

➤ Flash Technology



FTS 2301-2 DC RED LIGHT SYSTEM

**Reference Manual
Part Number F7912302**

SERIAL NUMBER

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Front Matter

Abstract

This manual contains information and instructions for installing, operating and maintaining the FTS 2301-2 System Components.

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Trademark Acknowledgements

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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 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. Under no circumstances remove or alter any safety interlock switch.

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Section 1 – Introduction

FTS 2301-2 System

The FTS 2301-2 system is comprised of an FTC 2301-2 Controller and one or more MKR 370 DC (L-810) and/or FH 370r DC (L-864) lighting fixtures.

FTC 2301

The FTC 2301-2 Controller is a 24V DC powered unit with two control channels labeled “Channel A” & “Channel B”. Channel A can control up to eight MKR 370 LED markers. Channel “B” can control one FH 370r LED Beacon.

Important! Channel A is designated for MKR 370 only. Channel B is designated for FH 370r DC only.

The FTC 2301-2 Controller directs beacon flashing and reports light operating status. It allows photodiode or manual override mode control. The auxiliary synchronization input allows for synchronization of FTC 2301-2 Controllers with no separation limit between units.

Note: An FTW 170-2 is required for synchronization.

A mounting diagram for the FTC 2301-2 is provided in Figure 2-1. Typical installation diagrams are provided in Figures 2-5 – 2-10.

FH 370r

The FH 370r DC is divided into two sections: base assembly and light engine. TB1, located in the base assembly, provides connection for input power from the FTC 2301. The LED Driver PCB, which supplies the appropriate output voltage to the LEDs, is also located in the base assembly.

The light engine is comprised of 36 highly efficient red LEDs which are focused by

Fresnel optics to produce the required 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 IR DC (Infrared) incorporates all features of the FH 370r DC 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.

A mounting diagram for the FH 370r is provided in Figure 2-3. An internal wiring diagram for the FH 370r DC is shown in Figure 2-11 and one for the FH 370r IR DC is shown in Figure 2-12.

MKR 370 DC

The MKR 370 DC is a 24V DC LED L-810 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 DC IR, which is visually identical to the MKR 370, 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 DC is provided in Figure 2-8. Complete installation diagrams and instructions are provided with the marker kit.

Specifications

Parameter	Specification
FTC 2301-2 Controller Physical Dimensions (H x W x Depth, Wt) (See Figure 2-2 for mounting dimensions) Operating Temperature Range DC Input Voltage Power Consumption Flash Rate Alarm Relay Contact Rating	9.51 x 7.32 x 4.92 in., 4 lbs. 241.5 x 185.9 x 125 mm., 1.81 kg -40 to +55 degrees Centigrade 24V DC 4 Watts Steady / 20 / 30 fpm 10 Amp @ 250V AC / 8 Amp @ 24V DC, Isolated contacts
L-864 FH 370r DC LED Beacon Physical Dimensions (H x Diameter, Wt) Flash Intensity (nominal) Beam Spread DC Input Voltage Power Requirement: FH 370r DC FH 370r IR DC	7.5 x 15.75 in, 26.3 lbs / 190.5 x 400, 11.9 kg. Night (Red) 2,000 \pm 25% ECD Horizontal: 360° / Vertical: 3° 24-48V DC 30 Watts (steady) 39 Watts (steady)
L-810 MKR 370 Physical Dimensions (H x Diameter, Wt): Intensity (nominal): Beam Spread: DC Input Voltage Power Requirement: MKR 370 DC MKR 370 DC IR	8 x 2 in, 1.0 lbs / 203.2 x 50.8 mm, 0.45 kg Night (Red) 32.5 \pm 25% ECD Horizontal: 360° / Vertical: 10° 24V DC 2.0 Watts (per fixture) 3.6 Watts (per fixture)

Operation

Controller

The controller begins programmed operation as soon as power is applied. The controller is shipped preconfigured for your application. It is also field customizable.

Beacon/Marker Connection

The FTC 2301-2 controller has two connections labeled Channel A (MKR 370 only) and Channel B (FH 370r DC only).

Either channel can be configured as steady or flashing. Channel A connections are at J1 terminals 4, 5 and 6. Connect the positive lead to J1 terminal 4 and the negative lead at J1 terminal 5. The ground connection is at terminal 6. Channel B connections are at J1 terminals 7, 8 and 9. Connect the positive lead at J1 terminal 7, and the negative lead at J1 terminal 8. The ground connection is at terminal 9.

Manual Override Operation

The unit's operation can be controlled manually by pressing the Manual Mode button. Press the button once for night mode and twice for day mode. The unit will stay in the selected mode for 30 minutes. The Manual Mode LED will be lit and the corresponding mode LED (Day or Night) will blink.

Controller Board

PCB1 has switches, connectors, and LEDs whose functions are described in the following headings. Figure 1-1 provides a pictorial of the PCB1 Controller Board.

Note: The system type (standard or Infrared) must be specified when ordering a replacement PCB1.

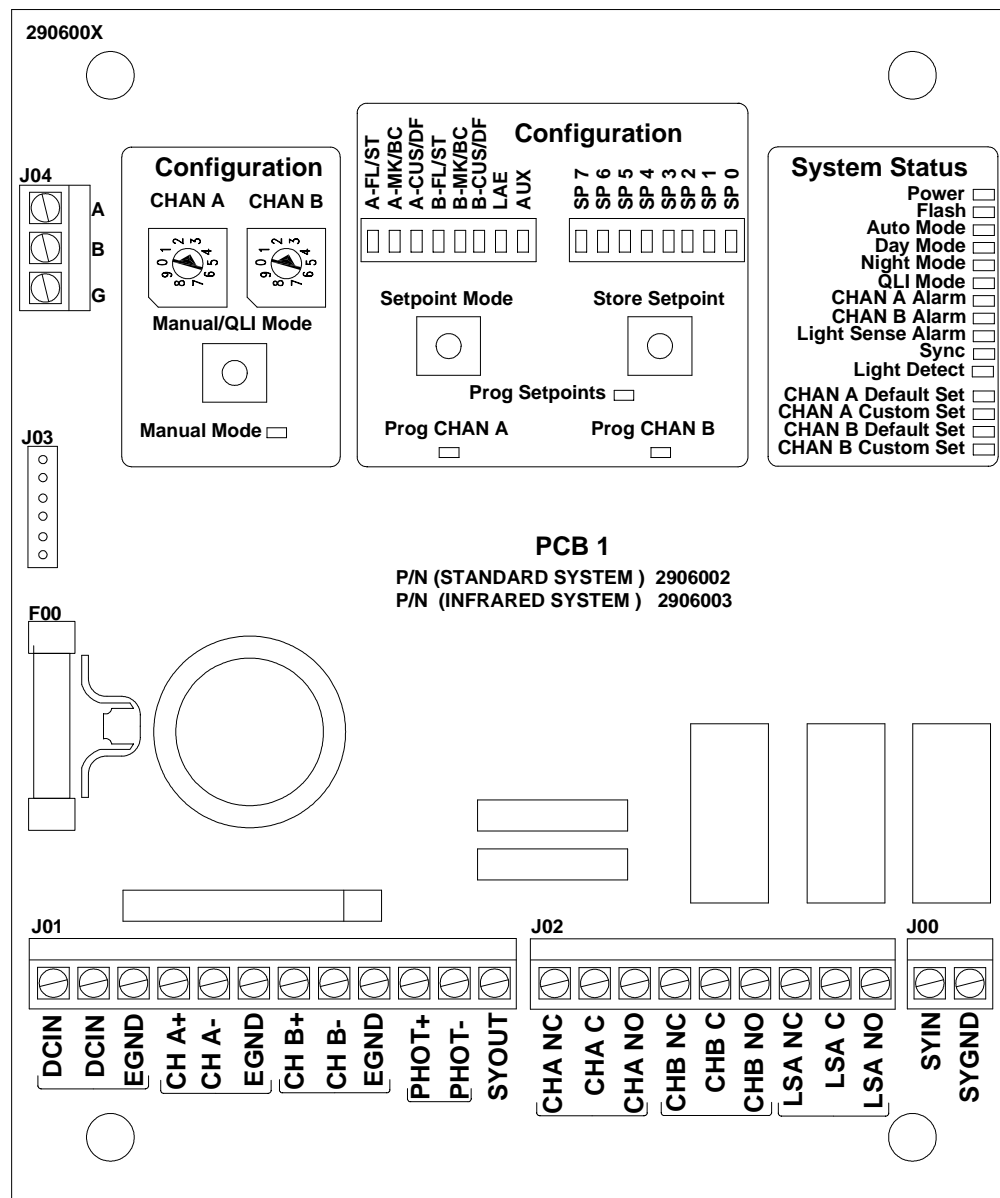


Figure 1-1 - PCB1 Controller Board

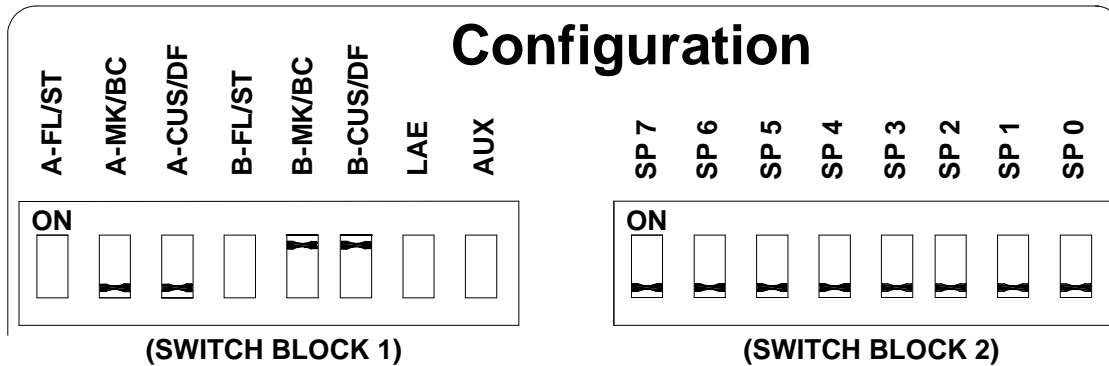


Figure 1-2 - Custom Configuration Switch Blocks

Table 1-1 - Custom Configuration Switch Block 1

(Left block)

Switch	On (Up)	Off (Down)
A-FL/ST	Channel A Steady	Channel A Flash
A-MK/BC	Switch A-MK/BC must be set to the Off (Down) position.	Channel A is configured for LED Marker
A-CUS/DF	Switch A-CUS/DF must be set to the Off (Down) position.	Channel A is configured for custom setpoints.
B-FL/ST	Channel B Steady	Channel B Flash
B-MK/BC	Channel B is configured for LED Beacon	Switch B-MK/BC must be set to the On (Up) position.
B-CUS/DF	Channel B is configured for default programming.	Switch B-CUS/DF should be set to the On (Up) position.
LAE	Light sense alarm is enabled. System will alarm if the photodiode does not trigger a mode change for 19 hours.	Light sense alarm is disabled. Switch "LAE" should be set to the "Off" position if a photodiode is not installed.
AUX	Sets flash rate to 20 flashes per minute.	Sets flash rate to 30 flashes per minute.

Note: Switch Block 2 (Right block) is reserved for future applications. Currently, all switches should be in the "Off" (down) position.

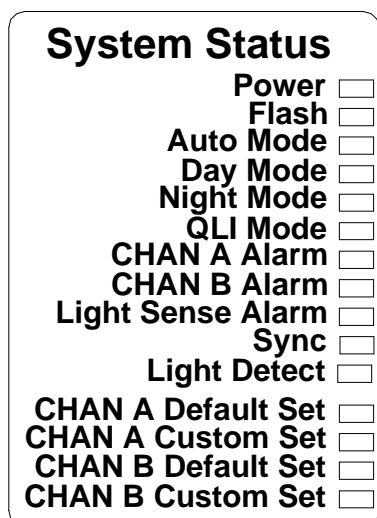


Figure 1-3 - Status LEDs

Table 1-2 - Status LEDs

LED	Function
Power	Input power is applied
Flash	Blinks in sync with the flash output to Channel A and Channel B.
Auto Mode	The unit is being controlled by the Light Sense Input.
Day Mode	The unit is operating in Day Mode. Steady for automatic operation and blinking for manual operation.
Night Mode	The unit is operating in Night Mode. Steady for automatic operation and blinking for manual operation.
QLI Mode	Indicates that a QLI is being performed.
CHAN A Alarm	An alarm is present on Channel A.
CHAN B Alarm	An alarm is present on Channel B.
Light Sense Alarm	The unit has failed to change modes for more than 19 hours via the photodiode sensor.
Sync	Blinking indicates that a Sync signal has been received from an FTW 170.
Light Detect	Indicates that a photodiode is connected to the unit.
CHAN A Default Set	Indicates that Switch "A-CUS/DF" is "Off" and Channel A is operating with factory default setpoints.
CHAN A Custom Set	Indicates that Switch "A-CUS/DF" is "On" and Channel A is operating with custom setpoints.
CHAN B Default Set	Indicates that Switch "B-CUS/DF" is "Off" and Channel B is operating with factory default setpoints.
CHAN B Custom Set	Indicates that Switch "B-CUS/DF" is "On" and Channel B is operating with custom setpoints.

Note: "CHAN A Custom Set" LED should be on indicating that the unit is programmed for custom setpoints. See Figure 1-2 and Table 1-1 for additional information.

Beacon / Marker Setpoint

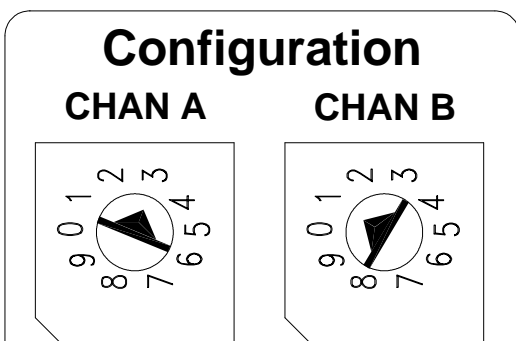


Figure 1-4 - Configuration Channels

Channel A

Set the rotary switch to match the total number of MKR 370 markers installed. The unit will alarm when the current falls below the number selected.

Important! Refer to “Custom Setpoints” to complete MKR 370 configuration.

Channel B

Set the rotary switch to 1 if a beacon is connected to Channel B. The unit will alarm when the current falls below the number selected.

Custom Setpoints

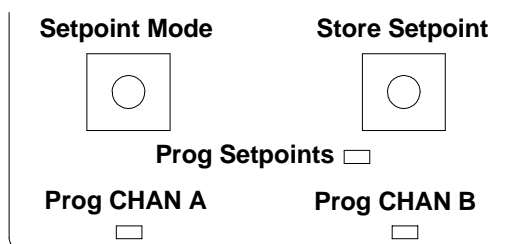
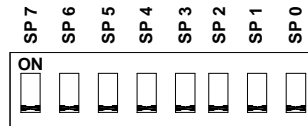


Figure 1-5 - Custom Setpoints

MKR 370 setup requires Custom Setpoint Configuration. The following steps describe how to change the setpoints for Channel A. Custom Setpoint configuration is not necessary for Channel B.

Note: All Switches on “Switch Block 2” must be in the Off (Down) position before configuring Custom Setpoints.



1. Set the rotary configuration dials to match the number of fixtures connected to each channel.
2. Press and hold the “Setpoint Mode” button for 5 seconds.
3. The “Prog Setpoints” LED will be illuminated.

- Channel A program mode is activated. The “Prog Chan A” LED will be lit.

- Manual mode “Night” is activated.

Important! Wait 60 seconds for system to stabilize before proceeding to Step 4.

4. Press and hold the “Store Setpoint” button for 5 seconds to set new Channel A parameters.
 - “Prog Setpoints” LED blinks while the button is pressed and goes solid when the new setpoint is confirmed.

Note: Custom Setpoint programming is not necessary for Channel B but is included for informational purposes.

5. Press “Setpoint Mode” button twice to end Channel A programming.

OR

Press “Setpoint Mode” button (briefly) to program Channel B. The “Prog Chan B” LED will be lit.

6. Press and hold the “Store Setpoint” button for 5 seconds to set new Channel B parameters.
 - “Prog Setpoints” LED blinks while the button is pressed and goes solid when the new setpoint is confirmed.
7. Press “Setpoint Mode” button (briefly) to return to normal operation.

Checkout Procedure

Important! MKR 370 (Chan A) requires Custom Setpoint Configuration before proceeding with Checkout Procedure. See "Custom Setpoints" (this section) for details.

Using the Photodiode

Note: Verify that Switch "LAE" on Switch Block #1 is not in the "Off" position.

1. Cover the photodiode 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 beacon or marker(s) connected to Channel A should be on and operating as programmed.
 - The beacon connected to Channel B should be on and operating as programmed.
2. Uncover the photodiode to allow light to strike it, or shine a light on it. With no alarms or errors:
 - The system is now in DAY mode.
 - The beacon(s)/marker(s) connected to both channels should turn off.

Using the Mode Override Switch

1. Press the "Manual Mode" switch.

With no alarms or errors:

- The system is now in NIGHT mode.
 - The beacon(s) and/or marker(s) should turn on and operate as programmed. See Table 1-1.
2. Press the "Manual Mode" switch again.

With no alarms or errors:

- The system is now in DAY mode.
- The beacon(s)/marker(s) should be off.

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

Quarterly Lighting Inspection

The FTC 2301-2 has a built in test procedure to aid in performing Quarterly Lighting Inspections (QLI). Manual/QLI Mode button is located in the "Configuration" box just below the "Chan A" and "Chan B" rotary switches. The procedure described below will eliminate the need to disconnect any wires from the unit to test alarm points.

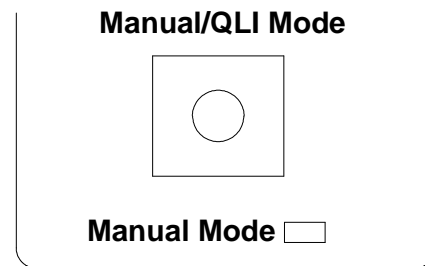


Figure 1-6 - QLI Mode

1. Press and hold the Manual/QLI button for 5 seconds to enter the QLI mode.
 - Night mode operation will be activated.
 - The "QLI Mode" System Status LED will be lit.
2. Press the Manual/QLI button to inhibit the operation of the lighting equipment connected to Channel A.
3. Press the Manual/QLI button to restore Channel A.
4. Press the Manual/QLI button to inhibit the operation of the lighting equipment connected to Channel B.
5. Press the Manual/QLI button to restore Channel B.
6. Press the Manual/QLI button to test the Light Sense Alarm (LSA).
7. Press the Manual/QLI button to restore the LSA and return to normal operation.

Note: Normal operation will resume after 15 minutes if the test procedure is not completed.

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

- 1/8" non-flared flat blade screw driver
- Digital volt-ohm meter
- Wire strippers
- Level
- Tools required to mount the controller

Controller Access

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

Mounting

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

Location

Locate the FTC 2301-2 Controller in an area with restricted access. You can place the controller any practical distance from the beacon(s) / marker(s). Do not allow the voltage drop at the fixture to exceed 3% of the supply voltage due to line loss.

Controller

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.

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

Photodiode Sensor

Use the following guidelines for installing the photodiode:

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

Installation Wiring

Typical system installation diagrams are provided in Figures 2-5 through 2-10. The system installation diagrams provided in this manual may not contain all of the required wiring information for installation at your site. Installation and wiring instructions concerning MKR 370 DC L-810 marker fixtures are supplied with the marker kit.

Wiring

Important! 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 diagrams 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 beacons and/or marker lights, 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%. Total power required is the sum of all lights plus 4 watts additional for the FTC 2301-2 Controller. Consult power requirements for each type of light in the Specifications table in Section 1.

Figure 2-6 shows the typical system wiring in an FAA type A0 installation with two markers. Figures 2-7 and 2-8 show the typical system wiring in an FAA type A1 installation with one beacon and one tier of markers.

Make electrical connections to J01 at the following terminals:

- Main power DCIN Terminals 1 & 2
- Ground at Terminal 3.
- Channel A (CHA+ & -) at Terminals 4 & 5.
- Channel A (EGND) Ground at Terminal 6.
- Channel B (CHB+ & -) at Terminals 7 & 8.
- Channel B (EGND) Ground at Terminal 9.
- Photodiode (PHOT + & -) Terminals 10 & 11.

The PHD 512 is supplied with an attached cable. Use #16 AWG stranded wire (minimum) if additional wire is needed.

Note: Ground the wire shield around the photodiode wires, if one is present, at J01 Terminal 3. Do not ground the shield to the photodiode.

Alarm monitoring connections for Channel A, Channel B and the Photodiode are provided at J02 Terminals 1 – 9. Each alarm point offers both NO and NC alarm connections.

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 (example: J02 terminals 1 & 2).

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.

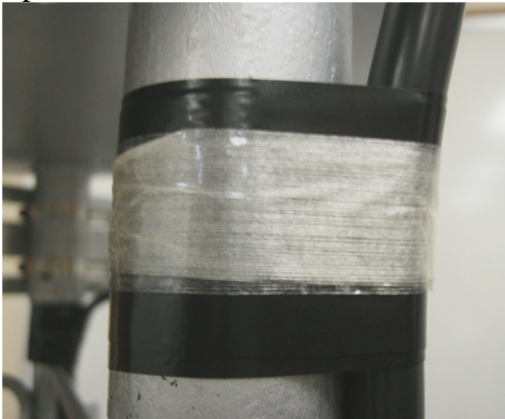
Securing the Cable

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

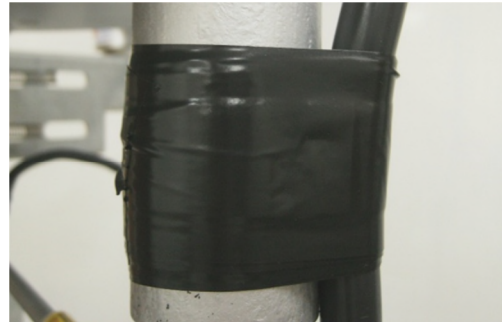
1. Run the cable along one of the tower legs and wrap two full turns of two-inch Scotchrap™ #50 tape, or the equivalent, around the cable and tower leg at regular intervals of about 5 feet (1.5 meters).



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.

Beacon Installation

Mounting

Important! 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 ½ inch galvanized or stainless steel hardware. Four mounting holes are provided on the beacon's base (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.

Leveling

1. Verify that the mounting surface is free of debris.
2. Align the four mounting holes in the base of the beacon with the holes in the tower or pedestal's mounting plate.
3. Leaving the hardware assemblies loose, secure the beacon with ½ inch stainless steel or galvanized hardware (Part # 5991740).
4. With the light engine secured by the two latches on the base, place a level on the beacon's top plate and verify that it is level in two directions.
Note: Flash Technology's "T"- Level (Optional Part # 11000013455) has two vials to simplify installation.
5. If the beacon is not level, add stainless steel shim material or washers (stainless steel or galvanized) as necessary to level the beacon.
6. Tighten the hardware once the beacon is level in both directions. Verify that the beacon is level once the hardware is fully tightened. If necessary, loosen the mounting hardware and repeat Step 5 until the beacon is level with the hardware fully tightened.

Installation Checklist

Use the following checklist when installing the system:

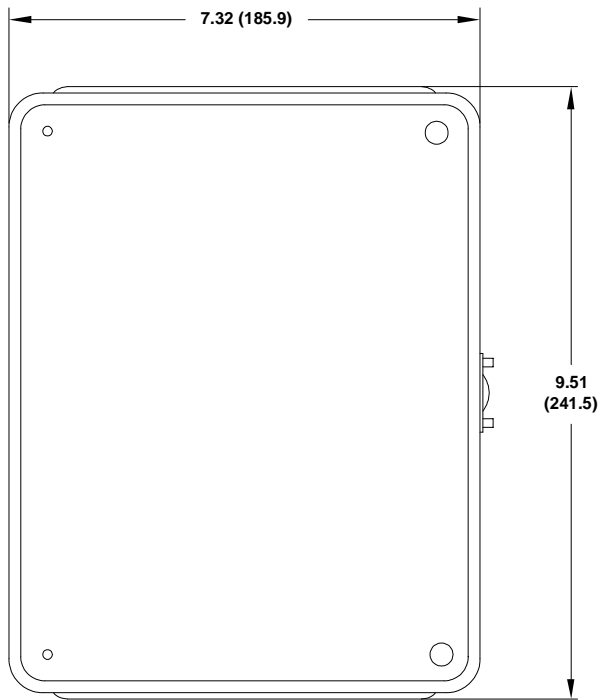
1. **Equipment Damage:**
Inspect all equipment for damage.
2. **Required Equipment:**
Verify the received equipment against the packing list to ensure completeness.
3. Consult site installation drawings for placement, mounting and wiring details.
4. Provide a power disconnect switch or a circuit breaker.
5. Check the lightning protection system.
6. Be sure that junction boxes will drain properly.
7. 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.

Complete the following steps before applying power:

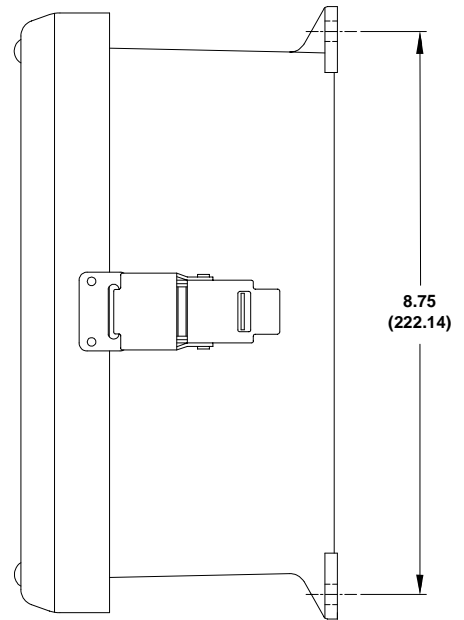
8. Examine the installation drawings:
 - Check for proper incoming service voltage. Verify that primary power voltage is the value stated on the ID plate.
 - Wire each unit according to the instructions.
 - Check all electrical connections for tightness.
 - Check all terminal strip connections for tightness.
 - If external alarm detection circuit responds to closed contacts, ensure that they are wired to the contacts that close on alarm (C & NO).
 - If external alarm detection circuit responds to open contacts, ensure that they are wired to the contacts that open on alarm (C & NC).
 - Protect alarm wiring by using shielded wires, grounding the shield, and placing wires in a conduit.
 - Connect the photodiode to the controller: the white wire to 'PHOT +' Terminal 10 and the black wire to "PHOT -" Terminal 11.

Important! MKR 370 (Chan A) requires Custom Setpoint Configuration. See Section 1 "Custom Setpoints" for details.

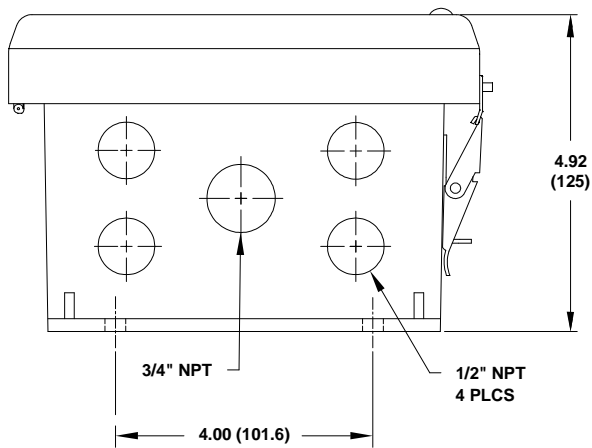
After completing all steps listed in the Installation Checklist, apply power to the system and perform an operational checkout. Refer to Section 1 "Checkout Procedure".



FRONT VIEW



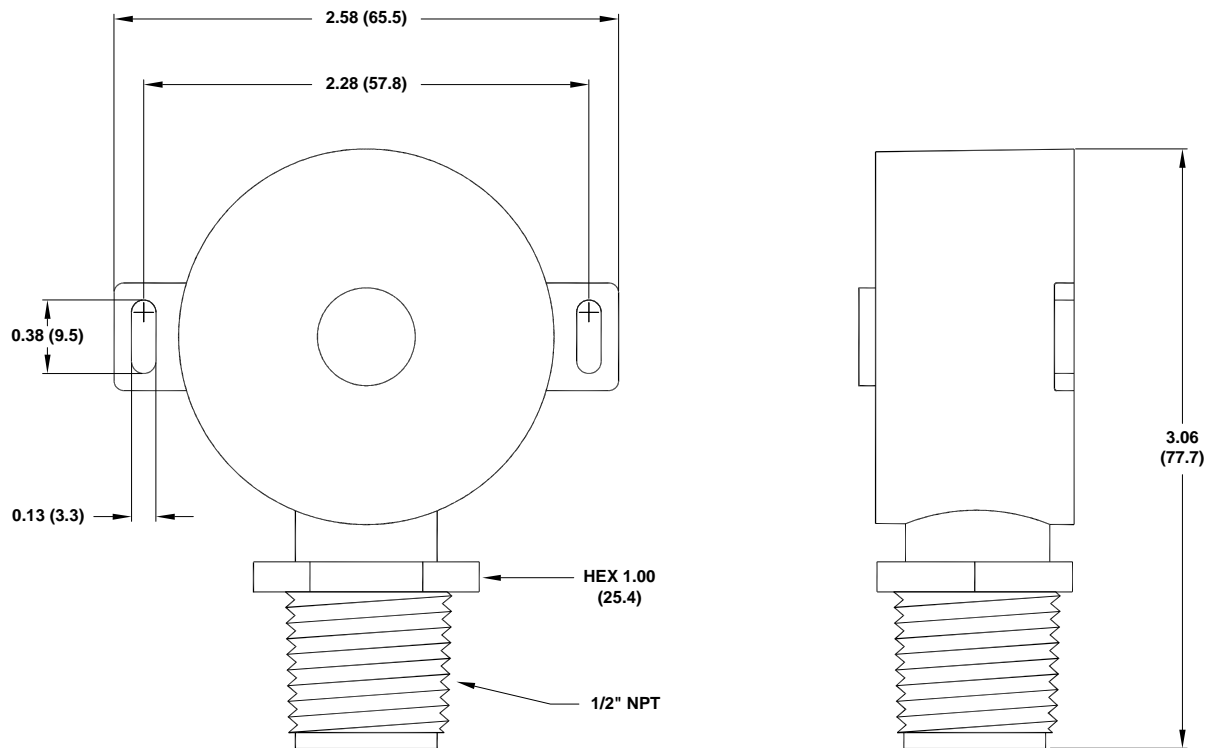
RIGHT SIDE VIEW



BOTTOM VIEW

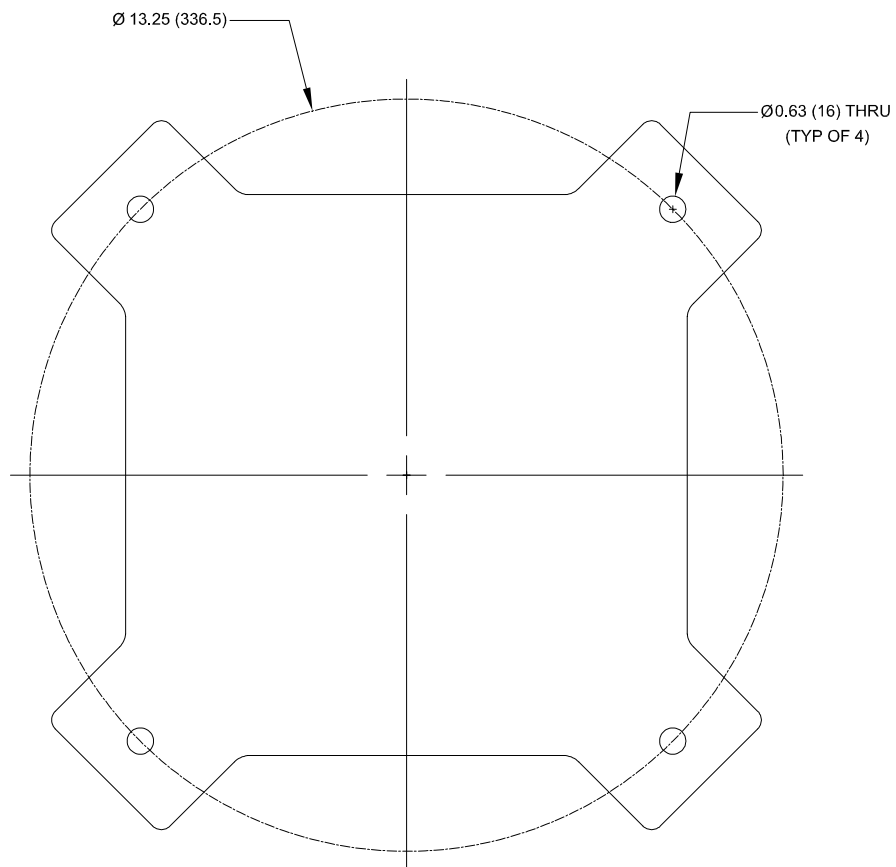
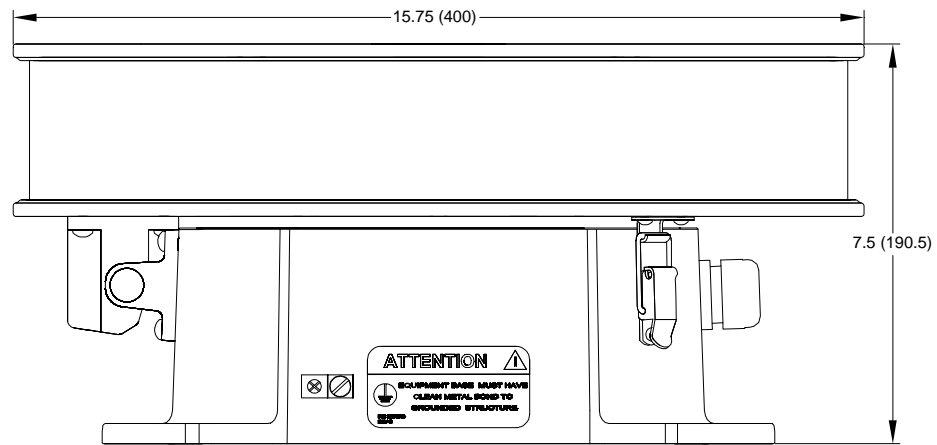
Note: All dimensions are in inches (millimeters).

Figure 2-1 - FTC 2301-2 Controller Mounting and Outline



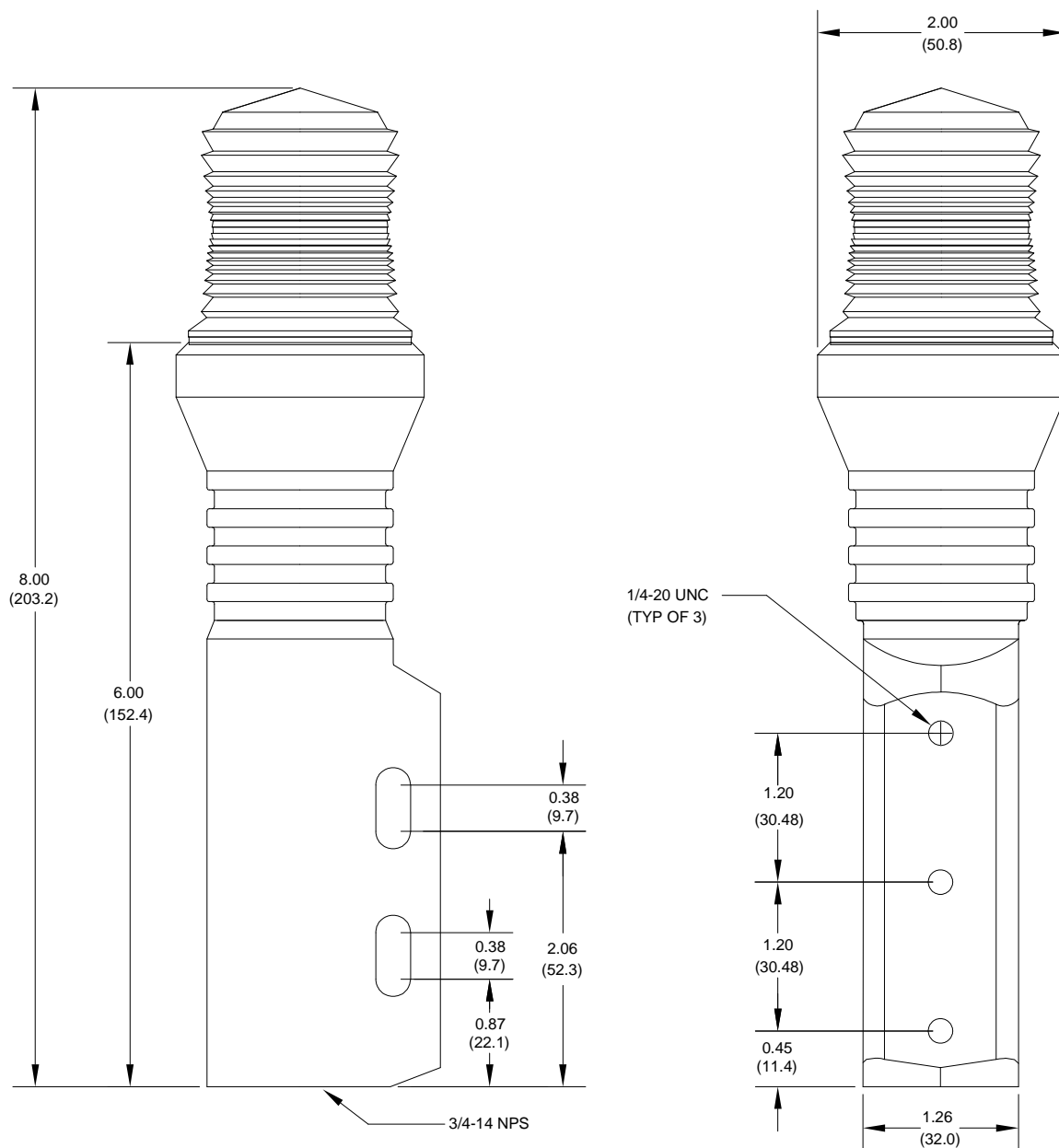
Note: All dimensions are in inches (millimeters).

Figure 2-2 - Photodiode Sensor (PHD 512) Mounting and Outline



Note: All dimensions are in inches (millimeters).

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



Note: All dimensions are in inches (millimeters).

Figure 2-4 - Marker Interface Mounting and Outline

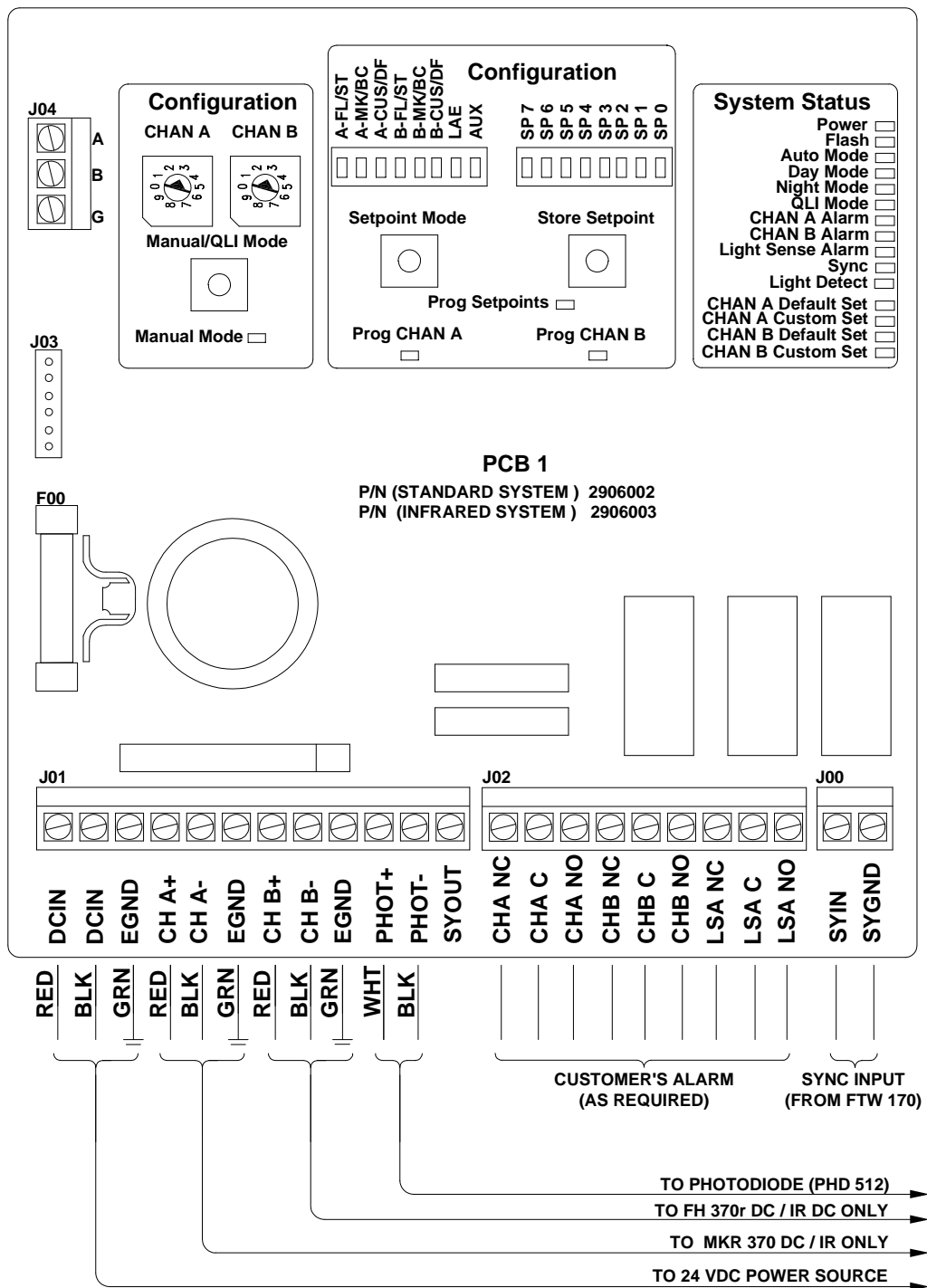
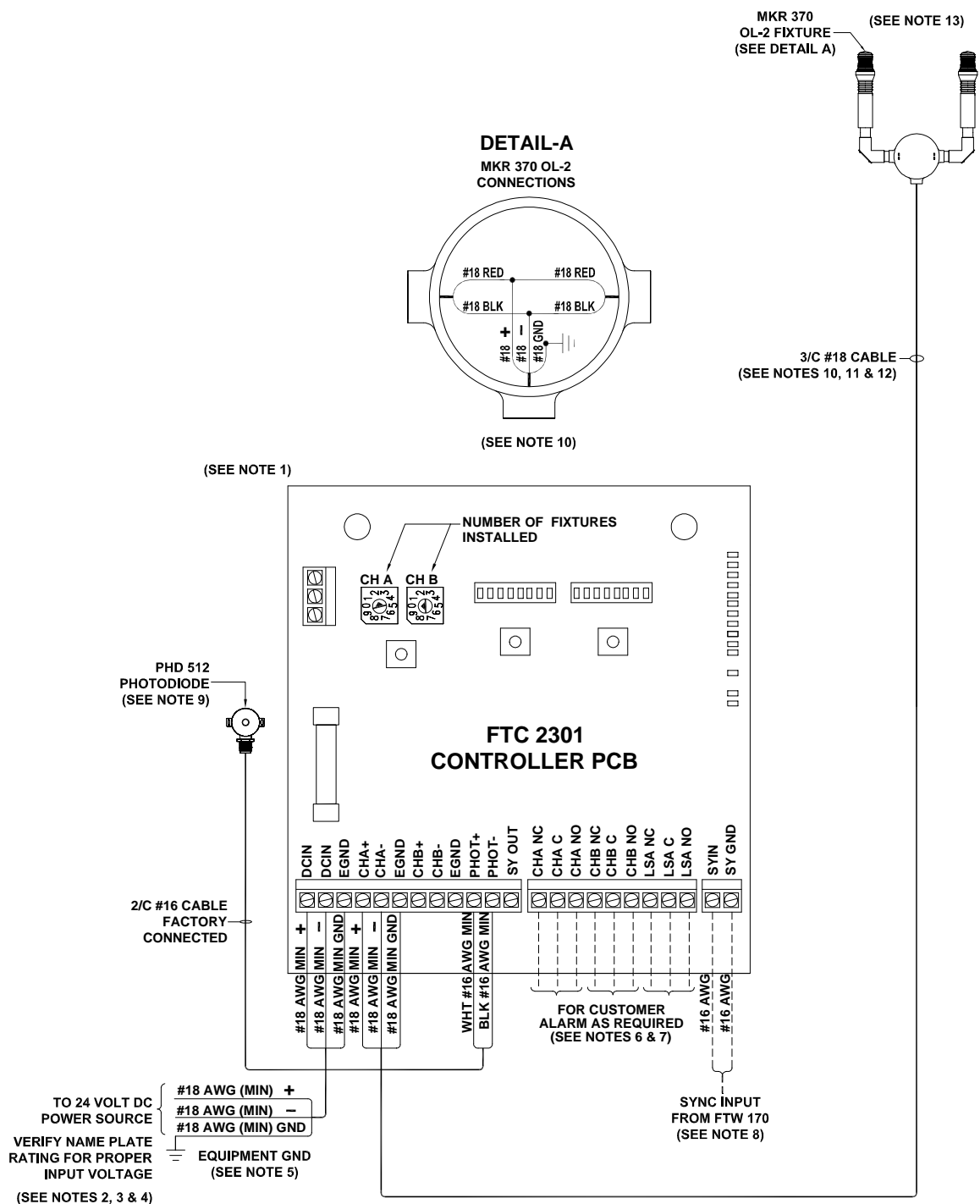
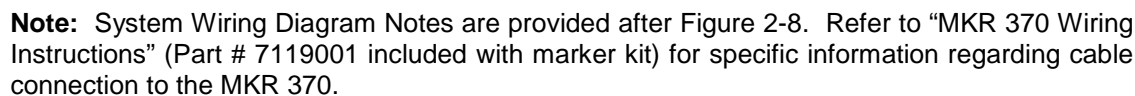


Figure 2-5 - Connection Diagram

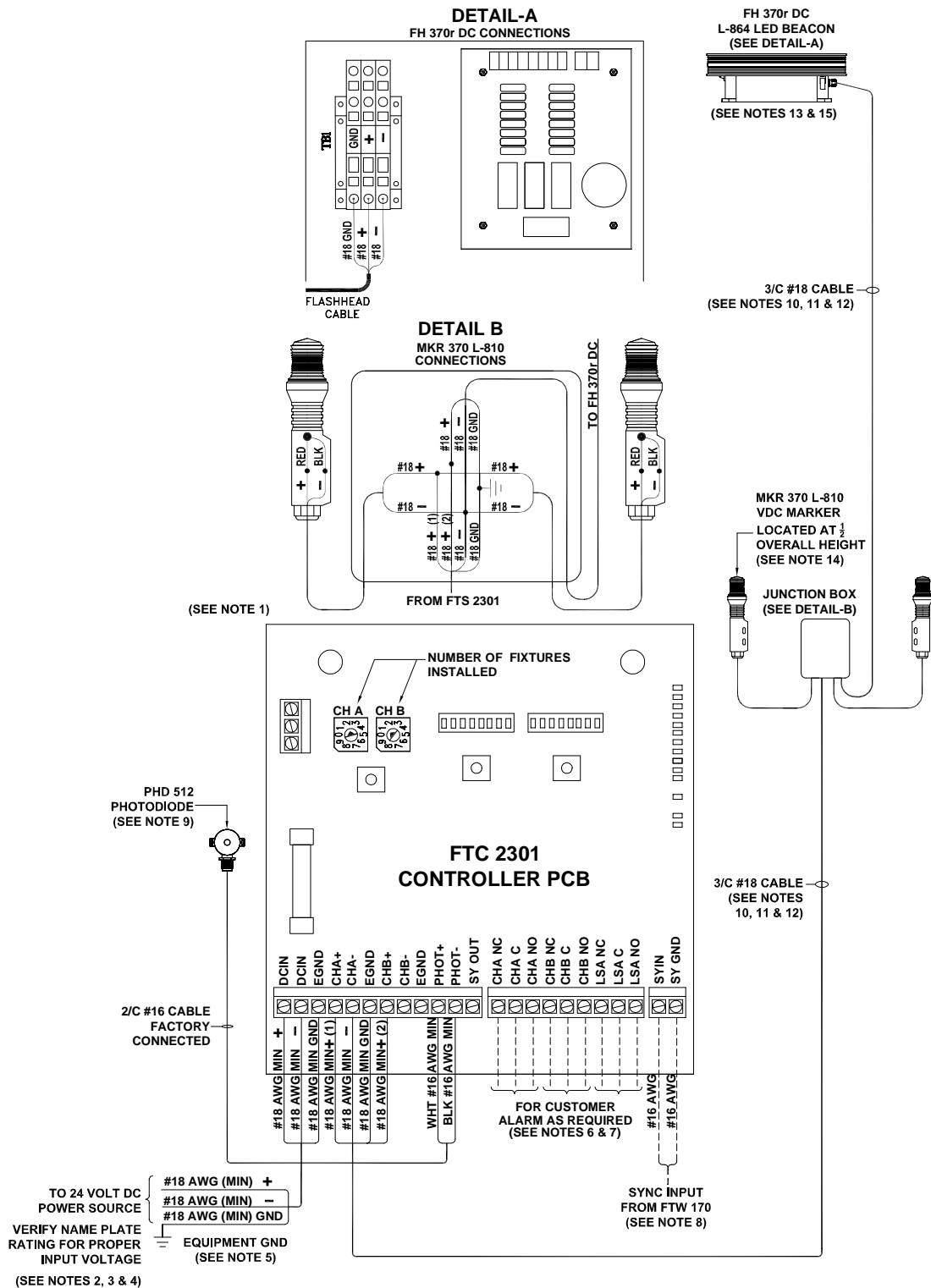


Note: System Wiring Diagram Notes are provided after Figure 2-8.

Figure 2-6 - Typical A0 Installation Wiring



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Note: System Wiring Diagram Notes are provided after Figure 2-8. Refer to “MKR 370 Wiring Instructions” (Part # 7119001 included with marker kit) for specific information regarding cable connection to the MKR 370.

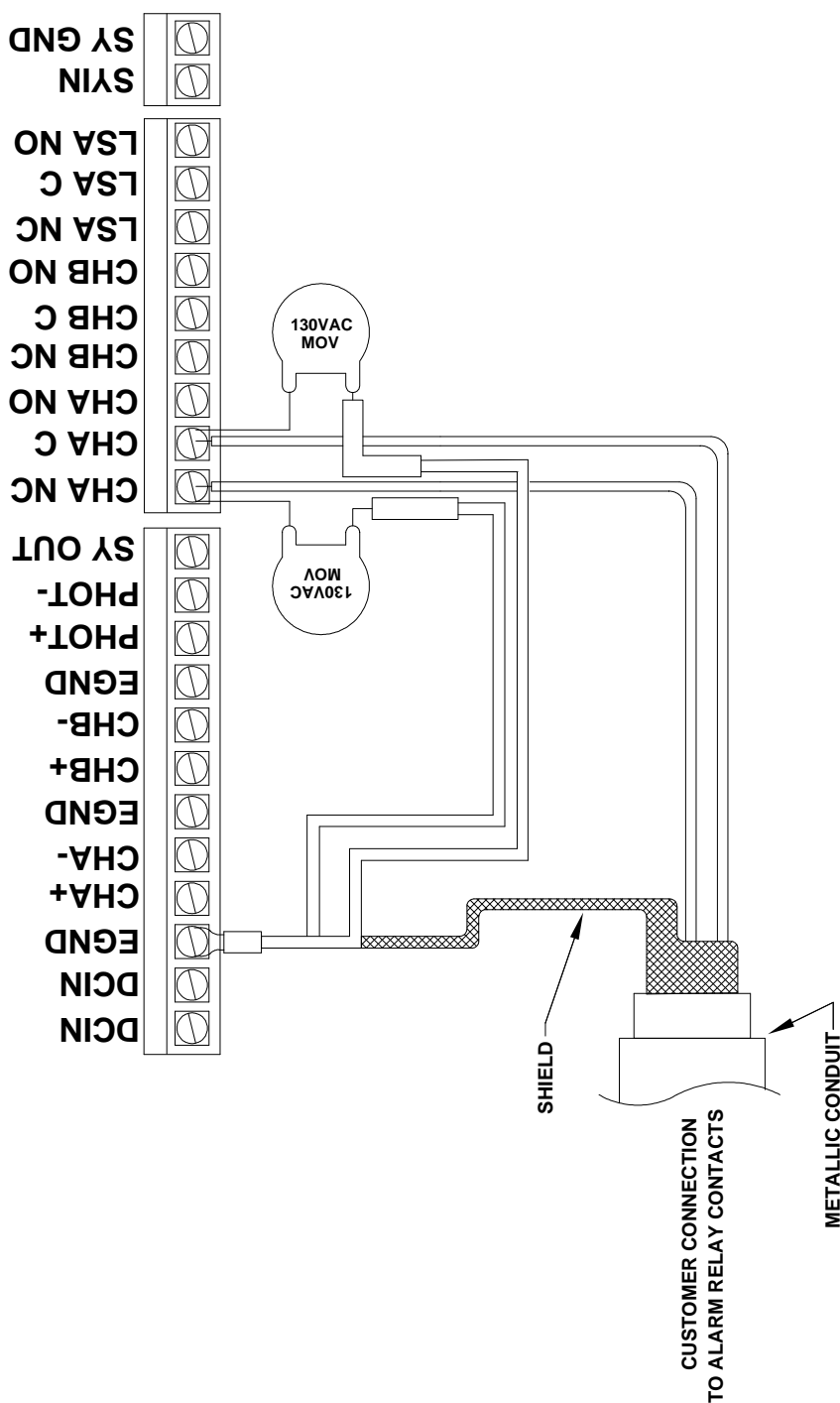
Figure 2-8 - Typical A1 Installation Wiring (4 Conductors)

System Wiring Diagram Notes

1. Mount the FTC 2301-2 enclosure vertically.
2. DC input power conductor size depends on the service voltage, the distance from the source and the number of lighting fixtures served. Assume the following:

30 VA for FH 370r DC (L-864 beacon)	39 VA for FH 370r IR DC L-864 beacon
2.0 VA for each MKR 370 DC (L-810 marker)	3.6 VA for each MKR 370 DC IR (L-810 marker).

Also see Note 4.
3. Input DC Line Voltage (24V DC) is connected to terminal strip TB1 (DCIN, DCIN & EGND).
4. 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 2301-2 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. 16 AWG minimum twisted pair cable for synchronization of units.
9. 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).
10. Vertical wires, if installed in conduit, must be supported per NEC guidelines and local electrical codes.
11. 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.
12. The 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.
13. **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.
14. Refer to Flash Technology supplied marker kit instructions for proper J-box mounting and installation standards. Refer to "MKR 370 Wiring Instructions" (Part # 7119001 included with marker kit) for specific information regarding cable connection to the MKR 370.
15. The FH 370r DC 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 LIGHTING EQUIPMENT.

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 LIGHTING EQUIPMENT.

Figure 2-10 - FTC 2301-2 Recommended Alarm Wiring

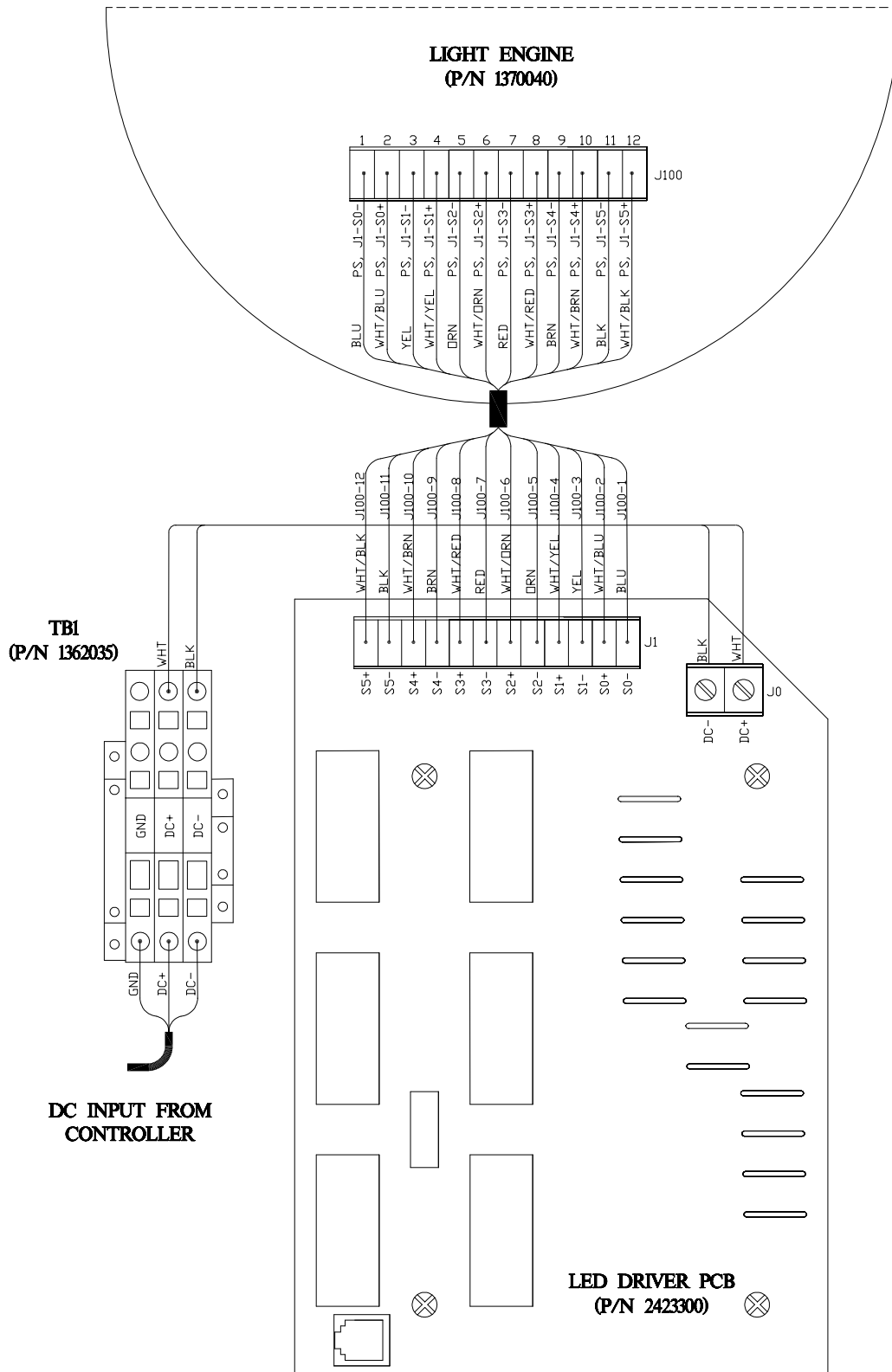


Figure 2-12 - FH 370r DC IR Internal Wiring

Section 3 – Maintenance and Troubleshooting

Safety

Warning!

Read the warning on Page iii now. Disconnect primary power before opening enclosures.

Work safely, as follows:

7. Remove rings and watches before opening the equipment.
8. Shut off the equipment and wait one minute before proceeding.
9. Remove the component or connect the test instruments.
10. Replace the component.
11. Turn on the power and test the system.
12. 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.

Note: Do not use compressed air to clean this equipment.

Troubleshooting

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 contains information to help locate the cause of a problem.

Table 3-1 - Major Troubleshooting Symptoms

Symptom	Possible Cause in Likely Order of Frequency
All lights fail	<ul style="list-style-type: none"> - Main power failure - External circuit breaker - PCB1 failure
Single light fails	<ul style="list-style-type: none"> - Check wiring for short or open in that line - Failure of individual lighting fixture
Erratic operation	<ul style="list-style-type: none"> - Loose connections - PCB1
Alarm	<ul style="list-style-type: none"> - Normal if a light or tier is out - PCB1 is configured incorrectly for the connected lighting equipment. <i>See Table 1-1 and Beacon/ Marker Setpoint.</i>
False alarm	<ul style="list-style-type: none"> - Check for correct alarm connections: normally open (NO) contacts close on alarm, normally closed (NC) contacts open on alarm. * - PCB1 failure
Lights do not flash	<ul style="list-style-type: none"> - Switch "A-FL/ST" and/or Switch "B-FL/ST" are set to the "On" position. - PCB1 failure.
Lights operate continuously	<ul style="list-style-type: none"> - A photodiode is not connected at J01 terminals 10 & 11. - Photodiode failure. - PCB1 failure.
Light Sense alarm will not reset	<ul style="list-style-type: none"> - Alarm can only be reset by a mode transition controlled by the photodiode. - Check the photodiode connections.

* 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 (example: J02 terminals 1 & 2).

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.

FTC 2301-2

PCB1 (2906002)

Remove: Unplug wire connectors at positions J01, J02, J00 and J04. Remove four Phillips-head screws located near the corners of PCB1. Lift the board out of the enclosure.

Replace: Reverse the removal procedure.

FH 370r DC (L-864 Beacon)

Light Engine

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 this 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.

LED Driver PCB

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: Reinstall in reverse order.

Section 4 – Major Replaceable Parts

Customer Service

Customer Service: 1-800-821-5825

Telephone: (615) 261-2000

Facsimile: (615) 261-2600

Internet Address:

www.spx.com/en/flash-technology/

Shipping Address:

Flash Technology
332 Nichol Mill Lane
Franklin, TN 37067

Replacement Parts

Table 4-1 lists the major replaceable parts for the system. To order spare or

replacement parts, contact Customer Service at 1-800-821-5825.

Repackaging the Controller

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 Controller in a strong double corrugated carton using a double thickness cardboard container and adequate padding. Do not drop. Use appropriate warning labels on the outside of the container.

Table 4-1 - Major Replaceable Parts

Equip. Model	Item	Description	Part Number
FTC 2301-2	F1 ¹	Fuse, 20A	11000011529
FTC 2301-2	PCB1 ²	Controller Board (Standard System)	2906002
FTC 2301-2	PCB1 ²	Controller Board (IR System)	2906003
FH 370r DC	Light Engine	FH 370r DC Light Engine Assembly	1370169
FH 370r DC	Base Assembly	FH 370r DC Base Assembly	1370168
FH 370r DC	LED Driver	FH 370r DC LED Driver PCB	2423100
FH 370r IR DC	Light Engine	FH 370r IR AC/DC Light Engine Assembly	1370040
FH 370r IR DC	Base Assembly	FH 370r IR DC Base Assembly	1370060
FH 370r IR DC	LED Driver	FH 370r IR DC LED Driver PCB	2423300
FH 370r DC / IR	TB1	FH 370r DC Terminal Block Assembly	1362035
FH 370r DC / IR	-	FH 370 Hinge Pin And Lanyard Assembly	1005303
System	Photodiode	PHD 512	1855512
System	Cable	18 AWG / 2 Conductor Cable (Conductor Colors: Black /Red)	4218000
System	Cable	18 AWG / 3 Conductor Cable (Conductor Colors: Black/White Green)	4318000
System	Cable	18 AWG / 4 Conductor Cable (Conductor Colors: Black/Red/White/Green)	5991990
System	MKR 370 (Single)	L-810 LED 2.0 W 24V DC Marker	1119000
System	MKR 370 (Single)	L-810 LED 3.6 W 24V DC IR Marker	1119002
System	MKR 370 (Double)	L-810 OL2 LED 4.0 W 24V DC Marker	1904120
System	MKR 370 (Double)	L-810 OL2 LED 7.2 W 24V DC IR Marker	1904130

1. Recommended as a spare part.

2. Varies by configuration ordered.

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
 - Advance replacements will be shipped ground unless the customer provides alternative shipping methods.

- 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

- 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.
- 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.