FLASH TECHNOLOGY

AN SPX DIVISION

SERIAL NUMBER

FTB 324-2, FTB 324-2LT

Medium Intensity Obstruction Lighting System
Reference Manual
Part Number 7913242

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Front Matter

Abstract

This manual contains information and instructions for installing, operating and maintaining the FTB 324-2 Medium Intensity Obstruction Lighting System.

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Applicable Specifications

This equipment meets or exceeds requirements for an FAA Type L-864 and L-865.

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 components, under normal operating conditions, for 2 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 150/5345-43F, 150/5345-51 and 150/4345-53C. The certification is valid as long as the system is maintained in accordance with FAA guidelines (FR doc. 04-13718 filed 6-16-04).

Personnel Hazard Warning

Dangerous Voltages

Dangerous line voltages reside in certain locations in this equipment. Also, this equipment may generate dangerous voltages. Although FTCA has incorporated every practical safety precaution, exercise extreme caution at all times when you expose circuits and components, and when you operate, maintain, or service this equipment.

Avoid Touching Live Circuits

Avoid touching any component or any part of the circuitry while the equipment is operating. Do not change components or make adjustments inside the equipment with power on.

Dangerous Voltages Can Persist with Power Disconnected

Under certain conditions, dangerous voltages can be present because capacitors can retain charges even after the power has been disconnected.

Protect yourself — always turn off the input (primary) power and wait for one minute for storage capacitors to drain their charge. Then, check between the red and blue wires on the flashhead terminal block with a voltmeter for any residual charge before touching any circuit element or component.

Do Not Depend on Interlocks

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

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Section 1 – Introduction and Operation

System

Each single FTB 324-2 System consists of an FH 324-3 Flashhead, a PC 324-2 Power Converter, a PEC 510 Photocell, and a connecting cable from the power converter to the flashhead.

The power converter supplies the controlling circuitry to convert main AC power to the required voltages for internal operation and the discharge energy for the flashhead. It also controls the flash rate.

The photocell senses changes in lighting conditions from day to night and from night to day thus signaling the power converter to change its operation appropriately. Also, a manual intensity switch can override the photocell if required.

NOTE

The Flashhead supplied with an FTB 324-2 System is an FH 324-3. If an older flashhead is used, please call Flash Technology for upgrades. See Table 4-3 for Retrofit Kits and Safety Support Tool.

Specifications

Physical

PC 324-2 (H x W x D, Weight)
- 14.00 x 16.75 x 8.44 in., 51 lbs.
- 355.6 x 425.5 x 214.4 mm, 23 kg.

FH 324-3 (H x Diameter, Weight)
- 29.5 x 18.25 in., 28 lbs.
- 749 x 463 mm, 12.7 kg.

PEC 510 Photocell (H x W x Depth)
- 3.06 x 2.58 x 1.02 in.
- 77.7 x 65.5 x 2.59 mm

Aerodynamic Wind Area

Flashhead	2.59 ft^2, 0.241 m^2
Power Converter	1.63 ft^2, 0.15 m^2

Environmental
- Complies with FAA specifications in AC 150/5345-43.

Performance Characteristics

Application - L-865 and L-864

Flash Intensity (nominal):

Day (White)	20,000 ± 25% ECD
Night (Red)	2,000 ± 25% ECD
White Backup	2,000 ± 25% ECD
Beam Spread	Horizontal: 360º
	Vertical: 5º

Flash Rate

Day (White)	40 flashes per min.
Night (Red)	20 flashes per min.
White backup	40 flashes per min.

Electrical (PC 324-2)

AC Voltage	120 or 240V, 60 Hz
	110 or 230V, 50 Hz
	208-240V 50 Hz
Volt-Amperes	250 peak
Day (White)	130W
Night (Red)	145W
White Backup	55W

Operation

The PC 324 Power Converter operates an FH 324. It monitors flashhead operation and signals an alarm if a failure occurs. The flashhead begins to operate as soon as power is applied. A photocell controls intensity for the system.

In daylight, lights flash white at a rate of 40 flashes per minute (FPM) at an intensity of 20,000 candelas. At night the light flashes red at a rate of 20 FPM at an intensity of 2,000 candelas.

Obstructions over 350 feet above ground level require several interconnected PC 324 power converters (typically three) operating the corresponding number of flashheads. A master/slave control line (two-wire) at terminals TB1-4 and TB1-5 at the front panel interconnects the units. A sync pulse on the line flashes all the lights in unison and at the same rate.

Table 1-1 – Model Configurations

Models	Lights	Operation
324-2E, 324-2LT	L-865 White (40 FPM) L-864 Red (20 FPM) L-810 Incandescent Markers	White During Daylight Red During Night
324-2L, 324-2EL, 324-2LTL	L-865 White (40 FPM) L-864 Red (20 FPM) L-810 Standard LED Markers	White During Daylight Red During Night
324-2M, 324-2EM, 324-2LTM	L-865 White (40 FPM) L-864 Red (20 FPM) L-810 6.8W LED Markers	White During Daylight Red During Night

Note:

1. The "E" option shown above denotes the addition of the optional modem card for remote diagnostics and monitoring.
2. The 324-2LT operates in the same manner as the 342-2 but several common features are not available.
    - The relay outputs are limited to Red Alarm, White Alarm and Marker Alarm. Photocell failure is also monitored and will trigger either the Red or White Alarm depending on mode.
    - Eagle monitoring is not available. This includes the RS-232 used for Tech Eagle, the RS-485 used to interface to the FTM-5000 or FTW-172, and the modem expansion port.
    - To upgrade the system to provide the additional relay contacts or to take advantage of Eagle diagnostics, please contact Flash Technology to purchase a 2903800 timing and trigger board.

Alarm Contacts

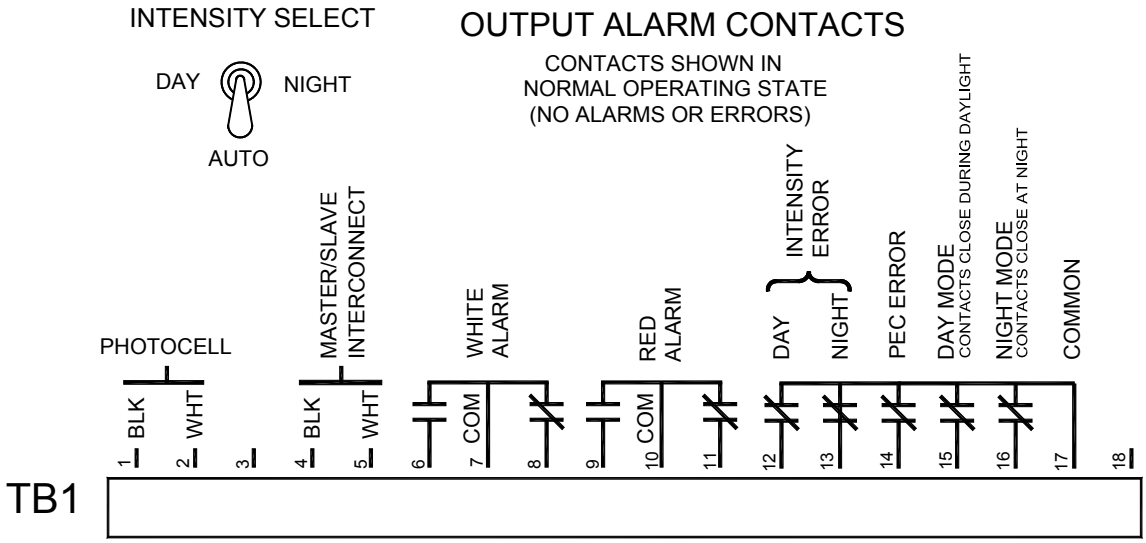


Figure 1-1 – TB1 Alarm Contacts

NOTE: 324LT systems do not have relay contacts TB1-12, TB1-13, TB1-15 or TB1-16.

Table 1-2 – Alarm Contacts

Contact	**Indication**
White Alarm	Combination of Day Intensity and Photocell Errors.
Red Alarm	Combination of Night Intensity and Photocell Errors.
Day Intensity Error	Incorrect day intensity.
Night Intensity Error	Incorrect night intensity.
Photocell Error	Photocell alarm. The PEC failed to transition within 19 hours.
Day Mode	Day mode operation.
Night Mode	Night mode operation.

Note: 324LT systems do not have intensity error or mode contacts.

Photocell

The photocell changes resistance as ambient light changes from day to night or from night to day. The Timing and Trigger Board (PCB1) in the master power converter then converts the changes into the necessary circuit operation to flash the lights at the appropriate intensity for day or night operation.

PCB1 Timing and Trigger Board

PCB1 controls and monitors the operation of the PC 324. Status indicators and setup options are shown below.

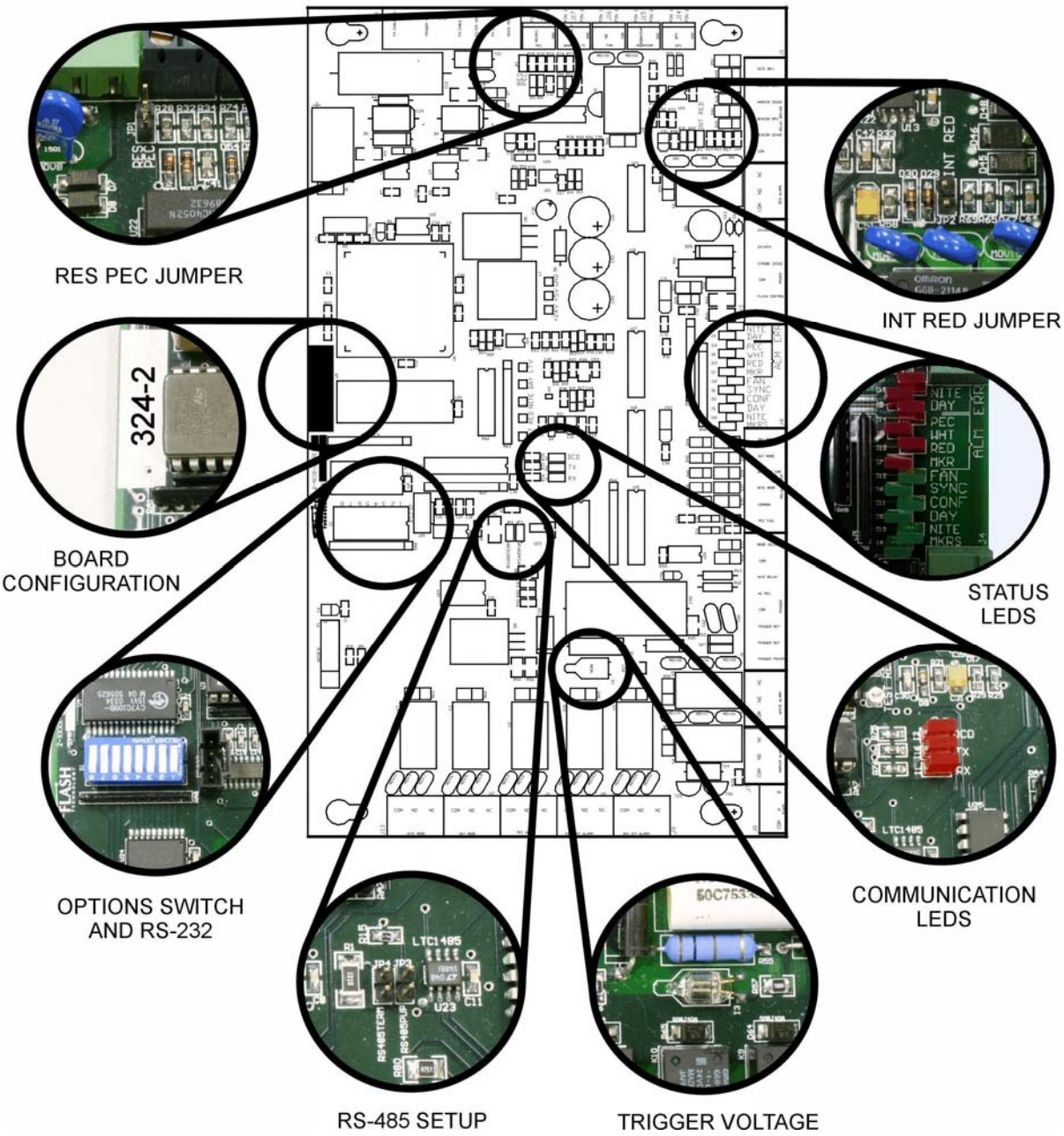


Figure 1-2 – 2903800 Board Configuration

Board Configuration

The 2903800 board is programmed from the manufacturer for operation in the PC 324. The board will be clearly marked in the area shown in Figure 1-2.

Options Switch

The options switch allows configuration of the RS-485 address, number of markers and alarm isolation.

Table 1-3 – Options Switch

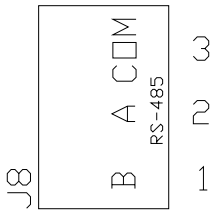
Switch	Function
1	Alarm Isolation (OFF – (default) Isolate) (ON – Report Alarm)
2-4	RS-485 Address
5-7	Number of Markers

Alarm Isolation

Setting switch #1 to ON allows a red alarm to be sent to other units over the master/slave sync. This feature is used to allow a slave beacon to send the rest of the system into white backup when a failure occurs in red night mode. The Master beacon will read the alarm and send all beacons into white backup. This is useful for stack systems that have all beacons at the same height and any failing beacon should cause the system to go to white backup. All units in the system must have the switch set to ON for this feature to be used. The default (OFF – Isolate) prevents slave units from causing the system to go to white back up if a red failure occurs on the slave. Generally, a system should only go to white back up if the top (master beacon) fails in red night mode.

RS-485 Communication

RS-485 is used to communicate with the FTM-5000 or FTW-17X for monitoring of multiple beacon systems. The connections are available on J8 in the lower right corner. The pin assignments are shown below:



When all switches are OFF, the RS-485 is disabled. Once addressed, modem and RS-232 communication will be disabled and the RS-485 will become active. Table 1-4 defines the RS 485 address setup.

Table 1-4 – RS 485 Address

2	3	4	Address
OFF	OFF	OFF	RS-485 Disabled
ON	OFF	OFF	1
OFF	ON	OFF	2
ON	ON	OFF	3
OFF	OFF	ON	4

Note: 324LT systems do not have RS-485 and switches 2-4 are not used.

Number of Markers

Switches #5-7 select the number of markers installed. Once set, the unit will alarm when the number of markers detected falls below this level. Table 1-5 describes the marker switch setup.

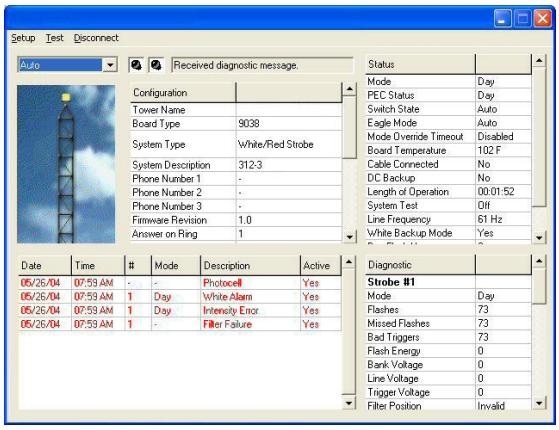
Table 1-5 – Marker Switch Setup

5	6	7	Markers
OFF	OFF	OFF	0
ON	OFF	OFF	1
OFF	ON	OFF	2
ON	ON	OFF	3
OFF	OFF	ON	4
ON	OFF	ON	5
OFF	ON	ON	6

RS-232

The RS-232 port allows programming and troubleshooting using Tech Eagle shown below (available for download from www.flashtechnology.com):

Note: The Tech Eagle connection is not available on 324LT systems.



A direct connect cable, part number 3859001, is required for connection between the 2903800 board and the PC. For more information, select the Help menu in Tech Eagle.

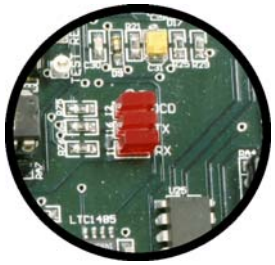
RES PEC Jumper

The RES PEC jumper is removed by default. The FTB 324 uses a PEC 510 resistive photocell for determining mode transition. To use an AC photocell, short this jumper and connect the output of the photocell to pins 4 (AC) and 5 (Return) of J5.

Trigger Voltage

The trigger voltage neon provides an indication that trigger power is being supplied to the 2903800.

Communication LEDs



The TX and RX LED's indicate the transmission and reception of data through the board's serial port via the RS-232, RS-485 or the modem card. The DCD LED will be active when a connection has been made via the modem.

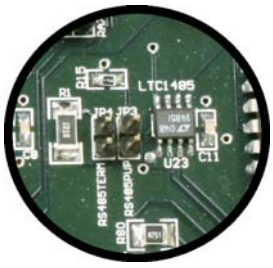
Status LEDs

Table 1-6 describes the status LEDs display alarm and mode information.

Table 1-6 – Status LEDs

LED	Indication
NITE ERR	Incorrect night intensity.
DAY ERR	Incorrect day intensity.
PEC ALM	Photocell alarm. The PEC failed to transition within 19 hours.
WHT ALM	Combination of DAY ERR and PEC alarm.
RED ALM	Combination of NITE ERR and PEC alarm.
MKR ALM	Detected markers have fallen below the level set by the options switch.
FAN	Not used.
SYNC	The Master / Slave Interconnect is active. Flashes during normal operation.
CONF	A valid flash has been detected.
DAY	Day mode operation.
NITE	Night mode operation.
MKRS	Marker output is active.

RS-485 Setup

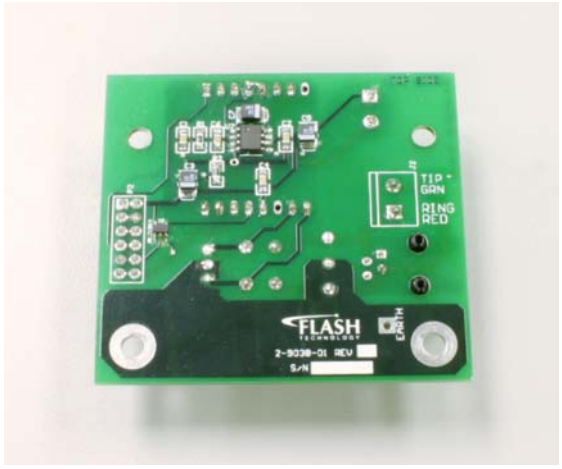


RS485TERM and RS485PUP are open by default and should be shorted only on the last 2903800 board in the series of equipment connected to an FTM-5000 or an FTW 17X series monitoring unit.

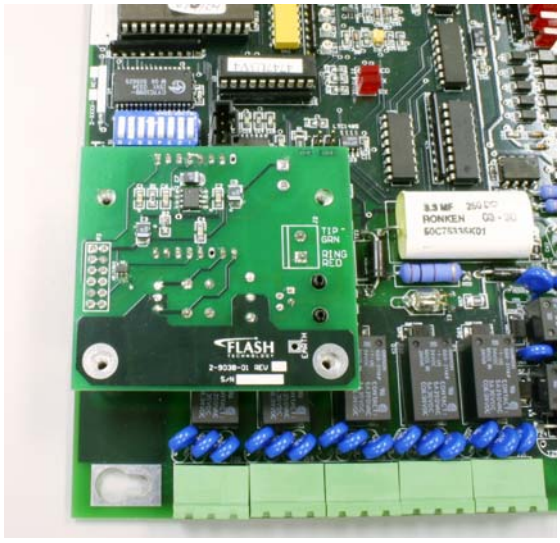
Internal Red Jumper

Always shorted for the FTB 324.

Optional Modem Card



The 2903801 modem board is installed in the lower left corner of the board.



The terminal block can be removed for easy connection of the phone wires.

The modem is included with all “E” (Eagle) systems or can be added later as an upgrade excluding the 324LT.

Section 2 - Mounting, and Installation

Unpacking

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

Tools

Although no special tools are necessary, Flash Technology suggests the following hand tools for installation and maintenance:

- 9 or 12 inch, flat blade #2 screwdriver
- #2 Phillips® head screwdriver
- Medium slip joint pliers
- Set of combination wrenches
- Long-nose pliers
- Assorted nut driver handles: 1/4", 5/16", 3/8" recommended
- Analog volt-ohm meter
- Multi-purpose crimp tool
- Safety Support Tool (P/N 1905333)

Access

WARNING

Before proceeding, read the warning on Page iii. Disconnect the primary power before opening enclosures.

Power Converter

The base of the power converter has mounting feet. The cover lifts off for unrestricted access to the interior. Release the latches that secure the cover to remove it for internal access.

Flashhead

Pivot the lens open by disengaging two quick-release latches. Two lanyard cables secure the lens. The flashhead normally contains no interlock. Disconnect primary power to the power converter before you open the flashhead. Wait one minute for storage capacitors to drain down. Open the flashhead and use a voltmeter to check that no voltage potential exists between the red and the blue wires on the ceramic terminal posts.

Mounting

Power Converter

Mounting and outline dimensions for the power converter are shown in Figure 2-1. Flash Technology does not furnish mounting hardware unless ordered as part of an installation kit. Use the following guidelines for mounting the power converter:

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

Allow space for air flow around the power converter.

You must use a bonding strap on a bolt through the power converter case leg. Connect the strap to the site grounding system.

Flashhead

Mounting and outline dimensions for the flashhead are shown in Figure 2-2. The flashhead must be protected from lightning strikes. The flashhead may be mounted to painted or unpainted surfaces. One of the mounting holes in the base of the flashhead contains a built-in electrical ground connection. Use the following guidelines for mounting the flashhead:

Use a lightning rod extended above the flashhead to protect it when it is mounted at the uppermost part of the structure.

Avoid locating a lightning rod where it would prevent tilting the lens open or interfere with access by maintenance or service personnel.

You must use a bonding strap with a flashhead mounting bolt when mounting the flashhead to the structure, using the mounting bolt to fasten the strap to the leg that contains the ground connection.

Flashhead Leveling

The flashheads must be level for correct vertical beam alignment. Two leveling vials—aligned with the mounting feet—are permanently attached to the flashhead assembly. Typically, the mounting surface for the flashhead is level and no adjustments are required. When the flashhead is level, bubbles in both leveling vials are centered. For leveling, use the following guidelines:

If adjustment is necessary, raise the appropriate mounting foot with shims or washers. Raising one foot by 1/16 inch (1.6 mm) tilts the beam about 1/2 degree.

Take extreme care to ensure that all four feet rest snugly against a firm mounting surface before tightening the mounting bolts. Failure to do so could result in serious damage to the base when you tighten the bolts.

Photocell

Mounting and outline dimensions for the photocell are shown in Figure 2-3. The photocell uses a male 1/2" NPT for mounting. Use the following guidelines to mount the photocell:

Locate the photocell where it has an unobstructed view of the polar sky.

It must not view direct or reflected artificial light.

The photocell may be supported directly by electrical conduit.

Ensure that the installation is watertight.

Installation

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

NOTE

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

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

You can find conduit and other distribution wiring details on electrical installation diagrams provided by Flash Technology or others. Installation instructions concerning red light marker fixtures are not part of this manual.

All communication wiring should have an insulation rating of 300 volts minimum. All power wiring should have an insulation rating of 600 volts. You must size power service wiring to satisfy the load demand of the red light system (if present) and the power converters. Read the notes on the installation wiring diagrams supplied both in this manual and with the equipment. See Figure 2-8 for information about wiring alarm connections to the main panel of the power converter.

Power Converter Wiring

Consult the installation wiring drawings. For service wiring, consider the voltage, length of the wire run, and the total load (number of lights). Assume a load of 175

volt-amperes per light, and do not permit the line voltage to drop by more than 5% due to wire resistance. Assume a load of 175 volt-amperes per light to determine the slow-acting fuse ratings at the power distribution panel. Use a value of 250 volt-amperes per light to determine fast-acting fuse ratings at the power distribution panel and to select a system feeder transformer (if used).

In multiple-unit systems, the master unit and slave units communicate over the "master/slave" interconnect wiring. To insure proper communication between all interconnected units, the power converters must be on the same electrical phase. Also, the "master/slave" interconnect wires must be twisted together at a minimum rate of 6 twists per foot. The recommended minimum size for control and signal conductors is #16 AWG.

Flashhead Wiring

The power converter and flashhead are interconnected by the flashhead cable. When Flash Technology Part Number 6340, or equivalent cable, is used, the two may be separated by a distance up to 600 feet. Consult the factory when a greater separation is necessary. The cable between the power converter and flashhead requires five conductors with 600 volts (minimum) insulation. Two of the conductors must be #10 AWG. The other three may be #14 AWG (minimum; for mechanical strength) if you are cabling together individual wires.

To ensure long-term equipment reliability, use continuous wiring between the power converters and their flashheads without intervening junctions or splices.

Securing the Cable

Flash Technology recommends the following method for securing the flashhead 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 also directly above and below any tower leg flanges that the cable may cross.

Photocell Wiring

The photocell is supplied with a pigtail for connection to wires that connect to the power converter. It is connected to the main panel of the power converter. It may be located any practical distance from the power converter. The recommended minimum wire gauge is #16 AWG.

The photocell terminals on the slave power converters must be jumpered from TB1-1 to TB1-2. (An alternative jumper may be installed on PCB1 J18-1 to J18-2.) Also, the master unit (to which the photocell is directly connected) must be connected to the top flashhead.

Installation Checklist

Complete the following steps before applying power to the lights.

1. Inspect all equipment for damage.
2. Verify the received equipment against the packing list to ensure completeness.
3. Power Converter Mounting. Position and mount each unit correctly, allowing adequate clearance for

opening the covers. Use the following checks:

1. Ensure that the case is mounted upright, is water tight, and grounded to the site grounding system.
2. Check hardware to ensure that all mounting hardware is tight.
3. Ensure that only the bottom of the case has drain holes and that they are clear.
4. Ensure that no holes are punched or drilled on the top surface of the case.
5. Ensure that air can flow around the case.
6. Mount the power converter away from radio frequency interference (RFI).

4. Power Converter Wiring. Examine the installation drawings and use the following checks:
    1. Check for proper incoming service voltage.
    2. Wire each unit according to the instructions.
    3. In multiple installations of three systems, all three power converters should be on the same breaker.
    4. Check all electrical connections for tightness.
    5. Check all terminal strip connections for tightness.
    6. Ground the power converter.
    7. Wires at master/slave interconnect terminals should be daisy-chained as a twisted pair between the master power converter and the slave units. The rate of twist is 6 per foot minimum. If a shielded cable is used, ground the shield. For example, ensure that TB1-4 is connected to all TB1-4 connections on all units, and TB1-5 is similarly connected.
5. Alarm Wiring.
    1. If external alarm detection circuit responds to closed contacts, ensure that they are wired to the contacts on TB1 that close on alarm.
    2. If external alarm detection circuit responds to open contacts, ensure that they are wired to the contacts on TB1 that open on alarm.
    3. Alarm wiring should be lightning and RFI protected: shielded, grounded shield, and in a conduit.
    4. If a specific alarm is ganged together from all power converters as one, ensure that the wiring follows local installation instructions.
6. Flashhead Mounting.
    1. Ensure that the flashhead lens can be opened without striking other objects.
    2. Level and aim the flashhead.
7. Flashhead Wiring.
    1. Protect the top flashhead against lightning strikes.
    2. Ground the flashhead.
    3. Check the wiring of the flashhead cable to the flashhead.
    4. Secure the flashhead cable to the tower. Support and tape the flashhead cable to prevent its movement by the wind.
8. Photocell.
    1. Locate photocell where it views unobstructed polar sky with no direct or reflected artificial lighting striking it.
    2. Mount the photocell vertically to prevent water from entering the

unit. Ensure watertight connections.

3. Connect the photocell to the master power converter.

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

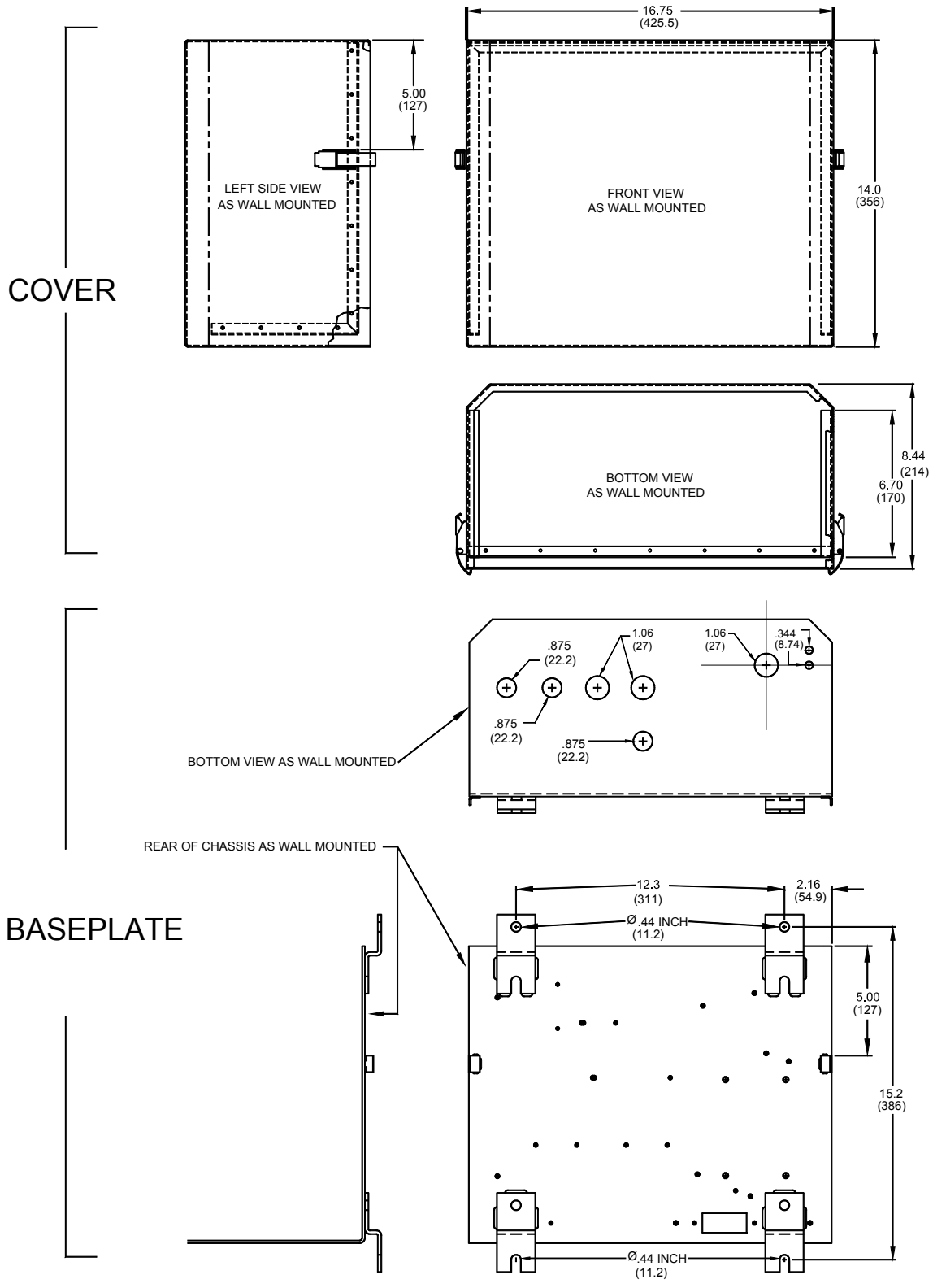
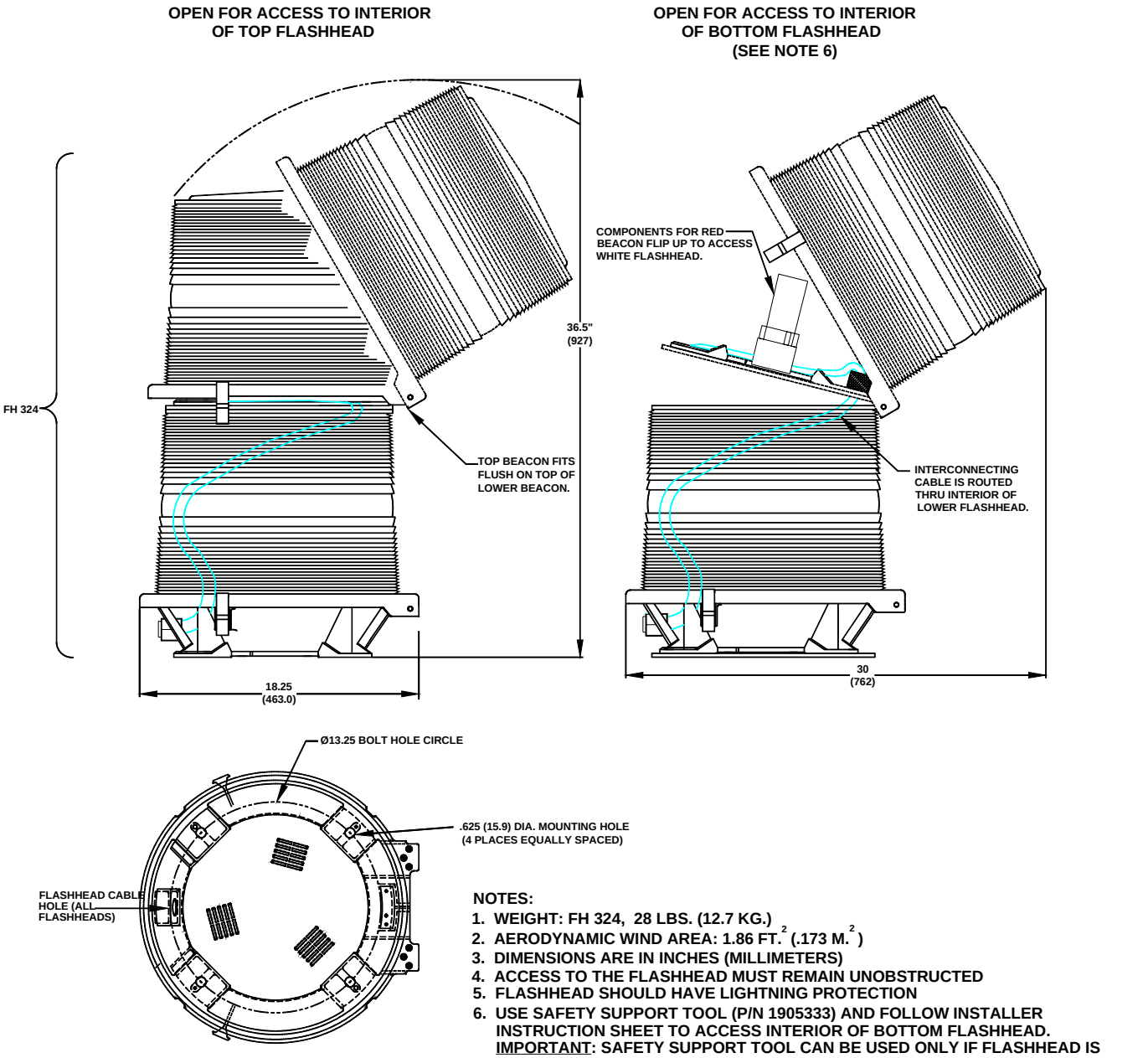


Figure 2-1 – Power Converter Mounting and Outline



NOTES:

1. **WEIGHT: FH 324, 28 LBS. (12.7 KG.)**
2. **AERODYNAMIC WIND AREA: 1.86 FT.^{2} (.173 M.^{2})**
3. **DIMENSIONS ARE IN INCHES (MILLIMETERS)**
4. **ACCESS TO THE FLASHHEAD MUST REMAIN UNOBSTRUCTED**
5. **FLASHHEAD SHOULD HAVE LIGHTNING PROTECTION**
6. **USE SAFETY SUPPORT TOOL (P/N 1905333) AND FOLLOW INSTALLER INSTRUCTION SHEET TO ACCESS INTERIOR OF BOTTOM FLASHHEAD. IMPORTANT: SAFETY SUPPORT TOOL CAN BE USED ONLY IF FLASHHEAD IS FH 324-3 OR HAS BEEN RETROFITTED (CALL FLASH TECHNOLOGY FOR DETAILS).**

Figure 2-2 – Flashhead Mounting and Outline

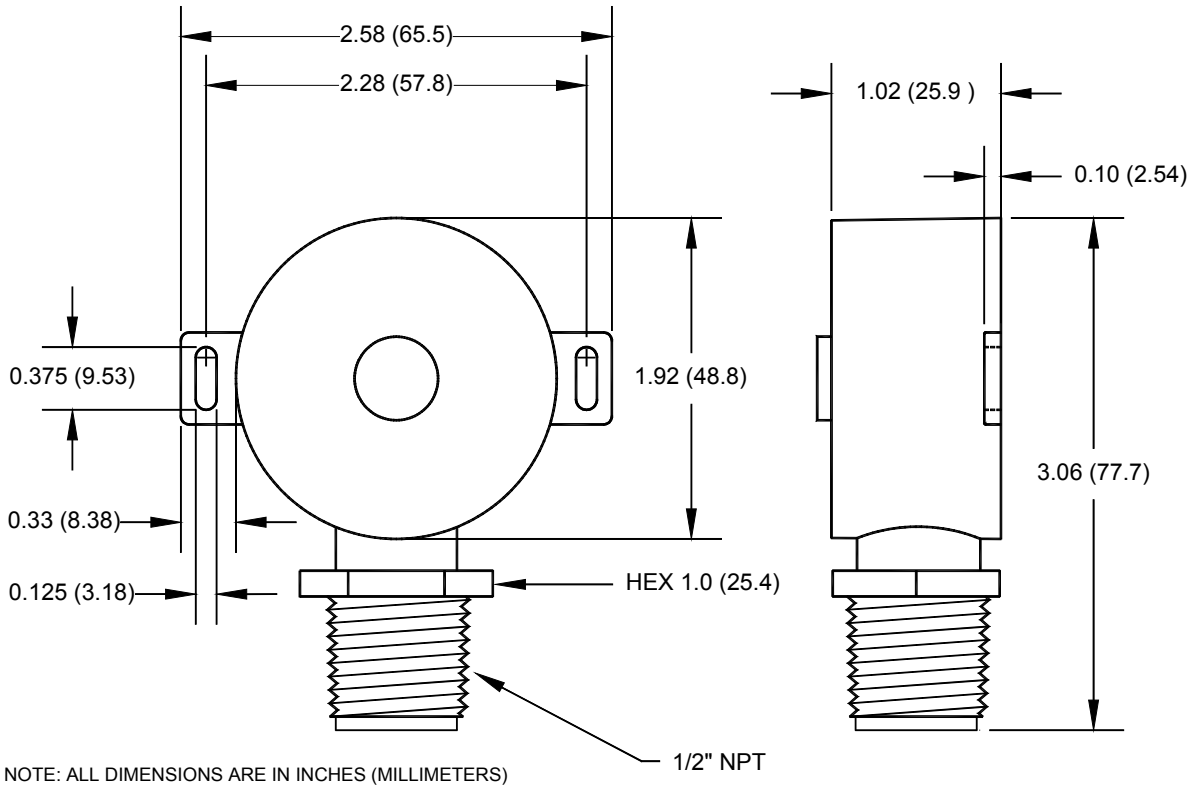


Figure 2-3 – Photocell Mounting and Outline

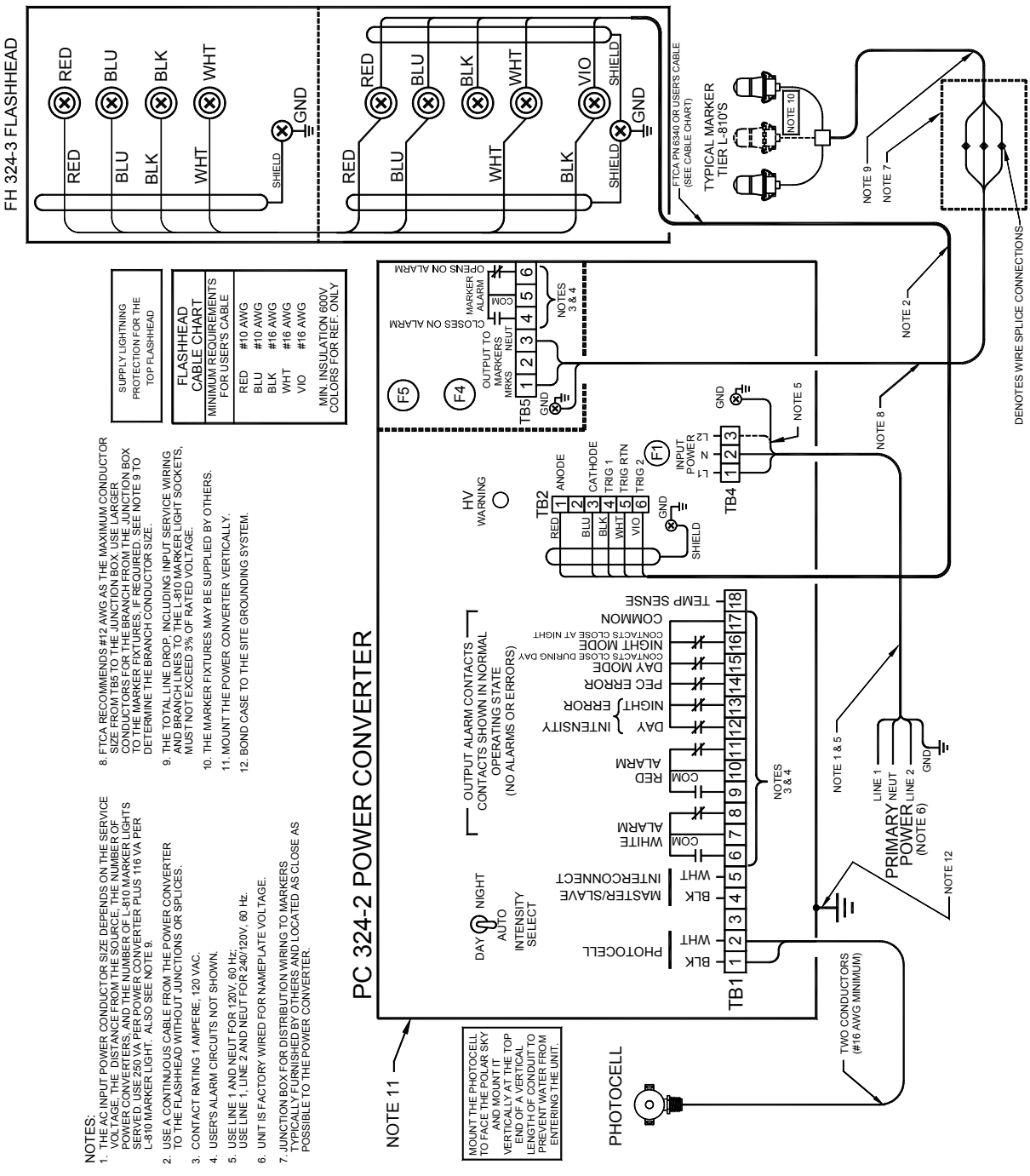


Figure 2-4 – Typical System Installation

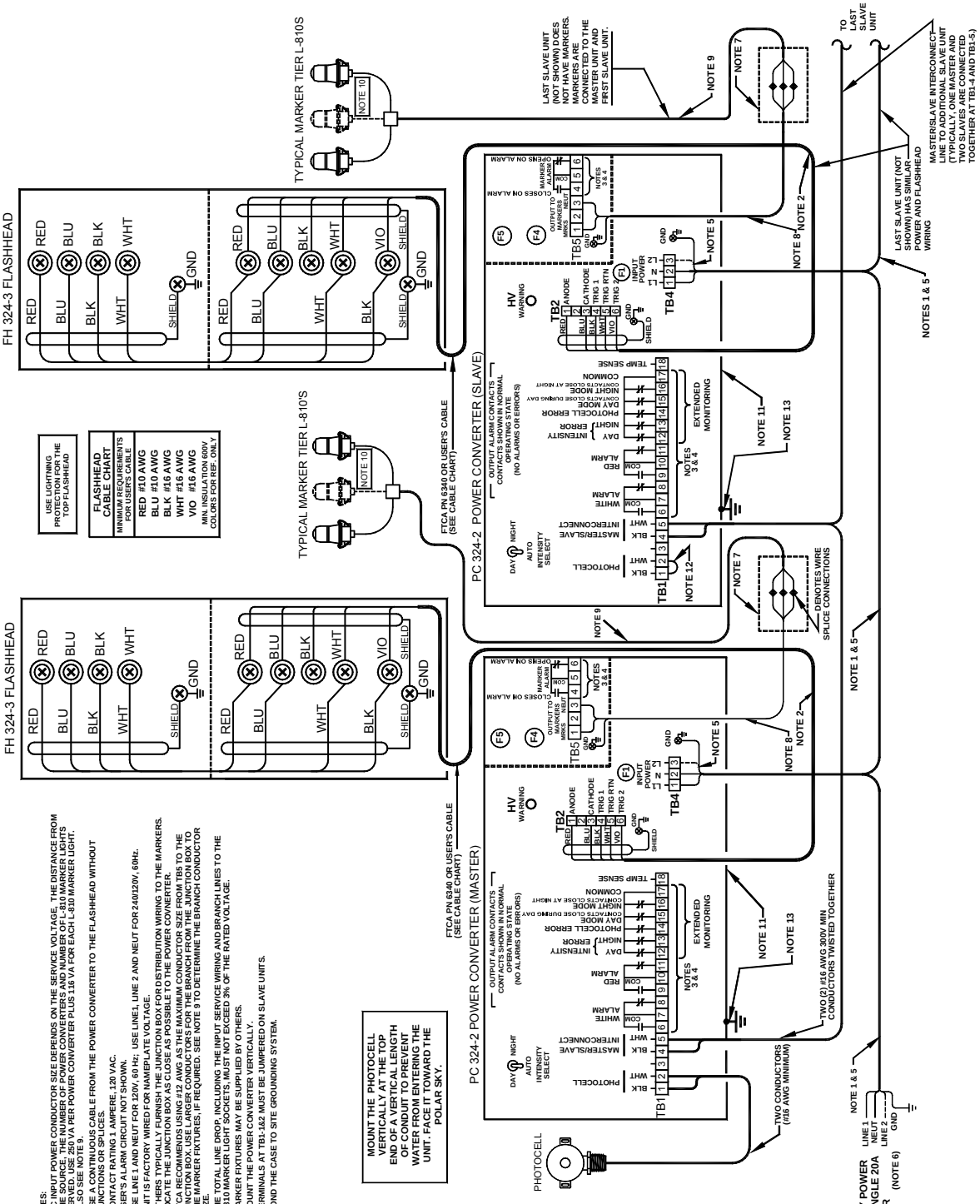


Figure 2-5 – Typical Multiple System Installation

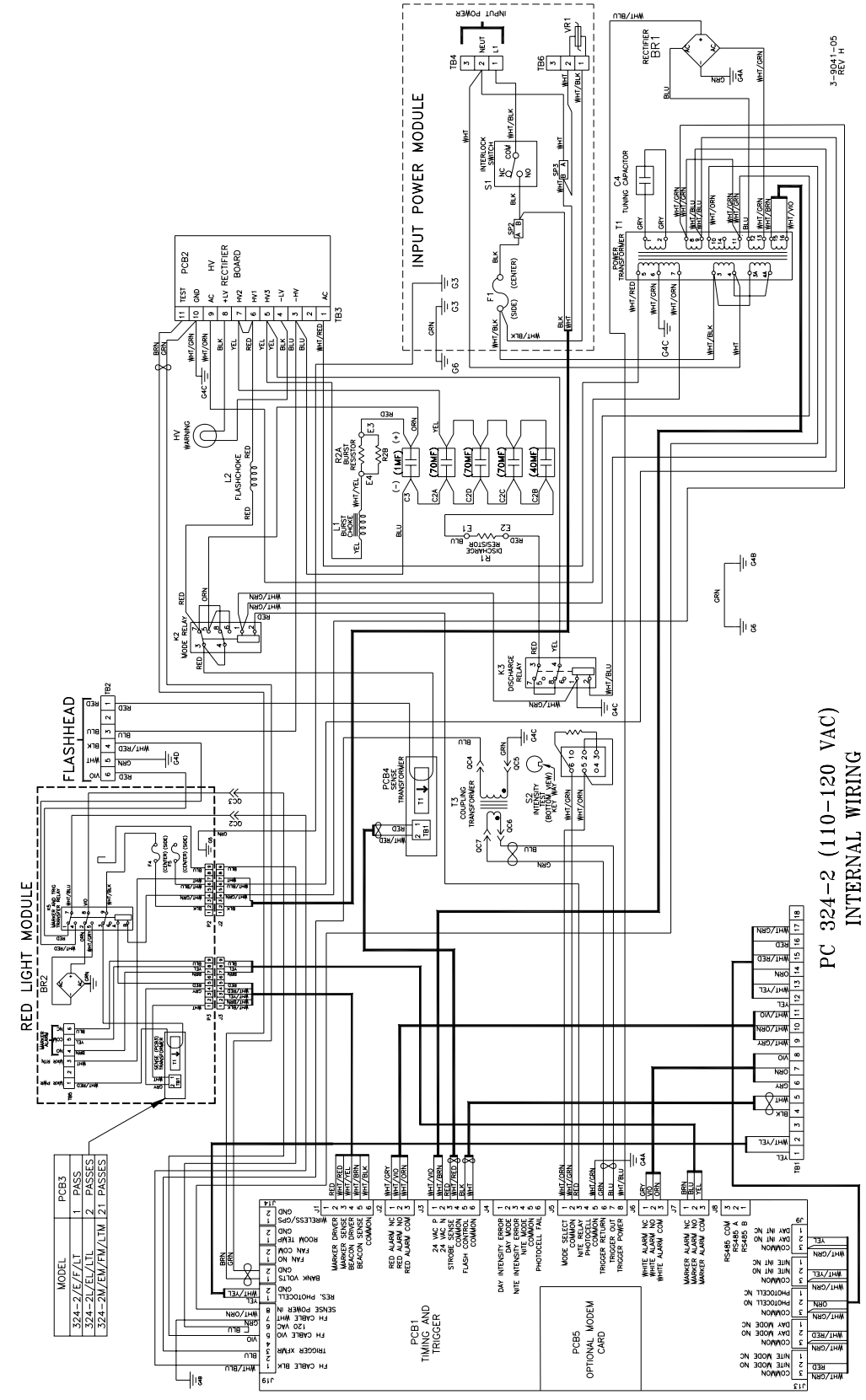


Figure 2-6 – PC 324 Power Converter Internal Wiring (110-120V)

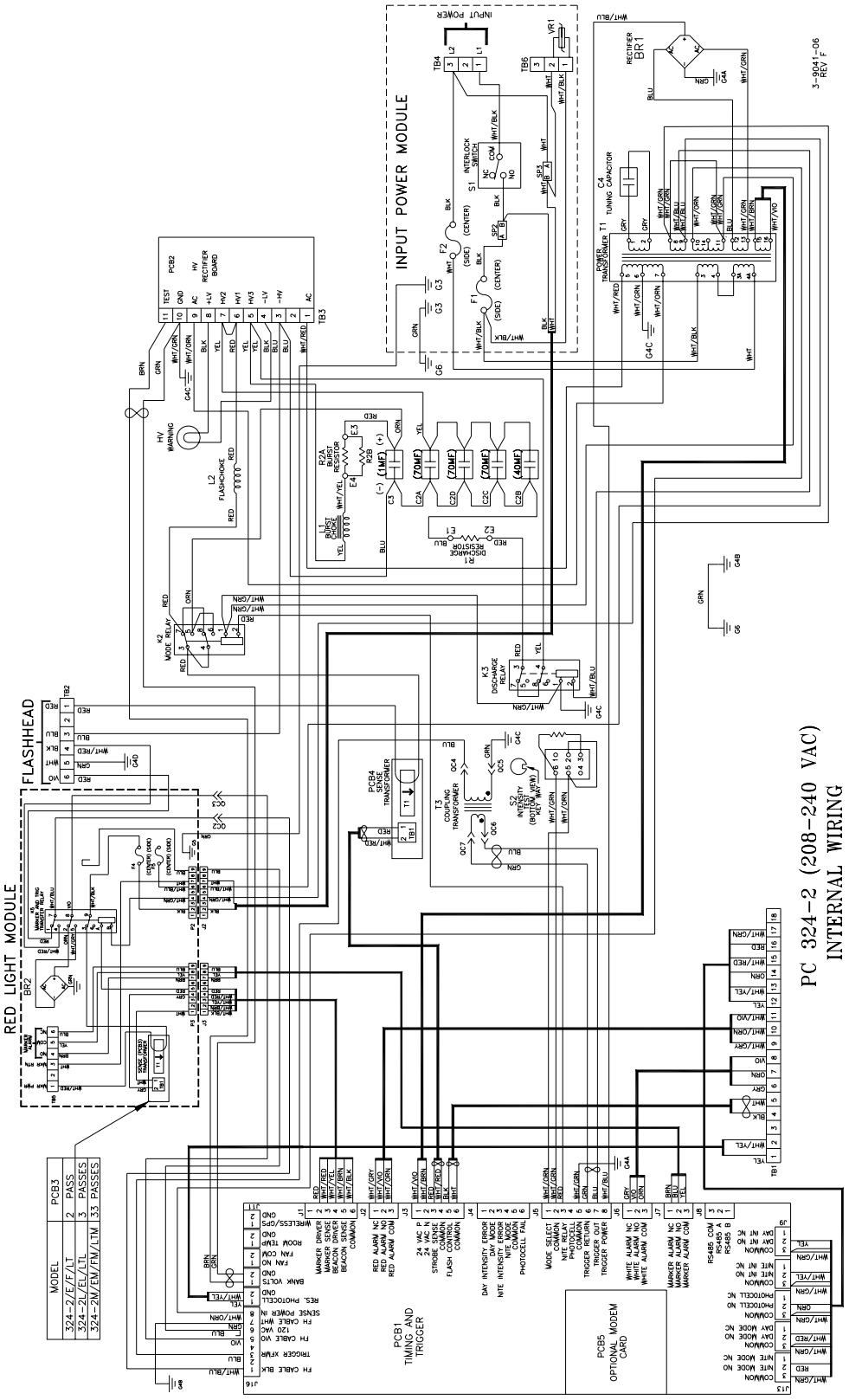
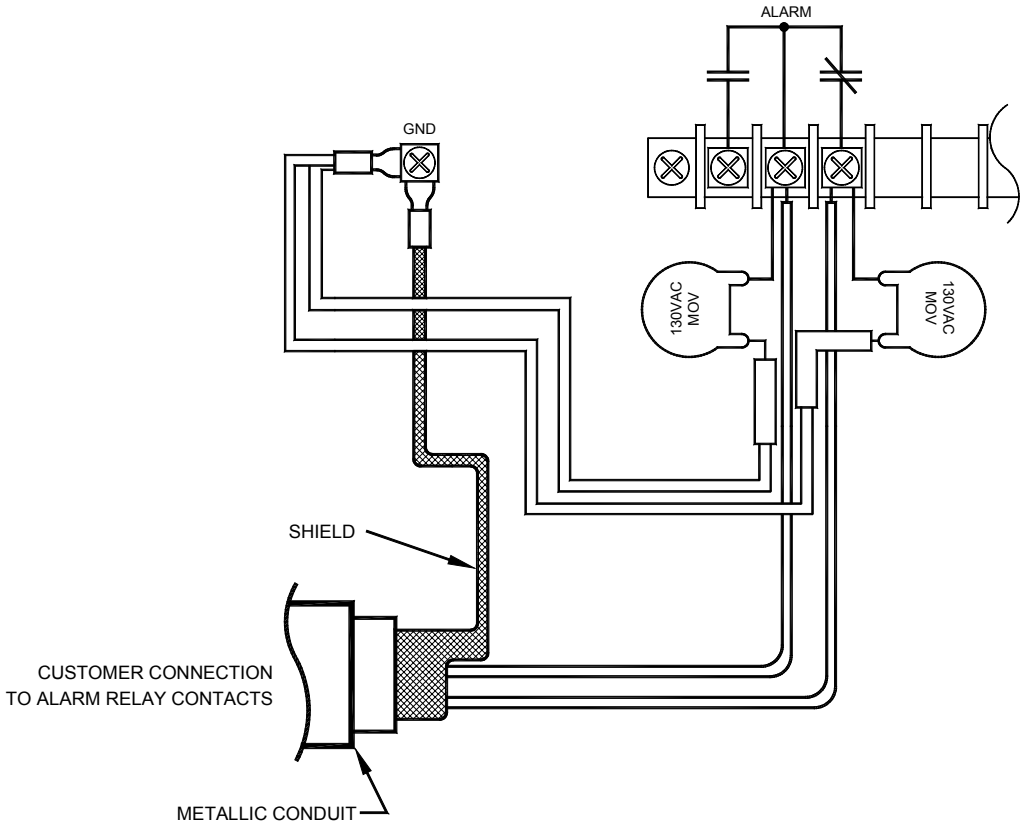


Figure 2-7 – PC 324 Power Converter Internal Wiring (208-240V)



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

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

NOTES:

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

Figure 2-8 – Recommended Alarm Wiring

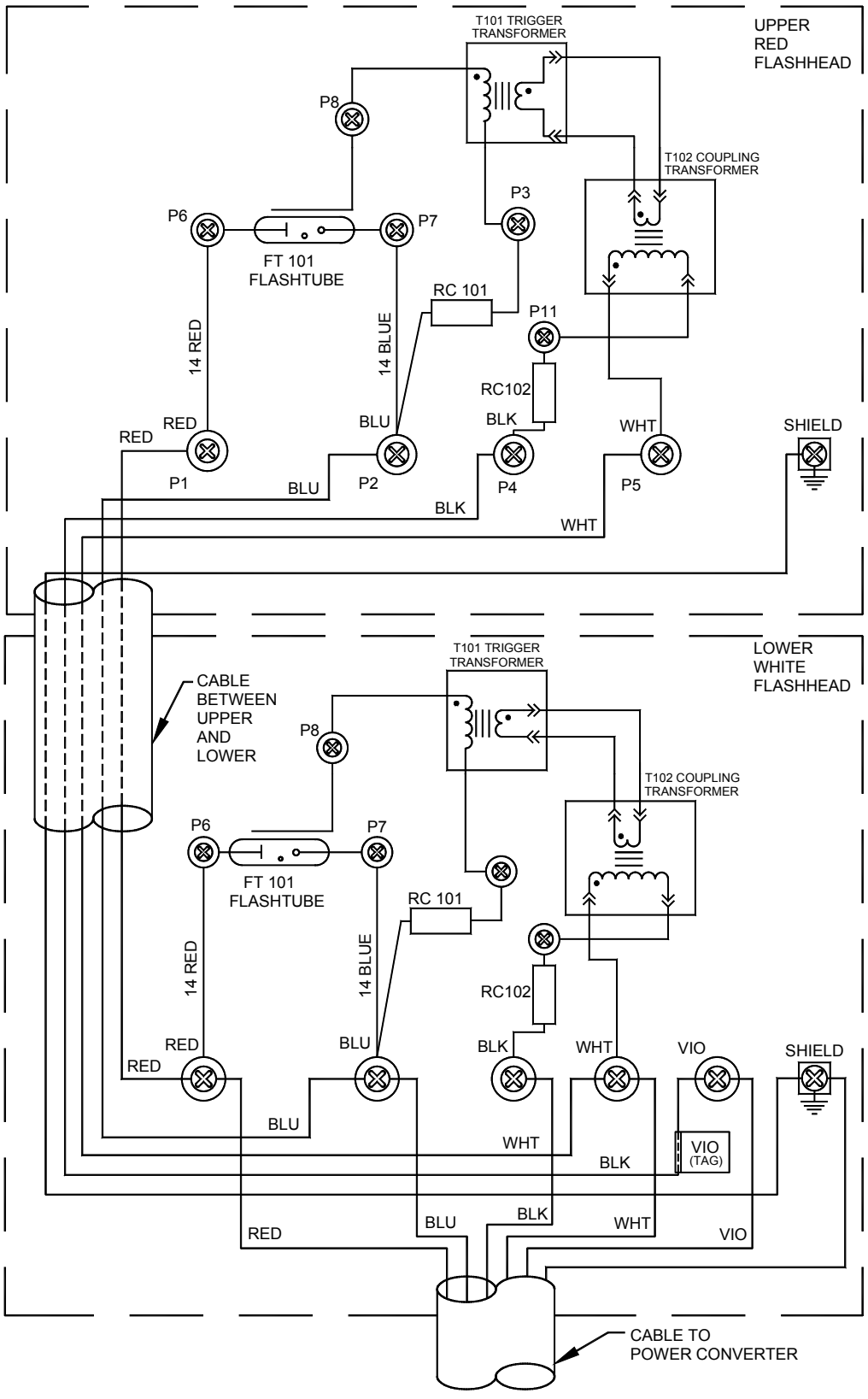


Figure 2-9 – FH 324 Internal Wiring

Section 3 - Maintenance and Troubleshooting

Safety

WARNING

STOP: Before proceeding read the warning on Page iii.

Work safely, as follows:

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

Preventive Maintenance

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

1. Verify that moisture has not 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 flashtube connections for signs of pitting or arcing. Verify that anode and cathode connections are firmly tightened.
5. Check all electrical connections for tightness and verify the absence of corrosion or electrical arcing.
6. Clean the outside surface of the lens with liquid detergent and water. Wipe it gently with a soft cloth or paper towel.
7. Clean the inside surface of the lens with a Flash Technology approved professional plastic cleaner such as Meguiar's Mirror Glaze® Clear Plastic Cleaner. Wipe the lens with cheesecloth only. Do not use regular cloth or paper towels.

Storage

Store equipment indoors when not in use. Circuit board, when not installed in the equipment, should be kept in antistatic bags or containers.

Diagnostic Testing

The only effective way to check out interconnected lights is to disconnect the master/slave interconnect wire that is connected between power converters and check the power converters as single units, as described in Master Unit.

Sync Signal Evaluation

Refer to Figure 2-5. Note that, for each power converter, the master/slave interconnect line and its return line are connected to TB1-4 and TB1-5 respectively. All units place a pulse on the line, which causes the power converters to flash all the lights at the same time. This pulse is the synchronization pulse. PCB1 in each power converter generates a sync pulse. The first sync pulse to be placed on the line synchronizes the remaining lights. The width of the sync pulse controls the mode of operation.

In the event of a top-most red light failure at night, the power converter places a back-up signal on the line that causes all connected units to flash the white lights at the correct night intensity.

The sync signal is a pulse and difficult to evaluate with a meter. You can detect the sync pulse as an instantaneous movement of the meter indicator. A digital meter with a max-min function may capture part of the pulse. This is generally a sufficient indication of a pulse being present. (A 24V pulse of 16 ms. width might read 12V on a 100 ms. capture time of max-min function.)

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 reject or bypass RFI, but Flash Technology cannot guarantee complete immunity beforehand. After installation, you may find it necessary to add external filters or use other methods to reduce RFI entering the equipment. To minimize interference, ensure proper installation in accordance with AC 70-7460, Appendix 1, Figure 2.

Component Testing

The following procedures describe how to check most of the unit's major electrical components. 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.

Capacitors

Evaluate the condition of a capacitor with an analog volt-ohmmeter operating in the resistance mode. The following method assumes an instrument with a X100 resistance scale.

Place the meter leads across the terminals of an isolated (no electrical connections to other circuits) and fully discharged capacitor. Observe the subsequent needle movement.

If the capacitor is functional, the needle initially indicates zero ohms, but soon begins to rise to higher indicated values. A capacitor that is disconnected from other circuitry is defective if it does not exhibit this behavior. The length of time it takes the needle to reach the 1-megohm reading (about 65% full-scale) is a measure of the capacitance. For example, the time is about 5 seconds for a 10-mfd. capacitor, or 10 seconds for a 20-mfd. capacitor, and so forth.

Manually discharge the capacitor before repeating this measurement. This test may not detect a malfunction that occurs only at high voltage.

A bank of capacitors connected in parallel may be checked as a single unit. If the test indicates a short circuit, the individual capacitors have to be disconnected and checked separately. A shorted capacitor is indicated if the resistance does not rise above zero after several seconds of measurement.

Wiring and Cabling

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

Inspection

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

Power Converter

Burst Choke (L1)

Measure the resistance of L1 from TB3-5 to ceramic post E4 (at burst resistor R2). Its resistance should be approximately 7 ohms.

Relays (K2, K3)

A malfunctioning relay may have faulty contacts, a sticky mechanism, or a defective coil. You may determine the first two possibilities by inspection and manually exercising the armature. You can confirm a defective coil by measuring the resistance. To measure the resistance of relay coils, first remove the wires from one of the connections to the coil terminals on the relay.

The resistance across the coil of the K2 Mode Relay or the K3 Discharge Relay should measure approximately 290 ohms.

Timing and Trigger Board (PCB1)

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

HV Rectifier Board (PCB2)

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

Sense Board (PCB4)

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

Discharge Resistor (R1)

The resistance of R1 between ceramic posts E1 and E2 should be 35,000 ohms.

Burst Resistor (R2)

The resistance of R2 between posts E3 and E4 should be 500 ohms.

Power Transformer (T1)

To test this transformer, first remove the PCB1 and the HV rectifier board (PCB2). Apply power to the unit and measure secondary winding voltages at the terminals indicated in Table 3-1.

Table 3-1 – Transformer Test Voltages

Terminals	Voltage Range Allowed
TB3-1 to TB3-9	900-1050 VAC
Terminal 2 of Relay K3 to chassis	100-120 VAC
J3-1 to J3-2 on PCB1	22-26 VAC

If the voltage on TB3-1 to TB3-9 is substantially below the specified minimum value, check the C4 Tuning Capacitor.

Flashhead

Flashtube (FT101)

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

Trigger Transformer (T101)

The measured resistance of the secondary winding (potted assembly) should be approximately 150 ohms. Check the ferrite core for cracks. Check the mounting screws for tightness.

Trigger Coupling Transformer (T102)

The coupling transformer should not have open windings. An ohmmeter will indicate a shorted winding because of the wire size. Check with an ohmmeter at the wire terminals.

Photocell Testing

Use the following procedure:

1. First, disconnect the photocell. The system should go to night operation after approximately one minute.
2. If multiple beacon system, disconnect the master/slave interconnect line on each power converter.
3. Operate the manual intensity control switch on each power converter in turn.
4. If each power converter operates correctly with the manual intensity control switch, troubleshoot the photocell wiring or the circuits in the erroneously operating power converter.
5. Reconnect all wires.

During daylight, completely block light from entering the photocell. If the system does not enter night mode after a few minutes, replace the photocell. At night, shine a light on the photocell, if the system does not enter day mode after a few minutes, replace the photocell.

Component Removal and Replacement

A power converter component location diagram is provided in Figure 4-1. A flashhead component location diagram is provided in Figure 4-2. A flashhead electrical wiring diagram is provided in Figure 2-9. A power converter internal wiring diagram is provided in Figure 2-6.

Note the location and color of all wires that you disconnect. When you replace the wiring after you replace the components, ensure that the wiring agrees with Figure 2-6.

The general procedure for removing components follows:

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

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

Power Converter Components

Capacitors

Before removing or replacing a capacitor always ensure it is discharged by checking with a voltmeter directly across the terminals. Discharge a capacitor by placing a resistance (25 watts/10,000 ohms or greater) between its terminals. Direct shorting may damage the capacitor, and connecting the terminals to the equipment chassis may fail to discharge it.

Remove the fuse for this procedure to prevent application of power if the interlock switch is accidently pressed.

Removal

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

Replacement

1. Reverse the removal procedure.
2. Verify that wiring is in accordance with the wiring diagram in Figure 2-6. Wires must be replaced exactly as removed. In some instances, a quick-connect wire terminal does not seat properly if it is not placed on the terminal cluster exactly as it was before removal. This occurs by interference between the insulation on the wire terminal and the insulation surrounding their terminal cluster on the capacitor. Flash Technology recommends that you lightly squeeze the quick-connect wire terminals with pliers before reinstalling them over the capacitor terminal blades.

Timing and Trigger Board Assembly (PCB1)

PCB1 is mounted on the left side of the component bracket.

Removal

1. Remove all green connector plugs from PCB1 headers.
2. Loosen (but do not remove) the four screws located near the corners of the board.
3. Lift the board from the bracket.

Replacement

1. Set options switch and jumpers to match the board just removed.
2. Reverse the removal procedure.

Input Power Module

Removal

1. Remove all accessible wires and cable connectors attached to the module and to T1 located under the module.
2. Loosen the truss-head screws in the base that fasten the module to the base.
3. Remove the screw under the ground terminal to the left of TB4. This screw fastens the module to the component bracket.
4. Carefully slide the module to the right and lift it out. Ensure that connectors are not bent while doing so.
5. Remove any additional connections necessary to remove the module.

Replacement

1. Reverse the removal procedure.
2. Verify that wiring agrees with Figure 2-6 and restore the wire routing to its original state.

Power Transformer (T1)

Removal

1. Remove the Input Power Module.
2. Remove the four screws holding the transformer to the base plate and remove the transformer.

Replacement

1. Reverse the removal procedure.
2. Verify that wiring agrees with Figure 2-6 and restore the wire routing to its original position.

Component Bracket

The Component Bracket supports the capacitors, terminal blocks, PCB1, PCB2, and other components.

Removal

1. Loosen the four screws holding PCB1 to the bracket and lift PCB1 up and out.
2. Loosen the two truss-head screws below PCB1 on the left side of the bracket that hold the bracket to the base plate.
3. Remove the screw on the left front side of the bracket that fastens the bracket to the Input Power Module.
4. Loosen the two truss-head screws in the base plate on the right side of the bracket that hold the bracket to the base plate.
5. Slide the bracket up off the screws. Be careful of the cable and cable connectors. You may hang the bracket over the edge of the connector panel to perform the remaining steps.

Replacement

1. Reverse the removal procedure.

HV Rectifier Board (PCB2)

The HV rectifier board is mounted on the right of the Component Bracket.

Removal

1. Remove the Component Bracket to gain access to PCB2.
2. Loosen, but do not remove, the screws holding PCB2 to the terminal block TB3.
3. Slide the circuit board out from under the terminal block screws.

Replacement

1. Reverse the removal procedure.
2. Restore the wire routing to its original state.

Mode Relay (K2), Discharge Relay (K3)

Remove the Component Bracket for adequate access to Relay K2.

Removal

1. Remove the capacitors.
2. Remove PCB1.
3. Remove the Component Bracket.
4. Loosen the screws that fasten the wiring connectors to the relay.
5. Carefully disconnect the wires from the terminals of the component and note their locations so that you may more easily replace them.
6. Remove the screws that hold the component to the base plate.
7. Remove the component

Replacement

1. Reverse the removal procedure.
2. Verify that wiring agrees with Figure 2-6 and restore the wire routing to its original state.

Flashhead Components

Flashtube (FT101)

Use the following removal and replacement procedures:

Removal

Carefully lift the flashtube upward from the tube socket assemblies.

Replacement

Line up the flash tube so that the pin closest to the red dot will be inserted into the tube socket connected to the red anode lead. Carefully insert the flashtube and settle it into place, making sure the ceramic base is resting directly on the tops of the tube socket assemblies.

Trigger Transformer (T101)

Use the following removal and replacement procedures:

Removal

1. At the trigger wire post adjacent to the flashtube, remove the large diameter wire coming from the trigger transformer.
2. At one of the smaller, side-mounted posts, remove the small wire to the trigger transformer.
3. Unplug the primary winding from the quick connects.
4. Remove the two 4-40 x 2" Phillips®-head screws holding the transformer assembly to the bracket. Note the orientation of the primary and the molded secondary winding with respect to fixed features on the bracket. The replacement unit must be installed with this same orientation.

Replacement

1. Reverse the removal procedure.
2. Reattach the wires.

Trigger Coupling Transformer (T102)

Removal

Removal and replacement are similar to the procedure for the Trigger Transformer (T101).

Operational Checkout

This section describes basic functional testing.

Observe the response of the equipment as indicated in Table 3-2. If the system contains more than one light, and the lights are interconnected for master/slave synchronization, perform the actual checkout steps described below only at the master unit. However, observe all lights for responses. These procedures assume that the following conditions are present:

1. The photocell is subjected to normal outdoor daylight.
2. All installation steps in Installation Checklist have been completed.
3. PCB1 is correctly programmed.

Table 3-2 – Function Indicators

Indicator	Function Description	Normal Operation	
		Day	Night
I15	NITE ERR – On for night intensity error.	OFF	OFF
I9	DAY ERR – On when a day intensity error has occurred (light flashed at the incorrect intensity).	OFF	OFF
I14	PEC ALARM – On for Photocell alarm (Photocell failed to switch state).	OFF	OFF
I8	WHT ALM – On when a white alarm occurs (white light failed).	OFF	OFF
I13	RED ALARM – On for red alarm (red light failure occurred).	OFF	OFF
I7	MKR ALM – On when a marker failure is detected.	OFF	OFF
I12	FAN – Not used.	NOT USED	NOT USED
I6	SYNC – Flicks on every six seconds.	FLICK	FLICK
I11	CONFIRM – On when PCB1 detects a valid flash. I 5 flickers at flash rate.	FLICK	FLICK
I5	DAY – On when power converter is in day mode.	ON	OFF
I10	NITE – On when the power converter is in night mode.	OFF	ON
I4	MKRS – On when the power converter is in night mode (if markers are installed).	OFF	ON
I3	TRIGGER POWER – Indicates 120 VDC trigger voltage is available.	ON	ON

Manual Override: Fixed Intensities

You may manually override automatic intensity control (as when the manual intensity override switch S2 is set to AUTO), but only if no synchronization line connects to other lights. Remove any wire from external circuitry attached to the master/slave interconnect terminals. Manual control is intended for temporary purposes (testing) only. Selecting Day or Night operation with the manual override switch activates an eight hour timer. Automatic intensity control will resume after eight continuous hours of operation in the manual override position (Day or Night).

Daytime

Switch the Intensity Control Switch (S2) to DAY

Night

Switch the Intensity Control Switch (S2) to NIGHT.

PCB1 Indicator Lamps

See Section 1 for a description of LED indicators on the PCB1 board for system checkout.

Standard System

The following procedures check normal operation.

1. **Check Normal Daytime Operation:** Apply power to the system (pull the plunger of the interlock switch or switches outward to the service position). Ensure that the manual intensity override switch or switches are set to AUTO and verify that the daytime responses at each power converter in the system are the same as those shown in Table 3-2 for Daytime operation.
   - Note that the white light is flashing at the daytime high-intensity.

2. **Check Normal Nighttime Operation:** Place an opaque (blocks all light) cover over the photocell and verify that the red night responses at each power converter in the system are the same as those shown in Table 3-2 for Nighttime operation.

   NOTE

   A minute may pass before the photocell responds to the darkened condition after power is applied.

   - Note that the strobe is flashing at the red nighttime intensity.

   Remove the cover from the photocell and allow the unit to return to day operation.

3. **Check Alarm Sensing:** Remove primary power and temporarily disconnect the black wire on TB2-4 and the violet wire on TB2-6. Apply primary power and verify the following:
   - The white strobe does not flash.
   - The WHT ALM LED (I8) is lit after three missed flashes.
   - The DAY ERR LED (I7) is lit.
   - The alarm circuit operates according to installation requirements.

   Cover the photocell as described in Step 2 and verify the following:

   - The red strobe does not flash.
   - The RED ALM LED (I13) is lit after three missed flashes.
   - The NITE ERR LED (I15) is lit.
   - The WHT ALM LED (I8) is lit after three missed flashes.

4. **Restore the Equipment After Checking:** Replace all disconnected wires. Remove the cover that you placed on the photocell. Ensure that the manual intensity override switch is in the AUTO position.
5. **If Any Responses are Not Normal:** If any of the responses above are not exactly as described, proceed to Troubleshooting.

Troubleshooting

Careful observation of operation often leads directly to a symptom cause. System-level problems affect all lights in a multiple-light system in the same way. Unit-level problems originate in a single light. However, some unit-level malfunctions can affect the entire multi-light system. Use Table 3-3 for troubleshooting a single unit and Table 3-4 for the system.

When you trace a problem to a specific component, see Component Testing and Component Removal and Replacement for further assistance.

Master Unit

A stand-alone unit is a single FTB 324. A master unit is similar to a stand-alone unit, except that it is the controlling unit in a multiple-light system. A master unit has the photocell connected and, in a multiple-light system, is the controlling unit with synchronization wires connected at the master/slave interconnect terminals at TB1-4 and TB1-5.

1. Temporarily disconnect the black master/slave interconnect wire at TB1-4.
2. Temporarily set the manual intensity override switch S2 to DAY.
3. Verify the Daytime responses are the same as those in Table 3-2.
4. Verify that the strobe is operating at daytime intensity (high intensity).
5. Check the synchronization signal at the black TB1-4 master/slave interconnect terminal with a voltmeter as in Sync Signal Evaluation. Use the intensity control switch to step the unit from one intensity to the other, or cover and uncover the photocell. If the synchronization signal is absent, replace PCB1. A signal response could indicate a slave unit problem or RFI (see Slave Unit, and RFI Problems).
6. Reconnect the black master/slave interconnect wire.
7. Place the manual intensity override switch in the AUTO position.

Slave Unit

A slave unit receives intensity information from a master unit over the master/slave interconnect wires at TB1.

1. Temporarily disconnect the black master/slave interconnect wire at TB1-4. The unit will go into day operation.
2. Verify the Daytime responses are the same as those in Table 3-2.
3. Check the synchronization signal at the black master/slave interconnect terminal with a voltmeter. The sync pulse must be present as described in Sync Signal Evaluation. Check wiring if sync is not present.
4. Select NIGHT at the manual intensity override switch. The unit will go into night mode with the strobe flashing at night intensity (low intensity).
5. Check the signal on the master/slave interconnect wire at TB1-4 with a voltmeter, as described in Sync Signal Evaluation. An absent pulse requires checking the system for RFI (see RFI Problems) and for another

malfunctioning unit connected to the master/slave interconnect wire.

6. Reconnect the master/slave interconnect wire to TB1-4.
7. Place the manual intensity override switch in the AUTO position.

Table 3-3 – Unit Troubleshooting Guide

Flash Conditions		Other Conditions			Probable Causes
Day	**Night**	**HV[1]**	**LV[2]**		
No	No	OK	OK		Flashhead Cable Connections T101 Transformer T1 Transformer BR1 Bridge PCB1
No	No	No	No	Blows Fuse F1	Varistor MOV T1 Transformer
No	No	No	No		F1 Fuse S1 Interlock T1 Transformer Connections – Main Power
No	No	No	OK		C2A-D or C3 Shorted Shorted FH Cable
No	No	OK	No	LED Status Indicators not lit	PCB1 Board T1 Power Transformer
No	No	OK	OK	Trigger Neon not lit	PCB1 Board T1 Power Transformer BR1 Bridge
No	OK	OK	OK	White Alarm	Flashtube (FT101) PCB1 Board K2 Relay L2 Flash Chock C2A-D Capacitors Open K5 Relay[3]
Red	OK	OK	OK		PCB1 K2 Relay K5 Relay[3]
OK	High Intensity	OK	OK	Red Alarm	PCB1 Board Photocell Circuit K2 Relay Intensity Select Switch Setting
OK	Backup Intensity	OK	OK	Red Alarm	Flashtube (FT102) K5 Relay[3] PCB1 K2 Relay
OK	No	-	OK	Red Alarm White Alarm	C3 Capacitor K5 Relay[3] PCB1 K2 Relay L1 Burst Choke R2 Burst Resistor
OK	Backup Intensity	OK	OK		K2 Relay PCB1 Board

Table 3-3 – Unit Troubleshooting Guide Continued

Flash Conditions		Other Conditions			Probable Causes
Day	**Night**	**HV[1]**	**LV[2]**		
-	-	OK	OK	Incorrect Mode	S2 Intensity Select Switch Not in AUTO PCB1
Red or White	OK	OK	OK	White Alarm	PCB1
OK	OK	OK	OK	Markers Out	F4 Fuse K5 Relay[3] PCB1 Board
OK	OK	OK	OK	Markers Stay On	K5 Relay[3] PCB1 Board
OK	OK	OK	OK	Marker Alarm	One or More Marker Lamps Out K5 Relay[3] PCB1 Board PCB3

[1]HV = High voltage. PCB2 or HV neon lamp lit confirms HV.

[2]LW = Low voltage. Any PCB1 LED on confirms LV.

[3]Replace the entire red light module if any components therein fail.

Table 3-4 – System Troubleshooting Guide

Flash Conditions		Other Conditions	Probable Causes
Day	**Night**		
No	No	No Lights	Main Power Line
OK	Day Flash	Possible PEC Error	PEC Photocell PCB1 Board Intensity Select Switch Jumper on TB1 & 2 on Slave Units Missing
Red	OK	Possible PEC Error	PEC Photocell Intensity Select Switch
-	-	Units Mixed Red and White	Intensity Select Switch Master / Slave Interconnect Wiring
OK	OK	Units Not Flashing Together	Master / Slave Interconnect Cable Connected to TB1-4 and TB1-5 PCB1 in One Unit Units on different circuit breakers / electrical phases.

Section 4 – Recommended Spare & Replaceable Parts

Customer Service

Customer Service: 1-800-821-5825

Telephone: (615) 261-2000

Facsimile: (615) 261-2600

Shipping Address:

Flash Technology
332 Nichol Mill Lane
Franklin, TN 37067

Ordering Parts

To order spare or replacement parts, contact customer service at 1-800-821-5825.

Power Converter Parts

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

Flashhead Parts

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

Photocell Parts

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

Table 4-1 – Power Converter Major Replaceable Parts

Reference	Description	Part Number	
		50 Hz	60 Hz
BR1	Diode Bridge		6902806
C2A,C,D	Capacitor, Main Bank, 70 mfd.		6720401
C2B	Capacitor, Main Bank, 40 mfd.		6386504
C3	Capacitor, Night Mode, 1 mfd.		6848202
C4	Capacitor, Tuning, 3 mfd.		6577903
F1	►Fuse, Power, MDL8	4901931* (2 Required)	4901931*
F4	Fuse, Marker, MDL5		4900345
F5, F6	Fuse, MDL1		4900337
HV	Neon, High Voltage Warning Light		4902317
K2	►Relay 24V, Mode		8900494
K3	►Relay 120V, Discharge		8900493
K5	Relay 24V, Red Light		4900499
L1	Choke, Burst		4850601
L2	Choke, Flash		4175200
PCB1	►Timing and Trigger Board**		2903800
PCB1	►Timing and Trigger Board 324LT		2903805
PCB2	►HV Rectifier Board		2458005
PCB3	Marker Sense Board (Incan. Or Standard LED)		2811101
	Marker Sense Board (120 Volt 6.8 Watt LED)		2811301
	Marker Sense Board (240 Volt 6.8 Watt LED)		2811302
PCB4	Sense Board		2811101
PCB5	Modem Board		2903801
R1	Resistor, Discharge		6900541
R2A&B	Resistor, Burst, 500 ohm		6900532
SW1	►Switch, Interlock		4901220
T1	Transformer, Power	8842901	8841201
T3	Transformer, Coupling		8336701
TB1	Terminal Strip, 18 Position		4901930
TB2, TB7	Terminal Strip, 6 Position		4902257
TB3	Terminal Strip, 11 Position		8721011
TB4, TB5	Terminal Strip, 3 Position		4902134
TB6, TB8	Terminal Strip, 3 Position		4902157
VR1	Varistor	6901081	6901079*
M1	Red Light Module		1181502

►Recommended as a spare part.

*This part number varies according to the specific equipment voltage configuration.

**Please specify the model number of the equipment when calling for a replacement.

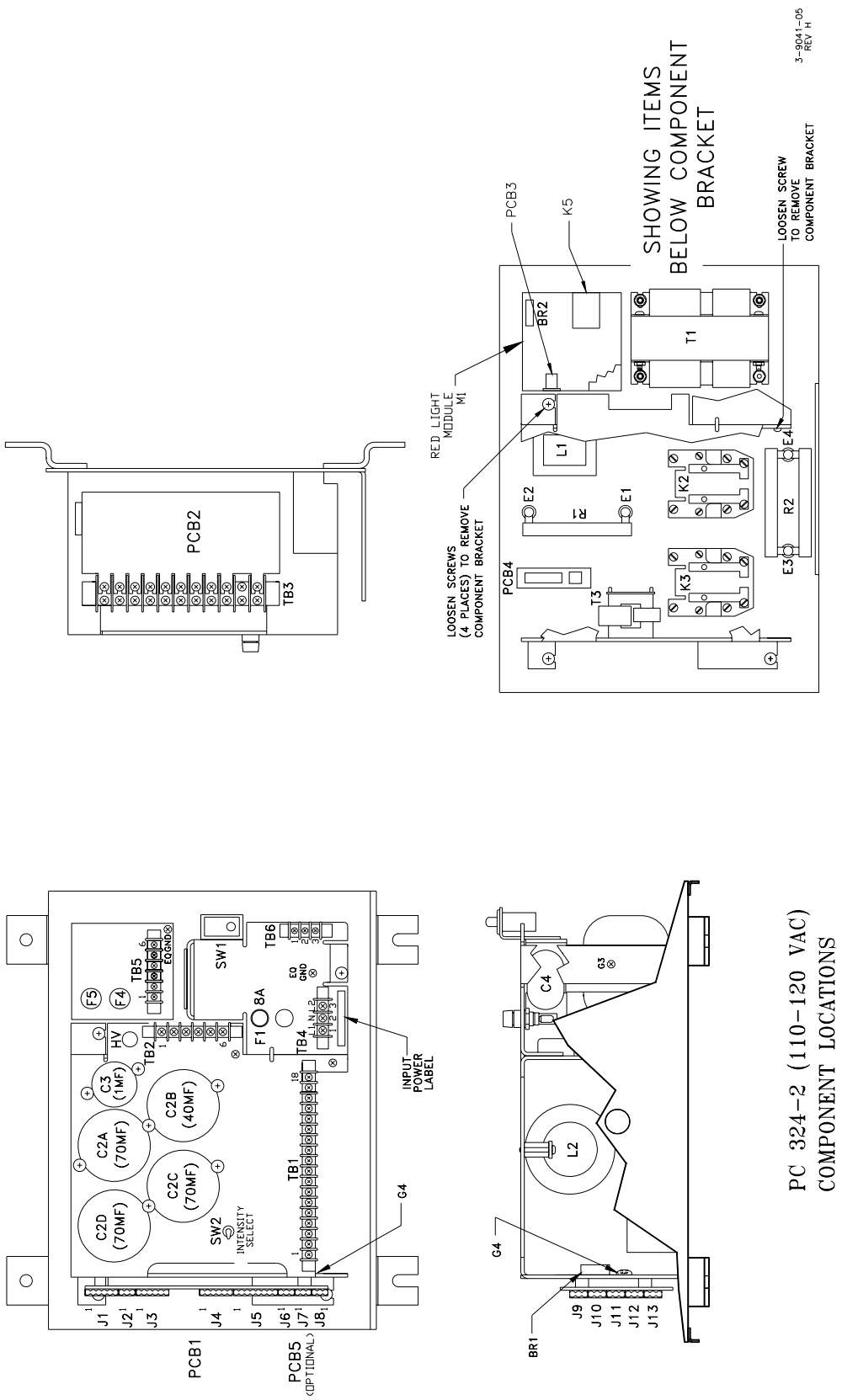


Figure 4-1 – Power Converter Component Locations

Table 4-2 – Flashhead Major Replaceable Parts

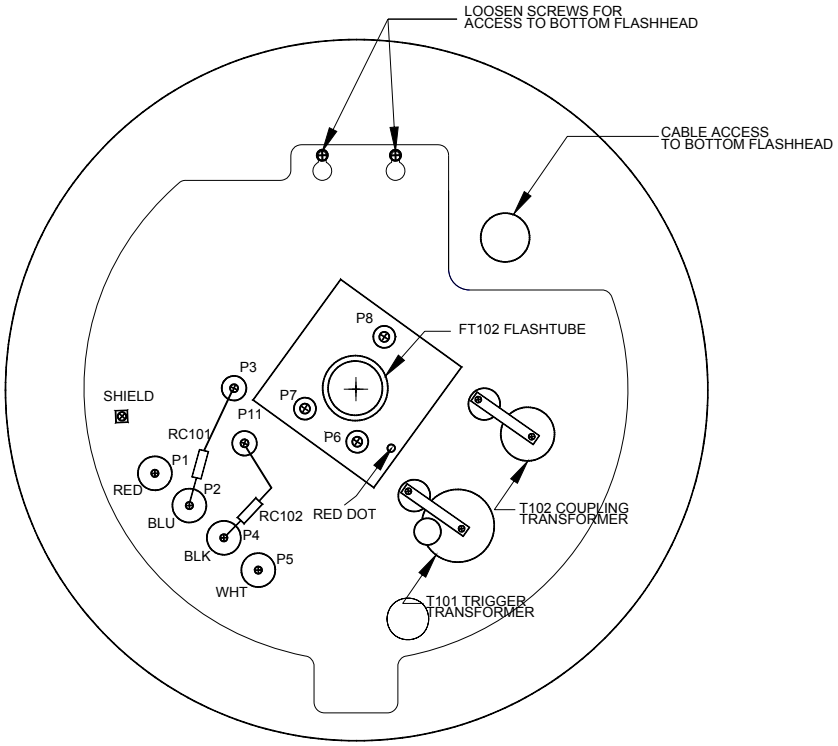
Reference	Description	Part Number
FT101	Flashtube (Lower)	8384329
FT102	Flashtube (Upper)	8384309
P1, P2, P4, P5,	Ceramic Spacer, ¾" diameter	5900844
P3, P6, P7,P8, P11	Ceramic Spacer, ½" diameter, short	5900842
RC101	R.C. Network	1403411
RC102	R.C. Network	1403412
T101	Transformer, Trigger	8288201
T102	Transformer, Coupling	8336701
	Flashtube Mounting Assembly Plate (Lower)	8905338
	Flashtube Mounting Assembly Plate (Upper)	8905341

Table 4-3 – Retrofit Kits and Safety Support Tool

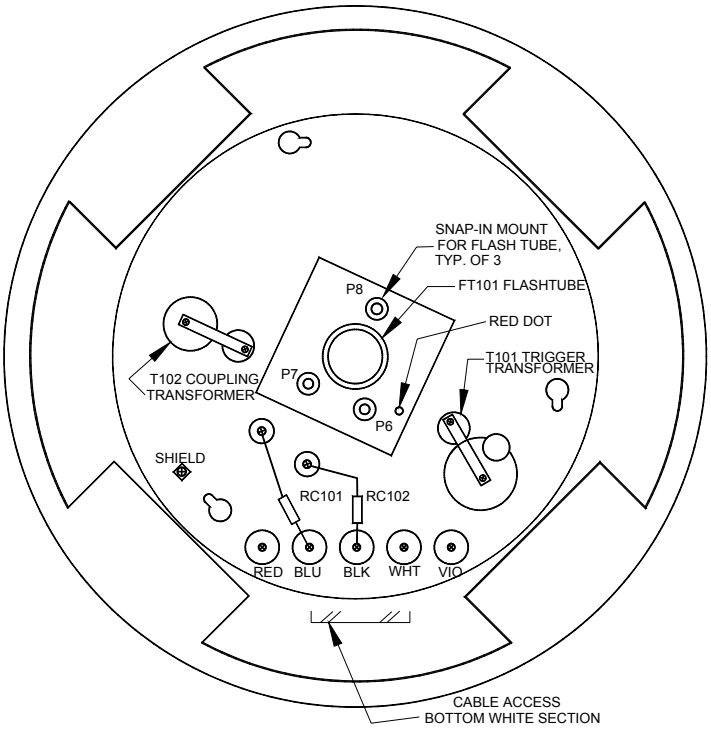
Reference	Description	Part Number
RETROFIT *	FH 324 Flashtube Mounting Assembly, Lower White (No Tube)	8905338
RETROFIT *	FH 324 Retrofit Kit w/ Safety Support Tool	1905345
RETROFIT *	FH 324 Retrofit Kit w/o Safety Support Tool	1905346
TOOL **	Safety Support Tool w/ Instruction	11000000943

***** Retrofit Kit is available for FH 324-1 and FH 324-2 only.

****** Safety Support Tool can be used only if Flashhead is FH 324-3 or has been retrofitted.



FH 324 Red (Upper) Flashhead Component Location



FH 324 White (Lower) Flashhead Component Location

Figure 4-2 – Flashhead Component Layout

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 getting information on the product's progress.

Failure to follow the below procedure may result in additional charges and delays. Avoid unnecessary screening and evaluation charges by contacting Technical Support prior to returning material.

1. To initiate an RMA, customers should 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
- Purchase Order (if non-warranty repair)
- Shipping Address
- Bill To Address
- Any additional information to assist in resolving the issue or problem

3. A purchase order (P.O.) is required in advance for the replacement of product that may be under warranty. Flash will then, at its discretion issue a credit once the validity of the warranty has been determined.

4. A P.O. is also required in advance for all non-warranty repairs. NOTE: the P.O. is required prior to the issuance of the RMA number.

- If the P.O. number is available at the time of the call, an RMA number will be issued and the customer must then fax or email the P.O. with the RMA number as the reference, to ensure prompt processing.
- If the P.O. number is NOT available at the time of the call, a Service Notification Number will be given to the customer and should be referenced on the P.O. when faxed or emailed to RMA Rep.
- Flash Technology will then, at its discretion, repair or replace the defective product and return the product to the customer based on the shipping method selected.
- The customer may purchase a new product before sending in the existing product for repair. If Flash Technology determines the existing product is still covered under warranty a credit will be issued to the customer for the new product.

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 may result in extra screening and delays.
- Must have all required information provided before an RMA number is assigned.

RETURN TO STOCK POLICY

- **Parts can be returned within 60 days of ship date and will be subject to a 25% restocking fee. Product must:**
    - Be in the original packaging
    - Not be damaged
- **After 60 days no parts can be returned.**