



SERIAL NUMBER



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

**Obstruction Lighting System
Reference Manual
Part Number 79120X2**

Front Matter

Abstract

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

Copyright

Copyright © 2008, Flash Technology®, Franklin, TN, 37067, U.S.A.

All rights reserved. Reproduction or use of any portion of this manual is prohibited without express written permission from Flash Technology and/or its licensor.

Trademark Acknowledgements

Flash Technology® is a registered trademark name.

ElectroFlash™, Flash Tech™, Flash Technology™, FTCA™, Flash™ and the Flash Technology Logo are all trademarks of Flash Technology.

All trademarks and product names mentioned are properties of their respective companies, and are recognized and acknowledged as such by Flash Technology.

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 150/5345-43E, 150/5345-51 and 150/4345-53B. The certification is valid as long as the system is maintained in accordance with FAA guidelines (FR doc. 04-13718 filed 6-16-04).

Personnel Hazard Warning

Dangerous Voltages

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

Avoid Touching Live Circuits

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

Dangerous Voltages Can Persist with Power Disconnected

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

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

Do Not Depend on Interlocks

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

Table of Contents

FTB 204-2S,PB,X; 205-11S; 207-2S,PB; 208-2S; 304-2S; 305-2S.....	i
Front Matter	ii
Abstract	ii
Copyright	ii
Trademark Acknowledgements	ii
Applicable Specifications	ii
Disclaimer	ii
Warranty	ii
Parts Replacement.....	ii
Personnel Hazard Warning	iii
Dangerous Voltages	iii
Avoid Touching Live Circuits	iii
Dangerous Voltages Can Persist with Power Disconnected.....	iii
Do Not Depend on Interlocks	iii
Table of Contents.....	iv
List of Figures.....	vii
Section 1 – Introduction and Operation	1
System Controller	1
Variations and Options	1
Specifications.....	1
Physical.....	1
Performance Characteristics	1
Operation.....	2
Beacon/Power Converter	2
Catenary Operation (FTB 207, 208)	2
Flash Modes	2
60/50 Hz Operation.....	2
Fixed Mode Operation	2
Configuring PCB1	3
Section 2 - Mounting and Installation.....	7
Unpacking	7
Tools	7
Access	7
HAZARD WARNING.....	7
Beacon/Power Converter	7
Flashhead	7
Mounting.....	7
Beacon Location	8
Beacon Angle.....	8
Controller Mounting	8
PEC Mounting	8
Wiring	8
Beacon Wiring	9
Lightning Protection	9
Installation Checklist	10

Section 3 — Maintenance and Troubleshooting.....	22
Safety	22
Preventive Maintenance.....	22
Storage	22
RFI Problems	22
Component Testing.....	23
Wiring and Cabling.....	23
Inspection.....	23
Capacitors	23
C1 — High Intensity Capacitor Bank.....	23
C2 — Medium Intensity Capacitor.....	23
C3 — Low Intensity Capacitor.....	24
C4 — Tuning Capacitor.....	24
FT101 — Flashtube	24
K1, K2 — Mode Relays, 24-volt DC Coil.....	24
K3 — Discharge Relay, 120 VAC Coil.....	24
L1 — Burst Choke.....	24
L2 — Flash Choke.....	24
PCB1 — Timing and Trigger Board.....	24
R1A, R1B — Bleed Resistors.....	24
PCB2 — HV Rectifier Board	24
R2A, R2B — Burst Resistors	24
T1 — Power Transformer.....	24
PCB3 — Sense Module	25
T101 — Trigger Transformer	25
VR1 — Suppressor Assembly	25
Troubleshooting.....	25
Component Removal and Replacement.....	28
Removal & Replacement — General	28
Section 4 – Recommended Spare & Replaceable Parts.....	32
Customer Service.....	32
Ordering Parts.....	32
Beacon / Power Converter Parts	32
Flashhead Parts	32
Returning Equipment – Return Material Authorization (RMA).....	37
Return to Stock Policy	38
Appendix 1 – Programming the Timing and Trigger Board.....	39
Connecting the Handheld.....	39
Using the Programmer	39
SETUP for Non S Versions	41
SETUP for S Versions	41
Parameters for Non S Versions.....	41
Parameters for S Versions.....	42
INFO	43
MODE CHANGE.....	43
Appendix 2 - FTB 204SPB and 207SPB Primary Backup.....	45
Operation.....	45
Installation.....	45

Appendix 3 - FTB 204-2X and 204-2SX Extended Separation	48
Introduction and Operation.....	48
Mounting and Installation.....	48
Flashhead Wiring.....	48
Securing the Cable	48
Spare Parts (for 204-2X/204-2SX versions only).....	53

List of Figures

Figure 1-1 – PCB1 (2904411) Timing and Trigger Board	4
Figure 1-3 – Typical 2-Tower 3-Tier Layout and Catenary Beacon Operation	6
Figure 2-1 – PC 204/207 Power Converter Mounting and Outline	12
Figure 2-2 – FH 204 Flashhead Mounting and Outline.....	13
Figure 2-3 – FTB 205/208 Beacon Mounting and Outline.....	14
Figure 2-4 – Wiring Overview of a System.....	15
Figure 2-5 – Junction Box, Three-Phase Installation Wiring	16
Figure 2-6 – Single-Phase Installation Wiring for FTB 204/207	17
Figure 2-7 – Single-Phase Installation Wiring for FTB 205/208	18
Figure 2-8 – Optical Assembly Internal Wiring	19
Figure 2-9 – PC 204/207 Power Converter Internal Wiring.....	20
Figure 2-10 – PC 205/208 Power Converter Internal Wiring.....	21
Figure 3-1 – Major Troubleshooting Symptoms	26
Figure 3-2 – Defective Component Locator Code.....	27
Figure 3-3 – Winding Directions	30
Figure 4-1 – Beacon / Power Converter Replacement Parts.....	33
Figure 4-2 – PC 204/207 Power Converter Component Locations	34
Figure 4-3 – PC 205/208 Power Converter Component Locations	35
Figure 4-4 – Flashhead Replacement Parts.....	36
Figure 4-5 – FTB 205 Optical Assembly, FH 204 Flash Component Locations	36
Figure A1-1 – DB9 Female.....	39
Figure A1-2 – Handheld Programmer	39
Figure A2-1 – PC 204SPB / 207SPB Installation Wiring	46
Figure A2-2 – PC 204SPB / 207SPB Internal Wiring.....	47
Figure A3-1 – PC 204-2X / 204-2SX Mid-Tower Installation Example.....	49
Figure A3-2 – PC 204-2X / 204-2SX Ground Level Installation Example.....	50
Figure A3-3 – PC 204-2X / 204-2SX Component Locations.....	51
Figure A3-4 – PC 204-2X / 204-2SX Internal Wiring	52

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

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 a 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. The controller sends intensity information to the lights to make them operate in the correct mode. The controller sends and receives coded signals over a two-wire communications cable (COMM LINK).

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 9.44 in., 70lbs.

584.2 x 435.1 x 239.8 mm, 31.8 kg

Wind Area: 2.4 ft², 0.22 m²

FH 204 (H x W x D, Weight)

23 x 18.6 x 12.8 in., 18lbs

584 x 472 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. A 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.

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 provides the highest degree of visibility in daylight and night. Three levels (tiers) of sequentially flashing lights are required. One tier of lighting is required at the top, one tier at the midpoint, and one tier at the bottom.

The tier flash sequence is middle, top, bottom. All lights at the same tier flash

simultaneously. The catenary flash rate is 60 flashes per minute. See

FTCA 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 daylight intensity of $270,000 \pm 25\%$ ECD.

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. You can also use the handheld terminal to control the modes (see section 5).

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.
HITE (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.

Be certain to remove all jumpers after checking the beacon.

Configuring PCB1

PCB1 (2904410 for S version, 2904411 for non S version) governs all the functions pertaining to operation. It has nine light emitting diode (LED) indicators, and one clear neon indicator that you can use to monitor equipment operations during checkout and troubleshooting. To monitor operation the following subsections instruct you to observe specified LEDs. The essential features on PCB1 for troubleshooting are shown in Figure 1-1 and Figure 1-2.

The factory programs PCB1 according to your purchase order, or the handheld terminal (p/n 1903776) may be used (see Section 5).

When replacing PCB1 in the field, ensure that the board is setup the same way as the board you are replacing. You can change some operations in the field by using the handheld terminal Figure 1-1 shows the locations of indicator lights useful for monitoring the equipment's operation.

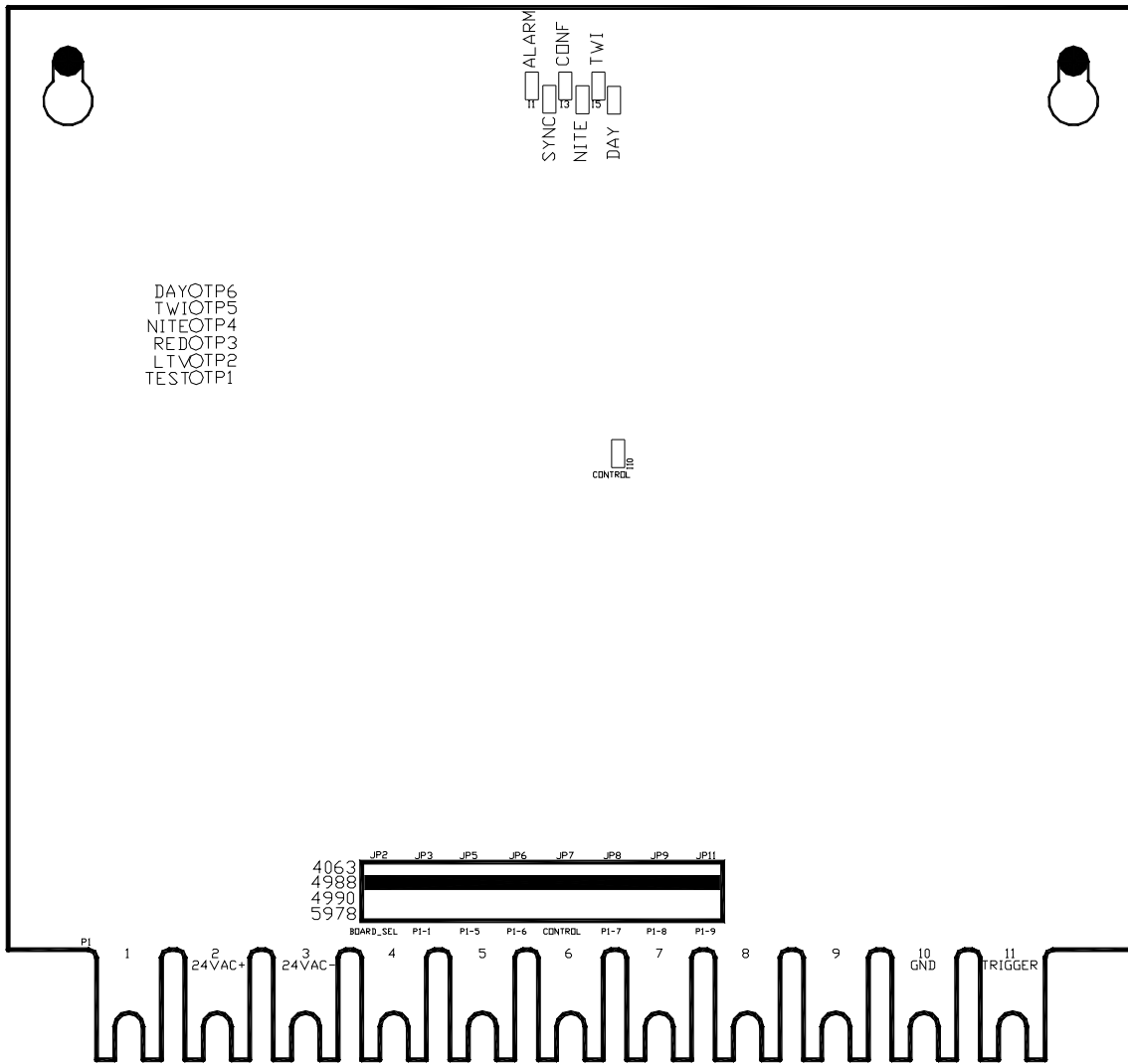


Figure 1-1 – PCB1 (2904411) Timing and Trigger Board

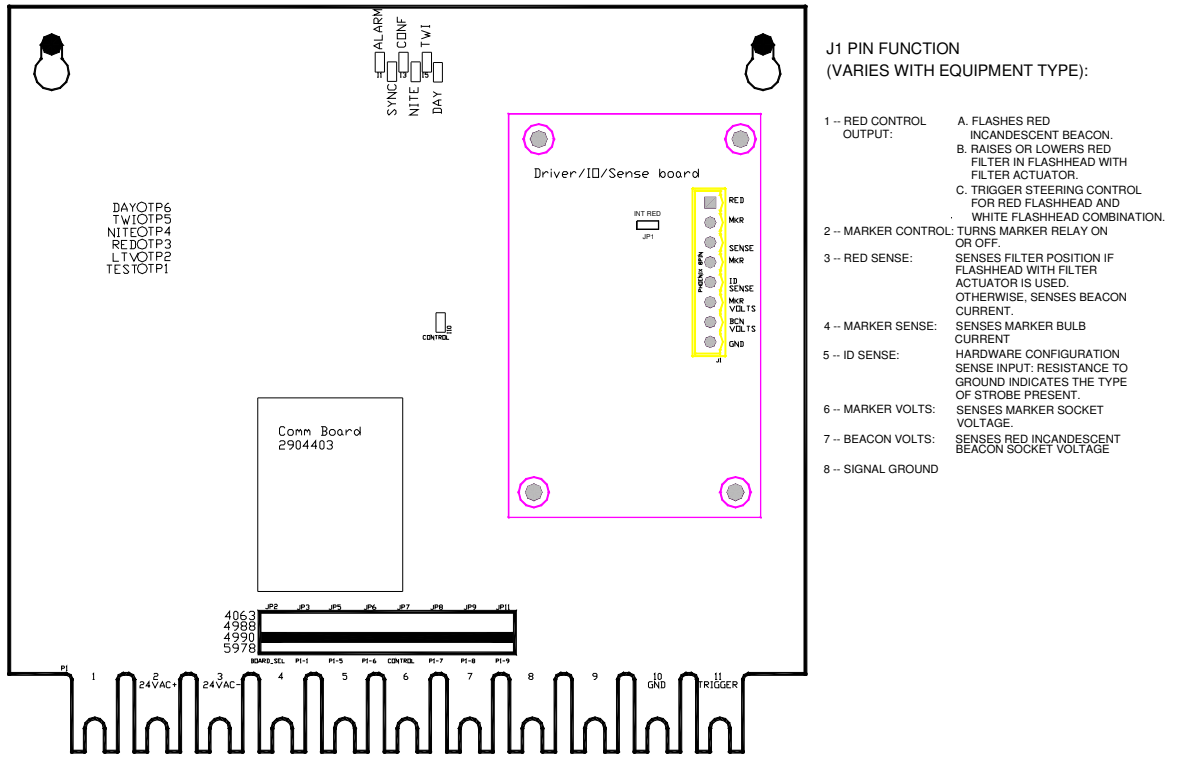


Figure 1-2 – PCB1 (2904410) Timing and Trigger Board For S Versions

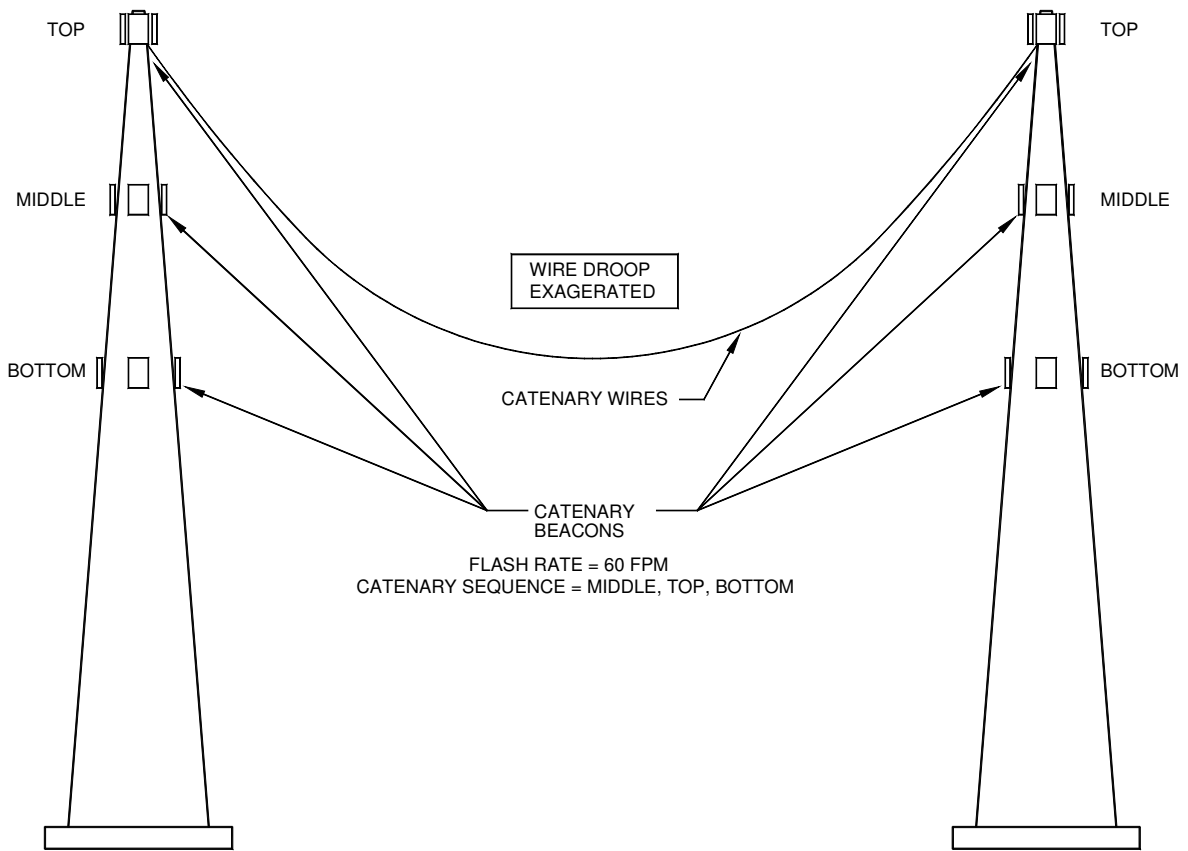


Figure 1-3 – Typical 2-Tower 3-Tier Layout and Catenary Beacon Operation

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, and promptly report damage claims to the freight handler.

FTCA factory programs beacons for operation at particular locations, and marks the shipping containers accordingly on the outside. FTCA 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. 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 on drawings.

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

HAZARD WARNING

Disconnect the primary power before opening the beacon or flashhead enclosures.

Beacon/Power Converter

Latches secure the hinged cover of the power converter or the beacon. When you release these you can swing open the cover for access to the inside.

Flashhead

Latches secure the hinged cover of the flashhead. When you release these you can swing open the cover for access to the inside.

Mounting

Outline, mounting, and clearance dimensions for your equipment 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 forms is show 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.

PEC Mounting

You may locate the PEC at any practical distance from the system controller. To ensure proper operation, observe the following requirements. Mount the PEC:

- With an unobstructed view of the polar sky.
- In a way that direct or reflected sunlight does not strike it.
- Vertically on the top end of a vertical length of conduit to prevent water from entering.

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

Wiring

NOTE

Only general information for a typical installation is presented here. Thus, more specific information may be needed for your site.

Consult any installation drawings prepared especially for your site or supplied with the equipment.

If installation drawings prepared specifically for your site disagree with information provided in this manual, the installation drawings should take precedence.

See Figure 2-4 – Wiring Overview of a System. System wiring consists of primary power and signal distribution wiring. 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 VDC 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. FTCA 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:

CAUTION

These 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 ElectroFlash 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. Equipment Damage:

Inspect all equipment for damage.

2. Required Equipment:

Verify the received equipment against the packing list to ensure completeness.

3. Beacon/Power Converter Mounting:

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

- 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.
- Mount the unit away from radio frequency interference (RFI).

4. 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.

5. Flashhead Mounting:

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

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

6. 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.

7. Photocell:

- Locate photocell where it views unobstructed polar sky with no direct or reflected artificial lighting striking it.
- Mount the photocell vertically on the top end of a vertical length of conduit to prevent water from entering the unit.
- Ground the wire shield around the photocell wires, if one is present.
- After running the photocell wires, check for continuity and shorts.

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

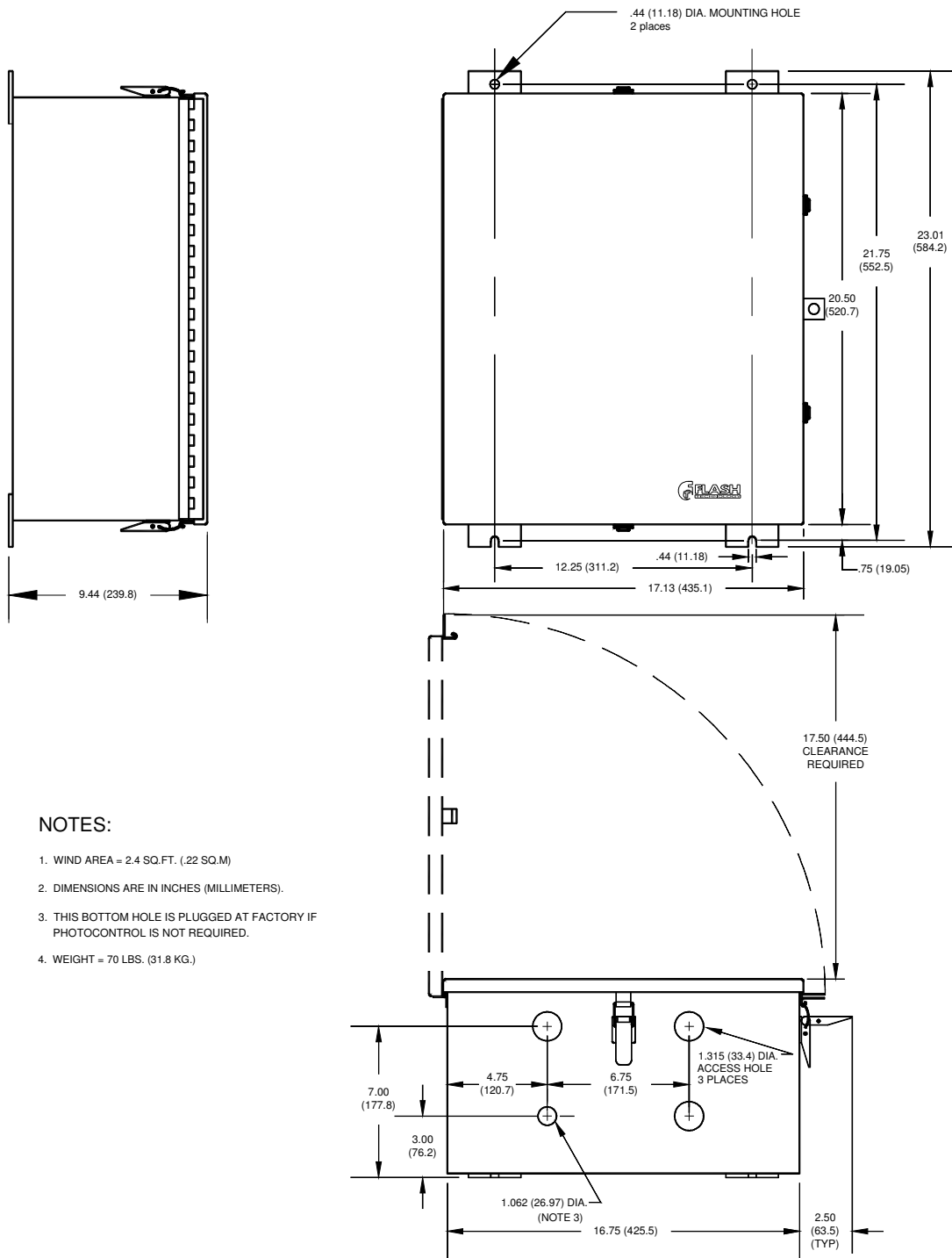
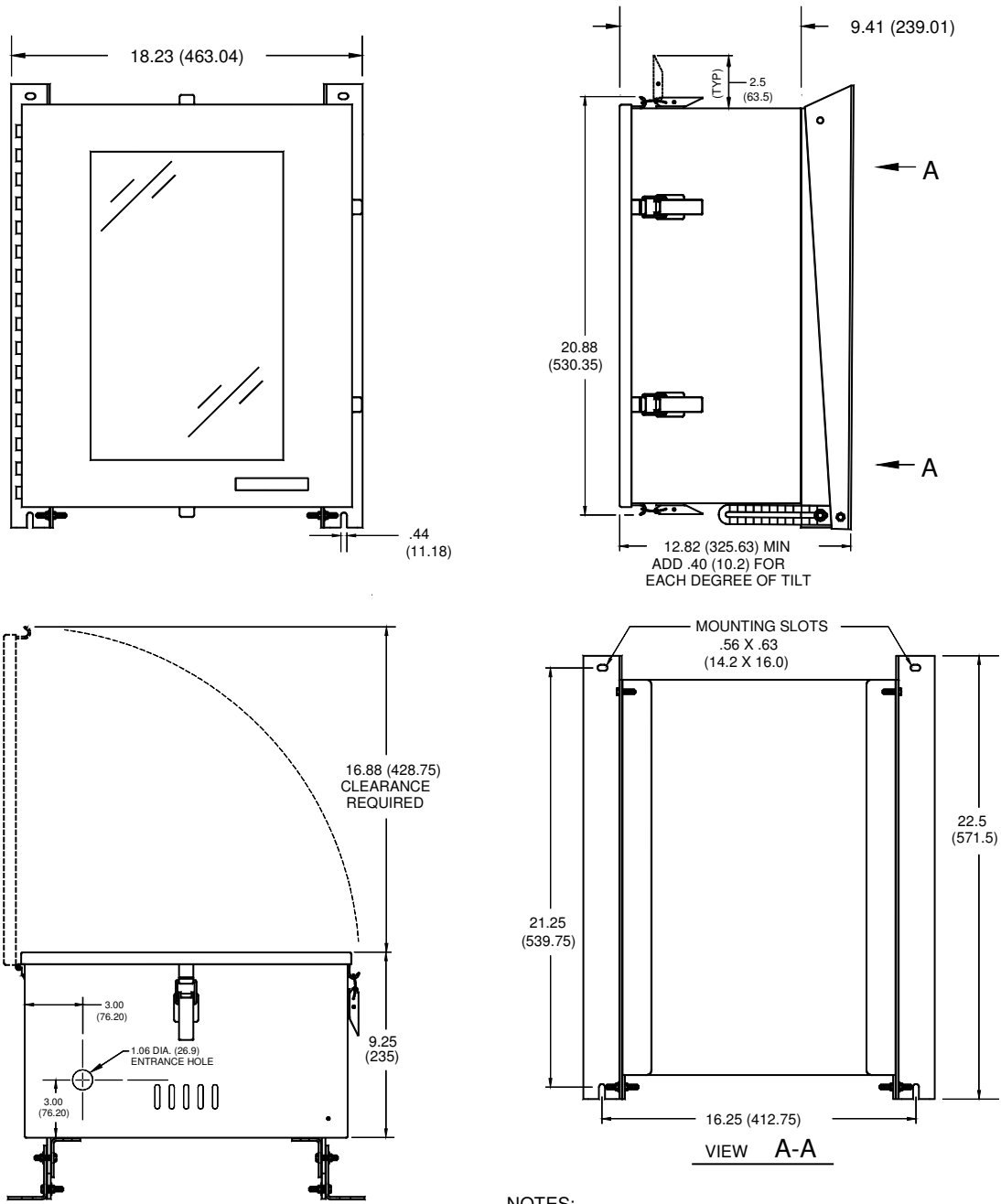


Figure 2-1 – PC 204/207 Power Converter Mounting and Outline



- 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

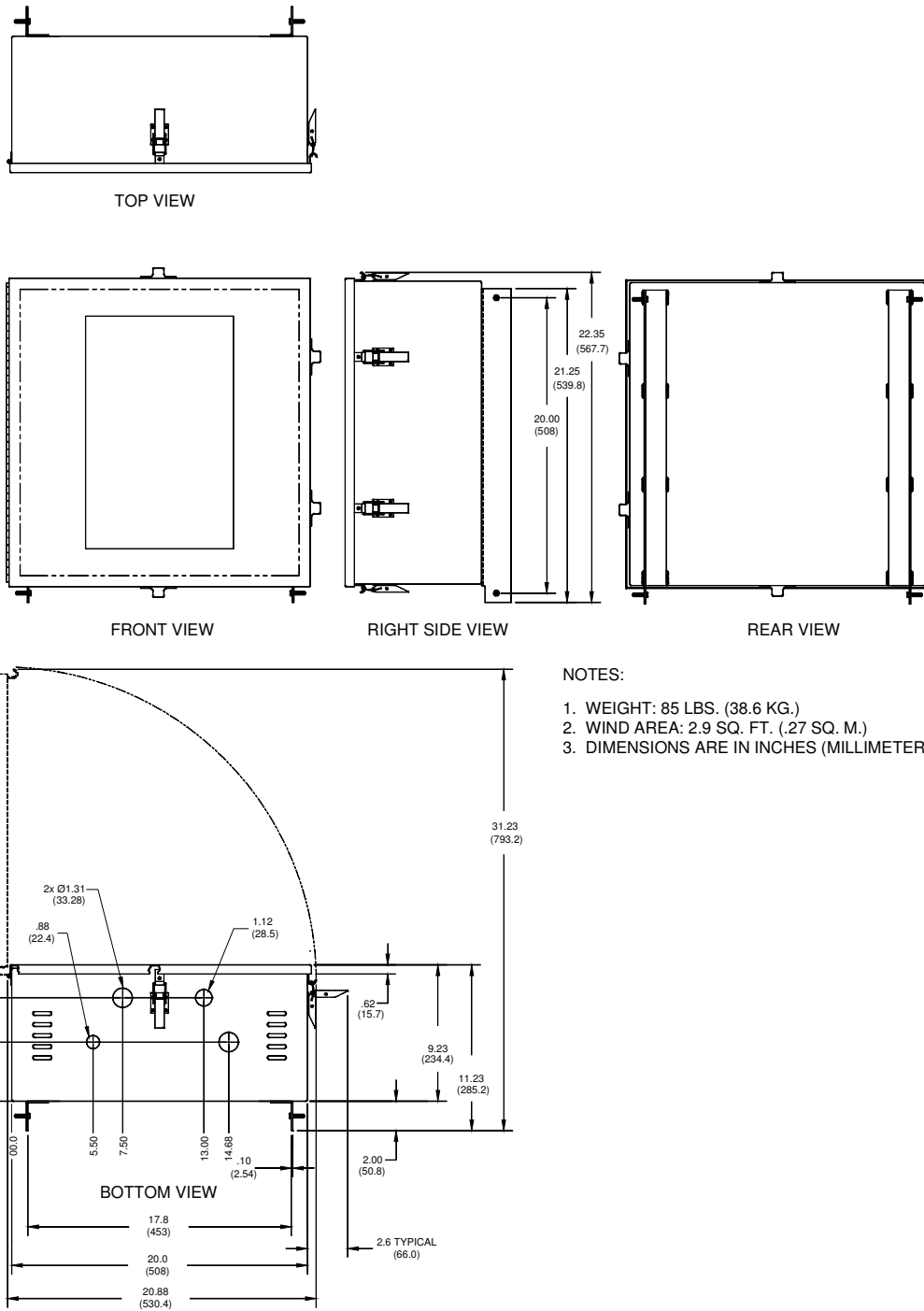


Figure 2-3 – FTB 205/208 Beacon Mounting and Outline

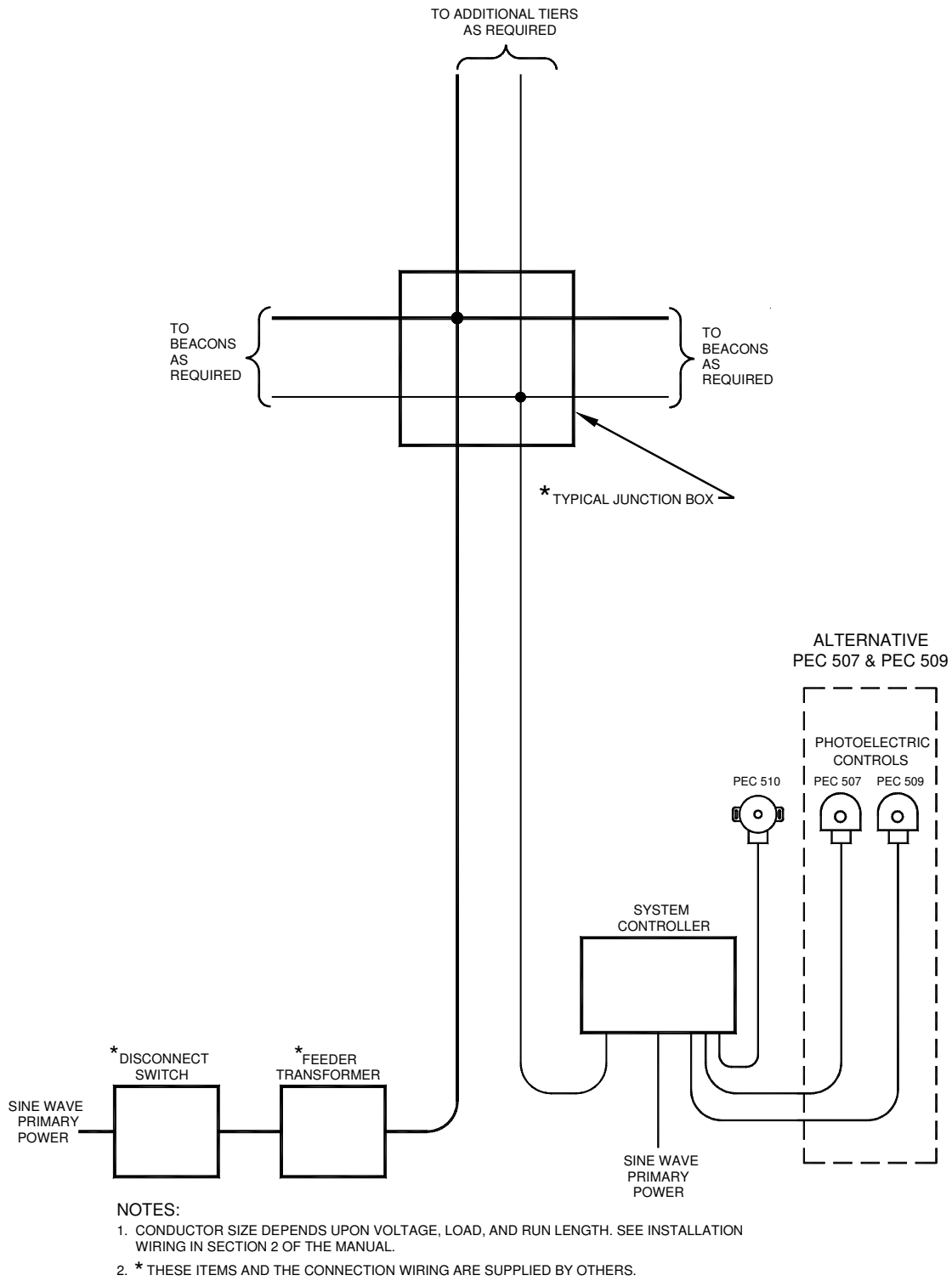


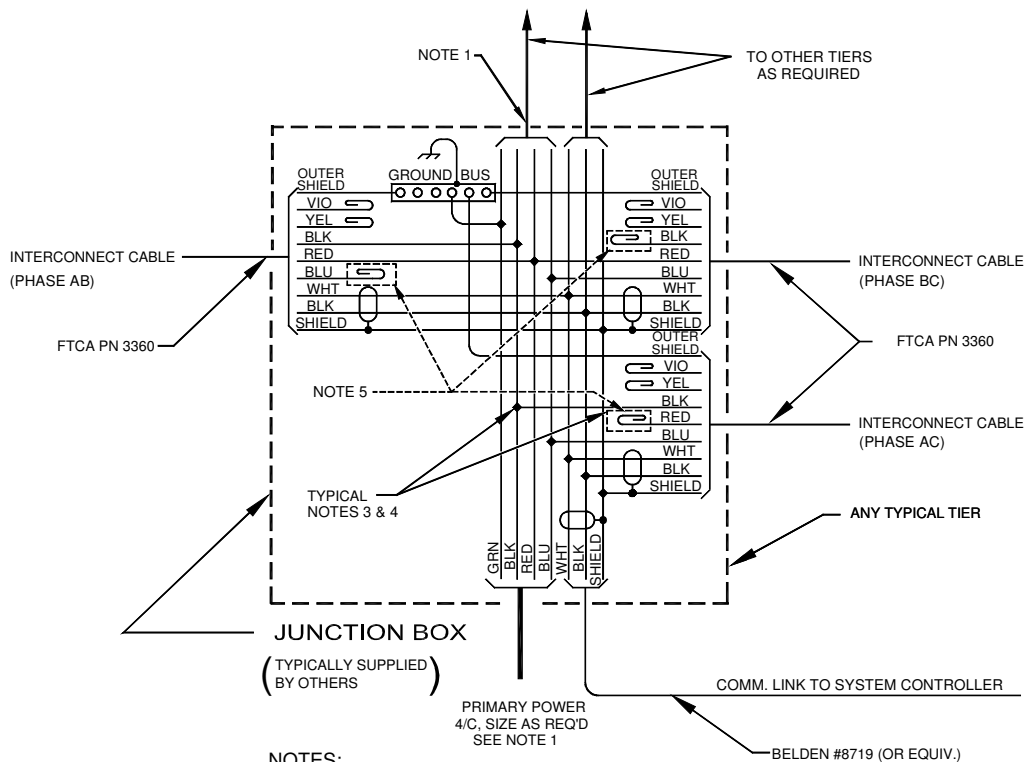
Figure 2-4 – Wiring Overview of a System

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:


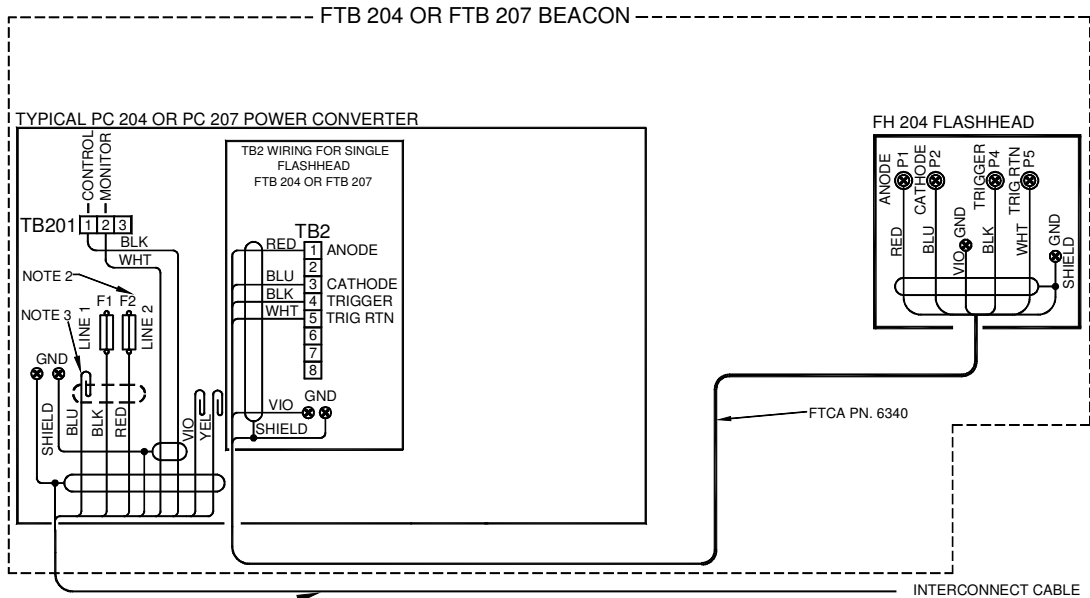
1. CONDUCTOR SIZE DEPENDS ON THE SERVICE VOLTAGE, THE LENGTH OF THE WIRE RUN, AND THE NUMBER OF BEACONS CONNECTED. USE 400-VOLT AMPERES PER BEACON TO CALCULATE THE TOTAL LOAD. DETERMINE THE WIRE GAUGE REQUIRED TO PREVENT THE VOLTAGE DROP CAUSED BY WIRE RESISTANCE FROM EXCEEDING 5% AT ANY BEACON. SEE 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.

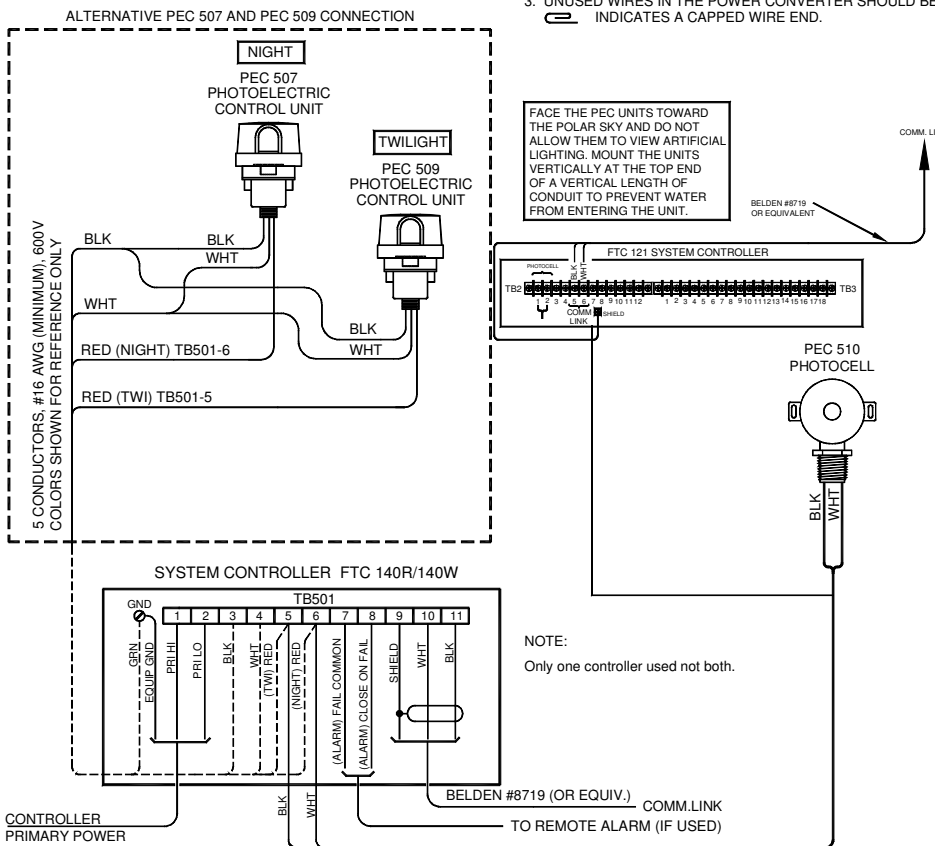
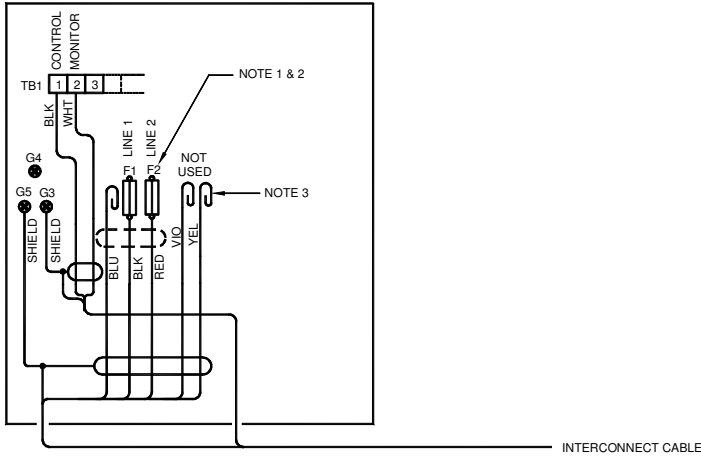
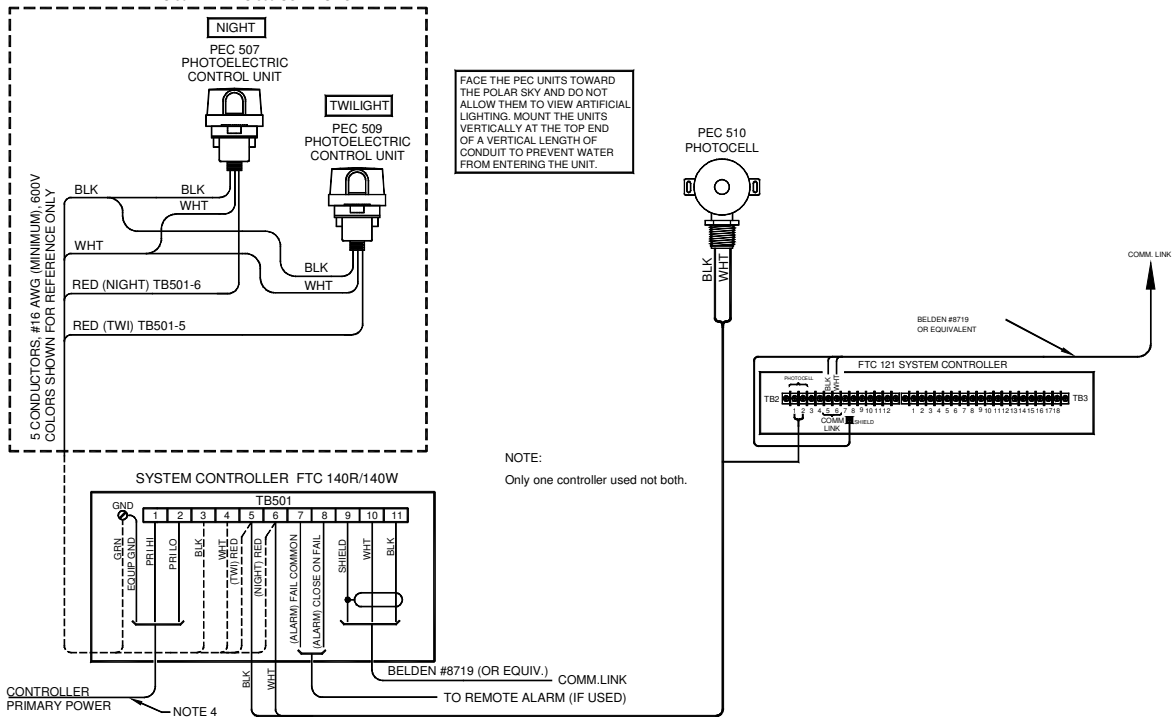


Figure 2-6 – Single-Phase Installation Wiring for FTB 204/207

TYPICAL FTB 205 OR FTB 208 BEACON



ALTERNATIVE PEC 507 AND PEC 509 CONNECTION



NOTES:

1. FACTORY WIRES EQUIPMENT TO NAMEPLATE VOLTAGE.
2. WHEN LINE 2 IS NEUTRAL, FACTORY REPLACES F2 BY A JUMPER.
3. UNUSED WIRES IN THE BEACON SHOULD BE CAPPED WITH WIRE NUTS.
 INDICATES A CAPPED WIRE END.
4. THE CONTROLLER MIGHT OPERATE AT A LINE VOLTAGE DIFFERENT FROM THE BEACONS. CHECK THE EQUIPMENT LABEL. ALSO ENSURE CORRECT LINE PHASING.

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

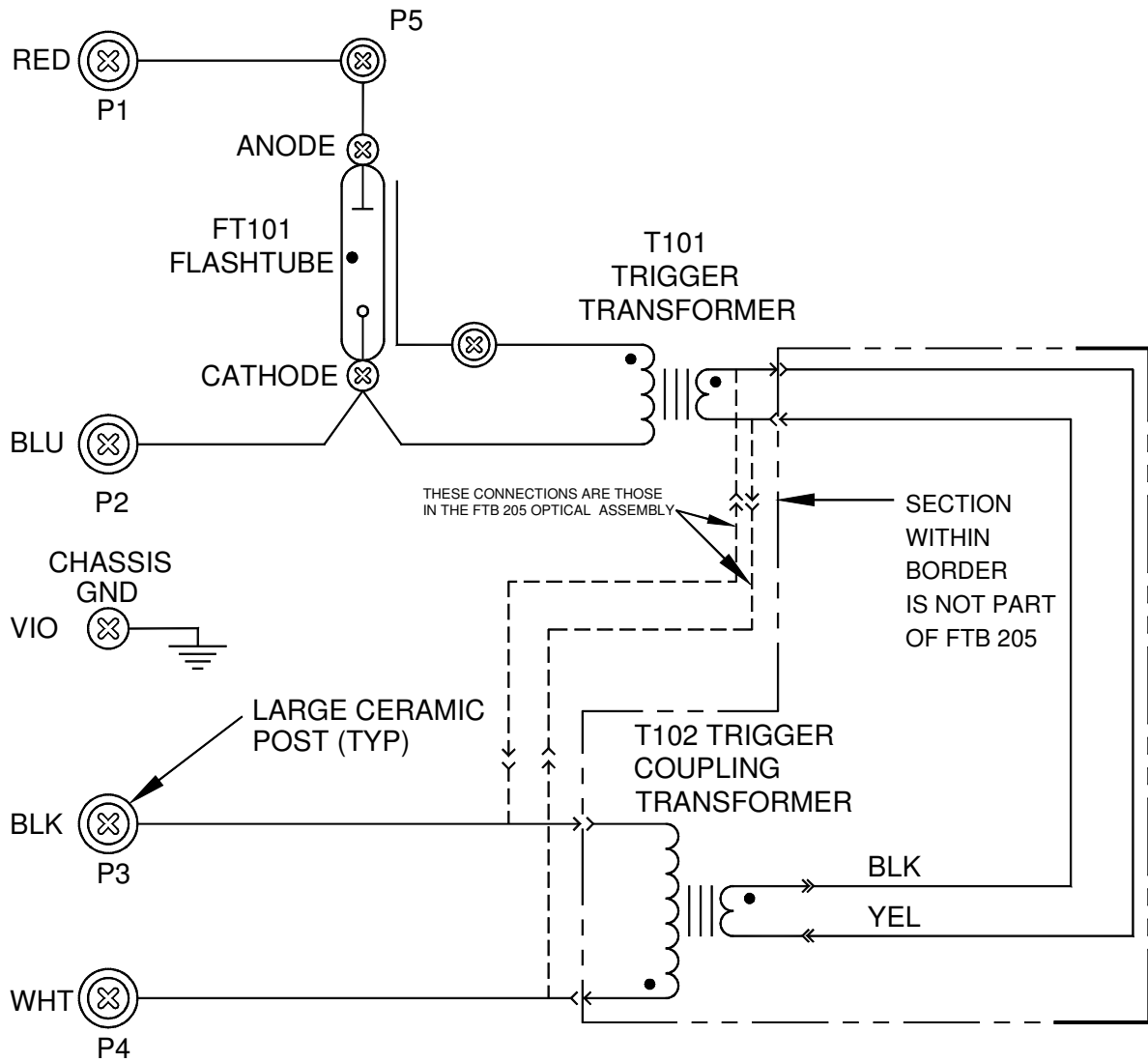
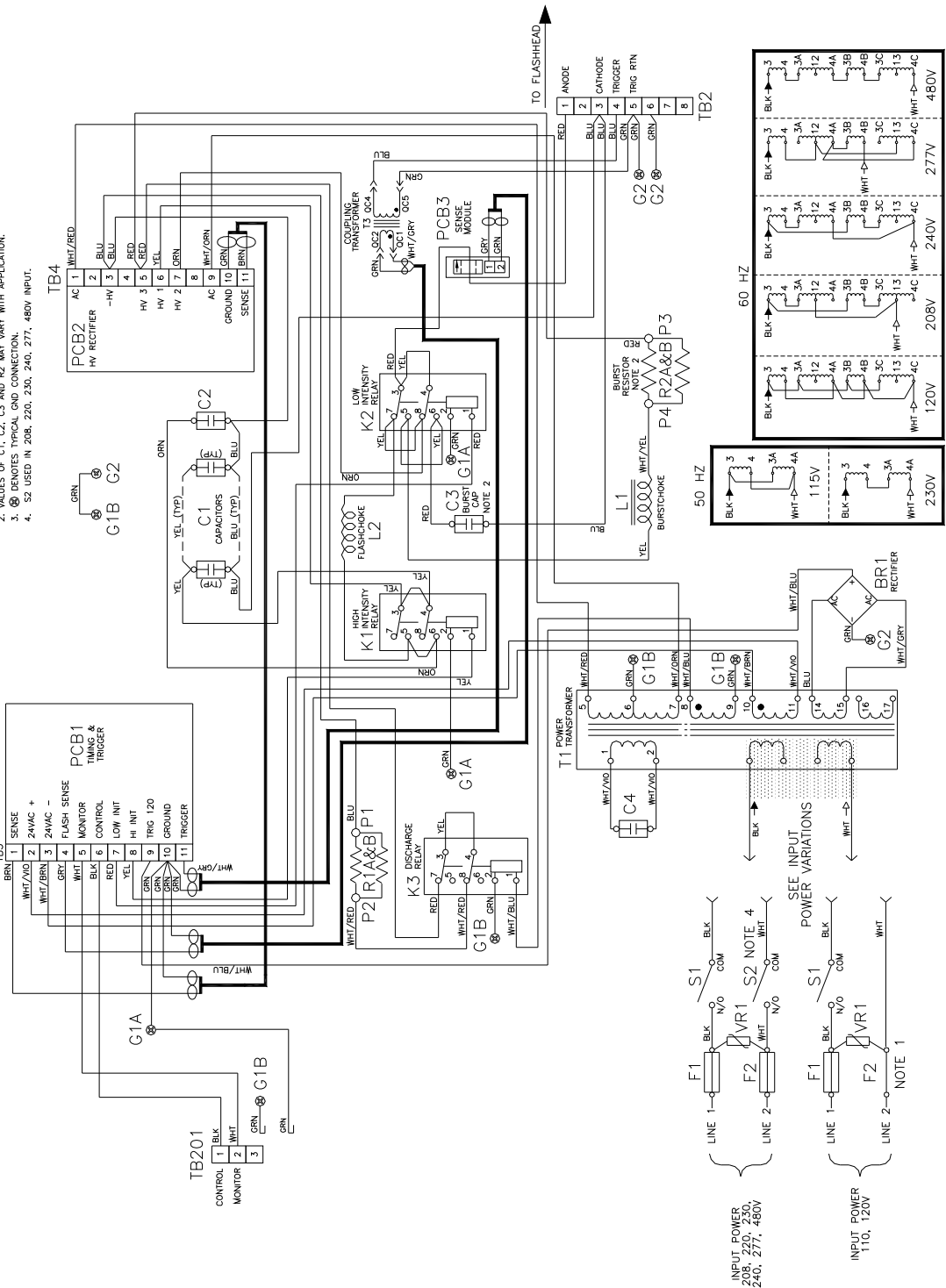


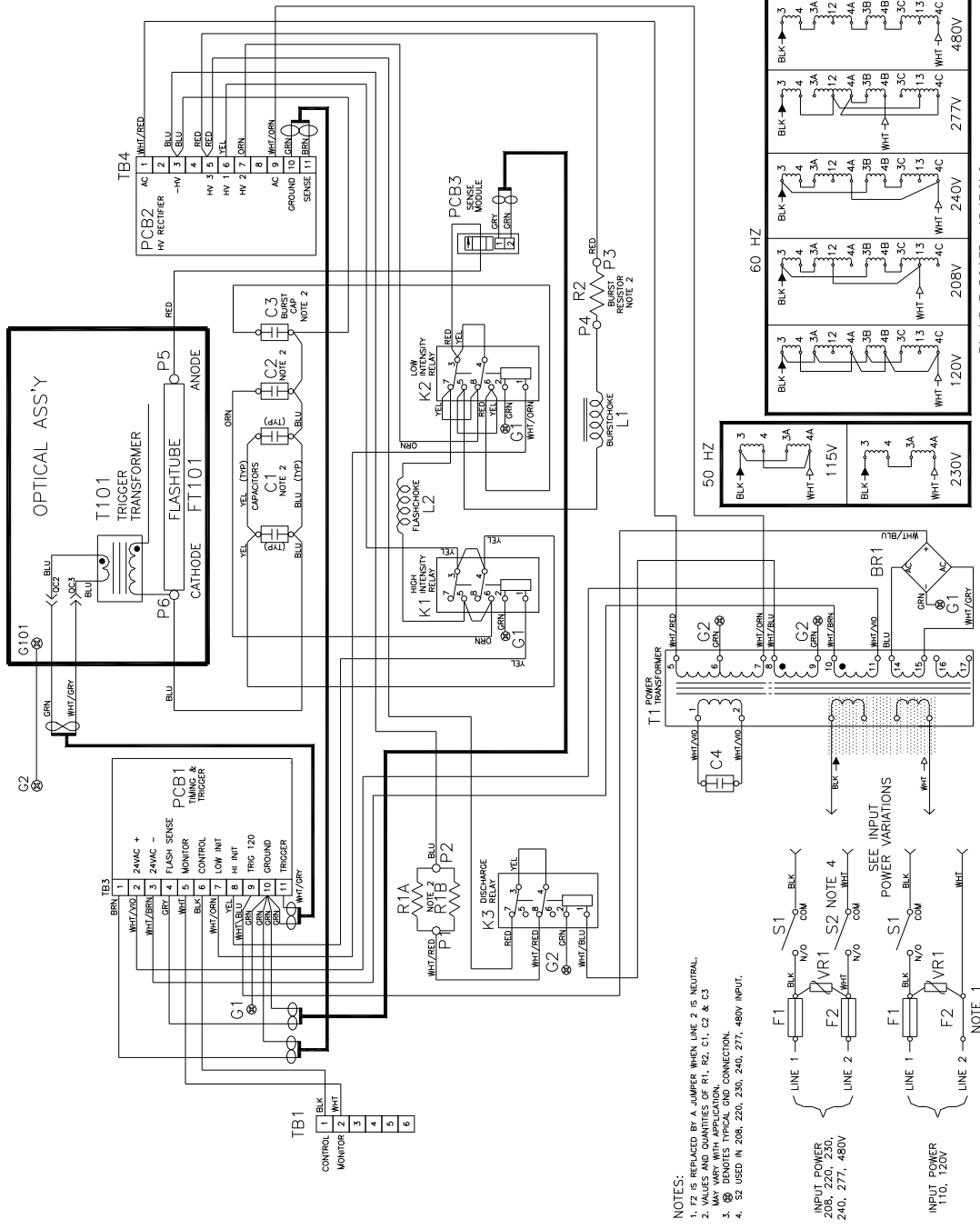
Figure 2-8 – Optical Assembly Internal Wiring

- NOTES:
1. F2 IS REPLACED BY 4 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.



PC 204-2/S, 207-2/S & 304-2/S POWER CONVERTER INTERNAL WIRING 3-7431-16 REV A

Figure 2-9 – PC 204/207 Power Converter Internal Wiring



- NOTES:
1. F2 IS REPLACED BY A JUMPER WHEN LINE 2 IS NEUTRAL.
 2. VALUES AND QUANTITIES OF R1, R2, C1, C2 & C3 ARE TYPICAL.
 3. ⊕ DENOTES TYPICAL GND CONNECTION.
 4. S2 USED IN 208, 220, 230, 240, 277, 480V INPUT.

3-7261-23
REV A

BEACON INTERNAL WIRING FOR
MODELS FTB 205-11/S, 208-2/S & 305-2/S

T1 INPUT POWER VARIATIONS

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 4-3, Figure , and Figure 4-4 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, and overheated component, corrosion, loose connections, faulty relays, incorrect hookup, and so forth.

Capacitors

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

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

If the capacitor is OK, the needle initially indicates zero ohms, but soon begins to

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

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

A bank of capacitors connected in parallel may be checked as a single unit. If 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.

C1 — High Intensity Capacitor Bank

The C1 main capacitor bank consists of several capacitors. Test these capacitors as described in Section Capacitors.

If the meter indicates a short circuit, you must isolate the individual capacitors and check them one at a time until you locate the defective capacitor.

C2 — Medium Intensity Capacitor

Test C2 as described in Section 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 in Section 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 in Section 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

First remove PCB1. The resistance from TB3-8 and TB3-7 to TB3-10 or the chassis 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 15 ohms.

L2 — Flash Choke

The resistance of this coil should be zero ohms. An infinite reading indicates an open coil.

PCB1 — Timing and Trigger Board

Replace this circuit board with one known to be in good condition. Be careful. For testing by substitution, the circuit board must have the same jumper configuration for JP12 through JP16 as the one being replaced in the unit. If the board is to remain in the unit, JP1 through JP11 must also be configured as the one being replaced.

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.

R2A, R2B — Burst Resistors

The measured resistance of the burst resistors in parallel should be 600 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.

PCB3 — Sense Module

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

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.

Troubleshooting

Effective troubleshooting procedure, beginning with the observation of beacon behavior, often leads directly to a faulty component or other abnormal condition. Figure 3-1 – Major Troubleshooting Symptoms lists many of the symptoms that a malfunctioning beacon might exhibit. In Figure 3-2 – Defective Component Locator Code these symptoms are correlated 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 3-2. Table 3-3 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 3-3 is listed in the order of its likelihood of causing the failure.

Observe components carefully. Check for loose connections. Many times, 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 Component Testing.

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.

Figure 3-1 – Major Troubleshooting Symptoms

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

Figure 3-2 – Defective Component Locator Code

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.

FOLLOW FLASHTUBE HANDLING

PRECAUTIONS

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 & 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/R1B & R2A/R2B — 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. Remove the two Phillips-head screws in the top of the transformer retaining bar that hold the transformer to the chassis.
2. The core is in two parts. Separate the core halves and slide the coils off the core.
3. Disconnect the wire terminals of the coils from their connections.

Replacement

1. Re-assemble the coils on the cores.
NOTE: 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.

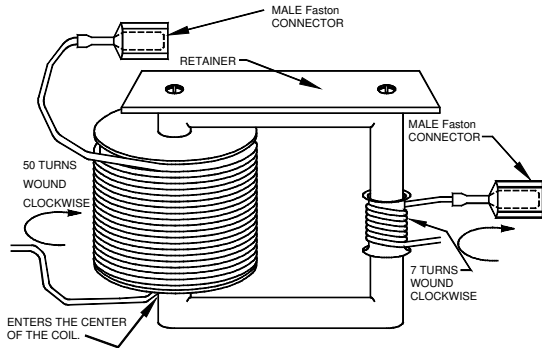


Figure 3-3 – Winding Directions

2. Fasten the assembled transformer to the chassis using the two long 4-40 Phillips-headscrews.

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

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. Loosen the screw on the end of each flashtube lead.
4. 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 viewed as in Figure 4-4.
9. Reinstall each plate on each side of the flashtube and tighten the screws.
3. Do not 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.
4. Note the orientation of the molded secondary winding with respect to fixed features on the plate because you must install its replacement with this same orientation.
5. Remove the outer half of the core and lift off the molded secondary winding. The primary winding remain hanging in place.
6. Remove the inner half of the core.

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.

Replacement

1. Reassemble the primary and secondary windings over the two halves of the core and attach the core to the bracket by means of the long screws. Do not overtighten.
2. Reattach the electrical wires. Refer to the electrical wiring diagram in Figure 2-11 to verify the connections.

Section 4 – Recommended Spare & Replaceable Parts

Customer Service

Customer Service: 1-800-821-5825

Telephone: (615) 261-2000

Facsimile: (615) 261-2600

Shipping Address:

Flash Technology
332 Nichol Mill Lane
Franklin, TN 37067

Ordering Parts

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

Beacon / Power Converter Parts

Figure 4-1 Power Converter Major Replaceable Parts lists the major replaceable parts for the power converter.

Flashhead Parts

Figure 4-4 lists the part numbers for the major replaceable parts

Reference	Description	Part Number
BR1	Diode Bridge	6902806
C1A-C1G	Capacitor, Day, 70 mfd	6720401
C2A	Capacitor, Twilight, 40 mfd	6386503
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	8900493
K3	Bleed Relay, 120 VAC	8900493
L1	Burst Choke	4850601
L2	Flash Choke	4175201
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
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	4901903
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
T3	Coupling Transformer	8336701
T101	Trigger Transformer	8288201
VR1	Suppressor, 120V	8250801
VR1	Suppressor, 208-240V	8250802
VR1	Suppressor, 480VV	8250804

► Recommended as a spare part.

Figure 4-1 – Beacon / Power Converter Replacement Parts

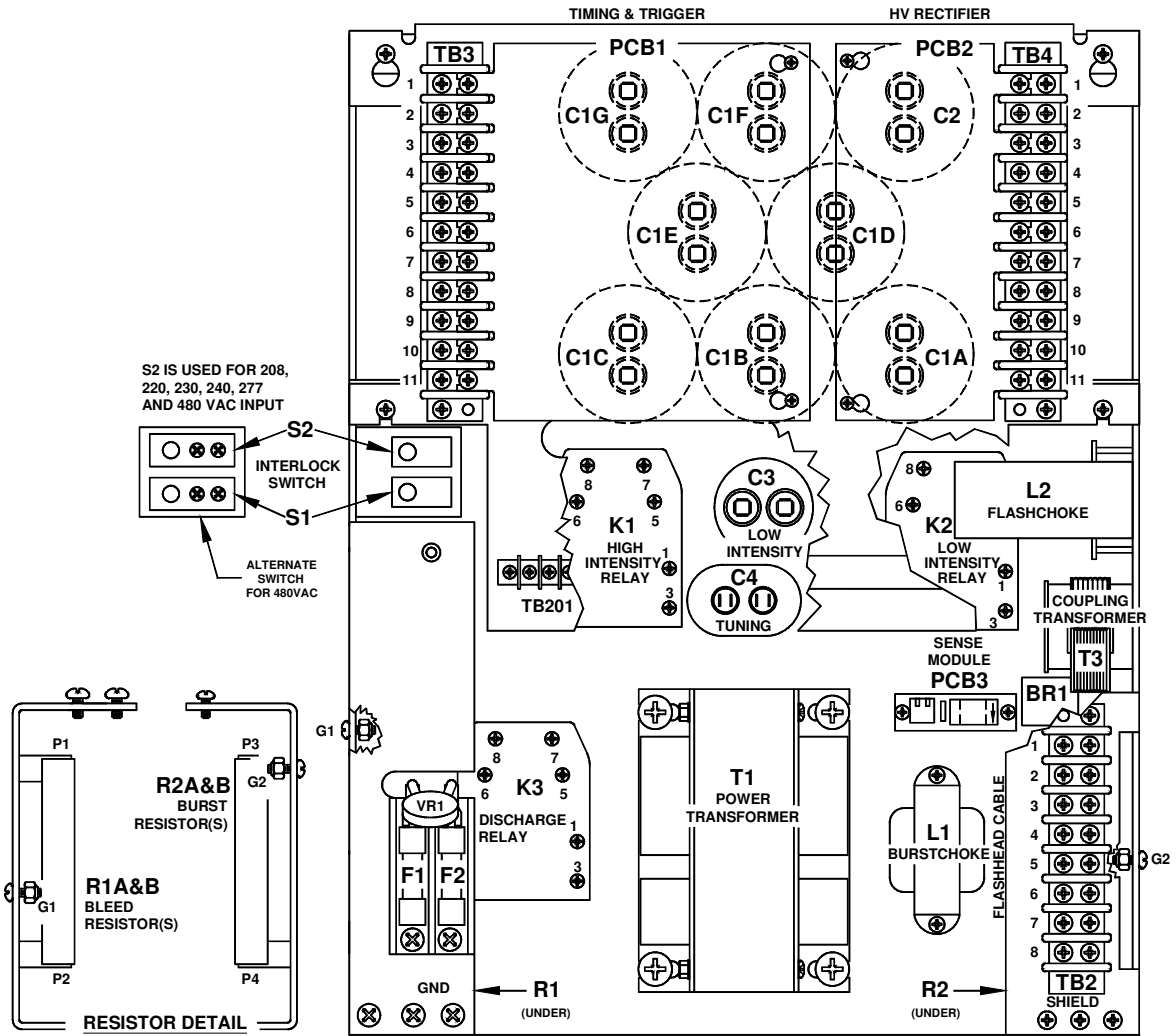


Figure 4-2 – PC 204/207 Power Converter Component Locations

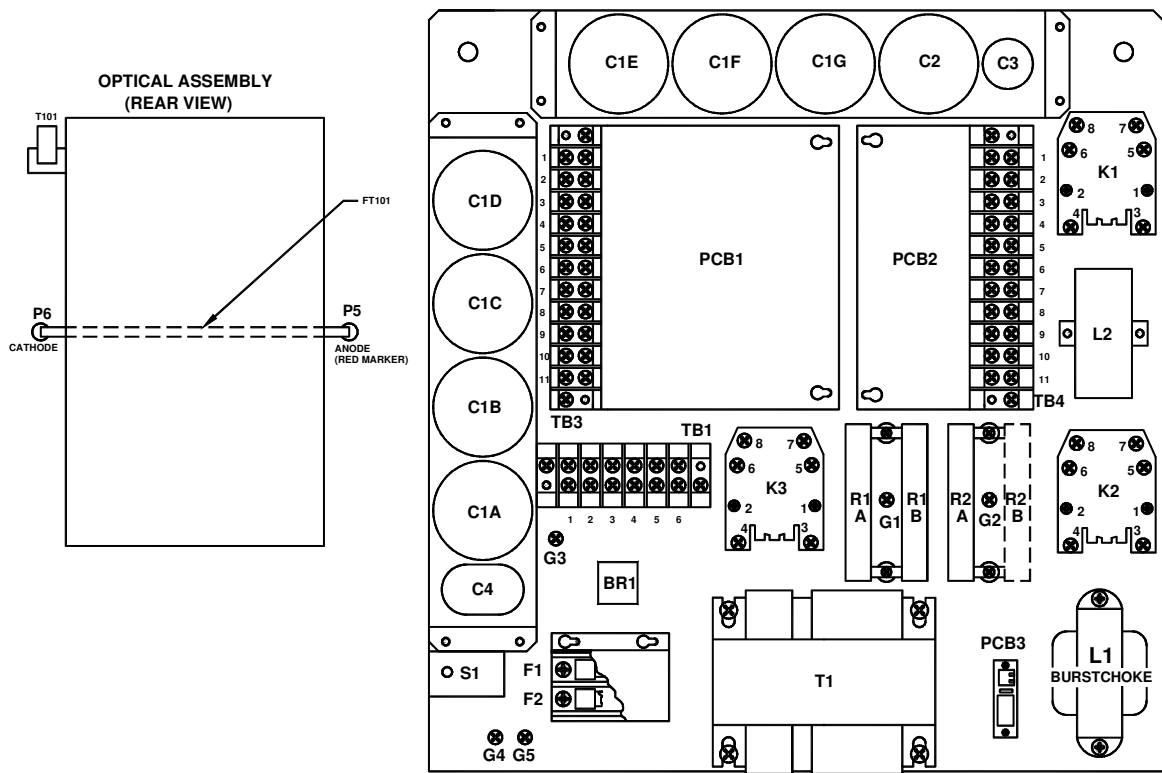


Figure 4-3 – PC 205/208 Power Converter Component Locations

Reference	Description	Part Number
FT101	▶ Flashtube	8671301
T101	Trigger Transformer	8288201
T102	Coupling Transformer	8336701

▶ Recommended as a spare part.

Figure 4-4 – Flashhead Replacement Parts

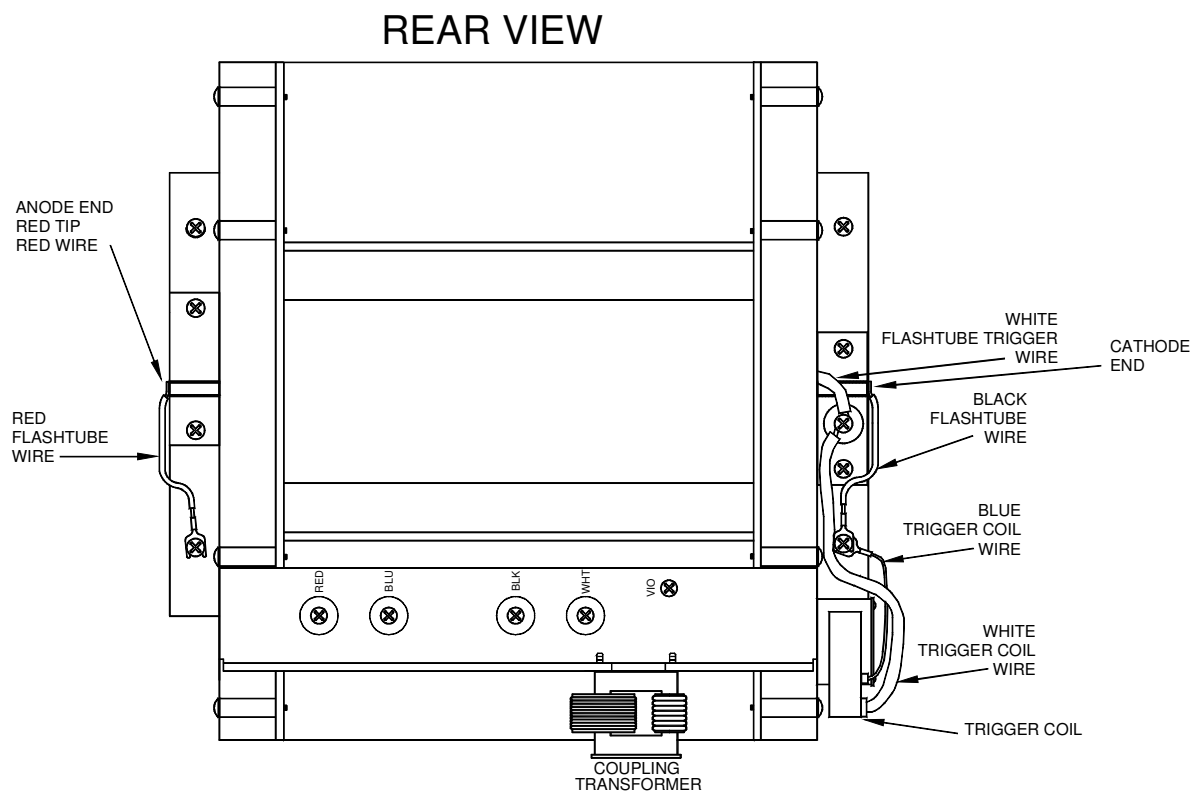


Figure 4-5 – FTB 205 Optical Assembly, FH 204 Flash Component Locations

Returning Equipment – Return Material Authorization (RMA)

If a product purchased from Flash Technology must be returned for any reason, please follow the procedure below:

NOTE: An RMA number must be requested from Flash Technology prior to shipment of any product. No returned product will be processed without an RMA number. This number will be the only reference necessary for returning and getting information on the product's progress.

1. To initiate an RMA, customers should call the Alarm Response & Compliance Center at (800-821-5825) to receive technical assistance and a case number. The following information is required before a case 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
 - Case Number (if previously given)
 - Reason for call, with a full description of the reported issue
2. The case number will then serve as a precursor to receiving an RMA number if it is determined that the product or equipment should be returned. To expedite the RMA process, please provide:
 - Return shipping method
 - Purchase Order (if non-warranty repair)
 - Shipping Address
 - Bill To Address
 - Any additional information to assist in resolving the issue or problem
3. A P.O. is required in advance for the replacement of product that may be under warranty. Flash will then, at its discretion issue a credit once the validity of the warranty has been determined.
4. A purchase order (P.O.) is also required in advance for all non-warranty repairs. NOTE: the purchase order is required prior to the issuance of the RMA number.
 - If the P.O. number is available at the time of the call, an RMA number will be issued and the customer must then fax or email the P.O. with the RMA number as the reference, to ensure prompt processing.

- If the P.O. number is NOT available at the time of the call, a Case Number will be given to the customer and should be referenced on the P.O. when faxed or emailed to RMA Rep.
 - Flash will then, at its discretion repair or replace the defective product and return the product to the customer based on the shipping method selected.
 - The customer may purchase a new product before sending in the existing product for repair. If Flash Technology determines the existing product is still covered under warranty a credit will be issued to the customer for the new product.
5. After receiving the Flash Technology RMA number, please adhere to the following packaging guidelines:
- All returned products should be packaged in a way to prevent damage in transit. Adequate packing should be provided taking into account the method of shipment.
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 15 business days. Products received after may result in extra screening and delays.
 - Must have all required information provided before a RMA number to be assigned.

Return to Stock Policy

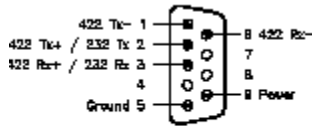
- Parts can be returned within 90 days of ship date and will be subject to a 20% restocking fee. Product must:
 - Be in the original packaging
 - Not be damaged
- After 90 days no parts can be returned

Appendix 1 – Programming the Timing and Trigger Board

Connecting the Handheld

The following table shows the connector pin assignments for the handheld. The receive and transmit 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



DB9 Female

Figure A1-1 – DB9 Female

A 9-pin RS-232 cable is used to connect the handheld to the 9044-01 controller board at connector J2 (9 pin Male connector). Power and ground is provided by this connector.

The same connector J2 on the 9044-01 is also used to connect a computer serial port for the enhanced user interface. This interface is used to set parameters, run production and vendor tests and display general operating information.

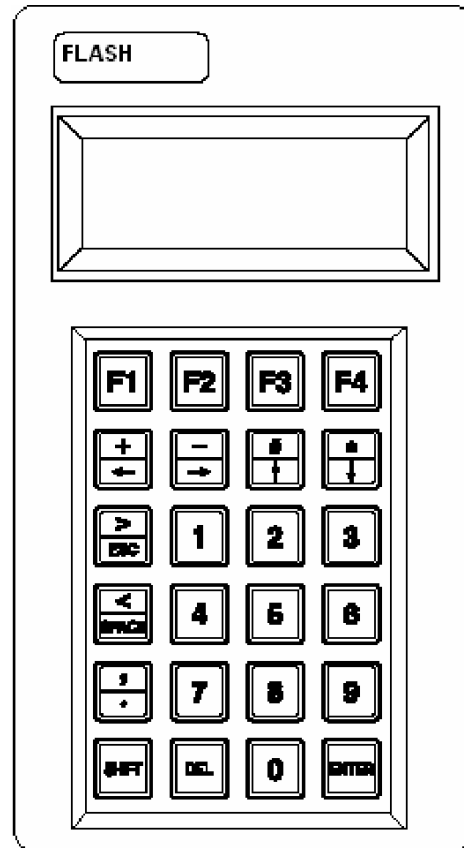


Figure A1-2 – Handheld Programmer

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 below for more details.

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

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

All the messages displayed on the LCD will be in capital letters.

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

Once the handheld programmer is connected to the 9044-01 and power is applied the 9044-01 will automatically recognize that the terminal is connected to it and will display the sign on message. Only terminals provided by Flash Technology will work with the 9044-01.

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

For S versions it 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 9044-01.
- F2: Enters the information menu, used to show a limited amount of useful operating info.
- F3: Causes the 9044-01 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. The 9044-01 does this to take the serial port out of the handheld terminal mode if the terminal has been removed to allow the serial port to be used for the enhanced user interface. This means that if you remove the handheld terminal and connect a computer to use the enhanced interface you must wait at most two minutes before pressing any key on the computer. You can cycle the power to the 9044-01 for faster access to the computer interface.

SETUP for Non S Versions

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 selected parameters. 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.

SETUP for S Versions

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 for Non S Versions

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 one (1) which in this case means Standard system.

If the board to be configured is not in the Standard mode press 1 and press F1 (OK).

NOTE

Even if your board is configured for Standard mode you will need to press 1 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. When complete, press NEXT. Be sure to write the numbers on the white space provided on the board.

If setting up a catenary system press 2 and F1 (OK).

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).

To change the Flash rate press NEXT until the LCD shows:

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

NOTE

Valid flash rates are 40fpm and 60 fpm for standard and catenary systems, respectively.

Then press the number corresponding to the desired flash rate and press F1 (OK)

Parameters for S Versions

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. Note: 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. When complete, press NEXT or BACK.

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 you are done press NEXT, BACK or EXIT.

INFO

The info menu has the following format for non S version:

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

The info menu has the following format for S version:

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

This menu is used to show a limited amount of information about the current 9044-01 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 an extra trigger for the operation of a secondary 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.

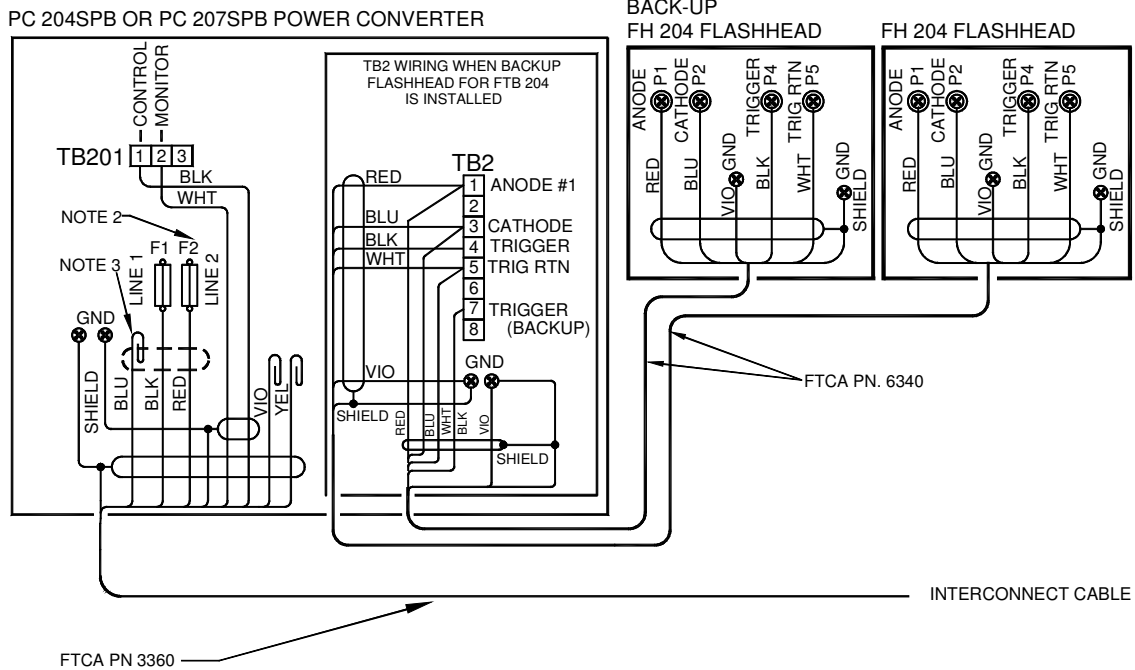


Figure A2-1 – PC 204SPB / 207SPB Installation Wiring

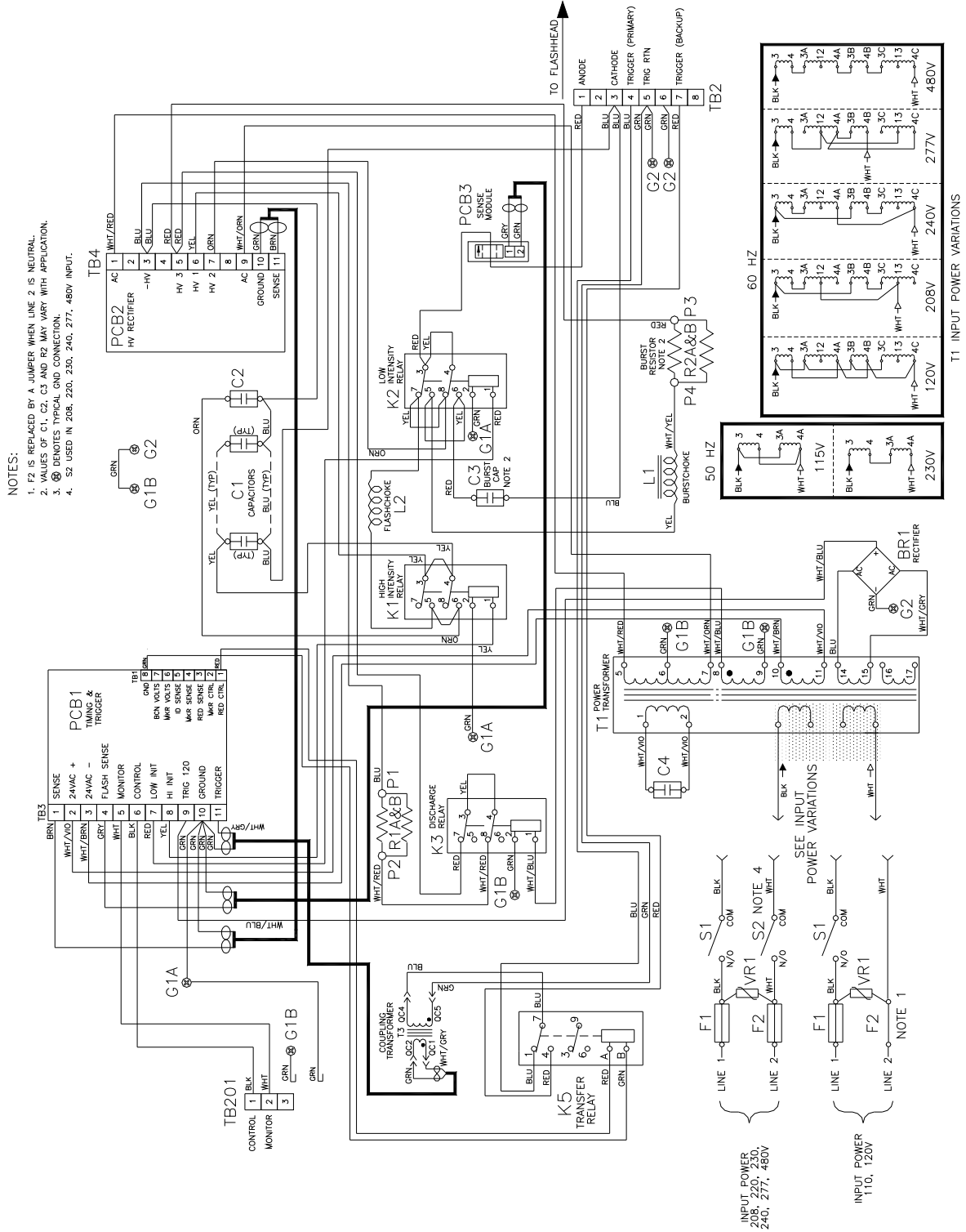


Figure A2-2 – PC 204SPB / 207SPB Internal Wiring

Appendix 3 - FTB 204-2X and 204-2SX Extended Separation

Introduction and Operation

The FTB 204-2X and 204-2SX consist of an FH 204 flashhead and a PC 204 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 A3-3, and the internal wiring is shown in Figure A3-4 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 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.

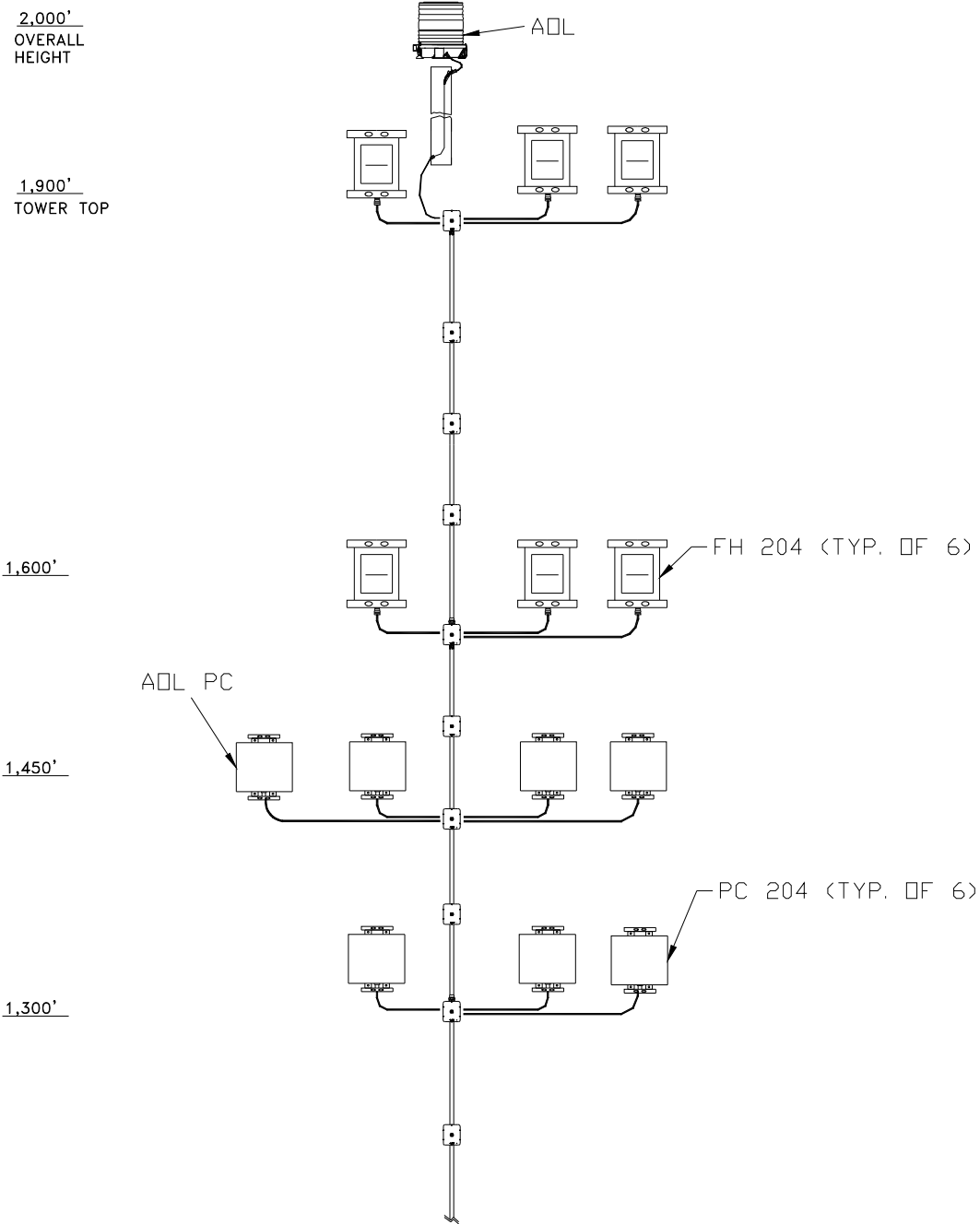


Figure A3-1 – PC 204-2X / 204-2SX Mid-Tower Installation Example

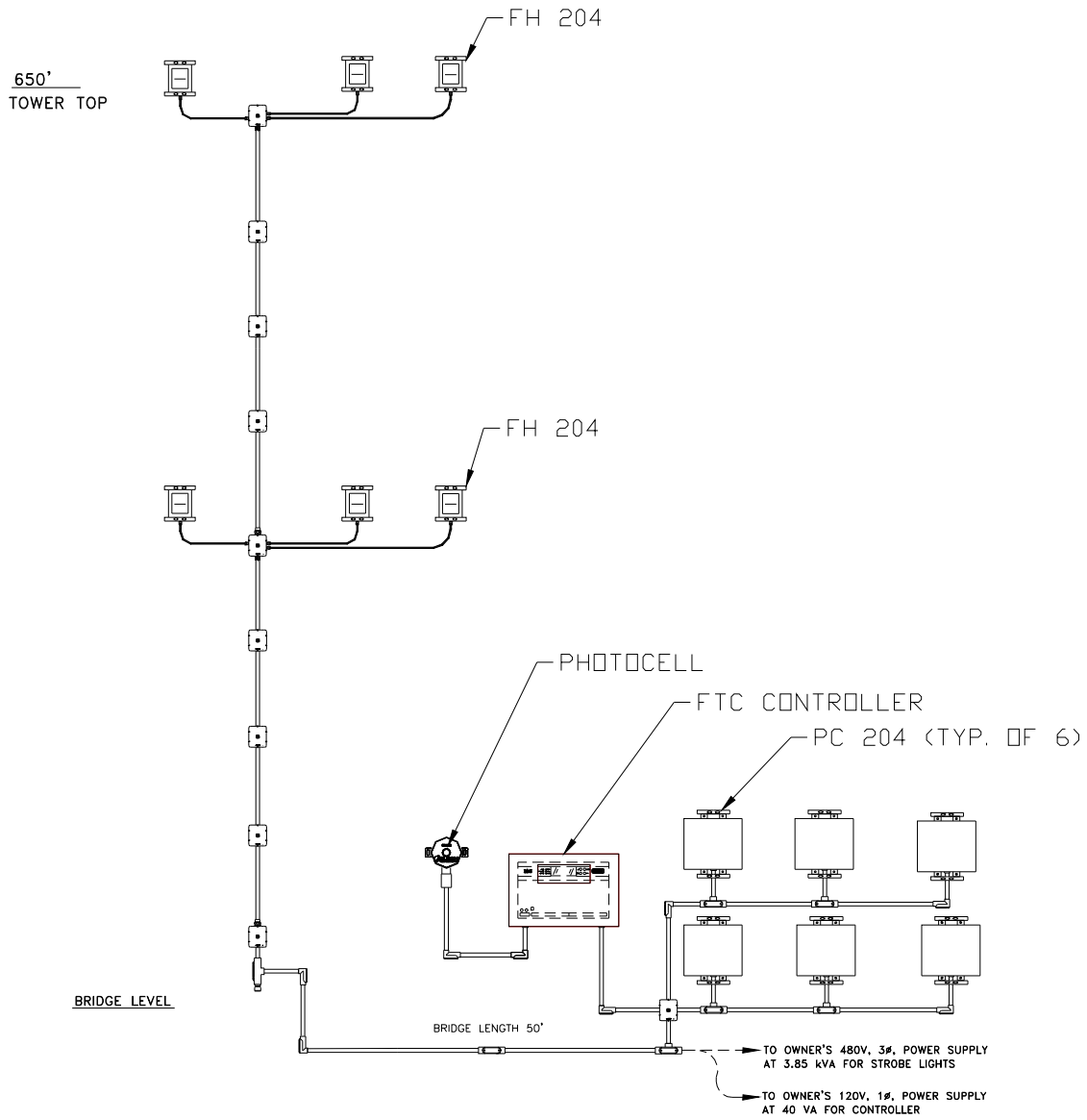


Figure A3-2 – PC 204-2X / 204-2SX Ground Level Installation Example

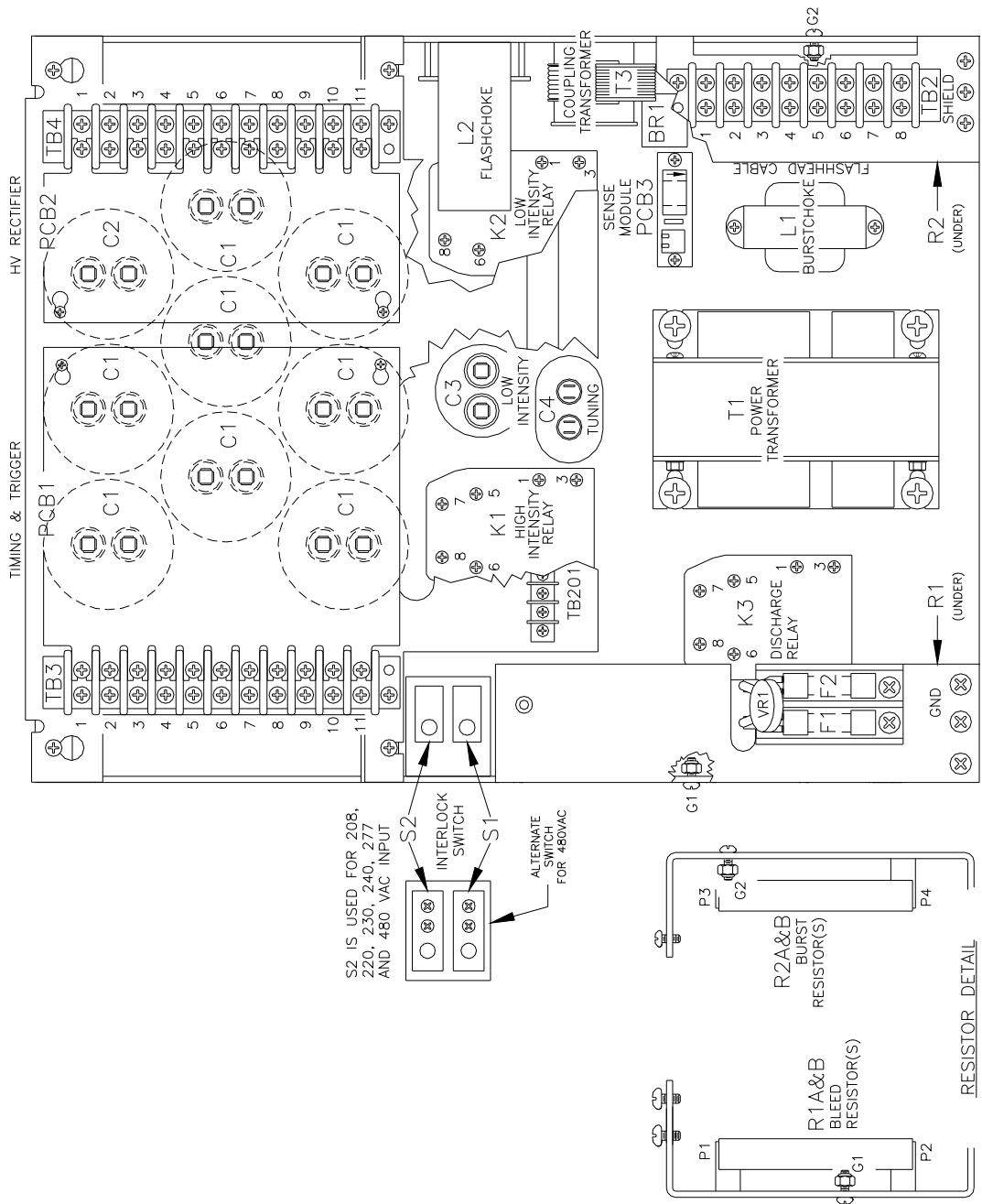


Figure A3-3 – PC 204-2X / 204-2SX Component Locations

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

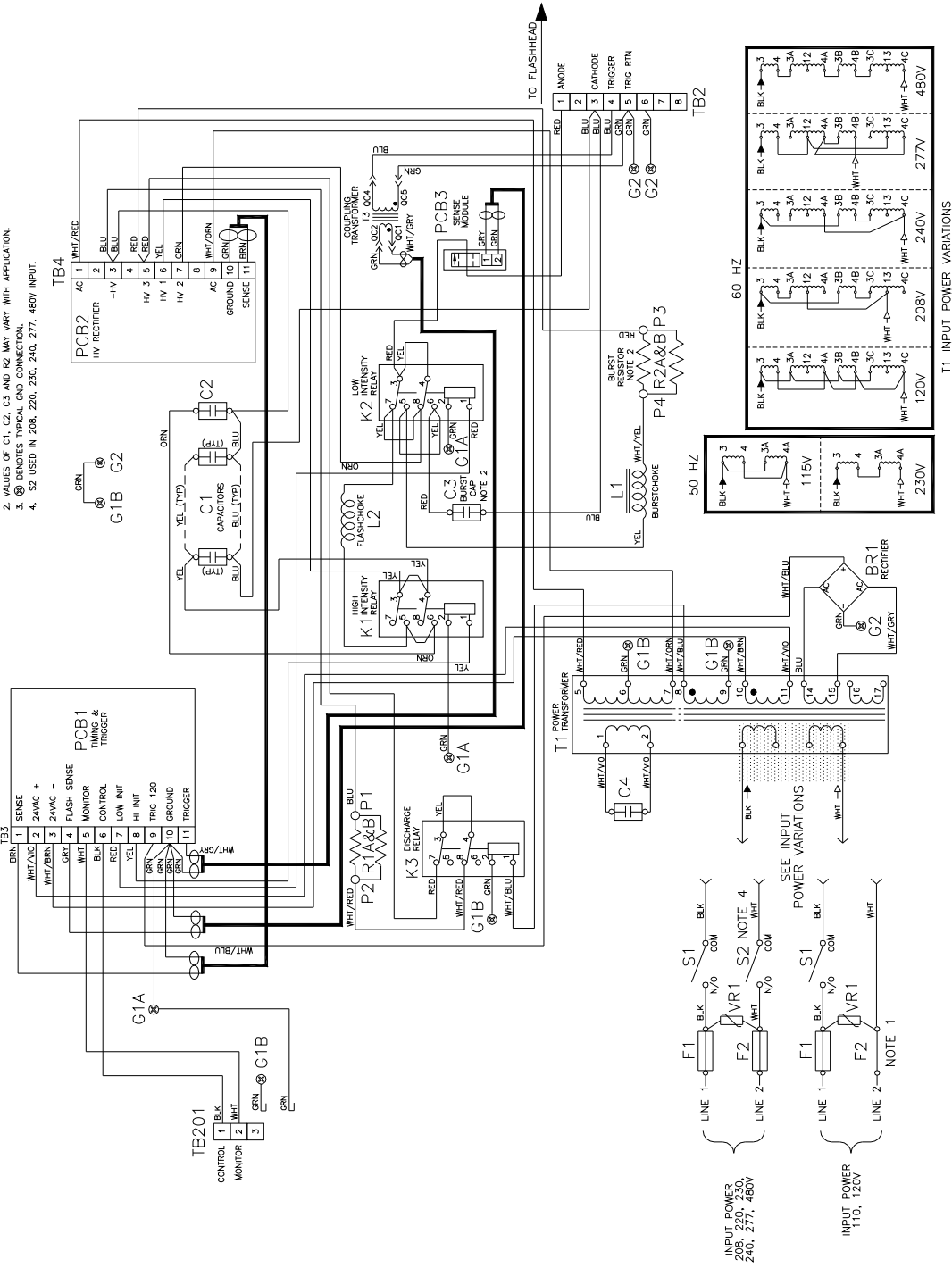


Figure A3-4 – PC 204-2X / 204-2SX Internal Wiring

Spare Parts (for 204-2X/204-2SX versions only)

Reference	Description	Part Number
C2	Capacitor, Twilight, 50 μ F	6732600
T1	Power Transformer, 120/240/480V, 60 Hz	4499501