

FLASH TECHNOLOGY



FTB 204-2, S, PB; 204-3X, SX; 205-11, S;
207-2, S, PB; 208-2, S; 304-2, S; 305-2, S

Obstruction Lighting System
Reference Manual
Part Number 79120X2

SERIAL NUMBER

Front Matter

Abstract

This manual contains information and instructions for installing, operating and maintaining the FTB 204, 205, 207, 208, 304 & 305 Obstruction Lighting Systems.

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Trademark Acknowledgements

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Applicable Specifications

This equipment meets or exceeds requirements for an FAA Type L-856 and L-857.

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. 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

The FTB 204 High Intensity Beacon consists of an FH 204 Flashhead and a PC 204 Power Converter in separate enclosures. The FTB 204X allows for extended separation, up to 700', between the PC 204 and the FH 204.

Note: See Appendix 3 for information specific to 204X systems.

The FTB 207 High Intensity Catenary Beacon consists of an FH 204 Flashhead and a PC 207 Power Converter in separate enclosures.

Note: See Appendix 2 for information specific to 204SPB and 207SPB systems.

The FTB 205 High Intensity Beacon is a self-contained unit with an optical assembly mounted in the enclosure.

The FTB 208 High Intensity Catenary Beacon is a self-contained unit with an optical assembly mounted in the enclosure.

System Controller

For standard (non-S) versions, an FTC 140 system controller directs flash timing and intensity and records and reports Beacon operating status. It enables either automatic or manual intensity control, and it continuously displays the flashing status of each Beacon. For further information, consult the FTC 140 System Controller Manual.

For "S" versions, an FTC 121 system controller monitors the status and operating parameters of the lights. The lights can be interrogated by the controller, or remotely via a telephone line connected to the controller. For further information, consult the FTC 121 System Controller Manual.

Variations and Options

The FTB304/305 (S) medium intensity systems operate in twilight and night modes only. In this case, wherever 204 and 205 appear in the manual substitute 304 and 305, respectively. Contact Customer Service at 1-800-821-5825 for a description of equipment variations and options.

Specifications

Physical

PC 204/207 (H x W x D, Weight)
23 x 17.13 x 9.42 in., 70 lbs.
584.2 x 435.1 x 239.2 mm, 31.8 kg
Wind Area: 2.4 ft², 0.22 m²

FH 204 (H x W x D, Weight)
22.5x 18.2 x 12.8 in., 18 lbs
571.5 x 462.3 x 325 mm, 8.2 kg
Wind Area: 1.99 ft², 0.18 m²

FTB 205/208 (H x W x D, Weight)
22.35 x 20.88 x 11.23 in., 85 lbs.
567.7 x 530.4 x 285.2 mm, 38.6 kg
Wind Area: 2.9 ft², 0.27 m²

Environmental

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

Performance Characteristics

Application

FTB 204/205 L-856
FTB 207/208 L-857

Flash Intensity (nominal):

Day (204/205) 270,000 ± 25% ECD
Day (207/208) 140,000 ± 25% ECD
Twilight 20,000 ± 25% ECD
Night 2,000 ± 25% ECD
Beam Spread Horizontal: 120°
Vertical: 3°

Flash Rate	
FTB 204/205	40 flashes per min.
FTB 207/208	60 flashes per min.

Electrical (factory pre-wired)	
AC Voltage	
120-480 VAC \pm 10%, 60 Hz	
110-230 VAC \pm 10%, 50 Hz	
Volt-Amperes	600 peak
Day	255W

Operation

The controller determines the operating intensity of the structure lights, and then informs the Timing and Trigger Board (PCB1) in each beacon.

Beacon/Power Converter

The beacon starts flashing when power is applied. A pair of shielded conductors between the beacons and the controller carries the control and monitoring signals for an entire system. Each beacon sends a flash confirmation signal to the controller for monitoring. Individual encoding identifies the beacon of origin, thus enabling all beacons in a system to individually report to the controller.

All beacons are capacitive discharge lights that use a xenon flashtube.

Note: If the controller is disconnected, or fails, all beacons flash by default at high intensity.

Catenary Operation (FTB 207, 208)

High intensity lights for towers that support catenary wires require three levels (tiers) of lights. An example of a typical catenary installation is shown in Figure 1-3. One tier is 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. The flash rate is 60 flashes per minute in all modes and the

flash sequence is as follows: middle – top – bottom. All lights at the same tier flash simultaneously.

Note: Flash Technology recommends FTC 121 controllers and GPS synchronization for catenary lighting systems.

Location

Flash Technology uses a standard format: it refers to the lowest level as Tier 1 and the most northerly facing light as beacon 1. Higher numbered beacons are placed around the structure in a North-East-South-West direction. Figure 1-3 shows a typical installation.

Flash Modes

Night

At nightfall, the controller switches the beacon to night mode operation; the flashhead flashes at the night intensity of $2,000 \pm 25\%$ ECD.

Twilight

At twilight, the controller switches the beacon to twilight mode operation; the flashhead flashes at the twilight intensity of $20,000 \pm 25\%$ ECD.

Day

At daybreak, the controller switches the beacon to day mode operation; the flashhead flashes at the required daylight intensity: $270,000 \pm 25\%$ ECD for FTB 204 & 205 and $140,000 \pm 25\%$ ECD for FTB 207 & 208.

60/50 Hz Operation

PCB1 can operate from either a 60Hz or a 50Hz power source.

Fixed Mode Operation

The following table explains how to force the beacon to operate continuously at a fixed flash intensity (mode). Use these procedures to check operation at all three flash intensities. A handheld terminal (PN 1903776) can also be used to control the modes (see Appendix 1).

Intensity	Procedure
DAY (High)	Place a jumper between Test Point 1 (TP1) labeled TEST and TP6 labeled DAY.
TWI (Twilight)	Place a jumper between Test Point 1 (TP1) labeled TEST and TP5 labeled TWI.
NITE (Low)	Place a jumper between Test Point 1 (TP1) labeled TEST and TP4 labeled NITE.
LTV	Factory use only. Causes continuous triggering. Do not use.

Note: Remove all installed test jumpers after beacon tests are completed.

Configuring PCB1

PCB1 (2904411 for standard version, 2904410 for “S” version) communicates with the system controller and governs all functions pertaining to the lighting unit’s operation. It has nine light emitting diode (LED) indicators, and one clear neon indicator that can be used to monitor equipment operations during checkout and troubleshooting. A handheld terminal (PN 1903776) is available and can provide more in-depth information when troubleshooting and testing the unit. Figures 1-1 and 1-2 show the location of the key components used for troubleshooting PCB1. Appendix 1 provides complete information regarding the functions of the handheld terminal.

The lighting unit is shipped from the factory with PCB1 programmed as specified by the purchase order. If field replacement of PCB1 becomes necessary, the handheld terminal may be used to program the replacement to match the programming of the original. Otherwise, the programming of the original PCB1 should be specified when ordering a replacement.

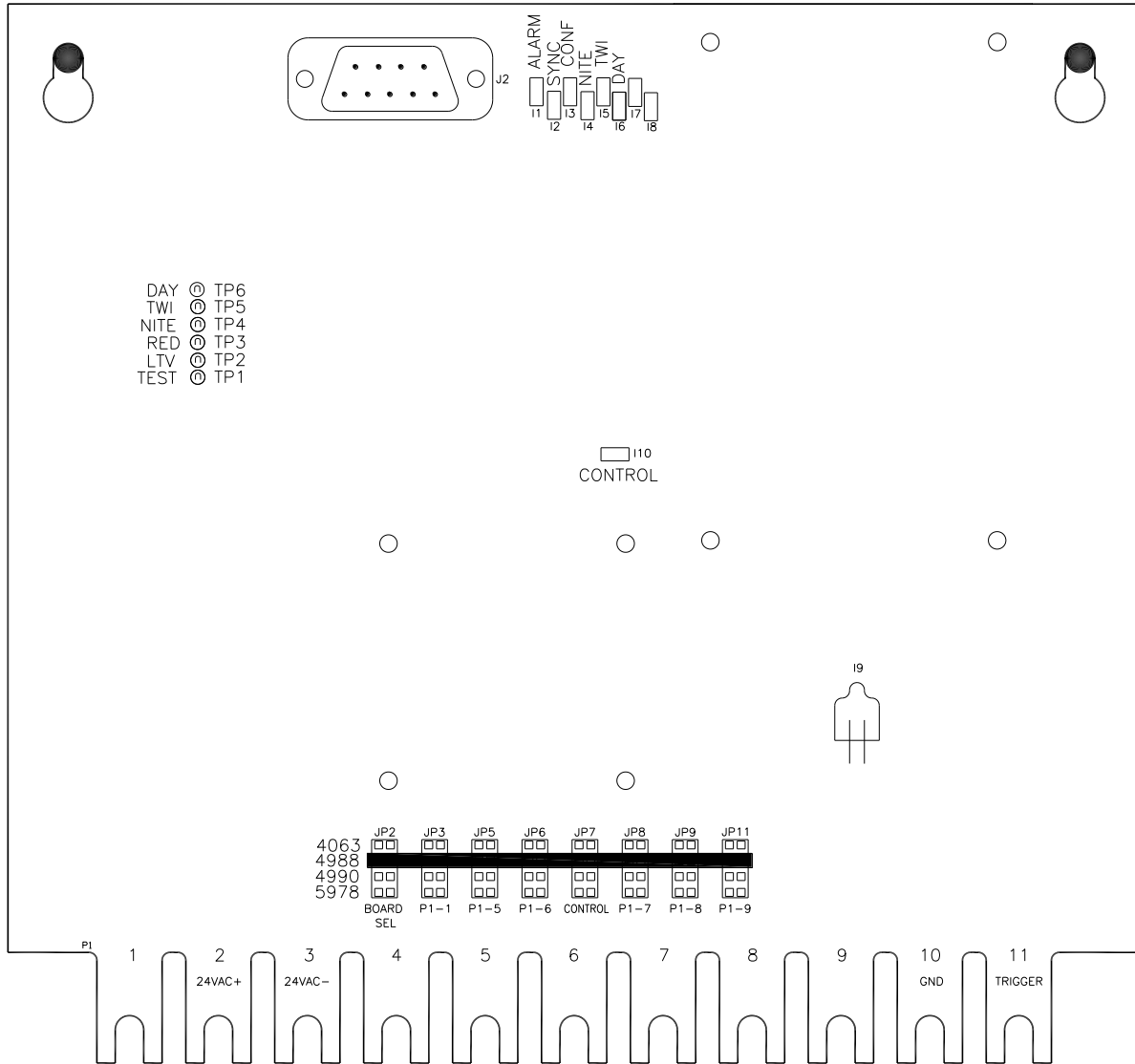


Figure 1-1 – PCB1 (2904411) Timing and Trigger Board Standard Version

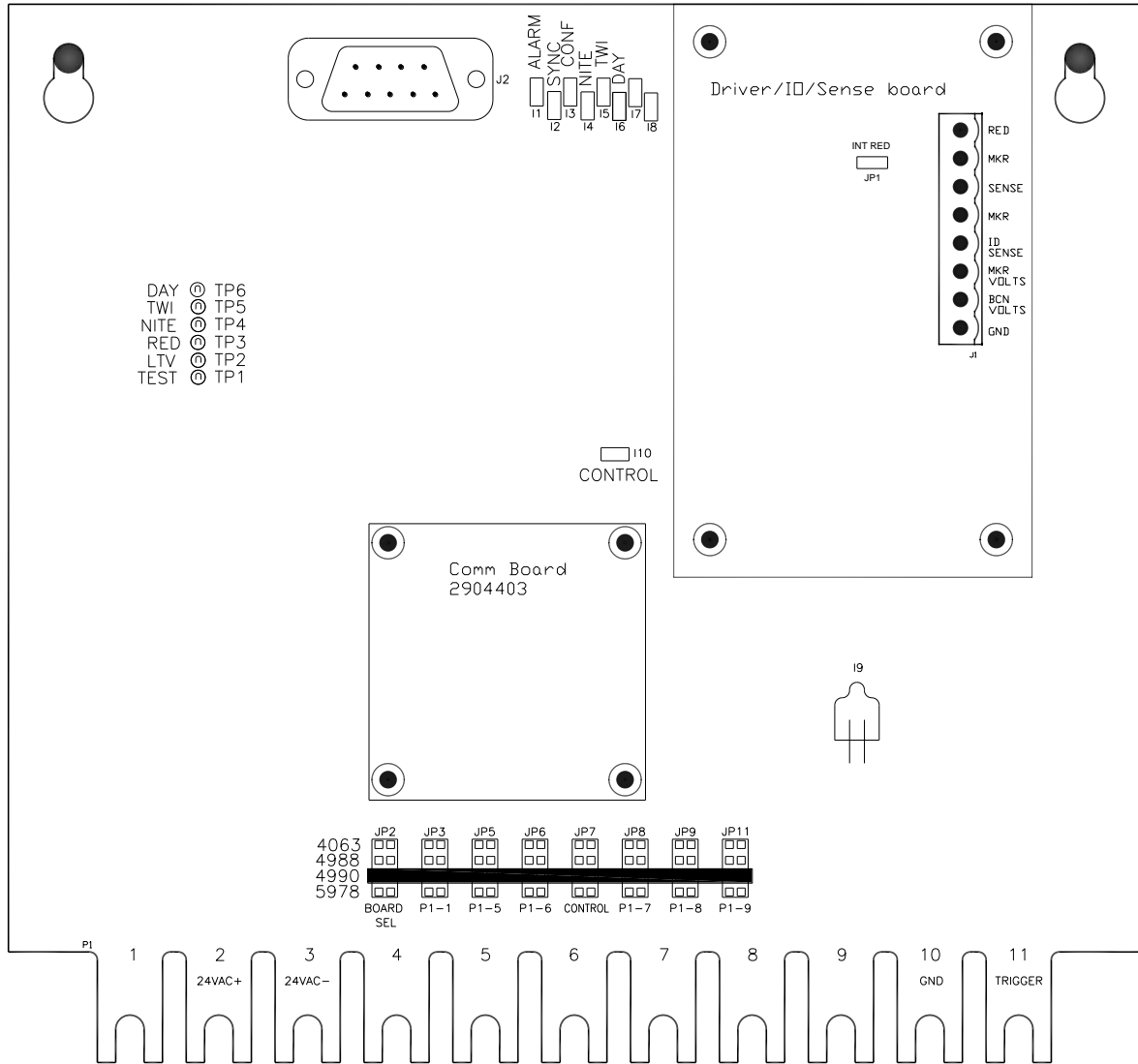


Figure 1-2 – PCB1 (2904410) Timing and Trigger Board “S” Version

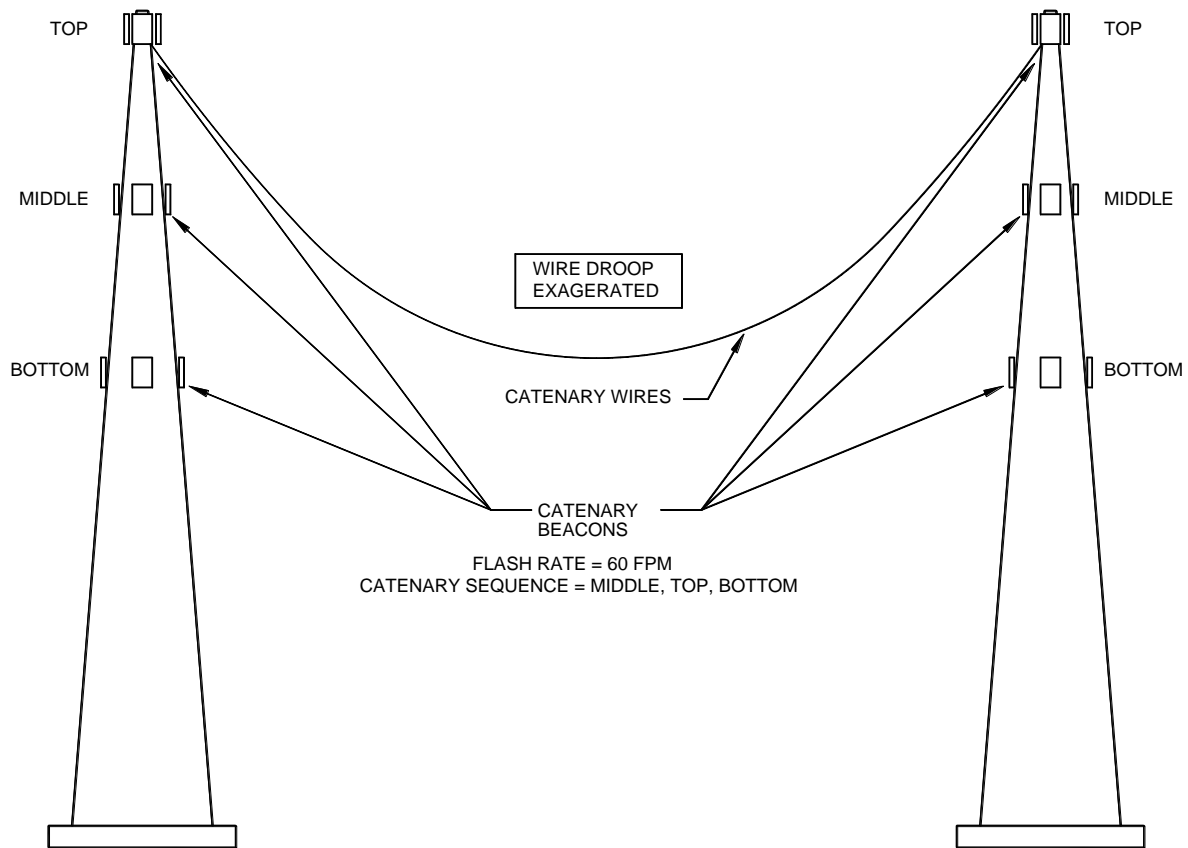


Figure 1-3 – Typical 2-Tower 3-Tier Layout and Catenary Beacon Operation

Section 2 – Mounting and Installation

Unpacking

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

Flash Technology programs beacons at the factory for operation at particular locations, and marks the shipping containers accordingly on the outside. The lowest level is referred to as Tier 1 and the most northerly facing light is referred to as Beacon 1. Higher numbered beacons are placed around the structure in a North-East-South-West direction. Therefore, you must maintain the beacon's identity according to the package identity of each beacon (for example, Beacon 1, Tier 1; Beacon 2, Tier 1; and so forth), and install it as called out.

Tools

Although no special tools are necessary, the following hand tools are suggested for installation and maintenance:

- #1 Phillips-head screwdriver, 8-inch long shank
- #2 Phillips-head screwdriver
- 3/16-in. flat blade screwdriver
- 1/4-inch flat blade screwdriver
- Medium slip-joint pliers
- 8-in. or 10-in. adjustable wrench
- Assorted nut drivers and combination wrenches
- Hand tools for electrical wiring
- Triplet™ Model 630-NA VOM, or equivalent analog volt-ohm meter, or a digital meter with an averaging function.

Access

WARNING!

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

Beacon/Power Converter

Latches secure the hinged cover of the power converter or the beacon. Release the latches and swing the cover open for internal access.

Mounting

Outline, mounting, and clearance dimensions are shown in the following figures:

- Figure 2-1 – PC 204 or PC 207 Power Converter Mounting and Outline
- Figure 2-2 – FH 204 Flashhead Mounting and Outline
- Figure 2-3 – FTB 205 or FTB 208 Beacon Mounting and Outline

Beacon Location

FAA Guidelines for beacon placement are published in AC 70/7460-1. Avoid placing a beacon within a strong radio frequency (RF) field. For example, a beacon within four feet of a radiating FM antenna is likely to pick up electromagnetic interference (EMI) that could cause improper operation or damage. Place a beacon at an adequate distance from a powerful RF radiator. Contact the factory for instructions when you cannot avoid this situation.

Beacon Angle

NOTE

Beacons (except AOL lights) are installed with specific elevation angles.

Various factors may influence the angle of beacon elevation for the units on your structure. These include: location of the structure, height of the beacon above ground, and other characteristics of the site and surrounding terrain. Advisory Circular 70-7460-1 contains guidelines for setting the elevation angle. Information derived from that source is shown in the following table.

AGL (ft)	Angle
0-300	+3°
300-400	+2°
400-500	+1°
500 >	0°

First, level the unit to obtain a reference elevation angle (the specified elevation angle is added to the reference angle). Use the spirit level located inside the enclosure for initial leveling—the tilting bracket has an incremental scale. The tilt mechanism is part of the permanently attached mounting bracket. To level the enclosure, tilt it by using the mounting brackets.

Controller Mounting

Locate the system controller in an area with restricted access. Controllers are available either in outdoor enclosures that can be attached to any vertical surface, or as an indoor, rack-mounted controller.

You can place the system controller anywhere within 2500 feet of the most distant beacon without further consideration. Consult with the factory if a greater distance is necessary.

Photocell Mounting

The photocell, also referred to as PEC 510, may be located any practical distance from

the system controller. Photocells with cable lengths up to 75' are available. The cable may be spliced using 16 AWG wire minimum to provide additional length if necessary.

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 should be supported directly by electrical conduit. It should not be mounted underneath the controller where it could be shadowed.
- Ensure that the installation is watertight.

Refer to the system controller manual for mounting and outline dimensions of the FTC140 and FTC121 Controllers and PEC 510.

Wiring

Note: 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 installation wiring should have an insulation rating of 600 volts. Size input power wiring to satisfy the load demand of the system.

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

System wiring consists of primary power and signal distribution wiring as shown in Figure 2-4. Primary power is usually taken from a load center to the various items of equipment. Signal wiring is between the beacons and the system controller. Make connections to beacons at nearby junction boxes. Always position junction boxes below the beacons with drain holes facing downward.

Beacon Wiring

Three-phase power often supplies large systems. However, the beacons are single-phase units that are connected from line-to-line (A-B, B-C, A-C). Therefore, phase differences occur between groups of beacons in the same three-phase system. In a three-phase system, phase A-C must supply the controller (not C-A) to allow the controller to be compatible with all beacons. Failure to ensure optimum phasing as described could result in intensity control problems.

Use circuit breakers or a safety switch with fuses for the primary power load center. Insulation should be rated at 600 V minimum. Wire size is a factor affected by the service voltage, the number of beacons in the system, and the length of the wire run to the beacons. To determine wire gauge, consider each beacon as a 400 volt-ampere load and do not permit the voltage drop caused by wire resistance to exceed 5% at any beacon. You may use this volt-ampere value to determine ratings for slow-acting fuses or circuit breakers for the system. For fast-acting fuses and a system feeder transformer (if used) consider a peak load of 600 volt-amperes for each beacon. Flash Technology recommends that you use National Electric Code guidelines for all primary wiring.

A label inside the beacon near the fuse block indicates the operating voltage and frequency of your beacon. Two internal

fuses are sized according to the operating voltage. When Line 2 is neutral, the factory replaces the F2 fuse with a jumper wire.

Make connections to distribution wiring at a nearby junction box. Consult the following installation wiring diagrams to guide you in wiring the equipment at your installation:

Important! The following figures are guidelines only. If they differ from the installation drawings for your site, use the site installation drawings.

Installation drawings in this manual are as follows:

- Figure 2-5 – Junction Box; Three-phase Installation Wiring
- Figure 2-6 – Single-Phase Installation Wiring for FTB 204 or 207
- Figure 2-7 – Single-Phase Installation Wiring for FTB 205 or 208

Lightning Protection

Though Flash Technology equipment is designed to withstand severe transient over-voltages, a lightning arresting system must be installed to prevent damage by lightning. Install a lightning arresting system to protect a light at the top of a mast or antenna. Transient suppressors from line-to-line and line-to-neutral are recommended at the primary power load center.

Installation Checklist

Complete the following steps before applying power to the lights.

1. Beacon/Power Converter Mounting:

Position and mount each unit correctly, allowing adequate clearance for opening the covers. Also, use the following guidelines:

- Verify that position number written on the outside of the lighting unit

matches the location on the tower as described in Section 1 “Location”.

- Ensure that the case is mounted upright, is water tight, and grounded.
- Check hardware inside the case to ensure that the mounting screws and nuts are tight.
- Ensure that only the bottom of the case has drain holes and that they are clear.
- Ensure that no holes are punched or drilled on the top surface of the case.
- Ensure that air can flow around the case.
- Lighting unit is mounted away from radio frequency interference (RFI).

2. Beacon/Power Converter Wiring:

Use the installation drawings and the following guidelines:

- Check for proper incoming service voltage.
- Wire each unit according to the instructions.
- In installations with multiple units, ensure that all units are wired to the same phase. In installations with multiple tiers and three phase wiring, follow the phasing chart in the installation drawings, or site drawings.
- Check all electrical connections for tightness.
- Check all terminal strip connections for tightness.
- Ground the power converter/beacon using a bonding strap from the case leg to the structure.

3. Flashhead Mounting:

Ensure that the flashhead lens can be opened without striking other objects.

- Level and set the flashhead at the required elevation angle.

4. Flashhead Wiring:

- Ground the flashhead.
- Check the wiring of the flashhead cable to the flashhead.
- Secure the flashhead cable to the tower. Support and tape the flashhead cable to prevent its movement by the wind.

5. 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 should be supported directly by electrical conduit. It should not be mounted underneath the controller where it could be shadowed.
- Ensure that the installation is watertight.

6. Controller:

- Perform the steps listed in “Installation Checklist” located in the supplied controller manual.

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

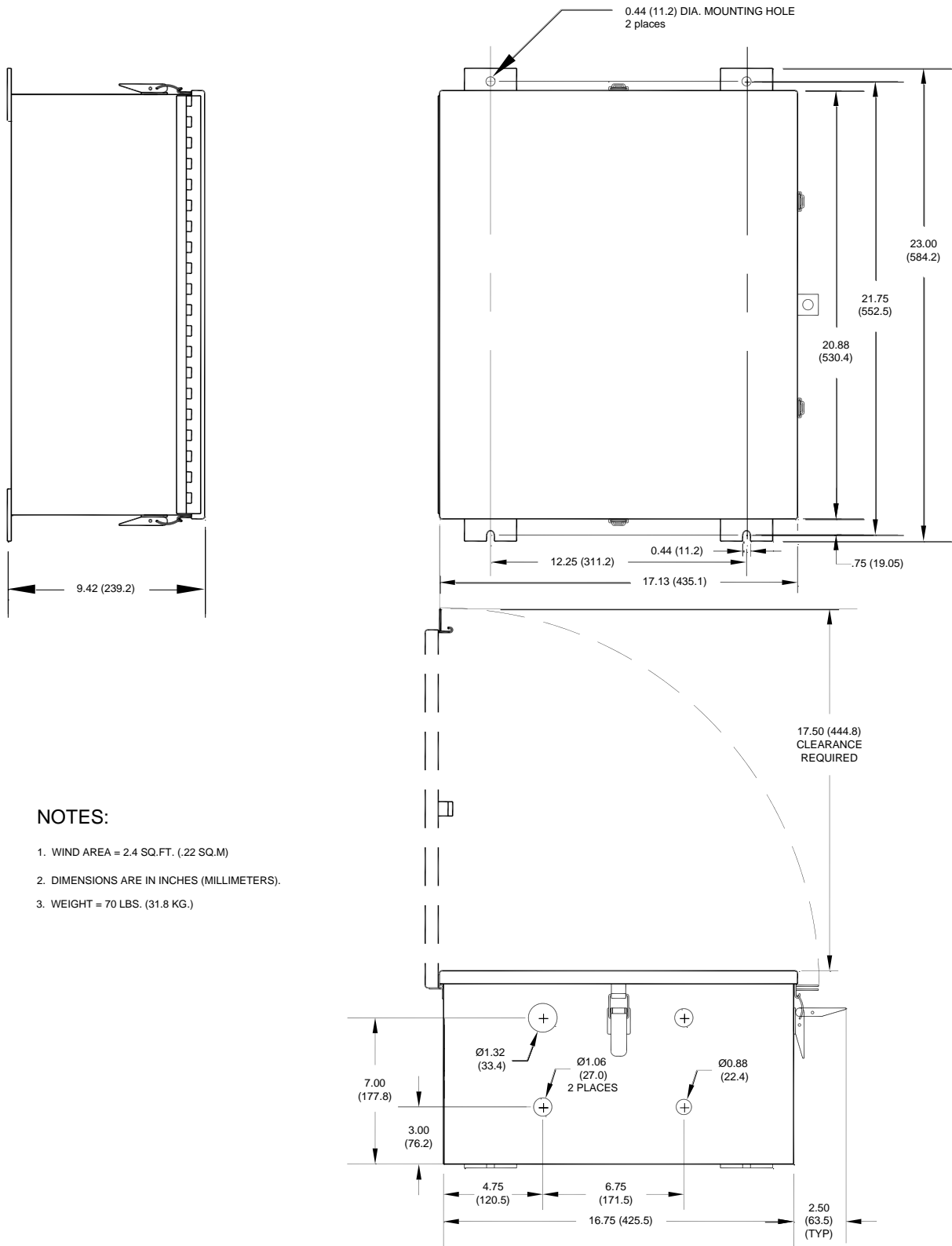
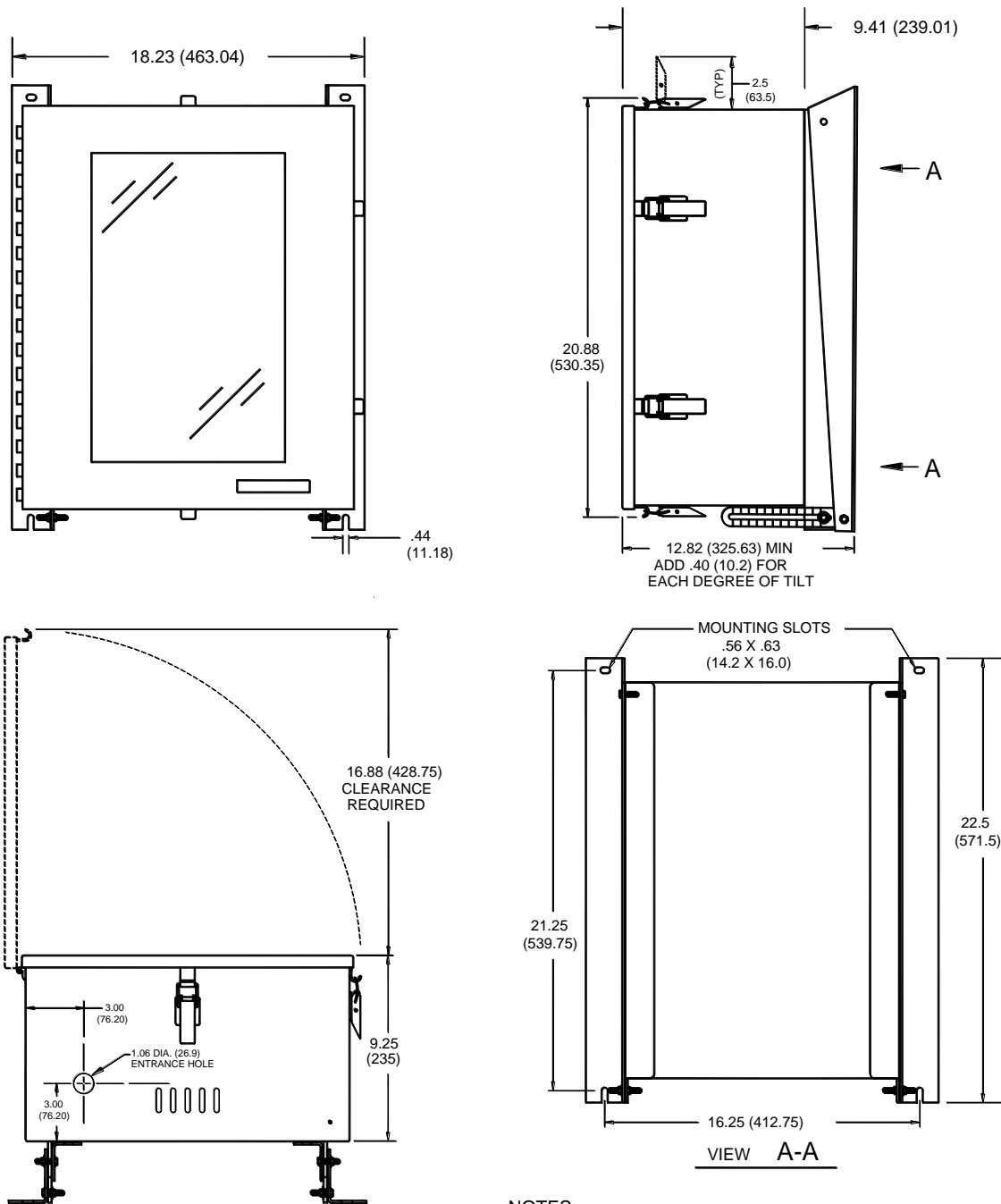


Figure 2-1 – PC 204/207 Power Converter Mounting and Outline



NOTES:

1. Weight: 18 lbs (8.2 kg)
2. Wind area: 1.99 sq ft (.18 sq m)
3. Dimensions are in inches (millimeters)

Figure 2-2 – FH 204 Flashhead Mounting and Outline

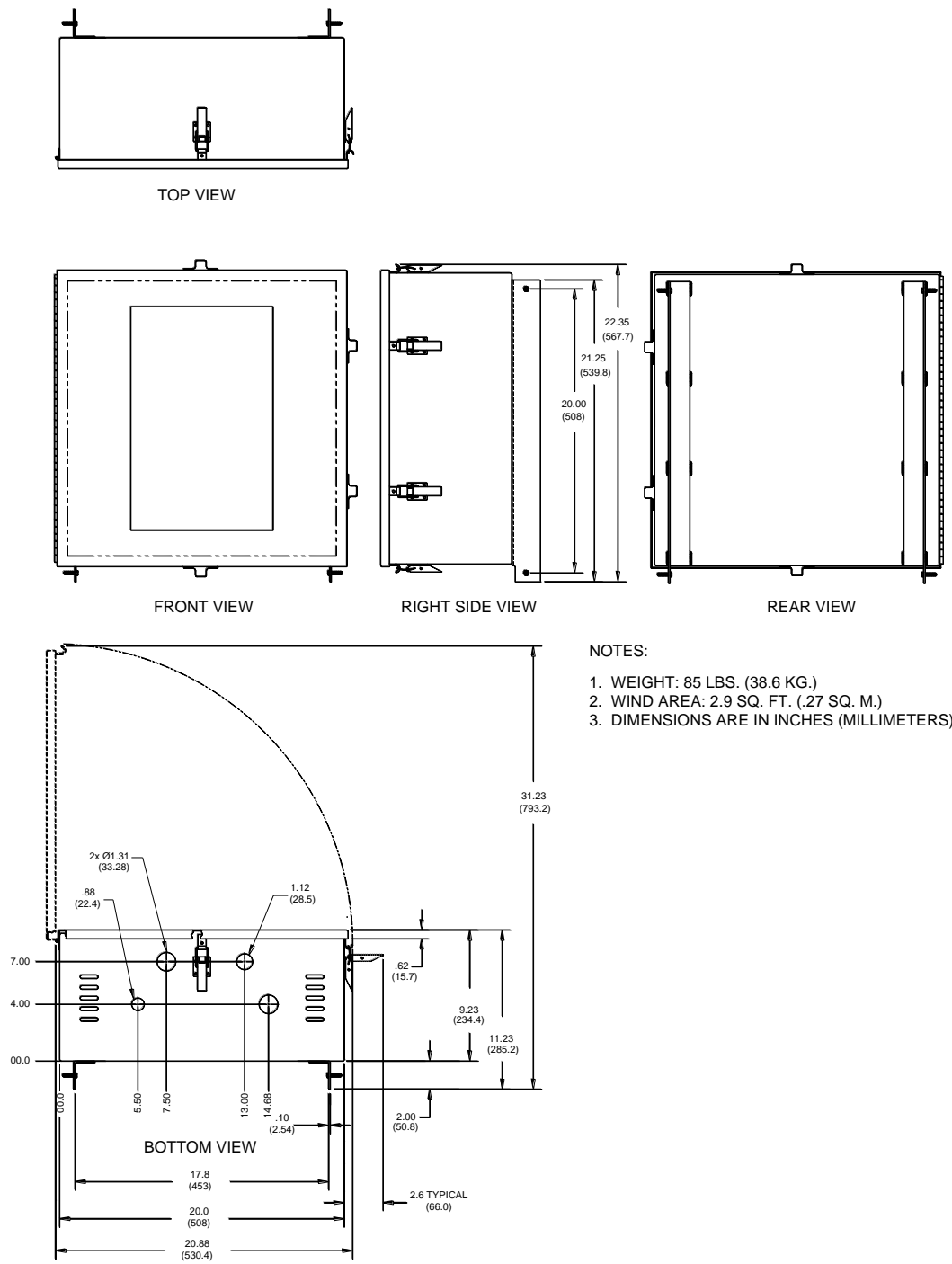
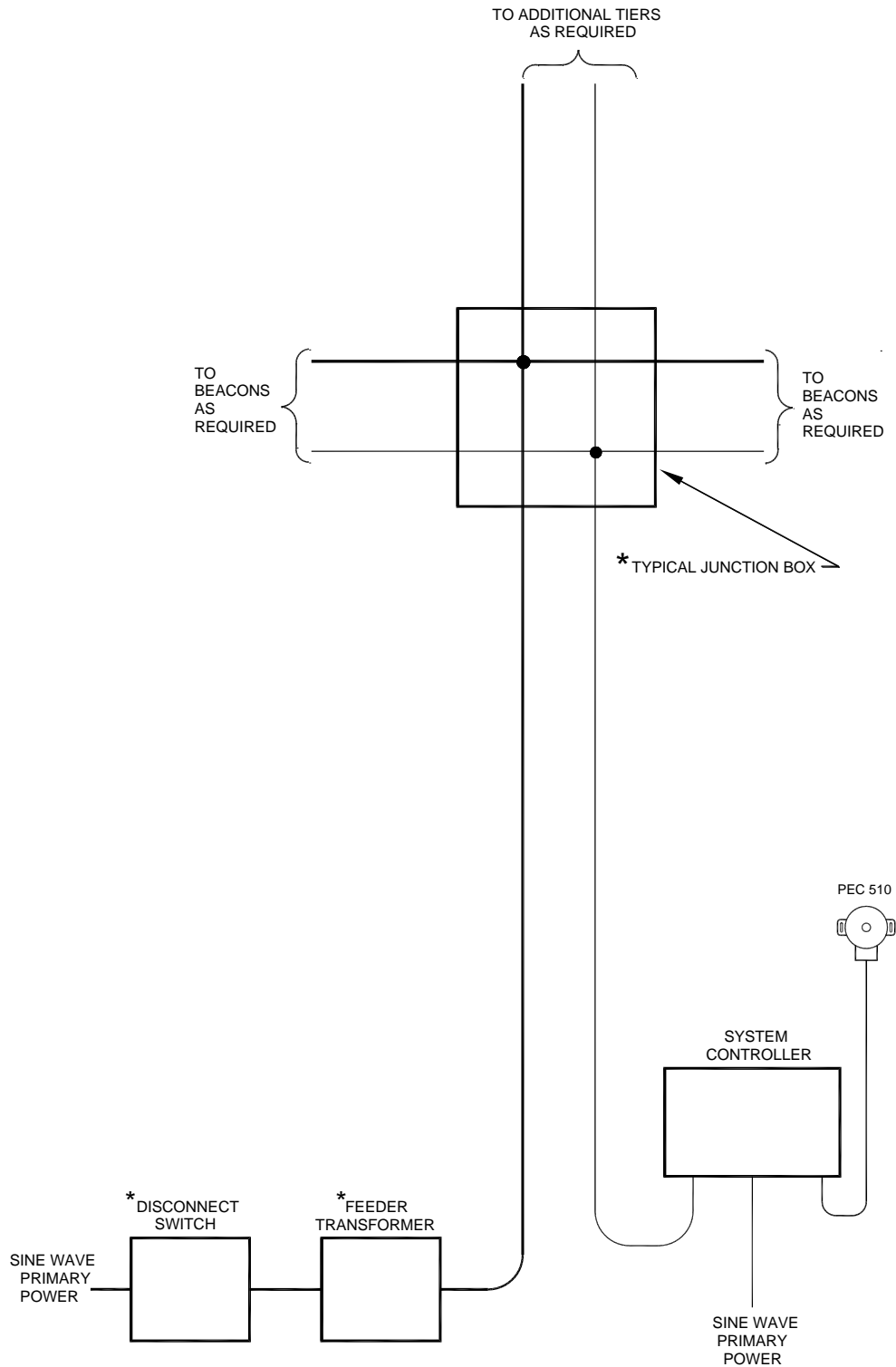


Figure 2-3 – FTB 205/208 Beacon Mounting and Outline



- NOTES:
1. CONDUCTOR SIZE DEPENDS UPON VOLTAGE, LOAD, AND RUN LENGTH. SEE INSTALLATION WIRING IN SECTION 2 OF THE MANUAL.
 2. * THESE ITEMS AND THE CONNECTION WIRING ARE SUPPLIED BY OTHERS.

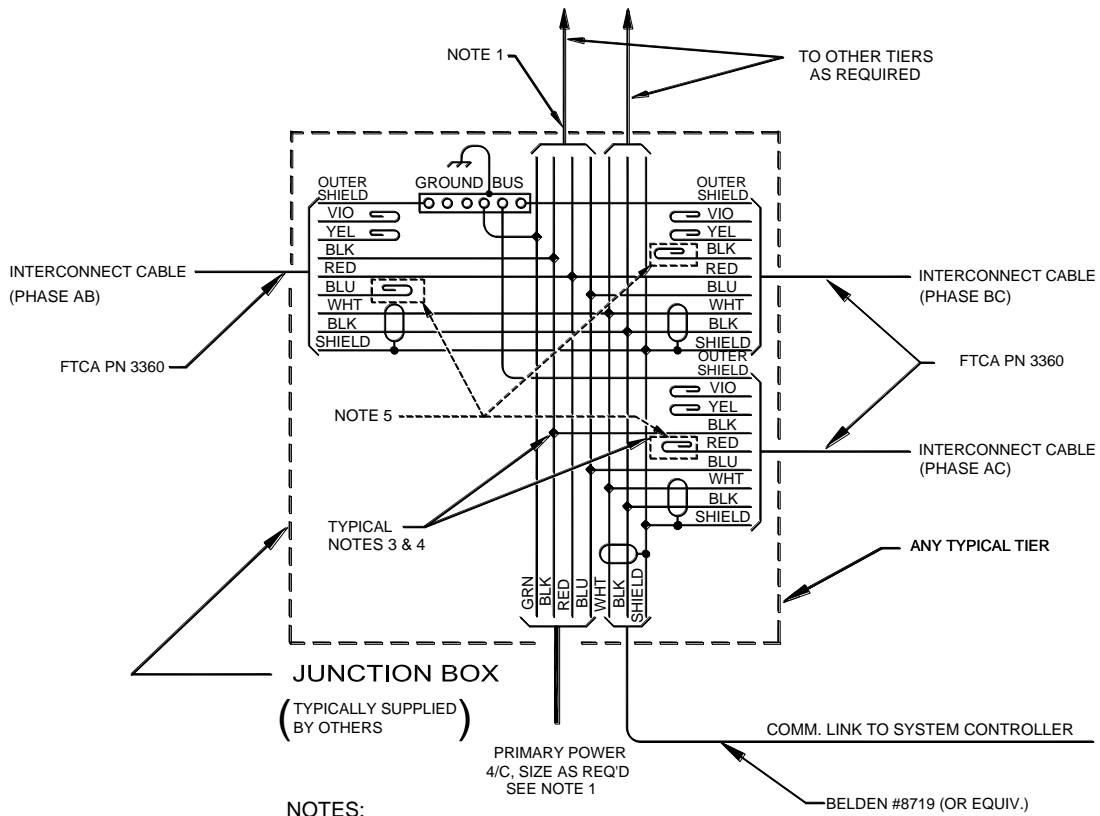
Figure 2-4 – Wiring Overview of a System

THREE PHASE CONNECTION CHART

	BEACON 1		BEACON 2		BEACON 3		BEACON 4 (IF USED)	
TIER	F1	F2	F1	F2	F1	F2	F1	F2
6	B	C	A	C	A	B	B	C
5	A	C	A	B	B	C	A	C
4	A	B	B	C	A	C	A	B
3	B	C	A	C	A	B	B	C
2	A	C	A	B	B	C	A	C
1	A	B	B	C	A	C	A	B

PHASE: A BLACK WIRE
B RED WIRE
C BLUE WIRE

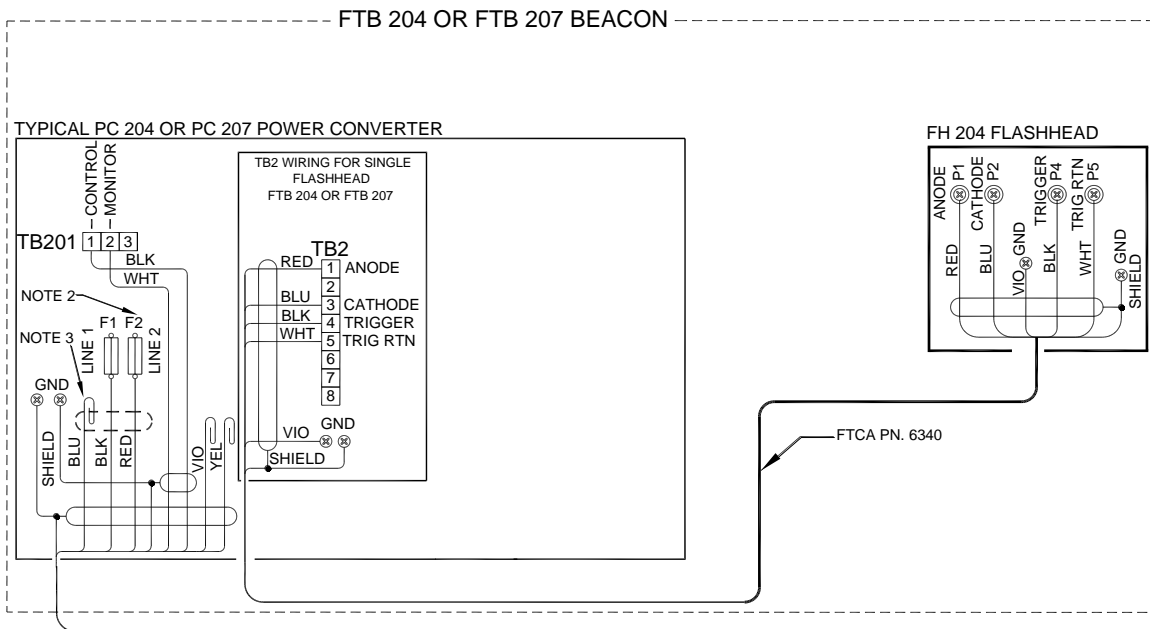
NOTE:
CONTROLLER WIRED TO
PHASE AC



NOTES:

1. CONDUCTOR SIZE DEPENDS ON THE SERVICE VOLTAGE, THE LENGTH OF THE WIRE RUN, AND THE NUMBER OF BEACONS CONNECTED. USE 400-VOLT AMPERES PER BEACON TO CALCULATE THE TOTAL LOAD. DETERMINE THE WIRE GAUGE REQUIRED TO PREVENT THE VOLTAGE DROP CAUSED BY WIRE RESISTANCE FROM EXCEEDING 5% AT ANY BEACON. SEE THE EQUIPMENT LABEL FOR UNIT VOLTAGE AND FREQUENCY.
2. THE CONTROLLER MIGHT OPERATE AT A LINE VOLTAGE DIFFERENT FROM THE BEACONS. CHECK THE EQUIPMENT LABEL AND ENSURE CORRECT LINE PHASING.
3. ◆ DENOTES WIRE NUT CONNECTION.
4. UNUSED WIRES IN THE JUNCTION BOX MUST BE CAPPED WITH NUTS.
 INDICATES A CAPPED WIRE END.
5. PRIMARY POWER CONNECTIONS IN THE JUNCTION BOX ARE CONNECTED AS REQUIRED BY THE THREE-PHASE CONNECTION CHART.

Figure 2-5 – Junction Box, Three-Phase Installation Wiring



- NOTES:
1. FACTORY WIRES EQUIPMENT TO NAMEPLATE VOLTAGE.
 2. WHEN LINE 2 IS NEUTRAL, FTCA REPLACES F2 BY A JUMPER.
 3. UNUSED WIRES IN THE POWER CONVERTER SHOULD BE CAPPED WITH WIRE NUTS.
- ⊔ INDICATES A CAPPED WIRE END.

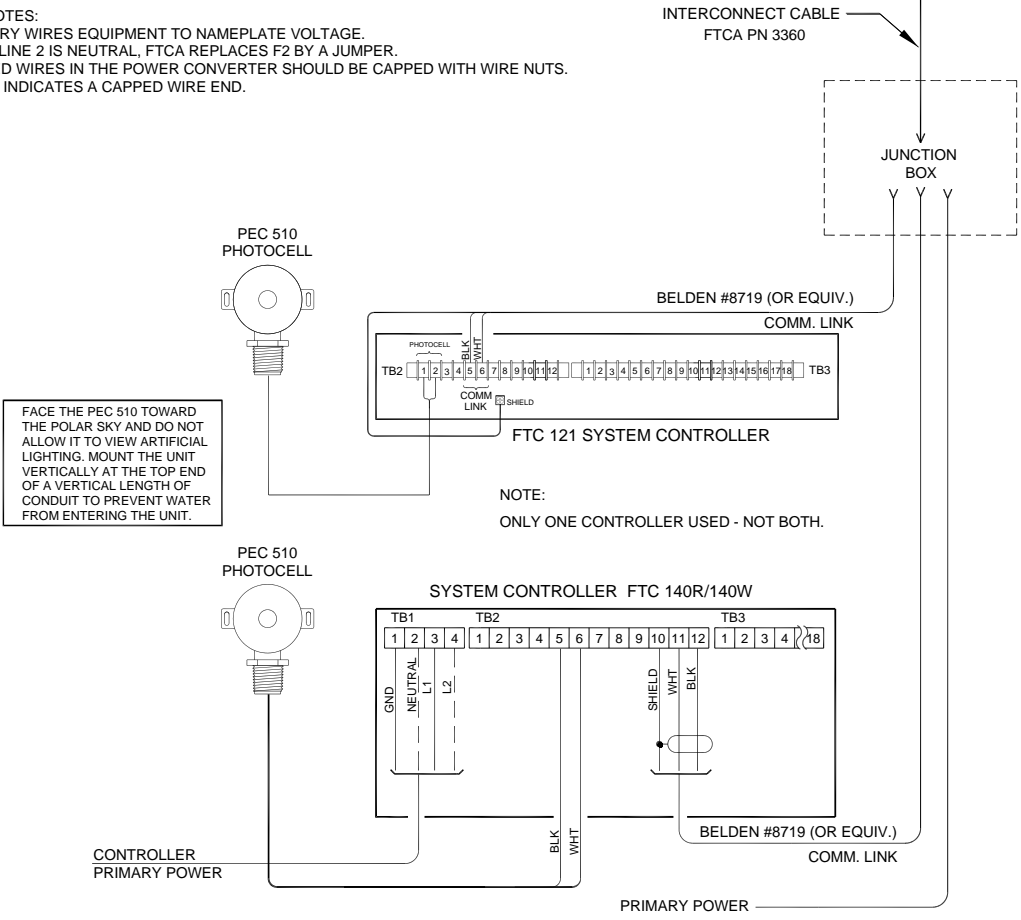
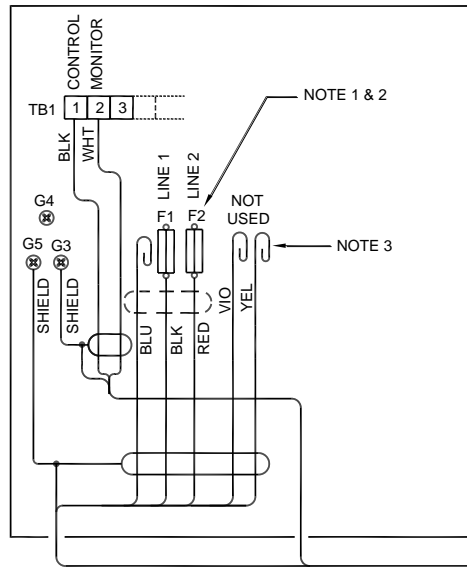


Figure 2-6 – Single-Phase Installation Wiring for FTB 204/207

TYPICAL FTB 205 OR FTB 208 BEACON



- NOTES:
1. FACTORY WIRES EQUIPMENT TO NAMEPLATE VOLTAGE.
 2. WHEN LINE 2 IS NEUTRAL, FTCA REPLACES F2 BY A JUMPER.
 3. UNUSED WIRES IN THE POWER CONVERTER SHOULD BE CAPPED WITH WIRE NUTS.
- INDICATES A CAPPED WIRE END.

INTERCONNECT CABLE
FTCA PN 3360

JUNCTION
BOX

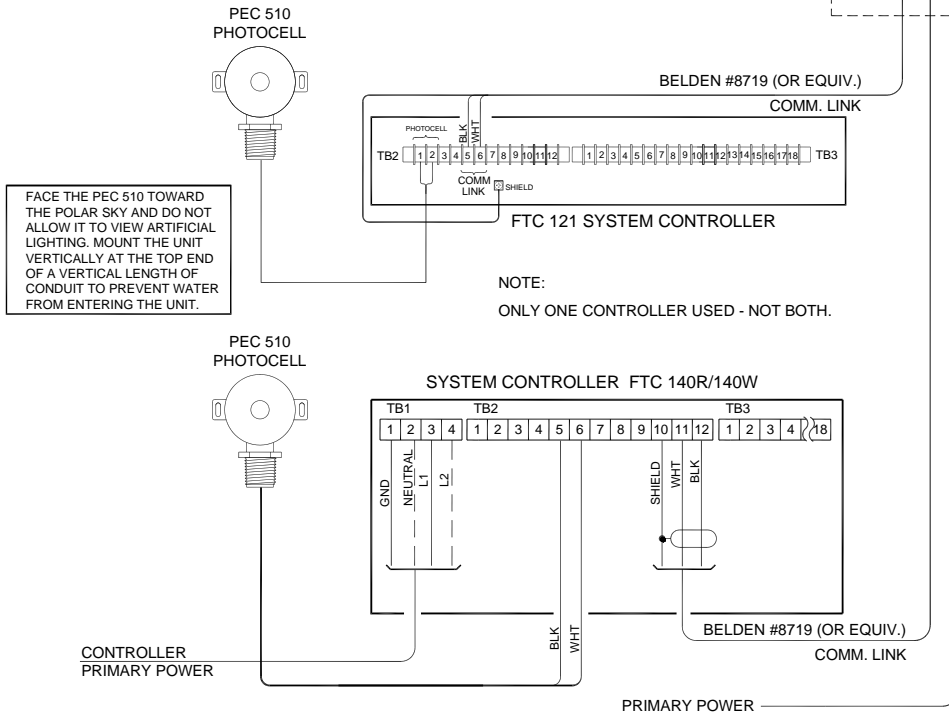


Figure 2-7 – Single-Phase Installation Wiring for FTB 205/208

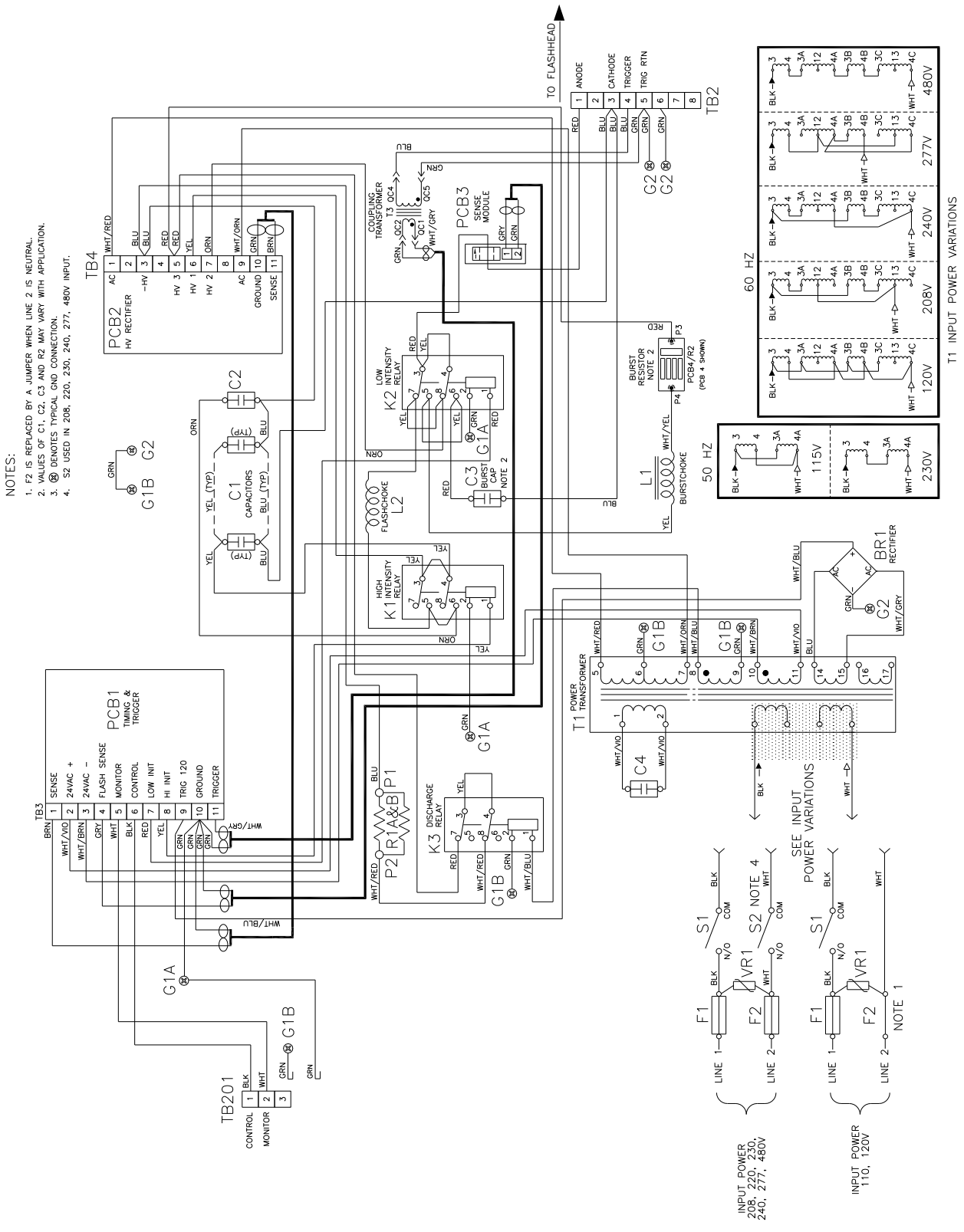


Figure 2-8 – PC 204/207 Power Converter Internal Wiring

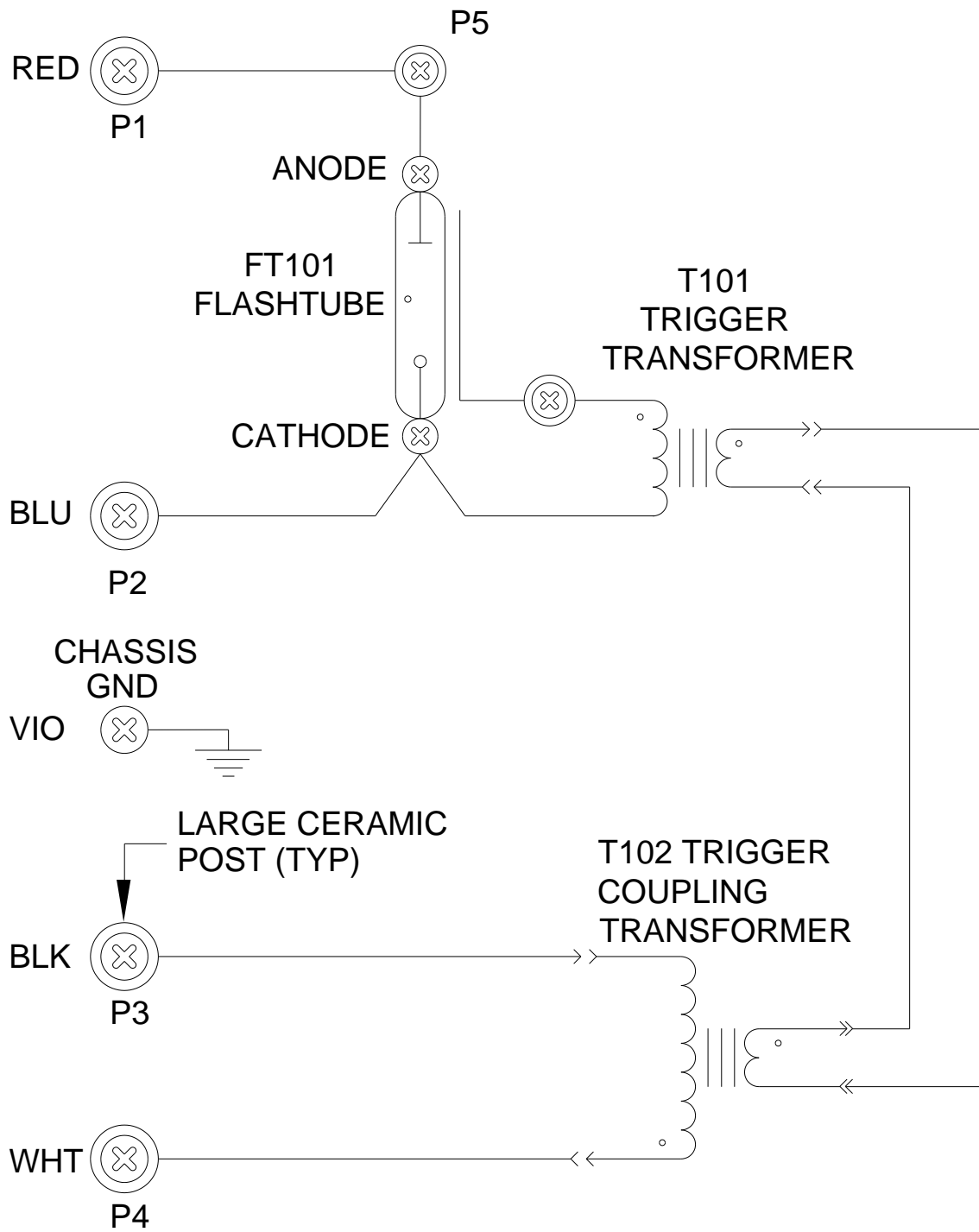


Figure 2-9 – FH 204 Internal Wiring

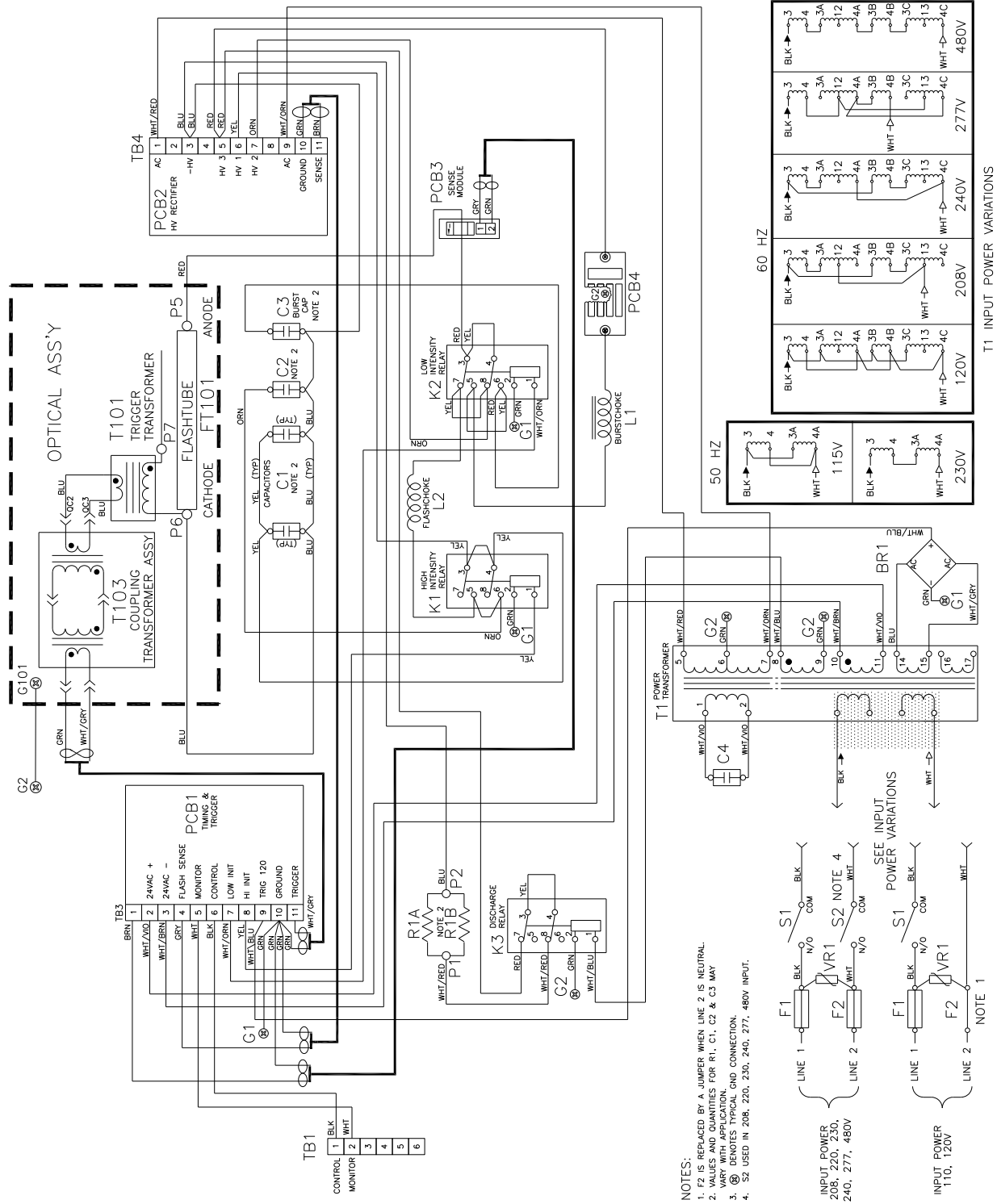


Figure 2-10 – PC 205/208 Power Converter Internal Wiring

Section 3 — Maintenance and Troubleshooting

Safety

HAZARD WARNING

Some procedures in this section may require making contact with electrical circuits. Read the warning on Page III.

Work safely, as follows:

- Remove rings and watches before opening the equipment.
- Shut off the equipment.
- Remove the component or connect the test instruments.
- Replace the component.
- Turn on the power and test the system.
- Turn off the power and disconnect the test equipment.

Preventive Maintenance

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

- Verify that moisture has not entered the equipment accidentally through gaskets or seals, or collected as condensation.
- Verify that all drain holes are clear.
- Check terminal blocks and relays for evidence of corrosion and electrical arcing. Clean or replace any component that shows evidence of high-voltage damage.
- Check flashtube connections for signs of pitting or arcing. Verify that anode and cathode connections are firmly tightened.
- Check all electrical connections for tightness and verify the absence of corrosion or electrical arcing.

- Clean the inside and outside surface of the glass with a non-abrasive glass cleaner.

Storage

No special considerations are required for long-term storage of the equipment. Circuit boards, when not installed in the equipment, should be kept in antistatic bags or containers.

RFI Problems

Radio frequency interference (RFI) can cause a light to flash intermittently, at the wrong rate, or at the wrong intensity. RFI can enter the light by way of any wire to or from the unit. For example:

- RFI on primary power wires could cause errors in flash rate and intensity.
- RFI on the control wire could cause a light to stay at night intensity.
- RFI on the PEC line could cause a light to stay at night intensity. RFI would not normally cause a light to stay at day/twilight intensity.
- Strong RFI could burn out PCB1 Timing and Trigger Board components.

The circuits are designed to reject or bypass RFI, but complete immunity cannot be guaranteed beforehand. It may be necessary, after installation, to add external filters or use other methods to reduce RFI entering the equipment.

Component Testing

The following procedures describe how to check most of the major electrical components. Always make resistance measurements with the power turned off. However, you must make voltage measurements with power applied. Thus, for your safety, perform all preliminary steps, such as connecting test leads or circuit jumpers, or disconnecting existing circuit connections, with the power turned off and storage capacitors discharged.

Refer to Figure 4-1, Figure 4-2, and Figure 4-3 for component layouts and locations.

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 connections, and so forth.

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 for measuring capacitance. Capacitance tests performed with a multimeter (analog or digital) may not detect a malfunction that occurs only at high voltage.

C1 — High Intensity Capacitor Bank

The C1 main capacitor bank consists of several capacitors. As described previously in “Capacitors”, the capacitor bank can be tested as a single unit. If the meter indicates a short circuit, each capacitor must be isolated and tested individually.

C2 — Medium Intensity Capacitor

Test C2 as described previously in “Capacitors”. Check the bank as a whole by placing the meter leads to the terminals of any C2 capacitor and pressing down the armature of the K3 discharge relay.

If a short circuit is indicated, you must isolate the capacitors and check them one at a time.

C3 — Low Intensity Capacitor

Test C3 as described previously in “Capacitors”. Remove all leads from one terminal cluster of this capacitor. The measured resistance across this capacitor should increase from zero to one megohm in approximately 1.5 seconds.

C4 — Tuning Capacitor

Test C4 as described previously in “Capacitors”. Remove the lead from one terminal of this capacitor. The measured resistance across the capacitor should increase from zero to one megohm in approximately 1.5 seconds.

FT101 — Flashtube

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.

K1, K2 — Mode Relays, 24-volt DC Coil

Remove PCB1 to isolate the relay coils. Perform a resistance measurement from TB3-7 and TB3-8 to TB3-10 (or chassis). The measured resistance should be approximately 290 ohms.

K3 — Discharge Relay, 120 VAC Coil

Disconnect one of the coil wires from the relay (terminal 1 or 2). The resistance across the relay coil should be approximately 290 ohms.

L1 — Burst Choke

The measured resistance of this choke should be approximately 9 ohms.

L2 — Flash Choke

The resistance of this coil should be less than 1 ohm. An infinite reading indicates an open coil.

PCB1 — Timing and Trigger Board

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’s controller type. See Section 1 “Configuring PCB1” and Figures 1-1 and 1-2 for additional information. Use the handheld terminal (PN 1903776) to program the replacement circuit board to match the programming of the original.

Important! Installation of an incorrectly configured PCB1 (29044xx) could result in damage to the board, incorrect operation of the unit or erratic operation of the system. The Board Selection jumper must **not** be set to “4063” or “5978” for this application.

R1A, R1B — Bleed Resistors

The measured resistance of the discharge resistors in parallel should be 17,500 ohms.

PCB2 — HV Rectifier Board

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

PCB3 — Sense Module

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

PCB4 — Surge Resistor

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

R2A, R2B — Burst Resistors

The measured resistance of the burst resistors in parallel should be 750 ohms.

T1 — Power Transformer

Prepare to test this transformer by removing PCB1 and PCB2. Energize the unit and measure secondary winding voltages as described in the following table.

Test Points	Voltage
TB4-1 to TB4-9	900 – 1050 VAC
TB3-9 to TB3-10	110 – 120 VAC
TB3-2 to TB3-3	22- 26 VAC
Across C4	550 to 600 VAC

If this AC voltage is substantially less than the specified minimum value, check the C4 tuning capacitor.

T101 — Trigger Transformer

The measured resistance of the flashtube cathode and trigger wire should be approximately 160 ohms. Check the potted secondary winding for evidence of high-voltage breakdown. Check the assembly screws for tightness and verify that the ferrite core is not fractured.

VR1 — Suppressor Assembly

First remove one of the VR1 leads from the fuse block terminal. The resistance across VR1 on the x100K ohm scale should be infinite.

Note: Flash Technology recommends replacing VR1 any time the input power fuse(s) (F1 & F2) are replaced.

Troubleshooting

Effective troubleshooting procedures, beginning with the observation of beacon behavior, often lead directly to a faulty

component or other abnormal condition. Table 3-1 – Major Troubleshooting Symptoms lists many of the symptoms that a malfunctioning beacon might exhibit. Table 3-2 – Defective Component Locator Code correlates these symptoms with components, assemblies, or conditions that, if defective or abnormal, could cause the beacon to behave as observed.

For example, assume that the beacon does not flash at all but some of its circuits are still operating; that is, fuses are not blown, relays operate, and so forth. This behavior is symptom C in Table 3-1. Table 3-2 indicates that a defective timing and trigger board would most likely cause symptom C behavior. The next most likely cause would be a defective rectifier board. The third would be the NITE capacitor, and so forth. Each item in Table 3-2 is listed in the order of its likelihood of causing the failure.

Observe components carefully. Check for loose connections. Many components, such as resistors and relays, show signs of their failures. Resistors discolor when overheated. Relay contacts may become dirty, or pitted and corroded. Check relay armatures to see if they function freely by moving the armature by hand (with power off). Most components suspected of causing a problem can be checked by following the procedures in Section 3 “Component Testing”.

Table 3-1 – Major Troubleshooting Symptoms

OBSERVED BEHAVIOR				
Symptom Code	Flash Intensity			Comments
	DAY	TWI	NITE	
A	NO	NO	NO	All circuits are dead.
B	NO	NO	NO	Primary line fuse repeatedly blows.
C	NO	NO	NO	Some circuits functioning.
D	OK	OK	OK	No confirmation.
E	OK	OK	OK	No DAY confirmation, but NITE OK.
F	OK	OK	NO	
G	OK	OK	HIGH	NITE too bright; ragged flash.
H	SKIPS	OK	OK	
I	LOW	OK	HIGH	
J	SKIPS	SKIPS	SKIPS	
K	NO	NO	NO	PCB2.
L	-	-	-	Inconsistent and erratic flash.
M	NO	NO	NO	No FAIL indication.

Table 3-2 – Defective Component Locator Code

Item	Component	Codes												
		A	B	C	D	E	F	G	H	I	J	K	L	M
C1A-C1M	DAY Capacitor Bank			5					1					
C2A-C2B	TWI Capacitor Bank			5										
C3	NITE Capacitor			5			2							
C4	Tuning Capacitor			4					2					
F1, F2	Line Fuses	1												
FT101	Flashtube			6			4				4			
K1	Day Mode Relay									2				
K2	Nite Mode Relay						1	1						
L2	Burst Choke						3							
PCB1	Timing & Trigger Board			1	4	1	5	2						
PCB2	HV Rectifier Board			2			7					1		
PCB4 / R2	Surge or Burst Resistor						6							
S1	Interlock Switch	2												
T1	Power Transformer	3	2	7										
PCB3	Sense Board				3	2								
T101	Trigger Transformer			3							3			
VR1	Suppressor		1											
--	Blown fuse in one leg of 3-phase power distribution; all beacons on the same phase are affected.								3					
--	Wrong phase between system controller and beacon.									1				
--	Trigger potential arcing to chassis.										1			
--	Wrong confirmation programming at the beacon.				2									
--	RF interference (RFI).											3	1	1
--	Poor connection in the discharge circuit between capacitors and the flashtube; or arcing to chassis.										2	2		
--	Monitor wiring.				1									
--	Controller setup.				1									

Component Removal and Replacement

The following procedures explain how to remove and re-install selected components that may require procedures that are not self-evident.

Removal & Replacement — General

Typically, follow these steps:

- Locate the component using the component location figures in Section 4.
- Note the location of the wire connections and the wire colors. Record these for reassembly.
- Disconnect the wire terminals.
- Remove or loosen as necessary the screws or nuts that hold the component.
- Remove the component.
- For replacement, typically reverse the removal procedure. Replace the wires to the correct terminals. Position the wires as closely as possible to their original routing position.

Capacitors

Removal

1. Using long-nose pliers, remove the wire terminals from the capacitor terminals.
2. Each capacitor is fastened by two Phillips-head screws. Remove these screws.
3. Lift the capacitor out of its retaining hole.

Replacement

1. Reverse the Removal procedure.

BR1 — Bridge Rectifier

Removal

1. Using long-nose pliers, pull off the wire terminals from the rectifier.
2. Remove the screw that holds the rectifier to the chassis.
3. Remove the rectifier.

Replacement

1. Reverse the Removal procedure.

K1/K2/K3 — Relays

Removal

1. Remove the wires on the relay terminals that connect the relays to the wiring harness or other components. Note the position and color of the wires.
2. Each relay has two screws that fasten the relay to the chassis. Remove these screws.
3. Lift the relay from the chassis.

Replacement

1. Reverse the Removal procedure.

L1 — Burst Choke

Removal

1. Remove the two wires that connect to the choke.
2. Remove the two screws that fasten the choke to the base plate.
3. Remove the choke.

Replacement

1. Reverse the Removal procedure.

L2 — Flash Choke

Removal

1. Find the connection points on relays K1 and K2 of the two wires connected to the flash choke.
2. Remove these two wires from the relays that connect to the choke. Note the color and connections of these wires.
3. Remove the two screws that fasten the choke to the base plate.

Note: The choke is held by two screws with insulation. Be sure the insulation stays in place.

Replacement

1. Reverse the Removal procedure.
2. Replace the wires on their correct terminals.

R1A&B, R2A&B or PCB4 — Resistors

Removal

1. Remove the wires connected to the resistors. Note the color and connections of these wires.
2. Remove the two screws that hold the resistors to their ceramic posts.
3. Remove the resistors.

Replacement

1. Reverse the Removal procedure.

T1 — Power Transformer

Removal

1. Many wires connect to the power transformer. Note the wire colors and numbers on the transformer to which these wires are connected.

2. Using long-nose pliers, remove the easily-accessible wire terminals from the transformer.
3. Remove the nuts holding the transformer to the base plate.
4. Partially lift out the transformer.
5. Remove the remaining wires.

Replacement

1. Reverse the Removal procedure.

T3 — Coupling Transformer (PC 204, 207)

Removal

1. Disconnect the wire terminals of the coils from their connections.
2. Remove the two Phillips-head screws in the top of the transformer retaining bar that hold the transformer to the chassis.

Replacement

1. Reverse the Removal procedure.

Important! The coils must have the same winding direction on the core. That is, the coils are wound clockwise looking down at the top retainer strap of the transformer. The top wire, using a male Faston connector, leaves the coil in a clockwise direction. Refer to Figure 3-3.

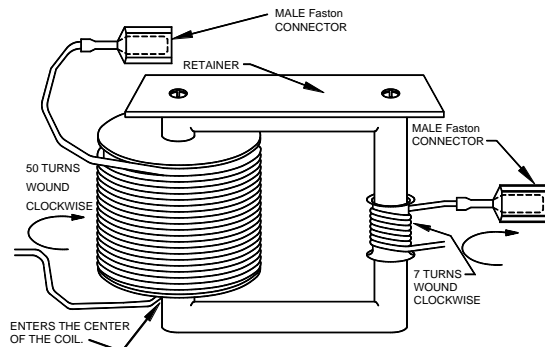


Figure 3-1 – Winding Directions

PCB1/PCB2 Circuit Boards

Removal

1. Loosen the screws on the terminal block that connect the wires to the Circuit Board.
2. Loosen the two screws (one in each corner of the Circuit Board) that fasten the Circuit Board to the chassis. Do not remove these screws because the board sits on standoffs, and if you remove the screws the standoffs will fall out of position.
3. Slide the board slightly to clear the heads of the four retaining screws.
4. Lift the board slightly to clear the four retaining screws and slide it out from under the screws on the terminal block.

Replacement

1. Reverse the Removal procedure.

Flashtube

Location: Part of the optical assembly

FOLLOW FLASHTUBE HANDLING PRECAUTIONS

Important! Always handle a flashtube by grasping the metallic end caps. Never touch the glass section with bare hands because skin oils or other contaminants can shorten flashtube life.

Removal

1. Loosen two screws that hold each plate that covers each end of the flashtube on the optical assembly.
2. Disconnect the trigger wire at the P101 ceramic post on the left side of the optical assembly viewed as in Figure 4-4.
3. The flashtube is supplied with connecting leads soldered to its ends.

4. Loosen the screw on the end of each flashtube lead.
5. At one end of the flashtube, use a slender, pointed tool between the end of the flashtube and the spring-loaded clip to pop the flashtube up and out of the clip. Do the same at the other end and carefully pull the flashtube out of the optical assembly.

Replacement

1. Observe the flashtube handling precaution noted previously.
2. Determine the anode and cathode ends: the anode has red wire soldered to it and red ink or dye on the end of the tube.
3. Ensure that the trigger extension wire has a short length of high voltage sleeving installed.
4. Insert the flashtube with the cathode end (no red ink) toward the trigger lead ceramic post.
5. Align the flashtube with the retaining clips at each end and press it down into the clips one end at a time. Press only at the metallic end caps.
6. Attach the trigger wire (white insulation) at the ceramic post P101. Remove any excess wire and do not leave a tail extending from under the screw. Do not forcefully tighten the screw.
7. Attach the red anode wire to its connection directly above the tube mounting clip.
8. Attach the black cathode wire of the flashtube to the screw on the upper end of the plate on the left side of the optical assembly as viewed in Figure 4-3.
9. Reinstall the plate on each side of the flashtube and tighten the screws.

Flashtube Clips

Location: Part of the optical assembly.

Removal

1. Remove the flashtube as described in Section Flashtube.
2. Remove two 8-32 screws from each flashtube clip plate.

Replacement

1. Reverse the Removal procedure. Be sure that joining surfaces are clean. Tighten the screws firmly.

Trigger Transformer T101

Location: On the optical assembly

Removal

1. At the flashtube, remove the large diameter white wire to the transformer secondary winding.
2. At a chassis ground screw remove the small wire to the transformer secondary winding.
3. Disconnect the primary winding wires. Remove the two 4-40 x 2-inch screws Phillips-head screws that hold the transformer assembly to the plate.

Replacement

1. Reverse the Removal procedure.

Section 4 – Recommended Spare & Replaceable Parts

Customer Service

Customer Service: 1-800-821-5825

Front Desk: (615) 261-2000

Facsimile: (615) 261-2600

Internet Address: www.flashtechnology.com

Shipping Address:

Flash Technology
332 Nichol Mill Lane
Franklin, TN 37067

Ordering Parts

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

Beacon / Power Converter Parts

Table 4-1 “Power Converter Major Replaceable Parts” lists the major replaceable parts for the power converter. Figure 4-1 shows the component locations for FTB 205 and 208. Figure 4-2 shows the component locations for PC 204 and 207.

Flashhead / Optical Assembly Parts

Table 4-2 lists the part numbers for the major replaceable parts in the flashhead / optical assembly. Figure 4-3 shows the component locations for all versions.

RMA Policy

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

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

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

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

Table 4-1 – Power Converter Major Replaceable Parts

Reference	Description	Part Number
BR1	Diode Bridge	6902806
C1A-C1G	Capacitor, Day, 70 mfd	6720401
C2A	Capacitor, Twilight, 40 mfd	6386504
C3	Capacitor, Night, 1 mfd	6848202
C4	Capacitor, Tuning, 3 mfd	6577903
F1, F2	► Fuse, 120V	†4900307
F1, F2	► Fuse, 208/230/240V	†4900303
F1, F2	► Fuse, 480V	†4900335
K1, K2	► Mode Relay, 24 VDC	†8900494
K201	Transfer Relay, 120 VAC	4900499
K3	Bleed Relay, 120 VAC	8900493
L1	Burst Choke	4850601
L2	Flash Choke	4175200
PCB1	► Timing and Trigger Board S versions	2904410
PCB1	► Timing and Trigger Board non S versions	2904411
PCB2	HV Rectifier Board	2458005
PCB3	Sense Board	2811101
PCB4	Surge Resistor	†2459000
R1A, R1B	Burst Resistor, 1.5k 50W	†6900535
R2A, R2B	Bleed Resistor, 35k 50W	6900541
S1, S2	Switch, Interlock	8205501
TB1	Terminal Strip, 6 Position	8721006
TB2	Terminal Strip, 8 Position	8721008
TB201	Terminal Strip, 6 Position	8721006
TB202	Terminal Strip, 18 Position	4901930
TB3, TB4	Terminal Strip, 11 Position	8721011
T1	Power Transformer, 120V, 60 Hz	8841501
T1	Power Transformer, 208V, 60 Hz	8841502
T1	Power Transformer, 240V, 60 Hz	8841503
T1	Power Transformer, 480V, 60 Hz	8841504
T1	Power Transformer, 230V, 50 Hz	8841001
T101	Trigger Transformer	8288201
T3	Coupling Transformer	8336701
VR1	Suppressor, 120V	8250801
VR1	Suppressor, 208-240V	8250802
VR1	Suppressor, 480V	8250804

► Recommended as a spare part.

†Varies by model number.

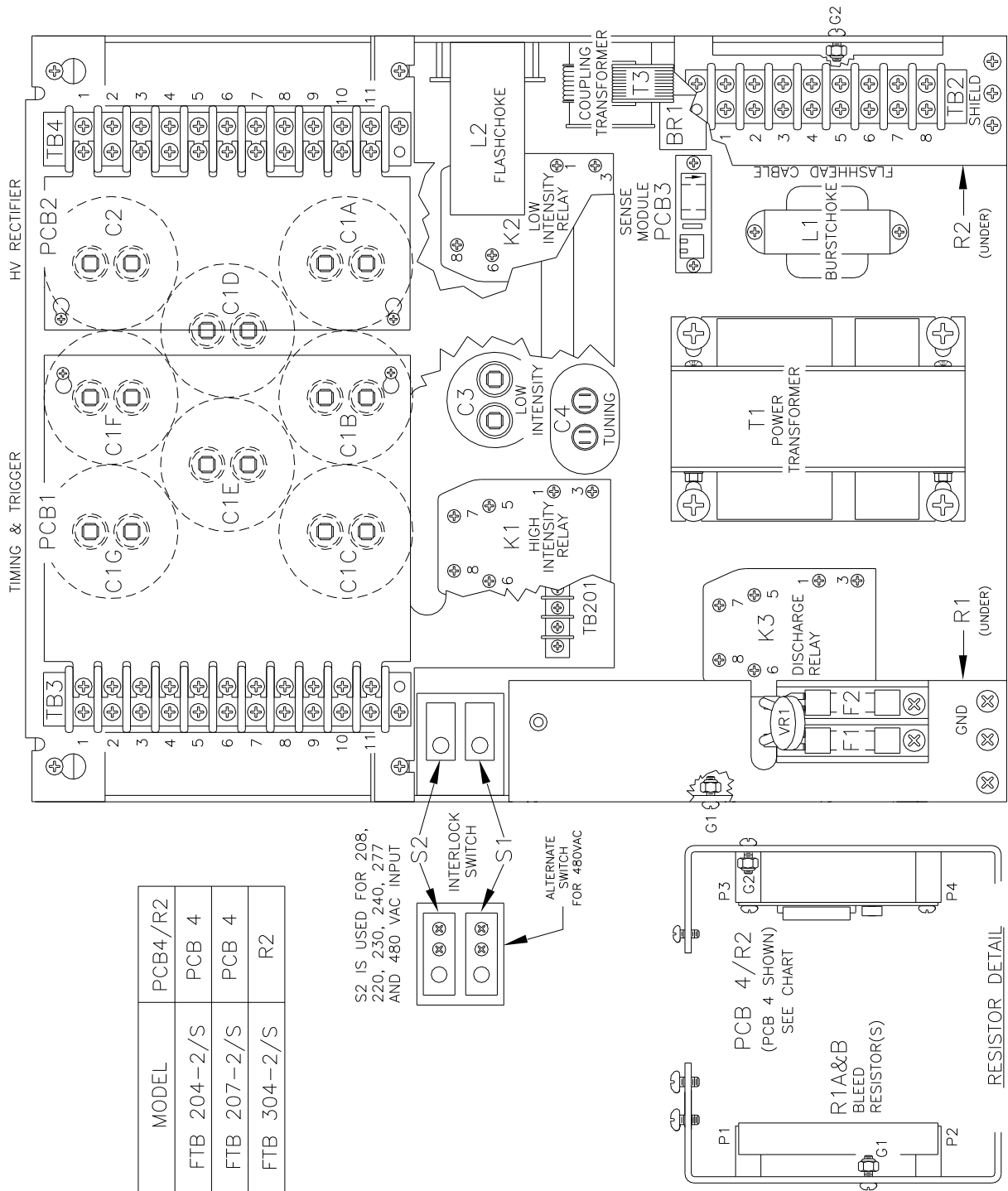


Figure 4-1 – PC 204/ 207 Power Converter Component Locations

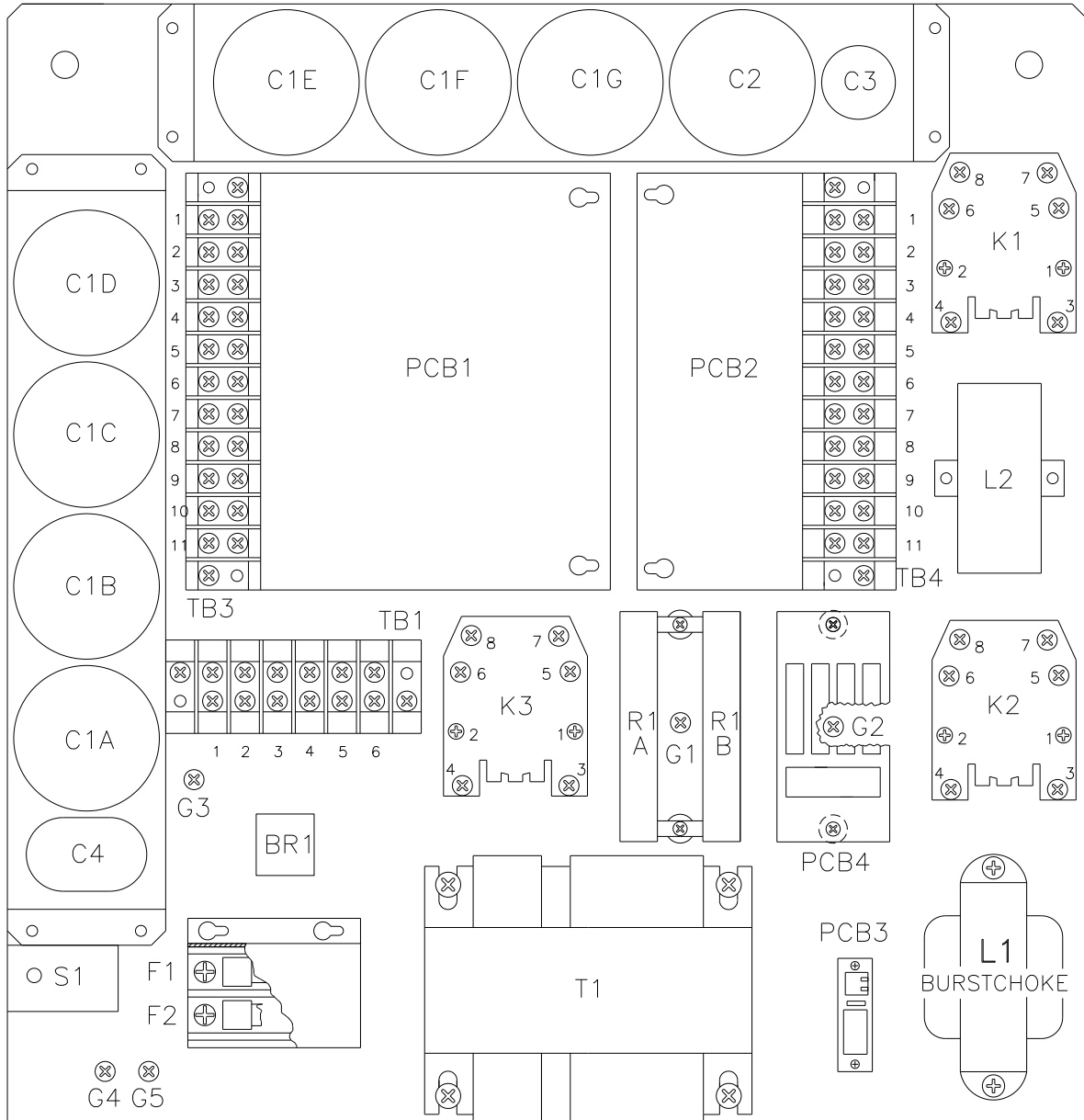


Figure 4-2 – FTB 205/208 Power Converter Component Locations

Table 4-2 –Flashhead / Optical Assembly Replacement Parts

Reference	Description	Part Number
FT101	▶Flashtube	4587703
T101	Trigger Transformer	8288201
T102	Coupling Transformer	8336701
T103	Kit Assy FTB 205 Coupling Transformer	F1900721

▶ Recommended as a spare part.

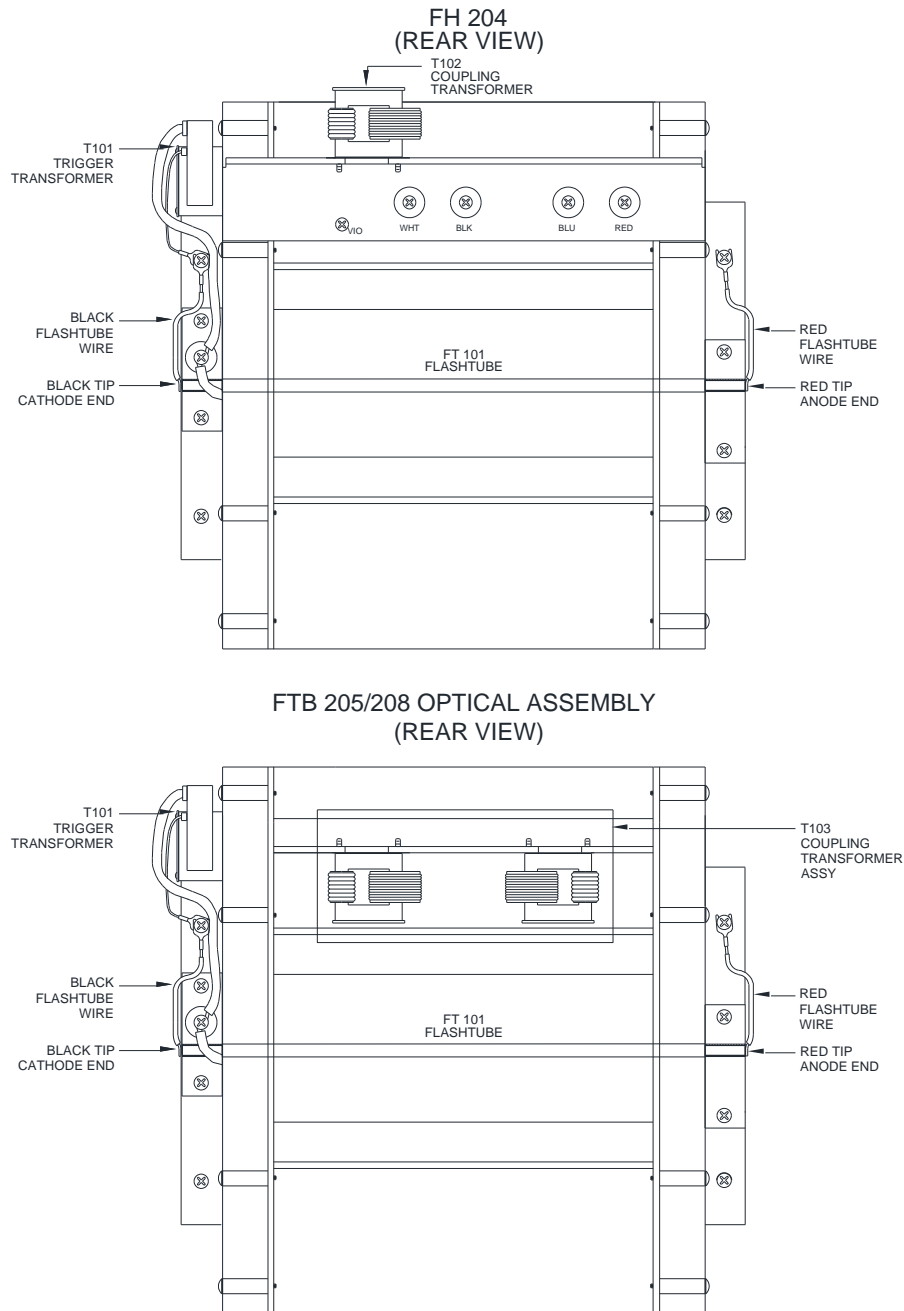


Figure 4-3 – FH 204 FTB 205/208 Optical Assembly Component Locations

Appendix 1 – Programming the Timing and Trigger Board

Connecting the Handheld

The following table shows the connector pin assignments for the handheld. Transmit and receive directions shown in the table are with respect to the handheld. The DB9 connector is located at the top of the handheld programmer.

DB9 Female	EIA-232 Function
3	Receive + receive
6	No connection - receive
2	Transmit + transmit
1	No connection - transmit
9	Power
5	Ground

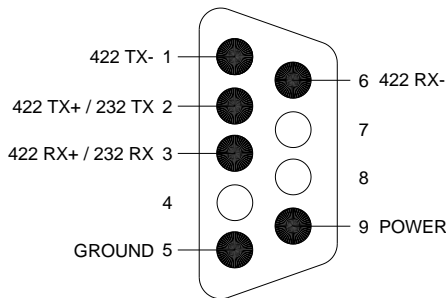


Figure A1-1 – DB9 Female

A 9-pin RS-232 cable is used to connect the handheld to the 29044xx controller board at connector J2 (9 pin Male connector). Power and ground is provided by this connector.

Using the Programmer

The programmer has a four line LCD display and 24 keys as shown in Figure A1-2.

The following is a general discussion of how the programmer works. See “Parameters” under the SETUP section for more details.

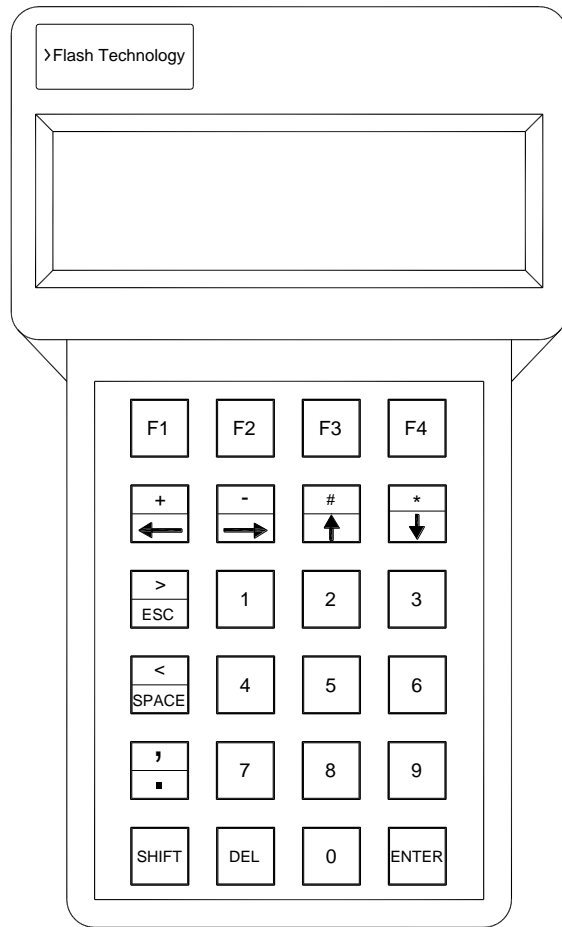


Figure A1-2 – Handheld Programmer

In the discussions to follow the 4 line LCD display will be represented as shown:

L1: *****
L2: *****
L3: *****
L4: *****

The display does not show the L1: etc. this is used to represent line 1, 2, 3 and 4 on the LCD.

Standard Version (2904411)

Once the handheld programmer is connected to PCB1 (2904411) and power is applied, the circuit board will automatically recognize that the terminal is connected to it and will display the sign on message.

Note: Only terminals provided by Flash Technology will work with the 29044xx circuit board.

The general format of the sign on message for non S versions is:

L1: FLASH TECHNOLOGY
L2: BOARD 4988
L3: (Blank or further information)
L4: ENTER TO CONTINUE

Once enter is pressed the first menu is displayed as follows:

L1: PRESS A FUNC KEY
L2: F1. SETUP F2. INFO
L3: F3. SHORT TEST
L4: F4. MODE CHANGE

To continue further, a function key must be pressed. The function keys are on the top row of the terminal. See Figure A1-2.

- F1: Enters the setup menus, used to configure the 2904411.

- F2: Enters the information menu, used to show a limited amount of useful operating info.
- F3: Causes the 2904411 to perform the short test.
- F4: Enters the mode change menu, used to manually change the operating mode (DAY, TWI, and NITE). Note: DAY equals HIGH, TWI equals MED and NITE equals LOW intensity.

Note: The handheld terminal will return to the sign on message from any other menu if no key is pressed within two minutes.

Setup

The setup menu has the following format:

L1: SETUP
L2: 0-1-1
L3:
L4: OK NEXT BACK EXIT

The first line displays the current menu. The second line displays the current setup. The numbers correspond to the system type, tier and beacon selected. The third line is blank. The fourth line displays what functions the keys F1 thru F4 will perform if pressed; the words are spaced to be over the corresponding function key. So, to move to the next menu you would press F2 (NEXT).

- F1: OK- is used to enter data.
- F2: NEXT- moves to the next item.
- F3: BACK- moves to the previous item.
- F4: EXIT- exits the setup menu.

Parameters: 204, 204X & 205 (Standard System)

Pressing the NEXT or BACK function key from the SETUP menu takes you to the parameters. The general format is:

- L1: SETUP**
- L2: SYSTEM**
- L3: 0- Std. 1- Air. 2- Cat**
- L4: OK NEXT BACK EXIT**

The currently selected option will have the cursor under it. For example:

“0-Std 1-Air 2-Cat” shows that the currently selected option for the parameter is zero (0) which in this case means Standard system.

If the board to be configured is not in the Standard mode press 0 and press F1 (OK).

Important! “1-Air” and “2-Cat” are not valid modes for this application and should not be selected.

Note: Even if your board is configured for Standard mode you will need to press 0 and F1 to change the tier and beacon number.

The display will change to:

- L1: SETUP**
- L2: TIER # 1**
- L3: Enter TIER #**
- L4: OK NEXT BACK EXIT**

Press the number keys to select the tier number you wish this board to be and then press F1 (OK). The Tier number displayed will change. The display will change to:

- L1: SETUP**
- L2: BEACON # 1**
- L3: Enter Beacon #**
- L4: OK NEXT BACK EXIT**

Press the number keys to select the beacon number you wish this board to be and then press F1 (OK). The Beacon number displayed will change.

Note: It is recommended to write the system type, tier and beacon numbers on the white space provided on the board.

Press NEXT and the display will change to FPM (Flashes Per Minute).

- L1: SETUP**
- L2: FPM 0-40 1-60 2-30**
- L3: 3-20 4-100 5-120**
- L4: OK NEXT BACK EXIT**

Press the number keys to select the number of flashes per minute and then press F1 (OK).

Note: Zero (0) should be selected for this application.

Press NEXT and the display will change to the FLICK selection.

- L1: SETUP**
- L2: FLICK**
- L3: 0-SINGLE 1-DOUBLE**
- L4: OK NEXT BACK EXIT**

Press the number keys to select the Flick setting and press F1 (OK).

Note: One (1) should be selected for this application.

Press F4 (EXIT) to return to the main menu.

Parameters: 207 & 208 (Catenary System)

Pressing the NEXT or BACK function key from the SETUP menu takes you to the parameters. The general format is:

- L1: SETUP**
- L2: SYSTEM**
- L3: 0- Std. 1- Air. 2- Cat**
- L4: OK NEXT BACK EXIT**

The currently selected option will have the cursor under it. For example:

“0-Std 1-Air 2-Cat” shows that the currently selected option for the parameter is two (2) which in this case means Catenary system.

If the board to be configured is not in the Catenary mode press 2 and press F1 (OK).

Important! “0-Std” and “1-Air” are not valid modes for this application and should not be selected.

Note: Even if your board is configured for Catenary mode you will need to press 2 and F1 to change the position.

The display will change to:

- L1: SETUP**
- L2: CAT TIER**
- L3: 0-BOT. 1-MID. 2-TOP**
- L4: OK NEXT BACK EXIT**

Press the number keys to select the catenary tier you wish this board to be and then press F1 (OK).

Press NEXT and the display will change to FPM (Flashes Per Minute).

- L1: SETUP**
- L2: FPM 0-40 1-60 2-30**
- L3: 3-20 4-100 5-120**
- L4: OK NEXT BACK EXIT**

Press the number keys to select the number of flashes per minute and then press F1 (OK).

Note: One (1) should be selected for this application.

Press NEXT and the display will change to the FLICK selection.

- L1: SETUP**
- L2: FLICK**
- L3: 0-SINGLE 1-DOUBLE**
- L4: OK NEXT BACK EXIT**

Press the number keys to select the Flick setting and press F1 (OK).

Note: One (1) should be selected for this application.

Press F4 (EXIT) to return to the main menu.

INFO

The info menu has the following:

- L1: INFO**
- L2: BOARD 4988**
- L3:**
- L4: NEXT BACK EXIT**

This menu is used to show a limited amount of information about the current 2904411 operation and configuration.

The first line displays the current menu. The second and third lines display board information. The fourth line displays what functions the keys F2 thru F4 will perform if pressed; the words are spaced to be over the corresponding function key. So, to move to the next item you would press F2 (NEXT).

- F2: NEXT- moves to the next item.
- F3: BACK- moves to the previous item.
- F4: EXIT- exits the setup menu. Items like energy, trigger voltage, flash rate and operating mode are displayed.

MODE CHANGE

The mode change menu has the following format:

- L1: MODE CONTROL**
- L2: CURRENT DAY**
- L3:**
- L4: DAY TWI NITE EXIT**

“S” Version (2904410)

Once the handheld programmer is connected to PCB1 (29044xx) and power is applied, the circuit board will automatically recognize that the terminal is connected to it and will display the sign on message.

Note: Only terminals provided by Flash Technology will work with the 29044xx circuit board.

The general format of the sign on message for S versions is:

- L1: FLASH TECHNOLOGY**
- L2: BOARD 4990**
- L3: (Blank or further information)**
- L4: ENTER TO CONTINUE**

Once enter is pressed the first menu is displayed as follows:

- L1: PRESS A FUNC KEY**
- L2: F1. SETUP F2. INFO**
- L3: F3. SHORT TEST**
- L4: F4. MODE CHANGE**

To continue further, a function key must be pressed. The function keys are on the top row of the terminal. See Figure A1-2.

- F1: Enters the setup menus, used to configure the 2904410.
- F2: Enters the information menu, used to show a limited amount of useful operating info.
- F3: Causes the 2904410 to perform the short test.
- F4: Enters the mode change menu, used to manually change the operating mode (DAY, TWI, and NITE). Note: DAY equals HIGH, TWI equals MED and NITE equals LOW intensity

Note: The handheld terminal will return to the sign on message from any other menu if no key is pressed within two minutes.

Setup

The setup menu has the following format:

- L1: SETUP**
- L2: DASH 10 T 1 B 1**
- L3:**
- L4: OK NEXT BACK EXIT**

The first line displays the current menu. The second line displays the current setup. The numbers correspond to the dash number, tier and beacon selected. The third line is blank. The fourth line displays what functions the keys F1 thru F4 will perform if pressed; the words are spaced to be over the corresponding function key. So, to move to the next menu you would press F2 (NEXT).

- F1: OK- is used to enter data.
- F2: NEXT- moves to the next item.
- F3: BACK- moves to the previous item.
- F4: EXIT- exits the setup menu.

Parameters: 204S, 204SX & 205S (“S” Version Standard System)

Pressing the NEXT or BACK function key from the SETUP menu takes you to the parameters. The general format is:

- L1: SETUP**
- L2: DASH # 10**
- L3: Enter Dash #**
- L4: OK NEXT BACK EXIT**

To change the dash number, enter a number and press F1 OK. Press NEXT to continue.

Important! The dash number shown is for example only and may not be correct for your application. Dash numbers should only be programmed by trained Flash Technology personnel or under the direction of same.

The display will change to:

- L1: SETUP**
- L2: TIER # 1**
- L3: Enter TIER #**
- L4: OK NEXT BACK EXIT**

Press the number keys to select the tier number you wish this board to be and then press F1 (OK). The Tier number displayed will change. The display will change to:

- L1: SETUP**
- L2: BEACON # 1**
- L3: Enter Beacon #**
- L4: OK NEXT BACK EXIT**

Press the number keys to select the beacon number you wish this board to be and then press F1 (OK). The Beacon number displayed will change. When complete, press NEXT.

Note: It is recommended to write the dash number, tier and beacon numbers on the white space provided on the board.

Parameters: 207S & 208S ("S" Version Catenary System)

Pressing the NEXT or BACK function key from the SETUP menu takes you to the parameters. The general format is:

- L1: SETUP**
- L2: DASH # 36**
- L3: Enter Dash #**
- L4: OK NEXT BACK EXIT**

To change the dash number, enter a number and press F1 OK. Press NEXT to continue.

Important! The dash number shown is for example only and may not be correct for your application. Dash numbers should only be programmed by trained Flash Technology personnel or under the direction of same.

The display will change to:

- L1: SETUP**
- L2: CAT TIER**
- L3: 0-BOT. 1-MID. 2-TOP**
- L4: OK NEXT BACK EXIT**

Press the number keys to select the catenary tier you wish this board to be and then press F1 (OK).

The display will change to:

- L1: SETUP**
- L2: BEACON # 1**
- L3: Enter Beacon #**
- L4: OK NEXT BACK EXIT**

Press the number keys to select the beacon number you wish this board to be and then press F1 (OK). The Beacon number displayed will change. When complete, press NEXT.

Note: It is recommended to write the dash number, tier and beacon numbers on the white space provided on the board.

INFO

The info menu has the following format:

- L1: INFO**
- L2: BOARD 4990**
- L3:**
- L4: NEXT BACK EXIT**

This menu is used to show a limited amount of information about the current 2904410 operation and configuration.

The first line displays the current menu. The second and third lines display board information. The fourth line displays what functions the keys F2 thru F4 will perform if pressed; the words are spaced to be over the corresponding function key. So, to move to the next item you would press F2 (NEXT).

- F2: NEXT- moves to the next item.
- F3: BACK- moves to the previous item.
- F4: EXIT- exits the setup menu. Items like energy, trigger voltage, flash rate and operating mode are displayed.

MODE CHANGE

The mode change menu has the following format:

L1: MODE CONTROL

L2: CURRENT DAY

L3:

L4: DAY TWI NITE EXIT

- F1: DAY- Changes the mode to DAY.
- F2: TWI- Changes the mode to TWI.
- F3: NITE- Changes the mode to NITE.
- F4: EXIT- exits the mode change menu and returns the mode to automatic.

This menu item is used to manually change the operating modes and functions just like the test jumpers on the board.

Appendix 2 - FTB 204SPB and 207SPB Primary Backup

Operation

The 204SPB and 207SPB provide a secondary trigger output for the operation of a backup flashhead as shown in Figure A2-1. The power converter operates the primary flashhead until a failure is detected. Once in alarm, the power converter will switch trigger to the backup flashhead and continue to operate normally.

Once in backup mode, the power converter will send a “Backup Mode” alarm to the FTC 121 Controller. This is intended to

alert the operator that the primary has failed and the unit is operating in backup mode. In the event that both the primary and backup flashhead fail, the power converter will send a normal “Strobe Failure” alarm to the controller.

Installation

The 204SPB and 207SPB are installed as described in Section 2 with the additional mounting and wiring of the backup flashhead. The internal wiring is shown in Figure A2-2 for reference.

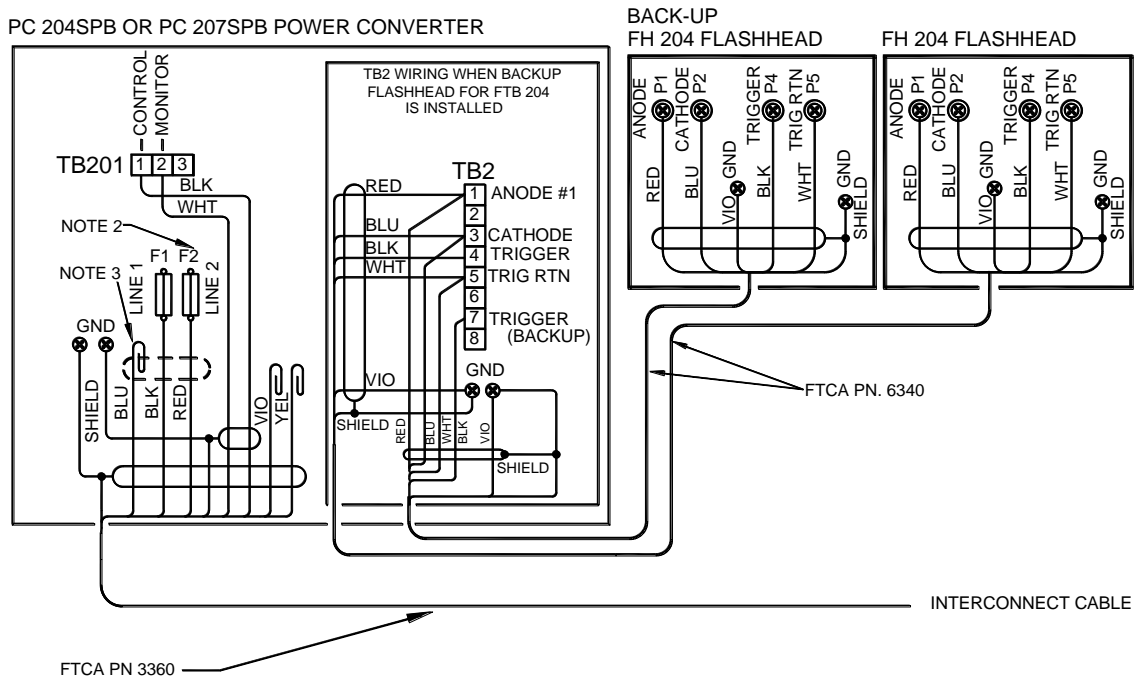
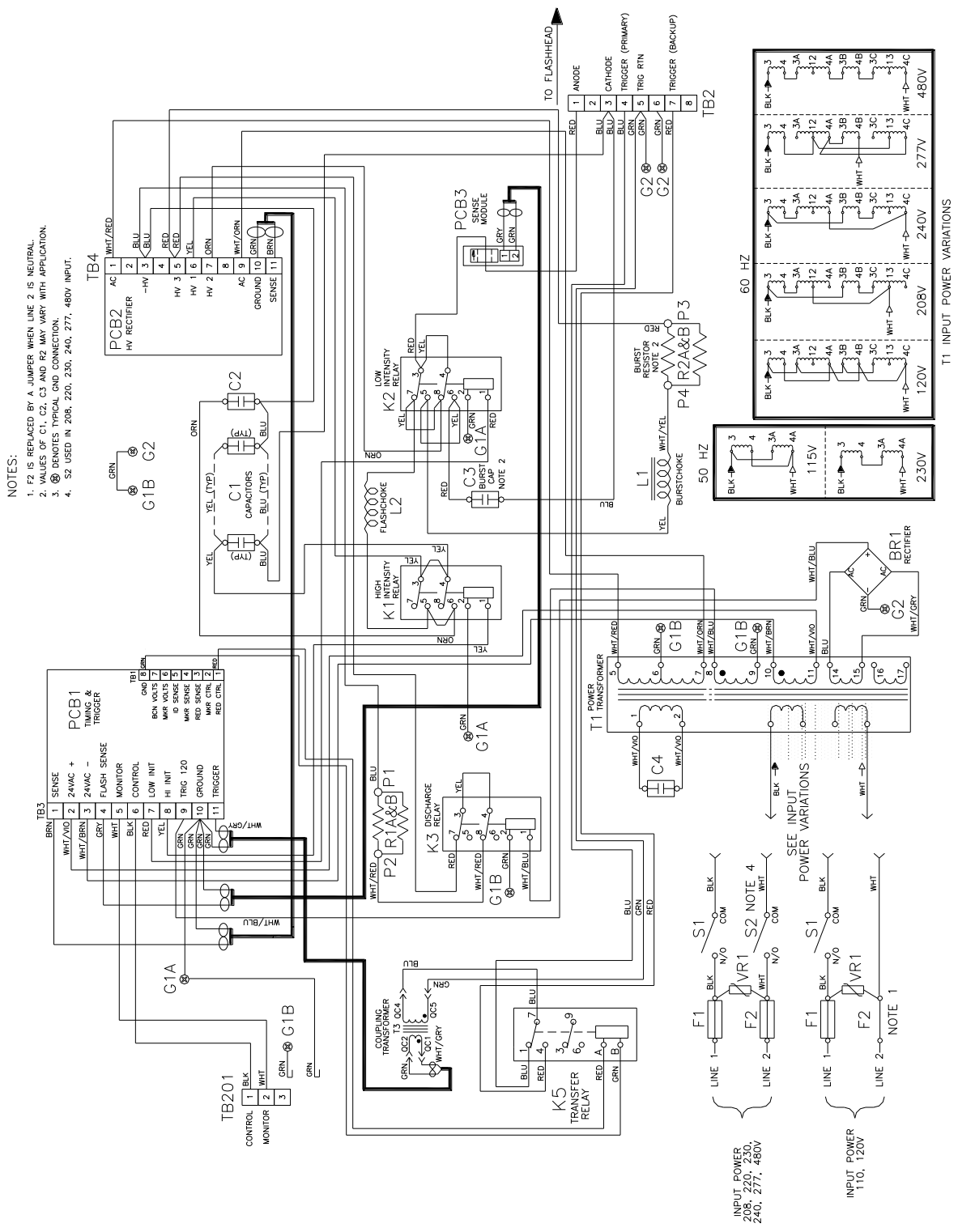


Figure A2-1 – PC 204SPB / 207SPB Installation Wiring



- NOTES:
1. F2 IS REPLACED BY A JUMPER WHEN LINE 2 IS NEUTRAL.
 2. VALUES OF C1, C2, C3 AND R2 MAY VARY WITH APPLICATION.
 3. ⊕ DENOTES TYPICAL GND CONNECTION.
 4. S2 USED IN 208, 220, 230, 240, 277, 480V INPUT.

Figure A2-2 – PC 204SPB / 207SPB Internal Wiring

Appendix 3 - FTB 204-3X, SX Extended Separation

Introduction and Operation

The FTB 204-3X and 204-3SX consist of an FH 204 flashhead and a PC 204-3 power converter. The lighting equipment operates and functions in a similar manner to other FTB 204 models except that the distance, or separation, between power converter and flashhead is greater (between 100 and 700 feet). The two main reasons for selecting the extended separation model are as follows: The power converter can either be mounted away from an antenna's RF field (see Figure A3-1) or at ground level (see Figure A3-2) thus minimizing antenna down time and improve serviceability, respectively. The power converter's component location is shown in Figure A3-4, and the internal wiring is shown in Figure A3-5 for reference.

Mounting and Installation

Refer to Section 2 – “Mounting and Installation”.

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 between 100 to 700 feet. 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 #16 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.

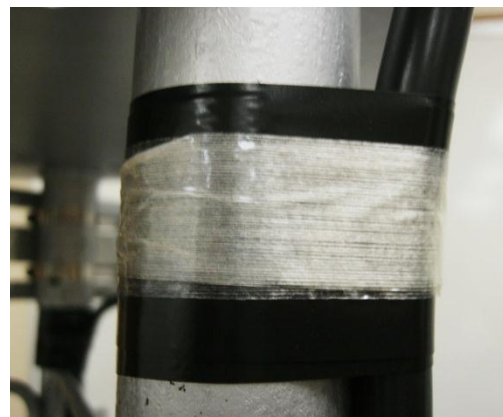
Securing the Cable

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 Scotchwrap™ #50 tape, or the equivalent, around the cable and tower leg at regular intervals every 4 to 5 feet (1.5 meters) per NEC.



2. Wrap three full turns of one-inch Scotchwrap Filament #890 tape, or the equivalent, over the Scotchwrap #50 tape.



3. Wrap four full turns of two-inch Scotchwrap #50 tape, or the equivalent, over the Scotchwrap Filament #890 tape.



4. Perform steps 1 through 4 also directly above and below any tower leg flanges that the cable may cross. The cable should be spaced approximately 1 inch from the edge of each flange.

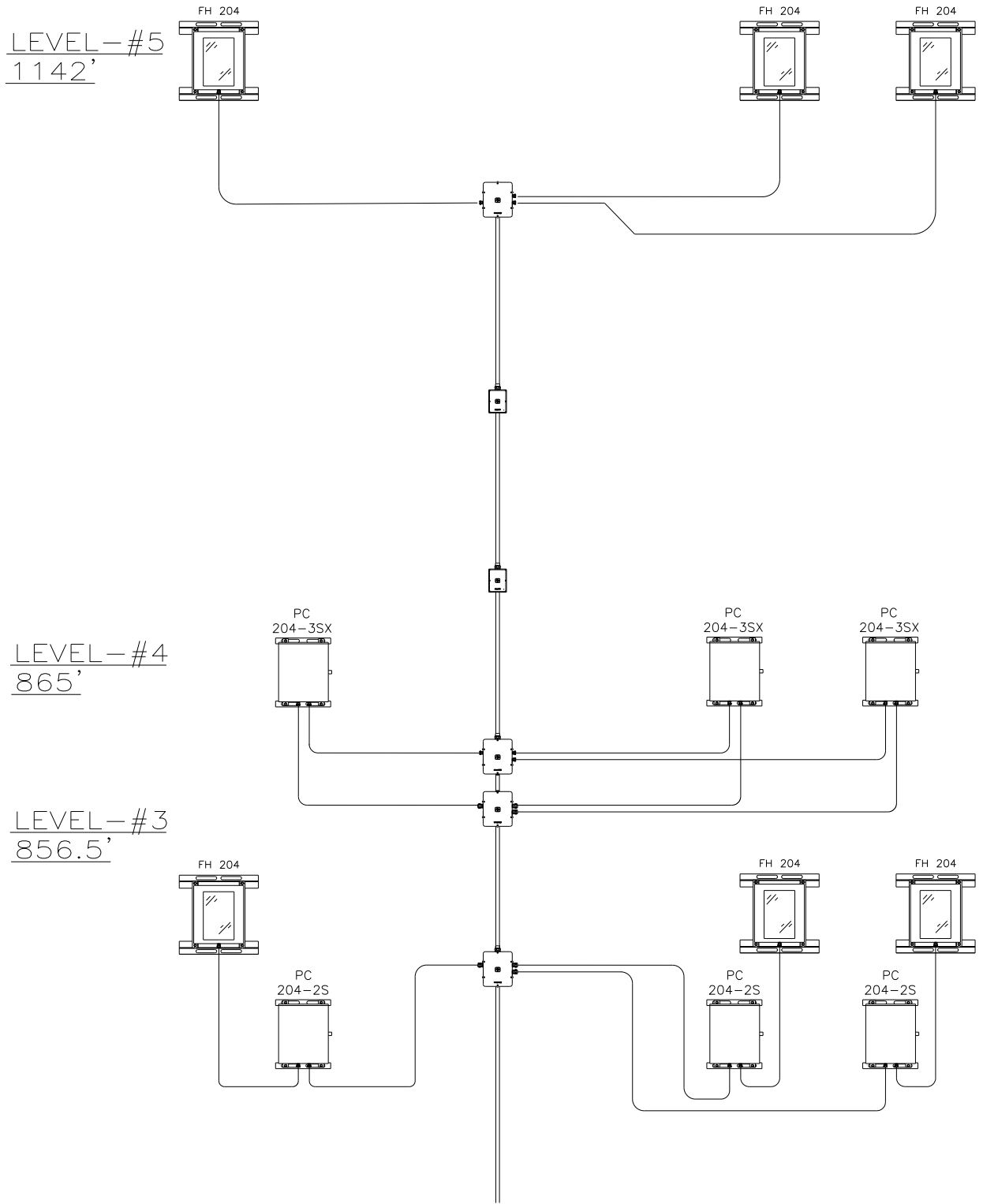


Figure A3-1 – PC 204-2 / 204-3X Mid-Tower Installation Example

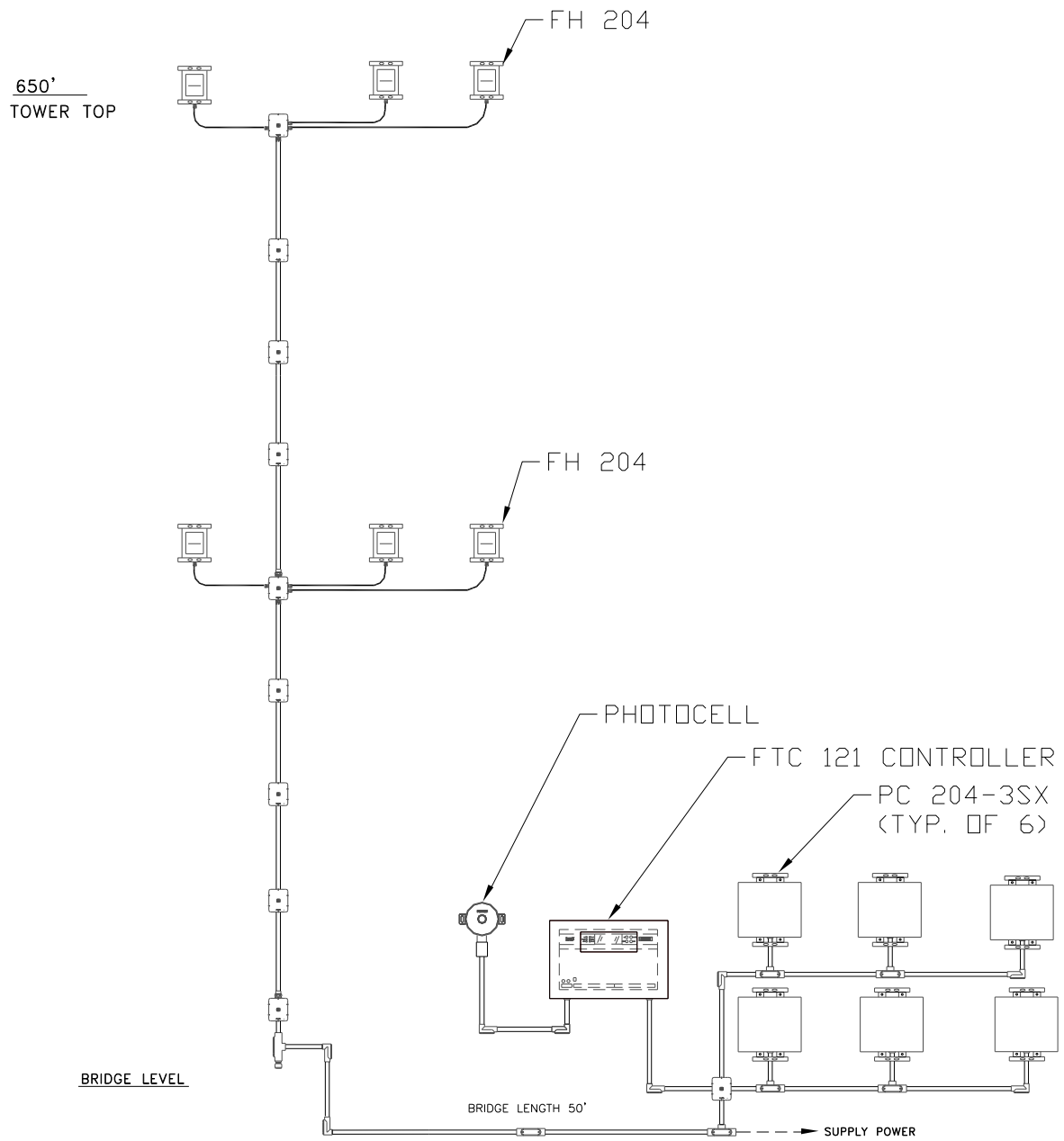
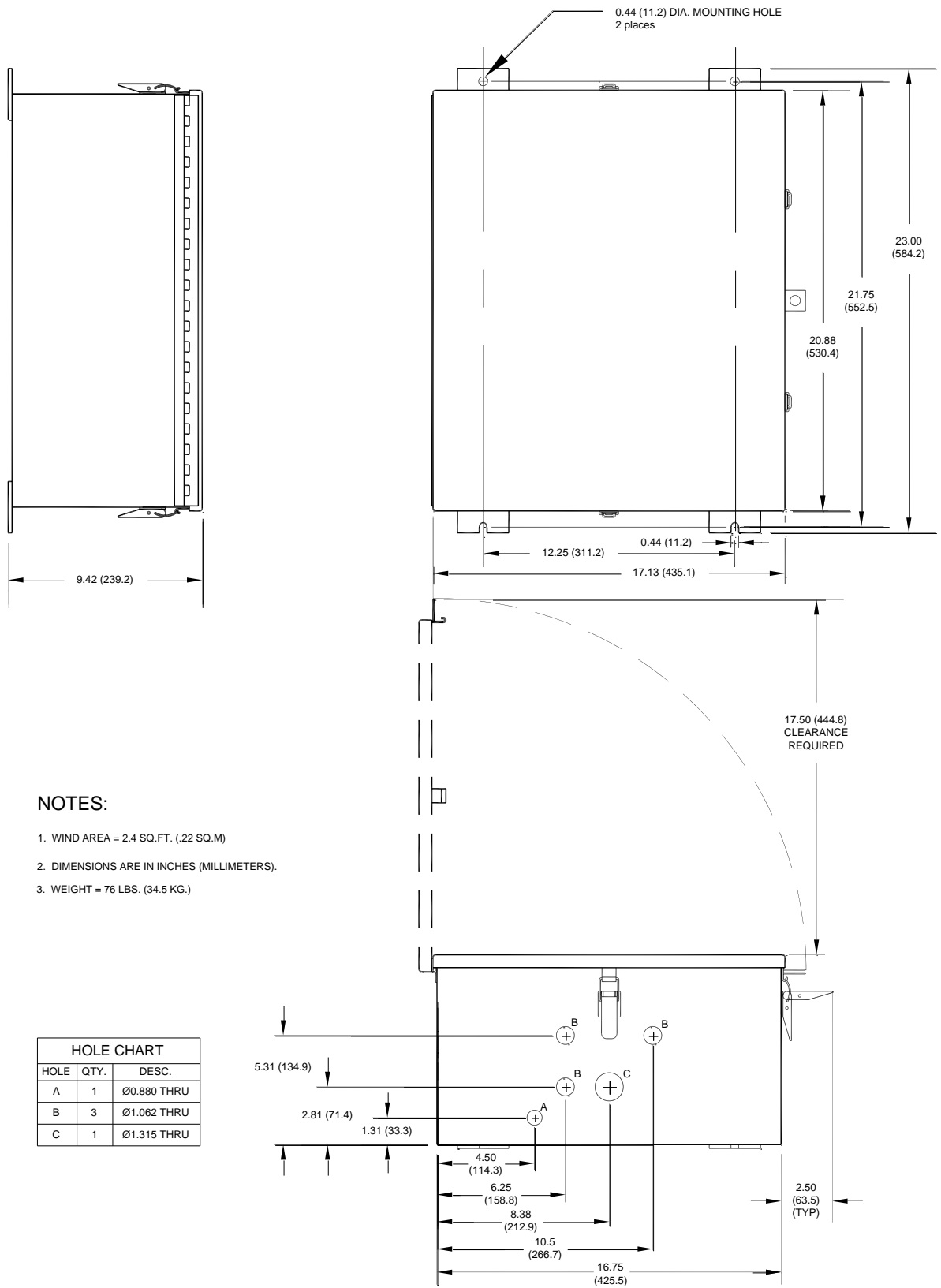


Figure A3-2 – PC 204-3X Ground Level Installation Example



NOTES:

1. WIND AREA = 2.4 SQ.FT. (.22 SQ.M)
2. DIMENSIONS ARE IN INCHES (MILLIMETERS).
3. WEIGHT = 76 LBS. (34.5 KG.)

HOLE CHART		
HOLE	QTY.	DESC.
A	1	Ø0.880 THRU
B	3	Ø1.062 THRU
C	1	Ø1.315 THRU

Figure A3-3 – PC 204-3X Power Converter Mounting and Outline

A		B		C	
PARTS LIST					
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31					
BR1	DIODE BRIDGE	F6902806			
C1	CAP 70MF	F6720401			
C2	CAP 50MF	F6732600			
C3	CAP 1MF	F6848202			
C4	CAP 3MF	F5249524			
F1	FUSE	F4900019			
F2	FUSE	F4900019			
K1	RELAY	F8900494			
K2	RELAY	F8900494			
K3	DISCHARGE RELAY	F8900493			
L1	BURST CHOKE	F485061			
L2	FLASH CHOKE	F4175200			
PCB1	TIMING & TRIGGER (204-3X)	F2904410			
PCB2	HV RECTIFIER	F2458005			
PCB3	SENSE TRANSFORMER	F281101			
PCB4	SURGE RESISTOR	F2459000			
RI&B	RESISTOR	F6900541			
S1	INTERLOCK SWITCH	F4900891			
S2	INTERLOCK SWITCH	F4900891			
T1	TRANSFORMER	F4499501			
T3	COUPLING TRANSFORMER	F1655601			
TB2	08 POS TERM STRIP	F4901235			
TB3	11 POS TERM STRIP	F4901234			
TB4	11 POS TERM STRIP	F4901234			
TB201	03 POS TERM STRIP	F4902157			
VR1	SUPPRESSOR, 120V	F8250801			
VR1	SUPPRESSOR, 208/230/240V	F8250802			
VR1	SUPPRESSOR, 480V	F8250804			

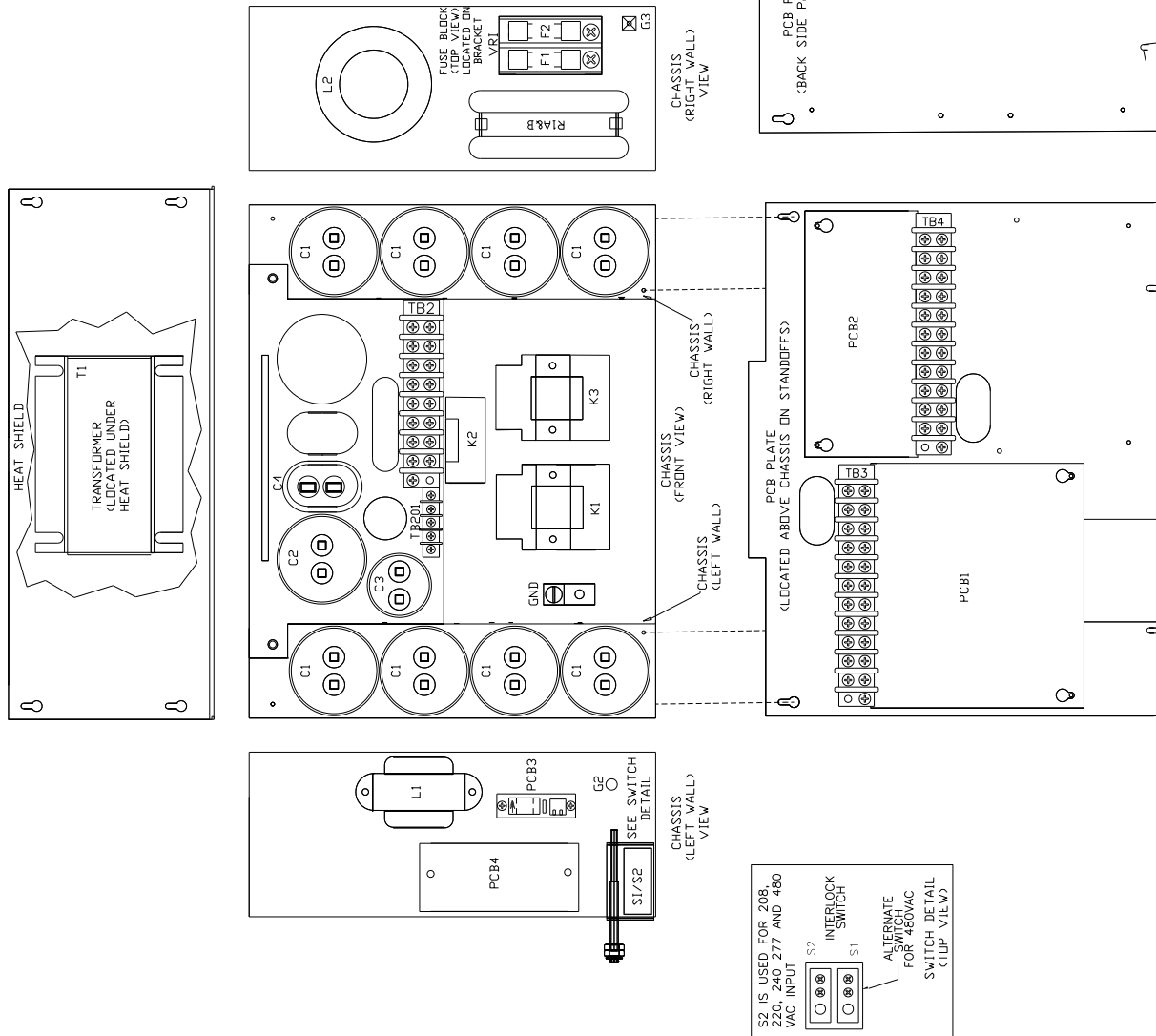


Figure A3-4 – PC 204-3X Power Converter Component Locations

- NOTES:
1. F2 IS REPLACED BY A JUMPER WHEN LINE 2 IS NEUTRAL.
 2. VALUES OF C1, C2, C3 AND R2 MAY VARY WITH APPLICATION.
 3. Ⓞ DENOTES TYPICAL GND CONNECTION.
 4. S2 USED IN 208, 220, 240, 277, 480V INPUT.

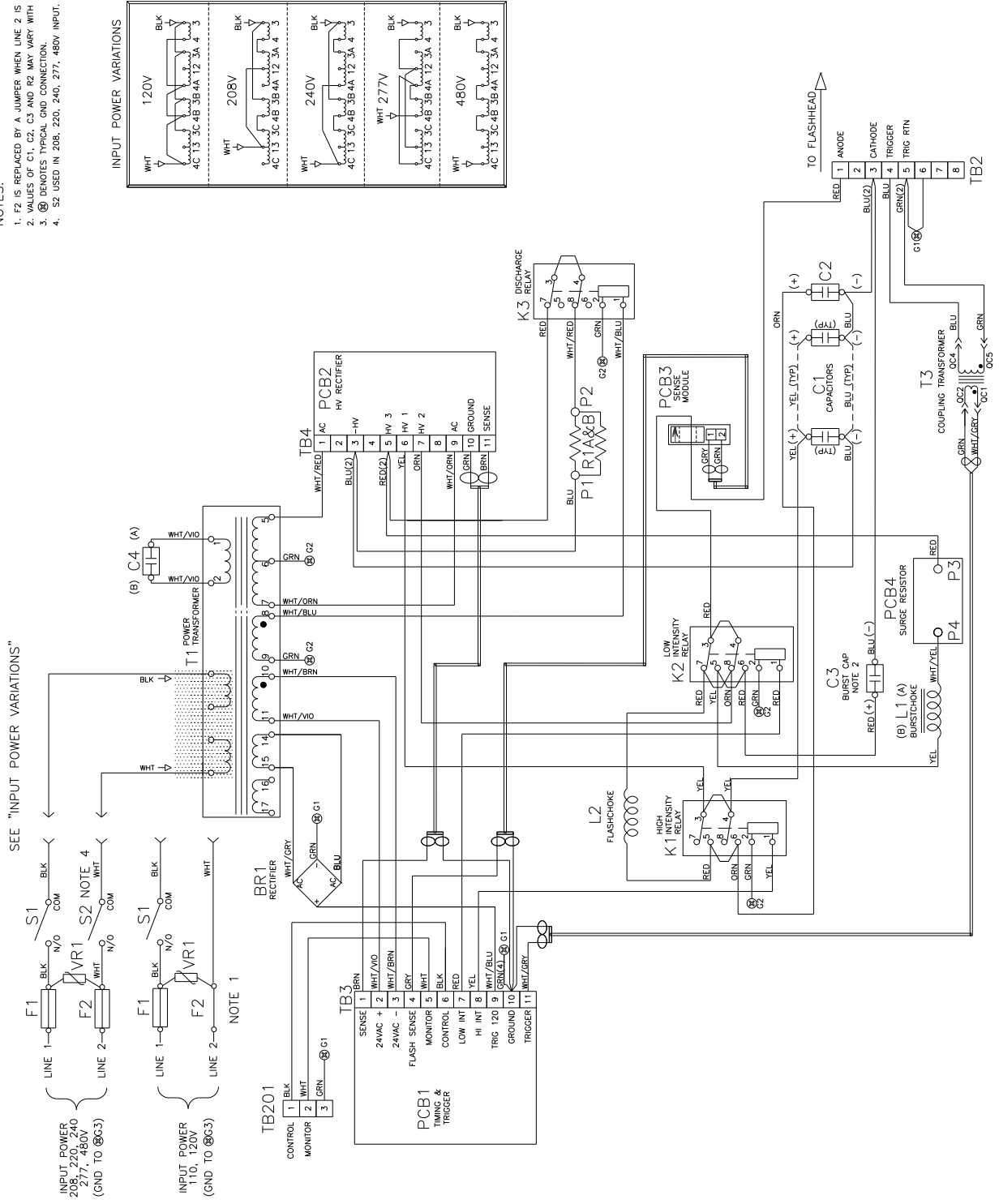


Figure A3-5 – PC 204-3X Power Converter Internal Wiring