FLASH TECHNOLOGY

VANGUARD® HIGH

FTS 270, FTS 372

FTS 270 – LED High Intensity Obstruction Lighting

FTS 372 – LED Medium Intensity Obstruction Lighting (AOL)

Reference Manual

Part Number F7912700

INSTALLATION CHECKLISTS

Use the following checklists when installing the system:

	All equipment has been inspected for damage
	All received equipment has been verified against the packing list to ensure completeness a. Contact Flash Technology technical support if items found to be missing
	Site installation drawings have been consulted for placement, mounting and wiring details

	A main power disconnect switch or a circuit breaker has been installed
	
	    a. A 20 AMP breaker should be used for the controller (FTC 270)
	    b. Consult site wiring diagram for sizing of circuit breakers for tower circuits

	The external ground lug of the controller is connected to the site grounding system.
	
	    a. Used 2AWG (*min*)
	    b. Bend radius of ground wire is greater than 8"
	    c. All exposed ground conductors are coated with a corrosion inhibitor

	Junction boxes have been installed to drain condensation properly
	Controller has been mounted and positioned to allow adequate clearance to open the cover
	Controller has been mounted upright
	All screws within the internal controller hardware are hand-tight
	Wiring connections have been terminated according to site drawings and equipment info-cards
	The input AC power and frequency matches the voltage specified on the unit's data label.
	Electrical connections have been double-checked for tightness
	All latches are secured to avoid moisture intrusion
	No holes have been punched or drilled to the top or sides of the enclosures
	The photodiode has been located where it has an unobstructed view of the polar sky. a. Photodiode mounting location will not view direct or reflected artificial light
	Photodiode wires are not spliced
	Photodiode is supported upright by rigid conduit, with flexible conduit for the wire run to the controller a. Photodiode installation is water tight
	Photodiode is not mounted underneath the controller where it could be shadowed
	Ensure the photodiode is connected to PCB2 - J3 (Clear to WHT, Black to BLK, drain wire to SHLD).

Complete the following steps before applying power:

	Examine installation drawings.
	Ensure the unit is wired according to the included instructions.
	Check all terminal strip connections for tightness.
	If external alarm detection circuit responds to closed contacts, ensure they are wired to the proper contacts that close on alarm.
	If external alarm detection circuit responds to open contacts, ensure they are wired to the proper contacts that open on alarm.
	Verify alarm wiring has been protected by using shielded wires. Also verify proper grounding of the shield wire, and that the wires are run through conduit.

FRONT MATTER

ABSTRACT

This manual contains information and instructions for installing, operating and maintaining the Vanguard High Intensity FTS 270 and Vanguard Medium Intensity FTS 372 system components.

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APPLICABLE SPECIFICATIONS

The equipment included in this system meets or exceeds FAA AC 150/5345-43 requirements for the FAA Type L-856, L-864, L-865 and L-810 obstruction lights. This equipment can accommodate system configurations that meet the FAA AC/7460-1L and earlier standards for marker configurations.

The equipment included in this system meets or exceeds requirements for Transport Canada CAR621.19 types CL-856, CL-864, CL-865 and CL-810.

The equipment included in this system meets or exceeds requirements for ICAO Annex 14 Volume 1 for High-intensity obstacle lights Type A and B, Medium-intensity obstacle lights Types A and B, as well as Low-intensity obstacle lights Type A and B.

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

With proper installation and with normal operating conditions, Flash Technology warrants all lighting components of the LED lighting system for 5 years from the date of shipment from Flash Technology. Monitoring components such as modem or battery, if present, are only covered by 2 years warranty from the date of shipment.

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 150/5345-53D. 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.

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SYSTEM OVERVIEW

The FTS 270 system is an LED Obstruction Lighting System monitored and controlled by the FTC 270 controller. The FTS 270 system may be comprised of High Intensity LED obstruction lights (FH 270), Medium Intensity LED obstruction lights (FH 372) and Low-Intensity LED obstruction lights (MKR 371). A complete system also includes the power converters for the LED obstruction lights. The system lights can produce white, red and infrared light in their appropriate modes.

The FTS 270 system is designed to meet and exceed FAA, ICAO and Transport Canada (TC) regulations and may be utilized for their corresponding valid obstruction lighting configurations. The FTC 270 controller can monitor, control and synchronize multiple High-intensity, Medium-intensity and Low-intensity lights.

The following table illustrates the systems capabilities:

Table 1-1: System and Component Model Combinations

Component	Specifications Met	Count Per System
FTC 270 (System Controller)	FAA, TC, ICAO	1 required per system
FH 270 (High-intensity LED Flashhead) PC 270-1 (Power converter for FH 270)	FAA: L-856(L)L-864(L) TC: CL-856, CL-864 ICAO: HI Type A, B	Up to 48 per system (0-6 Tiers, 0-8 Per Tier)
FH 372 (Medium-intensity LED Flashhead) PC 372 (Power converter for FH 372)	FAA: L-865(L)L-864(L) TC: CL-865, CL-864 ICAO: MI Type A, B	Up to 9 per system
MKR 371 (Low-intensity LED Marker) MKR 372 MARKER INTERFACE (For MKR 371)	FAA: L-810(L) TC: CL-810 ICAO: LI Type B	Up to 36 per system (0-9 Tiers, 0-4 Per Tier)

Flash Technology engineered the FTS 270 LED Lighting System for maximum LED life, reducing the need for service. Simple wiring, setup, and diagnostics increase the ease of installation and service.

Each high-intensity obstruction light consists of a flashhead (FH 270) and a connected power converter (PC 270-1). A maximum of forty-eight high intensity lights may be connected in a single lighting system. The light source for the flashhead is comprised of LEDs (Light Emitting Diodes). The LED control circuitry and drivers are located in the power converter. RS-485 communication is utilized as the communication link between the PC 270-1 and the system controller (FTC 270). The PC 270-1 may be located up to 2200' (RS-485 cable length) from the controller.

The FTS 372 is used on installations requiring a medium-intensity AOL beacon. The FTS 372 system consists of an LED flashhead (FH 372) and a connected power converter (PC 372). A maximum of nine (9) medium-intensity AOL beacons can be connected in a single lighting system. The FH 372 communicates with the FTC 270 via RS-485

communications. The PC 372 may be located up to 2200' (RS-485 cable length) from the controller. The flashhead may be located up to 375' (using #10 wire) from the power converter.

Installations of FTS 270 systems requiring L-810 markers is accomplished by using the MKR 371 connected to the MKR 372 MARKER INTERFACE as its power converter. The MKR 372 MARKER INTERFACE also communicates with the FTC 270 via RS-485 communications.

The FTC 270 provides overall system control including mode control, synchronization, alarm collection and notification. Isolated RS-485 provides robust and highly reliable communication between all units.

The PC 270-1 and PC 372 are both AC powered, and are not sensitive to input power phase. Both PCs have an operational voltage range of 100-277 VAC, 50/60 Hz with no modification necessary to the input power module. The FTC 270 and MKR 372 MARKER INTERFACE have an operation voltage range of 120-240 VAC, 50/60 Hz.

This manual provides guidance and recommendations for the installation, operation, and troubleshooting of the lighting system. Please read this document in its entirety before installation.

SYSTEM SPECIFICATIONS

The FTC 270, FH 270, PC 270-1, FH 372, PC 372, MKR 372 MARKER INTERFACE and the MKR 371s all comply with the following environmental FAA specifications (as defined in AC 150/5345-43) for continuous operation:

Specification Element	Specification Value
Temperature	Storage/shipping: • -67 deg to 130 deg. Fahrenheit (F) • -55 deg to 55 deg Celsius (C) Operating • -40 to 130 F • -40 to 55 C
Humidity	95% relative humidity
Wind	Wind speeds up to 150 miles per hour (mph)

The following tables detail the specifications of the individual components that may comprise an FTS 270 system:

Table 1-2: FTC 270 Specifications

	FTC 270 (Base)	FTC 270 (Loaded)
Input Voltage	120/240 VAC (+/- 10%) 50/60 Hz	
Power Consumption	7.2 W	19.4 W
Weight	25.1 lbs. (11.4 kg)	35.5 lbs. (16.1 kg)
Dimensions H x W x D (millimeters)	605 mm x 445 mm x 216 mm	
Dimensions H x W x D (inches)	23.82" x 17.5" x 8.51"	
Protection Rating	IP66	

Table 1-3: PC 270-1 & FH 270 Physical Specifications

	FH 270	PC 270-1
Input Voltage	White Strings: ~85 VDC Red & IR Strings: ~35 VDC	100-277 VAC (+/- 10%) 50/60 Hz
Weight	105.2 lbs. (47.7 kg)	64.7 lbs. (29.35 kg)
Dimensions H x W x D (millimeters)	525 mm x 942 mm x 314 mm	605 mm x 445 mm x 318 mm
Dimensions H x W x D (inches)	20.65" x 37.08" x 12.35"	23.82" x 17.5" x 12.51"
Aerodynamic Wind Area (ft²)	5.01	2.89 3.6 (with bracket)
Protection Rating	IP66	

Table 1-4: FH 270 & PC 270-1 Performance Characteristics

Specification Type	Mode (Color)	Flash Rate (Flashes per minute)	Nominal Intensity	Average Power Consumption * (Watts ± 5%)
FAA: L-856 (L) TC: CL-856 ICAO: HI Type A	Day (White)	40	270,000 ECD (+/- 25%)	299 W
	Twilight (White)	40	20,000 ECD (+/- 25%)	52 W
	Night (White)	40	2,000 ECD (+/- 25%)	38 W
FAA: L-864 (L) TC: CL-864 ICAO: MI Type B	Night (Red)	20	2,000 ECD (+/- 25%)	36 W
		30		37 W
		40		37 W
		60		38 W
	Night (Red & IR)	20	2,000 ECD (+/- 25%) >246 mW/sr	38 W
		30		39 W
		40		40 W
		60		42 W
ICAO: HI Type B	Day (White)	60	100,000 ECD (+/- 25%)	157 W
	Twilight (White)	60	20,000 ECD (+/- 25%)	38 W
	Night (White)	60	2,000 (+/- 25%)	40 W

* Peak VA is 1066

Table 1-5: FH 372 & PC 372 Physical Specifications

	FH 372	PC 372
Input Voltage	~58 VDC	100-277 VAC (+/- 10%) 50/60 Hz
Weight	26.3 lbs. (11.9 kg)	32.8 lbs. (14.88 kg)
Dimensions H x W x D (millimeters)	400 mm dia x 186 mm	605 mm x 445 mm x 216 mm
Dimensions H x W x D (inches)	15.75" dia x 7.31"	23.82" x 17.5" x 8.51"
Aerodynamic Wind Area (ft²)	0.69 ft²	2.89 ft²
Protection Rating	IP66	

Table 1-6: FH 372 & PC 372 Performance Characteristics

Specification Type	Mode (Color)	Flash Rate (Flashes per minute)	Nominal Intensity	Power Consumption * (Watts $\pm$ 5%)
FAA: L-865 (L) TC: CL-865 ICAO: MI Type A	Day (White)	40	20,000 ECD (+/- 25%)	66 W
	Night (White)	40	2,000 ECD (+/- 25%)	22 W
FAA: L-864 (L) TC: CL-864 ICAO: MI Type B	Night (Red)	20	2,000 ECD (+/- 25%)	19 W
		30		21 W
		40		22 W
		60		25 W
	Night (Red & IR)	20	2,000 ECD (+/- 25%)	21 W
		30		23 W
		40		25 W
		60		29 W

* Peak VA is 114

Table 1-7: MKR 372 MARKER INTERFACE & MKR 371 Physical Specifications

	MKR 372 MARKER INTERFACE	MKR 371
Input Voltage	100-240 VAC (+/- 10%) 50/60 Hz	24 VDC
Weight	10.1 lbs. (4.6 kg)	1.6 lbs. (0.7 kg)
Dimensions H x W x D (millimeters)	409 mm x 267 mm x 125 mm	229 mm x 70 mm x 54 mm
Dimensions H x W x D (inches)	16.1" x 10.5" x 4.91"	9.0" x 2.75" x 2.13"
Aerodynamic Wind Area (ft²)	1.11 ft²	0.16 ft²
Protection Rating	IP65, NEMA 4X	

Table 1-8: MKR 372 MARKER INTERFACE & MKR 371 Performance Characteristics

Specification Type	Mode	Flash Rate (Flashes per minute)	Nominal Intensity	Power Consumption * (Watts $\pm$ 5%)
MKR 372 MARKER INTERFACE (with 4 IR markers)	Steady	N/A	N/A	19.6 W
	Flashing	30		4.2 W
MKR 371 IR (single IR marker)	Steady	N/A	32.5 ECD (+/- 25%)	3.9 W
	Flashing	30		0.8 W

An internal wiring diagram is shown in Figure 6-1.

TB1 INPUT POWER AND TOWER COMMUNICATIONS (RS-485)

Input power connects to terminal block TB1 (Bottom right of the FTC 270). Mounted on TB1 is a Metal Oxide Varistor (VR1), which reduces line surges and transient voltages. An internal power disconnect (circuit breakers) are also mounted on TB1. Remove power from the FTC 270 before servicing circuit breakers or MOV. Input voltage range for the controller is 120-240 VAC 50/60 HZ.

The RS-485 communication cable also connects to TB1 (Far right on the terminal block). This communication link provides a 2-way data exchange between the ground controller (FTC 270) and the tower lighting components (PC, FH and MKR). The RS-485 link allows the controller to update the operating firmware of the boards (PCBs) on the tower, via the PCB2 Tower Controller Board.

Flag Indicator on the 2-pole circuit breakers is clearly marked with green OFF and red ON.

PCB1 DISPLAY BOARD
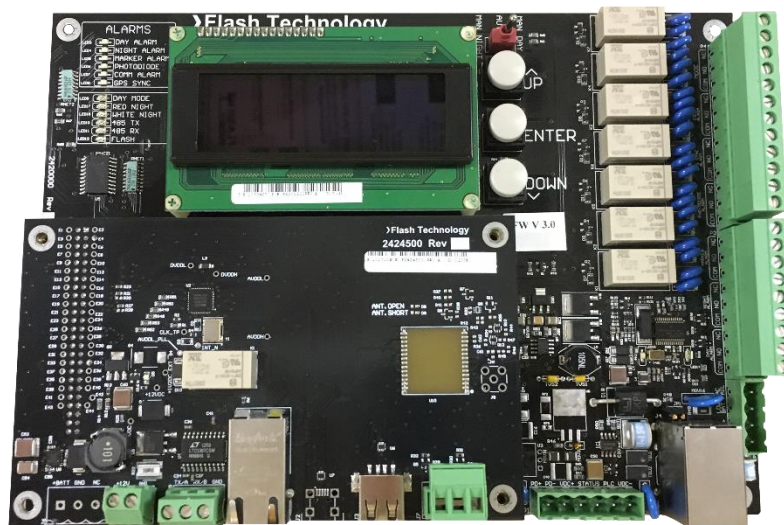
The display board (PCB1) provides a direct user interface to the system's status, configurations and diagnostic features. A User Interface with alphanumeric display and push-buttons provides system configuration and alarm notification. The PCB1 also comes equipped with six standard dry contacts for remote alarm monitoring. A mode override switch also enables a 30-minute tower operating mode override.

The PCB1 provides system status, alarm and programming information. The information display defaults to show the current system status as well as the basic configuration for the unit. See Section 3 for a detailed description for all menu functions of the information display.

The FTC 270 has additional add-on options, which include:

- Cellular Modem
- Local Wi-Fi Antenna
- PCB6 Alarm Relay Expansion Board

PCB2 TOWER CONTROLLER BOARD

The tower controller board (PCB 2) controls the operating mode and flash synchronization of all lights in the tower system. It does so by communicating with the controller boards in the various light units over an isolated RS-485 bus. A GPS antenna connected to PCB2 provides time and location information to the controller. This information is used as a mode change backup using sunrise/sunset data to change the operating mode in case of a photodiode failure.

PCB3 SMART BOARD

The smart board (PCB3) comes standard with the FTC 270. This allows the user to monitor and control the system remotely, and receive full diagnostic information through an LTE modem or Ethernet-based connectivity; SNMP, Modbus or Eagle protocols may be used. The PCB3 also provides the ability to read a USB drive for the purposes of updating firmware versions. The PCB3 also allows an optional Wi-Fi interface to the lighting system, using a long-range external antenna, or a short-range internal USB Wi-Fi dongle.

PCB4 POWER SUPPLY

The power supply (PCB4), located in the FTC 270 unit, converts input power to the correct DC operating voltage for the other components within the enclosure (12VDC). This does not provide power to any of the system lighting.

A backup battery is connected to PCB4. Under normal operations PCB4 will charge the battery, but in the event of loss of input power, PCB4 will draw power from the battery. This backup power is not sustainable for an extended period, but does allow the FTC 270 to send a notification to remote monitoring locations that a power loss event has occurred. It also prevents the controller boards from power cycling in the event of a short duration power failure event.

The battery backup does not power the Wi-Fi antenna, which requires 120 VAC to operate.

TB2 DC POWER ROUTING

TB2 is located in the bottom left-hand side of the enclosure and serves the purpose of routing the 12VDC power from PCB4 to various other components within the controller enclosure. The following components have their input power routed through TB2:

- PCB2 (Tower Controller Board)
- PCB6 (Alarm Relay Expansion Board)
- Wireless Switch
- Cellular Modem
- Wi-Fi POE (Power Over Ethernet) Adapter

NOTE! While the display board (PCB1) is powered by the PCB4 power supply, it is wired directly to PCB4 and not through TB2. PCB1 then routes power to PCB3, and PCB2 routes power to PCB5.

OPTIONAL - PCB6 ALARM RELAY EXPANSION BOARD

The display board (PCB1) comes factory equipped with six dry contact alarm relays (DAY ALARM, NIGHT ALARM, MAKRER ALARM, PHOTODIODE ALARM, GPS SYNC ALARM and COMM ALARM). The Optional Relay Expansion Boards (PCB6) allows up to 28 additional dry contact alarm points for greater insight into the cause of each alarm. Each Relay Expansion Board comes equipped with 14 dry contacts. The FTC 270 controller can accept up to two of the Relay Expansion Boards.

OPTIONAL – WIRELESS NETWORK CONNECTIONS

The FTC 270 may be supplied with a cellular modem option, which allows for remote access to the lighting system. It may also be supplied with a Wi-Fi Antenna which creates a local Wi-Fi access point for onsite wireless access to the lighting system. If either of these options are included in the FTC 270, then a 5-port gigabit Ethernet switch will also be included to provide the needed networking hardware to allow PCB3 to communicate with multiple devices.

Figure 1-1: View of FH 270 DUAL LED

The flashhead assembly is comprised of three identical FH 270 DUAL LED PANELs mounted to a single bracket, which orients them at 40-degree offsets from each other. The LED panels are field replaceable; however, they are not designed to be serviced in the field. Each single panel includes white, red and infrared LEDs, eliminating the need for a separate red flashhead.

Each FH 270 panel connects to the PC 270-1 with a factory supplied flashhead cable (shown below). This cable is pre-terminated from the factory and can be purchased in 10ft or 25ft lengths. White and blue stickers have been placed on both terminal ends of the cable to assist with installation.
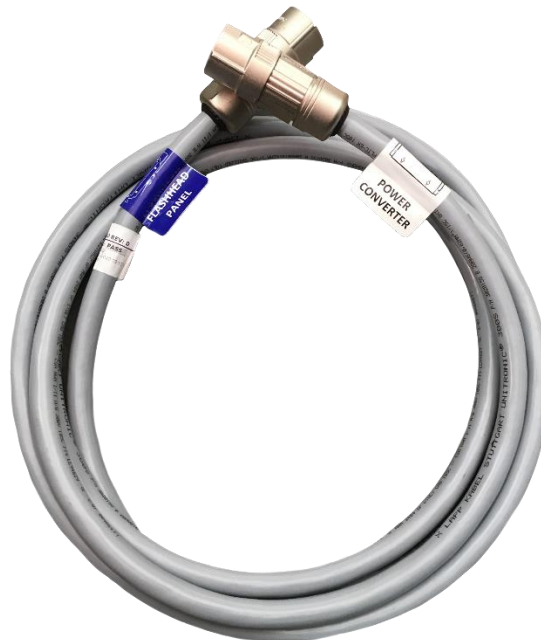
Input power is connected to terminal block TB1. Mounted on TB1 are surge suppression modules, which reduce line surges and transients. Input power circuit breakers are also mounted on TB1. Disconnect power from TB1 before servicing circuit breakers or OVPs.

Flag indicator on the 2-pole circuit breakers is clearly marked with green OFF and red ON.

The power supplies located in each PC 270-1 unit covert input power voltage (100-277 VAC, 50/60 Hz) to the correct DC operating voltage for the LED drivers (~58 VDC).

The control board (PCB 1) supervises flashhead operation and provides cumulative data to the ground controller (FTC 270) via a two-way communication path (RS-485).

An internal view and component layout diagram, with part names and numbers is show in figure 6-2.

The PC 270-1 comes equipped with an internal power disconnect used for local troubleshooting and repairs. Three power supplies are located on the backplate that provide ~58VDC to each driver assembly. Each driver assembly includes a driver board and capacitor board to operate each connected LED FH panel. TB1 is used for AC voltage input and RS-485 communication. Details of the PCB1 controller board can be found below in Figure 1-3. The bottom of the enclosure houses the 3 quick connect plugs for the FH cable that leads to each FH 270 panel.
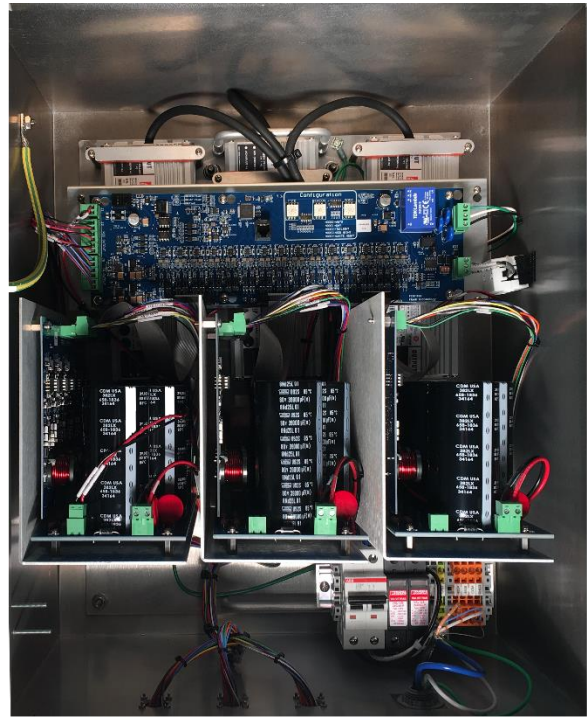
PCB1 CONTROLLER BOARD OVERVIEW
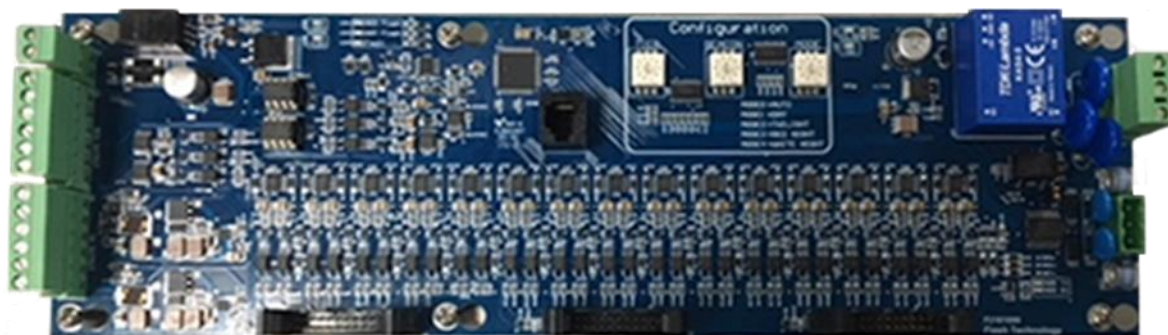
Figure 1-2: PC 270-1: PCB 1: Controller Board: F2161000

Each PC 270-1 will have one PCB1 controller board which is responsible for ensuring that all 3 LED panels flash in sync with each other in the proper mode. It also ensures that the FH 270 flashes in sync with the other lights on the tower structure.

The controller board also includes the LED driver circuitry for the RED and INFRARED LED strings.

NOTE: The termination jumper found on PCB1 should always be in the open position, unless it is the last lighting unit in the RS-485 communication line (the light furthest from the FTC 270 ground controller). If an FTS 372 AOL is present then all PC 270-1 jumpers will be in the open position and closed on the FH 372.

PCB1 CONTROLLER BOARD – ROTARY DIALS

In the "Configuration" area of the PCB1 Controller board there are (3) rotary dials. The tier and beacon rotary dials are used to set the RS-485 address, which must be a unique setting for each PC 270-1. The TIER rotary dial supports up to 6 tiers. The BEACON dial allows up to 8 FH 270s per tier. More details about the MODE dial can be found on the next page.

NOTE: The lowest level of lights is considered as Tier 1 (T1).
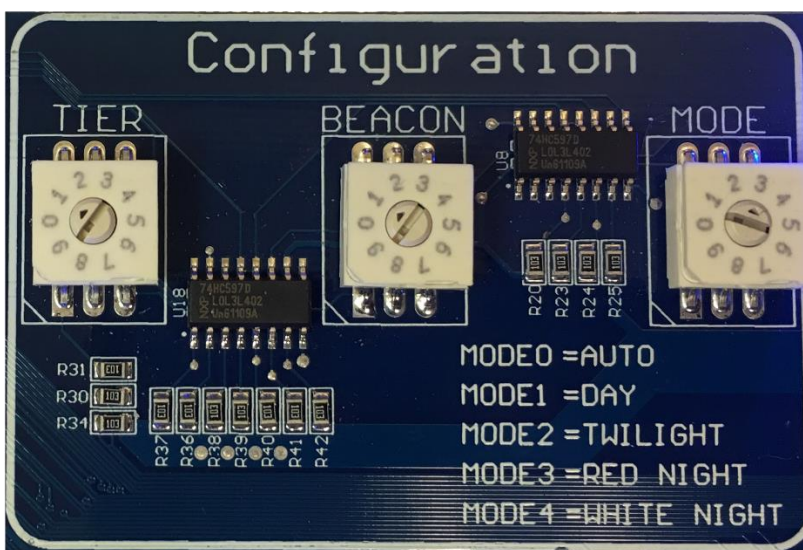
The controller board also includes a rotary dial to perform a local mode override for each individual PC 270-1. This mode override will timeout after 30 minutes, and returns to the mode communicated to it by the ground controller (FTC 270). The local mode override also terminates if the PCB is power cycled or rebooted.

Dial Position	Mode	Details
0	AUTO	Follows the tower operating mode of the FTC 270
1	White Day	Flashes in last known White Day Mode configuration.
2	White Twilight	Flashes in the last known White Twilight Mode configuration.
3	Red Night	Flashes in the last known Red Night Mode configuration.
4	White Night	Flashes in the last known White Night Mode configuration.
5*	IR Only	Only flashes the Infrared LEDs at the configured flash rate. (10 hour duration)
6*	Sleep Mode	No LEDs flash. No alarm asserted. (10 hour duration)
7*	QLI Inhibit	Flash all LED strings (for the current mode) dimly and generates an alarm (10 hour duration)
8*	QLI Inhibit – No Alarms	Flash all LED strings (for the current mode) dimly without asserting an alarm (10 hour duration)
9*	Factory Test	Used for PCB Factory Test. Not for field use.

* Not intended for field use unless directed by Flash personnel

PCB2 DRIVER BOARD & PCB 3 CAPACITOR BOARD

The Driver assembly consists of PCB 2 & PCB 3 mounted together as set. There are three sets of these assemblies within each PC 270-1. Each assembly has the required circuitry to drive 5 WHITE LED strings, one assembly for each LED Panel. The left most assembly is also used to provide DC power to the Red and Infrared drivers on PCB1 (J2 of PCB3 connects to J1 of PCB1).

PCB 4 POWER SUPPLY

The three power supplies (PCB 4) are located behind the bracket for PCB1. They accept 100-277 VAC 50/60Hz input power and supply 58VDC to PCB3 at J2.

The FTS 372 is a medium intensity obstruction (L865/L864) lighting system. The FTS 372 is a dual (white and red) LED light which includes Infrared LEDs. The FTS 372 is used for applications that require the use of an "AOL Flashhead" (i.e. F-Style and C-Style towers).

The FTS 372 is composed of a flashhead (FH 372) and a power converter (PC 372). The power converter may be installed at the same elevation as the top tier of L-856 lights (up to 2,000 ft. above ground level). It accepts an input power of 100-277 VAC 50/60 Hz. The power converter provides the operating voltage for the FH 372 (~58 VDC), and is a pass-thru for the RS-485 communications. The FH 372 may be installed up to 375ft. from the power converter with #10 conductors.

PC 372 - TB1 INPUT POWER AND TOWER COMMUNICATIONS CONNECTION POINT

Input power is connected to terminal block TB1. Mounted on TB1 are surge suppression modules, which reduce AC power line surges and transient voltages. Input power circuit breakers are also mounted on TB1. Disconnect power from TB1 before servicing circuit breakers or OVPs.

Flag indicator on the 2-pole circuit breakers is clearly marked with green OFF and red ON.

The PC 372 will have two RS-485 connections on TB1 (input and output). The RS-485 connections only to serve as a pass-through for the RS-485 connection to the FH 372. Nothing inside the PC 372 communicates on the RS-485 lines.
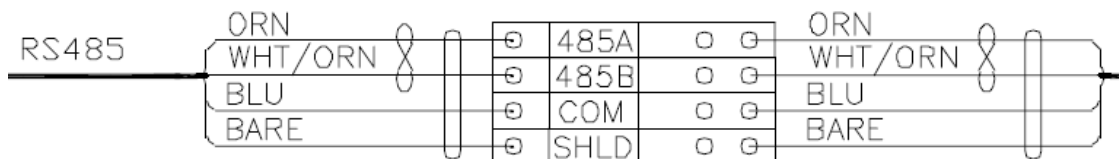
PC 372 - PCB 1 SURGE BOARD

The Surge Board (PCB1) provides protection against line surges and transients on the DC power output to the FH 372.

PC 372 - PCB2 POWER SUPPLY

The power supply (PCB2) located in each PC 372 unit convert input power voltage (100-277 VAC, 50/60 Hz) to the correct DC operating voltage for the FH 372 Flashhead (~58 VDC).

FH 372 (FLASHHEAD)

The FH 372 receives (~58 VDC) power from the PC 372, and connects to the RS-485 lines to communicate with the system controller (FTC 270). The rotary switch located on the circuit board in the upper portion of the FH 372 determines the devices RS-485 address and must be set. If there is only one FH 372 then its value would be set to 1. A second FH 372 would be set to 2. Continue this numbering scheme for additional units.

The circuit board in the upper portion of the FH 372 must be addressed appropriately when more than one FH 372 is included in the system. Use the reference table to below to ensure the correct switch position is selected.

Rotary Dial Position	AOL Beacon Address
1	1
2	2
3	3
4	4
5	5
6	6
0, 7-9	Do not use

NOTE: Ensure the termination jumper, located on the circuit board in the upper portion of the FH 372, is closed. If more than 1 AOL/FH 372 is present onsite, ensure the termination jumper is closed on the last FH372 in the RS-485 communication link.

LOW INTENSITY LED LIGHTING SYSTEM (MKR 372 MARKER INTERFACE AND MKR 371)

The FTC 270 controller can support lighting applications that require the use of low-intensity LED obstruction lights (i.e. L-810). These may be used in conjunction with high-intensity or medium-intensity lights (or both).

MKR 372 MARKER INTERFACE

A tier of marker lights is powered by the MKR 372 MARKER INTERFACE located at the marker tier level. This marker interface accepts 120-240 VAC input power, and provides 24VDC to power to up to four MKR 371 LED markers. An internal breaker is provided to disconnect power at the related marker tier level. The marker interface board communicates to the ground controller through the use of RS-485.

NOTE: The RS-485 termination jumper should be open on the MKR 372 INTERFACE PCB. In certain custom installations, when only low intensity led MKR fixtures (MKR 371) are used, the term jumper should be closed on the last MKR PCB with all other jumpers in the open position.
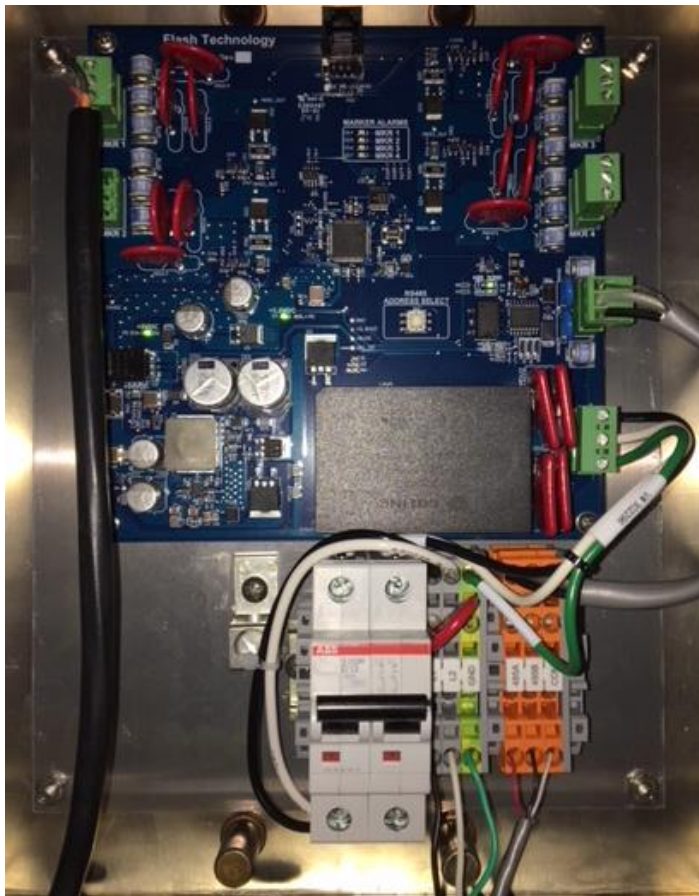
The marker interface board communicates to the ground controller through the use of RS-485. Each interface box must have a unique address for proper communication and alarming. This address is set using the rotary dial found on the marker board.

Rotary Dial Position	Tier Position*
1	Tier 1
2	Tier 2
3	Tier 3
4	Tier 4
5	Tier 5
6	Tier 6
7	Tier 7
8	Tier 8
9	Tier 9
0	Do not use

*Tier 1 being the lowest level of marker lights.
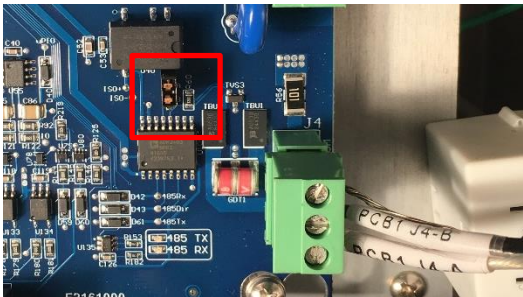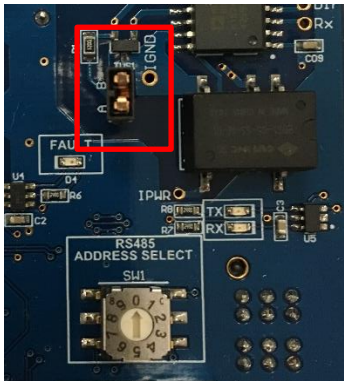
MKR 371

The MKR 371 is a DC driven LED marker, which is designed for easy installation and minimal service. The installation/mounting kit is comprised of (2) adjustable band clamps, wire nuts and electrical tape. The provided 18AWG marker cable will be run through metallic flexible conduit for enhanced EMI and RF protection.

PC 270-1, FH 372 & MKR 372 TERMINATION JUMPERS

Termination jumpers are found on the PC 270-1 PCB1 (controller board), FH 372 PCB1 (core board) and the MKR 372 Marker Interface PCB1 (marker board). These jumpers are used to assign an endpoint for the RS-485 communication link between the FTC 270 (ground controller) and the tower light components. The last lighting unit in the RS-485 link should have the jumper in the closed position (covering both pins), with all other jumpers in the open position.

Lighting Unit	Jumper Position*
PC 270-1	
FH 372	
MKR 372 Marker Interface	

*Jumpers shown in the closed position.

SECTION 2: MOUNTING AND INSTALLATION INSTRUCTIONS

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
- #2 Phillips® head screwdriver
- Wire strippers
- Channel locks
- Flush cut tool
- Level
- Tin Snips
- Mounting hardware for controller (if not provided in the system kit)
- Various drill bits

INSTALLATION OVERVIEW

INSTALLATION TIPS TO AVOID INTERFERENCE ISSUES

Since electromagnetic interference (EMI) issues with tower lighting systems installed on broadcast structures are hard to pinpoint and diagnose, it is best to prevent issues in advance by following good installation practices. These include shielding, grounding, and filtering as outlined below.

SHIELDING AND GROUNDING

The goal of shielding and grounding is to block EMI by surrounding all conductors and electronics of the lighting system with a continuous metal shield, which is grounded to the tower structure. This shield must have no gaps since RF Energy can pass through very tiny openings in metal enclosures or conduit.

- Ensure that all enclosures, junction boxes, and conduit are mounted on the tower structure with a tight metal-to-metal mounting (not through paint or rust).
- Verify that all enclosure and junction box doors and covers fit tightly and latch securely.
- Plug all unused enclosure holes with metal fittings or plugs.
- Run all power and communication cables and conductors within metal conduit or metallic flex.
- Ensure that all conduit and flex are in good condition so that metal completely surrounds all conductors including at junction of conduit/flex fittings and enclosure.
- Ensure that all conduit and flex fittings are correct type and size, and properly installed so that they make a tight metal to metal connection at each enclosure entry.
- Consider grounding the conduit at the base of the tower directly to the ground ring using #2 solid.

- If RF issues persist, install a flat bonding/grounding strap or braid (not wire) from each equipment enclosure to the tower.
- If RF issues persist, (after other work is complete) install copper tape at least 1" wide over the gap on enclosure or junction box between door and box. Install tape around entire perimeter of the box. Check that the tape makes a tight metal to metal fit with no gaps.

OTHER INSTALLATION TIPS

- To ensure erroneous alarms are not encountered, strip all wires properly to allow solid metal-to-metal contact on termination points. Make sure all screw electrical connections are hand tight and that plug-in connectors and terminals are snug and secured on printed circuit boards and terminal blocks.
- In each Junction box, point all wire splices up to reduce the chance of moisture damage and connection degradation.
- Ensure all electrical wiring connections meet factory recommended guidelines, NEC codes, and local and state requirements.

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.

FTC 270 CONTROLLER MOUNTING AND GROUNDING

Locate the FTC 270 controller in an area that will allow proper access to the enclosure. Turn the knobs to open the door for internal access. A standard lock may be used on the knobs for additional security.

Use the following guidelines for mounting the controller:

- Ensure that adequate space exists around the equipment for access during installation, maintenance, and servicing.
- The use of flexible conduit is recommended for all cable runs with the exception of the GPS antenna, cellular antenna and jacketed ground wires.
- Ground the controller using a 2 AWG insulated wire. Route all ground conductors down and away from the energized equipment and ensure there are no bends smaller than an 8-inch radius. If installed outdoors, the system controller should be bonded to the site grounding grid (via exothermic welding). If installed inside a shelter or building, route the 2 AWG insulated ground wire to the nearest down-link and attach using a compression fitting (c-tap).

FTC 270 CONTROLLER INPUT POWER CONNECTIONS

On the FTC 270 Controller, input power is connected to terminal block TB1. Mounted on TB1 is a Metal Oxide Varistor (VR1) which reduces line surges and transients. Input power circuit breakers are also mounted on TB1. Disconnect power from the FTC 270 before servicing circuit breakers or MOV.

Flag Indicator on the 2-pole circuit breakers is clearly marked with green OFF and red ON.

FTC 270 controllers are not sensitive to input power phase and have an operational voltage range of 100-240 VAC, 50/60 Hz with no modification necessary to the input power module.

Using a small flat tipped screwdriver, create an opening in the terminal position before inserting the wires. The provided RS-485 communication cable will terminate on the right side of TB1. Ensure you match the color-coding appropriately to avoid communication issues and improper system operation.
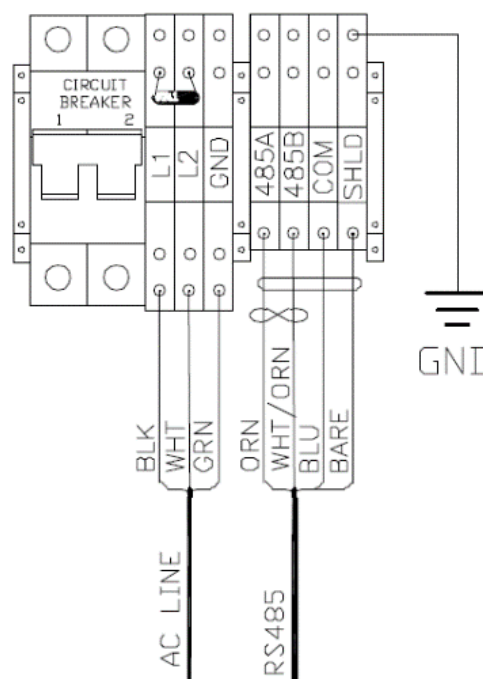
FTC 270 CONTROLLER DRY CONTACT CONNECTIONS

The dry contact monitoring connections are located on PCB1 and PCB6. The alarm contacts can be wired for normally closed (alarm on open) or normally open (alarm on closed).

FTC 270 CONTROLLER DATA COMMUNICATION

Advanced monitoring of the FTC 270 Controller is available by Ethernet SNMP, Cellular SNMP, and Cellular Eagle Protocol.

FTC 270 CONTROLLER PHOTODIODE CONNECTION

The photodiode (PHD 516) connects to J3 of the tower controller board (PCB2). If necessary, prepare the photodiode cable by stripping jacket and removing foil shield from black, clear, and drain wires. Connect the wires to matching labels on the PCB for proper operation (Clear to WHT, Black to BLK, drain wire to SHLD).
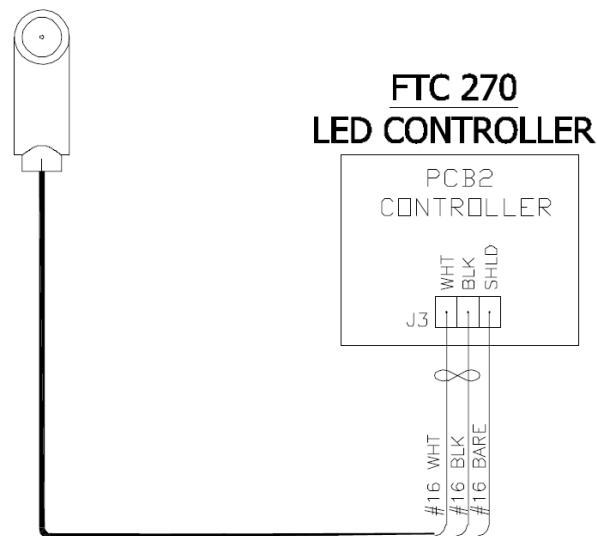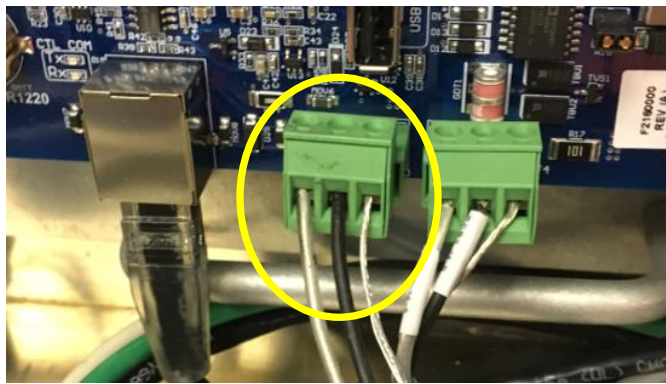
PHOTODIODE MOUNTING

Use the following guidelines for installing the photodiode:

- Locate the photodiode where it has an unobstructed view of the polar sky*.
- It must not view direct or indirect artificial light.
- The photodiode should be supported vertically at the top end of a vertical length of rigid conduit to prevent moisture intrusion.
- Ensure ½" flexible conduit is used for the PHD wire that routes to the FTC enclosure (bottom of the rigid conduit).

*If possible, mount the photodiode in a location that will allow easy access for future testing.

FH 372 INSTALLATION

FH 372 MOUNTING

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

The flashhead is mounted to the tower pedestal utilizing ½ inch galvanized or stainless steel hardware. Four mounting holes are provided on the flashhead base (Figure 2-13). The mounting holes will align with most tower pedestals. The flashhead must be installed level to maintain light output in accordance with FAA requirements.

- Verify that the mounting surface is free of debris.
- Align the four mounting holes in the base of the beacon with the holes in the tower or pedestal's mounting plate.
- Leaving the hardware assemblies loose, secure the beacon with the provided ½ inch stainless steel or galvanized hardware (Part # 5991740).
- With the light engine secured by the two outer latches, 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.

- If the beacon is not level, add stainless steel shim material or washers (stainless steel or galvanized) as necessary to level the beacon.
- Tighten the hardware once the beacon is level in both directions. Verify that the beacon is still level once the hardware is fully tightened.

FH 372 WIRING AND GROUNDING

The following procedure describes FH 372 wiring and grounding. Ensure you following the color coded guide on the terminal block for proper FH operation.

- With the flashhead securely mounted to the tower, unfasten the two latches that secure the light engine (top assembly) to the base.
- Lift the light engine assembly to expose the flashhead terminal blocks.
- Install the provided ¾" flex conduit & connector on the FH 372 and insert the wires.
- Prepare the flashhead power wires (input DC voltage):
  - Remove 6 inches of the outer jacket from each conductor.
- Connect the provided FH cable to the terminal strip using a non-flared flat tip screwdriver as follows:

Wire Color (Power/Voltage)	TB Position
Red	DC+
Black	DC-
Green	GND

Wire Color (Communication)	TB Position
Orange	485A
White/Orange	485B
Blue	COM
Bare	SHLD

- Ensure all wiring is tucked inside the flashhead base to avoid pinching and ensure the flexible conduit connector is properly sealed.
- Close the flashhead and secure the two latches.
- Connect a minimum 8 AWG grounding wire to the pre-installed grounding lug on the Beacon base exterior. Connect the other end of the wire directly to tower steel, collective buss bar, or customer preferred location. Ensure the use of an anti-corrosive agent is used on all terminal ends.

NOTE!! Avoid sharp bends in the ground wire and ensure the wire is routed down and away from the flashhead.

PC 270-1 INSTALLATION AND GROUNDING

Locate the PC 270-1 in an area that will allow proper access to the interior of the enclosure. Turn the knobs to open the door for internal access. A standard lock may be used on the knobs for additional security.

Use the following guidelines for mounting the power converter:

- Ensure that adequate space exists around the equipment for access during installation, maintenance, and servicing.
- Preplan the mounting location of the PC 270-1 before installation
    - Use the provided adjustable mounting bracket and hardware to mount the PC 270-1
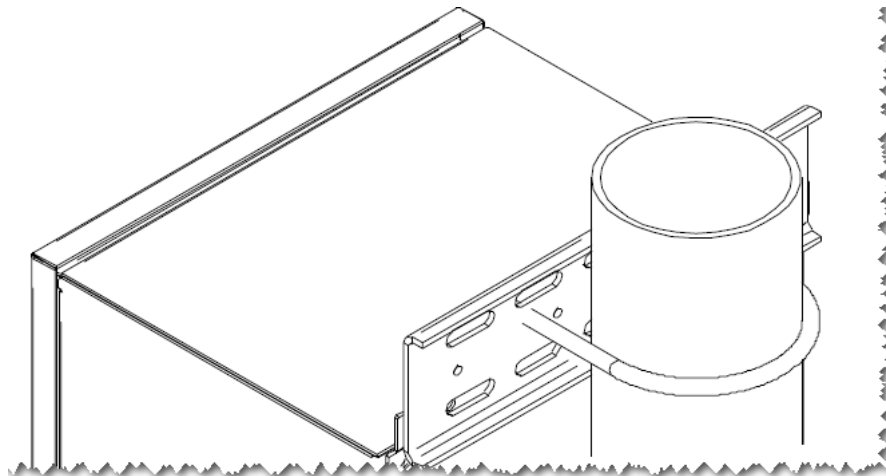
- Ground the PC 270-1 using a 2 AWG insulated wire to the tower. Route all ground conductors down and away from the energized equipment and ensure there are no bends less than an 8 inch bend radius.

POWER CONVERTER (PC 270-1) WIRING

On the PC 270-1, input power is connected to terminal block TB1. Mounted on TB1 is a Metal Oxide Varistor (VR1) which reduces line surges and transients. Input power circuit breakers are also mounted on TB1. Disconnect power from the FTC 270 before servicing circuit breakers or MOV.

Flag Indicator on the 2-pole circuit breakers is clearly marked with green OFF and red ON.

The power converters have an operational voltage range of 100-277 VAC, 50/60 Hz with no modification necessary to the input power module.
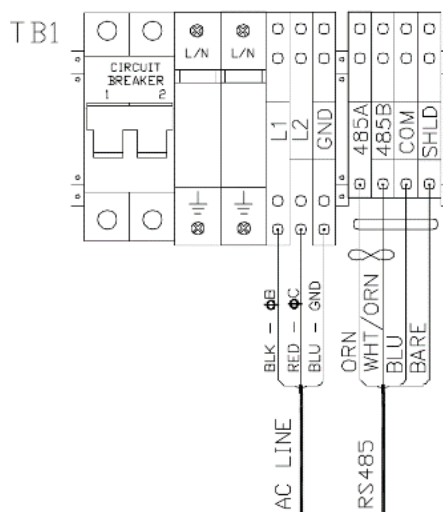
The provided RS-485 communication cable will terminate on the right side of TB1. Ensure you match the color-coding appropriately to avoid communication issues and improper system operation.

FLASHHEAD (FH 270) WIRING

Remove the white and blue caps found on either end of the supplied pre-terminated flashhead cable. Connect each FH 270 Panel to the PC 270-1. Verify connection points by looking at the stickers on each cable end. The connector requires a quarter turn to lock into place. Twist the connector end clockwise to ensure it is in the full-unlocked position prior to connecting to the FH 270 or PC 270-1. Failure to perform this step could result in poor cable termination or bent connector pins.

FLASHHEAD (FH 270) MOUNTING

The FH 270 mounts directly to the bracket assembly shown below. The bracket uses two u-bolts to attach to the tower leg. The bracket will come fully assembled from the factory.
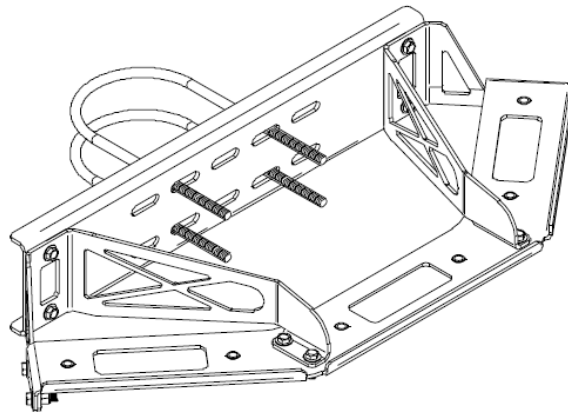
BRACKET ASSY FH 270

FLASHHEAD (FH 270) AIMING

Utilizing the tilt mechanism on each FH 270 panel, adjust the light to the appropriate angle using the table found below. Each panel has a leveling indicator on the sides of the panels.

Tier Level-Above Ground Level (AGL)	Elevation Angle
0 to 300 feet (91 meters)	3°
301 to 400 feet (122 meters)	2°
401 to 500 feet (152 meters)	1°
500 feet and higher	0°

Site-specific installation and wiring instructions concerning marker fixtures are supplied with the conduit and wire kit. The following illustrates a typical installation.

MKR 372 MARKER INTERFACE MOUNTING
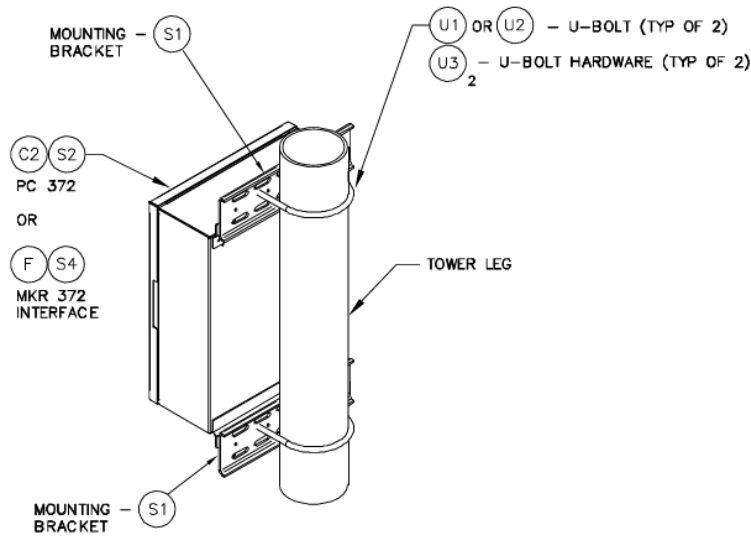
Figure 2-1: Typical MKR 372 INTERFACE Mounting

Notes for MKR 372 MARKER INTERFACE mounting:

- Mount the interface enclosure to the supplied brackets (ITEM "S1") using the provided hardware
- Ground the interface enclosure to the tower using 2 AWG insulated wire (preferred)
- Ensure that the enclosure is oriented so that it can be opened fully for service

MKR 371 LED MARKER (LOW INTENSITY SIDE LIGHT) WIRING

The following image shows a typical marker installation to the MKR 372 INTERFACE. The marker PCB allows up to 4 markers to be installed on each tier. The input voltage for the MKR 372 INTERFACE is powered by a single phase of a 3-phase 208VAC powered system. Always follow specific installation-wiring diagrams that come with the system.

NOTE:

- <u>MKR INTERFACE BOARD</u> – The white blue wire of the marker cable must be connected to the same terminal as the bare drain wire (as seen in the image below). Connections are polarity sensitive, correct wiring is critical for proper operation.
- <u>MKR 371 LED MARKER</u> – Cut off the bare drain wire, as this will not be used in the marker base.

LIGHTNING PROTECTION

All Flash Technology equipment is designed to withstand severe transient over-voltages. While not provided from Flash Technology, 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.

The presence of a copper lightning rod is recommended. Ensure the lightning rod is approx. 18" away from the upper most beacon and 36" above the beacon for proper protection.

SYSTEM WIRING DIAGRAMS

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

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 lighting fixtures and the length of the wire on that run.
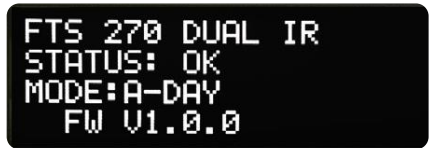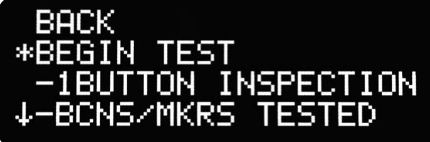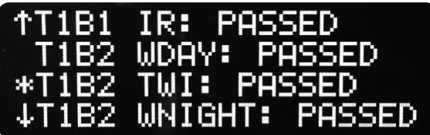
LIGHTING INSPECTION (LI) OVERVIEW

The FTC 270 has a built in test procedure to aid in performing Lighting Inspections (LI). The automated test eliminates the need to disconnect any wires from the unit to test alarm points. The lighting inspection can be performed as an automatic function or manually.

AUTOMATIC LIGHTING INSPECTION

The following procedure will run through all alarm points without any user interaction. The alarms tested during this inspection type will be based off the system configuration.
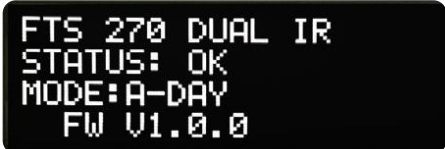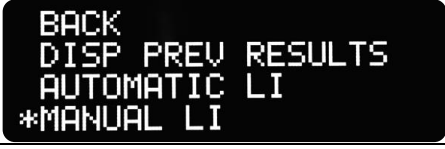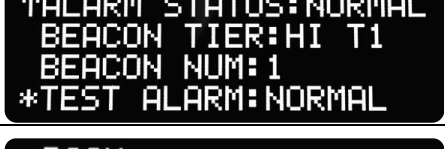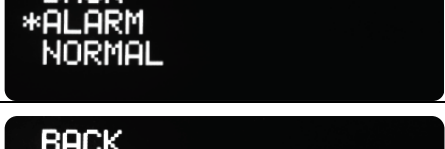
1.	From the main menu, scroll **DOWN** to "Lighting Inspections" and press **ENTER**.	FTS 270 DUAL IR STATUS: OK MODE:A-DAY FW V1.0.0
2.	Scroll to "Automatic LI" and press **ENTER**	BACK DISP PREV RESULTS *AUTOMATIC LI MANUAL LI
3.	Scroll to "Begin Test" and press **ENTER**	BACK *BEGIN TEST -1BUTTON INSPECTION ↓-BCNS/MKRS TESTED
4.	The display screen will indicate when the test is complete.	↑T1B1 IR: PASSED T1B2 WDAY: PASSED *T1B2 TWI: PASSED ↓T1B2 WNIGHT: PASSED

MANUAL LIGHTING INSPECTION

The following procedure will require a user to generate each alarm one at a time. Once the alarm has been confirmed, the user will need to restore/clear each alarm one at a time.

1. From the main menu, scroll **DOWN** to "Lighting Inspections" and press **ENTER**.	`FTS 270 DUAL IR`
	`STATUS: OK`
	`MODE:A-DAY`
	`  FW V1.0.0`

2. Scroll to "Manual LI" and press **ENTER**	` BACK`
	` DISP PREV RESULTS`
	` AUTOMATIC LI`
	`*MANUAL LI`

3. Scroll to the desired alarm and press **ENTER**	` BACK`
	`*BCN DAY ALARM`
	` BCN TWILIGHT ALARM`
	`↓BCN WHT NIGHT ALARM`

4. Scroll to "Test Alarm" and press **ENTER**	`↑ALARM STATUS:NORMAL`
	` BEACON TIER:HI T1`
	` BEACON NUM:1`
	`*TEST ALARM:NORMAL`

5. Scroll to "Alarm" and press **ENTER**	` BACK`
	`*ALARM`
	` NORMAL`

6. Scroll to "Normal" and press **ENTER** to restore/clear the alarm	` BACK`
	` ALARM`
	`*NORMAL`

NAVIGATING THE INFORMATION DISPLAY

Three pushbuttons to the right of the information display provide access to navigate the system menus, configure the system and review diagnostic information.

Table 3-1 describes the function of each button. The top level menu is described in Table 3-2.   Each menu option is discussed in the headings following Table 3-2.

Figure 3-1: Information Display

Table 3-1: Controller Display Buttons [1]

Button	Function
S1 UP ⬆	Navigates UP through the active menu options.
S2 ENTER	Confirms your selection or Advances to the NEXT option. Press and hold for 1.5 seconds then release to return to the previous menu. Press and hold for longer than 5 seconds to return to the main menu.
S3 DOWN ⬇	Navigates DOWN through the active menu options.

Table 3-2: Top Level Menu Options [1]

Menu Option	Description
SITE TOWER CONFIG	Selects the overall system configuration.
MONITORING CONFIG	Selects the type of monitoring equipment that will be used to monitor the system.
MONITORING STATUS	Provides status of the built in monitoring system.
LOCAL DIAGNOSTICS	Displays the firmware revision and multiple analog values for the controller, beacon and markers. This menu is especially helpful when troubleshooting the system.
LIGHTING INSPECTION	Allows the user to perform a lighting inspection. Automatic and Manual modes are available.
MODE OVERRIDE	Allows the system to be manually placed in any capable mode for a user definable period of up to 24 hours.
FACTORY TEST	Factory use only.
SYSTEM SETTINGS	Allows the user to reboot the system without physically interrupting input power or to restore configuration settings to factory default values. Also allows setting the real time clock's date/time + timezone

1. Menu options and features are based on firmware version 10/25/2019 (V ?.0.1).

SITE TOWER CONFIG

This menu enables programming of the lighting type, total quantity of beacons installed, flash rate and the marker operation as flashing or steady. Optional GPS synchronization and delay programming are provided in this menu as well.

TOWER TYPE

This menu options specifies whether or not the tower lighting system should be red, white or both (dual). The following table illustrates the relationship between these different modes and how the system would run during different times of the day.

Tower Type	DAY	TWILIGHT	NIGHT	Usage
RED	OFF	OFF	RED	FAA Style A
WHITE	WHITE	WHITE	WHITE	FAA Style B, C, D
DUAL	WHITE	WHITE	RED	FAA Style E, F, G

Table 3-3: Site Tower Configuration Menu Options

Site Tower Configuration	TOWER TYPE	Red	
		White	
		Dual	
	# OF HI BCN TIERS (Number of High-Intensity Beacon Tiers)	0 – 6	
	HI BEACONS PER TIER	HI BCN TIER[1-6] (# of beacons)	0-8
	# OF AOL BCNS (Number of AOL Beacons)	0-9	
	NUM OF MKR TIERS (Number of Marker Tiers)	0-9	
	MARKERS PER TIER	MARKER TIER[1-9] (# of markers)	MKRTIER NOT PRESENT (0), 1-4
	REGULATORY SPEC	FAA	

		ICAO	
		CAR 621	
		4K WHITE NIGHT	
FPM RED Flashes Per Minute Red [4]		20 FPM	
		30 FPM	
		40 FPM	
		60 FPM	
FPM WHITE Flash Per Minute - White		40 FPM	
		60 FPM	
GPS SYNC		Enable/Disable	
GPS Delay [5]		Load Default Value	Yes /No
			Yes Confirm?
		0000 ms Valid Range 0-3000	
Catenary [3]		Disabled/60FPM/40FPM	
Disarm PD (Photodiode) Alarm[6]		On /Off	
MODE CONTROL SCHED (Mode Control Schedule)		NIGHT TO TWI (Night to Twilight)	
		TWI TO DAY (Twilight to Day)	
		DAY TO TWI (Day to Twilight)	
		TWI TO NIGHT (Twilight to Night)	
TWR MODE CTRL (Tower Mode Control)		PHOTODIODE/GPS/SCHEDULE	
Auxiliary Input [7]	Help	A Secondary System Can Use The Auxiliary Input To Command Lights On/Off.	
	Command Status	On /Off	

		Control Type	Help	Auxiliary Input Can Be Controlled By Either Modbus Or Dry Contact, But Not Both.
			Disabled	
			Modbus	
			Dry Contact	
		Confirm Output Configuration	Help	Choose Which Dry Contact Output To Override With Auxiliary Input Lights On/Off Command Confirmation.
			Disabled	
			Mode Status	
			Comm Alarm	
			GPS Sync. Alarm	
			Photodiode Alarm	
			Marker Alarm	
			Night Alarm	
			Day Alarm	
		Heartbeat [8]	Range Is 0 – 65535 (Value 100 = 10.0s)	
	MKRS Enabled		Help	When no is selected, markers will be turned off and no config alarm will be triggered.
			Yes/No	
	MKR MODE		STEADY	FLASHING
	IR Enable[3]		Help	To enable infrared beacon, the beacon must support IR.
			Yes/No	
	IR IS NIGHT ALM (IR is night alarm)		When selected an IR alarm will also cause a night alarm. Yes/No	

	# OR RLY BOARDS (Number of Relay Boards)	0-4		
	RELAY BOARD CONFIG	RELAY BOARD[1-4] CONFIG	RLY[1-14]:	UNASSIGNED
				T1 GENERAL ALARM
				AOL TIER GENERAL ALARM
				MKRT# GENERAL ALARM
				TWILIGHT MODE
				T#B# GENERAL ALARM
				AOLBCN# GENERAL ALARM
	CATENARY CONFIG	FH 372 BCN#		MIDDLE
				TOP
				BOTTOM

MONITORING CONFIG

This option selects the type of monitoring for the system. The options include Local Ethernet Configuration, Primary Data Monitoring and Alternate Data Monitoring.

NOTE: DRY CONTACT MONITORING IS AVAILABLE REGARDLESS OF ANY ADDITIONAL METHOD SELECTED TO MONITOR THE SYSTEM.

LOCAL ETHERNET CONFIGURATION

The options available in the Local Ethernet Configuration provide a way to configure the FTC 270 to properly operate on the connected network.

When the FTC 270 utilizes a cellular modem the settings should be as follows:

IP Address Mode: Static

IP Address: 192.168.1.11

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.1.10

The MAC Address is not editable.

PRIMARY DATA MONITORING

The options available in the Primary Data Monitoring submenu are: Disabled, Cellular Eagle 2.0, RS 485 Modbus RTU, Ethernet SNMP, Ethernet Modbus (RTU / TCP) and Ethernet Eagle 2.0. A brief description of the application for each method is listed in the following bullet points:

- **Cellular Eagle** - selected when the system is purchased with a cellular modem and will be monitored by the Flash Technology NOC.
- **RS 485 Modbus RTU** - used to connect via serial cable to an external monitoring device on site that supports Modbus protocol. (Not currently available)
- **Ethernet SNMP** - used to connect via Ethernet to a server that is able to monitor SNMP traps.
- **Ethernet Modbus (RTU / TCP)** - used to connect via Ethernet to an external monitoring device on site or to a server connected to the network that is able to monitor Modbus devices. (Not currently available)
- **Ethernet Eagle -** selected when the system will be connected to the Flash Technology NOC

ALTERNATE DATA MONITORING

Alternate Data Monitoring allows for a secondary monitoring method. All options available in the Primary Data Monitoring menu are available in the Alternate Data Monitoring menu.

Note: Monitoring Options are mutually exclusive. Example: If RS 485 Modbus RTU is selected in either menu, it is removed from the available options in the other menu.

Ethernet SNMP, if used, must be selected as the Primary Data Monitoring method.

Table 3-4: Monitoring Configuration Menu Options

Load Factory Default	Yes /No		
	Yes Confirm?		
	Default of Primary / Alternate Monitoring		
Local Ethernet Configuration	IP Address Mode	Static	
		Dynamic	
	IP Address	XXX.XXX.XXX.XXX	
	Subnet Mask	XXX.XXX.XXX.XXX	
	Default Gateway	XXX.XXX.XXX.XXX	
	MAC Address	XXXXXXXXXXXX	
	Commit Settings	Yes /No	
		Yes Confirm?	
Primary Data Monitoring	Monitoring Method: Disabled		
	Monitoring Method: Cellular Eagle 2.0	Autoupdate: XX Hours - XX Minutes	Hours (Enter Value Ranging From 0 - 24)
			Minutes (Enter Value Ranging From 0 - 59)
		Primary Server IP Address (Enter IP Address)	
		Primary Server Port 54630	
		Alternate Server IP Address (Enter IP Address)	
		Alternate Server Port 54630	
		Listen Port 54631	
		Sim Card: (AT&T Direct, AT&T ROW, AT&T ROW2 or Customized)[1]	Select AT&T Direct (SIM is Blue/White Front, Orange Back)
			Select AT&T ROW (Rest Of World) (SIM Is Solid White)
			Select AT&T ROW2 (Rest Of World 2) (SIM Is Solid White)
			Select Customized if you know your APN and are connecting to a third party NOC
	Monitoring Method: RS 485 Modbus RTU	Autoupdate: Disabled	
		Baud Rat: 9600	
		Station Address: Default is 2 (Enter Value Ranging From 0 – 255)	
	Monitoring Method: Ethernet SNMP[2]	Autoupdate: XX Hours - XX Minutes	Hours (Enter Value Ranging From 0 - 24)
			Minutes (Enter Value Ranging From 0 - 59)
		Primary Server IP Address (Enter IP Address)	

		Primary Server Port (Enter Port Number Range Is 0 - 65535)	
		Alternate Server IP Address (Enter IP Address)	
		Alternate Server Port (Enter Port Number Range Is 0 - 65535)	
		Listen Port (Enter Port Number Range Is 0 - 65535)	
	Monitoring Method: Ethernet Modbus	Autoupdate: Disabled	
		Listen Port: 00502	
		Station Address: Default is 2 (Enter Value Ranging From 0 – 255)	
	Monitoring Method: Ethernet Eagle 2.0	Autoupdate: XX Hours - XX Minutes	Hours (Enter Value Ranging From 0 - 24)
			Minutes (Enter Value Ranging From 0 - 59)
		Primary Server IP Address (Enter IP Address)	
		Primary Server Port (Enter Port Number Range Is 0 - 65535)	
		Alternate Server IP Address (Enter IP Address)	
		Alternate Server Port (Enter Port Number Range Is 0 - 65535)	
		Listen Port (Enter Port Number Range Is 0 - 65535)	
Alternate Data Monitoring	Same Menu as Primary Data Monitoring.[3]		

1. Menu option applies to AT&T modems only. Menu is not shown when Verizon modem is installed.

2. Ethernet SNMP, if used, must be selected as the Primary Data Monitoring method.

3. Monitoring Options are mutually exclusive. Example: If RS 485 Modbus RTU is selected in either menu, it is removed from the available options in the other menu.

MONITORING STATUS

This menu is only available when Cellular Eagle is selected as Primary or Alternate Data Monitoring Method . This menu provides information such as signal strength, cell number, cell ESN and time since last poll.

The Test Connect option allows the user to manually test the unit's ability to connect to the monitoring system. All headings in the Monitoring Status menu, other than Test Connect, are informational only.

Table 3-5: Monitoring Status Menu Options

Monitoring Status	Signal Bars	
	Signal DB	
	CIP	
	Cell Number	
	Cell ESN	
	Since Last Poll	
	Test Connect	Yes /No
		Yes Confirm?
	Ethernet Link: (Status)	

LOCAL DIAGNOSTICS

The Local Diagnostics menu allows the user to review the status of the FTC 270 and beacon and marker tier, if installed. The Local Diagnostics menu provides valuable information when troubleshooting the system.

SITE EVENT HISTORY

Site Event History provides a list of the 30 most current events or alarms affecting the operation of the system. A few examples of events that may be found in the event history are:

• CFG CHANGE (Configuration Change)

• T1B1 COMM (Tier 1 Beacon 1 Communication failure)

• MKRT1 COMM -> ALM/RST (Marker Tier 1 Communication failure)

• REBOOT EVENT (Z) (System Reboot with reboot code)

All events, except "REBOOT EVENT", are followed by an arrow and either "ALM" (Alarm) or "RST" (Restore) to show their state at the time of the event. Move the * to an event and press ENTER to display the time in days hours and minutes since the event occurred.

Note: The FTC 270 maintains event times and up to 30 are displayed.

Local Diagnostics	Site Event History [1]	Mode Override ➡ Off	Mode Override ➡ Off
			0D 0h 15M
		Mode Override ➡ On	Mode Override ➡ On
			0d 0H 20M
	Display Board	Runtime Days	i.e. 400d

			FTC270DISP : Month Day Year
			Hours : Minutes : Seconds
		Firmware Revision	FW (Firmware) [Version X.X]
		REBOOT COUNT	
		Controller A2D	Temperature – Deg. C, Deg. F
		Site Name	
		Site ID	
	Tower Control Board	Runtime Days	
			FTC 270: Month Day Year
		Firmware Revision	Hours Min Sec
			Firmware [Version X.X]
		Reboot Count	
			Temperature – Deg. C, Deg. F
			Tower Voltage
			Photo Diode Value
		Controller A2D (Values)	Pressure
			Altitude
			Humidity
		Site Name	
		Site ID	
			GPS Communications
			Antenna
			Satellites In View
			Last Sync.
		GPS (Status Only) [2]	Sync Type
			Altitude
			Latitude
			Longitude
			GPS Time in UTC
	HI Beacon	Runtime Days	
			FH 270 Beacon: Month Day Year
		Firmware Revision	Hours Min Sec
			Firmware [Version X.X]
		RS 485 Communications Quality	Percentage between 0 and 100
		White A2D – Panel 1 String 0-4, Panel 2 String 0-4, Panel 3 String 0-4	

		Red A2D	
			Temperature
			Pressure
			Altitude
		Misc A2D	Humidity
		IR A2D [3]	
	AOL Beacon	Runtime Days	
		Firmware Revision	FH372: Month Day Year
			Hours Min Sec
			Firmware [Version X.X]
		RS 485 Communications Quality (Percentage between 0 and 100)	
		White A2D – White String 0-4 Voltage and Current	
		Red A2D – Red String 0-1 Voltage and Current	
		MISC A2D	Temperature
			Input Voltage
		IR A2D	String Voltage and Current
	Marker	Runtime Days	
		Firmware Revision	MKR 372: Month Day Year
			Hours Min Sec
			Firmware [Version X.X]
		RS 485 Communications Quality (Percentage between 0 and 100)	
		Markers Sensed	
		Marker A2D – MARKER 1-4 Currents, Marker Driver Voltage	
			Temperature
			INV
			Pressure
			Altitude
		Misc A2D	Humidity

LIGHTING INSPECTION (LI)

The Lighting Inspection (LI) menu allows the user to test the alarm function of the beacon in all modes, markers and the photodiode dry contact. The Lighting Inspection can be performed as an automatic function (Automatic LI) or manually (Manual LI). A description of each LI mode is provided in the following bullet points:

- **Automatic LI** cycles through all test points and logs the results for each. No interaction is required during an Automatic LI. The previous test results can be reviewed by selecting Display Previous Results in the Automatic LI menu.
- **Manual LI** requires each test point to be selected. Once the selected function has been tested, the function must be restored and the next test point selected. This method continues for all lighting components installed in the system.

Note: Some monitoring systems require additional time between alarm generation and receipt of the alarm. Manual LI mode is recommended in this instance.

	Display Previous Results	"No Valid Results" Will Be Displayed If A Lighting Inspection Has Not Been Performed.	
Lighting Inspection (LI)	Automatic LI	Begin Test (1 Button Inspection - Beacons & Markers Tested In Parallel With No User Interaction.)	Yes /No
			Yes Confirm?
			Yes Confirm?
	Manual LI	Beacon Day Alarm	Alarm/Normal
		Beacon White Night Alarm	Alarm/Normal
		Beacon Red Night Alarm	Alarm/Normal
		Beacon Twilight. Alarm	Alarm/Normal
		Marker Alarm	Alarm/Normal
		Photodiode Dry Contact Test	Alarm/Normal

MODE OVERRIDE

Mode Override allows the system to be manually placed in any capable mode for a user definable period of up to 1024 hours. Once the mode override function has been activated, Override Mode will show the operating mode of the system and the time left of the override.

Cancel Override returns the system to normal operation with mode control directed by the photodiode.

Mode Override	Start Mode Override	Override Mode	White Day[1]
			White Night
			Red Night[2]
			White Twilight
		Override Time	Hours (Enter Value Ranging From 0 - 1024)
			Minutes (Enter Value Ranging From 0 - 59)
		Start Override	Yes /No
	Cancel Override		Yes /No
	Override Mode: (Displays The Current Override Mode)		
	Override Left: (Displays The Amount Of Time Remaining In The Current Override Mode)		

1. System will not flash when Override Mode "White Day" is selected for systems programmed as "Tower Type Red"
2. Option will not be displayed for systems programmed as "Tower Type White".

SYSTEM SETTINGS

This menu allows the FTC 270 to restart without physically interrupting the power, or allows the configuration settings to be restored to factory default values. Setting the date and time are available here as well.

System Settings	System Reboot	Yes /No
		Yes Confirm?
	Reset Factory Default	Yes /No
		Yes Confirm?
	Customized Configuration[1]	Waiting for password
		*****
	Real Time Clock	Date
		Time
		Daylight Savings Time (Enable/Disable)

1. Requires a valid password to set the customized configuration. Upon success unit will set the customized configuration based on the password entered.

SECTION 4:   WEB INTERFACE

The FTC 270 provides an intuitive web interface that is accessible via Wi-Fi or Ethernet connection.

From this interface, all the information that is included on the Display PCB1 is also available to view and change.
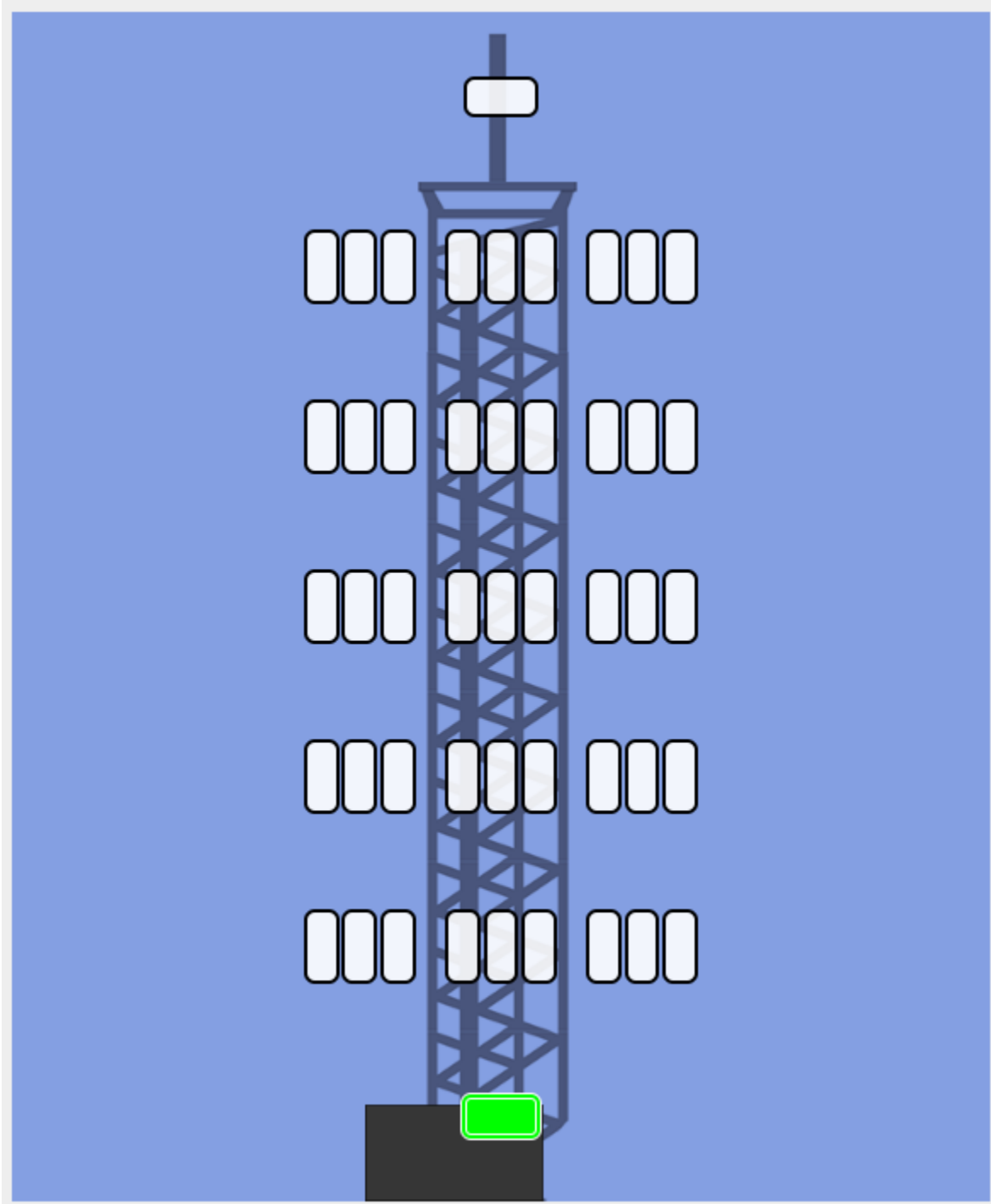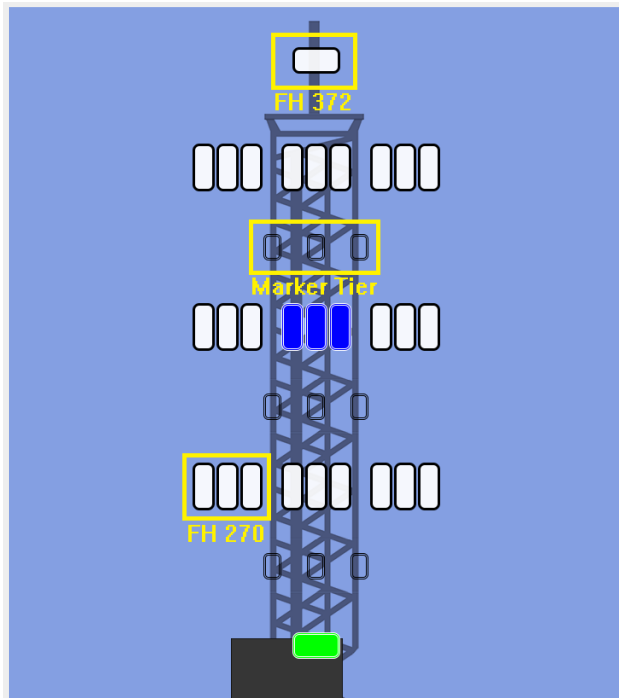
The focus of the home page is the tower visualization. The tower image includes hot spots that you may tap on to go to a details page for the light unit in question.

If a beacon (FH 270 or FH 372) in the system has an un-cleared alarm condition, it will show as a non-flashing icon and will appear in a blue color.

If the controller (FTC 270) has lost communications with any tower device, it will show as a non-flashing icon and will appear in a maroon color.

Marker alarms will appear in an orange color.

Legend	
Color Code	**Description**
	Tower Lighting Alarm
	Communication Alarm
	Marker Alarm

SECTION 5:   MAINTENANCE AND TROUBLESHOOTING

SAFETY WARNING!

Read the Personal Hazard Warning now (page vi**).** Disconnect primary power before opening enclosures.

Work safely, as follows:

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

PREVENTATIVE MAINTENANCE

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

1. Verify that moisture has not accidentally entered the equipment through gaskets or seals, or collected inside as condensation
2. Verify that all drain holes are clear
3. Check terminal blocks and relays for corrosion or arcing. Clean or replace any component that shows evidence of high-voltage 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 clean cloth or paper towel.
6. Check the circuit boards to ensure that they are free of accumulated dust. Brush and vacuum as necessary.

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

STORAGE

When not in use, equipment should be stored indoors. Circuit boards (PCBs), when not installed 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 at the wrong 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. After installation, you may find it necessary to add external filters or use other methods to reduce RFI entering the equipment.

DIAGNOSTIC TEST

The FTC 270 has built in diagnostic capabilities to assist in troubleshooting the system. Flash Technology recommends that a full system diagnostic test is run before troubleshooting individual system components.

COMPONENT TESTING

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.

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.

A2D VALUES (ANALOG TO DIGITAL)

The following information will provide details on how to use the Vanguard LED system diagnostic (A2D/Analog to Digital) values to diagnose failures within the LED flashhead (FH 270).

An LED string has two measurements for operation. String current and string voltage.

Description	Meaning
String Current (C)	Level of Light Intensity
String Voltage (V)	Health of the LED Strings

The string voltage indicates open or shorted LEDs in a string.

As LEDs fail in a shorted state, the string voltage will drop at an equal rate depending on the operating mode.

The FH 270 has 390 LEDs across three panels.

Flashhead (FH) Type	LED String Quantity (per panel)
FH 270	5 White strings with 24 LEDs per string
	5 Red LEDs
	5 Infrared LEDs

NOTE! The Red and IR strings are distributed across all three panels as one string (1/3 string per panel).

Failure	Result
LED string fails in an open state	Very high string voltage and minimal string current
LED fails in a shorted state	When a single white LED fails in a shorted state, the string voltage will drop by $1/24^{th}$ or 4.1%
	When single red or IR LEDs fails in a shorted state, the string voltage will drop by $1/15^{th}$ or 6.7%
	String current will remain the same.

TARGET A2D VALUES

Operating Mode	Low Temp. -40C/-40F	String Voltage Target	High Temp. 55C/131F	String Current Target	String Voltage Drop if 1 LED is lost
White Day	+50	950	-50	920	40
White Twi	+60	820	-60	300	34
White Night	+30	570	-30	570	24
Red Night	+45	755	-45	565	50
IR Night	+20	565	-20	NA	38
	Low Temp, Higher SV	Based at 24C/75F Ambient	Higher Temp, Lower SV	+ / - 10%	

FINDING THE A2D VALUES:

The following steps will be used to navigate to the A2D values within the system controller while onsite.

1. Press the **ENTER** button (1) time.
2. Scroll down to "Local Diagnostics" using the ↓ arrow and press **ENTER**.
3. Scroll down to HI Beacon Tier (or BCN depending on the FW version) and press **ENTER**.
4. Scroll down to Tier BCN press **Enter**
5. Select proper A2D (White, Red, IR) press **Enter**.
6. Select panel 1-3 press **Enter**
7. Select string **View Voltage and Current Values**

A2D TABLES:

The tables below provide details for an approximate drop for each mode and failure type.

Nominal White Day String Voltage A2D	950
1 LED shorted drops	40

Nominal White Twi String Voltage A2D	820
1 LED shorted drops	34

Nominal White Night String Voltage A2D	570
1 LED shorted drops	24

Nominal Red Night String Voltage A2D	755
1 LED shorted drops	50

Nominal IR String Voltage A2D	565
1 LED shorted drops	38

FAILURE SCENARIOS AND REMOTE TROUBLESHOOTING

A2D Values (additional details below table)	Recommended Replacement
1. High String Voltage & Low String Current	Single FH 270 Panel
2. Low String Voltage & Low String Current	Driver Assembly or Control Board
3. Normal String Voltage & Low String Current	Driver Assembly or Control Board

➢ If string voltage is above normal and string current is minimal – This indicates the LED string has failed in an open state and the flashhead panel should be replaced.

➢ If string voltage is below normal and string current is below normal – This indicates driver assembly or control board damage. The driver assembly or control board should be replaced.

➢ If string voltage is normal and string current is below normal – This indicates driver assembly or control board damage. The driver assembly or control board should be replaced.

➢ Other situations may be attributed to a failure in the sensing circuitry, indicating the control board may need to be replaced, instead of the driver assembly.

NOTE! If string voltage is below normal but string current is normal – There are shorted LEDs on that string. This in itself does not warrant flashhead panel or board replacement. This is not an indication that more LEDs will fail in the string.

Repair procedures are provided in Component Removal and Replacement.

COMPONENT REMOVAL AND REPLACEMENT

Note the wiring connections, wire colors, rotary dial positions and RS485 jumper positions when replacing boards. These must be replaced exactly as they were. If in doubt, refer to the INFO CARD on the cabinet door or the appropriate wiring diagram provided in this manual.

PC 270-1 HIGH INTENSITY POWER CONVERTER

PCB1 (F2161000 PCB FH CONTROLLER HIGH INTENSITY)

Remove:

1) Unplug all wire connectors.
2) Loosen seven Phillips-head screws which hold the PCB in place.
3) Slide the board to the left and then lift the board out of the enclosure.

Replace: Reverse the removal procedure.

- Connect the Ribbon Cables on J6, J7 and J8 to J1 of the corresponding order of PCB2 (J6 to PCB2 #1, J7 to PCB2 #2, J8 to PCB2 #3).
- Connect PB1's J1 to J2 of PCB3 CAP #1.
- Connect all 3 connectors for the RED OUTPUT at J3. Be sure that the BLK/RED wires are connected to J3.
- Connect all 3 connectors for the IR OUTPUT at J5. Be sure that the BLU/BRN wires are connected to J5.
- RS-485 communication wires must be connected to J4.
- AC input power wires must be connected to J2.
- Set rotary dials appropriately

PCB2 & PCB 3 (F2165000 - PCB FTB 270 HILED BCN DRIVER, F2165500 - PCB FTB 270 HILED BCN CAPACITOR)

Removal procedure:

1) Unplug all wire connectors.
2) Loosen three Phillips-head screws, which connect the driver assembly to the backplate of the enclosure.
3) Slide the bracket up and then lift the bracket with the boards out of the enclosure.

Replacement procedure: Reverse the removal procedure.

- When replacing assembly #1 (the left-most set), be sure to reconnect J2 to PCB1's J1.

PCB4 POWER SUPPLY (F5370800 - POWER SUPPLY 320W 54V 6A)

Removal:

1) Turn off input power by switching the Circuit Breaker on TB1 to the OFF position (GREEN).
2) Remove the bracket for PCB1, by first following the procedure for disconnecting the wiring harnesses to PCB1, then loosening the 4 screws retaining PCB1 and sliding the bracket down to remove the bracket.
3) Disconnect the input power lead to the power supply by removing GRN, BLU, BRN wires from the top half of TB2.

4) Disconnect the output power from the power supply by removing the corresponding RED, BLK wires from the bottom half of TB2.
5) Loosen the two Phillips-head screws located near the retaining bracket of the Power Supply. Slide the bracket out of the way and remove the Power Supply.

Replacement: Reverse the removal procedure.

- Be sure to connect the AC power input wire to the appropriate locations on the terminal block on TB2 (GRN wire to AC GND, BLU wire to AC L2, BRN wire to AC L1).
- Be sure to connect the DC output power wires to the appropriate locations on TB2 (BRN wire to DC+, BLU wire to DC-).

FH 270 HIGH INTENSITY FLASHHEAD

FH 270 DUAL LED PANEL (F1270110)

Removal:

1) Disconnect the flashhead cable by rotating the connector counter-clockwise to the unlock position, and then pull the cable off.
2) Loosen the two bolts that connect the FH 270 LED PANEL to the mounting bracket to provide about a ½" clearance.
3) Tilt the panel back (away from the front of the bracket) and then move the panel out and over the front lip of the mounting bracket.

Replacement: Reverse the removal procedure.

- With the retaining bolts loosened, slide the panel's u-bracket underneath the heads of the bolts and set back as far as it will go.
- Tighten the two bolts
- Reconnect the flashhead cable back to the FH 270 LED PANEL

FTC 270, FH 372, PC 372 AND MKR 372 MARKER INTERFACE

Note the wiring connections, wire colors, rotary dial positions and RS485 jumper positions when replacing boards. These must be replaced exactly as they were. If in doubt, refer to the INFO CARD on the cabinet door or the appropriate wiring diagram provided in this manual.

FIRMWARE UPGRADES

PREPARING THE USB DRIVE

The FTS 270 controller is capable of having its firmware upgraded via a USB drive. Firmware files can be found on Flash Technology's website http://www.flashtechnology.com/product-downloads/ and must then be loaded to a USB drive. The firmware file must be stored in the root directory of the USB drive (not in a folder).

UPGRADING DISPLAY BOARD FIRMWARE

- Place the USB drive into the USB slot on the controller's PCB3
- Once the update package is located on the drive, the unit's current firmware version will be displayed in a menu similar to "System X Firmware" and ask if you want to update the firmware.
- Select "Yes" to update
- Once completed, the unit will reboot
- Remove the USB drive

DOWNGRADING FIRMWARE

- Similar to the firmware upgrade process

ADDITIONAL NOTES

- It is advised to remove the USB drive once the firmware has been updated, however, a failure to do this will not result in the firmware being updated with each power cycle. The controller will recognize that the firmware file on the USB drive matches the file that was last used to upgrade it and will not commence the firmware upgrade process.
- Remote firmware upgrades are also possible. Remote upgrade requires network access (cellular or Ethernet) to the display board. Contact Flash Technology for more information about this process.

SECTION 6:   RECOMMENDED SPARE & REPLACEMENT PARTS

CUSTOMER SERVICE & CONTACT INFORMATION

Customer Service: 1-800-821-5825

Telephone: (615) 261-2000

Facsimile: (615) 261-2600

Internet Address: flashtechnology.com

Shipping Address:

> Flash Technology
>
> 332 Nichol Mill Lane
>
> Franklin, TN 37067

ORDERING PARTS

To order spare or replacement parts, contact Parts Department at 1-800-821-5825.

The following tables and figures provide the details on the major replaceable parts and their component locations for the FTC 270, PC 270-1, FH 270, PC 372, FH 372 and MKR 372 MARKER INTERFACE.

FTC 270 PARTS

Table 6-1 lists that major replaceable parts for the FTC 270, and Figure 6-1 shows the component locations.

Table 6-1: FTC 270 Replacement Parts

Reference	Item	Description	Part Number
FTC 270	PCB1	PCB FTC 270 CONTROLLER W/DISPLAY	2420102T
FTC 270	PCB2	PCB FTC 270 HILED CONTROLLER	2160000T
FTC 270	PCB6	PCB FTC 270 HILED RELAY INTERFACE	2164000T
FTC 270	PCB4	POWER SUPPLY 12VDC 2.0A	5370500
FTC 270	PCB3	PCB SMART BOARD WITHOUT GPS	2424500T
FTC 270	BATTERY	BATTERY 12V 4AH	4991885
FTC 270	MODEM	MODEM LTE ATT ETHERNET	5905106T
FTC 270		MODEM LTE VERIZON ETHERNET	5905107T
FTC 270	Wi-Fi ANTENNA	2.4 GHZ HIGH POWER ANTENNA	F5905130*
FTC 270	POE	POWER OVER ETHERNET (POE) ADAPTER	
FTC 270	WIRELESS SWITCH	SWITCH 5 PORT GIGABIT	5905260
FTC 270	TB1	TERM BLOCK INPUT AC POWER RS-485	1363010
FTC 270	TB2	TERM BLOCK FTC 270 DC-DC	1363014
FTC 270	PHOTODIODE	PHD 516 PHOTODIODE W/20' PIGTAIL SHLD	1855516
FTC 270		PHD 516 PHOTODIODE W/50' PIGTAIL SHLD	1855517
FTC 270		PHD 516 PHOTODIODE W/75' PIGTAIL SHLD	1855518
FTC 270	GPS BOARD	PCB FTS 371 GPS OPTION	2433000T
FTC 270	GPS KIT	FTS 371 GPS SYNC KIT	1370285

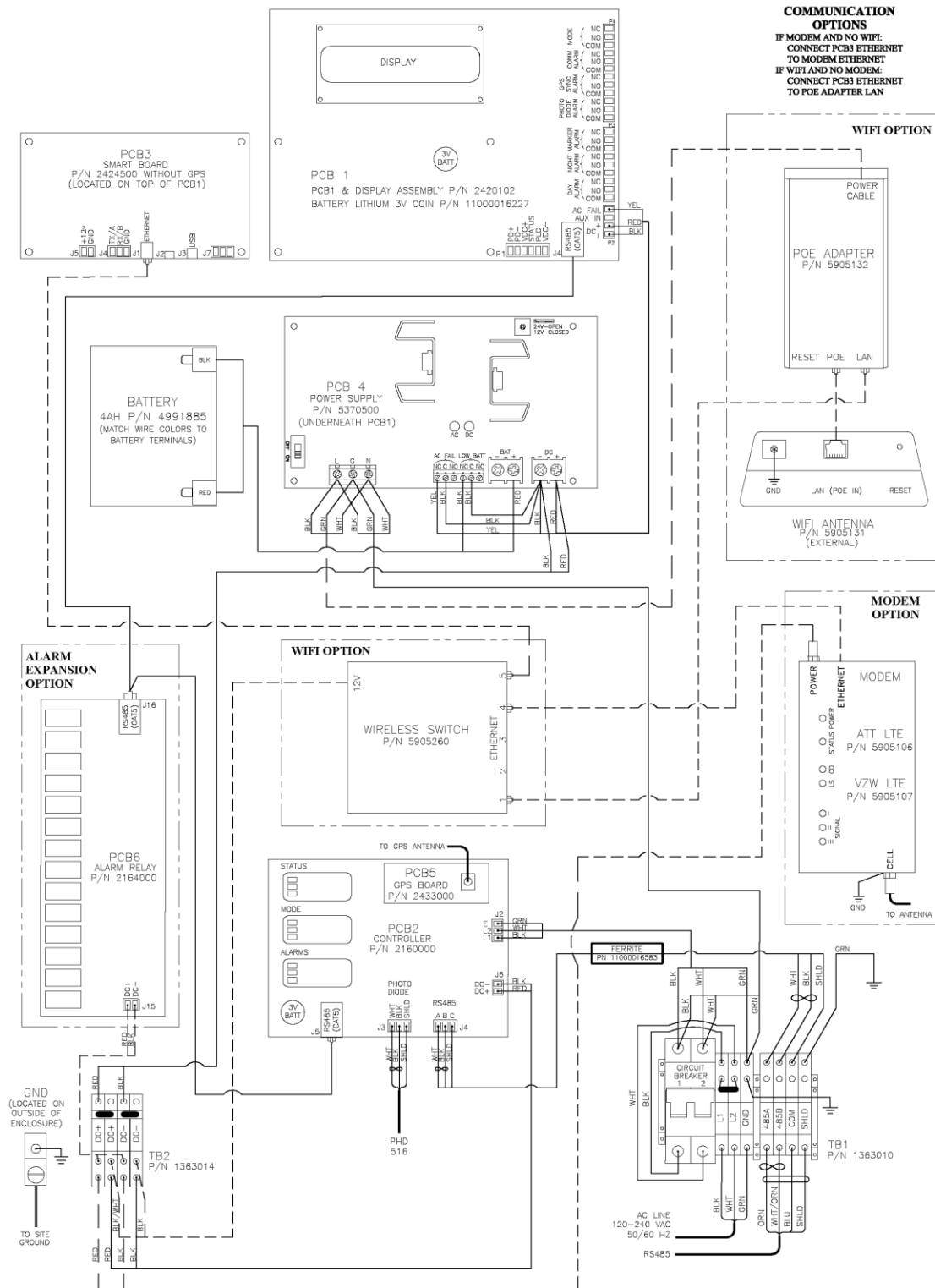*Only available as a kit (includes both Wi-Fi Antenna and POE)*

Figure 6-1: FTC 270 Internal Wiring & Component Locations

PC 270-1 AND FH 270 PARTS

Table 6-2 lists the major replaceable parts for the PC 270-1 and FH 270, and Figure 6-2 shows the component locations with the PC 270-1.

Table 6-2: PC 270-1 and FH 270 Replacement Parts

| Reference	Item	Description	Part Number
PC 270-1	PCB1	PCB PC 270 HILED CONTROLLER	2161000T
PC 270-1	PCB2 & PCB3 (#1, #2, #3)	PC 270 DRIVER ASEMBLY	1270210
PC 270-1	PCB4 (#1, #2, #3)	POWER SUPPLY 58V PC 270-1 ADJUSTED	1270800
PC 270-1	TB1	TERM BLOCK INPUT AC POWER RS-485 OVP	1363011
PC 270-1	TB2	TERM BLOCK PC 270-1 PWR SUPPLY AC-DC	1363012
PC 270-1	CONN (#1, #2, #3)	HARNESS PC 270-1 LED PANEL RED IR OUTPUT	4373004
FH 270	CABLE	CABLE FH 270, 10FT	4270000010
FH 270		CABLE FH 270, 25FT	4270000025
FH 270	LED PANEL	FH 270 DUAL LED – SINGLE PANEL	1270110
FH 270	PCB1	PCB FH 372 HILED AOL BCN CORE	F2162000T
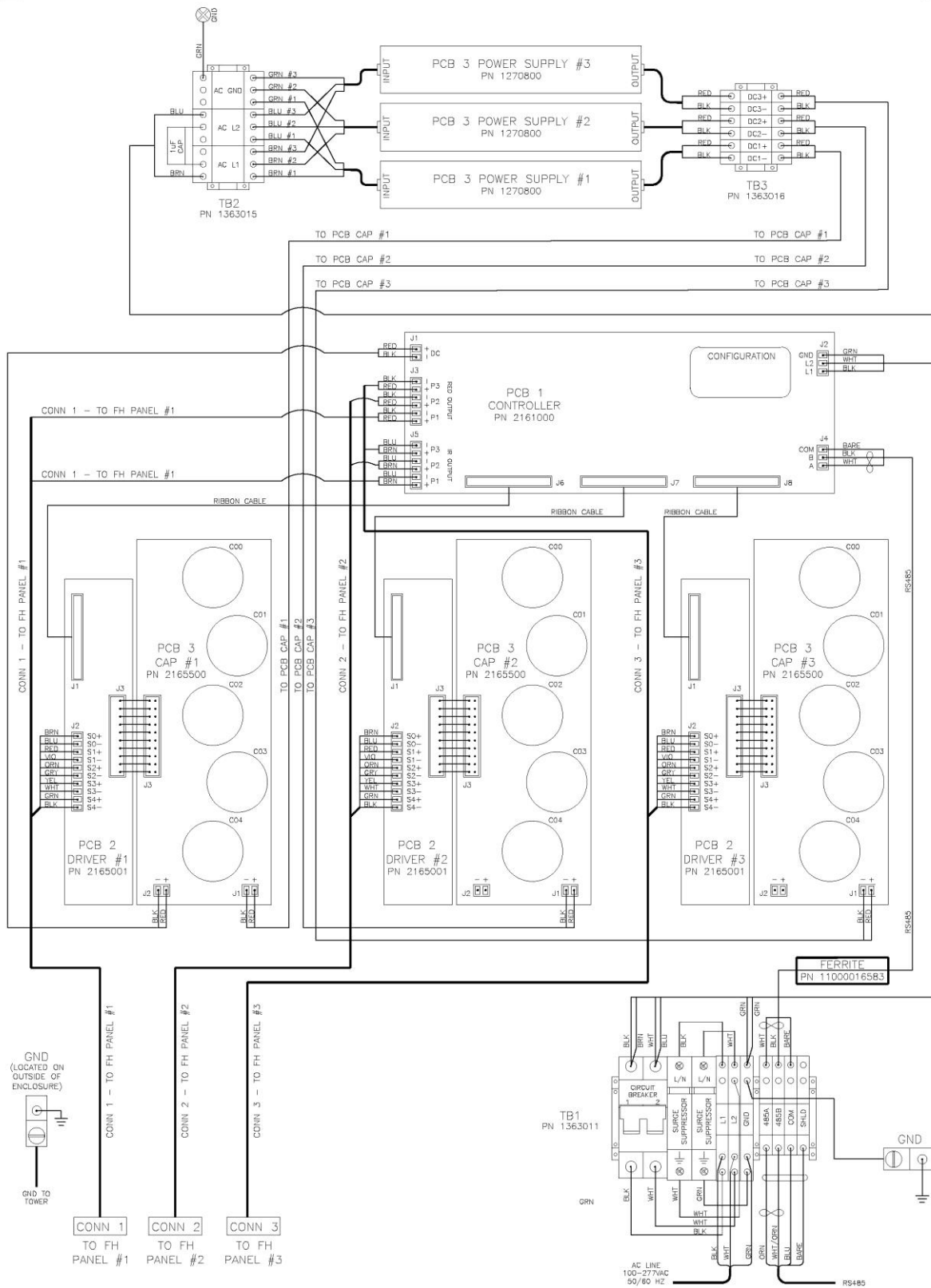
Figure 6-2: PC 270-1/PC 270-2 Internal Wiring & Component Locations

PC 372 AND FH 372 PARTS

The following table lists the major replaceable parts for the PC 372 and FH 372. Included below is also the wiring diagram with component locations for the PC 372.

Table 6-3: PC 372 and FH 372 Replacement Parts

| Reference	Item	Description	Part Number
PC 372	PCB1	PCB SURGE PC 372 277VAC QD TESTED	2420602T
PC 372	PCB2	POWER SUPPLY 58V SC 370 ADJUSTED	1370800
PC 372	CAPACITOR	CAP 230,000MF 75VDC	6370200
PC 372	TB1	TERM BLOCK INPUT AC POWER RS-485 OVP	1363011
PC 372	TB2	TERM BLOCK ASSY FH/SC CABLE	1362030
FH 372	LIGHT ENGINE	FH 372 LIGHT ENGINE REPLACEMENT	1372102
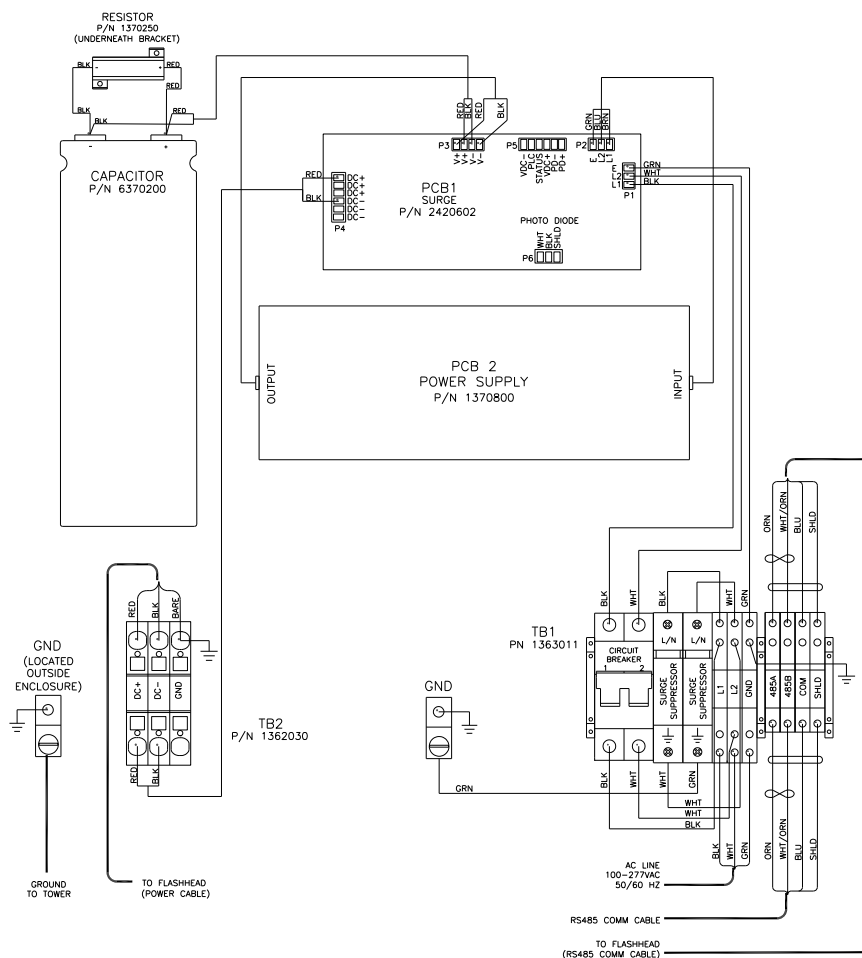
Figure 6-3: PC 372 Internal Wiring and Component Locations

Table 6-4 lists the major replaceable parts for the MKR 372 INTERFACE, and Figure 6-4 shows the component locations and wiring diagram

Table 6-4: MKR 372 MARKER INTERFACE Replacement Parts

Reference	Item	Description	Part Number
MKR 372 INT	PB1	PCB MARKER JBOX AC FTS 372 MKR 372 TESTED	2422100T
MKR 372 INT	TB1	TERM BLOCK INPUT POWER RS-485	1363010
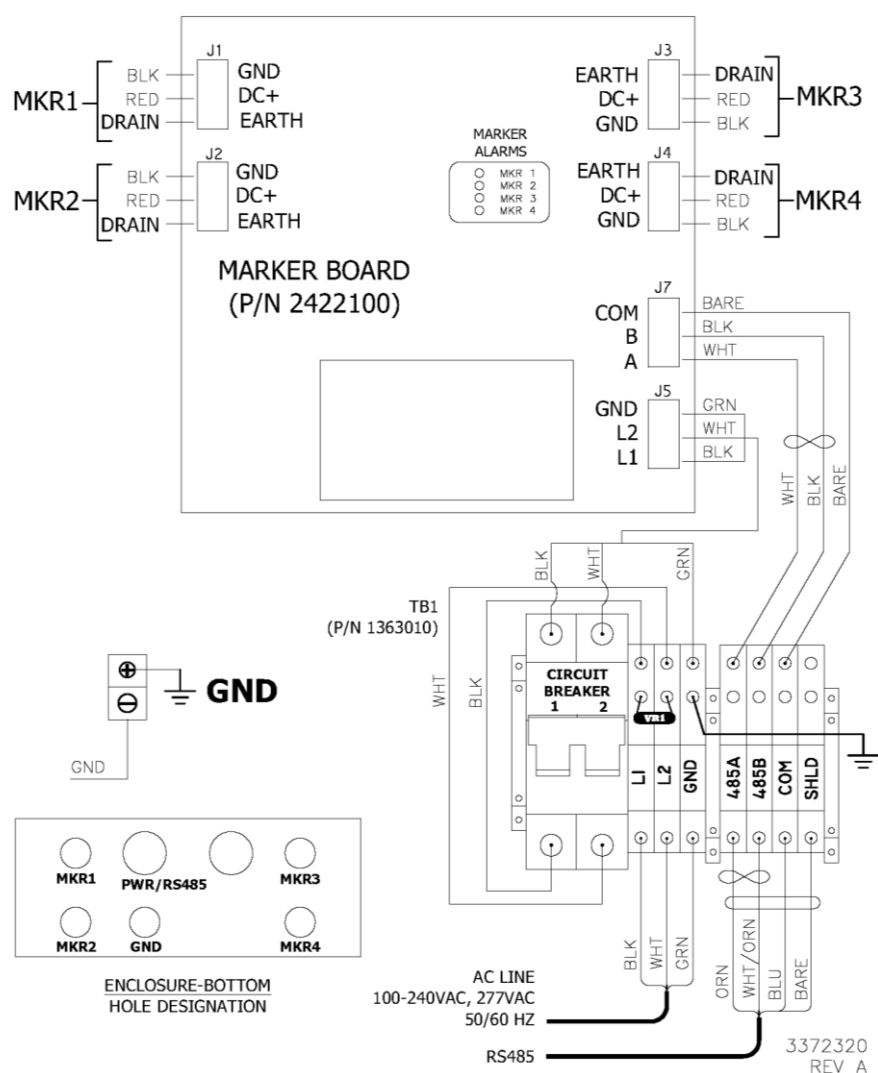
Figure 6-4: MKR 372 Interface Internal Wiring Diagram & Component Locations

RMA POLICY

If any system or part(s) purchased from Flash Technology need to be returned for any reason (subject to the warranty policy), please see the current RMA policy available online at:

flashtechnology.com/rma

To initiate an RMA, call the Flash Technology NOC to receive technical assistance (800-821-5825 Option 9, M-F, 7 a.m. to 7 p.m. CT).

Emailing a completed RMA request form to FlashSupport@spx.com can also start the process on sites not requiring detailed troubleshooting. The form can be filled out online at:

http://flashtechnology.com/rma-request-form/

NOTE: An RMA number must be requested from Flash Technology prior to return of any product. No returned product will be processed without an RMA number. Failure to follow the below procedure may result in additional charges and delays. Any product received without an RMA number is subject to return back to the sender. All RMA numbers are valid for 30 days.