FLASH TECHNOLOGY

FTB 310-7

White, Medium Intensity Obstruction Light

FTB 310-7B

White, Medium Intensity Obstruction Light with Backup Feature

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Medium Intensity Obstruction Lighting System
Reference Manual
Part Number F7913107

SERIAL NUMBER

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Front Matter

Abstract

This manual contains information and instructions for installing, operating and maintaining the FTB 310-7 and FTB 310-7B Medium Intensity Obstruction Lighting System.

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Trademark Acknowledgements

Applicable Specifications

This equipment meets or exceeds requirements for an FAA Type L-865 or L-866 (310-7C)

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 150/5345-43G and 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 line voltages reside in certain locations in this equipment. Also, this equipment may generate dangerous voltages. Although Flash Technology has incorporated every practical safety precaution, exercise extreme caution at all times when you expose circuits and components, and when you operate, maintain, or service this equipment.

Avoid Touching Live Circuits

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

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. Using a voltmeter, verify that no voltage is present on TB2 Terminals 1 & 3 (Flashhead terminal block red and blue wires) 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 310-7 System consists of an FH 308 Flashhead, a PC 310-7 Power Converter, a PEC 510 Photocell, and a connecting cable from the power converter to the Flashhead. (FTB 310-7B System consists of an FH 324W Flashhead and PC 310-7B Power Converter)

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.

Specifications

Physical

PC 310-7 & PC 310-7B (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 308 (H x Diameter, Weight)
17 x 18.25 in., 17 lbs.
431.8 x 463.5 mm, 7.7 kg.
FH 324W (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	0.93 ft^2, 0.0864 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

Flash Intensity (nominal):

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

Flash Rate

Day (White)	40 flashes per min.
Night (White)	40 flashes per min.

Electrical (PC 310-7)

AC Voltage	120 or 240V, 60 Hz
	110 or 230V, 50 Hz
	208-240V 50 Hz
Volt-Amperes	250 peak
Day (White)	130W
Night (White)	75W

Application - L-866

Flash Rate

Day (White)	60 flashes per min.
Night (White)	60 flashes per min.

Electrical (PC 310-7C)

AC Voltage	120 or 240V, 60 Hz
	110 or 230V, 50 Hz
	208-240V 50 Hz
Volt-Amperes	250 peak
Day (White)	220W
Night (White)	95W

Operation

The PC 310-7 Power Converter operates an FH 308 white Flashhead. 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 lights flash at a rate of 40 FPM at an intensity of 2,000 candelas.

Obstructions over 350 feet above ground level require several interconnected PC 310-7 power converters and corresponding Flashheads. A master/slave control line (two-wires) 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.

PC 310-7 Models

The three standard **PC 310-7** models are: PC 310-7, PC 310-7I and PC 310-7C. The **PC 310-7** is a white strobe (L-865) for day and night operation.

The **PC 310-7I** is a white strobe (day operation) that can interface with a Red Light Controller (RLC) for nighttime (L-864) operation. An alarm output from the RLC's uppermost beacon(s) will trigger the PC 310-7I to terminate operation of the RLC and flash the white strobe at low intensity.

The **PC 310-7C** is a white Catenary (L-866) lighting system. Towers that support catenary wires require three levels (tiers) of lights. One or more lighting units are installed at each of the following three locations: top of the structure, lowest point of the catenary and half way between the upper and lower levels. Each level must be lit to provide 360-degree coverage. Catenary lighting systems are required to flash at a rate of 60 flashes per minute (FPM) with the following flash sequence: middle – top – bottom.

Note: The position of each PC 310-7C is configured and marked at the factory. Verify the position of each unit before installation.

PC 310-7 Configurations

Each of the PC 310-7*X* models described previously is available in three configurations: PC 310-7 (standard), PC 310-7A and PC 310-7AE. A description of each configuration is provided below.

The **PC 310-7** provides all functions and alarm capabilities required for an L-864 lighting system. The system also provides an additional alarm point for notification of photocell failure.

The **PC 310-7A** provides all functions of the PC 310-7 and adds additional alarm relay contacts for day and night intensity errors as well as mode indication contacts for day and night. See Figure 1-1 and Table 1-1 for additional information. This model also provides Tech-Eagle capabilities via RS232 for on-site programming and troubleshooting. Remote monitoring capability via RS 485 is also provided.

The **PC 310-7AE** provides all functions of the PC 310-7A and adds a modem for remote Eagle monitoring via POTTS line.

The PC 310-7 may be upgraded to provide the features of the PC 310-7A at any time by replacing the timing and trigger. The PC 310-7A may be upgraded to provide the remote Eagle monitoring feature of the PC 310-7AE by adding a modem PCB. Contact Technical Support for additional information and pricing.

The **PC 310-7B** uses a dual light flash head with the primary on the top and the backup on the bottom. Under normal operation the primary light will produce a normal flash in the DAY and NIGHT mode. If the unit detects a failure, it will assert the alarm relay, toggle the alarm LED's, and switch to the backup light. The flashing of the alarm LED's is an indication that the unit has switched to the backup light. When the unit returns to DAY from NIGHT mode it will again try the primary light and upon failure it will switch to the backup light as previously described. This method of operation continues until the primary light is repaired.

Alarm Contacts

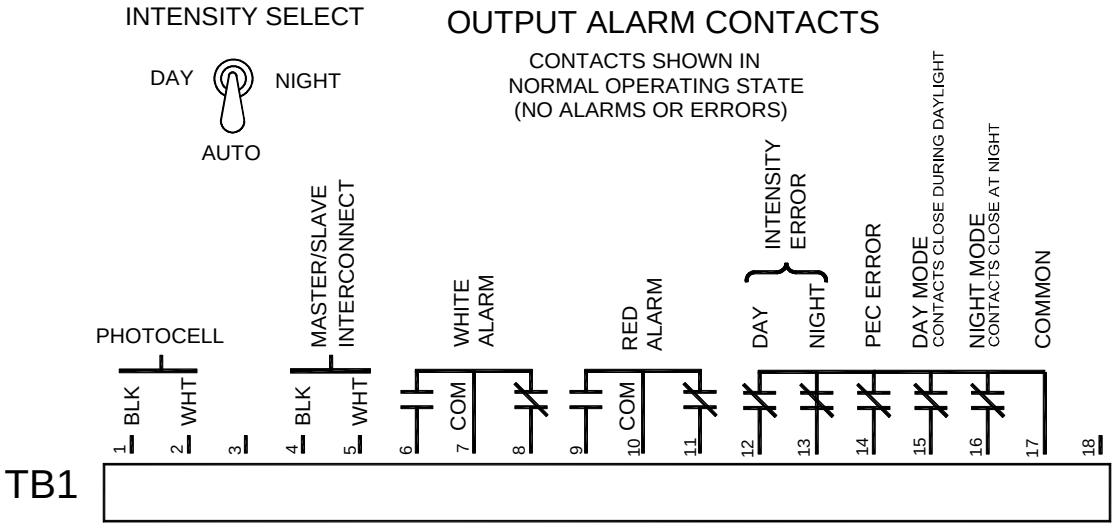


Figure 1-1 – TB1 Alarm Contacts

NOTE: Relay contacts TB1-12, TB1-13, TB1-15 and TB1-16 are standard on PC 310-7A and PC 310-7AE systems. PC 310-7 requires upgrade of PCB1.

Table 1-1 – 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.

*A and AE units only.

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 310-7. Status indicators and setup options are shown in the figure below and on the following pages. The figure shows the newer 290381X version of the PCB which is a direct plug-in replacement for the previous 290380X version.

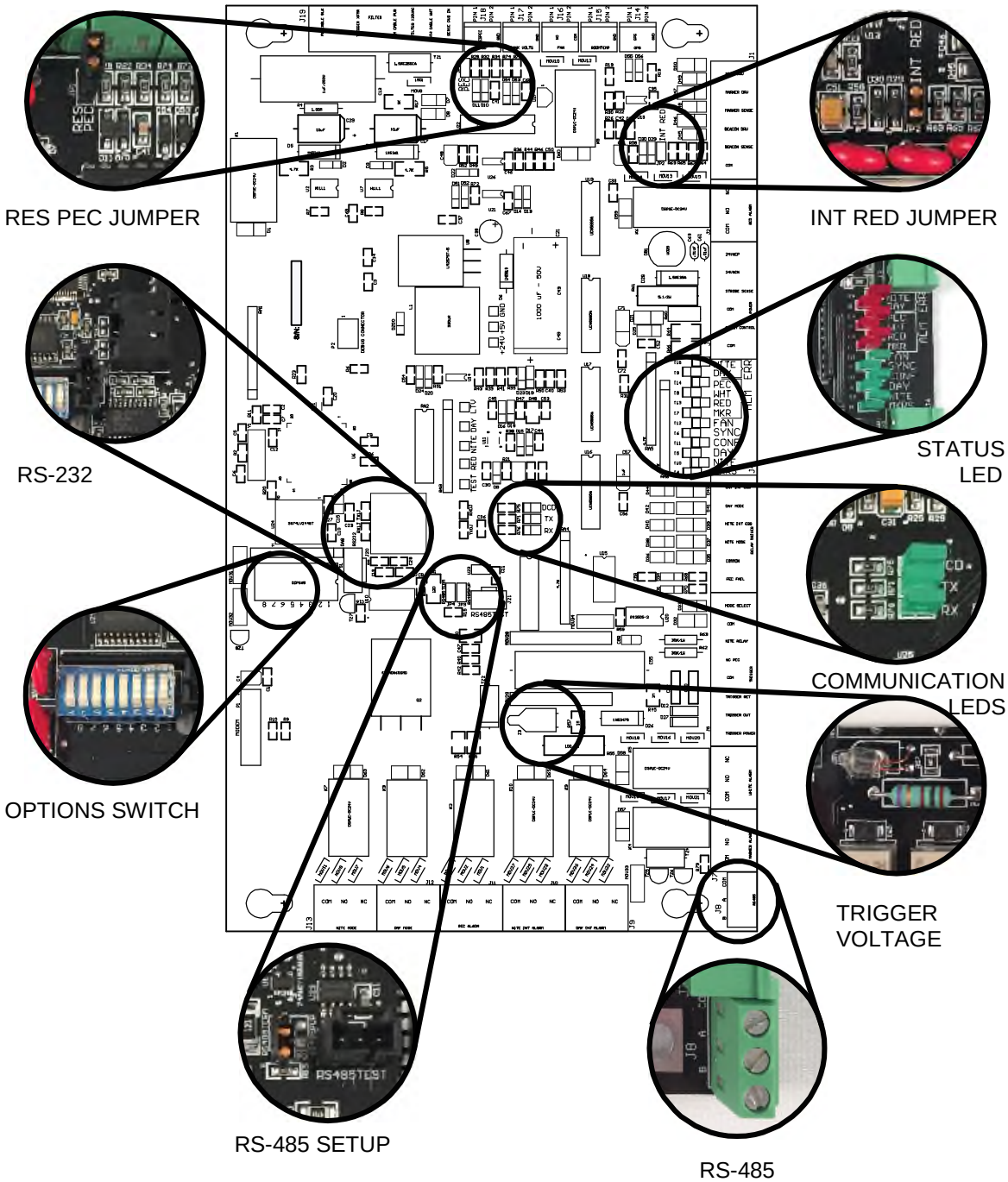


Figure 1-2 – 2903810 Board Configuration (replacement for the 2903800)

Options Switch

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

Table 1-2 – Options Switch

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

Alarm Isolation

Not used in FTB 310-7

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 communication will be disabled and the RS-485 will become active. Table 1-4 defines the RS 485 address setup.

Table 1-3 – 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: RS 485 communication is standard on PC 310-7A and PC 310-7AE models. Switches 2, 3 and 4 are disabled on PC 310-7 units.

Number of Markers

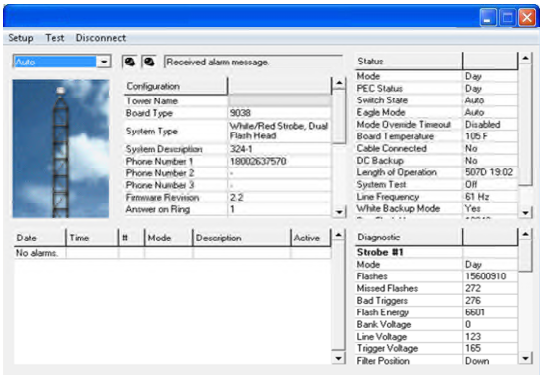
Not used in the 310-7.

RS-232

The RS-232 port allows connection to a laptop for programming and troubleshooting using Tech-Eagle. A Tech-Eagle screenshot is shown below. Tech-Eagle is available for download from www.flashtechnology.com.

If the RS-232 port on a 290380X version PCB is permanently connected or used for some other purpose than configuration and troubleshooting, external electrical isolation of the connection is required. The 290381X version of the PCB has electrical isolation built in.

> **Note:** The RS 232 communication port for Tech-Eagle is standard on PC 310-7A and PC 310-7AE units. PC 310-7 units require upgrade to access this feature.



A direct connect cable, part number 3859001, is required for connection between the 2903810 board and the PC. For more information, select the Help menu in Tech-Eagle.

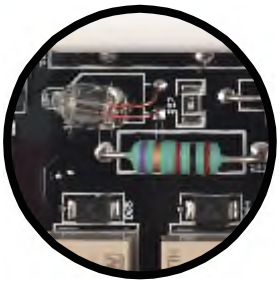
> **Note:** The RS 485 address must be disabled (DIP switches 2 – 4 set to the OFF position) before attempting to connect to the unit with Tech-Eagle. See "RS 485 Communication" for additional information.

RES PEC Jumper

The RES PEC jumper is removed by default. The FTB 310-7 uses a PEC 510 resistive photocell for determining mode transition. The "RES PEC" jumper must be "open" (jumper installed on one pin) on the master unit and "closed" (jumper installed on both pins) on all connected slave units.

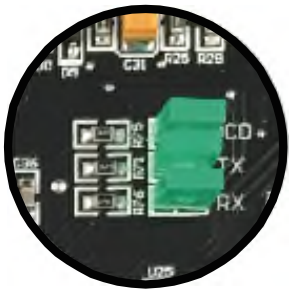
> **Note:** The PC 310-7 is shipped with the "RES PEC" jumper "open" by default.

Trigger Voltage



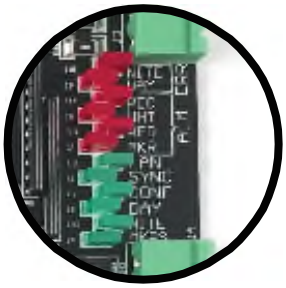
The trigger voltage neon provides an indication that trigger power is being supplied to the 2903810.

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



Twelve LEDs provide information regarding system status and any errors or alarms that are present. Table 1-4 describes the function of each LED.

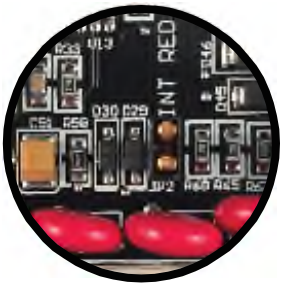
Table 1-4 – Status LEDs

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	RLC failure (310-7I only)
MKR ALM	Not used.
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	Not used.

RS-485 Setup

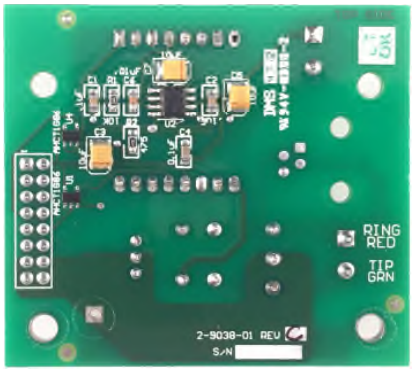
RS485TERM jumper is open by default and should be shorted only on the last 2903810 board in the series of power converters connected to the monitoring unit.

Internal Red Jumper

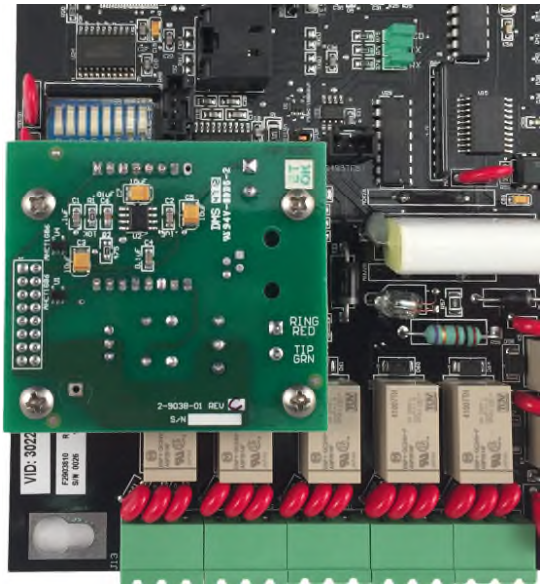


The INT RED jumper is always shorted (jumper placed over both pins) for the FTB 310-7 system.

Optional Modem Card



The 2903801 modem board is installed in the lower left corner of the 29038XX board.



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

> **Note:** The modem is included with 310-7AE units. The modem can be added as an upgrade to PC 310-7A units. PC 310-7 units require replacement of the 29038XX board and addition of the 2903801 modem board.

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

Access

WARNING

Before proceeding, read the warning on Page iii. Disconnect the primary power and wait one minute for storage capacitors to drain down 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

Important! The FH 308 and FH 324W do not contain an interlock switch. Disconnect primary power to the PC 310-7X and wait one minute for storage capacitors to drain down before opening the Flashhead.

The lens assembly is attached to the base by two hinges and secured by two latches. Disengage the latches and pivot the lens open. Two lanyards provide support for the lens assembly when the Flashhead is open. Use a voltmeter to verify that no voltage potential exists between the red and the blue wires of the Flashhead cable.

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

Important! Flash Technology recommends installation of one or more lightning rods near the uppermost Flashhead. Observe the following guidelines for lightning rod installation:

- The lighting rod(s) must extend 36" above (minimum) and be located horizontally 18" away from the Flashhead.
- The lightning rod's location must not interfere with access by service personnel.

Mounting and outline dimensions for the Flashhead FH 308 are shown in Figure 2-2 and FH 324W are shown in Figure 2-3. The Flashhead may be mounted to painted or unpainted surfaces but must be ensured a direct electrical path to tower steel. One of the mounting holes in the base of the Flashhead contains a built-in electrical ground connection. 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 2-4. 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. It should not be mounted underneath the controller where it could be shadowed.
- 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.

All communication wiring should have an insulation rating of 300 volts minimum. All power wiring should have an insulation rating of 600 volts. Input power wiring must be sized to satisfy the load

demand of all connected power converters. Read the notes on the installation wiring diagrams supplied both in this manual and with the equipment. See Figure 2-11 for information about wiring alarm connections to the main panel of the power converter.

Power Converter Wiring

Installation wiring diagrams are provided in Figures 2-5 and 2-6. Installation notes referenced in the wiring diagrams are located immediately after Figure 2-6. 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).

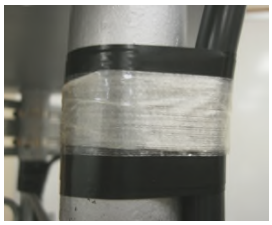
In multiple-unit systems, the master and slave units communicate over the "master/slave" interconnect wiring. To insure proper communication between all interconnected units, the power converters must be on the same electrical phase. Also, the "master/slave" interconnect wires must be twisted together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

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

Important! The photocell must be connected to the master power converter. The uppermost Flashhead must also be connected to the master power converter.

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

The photocell may be located any practical distance from the power converter. The

cable may be spliced to provide additional length. The recommended minimum wire gauge is #16 AWG if additional length is necessary.

The photocell terminals on the slave power converters must have a jumper installed from TB1-1 to TB1-2. As an alternative, a jumper may be installed on PCB1 J18-1 to J18-2.

Installation Checklist

Complete the following steps before applying power to the system.

1. Power Converter Mounting.

   Position and mount each unit correctly, allowing adequate clearance for opening the covers. Use the following checks:

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

2. Power Converter Wiring.

   Examine the installation drawings and use the following checks:

   a. Check for proper incoming service voltage.
   b. Wire each unit according to the instructions.
   c. In multi-unit installations, all power converters are on the same electrical phase. Connection to the same breaker will ensure that the units are on the same phase.
   d. Check all electrical connections for tightness.
   e. Check all terminal strip connections for tightness.
   f. Ground the power converter.
   g. 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.

3. Alarm Wiring:

   a. If external alarm detection circuit responds to closed contacts, ensure that they are wired to the contacts on TB1 that close on alarm.
   b. If external alarm detection circuit responds to open contacts, ensure that they are wired to the contacts on TB1 that open on alarm.
   c. Alarm wiring should be lightning and RFI protected: shielded, grounded shield, and in a conduit.
   d. If a specific alarm is ganged together from all power converters as one, ensure that the wiring follows local installation instructions.

4. Flashhead Mounting.

   a. Ensure that the Flashhead lens can be opened without striking other objects.
   b. Level and aim the Flashhead.

5. Flashhead Wiring.
    a. Protect the top Flashhead against lightning strikes.
    b. Ground the Flashhead.
    c. Check the wiring of the Flashhead cable to the Flashhead.
    d. Secure the Flashhead cable to the tower. Support and tape the Flashhead cable to prevent its movement by the wind.
6. 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 in the Installation Checklist, turn on the power and perform an operational checkout from procedures in Section 3 of this manual.

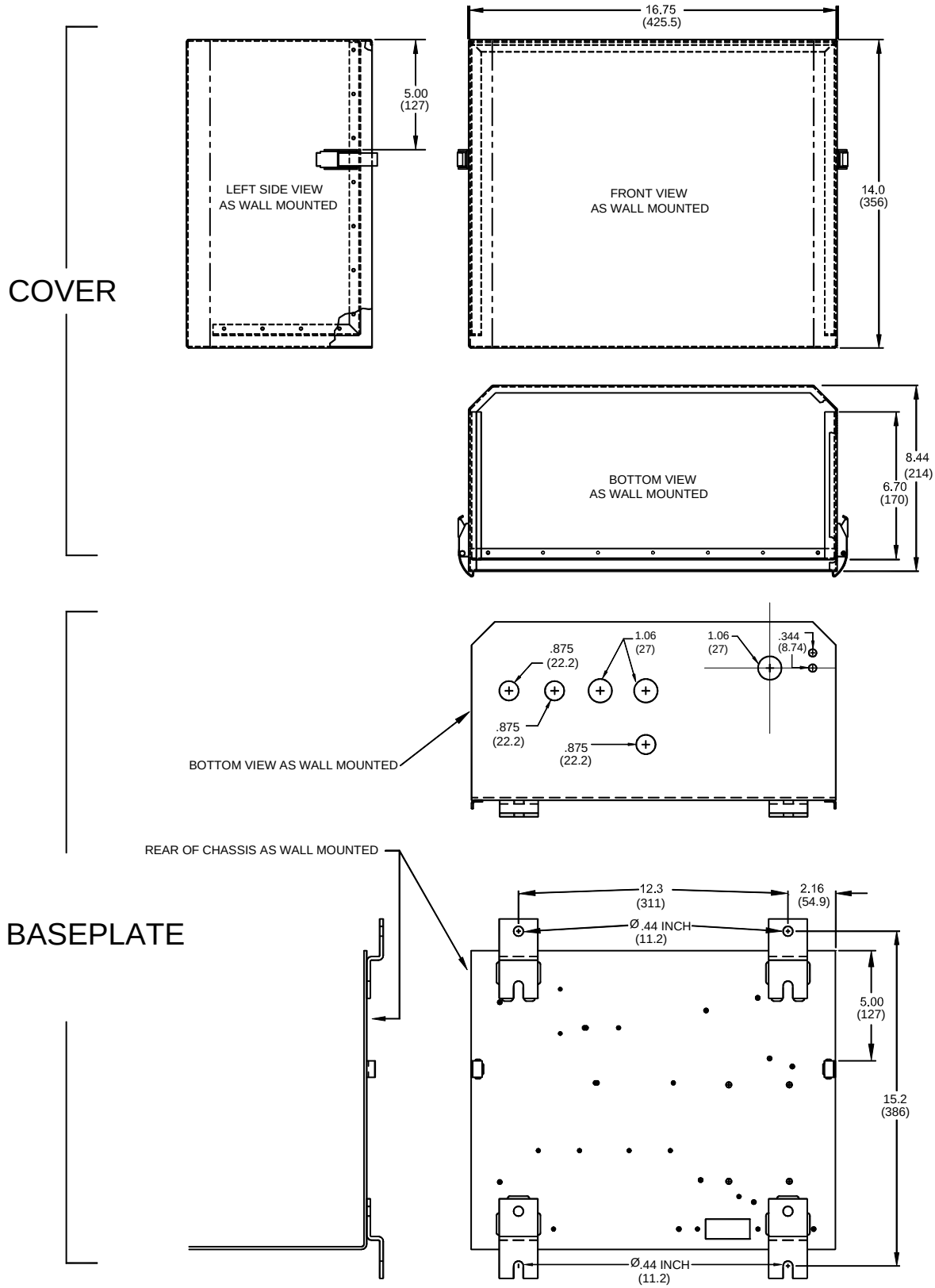
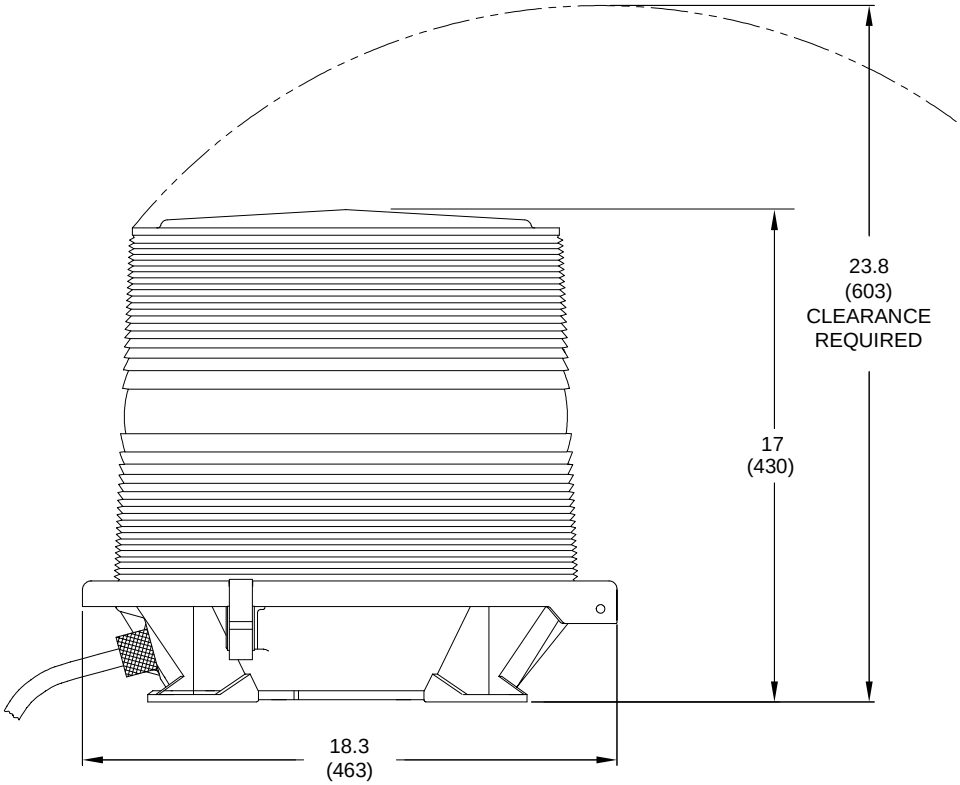
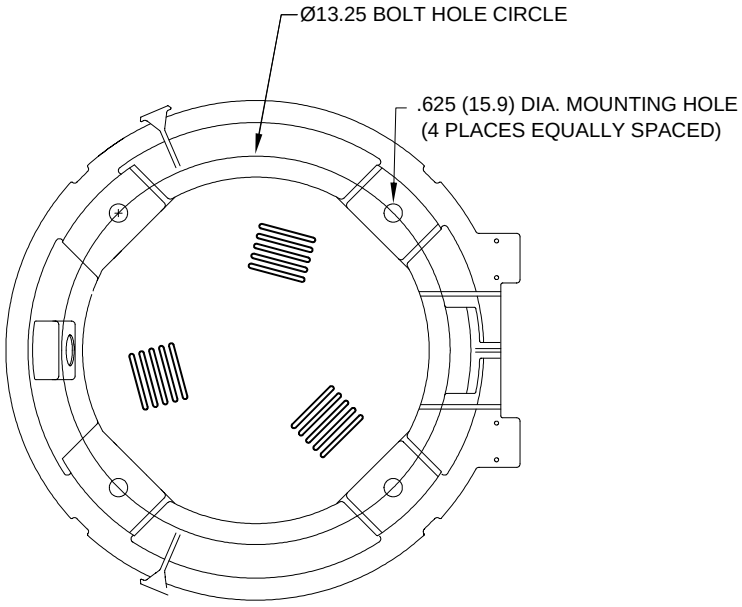


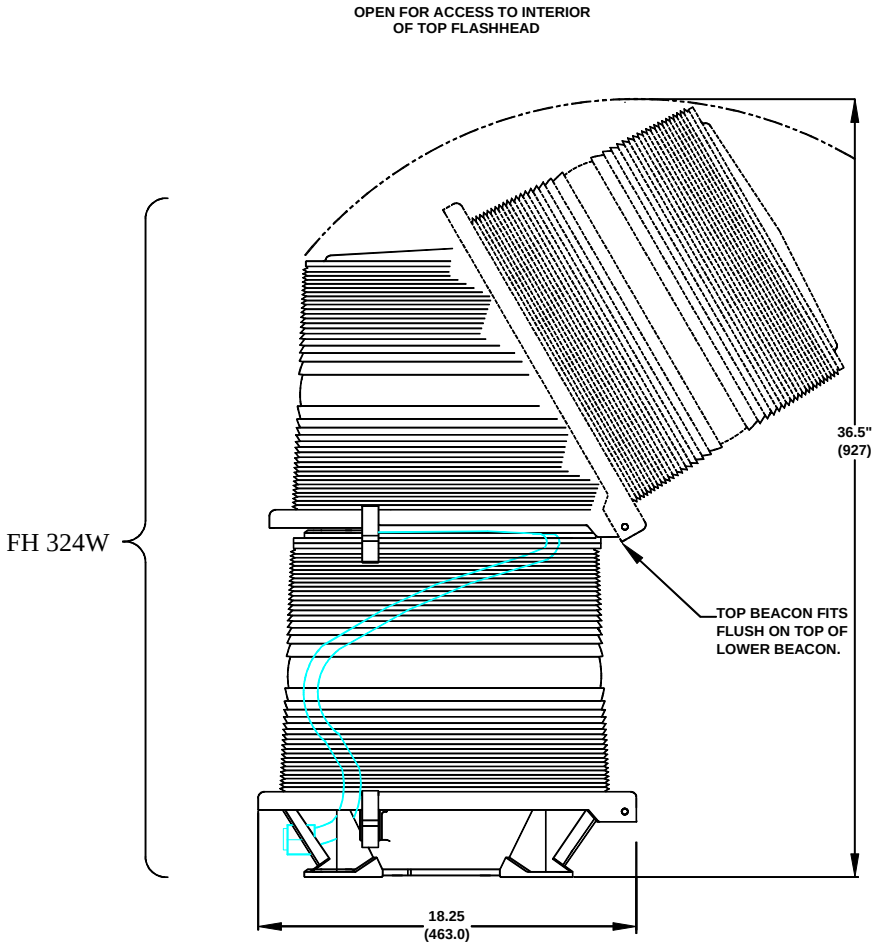
Figure 2-1 – Power Converter (PC 310-7 & PC 310-7B) Mounting and Outline

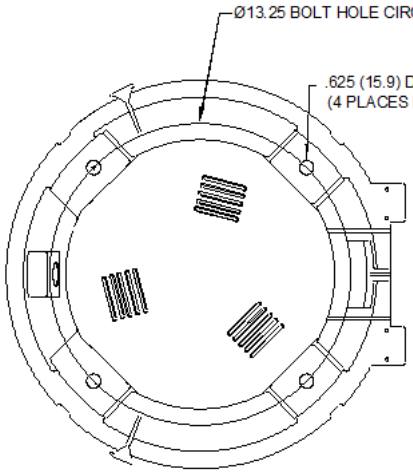




Note: All dimensions are in inches (millimeters).

Figure 2-2 – Flashhead (FH 308) Mounting and Outline

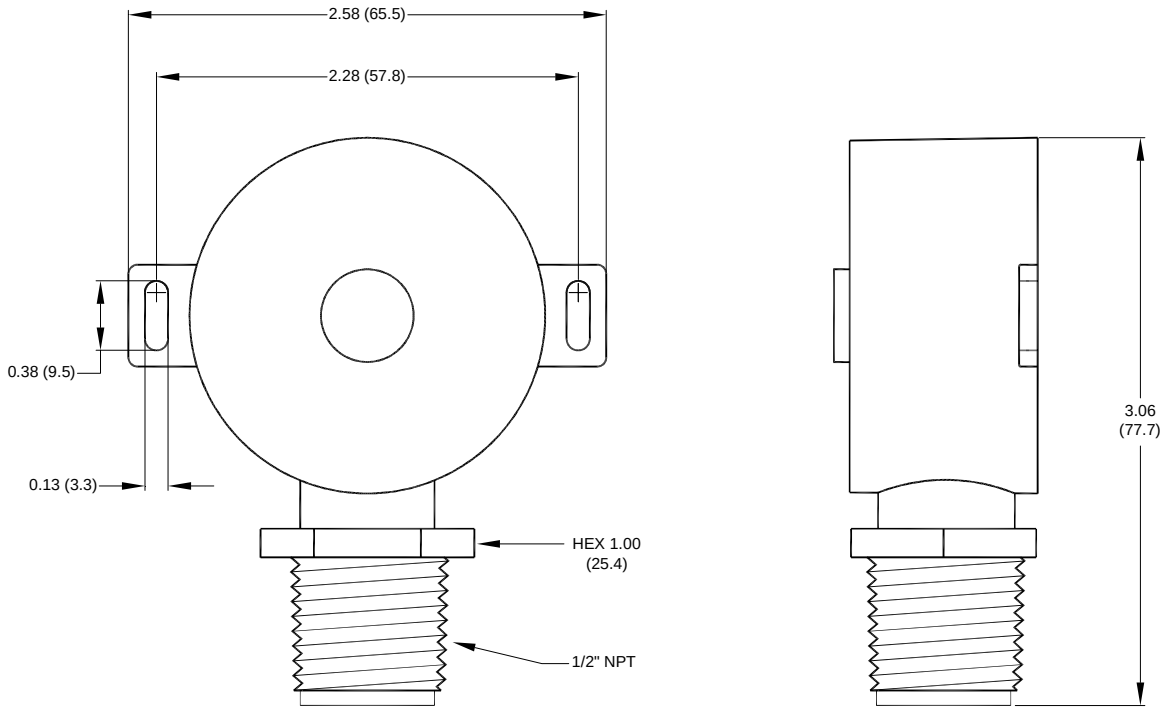




NOTES:
1. Weight: FH 324W, 28LBS. (12.7KG.)
2. Aerodynamic Wind Area: 1.86FT.² (.173M.²)
3. Access to the Flashhead must remain unobstructed.
4. Flashhead should have lighting protection.
5. Use “Safety Support Tool” (P/N 1905333) and follow installer instruction sheet to access the backup (bottom) of the Flashhead.

Note: All dimensions are in inches (millimeters).

Figure 2-3 – Flashhead (FH 324W) Mounting and Outline



Note: All dimensions are in inches (millimeters).

Figure 2-4 – Photocell Mounting and Outline

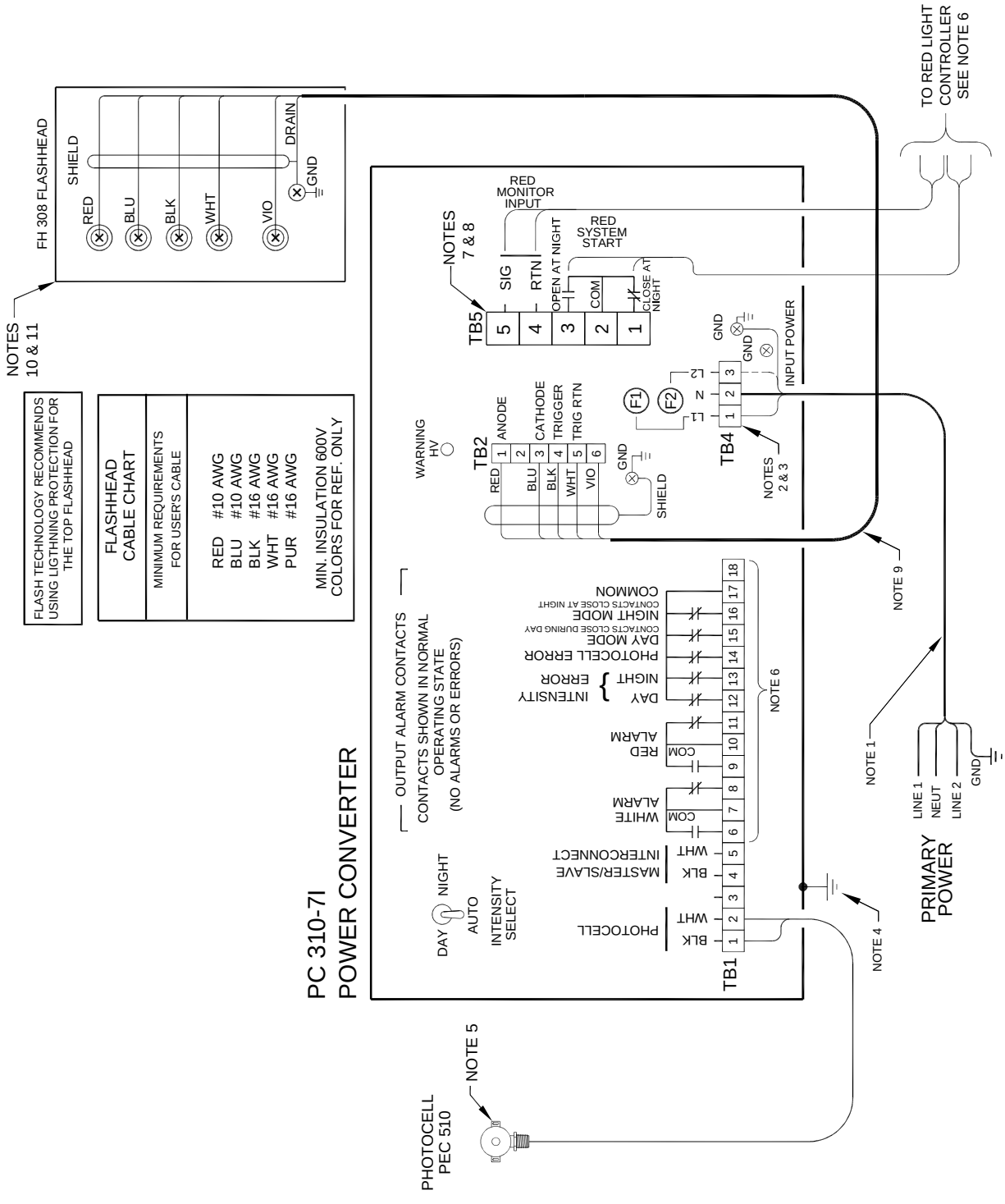


Figure 2-5 – Typical System Installation

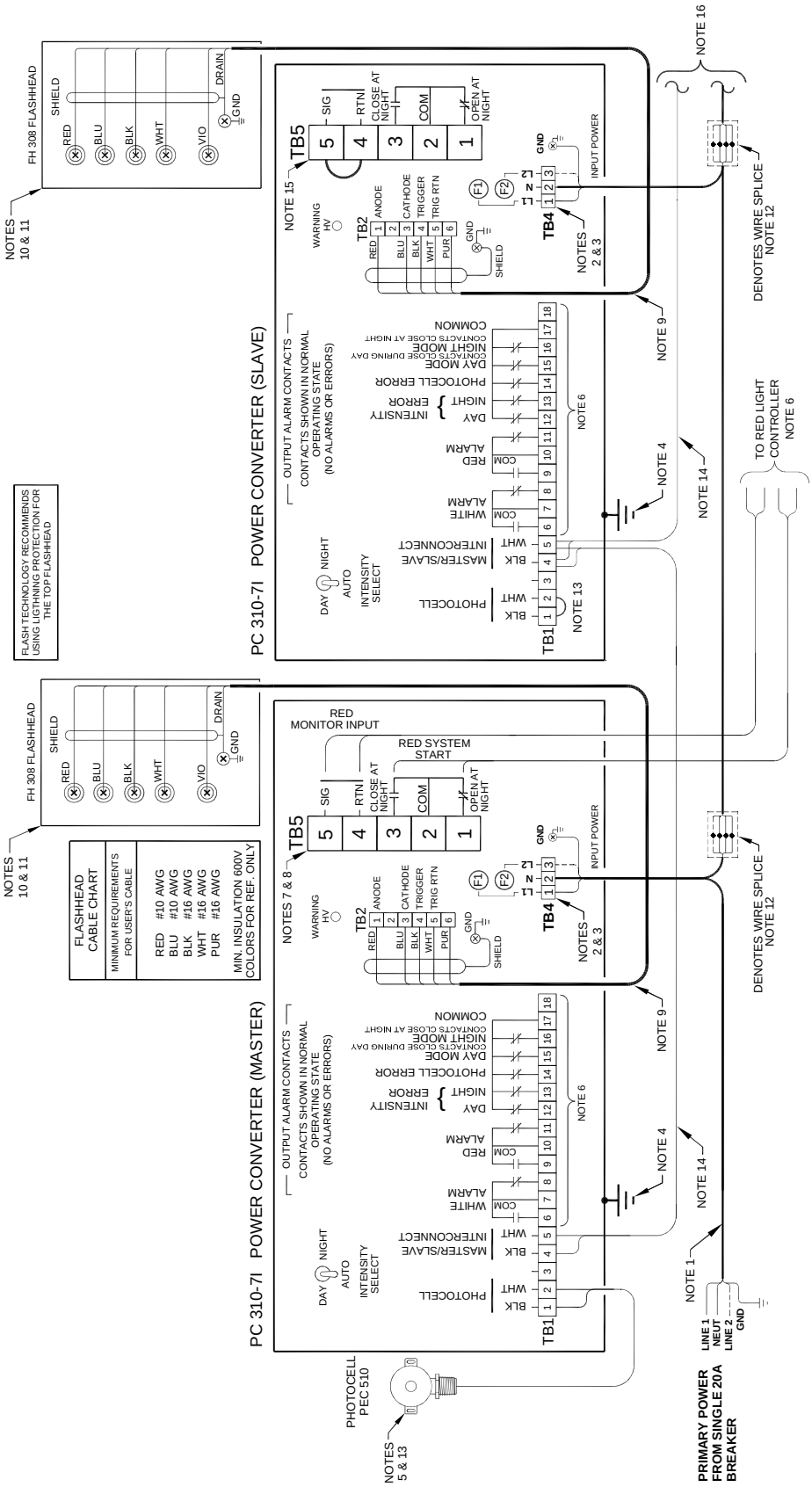


Figure 2-6 – Typical Multiple System Installation

System Wiring Diagram Notes

1. Determine input conductor size by considering the service voltage, distance from the source and the total load demand. 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. Input power wiring must be rated at 600V (min).
2. Use L1 and N for 120V, 60 Hz primary power; use L1, L2, and Neutral for 240V, 60 Hz. Unit is factory wired for nameplate voltage.
3. TB 4 is suitable for up to two #10 AWG conductors per position. Use a junction box if larger conductors are needed and run smaller gauge wire from the junction box to TB4 in each power converter.
4. Ground the case leg to the site grounding system.
5. Mount the photocell at the top end of a vertical length of conduit. The photocell must face an unobstructed polar sky. It must not be allowed to view direct or reflected artificial light.
6. Contact rating 5 amperes, 250 VAC. TB1 terminals 12 to 17 are alarms available on PC 310-7A & AE units only. Users alarm circuit not shown.
7. A PC 310-7I can control a red light system. Isolated contacts, rated at 5A 120 VAC, are available at TB5-1 and TB 5-2, and TB 5-2 and TB 5-3. TB 5-1 and -2 close at night, and TB 5-2 and -3 open at night. You may use the contacts to replace the red system photocell or to energize an intermediate relay that controls the red system power. The source of voltage for the relay should come from the red system, not from the PC 310-7I.
8. PC 310-7I strobe backup operation is available if the red system fails. You may connect the red system fail contacts (must be isolated - not connected to other circuits) to TB 5-4 and TB 5-5. This input expects the red system contacts to open on fail. If the contacts close on fail, the board must be reconfigured using Eagle / Tech-Eagle.
9. PC 310-7B operates a Dual White Only Flashhead, the top being the primary and the bottom being the backup. **Compared to a standard system, the RED wire on PCB1 J1 is moved to pin 4 and the WHT/YEL wire on J1 is moved to pin 2 to allow day and night operation on the Primary until a failure is detected.** Once the Primary (Top) fails the flash will occur on the Backup Layer (Bottom).
10. Flash Technology Part Number 4634000 or equivalent. Flash Technology recommends using a continuous cable without intervening junctions or splices from the Flashhead to the power converter.
11. The Flashhead must be ensured a direct electrical path to tower steel. One mounting hole in the base of the FH 308 contains a built-in electrical ground connection. Use a bonding strap with a Flashhead mounting bolt when mounting the FH 308 to the structure, using the mounting bolt to fasten the strap to the leg that contains the ground connection.
12. Flash Technology recommends installation of one or more lightning rods near the uppermost Flashhead and beacon. The lighting rod must extend 36” above (minimum) and be located horizontally 18” away from the Flashhead and beacon. The lightning rod’s location must not interfere with access by service personnel.
13. Determine branch conductor gauge by considering the load demand on each branch conductor and the length of the run. Master and slave units must be on the same electrical phase. Splice box (if required) typically furnished by others.
14. The photocell must be connected to the master power converter. A jumper must be installed on the photocell input of each slave power converter.
15. Two conductors #16 AWG rated at 300V (min.) twisted together; six twists per foot (min.).
16. A jumper must be installed on TB 5 terminals 4 & 5 of each PC 310-7I slave power converter.
17. Input power, master/slave interconnect, Flashhead and beacon wiring are the same on additional power converter(s) (if installed).

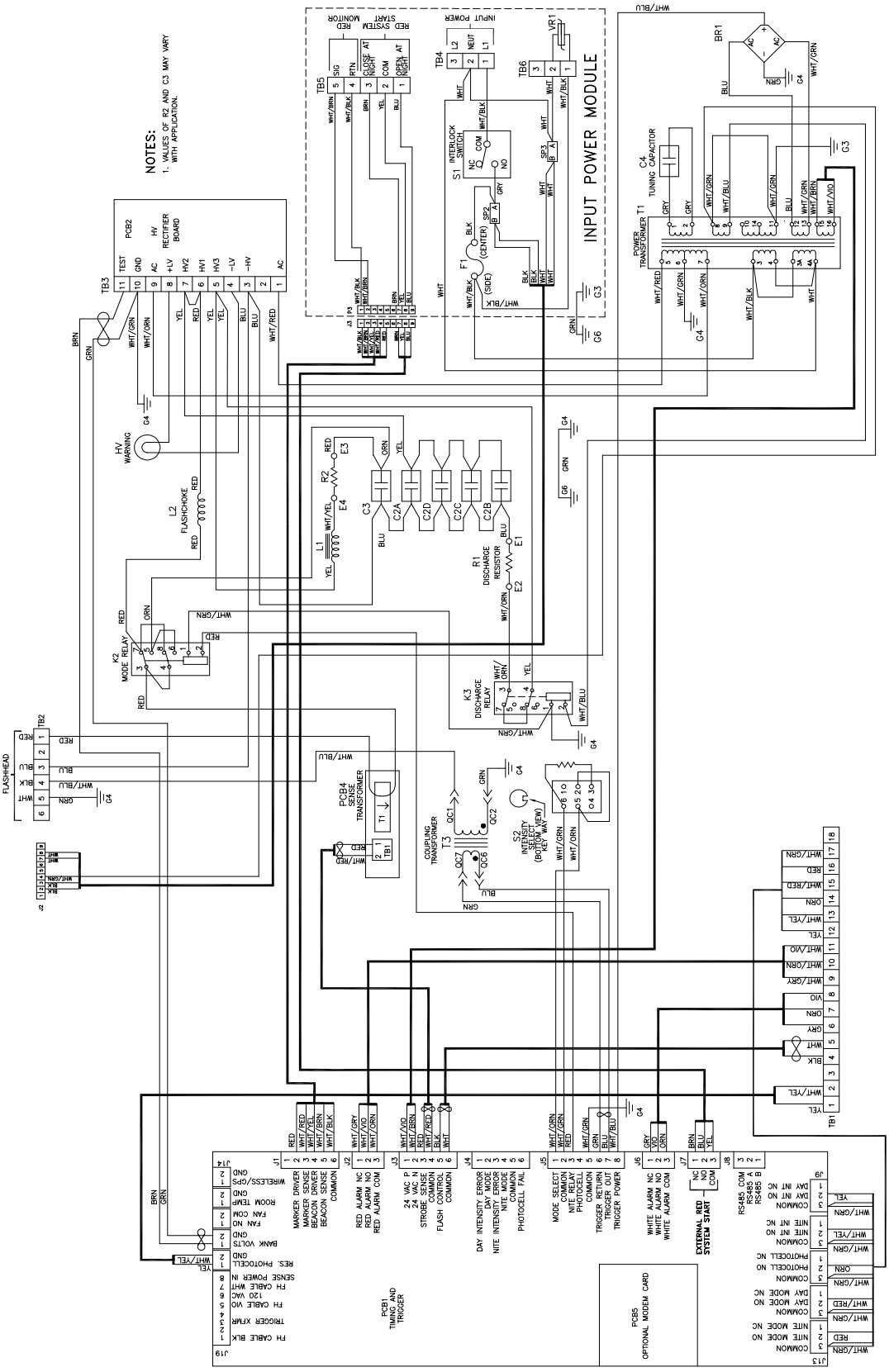


Figure 2-7 – PC 310-7 Power Converter Internal Wiring (110-120V)

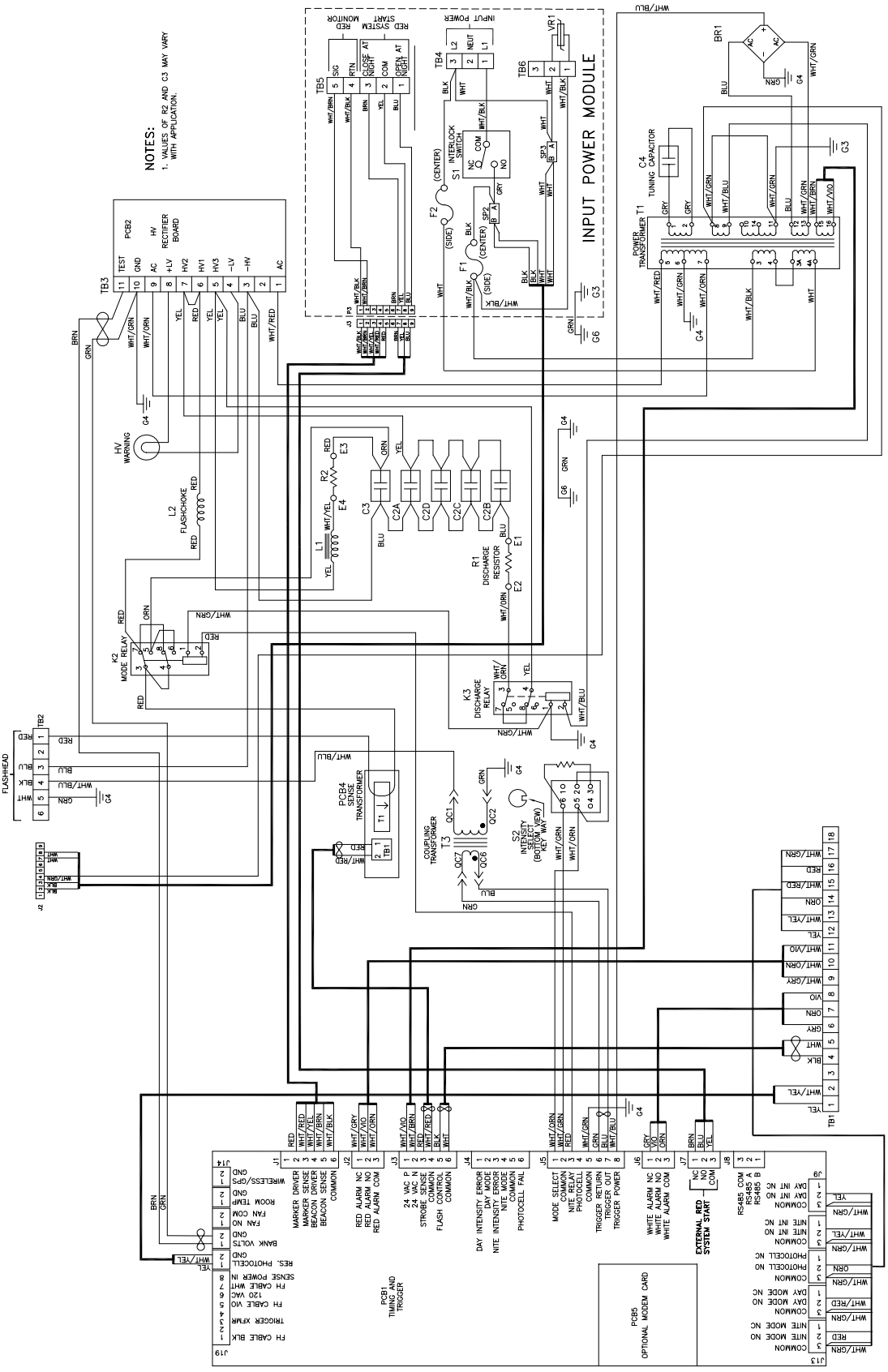


Figure 2-8 – PC 310-7 Power Converter Internal Wiring (208-240V)

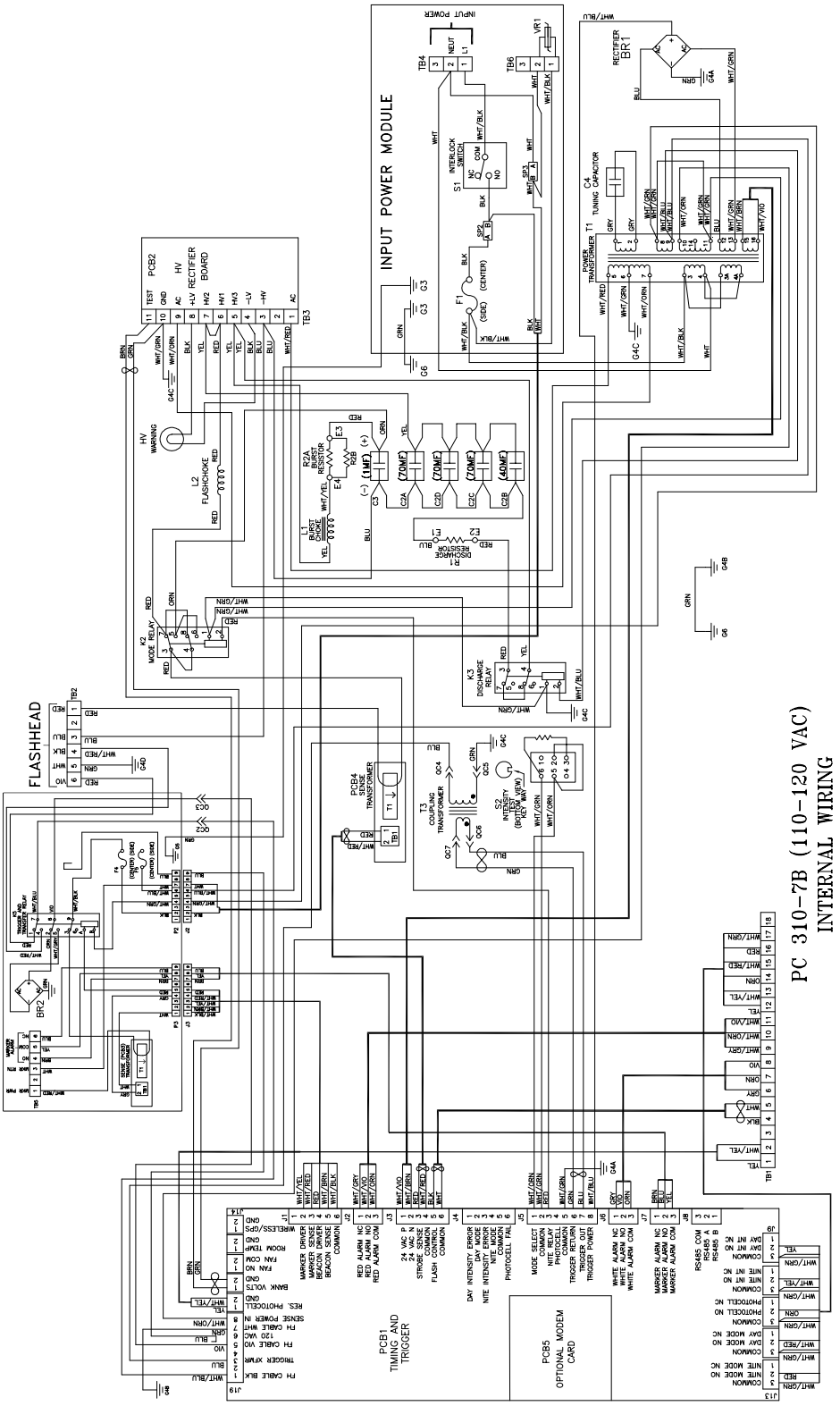


Figure 2-9 – PC 310-7B Power Converter Internal Wiring (110-120V)

NOTE! Wiring change made to J1 of the timing and trigger board for a PC 310-7B configuration. See “System Wiring Diagram Notes” for more information.

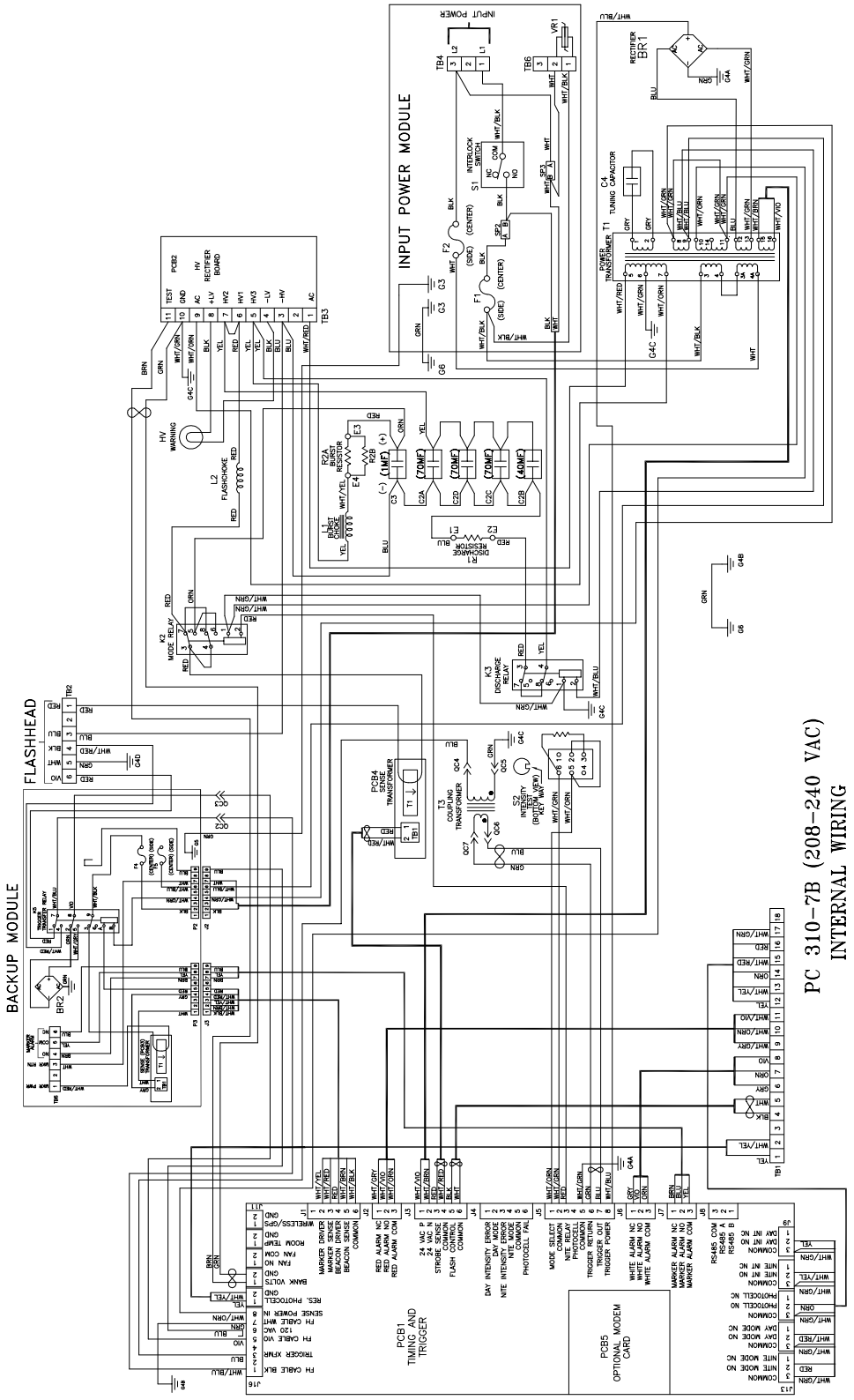
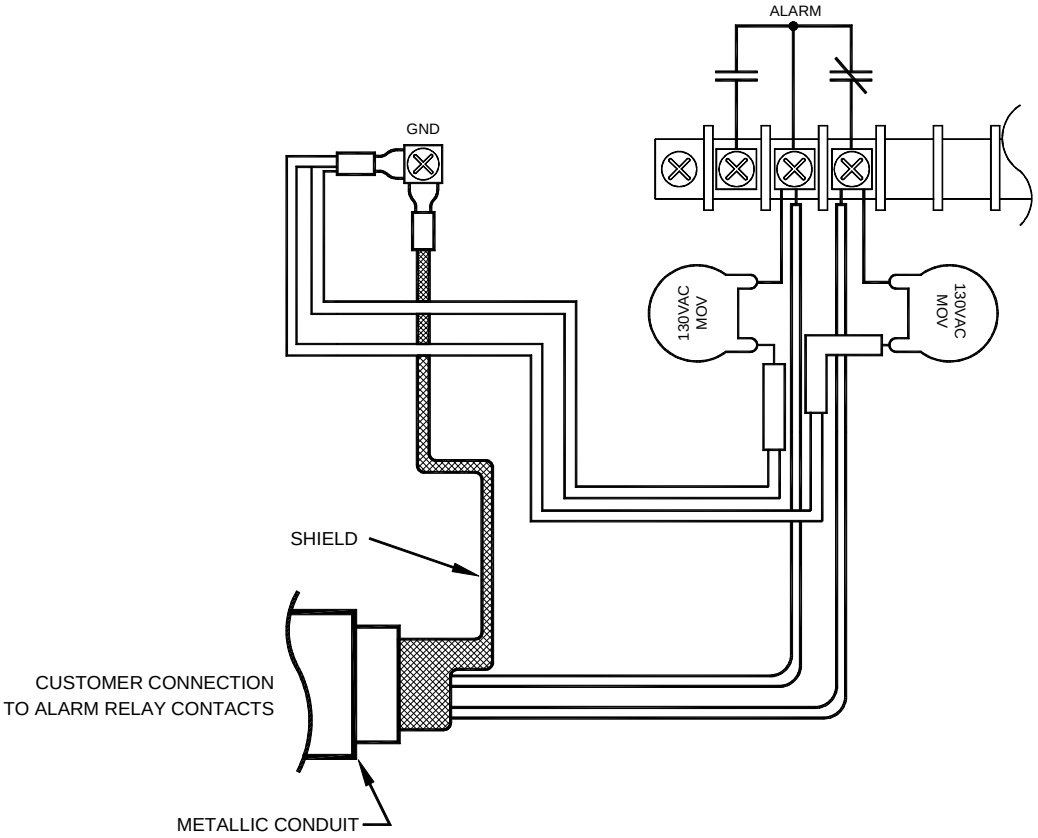


Figure 2-10 – PC 310-7B Power Converter Internal Wiring (208-240V)

NOTE! Wiring change made to J1 of the timing and trigger board for a PC 310-7B configuration. See “System Wiring Diagram Notes” for more information.



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 2-11 – Recommended Alarm Wiring

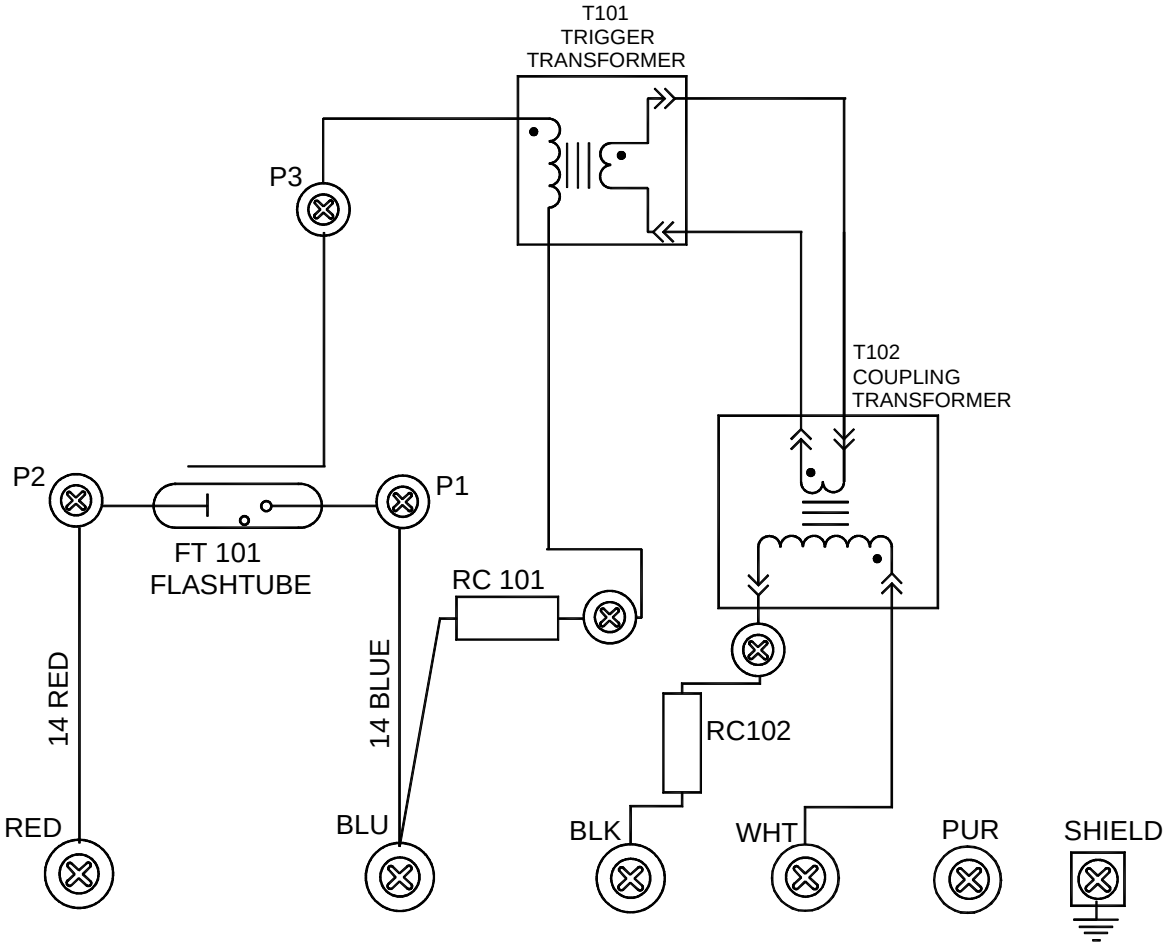


Figure 2-12 – FH 308 Internal Wiring

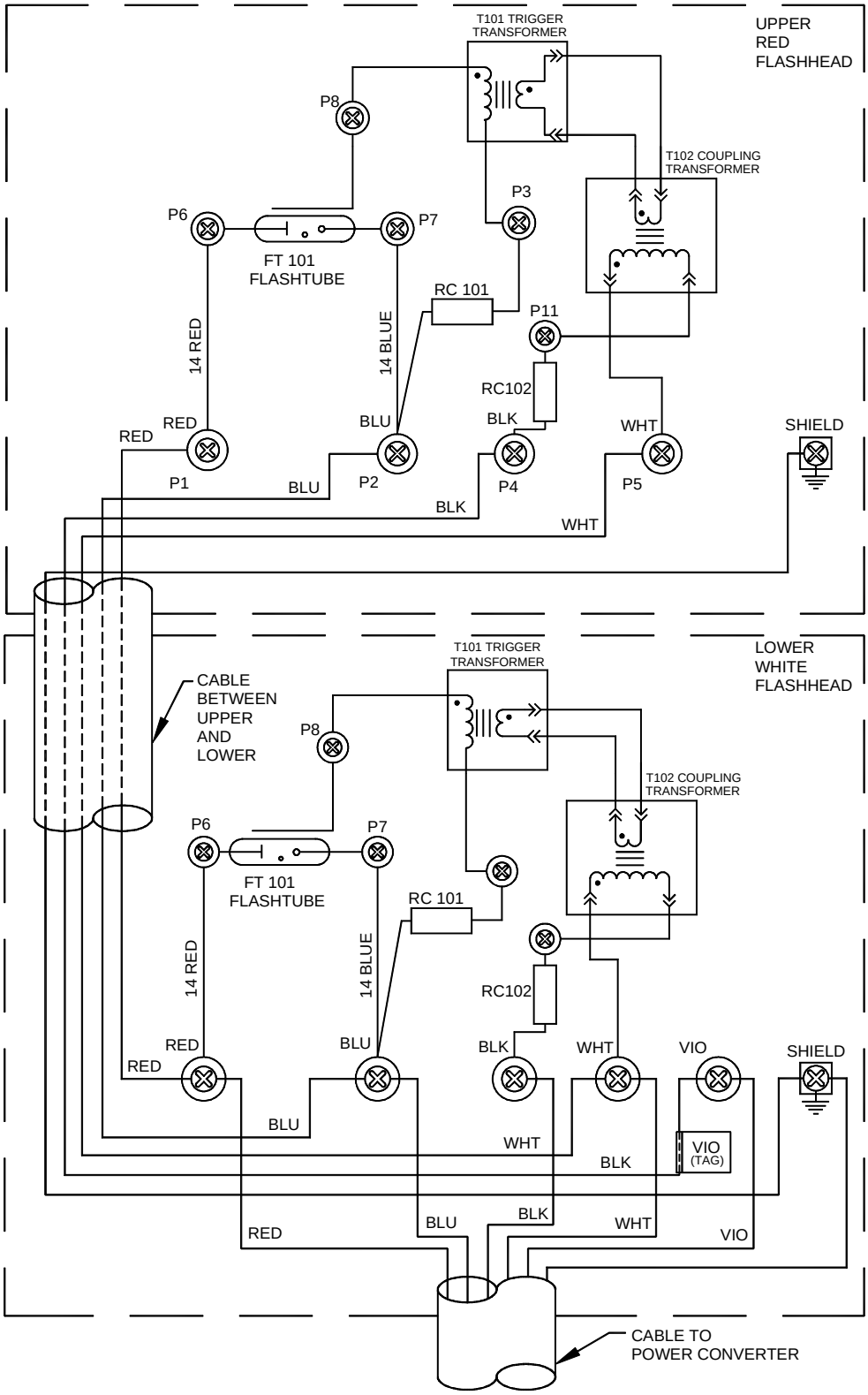


Figure 2-13 – FH 324W Internal Wiring

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.
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 boards, 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 2-6. 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.

The sync signal is a pulse and is 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.

> **Example:** 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

Many digital multimeters have the ability to measure capacitance. If a digital meter with this feature is not available, an analog volt-ohmmeter operating in the resistance mode may be used to evaluate the condition of a capacitor. The following method assumes an analog instrument with a resistance scale of X100.

Place the meter leads across the terminals of a fully discharged and isolated (no electrical connections to other circuits) capacitor. The meter will initially indicate zero ohms and the resistance measurement will increase if the capacitor is functioning normally. A capacitor that is isolated from other circuitry that does not exhibit this behavior is defective. The length of time it takes the meter to reach one meg-ohm is a measure of the capacitance. For example, the time is about 5 seconds for a 10 microfarad capacitor; 10 seconds for a 20 microfarad capacitor, and so forth. Manually discharge the capacitor before repeating this measurement.

A bank of capacitors connected in parallel may be checked as a single unit. If a short circuit is indicated, 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.

> **Note:** Review documentation supplied with the digital multimeter regarding capacitance measurement. Capacitance tests performed with a multimeter (analog or digital) may not detect a malfunction that occurs only at high voltage.

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 by disconnecting either the yellow or white yellow wire from L1. The resistance measurement across L1 should be approximately 9 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 measurement across the coil of the K2 Mode Relay or the K3 Discharge Relay should be approximately 290 ohms.

> **Note:** To easily measure the coil resistance of relay K2, unplug connector J5 from PCB1. Touch one of the meter's probes to the red wire (J5 pin 3) and touch the other to the chassis of the 310-7.
>
> To easily measure the coil resistance of relay K3, remove the white/blue wire from T1 terminal 9. Insert one of the meter's probes into the connector of the white/blue wire and touch the other to the chassis of the 310-7.

Timing and Trigger Board (PCB1)

Replace this circuit board with one known to be in good condition. Before installation, verify that the replacement is correctly configured to match the system type.

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.

> **Note:** To easily measure the resistance, remove the blue wire (not the jumper wire) from C2B and the yellow wire from the burst choke (L1). Insert the meter's probes into the connector of each wire.

Burst Resistor (R2) (R2A & R2B**)

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

> **Note:** To easily measure the resistance, remove the red wire from C3 and the white yellow wire from the burst choke (L1). Insert the meter's probes into the connector of each wire.
>
> ****Note:** If testing is performed on a PC 310-7B resistance value should be 250 ohms (There are *(2) 500 ohm resistors in parallel).*

Power Transformer (T1)

To test the T1 transformer, first remove 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 Tuning Capacitor (C4).

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 of T101 (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. In multiple beacon systems, 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

Component location diagrams for the power converter (PC 310-7, Figure 4-1) (PC 310-7B, Figure 4-2), and Flashhead (FH 308, Figure 4-3) (FH 324W, Figure 4-4) are located in Section 4. Internal wiring diagrams for the power converter (PC 310-7, Figures 2-7 & 2-8) (PC 310-7B, Figures 2-9 & 2-10) and Flashhead (FH 308, Figure 2-12) (FH 324W, Figure 2-13) are located in Section 2.
Note the location and color of all wires that are disconnected to access components for replacement. After installation of replacement components is complete, ensure that all wiring agrees with the corresponding wiring diagram.

The general procedure for removing components is as 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 the 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 2-7, 2-8, 2-9, or 2-10. 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 2-7, 2-8, 2-9, or 2-10 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 2-7, 2-8, 2-9, or 2-10 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 2-7, 2-8, 2-9, or 2-10 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	Dual System Night
I15	NITE ERR – On for night intensity error.	OFF	OFF	OFF
I9	DAY ERR – On when a day intensity error has occurred (light flashed at the incorrect intensity).	OFF	OFF	OFF
I14	PEC ALARM – On for Photocell alarm (Photocell failed to switch state).	OFF	OFF	OFF
I8	WHT ALM – On when a white alarm occurs (white light failed).	OFF	OFF	OFF
I13	RED ALARM – On for optional red alarm (red light failure occurred).	OFF	OFF	OFF
I7	MRK ALM – Not used.	OFF	OFF	OFF
I12	FAN – Not used.	NOT USED	NOT USED	NOT USED
I6	SYNC – Flicks once every six seconds.	FLICK	FLICK	FLICK
I11	CONFIRM – On when PCB1 detects a valid flash. I11 flickers at flash rate.	FLICK	FLICK	OFF
I5	DAY – On when power converter is in day mode.	ON	OFF	OFF
I10	NITE – On when the power converter is in night mode.	OFF	ON	ON
I4	MKRS – Not used.	NOT USED	NOT USED	NOT USED
I3	TRIGGER POWER – Indicates trigger voltage is available.	ON	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 white 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 nighttime intensity. The strobe does not flash if a red light system is used.

   Uncover the photocell and allow the unit to return to day operation.
3. **Check Alarm Sensing:** Remove primary power and disconnect the black wire on TB2-4. Apply primary power and verify the following:
   - The light does not flash.
   - The WHT ALM LED (I 8) is lit after three missed flashes.
   - The DAY ERR LED (I 7) is lit.
   - The alarm circuit operates according to installation requirements.
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.

Dual System (White in Daylight, Red at Night)

The following procedures check normal operation of a dual system, a system with red lights operated by an external red light controller. The external red light controller is connected to TB5.

1. **Check Daytime Operation:** Apply primary power and verify that daytime operation is identical to that for a standard system, step 1. Check Normal Daytime Operation.
2. **Check Nighttime Operation:** Cover the photocell and verify that the white light is not flashing and the red lights are operating normally. The MKRS LED (I 12) is off.
3. **Check Alarm Sensing by Simulating a Failure of the Red Light System:** In this step, you simulate a failure of the red light system. In some installations, you can do this by removing one of the wires (red or black) from the Red Light Controller that connects to the RED MONITOR INPUT at TB5-4 and TB5-5, if an alarm is signaled by contacts that open in the red light controller. See Figure 2-5 and Figure 2-6. Verify the following:
   - The system resumes strobe flashing (at night intensity).
   - The WHT ALM LED (I 8) is not lit.
   - The RED ALM LED (I 3) is lit.
   - The alarm circuit operates according to installation requirements.
4. **Restore the Equipment After Checking:** Replace all disconnected wires. Remove the cover that you placed on the photocell.
5. **If Any Responses are Not Normal:** If any of the responses above are not exactly as described, proceed to Troubleshooting.

Intensity stepping is controlled by a photocell. For testing, the photocell should be exposed to normal outdoor daylight. Figure 1-2 gives the location of the indicator lamps on the board, while Figure 4-1 shows the location of the board within the power converter.

6. **Verify Daytime Operation:** Use the procedure in "1. Check Normal Daytime Operation" for testing the power converter.
7. **Verify Nighttime Operation:** Use the procedure in "2. Check Nighttime Operation" for testing the power converter.

Troubleshooting

Effective troubleshooting procedures, beginning with the observation of system behavior, often lead directly to a faulty component or other abnormal condition. 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 310-7. A master unit is similar to a stand-alone unit, except that it is the controlling unit in a multiple-light system. The photocell and

uppermost Flashhead must be connected to the master unit. Mode control and synchronization information are provided by the master unit to the connected slave units over the interconnect cable connected at TB1 -4 and TB1-5.

1. Disconnect the black master/slave interconnect wire at TB1-4.
2. 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 TB1-4 (labeled "Black") with a voltmeter as described 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. 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 TB1-4 (labeled "Black") 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 beacon flashing at night intensity (low intensity).
5. Check the synchronization signal on the wire removed from TB1-4 with a voltmeter, as described in "Sync Signal Evaluation". An absent pulse may indicate another malfunctioning unit connected to the master/slave interconnect cable or RFI (see RFI Problems).
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	No	No	Fuse F1 fails when replaced	Varistor (MOV) T1 Transformer
No	No	No	No		Connections – Main Power F1 Fuse S1 Interlock T1 Transformer
No	No	OK	OK	Trigger Neon (I3) is lit.	Flashhead Cable Connections FT101 Flashtube PCB1 T101 (Trigger) Transformer T3 / T102 (Coupling) Transformer
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 (I3) is not lit.	PCB1 Board T1 Power Transformer BR1 Bridge
No	OK	OK	OK	White Alarm	Flashtube (FT101) PCB1 Board Trigger Transformer (T101) C2A-D Capacitors Open K2 Relay L2 Flash Choke
OK	High Intensity	OK	OK		PCB1 Board Photocell Circuit K2 Relay Intensity Select Switch Setting
OK	No	OK	OK	White Alarm	C3 Capacitor PCB1 K2 Relay L1 Burst Choke R2 Burst Resistor
-	-	OK	OK	Incorrect Mode	S2 Intensity Select Switch Not in AUTO PCB1
OK	Low Intenisty	OK	OK	Red Alarm (310-7I only)	External red system failure. Red system interface wiring. PCB1 Board Programming

[1]HV = High voltage. PCB2 or HV neon lamp lit confirms HV.
[2]LW = Low voltage. Any PCB1 LED on confirms LV.

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 Jumper Not Installed Across TB1-1 & TB1-2 On Slave Units
Low Intensity	OK	PEC Alarm is not lit.	PEC Photocell Intensity Select Switch
OK	OK	Units Not Flashing Together	Master / Slave Interconnect Wiring PCB1 failure in one unit Units On Different Circuit Breakers / Electrical Phases.
-	-	Units Mixed Red and White (310-7I Only)	Master / Slave units incorrectly interfaced with external red light controller
-	-	Incorrect Flash Sequence (310-7C Only)	PCB1 Board programmed incorrectly Controllers installed in the incorrect position

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 the parts department at 1-800-821-5825.

Power Converter (PC 310-7) Parts

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

Power Converter (PC 310-7B) Parts

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

Flashhead (FH 308) Parts

Table 4-3 lists the part numbers for the Flashhead major replaceable parts.

Flashhead (FH 324W) Parts

Table 4-4 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 (PC 310-7)

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, 0.5 mfd.		6848201*
C4	Capacitor, Tuning, 3 mfd.		6577903
F1	►Fuse, Power, MDL8	4901931*	4901931*
HV	Neon, High Voltage Warning Light		4902317
K2	►Relay 24V, Mode		8900494
K3	►Relay 120V, Discharge		8900493
L1	Choke, Burst		4850601
L2	Choke, Flash		4175200
PCB1	►Timing and Trigger Board PC 310-7		2903815**
	►Timing and Trigger Board PC 310-7A/AE		2903810**
	►Timing and Trigger Board PC 310-7AE		2903812**
PCB2	►HV Rectifier Board		2458005
PCB4	Sense Board		2811101
PCB5	Modem Board		2903801
R1	Resistor, Discharge		6900541
R2	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	Terminal Strip, 6 Position		4902257
TB3	Terminal Strip, 11 Position		8721011
TB4	Terminal Strip, 3 Position		4902134
TB5	Terminal Strip, 5 Position		4902154
TB6	Terminal Strip, 3 Position		4902157
VR1	►Varistor (110-120V)		8250801*
	►Varistor (208-240V)	8250802*	8250802*

►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. The 290381X PCB is a direct plug-in replacement for the 290380X.

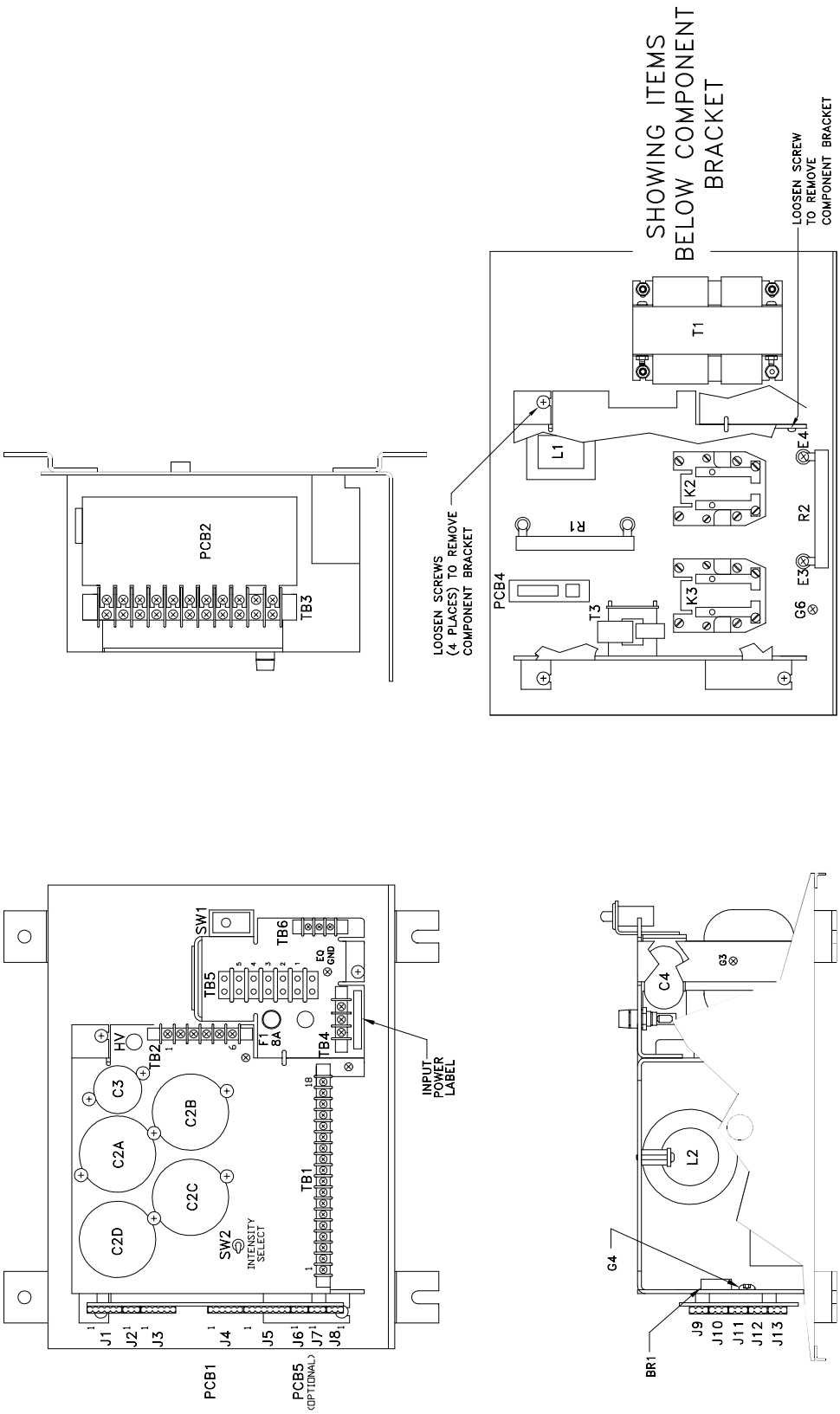


Figure 4-1 – Power Converter Component Layout (PC 310-7)

Table 4-2 – Power Converter Major Replaceable Parts (PC 310-7B)

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*	4901931*
HV	Neon, High Voltage Warning Light		4902317
K2	►Relay 24V, Mode		8900494
K3	►Relay 120V, Discharge		8900493
L1	Choke, Burst		4850601
L2	Choke, Flash		4175200
PCB1	►Timing and Trigger Board PC 310-7B		2903815**
	►Timing and Trigger Board PC 310-7B		2903810**
	►Timing and Trigger Board PC 310-7B		2903812**
PCB2	►HV Rectifier Board		2458005
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	Terminal Strip, 6 Position		4902257
TB3	Terminal Strip, 11 Position		8721011
TB4	Terminal Strip, 3 Position		4902134
TB5	Terminal Strip, 5 Position		4902154
TB6	Terminal Strip, 3 Position		4902157
VR1	►Varistor (110-120V)		8250801*
	►Varistor (208-240V)	8250802*	8250802*
M1	Backup 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. The 290381X PCB is a direct plug-in replacement for the 290380X.

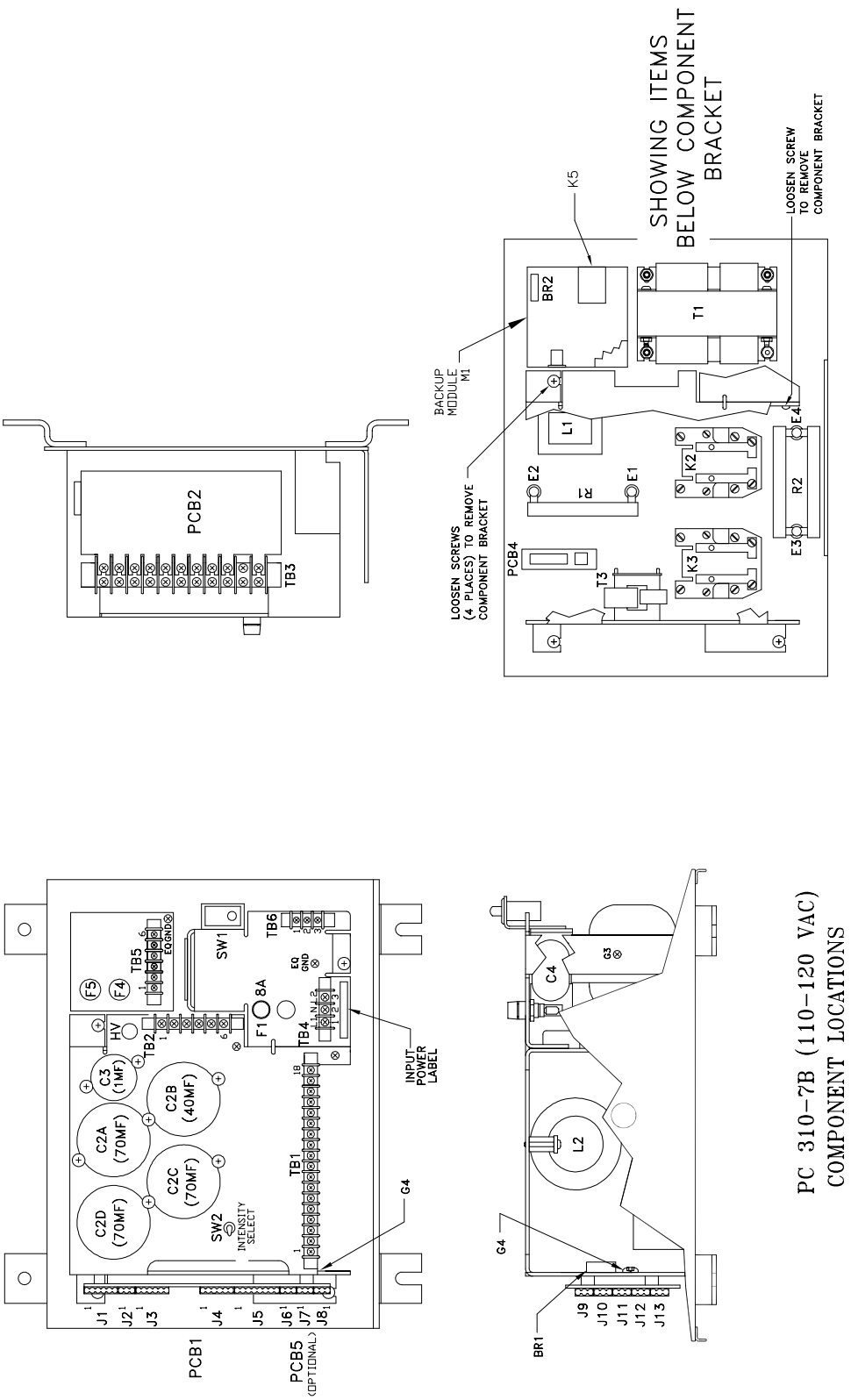


Figure 4-2 – Power Converter Component Layout (PC 310-7B)

Table 4-3 – Flashhead Major Replaceable Parts (FH 308)

Reference	Description	Part Number
FT101	Flashtube	8384329
P1,P2,P3	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	8905338

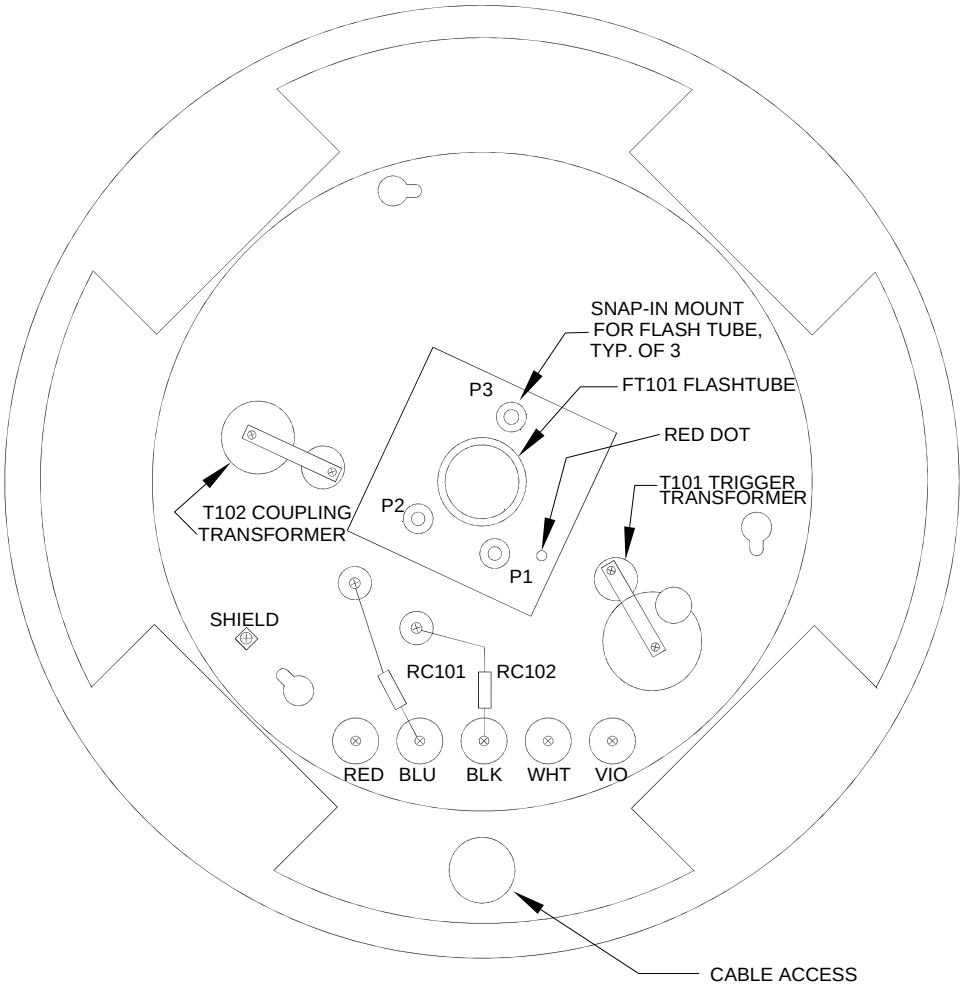
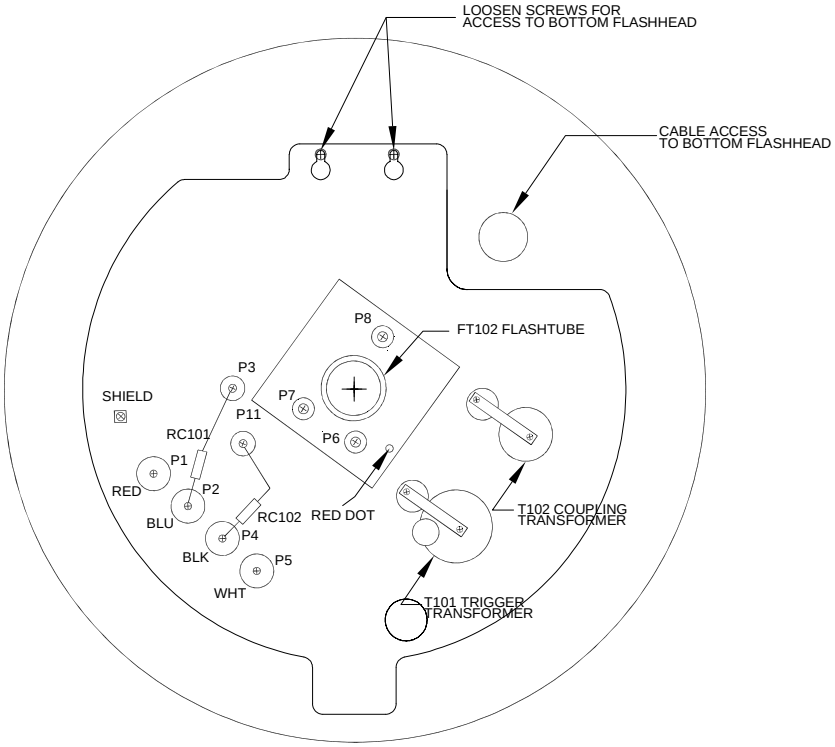


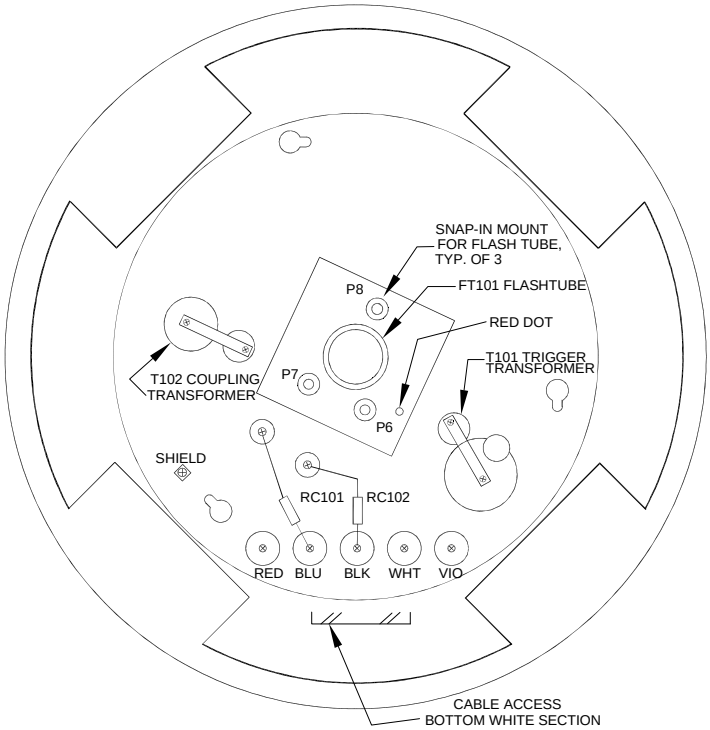
Figure 4-3 – Flashhead Component Layout (FH 308)

Table 4-4 – Flashhead Major Replaceable Parts (FH 324W)

Reference	Description	Part Number
FT101&102	Flashtube (Upper and Lower)	8384329
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



FH 324W Primary(Upper) Flashhead Component Location



FH 324W Backup (Lower) Flashhead Component Location

Figure 4-4 – Flashhead Component Layout (FH 324W)

Return Material Authorization (RMA) Policy

IF A PRODUCT PURCHASED FROM FLASH TECHNOLOGY MUST BE RETURNED FOR ANY REASON (SUBJECT TO THE WARRANTY POLICY), PLEASE FOLLOW THE PROCEDURE BELOW:

Note: An RMA number must be requested from Flash Technology prior to shipment of any product. No returned product will be processed without an RMA number. This number will be the only reference necessary for returning and obtaining information on the product's progress. Failure to follow the below procedure may result in additional charges and delays. Avoid unnecessary screening and evaluation by contacting Technical Support prior to returning material.

1. **To initiate an RMA: Call Flash Technology's National Operations Center (NOC) at (800-821-5825) to receive technical assistance and a Service Notification number. The following information is required before a Service Notification number can be generated:**
   - Site Name/Number / FCC Registration number/ Call Letters or Airport Designator
   - Site Owner (provide all that apply – owner, agent or subcontractor)
   - Contractor Name
   - Contractor Company
   - Point of Contact Information: Name, Phone Number, Email Address, Fax Number and Cell Phone (or alternate phone number)
   - Product's Serial Number
   - Product's Model Number or part number
   - Service Notification Number (if previously given)
   - Reason for call, with a full description of the reported issue

2. **The Service Notification number will then serve as a precursor to receiving an RMA number if it is determined that the product or equipment should be returned. To expedite the RMA process please provide:**
   - Return shipping method
   - Shipping Address
   - Bill to Address
   - Any additional information to assist in resolving the issue or problem

3. **Product within the Warranty Time Period**
   a. If to be returned for repair;
      - RMA # is generated
      - Once product is received and diagnosed;
        - Covered under warranty – product is repaired or replaced
        - Not covered under warranty – quote is sent to the customer for a bench fee of **$350 plus parts** for repair
          - If the customer does not want the product repaired, a **$50 test fee** is charged before being returned

   b. If advance replacement;
      - Purchase order may be required before the advance replacement order is created
      - RMA # is generated and the advance replacement order is created

- Once product is received and diagnosed;
    - Covered under warranty – credit given back if PO received
    - Not covered under warranty – credit **will not** be applied to PO
- Flash Technology has sole discretion in determining warranty claims. Flash Technology reserves the right to invoice for parts advanced if the associated failed parts are not returned within 15 days of issue or if product received is diagnosed to be non-warranty.
- Advance replacements will be shipped ground unless the customer provides alternative shipping methods.

4. **Product outside the Warranty Time Period**
    a. For Xenon System board repair; a purchase order is required at time of request for a RMA # for a standard **$350 repair bench fee**
        - RMA # is generated with the PO attached
        - If the board is deemed non-repairable after diagnosis, the customer is notified. If the customer purchases a new board, the repair bench fee is waived. If the customer does not buy a new board, a **$50 test fee** is charged before being returned or scrapped.
    b. For all other products; no purchase order is required to return the product for diagnosis
        - RMA # is generated
        - Once product is diagnosed, quote is sent to the customer for a bench fee of **$350 plus parts** for repair
        - Once the purchase order is received, the product will be repaired and returned
            - If the customer does not want the product repaired, a **$50 test fee** is charged before being returned or scrapped.

5. **After receiving the Flash Technology RMA number, please adhere to the following packaging guidelines:**
    • All returned products should be packaged in a way to prevent damage in transit. Adequate packing should be provided taking into account the method of shipment.
    Note: Flash Technology will not be responsible for damaged items if product is not returned in appropriate packaging.

6. **All packages should clearly display the RMA number on the outside of all RMA shipping containers. RMA products (exact items and quantity) should be returned to:**
    Flash Technology
    Attn: RMA #XXX
    332 Nichol Mill Lane
    Franklin, TN 37067

7. **All RMA numbers:**
    • Are valid for 30 days. Products received after 30 days may result in extra screening and delays.
    • Must have all required information provided before an RMA number is assigned.