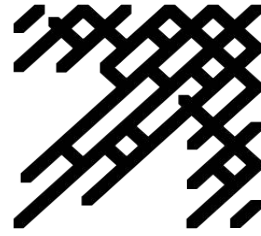


FLASH TECHNOLOGY



FTC 2201 Red Light Controller

Reference Manual
Part Number F7903667

SERIAL NUMBER

Flash Technology, 332 Nichol Mill Lane, Franklin, TN 37067
www.spx.com/en/flash-technology
(615) 261-2000

Front Matter

Abstract

This manual contains information and instructions for installing, operating and maintaining the FTC 2201 Red Light Controller.

Copyright

Copyright © 2016, Flash Technology®, Franklin, TN, 37067, U.S.A.

All rights reserved. Reproduction or use of any portion of this manual is prohibited without express written permission from Flash Technology and/or its licensor.

Trademark Acknowledgements

Flash Technology® is a registered trademark name.

All trademarks and product names mentioned are properties of their respective companies and are recognized and acknowledged as such by Flash Technology.

Applicable Specifications

This equipment meets or exceeds requirements for an FAA Type L-864.

Disclaimer

While every effort has been made to ensure that the information in this manual is complete, accurate and up-to-date, Flash Technology assumes no liability for damages resulting from any errors or omissions in this manual, or from the use of the information contained herein. Flash Technology reserves the right to revise this manual without obligation to notify any person or organization of the revision.

In no event will Flash Technology be liable for direct, indirect, special, incidental, or consequential damages arising out of the use of or the inability to use this manual.

Warranty

Flash Technology warrants all controller components, under normal operating conditions, for 1 year. LED Lighting components are warranted for 5 years.

Parts Replacement

The use of parts or components, in this equipment, not manufactured or supplied by Flash Technology voids the warranty and invalidates the third party testing laboratory certification which ensures compliance with FAA Advisory Circulars 150/5345-43G, 150/5345-53D, and Engineering Brief No. 67D. The certification is valid as long as the system is maintained in accordance with FAA guidelines (FR doc. 04-13718 filed 6-16-04).

Personnel Hazard Warning

Dangerous Voltages

Dangerous line voltages reside in certain locations in this equipment. Also, this equipment may generate dangerous voltages. Although Flash Technology 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.

Do Not Depend on Interlocks

Never depend on interlocks alone to remove unsafe voltages. Always check circuits with a voltmeter after turning the circuit breakers off. Under no circumstances remove or alter the wiring or interlock switches.

Table of Contents

Front Matter	ii
Applicable Specifications	ii
Disclaimer	ii
Warranty	ii
Parts Replacement.....	ii
Personnel Hazard Warning	iii
Table of Contents	iv
List of Figures	v
List of Tables	v
Section 1 – Introduction.....	1
FTC 2201 Controller.....	1
Specifications	1
Operation.....	2
Controller (PCB1).....	2
Beacon / Marker Connection	2
Mode Select Switch	2
Manual Override Operation	2
Normal LED Operation.....	2
Photocell	2
FH 370r	6
MKR 370	8
Section 2 – Outline, Mounting and Installation	9
Unpacking.....	9
Tools	9
Mounting.....	9
Controller	9
Photocell	9
Antenna Mounting	9
FH 370r AC Beacon (L-864)	10
MKR 370 AC (L-810)	10
Installation Wiring	10
Wiring.....	10
Lightning Protection	11
Securing the Cable	11
Installation Checklist	12
Checkout Procedure	13
Using the Photocell.....	13
Using the Mode Override Switch	13
GPS (if installed).....	13
Section 3 – Maintenance and Troubleshooting.....	25
Safety	25
Maintenance.....	25
Preventive Maintenance.....	25
Storage	25
RFI Problems	25

Troubleshooting	25
FTC 2201	25
Photocell	26
Component Removal and Replacement.....	27
FTC 2201	27
FH 370r AC / FH 370r IR AC	27
MKR 370 (L-810 Marker)	28
Section 4 – Major Replaceable Parts	29
Customer Service	29
Ordering Parts	29
FTC 2201 Controller Parts.....	29
FH 370r AC LED Beacon Parts.....	29
Photocell	29
Return Material Authorization (RMA) Policy	32

List of Figures

Figure 1-1 – PCB1 Controller Board	4
Figure 1-2 – PCB1 Controller Board with GPS.....	5
Figure 1-3 – FH 370r AC.....	6
Figure 1-4 – FH 370r AC Base (Internal).....	7
Figure 1-5 – MKR 370.....	8
Figure 2-1 – FTC 2201 Controller Mounting and Outline	14
Figure 2-2 – Photocell Sensor Mounting and Outline	15
Figure 2-3 – FH 370r LED Beacon Base Outline.....	16
Figure 2-4 – MKR 370 Mounting and Outline	17
Figure 2-5 – FTC 2201 Typical A0 Installation Wiring	18
Figure 2-6 – FTC 2201 Typical A1 Installation Wiring	19
Figure 2-7 – FTC 2201 Typical A1 (4 Conductor) Installation Wiring	20
Figure 2-8 – FTC 2201 Recommended Alarm Wiring.....	22
Figure 2-9 – FH 370r AC Internal Wiring.....	23
Figure 2-10 – FH 370r IR AC Internal Wiring.....	24
Figure 4-1 – FH 370r AC Component Locations	30

List of Tables

Table 1-1 – PCB1 Jumpers, Switches, Connectors and LEDs	3
Table 3-1 – Major Troubleshooting Symptoms.....	27
Table 4-1 – FTC 2201 Major Replaceable Parts	29
Table 4-2 – FH 370r AC Replaceable Parts.....	30
Figure 4-2 – FH 370r IR AC Component Locations	31
Table 4-3 – FH 370r IR AC Replaceable Parts.....	31

Section 1 – Introduction

FTC 2201 Controller

The FTC 2201 Controller operates one FH 370r AC (standard) or FH 370r IR AC (Infrared) L-864 LED Beacon and / or up to four MKR 370 AC or MKR 370 AC IR L-810 LED markers.* The FTC 2201 Controller directs beacon flashing and reports light operating status. It allows photocell or manual override mode control.

The FTC 2201 Controller with GPS option

permits synchronization of multiple FTC 2201 Controllers with no separation limit between units and no additional interconnect wiring required. Each FTC 2201 Controller must use a PCB1 Controller board with a GPS board and an antenna to obtain a GPS sync signal. A ‘SAT ERROR’ LED indicates status of the GPS synchronization. Otherwise, operation of the Controller is unchanged.

Specifications

Parameter	Specification
FTC 2201 Controller Physical Dimensions (H x W x Depth, Wt) (See Figure 2-1 for mounting dimensions) Operating Temperature Range AC Line Voltage Power Consumption: Alarm Relay Contact Rating	9.62 x 7.5 x 4.74 in, 4 lbs / 244 x 191 x 121 mm, 1.81 kg -40 to +85 degrees Centigrade 120/240V AC ±10% 60 Hz ±5% single phase 230V AC ±10% 50 Hz ±5% single phase 4 Watts 5 Amp @ 250V AC, Isolated contacts
L-864 FH 370r AC / FH 370r IR AC LED Beacon Physical Dimensions (H x Diameter, Wt) Flash Intensity (nominal) Flash Rate Beam Spread FH 370r AC LED Beacon Power Consumption: FH 370r IR AC LED Beacon Power Consumption:	7.5 x 15.75 in, 26.3 lbs / 190.5 x 400, 11.9 kg. Night (Red) 2,000 ± 25% ECD 20 fpm Horizontal: 360° / Vertical: 3° Min. 14 Watts 23 Watts
L-810 MKR 370 AC / MKR 370 AC IR Physical Dimensions (H x Diameter, Wt): Intensity (nominal): Beam Spread: MKR 370 AC Power Consumption: MKR 370 AC IR Power Consumption:	8 x 2 in, 1.0 lbs / 203.2 x 50.8 mm, 0.45 kg Night (Red) 32.5 ± 25% ECD Horizontal: 360° / Vertical: 10° 2.7 Watts (per fixture) 4.6 Watts (per fixture)

*When supplied with an FH 370r AC or MKR 370 AC, the FTC 2201 is designed for operation at 120V AC 60 Hz only. When supplied with an FH 370r IR AC or MKR 370 AC IR, the system may be specified for operation at 120/240V AC 60 Hz or 230V AC 50 Hz. FTC 2201 systems operating at 230 or 240V AC are limited to two (2) MKR 370 AC IR fixtures. FTC 2201 controller versions are available to support legacy lighting components and configurations. See FTC 2201 Reference Manual Rev. 7 for information regarding legacy lighting equipment.

Operation

The controller begins operation as soon as main power is applied.

Controller (PCB1)

PCB1 has jumpers, switches, connectors, and LEDs whose functions are described in Table 1-1. Figure 1-1 provides a pictorial of the standard PCB1 Controller Board. Figure 1-2 provides a pictorial of the PCB1 Controller Board with GPS sync.

Each PCB1 configuration must be programmed at the factory for a specific application. When ordering, be sure to specify the lighting requirements for your application.

Beacon / Marker Connection

The FTC 2201 controller has two connections for beacons and markers labeled “Steady” and “Flashing”. If the controller is being used to flash a beacon and run steady marker lights, the beacon is connected to L1 and L2 of the “Flashing” output (TB1-6 & 7) and the markers are connected to L1 and L2 of the “Steady” output (TB1-4 & 5). If the FTC 2201 controller is being used to flash L-810 markers only, they will be connected to the “Flashing” output (TB1-6 & 7).

Mode Select Switch

The DAY/AUTO/NIGHT manual override mode switch, which controls day, night or automatic operation (directed by the photocell), is located on the right center of PCB1. For normal operation, the switch should be placed in the AUTO position.

Manual Override Operation

Select the desired mode of operation (DAY or NIGHT) by using the DAY/AUTO/NIGHT switch as shown in Figures 1-1 and 1-2.

The DAY or NIGHT position of the switch overrides photocell control (Auto position). The override does NOT timeout.

Note: The Day and Night positions of the switch are intended for short term operation of the unit. The 19 hour photocell alarm timer is still active even if the unit is manually placed in Day or Night mode.

Normal LED Operation

The LEDs on the PCB1 Controller Board should operate as described in the following list with the DAY/AUTO/NIGHT switch in AUTO:

- The ALARM LEDs are not illuminated.
- The DAY or NIGHT mode LED is illuminated according to the ambient lighting conditions.
- The FLASH LED should be flashing if the unit is in NIGHT mode.

Photocell

The photocell changes resistance as ambient light changes from day to night or from night to day. The controller board (PCB1) converts the changes into the necessary circuit operation for day or night operation.

Table 1-1 – PCB1 Jumpers, Switches, Connectors and LEDs

JP1	Installed for all 120V AC systems. Systems with Infrared (IR) beacons or markers: Installed for operation at 230V AC; removed for operation at 240V AC.
JP2	Systems with Infrared (IR) beacons or markers: Installed for operation at 120 & 240V AC; removed for operation at 230V AC. Legacy systems with Incandescent markers: Refer to FTC 2201 manual Rev. 7.
JP3	Systems with Infrared (IR) beacons or markers: Installed for operation at 230/240V AC. (Not applicable to systems with FH 370r AC or MKR 370 AC.)
JP4 & JP5	Installed for operation at 120V AC. (Required for systems with FH 370r AC or MKR 370 AC.)
Manual Override Switch SW1	Auto: Normal operating position Day: Manual override to DAY mode Night: Manual override to NIGHT mode
LED I1	Flashing = Syncs with NIGHT mode flash of flashing circuit. Steady Off = No power or DAY mode.
LED I2	DAY - On = DAY mode; LED will blink if unit is in Manual Override to DAY mode.
LED I3	NIGHT - On = NIGHT mode; LED will blink if unit is in Manual Override to NIGHT mode.
LED I4	PEC Alarm - On = Photocell alarm. The unit failed to transition modes within 19 hours via the photocell input.
LED I5	Marker Alarm - On = Alarm condition exists on “Steady” output (TB1- 4 & 5).
LED I6	Beacon Alarm - On = Alarm condition exists on “Flashing” output (TB1-6 & 7). (Beacon Alarm or Flashing Marker Alarm depending on installation.)
LED I7	Satellite Error – On = Signals from fewer than three satellites are being received. (GPS enabled units only.)
SW2	Marker Alarm Switch - Set to the number of marker bulbs installed to establish alarm condition.

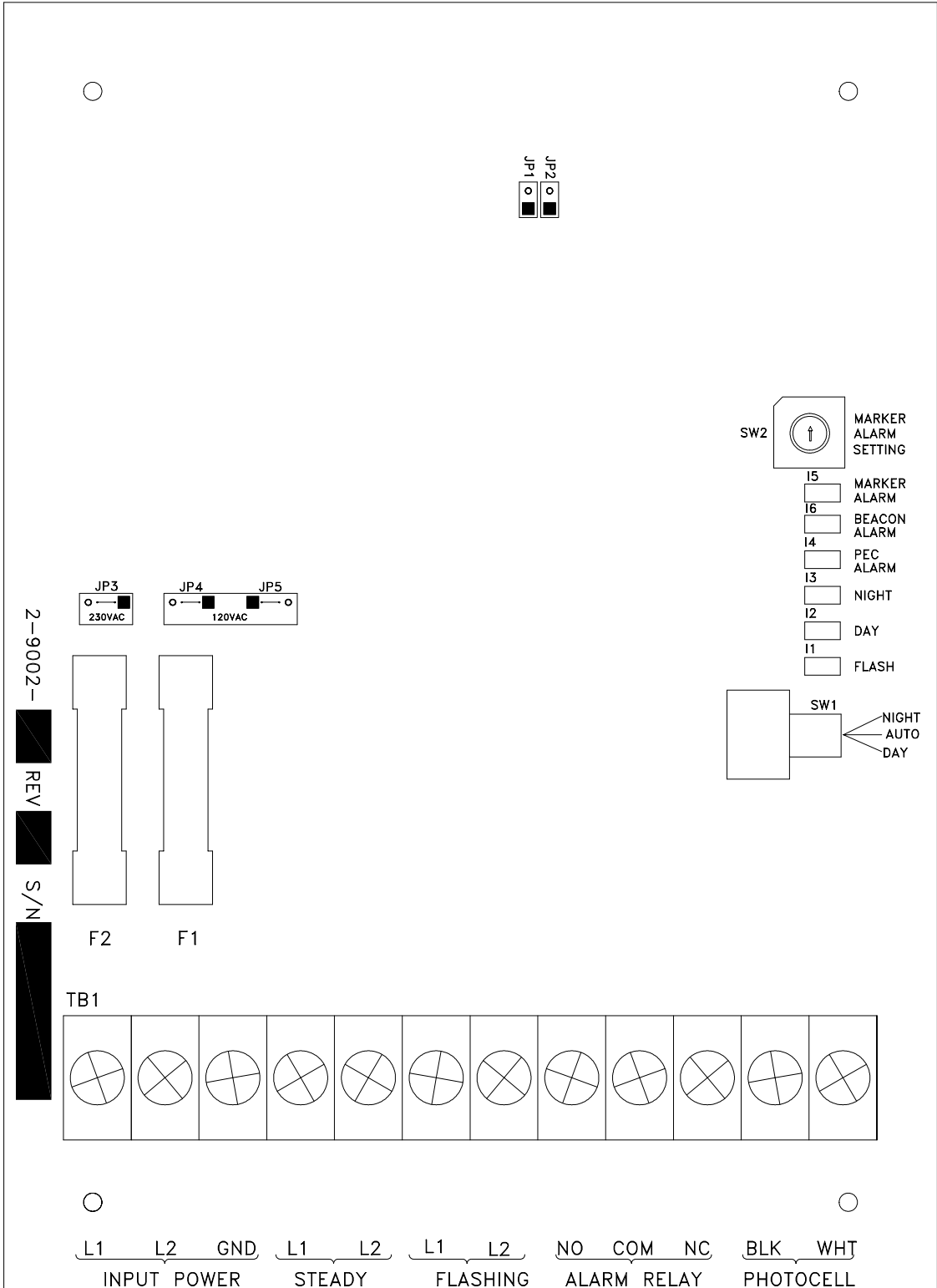


Figure 1-1 – PCB1 Controller Board

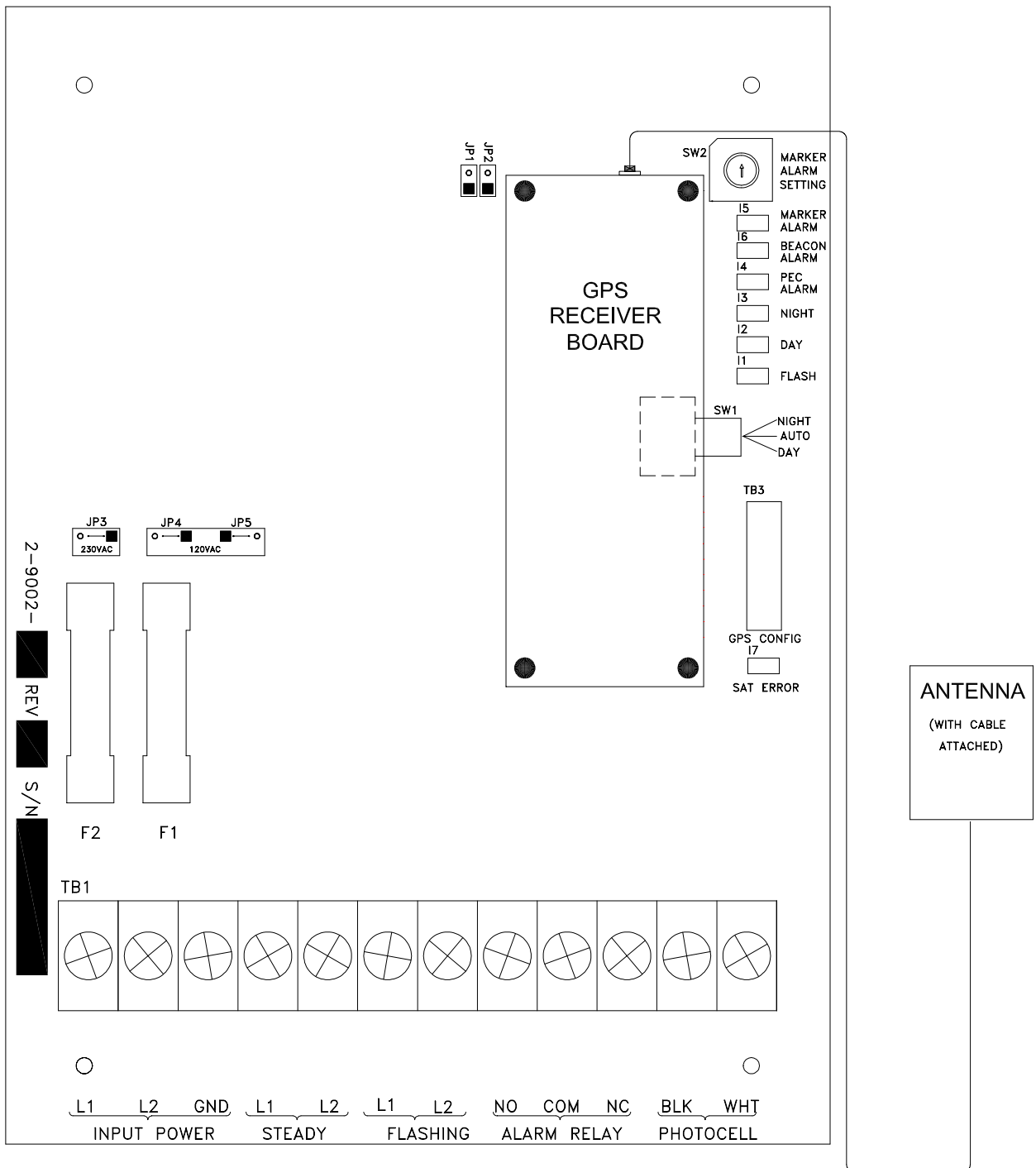


Figure 1-2 – PCB1 Controller Board with GPS

FH 370r

The FH 370r AC, shown in Figure 1-3, is divided into two sections: light engine, and base assembly. The light engine is comprised of 36 highly efficient red LEDs which are focused by Fresnel optics to produce the required output per FAA specifications for type L-864 beacons. In the event service is required, the light engine is field replaceable as a single assembly. The FH 370r AC component layout is shown in Figure 4-2 and the wiring diagram is shown in Figure 2-9.

The FH 370r IR AC (Infrared) is visually similar to Figure 1-3. It incorporates all features of the FH 370r AC and adds 12 infrared LEDs. The addition of IR ensures visibility of the obstruction to pilots aided by NVG (night vision goggles). The combination of standard Red (620nm) LEDs and IR (850nm) LEDs ensures maximum visibility to pilots in all circumstances. The FH 370r IR AC component layout is shown in Figure 4-3 and the wiring diagram is shown in Figure 2-10.

Figure 1-4 provides an overhead view of the FH 370r AC base assembly. Located in the base is a terminal block for input power connections and a power supply that converts the input AC voltage to the appropriate DC output. Mounted on the terminal block are two surge suppression units. A window in the top right corner of each surge suppression unit indicates its status. During normal operation, the window will appear dark. If the surge suppressor fails, the window will turn red; indicating that the surge suppression units should be replaced.



Note: FH 370r AC shown. FH 370r IR AC similar.

Figure 1-3 – FH 370r AC



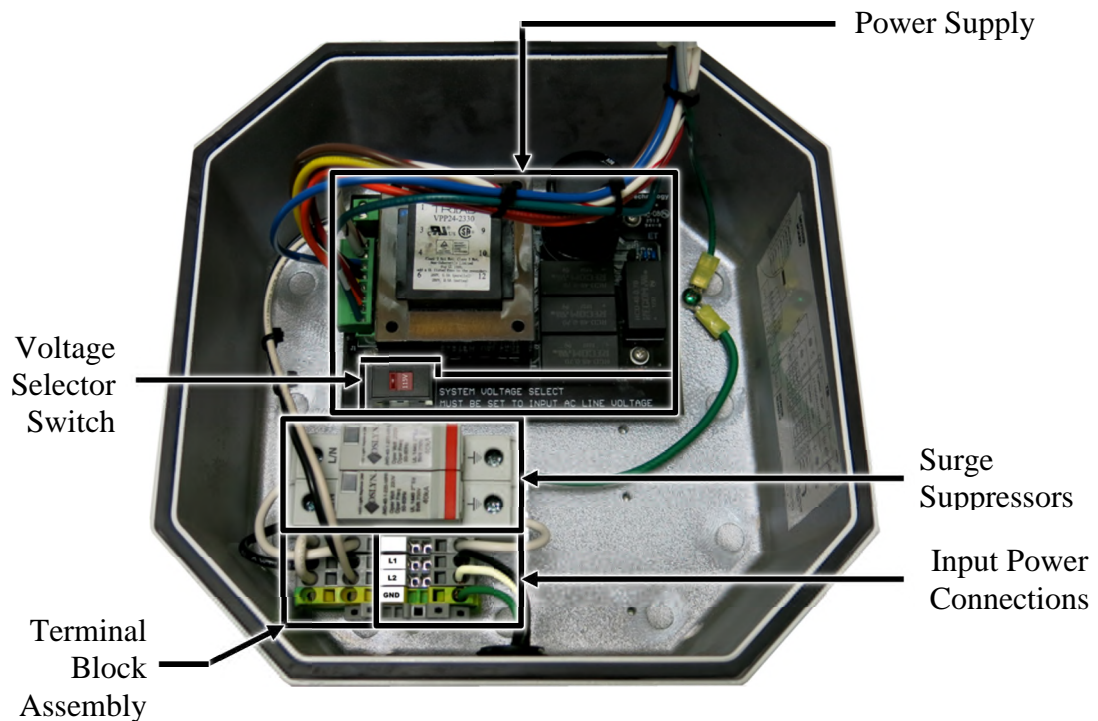
A voltage selector switch, located on the power supply, is marked to indicate the power supply's input voltage configuration (115V or 230V).

FTC 2201 controllers must be configured for operation at 120V AC 60 Hz when connected to an **FH 370r AC**. Use a flat blade screwdriver to move the power supply's voltage selector switch to the 115V position for operation with the FTC 2201 controller.

The FTC 2201 may be specified for operation at 120, 230 or 240V AC when connected to an **FH 370r IR AC**. Verify that the voltage selector switch is set to match the controller's input voltage before powering the system on.

Important! FTC 2201 controllers, when used with an **FH 370r AC**, are configured for operation at 120V AC, 60 HZ. The power supply, located in the base assembly of the FH 370r AC, must be set to 115V before applying power to the system.

FTC 2201 controllers may be configured for operation at 120, 230 or 240V AC when connected to an **FH 370r IR AC**. Verify that the power supply, located in the base assembly of the FH 370r IR AC is set to match the supply voltage to the FTC 2201 before powering the system on. The voltage selector switch should be set to 230V for operation at 240V AC.



Note: FH 370r AC shown. FH 370r IR AC similar.

Figure 1-4 – FH 370r AC Base (Internal)

MKR 370

The MKR 370 AC, shown in Figure 1-5, is an L-810 LED marker. The innovative design combines three highly efficient LED's and Fresnel optics into a compact cast aluminum base which is easy to install; requiring minimal hardware.

The MKR 370 AC IR (Infrared), which is visually identical to the MKR 370 AC, adds three IR LEDs. The addition of IR

ensures visibility of the obstruction to pilots aided by NVG. The combination of standard Red (620nm) LEDs and IR (850nm) LEDs ensures maximum visibility to pilots in all circumstances.

A mounting diagram for the MKR 370 is provided in Figure 2-4. Complete installation diagrams and instructions are provided with the marker kit.



Note: Refer to “MKR 370 Wiring Instructions” (Part # 7119001) for specific information regarding cable connection to the MKR 370.

Figure 1-5 – MKR 370

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. Promptly report damage claims to the freight handler.

Tools

Flash Technology suggests the following tools for installation and maintenance:

- 1/8" non-flared flat blade screw driver
- 9 or 12 inch, flat blade #2 screwdriver
- #2 Phillips® head screwdriver
- Set of combination wrenches
- Long-nose pliers
- Assorted nut driver handles: 1/4", 5/16", 3/8" recommended
- Digital volt-ohm meter
- Wire strippers
- Level

Mounting

Controller

A quick-release latch secures the enclosure's door. Release the latch and open the door for internal access.

Outline and mounting dimensions for the controller are shown in Figure 2-1.

Locate the FTC 2201 Controller in an area with restricted access. You can place the controller anywhere within 400 feet of the most distant beacon or marker. Consult with the factory if a greater distance is necessary.

Use the following guidelines for mounting the controller:

- Ensure that adequate space exists around the equipment for access during installation, maintenance and servicing.

- Allow space for air flow around the controller.

Note: Flash Technology does not furnish mounting hardware unless it is ordered as part of an installation kit.

Photocell

The photocell is supplied with pigtails for connection to the FTC 2201. The standard photocell (Part # 1855001) is supplied with 20' of cable. Photocells with cable lengths up to 75' are available.

The photocell may be located any practical distance from the FTC 2201. The cable may be spliced to provide additional length. The recommended minimum wire gauge is #16 AWG if additional length is necessary.

Mounting and outline dimensions for the photocell are shown in Figure 2-2. Use the following guidelines for the photocell:

- Locate the photocell where it has an unobstructed view of the polar sky.
- It must not view direct or reflected artificial light.
- The photocell may be supported directly by electrical conduit.
- Mount the photocell on the top end of a vertical length of conduit to prevent water from entering and damaging the unit.

Antenna Mounting

(Units with GPS only)

Mount the Antenna to the top of an outdoor structure facing an unobstructed view of the sky. If possible, provide a material below it that attracts the antenna's magnet. Do not place any materials above the antenna (including materials used to secure it) that block RF Energy. An

optional antenna with extended separation is available (see parts list).

FH 370r AC Beacon (L-864)

Outline and mounting dimensions for the FH 370r are shown in Figure 2-3.

Note: Flash Technology recommends the installation of one or more lightning rods near the uppermost lighting fixture(s). The copper lightning rods should extend a minimum of 36" above the height of the lighting fixture and a minimum of 18" horizontally away from the fixture.

The beacon is mounted to the tower pedestal utilizing 1/2" galvanized (Flash Technology part 5991740) or stainless steel hardware. Mounting holes are provided on the beacon base as shown in Figure 2-3. These mounting holes will align with most tower pedestals. The beacon must be installed level to maintain light output in accordance with FAA requirements.

Important! Ensure the flashhead is grounded to the tower.

MKR 370 AC (L-810)

Outline and mounting dimensions for the MKR 370 are shown in Figure 2-4.

Note: MKR 370 installation diagrams are included with the marker kit and are not part of this document.

Installation Wiring

Wiring

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

Note: If installation drawings prepared specifically for your site disagree with information provided in this manual, the site installation drawings should take precedence. Consult any site-specific installation wiring diagram supplied with your equipment.

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

All installation wiring should have an insulation rating of 600 volts. Wire size for the lights on each wire run is calculated from the number of lighting fixtures and the length of the wire on that run. Wire for the lights should be sized so that the voltage drop does not exceed 3% due to wire resistance. Assume 7.8 VA for the FH 370r AC and 25.6 VA for the FH 370r IR AC beacon. Assume 5 VA for each MKR 370 AC and 8.5 VA for each MKR 370 AC IR. Total power required is the sum of all lights plus 4.5 VA additional for the FTC 2201 Controller.

Typical installation wiring diagrams for the FTC 2201 are shown in Figures 2-5 through 2-7. Alarm wiring recommendations are shown in Figure 2-8.

Make electrical connections at the following terminals:

- Beacon or Flashing Marker: TB1-6 (L1) and TB1-7 (L2, N)
- Marker steady: TB1-4 (L1) and TB1-5 (L2, N)
- Photocell: (control) TB1-11 and TB1-12
- Alarm: TB1-8 and TB1-9 (NO) or TB1-9 and TB1-10 (NC).

Note: The alarm relay contacts are labeled to represent their state with the unit powered on and with no alarms present.

To ensure proper alarm monitoring, Flash Technology recommends monitoring contacts that are open in an alarm condition (TB1-9 and TB1-10).

Lightning Protection

All Flash Technology equipment is designed to withstand severe transient over-voltages. However, a lightning arresting system should be installed to prevent eventual damage by lightning. Transient suppressors from line-to-line and line-to neutral are recommended at the primary power load center.

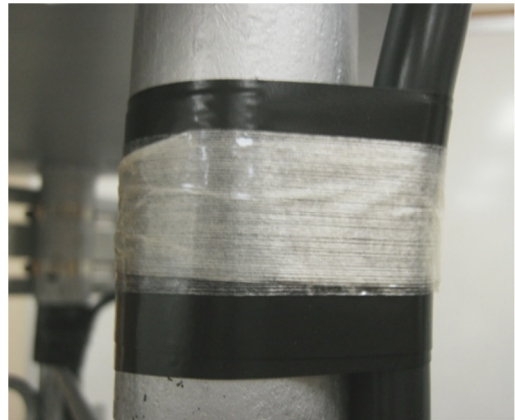
Securing the Cable

Flash Technology recommends the following method for securing the beacon and marker cable to a skeletal structure:

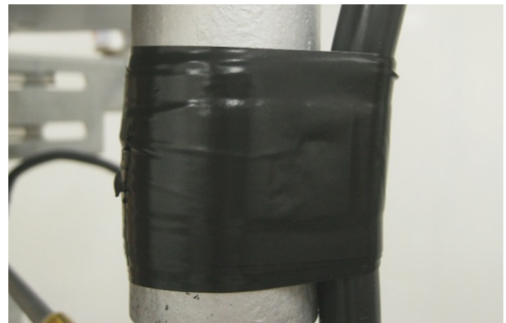
1. Run the cable along one of the tower legs and wrap two full turns of two-inch Scotchrap™ #50 tape, or the equivalent, around the cable and tower leg at regular intervals of about 5 feet (1.5 meters).



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 4 directly above and below any tower leg flanges that the cable may cross. The cable should be spaced approximately 1 inch from the edge of each flange to provide stress relief from vibration that may damage the jacket of the cable. A 5 foot service loop should be located near the beacon and the controller.

Installation Checklist

Use the following checklist when installing the system:

1. **Equipment Damage:**
Inspect all equipment for damage.
2. **Required Equipment:**
Verify the received equipment against the packing list to ensure completeness.
3. **Consult site installation drawings for placement, mounting and wiring details.**
4. **Provide a power disconnect switch or a circuit breaker.**
5. **Check the lightning protection system.**
6. **Be sure that junction boxes will drain condensation properly.**
7. **Controller:**
 - Position and mount the controller allowing adequate clearance to open the cover.
 - Ensure that the unit is mounted upright.
 - Check the internal hardware to ensure that all screws are tight.
 - Ensure that no holes are punched or drilled on the top surface of the enclosure.
 - Ensure that air can flow around the enclosure.
8. **Photocell:**
 - Locate the photocell where it has an unobstructed view of the polar sky (north).
 - It must not view direct or reflected artificial light.
 - The photocell should be supported directly by electrical conduit or mounted on the optional Antenna

Mounting Bracket (Kit PN 1905355). It should not be mounted underneath the controller where it could be shadowed.

- Ensure that the installation is watertight.

9. **GPS Antenna (Units with GPS only):**

The GPS antenna must be mounted outdoors with an unobstructed view of the sky.

Note: The GPS antenna can be mounted on the optional Antenna Mounting Bracket (Kit PN 1905355).

Complete the following steps before applying power:

10. **Examine the installation drawings:**

- Check for proper incoming service voltage. Verify that primary power voltage is the value stated on the ID plate.
- The unit is wired according to the instructions.
- Check all electrical connections for tightness.
- Check all terminal strip connections for tightness.
- If external alarm detection circuit responds to closed contacts, ensure that they are wired to the contacts on TB1-8 and TB1-9 (NO) that close on alarm.
- If external alarm detection circuit responds to open contacts, ensure that they are wired to the contacts on TB1-9 and TB1-10 (NC) that open on alarm.
- Protect alarm wiring by using shielded wires, grounding the shield, and placing wires in a conduit.

- The black wire of the photocell is connected to TB1-11 and the white wire is connected to TB1-12.
- The GPS antenna is connected to the GPS receiver board (units with GPS only).

After completing all of the preceding steps, apply power to the unit and perform an operational checkout from procedures in “Checkout Procedure”.

Checkout Procedure

Using the Photocell

Turn the DAY/AUTO/NIGHT Switch to AUTO:

The system is now under photocell control.

Cover the photocell to block it from all light. With no alarms or errors and after a 60 second delay:

- The system is now in NIGHT mode.
- The beacons should be on and flashing (if installed).
- The markers should be on steadily (or flashing depending on configuration).

Uncover the photocell so as to allow light to strike it, or shine a light on it. With no alarms or errors and after a 60 second delay:

- The system is now in DAY mode.
- The beacons and markers should turn off.

Using the Mode Override Switch

1. Turn the DAY/AUTO/NIGHT Switch to DAY:

With no alarms or errors:

- The system is now in DAY mode.
- The beacons and markers should turn off.

2. Turn the DAY/AUTO/NIGHT Switch to AUTO:

With no alarms or errors:

- The system is now under photocell control.
- The beacons and markers should be off during daylight and on at night.

3. Turn the DAY/AUTO/NIGHT Switch to NIGHT:

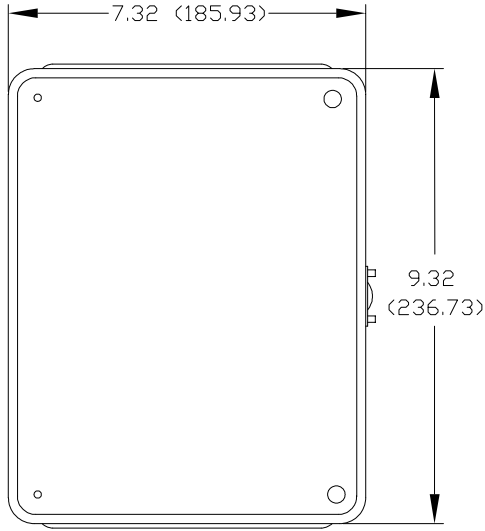
With no alarms or errors:

- The system is now in NIGHT mode.
- The beacons should be on and flashing (if installed).
- The markers should be on steadily (or flashing depending on configuration).

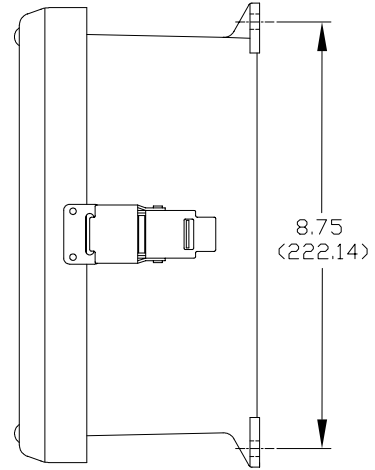
If the operation is not as described, go to Troubleshooting in Section 3.

GPS (if installed)

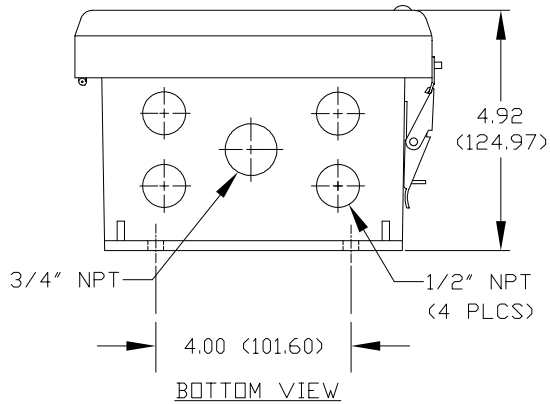
Verify that the “SAT Error” LED (I7) is not lit.



FRONT VIEW

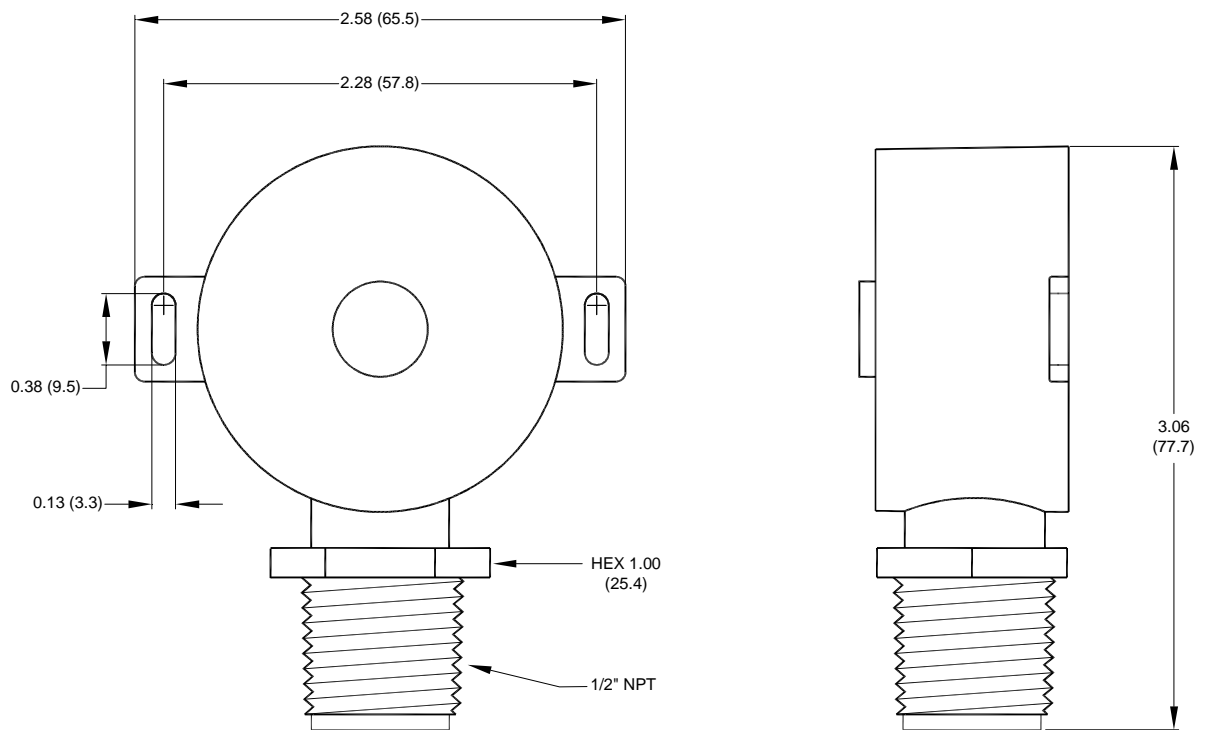


RIGHT SIDE VIEW



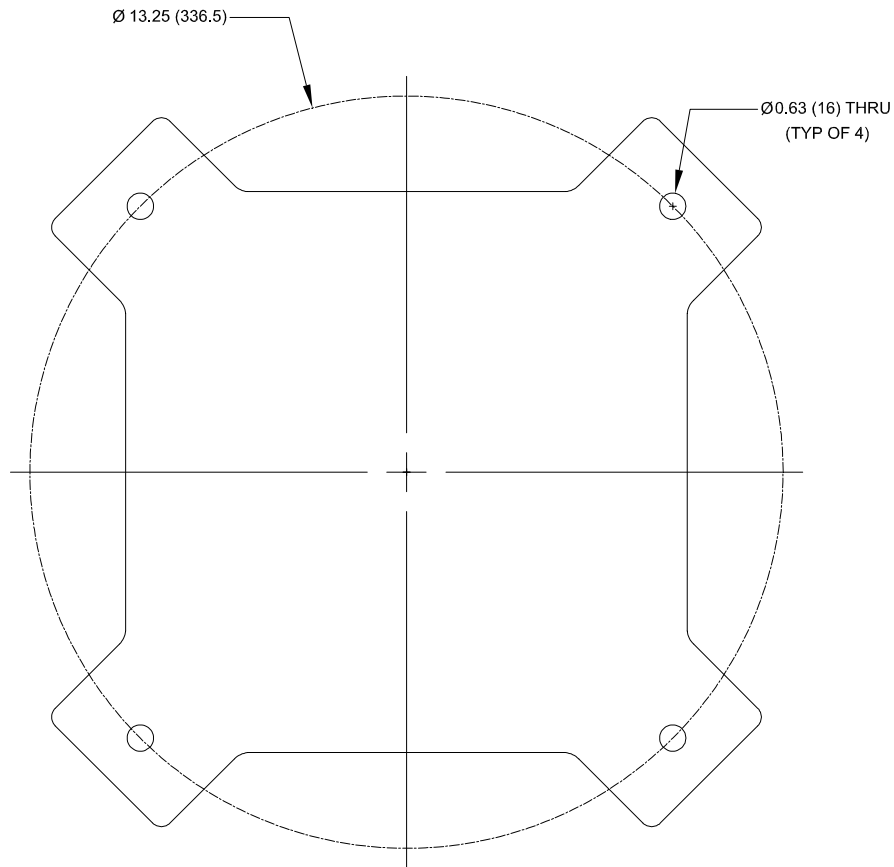
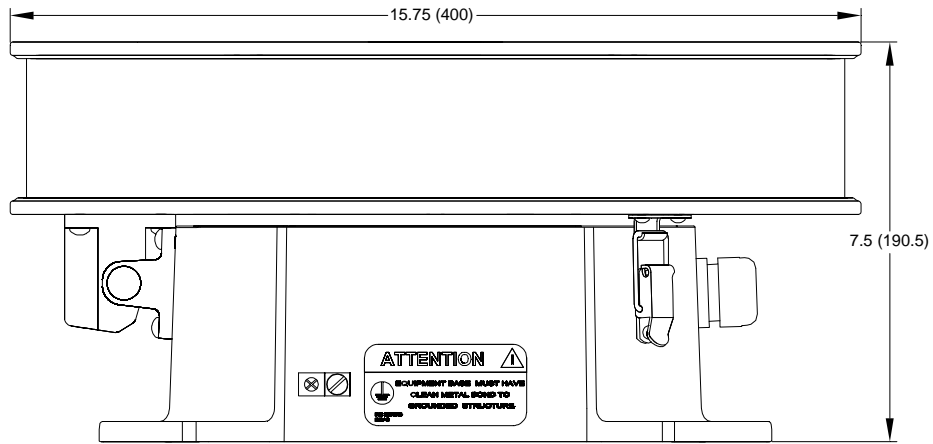
Note: All dimensions are in inches (millimeters).

Figure 2-1 – FTC 2201 Controller Mounting and Outline



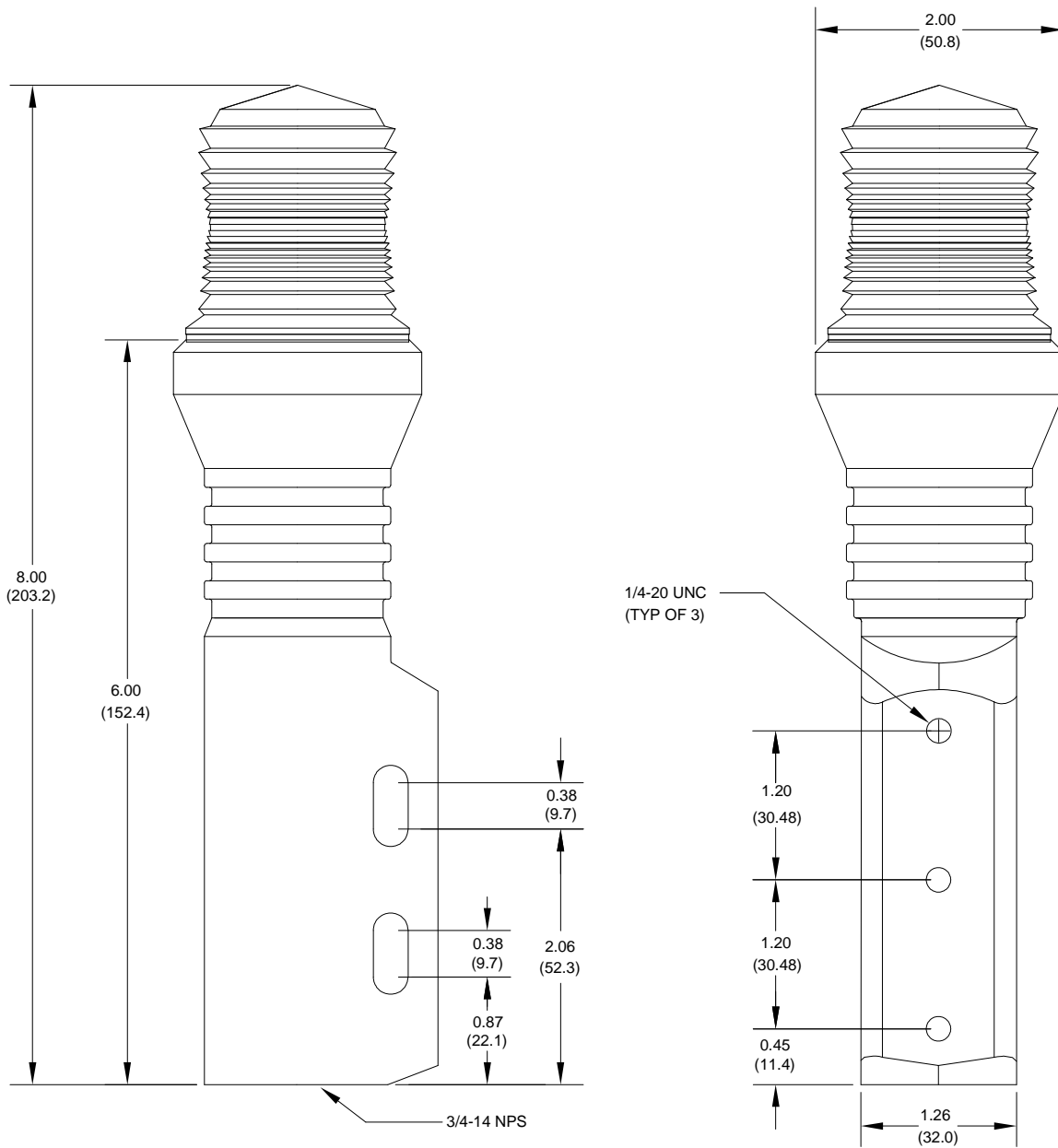
Note: All dimensions are in inches (millimeters).

Figure 2-2 – Photocell Sensor Mounting and Outline



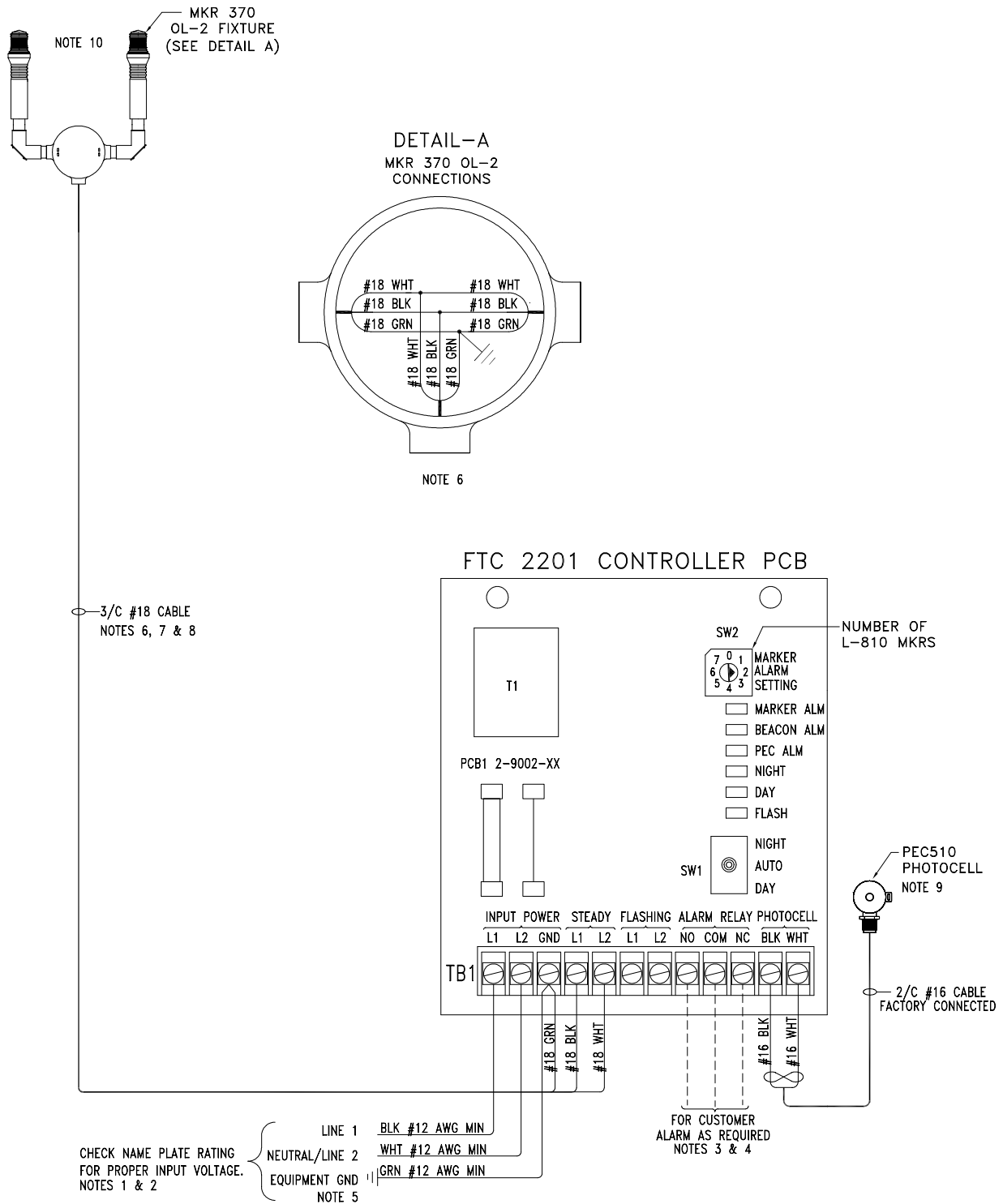
Note: All dimensions are in inches (millimeters).

Figure 2-3 – FH 370r LED Beacon Base Outline



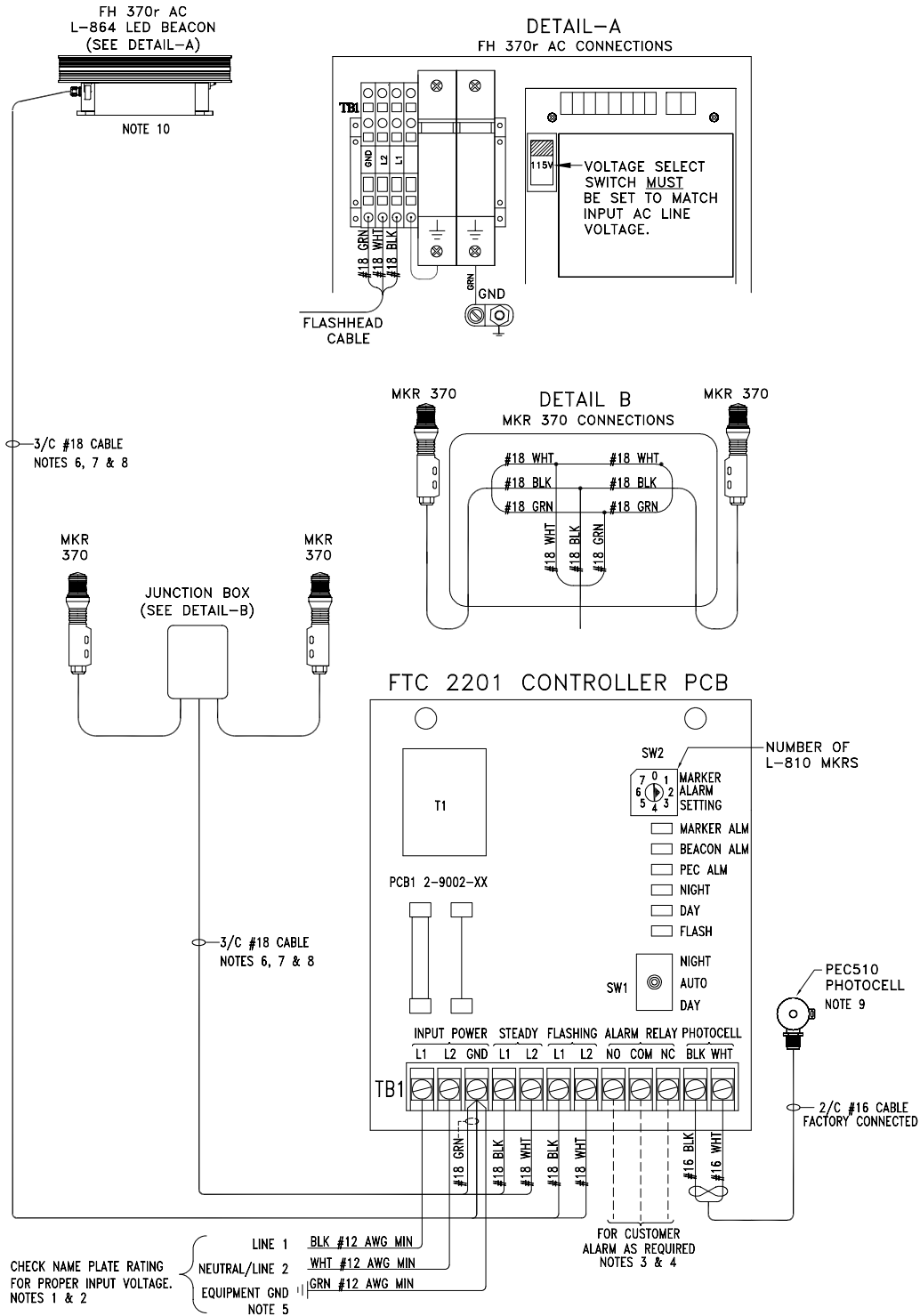
Note: All dimensions are in inches (millimeters).

Figure 2-4 – MKR 370 Mounting and Outline



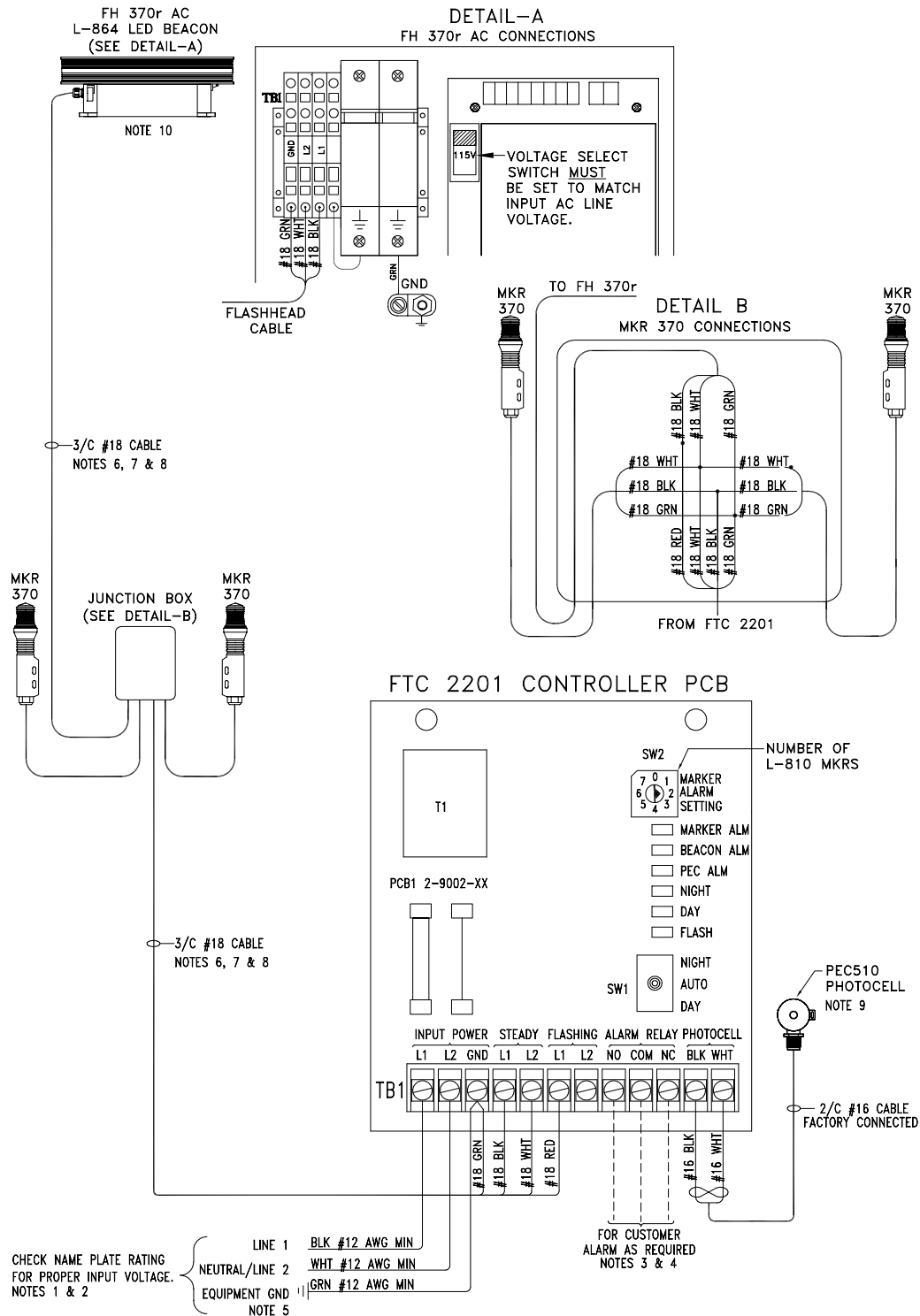
Note: System Wiring Diagram Notes are provided after Figure 2-7.

Figure 2-5 – FTC 2201 Typical A0 Installation Wiring



Note: System Wiring Diagram Notes are provided after Figure 2-7. MKR 370 connection instructions are provided with the marker kit.

Figure 2-6 – FTC 2201 Typical A1 Installation Wiring

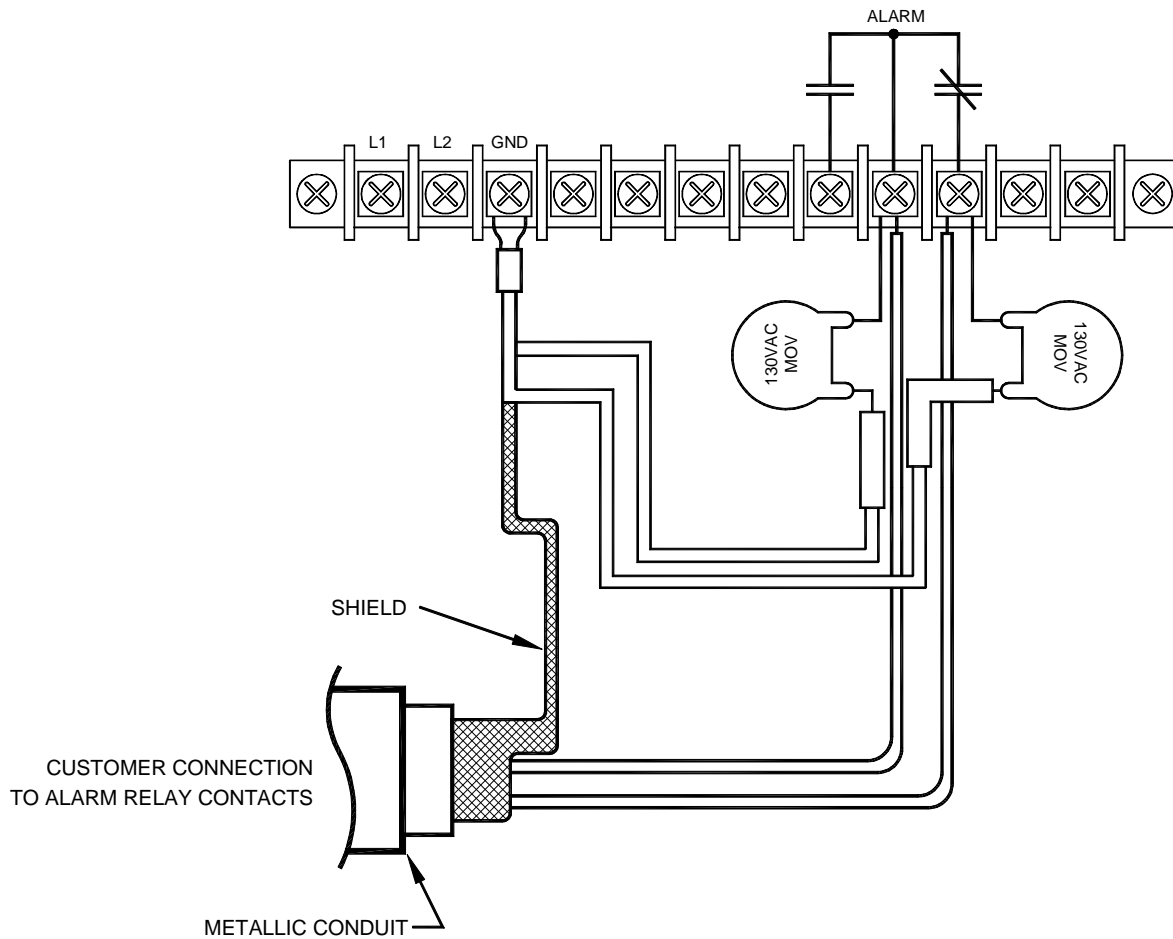


Note: System Wiring Diagram Notes are provided after Figure 2-7. MKR 370 connection instructions are provided with the marker kit.

Figure 2-7 – FTC 2201 Typical A1 (4 Conductor) Installation Wiring

System Wiring Diagram Notes

1. Mount the FTC 2201 enclosure vertically.
2. AC input power conductor size depends on the service voltage, the distance from the source and the number of lighting fixtures served. Assume 7.8 VA for the FH 370r AC and 25.6 VA for the FH 370r IR AC beacon. Assume 5 VA for each MKR 370 AC and 8.5 VA for each MKR 370 AC IR. Total power required is the sum of all lights plus 4.5 VA additional for the FTC 2201 Controller. Also see Note 4.
3. The AC Line Voltage is connected to terminal strip TB1 (L1, L2 & GND).
4. The total line drop, including the input service wiring and branch lines to the L-864 beacon and L-810 marker lights, must not exceed 3% of the rated voltage.
5. The FTC 2201 controller PCB must be grounded to the site grounding system. Equipment ground must be included to light fixtures if an approved conduit system is not used, or local code requires.
6. Dry contact alarm output contact rating 5 ampere, 250V AC. Contacts shown in normal operating state with no alarms or errors.
7. User's alarm circuit not shown.
8. Mount the photocell at the top end of a vertical length of conduit. Face it toward the polar sky (north). Photocell cable should be two conductors 16 AWG (minimum).
9. Vertical wires, if installed in conduit, must be supported per NEC guidelines and local electrical codes.
10. The following method is recommended for securing flashhead cables to a skeletal structure:
 - A. Wrap 2 full turns of two inch Scotchrap #50 tape, or equivalent alternate, around the cables and tower members at regular intervals along one of the tower legs.
 - B. Wrap 3 full turns of one inch Scotchrap filament #890 tape, or equivalent alternate, over the Scotchrap #50 tape.
 - C. Wrap 4 full turns of two inch Scotchrap #50 tape, or equivalent alternate, over the filament #890 tape. The last two turns should be applied with no tension.
 - D. Steps A thru C should be performed directly above and below tower leg flanges at intervals of not more than five feet. Do not pull cable tight against flanges or other hard surface. Allow 1" clearance.
11. Cables and conduit are not included as part of the installation kit, but are required for the installation shown and can be purchased with the lighting equipment.
12. **Install one or more lightning rods near the uppermost lighting fixture (L-810 or L-864).** The copper lightning rod(s) should extend a minimum of 36" above the height of the flashhead and a minimum of 18" horizontally away from the flashhead.
13. Refer to Flash Technology supplied marker kit instructions for proper J-box mounting, MKR 370 wiring and installation standards.
14. The FH 370r must be grounded to tower steel using 8 AWG wire minimum.



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 EQUIPMENT 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 2-8 – FTC 2201 Recommended Alarm Wiring

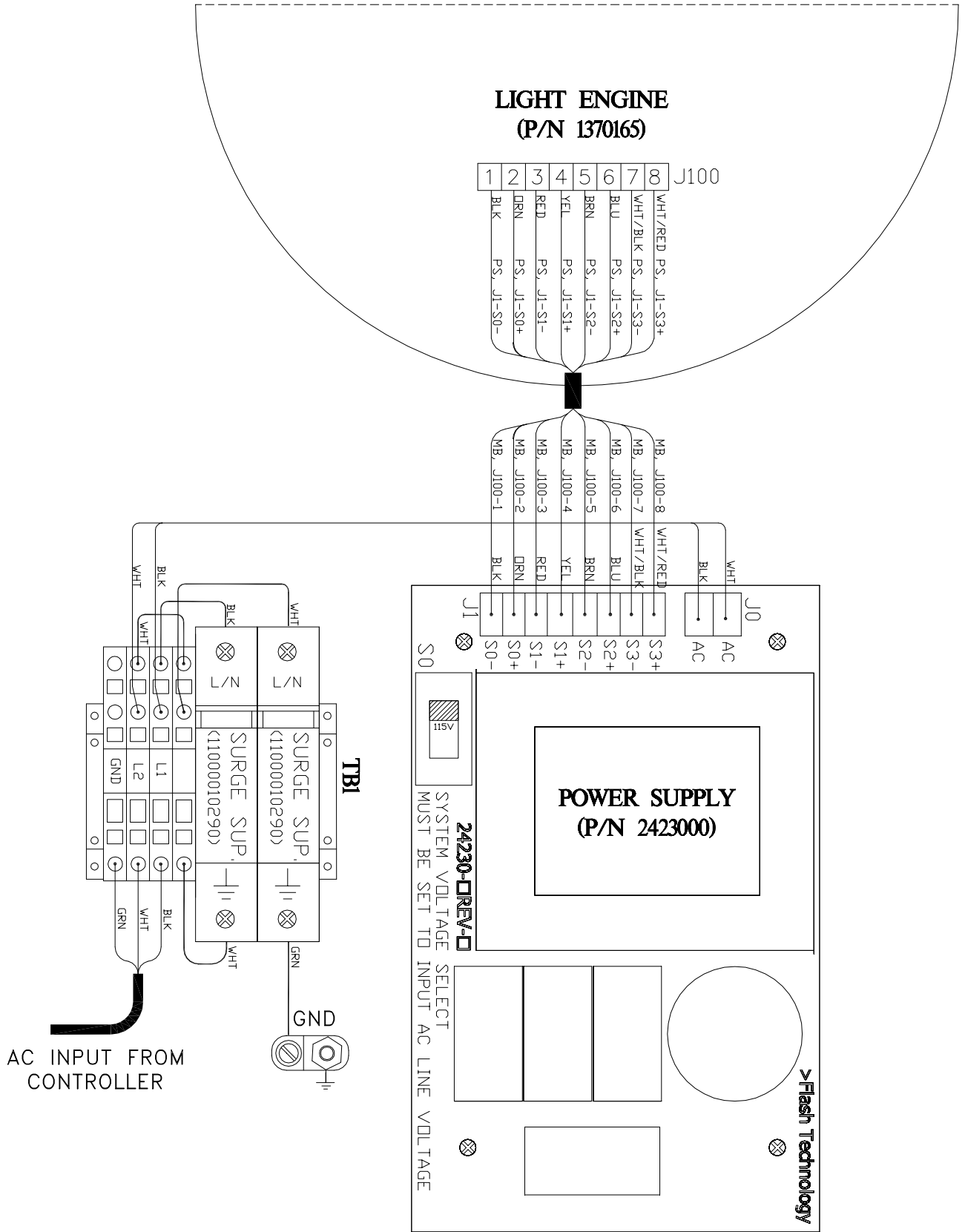


Figure 2-9 – FH 370r AC Internal Wiring

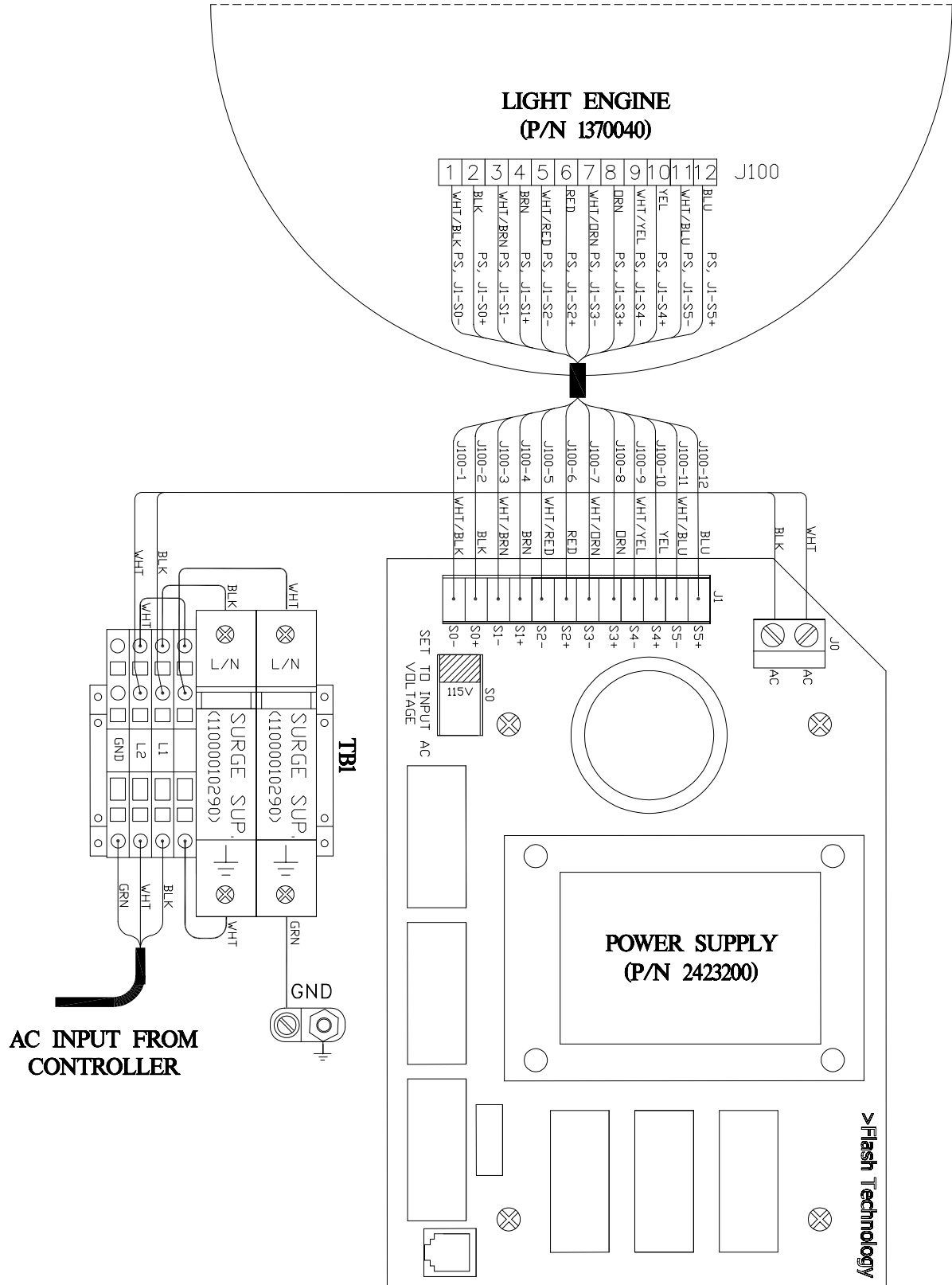


Figure 2-10 – FH 370r IR AC Internal Wiring

Section 3 – Maintenance and Troubleshooting

Safety

WARNING

STOP: Before proceeding, read the Personnel Hazard Warning on Page iii.

Work safely, as follows:

1. Remove rings and watches before opening the equipment.
2. Shut off power to 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.

Maintenance

The circuit boards should be kept free of accumulated dust. Brush and VACuum as necessary.

Important! Do not use compressed air to clean this 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 for corrosion or arcing. Clean or replace any component that shows evidence of damage.
4. Check all electrical connections for tightness and verify the absence of corrosion or electrical arcing.

5. Clean the outside surface of the lens with liquid detergent and water. Wipe it gently with a soft cloth.

Storage

Equipment should be stored indoors when not in use. Circuit boards, when not installed in the equipment, should be kept in antistatic bags or containers.

RFI Problems

The presence of radio frequency interference (RFI) can burn-out components, cause a light to flash intermittently, at the wrong rate, or intensity. RFI can enter the light by any wire to or from the unit. The circuits are designed to reject or bypass RFI, but Flash Technology 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. To minimize interference, ensure proper installation in accordance with AC 70-7460, Appendix 1, Figure 2.

Troubleshooting

FTC 2201

The most effective troubleshooting procedure begins with observing the behavior of the system. This often leads directly to a faulty component or other abnormal condition.

Table 3-1 provides a list of symptoms that may be observed if the system is operating incorrectly. The column following each symptom provides the possible causes in order of probability.

Note: Always make resistance measurements with the primary power turned off. However, you must make voltage measurements with 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.

Failing to Switch State

Switch the DAY/AUTO/NIGHT switch on PCB1 through all modes and verify that the lights follow the mode indicated by the switch position. The lights should be off in DAY mode, on in NIGHT mode, and in AUTO, respond according to the prevailing lighting conditions as determined by the photocell.

Failure to follow mode as directed by the switch may indicate failure of PCB1. Follow the steps to test the photocell if the unit is responding correctly to the switch.

Note: Some lights may be difficult to see in bright daylight.

Steady / Flashing Outputs

Check the output voltage to the tower lights connected at TB1. “Steady” light connections should have a steady voltage. “Flashing” connections should show a voltage pulse rate of 20 flashes per minute.

PCB1 operates a relay that transfers power to the beacon. If PCB1 control is absent, the beacon defaults to always on. Also, the side markers (if installed) turn on.

LED Status Indicators

Table 1-1 lists the function of each LED status indicator.

Photocell

Use the following procedure to test the operation of the photocell:

1. During daylight, completely block light from entering the photocell. At night, shine a light on the photocell. If

the system does not transition from the current mode after a few minutes, begin the following troubleshooting steps.

2. First, disconnect the photocell from the controller. The system should go to night operation after approximately one minute.
3. If the system does not transition to night mode with the photocell disconnected, confirm 3.3 VDC is present on the photocell connections (TB1 terminals 11 & 12).
4. If 3.3 VDC is not present, replace PCB1.
5. If the controller changes modes correctly with the photocell removed, inspect the photocell wiring or replace the photocell. Reconnect all wires once repair or replacement is completed and test for proper operation.

Error Condition

The SAT ERROR LED (I7) will be lit when the signal from fewer than three satellites is being received. The controller is not synchronized while this error condition exists.

The Satellite Error LED may remain lit for approximately 20 minutes after power up as the unit acquires satellites. If it remains lit for more than 20 minutes, it is probable that the antenna needs to be repositioned to improve reception. The ideal position is to allow the antenna to view a full hemisphere of sky without any barriers blocking reception. GPS information travels by “line of sight” and cannot penetrate through most barriers such as buildings, towers, and trees.

Table 3-1 – Major Troubleshooting Symptoms

Symptom	Possible Cause in Likely Order of Frequency
All lights fail	- Main power failure - External circuit breaker - PCB1 failure
Single light fails	- Check wiring for short or open in that line - LED fixture failure
Erratic operation	- Loose connections - PCB1
Alarm	- Normal if a light or tier is out
False alarm	- Check for correct alarm connections: normally open (NO) contacts close on alarm, normally closed (NC) contacts open on alarm - SW2 on PCB1 is set incorrectly. - PCB1
AUTO switch position fails to switch system from day to night or night to day	- Photocell - PCB1

Component Removal and Replacement

Note the wiring connections and wire colors when you remove wires from their connections. These must be replaced exactly as they were.

Important! For all service that requires removal or replacement, turn off or disconnect the power.

FTC 2201

PCB1 (29002XX)

Remove

1. Disconnect cable connectors and wires. A Phillips screwdriver is needed to loosen the screws that hold the wires.
2. Loosen the four screws located near the corners of PCB1.
3. Unplug the GPS antenna (if equipped).
4. Lift the board out of the enclosure.

Replace

Reverse the removal procedure.

FH 370r AC / FH 370r IR AC

Light Engine

FH 370r AC (1370165)

FH 370r IR AC (1370040)

Remove: The Light Engine is designed to be replaced as a single assembly. Unfasten the latches on the front of the beacon's base. Lift the light engine assembly to expose the wiring harness. Disconnect the light engine from the power supply by removing the connector at J1. Disconnect the ground wire that is attached to the light engine. Lower the light engine to the closed position. Pull on the ring attached to the hinge pin and remove the hinge pin. Lift the light engine assembly to remove it from the base.

Replace: Reinstall in reverse order.

Power Supply

FH 370r AC (2423000)

FH 370r IR AC (2423200)

Remove: Unfasten the two latches on the front of the beacon's base. Lift the light engine assembly to expose the power supply. Remove the connectors at J0 and J1. Remove the four screws that attach the power supply to the base.

Replace: Set the voltage selector switch to match the AC supply voltage. Reinstall in reverse order.

Surge Suppressor Assembly

Remove: Unfasten the two latches on the front of the beacon's base. Lift the light engine assembly to expose the surge suppressors. Disconnect the wires at the L/N and the Ground positions. Insert a flat blade screwdriver into the slot below the Ground position and push the handle toward the terminal block to release the surge suppressor assembly. To replace

only the surge suppressor, pull up on the surge suppressor module to remove it from the holder.

Replace: Position the L/N end of the surge suppressor over the DIN rail first. Insert a flat blade screwdriver into the slot below the Ground position and push the handle toward the terminal block. Push down on the surge suppressor assembly and remove the screwdriver. Verify that the surge suppressor is firmly attached to the DIN rail. Reconnect the wires to the surge suppressor. Lower the light engine assembly to the closed position and secure both latches on the base assembly. Apply power to the beacon and verify that it operates correctly. If not, recheck all connections.

MKR 370 (L-810 Marker)

The MKR 370 does not contain any user serviceable parts.

Section 4 – Major Replaceable 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
 332 Nichol Mill Lane
 Franklin, TN 37067

Ordering Parts

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

FTC 2201 Controller Parts

Table 4-1 lists the major replaceable parts for the Controller. Refer to Figure 1-1 and 1-2 for component locations.

FH 370r AC LED Beacon Parts

Figure 4-1 shows the component locations and Table 4-2 lists the major replaceable parts for the FH 370r AC LED Beacon. Figure 4-2 shows the component locations and Table 4-3 lists the major replaceable parts for the FH 370r IR AC LED Beacon.

Photocell

The part number for the single assembly PEC 510 Photocell is PN #1855001.

MKR 370 (L-810 Marker)

MKR 370 AC and MKR 370 AC IR do not contain any user serviceable components.

Table 4-1 – FTC 2201 Major Replaceable Parts

Item	Description	Part Number
F1 (120V)	Fuse, 8A ¹	4901931
F1/F2 (230/240V)	Fuse, 5A ¹	4900345
PCB1	Controller Board (standard) ²	29029XX
PCB1	Controller Board (GPS) ²	29002XX
RCVR	GPS Receiver Board	6903298
ANT	GPS Antenna with Cable	6903299
ANT	Antenna Kit GPS 75FT Extension ³	11000004213
PEC 510	Photocell	1855001
--	Kit, Antenna Mounting Bracket ³	1905355

1. Recommended as a spare part.
2. Varies by configuration ordered.
3. Optional Item

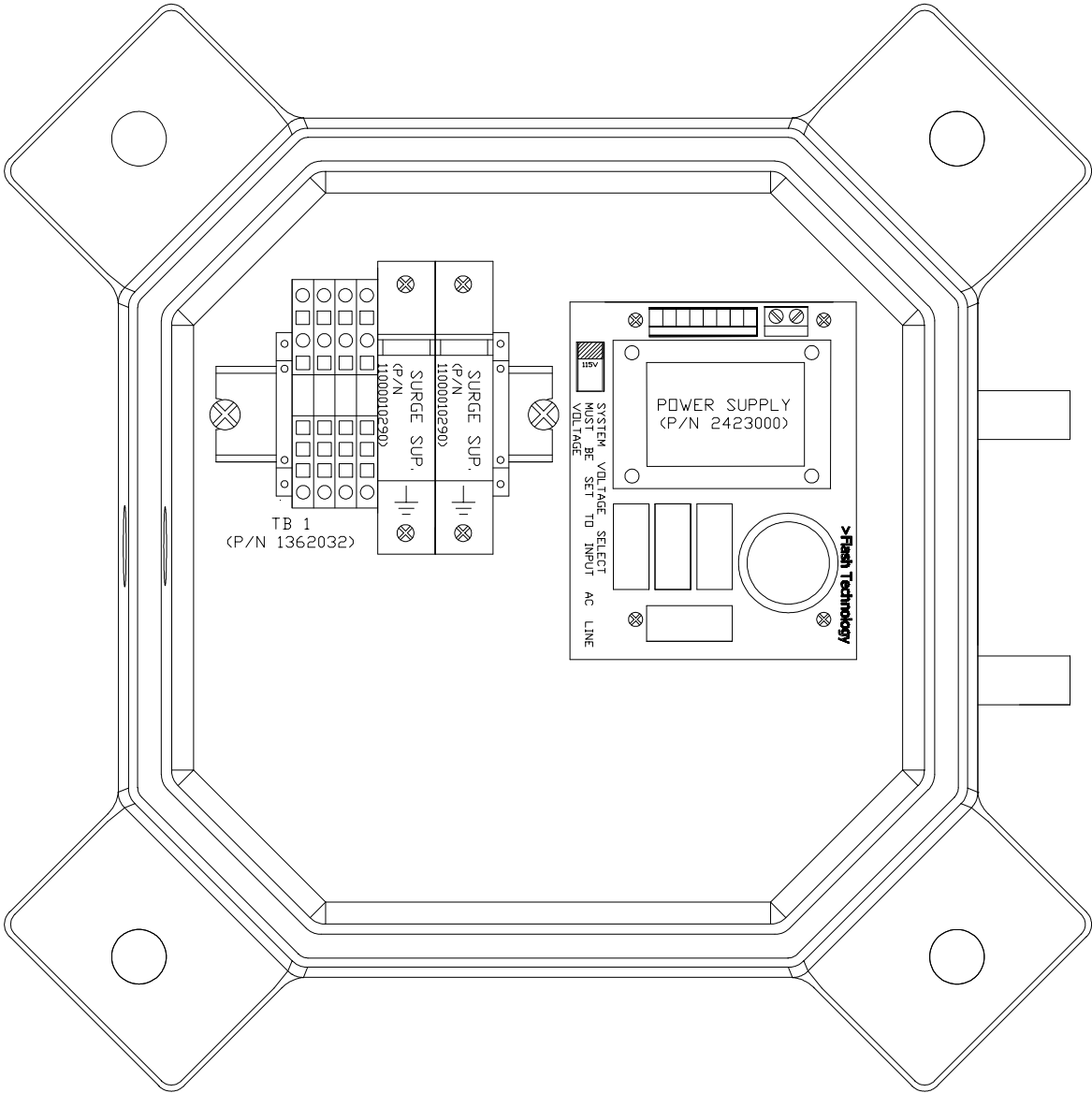


Figure 4-1 – FH 370r AC Component Locations

Table 4-2 – FH 370r AC Replaceable Parts

Description	Part Number
POWER SUPPLY FH 370r AC	2423000
SURGE SUPPRESSOR 220V 40kVA	11000010290
TERMINAL BLOCK ASSEMBLY	1362032
HINGE PIN AND LANYARD ASSEMBLY	1005303
FH 370r AC LIGHT ENGINE REPLACEMENT	1370165

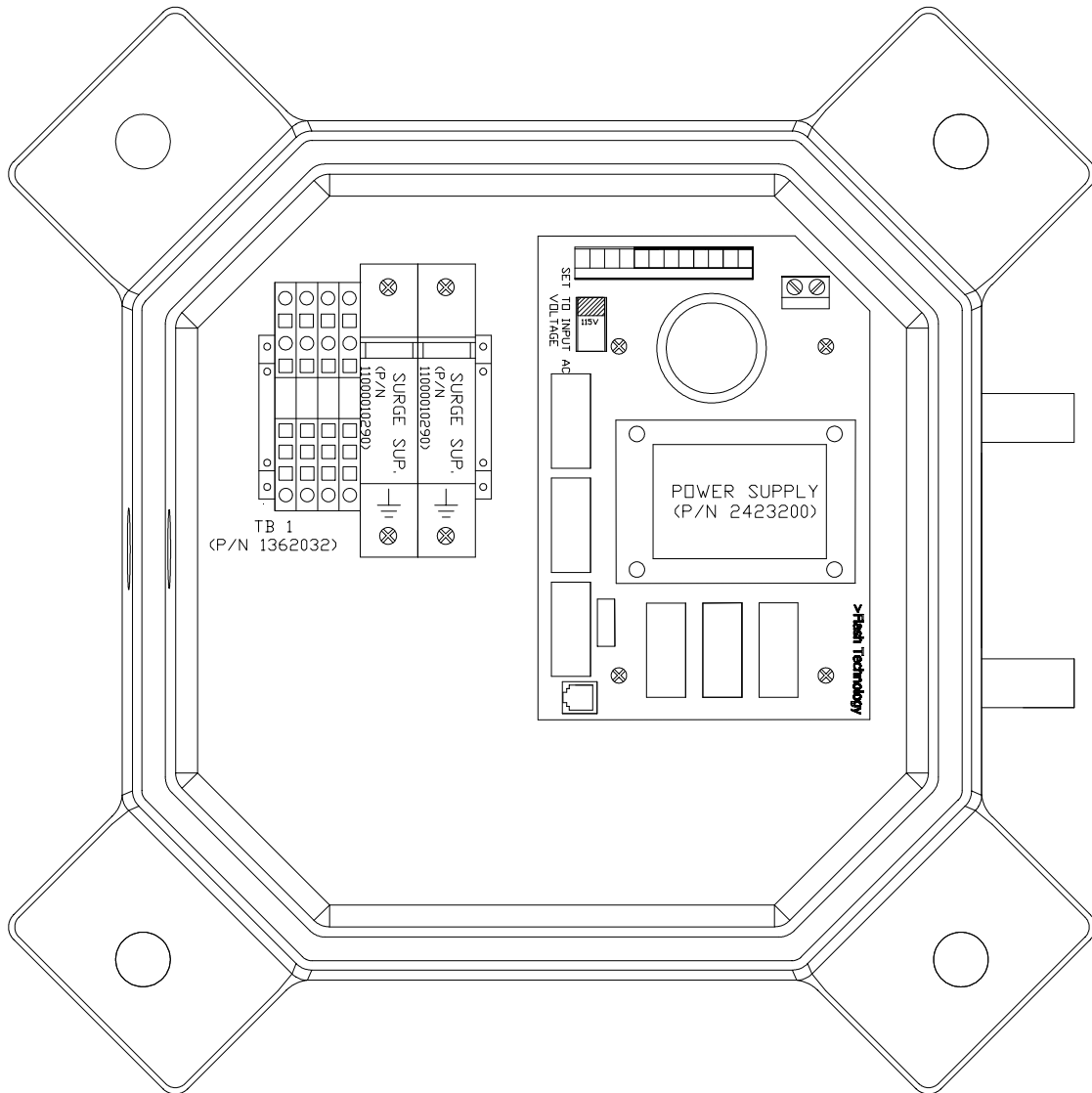


Figure 4-2 – FH 370r IR AC Component Locations

Table 4-3 – FH 370r IR AC Replaceable Parts

Description	Part Number
POWER SUPPLY FH 370r IR AC	2423200
SURGE SUPPRESSOR 220V 40kVA	11000010290
TERMINAL BLOCK ASSEMBLY	1362032
HINGE PIN AND LANYARD ASSEMBLY	1005303
FH 370r IR AC LIGHT ENGINE REPLACEMENT	1370040

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.

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.