter to a grounding rod.

   – Check all electrical connections for tightness.

   – Check all terminal strip connections for tightness.

5. Flashhead Installation:

- Check the wiring of the flashhead cable to the flashhead.
- Check the aim of the flashhead.

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

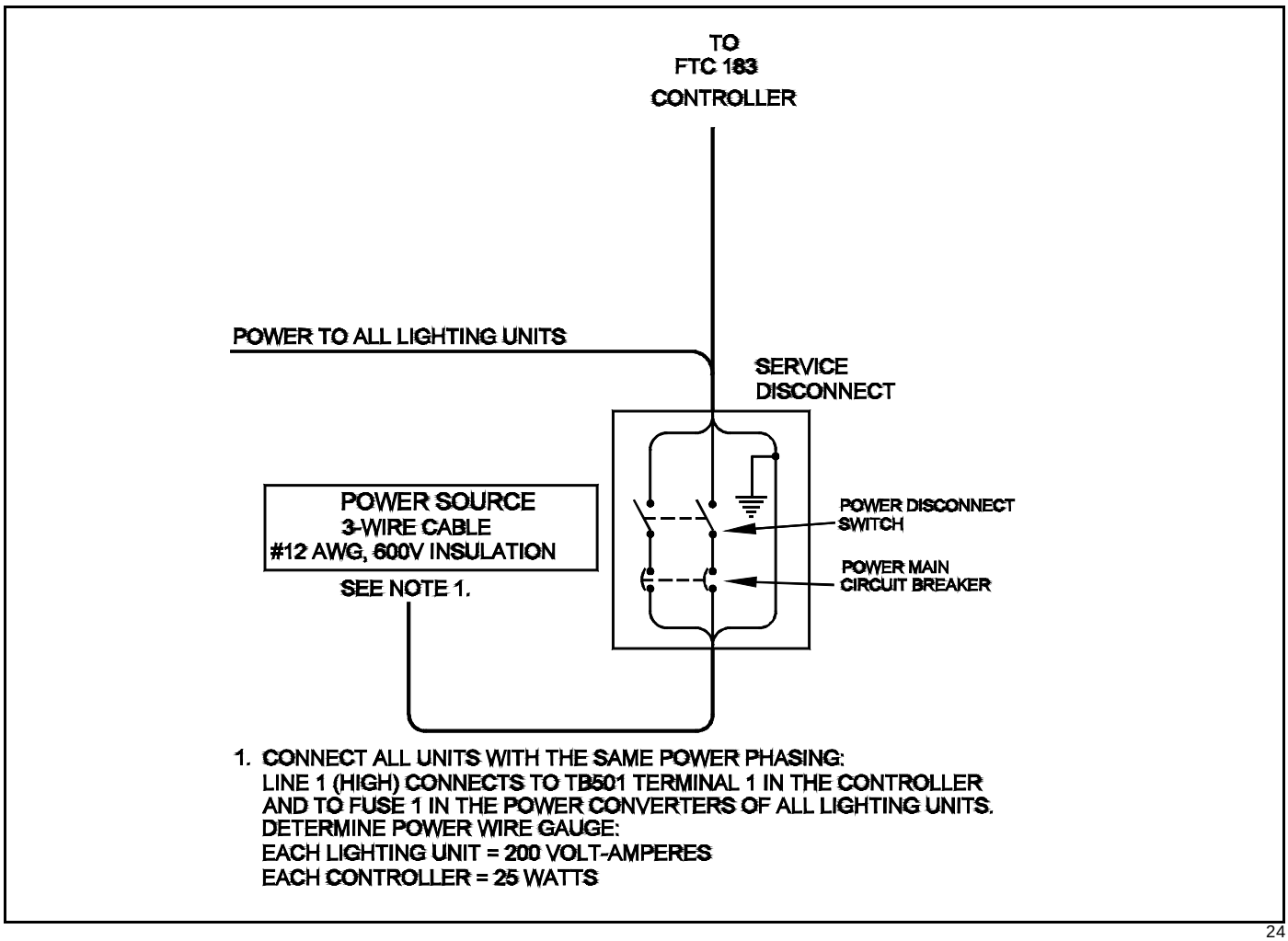
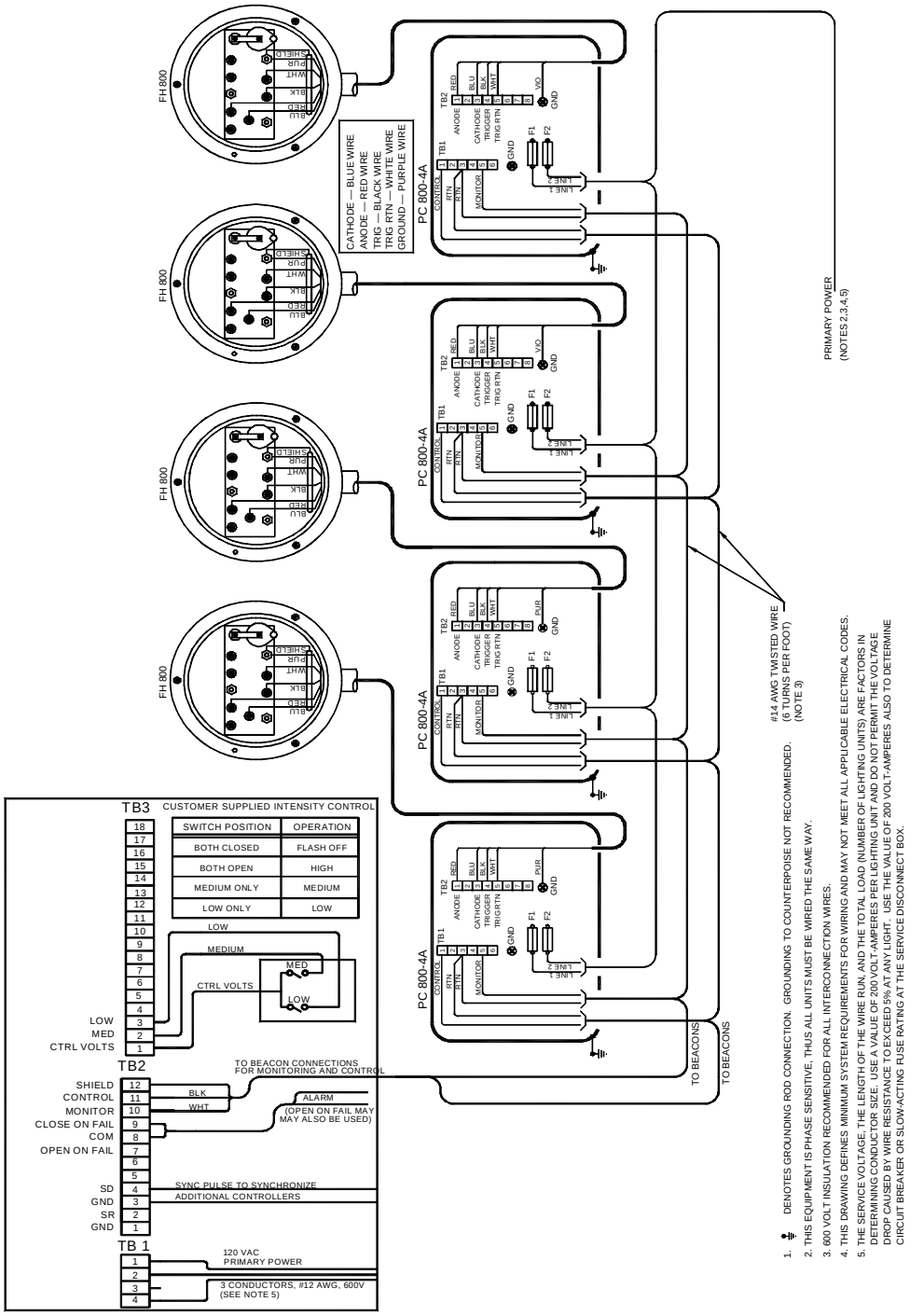


Figure 2-1 Recommended External Power Switching



1. DENOTES GROUNDING ROD CONNECTION. GROUNDING TO COUNTERPOISE NOT RECOMMENDED.
2. THIS EQUIPMENT IS PHASE SENSITIVE; THUS ALL UNITS MUST BE WIRED THE SAME WAY.
3. 600 VOLT INSULATION RECOMMENDED FOR ALL INTERCONNECTION WIRES.
4. THIS DRAWING DEFINES MINIMUM SYSTEM REQUIREMENTS FOR WIRING AND MAY NOT MEET ALL APPLICABLE ELECTRICAL CODES.
5. THE SERVICE VOLTAGE, THE LENGTH OF THE WIRE RUN, AND THE TOTAL LOAD (NUMBER OF LIGHTING UNITS) ARE FACTORS IN DETERMINING CONDUCTOR SIZE. USE A VALUE OF 200 VOLT-AMPERES PER LIGHTING UNIT AND DO NOT PERMIT THE VOLTAGE DROP CAUSED BY WIRE RESISTANCE TO EXCEED 5% AT ANY LIGHT. USE THE VALUE OF 200 VOLT-AMPERES ALSO TO DETERMINE CIRCUIT BREAKER OR SLOW-ACTING FUSE RATING AT THE SERVICE DISCONNECT BOX.

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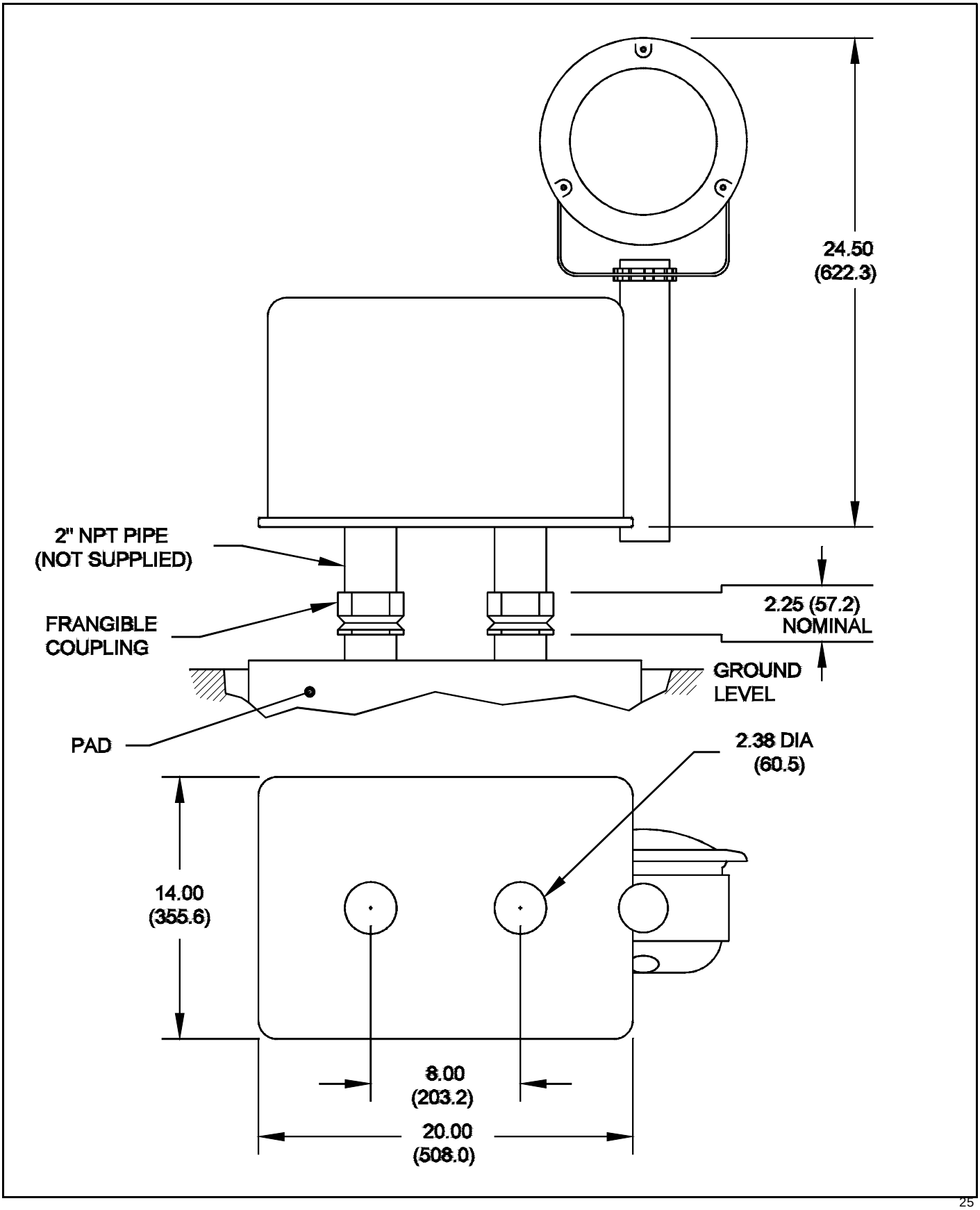
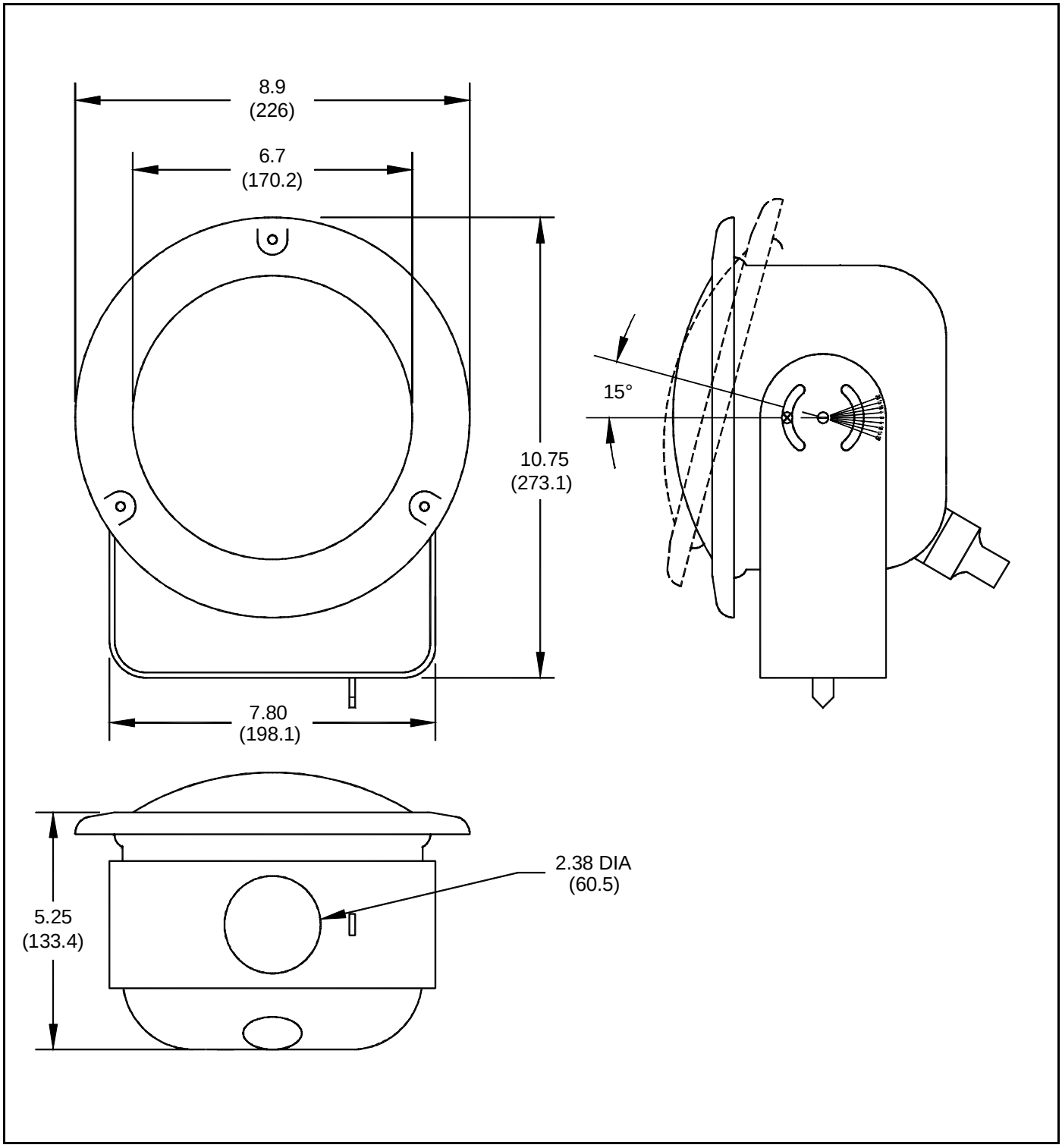
Figure 2-2 Installation Wiring of an FTS 800-4A System with Four Lighting Units



25

Figure 2-3 Comounted Lighting Unit — Mounting and Outline



26

Figure 2-4 Flashhead Mounting and Outline

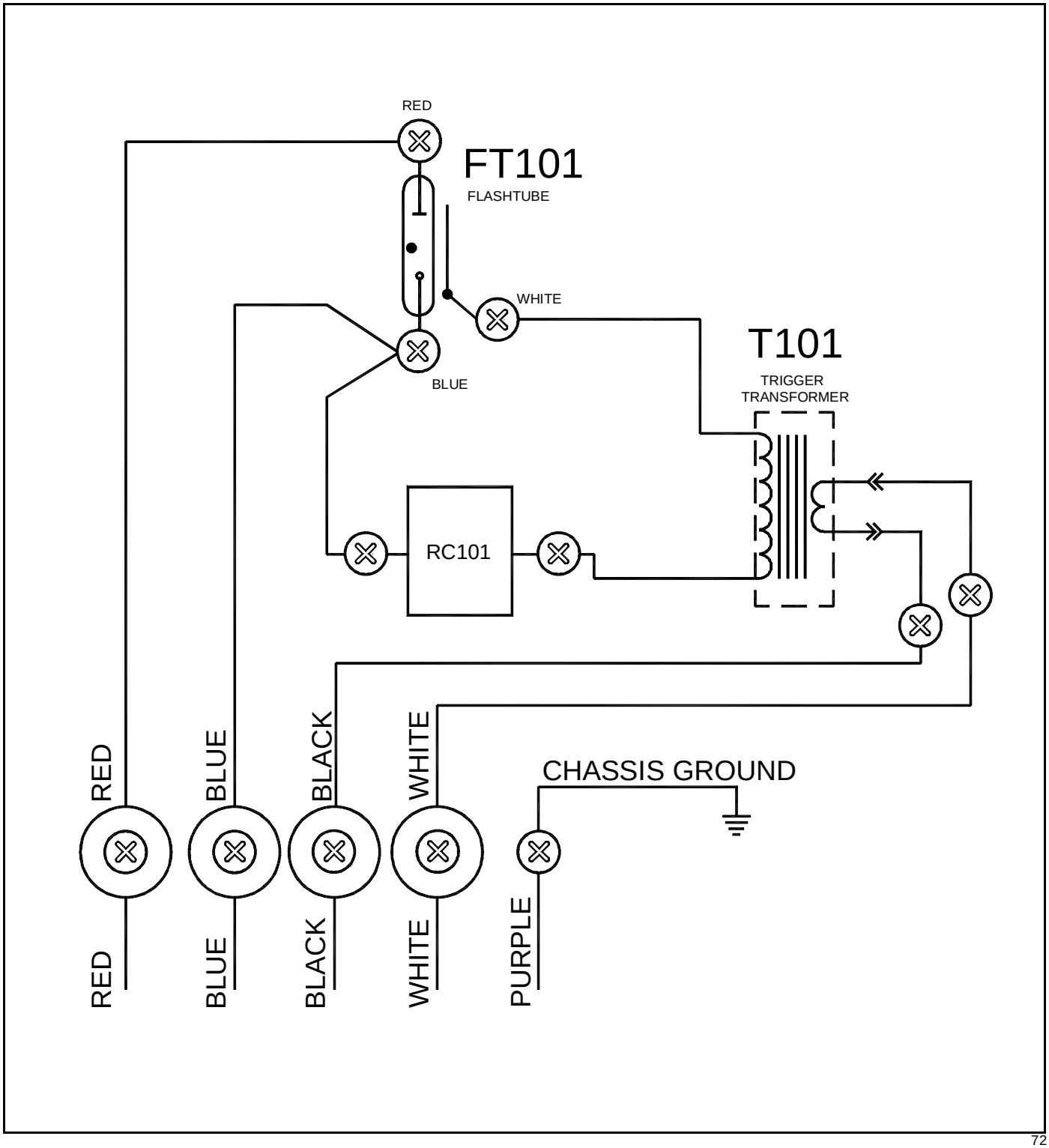


Figure 2-5 Flashhead Internal Wiring

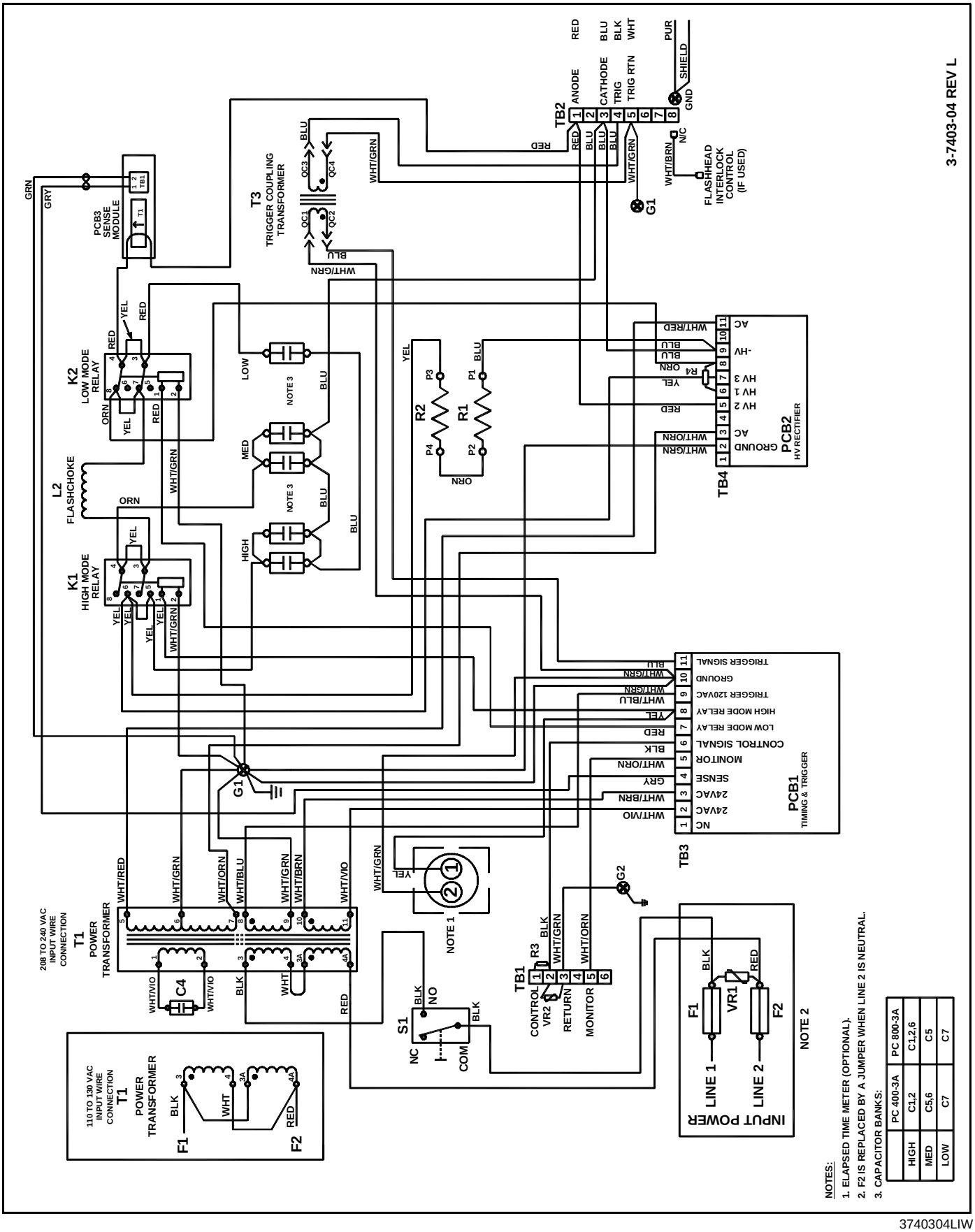


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Figure 2-6 Power Converter Internal Wiring

Section 3 — Maintenance and Troubleshooting

Preventive Maintenance

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

1. Verify that moisture has not accidentally 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.

Storage

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

RFI Problems

Presence of radio frequency interference (RFI) can cause a light to flash intermittently, at the wrong rate, or at the wrong intensity. RFI can enter the light 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 control wire could cause a light to stay at night 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.

Operation Checkout

Use the controller and the following procedure:

- Ensure that power is applied to the entire system.
- Turn the intensity switch on the controller to **L**. The lights should all flash sequentially at *low* intensity.
- Turn the intensity switch to **FLASH INHIBIT**. The lights should not flash.
- Turn the intensity switch on the controller to **M**. The lights should all flash sequentially at *medium* intensity.
- Turn the intensity switch on the controller to **H**. The lights should all flash sequentially at *high* intensity.
- At each preceding position, check the **LIGHT POSITION** confirmation lights on the front panel of the controller. They should all be *green* for each light position flashing correctly. A *red* position indicates a failing light.
- Observe the lights visually. The entire system should flash sequentially.
- If any light is failing, see *Troubleshooting*.

Mode Control for Manual Operation

The following steps in *Table 3-1 Mode Control* explain how to force a single Light to operate continuously at a fixed flash intensity (mode), information that is useful for troubleshooting the Light to check its operation at all three flash intensities. You can also use the handheld terminal, see chapter 5.

Table 3-1 Mode Control

Intensity	Jumper Placement[1]
HIGH	Between Test Point 1 (TP1) labeled TEST and TP6 labelled DAY.

Table 3-1 Mode Control

Intensity	Jumper Placement[1]
MEDIUM	Between Test Point 1 (TP1) labeled TEST and TP5 labelled TWI.
LOW	Between Test Point 1 (TP1) labeled TEST and TP4 labelled NITE.
LTV	*Factory use only.* Causes continuous triggering. ***Do not use.***

1. Be certain to remove all jumpers after checking the Light.

Troubleshooting

For effective troubleshooting, accurately observe the system's operating behavior. This can often lead you directly to the cause of a problem. The diagnostic procedures in this subsection are divided into the two following categories:

- System-level malfunctions, where all lighting units exhibit the same abnormal behavior
- Symptoms applying to one or more individual lighting units, but not to all of them

The most effective troubleshooting procedure begins with observing the behavior of the Lighting Unit. This often leads directly to a faulty component or other abnormal condition. *Table 3-2* lists many of the symptoms that a malfunctioning Lighting Unit might exhibit. In *Table 3-3* these symptoms are correlated with components, assemblies, or conditions that, if defective or abnormal, could cause the Lighting Unit to behave as observed.

For example, assuming that the Lighting Unit 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 a defective timing and trigger board would most likely cause symptom C behavior. The next most likely cause would be a defective rectifier board. The third would be the LOW mode capacitor, and so forth. Each item in *Table 3-3* is listed in the order of its likelihood of causing the failure.

Most components suspected of causing a problem can be checked by following the procedures in *Section Component Testing*.

Table 3-2 Observed Behavior

OBSERVED BEHAVIOR			
Symptom Code	Flash Observation		Comments
	High/Med Intensity	Low Intensity	
A	NO	NO	All circuits are dead
B	NO	NO	Repeatedly blows line fuses
C	NO	NO	Some circuits are functioning
D	No flash	No flash	No flash
E	OK	OK	Out of sequence
F	Weak	OK	Sometimes skips a flash
G	OK	OK	Erroneous fail

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

Item No.	Component	Codes						
		A	B	C	D	E	F	G
C1	Main Capacitor Bank			4				
C2	LOW Mode Capacitor			3	4			
C3	Tuning Capacitor						1	

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

Item No.	Component	Codes						
		A	B	C	D	E	F	G
F1, F2	Fuse	1						
FT101	Flashtube			6			2	
K2	Mode Relay							
PCB1	Timing and Trigger Board			1 and Footnote 3		Footnote 1		2
PCB2	HV Rectifier Board			2	1			
S1	Interlock Switch	2						
T1	Power Transformer	3	2	5				
T2	Sense Transformer							1
T101	Trigger Transformer			7				
VR1	Suppressor Assembly		1					
-	Open Control Line				1			
Footnote 2						3		
Footnote 3			3					

1. Boards not installed in the assigned locations for the correct sequence.
2. Check for RFI (see *Section RFI Problems*).
3. Check for a short circuit in the 24 VAC or 120 VAC secondary windings of the power transformer.

Component Testing

Always make resistance measurements with the power turned off. Voltage measurements require power to be on; 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.

PERSONNEL HAZARD WARNING

NOTE

Read the Warning on page iii.

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

Inspection

Closely inspect the units and check the connections against the installation instructions. Also, a close inspection may reveal insulation breakdown, an overheated component, corrosion, loose connections, faulty relays, incorrect hookup, and so forth.

Wires or cables that move repeatedly will ultimately break. Ensure that all cables (the flash head cable in particular) are securely fastened at short intervals to the structure or other supports.

Power Converter

Capacitors (C1, C2, C3)

Test capacitors with an ohmmeter capable of measuring one megohm or greater, using the procedure described following.

Resistance measured between the terminals of a fully discharged capacitor is initially zero and increases steadily with time if you leave the ohmmeter leads across the terminals. Eventually, an open circuit condition occurs. The time it takes for the complete transition from zero to maximum depends on the total amount of capacitance. A capacitor disconnected from other circuitry is defective if it does not exhibit this behavior. Manually discharge the capacitor before repeating this measurement. This procedure may not detect a failure that occurs at high voltage only. Please note that the final measured resistance across

C1 is limited to 100K ohms unless you disconnect the safety bleed resistor R1.

Relays (K1, K2)

A malfunctioning relay may have faulty contacts, a sticky mechanism, or a defective coil. You may determine the first two possibilities by inspection and by manually exercising the armature. Perform the following resistance measurement to confirm a defective coil:

1. Remove the PCB1.
2. Measure coil resistance between TB3-7 and the chassis to test Low Mode Relay K2.
3. Measure coil resistance between TB3-8 and the chassis to test High Mode Relay K1.

The measured coil resistance in either case should be approximately 290 ohms.

High Voltage Rectifier Board (PCB2)

Replace PCB2 with one known to be in good condition.

High Voltage Transformer (T1)

To test this transformer, first remove PCB1 and PCB2. Apply power to the unit and measure secondary winding voltages at the terminals indicated.

Table 3-4 T1 Transformer Voltages

Terminals	Voltage Range
TB4-3 to TB4-11	900-1050 VAC*
TB3-9 to chassis	100-120 VAC
TB3-2 to TB3-3	22-26 VAC

* If this AC voltage is substantially below the specified minimum value, check tuning capacitor C4.

Trigger Coupling Transformer (T3)

Visually observe the transformer for damage. Check the transformer for open windings by measuring the primary and secondary windings with an ohmmeter. An open winding indicates infinite ohms on the ohmmeter. A normal winding should indicate zero ohms.

Timing and Trigger Board (PCB1)

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

Program the replacement board to match the original board. The light and confirm number should be written on the original board. Be sure to write the numbers on the replacement board as well. Refer to chapters 1 and 5.

Bleed Resistor (R1)

The measured resistance of this component should be 100,000 ohms.

Interlock Switch (S1)

Try adjusting the switch bracket. The switch should clearly read zero ohms when it is closed and infinite ohms when it is open.

Flashhead

Flashtube (FT101)

Visually inspect the flash tube for broken electrodes, cracked glass, and the solder connections of the pins. A darkened envelope does not necessarily mean the light output would be unacceptable. Before concluding that a faulty flash tube is responsible for an inadequate flash, first rule out other possible causes such as weak or absent discharge voltage or triggering pulses.

Component Removal and Replacement

This section contains instructions for removal and replacement of most major replaceable components. *Section 4* provides component location diagrams for assembly and disassembly. Section 2 provides an internal wiring diagram of the FH 800 Flashhead and the PC 800 Power Converter.

High Voltage Transformer (T1)

Removal

1. Disconnect wires leading to the transformer
2. Remove four screws holding the transformer to the rear of the chassis and remove the transformer from the chassis.

Replacement

Reverse the Removal procedure.

Trigger Coupling Transformer (T3)

Removal

1. Disconnect the wires to quick-connects QC1 and QC4. Note the orientation of the wires (top wire of the primary or secondary coil).
2. Remove the two 4-40 x 2" Phillips-head screws holding the transformer assembly to the bracket.
3. Remove the transformer.

Replacement

1. Reinstall the transformer assembly to the bracket using the two long screws. Ensure that the wires have the same orientation on the core.
2. Reattach the electrical wires. Verify that wiring is correct.

Timing and Trigger Board (PCB1)

Removal

1. Loosen, but do not remove, all eleven screws holding the circuit board to TB3.
2. Loosen, but do not remove, the screws at the top that hold the board to the front of the chassis and lift the board from TB3.

Replacement

1. Cut the flash jumpers or set the dipswitches on the replacement board to match those in the board being replaced. Refer to *Tables 1-2* and *1-3*.
2. Cut the confirmation jumpers or set the dipswitches in the replacement board to match those in the board being replaced.
3. Reverse the Removal procedure.

HV Rectifier Board (PCB2)

Removal

1. Loosen, but do not remove, all eleven screws holding the circuit board to TB4.
2. Loosen, but do not remove, the screws at the top that hold the board to the front of the chassis and lift the board from TB4.

Replacement

Reverse the Removal procedure.

Energy Storage Capacitors

Removal

1. Disconnect the wires leading to the capacitors.
2. Remove the hold-down screws. Lift capacitors from their receiving holes and away from the chassis.

Replacement

Insert capacitors into their respective receiving holes. Replace hold-down screws to secure capacitors to the chassis. Reconnect wires to capacitors and verify that wiring agrees with the internal wiring diagram in Section 2. Wires must be replaced exactly as removed. In some instances, a quick-connect wire terminal does not seat properly if it is not placed on the terminal cluster exactly as it was before removal. Sometimes the insulation on the wire terminal interferes with the insulation surrounding the terminal cluster on the capacitor.

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Section 4 — Replaceable and Spare Parts

Customer Service

Technical Assistance	(800) 821-5825
Telephone:	(615) 261-2000
Facsimile:	(615) 261-2600

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 and Spare Parts

Table 4-1 lists the major replaceable parts for the power converter and spare parts for emergency repairs.

Flashhead Parts

Table 4-2 lists the major replaceable parts for the flashhead.

Returning Equipment

To return equipment to FTCA, call Customer Service for a Return Material Authorization (RMA) number.

Repackaging

Equipment must be returned in a container that provides maximum protection during shipping and handling. If the original cartons and packaging material are no longer available, package the lighting unit as follows:

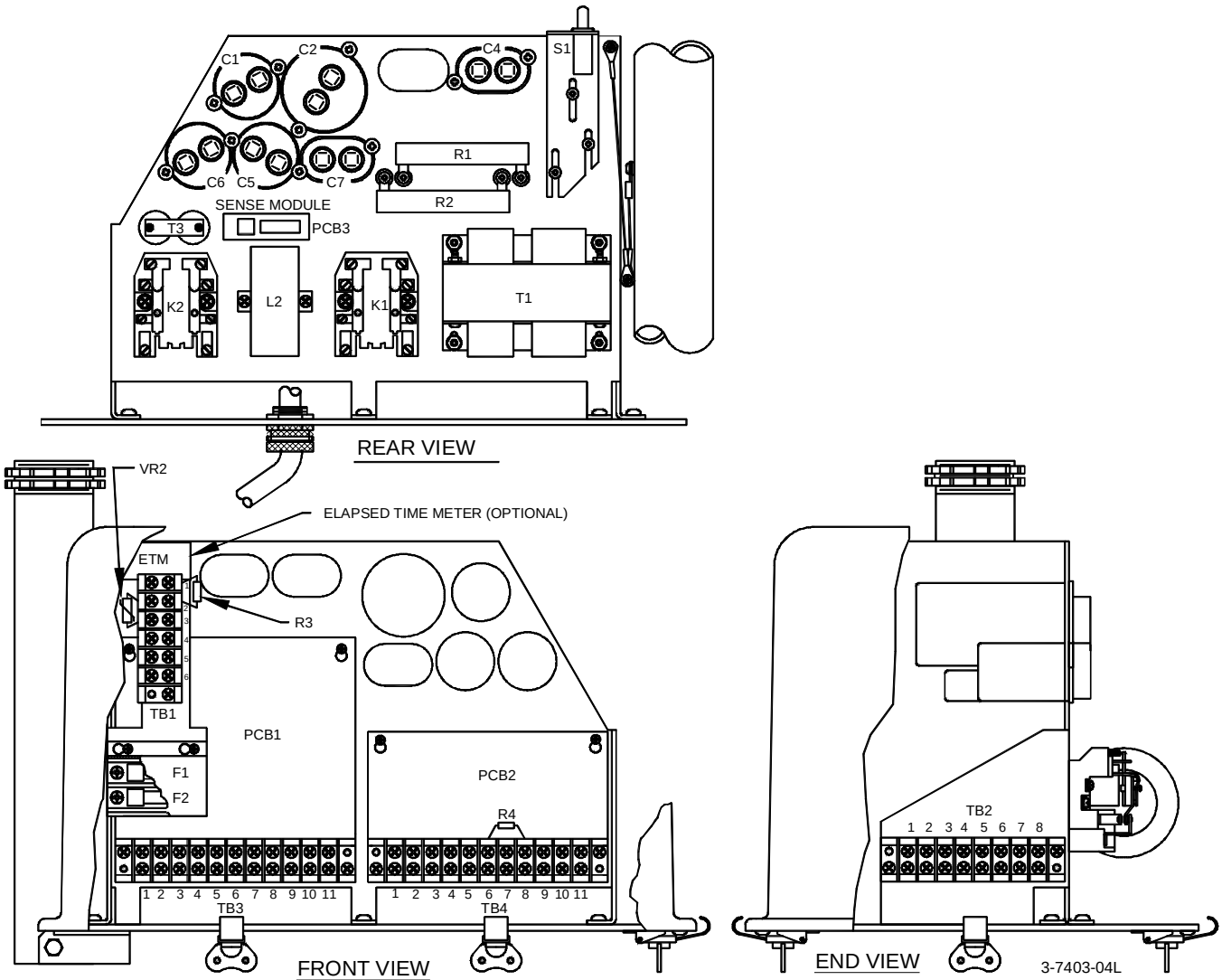
Power Converter: Ship and package the power converter in an upright position; that is, with the base downward. Pad the power converter so that corners cannot penetrate the box during shipment. Box each power converter separately using a double thickness cardboard container and adequate padding. Do not drop. Use appropriate warning labels on the outside of the container.

Flashhead: If you send the flashhead separately, package it in any strong, corrugated cardboard box with enough firm padding surrounding the flashhead to prevent damage.

Table 4-1 Power Converter Major Replaceable Parts

Description	Part Number	Quantity
Capacitor, Tuning, C4, 3 mfd.	6577903	1
Capacitor, Low Intensity, C1, 20 mfd.	6731401	1
Capacitor, High Intensity, C2, 70 mfd. Capacitor, High Intensity, C5 & C6, 15 mfd.	6720401 6731301	1 1
Capacitor, Medium Intensity, C7, 5 mfd.	6731101	1
Choke. Flash, L2	4175200	1
Timing and Trigger Board, PCB1	2904411	1*
Enclosure	3727900	1
Fuse, Power (F1, F2)	4900303	2
HV Rectifier Board, PCB2	2458002	1*
Interlock Switch, S1	4901220	1
Resistor, R1	6900541	1
Resistor, R2	6900542	1
Resistor, Buffer, R3	8435211	1
Resistor, R4	8435212	1
Relay, Mode (K1, K2)	8900494	2*
Sense Module, PCB3	2811101	1
Suppressor, VR1	6901081	1
Suppressor, VR2	6901079	1
Transformer, Power, T1, 60 Hz, 120 VAC Transformer, Power, T1, 60 Hz, 240 VAC	8841201 8841202	1 1
Transformer, Power, T1, 50 Hz	8842901	
Transformer, Trigger Coupling, T3	8336710	1
Terminal Strip, 6-position, TB1	8721006	1
Terminal Strip, 8-position, TB2	8721008	1
Terminal Strip, 11-position, TB3, TB4	8721011	2

* Recommended as a spare part.



3740304FCL

Figure 4-1 Power Converter Component Locations

Table 4-2 Flashhead Replaceable Parts

Description	Part Number	Quantity
Trigger Transformer	8288201	1
Flashtube FT 101	8901701	1*
RC Network RC 101	1403411	1
Post, Ceramic	5900842	6
Retaining Bezel	3735202	1

* Recommended as a spare part.

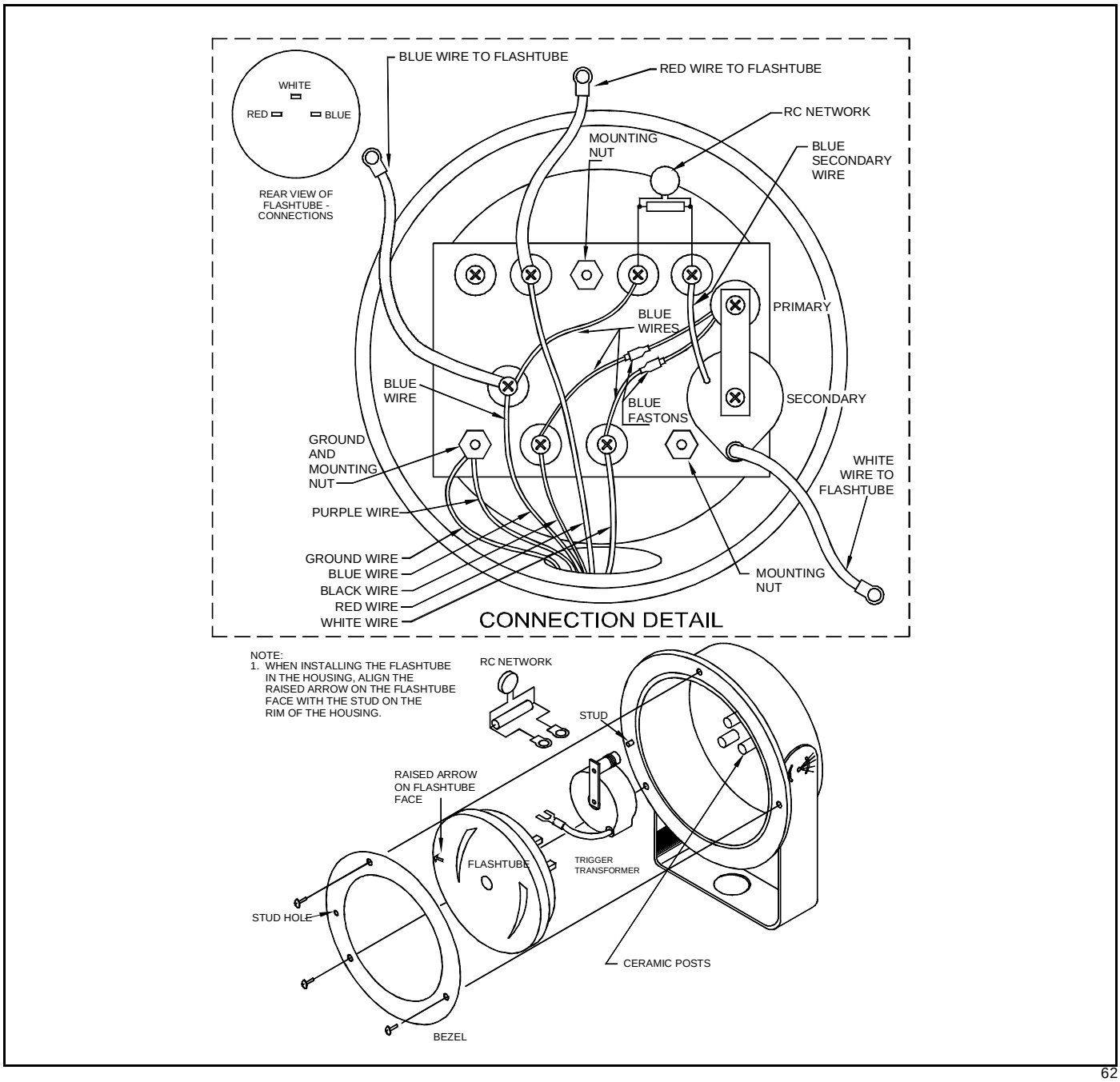


Figure 4-2 Flashhead Component Locations

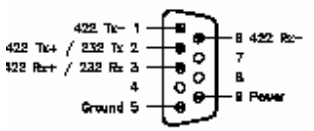
Section 5 — Programming T&T Board P/N 2904411

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.

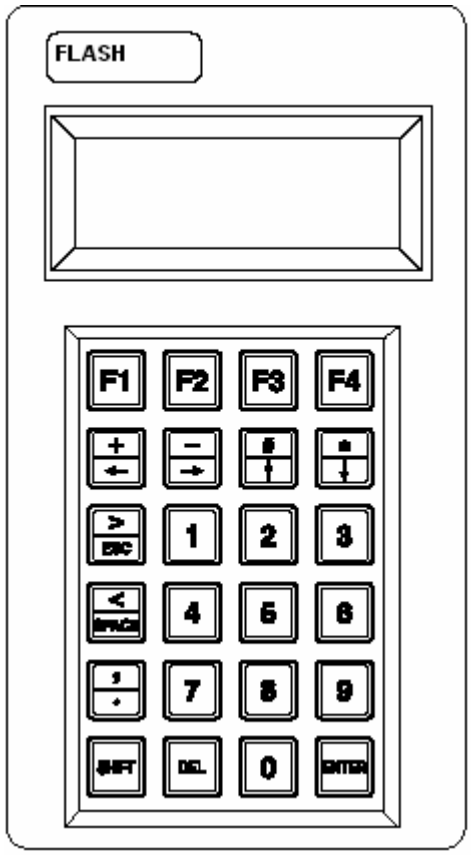


Figure 5-1 FIGURE 5-1 Handheld Programmer

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 4988

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 (DAY, TWI, and NITE). Note: For PN 2904411 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- Std. 1- Air. 2- Cat

L4: OK NEXT BACK EXIT

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

0-Std 1-Air 2-Cat shows that the currently selected option for the parameter is one (1) which in this case means Airport system.

If the board your are configuring is not in the Airport mode press 1 and press F1 (OK). **Note: Even if your board is configured for Airport mode you will need to press 1 and F1 to change the light and confirm number.**

The display will change to:

L1: SETUP

L2: AIRPORT # 1

L3: Enter Light #

L4: OK NEXT BACK EXIT

Press the number keys to select the light number you wish this board to be and then press F1 (OK). The Airport number displayed will change. The display will change to:

L1: SETUP

L2: CONFIRM # 1

L3: Enter Confirm #

L4: OK NEXT BACK EXIT

Press the number keys to select the confirm number you wish this board to be and then press F1 (OK). The Confirm number displayed will change. When you are done press NEXT. Be sure to write the numbers on the white space provided on the board.

To change the Flash rate press NEXT until the LCD shows: NOTE: Valid flash rates are 60fpm and 120 fpm for 800-4A series lights.

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)

INFO

The info menu has the following format:

L1: INFO

L2: BOARD 4988

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

L3:

L4: DAY TWI NITE EXIT

F1: DAY- Changes the mode to DAY.

F2: TWI- Changes the mode to TWI.

F3: NITE- Changes the mode to NITE.

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.

INDEX

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