



## ALSF/MALSRL 2000 V System

Medium Intensity Approach Lighting System (MALSRL) and Approach Lighting System with Sequenced Flashers (ALSF)

# User Manual

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**ADB  
SAFEGATE**



## A.0 Disclaimer / Standard Warranty

### CE certification

The equipment listed as CE certified means that the product complies with the essential requirements concerning safety and hygiene. The European directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

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## Note

See your sales order contract for a complete warranty description.

Replaced or repaired equipment under warranty falls into the warranty of the original delivery. No new warranty period is started for these replaced or repaired products.

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- Failing to make sure that auxiliary equipment complies with approval agency requirements, local codes, and all applicable safety standards if not in contradiction with the general rules.
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# 1.0 Safety

## Introduction to Safety

This section contains general safety instructions for installing and using ADB SAFEGATE equipment. Some safety instructions may not apply to the equipment in this manual. Task- and equipment-specific warnings are included in other sections of this manual where appropriate.

## 1.1 Safety Messages

### HAZARD Icons used in the manual

For all HAZARD symbols in use, see the Safety section. All symbols must comply with ISO and ANSI standards.

Carefully read and observe all safety instructions in this manual, which alert you to safety hazards and conditions that may result in personal injury, death or property and equipment damage and are accompanied by the symbol shown below.



WARNING

Failure to observe a warning may result in personal injury, death or equipment damage.



DANGER - Risk of electrical shock or ARC FLASH

Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage. ARC Flash may cause blindness, severe burns or death.



WARNING - Wear personal protective equipment

Failure to observe may result in serious injury.



WARNING - Do not touch

Failure to observe this warning may result in personal injury, death, or equipment damage.



CAUTION

Failure to observe a caution may result in equipment damage.



ELECTROSTATIC SENSITIVE DEVICES

This equipment may contain electrostatic devices.

## Qualified Personnel



Important Information

The term **qualified personnel** is defined here as individuals who thoroughly understand the equipment and its safe operation, maintenance and repair. Qualified personnel are physically capable of performing the required tasks, familiar with all relevant safety rules and regulations and have been trained to safely install, operate, maintain and repair the equipment. It is the responsibility of the company operating this equipment to ensure that its personnel meet these requirements.

Always use required personal protective equipment (PPE) and follow safe electrical work practice.

### 1.1.1 Introduction to Safety

#### CAUTION

##### Unsafe Equipment Use

This equipment may contain electrostatic devices, hazardous voltages and sharp edges on components

- Read installation instructions in their entirety before starting installation.
- Become familiar with the general safety instructions in this section of the manual before installing, operating, maintaining or repairing this equipment.
- Read and carefully follow the instructions throughout this manual for performing specific tasks and working with specific equipment.
- Make this manual available to personnel installing, operating, maintaining or repairing this equipment.
- Follow all applicable safety procedures required by your company, industry standards and government or other regulatory agencies.
- Install all electrical connections to local code.
- Use only electrical wire of sufficient gauge and insulation to handle the rated current demand. All wiring must meet local codes.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Protect components from damage, wear, and harsh environment conditions.
- Allow ample room for maintenance, panel accessibility, and cover removal.
- Protect equipment with safety devices as specified by applicable safety regulations
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning prior to returning power to the circuit.



**Failure to follow this instruction can result in serious injury or equipment damage**

### Additional Reference Materials



#### Important Information

- IEC - International Standards and Conformity Assessment for all electrical, electronic and related technologies.
- IEC 60364 - Electrical Installations in Buildings.
- FAA Advisory: AC 150/5340-26 (current edition), Maintenance of Airport Visual Aid Facilities.
- Maintenance personnel must refer to the maintenance procedure described in the ICAO Airport Services Manual, Part 9.
- ANSI/NFPA 79, Electrical Standards for Metalworking Machine Tools.
- National and local electrical codes and standards.

### 1.1.2 Intended Use



#### CAUTION

##### Use this equipment as intended by the manufacturer

This equipment is designed to perform a specific function, do not use this equipment for other purposes

- Using this equipment in ways other than described in this manual may result in personal injury, death or property and equipment damage. Use this equipment only as described in this manual.

**Failure to follow this instruction can result in serious injury or equipment damage**

### 1.1.3 Material Handling Precautions: Storage



#### CAUTION

##### Improper Storage

Store this equipment properly

- If equipment is to be stored prior to installation, it must be protected from the weather and kept free of condensation and dust.

**Failure to follow this instruction can result in equipment damage**

### 1.1.4 Operation Safety



#### CAUTION

##### Improper Operation

Do Not Operate this equipment other than as specified by the manufacturer

- Only qualified personnel, physically capable of operating the equipment and with no impairments in their judgment or reaction times, should operate this equipment.
- Read all system component manuals before operating this equipment. A thorough understanding of system components and their operation will help you operate the system safely and efficiently.
- Before starting this equipment, check all safety interlocks, fire-detection systems, and protective devices such as panels and covers. Make sure all devices are fully functional. Do not operate the system if these devices are not working properly. Do not deactivate or bypass automatic safety interlocks or locked-out electrical disconnects or pneumatic valves.
- Protect equipment with safety devices as specified by applicable safety regulations.
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Never operate equipment with a known malfunction.
- Do not attempt to operate or service electrical equipment if standing water is present.
- Use this equipment only in the environments for which it is rated. Do not operate this equipment in humid, flammable, or explosive environments unless it has been rated for safe operation in these environments.
- Never touch exposed electrical connections on equipment while the power is ON.

**Failure to follow these instructions can result in equipment damage**

### 1.1.5 Maintenance Safety

#### DANGER

##### Electric Shock Hazard

This equipment may contain electrostatic devices

- Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.
- Disconnect and lock out electrical power.
- Allow only qualified personnel to make repairs. Repair or replace the malfunctioning component according to instructions provided in its manual.



**Failure to follow these instructions can result in death or equipment damage**

### 1.1.6 Material Handling Precautions, ESD



#### CAUTION

##### Electrostatic Sensitive Devices

This equipment may contain electrostatic devices

- Protect from electrostatic discharge.
- Electronic modules and components should be touched only when this is unavoidable e.g. soldering, replacement.
- Before touching any component of the cabinet you shall bring your body to the same potential as the cabinet by touching a conductive earthed part of the cabinet.
- Electronic modules or components must not be brought in contact with highly insulating materials such as plastic sheets, synthetic fiber clothing. They must be laid down on conductive surfaces.
- The tip of the soldering iron must be grounded.
- Electronic modules and components must be stored and transported in conductive packing.

**Failure to follow this instruction can result in equipment damage**

### 1.1.7 Arc Flash and Electric Shock Hazard



#### DANGER

##### Series Circuits have Hazardous Voltages

This equipment produces high voltages to maintain the specified current - Do NOT Disconnect while energized.

- Allow only qualified personnel to perform maintenance, troubleshooting, and repair tasks.
- Only persons who are properly trained and familiar with ADB SAFEGATE equipment are permitted to service this equipment.
- An open airfield current circuit is capable of generating >5000 Vac and may appear OFF to a meter.
- Never unplug a device from a constant current circuit while it is operating; Arc flash may result.
- Disconnect and lock out electrical power.
- Always use safety devices when working on this equipment.
- Follow the recommended maintenance procedures in the product manuals.
- Do not service or adjust any equipment unless another person trained in first aid and CPR is present.
- Connect all disconnected equipment ground cables and wires after servicing equipment. Ground all conductive equipment.
- Use only approved ADB SAFEGATE replacement parts. Using unapproved parts or making unapproved modifications to equipment may void agency approvals and create safety hazards.
- Check the interlock systems periodically to ensure their effectiveness.
- Do not attempt to service electrical equipment if standing water is present. Use caution when servicing electrical equipment in a high-humidity environment.
- Use tools with insulated handles when working with airfield electrical equipment.

**Failure to follow these instructions can result in death or equipment damage**



## 2.0 Introduction

This section describes the ADB Safegate medium intensity approach lighting system with runway alignment indicator lights (MALSR) and approach lighting system with sequenced flashers (ALSF). The MALSR and ALSF are manufactured according to specification FAA-E-2325 and FAA-E-2628 respectively.

Refer to [Table 1](#) for the main differences between the MALSR and ALSF lighting systems. Refer to *MALSR/ALSF: Required Equipment* in this section for details concerning equipment differences.

### Note

The MALSR includes both the electronics for the sequenced flasher and controls for the steady burning lights. The ALSF per FAA-E-2628 includes only the electronics for the sequenced flasher.

**Table 1: Main Differences Between MALSR and ALSF**

ALSF	MALSR
FAA-E- 2628 specification	FAA-E-2325 specification
Up to 21 flashers	3, 5, or 8 flashers (optionally to 21)
Flashers only	Flashers and steady burning lights
Misfire monitoring	Misfire monitoring optional
Steady burning lights powered from separate series circuit	Steady burning light powered from 15 kVA voltage driven transformer

## 2.1 ALSF 2000 VDC High-Intensity Approach Lighting System

ADB Safegate's sequenced-flasher lighting systems include a primary control unit, junction boxes, individual control cabinets (ICC), and elevated flasher units. In the ALSF configuration, an array of light bars are installed symmetrically around the centerline of the approach lighting system, starting at the approach threshold and extending a total distance of 2,400 feet (731.5 m) outward into the approach zone. Up to 21 flashing lamp assemblies are installed in the outer portion of the approach lighting system at regular intervals. Flashing lights are arranged and connected in such a way as to produce a sequenced flashing light signal that has the appearance of a ball of light traveling down the system from the outer end (flasher farthest from the runway threshold) to the flasher assembly closest to the runway threshold. See catalog sheet 1037.

### Compliance with Standards

**FAA** : Designed according to ALSF-1, ALSF-2, ALSF-2/SSALR FAA-E-2628; FAA-E-2325 (Sequenced Flashing Components)

**ICAO** : Annex 14 para. 5.3.4.7 , 5.3.4.15 , 5.3.4.16 , 5.3.4.30 , and 5.3.4.31

**Military** : AFMAN(I) 32-1187/TM 811-5 (UFC 3-535-01) Approach Applications

### Uses

ALSF-1, ALSF-2, and ALSF-2/SSALR approach lighting systems with elevated sequenced flashing lights are used at airports and military air bases to provide landing approach guidance, such as runway alignment, height perception, horizontal reference, and roll guidance extending from the landing threshold outward (2,400-3,000 feet) into the approach zone.

#### ALSF-1

The ALSF-1 approach lighting system is used on Category I Instrument Landing Systems (ILS) and includes up to 24 light stations (100-foot spacing) with up to 22 centerline bars of steady-burning lights (five lights to a bar) and up to 15 flashers.

#### ALSF-2

The ALSF-2 approach lighting system is used on Category II runways and includes up to 30 light stations (100-foot spacing) with 30 centerline bars of steady-burning lights (five lights to a bar) and up to 21 flashers.

#### ALSF-2/SSALR

The SSALR approach lighting system has up to eight sequenced flashing lights and is used as part of a dual-mode approach lighting system (ALSF-2/SSALR) when Category I conditions exist on Category II designated runways.

## Theory of Operation

ADB Safegate’s sequenced-flasher lighting systems include a primary control unit, junction boxes, individual control cabinets (ICC), and elevated flasher units. In the ALSF configuration, an array of light bars are installed symmetrically around the centerline of the approach lighting system, starting at the approach threshold and extending a total distance of 2,400 feet (731.5 m) outward into the approach zone up to 3,000 feet (914 m) at facilities where high-speed military aircraft share runway usage. Up to 21 flashing lamp assemblies are installed in the outer portion of the approach lighting system at regular intervals. Flashing lights are arranged and connected in such a way as to produce a sequenced flashing light signal that has the appearance of a ball of light traveling down the system from the outer end (flasher farthest from the runway threshold) to the flasher assembly closest to the runway threshold.

### Note

Steady-burning portion of ALSF system is ordered separately. See ADB Safegate PAR-56 catalog sheet 1042 for more details.

### 2.1.1 ALSF System

This subsection describes the ALSF system.

See [Figure 1](#) . The ALSF system comes in two configurations: ALSF-1 and ALSF-2. Refer to [Table 2](#) for an overview of ALSF configurations.

**Table 2: ALSF Configurations**

ALSF-1	ALSF-2	SSALR
Directs aircraft to runway centerline under CAT I and CAT II conditions	Directs aircraft to runway centerline under CAT I, II, III conditions.	Directs aircraft to runway centerline when visibility conditions are better
Up to 15 flashers	Up to 21 flashers	3, 5, or 8 flashers. Every other flasher up to #9 is active; the rest are inactive. Operator can reconfigure the
3-Step intensity	3-Step intensity	3-Step intensity

The ALSF consists of an array of light bars installed symmetrically about the approach lighting system centerline, starting at the approach threshold and extending a total distance of 2400 feet (731.52 m) outward into the approach zone up to 3000 feet (914.4 m) at facilities where high speed military aircraft share runway usage.

### Note

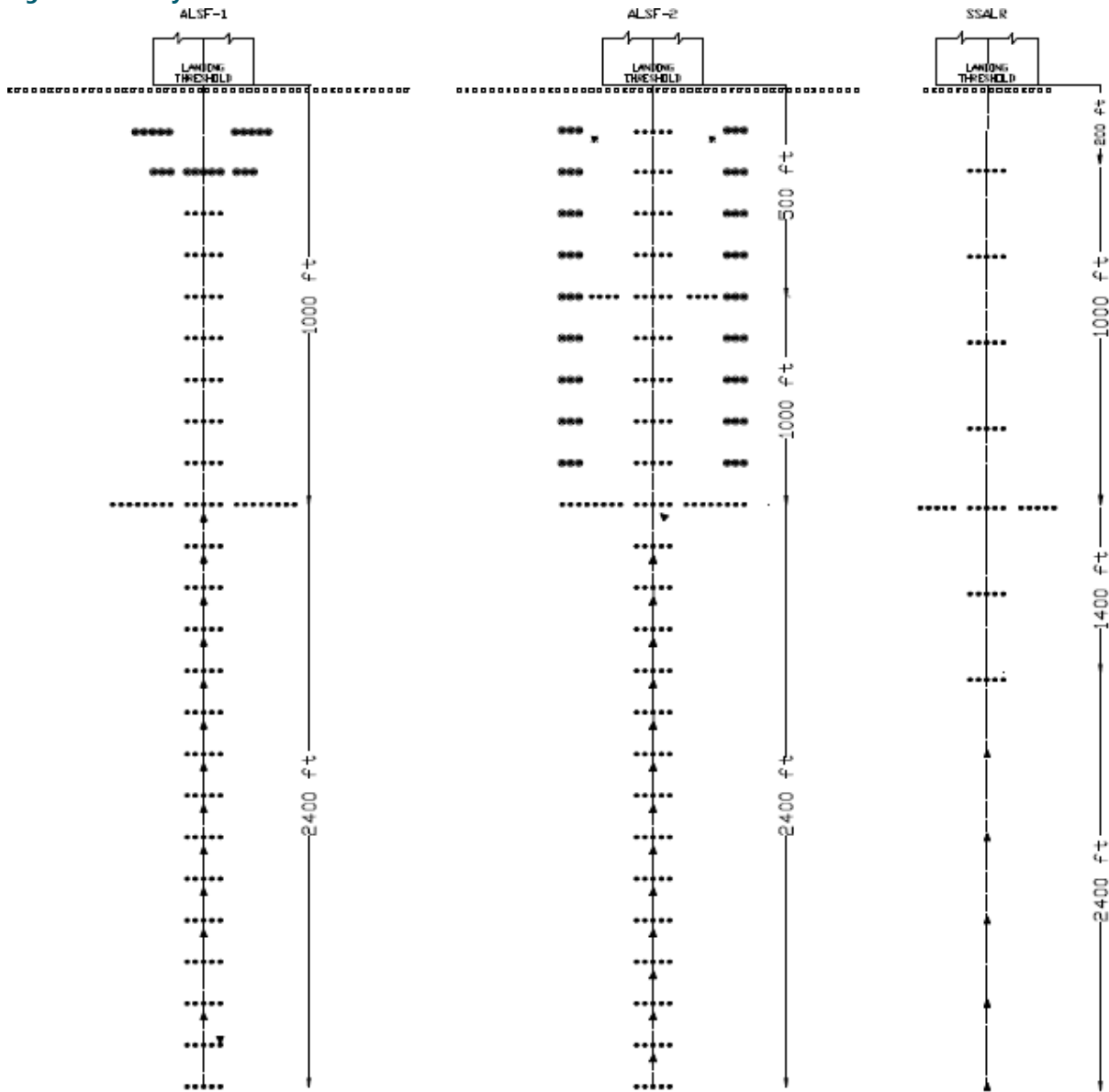
For steady burning PAR 56 (FAP) used with the ALSF system, refer to instruction manual 96A0119, PAR-56 Steady Burning Approach Light.

Up to 21 flashing lamp assemblies are installed in the outer portion of the approach lighting system at regular intervals, so arranged and connected as to produce a sequenced flashing light signal that has the appearance of a ball of light traveling down the system from the outer end (flasher farthest from the runway threshold) to the flasher assembly closest to the runway threshold.

### 2.1.2 SSALR Mode

See [Figure 1](#) . Refer to [Table 2](#) . Both ALSF-1 and ALSF-2 can be operated in the SSALR mode.

**Figure 1: ALSF System**



Legend	
●	High Intensity Steady Burning White Lights
□	Threshold Lights
●	Steady Burning Red Lights
▲	Sequenced Flashing Lights
*	Red Side Row Lights Aligned with Touchdown Zone Lights on Runway
■	Medium Intensity Steady Burning White Lights

## 2.2 High-Intensity Approach Lighting System

### Compliance with Standards

<b>FAA:</b>	Designed according to ALSF-1, ALSF-2, ALSF-2/SSALR FAA-E-2628; FAA-E-2325 (Sequenced Flashing Components)
<b>ICAO:</b>	Annex 14 para. 5.3.4.7, 5.3.4.15, 5.3.4.16, 5.3.4.30, and 5.3.4.31
<b>Military:</b>	AFMAN(I) 32-1187/TM 811-5 (UFC 3-535-01) Approach Applications

### Uses

ALSF-1, ALSF-2, and ALSF-2/SSALR approach lighting systems with elevated sequenced flashing lights are used at airports and military air bases to provide landing approach guidance, such as runway alignment, height perception, horizontal reference, and roll guidance extending from the landing threshold outward (2,400-3,000 feet) into the approach zone.

- ALSF-1**
  - The ALSF-1 approach lighting system is used on Category I Instrument Landing Systems (ILS) and includes up to 24 light stations (100-foot spacing) with up to 22 centerline bars of steady-burning lights (five lights to a bar) and up to 15 flashers.
- ALSF-2**
  - The ALSF-2 approach lighting system is used on Category II runways and includes up to 30 light stations (100-foot spacing) with 30 centerline bars of steady-burning lights (five lights to a bar) and up to 21 flashers.
- ALSF-2/SSALR**
  - The SSALR approach lighting system has up to eight sequenced flashing lights and is used as part of a dual-mode approach lighting system (ALSF-2/SSALR) when Category I conditions exist on Category II designated runways.

### Operating Conditions

Temperature:	-67 °C to +137 °C (-55 °F to +55 °F)
Humidity:	0 to 100%
Altitude:	0 to 10,000 ft (3048 m) maximum

### Master Control Cabinet Input Power Requirements

Voltage	Maximum Number of Flashers	Maximum Power Requirements
120/240 VAC	3	4 kVA
	6	5 kVA
	9	6 kVA
	12	7 kVA
	15	8 kVA
	18	9 kVA
	21	10 kVA
480 VAC	12	7.5 kVA
	21	11 kVA

---

### Flasher Tester

The portable flasher tester is equipped with a test cable and plug, which connect to a socket in the ICC to monitor the operation of the flasher light unit. The flasher tester is capable of testing the power circuits and control signals from the primary control unit to the ICC, and from the ICC to the flash head.



### High-Voltage Wire

Used to interconnect elevated flash head and individual control cabinet. Wire is supplied in 500-foot spools only. Please specify total length (in feet) of wire required when ordering.

---

High-Voltage Wire Ordering Code 12 AWG, 3 kV

89A0110-1

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## 3.0 MALSR 2000 VDC Medium-Intensity Approach Lighting System

The MALSR approach lighting system with elevated sequenced flashing lights is used at airports and military air bases to provide landing approach guidance, such as runway alignment, height perception, horizontal reference, and roll guidance extending from the landing threshold outward (2,400-3,000 feet) into the approach zone. ADB Safegate's sequenced-flasher lighting system includes a primary control unit, junction boxes, individual control cabinets, a 15 kVA steady-burning light transformer, and elevated flasher units. See catalog sheet 1039.

### Compliance with Standards

FAA: Designed according to MALSR FAA-E-2325

### Uses

The MALSR approach lighting system with elevated sequenced flashing lights are used at airports and military air bases to provide landing approach guidance, such as runway alignment, height perception, horizontal reference, and roll guidance extending from the landing threshold outward (2,400-3,000 feet) into the approach zone.

### Theory of Operation

ADB Safegate's sequenced-flasher lighting system includes a primary control unit, junction boxes, individual control cabinets, a 15 kVA steady-burning light transformer, and elevated flasher units. In the MALSR configuration, an array of light bars are installed symmetrically around the centerline of the approach lighting system, starting at the approach threshold and extending a total distance of 2,400 feet (731.5 m) into the approach zone and up to 3,000 feet (914.4 m) at facilities where high-speed military aircraft share runway usage. Up to 11 flashing lamp assemblies are installed in the outer portion of the approach lighting system at regular intervals. Flashing lights are arranged and connected to produce a sequenced flashing light signal that has the appearance of a ball of light traveling down the system from the outer end (flasher farthest from the runway threshold) to the flasher assembly closest to the runway threshold.

## 3.1 MALSR System

See [Figure 2](#) . The MALSR system is used at airports to provide landing approach guidance under Category I conditions.

The MALSR system consists of an array of lights placed within 2400 feet (731.52 m) of the approach area. It includes:

- Primary control cabinet.
- Three to eleven sequenced flashers. Eight flashers are standard.
- 15 kVA power transformer.
- 9 five-light bars installed symmetrically about the approach lighting centerline. Each light bar has five PAR-38 lamp holders for a total of 45 lamp holders.
- 18 PAR-56 lamp holders used for a threshold marker. Refer to instruction manual 96A0119, PAR-56 Steady Burning Approach Light.

### Note

The optional L-850E approach light can be used as a threshold marker, depending on site requirements.

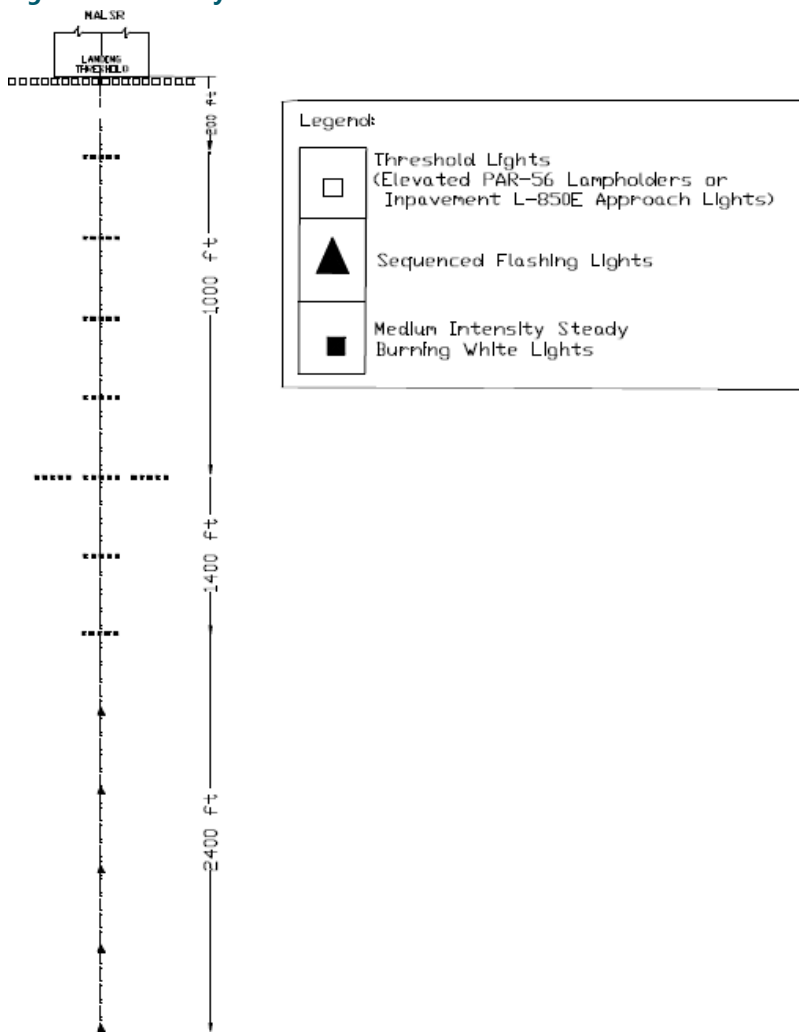
### Note

The ADB Safegate's MALSR lighting option can be modified to a 21-flasher ALSF system at a later time.

The sequenced flashers are installed in the outer portion of the approach lighting system at regular intervals, so arranged and connected as to produce a sequenced flashing light signal having the appearance of a ball of light traveling down the system from the outer end with the flasher farthest from the runway threshold to the flasher assembly closest to the runway threshold twice a second.

Sequenced flashers and steady burning lights may include low, medium, or high intensity lights. The intensity is regulated by providing three voltage steps from a 15 kVA transformer.

**Figure 2: MALSR System**



## 3.2 MALSR/ALSF Assemblies

This subsection describes the MALSR and ALSF assemblies. Refer to the Parts section for ordering information.

The MALSR and ALSF systems have in common the following assemblies: primary control cabinet, sequenced flasher, individual control cabinet, flasher light unit, aiming device, junction box, and flasher tester. Only the MALSR has the 15 kVA power transformer, PAR-38 lampholder, and PAR-56 lampholder assemblies. Refer below for a discussion of each assembly.

### 3.2.1 Primary Control Cabinet

The primary control cabinet contains the control and optional monitoring PCBs and circuitry to operate the sequenced flashers and steady burning lights in remote and local mode. The primary operates on 120/240 Vac, 60 Hz, three-wire, single phase input power and provides power and timing signals to the individual flashers. Timing signals are provided by line-synchronous (60 Hz) solid state timing. Three-step 120 Vac intensity control signals are provided to the individual control cabinets that control the flashers.

The primary also supplies power and three voltage steps to the primary of the 15 kVA power transformer. The transformer powers the steady-burning lamps. A 100 W, 120 Vac light, with protective wire mesh cover, is installed in the primary control cabinet to provide adequate illumination for nighttime maintenance operations. A service entrance switch is provided to disconnect incoming 120/240 Vac power to the primary for maintenance purposes.



An hour meter is installed in the primary control unit to indicate the number of hours of flasher operation on the high intensity step. The meter indicates time in hours and tenths of hours up to 9999.9 hours.

### 3.2.2 Sequenced Flasher

The sequenced flasher assembly consists of a flasher unit and the individual control cabinet that is powered from a 120/240 Vac, 60 Hz, three-wire, single phase supply.

#### 3.2.2.1 Individual Control Cabinet

Each flasher unit is controlled by an individual control cabinet (ICC). Mounting lugs and bolts are provided on the back of the cabinet and two 2-inch threaded fittings are provided on the bottom of the cabinet for mounting. A third fitting on the bottom of the cabinet is provided to accommodate a 3/4-inch flexible conduit.

#### 3.2.2.2 Flasher Light Unit

The flasher light unit consists of a lamp and shell assembly. The shell assembly houses the inner components of the light unit. Clips hold the lens in place and provide a watertight seal in conjunction with the gasket. The lamp assembly is composed of a PAR-56 xenon flashtube, embedded trigger transformer, and internal wiring. Minimum rated lamp life is 1000 hours on the high intensity setting.

All components in the lamp housing are accessible by removing the lamp. An interlock switch is incorporated in the flasher unit so that opening the unit will disconnect all incoming power and discharge all high-voltage circuits. The flasher unit with mounting attachments has a maximum total weight of 5 lb.

### 3.2.3 Aiming Device

The aiming device permits adjustment and measurement of the vertical elevation angle of the PAR-38 and PAR-56 lampholders (for the MALSR system) or the flasher light unit (for the ALSF system). It is a single unit consisting of a housing, support, trip cord and attaching parts. The aiming device permits aiming of the lamp axis perpendicular to the plane of the cover glass to any angle from 0.0 to +25 degrees above the horizontal.

The aiming device can be used to remotely aim the PAR-38 lamp (for MALSR only) or flasher light unit (for ALSF only) mounted on low impact resistance structures conforming to FAA-E-2604 or FAA-E-2702. The aiming angle is indicated on a scale calibrated in 1-degree intervals and is accurate to within  $\pm 1/2$  degree of the actual aiming angle with device attached.

### 3.2.4 Junction Box

The junction box is used to distribute power and control signals to the individual control cabinets. A total of 3-21 junction boxes exist, depending on the number of sequenced flashers in the system. A junction box is normally used with each flasher. Each junction box has two terminal strips to accommodate the incoming and outgoing power, control circuit wiring, and monitoring wiring for the flasher unit.

### 3.2.5 Flasher Tester

The flasher tester unit is used to check the operation of the flasher light unit. The portable tester contains a voltmeter, pulse detector, intensity and trigger control switches, and is equipped with a test cable with plug that connects to a socket in the individual control cabinet. The flasher tester is capable of testing the power circuits and control signals from the primary timer to the individual control cabinet and from the individual control cabinet to the flasher light unit.

#### 3.2.5.1 15 kVA Power Transformer (MALSR Only)

The 15 kVA 60 Hz power transformer powers the steady-burning PAR-56 and PAR-38 lights on the MALSR. Taps on the transformer are switched by contactors in the primary control cabinet to provide power at any one of three voltage levels to the steady-burning lights. Taps provided on the primary of the transformer permit secondary voltage adjustment to within 2.5% of the secondary outputs specified in [Table 3](#) with a nominal supplied voltage primary input between 210 and 252 volts.



**Note**

Table 3 applies only when output voltage is connected to 240 Vac primary input.

**Table 3: MALSR Power Transformer Output Voltage**

Intensity Step	Secondary Output
Low	50/100 Vac $\pm 0.5\%$
Medium	75/150 Vac $\pm 0.5\%$
High	120/240 Vac $\pm 0.5\%$

The transformer is housed in an outdoor, raintight enclosure with lugs provided on the back of the enclosure for mounting the cabinet in a vertical position. Two external lightning arrestors are provided for input and output lightning protection.

**3.2.6 PAR-38 Lamp Holder (MALSR Only)**

For the MALSR only, 45 PAR-38 lamp holders are mounted 5 to a bar in the runway approach. Each lamp holder is designed to accommodate a 150 W, 120 Vac PAR-38 spot lamp. An adjustable base on the lamp holder permits vertical adjustment from the horizontal to 25 degrees above the horizontal.

The mounting hardware also permits horizontal alignment of the light beam axis to any horizontal angle within  $\pm 1$  degree. The lamp holder has a mounting base that mounts to a 2-inch (EMT) conduit, on the open top of a frangible coupling or on a light bar with Type FAC adapter sleeve.

**3.2.7 PAR-56 Lamp Holder (MALSR and ALSF)**

For the MALSR only, 18 PAR-56 lamp holders are installed on the runway threshold. The lamp holder has mounting clips to hold a green or red filter and is designed to accommodate a

300 W or 500 W, 120 Vac PAR-56 lamp. Each lamp holder has an adjustable base for vertical adjustment and mounts to a 2-inch (EMT) conduit, or on top of a frangible coupling. Refer to instruction manual 96A0119, PAR-56 Steady Burning Approach Light.

## 4.0 MALSR/ALSF Theory of Operation

This subsection describes the operations of the primary control cabinet, junction boxes, individual control cabinets, and flasher monitoring.

### 4.1 Primary Control Cabinet

This subsection describes the MALSR/ALSF primary control cabinet operations. See figures [Figure 42](#) for MALSR or [Figure 43](#) for ALSF in the Wiring Schematics section for the primary control cabinet wiring connections.

The primary control cabinet supplies 120/240 Vac intensity commands and trigger pulses to the individual control cabinets. A timing generator in the primary, synchronized to the 60 Hz line, provides separate trigger pulses to each individual control cabinet to create the flash sequence effect.

The individual control cabinet contains a lamp failure monitoring and feedback circuit that provides a separate feedback pulse to the primary from the individual control cabinet each time its lamp flashes. The primary uses these signals to determine when a misfire occurs. The primary cabinet also contains a status-output circuit consisting of normally open contacts that close to indicate the status of the system operation, including caution and failure indication.

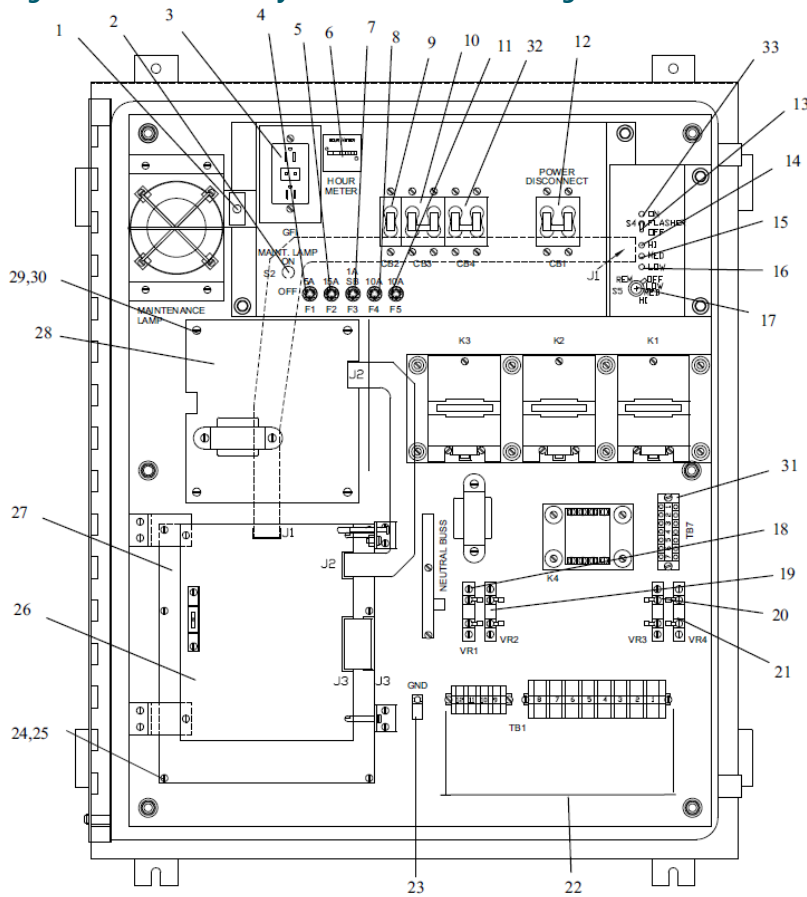
Operation of the system can be either by local control using the rotary switch (S5 on the control panel), or by 120 Vac or +48 Vdc remote control signals from a distant location. A power-on reset is performed each time the primary is turned on or when a power interruption has occurred. When the system is turned on, operation begins at the lowest intensity level and within one-half second switches over to the selected intensity level.

#### 4.1.1 Varistor

See [Figure 3](#) through [Figure 5](#) . Varistors on the primary control cabinet VR1 (18), VR2 (19), VR3 (20), and VR4 (21) provide lightning protection in the primary control cabinet at the input supply terminals of TB1, as well as at the power supply to the individual control cabinet. The metal oxide varistors are very fast acting but are effective only if they are grounded with a very short length of cable to a counterpoise providing a low-resistance path for a lightning discharge.

The failure condition for these varistors is a direct short that is usually visually indicated by a large amount of charring on the surface. This charring indicates a lightning strike has occurred or an excessive input voltage has been supplied to the system.

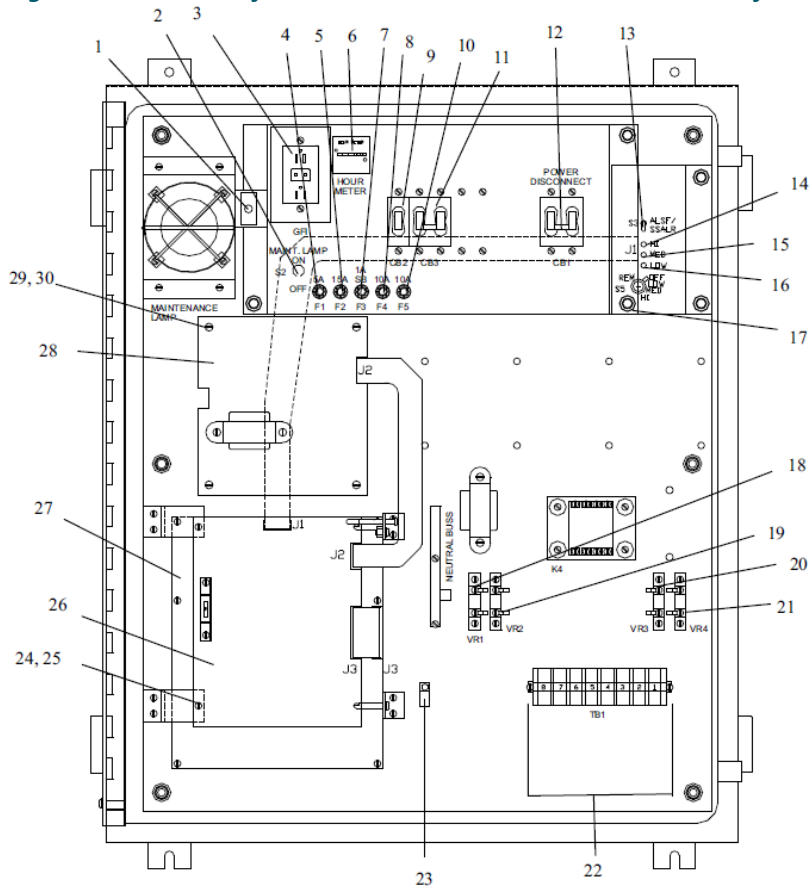
**Figure 3: MALSR Primary Control Cabinet Panel** Figure 3 Continued



**Table 4: Figure 3 Item Descriptions**

1. Interlock Switch	8. Fuse F4	15. LED MED	22. Terminal Block TB1	28. Monitor PCB
2. Switch S2	9. Circuit Breaker CB2	16. LED LOW	23. Earth Ground	29. Screw
3. GFI	10. Fuse F5	17. Switch S5	24. Screw	30. Lockwasher
4. Fuse F1	11. Circuit Breaker CB3	18. Varistor VR1	25. Lockwasher	31. Terminal Block TB7
5. Fuse F2	12. Circuit Breaker CB1	19. Varistor VR2	26. Control PCB	32. Circuit Breaker CB4
6. Hour Meter	13. Switch S4	20. Varistor VR3	27. I/O PCB	33. ON LED
7. Fuse F3	14. LED HI	21. Varistor VR4		

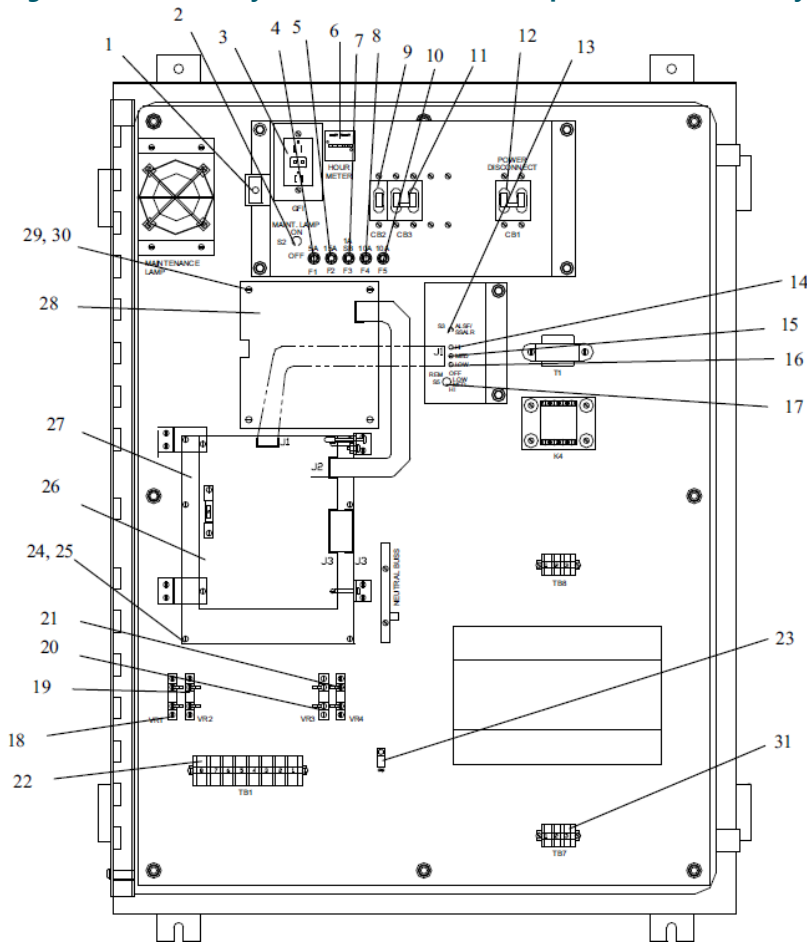
**Figure 4: ALSF Primary Control Cabinet Panel (Standard 120/240 System)**



**Table 5: Figure 4 Item Descriptions**

1. Interlock Switch	7. Fuse F3	13. Switch S3	19. Varistor VR2	25. Lockwasher
2. Switch S2	8. Fuse F4	14. LED HI	20. Varistor VR3	26. Control PCB
3. GFI	9. Circuit Breaker CB2	15. LED MED	21. Varistor VR4	27. I/O PCB
4. Fuse F1	10. Fuse F5	16. LED LOW	22. Terminal Block TB1	28. Monitor PCB
5. Fuse F2	11. Circuit Breaker CB3	17. Switch S5	23. Earth Ground	29. Screw
6. Hour Meter	12. Circuit Breaker CB1	18. Varistor VR1	24. Screw	30. Lockwasher

**Figure 5: ALSF Primary Control Cabinet Panel (Optional 240/480 Vac System)**



**Table 6: Figure 4 Item Descriptions**

1. Interlock Switch	7. Fuse F3	13. Switch S3	19. Varistor VR2	25. Lockwasher
2. Switch S2	8. Fuse F4	14. LED HI	20. Varistor VR3	26. Control PCB
3. GFI	9. Circuit Breaker CB2	15. LED MED	21. Varistor VR4	27. I/O PCB
4. Fuse F1	10. Fuse F5	16. LED LOW	22. Terminal Block TB1	28. Monitor PCB
5. Fuse F2	11. Circuit Breaker CB3	17. Switch S5	23. Earth Ground	29. Screw
6. Hour Meter	12. Circuit Breaker CB1	18. Varistor VR1	24. Screw	30. Lockwasher
				31. Terminal Block TB7

#### 4.1.2 Ground fault interrupter

See [Figure 3](#) through [Figure 5](#) . The primary control cabinet ground fault interrupter (GFI) (3) supplies 120 Vac power for the operation of external devices. The outlet is protected with 15 A fuse F2.

#### 4.1.3 Trigger Timing Requirements (ALSF Only)

The ALSF primary control cabinet outputs trigger pulses gated to flash units according to whether the ALSF mode or SSALR mode is used.

#### 4.1.4 ALSF Mode

For the ALSF mode, all flash units are active so the sequence will begin with the station farthest from the threshold (station 24 for 3000-ft [914.4-m] approach systems) and advance through station 10, then begin over again with station 24. The time from trigger pulse to trigger pulse on sequential flashers corresponds to one cycle of the 60-hertz line.

#### 4.1.5 SSALR Mode

For the SSALR mode, alternate flash units are active, and they are the flash units at stations 24, 22, 20, 18, and 16 with the flasher at station 24 being the most distant from the runway threshold. The sequence begins with station 24 and continues in descending order through station 16, where the sequence will restart at station 24. The time from trigger pulse to trigger pulse on adjacent flashing stations corresponds to every other cycle of the 60-hertz line (33.33 milliseconds).



#### Note

Under some conditions, a 3000-ft (914.4-m) approach lighting system may be required. The primary control unit in this case is capable of flashing 21 flashers in the ALSF mode and 8 flashers in the SSALR mode.

#### 4.1.6 Fault Detection Criteria (ALSF Only)

Refer to [Table 7](#) for ALSF fault detection criteria.

**Table 7: ALSF Fault Detection Criteria**

Mode	Caution	Failure
ALSF	Any two units out.	Any two consecutive units out. Any three nonconsecutive units out.
SSALR	Any one unit out.	Any two units out.

#### 4.1.7 Primary Timer

The primary timer provides trigger signals to discharge the flashers in sequential order from the unit farthest from the threshold to the unit nearest the threshold. The timer provides a 120 V pulse to each individual control cabinet (ICC) and monitors the discharge of each flasher. If a fault has occurred and exceeds the preset level, a signal is generated and a fault light activated.

#### 4.1.8 Primary Control Cabinet Panel

See [Figure 3](#) through [Figure 5](#). The panel contains high-powered components and support devices not found on the printed circuit boards. For more detail on the primary control cabinet panel controls and indicators, refer to [Table 22](#) in [Operation](#) on page 61.

### 4.2 Individual Control Cabinet (ICC)

This subsection describes the operations of the MALSR/ALSF individual control cabinet.

An interlock switch on the individual control cabinet door disconnects incoming power to the individual control cabinet in the event the door is opened while power is still present. The interlock switch may be bypassed or cheated by pulling out the plunger. The interlock switch removes power to the relay K1, which supplies the high voltage transformer.

The individual control cabinets contain a high-voltage dc power supply and flash capacitors to operate the flash head. The high voltage capacitors are discharged through the lamp to produce the flash. The flash capacitors C9, C10, and C11 are oil-filled and of the continuous duty-cycle type. These high voltage capacitors are switched in and out of the circuit to produce the three flash intensities (low, medium, and high).

The high-voltage power supply in the individual control cabinet consists of a voltage-regulating transformer T1, a resonant capacitor C8, and a bridge rectifier consisting of diodes D1 to D4. Capacitor C8 reacts with the magnetics of the voltage-regulating transformer to produce an output voltage impervious to input voltage variations. The transformer is self-limiting and can withstand a momentary short circuit.

The 2000 Vdc output of the bridge rectifier charges up flash capacitor C11 (through current-limiting resistor R23) and flash capacitors C9 and C10 (through R23). Capacitor C11 is always connected in the circuit, but flash capacitors C10 and C9 are switched in or out by relays K2 and K3. [Table 8](#) describes which capacitors are charged in each intensity step.

**Table 8: Intensity-Step Capacitors**

Intensity	HV POWER SUPPLY RELAYS(S)	Flash Capacitor(s) in Circuit
Low	None	C11
Medium	K2	C10 & C11
High	K2 & K3	C9, C10, C11

The high-voltage flash capacitors provide the charge necessary for a large current surge at +2000 Vdc necessary to operate the flash tube. The 1.25-microfarad capacitor C11, which is continuously connected to the circuit, provides a low-intensity flash, since it is the smallest in value. If 2.7-micro farad capacitor C10 is placed in parallel with C11 by closing the contacts of K2, the increased capacitance produces the medium intensity flash.

If capacitor C9 is placed in parallel with C10 and C11 by closing the contacts of K3, the total capacitance is now increased to 27 micro farads and provides the energy for the high intensity flash. Capacitor C9 also has a high-voltage resistive-bleeder-network PC board mounted on it which discharges capacitors C9, C10 and C11 when not in use.

Inductor L1, mounted on the resistive-bleeder PC board, provides a reduction in the rise time of the current to the flash tube but does not reduce the overall energy provided to the flash tube. This increases the life of the lamp. The charge to the flash capacitors is provided by R23, a 1-kilohm, 100-watt wire-wound resistor.

This 100-watt resistor limits the maximum amount of current that a discharged capacitor can load upon the high-voltage supply, limiting the charge rate of the capacitor. Capacitors C9 and C10 will only charge if their corresponding relay contacts are closed. Although no current will be drawn if the relay contacts are open, both terminals C9 and C10 will be at +2000 Vdc if not in use.

#### 4.2.1 Flasher Monitoring

For monitoring purposes, all of the flasher assemblies are connected by a single pair of wires. This buss serves to provide the flash signal to the primary control cabinet.

For operation of the flash detector, the events occur as follows: A trigger signal is emitted from the input/output PC board to the individual control cabinet. At the same time, a timer is started on the Control PC board to detect a misfire and is referred to as a misfire detector.

If the flasher assembly discharges its lamp when the trigger signal is emitted from the I/O PC board, a return pulse from the flasher assembly will be supplied to the flasher-discharge detector in the primary cabinet. This misfire detector will send STOP command to the timer on the control PC board. This stops the detector and prevents it from indicating an alarm condition when a flasher has not discharged properly.

On the other hand, if the flasher assembly has failed to discharge its lamp after receiving the trigger signal emitted from the I/O PC board, no pulse is returned from the flasher assembly to the flasher-discharge detector in the primary control cabinet. Since the detector has not received any pulse, the detector will not issue the STOP command to the control PC board's misfire detector, and the timer in this circuit will time out and produce a count signal. The count is then stored on the monitor PC board. If the number of counts (misfires), as set by the thumbwheel switch, is exceeded, an alarm is generated.

### 4.3 MALSR/ALSF: Required Equipment

Refer to [Table 9](#) for the MALSR/ALSF required equipment that is supplied. Refer to [Table 10](#) for the MALSR and ALSF required equipment that is not supplied. Refer to [Parts](#) on page 95 for ordering information.

**Table 9: MALSR/ALSF Required Equipment Supplied**

Component	MALSR	ALSF
Primary control cabinet	1	1
Flashing light heads	3 to 8	Up to 21
Individual control cabinets	3 to 8	Up to 21
Junction Boxes	3 to 8	Up to 21



**Table 9: MALSR/ALSF Required Equipment Supplied (Continued)**

Component	MALSR	ALSF
Aiming device	1	1
Flasher tester	1	1
Instruction manual. Includes flasher tester instructions.	1 per order	1 per order
Power transformer	1	None
15 kVA power transformer	1	None
Lightning arrestors	2	None
PAR-38 lampholders	45	None
PAR-56 lampholders	18	None
Mating connectors for individual control cabinet and flasher tester	2	None
H.V. interconnecting wire from flash head to individual control cabinet	As required	None
Spare PCB of each type present on each unit of equipment (spare parts trunk)	1 set	None

**Table 10: MALSR/ALSF Required Equipment Not Supplied**

Description	Quantity
PAR-38, 150 W, 120 V spot lamps (MALSR only)	1
PAR-56, 300 W, 120 V spot lamps (MALSR only)	1
Frangible couplings	1
Low impact resistance structures	1
2-inch (50.8 mm) EMT conduit	1
L-850B and L-850E semiflush lighting fixtures, if used (MALSR only)	1
L-830 or 1500 W, 20/20 A isolation transformer (ALSF only)	1
Direct earth burial transformers for semiflush lighting fixtures, if used. Includes 300 W, 240/45.5 V and 200 W, 240/30.3 V transformers.	1

## 4.4 Specifications

This subsection describes the specifications for the MALSR and ALSF. Refer to the [Parts](#) on page 95 for part numbers.

### 4.4.1 Primary Control Cabinet

The primary control cabinet contains control circuitry and monitoring PCBs, which provide the power, timing signals, misfire monitoring circuitry, and three-step intensity control signals to the sequenced flasher assemblies in remote (120 VAC or +48 VDC control) and local mode. The primary cabinet can control up to 21 sequenced flasher assemblies, providing power and trigger signals to produce a sequenced flashing light signal having the appearance of a ball of light traveling down the approach zone.

#### 4.4.1.1 Equipment Data (Primary Control Cabinet)

<b>Input and Output Voltage</b>	<b>120/240 VAC, +10%, 60 Hz, three-wire, single-phase (neutral center-tapped). Optional input: 480 VAC, +10%, 60 Hz, two-wire, single-phase.</b>
Output Trigger Pulses	Time-synchronized with the 60 Hz line
Time from Trigger Pulse to Trigger Pulse	In ALSF mode, corresponds to one cycle of 60 Hz line, 16.67 ms. In SSALR mode, corresponds to every other cycle of the 60Hz line or 33.3 ms.
Modes of Operation	Manual (local) control and remote control (+48 VDC or 120 VAC)
Enclosure	NEMA 4, outdoor and ventilated (to prevent condensation)
Maintenance Features on Control Cabinet	- Rotary control switch for manual control of brightness level of system
	- Flasher ON/OFF switch to de-energize flashers (if desired) when the approach lights are energized
	- LED indicators on control panel for system monitoring
	- Service entrance switch disconnects incoming power to the control unit
	- 100 W maintenance light
Lightning Protection	Rugged surge protection on all input and output electrical connections

	<b>Dimensions</b>	<b>Gross Weight</b>
<b>120/240 VAC (standard)</b>	37.25 x 30 x 11.38 in	137 lb
	94.6 x 76.2 x 28.9 cm	62 kg
<b>480 VAC</b>	48 x 36 x 16.38 in	279 lb
	125.1 x 91.4 x 41.6 cm	126.6 kg

#### 4.4.1.2 Primary Input Power Requirement

<b>Voltage</b>	<b>Maximum Number of Flashers</b>	<b>Maximum Power Requirements</b>
120/240 VAC	3	4 kVA
	6	5 kVA
	9	6 kVA
	12	7 kVA
	15	8 kVA
	18	9 kVA
	21	10 kVA
480 VAC	12	7.5 kVA
	21	11 kVA

#### 4.4.1.3 High-Voltage Wire

Used to interconnect elevated flash head and individual control cabinet. Wire is supplied in 500-foot spools only. Please specify total length (in feet) of wire required when ordering.

#### 4.4.1.4 High-Voltage Wire Ordering Code

12 AWG, 3kV	89A0110-1
-------------	-----------

#### 4.4.2 Flasher

Elevated Flash Head Each elevated flash head assembly consists of a flashing light head, which houses a PAR-56 flashtube and a trigger transformer. A safety interlock switch is incorporated in the flash head. It works in conjunction with the individual control cabinet (ICC) interlock switch to discharge the voltage across the flash lamp when either the ICC door is opened or the flash-tube is removed.

##### 4.4.2.1 Equipment Data

<b>Input Voltage</b>	<b>+2,000 VDC</b>
Lamp	PAR-56 xenon flashtube
Lamp	Life Average 1,000 hours on high-intensity step
Intensity Decrease	30% or less over minimum rated lamp life
Flash Duration	40-100 microseconds
Flash Skipping	Less than 1% with no consecutive skipping
Light Beam Axis	Adjustable vertically from the horizontal to 25° above the horizontal
Vibration	Withstands vibration in frequency range of 10 to 2,000 Hz in accordance with NEMA Standard FA1-3.01
Enclosure	Rain tight
Mounting	On a 2-inch (5.08 cm) frangible coupling or 2-inch EMT conduit, or 1.5-inch (3.81 cm). OD tube or 1.5-inch schedule 40 pipe. Mounting can be on a 1-inch (2.54 cm) pipe (used on an aluminum tower) using adapter sleeve.
Installation Distance	A maximum of 60 ft (18.3 m) from ICC
Dimensions	13.33 x 6.25 x 8.31 in (33.86 x 15.88 x 21.11 cm)
Weight	4 lb (1.8 kg)

##### 4.4.2.2 Elevated Photometric Data

Intensity Setting	Flashtube Intensity	
	Maximum Effective Intensity	Minimum Effective Intensity
High	20,000 cd	8,000 cd
Medium	2,000 cd	800 cd
Low	450 cd	150 cd

#### 4.4.3 In-pavement Flasher

In-pavement flashers are no longer available with this system. If in-pavement flashers are required, see catalog sheet 2091.

#### 4.4.4 Individual Control Cabinet (ICC)

Each flasher unit is controlled by an individual control cabinet, which houses triggering circuits, terminal blocks, and lightning arrestors. A safety interlock switch is incorporated into the enclosure to discharge the high-voltage circuitry when the cabinet door is opened.

##### 4.4.4.1 Equipment Data

Quantity	One for each flash unit
Enclosure	Outdoor, door handle can be padlocked
Input Voltage	120/240 VAC, 60 Hz, three-wire, (neutral center-tapped)
Input Current	1 A in high intensity (average)
Flash Lamp Output Voltage	+2,000 VDC

Maximum Power Consumption	250 W or less
Intensity Step Change Component Life	150,000 operations minimum
Protection	Rugged surge protection on all external wiring connections
Mounting	Two 2-inch (5.08 cm) threaded fittings are provided on bottom of cabinet for mounting. Mounting lugs are also provided on back of the cabinet.
Installation Distance	ICC can be installed a maximum of 2,400 ft (914 m) from primary control cabinet. Contact ADB Safegate for distances over 2,400 ft (914 m).
Dimensions	20 x 16 x 8 in (50.8 x 40.64 x 20.3 cm)
Weight	57 lb (25.85 kg)

#### 4.4.5 Aiming Device

The aiming device is used to adjust and measure the vertical elevation angle of PAR-38 and PAR-56 steady-burning or flashing lamp holders. The aiming device permits aiming of the lamp axis perpendicular to the plane of the cover glass at any angle from 0° to +25° above the horizontal, even when mounted on low impact-resistant structures conforming to FAA-E-2604 or FAA-E-2702. The aiming angle is indicated on a scale calibrated in 1° intervals, and the actual aiming angle of the lamp holder with the aiming device attached is accurate to within ±0.5°.

##### 4.4.5.1 Equipment Data

Quantity	One
Aiming	Flash lamp axis can be aimed from 0° to 25° above the horizontal
Scale	Calibrated in 1° increments
Accuracy	±0.5°
Dimensions	7 dia. x 10 H in (17.78 dia. x 25.4 H cm)

#### 4.4.6 Flasher Tester

The portable flasher tester is equipped with a test cable and plug, which connect to a socket in the ICC to monitor the operation of the flasher light unit. The flasher tester is capable of testing the power circuits and control signals from the primary control unit to the ICC, and from the ICC to the flash head.

##### 4.4.6.1 Equipment Data

Contains	Voltmeter, pulse detector, test-signal switch, and intensity- and trigger-control switches
Test Cable	Plugs into socket in the ICC
Dimensions	9 x 17 x 10 in (22.9 x 43.2 x 25.4 cm)
Weight	3.5 lb (1.59 kg)

#### 4.4.7 Junction Box

Junction boxes are used to distribute power and control signals to the ICCs. One junction box is required for each sequenced flasher in the system. Each junction box has two terminal strips to accommodate the incoming and outgoing power, control circuit, and monitoring wire for the flasher unit.

##### 4.4.7.1 Equipment Data

Quantity	One for each flasher unit
Conduit Hub	Two 2-inch hubs in the bottom of the box
Dimensions	14 x 14 x 6 in (35.56 x 35.56 x 15.24 cm)
Weight	15 lb (6.8 kg)

#### 4.4.8 Spare Parts Trunk

Spare Parts Trunk includes I/O interface, Control PCB, ICC Flasher PCB, Bleeder, and Monitoring PCBs.

## 4.5 Ordering Information

The following equipment is supplied for the ALSF-1, ALSF-2, and ALSF-2/SSALR approach lighting systems per FAA-E-2628:

Quantity	Description
1	Primary Control Cabinet
Up to 21	Flashing Light Heads
Up to 21	Individual Control Cabinets
Up to 21	Junction Boxes
1	Aiming Device
1	Flasher Tester
1	Instruction Manual

Additional equipment may be required, but must be ordered separately:

- PAR-56 Lamp Holder Assemblies
- PAR-56 Lamps
- Frangible Couplings
- Low Impact-Resistant Structures
- High-Voltage Interconnection Wire
- Spare Parts Trunk
- L-830 Isolation Transformer
- 1,500W, 20 A/20 A, Isolation Transformer
- For in-pavement FAA-E-2952 (Replacement for 2491) ALSF high-intensity system applications, see Catalog Sheet 2029 for details.

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## 5.0 Installation

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### WARNING

Allow only qualified personnel to perform the following tasks. Observe and follow the safety instructions in this document and all other related documentation.

---

This section describes instructions for installing the medium intensity approach lighting system with runway alignment indicator (MALSR) and the approach lighting system with sequenced flashers (ALSF). Refer to FAA-E-2325, site drawings, and airport plans and specifications for the specific installation instructions.

### Unpacking

Handle equipment very carefully to prevent component damage. Note any exterior damage to the carton/crate that might lead to detection of equipment damage. Open the top of the carton/crate. Remove foam packing from the top of the box. Carefully lift the unit out of the box by the handles on the side of the motor box.

---



### WARNING

Do not lift the unit by the head. Failure to observe this warning may result in equipment damage.

---

Unpack the carton/crate upon receipt and check the contents and their condition. If you note any damage to any equipment, file a claim with the carrier immediately. The carrier may need to inspect the equipment.

## 5.1 MALSR/ALSF Installation

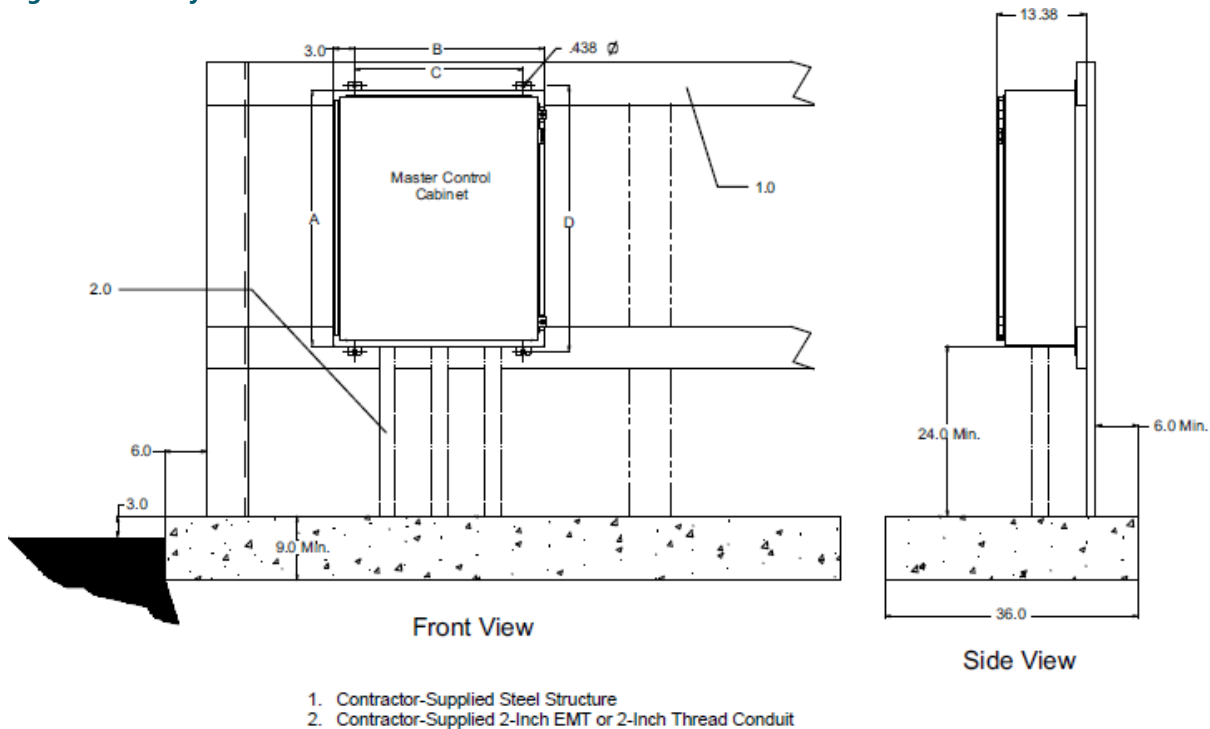
This subsection provides installation instructions for the MALSR/ALSF. The installation shall conform to the applicable sections of the National Electric Code and local codes.

### 5.1.1 Installing Primary Control Cabinet

To install the primary control cabinet, follow the guidelines below.

See [Figure 6](#) . Refer to [Table 11](#) . Refer to site drawings for specific installation details.

**Figure 6: Primary Control Cabinet Installation and Dimensions**



**Table 11: MALSR/ALSF Primary Control Cabinet Dimensions**

System	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)
MALSR	36 (91.44)	30 (76)	24 (60.96)	37.25 (94.615)
ALSF	36 (91.44)	30 (76)	24 (60.96)	37.25 (94.615)
ALSF (480 Vac)	48 (121.92)	36 (91.44)	30 (76)	49.25 (125.095)

- Mount the primary control cabinet vertically through the external mounting lugs provided on the back of the cabinet.
- Drill conduit holes in the cabinet as required at the time of installation.
- When the primary cabinet is mounted inside a vault, secure the cabinet to the wall by using bolts and bolt anchors or as specified by site installation drawings.
- When the primary cabinet is mounted out on the field, provide a concrete pad and fabricate and secure a steel framework in the concrete pad to mount the primary control cabinet and other equipment as specified in site drawings. Concrete pad size and structure size is to be determined by the contractor and applicable local specifications.



## 5.2 Installing Individual Control Cabinet

To install the individual control cabinet, follow the guidelines below.

- See [Figure 7](#) and [Figure 8](#). Refer to site drawings for location and mounting provisions. Individual control cabinets can be installed a maximum of 2400 feet (732 m) from the primary control cabinet. Contact ADB Safegate for distances greater than 2400 feet.

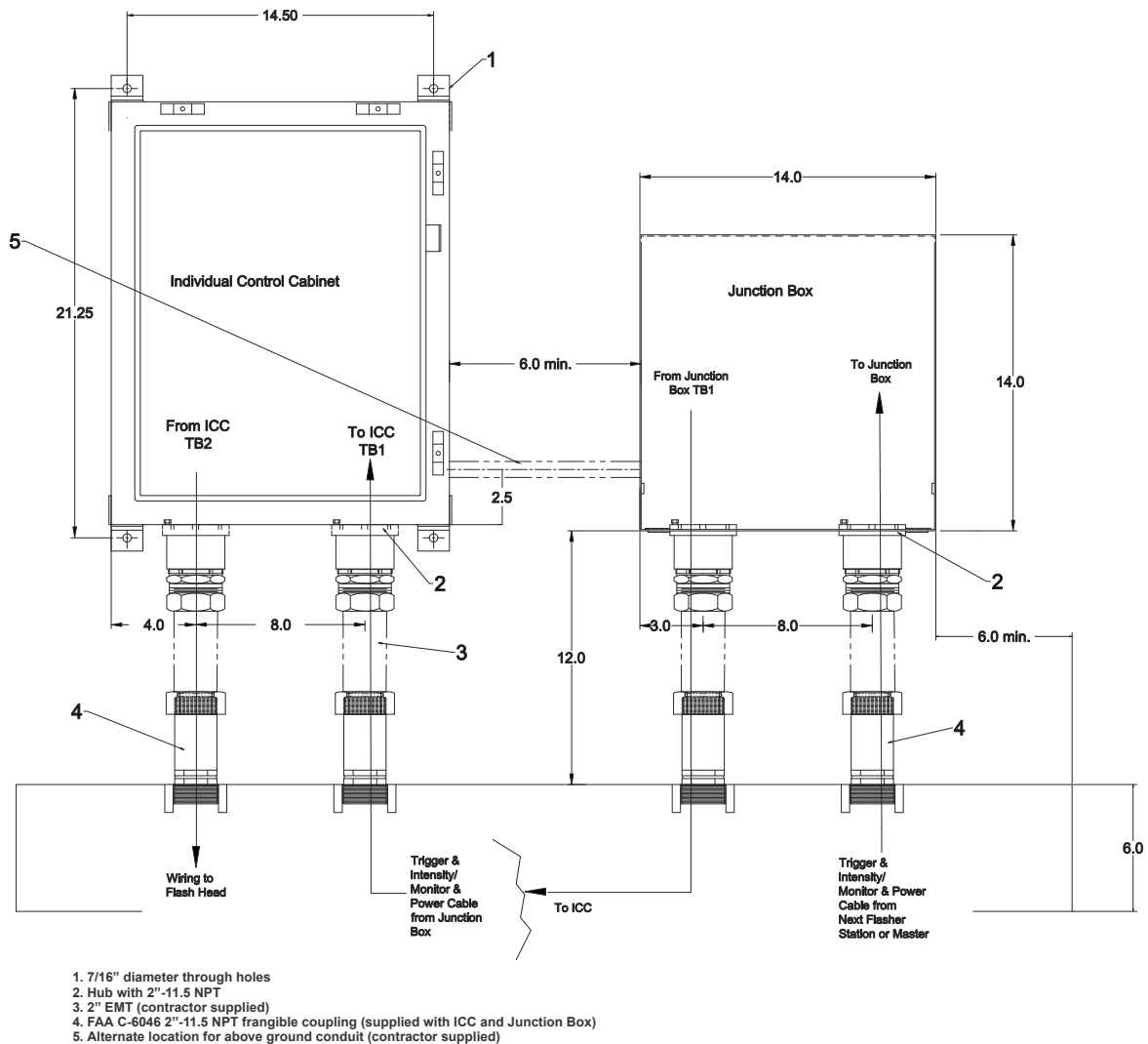
### Note

Item # 5 in [Figure 7](#) and item #2 in [Figure 8](#) show an alternate location for contractor-supplied conduit above ground. The alternate conduit is for running wires from the junction box to the individual control cabinet if wiring is not done through underground conduit system.

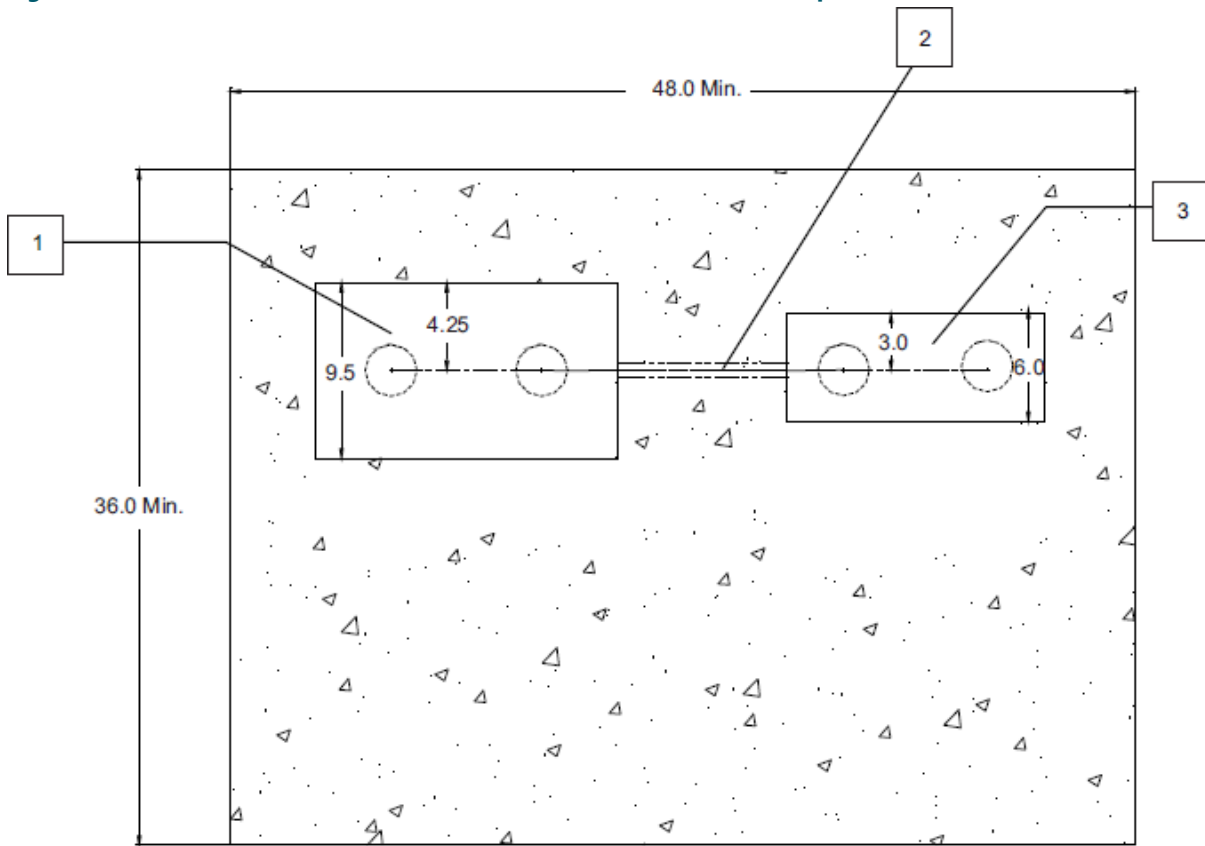
### Note

Contractor should determine conduit layout system to be used per plans and specifications and local electrical codes.

**Figure 7: Individual Control Cabinet and Junction Box Dimensions and Wiring**



**Figure 8: Installation of Individual Control Cabinet and Junction Box (Top View)**



1. Individual Control Cabinet
2. Alternate Location for Contractor-Supplied Conduit Above Ground
3. Junction Box

- Two 2-in. (50.8-mm) conduit hubs are provided for mounting and wiring of the cabinet. Cabinets should be mounted on frangible couplings, and a concrete pad should be provided. The cabinet also has external mounting lugs if the cabinet must be mounted on a structure.



**CAUTION**

Two vents are mounted on the enclosure. Do not remove one of the vents, for example, to attach a conduit from the junction box. Both vents are needed to prevent condensation from occurring inside the enclosure.

**5.2.1 Mounting Junction Box**

To mount the junction box, follow the guidelines below.

- Refer to site drawings for location and mounting provisions.
- Locate the junction box next to the individual control cabinet. This is the preferred method of installation.
- Mount the junction box on frangible couplings.



**Note**

The junction box is supplied with two 2-in. (50.8-mm) conduit hubs for mounting and wiring.

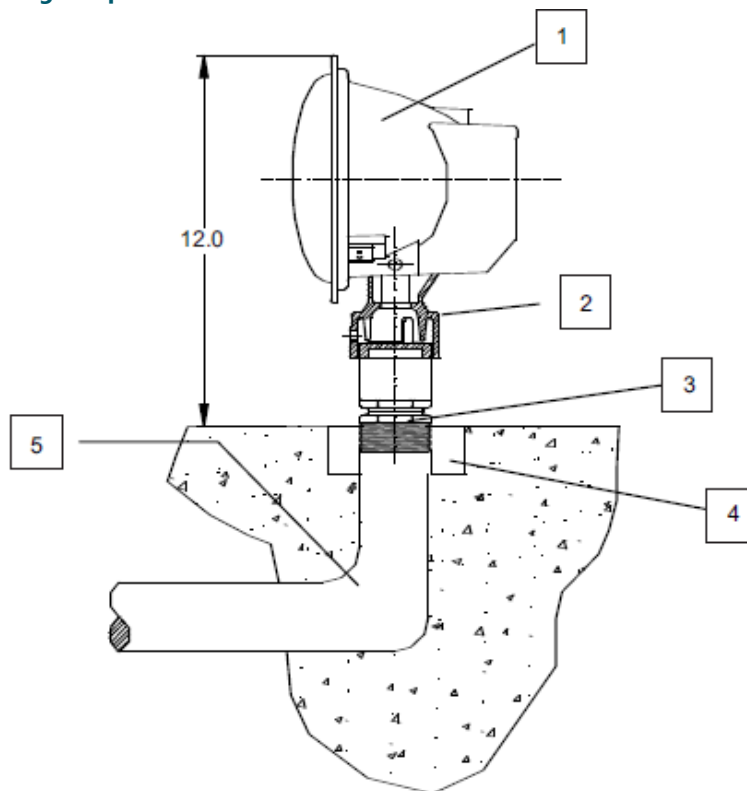
- See [Figure 7](#) and [Figure 8](#) for recommended installation and dimensions.

## 5.2.2 Mounting Flasher Light Unit

The flasher light unit is comprised of the lamp holder assembly and slip fitter. To mount the flasher light unit, follow the guidelines below.

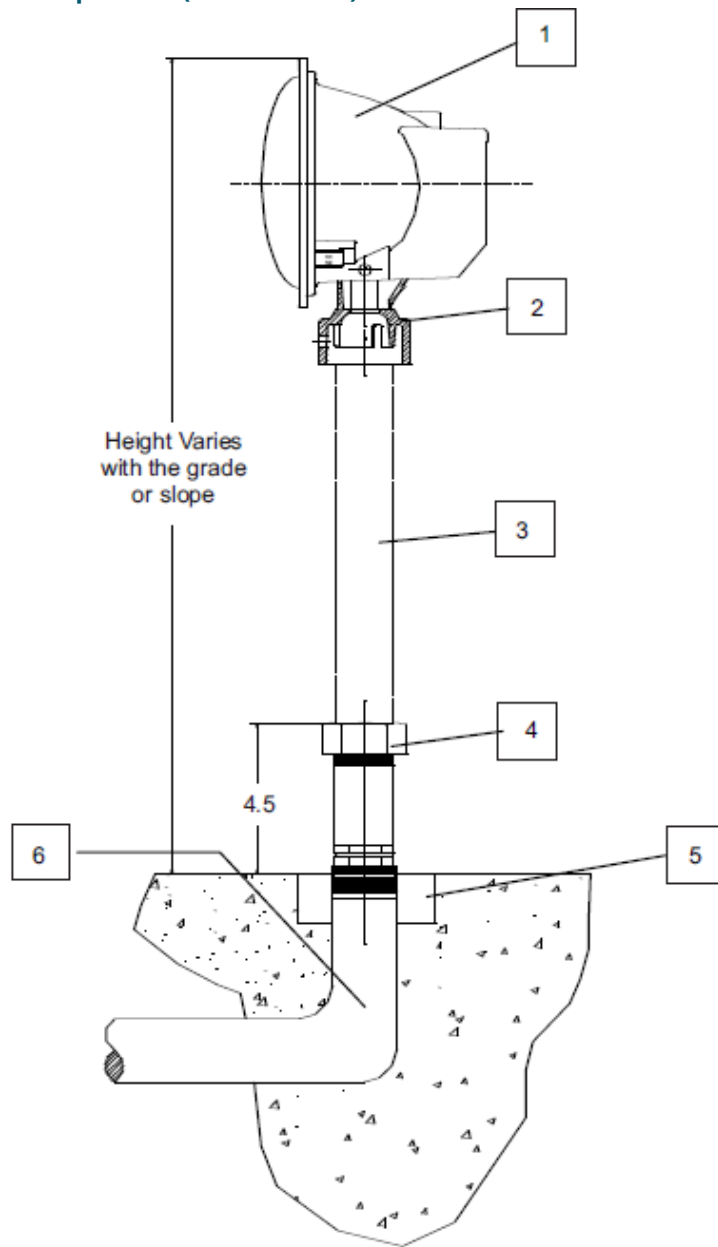
- Refer to site drawings for location and mounting provisions.
- The slip fitter is designed to fit on 2-inch (50.8-mm) EMT, 2-inch (50.8-mm) frangible couplings, and 1.5-inch (38.1-mm) pipe.
- If mounted on a 1-inch (25.4-mm) OD pipe, an adapter sleeve must be used.
- Connector kits and 2-conductor AWG 16 cable are required when mounting on frangible couplings. Align lamp holders with the extended centerline of the runway.
- See [Figure 9](#) through [Figure 15](#) for the flasher light unit mounting options. The flasher light unit can also be mounted on an aluminum tower with the use of an adapter sleeve. The slip fitter is secured by tightening three round-head machine screws.

**Figure 9: Flashing Lamp Holder**



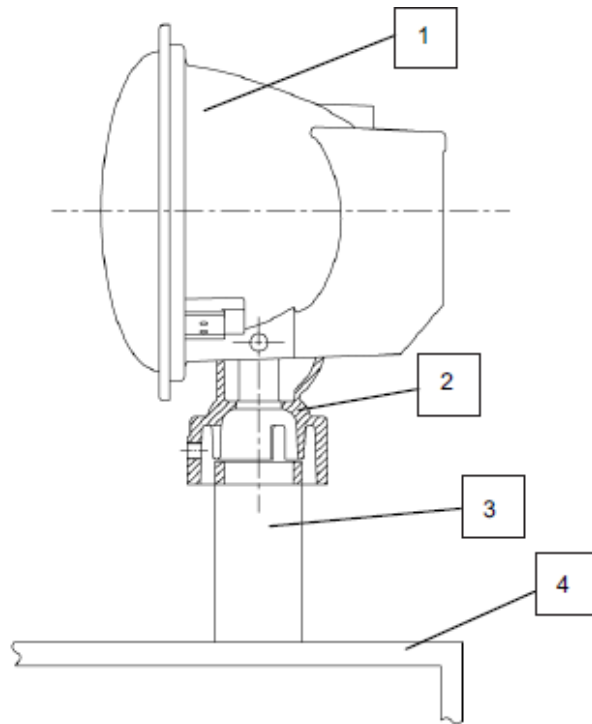
1. Flashing Lamp Holder Assembly
2. Slip Fitter
3. Frangible Coupling (Type F2C)
4. Contractor-Supplied Two-Inch Conduit Coupling
5. Contractor-Supplied Two-Inch Conduit 90-Degree Elbow

**Figure 10: Flasher Lamp Holder (EMT Mounted)**



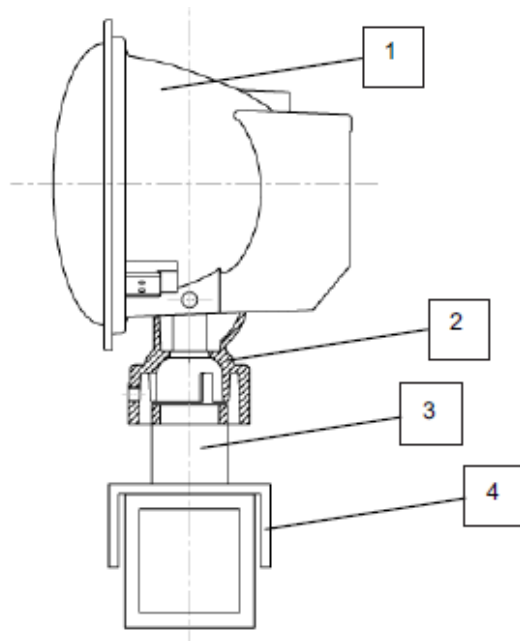
1. Flashing Lamp Holder Assembly
2. Slip Fitter
3. Contractor-Supplied Two-Inch EMT
4. Frangible Coupling (Type EMT)
5. Contractor-Supplied Two-Inch Conduit Coupling
6. Contractor-Supplied Two-Inch Conduit 90-Degree Elbow

**Figure 11: Platform Mount**



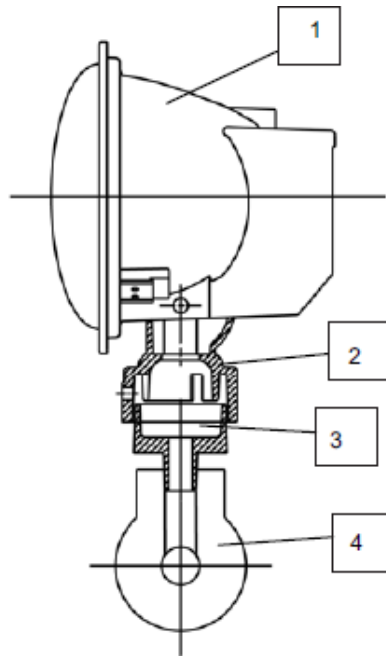
1. Lamp Holder Assembly
2. Slip Fitter
3. 1-1/2 Schedule 40 Pipe
4. Platform Structure

**Figure 12: Fiberglass Tower Mount**



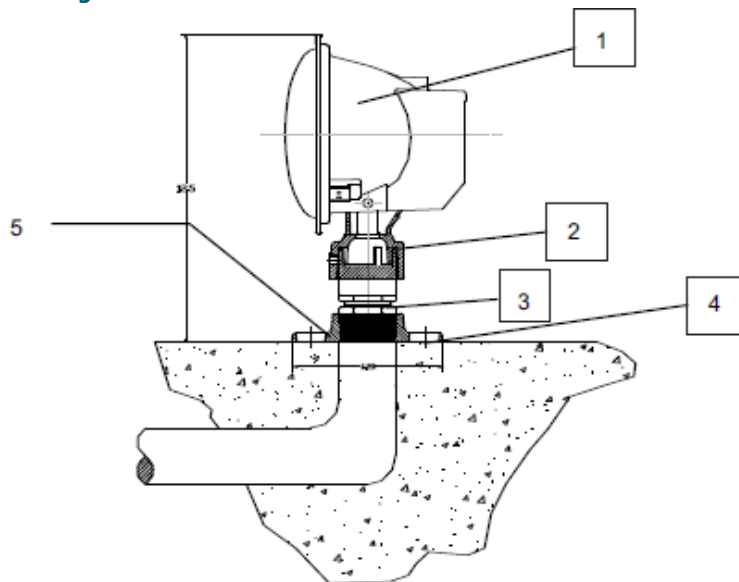
1. Lamp Holder Assembly
2. Slip Fitter
3. 1-1/2-Diameter Tube
4. Fiberglass Tower Cross Arm Hub

**Figure 13: Aluminum Tower Mount**



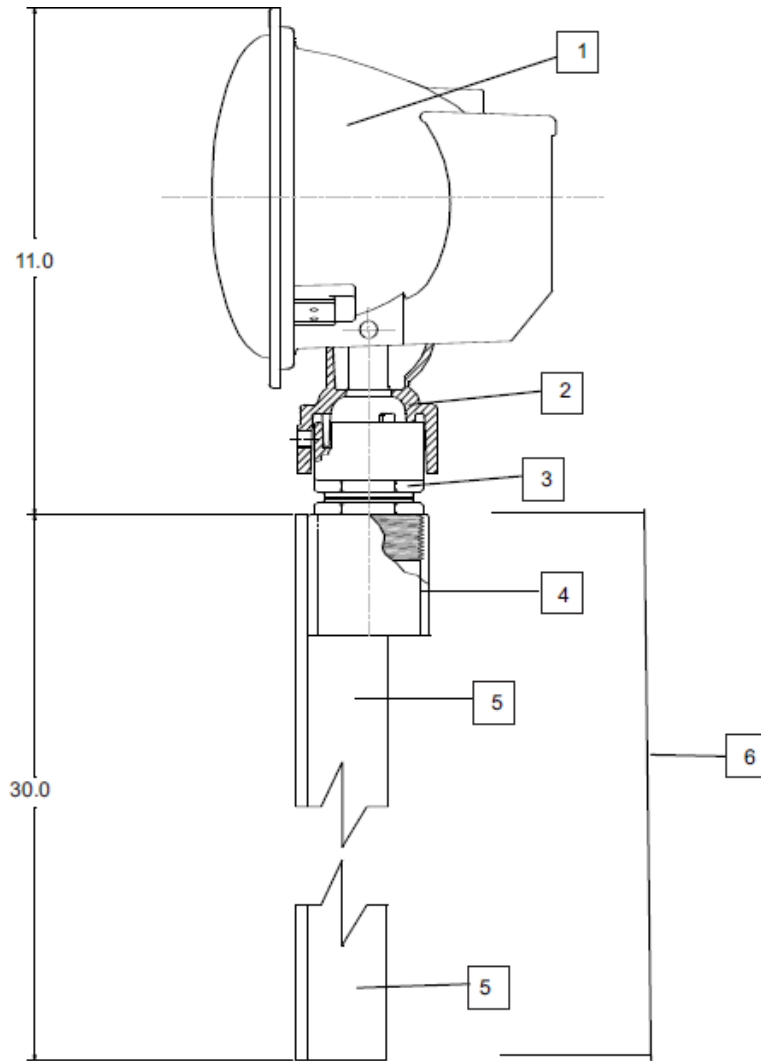
1. Lamp Holder Assembly
2. Slip Fitter
3. Adapter Sleeve (Type FAC)
4. Aluminum Tower Cross Arm Hub

**Figure 14: Floor Flange Mount**



1. Lamp Holder Assembly
2. Slip Fitter
3. Frangible Coupling (Type F2C)
4. 9/16-Diameter Through Holes Equally Spaced on 4-3/4-Diameter Bolt Circle
5. Floor Flange

Figure 15: Stake Mount



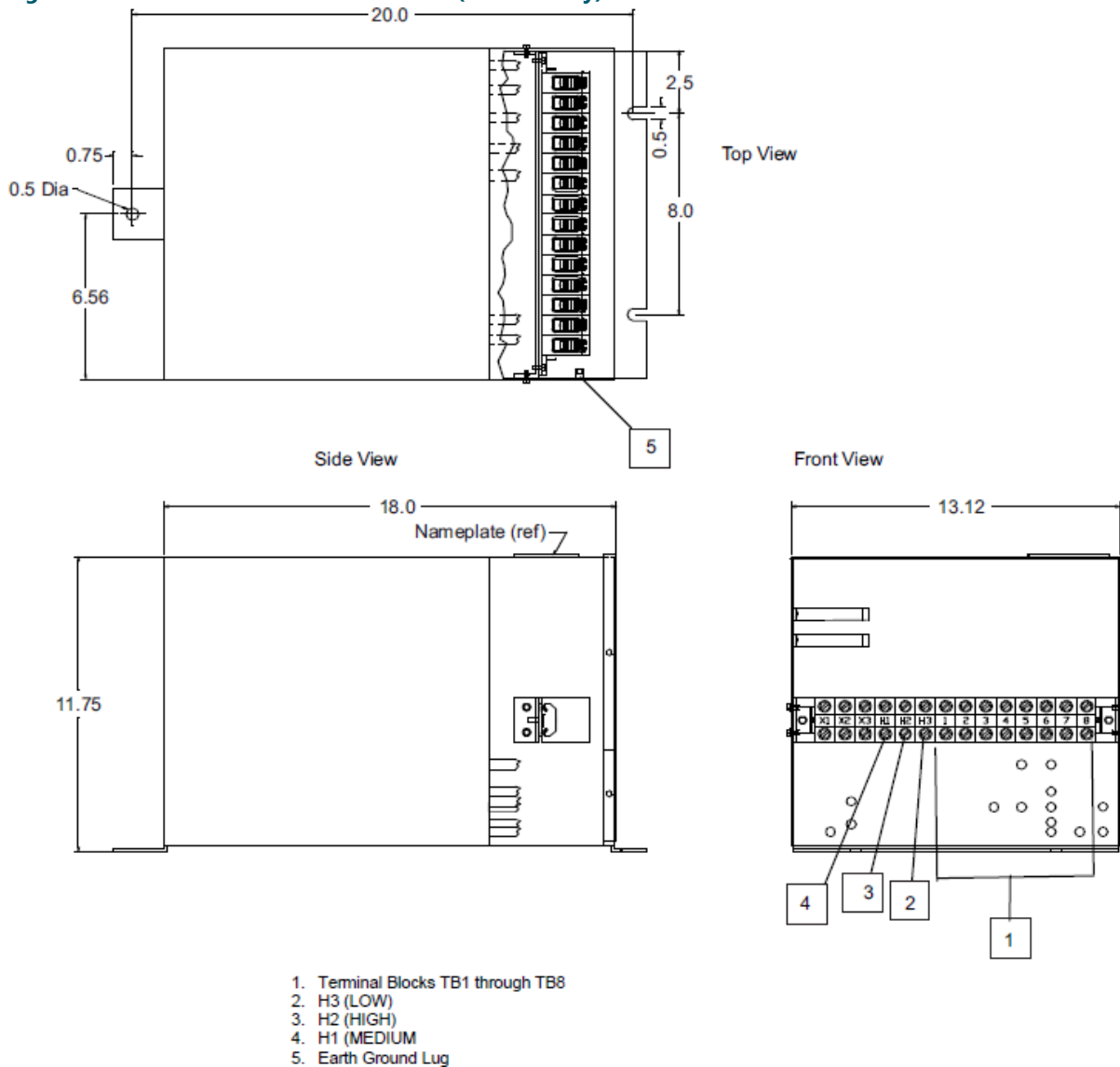
1. Lamp Holder Assembly
2. Slip Fitter
3. Frangible Coupling (Type F2C)
4. Hub
5. 2 x 2 Steel Angle
6. Stake Assembly

### 5.2.3 Mounting Power Transformer (MALSR Only)

To mount the MALSR power transformer, follow the guidelines below.

See Figure 16 . Refer to site drawings for location and mounting provisions.

**Figure 16: 15 kVA Transformer Installation (MALSR Only)**



The preferred method of installation is to locate the power transformer near the primary control cabinet in the vault.

The transformer weighs 262 lb (118.819 kg). External mounting lugs are provided on the back of the transformer for vertical mounting. Secure the cabinet to a wall using bolts and bolt anchors or as specified by site installation.

When the power transformer is mounted out on the field, a concrete pad should be provided and a steel framework should be fabricated and secured in the concrete pad to mount the transformer and other equipment as specified in site drawings. Concrete pad size and structure size are to be determined by contractor and applicable local specifications.



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### 5.2.4 Installing Lightning Rod

Lightning protection is provided by metal oxide varistors in the primary control cabinet at the input supply terminals of TB1 and the supply power to the individual control cabinet. The fast-acting metal oxide varistors are effective only if a very short length of ground cable is connected to the lightning rod. Therefore, install the lightning rod as close as possible to the cabinet.



#### Note

A large amount of charring on the surface of a metal oxide varistor is an indication that a lightning strike has attempted to enter the system. If this has occurred, replace the shorted varistor and verify that the system is still operating properly.

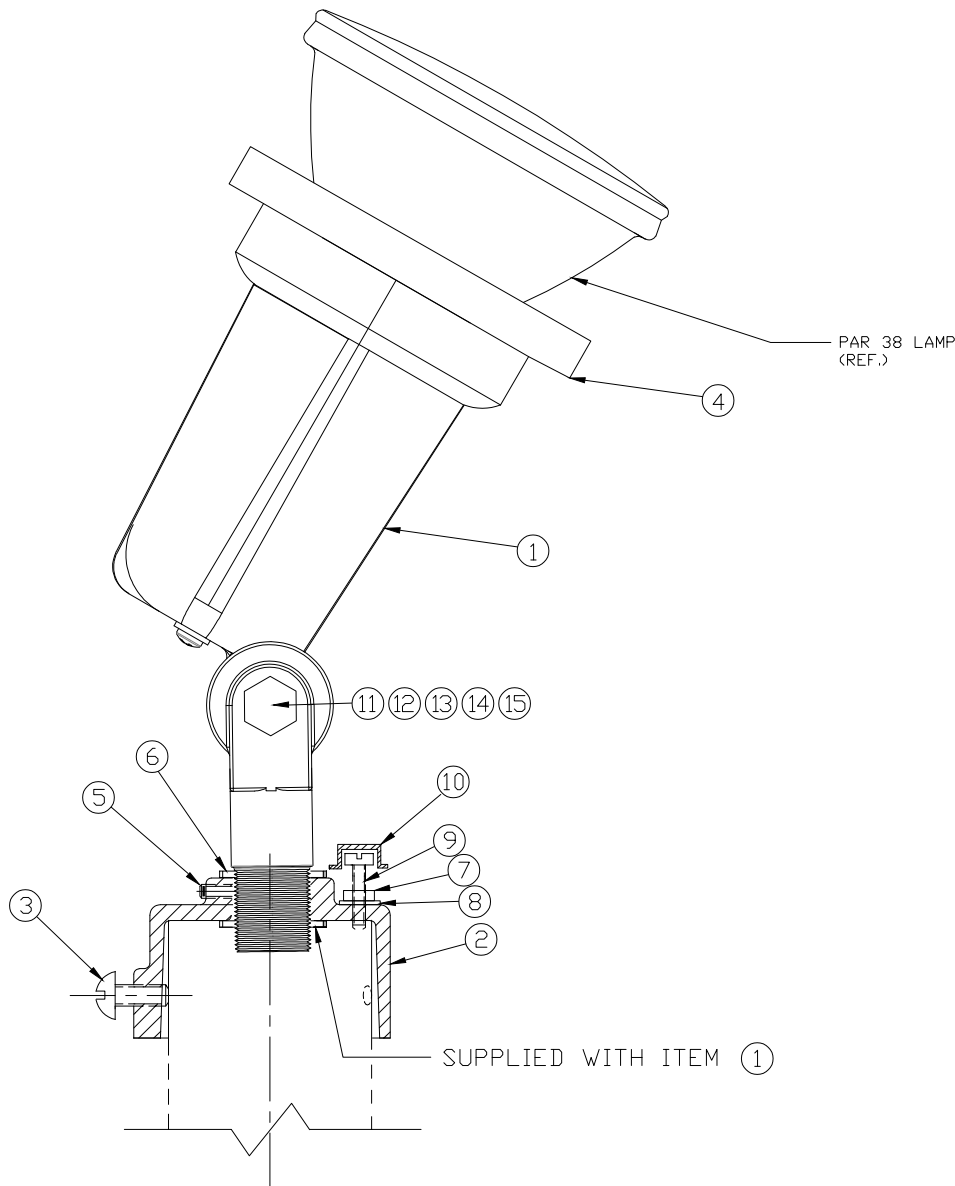
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### 5.2.5 Mounting PAR-38 Lampholder (MALSR Only)

To mount the MALSR PAR-38 lampholder, follow the guidelines below.

- Loosen the bolt/nut on the knuckle assembly (11) of the lamp holder and rotate the lamp housing (1) to a convenient working angle of approximately 45 degrees and tighten the bolt/nut (do not over tighten, a final torque will be applied later).
- Mount the PAR-38 lampholder assembly to a frangible coupling, EMT, or fiberglass or aluminum tower cross arm hub and tighten the 3 set screws (3).
- Refer to section [Aiming PAR-38 Lampholders \(MALSR Only\)](#) for aiming the PAR-38 lampholder.

**Figure 17: PAR-38 Lampholder Assembly (MALSR Only)**



**Table 12: PAR-38 Lamp Holder Assembly**

Item	Description
1	Lamp Housing
2	Slip Fitter
3	SS Hex Head Bolt

**Table 12: PAR-38 Lamp Holder Assembly (Continued)**

Item	Description
4	Lamp Holder Gasket
5	Set Screw
6	SS Washer
7	SS Hex Nut
8	SS Lock Washer
9	SS Hex Head Bolt (Vertical Support Bolt)
10	Hex Head Bolt Cap
11	Knuckle Assembly
12	SS Hex Head Bolt
13	SS Lock Washer
14	SS Washer
15	SS Lock Nut

### 5.2.6 Mounting PAR-56 Lamp holder (MALSR Only)

To mount the MALSR PAR-56, follow the guidelines below.

- Mount a total of 18 PAR-56 lamp holders (typical) on the runway threshold.
- Use the base to adjust the vertical elevation of the lamp holder.
- See [Figure 6](#) in this section. Mount the mounting flange onto a frangible coupling, 2-inch (50.8-mm) conduit, or light bar.

#### 5.2.6.1 Installing Primary PCBs



#### **WARNING**

Be very careful when installing PC boards in the primary control cabinet. Components on the boards can be easily damaged.

Contents are static-sensitive. Must be grounded when handling PCB.

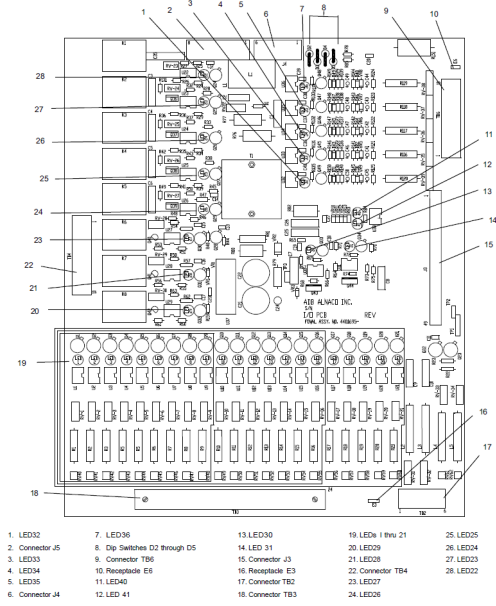
This subsection describes installation procedures for primary PCBs. For part numbers, refer to the Parts section.

#### 5.2.6.2 Installing I/O PC Board

1. See [Figure 3](#) through [Figure 5](#) in the Description section. Insert I/O PC board (27) in the primary control cabinet component side outward so that the holes are aligned with the 6 standoffs.
2. Install six 10-32 screws (24) and #10 split lock washers (25) to secure the I/O board to the standoffs.
3. See [Figure 18](#) . Plug in the E3 (wire #122) and E6 (wire #121) ground plugs into the E3 (16) and E6 (10) receptacles.
4. Slide female TB3 connector into male TB3 connector (18) on the PC board.

5. Slide female connectors TB2, TB4 and TB6 into male TB2 (17), TB4 (22), and TB6 (9) connectors on the PC board.
6. Plug female connectors J3, J4, and J6 into male J3 (15), J4 (6), and J5 (2) connectors on the PC board respectively.

**Figure 18: Input/Output PC Board**

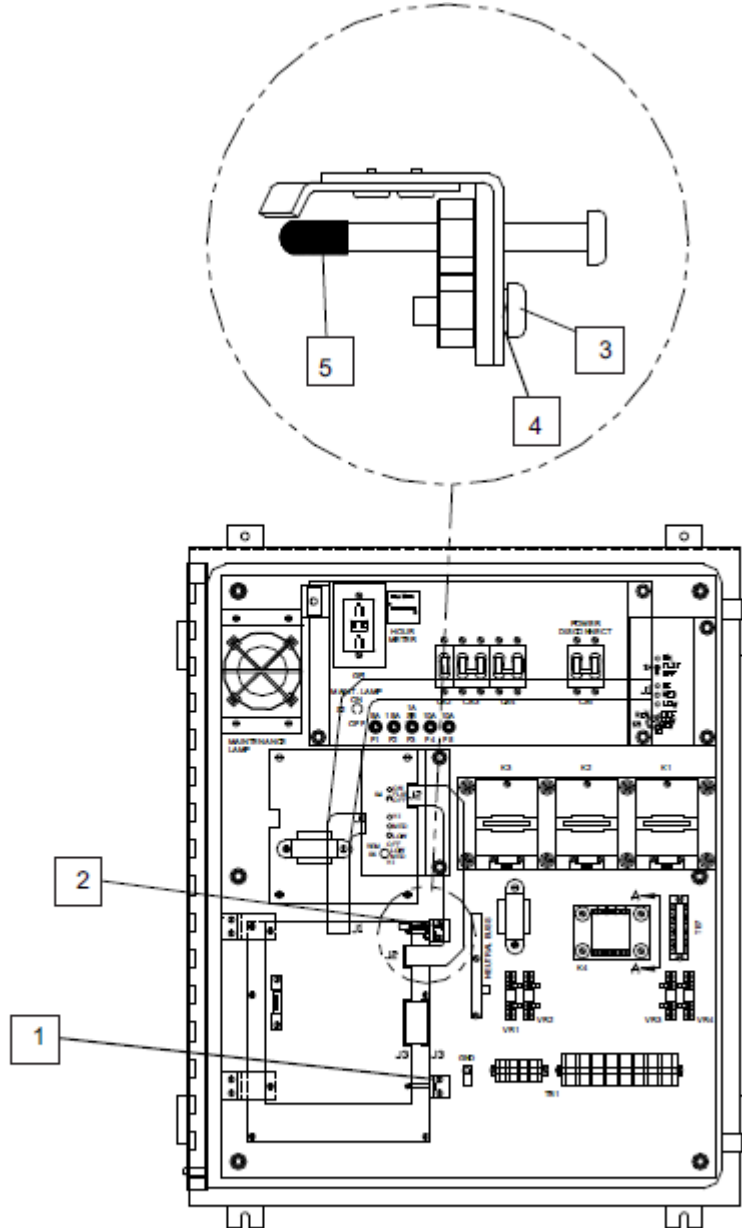


### 5.2.6.3 Installing Control PC Board

To install the control PC board, perform the following procedure:

See [Figure 19](#) . Align the control PC board with the hinges #1 (1) and #2 (2) in the primary control cabinet.

**Figure 19: Aligning Primary Control Cabinet Hinges**

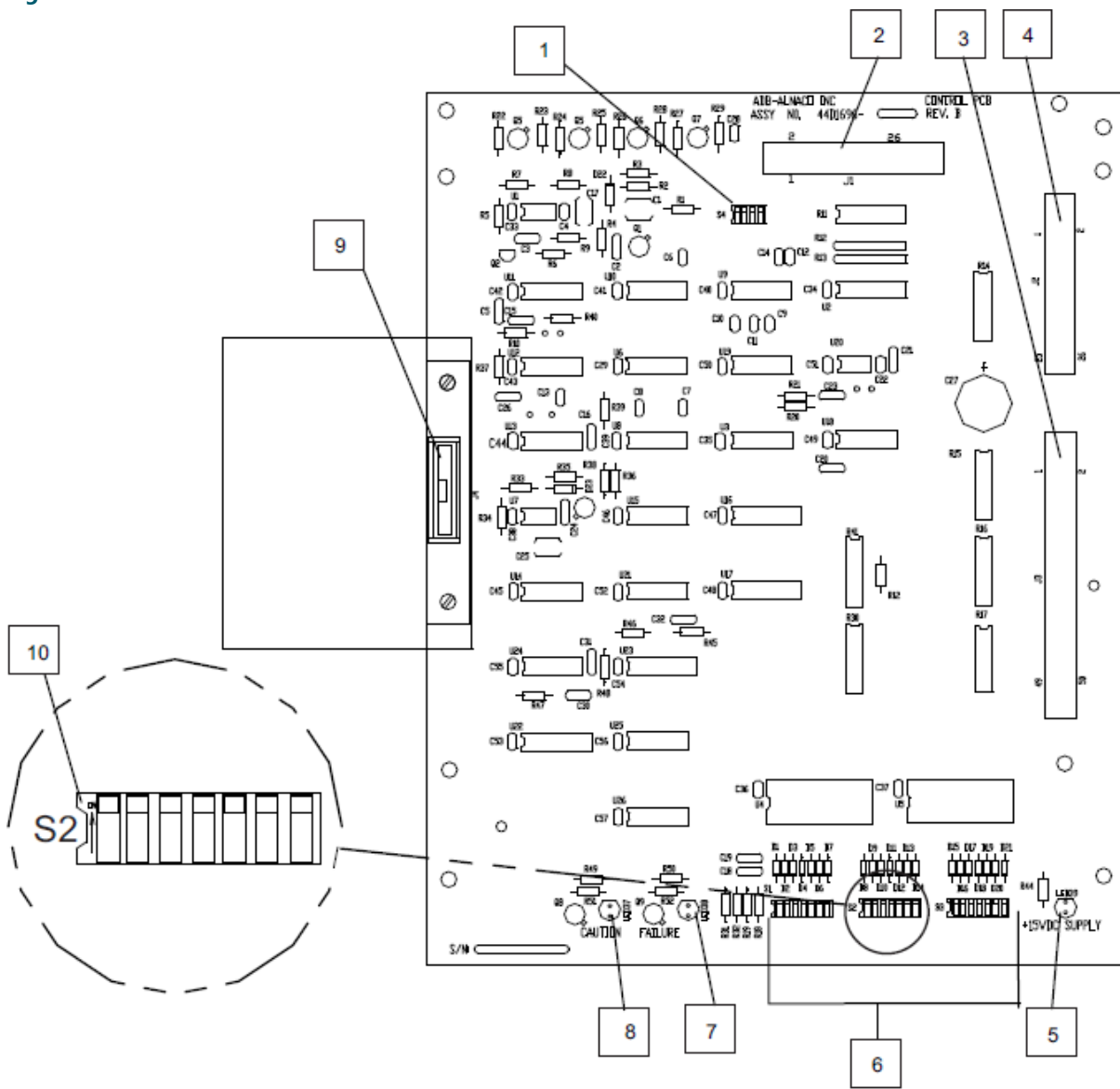


1. Hinge #1
2. Hinge #2
3. Panhead Screw
4. Lockwasher
5. Hinge

### 5.2.7 Installing Control PC Board (contd.)

1. Attach hinges #1 and #2 to the control board using the two 8-32 pan head screws (3) and lockwashers (4).
2. See Figure 20 . Plug female connectors J1, J2, and J3 into male J1 (2), J2 (4), and J3 (3) connectors on the control board.

**Figure 20: Control PC Board**



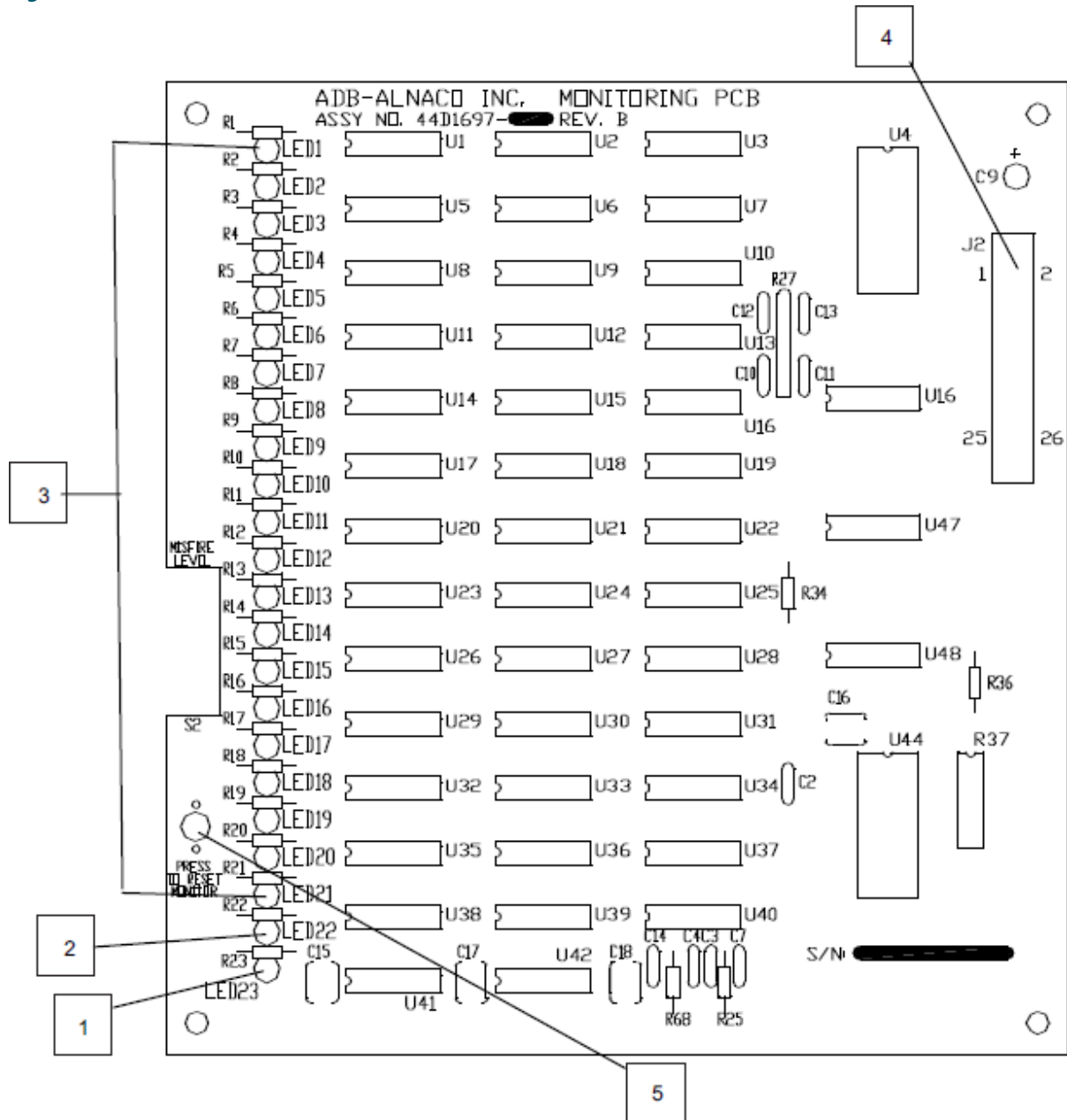
- |                 |   |               |                                  |
|-----------------|---|---------------|----------------------------------|
| 1. Switch S4    | 4. Connector J2                                       | 7. LED 38     | 10. ON Position for Dip Switches |
| 2. Connector J1 | 5. LED 39   | 8. LED 37     |                                  |
| 3. Connector J3 | 6. S1, S2, S3 (3 Sets of Dip Switches D1 through D21) | 9. Thumbwheel |                                  |

### 5.2.8 Installing Monitor PC Board

To install the monitor PC board, perform the following procedure:

1. See [Figure 3](#) through [Figure 5](#) in the Description section. Place monitor PC board onto the 4 standoffs above the I/O PC board in the primary control cabinet and install four 10-32 screws (29) and lockwashers (30) to secure the board in place.
2. See [Figure 16](#) . Connect the J2 female connector to the J2 male connector (4) on the Monitor PC board.

**Figure 21: Monitor PC Board**



1. LED 23
2. LED 22
3. LEDs 1 through 21
4. Connector J2
5. Reset Button

### 5.2.9 Installing In-pavement Flashing Light on LB-4 Base

This subsection provides installation information for the MALSR and ALSF in-pavement flashing light. It discusses how to connect the Individual Control Cabinet (ICC) wiring to the light fixture and how to install the light fixture on the base.

**Note**  
Replacement in-pavement fixtures are no longer available from ADB Safegate.

#### 5.2.9.1 Connecting ICC Wiring to Light Fixture

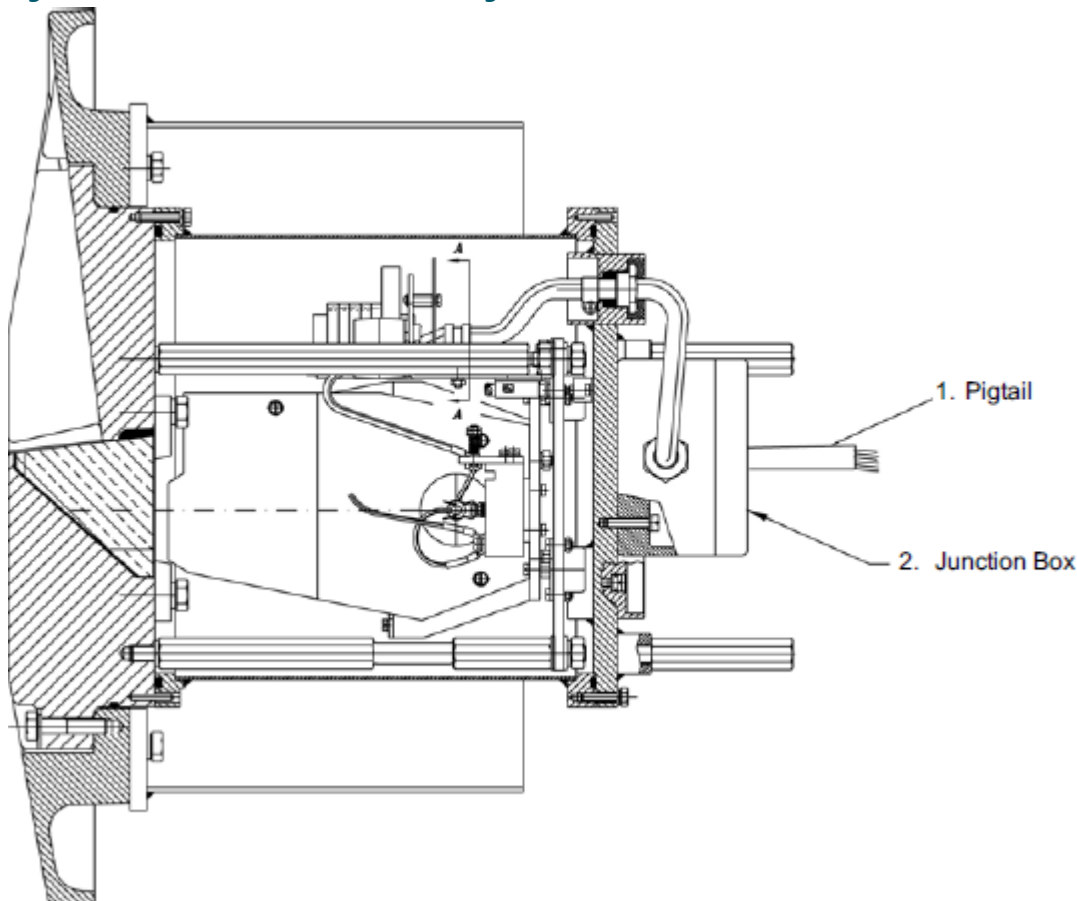
Connect the separately supplied ICC cable (part number 6104.90.206) to the in-pavement flashing light. Three methods may be used to connect the 6-core cable: use the junction box termination, use an optional flash head connector, or splice the cable wire. Refer below for a discussion of each method. Refer to Optional Parts in the Parts section for the 6-core cable part number.

**Note**  
For distances over 100 feet between the ICC cable and the light fixture, always use the in-pavement light fixture with PCB option (part number 44A6234-2).

#### 5.2.9.2 Junction Box Termination

See [Figure 17](#) . See also [Figure 46](#) in the Wiring Schematics section. The preferred method for connecting the 6-core cable is using the junction box termination. If the ADB Safegate wire (part number 6104.90.206) is used, termination can be made inside the wire junction box (2) on the bottom of the flash head after removing the pigtail (1) provided.

**Figure 22: Junction Box Termination Wiring Method**





### 5.2.9.3 Optional Flash Head Connectors

The second method for connecting the 6-core cable is to use an optional flash head connector. The optional connector is intended to be used with a 6-core cable that has an outside diameter of 0.510 in. Refer to Optional Parts in the Parts section for connector kit and cable part numbers.

To assemble the optional in-pavement flasher connector assembly, perform the following procedure:

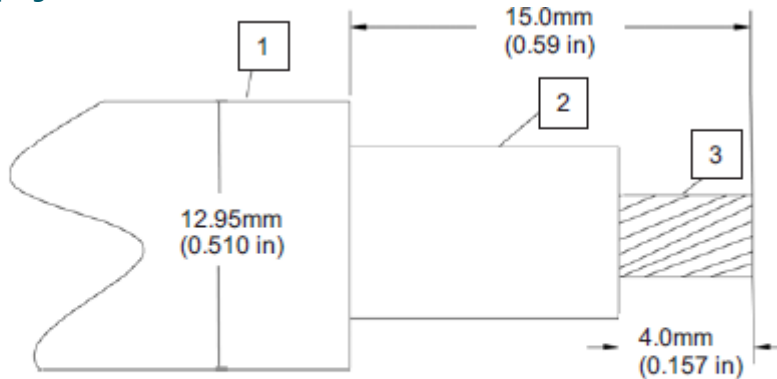
1. Prepare the cable wire by stripping wire ends to specified lengths as shown in [Figure 23](#) . Be careful not to cut through outer jacket into individual wire insulation. Repeat for all six wires.



**Note**

Connectors are designed to be used with ADB Safegate 6-core cable wire (part number 6104.90.206).

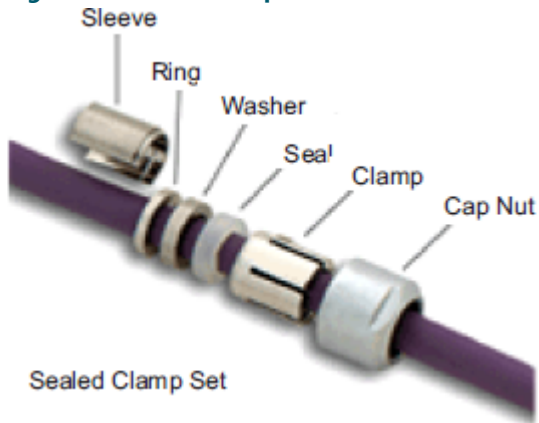
**Figure 23: Stripping Wire Ends**



1. Wire Jacket
2. Wire Insulation
3. Wire

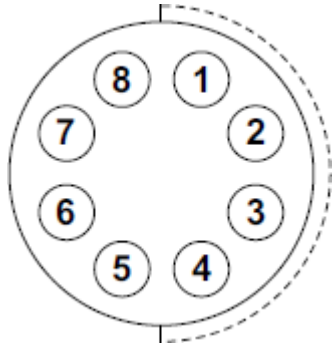
2. Assemble connector pieces onto wire as shown in [Figure 24](#) .

**Figure 24: Sealed Clamp Set**



3. Solder contacts by performing the following procedure:
  - a. Slide 7 mm (0.276 in.) pieces of supplied heat shrinkable tubing over individual contacts.
  - b. Solder cable conductors to contacts with Rosin core solder according to the wiring diagram in [Figure 25](#) . Refer to [Table 13](#) for wiring functions.

**Figure 25: Wiring Diagram (Female Connector)**

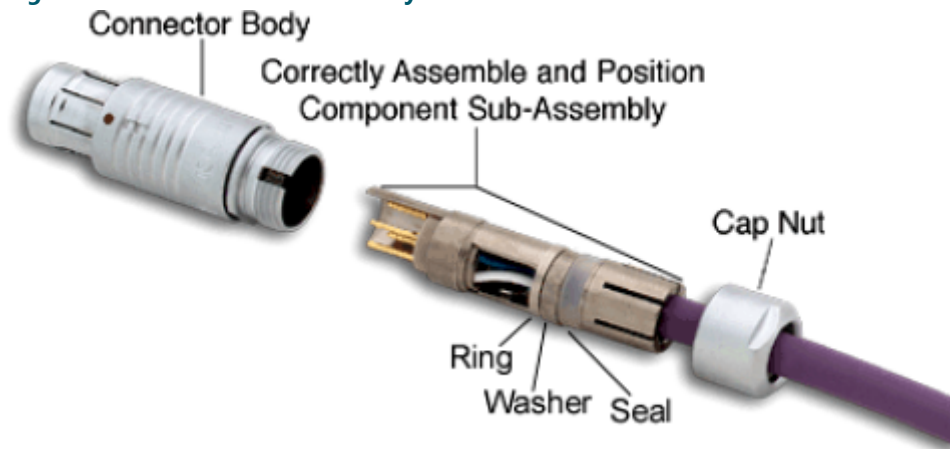


**Table 13: Wiring Color and Functions**

Item	Function	Color
1	Lamp anode 2kV	Brown
2	No connect (NC)	Not applicable
3	Safety relay (120 V)	Black
4	Lamp cathode 2kV return	Gray
5	Trigger	Blue
6	Safety relay (120 V)	Black
7	Trigger return	Yellow green
8	No connect (NC)	Not applicable

- c. Slide heat shrinkable tubing over contacts and solder joints.
  - d. Apply heat to shrink.
4. Slide ring toward contact block and position sleeve between contact block and ring. Make sure that the ring does not move off the end of the outer jacket.
5. See [Figure 26](#) . Slide all remaining components along the cable toward the contact block.

**Figure 26: Final Connector Assembly**



6. Carefully slide connector body over component sub-assembly.



**CAUTION**

The connector body is keyed so that it will easily slide over the sub-assembly. Do not force the connector body onto the sub-assembly or permanent damage to the connector will result.

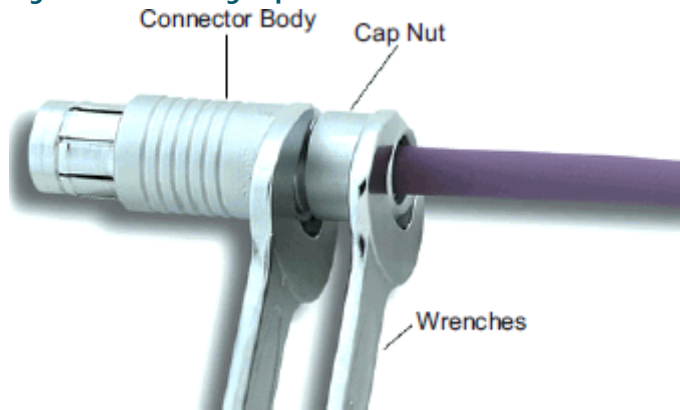
7. Apply locking compound to the connector threads. Place cap nut onto the connector body and tighten with torque wrench as shown in [Figure 27](#) to Nm (70.8 inch-pounds).



**Note**

Connectors are supplied with watertight end caps. Connectors are ONLY watertight when plugged into mate or end cap. Any connector left unplugged from mate should be plugged into an end cap to prevent moisture from entering contact area.

**Figure 27: Mounting Cap Nut**



5.2.9.4 Splicing Cable Wire

The third method for wiring is by splicing to the pigtail (See Item #1 on [Figure 22](#)) and heat shrinking with a watertight seal.

### 5.2.10 Installing In-pavement Flasher on Base

To install the in-pavement flasher on the LB-4A or LB-4 modified base, perform the following procedure:

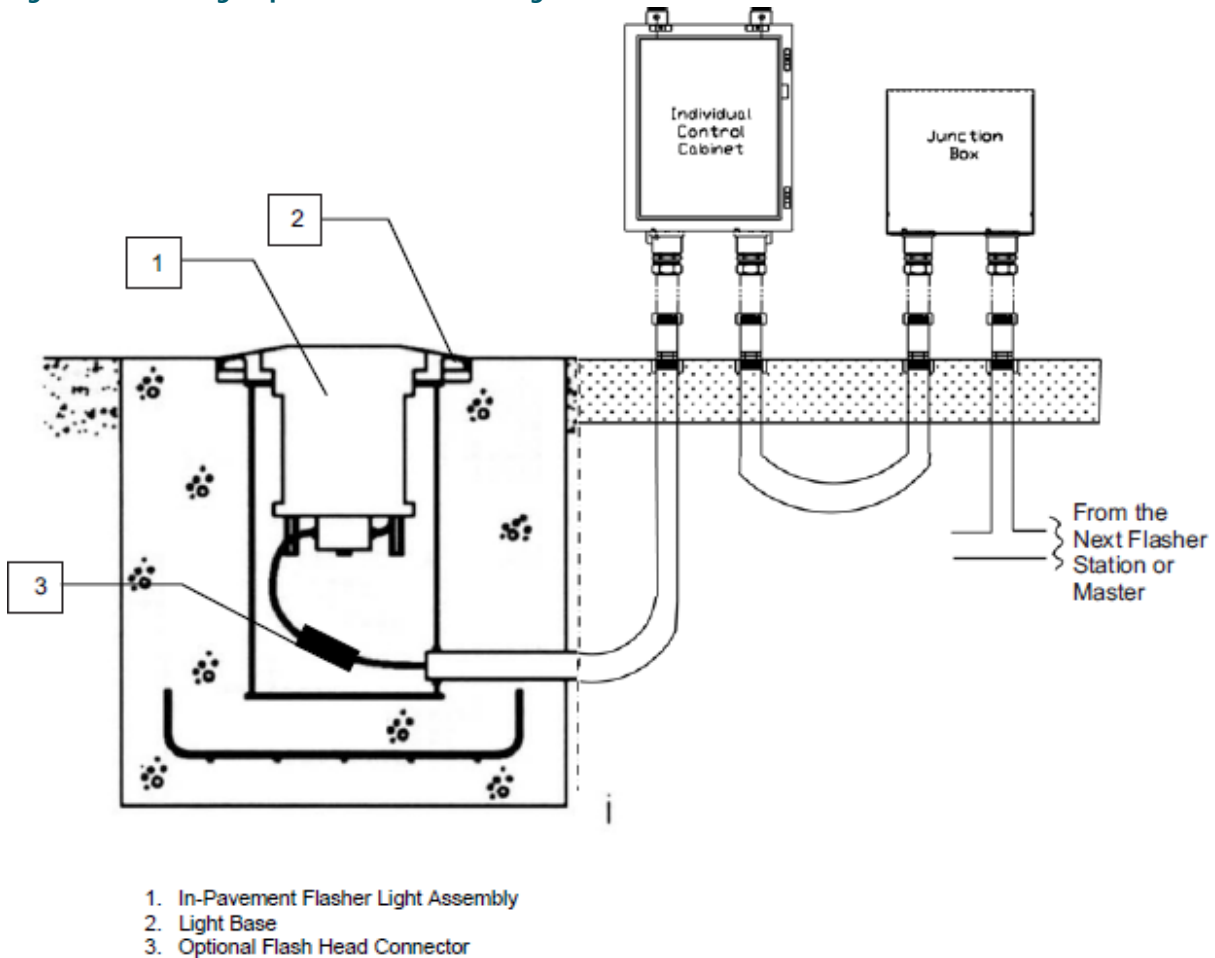
1. See Figure 28 . Clean the light base (2) receptacle. Make sure that the base receptacle does not contain water and is completely clean and dry. The mating surfaces must be clean and free of foreign particles.



#### Note

In Figure 28 , the individual control cabinet and junction box are supplied by others.

Figure 28: Installing In-pavement Flasher on Light Base



2. Place the adapter ring on the base and align 3/8-16 tapered holes with the six holes in the light base flange.
3. Bolt the adapter ring to the light base. Use six contractor-supplied bolts and lock washers and insert the bolts from inside the base through the holes in the light base flange.

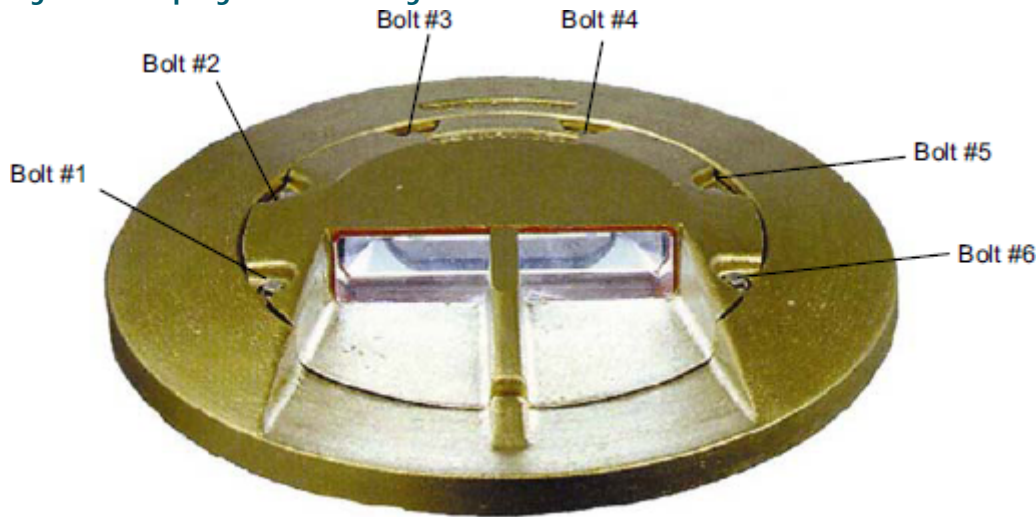


#### CAUTION

A gasket has not been supplied and no gasket is required between the adapter ring and the base. Do not install a gasket between the adapter ring and the base. Installing a gasket prevents correct load transfer when aircraft rolls over it and hinders torquing operation.

4. If thread locking adhesive is used, apply only one drop of Grade AV Loctite® to each of the six 3/8-inch (9.525-mm-) diameter optical assembly mounting bolts. See “Installation Guidance for In-pavement Fixtures”.

**Figure 29: Torquing Outer Mounting Bolts**



**i Note**

Applying more than one drop of Loctite to the bolt threads will create future difficulty in removal of the bolts.

**i Note**

After several re-lamping procedures, threaded holes may accumulate with dirt and excessive Loctite. If this occurs, screws may not seat properly. Clean tapped holes with wire brush or hand tap, then blow off with clean, dry, oil-free low pressure air, or use Loctite Chisel 79040 and spray on threads and allow to soak for 15-30 minutes, depending upon the amount of build-up. Wipe off or blow off with clean, dry, oil-free low pressure air. After the bolt has been torqued three times, replace with new bolt. If the bolt is continuously loose, inspect tapped thread in the light base flange for damage. If thread is damaged, contact ADB Safegate, Sales Department for field repair inserts kit.

5. Turn on the power to check that the lamp will illuminate. Operate for a minimum of five minutes.
6. Insert the optical assembly into the adapter ring.
7. Apply one drop of Loctite 242 to each of the six light assembly mounting bolts supplied with the in-pavement fixture. Install the six bolts and lock washers. Refer to “Installation Guidance for In-pavement Fixtures” on page 77.

### 5.2.11 Wiring Primary Control Cabinet

See [Figure 39](#) and [Figure 42](#) for the MALSR and [Figure 40](#) and [Figure 43](#) for the ALSF in the Wiring Schematics section. All wiring and connections shall be made in accordance with the National Electrical Code and Local Regulatory Authority and as specified on the installation drawings.

To wire the primary control cabinet, perform the following procedure:

1. Connect 120/240 Vac, single phase, input power (AWG 8, 600 V) to terminal block TB1 terminals TB1-1 (120 V), TB1-2 (N), and TB1-3 (120 V) in the primary control cabinet.



#### Note

For ALSF optional 480 Vac system, connect 480 Vac, input power (2-1/C, AWG 10, 600 V) to terminal block TB1 terminals TB1-1 (480 V), TB1-3 9N).

2. Connect an earth ground (AWG 4, minimum) wire to the earth ground lug on the primary control cabinet.
3. Connect the flasher power wiring (3 single-conductor, AWG 10, 600 V) from the primary cabinet terminal block TB1 terminals 6 to 8 to terminal block TB1 terminals 1 to 3 in the junction box closest to the primary.
4. Connect all junction boxes in parallel.
5. See [Figure 41](#) in the Wiring Schematics section. Refer to [Table 14](#) and [Table 15](#).

Make remote control connections (either 120 Vac or +48 Vdc) as shown in [Figure 42](#) to terminal block TB6 and remote indications as shown on TB4. A separate male terminal block is provided to make these connections.



#### Note

+48 Vdc can be used for remote control. Connect +48 Vdc COMMON to TB6-8. Do not use TB6-1 if +48 Vdc control is used.

**Table 14: Remote Control Connections to Terminal Block TB6 in Primary Control Cabinet**

If operation desired is to...		Then connect TB6-1 to...	And open TB6-1 to...
Turn approach system on		TB6-7	Not applicable
Turn approach system off		Not applicable	TB6-7
Set ALSF mode only		TB6-2	Not applicable
Set SSALSR mode only		Not applicable	Not applicable <sup>1</sup>
Set individual intensity command	Low Intensity	TB6-3	TB6-4, -5
	Medium Intensity	TB6-4	TB6-3, -5
	High Intensity	TB6-5	TB6-3, -4
Set incremental intensity command	Low Intensity	TB6-3	TB6-4, -5
	Medium Intensity	TB6-3, -4	TB6-5
	High Intensity	TB6-3, -4, -5	Not applicable

#### Notes

- <sup>1</sup> If voltage is present on TB6-2, ALSF mode is commanded. When no voltage is present, SSALR mode is commanded.
- <sup>2</sup> Refer to "Adjusting Intensity Command Dip Switch on Control PC Board" on page 58 under "Programming Primary PCBs" on page 58
- <sup>3</sup> Refer to "Adjusting ALSF Intensity Command Dip Switch" on page 60 under "Programming Primary PCBs" on page 58.

**Table 15: Remote Feedback Indication Connections to TB4 in the Primary Control Cabinet**

If remote feedback indication is...	Then signal is present from TB4-1 to...	And connection is...
ALSF Mode only	TB4-3	Closed
SSALR Mode only	TB4-3	Open
Low Intensity	TB-4-4	Closed

**Table 15: Remote Feedback Indication Connections to TB4 in the Primary Control Cabinet (Continued)**

<b>If remote feedback indication is...</b>	<b>Then signal is present from TB4-1 to...</b>	<b>And connection is...</b>
Medium Intensity	TB-4-5	Closed
High Intensity	TB-4-6	Closed
Flasher System ON	TB-4-7	Closed
Flasher System OFF	TB-4-7	Open
Primary in Local Control	TB-4-8	Closed
Primary in Remote Control	TB-4-8	Open
Caution Mode	TB-4-9	Closed
Fault Mode	TB-4-10	Closed

### 5.2.12 Wiring Individual Control Cabinet

Make wiring connections as shown on the external wiring diagram shown in [Figure 39](#) for the MALSR and [Figure 40](#) for the ALSF in the Wiring Schematics section. See also [Figure 44](#) for a detailed schematic for the elevated flasher and [Figure 44](#) for a detailed schematic for the in-pavement flasher.

To wire the individual control cabinet, perform the following procedure:

1. Make power connections from TB1-1 to TB1-3 in the junction box to TB1-1 to TB1-3 in the individual control cabinet using 3 single-conductor, AWG 10, 600 V wire.
2. Ground cabinet using AWG 10 (minimum) ground wire connected to ground lugs E1 in the individual control cabinet and junction box. Connect ground wire to a grounding rod or counterpoise installed a short distance from the junction box.
3. Make connections from terminal block TB2 in the junction box to terminal block TB1 in the individual control cabinet as shown on the wiring diagram.

### 5.2.13 Wiring Junction Box

See [Figure 39](#) for the MALSR or [Figure 40](#) for the ALSF in the Wiring Schematics section.

Two 2-inch (50.8 mm) conduit hubs are provided on the bottom of the box for wire entrance and exit. Refer to FAA drawing D-6131-17 for tower wiring.

To wire the junction box, perform the following procedure:

1. Connect power wiring (3 - 1/C - 10 AWG, 600 V) from junction box terminal block TB1 terminals 1 to 3 to individual control cabinet terminal block TB1 terminals 1 to 3, respectively for all flashers.
2. Connect the trigger wiring from junction box 1 terminal block TB2-1 to terminal block TB1 in individual control cabinet #1, from junction box 2 terminal block TB2-2 to terminal block TB1-6 in individual control cabinet #2; from TB2-3 in junction box 3 to TB1-6 in individual control cabinet #3, etc. Use AWG 18, 600 V wire for trigger wiring.
3. Make connections from TB2 terminals 1 to 4 in primary control cabinet to TB2 terminals 8 to 11 in junction box closest to primary using AWG 18, 600 V wire.
4. Wire all other junction boxes in parallel.

### 5.2.14 Wiring Elevated Flasher Light Unit

To wire the elevated flasher light unit, perform the following procedure:

1. See [Figure 39](#) for the MALSR and [Figure 40](#) for the ALSF in the Wiring Schematics section. Use AWG 12, 3 kV silicone wire for all wire connections between individual control cabinet and flash head.
2. Make the following wiring connections between individual control cabinet and flash head:
  - TB2 terminal 1 in individual control cabinet to high-voltage TB1 terminal 1 (anode) in flash head
  - TB2 terminal 2 to TB1 terminal 2 (cathode)
  - TB2 terminal 3 to TB1 terminal 3 (trigger)
  - TB2 terminal 4 to TB1 terminal 4 (interlock)
  - TB2 terminal 5 to TB1 terminal 5 (interlock)

### 5.2.15 Wiring In-pavement Flasher Light Unit

To wire the in-pavement flasher light unit, perform the following procedure:

1. See [Figure 39](#) for the MALSR and [Figure 40](#) for the ALSF in the Wiring Schematics section. See [Figure 44](#) for in-pavement flasher with PCB wiring. See [Figure 45](#) for the trigger interface wiring. See [Figure 46](#) for the in-pavement without PCB



wiring. Use AWG 12, 3 kV silicone wire or 6 conductor wire (part number 6104.90.206) for all wire connections between individual control cabinet and flash head.

2. Make the following wiring connections between individual control cabinet and flash head:

- TB2 terminal 1 in individual control cabinet to high-voltage TB1 terminal HT (anode) in flash head
- TB2 terminal 2 to TB1 terminals 1 (cathode) and 3 (trigger ground)
- TB2 terminal 3 to TB1 terminal 2 (trigger)
- TB2 terminal 4 to TB1 terminal 4 (interlock)
- TB2 terminal 5 to TB1 terminal 5 (interlock)

### 5.2.16 Wiring PAR-38/PAR- 56 (MALSR Only)

See [Figure 39](#) in the Wiring Schematics section. To wire the MALSR PAR-38/PAR-56, use 3 single-conductor (AWG 2, 600 V) wires to connect the PAR-38 or PAR-56 lampholders to the 15 kVA power transformer's terminal block TB1 terminals X1 (120 V/75 V/50 Vac), X2 (NEUTRAL) and X3 (120 V/75 V/50Vac).

### 5.2.17 Wiring 15 kVA Power Transformer (MALSR Only)

The power transformer supplies power to the PAR-38 approach lights and the PAR-56 steady burning threshold lights.

To wire the MALSR 15 kVA power transformer, perform the following procedure:

1. See [Figure 39](#) in the Wiring Schematics section. Connect the primary cabinet terminal strip TB1 terminals 5, 6, and 7 to terminal block TB1 terminals H1 (MEDIUM), H2 (HIGH), and H3 (LOW) in the power transformer, respectively.
2. Connect terminal TB1-4 through TB1-7 (120 Vac) in the primary control cabinet initially to TB1-2 on the power transformer. This tap may require adjustment to obtain the correct output voltage.



#### Note

Taps TB1-1 through TB1-8 are provided to adjust the output voltage of the power transformer. Refer to Step 13 in Start-Up Adjustments in the Operations section for adjustment procedure. Use 3 single-conductor (AWG 4, 600 V) wires for the connections.

3. Connect an AWG 2 (minimum) ground wire to the earth ground lug on the power transformer.
4. See [Figure 39](#) . Connect terminals X1 (120V/75V/50 VAC), X2 (NEUTRAL), and X3 (120V/75V/50 VAC) on terminal block TB1 in the power transformer to the PAR-38/PAR- 56 lampholders. Use 3 single- conductor (AWG 2, 600 V) wires for the connections for each terminal.

### 5.2.18 Aiming Lampholders

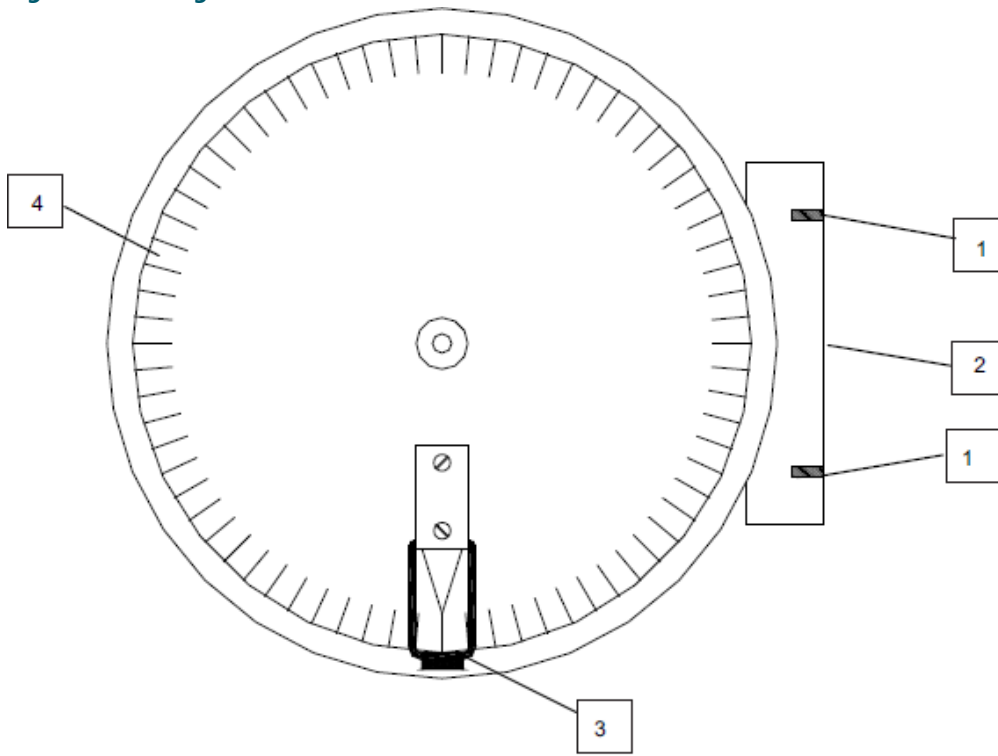
An aiming device is used to set the vertical angular position of the lamps. The lampholders are mounted on either conduit, pipe, or towers as outlined in the site installation drawings.

#### 5.2.18.1 Assembling Aiming Device

To assemble the aiming device, perform the following procedure:

1. Remove the aiming device components from the instrument case.
2. See [Figure 30](#) . Remove two #10-32 x 3/4 screws (1) from the aiming device mounting pad (2).

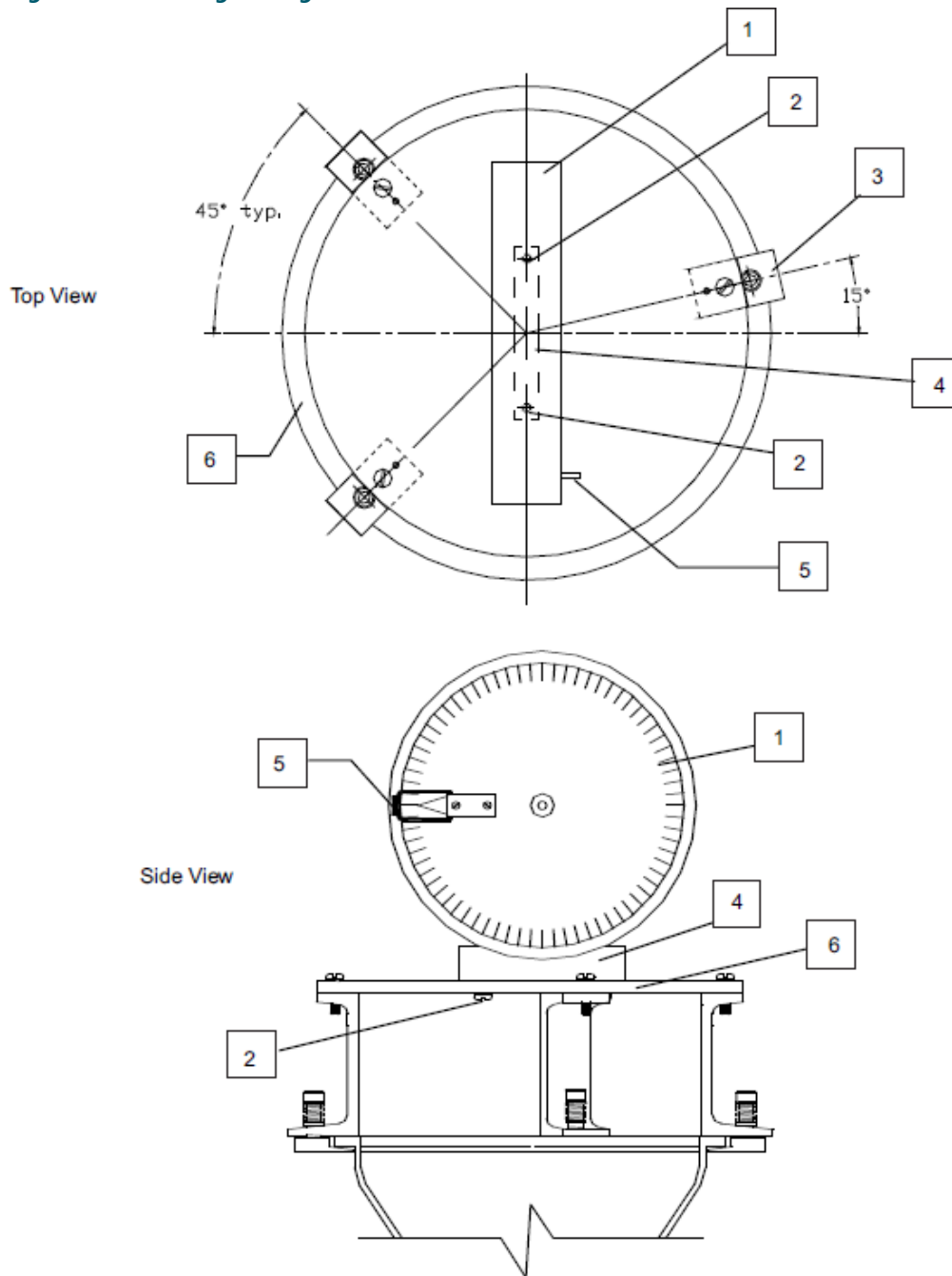
**Figure 30: Aiming Device**



1. #10-32 x 3/4 Screws
2. Bottom of Mounting Pad
3. Locking Lever
4. Aiming Device Dial Face

- See [Figure 31](#) . Take the base plate (6) (round disc with three standoffs) and rotate so that the standoff (3), located at 15 degrees above the horizontal, is positioned to the right of the assembler.

**Figure 31: Mounting Aiming Device**

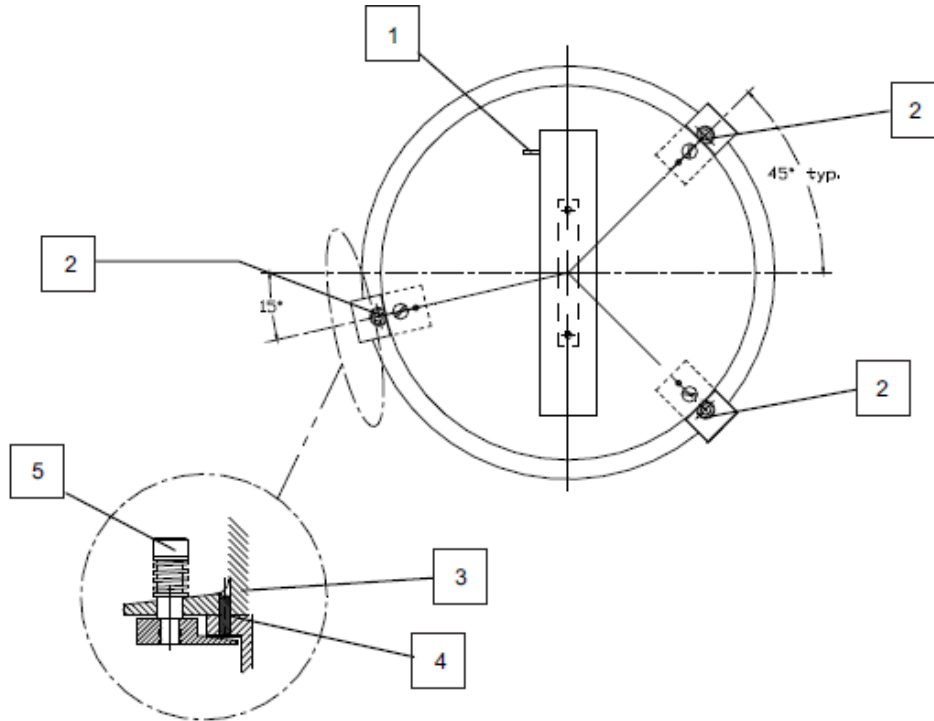


- |                         |                                   |                  |
|-------------------------|-----------------------------------|------------------|
| 1. Aiming Device Dial   | 3. Standoff Located at 15 Degrees | 5. Locking Lever |
| 2. # 10-32 x 3/4 Screws | 4. Mounting Pad                   | 6. Base Plate    |

- Take the aiming device and turn it so that when mounted on the base plate (6) the dial (1) is facing toward the single standoff (3) located at 15 degrees. Position the two tapped holes in the bottom of the mounting pad over the mating holes in the base plate. Insert mounting pad screws (2) and lockwashers and tighten hardware.

5. See Figure 32. Rotate the three-leg clamps (3) so that the tapered tang on the clamp is at a right angle to the back edge of the standoff by pushing down on the spring-loaded shoulder screw (5).

**Figure 32: Aiming Device Leg Clamp Locations (Top View)**



- |                        |                              |                                 |
|------------------------|------------------------------|---------------------------------|
| 1. Locking Lever       | 3. Section View of Leg Clamp | 5. Spring-Loaded Shoulder Screw |
| 2. Leg Clamp Locations | 4. Index Pin                 |                                 |

6. Attach the snap-swivel and cord to the aiming dial locking lever (1) if the lever cannot be reached during the aiming procedure. The aiming device is now ready to be mounted on the lampholder.

### 5.2.18.2 Aiming Lamp Holders (Conduit or Pipe Mounted)

This section outlines the procedure to aim steady burning or flashing lamp units that are mounted at ground level to approximately a six-foot (1.83-m) elevation (or easily reached by a ladder).

To aim lamp holders, perform the following procedure:

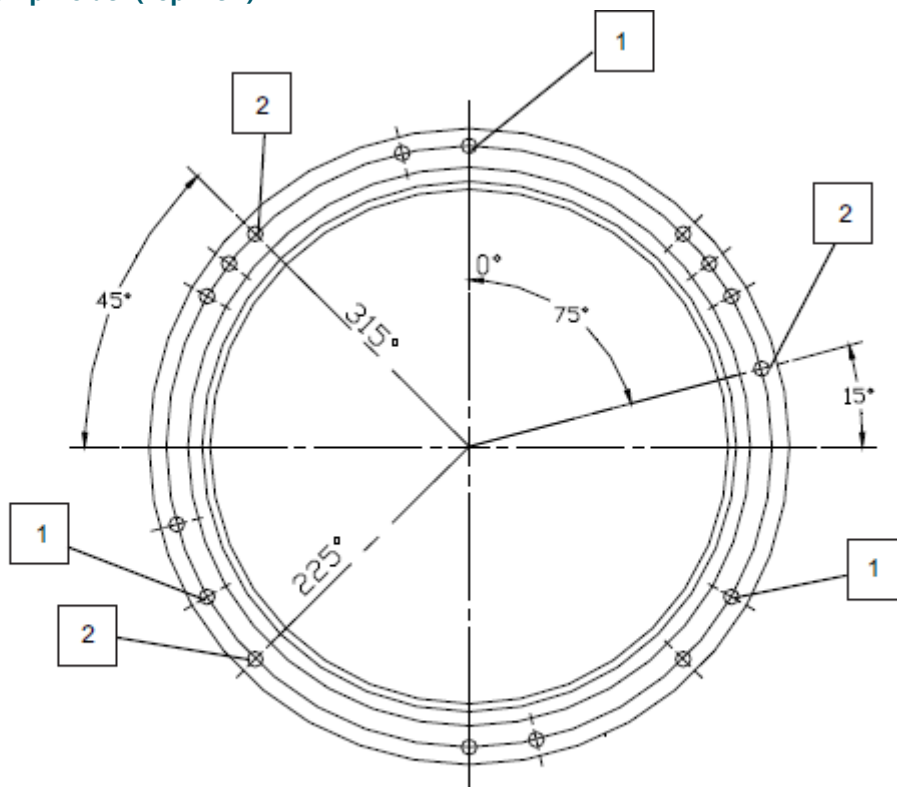
1. After the lamp holder has been wired and secured to conduit or pipe and aligned with the runway centerline per site specifications, secure the aiming device to the lamp holder.
2. Take the assembled aiming device and position it over the face of the lamp and align the three indexing pins (see [Figure 24](#) , Item 4), protruding from each of the standoffs, with the three mating index pin holes (see [Figure 25](#) , Item 2) found in the flanged lip of the lamp holder.



#### Note

See [Figure 33](#) . These indexing pins and holes are located at 75, 225, and 315 degrees.

**Figure 33: Lamp Holder (Top View)**



1. Lamp Clips
2. Index Pin Holes

3. See [Figure 31](#) . Place the index pin located in the standoff (3) located 15 degrees counterclockwise from horizontal into the index hole located approximately at 2 o'clock position on the lamp holder's flanged lip.



#### Note

After this first index pin has been inserted into the correct hole, the other two index pins will fit only into their correct holes.



**Note**

See Figure 30 . When the aiming device has been installed correctly, the aiming device dial face (4) is located to the installer's right and the device hangs vertically.



**Note**

Once the aiming device is oriented correctly and index pins are inserted into the index holes, the standoffs will set against the lip of the lamp holder.

4. See Figure 7 . To clamp the aiming device onto the lamp holder, rotate the three leg clamps (3) by pushing down on the spring-loaded shoulder screws (5), so that the tapered tang grips the backside of lamp holder's rim. Once the leg clamp is in position, release the pressure on the spring-loaded shoulder screw.
5. See Figure 31 . Release the aiming dial (1) by pulling back on the locking lever (5) and holding open with hasp.
6. See Figure 34 . To aim the lamp holder to the required vertical setting, loosen the two 1/4- 20 jam nuts (1) on the adjusting screws (2,4) located on the side of the lamp holder's slip fitter, and then turn both adjusting screws until the required elevation setting is reached on the aiming device dial.



**Note**

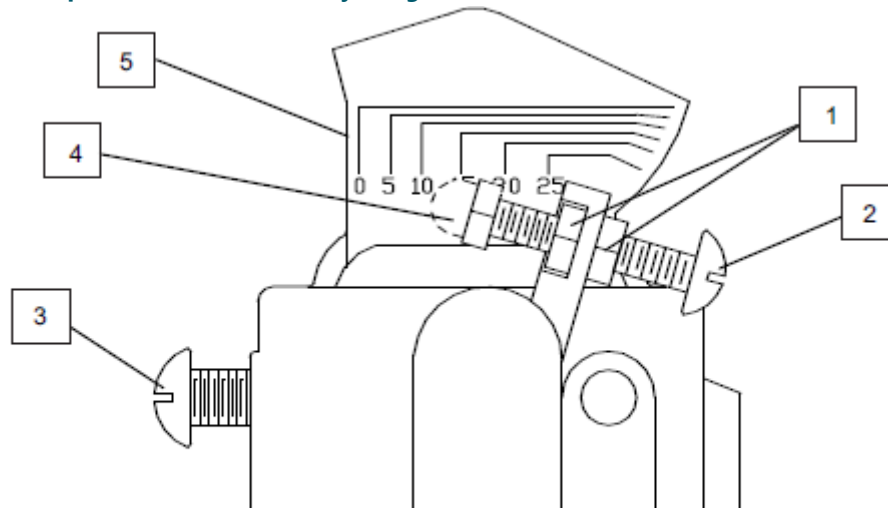
The scale on the aiming device dial is calibrated in 1-degree increments.



**Note**

The adjusting screws are designed to work against each other. If one screw is turned clockwise, as viewed from the head of the screw, then the other screw is turned counterclockwise to effect a change in elevation setting.

**Figure 34: Slip Fitter Dial Face and Adjusting Screws**



1. Jam Nuts

3. Slip Fitter Screw

5. Slip Fitter Dial

2. Adjusting Screw

4. Adjusting Screw

7. Once the desired setting is achieved, make sure that both adjusting screws are seated against screw stops, then tighten all jam nuts to lock adjusting screws in place.



**Note**

Recheck to make sure the angle setting has not changed when screws/nuts were tightened. If the setting has changed, loosen nuts and adjust accordingly.

8. Remove the aiming device fixture by rotating the leg clamps away from the lamp holder's flanged lip.
9. Repeat above steps for each lamp holder in the system.

### 5.2.18.3 Aiming Lamp Holders (Tower Mounted)

This subsection outlines the procedure to aim steady burning or flashing PAR-56 lamp units that are mounted on aluminum or fiberglass towers (masts).

To aim the tower-mounted lamp holders, perform the following procedure:

1. Place the tower in the down position. Rest the tower on a sawhorse or other adequate support structure. Mount and wire the lamp unit and align with the runway centerline per site specifications.
2. See [Figure 34](#) . Loosen 1/4-20 jam nuts (1) on the adjusting screws (2,4) that are located on the sides of the lamp holder's slip fitter.
3. Turn the adjusting screws so that the bottom edge of the lamp holder is aligned with the zero angle setting as marked on the dial (5) on the side of the slip fitter. Tighten the jam nuts to lock the lamp holder in the zero position.
4. See [Figure 31](#) . Take the assembled aiming device, remove the aiming dial, and then install the dial on the slip section, supplied by tower manufacturer (Ref. VEGA F.A.M. by Jaquith Industries) using the dial strap clamp. Release the aiming dial by pulling back on the locking lever (5), and hold the lever open with the hasp.
5. See [Figure 33](#) . Read and record the angle of the tower as it rests on the sawhorse, then aim the lamp holder to the required vertical setting by loosening the two 1/4-20 jam nuts (1) on the adjusting screws again and turning the screws until the required elevation setting is reached.



#### Note

To make an accurate determination of the required elevation setting while the tower is resting on the sawhorse, compensation must be made for both the angle of the tower and the natural droop at the top of the tower due to its weight. Refer below for an example of how to compensate for these two factors.

#### Example:

Elevation desired is 14 degrees. The aiming dial in free mode reads 84 degrees. The angle of the tower on the sawhorse (recorded previously) is 10 degrees.

To determine the elevation setting, perform the following: First, turn the adjusting screws until the aiming dial reads 90 degrees minus 10 degrees = 80 degrees.

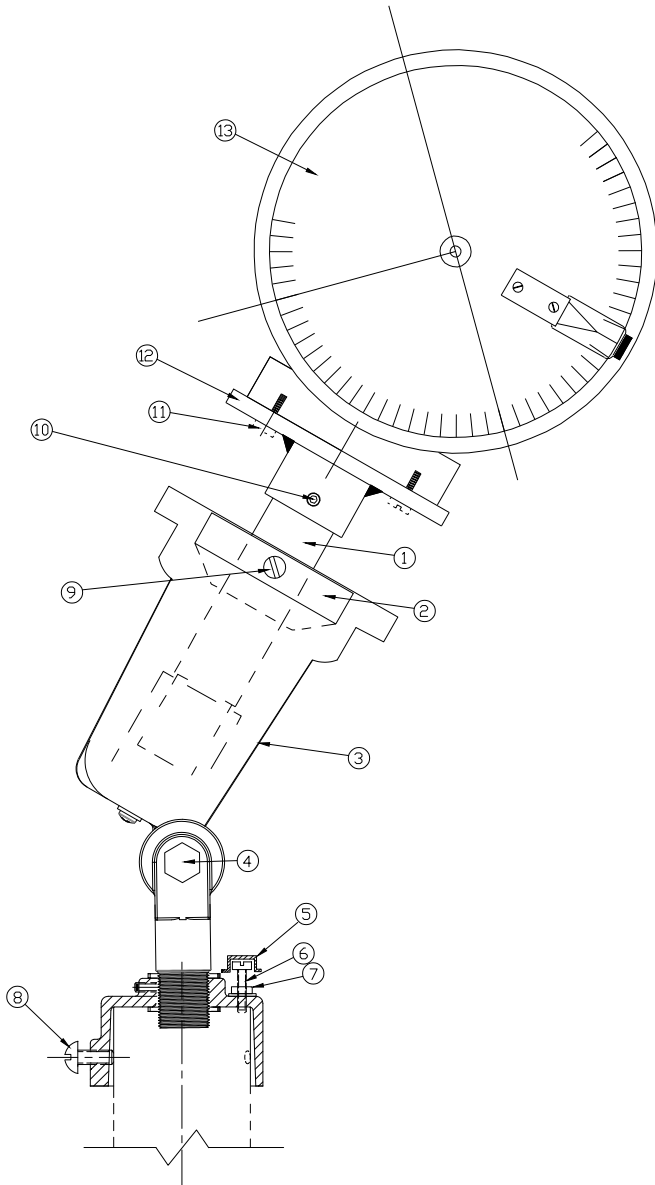
Second, subtract the desired elevation angle (14 degrees) from 80 degrees. The result is 66 degrees (90-10-14 = 66). This is the new angle required. Continue turning adjusting screws until this setting is reached.

6. Now remove the aiming dial from the tower's slip section, reassemble on the base plate, and install the aiming assembly on the lamp holder.
7. After the setting has been reached, tighten both jam nuts on the adjusting screws to lock the lamp holder into position.
8. Now lock the aiming dial in place by releasing the hasp. The locking lever will now prevent the dial from turning.
9. Attach the snap-swivel and nylon cord to the locking lever before raising the tower.
10. Raise and lock the tower into vertical position. Pull on the cord and hold to allow the aiming dial to rotate so that it can measure the elevation angle of the lamp holder.
11. After the aiming dial has come to rest, release the cord and lock the dial in place. Lower the tower and read the elevation setting of the lamp holder. If the desired setting has not been obtained, release the dial and loosen the jam nuts on the adjusting screws. Turn the screws accordingly to correct the elevation setting.
12. Repeat steps 6 through 11.
13. After the correct elevation has been achieved, secure the tower and repeat the process for all remaining towers.

### 5.2.19 Aiming PAR-38 Lampholders (MALSR Only)

To aim the MALSR PAR-38 lamp holders, follow the procedure in this section for Adjusting Horizontal Aim and Adjusting Vertical Aim.

**Figure 35: MALSR PAR-38 Aiming Device**



**Table 16: PAR-38 Lamp Holder Assembly With Aiming Device**

Item	Description
1	Socket Adapter
2	Support Plug
3	Lamp Housing
4	Knuckle Assembly
5	Hex Head Bolt Cap
6	SS Vertical Support Bolt
7	SS Nut
8	SS Hex Head Bolt
9	Set Screw
10	Set Screws



**Table 16: PAR-38 Lamp Holder Assembly With Aiming Device (Continued)**

Item	Description
11	Screws
12	Aiming Device Mounting Adapter
13	Aiming Device

### 5.2.19.1 Adjusting Horizontal Aim

To adjust the horizontal, perform the following procedure:

1. See [Figure 35](#) . Loosen the 3 hex bolts (8) in slip fitter and/or the 8-32 set screw in the slip fitter’s collar.
2. Rotate the assembly to the correct horizontal position with the center of the light beam parallel to the runway centerline.
3. Tighten the 3 hex bolts (8) in the slip fitter.

### 5.2.19.2 Adjusting Vertical Aim

To adjust the vertical, perform the following procedure:

1. See [Figure 35](#) . Attach the support plug (2) onto the socket adapter (1).



#### Note

The tapered end of the support plug (2) should be on the same end as the threads on the socket adapter (1). Locate the support plug 2.124 inches from the threaded end of the socket adapter (1) and tighten the set screw (9) to hold in place.

---

2. Attach aiming device mounting adapter (12) to aiming device (13) using two screws (11).
3. Loosen the screw in the knuckle assembly (4) of the lamp holder rotate the lamp housing (3) to convenient working angle of approximately 45 degrees and tighten screw in the knuckle assembly (4).
4. Make sure that power to the lamps has been turned off.
5. Screw the socket adapter (1) with the attached support plug (2), into the lamp housing (3).
6. Place the aiming device (13) with the attached mounting adapter (12), onto the end of the socket adapter (1).
7. Position the dial face of the aiming device (13) vertically so that the dial is level and can be read and the dial can rotate freely. Tighten the two set screws (10) in the mounting adapter's sleeve to hold in position.
8. Remove cap (5) from vertical support screw (6).
9. Loosen nut (7).
10. Adjust vertical support screw (6) so the head of the screw is approximately level with with the knuckle assembly bolt.
11. Place cap (5) back on the vertical support screw.
12. Loosen the screw (4) in the knuckle assembly and move the lamp housing to correct the vertical angle (according to site specifications). Tighten knuckle assembly (4) and recheck setting.
13. Torque knuckle assembly nut (4) to 30-32 in-lbs.
14. Adjust vertical support bolt (6) by hand until the cap is touching the lamp housing.
15. Tighten nut (7).

## 5.2.20 Programming Primary PCBs

This subsection describes procedures for programming the primary PCBs.

### 5.2.20.1 Adjusting Flasher Dip Switches on Control PC Board

See [Figure 21](#) in this section. Set the three sets (S1, S2, S3) of 7 dip switches (6) to ON or OFF position according to the number of flashers that are wired to the I/O PC board at the bottom of the Control PC board in the primary control cabinet.

#### Note

The protective plastic cover on the dip switches can be pulled off to set the switches.

For the MALSR mode, set every other switch (starting from the first switch on S1 going left to right) to the ON position until the number of switches turned on equals the number of flashers in the system.

For ALSF mode, turn on the switches consecutively (starting from the first switch on S1 going from left to right) according to the number of flashers.

#### Note

Refer to [Table 17](#) for setting the switches to indicate the number of flashers in standard MALSR and ALSF configurations.

**Table 17: Setting Switches For Number of Flashers**

# FLASHERS	S1							S2							S3							
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	
5 (MALSR)	•		•		•		•	•														
8 (MALSR)	•		•		•		•	•			•		•		•							
12	•	•	•	•	•	•	•	•	•	•	•	•	•									
15	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
21	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	

Note that indicates that the switch is in the ON position. An empty location indicates that the switch is in the OFF position. For example, a MALSR system with 5 flashers would have the following configuration of S1, S2 and S3:

S1 ON - #1, #3, #5, #7

S2 ON - #2

S3 ON - None

All other switches will be in the OFF position. An ALSF system with 12 flashers would have the following configuration of S1, S2 and S3:

S1 ON - #1, #2, #3, #4, #5, #6, #7

S2 ON - #1, #2, #3, #4, #5

S3 ON - None

All other switches will be in the OFF position.

### 5.2.20.2 Adjusting Intensity Command Dip Switch on Control PC Board

This subsection provides information for adjusting the MALSR and ALSF intensity command dip switch on the control PCB.

### 5.2.20.3 Adjusting Intensity Command Dip Switch

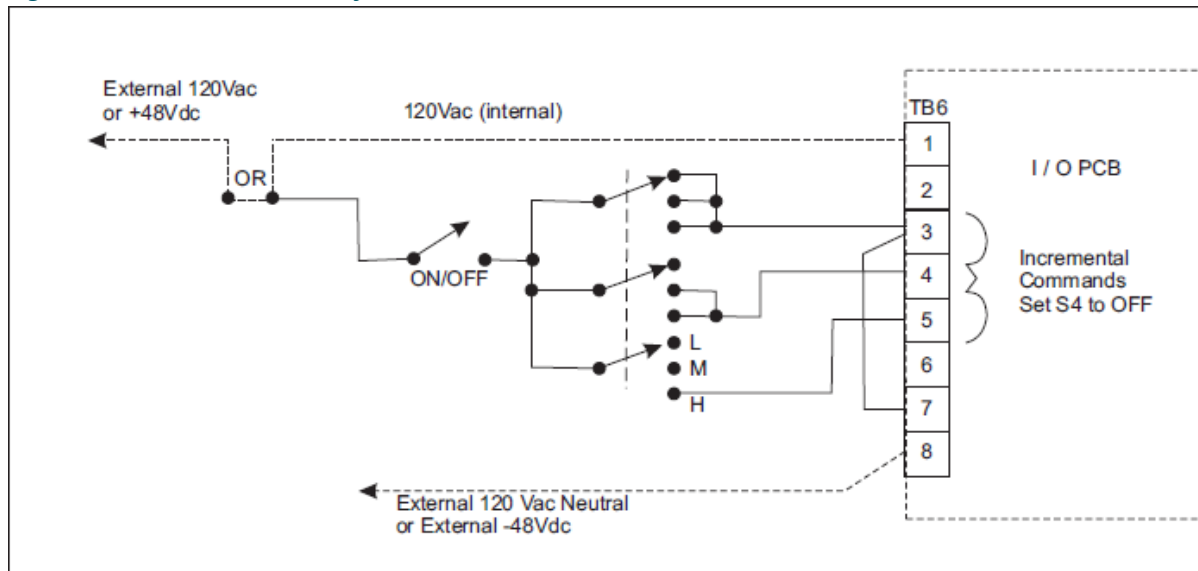
See [Figure 21](#) . For the MALSR system, an intensity-command-mode dip switch S4 (1) is located on the Control PC board in the primary control cabinet. Four dip switches are present, but only dip switch #1 is connected. Verify that switch #1 is set to the OFF position.

#### **i** Note

The ON/OFF position is marked on the dip switch (10).

See [Figure 36](#) . Refer to [Table 18](#) for the incremental intensity commands normally used for the MALSR system.

**Figure 36: Incremental Intensity Commands**



**Table 18: Table 3-6 Incremental Intensity Commands S4 Dip Switch #1 Set to OFF**

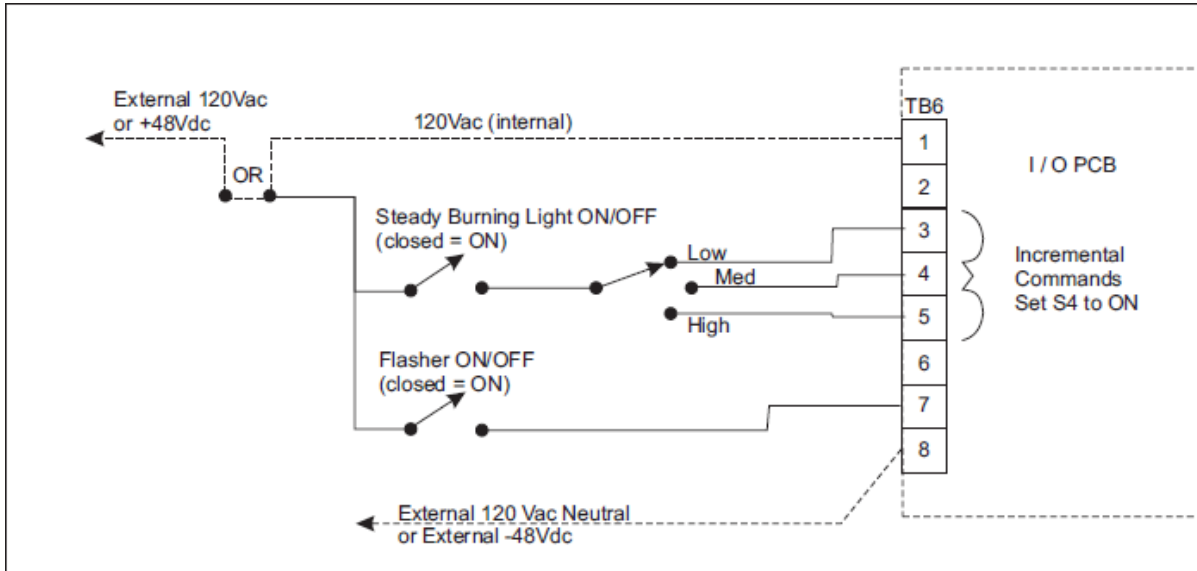
Intensity Command	Signal Present on TB6-3	Signal Present on TB6-4	Signal Present on TB6-5
Low	Yes	No	No
Medium	Yes	Yes	No
High	Yes	Yes	Yes

### 5.2.20.4 Adjusting ALSF Intensity Command Dip Switch

For the ALSF system, see [Figure 37](#) . Refer to [Table 19](#) for the individual intensity commands normally used on the ALSF system.

See Figure 21 . Verify that S4 switch #1 set to ON.

**Figure 37: Individual Intensity Commands/Separate Control of Steady Burning Lights and Flashers**



**Table 19: Individual Intensity Commands S4 Dip Switch #1 Set to ON**

Intensity Command	Signal Present on TB6-3	Signal Present on TB6-4	Signal Present on TB6-5
Low	Yes	No	No
Medium	No	Yes	No
High	No	No	Yes

### 5.2.20.5 Turning Off Flashers

If it is desired to turn off the flashers while maintaining control of the steady burning lights, see Figure 36 .

#### 5.2.20.6 Adjusting Thumb Wheel on Control PC Board

See [Figure 20](#) . The thumb wheel (9) on the control PC board is used with the monitoring option in the primary control cabinet. Set the thumb wheel to the number of flasher misfires for the monitoring system to indicate a fault condition.

For example, if the thumb wheel is set to 5, the system triggers an alarm after 5 misfires are detected.

#### 5.2.20.7 Checking and Adjusting for Start-Up

Refer to Start-Up Procedures in the Operations section for start-up checks and adjustments.

## 6.0 Operation

This section provides information for operating the medium intensity approach lighting system with runway alignment indicator lights (MALSR) and approach lighting system with sequenced flashers (ALSF).

Operating the MALSR/ALSF involves local and remote control; interlock switches; ground fault interpreter; controls and indicators on input/output and control PCBs; start-up and emergency, equipment, and individual cabinet shutdown procedures; and radio controller operations (MALSR only).

### Local and Remote Control

The MALSR/ALSF system can be operated by local control by manually setting switches on the control panel in the primary control cabinet. The MALSR/ALSF can also be operated by remote control using +48 Vdc or 120 Vac signals to turn the system on or off and to set the system to one of three brightness levels: low, medium, or high. See [Figure 36](#) and [Figure 37](#) for an example of remote control wiring. A source of 120 Vac for control is available from TB6 #1, or an external source of 120 Vac or +48 Vdc can also be used. If an external control voltage source is used TB6 #8 should be used for the 120 Vac neutral or -48 Vdc connection.

See [Figure 3](#) through [Figure 5](#) in the Description section. Refer to [Table 20](#) . Local control uses five-position rotary switch S5 (17) on the control panel in the primary control cabinet. Refer to [Table 21](#) for more information about local and remote control.

**Table 20: Local Control Switch S5 Functions**

Switch Position	Function
REMOTE	System operates by 120 Vac or +48 Vdc signals only. Turns on system to one of three intensity levels or off from an interface panel or air-ground receiver.
OFF	Turns system off
LOW	Turns system on to low intensity
MEDIUM	Turns system on to medium intensity
HIGH	Turns system on to high intensity

### Interlock Switches

Interlock switches are provided on all the flashers and control cabinets to disconnect power when a cabinet door or flasher is opened. The interlock switch is closed on the primary and individual control cabinets when the cabinet door is closed and the screws on the door are tightened. The interlock switch on the primary and individual control cabinets can be bypassed for servicing by simply pulling out the shaft of the interlock switch. However, the interlock switch on the flasher can be defeated only by carefully shorting terminals 4 and 5 on terminal block TB2.



### CAUTION

Do not forget to remove short after servicing is completed. Failure to observe may result in equipment damage.

### Ground Fault Interpreter

See [Figure 3](#) through [Figure 5](#) . The ground fault interpreter (GFI) outlet (3) on the primary control cabinet supplies 120 Vac power for operation of external equipment. This outlet is designed to prevent accidental electrocution of the operator using the outlet. The Test button is used to test the operation of the GFI outlet. The Reset button is used to reset the GFI outlet when it is tripped.

### Controls and Indicators

This subsection describes controls and indicators for the primary control cabinet, input/output PCB, control PCB, and monitor PCB.

## 6.1 Primary Control Cabinet Controls and Indicators

See [Figure 3](#) through [Figure 5](#) in the Description section. Refer to [Table 21](#) for primary control cabinet controls and indicators.

**Table 21: Primary Control Cabinet Controls and Indicators**

Item	Controls/Indicators	Function
1	Interlock switch	Allows the primary control cabinet to be energized when the door is closed. Refer to "Interlock Switches" on page 61.
2 <sup>1</sup>	Switch S2	Turns maintenance light on or off in the primary timer.
4	Fuse F1 (5 A)	Protects maintenance light circuit.
5	Fuse F2 (15 A)	Protects 120 Vac receptacle.
6	Hour Meter	Records number of hours of lamp operation at the high intensity level.
7	Fuse F3 (1A, S.B.)	Protects power to DC supply.
8	Fuse F4 (10 A)	Protects power to contactors and trigger circuit.
9	Circuit breaker CB2 (15 A)	Protects 120/240 Vac for MALSR (120 Vac for ALSF) control circuit power to interlock switch for MALSR.
10	Fuse F5 (10 A)	Protects power to remote control.
11	Circuit breaker CB3 (30 A)	Protects 120/240 Vac power supply controller by a contactor that is used to supply the individual control cabinet.
12	Circuit breaker CB1 (100 A)	Provides 120/240 Vac power for disconnect switch to turn system on or off.
13	Switch S3 (ALSF/SSALR only) Switch S4 (MALSR only)	Selects ALSF and SSALR modes as long as switch S5 has not been set to REMOTE. Allows the sequenced flashers to be turned on or off when the approach lights are energized.
14	LED indicator HI	When lit, indicates system on high intensity.
15	LED indicator MED	When lit, indicates system on medium intensity.
16 <sup>2</sup>	LED indicator LOW	When lit, indicates system on low intensity.
17	Switch S5	Selects operational mode. Under remote operation, allows the system to be turned on to one of three intensity levels or turned off from an interface panel or air-ground receiver. Refer to <a href="#">Table 20</a> .
32	Circuit breaker CB4 (70 A) (MALSR only)	Protects 120/240 Vac approach light power.
33	LED ON (MALSR only)	When lit, indicates system is turned on.

### Notes

<sup>1</sup> The maintenance light will operate even if the power disconnect switch has been opened. Unscrew wire cage to replace lamp.

<sup>2</sup> The LOW LED is lit when :

- S5 is set to LOW.
- S5 is set to REMOTE and remote control switch is set to LOW.
- S5 is set to OFF and voltage is present.
- REMOTE is set to OFF and voltage is present. (This indicates that the primary is in hot standby mode.)



### 6.1.1 Input/Output PCB Controls and Indicators

See [Figure 18](#) in the Installation section. Refer to [Table 22](#) for Input/Output (I/O) PCB controls and indicators.

**Table 22: Input/Output PCB Controls and Indicators**

Item	LED	Description	Function
1	LED #32	Remote ALSF/SSALR mode LED (ALSF/SSALR only)	When unlit, indicates ALSF mode is selected. When lit, the SSALR mode is selected. Works only under remote control.
3	LED #33	Remote low intensity LED	When lit, indicates system operating at low intensity under remote control.
4	LED #34	Remote medium intensity LED	When lit, indicates system operating at medium intensity under remote control.
5	LED #35	Remote high intensity LED	When lit, indicates system operating at medium intensity under remote control.
7	LED #36	Remote flashers ON LED	When lit, indicates power is supplied to flashers under remote control.
11 <sup>1</sup>	LED #40	Monitor failure LED (red)	When lit, indicates monitor has failed.
12 <sup>1</sup>	LED #41	Monitor operational condition LED (green)	When lit, indicates monitor is functioning properly.
13	LED #30	Flasher medium intensity	When lit, indicates flashers operating at medium intensity.
14	LED #31	Flasher high intensity LED	When lit, indicates flashers operating at high intensity.
19 <sup>2</sup>	LED #1 through 21	Flasher LEDs (green)	When lit, indicates when the corresponding flasher flashes.
20 <sup>2 3 4</sup>	LED #29	Fault indicating LED	When lit, indicates the preset failure level has been reached.
21	LED #28	Caution indicating LED	When lit, indicates the impending flasher failure level has been reached. System is still operable.
23	LED #27	Local/Remote LED	When lit, indicates system is under local control. When unlit, indicates system under remote control.
24	LED #26	Flasher On LED	When lit, indicates power is being supplied to flashers under local control.
25	LED #25	High Intensity LED	When lit, indicates system operating at high intensity under local control.
26	LED #24	Medium intensity LED	When lit, indicates system operating at medium intensity under local control.
27	LED #23	Low intensity LED	When lit, indicates system operating at low intensity under local control.
28	LED #22	ALSF/SSALR mode LED (ALSF/SSALR only)	When unlit, indicates ALSF mode is selected. When lit, the SSALR mode is selected. Works only under local control.

**Notes**

- <sup>1</sup> Only used with monitoring option
- <sup>2</sup> LEDs #1 through 21 represent flashers #1 through 21 in the MALS system. The total number of LEDs on the board that will flash depends on the number of flashers installed and operating
- <sup>3</sup> Refer to Troubleshooting section for thumbwheel setting troubleshooting procedure.
- <sup>4</sup> Only used with monitoring option.

### 6.1.2 Control PCB Controls and Indicators

See [Figure 20](#) in the Installation section. Refer to [Table 23](#) for control PCB controls and indicators.

**Table 23: Control PCB Controls and Indicators**

Item	Controls/Indicators	Description	Function
1	S4	Mode dip switch	Used to set dip switch #1 to Off for MALSR mode. For ALSF mode, used to set switch #1 to ON.
5	LED #39	Power supply LED (green)	When lit, indicates I/O PCB is supplying +15 Vdc to the control PCB.
6	S1, S2, S3	Flasher dip switches	Used to set every other dip switch to ON position until the number of switches set to ON position equals the number of flashers in the system. Starts with #1 dip switch on S1 from left to right.
7 <sup>1</sup>	LED #38	Fault indicating LED (red)	When lit, indicates flasher fault level has been reached. Two or more flashers have failed.
8 <sup>1</sup>	LED #37	Caution indicating LED (red)	When lit, indicates impending flasher failure has been reached. System is still operable.

**Notes**

<sup>1</sup> Only used with monitoring option.

### 6.1.3 Monitor PCB Controls and Indicators

See [Figure 21](#) . Refer to [Table 24](#) for monitor PCB controls and indicators.

**Table 24: Monitor PCB Controls and Indicators**

Item	Controls/Indicators	Description	Function
1	LED #23	Reset LED (Red)	When lit, indicates: <ul style="list-style-type: none"> <li>• System is initially turned on</li> <li>• When power is first applied</li> <li>• When system's on/off selector switch has been recycled</li> <li>• When reset button is depressed</li> </ul>
2	LED #22	Preset LED (Red)	When lit, indicates: <ul style="list-style-type: none"> <li>• When system is initially turned on</li> <li>• On/off switching</li> <li>• When power is first applied</li> <li>• Every time a 100-flash-count sequence has been completed or when changing intensity level</li> </ul>
3	LED #1 through 21	Flasher LEDs (Green)	When lit, indicates a flasher has failed. LEDs #1 through 21 correspond to flashers #1 through 21.
5	Reset button	Reset button	When pressed, reset button resets the 100-flash-count sequence.

## 6.1.4 Start-Up Procedures



### WARNING

De-energize the circuit and lock out the circuit or regulator so that the circuit cannot be energized by remote means before attempting to service the MALSR.

This subsection describes the following start-up procedures: start-up checks, start-up adjustments, radio controller checks for MALSR, and SSALR mode setup for ALSF.

## 6.1.5 Start-Up Checks

To make start-up checks, perform the following procedure:

1. Make all connections, including remote control.
2. See [Figure 3](#) through [Figure 5](#) in the Introduction section. Make sure circuit breakers CB2 (9) and CB3 (11) and the disconnect switch CB1 (12) are in the OFF position in the primary control cabinet.
3. Turn on the power.



### Note

Power should still be present at the maintenance light and maintenance outlet in the primary cabinet.

4. Make sure the control panel LED LOW (16) is lit when switch S5 (17) is set to OFF or REM.



### Note

LED LOW is the low intensity LED. When S5 is set to REMOTE, the remote control switch is set to OFF and voltage is present at input of the primary. This indicates that the system is in hot standby mode ready to turn on at low intensity when S5 is set too low or LOW is selected by remote control.

## 6.1.6 Start-Up Adjustments

This subsection provides start-up adjustments for the MALSR and ALSF.

### 6.1.6.1 MALSR Start-Up Adjustments

To make adjustments for MALSR start-up, perform the following procedure:

1. Verify that the maintenance light turns on and that power is present in the maintenance outlet.
2. See [Figure 3](#) in the Description section. Turn rotary switch S5 (17) on the primary control cabinet to OFF. LED LOW (16) should be lit, indicating the system is in hot standby mode.
3. Engage disconnect switch CB1 (12) and circuit breakers CB2 (9) and CB3 (11).
4. Turn switch S5 (17) to LOW.



### Note

The steady-burning lights should turn on dim. LED LOW (16) should remain lit. The power transformer's secondary voltage should be approximately 50/100 Vac.

5. Turn switch S5 (17) to MED. The steady burning lights should turn on to medium brightness. LED MED (15) (medium intensity LED) should be lit. The secondary voltage on the power transformer should be approximately 75/150 Vac.
6. Turn switch S5 (17) to HI. The steady burning lights should turn on to high intensity. LED HI (14) (high intensity LED) should be lit. The secondary voltage on the power transformer should now be 120/240 Vac.
7. Set switch S5 (17) to the OFF position and S4 (13) to the ON position.
8. Turn on circuit breaker CB4 (32). LED LOW (16) (low intensity LED) should be lit.

9. Repeat steps 4, 5, and 6. The sequenced flashers and the steady burning lights should turn on to the respective brightness levels: high, medium, and low. The respective brightness level LEDs HI (14), MED (15), and LOW (16), and LED ON (33) should be lit.
10. Set switch S5 (17) to the REMOTE position while leaving S4 (13) set to the ON position, and verify remote control panel operation of the MALSR system as given in steps 11 through 13 below.

**Note**

Low intensity LED LOW (16) should be lit when the remote switch is set to OFF.

11. Set the remote control panel switch to LOW and verify MALSR system is operating at the low intensity level. LED LOW (16) and LED ON (33) should be lit.
12. Set the remote control panel switch to MED and verify MALSR system is operating at medium intensity level. LED MED (15) and LED ON (33) should be lit.
13. Set the remote control panel switch to HI and verify MALSR system is operating at the high intensity level. LED HI (14) should be lit.
14. Record the power transformer's output voltage when the system is operating on the high intensity step under full load.

**WARNING**

DO NOT move the wire in step 15 with power applied. Turn off power prior to moving the wire.

15. Shut down the system, move the input 120 Vac line (from TB1-4 on primary cabinet) connection on the power transformer (between TB1-1 through TB1-8) until an output voltage closest to 240 Vac is obtained across the power transformer's terminals TB1-X1 and TB1-X3. See [Figure 39](#) in the Wiring Schematics section.

**Note**

This may take several attempts.

### 6.1.6.2 ALSF Start-Up Adjustments

**WARNING**

Power will still be present at the maintenance light and the maintenance outlet in the primary control cabinet.

To make adjustments for ALSF start-up, perform the following procedure:

1. Turn on input power to the primary control cabinet.
2. Using a voltmeter, measure voltage across TB1-1 to TB1-2 and TB1-3 to TB1-2. Measure voltage across TB1-1 to TB1-3.
3. See [Figure 4](#) and [Figure 5](#). Verify that the maintenance light turns on and that there is power present in the ground fault interpreter (GFI) outlet (3).
4. Turn rotary switch S5 (17) to the OFF position and pull out shaft on interlock switch (1).
5. Engage power disconnect switch CB1 (12) and circuit breakers CB2 (9) and CB3 (11).
6. Turn switch S5 (17) to the LOW position. The sequenced flashing lights should start flashing in sequence in low intensity. LED LOW (16) should remain lit.
7. Turn switch S5 (17) to MED. The sequenced flashing lights should start flashing in sequence in medium intensity. LED MED (15) (medium intensity LED) should be lit.
8. Turn switch S5 (17) to HI. The sequenced flashing lights should start flashing in sequence in high intensity. LED HI (14) (high intensity LED) should be lit.
9. Set switch S5 (17) to REM, and verify remote control panel operation of the ALSF system as given in steps 10 through 12 below.



### Note

Low intensity LED LOW (16) should be lit when the remote switch is set to OFF.

10. Set the remote control panel switch S5 (17) to LOW and verify ALSF system is operating at the low intensity level. LED LOW (16) should be lit.
11. Set the remote control panel switch S5 (17) to MED and verify ALSF system is operating at medium intensity level. LED MED (15) should be lit.
12. Set the remote control panel switch S5 (17) to HI and verify ALSF system is operating at the high intensity level. LED HI (14) should be lit.

### 6.1.7 Radio Controller Checks (MALSR Only)

If a radio controller is used to turn on the MALSR system by remote control, verify on/off and brightness level operation of the MALSR system using the radio controller.

### 6.1.8 SSALR Mode Setup (ALSF Only)

See [Figure 4](#) and [Figure 5](#) . For the ALSF system, to set to SSALR mode, set switch S3 (13) to the SSALR mode. All odd-numbered flashers will flash up to 15, and every flasher after that is suppressed. This produces a total of 8 operating flashers in the SSALR mode.

See [Figure 18](#) . To reduce to 5 flashers, move the trigger wires attached to terminal block TB3 (18) on the 21 flasher I/O Interface PCB to the locations referred to in [Table 25](#) . These wiring connections will give the full 15 flasher output when the regular ALSF-2 mode is selected.

**Table 25: Reducing to 5 Flashers for SSALR**

MOVE WIRE # LISTED BELOW...	From...	To...
1	TB3-1	TB3-6
2	TB3-2	TB3-7
3	TB3-3	TB3-8
4	TB3-4	TB3-9
5	TB3-5	TB3-10
6	TB3-6	TB3-11
7	TB3-7	TB3-12
8	TB3-8	TB3-13
9	TB3-9	TB3-14
10	TB3-10	TB3-15
11	TB3-11	TB3-16
12	TB3-12	TB3-17
13	TB3-13	TB3-18
14	TB3-14	TB3-19
15	TB3-15	TB3-20

## 6.2 Shutdown Procedures

This subsection describes emergency and equipment shutdown procedures.

### 6.2.1 Emergency Shutdown

See [Figure 3](#) through [Figure 5](#) . Set the primary control cabinet disconnect switch CB1 (12) to OFF. This removes all power to the system, except power to the maintenance light and outlet in the primary control cabinet.

### 6.2.2 Equipment Shutdown

Equipment shutdown involves shutting down the primary control cabinet switches and the individual control cabinet.

#### 6.2.2.1 Primary Control Cabinet Switches Shutdown

To remove power from the primary control cabinet switches, refer to [Table 26](#) .

**Table 26: Primary Control Cabinet Switches Shutdown**

If using this system...	Set to this position...	To remove...
MALSR/ALSF	Disconnect switch CB1 to OFF	Power from all circuits
MALSR Only	Circuit breaker CB4 to OFF	Power from approach lights
MALSR/ALSF	Circuit breaker CB3 to OFF	120/240 Vac power to sequenced flashers
MALSR/ALSF	Circuit breaker CB2 to OFF	120 Vac power from primary control cabinet circuits

#### 6.2.2.2 Individual Control Cabinet Shutdown

To shut down the individual control cabinet, perform the following procedure:

1. Open the lid of the individual control cabinet.  
The interlock switch disconnects the input 120/240 Vac power to the cabinet.
2. Set the power switch in the individual control cabinet to OFF. Wait a minimum of one minute for the flash capacitors to discharge.

## 7.0 Maintenance and Repair

This section provides maintenance information for the medium intensity approach lighting system with runway alignment indicator lights (MALSR) and approach lighting system with sequenced flashers (ALSF).

### 7.1 Maintenance Schedule

To keep the MALSR and ALSF operating efficiently, follow a preventive maintenance schedule. Refer to [Table 27](#) . Refer to FAA AC 150/5340-26 for more detailed information.

**Table 27: MALSR/ALSF Maintenance**

Interval	Maintenance Task	Action
Weekly	Check all lights and flasher operations on all intensity steps.	If not flashing, replace lights.
	Check for damaged or misaligned parts.	Replace damaged parts and realign misaligned parts.
Monthly	Check the operation of the door latch and GDI and of interlocks on the primary and individual control units.	If not operating properly, replace door latch and GDI. Replace interlocks on the primary and individual control units.
	Check for presence of water in all enclosures and light heads.	Ensure weep hole is free of obstructions and remove any existing water.
Every Three Months	Check for dim or missing flashes.	Replace flasher.
	Measure input voltage levels on the primary control unit and individual control cabinets.	Verify the input voltage levels below. For primary control cabinet: 120/240 Vac, 60Hz, three-wire, neutral center-tapped For individual control cabinet: 185-260 Vac, 60 Hz, 3-wire, single phase (neutral center tapped) supplied from Primary Control Cabinet.
Semi-annually	Check gaskets for signs of deterioration and interior wiring in all cabinets for tight connections and signs of cracks or deterioration.	Replace deteriorated gaskets and tighten connections on interior wiring.
	Check all structures for corrosion or loose paint.	Replace corroded structures.
	Check lamp holder gaskets for cracking and signs of deterioration.	Replace lamp holder gaskets as needed.
	Check elevation of flash heads and alignment of fixtures.	Refer to Step 6 in <i>Aiming Lampholders (Conduit or Pipe Mounted)</i> in the <i>Installation</i> section for procedure for setting elevation. Align misaligned fixtures.
	Check ground connections, lightning arrestors, and rigidity of support structures.	Tighten ground connections. Replace lightning arrestors. Tighten loose support structures.
	Check the approach line-of-sight clearance for obstruction by vegetation or new structures that may violate the approach clearance criteria for the airport.	Remove vegetation and structures.
Annually	Check circuit breakers, fuse holders, and contacts, all relays and flash capacitors.	Replace circuit breakers, fuse holders, contacts, relays, and flash capacitors.
	Check resistance of grounding system.	If resistance is high, repair by doing such things as replacing rods and cables.
	Check power distribution equipment.	Replace power distribution equipment.
	Check insulation resistance of cable.	If reading is less than 500 V on meter or leaking to ground, replace cable.

## 7.1.1 Maintenance Procedures

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### WARNING

High voltages are present in the individual control cabinet and the flasher light unit. Interlock switches are provided in the cabinets and flasher head to remove power when the cabinet door is opened or the lamp is removed. Allow one minute for the flash capacitors to discharge before touching any electrical parts in the cabinet. Verify that they are discharged by touching a wire connected to TB2 terminal to the earth ground. The TB2 terminal is a large white insulator.

---

This subsection describes maintenance procedures listed below for the MALSR and ALSF.

- checking performance
- checking electrical connections
- inspecting and replacing flash lamp
- inspecting and replacing lamp gaskets
- replacing lamps

## 7.1.2 Checking Performance

Checking performance involves the following:

- checking flash rate
  - checking skipped flashes
  - checking system voltage
  - checking equipment visually
- 



### Note

The flasher tester and optional frequency counter may be used to check equipment performance.

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### 7.1.2.1 Checking Flash Rate

To check the flash rate, count visually and count with a frequency counter. Refer below for a discussion of these two methods.

### 7.1.2.2 Counting Flash Rate Visually

To count visually, perform the following procedure:

1. Turn the system on at any intensity level.
2. Observe the number of flashes on the row of green LEDs on the I/O PCB in the primary control cabinet over a one minute time interval. During normal operation,  $120 \pm 1$  flashes per minute should occur.

### 7.1.2.3 Counting Flash Rate with Frequency Counter

A frequency counter with 10:1 probe at trigger output TB3 terminal 1 can be used to measure the flash rate.

To count with a frequency counter, perform the following procedure:

1. Set the period to  $0.500 \pm 0.008$  seconds.
2. If the counter has an adjustable input, set the counter to trigger on a positive slope with a 5 to 10 V level.

### 7.1.2.4 Checking Skipped Flashes

When two skips occur in 100 flashes, a flash lamp may be near the end of its life. Check the number of hours the lamp has operated. If the flash lamp operates in high intensity for over 800 hours for MALSR and ALSF, replace lamp(s).

### 7.1.2.5 Checking System Voltage

Checking system voltage involves checking primary control cabinet and individual control cabinet voltages.

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### 7.1.2.6 Checking Primary Control Cabinet Voltages

To check the primary control cabinet voltages, perform the following procedure:

1. While operating the system at the high intensity level, measure the input voltage between terminal strip TB1 terminals 1 and 3.
2. Refer to [Table 28](#) to verify the input voltages on the primary control cabinet.



#### Note

Use a true RMS ammeter to measure the voltages in [Table 28](#).

**Table 28: Primary Control/Individual Control Cabinet Input Voltages**

Across Terminal Block TB1	AC Voltages
Terminals 1 to 2	120 Vac $\pm$ 5%
Terminals 2 to 3	120 Vac $\pm$ 5%
Terminals 1 to 3	240 Vac $\pm$ 10%

### 7.1.2.7 Checking Individual Control Cabinet Voltages

To check individual control cabinet voltages, perform the following procedure:

1. While operating the system at the high intensity level, open the individual cabinet door and pull out the plunger on the interlock switch.
2. Measure voltage between TB1 terminals 1 and 3.
3. Refer to [Table 28](#) to verify the voltages at all individual control cabinets.



#### Note

Use a true RMS ammeter to measure the voltages in [Table 28](#). Minimum input voltage to the Individual Control Cabinet is 185 Vac.

### 7.1.2.8 Checking Equipment Visually

To check the equipment visually, perform the following procedure:

1. Operate the system on all three brightness steps and visually verify that lamps switch to the brightness level selected. Levels will be indicated by red LEDs in the control cabinet.
2. Record any lamp failures and broken filters.
3. Replace lamps and filters when the system is turned off.
4. Inspect all lamps and filters for damage or misalignment.
5. Check for cracks, pits, and any evidence of leaks around the lamp and filter gaskets.
6. Replace any damaged glassware or gaskets.
7. Clean dirty glassware using a liquid glass cleaner and wipe dry with a soft clean cotton cloth.
8. Check light supports and guys for rigidity, misalignment, and rust or corrosion.
9. Check for dirt or water in the interior of all cabinets. Check gaskets in cabinet interiors for cracks or any sign of deterioration.
10. Remove dirt from the interior of the cabinet and replace any gaskets showing signs of deterioration.

### 7.1.3 Checking Electrical Connections

To check electrical connections, perform the following procedure:

1. Check operation of interlock switches in the primary control and the individual control cabinets.
2. Check terminal blocks, PC boards, and connectors for any signs of dirt, corrosion, or moisture. Clean if necessary. Check all terminal connections for tightness.
3. Check relay contacts for excessive pitting or burning. Replace any relay with excessive pitted or burned contacts. Check for sparks being emitted by relay contacts during the operation of the flashing lights. Replace contacts that are excessively pitted or burned.
4. Check lighting contactors for closed contacts.
5. Check flash capacitors in the individual control cabinets for signs of oil leakage and bulges in the case. Replace capacitor if any of these conditions are discovered.
6. Check lightning arrestor connections for tightness and any evidence of damage. Replace any damaged arrestors.

### 7.1.4 Inspecting and

Change lamp when the hour meter indicates the hours of operation on the high intensity level have exceeded replacement hours. Refer to [Table 29](#).

**Table 29: Replacing Lamps (Steady Burning and Flashing)**

Approach Lighting System	Wattage	Lamp Type	Rated Lamp Life (Hours)	Replacement Hours	Part Number
MALSR	PAR-56 300 W, 120 Vac	Steady burning	2000	1600	48A0118
MALSR	PAR-56 200 W, 6.6 Vac	Steady burning	600	480	48A0094
ALSF	PAR-56 300 W, 20 A	Steady burning	500	400	48A0091
ALSF	PAR-56 500 W, 20 A	Steady burning	500	400	48A0092
ALSF/ MALSR	PAR-56 XENON	Flashing	1000	800	48B0022
MALSR	PAR-38 150 W, 120 Vac	Steady burning	2000	1600	48A0447

To inspect and replace the PAR-56 lamp, perform the following procedure:

1. Loosen the three clips around the lamp and rotate clips so that the lamp can be moved.
2. Pull the lamp out of the fixture.
3. Find the rectangular slot located on the outside diameter of the lamp gasket. Insert a medium size flat bladed screw driver into the slot and gently pry on the lamp gasket to free the lamp from the housing.
4. Inspect the base of the flash lamp for dirt, moisture, or deposits.
5. Clean with a glass cleaner.
6. Replace the lamp if connections are corroded beyond cleaning or if the lens is badly pitted or cracked or has exceeded the lamp life (refer to [Table 29](#)). To replace a lamp, perform the following procedure:
  - a. Disconnect the three wires on the base of the lamp and connect to the base of the replacement lamp.



**Note**

Be careful not to mix up the three wires.

- b. If the lamp needs to be replaced, remove the gasket and discard the lamp. Inspect and replace the lamp gasket. Refer to the subsections Inspecting and Replacing Lamp Gasket - Flashing Lamp and Inspecting and Replacing Lamp Gasket - Steady Burning Lamp in this section.

- 
- c. After the gasket has been properly installed on the lamp, position the lamp back into the lamp housing. Make sure that the arrow molded on the face of the lamp points up.
- 



### **CAUTION**

Failure to install the lamp with the arrow pointing up will prevent the lamp from operating properly. It may cause either immediate lamp failure or the lamp may have a very short lamp life.

---

- d. Tighten the three lamp clips over the lamp gasket.
- e. For steady burning lamps, manually reset the hour meter after changing a lamp.

### **7.1.5 Inspecting and Replacing Lamp Gasket - Flashing Lamp**

To inspect and replace the flashing lamp gasket, perform the following procedure:

1. Check the gasket for cuts, cracks, brittleness, or any sign of deterioration. If in doubt replace the gasket.
2. If re-installing or replacing the gasket, locate the word TOP that is molded into the outer lip of the gasket. The gasket lip that has the word TOP faces outward when installed.
3. Align the word TOP with the ARROW that is molded into the face of the lamp and then install the gasket over the outer diameter of the lamp.
4. Turn the lamp over and inspect the backside of the lamp to ensure that the three molded relief slots in the gasket are aligned with the three sets of index pads that are molded on the backside of the lamp. If any of the index pads are covered by the gasket flange, rotate the gasket slightly until all of the index pads are within the relief slots in the gasket lip.
5. The lamp is now ready to be installed into the multi-head housing.

### **7.1.6 Inspecting and Replacing Lamp Gasket - PAR-38 Steady Burning Lamp**

To inspect and replace the steady burning lamp gasket, perform the following procedure:

1. Check the gasket for cuts, cracks, brittleness, or any sign of deterioration. If in doubt, replace the gasket.
2. If replacing the gasket, remove the PAR-38 lamp, remove the gasket and replace with new gasket, re-install the PAR-38 lamp.
3. If replacing a PAR-38 gasket, it is recommended to replace the gaskets for all PAR-38 lamps on the same light bar.

### **7.1.7 Inspecting and Replacing Lamp Gasket - PAR-56 Steady Burning Lamp**

To inspect and replace the steady burning lamp gasket, perform the following procedure:

1. Check the gasket for cuts, cracks, brittleness, or any sign of deterioration. If in doubt, replace the gasket.
2. If re-installing or replacing the gasket, locate the word TOP that is molded into the outer lip of the gasket. The gasket lip that has the word TOP faces outward when installed.
3. Install the gasket over the outer diameter of the lamp so that the gasket lip that has the word TOP is on the front of the lamp. Turn the lamp over and inspect the backside of the lamp to ensure that the three molded relief slots in the gasket are aligned with the three sets of index pads that are molded on the backside of the lamp. If any of the index pads are covered by the gasket flange, rotate the gasket slightly until all of the index pads are within the relief slots in the gasket lip.
4. The PAR-56 lamp is now ready to be installed into the housing.

## 7.2 Troubleshooting



### WARNING

Allow only qualified personnel to perform the following tasks. Observe and follow the safety instructions in this document and all other related documentation.

De-energize the circuit and lock out the circuit or regulator so that the circuit cannot be energized by remote means before attempting to service the fixture.

A lethal potential of 2000 Vdc exists in the MALSR system. Ground capacitors with a grounding wire and wait one minute prior to touching any part in the high-voltage compartment. Only personnel authorized to troubleshoot on high voltage equipment shall make any measurements with the power on. When it is absolutely mandatory that an interlock be bypassed to trace a fault or correct a malfunction, authorized maintenance personnel may cheat the interlock by pulling out on the shaft for the specific test to be made. The interlock shall be restored to working conditions before closing the cabinet door.

This section contains troubleshooting information for the medium intensity approach lighting system with runway alignment indicator lights (MALSR) and the approach lighting system with sequenced flashers (ALSF). This information covers only the most common problems that you may encounter. If you cannot solve the problem with the information given here, contact your local ADB Safegate representative for help.

This subsection provides troubleshooting procedures.

Problem	Possible Cause	Corrective Action
<b>1. Fault indicator signal</b> activated	Two or more flashers failed	Check lamps for failure and replace defective or burned-out lamps. Check trigger transformers.
	Disconnect switch disengaged in primary control cabinet	Set disconnect switch CB1 to ON.
2. System not operating	No input power	Measure 120 Vac input voltage at the terminal block TB1 terminals 1 to 2 and 2 to 3 in the primary control cabinet. Then measure 240 Vac at TB1 terminals 1 to 3. If incorrect, check input power source.
	Circuit breaker tripped in primary control unit	Set circuit breakers CB2, CB3 and CB4 to ON.
	Blown fuse	Check and replace any blown fuse in the primary control.
<b>3. System operates in local</b> but not in remote control	Blown fuse F5	Replace blown fuse.
	Incorrect remote control wiring	Check wiring. See <a href="#">Figure 39</a> for the MALSR and <a href="#">Figure 40</a> for the ALSF in the <i>Wiring Schematics</i> section.
4. Flashers not operating	Flasher control circuit not operating	Replace circuit.
	Defective contactor	Replace contactor.
<b>5. Flasher not operating on medium or high</b> intensity as seen by LED for medium or LED for high intensity	One flasher defective	Replace flasher.
	Defective relay	Replace relay.
	Defective intensity control circuit.	Replace intensity control circuit.
	Defective trigger PCB	Replace trigger PCB.
<b>6. One flasher operation</b> intermittent	Defective lamp	Replace lamp.
	Defective trigger transformer	Replace trigger transformer. Refer to <a href="#">Trigger Transformer Replacement</a> on page 76
	Weak trigger control signal from primary control cabinet	Check with flasher tester.

Problem	Possible Cause	Corrective Action
<b>7. One or more flashers</b> fail to change in intensity when the intensity is changed	Defective relay	Check relays K2 and K3 for freedom of movement.
<b>8. Approach lights operate</b> only on low intensity	Remote interface circuit	If approach light operates correctly under local control, then the problem is in the remote circuit. Check the remote interface circuit.
<b>9. Approach lights not</b> going from medium to high intensity when local control switch S5 turned from medium to high intensity	High intensity selected displayed on control-switch-indicating LED	Examine intensity-level control signals from TB2 terminal 2.
<b>10. Approach lights not going from medium to high intensity when remote control switch S5 turned from medium to high intensity</b>	Remote interface circuit	Observe operation of LED. Check control signals to TB6 terminal 5.
11. Approach lights not operating	Disconnect switch CB1 set to OFF	For MALSR, set CB1 to ON position. For ALSF, set S1 to ON position.
	Switch S5 set to OFF	For MALSR, set S5 to REMOTE for remote control of system.
	Input power failure	Check voltage at TB1. If no voltage or low voltage, check external power supply.
	Blown fuse	Check and replace any blown fuse.
	Defective contactor	Check voltage across coil of contactor K1. If voltage is approximately 120 Vac, replace contactor.
<b>12. Number of flasher misfires in 100 flashes greater than</b> thumbwheel setting	Defective flasher(s)	Replace flashers.
<b>13 . Thumbwheel sets number of flasher misfires in 100 flashes before fault condition alarm triggered</b>	Defective flasher(s)	Repair flasher(s).

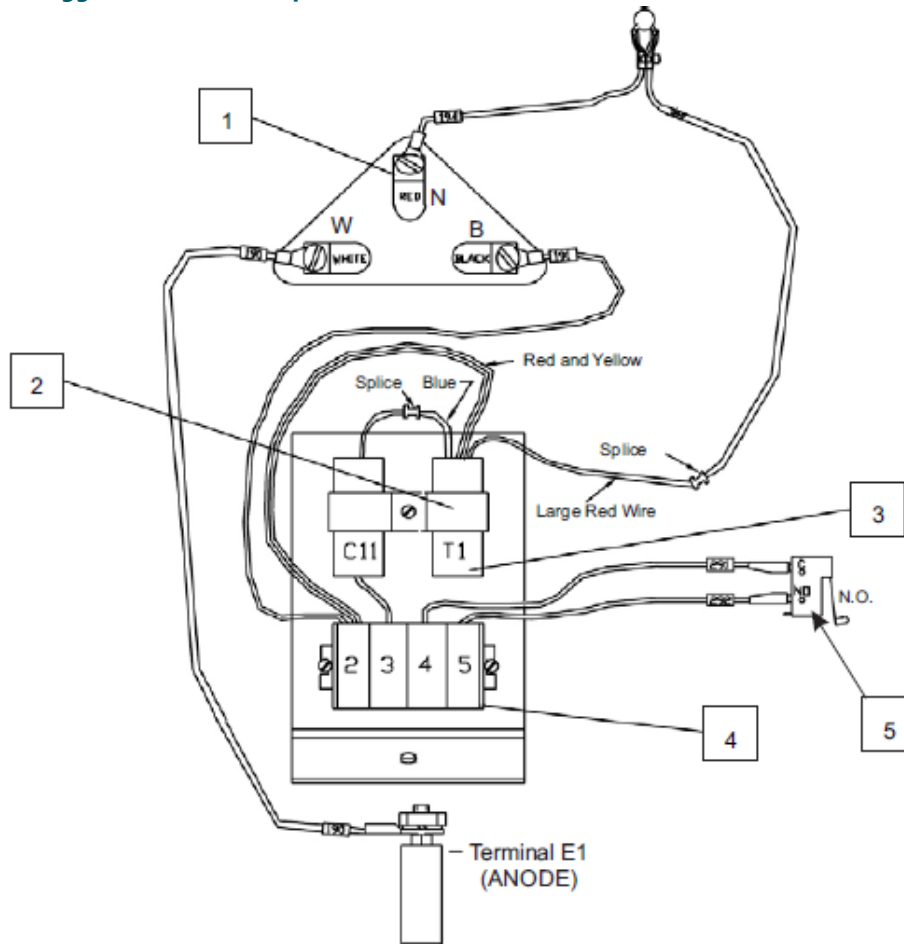
## 7.2.1 Trigger Transformer Replacement

The trigger transformer assembly part numbers are 44B1780-3 (without mounting back plate) and 44B1780-1 (with mounting back plate).

To replace the trigger transformer, perform the following procedure:

1. See [Figure 38](#) . To remove the old trigger transformer, remove the hold down bracket (2).

**Figure 38: Trigger Transformer Replacement**



- |                        |                            |
|------------------------|----------------------------|
| 1. Flash Tube Red Post | 3. Trigger Transformer     |
| 2. Hold Down Bracket   | 4. Terminal Block TB1      |
|                        | 5. Safety Interlock Switch |

2. Remove the red/yellow wires from TB-1 (4).
3. Remove the blue wire from TB-2.
4. Remove wire #194 from the flash tube red post (1).
5. To replace with a new trigger transformer, place the red/yellow wires in TB-1.
6. Place the blue wire in TB-2.
7. Place wire #194 on the red post of the flash tube (1).
8. Place the trigger transformer through the hold down bracket (2) and tighten the screw.

### 7.3 Schematics

Figure 39: MALSR External Wiring

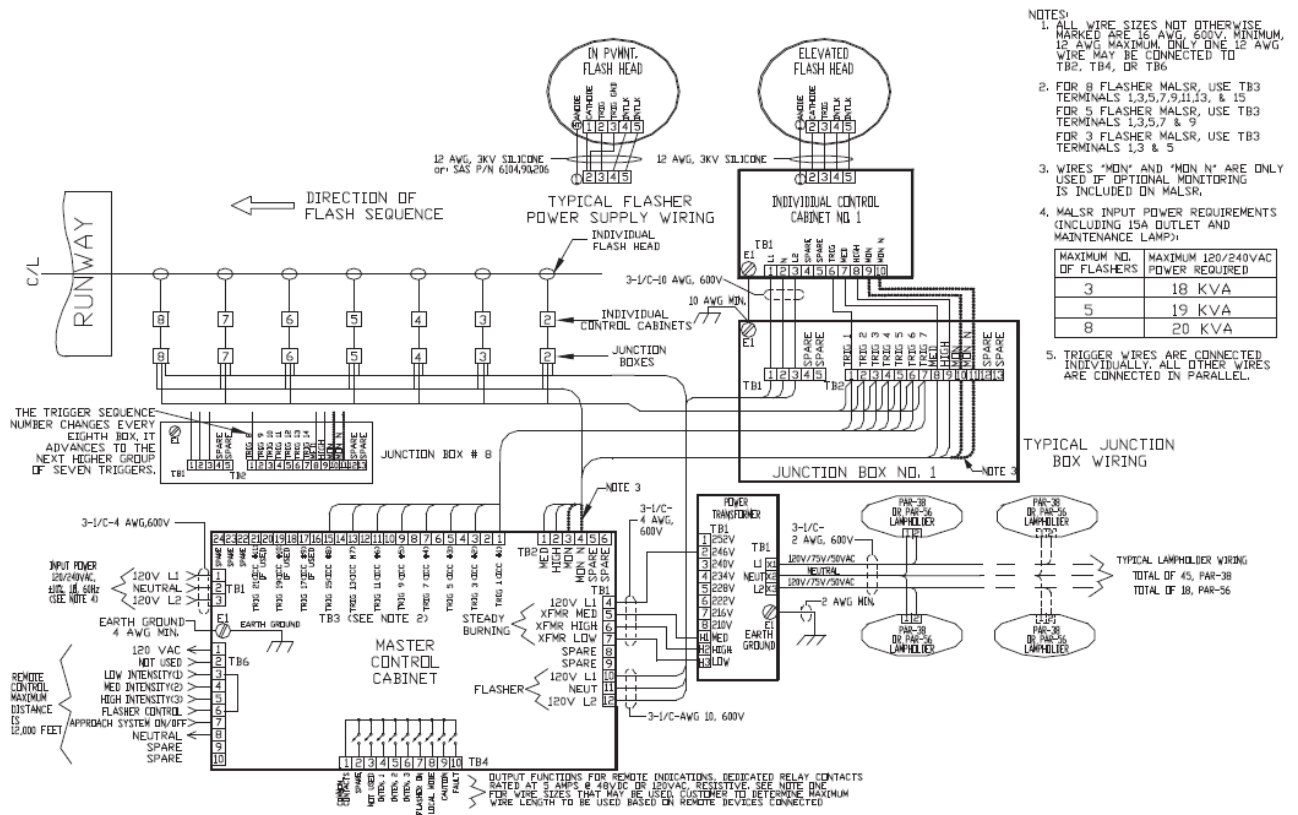
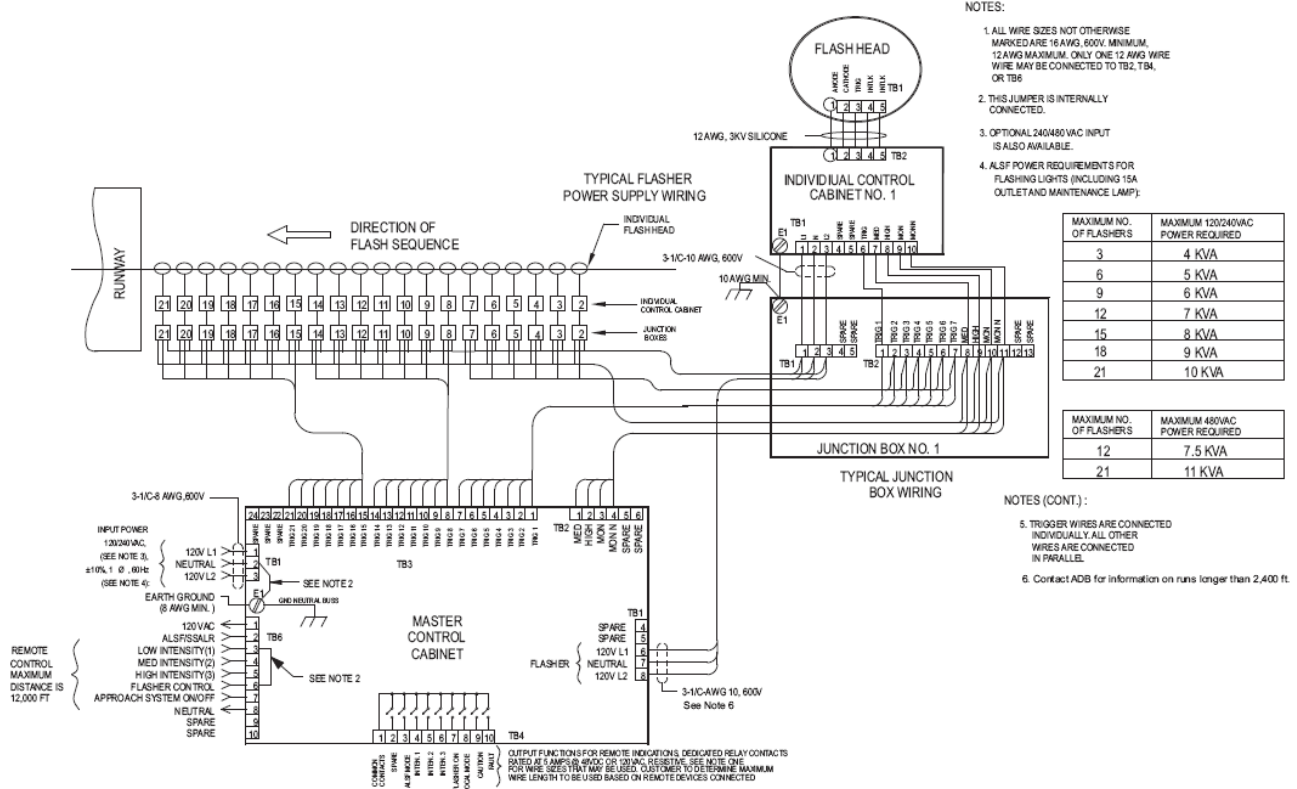
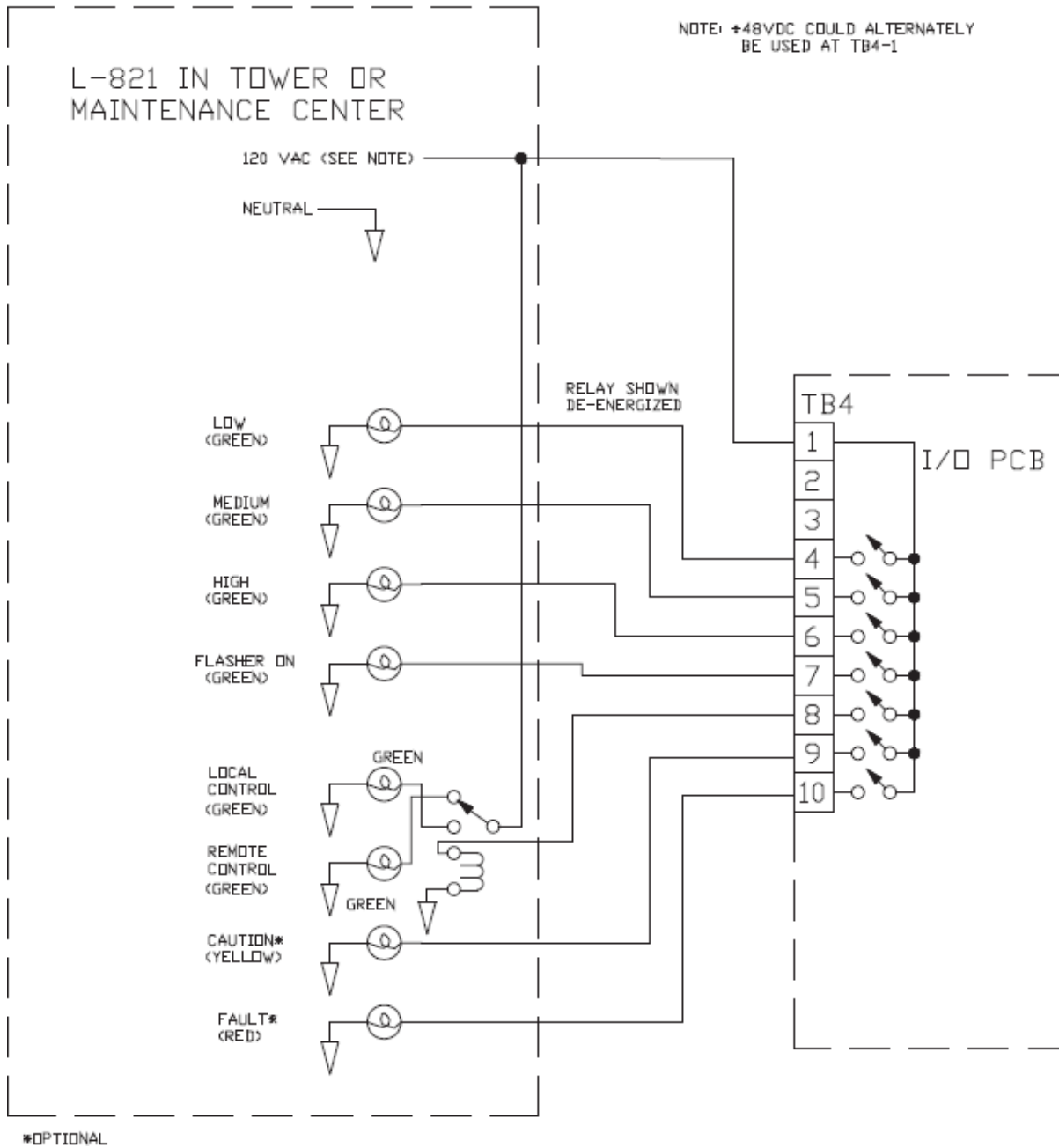


Figure 40: ALSF External Wiring

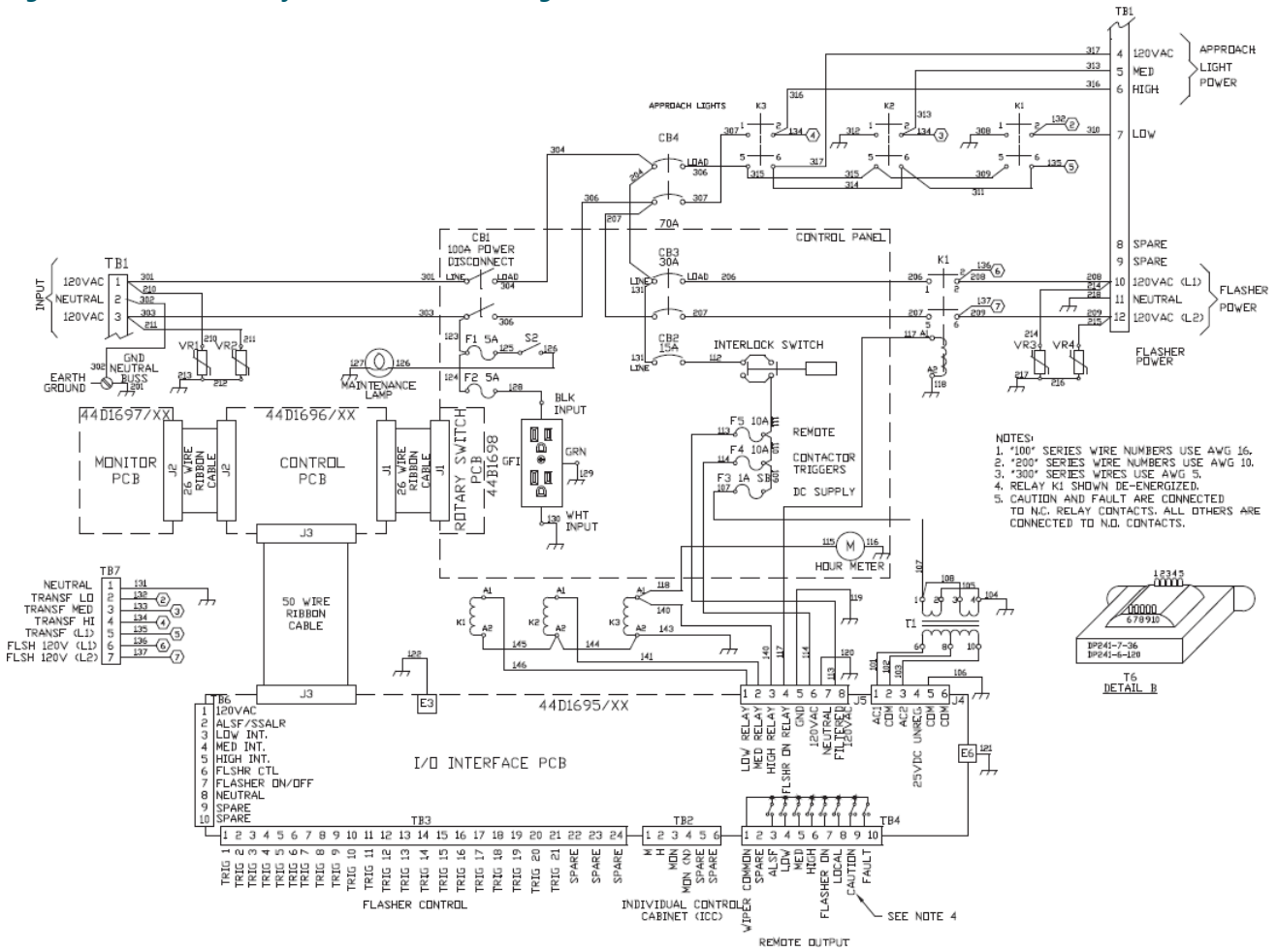




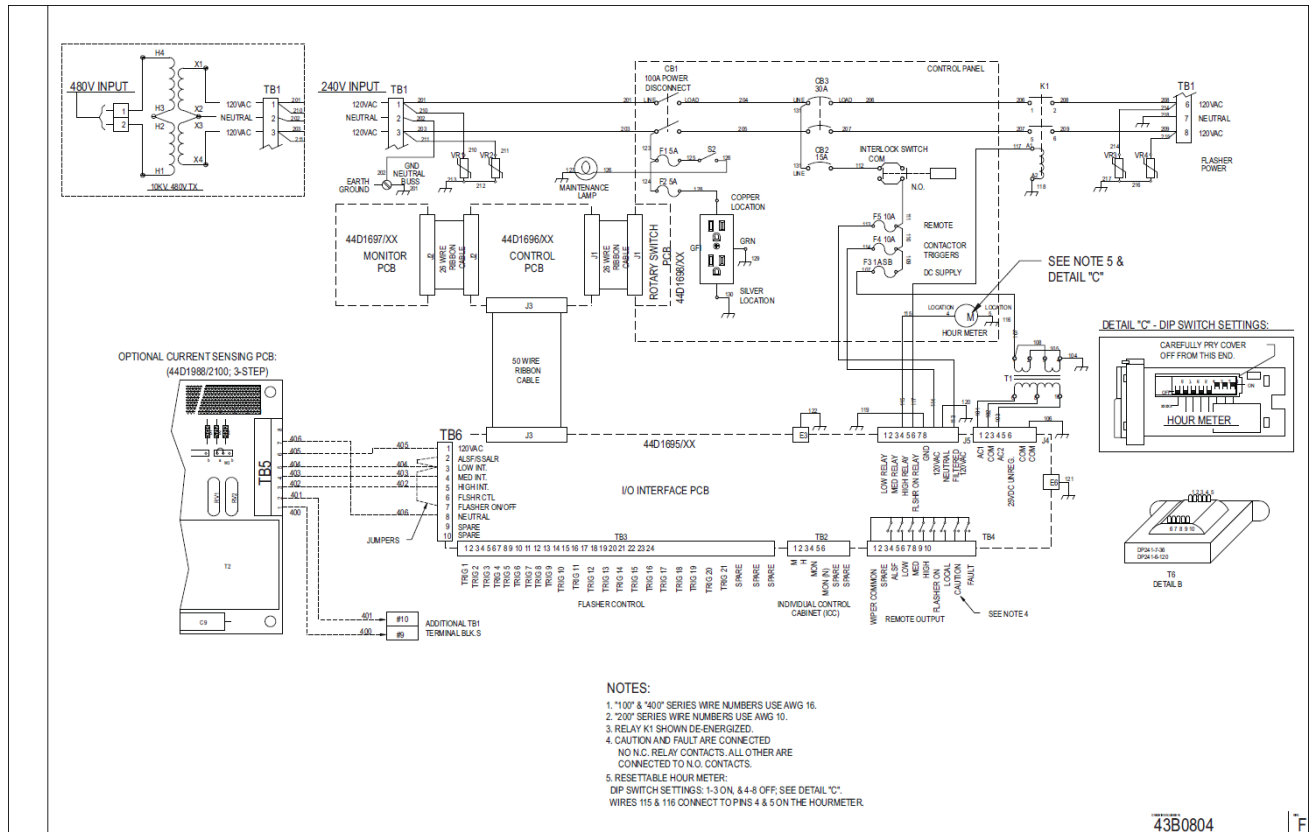
**Figure 41: Typical Remote Control Connections**  
 TYPICAL REMOTE CONTROL CONNECTIONS  
 (REMOTE FEEDBACK INDICATION CONNECTIONS)



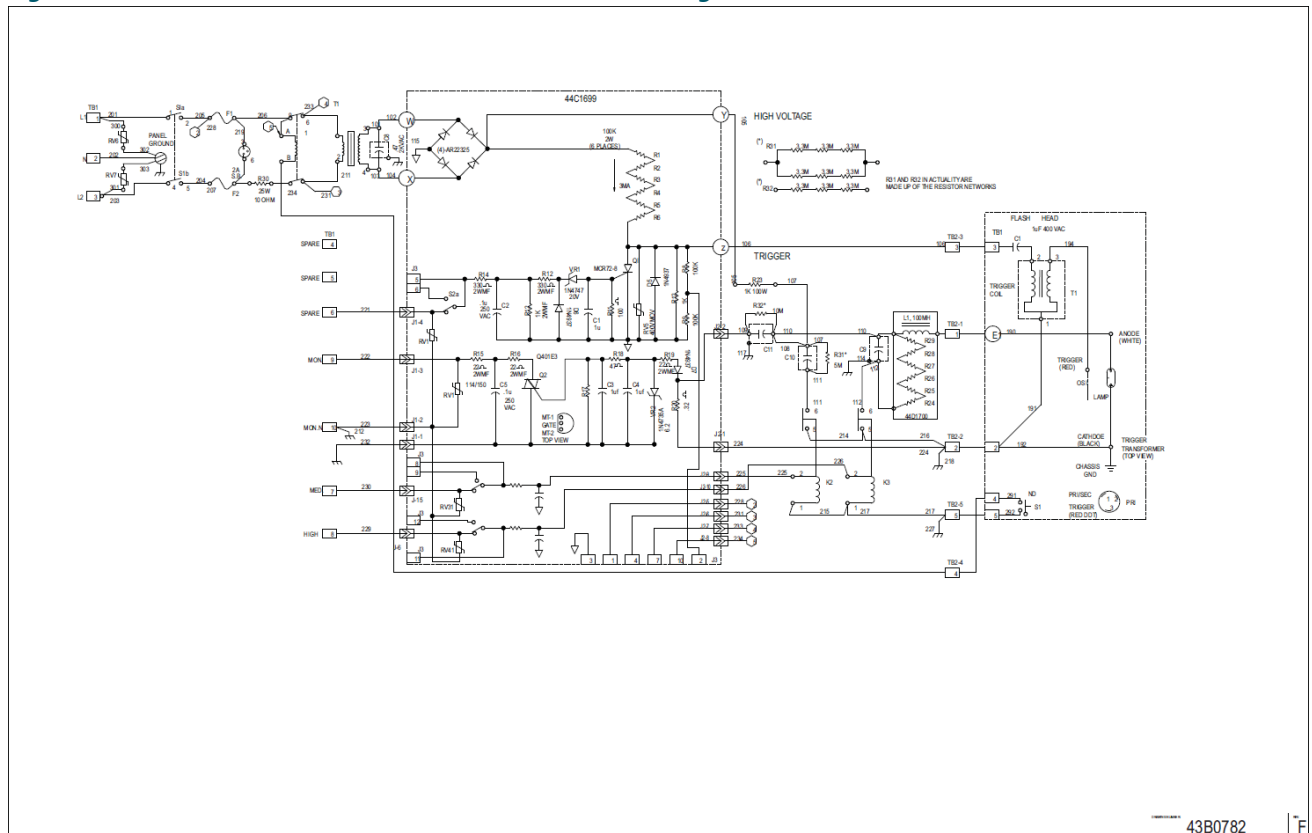
**Figure 42: MALSR Primary Control Cabinet Wiring**



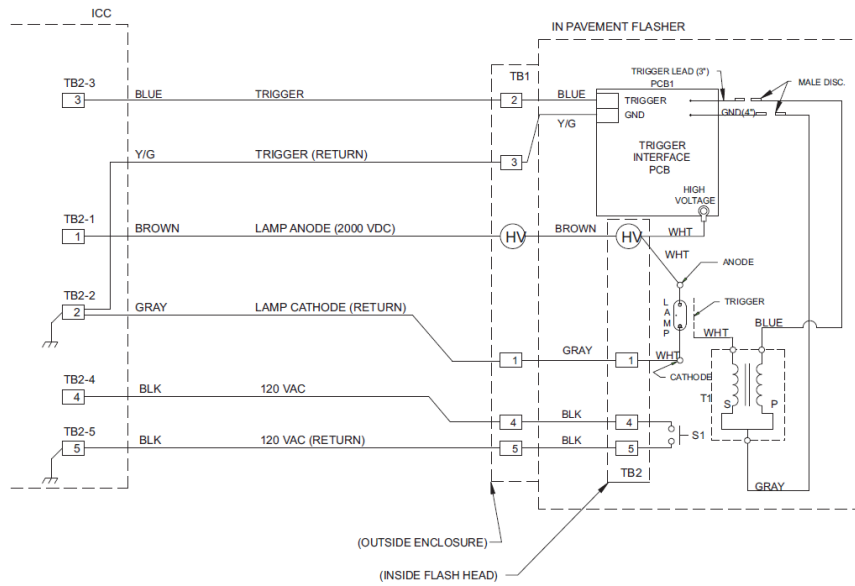
**Figure 43: ALSF Primary Control Cabinet Wiring**



**Figure 44: MALSR/ALSF Individual Control Cabinet PCB Wiring**

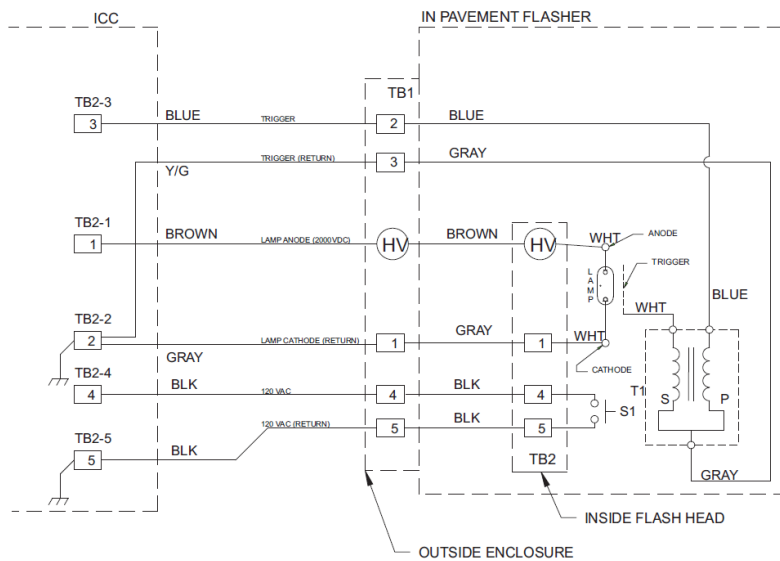


**Figure 45: In-pavement Flash Head with Trigger Interface Wiring**



DRAWING TITLE:  
 INDIVIDUAL CONTROL CABINET  
 IN-PAVEMENT FLASHER  
 MALSR / ALSF  
 ICC CONNECTION & TRIGGER MODIF.  
 WIRING DIAGRAM  
 43A2745

**Figure 46: In-pavement Flasher (without PCB) Wiring**



DRAWING TITLE:  
 INDIVIDUAL CONTROL CABINET  
 IN-PAVEMENT FLASHER  
 MALSR / ALSF  
 ICC CONNECTION  
 WIRING DIAGRAM  
 43A2813

## 8.0 Parts

To order parts, call ADB Safegate Customer Service or your local representative. Use this five-column parts list, and the accompanying illustration, to describe and locate parts correctly.

### 8.1 MALSR/ALSF Ordering Code

This subsection describes the ordering code for the medium intensity approach lighting system with runway alignment indicator lights (MALSR) and the approach lighting system with sequenced flashers (ALSF).

#### Master Control Cabinet

44D1650 - X X X X

##### Flashers

- 1 - 8 flashers (maximum)
- 2 - 15 flashers (maximum)
- 3 - 21 flashers (maximum)

##### Monitoring

- 1 - Without monitoring
- 2 - With Monitoring (standard)

##### Voltage

- 1 - 120/240 VAC (standard)
- 2 - 480 VAC

##### Enclosure Type

- 1 - Standard
- 2 - Stainless steel

#### ICC Ordering Code

44D1651 - X

##### Flasher Type

- 1 = Elevated Flasher
- 3 = Elevated Flasher Panel Only
- 5 = Elevated Flasher (Stainless Steel)

#### Spare Parts Trunk

44D1652 - X 1 X 0

##### Monitoring

- 1 = Flasher With Monitoring (Standard)
- 2 = Flasher Without Monitoring

##### Frequency

- 1 = 60 Hz

##### Flashers

- 1 = 8 Flashers (Maximum) System
- 2 = 15 Flashers (Maximum) System
- 3 = 21 Flashers (Maximum) System

##### Notes

- The spare parts trunk must be ordered separately for FAA-E-2628 applications
- Sequenced flashing components (Part No. 44A1788) are ETL Certified according to FAA-E-2325

#### Aiming Device Ordering Code

44D1654 - X

##### Lamp Application

- 1 = For PAR -56 Lamp Only
- 2 = For PAR -56 and PAR -38 Lamps

#### Flash Head Ordering Code

44D1677 - X

##### Slip Fit

- 1 = Slip fitting for 2-inch EMT, 1.5-inch tube and tower
- 2 = Slip fitting for 1.5-inch Schedule 40 pipe and 62B0064 frangible coupling only

**Note:** Flash head includes lamp

### 8.2 MALSR/ALSF Parts List

This subsection provides the MALSR/ALSF parts list.

### 8.2.1 MALSR/ALSF Primary Control Cabinet Common Parts List

See Figure 47 through Figure 49 . This subsection provides a list of parts for the primary control cabinet that are common to both MALSR and ALSF. The MALSR primary control cabinet part number is 44D1655-X. The ALSF primary control cabinet part number is 44D1650-XXXX.

Item	Description	Part Number	Quantity
1	Interlock switch	45A0303	1
2	Fuse, 5 A (BUSS AGC-5)	47A0015	1
3	Fuse, 15 A (BUSS AGC-15)	47A0016	1
4	Ground fault outlet	47A0041	1
5	Hour meter	52A0100	1
6	Fuse, 1 A, S.B. A (BUSS MDL-5)	47A0017	1
7	Fuse 10 A (BUSS MDL-1)	47A0018	2
8	Circuit breaker, 15 A (AIRPAX #219-2-1-63F-3-15)	57A0047	1
9	Circuit breaker, 30 A (AIRPAX #219-2-1-62-3-1-30)	57A0048	1
10	Switch, Switch, MALSR, 120/240 Vac, 100A (AIRPAX #219-2-1-63F-3-1-100) Switch, ALSF, 120/240 Vac, 100A (AIRPAX #219-2-0-SW-3-1-100)	57A0057 57A0046	1
11	Rotary switch PCB Rotary switch PCB, MALSR Rotary switch PCB, ALSF	44B1698-1 44B1698-2	1
12	Contact, 16 A, 120 Vac	53A0412-30	1
13	Varistor	32A0011	4
14	Control PCB Control PCB, 60 Hz with monitoring Control PCB, 60 Hz without monitoring	44D1696-11 44D1696-21	1
15	I/O PCB I/O PCB, 5 flasher (maximum) system I/O PCB, 8 flasher (maximum) system I/O PCB, 11 flasher (maximum) system	44D1695-08 44D1695-15 44D1695-21	1
16	Transformer (SIGNAL #DP-241-7-36)	35A0225	1
17	Monitor PCB Monitor PCB, 5 flasher (maximum) system, MALSR Monitor PCB, 8 flasher (maximum) system, MALSR Monitor PCB, 11 flasher (maximum) system, MALSR	44D1697-08 44D1697-15 44D1697-21	1
18	Lamp, 100 W (SYLVANIA #100A125)	48A0010	1
19	Lamp socket, snap-in	49A0116	1

Figure 47: MALSR Primary Control Cabinet

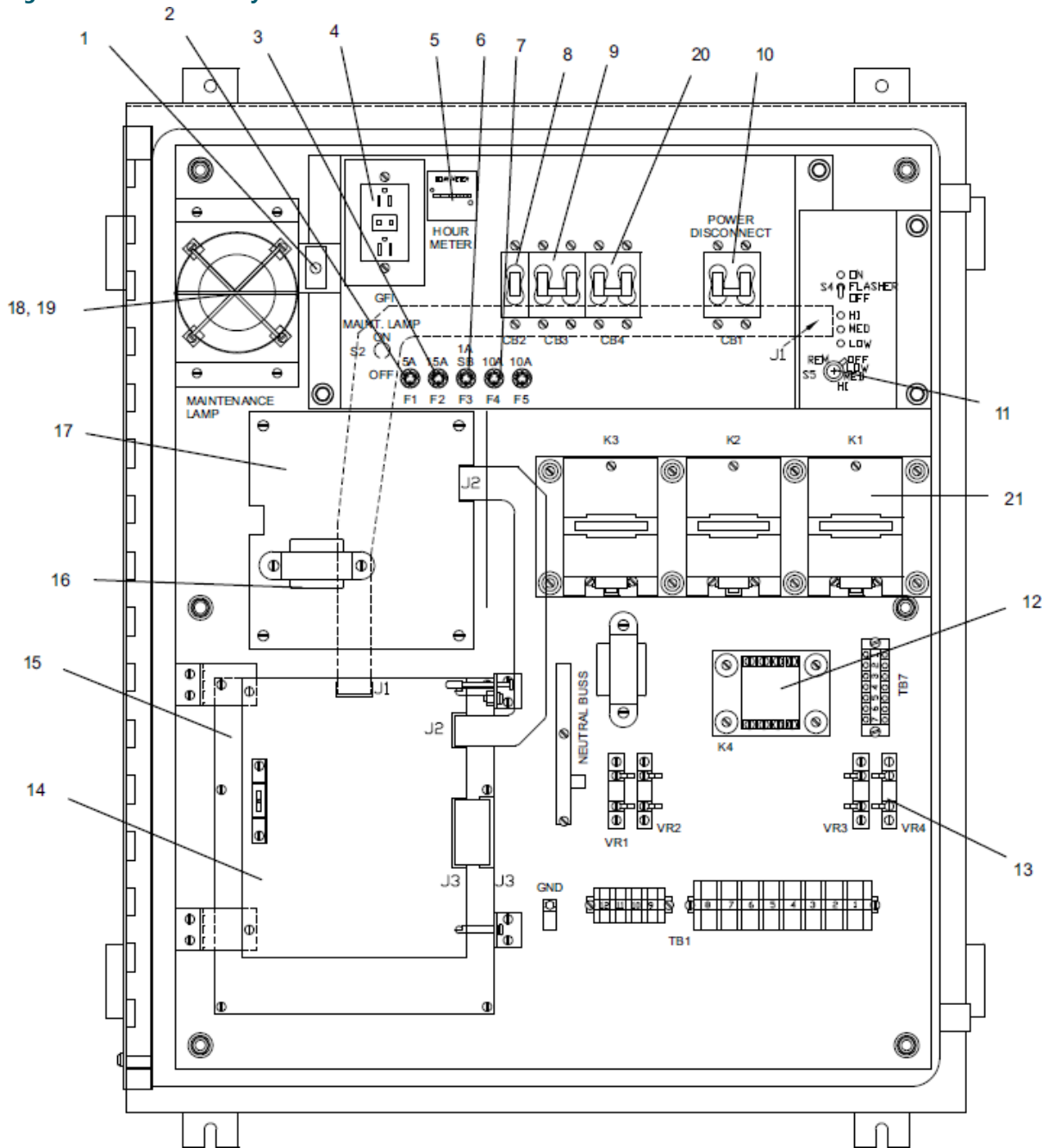
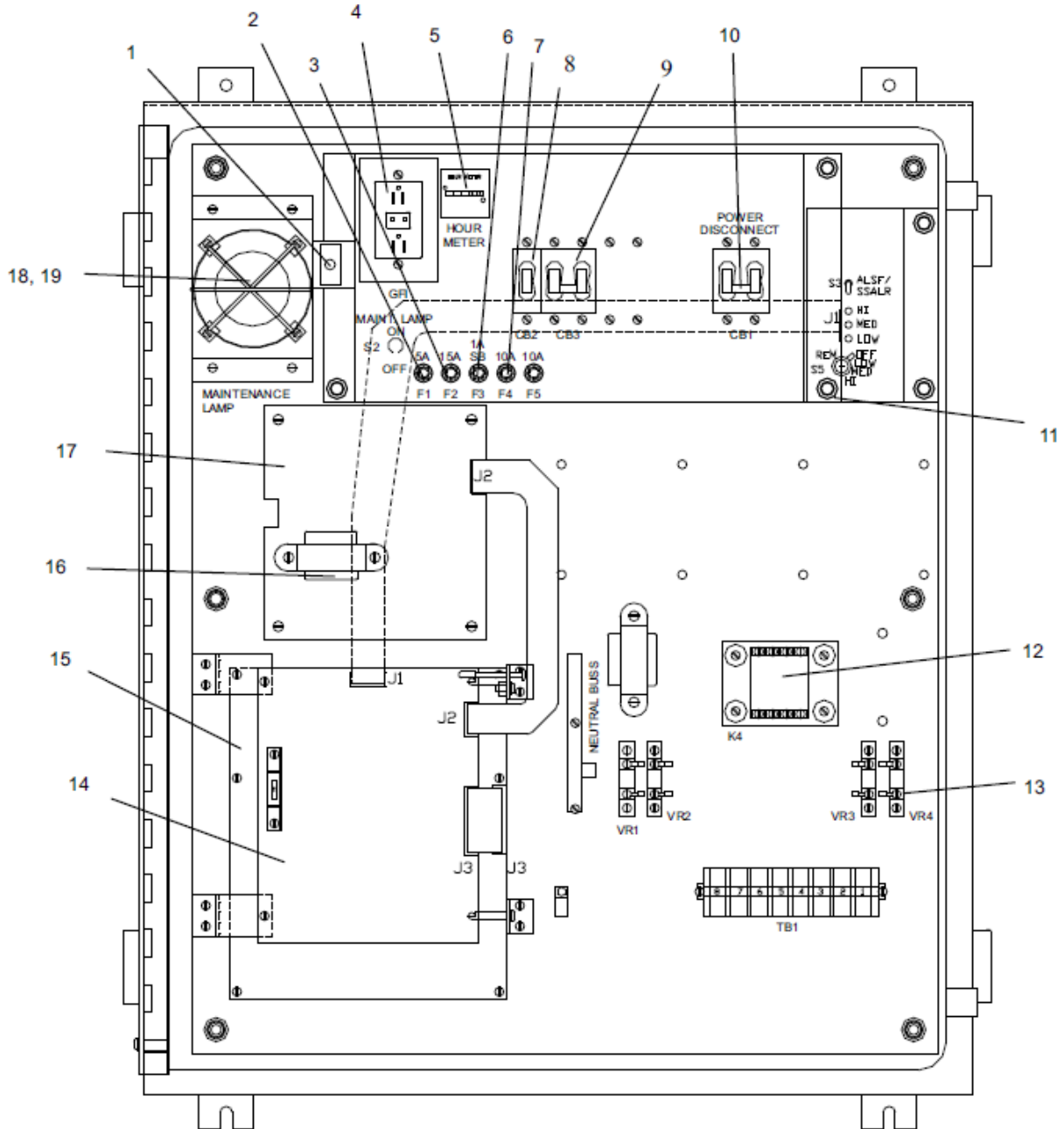
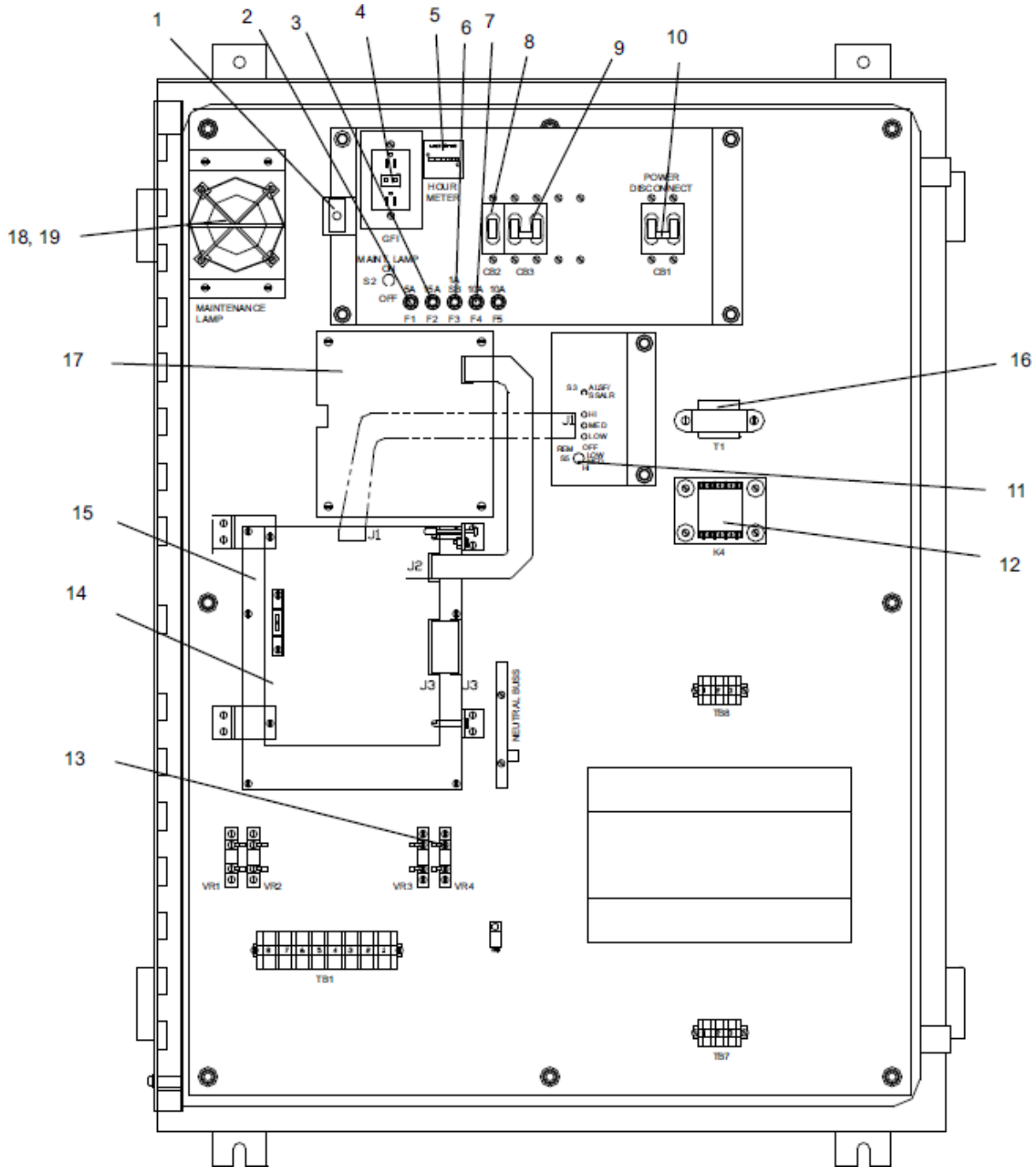


Figure 48: ALSF Primary Control Cabinet (Standard 120/240 Vac System)





**Figure 49: ALSF Primary Control Cabinet (Optional 240/480 Vac System)**



### 8.2.2 MALSR Primary Control Cabinet Specific Parts List

See [Figure 47](#) . This subsection provides primary control cabinet parts applicable only to the MALSR system.

The MALSR primary control cabinet part number is 44D1655-X.

Item	Description	Part Number	Quantity
20	Circuit breaker, 70 A (AIRPAX #219-2-1-62F-3-1-70), MALSR	57A0049	1
21	Contactors, 70 A, 120 Vac (TELEMECANIQUE #LC1- 050BK), MALSR	53A0252	3

### 8.2.3 Flashing Light Assembly Parts List

See Figure 50 . Refer to Table 30 for flashing light assembly part numbers.

**Table 30: Flashing Light Assembly Part Numbers**

Flashing Light Assembly Type	Part Number
Uses slip fitter with 2-in. EMT, 1-1/2-in. (50.8 mm) tube and towers	44D1677-1
Uses slip fitter with 1-1/2-in. Schedule 40 pipe and 62B0064 frangible coupling	44D1677-2

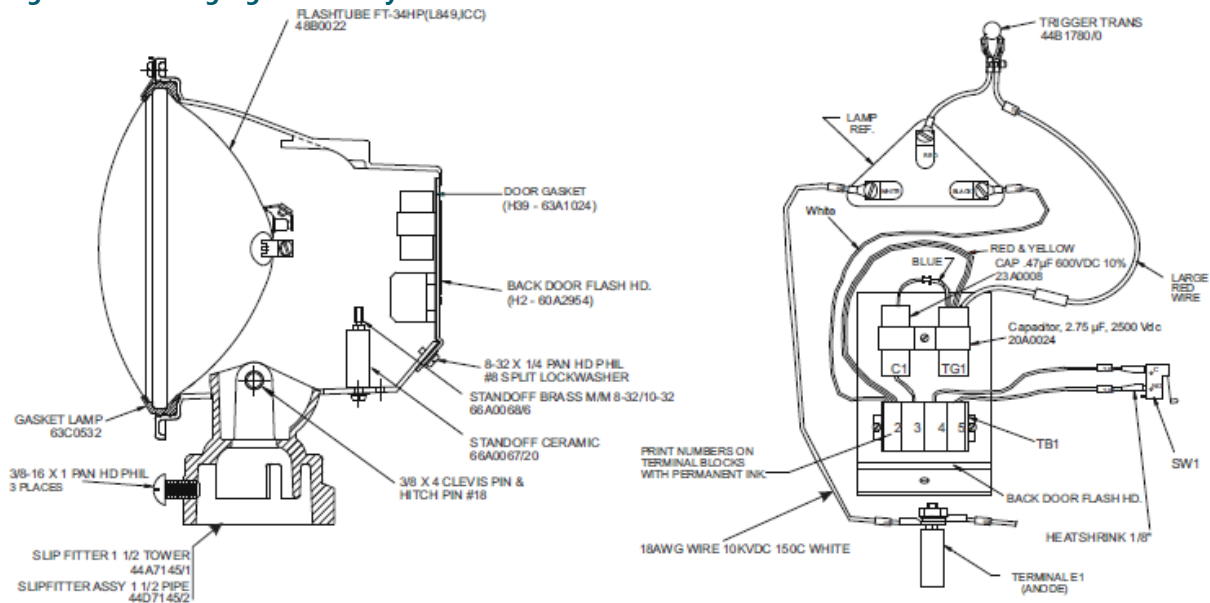
**Table 31: Flashing Light Assembly Part Numbers**

Item	Description	Part Number	Quantity
1 <sup>1</sup>	Lamp clip	60B0900	3
10 <sup>1</sup>	Safety Interlock Switch	45A0297	1
11 <sup>1</sup>	Safety Interlock Switch Insulator Plate	63B0534	1

**Notes**

<sup>1</sup> Not shown

**Figure 50: Flashing Light Assembly**

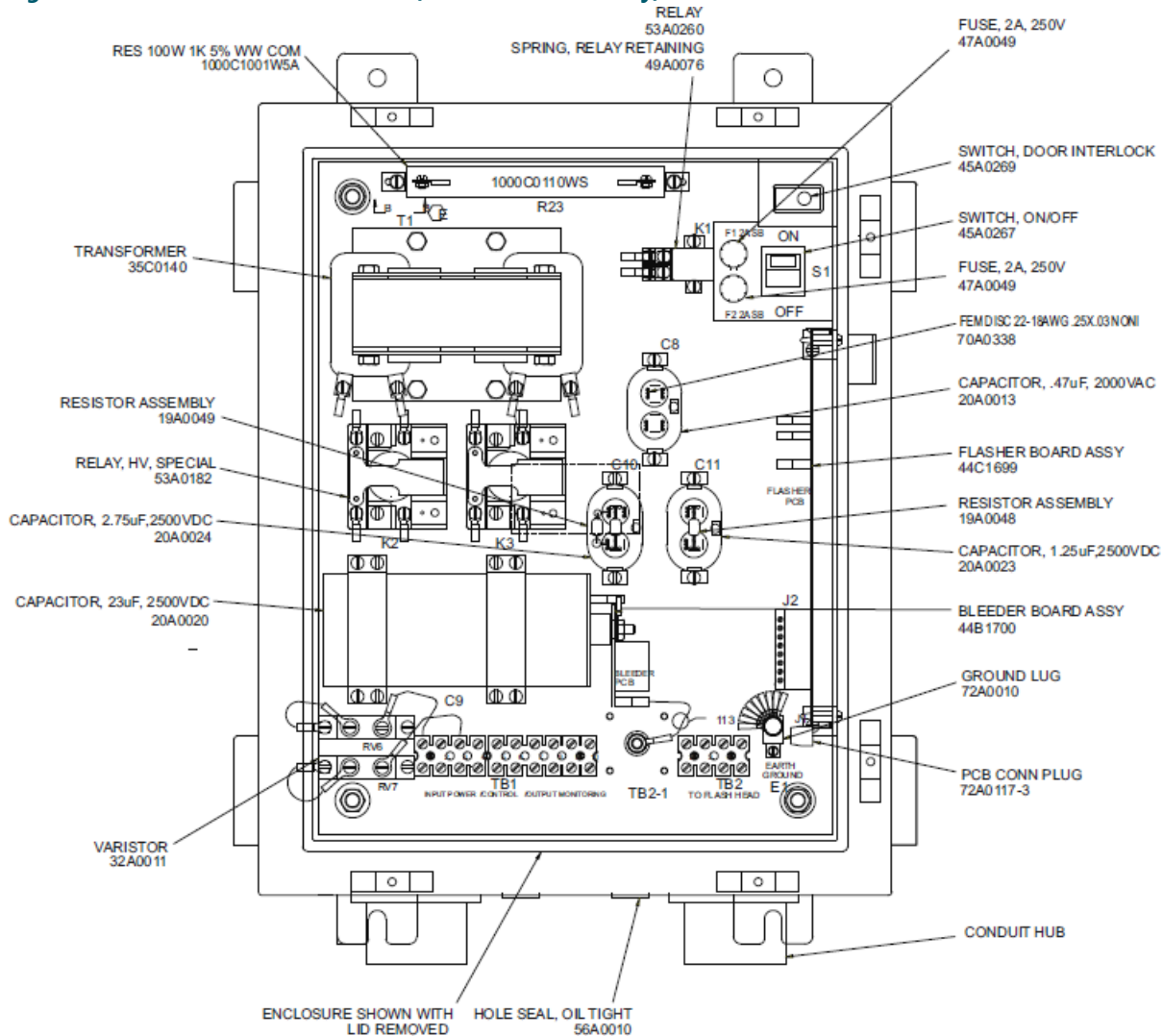


### 8.2.4 Individual Control Cabinet Parts List

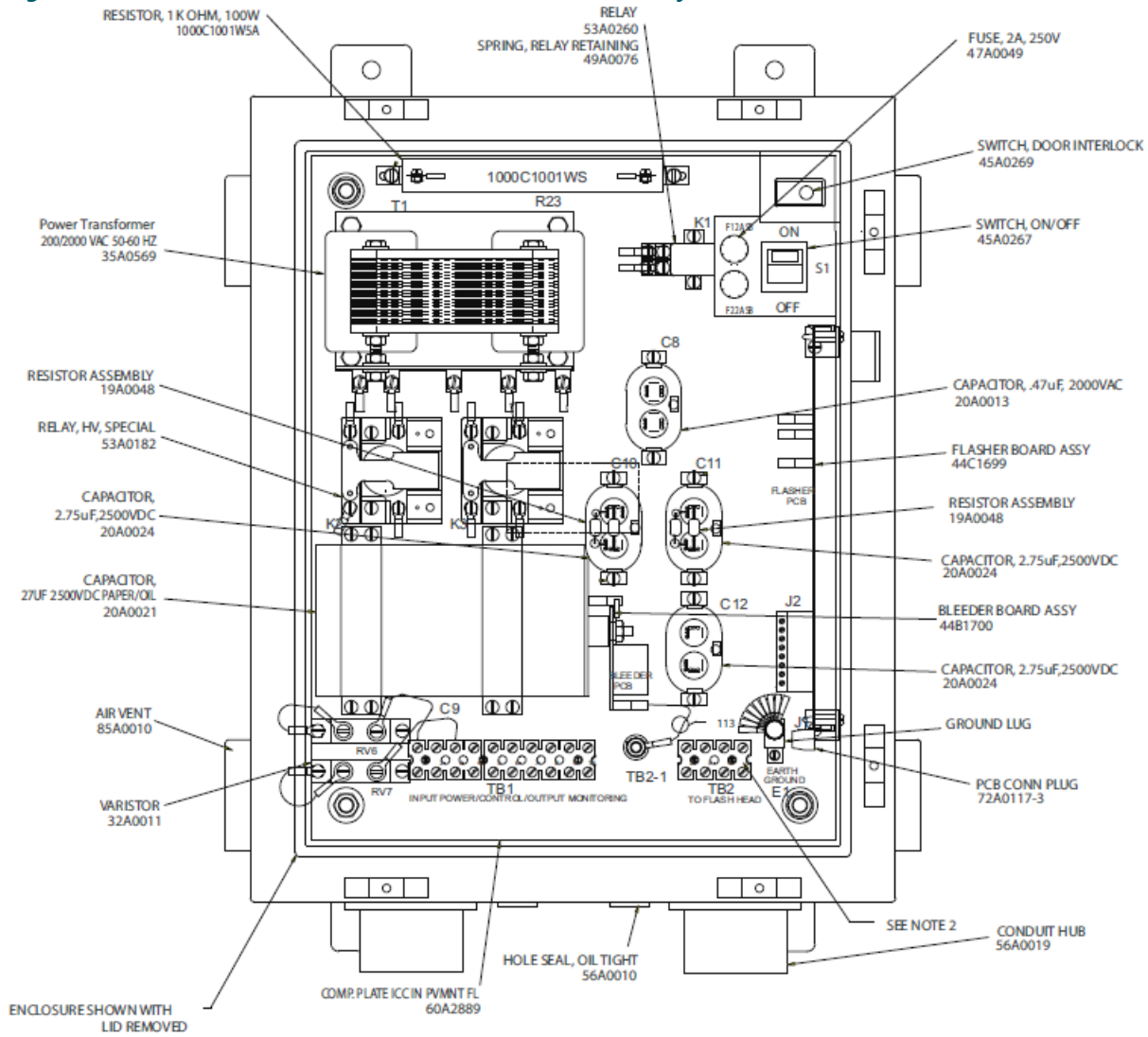
See [Figure 51](#) for the individual control cabinet with elevated flasher. See [Figure 52](#) for the individual control cabinet with in-pavement flasher. Individual control cabinet part number is 44D1651-1 for the ICC with elevated flasher and 44D1651-2 for the ICC with in-pavement flasher.

Item	Description	Part Number	Quantity
	Transformer		1
16	Transformer, (for elevated flasher unit)	35C0140	
	Transformer, (for in-pavement flasher unit)	35A0569	

**Figure 51: Individual Control Cabinet (Elevated Flasher Only)**



**Figure 52: Individual Control Cabinet (In-Pavement Flasher Only)**



### 8.2.5 Steady Burning Light Assembly Parts List

Refer to instruction manual 96A0119, PAR-56 Steady-Burning Approach Light for parts list and diagrams for the steady burning light assembly.

### 8.2.6 MALSR PAR-38 Lampholder Assembly Parts List

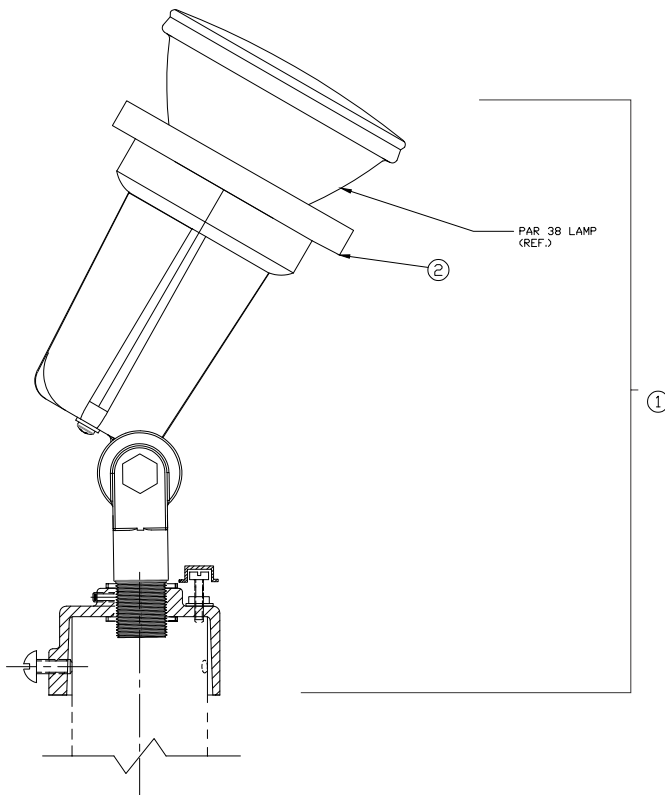
See Figure 53 . PAR-38 parts apply only to the MALSR system.

Item	Description	Part Number	Quantity
1 <sup>1</sup>	Lampholder assembly	44C1683	1
2	PAR-38 Lampholder gasket	SP.MS00028-000-01	1 (qty 1=45pcs)

**Notes**

<sup>1</sup> The lampholder assembly includes the PAR-38 lampholder, slip fitter, and all related hardware. Individual components of the lampholder are not available as spare parts.

**Figure 53: MALSR PAR-38 Lampholder Assembly**



### 8.2.7 MALSR/ALSF In-pavement Flasher (without PCB) Parts List

See Figure 54 . Refer below for the in-pavement flasher without PCB parts list. The part number for the in-pavement flasher is 44A6234-1.



**Note**

This fixture is no longer available.



**Note**

The previous part number for the in-pavement flashing light was 1440.02.050.

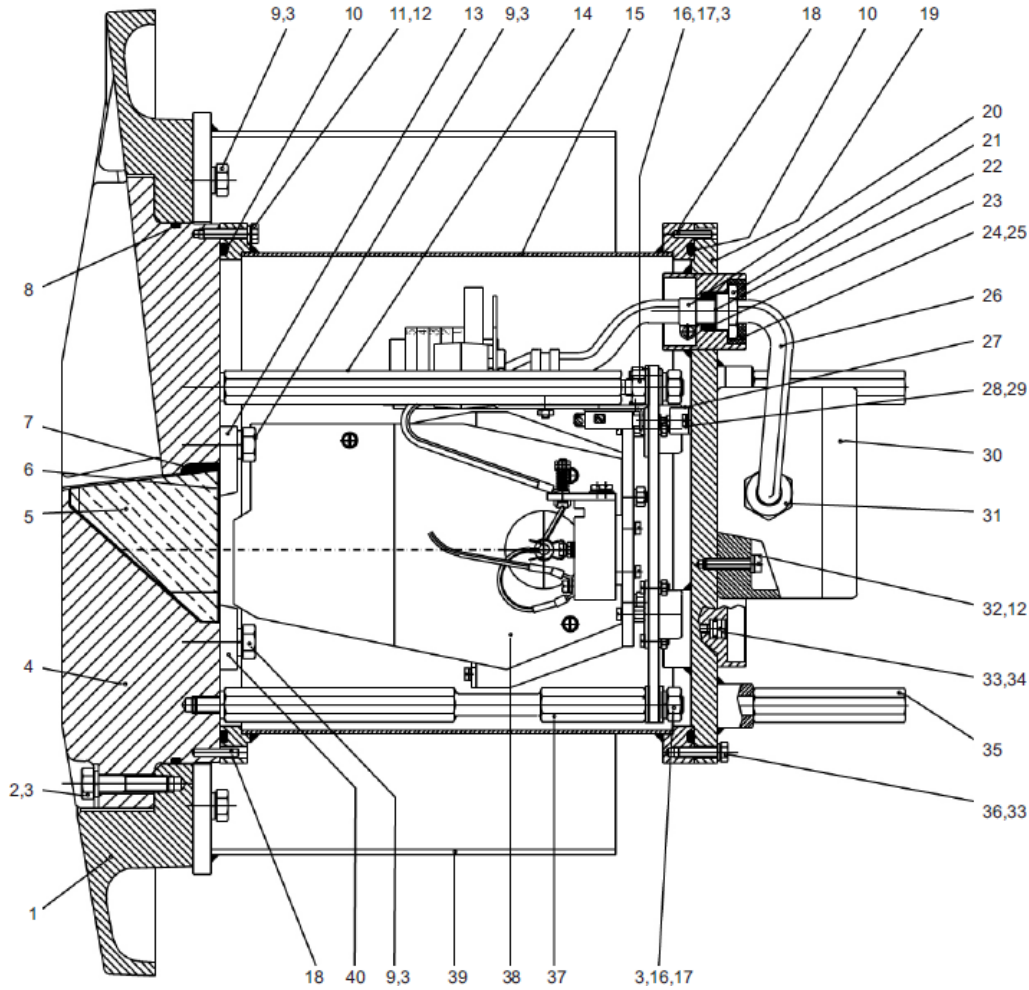
Item	Description	Part Number	Quantity
1	Ring, cast iron	4070.93.970	1
2	Screw, #3/8–16 UNC x 7/8, stainless steel	7200.13.813	6
3	Spring, washer M10, stainless steel	7284.10.464	28
4	Cover, cast iron	4070.93.960	1
5	Lens, glass	5050.01.300	1
6	Prism strip, silicone	4070.97.150	2
7	Sealant, RTV	7835.55.150	AR
8	O-ring, 11.984 diameter, rubber	7080.90.390	1
9	Screw, #3/8–16 UNC x 7/8, stainless steel	7200.23.806	14
10	O-ring, 10.975 diameter, rubber	7080.90.380	2
11	Screw, M6 x 25, stainless steel	7100.08.576	6
12	Spring, washer, M6, stainless steel	7284.10.445	22
13	Lens holder, left, steel plated	4070.95.390	1
14	Stud, steel plated	4070.95.360	2
15	Light base, steel plated	4070.95.140	1
16	Hex nut, M10, stainless steel	7150.53.300	6
17	Flat washer, M10, stainless steel	7283.04.710	8
18	Alignment pin, stainless steel	7275.60.313	1
19	Inner cover, steel plated	4071.59.120	1
20	Cable clamp, nylon	6126.22.050	1
21	Nut for PC, brass	4070.97.130	1
22	Washer for PC, stainless steel	4070.97.130	1
23	Packing ring, PG16, rubber	6126.01.301	1
24	Sealant	7835.55.070	AR <sup>1</sup>
25	Sealant	7835.45.100	AR <sup>1</sup>
27	Interlock switch, stainless steel	4070.97.010	1
28	Screw, M4 x 8, stainless steel	7110.08.358	2
29	Spring washer, M4, stainless steel	7284.10.416	2
30	Box for connection, aluminum	4071.57.660	1
31	Compression gland, brass	6126.01.330	1
32	Screw, M6 x 16, stainless steel	7110.08.561	4
33	Pressure release screw, stainless steel	4070.97.040	1
34	O-ring, silicone	7080.90.016	1
35	Stud, steel plated	4070.96.531	3
36	Screw, M6 x 20, stainless steel	7100.08.569	6

Item	Description	Part Number	Quantity
37	Stud, steel plated	4070.95.351	1
38	Optical system	4070.95.351	1
40	Lens holder, right, steel plated	4070.95.390	1

**Notes**

1 AR: As Required

**Figure 54: In-pavement Flasher Assembly (without PCB) Reference Only**

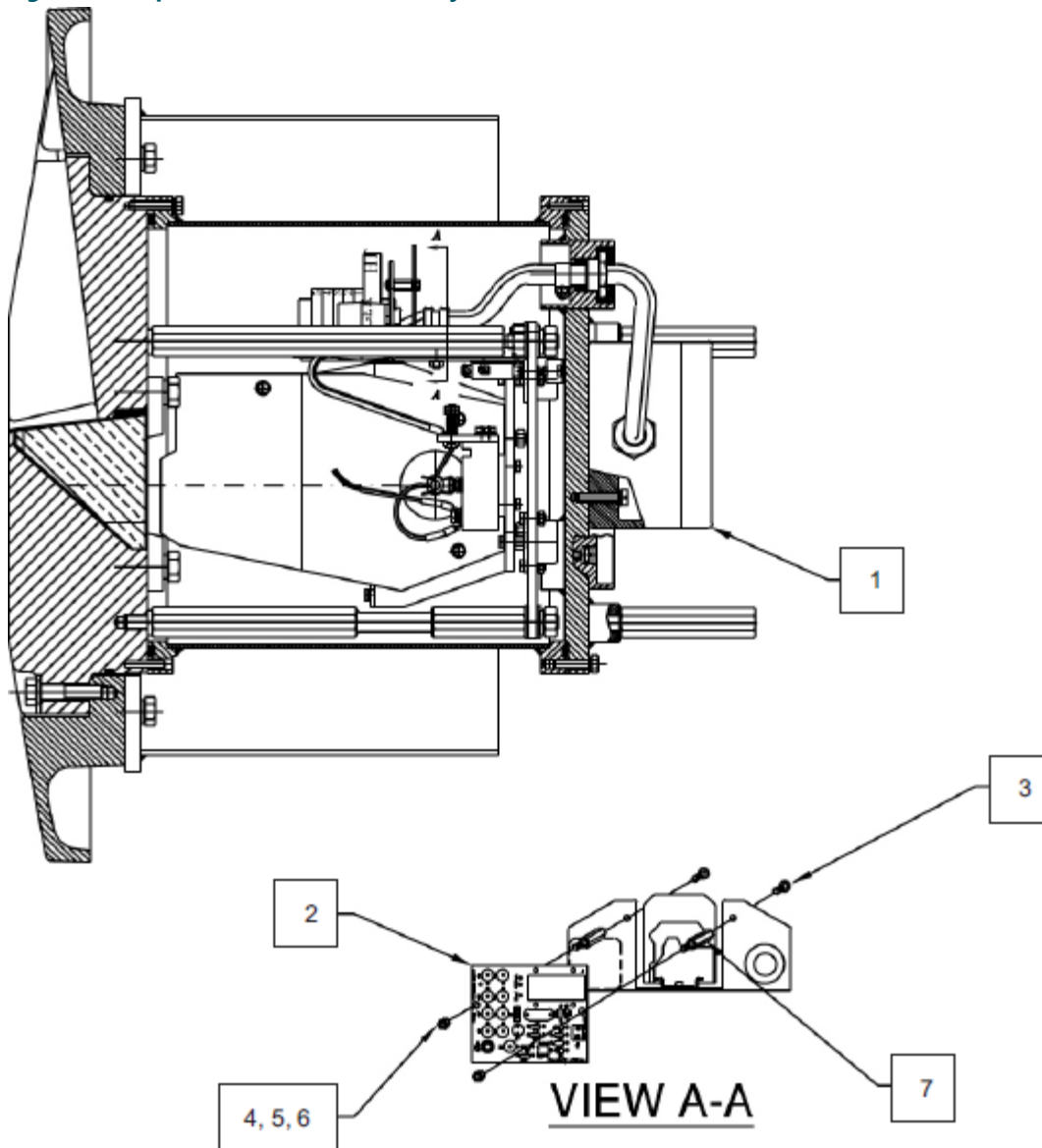


### 8.2.8 MALSR/ALSF In-pavement Flasher (with PCB) Parts List

See Figure 55. Refer below for the in-pavement flasher with PCB parts list. The part number for the in-pavement flasher with PCB is 44A6234-2.

Item	Description	Part Number	Quantity
1	E2628 in-pavement flasher	1440.02.050	1
2	PCB assembly in-pavement rigger interface	44A6235	1
3	Screw, 6-32 x 3/8 pan head	64A0198-6	2
4	Nut, 6-32 hex	65A0015-11	2
5	Flat washer, #6	66A0015-11	2
6	Exterior lock washer, #6	66A0039-4	2
7	Standoff hex M-F 1/2 x, 6-32	66A0129-8	2
Not shown	Male disc, 16-14 AWG 0.25 x 6-32	70A0328	2

Figure 55: In-pavement Flasher Assembly (with PCB)





## 8.2.9 MALSR/ALSF In-pavement Optical Assembly Parts List

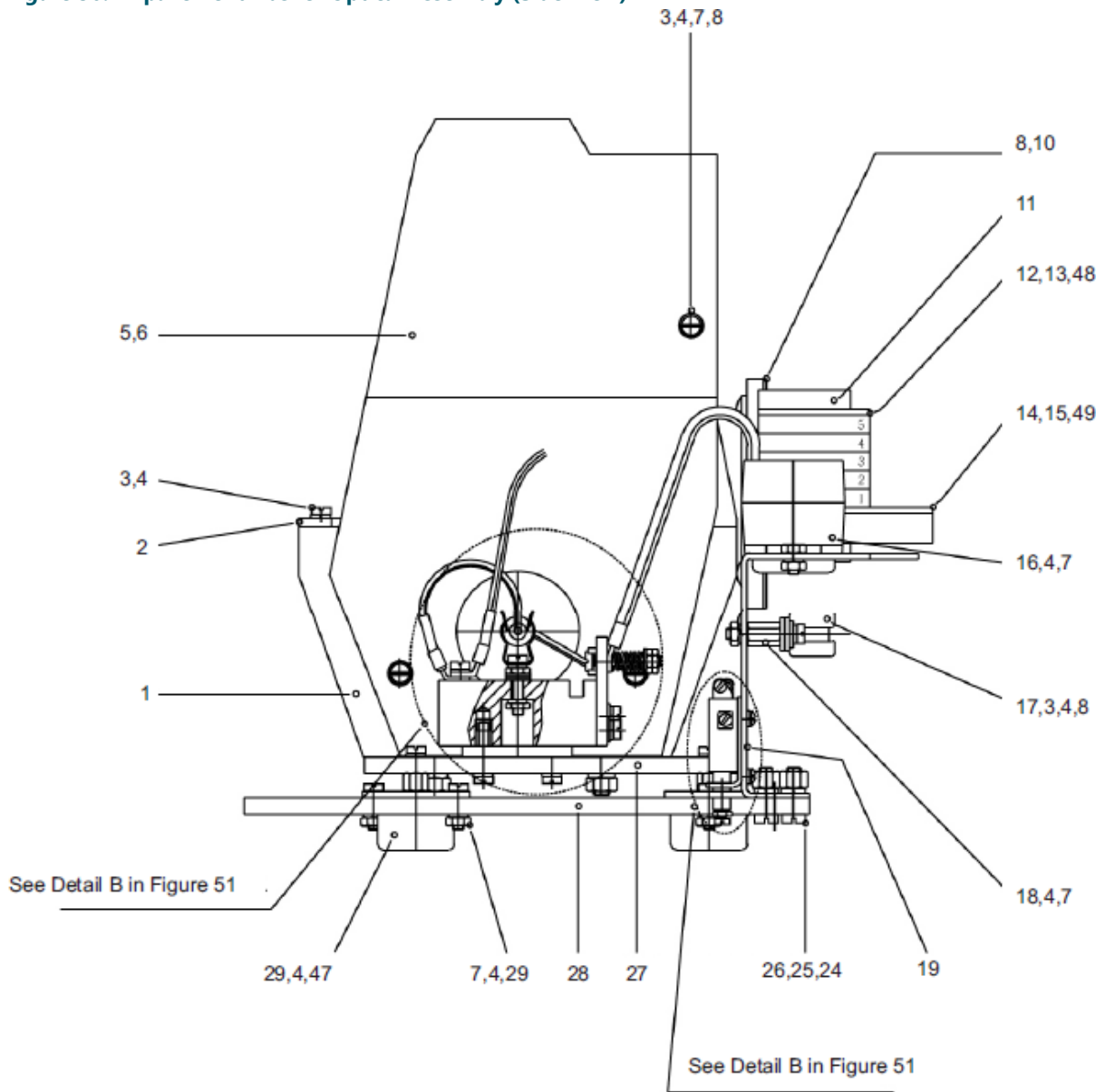
See Figure 55 through Figure 57 Refer below for the in-pavement optical assembly parts list. The part number for the optical assembly is 4071.59.180.

Item	Description	Part Number	Quantity
1	Reflector assembly	4070.97.110	1
2	Reflector clamp, stainless steel	4070.97.120	1
3	Screw, SCH M4 x 10, stainless steel	7110.08.362	17
4	Spring washer, M4, stainless steel	7284.10.416	32
5	Reflector, aluminum, left	4070.95.470	1
6	Reflector, aluminum, right	4070.95.470	1
7	Hex nut, M4, stainless steel	7150.53.180	18
8	Flat washer, M4, stainless steel	7283.04.230	16
9	Terminal block, support	4071.57.680	1
10	Blind rivets	7272.90.530	2
11	End barrier	6112.45.400	2
12	Terminal block	6112.45.420	5
13	Marker (1,2,3,4,5)	6112.45.422	5
14	Terminal block	6112.45.410	1
15	Marker (HT)	6112.45.412	1
16	Trigger transformer	1440.02.180	1
17	Cable clamp	6126.22.050	1
18	Stud, L 12 x M4 M/F	4060.65.570	1
19	Interlock switch support, stainless steel	4090.97.050	1
20	Screw #6-32 UNC ¼, stainless steel	7211.10.601	2
21	Screw #6-32 UNC ½, stainless steel	7211.10.603	1
22	Hex nut #6-32, stainless steel	7250.08.011	1
23	Interlock switch	6150.90.120	1
24	Screw M5 x 16, stainless steel	7110.08.561	4
25	Spring washer, M5, stainless steel	7284.10.426	8
26	Hex nut, M5, stainless steel	7150.53.200	4
27	Optical support, aluminum	4070.95.320	1
28	Main support, aluminum	4070.95.310	1
29	Screw SCH M4 x 16, stainless steel	7110.08.370	9
30	Lamp support	4070.97.070	2
31	Tab (6.3 - diameter 4)	6111.87.090	2
32	Helicoil M4, stainless steel	7162.08.240	8
33	Spade connector, A4-2.5	6110.12.005	2
34	Insulating flexi therm, ¼-in.	6108.75.807	
35	Insulated wire, 16 AWG, 9 kV	6103.93.010	
36	Xenon flashing tube	2990.82.650	1
37	Lampholder, brass	6130.99.370	2

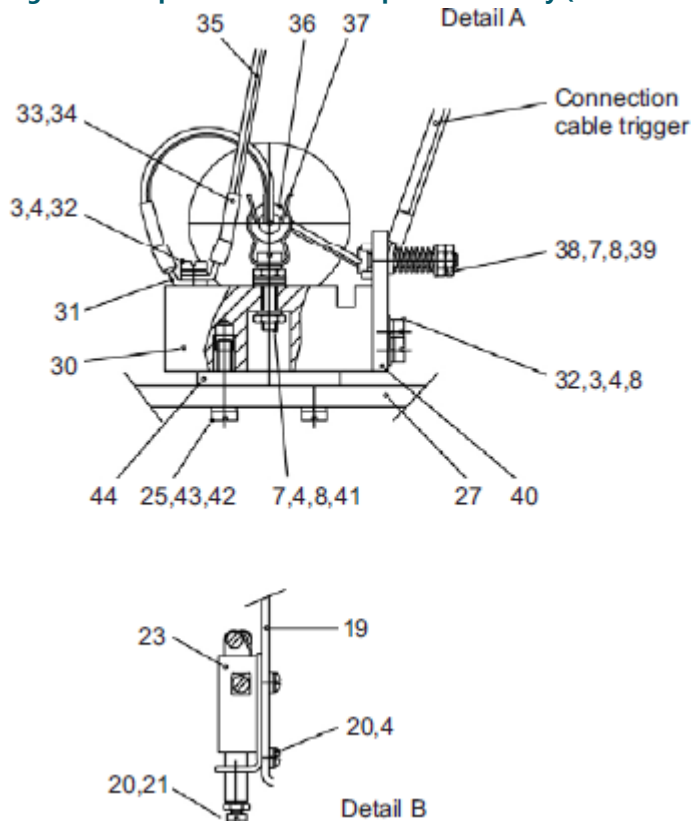
Parts

<b>Item</b>	<b>Description</b>	<b>Part Number</b>	<b>Quantity</b>
38	Screw M4 x 25, stainless steel	7110.08.383	1
39	Spring D.7 x 16, stainless steel	5000.04.690	1
40	Connector, H.V., trigger wire	4070.97.090	1
41	Screw M4 x 20, stainless steel	7110.08.377	2
42	Screw M5 x 20, stainless steel	7110.08.443	4
43	Helicoil, M5, stainless steel	7162.08.250	4
44	Lamp holder	4070.97.080	2
45	Grommet	6126.20.565	1
46	Reflector holder, stainless steel	4070.95.680	1
47	Shock absorber	7030.00.010	3
48	End plate for terminal block	6112.45.421	1
49	End plate for terminal block	6112.45.411	1

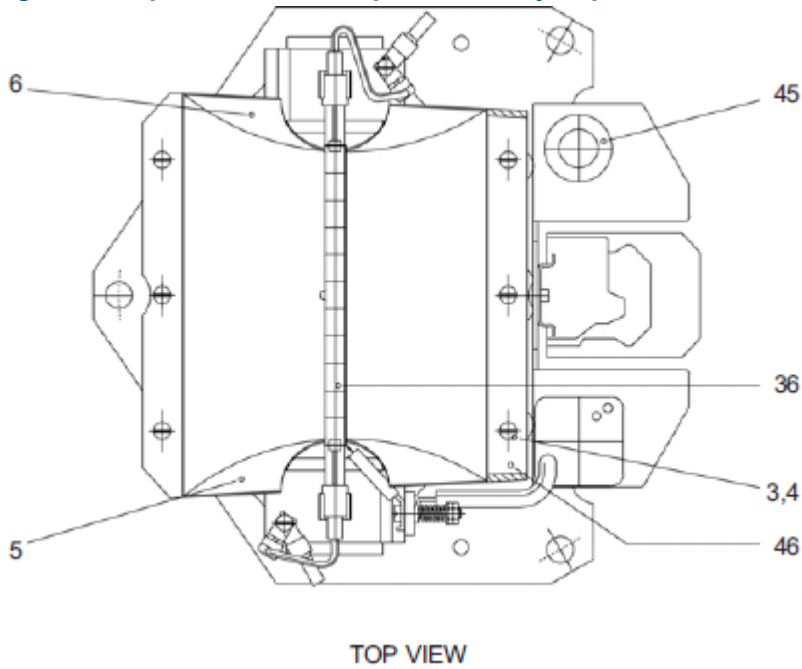
Figure 56: In-pavement Flasher Optical Assembly (Side View)



**Figure 57: In-pavement Flasher Optical Assembly (Detail A and Detail B)**



**Figure 58: In-pavement Flasher Optical Assembly (Top View)**



## 8.2.10 Optional Parts

See [Figure 38](#) . Refer below for optional parts.

Item	Description	Part Number	Quantity
26 <sup>1</sup>	6-core cable	6104.90.206FT	AR <sup>2</sup>
Not shown	Connector kit, in-pavement flasher, male plug	70A0618	1
Not shown	Connector kit, in-pavement flasher, female receptacle	70A0619	1

### Notes

<sup>1</sup> One 6-core cable is needed with each in-pavement flasher. Please specify total length of cable required (in feet) when ordering

<sup>2</sup> AR: As Required

## 8.2.11 Separate Line Item Optional Parts

This subsection provides separate optional line items.

Item	Description	Part Number	Quantity
Not shown	Flasher tester (Type FLT)	44D1686-1	
Not shown	Frangible coupling (Type EMT)	44B0180	1
	Frangible coupling (Type F2)	62B0064	1
Not shown <sup>1</sup>	High voltage wire, AWG 12, 3 kV	89A0110-1	AR <sup>2</sup>
Not shown	Lamps, PAR-38, 150 W, 120 Vac, standard, for MALSR only	48A0447	1
	Lamps, PAR-56, 300 W, 120 Vac	48A0118	1
	Lamps, PAR-56, 200 W, 6.6 A	48A0094	1
	Lamps, PAR-56, 300 W, 20 A	48A0091	1
	Lamps, PAR-56, 500 W, 20 A	48A0092	1
Not shown	Power transformer, 15 kVA (Type T15) for MALSR only	44D1685-1	1
39 <sup>3</sup>	LB-4 deep base		1

### Notes

<sup>1</sup> Used to interconnect flash head and individual control cabinet. Customer must specify length of wire. Wire is supplied in 500 ft spools only.

<sup>2</sup> AR :As Required

<sup>3</sup> See [Figure 58](#) . Contact ADB Safegate for part number.


### 8.2.12 Separate Line Items Required Parts List

This subsection provides parts for separate line items that are required but not included with the ALSF/MALSR system.

Item	Description	Part Number	Quantity
Not shown	Junction box assembly	44D1653	1
Not shown	Aiming device kit		
	Aiming device, MALSR/ALSF	4D1654	1
	Aiming device (for MALSR PAR-56 lamps only)	44D1654-1	1
	Aiming device (for MALSR PAR-56 and PAR-38 lamps)	44D1654-2	1
Not shown	Spare parts trunk, for ALSF only	44D1652	1
Not shown	Power transformer, 15 kVA, MALSR only	44D1685-1	1

### 8.2.13 Recommended Spare Parts

This subsection provides recommended spare parts for the primary control cabinet, flashing light assembly, individual control cabinet, in-pavement flasher final assembly, and in-pavement flasher optical assembly.

 **Note** This spare parts list assumes the spare parts trunk is already available.

#### 8.2.13.1 Primary Control Cabinet Spare Parts

See [Figure 47](#) through [Figure 49](#) . Refer below for Primary Control Cabinet spare parts.

Item	Description	Part Number
2	Fuse, 5A (BUSS AGC-5)	47A0015
3	Fuse, 15 A (BUSS AGC-15)	47A0016
6	Fuse, 1 A, S.B. (BUSS MDL-1)	47A0017
7	Fuse, 10 A (BUSS AGC-10)	47A0018
12	Varistor	32A0011

#### 8.2.13.2 Flashing Light Assembly Spare Parts

See [Figure 50](#) . Refer below for flashing light assembly spare parts.

Item	Description	Part Number
2	Flash lamp	48B0022
7	Trigger transformer assembly	44B1780-1

#### 8.2.13.3 Individual Control Cabinet Spare Parts

See [Figure 51](#) . Refer below for Individual Control Cabinet spare parts.

Item	Description	Part Number
3	Relay	53A0260
	Relay, DPDT, 120 Vac, 15 A at 277 Vac, ALSF only	53A0183
	Relay, DPDT, 120 Vac, 15 A at 277 Vac, MALSR only	
4	Fuse, 2 A, 250 V, SLO-BLO (BUSS MDA-2)	47A0049
15	Relay, DPDT, coil, 120 Vac	53A0182

### 8.2.13.4 In-pavement Flasher Spare Parts

See [Figure 54](#) . Refer below for in-pavement flasher final assembly spare parts.

Item	Description	Part Number
5	Lens, glass	5050.01.300
7	Sealant, RTV	7835.55.150
8	O-ring, 11.984 diameter, rubber	7080.90.390
10	O-ring, 10.975 diameter, rubber	7080.90.380

### 8.2.13.5 In-pavement Flasher Optical Assembly Spare Parts

See [Figure 55](#) through [Figure 57](#) . Refer below for in-pavement flasher optical assembly spare parts.

Item	Description	Part Number
16	Trigger transformer	1440.02.180
23	Interlock switch, MS16106-1	6150.90.120
36	Xenon flashing tube, P4070.97.140.E	2990.82.650





## Appendix A: SUPPORT

Our experienced engineers are available for support and service at all times, 24 hour/7 days a week. They are part of a dynamic organization making sure the entire ADB SAFEGATE is committed to minimal disturbance for airport operations.

### ADB SAFEGATE Support

#### Live Technical Support - Americas

If at any time you have a question or concern about your product, just contact ADB SAFEGATE's technical service department. Trained in all areas of system issues, troubleshooting, quality control and technical assistance, our highly experienced Technical support specialists are available 24 hours a day, seven days a week to provide assistance over the phone.

ADB SAFEGATE **Americas Technical Service & Support (US & Canada): +1-800-545-4157**

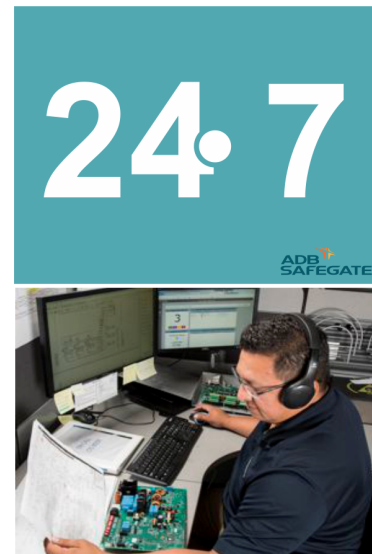
**ADB SAFEGATE Americas Technical Service & Support (International): +1-614-861-1304**

During regular business hours, you can also Chat with a Service Technician. We look forward to working with you!

#### Before You Call

When you have an airfield lighting or system control system problem it is our goal to support airfield maintenance staff as quickly as possible. To support this effort we ask that you have the following information ready before calling.

- The *airport code*
- If not with an airport, then company name (prefer customer id number)
- Contact phone number and email address
- Product with part number preferable or product number
- Have you reviewed the product's manual and troubleshooting guide
- Do you have a *True RMS* meter available (and any other necessary tools)
- Be located with the product ready to troubleshoot



#### Note

For more information, see [www.adbsafegate.com](http://www.adbsafegate.com), or contact ADB SAFEGATE Support via email at [support@adbsafegate.com](mailto:support@adbsafegate.com) or

Brussels: +32 2 722 17 11

Rest of Europe: +46 (0) 40 699 17 40

Americas: +1 614 861 1304. Press 3 for technical service or press 4 for sales support.

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### A.1 ADB SAFEGATE Website

The ADB SAFEGATE website, [www.adbsafegate.com](http://www.adbsafegate.com), offers information regarding our airport solutions, products, company, news, links, downloads, references, contacts and more.

### A.2 Recycling

#### A.2.1 Local Authority Recycling

The disposal of ADB SAFEGATE products is to be made at an applicable collection point for the recycling of electrical and electronic equipment. The correct disposal of equipment prevents any potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling. The recycling of materials helps to conserve natural resources. For more detailed information about recycling of products, contact your local authority city office.

### **A.2.2 ADB SAFEGATE Recycling**

ADB SAFEGATE is fully committed to environmentally-conscious manufacturing with strict monitoring of our own processes as well as supplier components and sub-contractor operations. ADB SAFEGATE offers a recycling program for our products to all customers worldwide, whether or not the products were sold within the EU.

ADB SAFEGATE products and/or specific electrical and electronic component parts which are fully removed/separated from any customer equipment and returned will be accepted for our recycling program.

All items returned must be clearly labeled as follows:

- For *ROHS/WEEE* Recycling
- Sender contact information (Name, Business Address, Phone number).
- Main Unit Serial Number.

ADB SAFEGATE will continue to monitor and update according for any future requirements for *EU directives* as and when *EU member states* implement new *regulations* and or *amendments*. It is our aim to maintain our *compliance plan* and assist our customers.

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