



400 V: MALSR and ALSF

Medium Intensity Approach Lighting System and Approach Lighting System
with Sequenced Flashers (Elevated and In-pavement Flashers)

User Manual

96A0400, Rev. Q, 2024/05/22


**ADB
SAFEGATE**

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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.
 - CSA - C22.2 No.180:13 (R2018) Series isolating transformers for airport lighting
 - 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 Material Handling: Heavy Equipment



DANGER

Unstable load

Use caution when moving heavy equipment

- Use extreme care when moving heavy equipment.
- Verify that the moving equipment is rated to handle the weight.
- When removing equipment from a shipping pallet, carefully balance and secure it using a safety strap.

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

1.1.5 Material Handling Precautions: Fasteners



DANGER

Foreign Object Damage - FOD

This equipment may contain fasteners that may come loose - torque properly.

- Only use fasteners of the same type as the one originally supplied with the equipment.
- Use of incorrect combination of gaskets, bolts and nuts can create severe damages to the product installation and create safety risk .
- You need to know what base the light fixture will be installed in, in order to chose the correct gasket, bolts and nuts.
- Bolt type, length, and torque value are determined by type of base, height of spacers used, and clamp force required in FAA Engineering Brief No 83 (latest revision).
- Due to the risk of bolts vibrating loose, do not use any type of washer with the fixing bolts (such as split lock washers) other than an anti-vibration washer. Anti-vibration washers as defined in FAA EB 83 (latest edition) must be used. For installations other than FAA, use the base can manufacturer's recommendations.
- Always tighten the fasteners to the recommended torque. Use a calibrated torque wrench and apply the recommended adhesive type.
- Obey the instructions of the adhesives necessary for the fasteners.

Failure to follow these warnings may cause the fasteners to loosen, damage the equipment, potentially to loosen the equipment. This can lead to a highly dangerous situation of FOD, with potential lethal consequences.



Note

To minimize the risk of errors, the ADB SAFEGATE Sales Representative will have information on which gasket goes with which base. This information is also provided in the product Data sheets, the User Manuals and the Spare Part Lists.



CAUTION

Use of incorrect combination of gaskets, bolts and nuts can create severe damages to the product installation and create multiple safety risks.

To obtain a safe and watertight installation the O-ring and retaining bolt stated in the document must be used.

You need to know what base the light fixture will be installed in, in order to choose the correct gasket, bolts and nuts.

Failure to follow these cautions can result in equipment damage or aircraft FOD.

1.1.6 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

1.1.7 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

1.1.8 Maintenance

This section provides maintenance information and procedures for the F-Range light fixtures.

Preventive Maintenance - Inset Lights

Maintenance personnel must refer to the maintenance procedure described in the ICAO Airport Services Manual, Part 9, Airport maintenance practices and in FAA Advisory Circular N° AC150/ 5340-26.



DANGER

Electric Shock Hazard

This equipment may contain electrostatic devices

- Do not carry out any action on the fixture unless you have read and understood all the information in the Safety Section.
- 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.
- Make sure that the power to the series circuit is OFF when you carry out maintenance.

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



CAUTION

Use of incorrect combination of gaskets, bolts and nuts can create severe damages to the product installation and create multiple safety risks.

To obtain a safe and watertight installation the O-ring and retaining bolt stated in the document must be used.

You need to know what base the light fixture will be installed in, in order to choose the correct gasket, bolts and nuts.

Failure to follow these cautions can result in equipment damage or aircraft FOD.

1.1.9 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

1.1.10 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

Provides the purpose, scope, and applicability of the technical manual.

The manual shows the information necessary to:

- Install and maintain the ALSF/MALSR system and associated equipment.

2.1 Low-Voltage ALSF/MALSR Approach Lighting System

Compliance with Standards

FAA:	Designed according to ALSF-1, ALSF-2, ALSF-2/SSALR: FAA-E-2628; MALSR: FAA-E-2325
ICAO:	Annex 14 Vol. 1, para. 5.3.4, 5.3.4.17, 5.3.7, and 5.3.8
Military:	UFC 3-535-01 – Chapter 3 for Approach Applications using sequenced flashing lights

ALSF Uses

ALSF-1, ALSF-2, and ALSF-2/SSALR approach lighting systems with 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. Note that FAA-E-2628 specifies only the sequenced flasher portion of the ALSF approach lighting system. The steady-burning portion of an ALSF system is implemented using either a 6.6 A or 20 A series circuit.

- 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.



Note

For ICAO applications, the system can also be used with up to 30 flashers.

MALSR Uses

The MALSR approach lighting system with 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. Note that FAA-E-2325 specifies both the sequenced flasher and steady-burning portions of a MALSR approach lighting system.

Operating Conditions

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

2.2 LV ALSF/MALSR

Low-Voltage ALSF High-Intensity and MALSR Medium-Intensity Approach Lighting Equipment with Elevated and In-pavement Sequenced Flashers 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. Flasher operating voltage is +400V DC instead of +2000V DC used in traditional systems, improving safety. This also allows standard 600V cable to be used between the flasher and Individual Control Cabinet (ICC).

This eliminates the need for high voltage interconnecting cable. MALSR sequenced flashers can be easily expanded to ALSF at a later date.

2.3 About this manual

2.3.1 How to work with the manual

1. Become familiar with the structure and content.
2. Carry out the actions completely and in the given sequence.

2.4 Product Introduction

Sequenced flashing lights are used predominantly during reduced visibility as a landing aid in the approach area or the runway threshold area.

The units flash in sequence at 3 selectable brightness levels (3 steps).

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).

2.4.1 Theory of Operation

The ADB Safegate sequenced-flasher lighting systems includes a master control cabinet, junction boxes, individual control cabinets (ICC), either elevated or in-pavement flasher units and, maintenance software that can be loaded on a PC running a Windows™ operating system. For MALSR systems, a 15kVA transformer is also provided to power the steady-burning lights.

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 (30 for ICAO applications) are installed in the outer portion of the approach lighting system at regular intervals.

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. Typically, up to 8 flashing lamp assemblies are installed in the outer portion of the approach lighting system at regular intervals.

The MALSR system uses white 120V AC PAR-38 fixtures for the steady burning light bar arrays. Also, the MALSR system uses green elevated 120V AC PAR-56 fixtures for the threshold bar. The ALSF system uses white or red elevated PAR-56 6.6A or 20A fixtures for light bar arrays and green PAR-56 6.6A or 20A fixtures for the threshold bar.

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 twice per second.

2.4.2 ALSF System

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

Table 1: ALSF Configurations

ALSF-1	ALSF-2	SSALR
Directs aircraft to runway centerline under CAT I and CAT II conditions with waiver.	Directs aircraft to runway centerline under CAT I, II, III conditions.	Directs aircraft to runway centerline when visibility conditions are better than CAT I.
Up to 15 flashers	Up to 21 flashers	5 flashers. Every other flasher up to #9 is active; the rest are inactive. Operator can reconfigure the number of active flashers.
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 and, 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, Type FAP PAR-56 Approach Light.

2.4.2.1 ALSF Uses

ALSF-1, ALSF-2, and ALSF-2/SSALR approach lighting systems with 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. Note that FAAE-2628 specifies only the sequenced flasher portion of the ALSF approach lighting system. The steady-burning portion of an ALSF system is implemented using either a 6.6A or 20A series circuit.

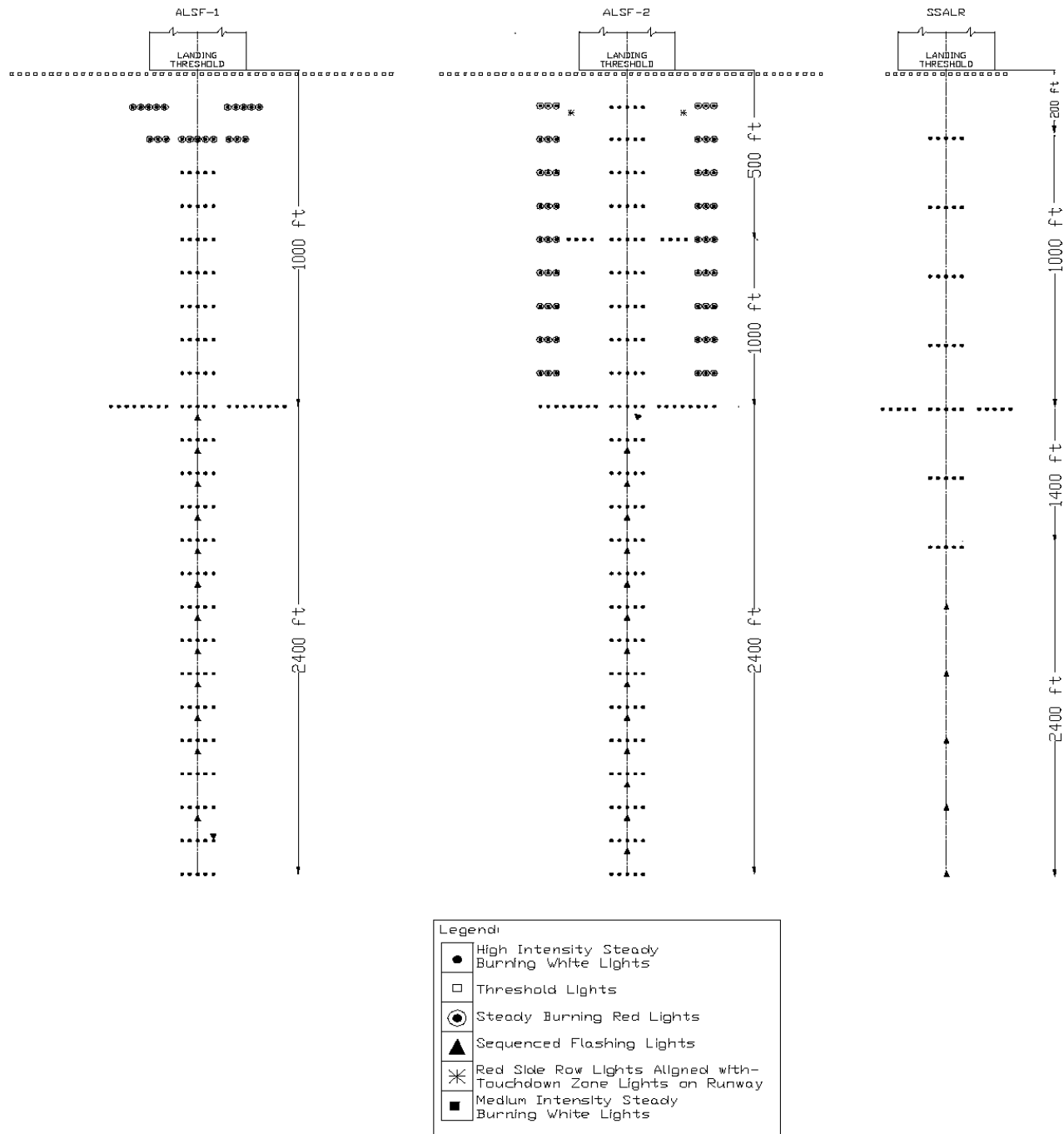
2.4.2.2 ALSF-1

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.

2.4.2.3 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.

Figure 1: ALSF System



2.4.2.4 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.



Note

For ICAO applications, the system can also be used with up to 30 flashers with an additional 2 optional REIL flashers.

2.4.2.5 SSALR Mode

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

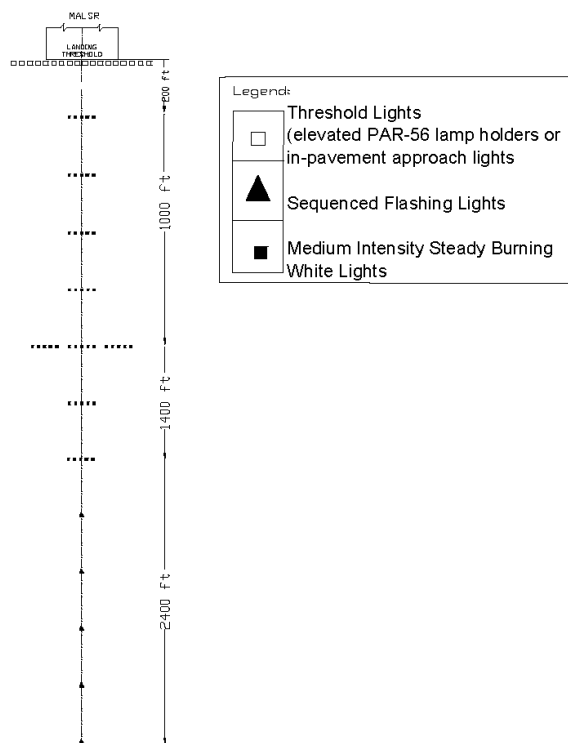
2.4.3 MALSR System

2.4.3.1 MALSR Uses

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

The MALSR approach lighting system with 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. Note that FAA-E-2325 specifies both the sequenced flasher and steady-burning portions of a MALSR approach lighting system.

Figure 2: MALSR System



MALSR system includes:

- A master control cabinet.
- 3-8 sequenced flashers. Five 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, *Type FAP PAR-56 Approach Light* for more information on this fixture



Note

The optional FAA-E-2968 in-pavement approach light can be used as a threshold marker, depending on site requirements.

The ADB SAFEGATE MALSR sequenced flasher can be modified to a 21-flasher ALSF system at a later time.

2.4.3.2 Environmental Operating Conditions

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

2.4.3.3 Features

- MALSR sequenced flashers can be easily expanded to ALSF at a later date.
- Flasher operating voltage is +400V DC instead of +2000V DC used in traditional systems, improving safety. This also allows standard 600V cable to be used between the flasher and Individual Control Cabinet (ICC). This eliminates the need for high voltage interconnecting cable.
- Lamp subassembly in elevated flash head can be quickly and easily replaced without the use of tools.
- In-pavement flasher uses an aluminum top cover, reducing maintenance requirements. This also results in a very low weight.
- In-pavement flasher height above ground (without snow plow ring) is only 0.75" high.
- In-pavement flasher height above ground (with snow plow ring) is only 0.5" high.
- Flashers can be up to 393 ft. (120 m) from the ICC, allowing placement outside the obstacle free zone.
- ICC can be optionally supplied with one cabinet that can connect to 3 flashers, minimizing acquisition and installation cost.
- ICC uses a highly efficient power supply. This yields lower power consumption, elimination of peak inrush currents, and allows use of smaller gauge supply power wires compared to traditional capacitive discharge systems.
- Numerous remote control/monitoring options maximize system flexibility. Remote control/monitoring can be accomplished via:
 - Single or dual field bus.
 - Individual 24V DC, 48V DC or 120V AC hard-wired copper connections.

2.4.4 MALSR/ALSF Required Equipment:

Refer to [Table 2](#) for the MALSR/ALSF required equipment that is supplied. Refer to [Additional equipment may be required, and must be ordered separately](#) for the MALSR and ALSF required equipment that is not supplied. Refer to "Parts" on page 121 for ordering information.

Table 2: MALSR/ALSF Required Equipment Supplied

Description	MALSR	ALSF
Master Control Cabinet	1	1
Sequence Flasher Heads	3 to 8	Up to 21
Individual Control Cabinets	3 to 8	Up to 21
Junction Boxes	3 to 8	Up to 21
15 kVA Power Transformer	1	None
PAR-38 Lamp Holders	45	None
PAR-56 Lamp Holders	18	None
Flasher Test Equipment (Laptop and Software)	1	1
Mating Connectors for ICC and the flasher tester laptop	2	None
Steady-Burning Aiming Device (PAR-38/-56)	1	None
Elevated Flasher Aiming Device	1	1
Spare Parts Trunk	1	None
Instruction Manuals	1 set	1 set



Note

See ADB Safegate catalog sheet 1042 for more details on ALSF or MALSR PAR-56 fixtures.

2.4.5 Additional equipment may be required, and must be ordered separately

- 45-PAR-38, 120W or 150W, 120V AC lamps.
- 18-PAR-56, 300W, 120V AC lamps.
- Frangible couplings.
- Low impact-resistant structures.
- 2-inch (50.8 mm) EMT conduit.



Note

New MALSR systems will use the 150 W PAR-38 Lamps.

- For in-pavement FAA-E-2968 MALSR medium-intensity system, Style I, unidirectional white applications, use part number 44A6439-1000. This fixture uses one 105W lamp and is photometrically equivalent to the older style 200W L-850B fixtures that were used in this application. See catalog sheet 2000 for more details.
- For in-pavement FAA-E-2968 MALSR medium-intensity system, Style II, unidirectional green applications, use part number 44A6440-1000. This fixture uses three 62W lamps and is photometrically equivalent to the older style 200W L-850E fixtures that were used in this application. See catalog sheet 2029 for more details.
- Encapsulated (FAA Style) isolation transformers are available for voltage-driven, medium-intensity approach lighting applications. For 105W, 240V AC to 15.9V AC applications, use part number 35C0095. For three 62W lamp applications, a 186W, 240V AC to 28.2V AC transformer is used (Part No. 35C0096). See catalog sheet 2000 for white approach MALSR application.

2.4.6 Some Useful Terms and Definitions

Table 3: Terms and Definitions

Term	Description
Binary notation	All data in the digital circuits is treated using "1" and "0". Thus, all decimal notations are transcribed into binary notations.
FCU	Flasher Control Unit (ICC)
Hexadecimal notation	This is a way to write numbers in a base of 16, instead of the standard 10. In the manual, it is used for bits and addresses, because it better identifies the active data address or data lines.
ICC	Individual Control Cabinet
LMC	Local Master Controller
Local bus	The communication bus, which exchanges data and control signals between the FCUs and the LMC.
MW	Multi-wire
PCB	Printed Circuit Board
PE	Protective Earth
UI	User Interface

2.4.7 Master Control Cabinet

The master control cabinet contains a control / monitoring board, called the Local Master Controller (LMC), that provides the power, timing signals, misfire monitoring circuitry, and three-step intensity control signals to the sequenced flasher assemblies in remote and local mode.

2.4.8 Equipment Data (Master Control Cabinet)

Input Voltage 120/240 Vac, +10%/-15%, 50/60Hz, three-wire, single-phase (neutral center-tapped).

- Time from:
 - In ALSF mode, corresponds to one cycle, Trigger Pulse corresponds to one cycle of the 60Hz line, or 16.67 ms.
 - In SSALR mode, Trigger Pulse corresponds to every other cycle of the 60Hz line or 33.3 ms.
 - For MALSR, corresponds to every other cycle of the 60Hz line or 33.3 ms.
- Enclosure NEMA 4, outdoor and ventilated (to prevent condensation).
- Maintenance:
 - Rotary control switch for manual operation.
 - Flasher ON/OFF switch to de-energize flashers (if desired) when the approach lights are energized.
 - LED indicators for system monitoring.
 - Service entrance switch disconnects incoming power.
 - 100W maintenance light.
 - Door can be locked in a 120° open position.
 - Lightning Protection on all input and output electrical connections.

2.4.8.1 Gross Weight and Dimensions

- 137 lb. (62 kg)
- 37.25 x 30 x 11.38 in (94.6 x 76.2 x 28.9 cm) (H x W x L)

2.4.9 Master Input Power Requirement

Table 4: Master Input Power Requirement

Voltage	Max. No. of Flashers	Max. Power Requirements ALSF	Max. Power Requirements MALSR
120/240 Vac	3	4kVA	18kVA
	5	5kVA	19kVA
	6		
	8	6kVA	20kVA
	9		
	12	7kVA	
	15	8kVA	
	18	9kVA	
	21	10kVA	

2.4.10 Flasher

2.4.10.1 Elevated Flash Head (UEL)

Each elevated flash head assembly consists of a flashing light head, which houses a low voltage (400 Vdc) flashtube and a trigger transformer. A safety interlock switch disconnects the individual control cabinet (ICC) power when the flash head is opened. The elevated flash head is rated IP45.

2.4.10.2 Type FFL In-pavement Flasher (MALSR and ALSF)

For both MALSR and ALSF, each in-pavement flasher consists of a aluminum fixture, which houses the low voltage (400 Vdc) linear xenon flashtube, trigger transformer, and optical assembly. The unique optical assembly ensures that the fixture meets FAA/ICAO photometric requirements. A safety interlock switch discharges the voltage across the flash lamp when the fixture is opened for service. A 6-core (5-conductor and shield) cable is used between the ICC and the in-pavement flasher.

A 6-core cable pigtail is provided with the fixture. Two methods may be used to connect the 6-core cable to the light fixture. The 6-core pigtail can be spliced to the matching 6-core interconnecting cable using a conventional waterproof splice. Also, a mating connector is available to allow the entire fixture to be quickly disconnected from the circuit.

In-pavement flasher height is 0.75 inch without the snow plow ring and fits on a standard FAA 12-inch base can. Fixture height is 0.5 inch with the snow plow ring.

2.4.10.3 In-pavement and Elevated Flasher Fixture Equipment Data

Input Voltage	+400 Vdc
Lamp	Xenon flashtube
Lamp Life	Average 1,000 hours on high-intensity step
Intensity Decrease	30% or less over minimum rated lamp life
Flash Skipping	Less than 1% with no consecutive skipping
Elevated Light Beam Axis	Adjustable vertically from the horizontal to 25° above the horizontal
Vibration	Withstands vibration in frequency range of 10 to 2,000Hz in accordance with NEMA Standard FA1-3.01
Elevated 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 393 ft. (120 m) from the ICC
Elevated Dimensions	10.6 x 5.75 x 6.7 in - H x W x D (27 x 14.6 x 17 cm)
In-pavement	Fits on standard 12-inch base can.
Elevated Wt.	4 lb (1.8 kg).
In-pavement Weight	16.5 lb. (7.5 kg).

2.4.11 Individual Control Cabinet (ICC)

Each flasher fixture 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 flash lamp power circuitry when the cabinet door is opened. The ICC can connect to one flasher or optionally, 3 flashers. The ICC includes an anti-condensation heater. As soon as power is applied the anti-condensation heater(s) can activate, even if the flashing light system is switched off.

2.4.12 Aiming Devices

2.4.12.1 Elevated PAR-38/56 Steady-Burning Lamps

Aiming devices can be used on either ground mounted lights or when the lights are mounted on low impact resistant structures conforming to FAA-E-2604 or FAA-E-2702. The aiming device is used to adjust the vertical elevation angle of PAR-38 and PAR-56 steady-burning 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. The aiming angle can be calibrated in 1° intervals, and the actual aiming angle of the lamp holder with the aiming device attached is accurate to within ±0.5°.

2.4.12.2 Elevated Type UEL Flashing Lamps

This aiming device is used to adjust the vertical elevation of the elevated flash head. It is available either as an electronic or as a simple mechanical (bubble level) based unit. Both aiming devices have a scale calibrated in 1 degree increments and are accurate to within ±0.5°.

The electronic aiming device permits adjustment and measurement of the vertical elevation angle of the UEL lamp holder for fixtures mounted over 6 ft. (1829 mm) high and, the bubble level aiming device can be used on fixtures mounted 6 ft. (1829 mm) high or less. It is a single unit consisting of a housing, support, trip cord (on electronic level only) 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 electronic aiming device can be used to remotely aim the UEL lamp holder on low impact resistance structures conforming to FAA-E-2604 or FAA-E-2702.

2.4.13 Flasher Tester

Flasher Tester functionality is accomplished using software (supplied on a CD with the system) that provides advanced monitoring and on-site configuration capabilities. The software may be loaded either on a customer supplied laptop or (optionally) on a laptop provided with the system. The laptop is connected to either the Master or any ICC using a communication dongle. The software provides user-adjustable parameter setting and configuration functions and detailed individual status monitoring screens.

2.4.14 Junction Box

Junction boxes are used to distribute power and communications 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 all wires used for the flasher unit.

2.4.15 FAA Spare Parts Trunk

The optional FAA Spare Parts Trunk includes Master, ICC and flashing-fixture PCBs.

2.4.16 MALSR Steady-Burning Light Components

2.4.16.1 MALSR Lamp Holders

PAR-38 Lamp Holder

There are 45 clear PAR-38 lamp holders mounted five to a light bar in the runway approach. Each lamp holder is designed to accommodate 120W or 150W, 120V AC PAR-38 lamps. An adjustable base on the lamp holder permits vertical adjustment from the horizontal to 25° above the horizontal. Also, the mounting hardware permits horizontal alignment of the light beam axis to any horizontal angle within $\pm 1^\circ$. The lamp holder has a mounting base that mounts on the open top of a frangible coupling, on a light bar with an adapter sleeve, or to a 2-inch (EMT) conduit.

PAR-56 Lamp Holder

Eighteen PAR-56 lamp holders are installed on the runway threshold. The lamp holder has mounting clips to hold the green filter and is designed to accommodate a 300W, 120V AC 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. PAR-56 lamp holders are ordered separately. See Catalog Sheet 1042 for ordering information.

2.4.16.2 MALSR 15kVA Power Transformer

The 15kVA, 60Hz power transformer powers the steady-burning PAR-56 and PAR-38 lights. Taps on the transformer are switched electronically by the master control cabinet to provide power at any one of three voltage levels to the steady-burning lights. Additional taps provided on the primary of the transformer permit manual secondary voltage adjustment to within 2.5% of the required secondary output assuming the primary voltage is between 210V and 252V AC. The transformer is housed in an outdoor, rain-tight enclosure with lugs provided on the back of the enclosure for mounting the cabinet in a vertical position. Two internal MOV lightning arrestors are provided for input and output lightning protection.

Table 5: MALSR Power Transformer Nominal Output Voltage

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

2.4.17 MALSR Ordering Information

The following equipment is supplied for the MALSR approach lighting systems per FAA-E-2325:

Table 6: MALSR Component Ordering by Configuration

Quantity	Description
1	Master Control Cabinet
3 to 8	Sequence Flasher Heads

Table 6: MALSR Component Ordering by Configuration (Continued)

3 to 8	Individual Control Cabinets
3 to 8	Junction Boxes
1	15 kVA Power Transformer
45	PAR-38 Lamp Holders
18	PAR-56 Lamp Holders
1	Flasher Tester Equipment
1	Steady-Burning Aiming Device (PAR-38/-56)
1	Elevated Flasher Aiming Device
1	Spare Parts Trunk
1	Instruction Manual

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

- PAR-38, 120W or 150W, 120V AC lamps
- PAR-56, 300W, 120V AC lamps
- Frangible couplings
- Low impact-resistant structures
- For in-pavement FAA-E-2968 MALSR medium-intensity system, Style I, unidirectional white applications, use part number 44A6439-1000.
- This fixture uses one 105W lamp and is photometrically equivalent to the older style 200W L-850B fixtures that were used in this application. See catalog sheet 2000 for more details.
- Encapsulated (FAA Style) isolation transformers are available for voltage-driven, medium- intensity approach lighting applications. For 105W, 240V AC to 15.9V AC applications, use part number 35C0095.
- For in-pavement FAA-E-2968 MALSR medium-intensity system, Style II, unidirectional green applications, use part number 44A6440-1000. This fixture uses three 62W lamps and is photometrically equivalent to the older style 200W L-850E fixtures that were used in this application. See catalog sheet 2029 for more details.
- Encapsulated (FAA Style) isolation transformers are available for voltage-driven, medium- intensity approach lighting applications. For three 62W lamp applications, a 186W, 240V AC to 28.2V AC transformer is used (Part No. 35C0096). See catalog sheet 2000 for white approach MALSR application

2.4.18 ALSF Ordering Information

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

Table 7: ALSF Component Ordering by Configuration

Quantity	Description
1	Master Control Cabinet (up to 32 for ICAO applications)
Up to 21	Flashing Light Heads (up to 32 for ICAO applications)
Up to 21	Individual Control Cabinets (up to 32 for ICAO applications)
Up to 21	Junction Boxes
1	Steady-Burning Aiming Device
1	Elevated Flasher Aiming Device
1	Flasher Tester Equipment
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
- Spare Parts Trunk
- L-830 Isolation Transformer or (1) 1,500W, 20A/20A, Isolation Transformer



Note

For in-pavement FAA-E-2952 (Replacement for 2491) ALSF high-intensity system applications, see Catalog Sheet 2029 for details.

2.4.19 Specifications

2.4.19.1 Commissioning Records

This table may be used to record the configuration of the system.

APPROACH	Mode name	Notes
	Cycle time in seconds	

Table 8: Commissioning Record

Control unit ID	Flasher ID	SW2	Timing in ms	REIL	Group
Control unit 1	Flasher A				
	Flasher B				
	Flasher C				
Control unit 2	Flasher A				
	Flasher B				
	Flasher C				
Control unit 3	Flasher A				
	Flasher B				
	Flasher C				
Control unit 4	Flasher A				
	Flasher B				
	Flasher C				
Control unit 5	Flasher A				
	Flasher B				
	Flasher C				
Control unit 6	Flasher A				
	Flasher B				
	Flasher C				
Control unit 7	Flasher A				
	Flasher B				
	Flasher C				

Table 8: Commissioning Record (Continued)

Control unit ID	Flasher ID	SW2	Timing in ms	REIL	Group
Control unit 8	Flasher A				
	Flasher B				
	Flasher C				
Control unit 9	Flasher A				
	Flasher B				
	Flasher C				
Control unit 10	Flasher A				
	Flasher B				
	Flasher C				
Control unit 11					
Control unit 12					
Control unit 13					
Control unit 14					
Control unit 15					
Control unit 16					
Control unit 17					
Control unit 18					
Control unit 19					
Control unit 20					
Control unit 21					
Control unit 22					
Control unit 23					
Control unit 24					
Control unit 25					
Control unit 26					
Control unit 27					
Control unit 28					
Control unit 29					
Control unit 30					
Control unit 31					
Control unit 32					

2.4.19.2 Default Settings Multiwire

Table 9: Back-indication signals Multi-wire

P1	Function
1	SFL running - contact closed when running
2	RTILS/REILS running - contact closed when running
3	REILS DOWN - contact closed in case of alarm
4	Misfire on 1 ICC (latched) - contact closed in case of alarm

Table 9: Back-indication signals Multi-wire (Continued)

P1	Function
5	Misfire on 2 consecutive ICCs (latched) - contact closed in case of alarm
6	Communication error on local bus + Security (Door + MOV) - contact open in case of alarm
7	Over temperature - contact closed in case of alarm
8	Alarms 3 + 5 + 6 combined in OR mode - contact closed in case of alarm
9	Common
10	GNDext
11	Vext+
12	PE

The above settings can be modified at any time, by using the Flasher Tester Software. It is the customer's responsibility to modify the configuration. Modification of the Multi-wire configuration is only possible using the Flasher Tester Software.

Table 10: Remote control signals Multi-wire

P2	Function
1	SFL ON Step 1
2	SFL ON Step 2
3	SFL ON Step 3
4	REILS/RTILS ON step 1
5	REILS/RTILS ON step 2
6	REILS/RTILS ON step 3
7	Reset alarms
8	Reserved for future use
9	Common
10	Vext+
11	GNDext
12	PE

The above settings can be modified at any time, by using the Flasher Tester Software. It is the customer's responsibility to modify the configuration. Modification of the Multi-wire configuration is only possible using the Flasher Tester Software.

2.4.19.3 Customized Settings Multi-wire

The following table can be used to record the Back-indication signals

Table 11: Back-indication signals

P1	Function
1	
2	
3	
4	
5	
6	
7	

Table 11: Back-indication signals (Continued)

P1	Function
8	
9	Common
10	GNDext
11	Vext+
12	PE

The following table can be used to record the Remote control signals

Table 12: Remote control signals

P2	Function
1	
2	
3	
4	
5	
6	
7	
8	
9	Common
10	Vext+
11	GNDext
12	PE

2.4.20 Technical Data

The flashing light system meets ICAO (International Civil Aviation Organization) and FAA (Federal Aviation Administration) requirements, as well as those of the IEC 61824 and IEC 61000-6-4 and 61000-6-2 standards of the International Electro-technical Commission.

2.4.20.1 Operational Limits

The flashing light units are designed for outdoor use in the airport approach area.

They are designed to meet the requirements of the various specifications mentioned above. Operation outside the design limitations of these specifications may result in degradation of performance, damage or failure of components or hazardous conditions.

2.4.20.2 Temperature range

The equipment is designed for an operation at an ambient temperature from -50° C up to +55° C (-67° F to +137° F).

2.4.20.3 Humidity range

The PCBs inside the light unit are tropicalized to resist humidity conditions up to 95% without condensation.

2.4.20.4 Input voltage range

The system is designed to operate on 240/120 Vac. The absolute minimum and maximum limits for the power supply are 190 V up to 260 Vac.

For cable sizing a minimum voltage of 190V phase to phase should be considered to permit 10% voltage fluctuations of the power supply source.

2.4.20.5 Rated frequency

50/60 Hz ($\pm 5\%$).

2.4.20.6 Power consumption

The maximum line current per cabinet at 2 flashes/s and maximum brightness step will be 1.5A.

Table 13: Remote control and monitoring

Control Multi-wire 24 Vdc	Back-indications monitoring MW free contacts (24 Vdc)
Multi-wire 48 Vdc	MW free contacts (48 Vdc)

2.4.20.7 Multi-wire Control signals

The control signals (any polarity permitted) feed relay coils protected by an RC circuit for transient over-voltage.

Table 14: Multi-wire Control Signal Specifications

Multi-wire: Minimum voltage	48 Vdc remote control 40 Vdc	24 Vdc remote control 21.6 Vdc
Maximum voltage	65 Vdc	35 Vdc
Current consumption	about 9 mA at 48 Vdc	about 16 mA at 24 Vdc

Multi-wire back-indication signals

The back-indication signals are provided over dry contact relays.

The maximum contact load is:

- AC-110 V-0.5 A-60 VA
- DC-110 V-0.5 A-30 W

Multi-wire, internal power supply

The Multi-wire has a small power supply on board, floating towards ground level and short-circuit protected by self-repairing polyswitches. The maximum current is 200 mA for 48 Vdc and 400 mA for 24 Vdc.

This source is useable to control the system with contact signals and to deliver at the same time voltage feedback signals. Notice that the output voltage of this power supply is fully depending on the input voltage. Thus take the maximum input voltage drop into account for cable sizing of the control signal cable.



Note

For FAA ALSF and MALSR applications, 120 Vac relays interface to a 24 Vdc (48Vdc) multiwire board.

2.4.20.8 EMC conformity

According to EN61000-6-4 (Generic standard, Industrial environment, Emission), para. 7.1, the flashing light system will not be used in residential, commercial and light-industrial environment

2.4.21 ICC Mechanical Data

ICC-1: Dimensions and Weight

Outer dimensions (WxDxH):	16.5 x 9.25 x 20.5-inches (420 x 235 x 520 mm) (without mounting kit)
Total weight:	42.7 lbs. (19.4 kg)

ICC-3: Dimensions and Weight

Outer dimensions (WxDxH):	31 x 13.3 x 25.6-inches (790 x 340 x 650 mm) (sun roof & base included)
Total weight:	103.6 lbs. (47 kg)

2.4.22 ADB SAFEGATE ALSF / MALSR System Specifications

This subsection describes the specifications for the MALSR and ALSF. Refer to the *Parts* section for part numbers.

2.4.22.1 Master Control Cabinet

This subsection describes the specifications for the master control cabinet.

Table 15: Time from Trigger Pulse to Trigger Pulse

MALSR	ALSF	SSALR
Corresponds to every other cycle of the 60 Hz line (33.33 ms)	Corresponds to one cycle of 60 Hz line (16.67 ms)	Corresponds to every other cycle of the 60 Hz line (33.33 ms)

2.4.22.2 Maintenance Features on Control Cabinet

Refer to the list below for the MALSR/ALSF approach lighting systems control cabinet maintenance features.

- 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.
- Service entrance switch disconnects incoming power to the control unit.
- Maintenance light (100 W, 120 Vac); 120 Vac, single phase, 15 A, grounding-type receptacle with built-in fault interrupter.
- Door can be locked in a 120 degree position.

Enclosure	NEMA-4, Enclosure is outdoor and ventilated to prevent condensation.
Mounting	Mounting lugs provided on the back of the cabinet for mounting the cabinet vertically.
Dimensions	37-1/4 x 30 x 13-3/8 inches (94.6 x 76.2 x 34 cm)
Total Weight	137 lb (62.14 kg)

2.4.22.3 Aiming Device

This subsection describes the specifications for the PAR38 / PAR56 aiming device.

Quantity	One
Aiming	Flash lamp axis can be aimed from 0 to 25 degrees above the horizontal.
Scale	Calibrated in 1-degree increments

Accuracy	±1/2 degree
Dimensions	7 in. x 10 in. (17.8 cm x 25.4 cm) diameter
Weight	10 lb (4.5 kg)

2.4.22.4 Junction Box

This subsection describes the specifications for the junction box.

Quantity	One junction box for each flasher. Junction boxes are made to FAA drawing D-5140-2 except for the following: 1-in. conduit hub is replaced by two 2-in. conduit hubs at the bottom of the box. Terminal blocks are of the enclosed-base type for use with pressure-type terminals meeting the requirements of FAA-G-2100c, paragraph 3.5.34. Boxes provide control- and monitor-wire interconnection between master control cabinet and individual control cabinets.
Conduit Hubs	Two 2-in. hubs on the bottom of the box
Dimensions	14 x 14 x 6 in. (35.6 x 35.6 x 15.2 cm)
Weight	15 lb (6.8 kg)

2.4.22.5 PAR-38 Lampholders (MALSR Only)

This subsection describes the specifications for the MALSR PAR-38 lampholders.

Design	The PAR-38 lampholders are designed to accommodate 120W or 150W, 120 Vac, PAR-38 spot lamps.
Quantity	Total of 45 lampholders
Installation	5 PAR-38 lampholders are installed on a light bar. Nine light bars are in a system.
Mounting	Mounts on a 2-inch EMT conduit, to the top of a frangible coupling or with adapter sleeve, on an aluminum or fiberglass tower.
Dimensions	9 x 3 x 3 in. (22.9 x 7.6 x 7.6 cm)

2.4.22.6 PAR-56 Lampholders (MALSR and ALSF)

This subsection describes the specifications for the MALSR PAR-56 lampholders.

Design	The PAR-56 lampholders are designed to accommodate 200 W, 300 W, 500 W 6.6 A, 20 A, or 120 Vac depending upon application.
Quantity	Total of 18 lampholders
Mounting	Mounts on a 2-inch EMT conduit, to the top of a frangible coupling or with adapter sleeve on an aluminum or fiberglass tower.
Dimensions	13-1/3 x 6-1/4 x 8-5/16 in. (33.86 x 15.88 x 21.11 cm)

2.4.22.7 15 kVA Power Transformer (MALSR Only)

This subsection describes the specifications for the MALSR 15 kVA power transformer. This transformer provides power and intensity control to the steady burning PAR-38 and PAR-56 lamps.

Rating	15kVA
Input	210-252 Vac, 60 Hz
Output	120/240 Vac
Taps	Taps are provided on the primary to permit adjustment of secondary voltages.

Output Voltage	Refer to Table 5 for output voltage. Table 5 applies only when output voltage is connected to 240 Vac primary input.
Lightning Protection	Two internal lightning arrestors are provided on the transformer's input and output power lines.
Dimensions	18 x 13.25 x 12 in. (45.7 x 33.7 x 30.48 cm) (L x H x W)
Weight	262 lb (119 kg)

3.0 Installation of the System

Safety Instructions



WARNING

- Read installation instructions in their entirety before starting installation.



DANGER

- Only qualified personnel may install or repair electrical equipment in accordance with NFPA 70B, Electrical Equipment Maintenance and NFPA 70E, Electrical Safety Requirements for Employee Workplaces.
- Disconnect and tag out the sources supplying electrical power to this device before making or repairing connections to this device in accordance with airport lockout and tagout procedures.
- Use approved testing equipment to test that the circuit is de-energized.
- All applicable regulations in accordance with local codes and FAA standards must be followed.

When working on or carrying out measurements on the device, the following basic rules must be followed:



CAUTION

- The device must be disconnected from the main power supply (isolated)
- The device must be secured against being accidentally switched on.
- Disconnection must be measured or checked.
- The ICC housing must not be opened until all electrical supply cables have been disconnected for at least 1 minute.
- Only potential-free instruments may be used for measurements on components.



WARNING

- Components may carry hazardous or deadly voltages even after being switched off.



WARNING

ESD susceptible devices (ESDS): Components susceptible to damage by electrostatic discharges. The component assemblies contain components that are susceptible to electrostatic discharges. These components can be very easily destroyed if not handled properly. However, if it is necessary to work on electronic assemblies, follow the instructions below:

- Electronic assemblies should only be touched if working on them is absolutely necessary.
- If assemblies have to be touched, use a static discharge strap.
- Connection pins and printed circuit conductors must not be touched.
- Assemblies must only be held by the edge.
- Assemblies may not be brought into contact with highly insulating materials e.g. plastic parts, insulating table tops, or clothing made of artificial fibers.
- Assemblies may only be placed on conductive surfaces.
- Assemblies and components must only be stored or dispatched in conductive packaging (such as metallic or metallized plastic containers).
- If the packaging itself is not conductive, assemblies must be wrapped in a conductive material before packing

3.1 Overview

This section provides instructions for the installation of the flashing system.

Refer to the project drawings and specifications for specific installation details.

All references in this chapter refer to the drawings at the end of this manual, see "Schematics" on page 131.

3.1.1 Preparation of the Flashing Equipment

Action 1: Unpacking

Unpack the crates upon receipt and examine the units to insure that no damage has occurred during shipping.



Note

Inspect crates visually upon receipt to detect any possible damage to the equipment prior to unpacking.

If damage is detected to packaging or equipment, probably caused by transport, please immediately make a claim to the shipper. If required, prepare necessary evidence and fill out a claim form from the shipper.

Action 2: Identification of the ICC cabinets

Identify clearly the cabinets according to their physical location. Flasher #1 is always the flasher farthest from the runway.

You can keep a record of the data by filling in the table in "Commissioning Records" on page 15 of this manual.

Action 3: Identification of the MCC

- The MCC may be installed anywhere along the line of the flashing lights.
- Only one MCC is required for one sequenced flashing system and includes RTILS/REILS, if present.

- The Local Master Control PCB in the MCC will need to be configured on site for the required configuration. See "Operation" on page 53, for more information.
- The Master Control Cabinet (part number: "Parts" on page 121) contains the necessary hardware to connect to:
 - The Individual Control Cabinets, ICC-1 or ICC-3.
 - All the required remote control interfacing circuitry (the Multi-wire connection board).
 - The external temperature probe.

Action 4: Prepare circuit boards

Although holes are present in the EMC covers, it will not always be possible to access all the Dip-switches and/or jumpers if the covers are installed.

(This is the case for the side mounted PCBs in the ICC -3).

Remove the EMC protection plate from the ICC PCB, if necessary. Be sure to replace EMC covers after configuration.

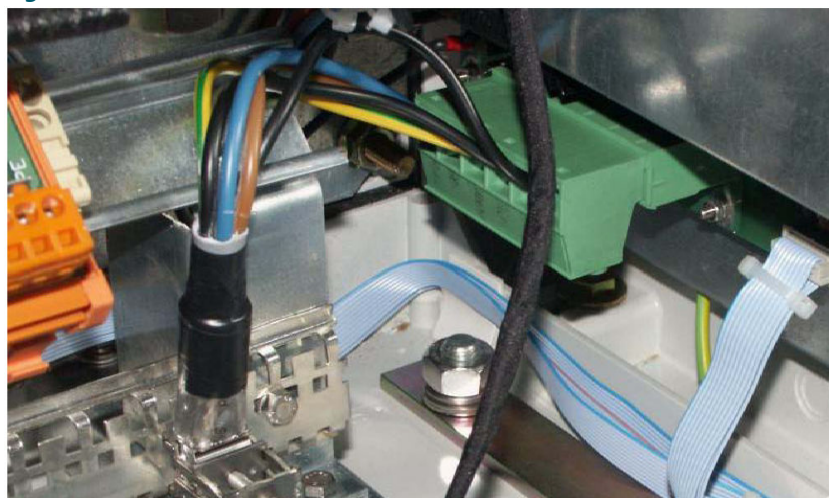
For safety reasons, turn power OFF at the Master and open the ICC incoming AC power supply fuse link(s) (on the DIN rail next to the power supply terminals).

Table 16: Connections, cable terminals

Name	Type	Purpose	External wiring	Remarks
TB2	6-pin PHOENIX (10.16 mm)	Lamp connection to ICC	x	Connect the shielding of the cable to the chassis of the cabinet

- Apart from the cabling between UEL or FFL (lamp units) and ICC (flasher control units), the power supply cabling and Local Bus interconnection, the ICC cabinets are pre-wired in the factory.

Figure 3: TB2 Connector

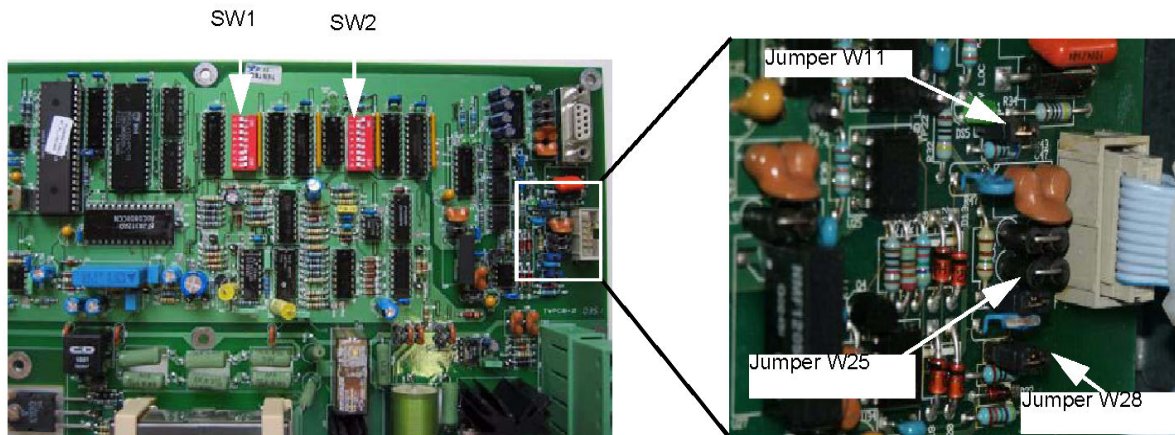


• Removal of the jumpers

For installations where the MCC is physically installed at the end of the flashers, jumpers W11, W25 and W28 must be removed on all the ICC units EXCEPT on the last ICC on the local bus communication line that is farthest from the MCC. Make sure that the external "local bus" data line, in the first and last cabinet are respectively connected to P3 & P1 on PCB 1498. The drawing in "Schematics" on page 131 can make this clear.

This is necessary to properly terminate the local bus communication line to insure proper communication between all ICCs and the MCC.

Figure 4: FCU PCB 1487: Switch Banks and Jumpers



3.2 Preparation for Installation

3.2.1 Concrete slabs

- **Location**

The ICC Cabinets may be installed either close to the flashing lights they control or at a remote location up to 393 Feet (120 m) away, provided the cross-section of the cable from ICC to lighting fixture allows for the total distance between the two, including mast height if any. Mount ICC's on frangible couplings (separately supplied) if within the safety area. Refer to the site drawings for cable sections and distances.

- **The Concrete Slabs**

The preferred method of installation for the ICC cabinets is on concrete foundations protruding slightly above the surrounding ground level. Protrusion should be limited to the minimum compatible with a possible flooding of the surrounding terrain.

The concrete is cast so that the foundation rests on firm soil, below the frost line.

Figure 5: ICC Dimensions concrete slab

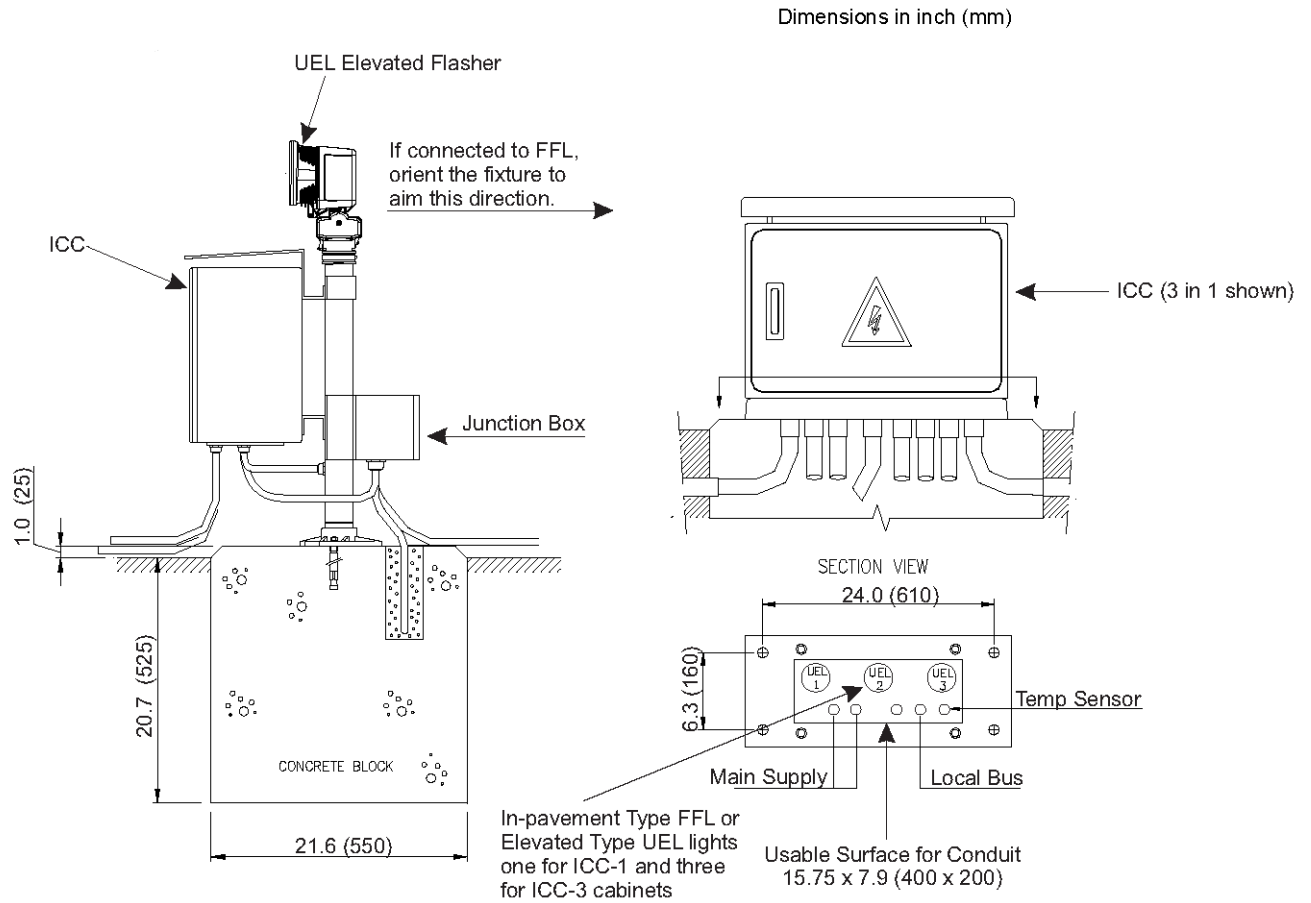


Figure 5 shows dimensions that are generally acceptable but can be modified to suit local conditions e.g. soil strength characteristics or other local characteristics.

3.3 Contractor

In the concrete mounting block, the contractor must provide:

- A sufficient number of pipes/ducts for the different cables needed.

The quantity of cables depends on the system design. See table below.

UNIT	Number of cables	Mains supply IN/OUT	Local bus IN/OUT to receive two cables	LIGHTING FIXTURES		
				N° 1	N° 2	N°3
ICC -1	4	X	X	X	/	/
ICC -3	6	X	X	X	X	X

- Install the anchor bolts securing the ICC cabinet, into the concrete. These may be installed before the concrete has cured, or holes can be drilled for installing the anchor bolts afterwards.

3.4 Physical Installation

3.4.1 Mechanical Mounting and Electrical Connections

The individual control cabinets should be installed outside the safety area. If installed inside, the installation needs to be frangible. In order to limit the effects of the jet blast, it is recommended to install the cabinets with their largest vertical surface parallel to the approach axis.

3.4.2 Unpacking the Equipment

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.

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.

The installation shall conform to the applicable sections of the National Electric Code and local codes.

3.4.3 Installing Master Control Cabinet

To install the master control cabinet, follow the guidelines below. See [Figure 6](#). Refer to [Table 17](#). Refer to the site drawings for specific installation details.

Figure 6: Master Control Cabinet Installation and Dimensions

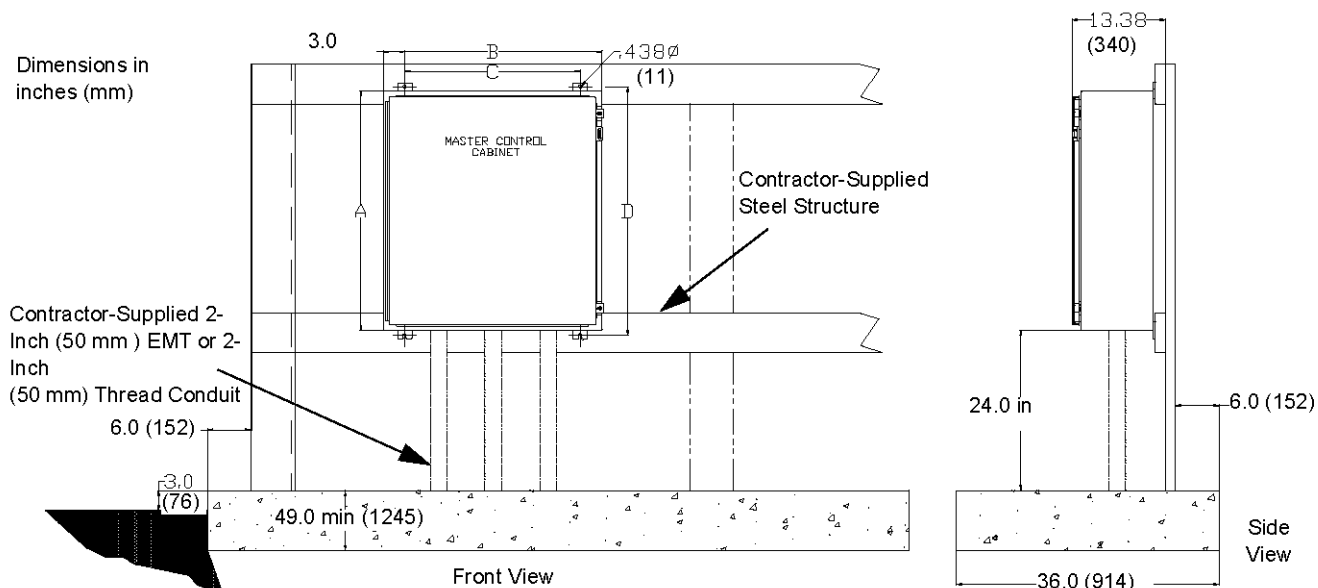


Table 17: MALSR/ALSF Master Control Cabinet Dimensions

System	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)
MALSR/ALSF	36 (91)	30 (76)	24 (61)	37 (95)

- Mount the master 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 master 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 master 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 master 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.

3.4.4 Installing the Individual Control Cabinets

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

3.4.5 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 (separately supplied).



Note

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

- See [Figure 5](#) for recommended installation and dimensions.

3.4.6 Installation of ICC 1 or ICC 3

Install the ICC as in the drawings below:

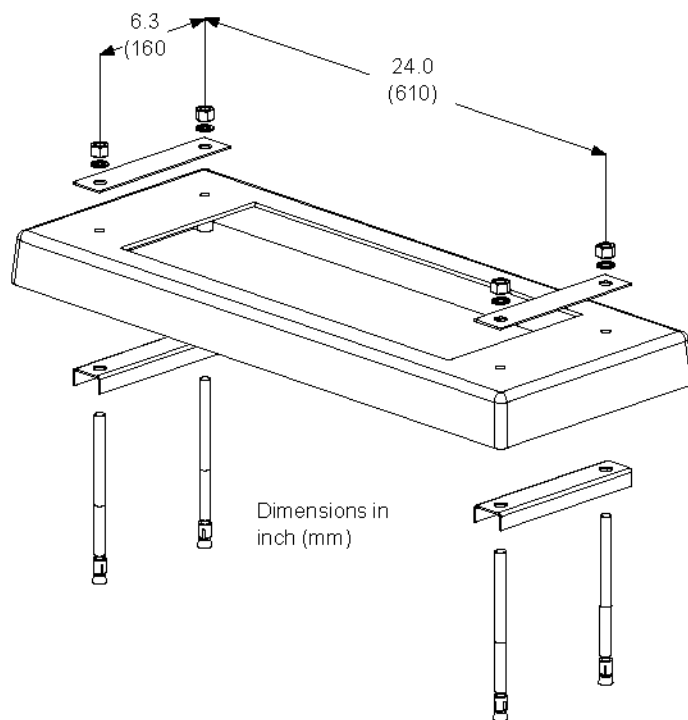
After the concrete slabs are cured, the control units may be installed and secured with anchor bolts (see the drawings).

Note **BEWARE:** Make sure you have the correct physical numbering of the control units (see your physical layout).

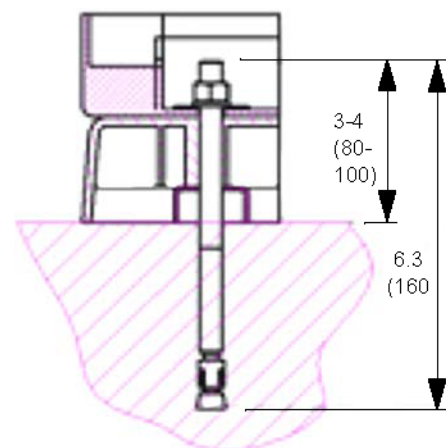
After installation, apply a watertight silicone seal between the control unit base and the concrete and fill the duct openings with insulating expansion foam.

The ICC may be installed as shown in the pictures below or, on a mounting pole using an optional mounting kit (1440.20.200). The pole must be installed on a concrete slab. Use the junction box to connect the power supply cables and distribute the phases over the different ICCs, especially in the case of using a three-phase power supply. The control, supply and lamp (UEL or FFL) cables can enter into the cabinet through a bottom plate that can be fitted in the bottom of the cabinet. The ordering code for the replacement bottom plate is 4072.01.530. The cables must enter the cabinet through watertight connectors in order to limit the ingress of vermin, insects and water.

Figure 7: Dimensions and sequence of mounting on a slab using anchor bolts (dimensions in mm)

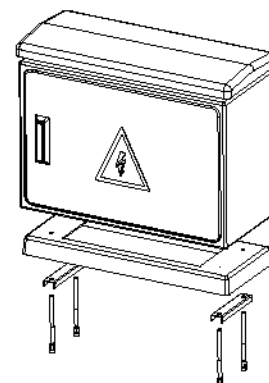
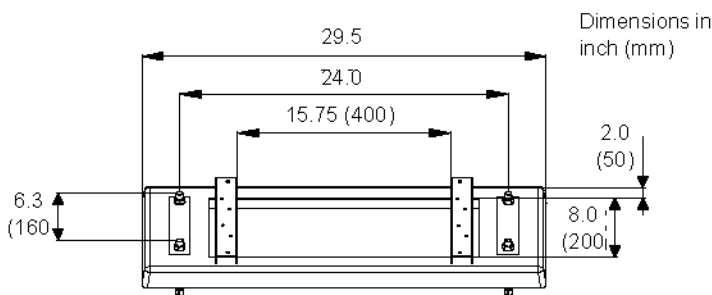


Details of ICC mounting.



Install the anchor bolts so that they protrude above the concrete by 80 to 100 mm.

NOTE: For the installation shown, the ICC must be mounted outside the safety area.

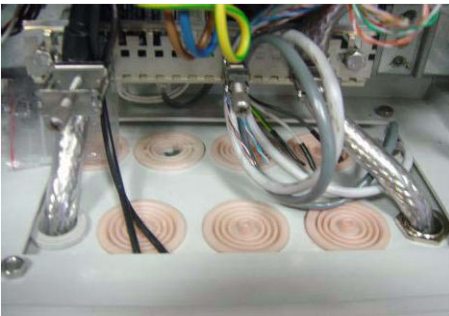


More details on cabling for the ICC can be found in the drawings at the end of this manual.

Figure 8: ICC-1: Example of a Pole Mounted ICC



Figure 9: Typical Cable Entry Detail



3.5 Electrical Connections

Make sure that the cable selection and cable entry details are correct.

3.5.1 Power Supply Cable

Keep in mind that the system is designed so that power is permanently connected to the ICC Cabinet.

Terminals:

- The terminals (screw type) accept wire cross-sections ranging from 1.5 up to 16 mm² (16 - 6 AWG).
- Insulation stripping length: 1/2-inch (12mm). Clamping screw: M4. Screwdriver blade: 5.5 x 1.0. Tightening torque range: 0.9 to 1.8 ft-lb (1.2 to 2.4 N-m).

In the ICC-3: double terminals are present for the three phases, the neutral and Earth ground connection.

In the ICC-1: single terminals are present for each of the single-phase 240 Vac wires. Double terminals are present for the Earth ground connection.

- An external junction box is required for each ICC.

3.5.2 Local Bus Data Line Interlinking Cables

Remember:

- To use 18 AWG, Triad, Shielded, 600 V cable. ADC Advanced Digital Cable 6801TOS or equivalent.
- To connect the bus cable to P3 terminal on the local bus interface PCB of the first cabinet and to P1 on the last cabinet in the LOCAL Bus communication line.

Terminals:

P1 and P3: WAGO 231-303/026-000 cage-clamp connectors type for wires of 0.08 to 2.5 mm² (28-12 AWG). Connector spring activation is possible with screwdriver blade 3.5 x 0.5mm or with operating lever WAGO 231-131.

Recommended stripping length: 6 mm (1/4 in).

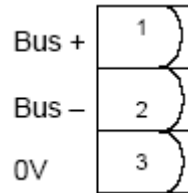
3.5.3 Connection

- The use of a proper cable for Bus+ and Bus- and a zero volt connection wire is imperative.
During installation, care must be taken that the bus polarity remains the same in all the ICC cabinets.



Note

If the polarity is inverted on a control unit this will not cause damage, but the flashers in the control unit will not respond to the commands of the MCC.



3.5.4 Cable

The cable between the ICC PCB and the flashing light is a 5-Core shielded (armored) cable with a maximum length up to 393 feet (120 m).

For line lengths up to 131 ft (40 m), the recommended cable is a 5/C, 14AWG, 600V, shielded cable, ADB SAFEGATE part number 89A0290/5 (Alpha Part No. 65405CY-SL), or equivalent. This cable is supplied in 1000ft spools.

For line lengths up to 213 ft (65 m), use 12 AWG. For line lengths up to 328 ft (100 m), use 10 AWG. For Line lengths up to 383 ft (120 m), use 8 AWG.

Terminals:

- The lamp cable is connected to each ICC PCB and to its respective flashing light by means of the green TB2 connector (for conductors 0.5 up to 6 mm²; 20 - 7 AWG).
- Insulation stripping length: 9 mm (1/3-in). Clamping screw: M4. Screwdriver blade: 4.0 x 1.0. Tightening torque range: 0.9 to 1.8 ft-lb (1.2 to 2.4 N«m).

Trigger: Lamp cathode

+400V: Lamp anode

PE: Protective earth

Cab +: Flash lamp interlock switch

Cab -: Flash lamp interlock switch

The shield is connected only at the ICC.



Note

The terminals for both elevated and inset flashing lights are different. Check the details in the wiring diagrams in "Schematics".

3.5.5 Remote control connections

Individual wires are always used for remote control commands and back-indications.

These are connected to the multi-wire board via the terminal blocks in the bottom of the MCC.

Terminals:

- The terminal blocks in the bottom of the MCC are cage-clamp connectors for wires from 0.08 to 2.5 mm² (28 - 12 AWG). Recommended stripping length: 6 mm (1/4-in).

Connection:

The function of each input terminal is determined in the software. Configuration of this terminal block has to be known to make the right connections.

3.5.6 External temperature sensor cable

This can be connected to any ICC. One sensor only is required per complete flashing system. Sensor is mounted using a 17mm (11/16") inside diameter gland, such that it can measure the outside air temperature.

3.5.7 Earth to ground connection

Earth to ground connection should be executed in accordance with applicable local regulations:

Recommendations and accessories:

- For strain relief and grounding of the cable armor (shield) there is a cable clamp usable for different cable diameters mountable on the grounded rail at the bottom of the ICC (Use one cable clamp per cable).

Figure 10: Cable clamp



- Earth connection of the unit has to be done with an individual grounding rod (by preference interconnected with the other cabinets) or with a grounding wire (Check local legislation for installation requirements and required cross-section).

3.5.8 Cabling Preconditions

Installation of the cables shall be in ducts, in pipes or directly buried in the ground.

All cables enter the ICC cabinets through the bottom.

- ICC -1 via glands through the gland plate,
- ICC -3 via ducts in the concrete

Please check compliance with local requirements and regulations.

In any case, please ensure you have provided:

- Sufficient mechanical protection of the cables
- An adequate Earth to ground connection of the ICC cabinets
- An adequate Earth to ground connection of the cable armor

Table 18: Recommended types of cable

Function	Type	Number of conductors	Required section/ diameter	Comments
Power supply cable	120/240 Vac, 3/C	3 conductors, neutral center tapped connection	Depends on the length and the system layout (see Figure 11)	Cable should be rated for 600V. To ease disconnection, we recommend the use of a flexible cable.
	Three-phase Power distribution cable	5 (3 Ph+N+ Earth to ground connection		We recommend a PVC covered, flexible metallic conduit (cable with armor or shield).
				WIRE CROSS-SECTION / MAXIMUM CABLE LENGTH
Cable between the cabinet and fixture	Alpha cable part # 65405CY-SL LAPP Cable Oilflex Classic 100CY	5 + shield	Depends on length (see remarks)	• # 16, (1.5 mm2) / 98'- 5" (30 m) • # 12, (2.5 mm2) / 164' - 5" (50 m) • # 10, (4 mm2) / 262' - 5" (80 m) • # 8, (6 mm2) / 393' - 8" (120 m)
Multi-wire control cable between master and substation or tower	Individual wires rated 600V	(number of signals + 1 common wire)	# 18 (0.8mm ²)	The factor (number of signals + return(s)) depends on the remote control system design: • Combining the remote control and back-indication signals in 1 cable is only possible if there is no (or only low level) crosstalk risk between these signals (as is the case with one common DC energy source for remote control and back-indication signals).

Proper power cable sizing, to fit the actual field particulars, is possible using the ADB Safegate calculation tool "power cable work file selection sheet.xls" as shown below:

This “cable calculation program” is available from ADB Safegate upon request.

Figure 11: Example for an ALSF-2, 21-fixture configuration:

Standard configuration

Type of approach: Custom system
Runway width: []
Home run cable length: []
Chosen section of home run cable: []
Minimum section required for home run cable: [] mm²

Common information

Power supply on Box N°: []
Type of power supply: []
Nominal voltage on Power supply between L & N: 230V

System overview

N° of flashers	#VA flashers	N° of flashers	#VA flashers
Cable length	#VA m	Cable length	#VA m
Minimum section required	#VA mm ²	Minimum section required	#VA mm ²
Price for cable	#VA	Price for cable	#VA

Runway side: []
Lead-in side: []
Home run cable: []
Home run cable length: M
Price for home run cable: []

Custom approach

N° of flashers: []
With / Without RTILS: []
Cable length between flashers: M
Cable length between flashers and RTILS: M
Runway width: M

Additional information

Cable cost information			
2.5 mm ²	[]	16 mm ²	[]
4 mm ²	[]	25 mm ²	[]
6 mm ²	[]	35 mm ²	[]
10 mm ²	[]	Currency	[]

The input power supply point is at the 21st fixture (nearest to the threshold) with a distance to the substation of 2953 ft. (900 m) (home run) and a nominal source voltage between L and N of 240 Vac from a 3 phases +N network.

Table 19: Results given by the “power cable work sheet file” are:

Supply	Cross-section of cable home run	Cross-section of cable between the units	Comments
Three-phase	6 mm ²	6mm ²	
Single-phase	10 mm ²	10mm ²	

Lamp cable:

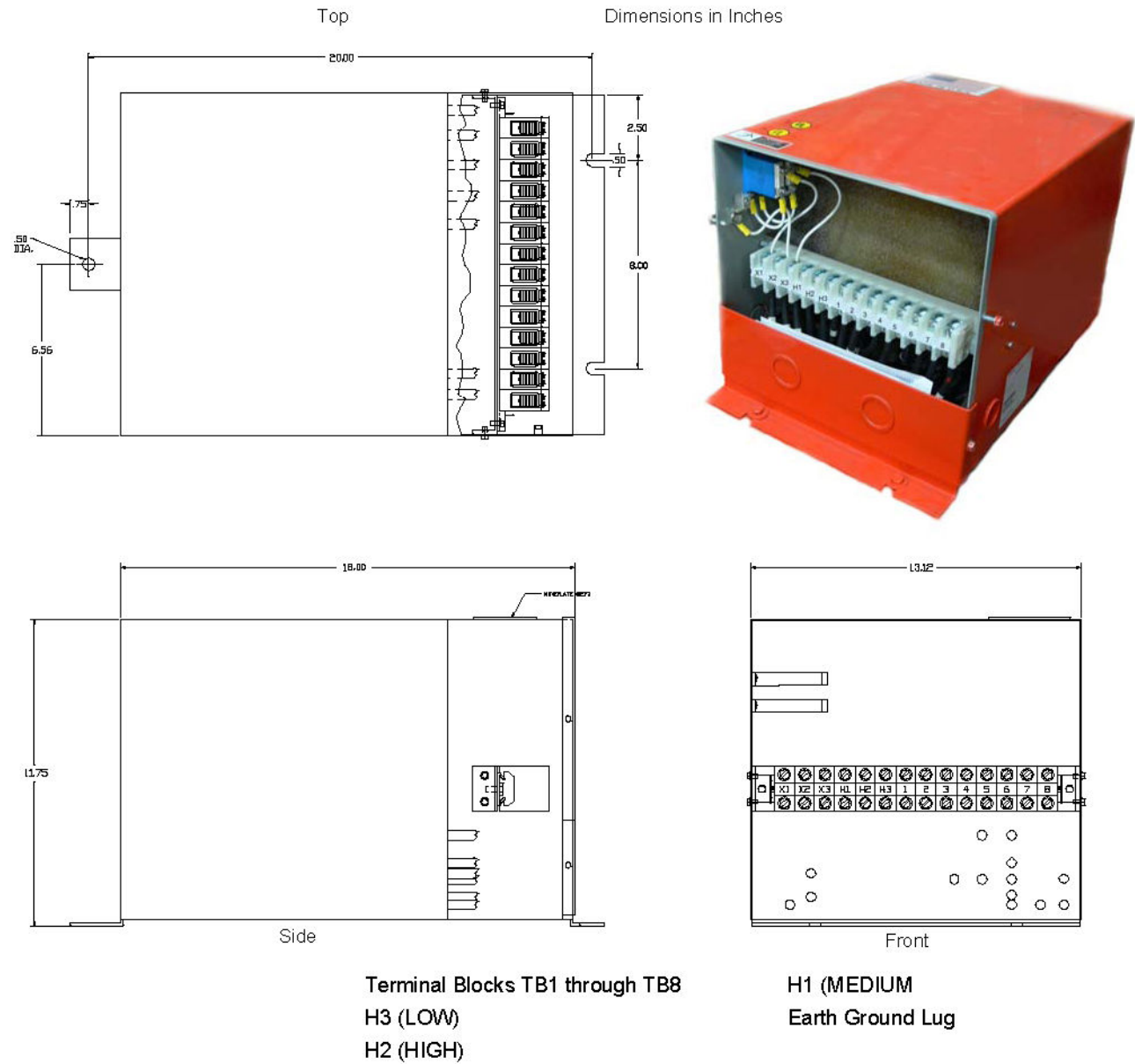
This should be a shielded cable with five conductors. **There is no need for a high voltage cable.**

See “Schematics” for color coding.

3.5.9 Mounting Power Transformer (MALSR Only)

To mount the MALSR power transformer, follow the guidelines below. Refer to site drawings for location and mounting provisions

Figure 12: 15 kVA Transformer Installation (MALSR Only)



Terminal Blocks TB1 through TB8	H1 (MEDIUM
H3 (LOW)	Earth Ground Lug
H2 (HIGH)	

**Note**

The preferred method of installation is to locate the power transformer near the master control cabinet.

- The transformer weighs 262 lb. (118.8 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 the site installation drawings.
- When the power transformer is mounted out in 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.

3.6 Installing Lightning Rod

Install the lightning rod as close as possible to the cabinet.

**Note**

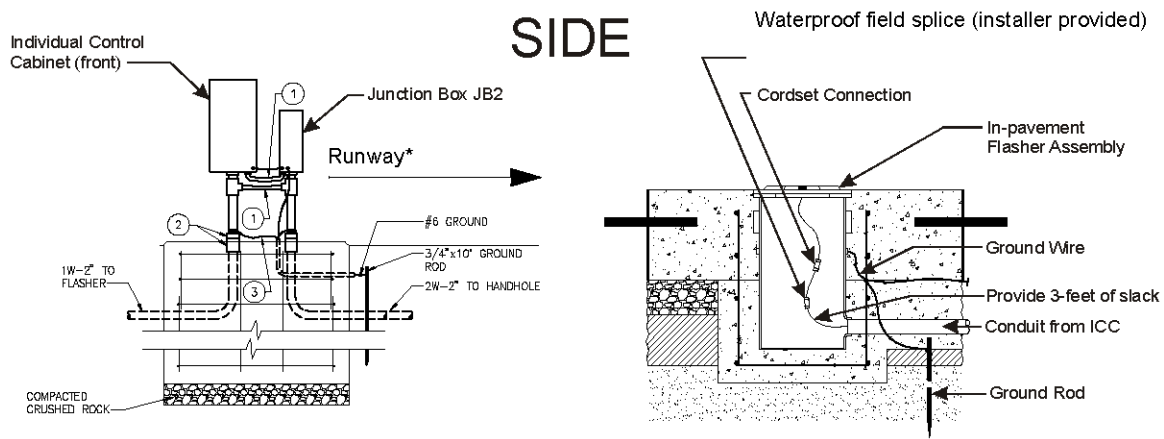
Lightning protection is provided by metal oxide varistors in the master control cabinet at the input supply terminals of TB1 and the supply power to the individual control cabinet. The fast-acting metal oxide varistors are most effective if a low resistance ground cable in compliance with the NEC and local codes, is connected to the lightning rod.

A large amount of charring on the surface of a metal oxide varistor is an indication that the system has taken a lightning strike. If this has occurred, the varistor has done its job and must be replaced before placing the system back in operation. After replacing the varistor, test that the system is operating properly.

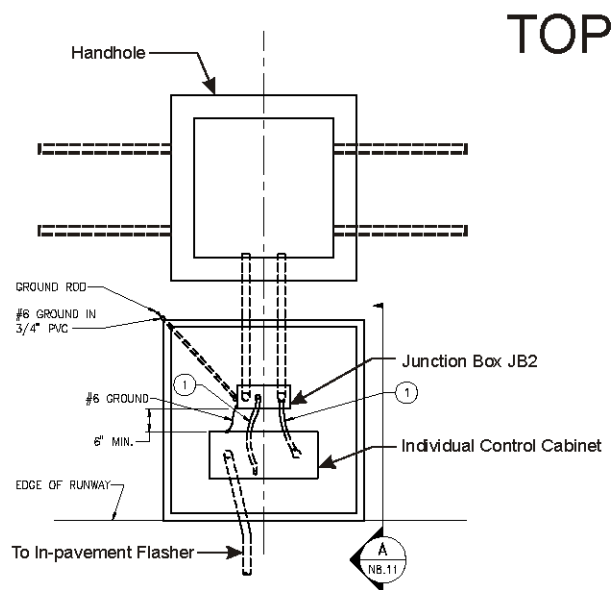
3.7 Installing In-pavement Flasher on the Base and ICC Cable Connections

The drawings on this page are for reference only and are not intended for design purposes.

Figure 13: Flasher Installation



* Insure that the ICC is oriented such that when the cabinet door is opened, a user standing in front of the cabinet is facing in the direction of the flashing fixture.



DRAWING NOTES:

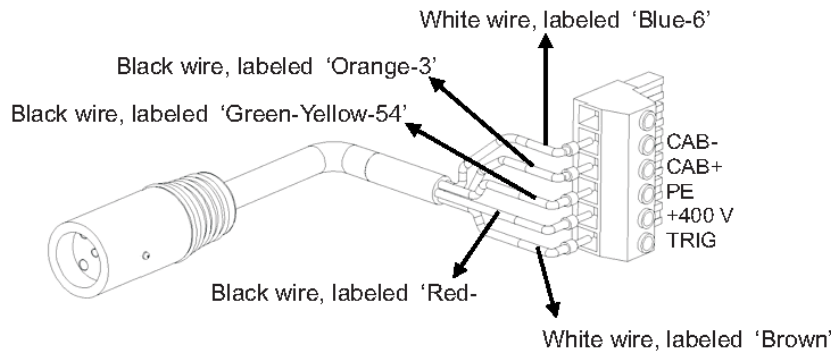
- ① 1\" LIQUID TIGHT FLEXIBLE METAL CONDUIT (LFMC) WITH COORDINATED FITTING, 1 FOR POWER, 1 FOR CONTROL.
- ② 2\" FRANGIBLE COUPLING, WITH PVC/RGS COUPLINGS (TYPICAL FOR 4).
- ③ #6 BARE GROUND, PROVIDE GROUND STRAPS FOR ALL CONDUITS.

3.8 Connecting the In-pavement Flashing Light

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.

Pull the interconnection cable between the ICC and the fixture through the conduit. Terminate the cable at TB2 inside the ICC. See the wiring diagram at the end of this manual for details. Using a waterproof field splice kit (contractor supplied), splice the interconnection cable to the mating female connector, part no. 4072.02.960. Set the in-pavement fixture upside down beside the base can. Plug the fixture male plug into the female plug. Wrap electrical tape around the male-female plug connection.

Figure 14: Connections to the Male In-pavement Fixture Connector (field splice kit not shown)

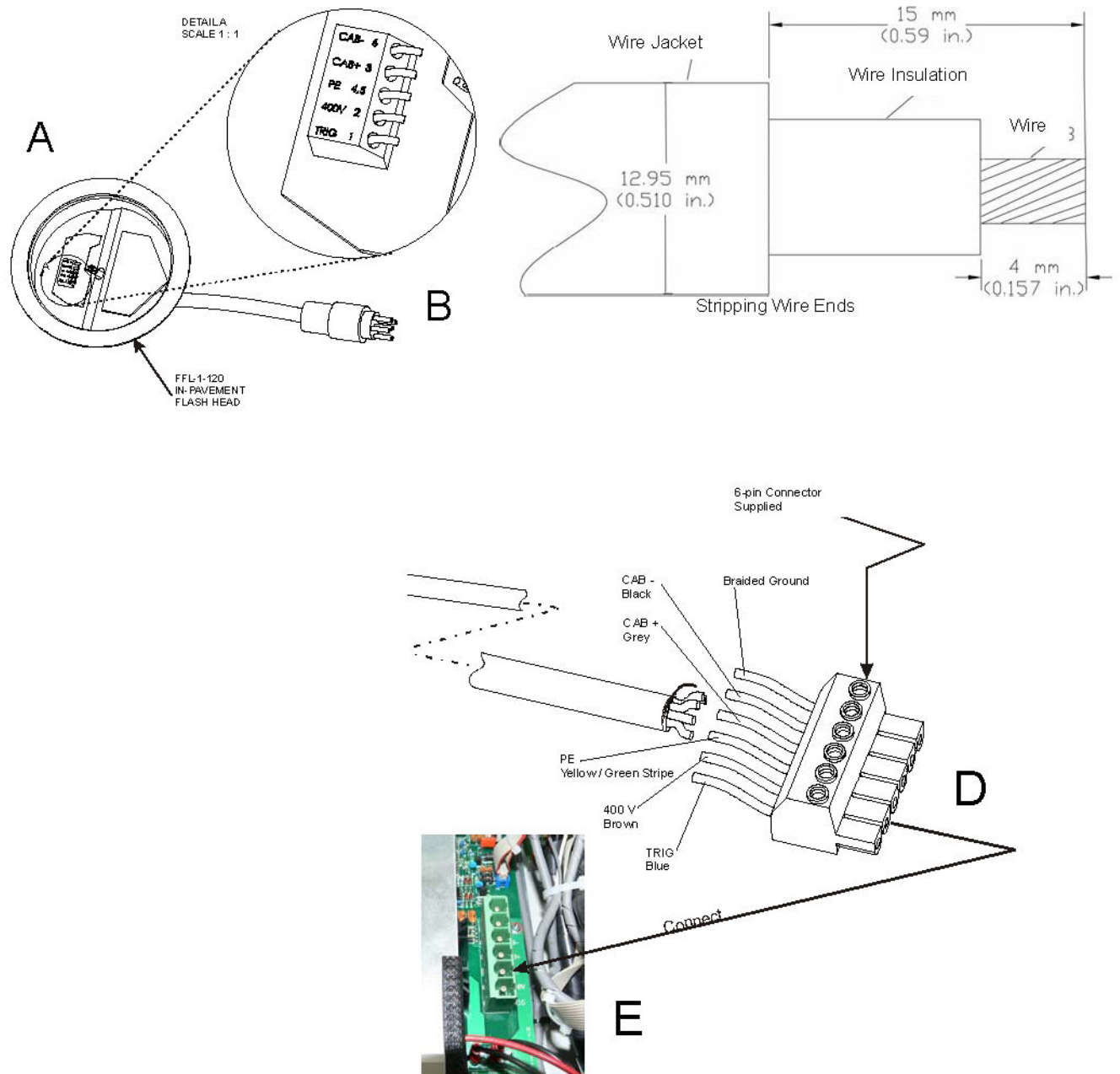


To assemble the in-pavement flasher connector assembly, perform the following procedure:

1. Install the Individual Control Cabinet (ICC), watertight conduit connectors and pull the cable as per the ALSF / MALSR instruction manual and the airfield drawings.
2. Prepare the cable wire by stripping wire ends off each end to specified lengths as shown in Figure 15. Be careful not to cut through the outer jacket into the individual wire insulation. Repeat for all five wires. Cut the shield wire off at the field splice.
3. Connect the connection cable, max 393 Ft. (120 m) to the FEMALE connector (shown in Figure 13) using a waterproof field splice kit. If the female cordset is not labeled, you will need to make a resistance measurement (tone) and label each wire to make the correct connections. Cut the cable rubber filler off, so it doesn't interfere with the installation.
4. The in-pavement light fixture is already assembled. The detail between A and B on Figure 15 is to indicate the fixtures internal wire connections.
5. Connect the 5/C female cordset (4) to the MALE connector.

6. Wrap the connection between the in-pavement light cord and the female cordset with electrical tape.
7. Connect the remaining end of the connection cable, max 393 Ft. (120 m) to the DIN Plug (TB2) supplied in the ADB Safegate ICC.

Figure 15: In-pavement connections



3.9 Mounting the Flashing Lights

To mount and connect the light assembly, proceed as follows:

Table 20: Required Tools

Description	Description
Torque wrench	Screwdriver, flat blade AG. 8x150
Socket hex, 3/8", vis 3/8", J.9/16LA	Screwdriver, pozi-drive AD.2x125
Socket hex, 3/8", vis M10, J.17LA	Loctite 270
Socket, 1/4", 1.6x8 Flat, RS.8E	Loctite 222
Socket, 1/4", Pozidriv2, RD.2	Molycote BG87 INERTA grease
Extension, 1/4", R.210	Natural hydraulic vacuum silicone grease
Adaptation, 1/4"-3/8", R.232	Attack driver
Hinged handle - short	Hammer 212A50
Plier	Bit holder
Opening tool	Bits END202, Pozidriv2

3.9.1 Overview of Sequence of Work

- Electrical contractor locates new light bases and interconnecting conduit trench, and excavates for light base bottom section by saw cutting or core drilling. Electrical contractor prepares subgrade and stone subbase, sets bottom section with rebar, rigid steel conduit stubs, drain, and pours high early strength concrete-encasement excavation. Electrical contractor shall record can locations and elevations of mud plate after concrete-encasement.
- Electrical contractor excavates conduit trench, installs rigid steel and fittings, backfills conduit trench with high early strength concrete.
- General contractor prepares and installs concrete pavement. Electrical contractor makes a pilot core to find mud plate center point indent before final core-drilling.
- Electrical contractor core-drills concrete pavement. Electrical contractor installs top section, y-flange ring, space and lighting fixture, and pours epoxy joint sealer. Provide space for adjustment with spacers, maximum number of spacers shall be 3.
- See specific details as shown in FAA AC 150/5340-30 (current edition).

3.9.2 Installation on L-868 Base

The light assembly is shipped complete, and is ready for installation.

To install the fixture on an L-868 base, see FAA AC 150/5345-30 and the project site-specific plans and specifications for details on L-868 base installation.



Note

Mounting bolts are not supplied with the fixture. Mounting bolts and anti-rotation lock washers are normally supplied with the base can spacer or flange ring. If a flange ring is used, the bolt length is 1-1/4 inch (32mm) plus the thickness of the flange ring.

Also read the following guidelines:

1. Clean the base receptacle. Make sure the base receptacle is completely clean and dry. The mating surfaces must be clean and free of foreign particles.
2. If, present, fit an appropriate lifting tool into the two threaded holes, which are located 180° apart in the cover.



The lifting tool can be made from two 1/2 x 13 eyebolts (1-inch ID) and a 1/2-inch diameter, 16-inch (406mm) long rod or pipe inserted through the eyebolts.



CAUTION

Never hold the light fixture by the wires. Doing so may damage the insulation, break the waterproof seal and cause insulation faults and water leakage.

3. Carry the light assembly to the base.
4. Place the light assembly next to the opening in the L-868 base so that the L-823 connector can be connected with the mating receptacle from the L-830 or L-831 isolation transformer in the base. Make sure that the connection is solid and secure. Refer to the Electrical Supply section of the User manual for required isolation transformers.
5. Make sure items such as spacers, shims and gaskets are installed on the light base as indicated on site plans, specifications and drawings.
6. Position the light assembly over the L-868 base and set it onto the base. Align the light according to FAA AC 150/5345-30 and project plans and specifications. Remove the eyebolts and lifting rod.



CAUTION

Ensure that the cord set wires are NOT pinched between the base can and the fixture. Pinched wires can cause water to be drawn inside the fixture.

7. If present, lubricate the labyrinth gasket with water. soap may be added to the water (8" only).



CAUTION

Do not use silicon or any other type of grease. Avoid the use of soap that contains silicon or glycerin.

8. Attach the six fixing bolts and anti-vibration washers. [See FAA EB-83 (latest revision)]



CAUTION

Due to the risk of bolts vibrating loose, do not use any type of washer with the fixing bolts (such as split lock washers) other than an anti-vibration washer. Anti-vibration washers as defined in FAA EB-83 (latest revision).

9. Turn on the power to determine whether the fixture will illuminate. Operate for a minimum of five minutes.

3.9.3 Torquing and Installation Guidance for In-pavement Fixtures

In-pavement fixtures must be installed according to the plans and specifications; the applicable regulatory guidance; and the following guidance. The importance of using the proper fixture clamping components and bolt torque to minimize the risk for fixture failure or loosening of clamping components cannot be overemphasized. Refer to ["Bolt Torqueing Maintenance"](#) for torque and installation guidelines for this fixture.



WARNING

Foreign Object Damage

Read installation instructions in their entirety before starting installation.

- Failure to follow the installation guidance could result in bolt loosening or bolts breaking off, resulting in catastrophic failure of the fixture and/or the mounting system components.

Failure to follow these warnings may result in serious injury or equipment damage.

3.10 Wiring the Master Control Cabinet

See “Schematics”. 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 master 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 master control cabinet.
2. Connect an earth ground (AWG 4, minimum) wire to the earth ground lug on the master control cabinet.
3. Connect the flasher power wiring (2 single-conductor, AWG 10, 600 V) from the master cabinet terminal block TB1 terminals 10 and 12 to terminal block TB1 terminals 1 and 2 in the junction box closest to the master.
4. Connect all junction boxes in parallel.
5. See [Figure 69](#) or [Figure 70](#) in “Schematics”. Make remote control connections (either 120 Vac or +48 Vdc) to terminal block TB2.
6. Make the communications cable connections from the master control cabinet PCB-4 terminal P1 through the junction box to PCB-1498 P1 in the individual control cabinet using ADC Advanced Digital Cable 68010TOS, 18 AWG, Triad, Shielded, 600 V cable or ADB SAFEGATE-approved equivalent cable. Then connect PCB-1498 P3 through the junction box to PCB-1498 P1 of the next individual control cabinet.
7. Make the remote control/monitoring wiring connections as shown on the external wiring diagram shown in [Figure 69](#) or [Figure 70](#) for the MALSR and ALSF in “Schematics”.

3.11 To Wire the Individual Control Cabinet

Perform the following procedure:

1. Ground cabinet using AWG 10 (minimum) ground wire connected to the ground in the individual control cabinet and the junction box. Connect ground wire to a grounding rod or counterpoise installed a short distance from the junction box.
2. 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.

3.12 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 69](#) in the *Wiring Schematics* section. Connect the master 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. Initially connect the MCC terminal TB1-4 (xfmr common) to 15 kVA transformer TB1-3 through TB1-7 (120 Vac). Note that this tap may require adjustment later on to obtain the correct output voltage.



Note

15 kVA transformer taps TB1-1 through TB1-8 are provided to adjust the output voltage of the power transformer. 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 69](#) . 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 lamp holders. Use 3 single-conductor (AWG 2, 600 V) wires for the connections for each terminal.

3.13 Aiming the UEL Lamp holders

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

For elevated flashing fixtures, the aiming device is available either as an electronic or as a simple mechanical (bubble level) based unit. Both aiming devices are accurate to within $\pm 0.5^\circ$.

Table 21: Elevated Flasher Aiming Devices

Device	Part No.
Electronic Aiming Device ¹	1570.05.400
Bubble Level Aiming Device ²	1570.05.410

Notes

- ¹ For fixture mounting heights from 6 ft. (1.82 m) to 33 ft. (10 m)
² For fixture mounting heights below 6 ft. (1.82 m)

3.13.1 Bubble Level Aiming Device

The bubble level aiming device consists of a support, which is secured on the light unit, in the place of the optical cartridge, and which is equipped with a elevation angle setting device, a sighting device (both with a graduated scale) and a bubble level.

The elevation angle setting device is graduated from 0 to 25°. For the azimuth setting, the system can be rotated around a vertical axis, and has 4 set positions that allow aiming at reference points (generally other lights) in a direction parallel or perpendicular to the center line. The sighting device is graduated from -4 to +4° to allow for toe-in angles. Two additional set positions at -15 and +15° permit the setting of elevated REIL/RTIL flashing lights.

1. Assemble the system by removing the optical cartridge and installing the leveling device in its place.
2. Tighten the securing screw.
3. Set the elevation angle on the setting device and the azimuth (toe-in) angle on the sighting device. For the correct elevation and toe-in angles refer to the project plans and specifications.



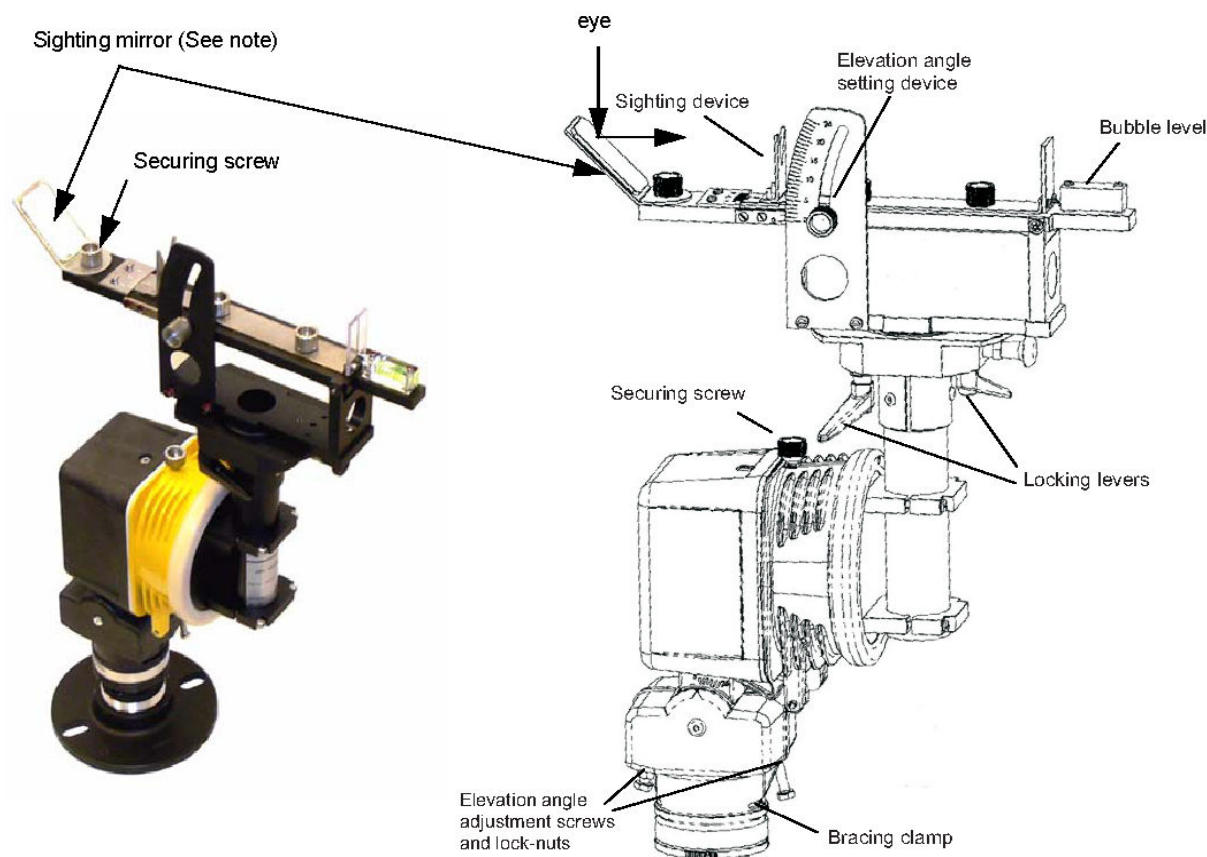
Note

FAA MALSR fixtures are usually set at +6°.

4. Approximately level the light to allow the azimuth orientation of the light.
5. Set the light in the correct direction using the sighting device, aiming at the next or former light in the same alignment. For lights in a barrette, a side row or a wing bar, aiming laterally at another light is possible. For this purpose release the two locking levers, turn the system 90° until a distinct click can be felt, and tighten the locking levers. If there is no light in the same alignment, use a reference pole.
6. Secure the bracing clamp. Loosen the lock-nuts.

7. Use the bubble level to set the light at the correct elevation by unscrewing/ tightening slightly the two elevation angle adjustment screws. Tighten the screws sufficiently to avoid any play, but do not over-tighten them. Once this is done, secure the two lock-nuts.
8. Remove the device. Put the optical cartridge back in place, connect the lamp and latch the lamp.

Figure 16: Bubble Level Aiming Device (1570.05.410)



Note

Use the mirror to look down through the sighting device for horizontal alignment. You may optionally look directly through the sighting device by loosening the mirror securing screw and rotating it out of the way.

3.13.2 Adjusting Horizontal

To adjust the horizontal, perform the following procedure:

1. Loosen the 3 screws in slip collar and/or the 8-32 set screw in the slip collar.
2. Rotate the assembly to the correct horizontal position with the center of the light beam parallel to the runway centerline.
3. Retighten screws.

3.13.3 Electronic Aiming Device

This system is suited for elevated fixtures mounted on safety approach masts or fiberglass Device towers, when it is not possible to get access to the top of the mast/tower in its standing position.

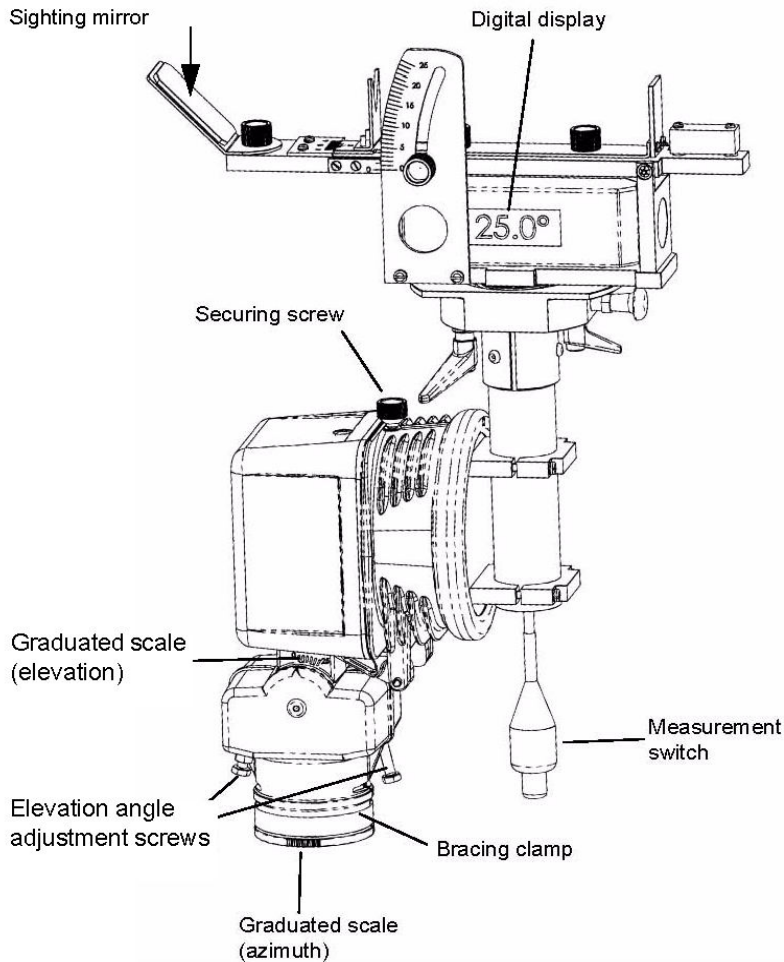
Composition : The system consists of a support similar to the one used with the bubble level device (see [Bubble Level Aiming Device](#)). However, the support is equipped with a sensor activated with a switch, with a 33 ft. (10 m) long cable. The operator can then operate the sensor from the ground, and read the elevation angle measurement when the mast/tower is tilted on the ground.



Note

During the installation of the approach line, a quicker method is to use a platform at the light level for an easy initial adjustment.

Figure 17: Electronic Aiming Device (1570.05.400)



1. Lower the mast. See instruction manual of the supplied masts.
2. If the mast has been correctly installed, i.e. its tilting axis is perpendicular to the centre line, a light with 0° toe-in will have its front surface fully horizontal when the mast is tilted over 90° (down to the horizontal). With the mast in this position, adjust the light by turning it around the tube, and then tighten the bracing clamp. For lights with a toe-in, first adjust the light for 0° toe-in. Make a reference mark on the tube just below the zero mark at the bottom of the slip fitter. Using the graduated scale, turn the light around the tube to the desired toe-in, and tighten the bracing clamp.
3. Remove the optical cartridge and install the leveling device in its place. Tighten the securing screw.
4. Raise the mast. Operate the switch to take a measurement.
5. Lower the mast and read the angle indicated on the digital display. Calculate the difference between the real angle and the required one.
6. If necessary, adjust the elevation angle by unscrewing/tightening slightly the two opposite screws. Tighten the screws sufficiently to avoid any play, but do not overtighten them. Once this is done, secure the two counter-nuts. While doing the correction, two measurements means are useable: - The elevation scale on the side of the light body (coarse measurement); - The

3.13.4 Commissioning

Final check: A flight check must be performed to insure there is no major misalignment of the fixtures.



Note

The system must not be put in operation until all errors have been corrected and the flight check is passed successfully.

3.14 Aiming the PAR-56 Lamp holders

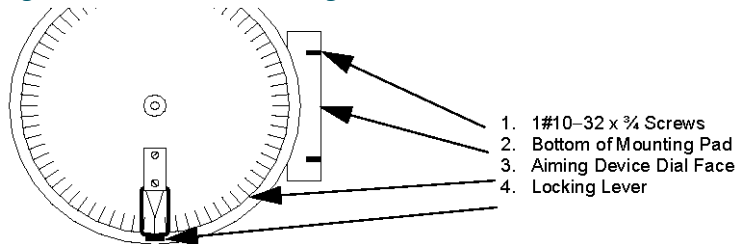
A separate aiming device (for PAR-56 only, order 44D1654-1 or for PAR-56 and PAR-38, order 44D1654-2) is used to set the vertical angular position of the steady burning elevated lamps. The lamp holders are mounted on either conduit, pipe, or towers as outlined in the site installation drawings.

3.14.1 Assembling the Aiming Device

To assemble the aiming device, perform the following procedure:

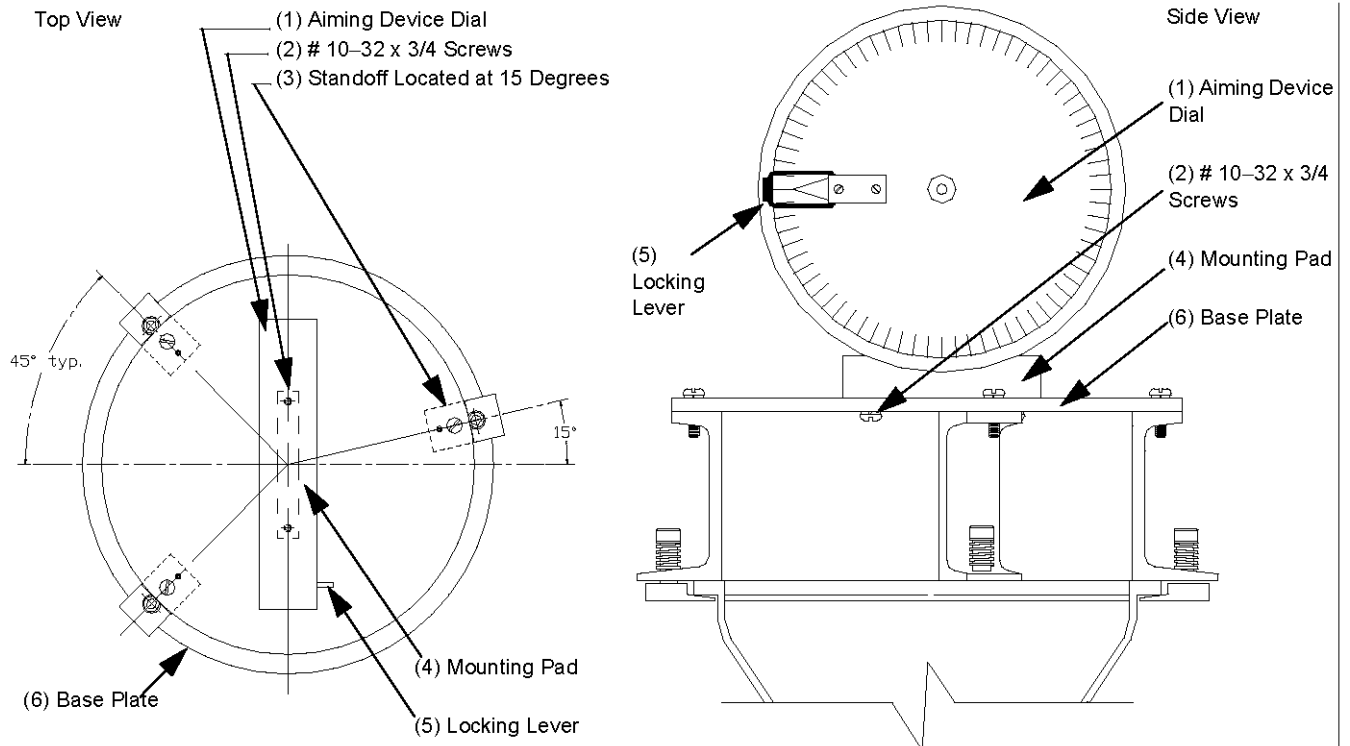
1. Remove the aiming device components from the instrument case.
2. See [Figure 18](#) . Remove two #10-32 x 3/4 screws (1) from the aiming device mounting pad (2).

Figure 18: The PAR-56 Aiming Device



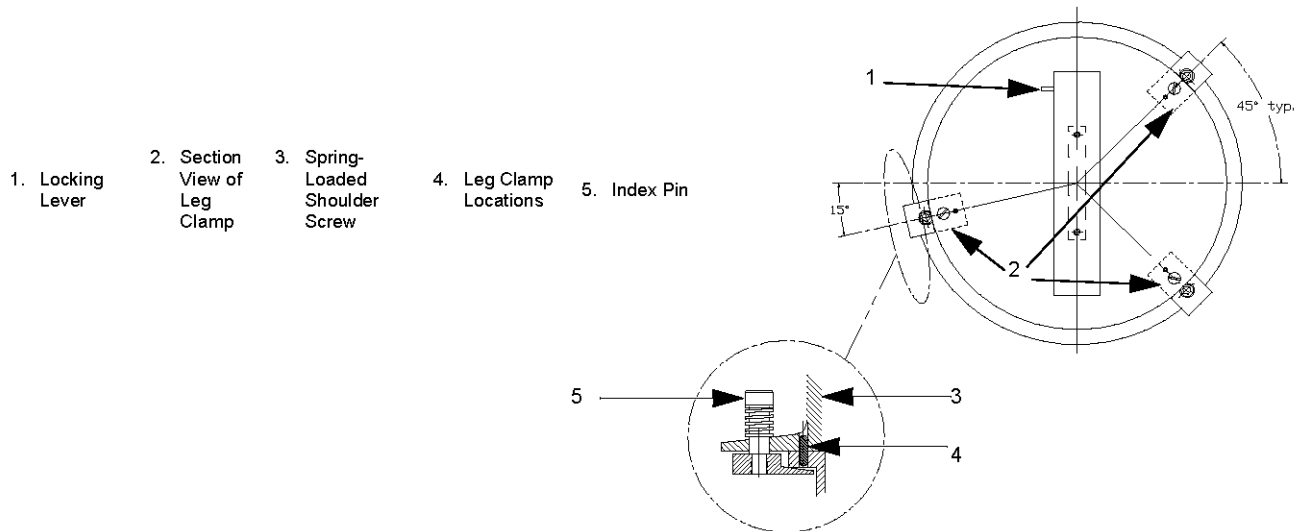
3. See [Figure 19](#) . Take the base plate (6) (round disc with three standoffs) and rotate so that the standoff (3), located at 15 degrees above the horizontal, is positioned to the right of the assembler.

Figure 19: Mounting the PAR-56 Aiming Device



4. 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 lock washers and tighten hardware.
5. See [Figure 20](#) . 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 20: Aiming Device Leg Clamp Locations (Top View)



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 lamp holder.

3.14.2 Aiming Lamp holders (Conduit or Pipe Mounted)

This section outlines the procedure to aim steady burning 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:

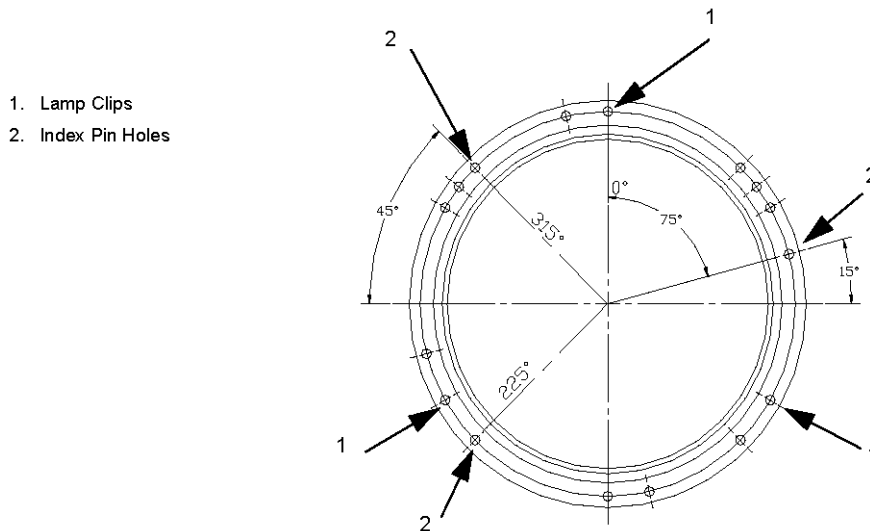
1. After the lamp holder has been wired and secured to conduit or pipe and aligned with the runway centerline per site specifications, secure the aiming device to the lamp holder.
2. Take the assembled aiming device and position it over the face of the lamp and align the three indexing pins (see [Figure 20](#), Item 5), protruding from each of the standoffs, with the three mating index pin holes (see [Figure 21](#), Item 2) found in the flanged lip of the lamp holder.



Note

See [Figure 19](#). These indexing pins and holes are located at 75, 225, and 315 degrees.

Figure 21: Lamp Holder (Top View)



3. See [Figure 19](#). 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.

See [Figure 18](#). 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.

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 20](#). 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 19](#). Release the aiming dial (1) by pulling back on the locking lever (5) and holding open with the hasp.
6. See [Figure 22](#). 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.

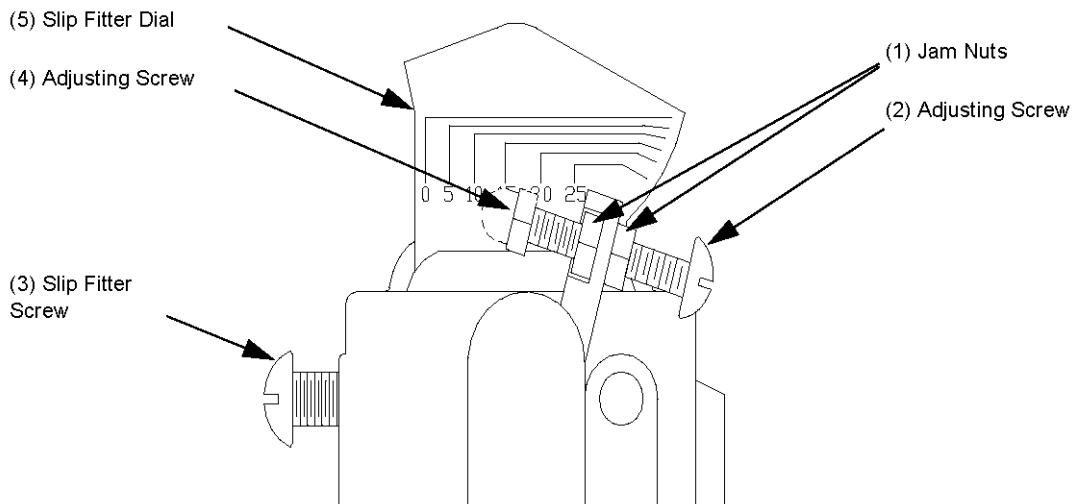


Note

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

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 22: Slip Fitter Dial Face and Adjusting Screws



7. Once the desired setting is achieved, make sure that both adjusting screws are seated against screw stops, then retighten 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.

3.14.3 Aiming the Lamp holders (Tower Mounted)

This subsection outlines the procedure to aim steady burning or flashing PAR-56 lamp units holders (Tower Mounted) 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 21](#) . 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. Retighten the jam nuts to lock the lamp holder in the zero position.
4. See [Figure 19](#) . Take the assembled aiming device, remove the aiming dial, and then install the dial on the slip section, supplied by tower manufacturer (For example: the 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 22](#) . 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.

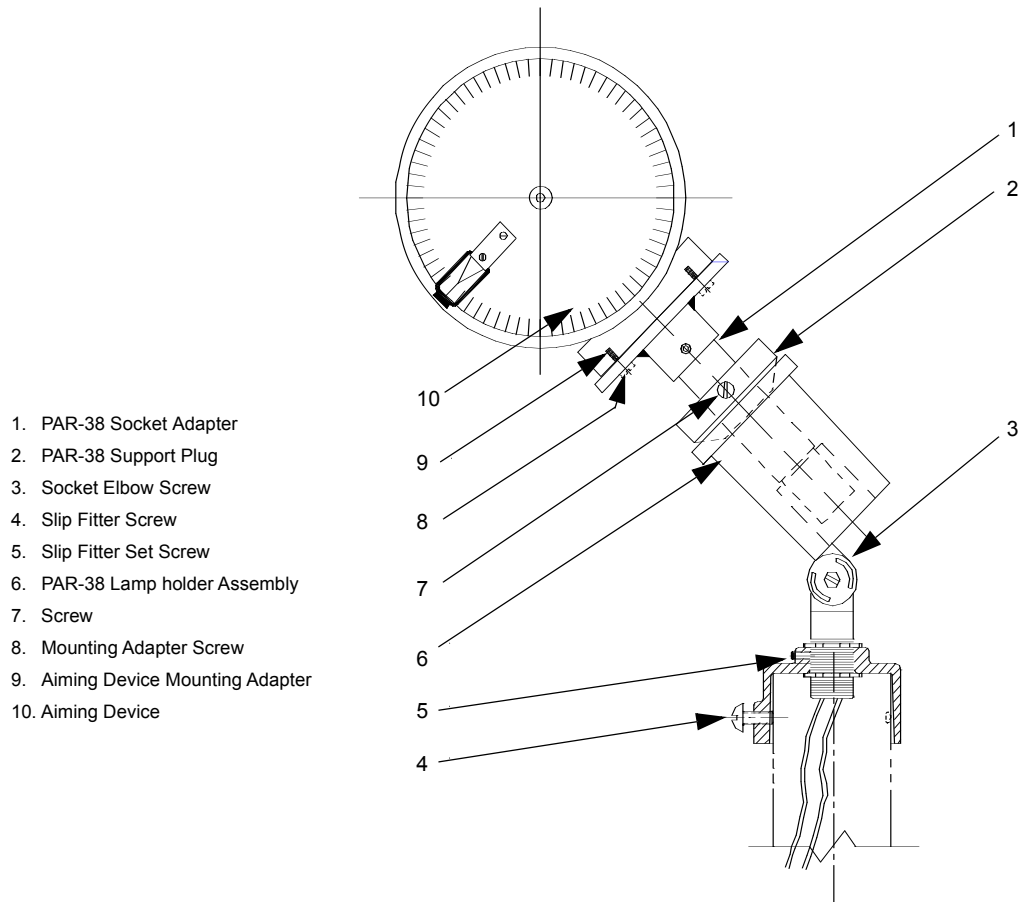
6. Now remove the aiming dial from the tower's slip section, reassemble on the base plate, and install the aiming assembly on the lamp holder.
7. After the setting has been reached, tighten both jam nuts on the adjusting screws to lock the lamp holder into position.
8. Now lock the aiming dial in place 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.

3.15 Aiming PAR-38 Lamp holders (MALSR Only)

To aim the MALSR PAR-38 lamp holders, perform the following procedure:

1. See [Figure 23](#) . Install PAR-38 lamp holder assembly (5), less PAR-38 lamp, onto the appropriate mount such as a frangible coupling or an EMT.
2. Secure by tightening the three screws (4) in the slip fitter.

Figure 23: MALSR PAR-38 Aiming Device



3.15.1 Adjusting Horizontal

To adjust the horizontal, perform the following procedure:

1. See [Figure 23](#) . Loosen the 3 screws (4) in slip fitter and/or the 8-32 set screw (5) 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. Retighten the screws.

3.15.2 Adjusting Vertical

To adjust the vertical, perform the following procedure:

1. See [Figure 23](#) . Attach the PAR-38 support plug (2) onto the socket adapter (1).



Note

The tapered end of the support plug should be on the same end as the threads on the socket adapter. Locate the support plug 2.124 inches (5.4 cm) from the threaded end of the socket adapter (1) and tighten the set screw (5) to hold in place.

2. Attach aiming device mounting adapter (9) to aiming device (10) using two screws (8).
3. Loosen the screw in the socket elbow (3) of the lamp holder and rotate the lamp holder (6) to convenient working angle (approximately 45 degrees) and retighten screw.
4. Make sure that the power to the lamps has been turned off.
5. Screw the socket adapter (1) with support plug (2) attached into the lamp socket in the lamp holder.
6. Place the aiming device (10) with mounting adapter (9) attached onto the end of the socket adapter (1).
7. Position the dial face of the aiming device vertically so that the dial can be read and is level so that the dial can rotate freely. Tighten the two set screws (7) in the mounting adapter's sleeve to hold in position.
8. Loosen the screw (8) in the elbow of the lamp holder (3) and move the lamp holder to correct the vertical angle (according to site specifications). Tighten screw and recheck setting.



Note

Refer to manual 96A0119 for mounting and aiming the 44D1661-XXXX Steady-Burning Approach Light.

4.0 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).

4.1 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 master and individual control cabinets when the cabinet door is closed and the screws on the door are tightened. The interlock switch on the master 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 CAB+ and CAB- on terminal block TB2 in the ICC.

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

4.2 Local and Remote Control

The MALSR/ALSF system can be operated by local control by manually setting switches on the control panel in the master control cabinet. The MALSR/ALSF can also be operated by remote control using +24 Vdc, +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.

Refer to [Table 22](#). Local control uses five-position rotary switch S5 on the control panel in the master control cabinet. Refer to [Table 23](#) for more information about local and remote control.

Table 22: Local Control Switch S5 Functions

Switch Position	Function
REMOTE	System operates by 120 Vac, +24 Vdc 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

4.3 Master Control Cabinet Controls and Indicators

See [Manual configuration](#) for configuration details. Refer to [Table 23](#) for master control cabinet controls and indicators.

4.4 Ground Fault Interpreter

The ground fault interpreter (GFI) outlet (3) on the master 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.

4.5 MCC Controls and Indicators

This subsection describes controls and indicators for the master control cabinet, the Local Master PCB, and the Flasher Control PCB.

Table 23: Master Control Cabinet Controls and Indicators

Item	Controls/Indicators	Function	Note
1	Interlock switch	Allows the master control cabinet to be energized when the door is closed. Refer to <i>Interlock Switches</i> in this section.	
2	Switch S2	Turns maintenance light on or off.	B
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	Spare	
8	Fuse F4 (10 A)	Protects power to contactors, remote control and PC boards.	
9	Circuit breaker CB2 (15 A)	Protects interlock switch (120 Vac) and equipment connected to fuse F4.	
10	Fuse F5	Spare	
11	Circuit breaker CB3 (30 A)	Protects 240 Vac power supply to contactor K4 and power to the individual control cabinets.	
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)	Selects ALSF and SSALR modes as long as rotary switch S5 has not been set to REMOTE.	
	Switch S4 (MALSR only)	Allows the sequenced flashers to be turned on or off when the approach lights are energized.	
14	NEON indicator HI	When lit, indicates system on high intensity.	
15	NEON indicator MED	When lit, indicates system on medium intensity.	
16	NEON indicator LOW	When lit, indicates system on low intensity.	A
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 Table 22 .	
32	Circuit breaker CB4 (70 A) (MALSR only)	Protects 120/240 Vac steady burning approach light power.	
33	ON/OFF indicator (MALSR only)	When lit, indicates system is turned on.	



Note

A: The LOW NEON Light 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 master is in hot standby mode.)

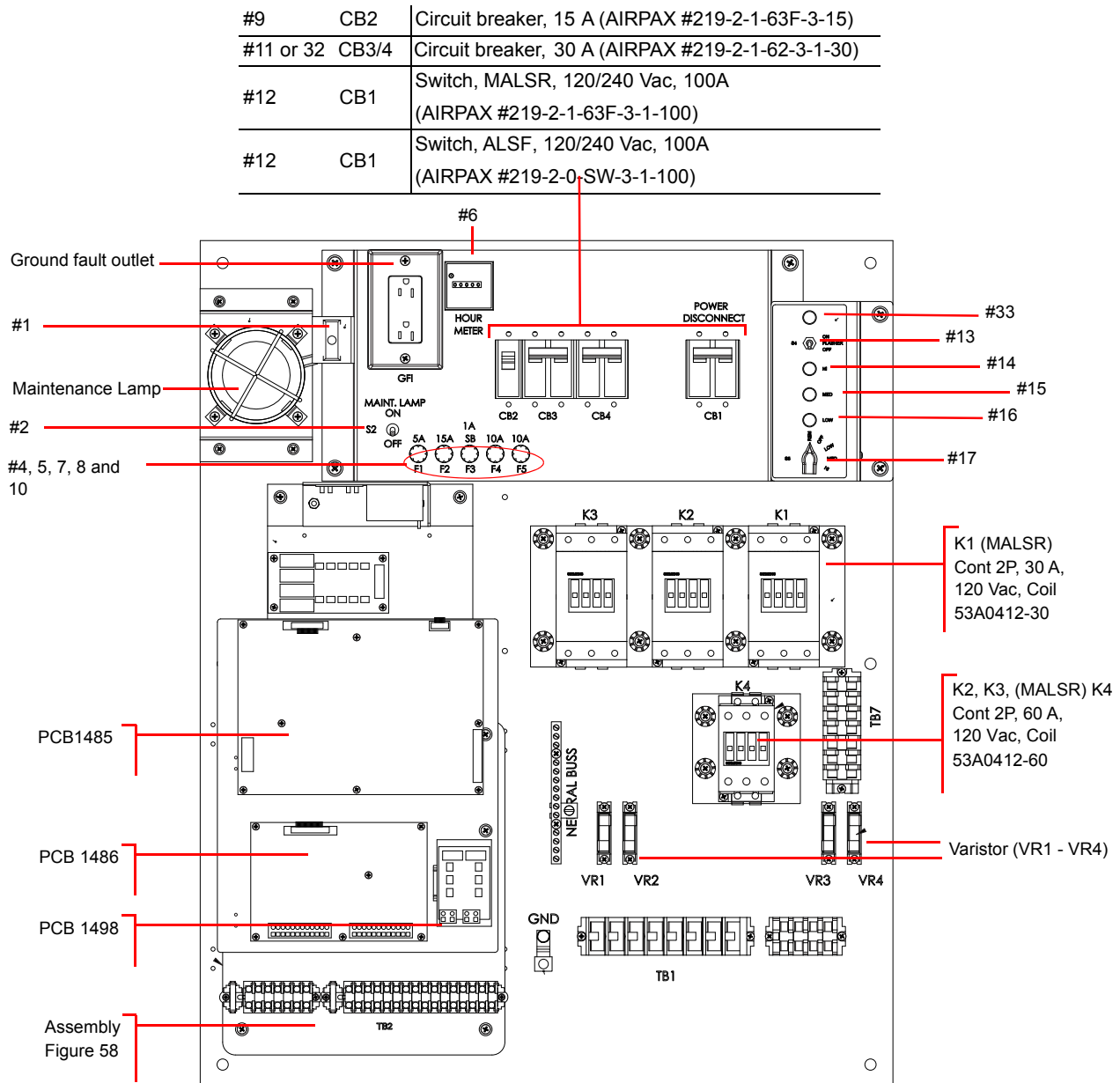


Note

B: The maintenance light will operate even if the power disconnect switch has been opened.

Unscrew wire cage to replace lamp.

Figure 24: Master Control Cabinet Parts and Diagram (MALSR Shown)



4.6 System Configuration

The configuration can be done either manually or by means of a laptop & software interfacing with the ICC via the Dongle.



Note

The ALSF can only be configured by means of a laptop and software.



CAUTION

Make sure that if a Dip-switch setting has been changed in any cabinet, the main power supply is switched off for a few seconds in order to confirm the change of the dip-switch in the cabinet where the change took place. If this is not done, the system will not recognize the hardware (dip-switch) change.

4.6.1 Manual configuration

4.6.1.1 Action 1: Configuration of the ICCs

1. • For the dip-switch settings of each ICC , refer to [Table 35](#).



Note

The factory setting for the local bus communication is:
38400 baud (SW 1-5 is OFF & SW 1-6 is ON);
even parity (SW 1-7 is ON & SW 1-8 is ON).
Dip-switches SW 1-1 to SW 1-4 are not used.

This configuration must be the same for all the units connected to this bus. This is the factory & recommended setting. These values should not be changed, except if severe problems occur in the communication between the different flasher units.

- If the MCC is physically installed at either end of the flashers check if all the jumpers (W11, W25, W28) are removed on the Flasher Control PCBs, except for the ICC farthest from the MCC. See the drawings at the end of this manual.
 - If the MCC is physically located somewhere in the middle of the flashers, both the physical routing of the CAT5e communication cable wire and the jumpers (W11, W25, W28) are different for this type of installation. See [Manual configurations Overview](#)
1. Set the dip-switch bank SW2 on each ICC so that the slave number of the first ICC corresponds to 1, and that the number for each following ICC is incremented by one, up to the last ICC. The slave number is set using binary code. (i.e. 00011 binary = 3 decimal).
 2. Check if all the jumpers (W11, W25, W28) are set properly.

4.6.1.2 Action 2: Configuration of the MCC (PCB)

1. For the Dip-switch settings of the MCC refer to [Table 25](#).



Note

The local bus communication setting (baud rate, parity) should be the same for each ICC.

Parameters that must be defined by setting the dip-switches on the MCC are:

- The number of ICCs in the system is defined by SW5-1 to SW5-6 (Note that the value that is set is in binary code).

For 1 to 31 ICCs the number must be converted to a binary value and for each bit 1, the corresponding switch must be set to ON.

1. Set the MCC dip switches as required by [Table 25](#) in binary format.
2. Set SW5-1 to SW5-6 in the MCC to the correct number of ICCs.

4.6.1.3 For 32 ICCs, all switches must be set to OFF.

- If SW2-3 is set, the last 2 ICCs are declared as REIL1 and REIL 2 respectively. Their misfire limit is set to 1.
- The cycle value of mode 1 is set according to SW2/4:

Table 24: Set Cycle Timing SW2/4

SW2-4	ON	1 cycle per second
	OFF	2 cycles per second

- The sequence times of mode 1 are set using SW2/1 and SW2/2

Table 25: Dip-switch Settings SW2

Dip-switch bank SW2		Sequence time	Mode	
SW2-1	SW2-2		Number	NAME
OFF	OFF	16 msec	1	ALSF-2
			3	ALSF-1
			2	SSALR
ON	OFF	33 msec	4	SSALS/F
			5	MALS/F
			6	MALSR
OFF	ON	66 msec	7	(ODALS)
ON	ON	Invalid!		

The sequence time of the first ICC is set to 0, the next ICCs will have a sequence time equal to the interval time defined by the switches, multiplied by their slave number in the system. If a REIL system is included in the configuration, the 2 last ICCs receive the same flash timing.

If the manual configuration option is selected, the dongle and software will not be useable.

Also when the system is configured via the manual configuration (not via the dongle & software) the physical connection needs to be logically in accordance with the sequence of the ICCs, i.e. ICC with address 1 needs to be physically the first in the communication line, ICC 2 the 2nd, etc... The MCC and last ICC are used to terminate the local bus communication line.

Table 26: Dip Switches SW1-SW5 for Manual Configuration

Switch-bank	Type	Setting		Use	Remarks
SW1	Dip	xxxxxxx		Not used, assuming a multi-wire remote control is implemented.	
SW2	Dip	1 +	2		
		OFF	OFF	16 msec interval time	
		ON	OFF	33 msec interval time	
		OFF	ON	66 msec interval time	
		ON	ON	Invalid	
		3	ON	Declaration of REILS	
		4	ON	1 cycle per second	
			OFF	2 cycles per second	
SW3	Rotary	0		Flasher system OFF	
		1		Step 1	
		2		Step 2	
		3		Step 3	
		9		Remote Control	
SW4	Dip	1	OFF	Enabling of the control by the LMC PCB rotary switch SW3	
			ON	Hardware local kill ON	No control by SW3
		2	OFF	See note 1	
		3	OFF	See note 2	
		4	OFF	Configuration via dongle & software	
			ON	Manual config by SW2 and SW5	
		5 +	6		
		OFF	OFF	Baud rate local bus 9600 baud	
		ON	OFF	Baud rate local bus 19200 baud	
		OFF	ON	Baud rate local bus 38400 baud	DEFAULT SETTING
		ON	ON	invalid	
		7 +	8		
		OFF	OFF	No parity	
		ON	OFF	Invalid (no parity)	
		OFF	ON	Local bus Odd parity	
		ON	ON	Local bus Even parity	DEFAULT SETTING

Table 26: Dip Switches SW1-SW5 for Manual Configuration (Continued)

Switch-bank	Type	Setting		Use	Remarks
SW5	Dip	1 >6		Number of ICCs in the system	Binary coding
		7		Not used	
		8	OFF	Disabling the use of the dongle	
			ON	Enabling the use of the dongle	



Note

SW4-2 - Initialize the data of E²PROM

The MCC stores the system parameters in an E2PROM. At first power-up or when the system must be completely reconfigured, it is possible to clear the E2PROM and return to the default factory settings. To do this, put the switch to ON, power down the MCC and turn it ON again after 5 seconds. Do not forget to set the switch back to OFF or the E2PROM will once again be cleared at the next power cycle!!



WARNING

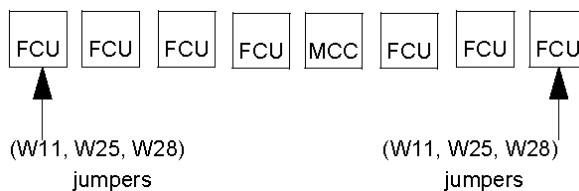
This will clear all the parameters, the system layout included. They must then all be restored via the software, or by using the dip-switches.



Note

SW4-3 - Lock to boot

This switch is always OFF in a functioning system. It is only used if there is a major problem during upload of a new application code



4.6.2 Configuration via the Dongle

4.6.2.1 Action 1: Configuration of the ICCs

- For the dip-switch settings of each ICC, refer to [Table 35](#).

The factory setting for the local bus communication is:

- 38400 baud
(SW1-5 is OFF and SW1-6 is ON).
- Even parity
(SW1-7 is ON and SW1-8 is ON).
- Dip-switches

SW1-1 to SW1-4 are not used.

These settings must be the same for all the units connected to this bus. This is the factory and recommended setting. These values should not be changed, except if severe problems occur in the communication between the different flasher units.

- Check if all the jumpers (W11, W25, W28) are removed on the Flasher Control PCBs, except for the ICC farthest from the MCC on the local bus. Install jumpers (W15, W16 & W18) on the Local Master PCB.
1. Set the slave number on SW2 for each ICC so that every slave has a unique address. The slave number is set using binary code. (i.e. 00011 binary = decimal 3).
 2. For the ease of defining the layout through the software, choose a logical numeric sequence addressing of the ICCs.

4.6.2.2 Action 2: Configuration of the MCC (Local Master PCB)

1. The settings for the local bus communication should be:

- 38400 baud
(SW4-5 is OFF and SW4-6 is ON)
- Even parity
(SW4-7 is ON and SW4-8 is ON)



Note

The local bus communication settings (baud rate, parity) should be the same as for the ICCs.

1. Set the dip-switch SW4-4 on the MCC in position "Off" and SW5-8 to "ON" to enable the dongle use.
2. Set the local bus communication baud rate and parity.

4.6.2.3 Action 3: Connect the dongle & define the layout through the software

1. To connect the "dongle" to any ICC or to the (MCC) LMC PCB follow the steps below.
 1. Connect the "dongle" to any ICC or to the LMC PCB via the serial DB-9 connector.
 2. Connect your laptop loaded with the software, latest version, to the dongle.
 3. Launch the Flasher.exe program.
 4. Verify in the configuration menu that the COM port and the communication parameters have been selected in accordance with your laptop configuration.

4.6.2.4 Action 4: Software based configuration



Note

You need the configuration tool to perform this procedure.
See [Configuration tool](#).

To configure the equipment with the configuration tool, set the switches of the Local Master Controller (LMC) PCB as described in this section:

- Enable local control;
- Enable software configuration;
- Set the number of FCUs in the system;
- Restart the LMC;
- Define the system layout with the configuration tool;
- Define the flashing mode with the configuration tool.

Enable local control

The MCC rotary switch should be set to LOW intensity in LOCAL during this procedures. Also, set the LMC rotary switch to 0. When finished, return the LMC rotary switch to position 9.

Enable software configuration

To enable software configuration, set switch SW4 of the LMC PCB as follows:

Table 27: Dip-switch SW4 settings of the LMC PCB

Setting	Dip-switch 1-6 of switch SW							
	1	2	3	4	5	6	7	8
ON						X	X	X
OFF	X	X	X	X	X			

Set number of FCUs in system

Set switch SW5 of the LMC PCB as follows. In SW5, dip-switches 1-6 represent the total number of FCUs in the system. For dip-switches 1-6, set the same binary address as you set for the last FCU in the entire system (FCU PCB, SW2). Set SW5-7 to OFF and SW5-8 to ON.

Restart the LMC

To activate the dip-switch settings in the whole system, you must switch OFF the power in the MCC, which contains the LMC.

1. Make sure that the other cabinets in the system are switched ON.
2. Switch OFF power to the MCC. *Leave the power off for approximately 10 seconds.*
3. Switch ON power to the MCC.

Define the system layout

Define the number of FCUs and boxes in the system and set a layout for the units. The FCU layout determines the order in which the lamps flash during a flashing sequence.



CAUTION

Make sure that all flash units are connected to the FCUs in a logical order. For example, the first flash unit is the one that is farthest away from the runway. If the system has REILs, they must be closest to the runway and have the highest logical address.

4. Open the configuration tool.
5. Go to menu **Layout**.

Flasher layout	
NUMBER OF DEVICES	
The number of FLASHERS and the number of BOXES is INCLUSIVE of the REILS (if present)	
Number of flashers (inclusive REIL)	20
Number of boxes (inclusive REIL)	7

Flasher layout	
Box 1: Number of flashers in box	3
Flasher A: Sequence	1
Flasher A: Slavenumber	1
Flasher B: Sequence	2
Flasher B: Slavenumber	2
Flasher C: Sequence	3
Flasher C: Slavenumber	3
Box 2: Number of flashers in box	3
Flasher A: Sequence	4
Flasher A: Slavenumber	4
Flasher B: Sequence	5
Flasher B: Slavenumber	5
Flasher C: Sequence	6
Flasher C: Slavenumber	6

- Set the number of flashers, including REIL flashers. *See the graphic.*
- Set the number of boxes in your system. *See the graphic.*
- Set a sequence and a slave number for each flasher.
- Set some of the flashers to be REILs or RTILs, if applicable to your system. *Click* the field after the sequence number. *See the graphic.*
- Press **Program**. *See the graphic.* The changes are now sent to the LMC.

Flasher layout	
CAUTION	
The following parameters are a COPY from the system database. Changes made here are transmitted to the system only when the PROGRAM button is hit	
Program	

Flasher: Status	
INDIVIDUAL FLASHER STATE	
The following data is read form the flashers and cannot be changed	
Local Master	On line
Flasher 1	On line
Flasher 2	On line
Flasher 3	On line

- Check the message windows that appears on screen. "*Layout OK*" means that the new layout was sent successfully. "*Layout Not OK*" means that you must check the layout and the dip-switch settings again.
- Go to section **Flasher data**.
- Press **Status**.
- Make sure that the status of LMC and all flashers is **Online**. *If they are not on-line*, check the power supply to all cabinets, the position of the door switch, the binary addresses on the FCU PCBs, and the local bus communication cable.

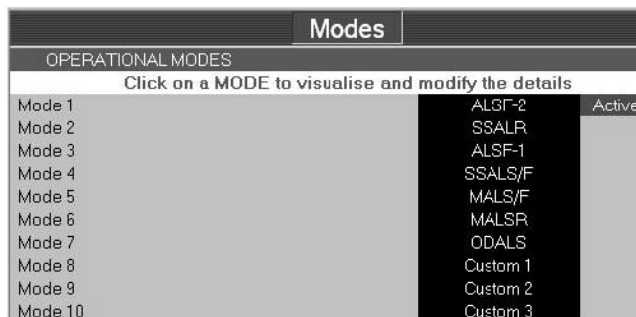
Define the flashing mode

The following flashing modes are available:

Table 28: Flashing modes

Mode	Description
ALSF-1	Approach Light System with Sequenced Flashing Lights (ILS Cat-I Configuration)
ALSF-2	Approach Light System with Sequenced Flashing Lights (ILS Cat-II Configuration)
SSALR	Simplified Short Approach Lighting System with Runway Alignment Indicator
SSALS	Simplified Short Approach Lighting System with Sequenced Flasher
MALSR	Medium-Intensity Approach Lighting System with Runway Alignment Indicator
MALSF	Medium-Intensity Approach Lighting System with Sequenced Flashers
ODALS	Omni Directional Approach Lighting System
Custom	To be defined by the customer.

15. Open the configuration tool.



16. Switch the equipment ON.

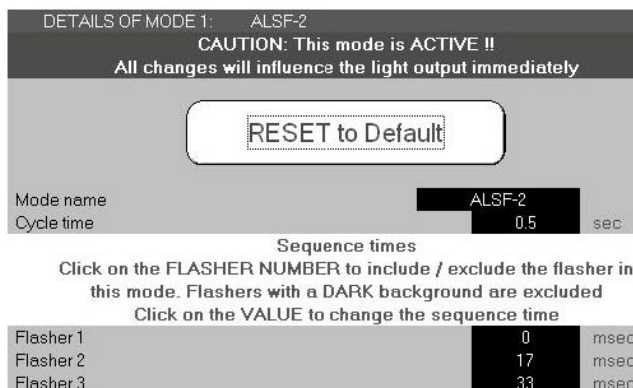
17. Select the menu **Modes**.

18. Go to section **Operational modes**.

19. Select the active mode. *Click the field next to the mode description to make it active (see the graphic).*

20. Modify the available modes, if necessary. Click a mode field to show the mode details in section **Details of mode**.

21. Define the **Cycle time** for each mode. *This is the time it takes for all units to flash once in the predefined sequence.*



22. Define which flashers are included in the selected mode. *To include a flasher, click on the flasher name so that the background color changes.*

23. Set the correct sequence time in milliseconds.

4.6.2.5 Action 5: Definition of the Inputs and Outputs

1. Depending on what type of control & back-indication signals will be used, you must change parameters in the 'IO' menu. The parameters for the MW control & back-indication can be changed in this menu.



Note

The system can only be completely configured if the power supply is present in all cabinets.

Via the control menu you can switch on the system at the chosen brilliancy. OFF - STEP1 - STEP2 - STEP3. The REILS or RTILS must be switched on separately from the SFL.

If, after the startup and a visual inspection of the system, some lamps remain off, details on ICCs & communication can be obtained through the 'Status' and 'Flasher Data' menus. This will help to identify the cause of the problem.

ADB Safegate part number 1444.00.010 includes both the dongle, dongle cables and, software on a CD. This dongle comes complete with its cables and a CD that contains the software.

See [Initial Software Installation and Software Use](#) for additional details on use of the software.

1. Switch on the system.
2. Check the configuration from the software application via the Dongle.
3. Test the configuration.

4.6.3 Configuration of the REIL/RTIL system

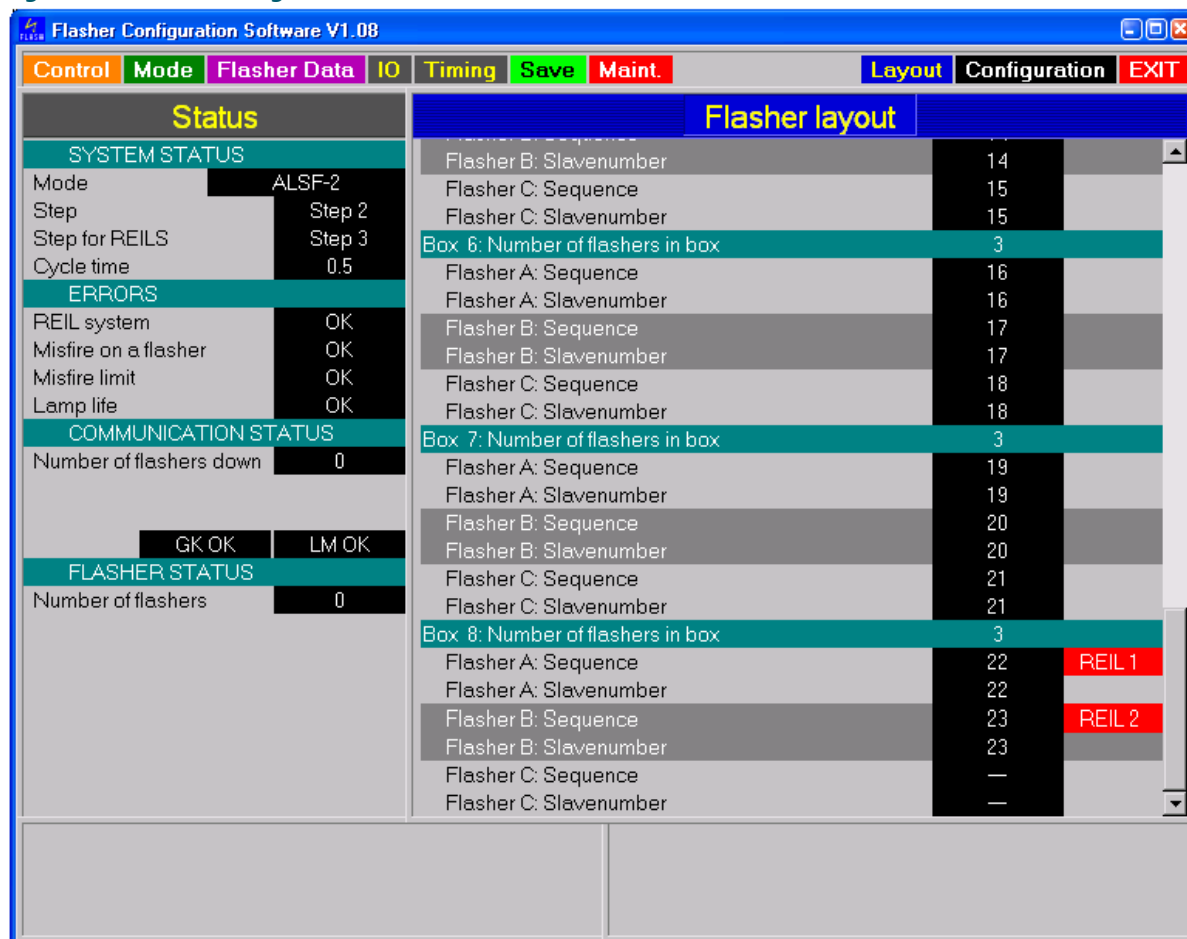
4.6.3.1 SFL including a RTIL (Runway Threshold Identification) system:

To include 2 REIL/RTIL flashing lamps in the Sequenced Flashing System, the two ICC boards that will control the RTIL lamps must be defined.

- Manual configuration

Physically the RTIL ICCs must be situated as the last units in the local bus communication line if the system is configured manually. On the MCC Local Master PCB, you must declare that a RTIL system is present. Put the SW bank 2 dip-switch 3 on the Local Master PCB in the ON-position to do this. The ICCs connected to the RTIL lamps must receive the two last slave numbers in the row. i.e., if a SFL with RTILs consists of 23 lights the RTIL lights will carry the slave numbers 22 & 23. The system will then automatically know that the last two units in the communication line are defined as RTIL lights. Therefore, they will both flash at the same time after the last light within the SFL has flashed.

Figure 25: Flasher Configuration Software



- Software configuration

When the system is configured via the software through the dongle, any lamp in the system can be declared as an RTIL light in a SFL. You just need to know the slave number of the ICCs that you will want to operate as RTIL and set them in RTIL mode by clicking the right field next to the corresponding ICC in the layout menu. The grey area will then become red and show REIL1 or REIL2, see Figure 25. Through the software the RTILs can be switched on/off independently from the SFL.

4.6.3.2 REIL (Runway End Identification) or RTIL only system

- The flasher system can be used also as a REIL or RTIL without SFL. Only two lamps, 2 ICCs & 1 MCC will be necessary in this configuration.
- Same configuration as for the SFL incl. RTIL but with only two ICC slaves.
- In both Software and manual configuration, the REILS (RTILs) must be defined.



Note

The RTILS can only be activated separately (without activation of the SFL) from the Software or a J-Bus control if a SFL line is included in the system. (Not via a Multi-wire control.)

4.7 Technical Description of the Control Cabinets, System Components and Available Options

4.7.1 Individual Control Cabinets (ICC)

Each flasher requires one ICC (Individual Control Cabinet). There are 2 cabinet sizes:

- A single ICC (ICC-1) controlling one lamp unit.
- A multiple ICC with 3 units in one control unit (ICC-3) controlling three lamp units.



ICC -3



ICC -1

Any combination of these ICC cabinets is possible to obtain the required field configuration.

Note that the "ICC-3" has doubled terminals for a three-phase with neutral connection while the "ICC -1" has only single-phase connection terminals.

The "ICC-1" requires a junction box to connect it to the power supply cable. See [Figure 59](#).

4.7.2 Master Control Cabinet (MCC)

Each system requires one MCC (Master Control Cabinet). Each MCC contains a PCB that generates the control signals to all the Individual Control Cabinets and connects the system to the remote control system.

Remote control and back-indication signals are possible through +24 Vdc, +48 Vdc or 120 Vac Multi-wire cable.

4.7.3 Configuration

Configuration of the system can be done using Dip-switches or through a PC. The remote control interface is factory set, depending on what has been ordered.

To modify the remote control parameters of a system you will require:

- The dongle,
- The software,
- A PC with serial port (Windows Operating System).

4.7.4 Installation options

The following installation options are available:

- Additional over-voltage protection (max. 40kA, 8/20ps-pulse) on the input terminals.
- External temperature sensor.



Note

Critical components of the ICC are protected against over-voltage with components mounted on-board suitable for a typical environment usage.

The additional over-voltage protection option is recommended for areas where frequent lightning occurs. The condition of the over-voltage protection can be monitored remotely.

4.7.5 Operating Principle

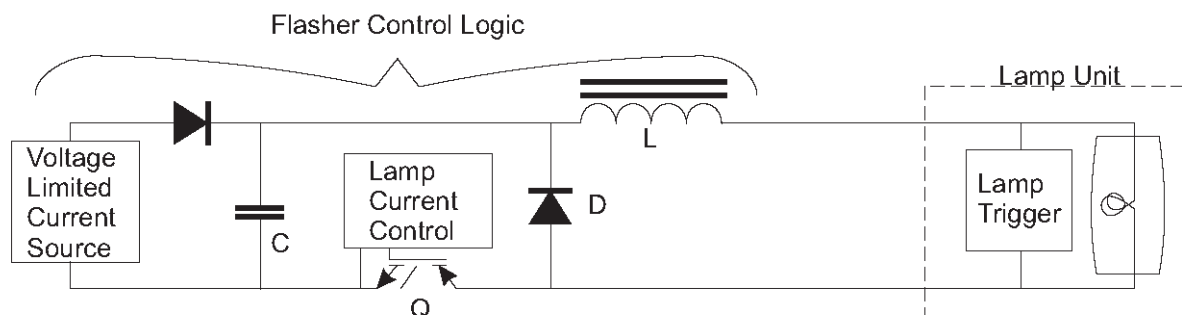
This flashing system is based on a low voltage (400 Vdc) xenon-filled flashtube.

The wire around the flashtube serves to trigger the lamp by means of a voltage pulse of about 8 to 12kV between the trigger wire and the lamp anode.

The trigger voltage pulse is delivered by a small trigger capacitor in the lamp trigger circuit (located in the lamp unit) charged at 300 Vdc.

- See [Figure 26](#). The flash energy is stored in a large capacitor C.
- By means of a transistor Q, the capacitor voltage is quickly applied to the lamp. This generates the trigger pulse.
- The capacitor C will start to discharge through the flash lamp.
- The current pulse will be limited by the series choke L.
- As soon as the requested energy is supplied to the lamp, the transistor Q will be deactivated (open). The remaining energy stored in the series choke will flow through the lamp and the diode D.
- The capacitor C is charged again by the voltage limited current source.
- The charge current will depend on the power consumed by the lamp.
- The micro controller will select one out of 7 current levels to fully charge the capacitor prior to the next flash instance.

Figure 26: Flasher control



4.8 Lightning Protection

4.8.1 Flasher system

The flasher system is by definition installed outside in the field and is subject to lightning strikes.

For this reason, the ICC cabinets come with built-in lightning protection.

All metal parts are interconnected and there are earth ground lugs for the customer's use.

4.8.2 External wiring

In the external cabinet wiring, all cable shields must be connected to the cabinet earth ground. This must be done for the cable to the lamp, the main supply and the local bus connections.

Nevertheless, a major part of the efficiency of the protection is in the external wiring. All necessary steps must be taken to insure a direct connection between the earth lug of the cabinet and a solid local earth ground (counterpoise or at the very least a large section grounding wire).

As an option, each ICC -cabinet can be equipped with MOV (Metal Oxide Varistors) over-voltage protection on the main input. This will protect the cabinet if the lightning strikes nearby. It is possible to check remotely (Modbus or Multi-wire) if the MOVs are still intact or have to be replaced.

We recommend that the optional over-voltage protection be installed in any area where lightning occurs frequently.

4.8.3 Local bus input

The local bus input is, at the input and the output level, protected by gas arresters (see Local bus interface). Here too, the cable armor (shield) must be connected to a low-resistance earth ground. On the flasher control unit (FCU) PCBs there is supplementary solid-state protection that can absorb substantial amounts of energy injected as a result of a nearby strike.

It must be stressed that although there can be no guarantee that there will be no damage after a lightning strike, if the necessary precautions are taken, the damage will remain limited.

4.9 ICC (Individual Control Cabinet) FCU PCB 1487

The flasher control unit is a CPU-controlled PCB that receives its input messages from the MCC (or the dongle) via the local bus interface. There is no direct connection to the remote control system.

The board contains a Switched Mode Power Supply (SMPS) to charge the flash energy capacitor and has the necessary hardware to drive and monitor the lamp.

The PCB within the ICC counts the number of misfires and sends error messages back to the MCC.

If the number of flashes exceeds the lamp lifetime, a message is sent to the system.

4.9.1 FCU PCB Fuse

F1 - Fuse rated 2 AT, 5x20 mm.

Table 29: FCU PCB 1487 Connectors

Name	Type	Purpose	Factory wiring	External wiring	Remarks
P1	5-pin Stocko	Monitoring of the temperature sensor	x		
P2	3-pin Stocko	Monitoring of the door contact	x		
P3	3-pin Stocko	Monitoring of the MOVs	x		
P4	10-pin flat-cable	Local bus connector	x		
P5	3-pin Wago	Heating resistor	x		
P6	3-pin Wago	Mains supply	x		
P7	3-pin Molex	Mains supply for the SMPS	x		 CAUTION if the SMPS is not connected to this board, there is a dummy plug on P7 to avoid accidental contact with the mains supply.

Table 29: FCU PCB 1487 Connectors (Continued)

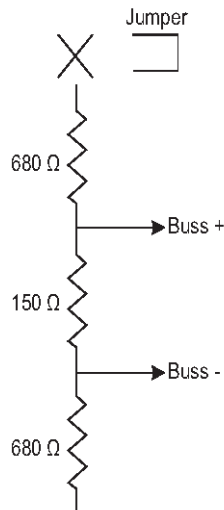
Name	Type	Purpose	Factory wiring	External wiring	Remarks
J1	SUBD9	Connector for the dongle		x	Parameterization of the SFL
TB1	6-pin Phoenix	DC supply connection	x		Return from the SMPS
TB2	6-pin Phoenix 0.4-in (10.16 mm)	Lamp connection		x	
TB3	Fast-on	Capacitor	x		 WARNING Insure the polarity blue or white, and red wires are correct!
TB4	Fast-on	Coil	x		 CAUTION the terminal PE (Potential to Earth) is never connected

4.9.2 FCU PCB 1487 Jumpers

Jumpers are included on the PCBs to terminate the local bus, when necessary. During installation and setup, they may have to be removed. See [System Configuration](#) .

Jumpers are used in the following diagram to short out / or leave in, the 680 Ω and 150 Ω resistors. Their function is described as follows.

Figure 27: FCU PCB 1487 Jumpers



- The 150 Ω resistor is used to terminate the bus. It may only be installed at the physical ends of the bus i.e., at the first and the last device physically found on the local bus communication cable.
- The 680 Ω resistors always come in pairs. There is a pull-up resistor on the positive bus wire and an identical pull-down resistor on the negative wire. Their purpose is to polarize the bus when no device is talking. After a message is sent by the MCC, but before an ICC starts responding, the bus is polarized to a safe position by the internal high-value pull- up/down resistors. Under extreme conditions of interference, additional 680 Ω resistors can be installed to decrease the sensitivity of the bus. Note that the 680 Ω resistors may only be connected at the LMC PCB and the last Individual Control Units (ICC) farthest from the MCC in the system, otherwise the bus drivers will become overloaded.

Table 30: FCU PCB 1487 Jumpers

Jumper	Bus use	Resistor Pull up	680 ohms Pull down	Terminating resistor 150 ohms	Notes
W11			x		
W28	Local bus			x	
W25		x			

Note

Jumpers W11, W28 and W25 must be placed on both ends if the MCC is in the middle of the ICCs.

4.9.3 FCU PCB Dip-switches

There are two Dip-switch banks on the FCU PCB that are used to configure the ICC and thus pre-install some parameters.



CAUTION

- If a switch setting is changed, it will only be taken into account after the next power down cycle, i.e. power down the system in order to make a change in the hardware setting effective.

Table 31: FCU PCB Dip-switches

Switch-bank	Type	Setting	Use	Flash er	SW2- SW2-	SW2- SW2-	SW2- SW2-	SW2- SW2-	SW2- SW2-	SW2- SW2-	SW2- SW2-	SW2- SW2-
					1	2	3	4	5	6	7	8
				#1	•	o	o	o	o	o	o	o
				#2	o	•	o	o	o	o	o	o
				#3	•	•	o	o	o	o	o	o
				#4	o	o	•	o	o	o	o	o
				#5	•	o	•	o	o	o	o	o
				#6	o	•	•	o	o	o	o	o
				#7	•	•	•	o	o	o	o	o
			Slave number of the MCC (local	#8	o	o	o		o	o	o	o
				#9	•	o	o		o	o	o	o
			bus)	#10	o	•	o		o	o	o	o
			MUST BE UNIQUE for each ICC	#11	•	•	o		o	o	o	o
			Valid value from 1 to 32 (binary	#12	o	o	•		o	o	o	o
SW2	Dip	xxxxxxxx		#13	•	o	•		o	o	o	o
			code)	#14	o	•	•		o	o	o	o
			SW2 has eight dip switches.	#15	•	•	•		o	o	o	o
			Set as per chart to the right.	#16	o	o	o	o		o	o	o
				#17	•	o	o	o		o	o	o
			0=off and 1=on	#18	o	•	o	o		o	o	o
				#19	•	•	o	o		o	o	o
				#20	o	o	•	o		o	o	o
				#21	•	o	•	o		o	o	o
				#22	o	•	•	o		o	o	o
				#23	•	•	•	o		o	o	o
				#24	o	o	o			o	o	o
				#25	•	o	o			o	o	o
				#26	o	•	o			o	o	o
				#27	•	•	o			o	o	o
				#28	o	o	•			o	o	o
				#29	•	o	•			o	o	o
		1	OFF	Internal use								
		2	OFF									
		3	OFF									

Table 31: FCU PCB Dip-switches (Continued)

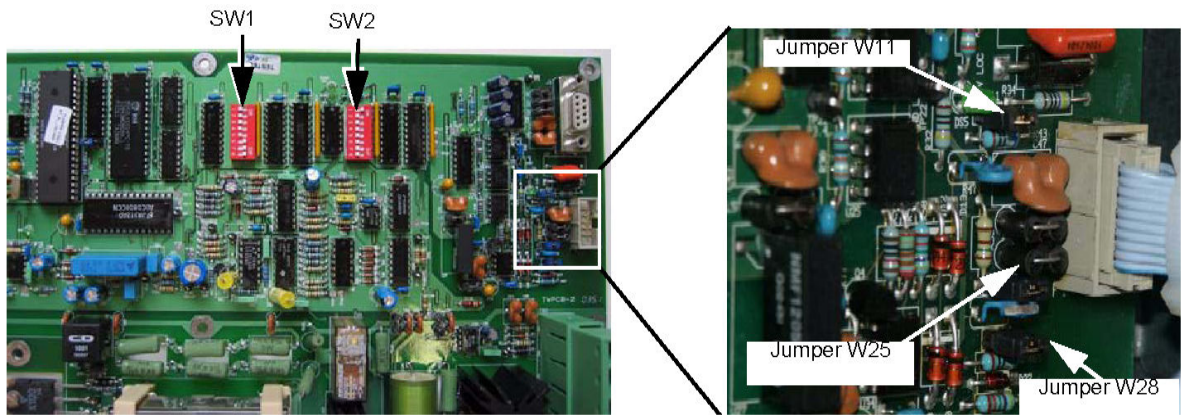
Switch-bank	Type	Setting		Use	Remarks											
					Flash er	SW2-	-	SW2	-	SW2	-	SW2	-	SW2	-	SW2-
		4	OFF													
		5 +	6													
SW1	Dip	OFF	OFF	Baud rate local bus 9600 baud												
		ON	OFF	Baud rate local bus 19200 baud												
		OFF	ON	Baud rate local bus 38400 baud												
		Factory Setting														
		ON	ON	Invalid												
		7 +	8													
		OFF	OFF	No parity												
		ON	OFF	Invalid (no parity)												
		OFF	ON	Local bus Odd parity												
		ON	ON	Local bus Even parity												
					Factory Setting											



Note

The baud rate and parity of the local bus should only be changed if you experience severe problems in communication between the units. In this case ALL the units should be set to the same baud rate and parity!

Figure 28: FCU PCB 1487: Switchbanks and Jumpers



4.9.4 ICC LEDs

The ICC is equipped with a number of LEDs. Their function is shown below.

Table 32: ICC LED Indicators

Name	Indication	Status	Remarks
DS1	FLASH command	Duration is proportional to the selected step.	
DS2	RUN	1 Flash per second	Higher rate during software upload
DS3	Rx local bus	Normally OFF Lights up momentarily during transmission or reception.	If one of these LEDs is OFF, there is no traffic on the corresponding bus.
DS4	Tx local bus		If one of these LEDs is ON, there is may be, a polarity inversion on the bus.
DS5	Isolated supply local bus	ON	
DS6	FLASH	ON during flash request	Hardware flash command to IGBT Driver

4.10 Local Bus Interface PCB 1498

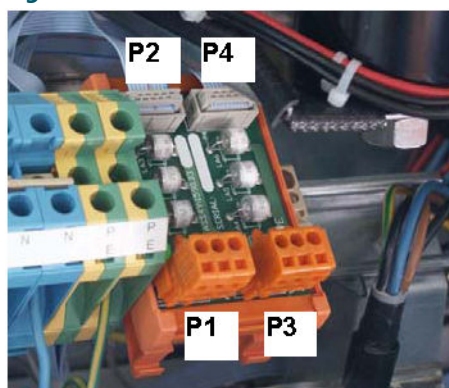
This is a small PCB mounted on the DIN rail that provides the interconnection of the local bus between the ICC cabinets.

The PCB is equipped with gas arrestors for over-voltage protection.

For ease of wiring, there are 2 connectors for the local bus P1 and P3.

- One is for the connection to the next cabinet's PCB 1498 P1 (input),
- The other for the connection to the preceding ICC cabinet's PCB 1498 P3 (output).
- The external local bus connection from the MCC P3 is connected to P1 in the first ICC, and then P3 of that cabinet is connected to P1 in the next ICC, and so on. See the external connection diagram in section 9.
- The flat-cable connectors P2 and P4 are for internal distribution of the bus signal, and are factory wired.

Figure 29: Local Bus interface, PCB 1498



4.11 MCC (Local Master) PCB 1485

The MCC Local Master PCB provides the control for the complete system.

Three modes of control exist:

- Remote control
- Local control
- Control via the Dongle

The Local Master PCB is a CPU-controlled printed circuit board. It interfaces with the remote control system that provides the command and back-indication signal functions. The MCC is not only the unique connection point for the customer's remote control system, it is also the device that maintains a continuous communication with all the ICCs under its command. All the data received is collected into a single database that gives the user a quick overview of the system without having to scan all separate ICC PCBs. Full information on the individual ICCs can also be found in the data-base.

Data on the system can only be obtained using a PC and a Dongle.

The data exchange between the MCC and the individual ICCs is achieved over a twisted pair RS-485, 3 wire connection. This communication link is called the "local bus" connection. See also Chapter 4 "local bus Interface, PCB1498". The protocol is proprietary.

The rotary switch in the MCC connects to the Local Master PCB to provide Local and Remote control functions.

On the Local Master PCB, there is a rotary selector switch SW3. It is normally not used and is set to position 9. If the MCC cabinet rotary switch is not present, it can optionally be used to select either remote control (position 9) or local control (position 1, 2 and 3 according to the brightness setting required).

The dongle is connected to the system using either the MCC or any ICC. When configuring the system using a PC, the MCC loses the master command over the local bus and the software is used to define the control and configuration of the system. At that moment the Multi-wire and the busses also lose control over the system. All settings and control parameters are set via the software.



Note

For FAA MALSR applications, all settings and control parameters can be set using only the DIP switches.

4.11.1 Protections

All the bus signals (local bus and the optional Modbus) are protected with solid-state devices against over-voltages (lightning strike). They are galvanically isolated from the LMC and FCU PCB signals to better absorb sudden surges on the bus.

4.11.2 Start-up and scanning

At power-up the MCC reads its local E² PROM memory to find the system configuration. Then it will contact all the system's ICC PCBs via the local bus. System configuration data is sent to each ICC to program it for normal operation.

Depending on how the system was configured it will read the configuration from the dip- switches or the E²PROM.

After the start-up sequence, the MCC continues to scan all the ICCs sequentially to ensure correct operation. If REIL flashers are used, they are scanned at a higher rate for applications where it is required to switch one OFF if the other fails (misfires).

Supplementary messages are interleaved with this scan cycle when commands are received from Local or Remote control.

4.11.3 Synchronization

The main purpose of a flasher system is that each unit flashes in a predefined sequence, interval and repetition rate.

Each ICC is an autonomous device that decides for itself when it is to flash. This is based on 2 parameters: the cycle time and the sequence time.

The cycle time defines the repetition rate. It can be programmed to:

- 2 flashes per second (FAA and ICAO standard),
- 1 flash per second,
- 1 flash every 2, 5 or 10 seconds.

The sequence time is the delay counted from the beginning of a cycle that defines the moment a lamp must flash.

One of the functions of the MCC is to keep all the ICCs synchronized so that they will flash in sequence. This is accomplished by sending a unique message to all the ICCs at regular intervals. This guarantees the system will keep the flashing sequence within a few milliseconds.

The CPU on each FCU PCB generates an internal clock with a precision that depends directly on the internal quartz crystal (100 ppm, i.e. 0.001%). This clock is the reference time base for all the internal timers. In order to achieve a continuous 1 msec precision on the flashing timing, a re-synchronizing message is sent by the MCC once every 10 seconds. This corrects for any drift in the clock frequency.

4.11.4 Real-time measurements

The MCC is also the controller for the real-time measurement. This allows the user to check if each ICC flashes at the expected moment.

The real-time measurement only runs on request by the user and for a limited time that the user can select (min 5 sec to max 60 sec). During this time, the MCC captures and stores the exact moment when each lamp flashes.

During real-time measurement, the synchronizing messages are suspended. This allows the user to check for possible timing drift of each ICC.

After the measurement terminates, the captured data is available in the data base.

Table 33: PCB 1485 Connectors

Name	Type	Purpose	To be connected by customer	Factory connections	Remarks
P1	20-pin flat cable	External Modbus		x	
P2	10-pin flat cable	Local bus (coming from the closest ICC)	x		
P3	10-pin flat cable				Alternative to P2
P4	6-pin Phoenix	Mains supply			Not used
P5	26-pin flat cable	Supply for multi-wire control		x	
P6	3-pin Stocko	Monitoring for the MOVs	x		
P7	3-pin Stocko	Monitoring for the door contact	x		
P8	5-pin Stocko	Monitoring for the temperature sensor probe	x		
P9	5-pin Stocko	Monitoring for the door contact			
J1	3-pin Wago	Mains supply of the Multi-wire			Not used
J2	SUBD9	Connection of the dongle			Sets the Parameters of the sequenced flashing lights (SFL)
J3	3-pin Wago	Synchronization between MCCs			Not used
J4	3-pin Wago	Mains supply			Not used
J5	3-pin Wago	Heating resistor			Not used
TB1	6-pin Phoenix	DC supply	x		

4.12 PCB 1485 Jumpers

Table 34: PCB 1485 Jumpers

Jumper	Bus use	Rx : Tx	Resistor 680 ohms		Terminating resistor 150 ohms	Remarks
			Pull up	Pull down		
W1	Remote Bus A	Tx -		x		not used
W2		Tx +	x			not used
W3		Tx			x	not used
W4		Rx +	x			not used
W5		Rx -		x		not used
W6	Remote Bus B	Rx			x	not used
W7		Rx -		x		not used
W8		Tx			x	not used
W9		Tx +	x			not used
W10		Tx -		x		not used
W11	Local bus jumpers	R x+	x			not used
W12		Rx			x	not used
W13		-		x		for future use
W14		+	x			
W15		-		x		
W16		+	x			
W17	Synchronization line				x	for future use
W18	Local bus jumper				x	
W19	Bus A					not used
W20	Bus B					not used

4.12.1 Rotary and Dip-switches

There are a number of dip-switches on this PCB that are used to configure it, to set some parameters or to reset completely the MCC.

Figure 30: MCC, PCB1485: Switches

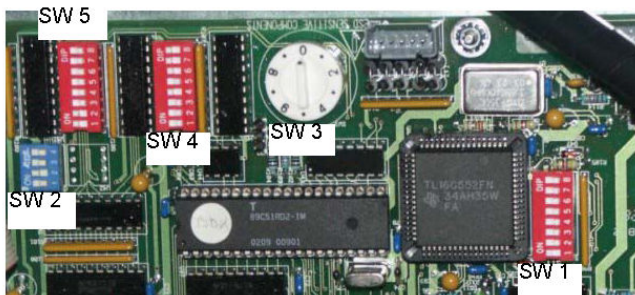


Table 35: PCB 1485 Rotary and dip-switches

Switch-bank	Type	Setting		Use	Remarks
SW1	Dip	xxxxxxx		not used	
SW2	Dip	1 +	2		Manual config SW4 /4
		OFF	OFF	16 msec interval time	
		ON	OFF	33 msec interval time	
		OFF	ON	66 msec interval time	
		ON	ON	invalid	
		3	ON	Declaration of REILS	
		4	ON	1 cycle per second	
			OFF	2 cycles per second	
SW3	Rotary	0		Flasher system OFF	Set to position 9 for both FAA MALSR and ALSF applications using a master control cabinet (MCC).
		1		Step 1	
		2		Step 2	
		3		Step 3	
		9		Remote control	
SW4	Dip	1	OFF	Enabling of the control by the rotary SW3	
			ON	Hardware local kill ON	No control by SW3
		2	OFF	See note 1	
		3	OFF	See note 2	
		4	OFF	Configuration by use of the dongle	
			ON	Manual config by SW2 and SW5	 Note Manual Configuration not available on ALSF/SSALR applications
		5 +	6		
		OFF	OFF	Baud rate local bus 9600 baud	
		ON	OFF	Baud rate local bus 19200 baud	
		OFF	ON	Baud rate local bus 38400 baud	Factory settings
SW4	Dip	ON	ON	invalid	
		7 +	8		
		OFF	OFF	No parity	
		ON	OFF	Invalid (no parity)	
		OFF	ON	Local bus Odd parity	
		ON	ON	Local bus Even parity	Factory settings

Table 35: PCB 1485 Rotary and dip-switches (Continued)

Switch-bank	Type	Setting	Use	Remarks
SW5	Dip	1 >6	Number of ICCs in the system	See Table 36
		7	Not used	
		8	OFF	Disabling of the use of the Dongle
			ON	Enabling of the use of the Dongle

Note

Except where specifically noted, all the switches are read at power-up. If a switch setting is changed, it will only be taken into account after the next power-down/power-up cycle.



CAUTION

SW4-2 - Initiation of the data E²PROM

The MCC stores the system parameters in an E²PROM. When first powered-up or when the system must be completely reconfigured, it is possible to clear the E²PROM and return to the default factory settings. To do this, put the switch in the ON position, power down the MCC and turn it ON again after 5 seconds. Do not forget to set the switch back to OFF or the E²PROM will once again be cleared at the next power cycle.

This will clear all the parameters, including the system layout data. The system parameters must be restored via the software, or by using the dip-switches.

Note

SW4-3 - Lock to boot

This switch is always OFF in a functioning system. It is only used if there is a major problem during upload of new application code.

Table 36: SW5 dip switch

Flasher	SW2-1	SW2-2	SW2-3	SW2-4	SW2-5	SW2-6	SW2-7	SW2-8
#1	•	0	0	0	0	0	0	0
#2	0	•	0	0	0	0	0	0
#3	•	•	0	0	0	0	0	0
#4	0	0	•	0	0	0	0	0
#5	•	0	•	0	0	0	0	0
#6	0	•	•	0	0	0	0	0
#7	•	•	•	0	0	0	0	0
#8	0	0	0	•	0	0	0	0
#9	•	0	0	•	0	0	0	0
#10	0	•	0	•	0	0	0	0
#11	•	•	0	•	0	0	0	0
#12	0	0	•	•	0	0	0	0
#13	•	0	•	•	0	0	0	0
#14	0	•	•	•	0	0	0	0
#15	•	•	•	•	0	0	0	0

Table 36: SW5 dip switch (Continued)

Flasher	SW2-1	SW2-2	SW2-3	SW2-4	SW2-5	SW2-6	SW2-7	SW2-8
#16	0	0	0	0	•	0	0	0
#17	•	0	0	0	•	0	0	0
#18	0	•	0	0	•	0	0	0
#19	•	•	0	0	•	0	0	0
#20	0	0	•	0	•	0	0	0
#21	•	0	•	0	•	0	0	0
#22	0	•	•	0	•	0	0	0
#23	•	•	•	0	•	0	0	0
#24	0	0	0	•	•	0	0	0
#25	•	0	0	•	•	0	0	0
#26	0	•	0	•	•	0	0	0
#27	•	•	0	•	•	0	0	0
#28	0	0	•	•	•	0	0	0
#29	•	0	•	•	•	0	0	0
#30	0	•	•	•	•	0	0	0
#31	•	•	•	•	•	0	0	0
#32	0	0	0	0	0	•	0	0

4.12.2 MCC LEDs

The MCC is equipped with a number of LEDs. Their function is described in the table below.

Table 37: MCC LED Indicators

Name	Indication	Status	Remarks
DS1	Isolated supply Bus A	ON	
DS2	Isolated supply Bus B		
DS3	Isolated supply local bus		
DS4	Reserved		For future use
DS5	RUN	1 flash per second	Higher rate during software upload
DS6	Rx local bus		
DS7	Tx local bus	Normally OFF.	If one of these LEDs is OFF, there is no traffic on the corresponding bus.
DS8	Rx Bus A		
DS9	Tx Bus A	Lights up momentarily during transmission or reception.	If one of these LEDs stays ON, there may be a polarity inversion on the bus.
DS10	Rx Bus B		
DS11	Tx Bus B		

4.13 Multi-wire Remote Control and Monitoring Interface PCB 1486

The Multi-wire interface (in the MCC) is a simple device with 8 command (input) terminals (connectors P2) and up to 8 back-indication (output) terminals (connector P1). For 120 Vac remote control applications, there are multiple back indicators available. Separate relays are used for the back indication.

It provides a simple remote control system via relays and also provides galvanic isolation between the remote control system and the flashing system. The Multi-wire is connected to the MCC by a flat cable on connector P3. Its presence is detected automatically.

In case the internal power supply is not used (external remote control power supply is available) there is no need to connect this PCB to the mains supply (plug J1).

The user can also use the internal power supply to interface to the remote control system. This power supply is short-circuit protected by self-repairing poly-switches. The maximum current is 200 mA for 48 V and 400 mA for 24 V. If the remote control is 120 Vac, separately mounted 120 Vac relays feed the input of the multi-wire PCB.

4.13.1 Control signals and back-indication

The Multi-wire interface exists in 2 versions: 24 Vdc (part number 1593.13.511) and 48 Vdc (1593.13.521).

The relays are DC, but are not polarized, i.e. the control can be inverted.

The back-indications signals are provided over dry contact relays.

Figure 31: ALSF I/O settings: Click on I/O TAB

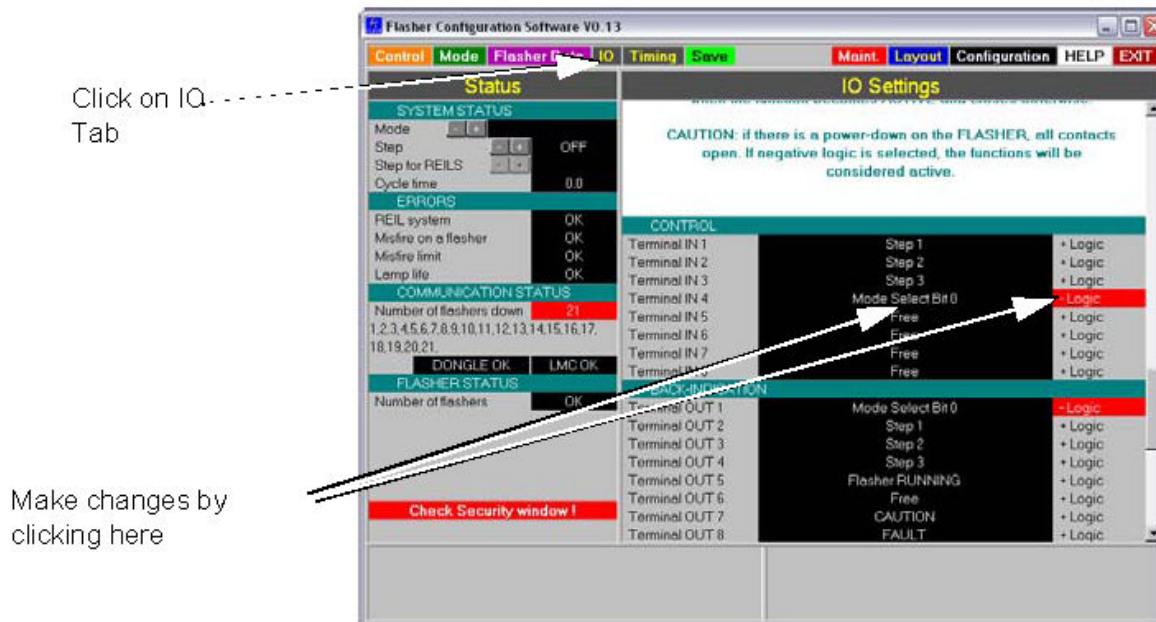
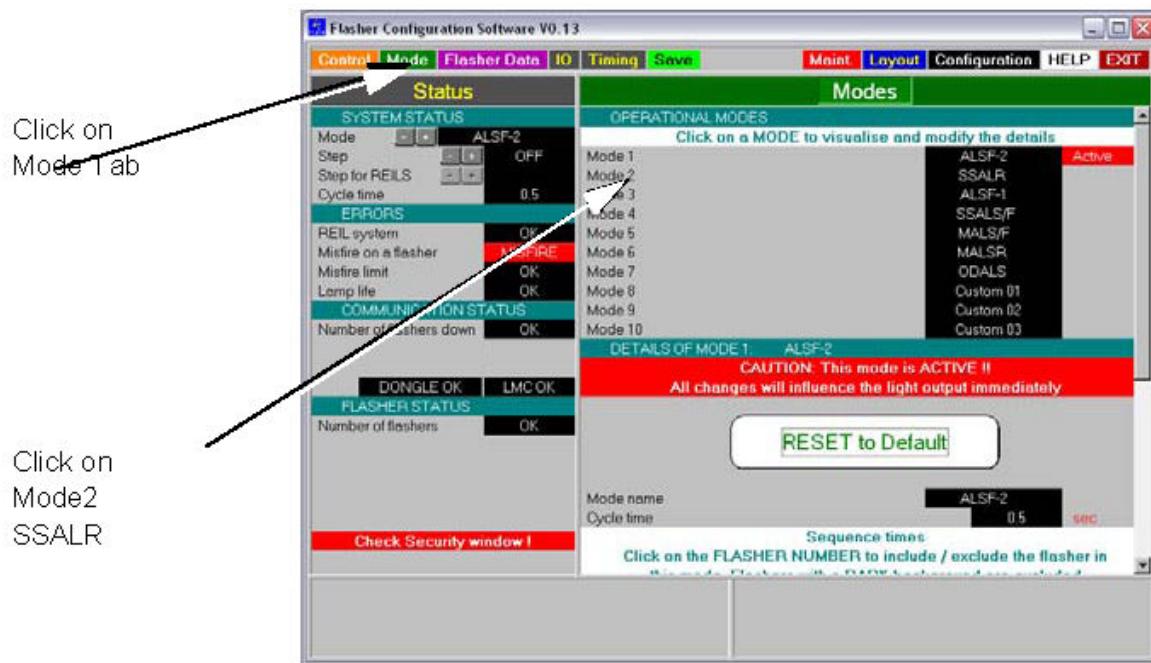


Figure 32: Click on Mode tab and click on Mode 2 SSALR



4.13.2 FCU Multi-wire I/O Configuration for the FAA Market

Table 38: Multi-wire Signals

Name	Type	Function
Mode Select Bit 0	Output	This signal shows the value of mode select bit 0. This signal allows the upper system to know what mode the FCU was commanded to.
Mode Select Bit 1	Output	This signal shows the value of mode select bit 1. This signal allows the upper system to know what mode the FCU was commanded to.
Step 1	Output	This signal is made HIGH if the system was COMMANDED to step 1.
Step 2	Output	This signal is made HIGH if the system was COMMANDED to step 2.
Step 3	Output	This signal is made HIGH if the system was COMMANDED to step 3.
Local	Output	This signal is made HIGH when the local control selector switch is NOT in the remote position. Combined with the step signals above and the running signal, this allows the upper system to know what the locally commanded conditions are.
CAUTION	Output	This signal is made HIGH when CAUTION condition exists for the FCU in the currently COMMANDED mode.
FAULT	Output	This signal is made HIGH when FAULT condition exists for the FCU in the currently COMMANDED mode.
Explicit ON	Input	This signal is made HIGH by the upper system to command the FCU to switch on. Normally, the FCU will switch on as soon as an intensity is given. If the explicit on signal is present, both an "intensity" and the "explicit on" signal must be HIGH for the FCU to switch on.

4.13.3 Functions

The function of each input terminal is determined in the software.

There are two possibilities:

- Manual Configuration

For systems that utilize remote control without use of the Modbus, there is an alternative way to configure the system without the use of the dongle and the software.

First the switch SW4/4 of the Local Master PCB must be set to ON to select manual configuration.

The system is configured using the dip-switches. Only the Multi-wire remote control and back-indication are available. See [Table 35](#).

- Configuration by use of the dongle and the software (Windows I/O).

I/Os can be defined by means of the flasher software and dongle.

4.13.4 Input connector P2: remote control command signals

This connector is only directly used via interface relays mounted in the MCC for 24 Vdc, 48 Vdc or 120 Vac remote control signals.

The connector type is WAGO 231-312/026-000 cage-clamp connector (part number 6112.33.112). See "Schematics" on page 131.

Command signals on connector P2 are:

Table 39: PCB 1486 Input functions

Function	Description	Manual config assignation
Step 1	If one of the contacts is activated, the ICCs switch ON at the selected step. If nothing is activated, the ICC goes OFF.	Terminal IN 1
Step 2	Note that if more than 1 terminal is activated simultaneously, the flasher highest step takes precedence.	Terminal IN 2
Step 3		Terminal IN 3
REILS ON	When activated, this switches the REILS ON at the step defined above.	Terminal IN 4
Reset misfire	If there was a latched misfire condition, activating this terminal clears it.	Terminal IN 8
Free	These terminals are not used.	Terminals IN 5, IN 6, IN 7
Mode Select Bit 0	It is possible to select one of the first 4 modes via the Multi-wire. By default mode 1 is used. If only the mode select bit 0 is attributed to a terminal, it selects mode 0 (OFF) or 1 (ON). If both functions are attributed to 2 terminals, then modes 2 and 3 can also be selected. Bit 0 - Bit 1	Not used
Mode Select Bit 1	• OFF - OFF - Use mode 1 • ON - OFF - Use mode 2 • OFF - ON - Use mode 3 • ON - ON - Use mode 4	Not used



Note

The control commands may use an external DC supply (polarity: any) or an internal DC supply (positive or negative: see wiring drawings.)

4.13.5 Mode selection: ALSF1 / SSALR / MALSR / ALSF2

Modes of Operation: The control commands may use an external DC supply (polarity: any) or an internal DC supply (positive or negative: see drawings).

Figure 33: External supply 24 Vdc or 48 Vdc: Polarity=either.

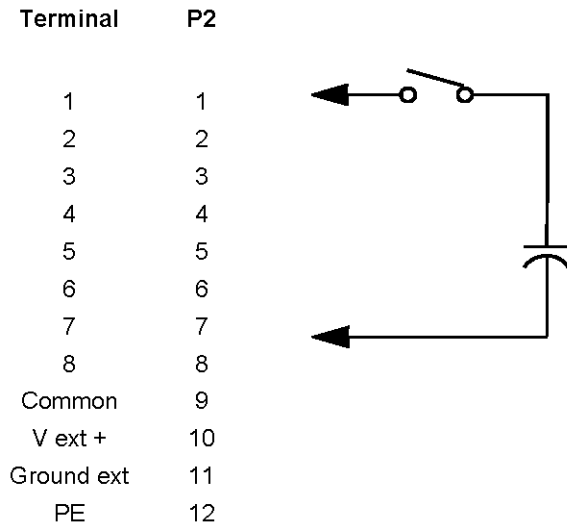


Figure 34: Internal power supply 48 Vdc or 24 Vdc Polarity=positive

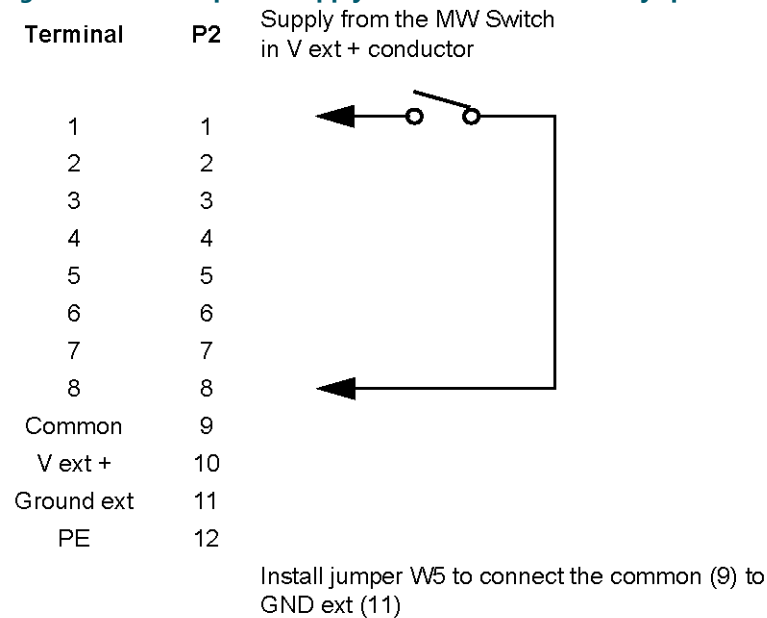
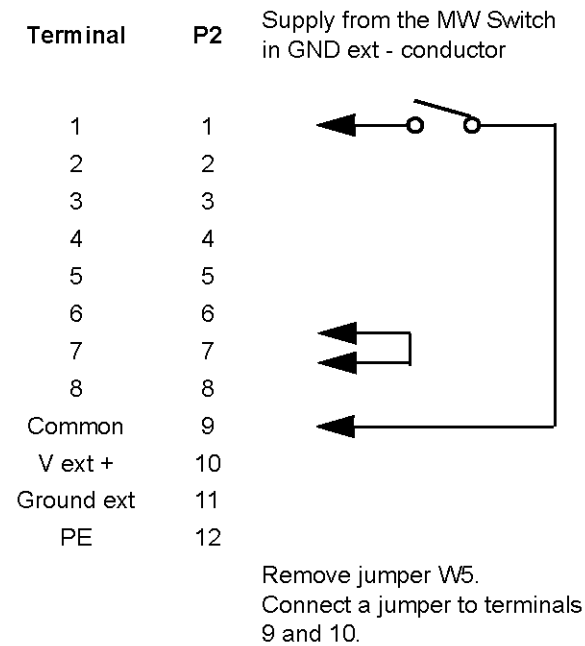


Figure 35: ernal power supply 48 Vdc or 24 Vdc Polarity=negative



Note
For FAA MALSR and ALSF applications using 120 Vac remote control, both jumpers W5 and W6 are removed.

4.13.6 Back-indication Output Functions

Connector P1 is used for the back-indication signals.

The connector type is WAGO 231-312/026-000 cage-clamp connector (part number 6112.33.112). This connector can accept wires of 0,08 to 2,5 mm² (28 - 12 AWG).

Wiring: see "Schematics".

Table 40: Back-indication Signals

Function	Condition	Description	Manual configuration setting
Misfire on 1 ICC	released	The terminal contacts are activated when a misfire occurs and are released at the next correct flash.	Not used
Misfire on at least 2 ICCs	released		Not used
Misfire on 2 consecutive ICCs	released		Not used
Misfire on 1 ICC	latched	These terminal contacts are activated when the error occurs and remain active until the Reset Misfire contact is activated.	Terminal OUT 1
Misfire on at least 2 ICCs	latched		Terminal OUT 2
Misfire on 2 consecutive ICCs	latched		Terminal OUT 3
Misfire limit reached	latched	This terminal is activated if the number of misfires exceeds the limit on at least one ICC. The condition is cleared by activating the reset misfire function.	Not used
Lamp Life limit reached	latched	This terminal is activated if the number of flashes exceeds the lamp life time on at least 1 ICC. The condition is cleared by activating the reset misfire function.	Not used
Function	Condition	Description	Manual configuration setting

Table 40: Back-indication Signals (Continued)

Function	Condition	Description	Manual configuration setting
REILS DOWN		If there is a misfire on 1 of the REIL ICCs and the other one is switched OFF automatically, then this terminal is activated.	Terminal OUT 4
Overtemperature		When the inside temperature of an ICC or the MCC exceeds the programmed maximum temperature, this terminal is activated. As soon as the temperature drops under the limit on all the devices, the terminal resets.	Terminal OUT 5
Communication problems on local bus		If the MCC cannot contact one of the ICCs this terminal is activated. As soon as the condition is repaired and the ICC is back on line, the terminal resets.	Terminal OUT 6
Security (DOOR open + MOV blown)		The security parameters check for defects in the protection of the Control units (MOV) or intrusion (DOOR open or flasher fixture open). As soon as the condition is repaired or the door/fixture is closed, the terminal resets. MOV monitoring is available only with the higher rated ICC lightning protection option.	Terminal OUT 7
Security (DOOR open)			Not used
Security (MOV blown)			Not used
Free		This terminal is not used.	Terminal OUT 8
Flasher RUNNING		Contact is closed when the flasher system received a valid step + mode command.	Not used

4.13.7 Back-indication Modes of operation

The back-indication signals may be provided:

- Over dry contact relays
- Over polarized contacts (positive or negative)

See drawings below for 24 Vdc or 48 Vdc applications:

Figure 36: Dry contacts:

Terminal P1 Supply by user: max 110 Vdc, polarity: any

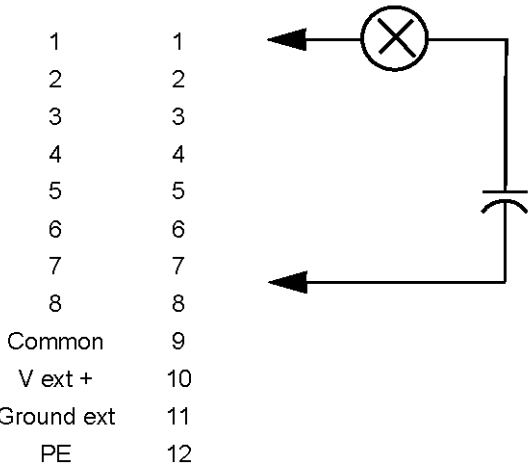
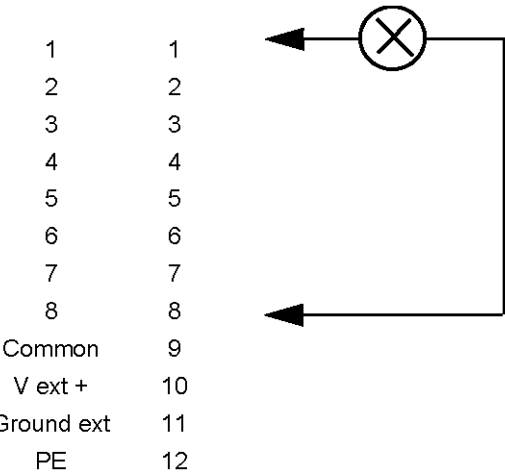


Figure 37: Polarized contact negative

Terminal P2 Supply from the Multi-wire load in GND ext - conductor



Install jumper W6 to connect the common to V ext +.

- Jumpers W15, W16 and W18: Insure that these jumpers are present.
- All other jumpers (W1-W14, W17, W19, W20, W32): Not used. If a jumper is present it can remain in place.

Figure 39: Manual Configuration Jumpers and Switches

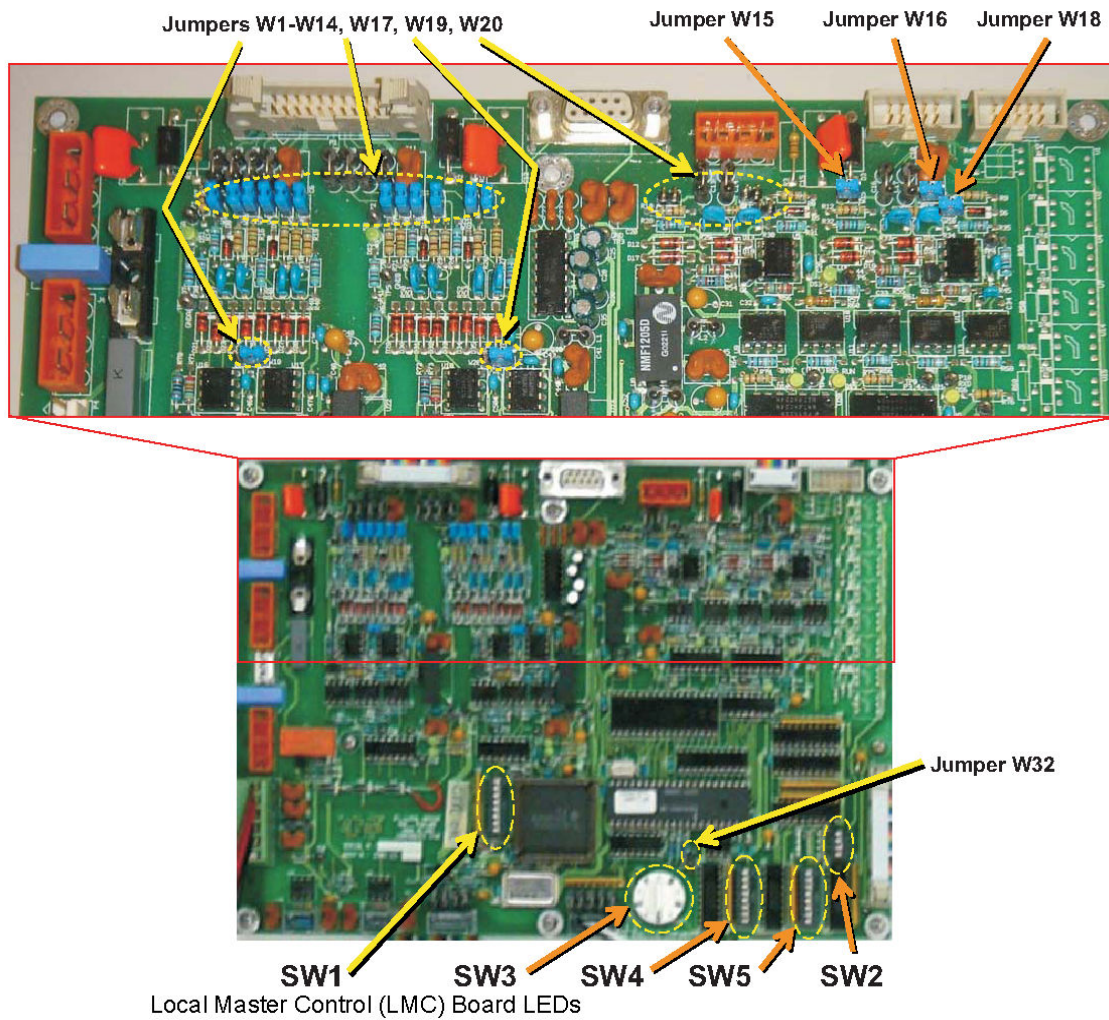
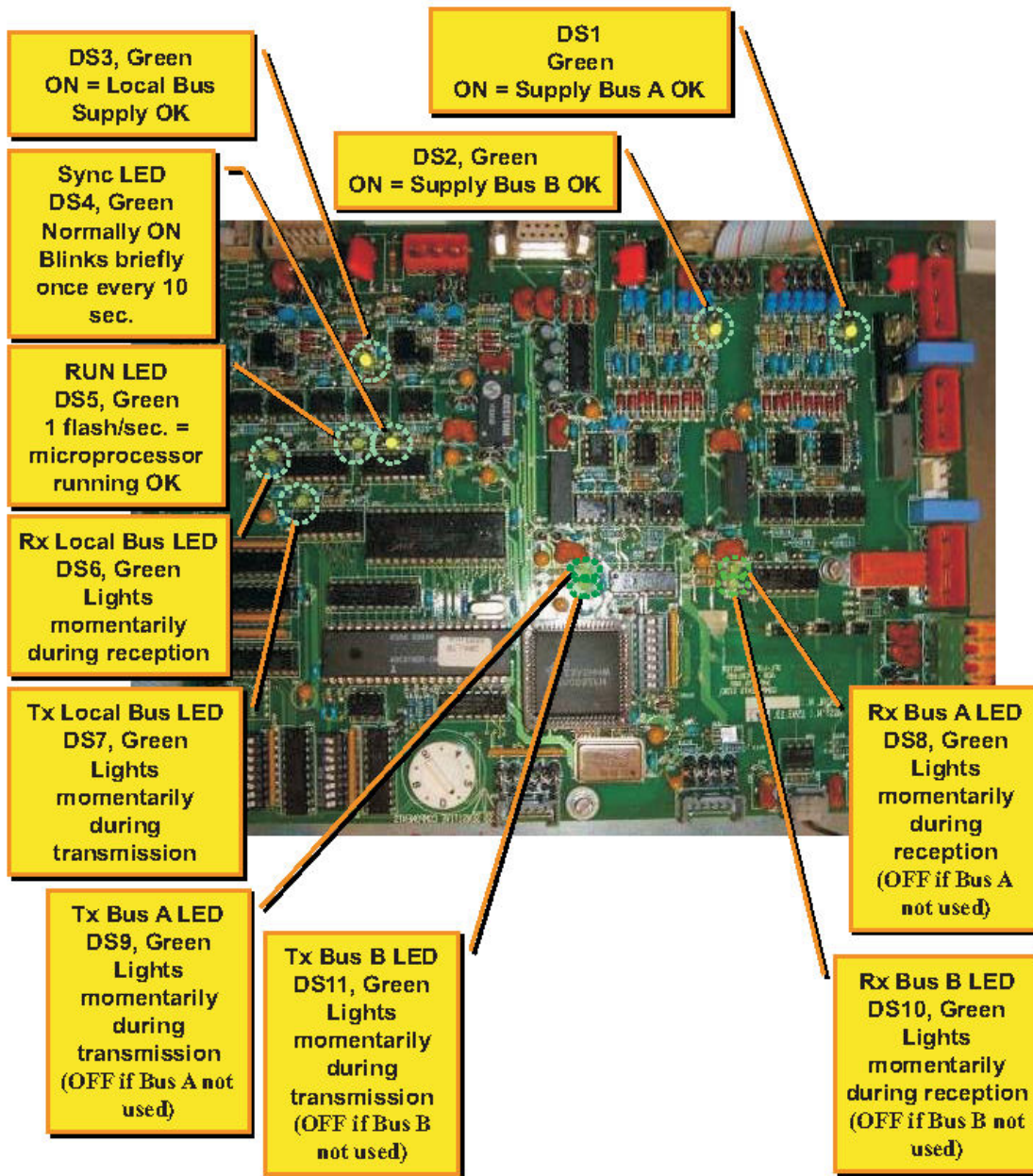


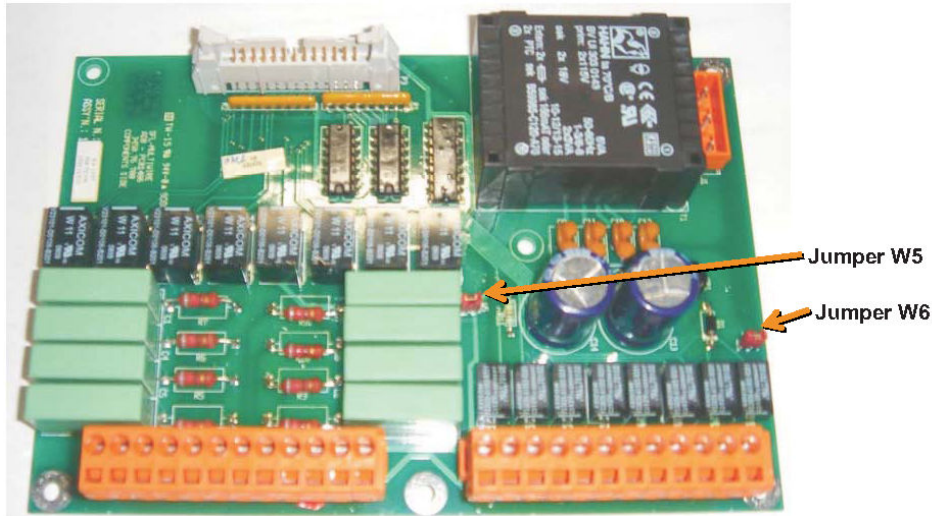
Figure 40: LMC LED Indications



4.13.10 Configuring the Jumpers of the Multi-Wire Board

Jumpers W5 and W6: Insure that neither jumper is present. Remove them if present.

Figure 41: Multi-Wire Board



i Note

Use jumpers W5 and W6 if an internal power supply is used. See [Table 41](#).

Depending on the remote control system Multiwire and/or J-bus modules are installed next to the LMC PCB.

4.13.11 Multiwire

There are two different Multiwire PCB's

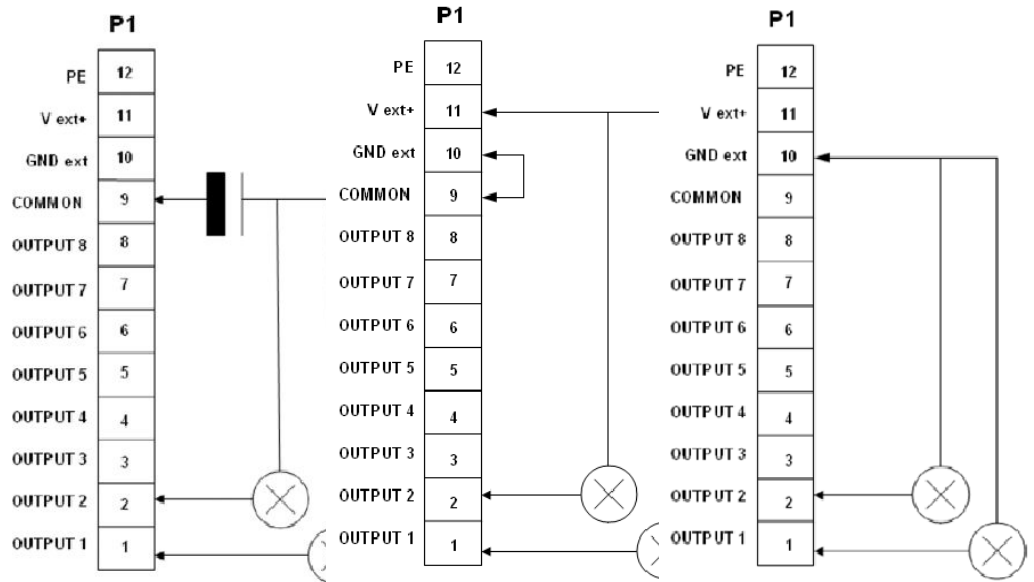
- Multiwire board 1593.13511 for 24Vdc signals
- Multiwire board 1593.13521 for 48Vdc signals

Different connection possibilities:

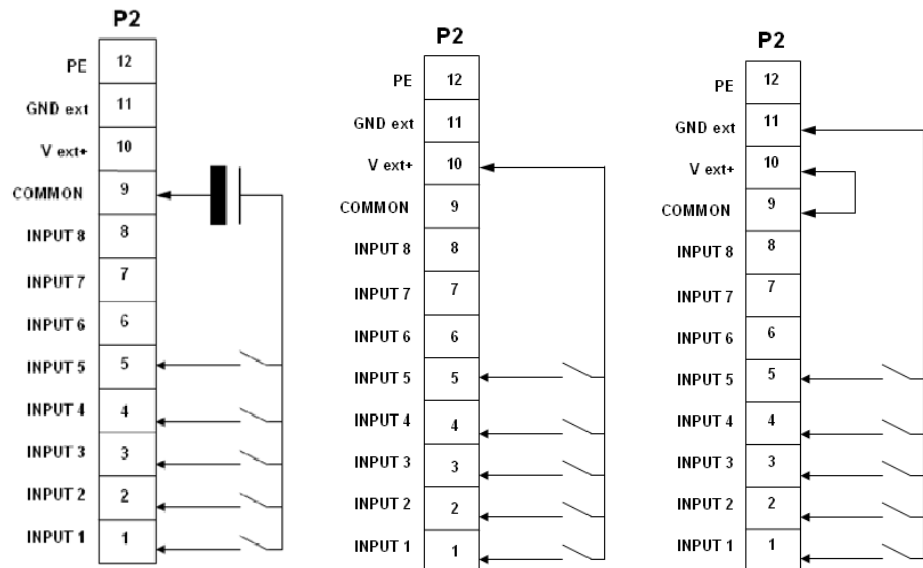
- External power supply
- Internal power supply

Table 41: Multiwire Configurations

Back indication	External power supply (polarity is not important) Max. 110Vdc	Internal power supply (polarized contacts positive)	Internal power supply (polarized contacts negative)
Remarks	Remove strap W6	Remove strap W6	Install strap W6



Control signal	External power supply 24Vdc/48Vdc	Internal power supply (switch in + conductor)	Internal power supply (switch in – conductor)
Remarks	Remove strap W5	Install strap W5	Remove strap W5



4.13.12 Flasher Controller Unit (FCU) Board

Configuring the Dip-switches (example of 5-light MALSR)

SW1: 1=OFF; 2=OFF; 3=OFF; 4=OFF; 5=OFF; 6=ON; 7=ON; 8=ON.

SW2 Flasher #1: 1=ON; 2=OFF; 3=OFF; 4=OFF; 5=OFF; 6=OFF; 7=OFF; 8=OFF

SW2 Flasher #2: 1=OFF; 2=ON; 3=OFF; 4=OFF; 5=OFF; 6=OFF; 7=OFF; 8=OFF

SW2 Flasher #3: 1=ON; 2=ON; 3=OFF; 4=OFF; 5=OFF; 6=OFF; 7=OFF; 8=OFF

SW2 Flasher #4: 1=OFF; 2=OFF; 3=ON; 4=OFF; 5=OFF; 6=OFF; 7=OFF; 8=OFF.

SW2 Flasher #5: 1=ON; 2=OFF; 3=ON; 4=OFF; 5=OFF; 6=OFF; 7=OFF; 8=OFF.

Note
Flasher Number 1 is the flasher farthest from the runway.

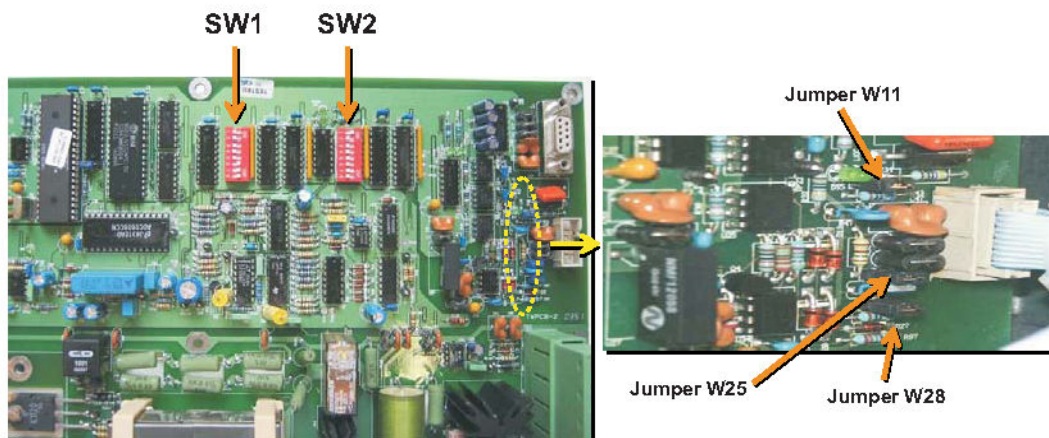
4.13.13 Configuring the Jumpers

Remove jumpers W11, W25 & W28 on all FCUs but the FCU farthest from the Master Control Cabinet (MCC). As an example of 5-light MALSR with the MCC closest to Flasher #5, the jumper settings would be:

- W11, W25 & W28 Flasher #1: All 3 jumpers present. Note: Flasher Number 1 is the flasher farthest from the runway.
- W11, W25 & W28 Flasher #2: All 3 jumpers removed.
- W11, W25 & W28 Flasher #3: All 3 jumpers removed.
- W11, W25 & W28 Flasher #4: All 3 jumpers removed.
- W11, W25 & W28 Flasher #5: All 3 jumpers removed.

Note
Flasher Number 5 is the flasher closest to the runway.

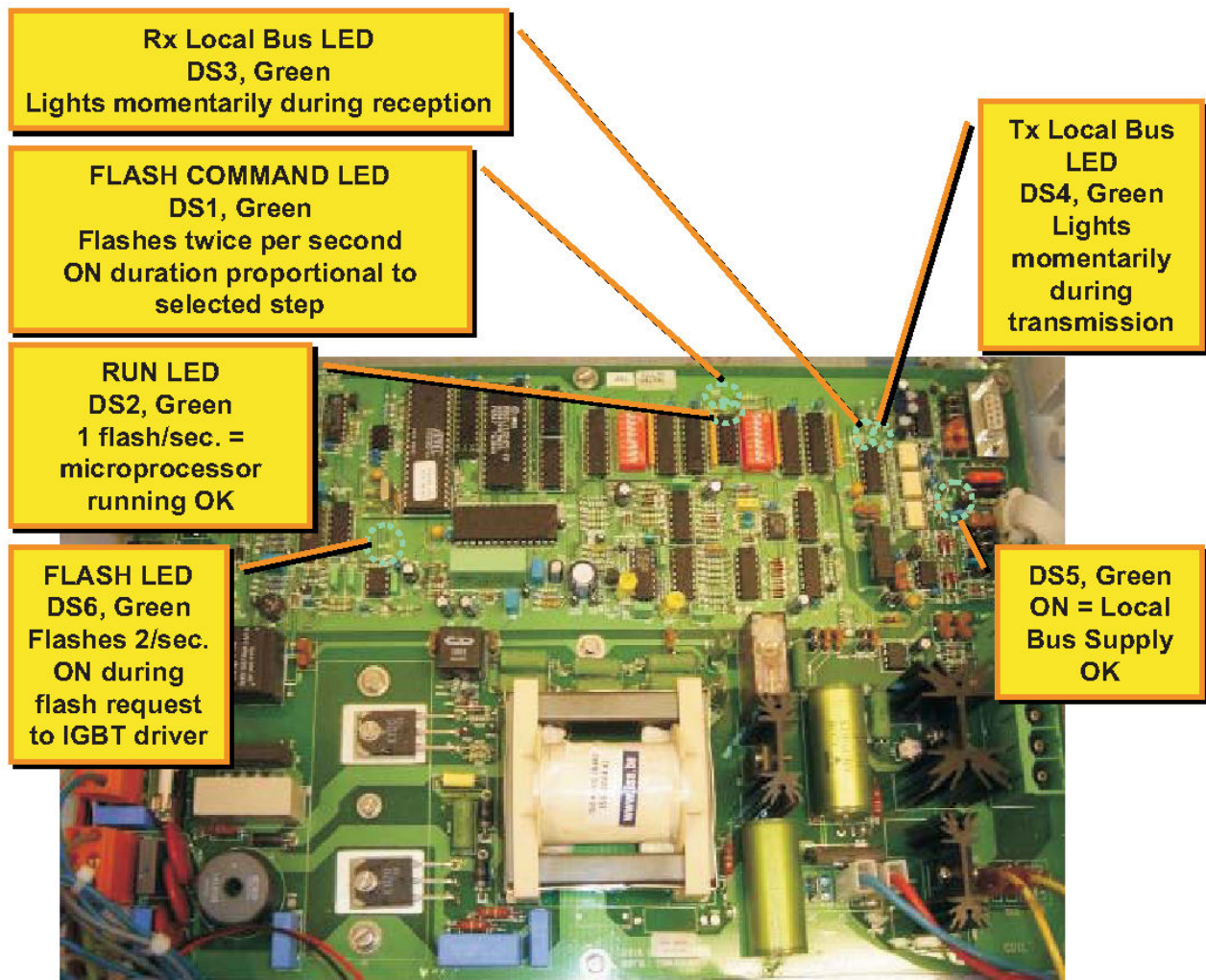
Figure 42: Flasher Control Unit (FCU) Board Jumpers and Switches



Note
Jumpers W11, W25 and W28 must be placed on both ICC ends if the Master is in the middle

4.13.14 Flasher Control Unit (FCU) Board LEDs

Figure 43: Flasher Control Unit (FCU) Board LED Indicators



4.14 External Temperature Probe

The external temperature probe should be attached to one of the ICC cabinets.

The local master control (LMC) PCB interprets the data received from the external temperature probe connected to P8.

This temperature reading is used for the system to control the anti condensation heating resistors.

Figure 44: External Temperature Probe (1440.21.000)



4.15 Dongle

The dongle comes with all interconnection cables and a CD-ROM with the latest software version. This software has been tested to function correctly with Windows NT / Windows 95/ Windows 98/ Windows 2000, Windows XP, Windows Vista and Windows 7 (32 bit).



Note

Windows™ is a registered trademark of Microsoft Corporation.

The dongle, which is a small PCB, is the interface between the flasher system and a PC running the flasher configuration program under one of the Window™ versions listed above. For FAA applications, it is normally used for the flasher tester function. It can optionally be used to adjust system parameters.

It connects on one side to any of the ICCs or the MCC and on the other side to a COM (RS- 232) port of a PC or laptop that has the flasher software installed.

When the dongle is connected between the system and a laptop running the flasher software, the Local Master PCB bus is deactivated.

The dongle collects all the necessary data from the MCC and the individual ICCs.



Note

If the MCC is down or if the dongle control has not been enabled by means of the dip- switches (see [Table 35](#)), the dongle will not take over control of the system. An error message will appear in the Flasher Software window to indicate this.

The dongle derives its power from the device to which it is connected (ICC or MCC).

The dongle provides the synchronization messages instead of the Local Master PCB.



CAUTION

During transfer of control, there can be anomalous timings on the ICCs, i.e. there can be an aborted cycle or the random triggering of a lamp. This is due to the differences in timing between the Local Master PCB bus and the dongle.

DO NOT start-up the dongle and the laptop connection while the flasher system is in use.

Real time measurements are possible through the dongle. The results are analysed and shown on the screen of the PC. It is necessary to set the switches SW4/4 and SW5/8 on the Local Master PCB to enable control and configuration with the PC using the dongle.

4.15.1 Dongle LED Indicatorss

The Dongle is equipped with a number of LED Indicators to help during system installation and repair.

Table 42: Dongle Status LED Indicators

Name	Indication	Status	Remarks
DS1	TxD to laptop	Normally OFF. Lights up momentarily during transmission or reception.	If one of these LEDs is OFF, there is no traffic on the corresponding bus. If one of these LEDs stays ON, there may be a polarity inversion on the bus.
DS2	RxD from laptop		
DS5	Isolated supply for communication		
DS7	RUN	1 flash per second	
DS8	TxD to flasher system	Normally OFF. Lights up momentarily during transmission or reception.	If one of these LEDs is OFF, there is no traffic on the corresponding bus. If one of these LEDs stays ON, there may be a polarity inversion on the bus.
DS9	RxD from flasher system		

4.15.2 Cable layout

- The cable between the laptop and the Dongle:

Both are interconnected with a null-modem cable (DB9 female -- DB9 female) with the following minimum configuration:

COM-PC	Dongle J3
Pin 2 (RxD)	Pin 3 (TxD)
Pin 3 (TxD)	Pin 2 (RxD)
Pin 5 (GND)	Pin 5 (GND)
Pin 7 (RTS)	Pin 8 (CTS)
Pin 8 (CTS)	Pin 7 (RTS)

- Cable between dongle and ICC or MCC:

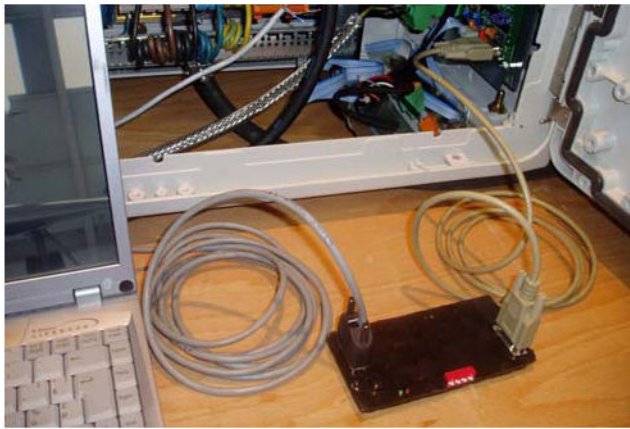
This should be a pin-to-pin (DB9 male -- DB9 male) cable with the following layout:

Dongle	MCC or ICC
Pin 2	RxD
Pin 3	TxD
Pin 5	GND
Pin 7	RTS
Pin 9	+ 15 Vdc

4.15.3 Dip-switch bank

The dip-switch bank that is mounted on the Dongle is used to set the communication speed parameters. Set the switches to 10101010 if not already set like this by default. In the configuration menu of the software, choose the used COM port on your laptop, '38400' bd & 'EVEN' parity. This will allow proper communication between the ICCs, MCC and the Dongle.

Figure 45: Connection: ICC , Dongle and Laptop



4.16 Initial Software Installation and Software Use

This section provides additional details on use of the software.

4.16.1 Configuration tool

You can operate the equipment directly from your PC with the configuration tool.



WARNING

Do not use the configuration tool unless you have permission to do so. If you activate the configuration tool, you transfer all control of the equipment to the tool. In this situation, remote or local control of the equipment is not possible.

4.16.2 Install the configuration tool

The configuration tool is software that gives you full control of the entire equipment from your PC. You can use the tool to configure the equipment after installation or maintenance work.

4.16.3 System requirements:

- PC with Microsoft Windows operating system;
- At least 50 Mbytes free disk space;
- 1 free serial communication (COM) port, or a virtual serial communication port over a USB bridge or a PCMCIA card;
- PC user account with either administrator or power user rights.

4.16.4 Configuration tool package:

- 1 dongle with embedded software;
- 1 installation CD-Rom with a flasher program;
- 2 cables:
- Extension cable (DB9M/DB9M-1,5 m);
- Cable null modem (DB9F/DB9F-1,8 m).

4.16.5 Install software

1. Open Windows Explorer.
2. In Windows Explorer, open the main folder of the installation CD-ROM.
3. Run the setup application file. Follow the instructions of the installation program. The software is now installed.
4. Copy the system upgrade files (.upl) from the installation CD to the directory where you installed the software.

4.16.6 Connect cables

1. Make sure the equipment is switched OFF.
2. Open the cabinet.
3. Connect the extension cable to the dongle (B) and to the PC connector of the cabinet (A).
You can connect directly to any ICC cabinet or to the LMC PCB in the MCC.
4. Connect the cable null modem to the dongle (B) and to the serial communication port of your PC (C).

4.16.7 Start software

1. Switch the equipment ON. The equipment also supplies power to the dongle.
2. Start the configuration tool. Go to Start > All programs > MCR_WIN > MCR_WIN. Alternatively click the MCR_WIN.exe file in the directory where you installed the software. The configuration tool opens.
3. Select the menu Configuration.
4. Select the applicable serial communication port (COM) to which you connected the dongle.



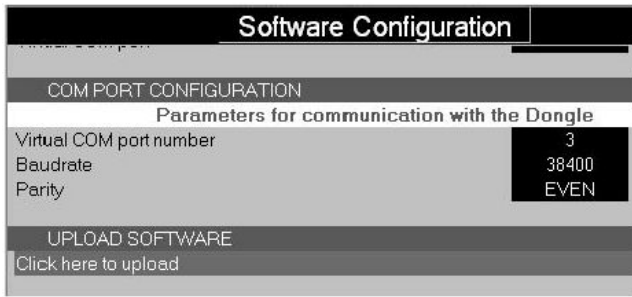
Note

The baud rate and parity settings for the communication between the PC, dongle and the equipment must be the same. For the dongle, the default baud rate is 38400 and the default parity setting is EVEN.

5. The dongle makes the connection to the equipment automatically.

4.17 Upload New Software

Figure 46: Configuration tool



1. Save the installation files of the new software to your PC.
2. Open the configuration tool.
3. Go to menu Configuration > Upload software.
4. Select Click here to upload. You can now see the available software versions on your PC.
5. Select and confirm GKFL (dongle).

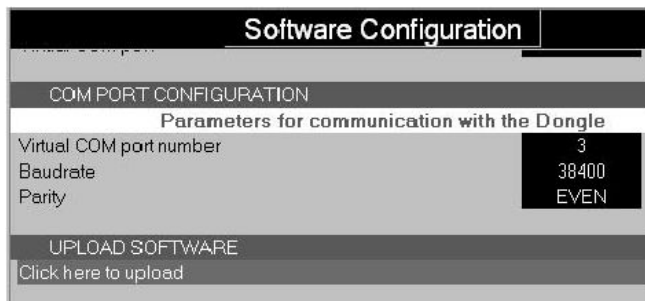
The software is now uploading.



CAUTION

You must configure the system layout again after you do this procedure. When you reset the LMC, the system starts to use the default parameters.

6. Save the installation files of the new software to your PC.



7. Open the configuration tool.
8. Go to menu Configuration > Upload software.
9. Select Click here to upload. You can now see the available software versions on your PC.
10. Select and confirm LM (LMC). The software is now uploading.
11. If the uploading is successful, reset the LMC. Set the dip-switch SW4 as follows:

Table 43: SW4 Settings

Dip	1	2	3	4	5	6	7	8
ON		X				X	X	X
OFF	X		X	X	X			

12. Switch OFF the cabinet, where the LMC is installed. Leave the cabinet OFF for approximately 10 seconds.
13. Switch ON the cabinet, where the LMC is installed.

14. Set the dip-switch SW4 of the LMC PCB as follows:

Table 44: SW4 Settings

Dip	1	2	3	4	5	6	7	8
ON						X	X	X
OFF	X	X	X	X	X			

- SW 2 should be moved to ON and then back to OFF in order to reset.

15. Configure the system layout. See [Action 4: Software based configuration](#).



CAUTION

You must configure the system layout before you can do this procedure. See [Action 4: Software based configuration](#)

16. Save the installation files of the new software to your PC.

17. Open the configuration tool.

18. Go to menu Configuration > Upload software.

19. Select Click here to upload.

You can now see the available software versions on your PC.

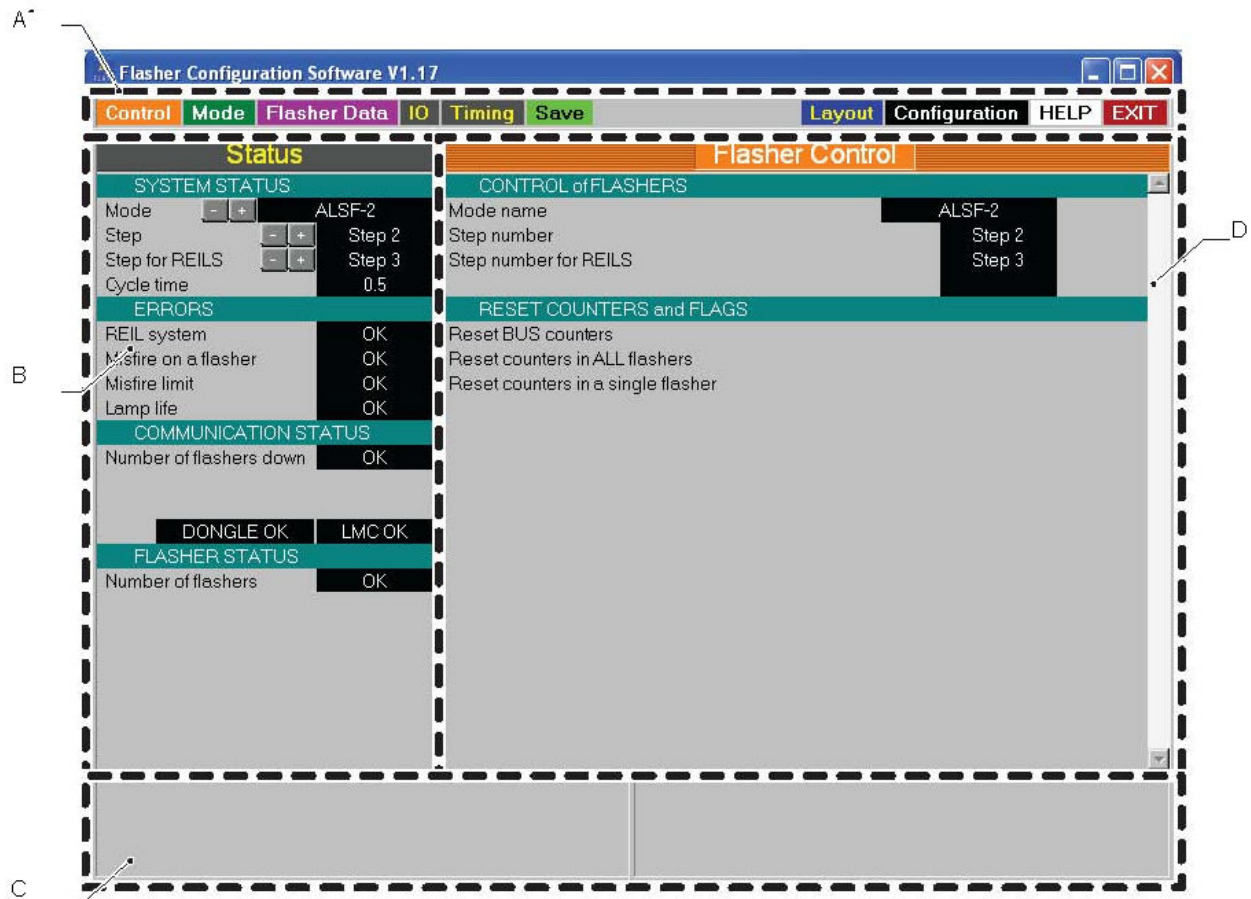
20. Select and confirm FCU.

21. Select the specific FCU PSBs, the software of which you want to upgrade.

The software is now uploading.

Software Configuration	
COM PORT CONFIGURATION	
Parameters for communication with the Dongle	
Virtual COM port number	3
Baudrate	38400
Parity	EVEN
UPLOAD SOFTWARE	
Click here to upload	

Figure 47: Configuration tool screen



A Menu bar

B Status view

C Communication connection status view

D Active menu view

Table 45: Menu Information

Screen item	Description
Menu bar	The menu bar shows the available menu items and the Exit button.
Status view	This view is always visible. The view shows the present status of the input and output current. It allows you to change the selected brightness step and select the active circuits. The view also shows error messages and status of burnt lamps.
Communication connection status view	This view shows possible communication errors between the dongle and the equipment.
Active menu view	The active menu changes when you select a menu item from the menu bar. You can scroll this view up or down.

4.17.1 Control menu

The menu allows you to change the active flasher mode and step. You can also reset counters.

Table 46: Control menu

Item	Description
Mode name	Change the active flasher mode.
Step number	Change the active brightness step for the sequence flashers.
Step number for REILS	Change the active brightness step for the REILS units.
Reset bus counters	Reset the error counters for bus communication.
Reset counters in all flashers	Reset the misfire counters for all flashers. You can do this, for example, after you replace a broken lamp.
Reset counters in a single flasher	Reset the misfire counters for a specific flasher. You can do this, for example, after you replace a broken lamp.

4.17.2 Mode menu

The menu allows you to check and adjust the predefined mode settings.



CAUTION

Be careful when you change the settings. If you change the settings of an active mode, the changes will take effect immediately.

Table 47: Mode menu

Item	Description
Operational modes	Check or adjust the predefined mode settings. Note that if you change the cycle time, the number of flashes per second also changes.
Details of mode	

4.17.3 Flasher data menu

Status menu

The menu shows the on-line status of all flashers in the system.

Table 48: Status menu

Item	Description
Individual flasher state	The menu shows the on-line status of all flashers in the system. You can view the statuses, but you cannot change anything.

Active state menu

The menu allows you to check the actual state of each flasher. You can also compare the actual state to the requested commands.

Table 49: Active state menu

Item	Description
Individual active state	The menu shows the actual state of each flasher. It also shows the latest requested step and mode. If there is a difference between the actual state and a requested state, the difference is shown in seconds.

Misfire state and counter menu system

The menu allows you to set limits for the allowed number of misfires for each flasher in the counter menu system.

Table 50: Misfire state and counter menu

Item	Description
Individual misfire state	Set a misfire limit for each flasher in the system. The limit is based on the number misfires a lamp is allowed to produce before an alarm is sent. Note that in this menu, you can only change the limit field.

Flasher counter limit menu

The menu allows you to set limits for the lamp life of each flasher in the system.

Table 51: Flasher counter menu

Item	Description
Individual flash limit	Set a lamp life limit for each flasher in the system. The limit is based on the number of flashes a lamp is allowed to produce before it must be replaced. Note that in this menu, you can only change the limit field.

Flasher temperature data menu

The menu show the internal and external temperatures of the cabinets. The external temperature is shown only if the external temperature probe (option) is installed.

Table 52: Flasher temperature menu

Item	Description
Individual temperature parameters	The menu shows the internal temperature of the cabinets. If the external temperature probe (option) is installed, the menu also shows the external temperature of the cabinets and the possible difference between the two temperatures. You can also set a minimum and maximum allowed temperatures. You can view the statuses, but you cannot change anything.

Flasher security menu

The menu allows you to check and adjust the predefined mode settings.

Table 53: Flasher security menu

Item	Description
Security parameters	The menu shows the status of all MOV modules and door switches in the system. You can view the statuses, but you cannot change anything. Example: FCU-3 cabinets:

- If the door switch status is open for only one flasher, the lamp cover may be open.
- If the door switch status is open for all three flashers, the cabinet door is open.

Flasher steps menu

The menu allows you to configure the intensity levels of each step.



CAUTION

Do not change the settings, unless it is absolutely necessary. If you change the settings of an active step, the changes will take effect immediately.

Table 54: Flasher steps menu

Item	Description
Steps	Configure the intensity level steps (1-3) separately for each flasher in the system.

Software version menu

The menu shows you the firmware and boot versions present in the system.

Table 55: Software version menu

Item	Description
Master and flasher software version	The menu shows the firmware and boot versions present in the system. For example, Local Master Controller (LMC), dongle, and flashers.

Read communication counters menu

The menu allows you to check the status of communication counters for individual flashers.

Table 56: Read communication counters menu

Item	Description
Read communication counters	The menu shows the status of communication counters for individual flashers. To request the status for a specific flasher, enter the flasher number in the field "Request read from flasher".

Read flasher counters menu

The menu allows you to check the status of flasher counters for individual flashers.

Table 57: Read flasher counters menu

Item	Description
Read flash counters	The menu shows the status of flash counters for individual flashers. To request the status for a specific flasher, enter the flasher number in the field "Request read from flasher".

4.18 Start Up the System

To start up the system, follow the procedures outlined below.

1. Open all the Doors of the ICC Cabinets and the MCC
2. Ensure that the Master Control Cabinet (MCC) door is open
3. Ensure all ICC doors are open
4. Verify that fuselinks F1 & F2 are removed (opened)
5. Set the Rotary Switch in the MCC to the OFF position
6. Switch ON the main AC Supply
7. Verify that the input voltage to the MCC is correct
8. Switch ON Circuit Breaker CB1 in the MCC
9. On the MCC:
 - Pullout door interlock switch to lock into ON position
 - Switch system ON using the Rotary Switch to Low intensity Verify that the input voltage to each ICC is correct
 - Check all LEDs on the LMC board in the MCC
 - Switch the system to Medium and High using the Rotary Switch. Return to Low intensity.
 - Verify input voltage is correct at each ICC
 - Turn CB1 off in the MCC
10. Go progressively to all ICCs in turn:
 - Replace fuselinks F1 & F2
 - Pull out each door interlock switch to lock them in the ON position
11. Turn on CB1 in the MCC
12. Check all ICC flasher control PCB LEDs
13. System should flash at the correct rate and be functionally operational
14. Set the Master Rotary Switch in the Remote Position and verify operation in Remote Control
15. Close all cabinet doors

Table 58: MCC LED Indications

Name	Indication	Status	Remarks
DS1	Isolated supply Bus A	ON	
DS2	Isolated supply Bus B		
DS3	Isolated supply local bus		
DS4	Reserved		For future use
DS5	RUN	1 flash per second	Higher rate during software upload
DS6	Rx local bus	Normally OFF Lights up momentarily during transmission or reception.	One of these LEDs permanently OFF, no traffic on the corresponding bus.
DS7	Tx local bus		
DS8	Rx bus A		
DS9	Tx bus A		One of these LEDs permanently ON, polarity in version on the bus (most probably).
DS10	Rx bus B		
DS11	Tx bus B		

Table 59: ICC LED Indications

Name	Indication	Status	Remarks
DS1	FLASH command	Duration is proportional to the selected step	
DS2	RUN	1 Flash per second	Higher rate during software upload
DS3	Rx local bus	Normally OFF Lights up momentarily during transmission or reception.	One of these LEDs permanently OFF, no traffic on the corresponding bus.
DS4	Tx local bus		One of these LEDs permanently ON, polarity in version on the bus (most probably).
DS5	Isolated supply local bus	ON	
DS6	FLASH	Duration is proportional to the selected step.	Hardware flash command to IGBT Driver


Note

The flash lamp(s) must flash at a rate of 1 or 2 flashes/sec, as applicable.

16. Check the brightness steps by switching the rotary switch in the MCC cabinet to low, medium and high.

4.19 Shutdown Procedures

This subsection describes emergency and equipment shutdown procedures.

4.19.1 Emergency Shutdown

Set the master control cabinet disconnect switch CB1 to OFF. This removes all power to the system, except power to the maintenance light and outlet in the master control cabinet.

4.19.2 Equipment Shutdown

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

Table 60: Master Control Cabinet Switches Shutdown

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	240 Vac power to sequenced flashers
MALSR/ALSF	Circuit breaker CB2 to OFF	120 Vac power from master control cabinet circuits

4.19.3 Master Control Cabinet Switches Shutdown

To remove power from the master control cabinet switches, refer to [Table 60](#)

1. If operated in Remote Control, command the system to OFF.
2. Open the Master Control Cabinet (MCC) door.
3. Set the Rotary Switch in the MCC to the OFF position.
4. Switch OFF Circuit Breaker CB1 in the MCC.

4.19.4 Individual Control Cabinet Shutdown

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

1. Open the door of the individual control cabinet. The interlock switch disconnects the input 240 Vac power to the cabinet.
2. Open up both fuse links in the ICC.
3. Wait a minimum of one minute before working inside the ICC.

5.0 Maintenance



WARNING

- Read installation instructions in their entirety before starting installation.



DANGER

- Only qualified personnel may install or repair electrical equipment in accordance with NFPA 70B, Electrical Equipment Maintenance and NFPA 70E, Electrical Safety Requirements for Employee Workplaces.
- Disconnect and tag out the sources supplying electrical power to this device before making or repairing connections to this device in accordance with airport lockout and tagout procedures.
- Use approved testing equipment to test that the circuit is de-energized.
- All applicable regulations in accordance with local codes and FAA standards must be followed.

5.1 Replacement of the ICC Board

- The cover plate (EMC protection plate) over the ICC board is fixed with 4 fast locking screws (quarter turn to unlock). Remove the ribbon cable attached to the cover. Remove the cover.
- Take note of the position of the connectors before disconnecting the board.
- Take note of the dip-switch settings on the ICC board. (also jumper-setting of the local bus)
- The board is fixed with 9 screws M3; in every corner and in the middle of each axis, and with 2 screws M4; next to the two transistors 2SK1120: Q7 and Q9. To improve the heat transfer of the two transistors (Q7 and Q9) to the mounting plate, there is a heat conductive paste between the mounting plate and the aluminum heat sink. Apply heat sink paste on the replacement board. All screws should always be put back in place!
- In the "ICC-3" there are 2 ICC boards mounted on the left- and right-hand side of the cabinet.
- These boards are mounted on a special mounting plate that is fixed to the rear plate by means of 4 screws M4 and to the cabinet with 2 screws M5.
- Before mounting the ICC board to the special mounting plate, check on which side the plate should be mounted.
- Mount the board. Reconnect the board.
- Check the switch settings and the jumper settings before reinstalling the cover.
- Check the operation of the board.

5.1.1 Replacement of the Electrolytic Capacitor

Take care to connect this capacitor with the correct polarity. Reversing the polarity will not only damage the capacitor, but also the control electronics. Inverting the polarity may result in serious injury.

5.1.2 Replacement of the DC power Supply

This power supply is equipped with two connectors plugs at the top (AC) and six connectors at the bottom (DC).

The input AC voltage for the DC power supply is derived from connector P7 on an ICC board (the left one in case of an ICC -3) in the cabinet. The supply is mounted by means of 2 screws M4 on the rear plate and can be removed for troubleshooting purposes.

The output DC voltage(s) are distributed inside the cabinet (from one to the other ICC boards in the case of an ICC-3, by means of six wires).

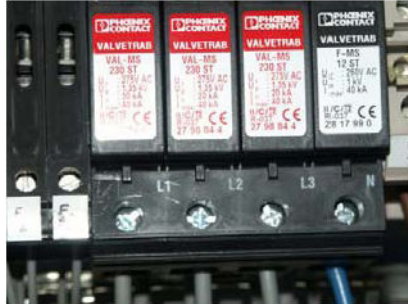
Table 61: DC supply voltages

	Brown wire	Red wires	Black wires	White wire
Voltage	+15V	+5V	GND	-15V

5.2 Replacement Optional Over-voltage Protection

There is no special equipment required to replace the cartridge but replacement cartridges must be of the same type and have to be plugged in correctly to be effective.

Figure 48: Over-voltage protection cartridges



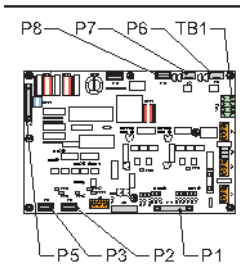
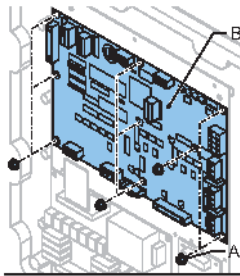
5.3 Local Master Controller (LMC) and remote control PCBs

If you replace some of the PCBs described in this section, you must also configure the system, as instructed by the procedures. Before you can configure the system, you must change some dip-switch settings to enable configuration. For more information on configuration, see [Configuring the System](#).

5.3.1 LMC

1. Switch ON the equipment.
2. Open the configuration tool.
3. Go to menu **SAVE**.
4. Save the used IO profile.
Select **Save** and save the profile on your PC
5. Switch OFF all power to the equipment.
6. Open the Master Control Cabinet (MCC) door.
7. Note the locations of all cables connected to the LMC PCB.
8. Disconnect the cables to the LMC PCB.
9. Take out the eight nuts (A).
10. Replace the LMC PCB (B).
Copy the dipswitch and jumper settings from the old PCB.
11. Put in the eight nuts (A)
12. Connect the cables to the connectors:
 - a. Power distribution from the DC unit to TB1;
 - b. MOV connection to P6;
 - c. Door switch to P7;

- d. Optional modules to P8;
- e. Multiwire connection to P5;
- f. Local bus to P2 or P3;
- g. J-Bus connection to P1 (optional).

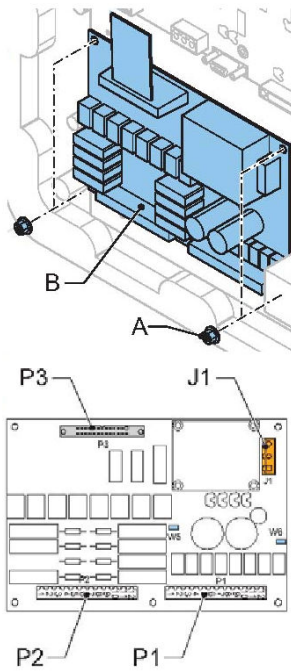


- 13. Close the cabinet door.
- 14. Switch ON the equipment.
- 15. Open the configuration tool.
- 16. Go to menu **SAVE**.
- 17. Restore the IO profile.
Select **Restore** and browse to the saved profile on your PC.
- 18. Switch OFF all power to the equipment.

5.3.2 Multiwire

This procedure applies to both 24 V DC and 48 V DC type of multiwire PCBs.

- 1. Make sure that all power to the equipment is OFF.
- 2. Open the cabinet door.
- 3. Disconnect the cables from the PCB (B).
- 4. Take out the six nuts (A).
- 5. Replace the PCB (B). Make sure you use the same type of PCB. **Copy the jumper settings from the old PCB.**
- 6. Put back the six nuts (A). *Use a number 5.5mm socket wrench.*
- 7. Connect the cables to the connectors:
 - a. Power supply to J1;
 - b. LMC to P3;
 - c. Input and output signal connectors to P1 and P2.



8. Switch ON the equipment.
9. Open the configuration tool.
10. Go to menu **IO**.
11. Check all multi-wire settings.
If necessary, click the fields next to the terminal names to open a selection window (see the graphic).
12. Close the cabinet door.

5.3.3 Multi-wire cable

1. Make sure that all power to the equipment is OFF.
2. Open the cabinet door.
3. Disconnect the flat multi-wire cable from the connector P5 of the LMC PCB and P3 of the multi-wire PCB.
4. Put in the new multi-wire cable.
5. Connect the flat multi-wire cable to the connector P5 of the LMC PCB and P3 of the multi-wire PCB.
6. Close the cabinet door.



Note

The replacement LMC board will not have pre-existing jumpers at W15, W16 or W18. Substitute the jumpers from the replaced board or substitute the unused jumpers on W1-W6.

5.4 ALSF/MALSR Maintenance

5.4.1 ALSF/MALSR Maintenance Schedule

To keep the MALSR and ALSF operating efficiently, follow a preventive maintenance schedule. Refer to [Table 62](#). Refer to FAA AC 150/5340-26 for more detailed information.

Table 62: MALSR/ALSF Maintenance

Interval	Maintenance Task	Action
Monthly	Visually check all lights, including flashers, on all brightness steps.	Replace lamps, if necessary.
	Visually check for dim lamp.	Clean optical surface if dirty. Check for presence of moisture. Check for lamp aging or physical displacement.
Every Three Months	Check sequenced flasher flash rate.	Verify flash rate (120 flashes per minute) either visually or, using Flasher Tester laptop. Tolerances: - Initial: ± 2 flashes per minute - Operating: ± 2 flashes per minute
	Check remote control function.	Operate system in all remote control steps to verify operation.
	Visually check for damaged (such as broken elevated or in pavement lens) or misaligned lights.	Repair or replace lights.
	Visually check the approach line-of-sight clearance for vegetation or other obstructions.	1. Remove vegetation. 2. Use weed killer.
According to local practice (or annually)	If consistent with airport requirements, check for water in excess of six inches in base can.	Pump water from base. Remove and inspect light for water damage.
According to local practice (manufacturer recommendation is once every 60 days)	Check for improper torque on in pavement hold-down bolts.	Torque six fixture bolts, see Bolt Torque Preventive Maintenance Schedule .
Annually	Check elevated flashing fixture vertical and horizontal angles. Vertical angle for elevated flasher is normally 6° .	Readjust using aiming device. Tolerances: Initial: $\pm 1^\circ$ Operating: $\pm 2^\circ$
	Record meter readings Take system out of service according to local practice. When finished, return the system to service according to local practice. See Operating the System section for procedure.	Measure the input voltage at the MCC, each FCU and the 15KVA transformer in the High intensity step. Line-Line voltage must be: 240Vac $\pm 3\%$ (Initial) and $\pm 5\%$ (Operating)

Table 62: MALSR/ALSF Maintenance (Continued)

Interval	Maintenance Task	Action
Annually	Record meter readings Take system out of service according to local practice. When finished, return the system to service according to local practice. See Operating the System section for procedure.	Measure the input current at the MCC and the 15KVA transformer in all three steps. Record as reference data for use in future preventive maintenance and troubleshooting efforts.
	Record meter readings Take system out of service according to local practice. When finished, return the system to service according to local practice. See Operating the System section for Procedure.	Remove the cover on the transformer. Measure the 15KVA transformer output voltage. Each side of the Line-Neutral voltage must be- • High: 120Vac • Medium: 75Vac • Low: 50Vac • The Line-Line voltage must be- • High: 240Vac • Medium: 150Vac • Low: 100Vac • Tolerances on all measurements: • ±3% (Initial) • ±5% (Operating)
Annually (Optional)	Record meter readings	Verify +400 Vdc output voltage from each FCU is "OK" using Flasher Tester laptop. Record as reference data for use in future preventive maintenance and troubleshooting efforts.
Annually	Check all structures for rot or corrosion. Check all light supports for rigidity, guy tensions, and obvious misalignment.	Re-paint, repair or replace.
	Check equipment electrical connections.	Remove power at input of MCC. Wait 1 minute before working on FCU cabinets. Visually inspect lighting arrestors. Check that all terminal connections and cable connections are tight and clean. Replace or tighten all connections that show signs of heating.
	Check for obstruction in in-pavement output channel.	Clean channel and prism surface.
	(Elevated) Check for dirty lens.	Clean with glass cleaner.
	Check fuse holders, circuit breakers, door switches and relays.	Repair or replace.
Every 3 Years	Check conductor and insulation resistance of all power and control cables.	Record all measurements and compare with previous readings.
During Lamp Changes	Check for interior cleanliness or presence of moisture inside light fixture.	Open the light assembly. Clean fixtures, if necessary, to maintain full light output. If Moisture present- • In-pavement: Replace O-rings and other parts found defective. Use pressure test plug to verify no leakage is present. Perform meg check. • Elevated: Check drain holes. Replace gasket if defective

Table 62: MALSR/ALSF Maintenance (Continued)

Interval	Maintenance Task	Action
After 900 hours of operation in High intensity	It is recommended to replace all xenon flash lamps systematically when, at full intensity, 90% of the useful life has been reached	Replace the lamps.
If heavy snowfall predicted		During winter months, permanently mark location of low mounted elevated fixtures on either side of the runway using red flags or sticks to facilitate snow removal and lessen the risk of damage to the fixtures by snow removal equipment.
After snow removal	Check for damaged in-pavement light fixtures.	Replace damaged fixtures. Use broom for snow removal. Follow recommended snow removal techniques described in AC 150/5200-30.

5.4.2 Maintenance Procedures



WARNING

Read installation instructions in their entirety before starting maintenance. +400 Vdc is 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 connecting the 400 V TB2 terminal to earth ground.

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

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

5.4.3 Checking System Performance

Checking performance involves the following:

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

5.4.4 Checking System Voltage

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

Checking the Master Control Cabinet Voltages

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

1. While operating the system at the high intensity level, measure the input voltage between terminal block TB1 terminals 1 and 3.
2. Refer to [Table 63](#) to verify the input voltages on the master control cabinet.



Note

Use a true RMS multimeter to measure the voltages in [Table 63](#).

Table 63: Master Control/Individual Control Cabinet Input Voltages

Across Terminal Block TB1	AC Voltages
Terminals 1 to 2	120 Vac $\pm 2.5\%$
Terminals 2 to 3	120 Vac $\pm 2.5\%$
Terminals 1 to 3	240 Vac $\pm 5\%$

Checking the Individual Control Cabinet Voltages

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

3. While operating the system at the high intensity level, open the individual cabinet door and pull out the plunger on the interlock switch.
4. Measure voltage between 1 and 2 on the input terminal block.
5. Verify the voltage at the input terminals of all the individual control cabinets is 240 Vac $\pm 5\%$.



Note

Use a true RMS voltmeter to measure the voltages in [Table 63](#).

5.4.5 Checking the 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.
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 cabinets and replace gaskets showing signs of deterioration.

Checking the Electrical Connections

To check electrical connections, perform the following procedure:

11. Check operation of interlock switches in the master and the individual control cabinets.
12. Check terminal blocks, PC boards, and connectors for any signs of dirt, corrosion, or moisture.
Clean if necessary. Check all terminal connections for tightness.
13. Check lightning arrestor connections for tightness and any evidence of damage.
Replace any damaged arrestors.

5.4.6 In-pavement Flashing Light

The assembly's service life depends to a large extent on being waterproof. All metal mating surfaces and seals must be clean, smooth, dry and free of all foreign particles if the light fixture is to operate for extended periods without requiring maintenance.

Greasing of O-ring seals may be required as indicated in this manual.

Preventive maintenance of the light fixtures should be performed as listed in [Table 65](#).

Maintenance frequency depends on the conditions under which the runway is used (i.e. climate, traffic, etc.). The recommended practices for maintenance are described in the FAA advisory circular no. AC 150/5340-26.

For components mentioned in this chapter, refer to the Exploded View, [Figure 68](#).

Always turn the fixture upside down next to the base when lifting it out of the base.

How to open the light assembly

To open the light assembly, proceed as follows (for tools to use, refer to [Table 63](#)):

Step Action

1. Turn the light unit upside down.
2. Remove the pressure release screw.



3. Remove the 6 lamp enclosure screws.
4. Insert a flathead tip in the dedicated slot between cover and inner cover and rotate it to separate the inner cover from the cover.

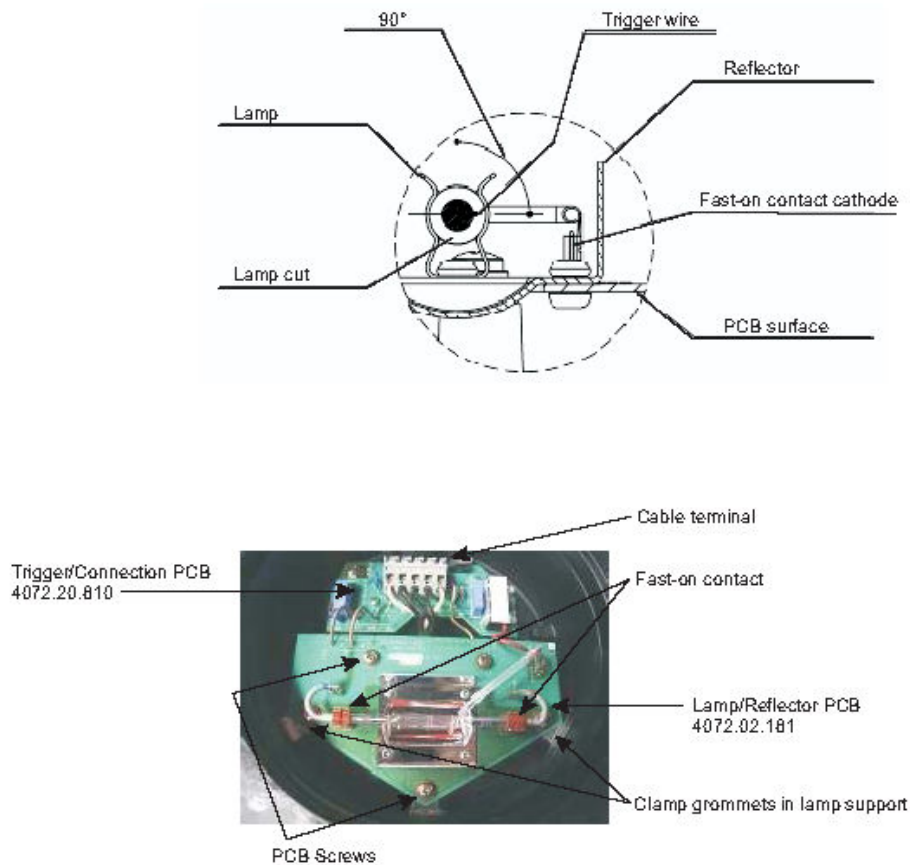
5.4.7 How to replace a lamp

1. Disconnect the fast-on connectors of the lamp from the printed circuit board.
2. Using soft cotton gloves, remove the lamp from the printed circuit board part, holding the reflector.
3. Install a new lamp:
 - a. The lamp is supplied ready for installation.
 - b. Make sure that the lamp is positioned so that the trigger wire is in the position shown in [Figure 49](#).
 - c. Gently position the lamp with its grommets on the lamp holder clamps and push down.
 - d. The lamp is very brittle so handle with care.
 - e. Never touch the quartz bulb of the lamp with your bare fingers. It will reduce the lifetime of the lamp considerably. Should this happen, clean the bulb with isopropyl alcohol. Make sure there is good contact between the fast-on connectors and the terminals.
4. Reassemble the light fixture in reverse order.

5.4.8 How to replace the trigger and lamp holder PCBs

1. Disconnect the wires from the terminal block, by inserting a small screwdriver in the upper contact hole and pushing on the spring contact of each particular terminal. See How to replace a lamp above.
2. Remove the faulty or defective PCB(s) by removing the screws.
3. Position the new PCB(s) with new dampers.
4. Torque down the fixing screws.
5. Connect the wires to the terminal block and reinstall the lamp(s).

Figure 49: Lamp Position



5.4.9 How to close and test the light fixture

To close an optical unit, proceed as follows:

1. Turn the cover upside down.
2. Make sure that the contact surfaces with the O-ring are clean.
3. Put a new O-ring gasket greased with Novagard G322L (p/n 67A0009) silicone grease over the cover in the appropriate groove.
4. Remove the pressure release screw.
5. Gently put the inner cover on the cover, taking into account the keying pin between both parts.
6. Press the inner cover on the cover and secure with the screws.
7. Dielectric test:

Check the electrical insulation from the 5-pole plug male wires to the light fixture body

Interconnect wire terminals 1, 2, 3 and 4 together

- This can be accomplished by attaching a mating receptacle (p/n 4072.03.960) and connecting to the conductors on the end of the cable assembly

Using a meg-ohmmeter, measure the insulation resistance between these wires and the fixture body. Insure the resistance, after 1 minute is:

- >1G ohms at 1000VDC, or alternately
- >1G ohms at 500VDC



Note

Make sure that the earth ground terminal is not included in the measurement

8. Closing and Testing the Fixture

- Remove the Pressure Release Screw.
- A Pressure Testing Device is used to pressure test the fixture. It screws into the pressure release port on the bottom cover and accepts a typical air hose fitting.
- Put entire fixture in bucket of water.
- Pressure test at 20 psi (137.9 kPa) for one minute in water and look carefully for any air bubbles emanating from the light fixture.



Note

The Pressure Testing Device has a 40 psi (275.8 kPa) relief valve so the fixture cannot be over pressurized.

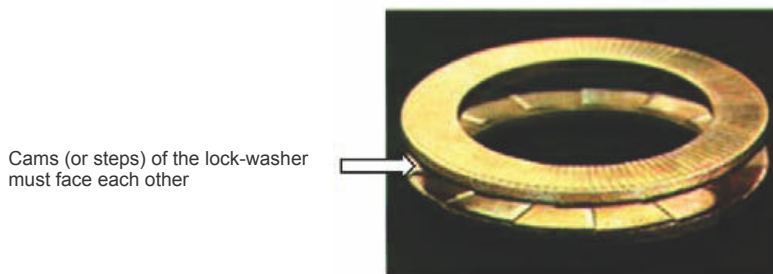
- Remove the Pressure Testing Device.
- Make sure the O-ring seal of the pressure release screw is in good condition and resecure the Pressure Release Screw.

5.4.10 Bolt Torque Preventive Maintenance Schedule

An established schedule for checking light fixture bolt torque and bolt condition is mandatory. This is particularly true for areas that are subject to high impact loads from aircraft such as runway status lights, runway touchdown zone lights, runway centerline lights, and taxiway lead-off lights. Although AC 150/5340-26 offers a recommended schedule for periodic checks, these checks should be tailored to the facility based on local conditions such as environmental issues and runway traffic load.

1. Torque according to: FAA Engineering Brief No 83 (latest revision).

Figure 50: Anti-vibration washer example



CAUTION

Per FAA AC 150/5340-30, Chapter 10, and FAA Engineering Brief No 83 (latest revision), it is extremely important that other types of washers, such as split washers, must not be used. Failure to use properly installed anti-vibration lock washers will cause mounting bolts to become loose. The cams (or steps) of each half of the lock washer must face each other.

FAA Cert Alert No. 14-03 refers to AC 150/5340-26 for the frequency of checking bolt torque. AC 150/5340-26 (latest revision) paragraph 5.3.4.1.4, *Bi-Monthly Checks* states: "The torque of the bolts attaching the light fixture to its base should be checked with a calibrated torque wrench – never use an impact wrench."

Regular inspection as outlined in FAA Engineering Brief 83 (latest edition), Canada Civil Aviation Safety Alert Document CASA 2014-05, and any other applicable regulatory guidelines is critical in insuring torque on all bolts is restored to optimum values. Bolts that loosen more often should be inspected and re-torqued on a more frequent basis.

It is especially important to maintain a regular inspection schedule for LED fixtures. Since LED fixtures operate more reliably and are not subject to removal/replacement/re-torque as frequently as would be seen with incandescent fixtures, it is even more important to implement regular torque inspections.

It is critical that remedial action be taken if bolts are found to be loose or missing during inspection. If this occurs, it is important to carefully inspect all structural elements of the mounting system as defined in Installation. Also inspect the base can for general structural conditions such as:

- Is the base can solidly mounted in the pavement, and not moving or rocking during rollovers?
- If a base can extension is present, are all extension attachment bolts tight?

If poor base can structure or mounting system components are not in accordance with regulatory requirements or are in poor condition, it is the airport's responsibility to:

- Increase the frequency of bolt torque inspection to insure that no bolts become loose or missing.
- Quickly replace/repair the mounting system components, which may include replacing the entire base can.

Airport operators must also ensure these maintenance activities are properly documented.

Digital Asset Tracking and Service Application Information

ALIS is ADB SAFEGATE's new digital asset tracking, inspection and service solution, helps airports easily register airside assets, electronically schedule and track maintenance, and record maintenance and inspection tasks in compliance with ICAO and FAA standards.

Easy to implement and use, cloud-based software enables a more reliable and fail-safe approach to asset tracking and maintenance by always using live field data and eliminating inefficiencies caused by human error. Every asset is registered using GPS data and its status recorded, so airport maintenance teams get a clearer view of maintenance schedules and history, allowing them to manage resources more effectively as well as improve the safety and longevity of airside assets. This increased visibility helps airports plan and schedule preventive maintenance, or undertake corrective maintenance more quickly, to reduce downtime and significantly improve operational availability.

<https://adbsafegate.com/product-center/airfield/airside-services/ALIS-airside-maintenance>

- Easily integrates electronic torque measurements and photometric measurement reports to provide a complete view of the asset's status.
- ALIS can be integrated with the AirTorque or Ingersoll Rand® QX series wrenches, which are used for accurate, ergonomic torque inspections of AGL fixtures. The applied torque can seamlessly be registered in the ALIS system as a part of the maintenance record.
- The iPhone application of ALIS – ALIS Personal – makes it easier than ever to register maintenance actions while working. It will proactively show you which assets you still need to work on and select the closest one to you automatically. ALIS Personal acts as a feedback and information device for the associated torque wrench.

5.4.11 Testing for Leaks

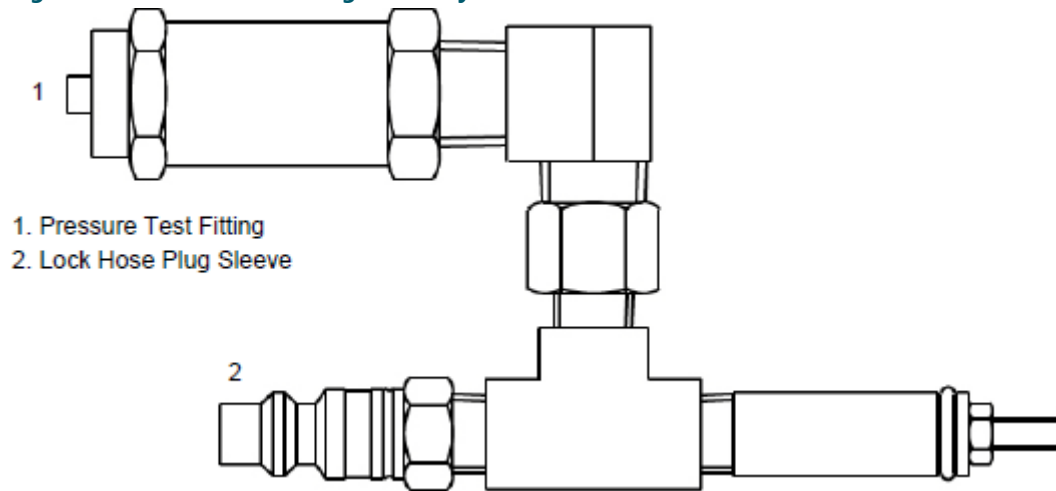
To test for leaks, perform the following procedure:

1. See [Figure 51](#).
Remove pressure relief screw.
2. See [Figure 52](#).
Screw pressure test fitting into the pressure relief port (the opening created when the pressure relief screw is removed).
Screw fitting hand-tight.

Figure 51: Pressure Relief Screw



Figure 52: Pressure Test Fitting Assembly



3. Attach the shop airline to the lock hose plug sleeve (2).
4. Pressurize to 20 psi.
5. Submerge the pressure test fitting in a water tank.
Check for air bubbles. Air bubbles indicate a leak.
6. Locate the leak source, depressurize, replace the seal that is leaking, reassemble, and retest by following steps 4 and 5.
If leak is fixed, depressurize and reinstall the pressure release screw (1).

Go to [Overview of Sequence of Work](#) to finish.

5.4.12 Individual Control Cabinets (ICCs)

Preventive maintenance tasks

On each of the ICCs in the system:

- Reconnect fuses F1 and F2.
- Pull the door lock towards you and lock it in the ON position.

Check the following LEDs of the ICCs through the holes of the EMC plate.

Table 64: ICC LED Indications

Name	Indication	Status	Remarks
DS1 FLASH command		Duration is proportional to the selected step. ON time longer for High, shorter for Med and shortest for LOW	none
DS2 RUN		1 FLASH per second	Higher rate during software upload
DS3 Rx local bus		Normally OFF Lights up momentarily during transmission or reception	One of these LEDs OFF, no traffic is on the corresponding bus
DS4 Tx local bus			One of these LEDs stays ON, there may be a polarity inversion on the bus.
DS5 Isolated supply local bus		ON	none
DS6 FLASH		ON during flash request	Hardware flash command to IGBT Driver

The flash lamps must flash at the correct rate and selected brilliancy.

5.4.13 Flashing Sequence

Check the flashing sequence of the whole system. If it is not correct, change the dip-switch addresses in the ICCs where necessary or adapt the sequence number via the flasher tester software.

5.4.14 3-in-1 ICC AC Current Check

Check the power distribution between the phases.

(If applicable, check the neutral current. For an equal number of units distributed over the 3 phases it should be less than 1A RMS. If there is a loading difference of 1 or 2 units between all the phases it should be less than 2.5 A RMS.)

5.5 UEL Light Maintenance

In this chapter, maintenance of the UEL light is described as well as the procedures of how to replace the lamp and the optical cartridge. Preventive maintenance of the light fixtures should be performed as listed in [Table 65](#).

Maintenance frequency depends on the conditions under which the runway is used (i.e. climate, traffic, etc.). The recommended practices for maintenance are described in the FAA Advisory Circular no. AC 150/5340-26.

For the numbering of the components mentioned in this chapter, refer to the exploded [Figure 55](#).

5.5.1 Preventive Maintenance

In the table below you will find a checklist of preventive maintenance tasks.

Before attempting service, de-energize and lockout the master control cabinet input power to insure that the fixture cannot be energized by remote means.

5.5.2 How to Replace the UEL Lamp

Lamp replacement is preferably performed in the maintenance shop but, it can also be done in the field. The following table instructs you on how to replace a lamp in the maintenance shop: See [Figure 55](#)

1. Open the fitting by pulling down the optical cartridge (1).
2. Disconnect the cable from the lamp (2).
3. Remove the optical cartridge and replace it with a new one.

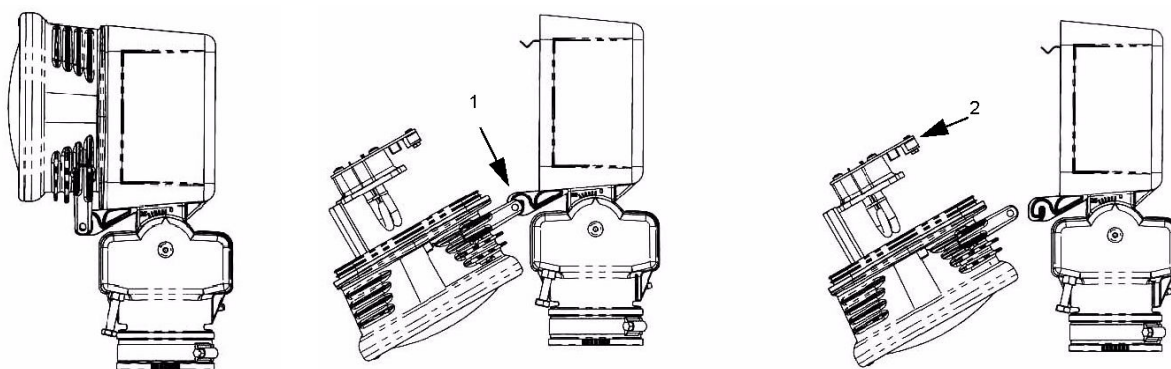
4. Re-connect the lamp cable.
5. Close the optical cartridge.
6. If serviced in the maintenance shop:
 - a. Remove the lamp by unscrewing the four fixation screws.
 - b. Clean the cartridge and especially the front glass (1b), check the condition of the reflector (1c), the gaskets (1a and 1d) and the spring (7), and replace if needed.
 - c. Carefully install the new lamp.
 - d. Retighten the four screws. The optical cartridge is now ready to be used again.

Touching the quartz bulb with bare fingers may seriously shorten the lamp's life. If the bulb has been touched, wipe it carefully with a piece of lens cleaning tissue or similar material moistened with isopropyl alcohol.

Illustration

The illustration in [Figure 53](#) clarifies the procedure described above.

Figure 53: UEL Lamp Assembly



5.5.3 How to Dismantle the Optical Assembly

The following table instructs you on how to dismantle the optical assembly (usually done in the maintenance shop):

1. Remove the optical cartridge (1) from the light.
2. Remove the lamp (2).
3. Slide the front gasket (1a) around the front of the cartridge.
This releases the reflector (1c) and the front glass (1b).
4. Reassembly is done in the opposite order.

As the reflector used in the optical assembly is not symmetrical, correct positioning is necessary and will be obtained when the hole in the reflector corresponds with the positioning pin of the optical cartridge.

Illustration

The illustration below clarifies the procedure described above.

Figure 54: UEL Lamp Assembly

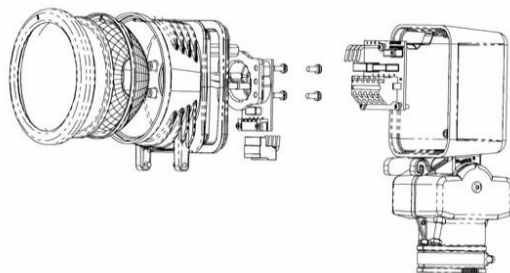


Figure 55: UEL Exploded View

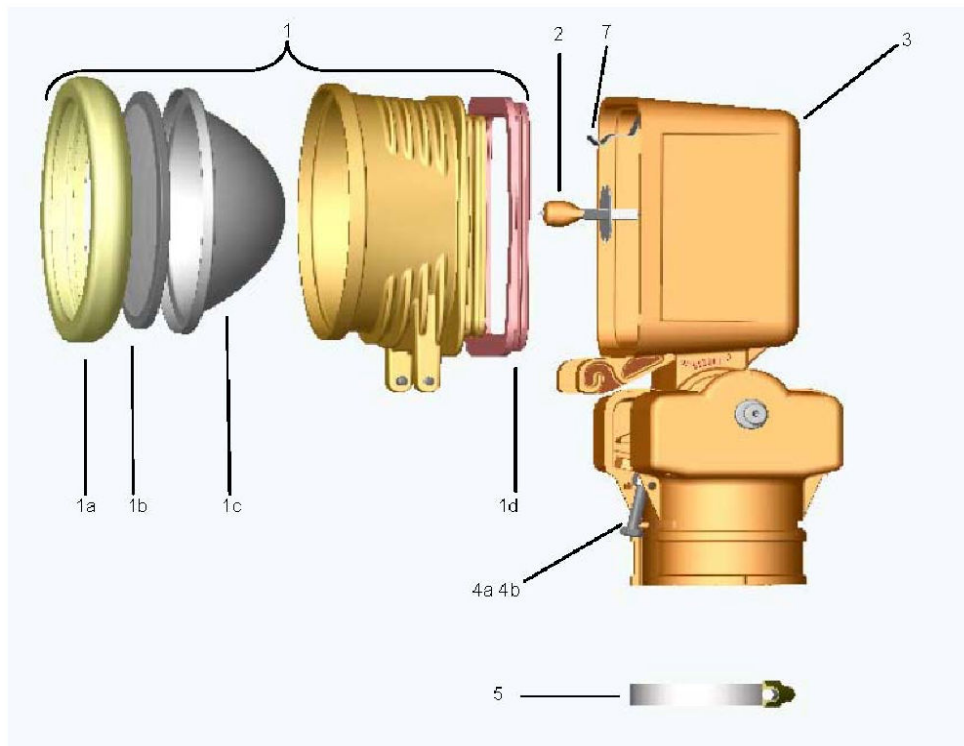


Table 65: 400 Vdc Flashing Light and MALSR Steady Burning Lights Performance Checks

Interval	Check	Action
Monthly	Visually check all lights, including flashers, on all brightness steps.	Replace lamps, if necessary.
	Visually check for dim lamp.	Clean optical surface if dirty. Check for presence of moisture. Check for lamp aging or physical displacement.
Quarterly	Check sequenced flasher flash rate.	Verify flash rate (120 flashes per minute) using Flasher Tester laptop. Tolerances: Initial: ± 2 flashes per minute Operating: ± 2 flashes per minute
	Check remote control function.	Operate system in all remote control steps to verify operation.
	Visually check for damaged (such as broken elevated or in- pavement lens) or misaligned lights.	Repair or replace lights.
	Visually check the approach line-of-sight clearance for vegetation or other obstructions.	1. Remove vegetation. 2. Use weed killer.
According to local practice (manufacturer's recommendation is once every 60 days)	Check for improper torque on inpavement hold-down bolts.	Torque six fixture bolts (cross-corner) to 185 ± 5 in.-lbs (20.902 ± 0.565 N•m).

Table 65: 400 Vdc Flashing Light and MALSR Steady Burning Lights Performance Checks (Continued)

Interval	Check	Action
Annually	Check elevated flashing fixture vertical and horizontal angles. Vertical angle for elevated flasher is normally 6°.	Readjust using aiming device. Tolerances: Initial: $\pm 1^\circ$ Operating: $\pm 2^\circ$
	Record meter readings Take system out of service according to local practice. When finished, return the system to service according to local practice. See Operating the System section for procedure.	Measure the input voltage at the MCC, each ICC and the 15KVA transformer in the High intensity step. Line-Line voltage must be: 240Vac $\pm 3\%$ (Initial) and $\pm 5\%$ (Operating)
	Record meter readings Take system out of service according to local practice. When finished, return the system to service according to local practice. See Operating the System section for procedure.	Measure the input current at the MCC and the 15KVA transformer in all three steps. Record as reference data for use in future preventive maintenance and troubleshooting efforts.
Annually	Record meter readings Take system out of service according to local practice. When finished, return the system to service according to local practice. See Operating the System section for Procedure.	Remove the cover on the 15KVA transformer. Measure the 15KVA transformer output voltage. Each side of the Line-Neutral voltage must be: High: 120Vac Medium: 75Vac Low: 50Vac The Line-Line voltage must be: High: 240Vac Medium: 150Vac Low: 100Vac Tolerances on all measurements: $\pm 3\%$ (Initial) $\pm 5\%$ (Operating)
Annually (Optional)	Record meter readings	On Flasher: Active State screen, verify "Capacitor voltage" and "Lamp current" on each Flasher is OK using Flasher Tester laptop. Record as reference data for use in future preventive maintenance and troubleshooting efforts.
Annually	Check all structures for rot or corrosion. Check all light supports for rigidity, guy tensions, and obvious misalignment.	Re-paint, repair or replace.
	Check equipment electrical connections.	Remove power at input of MCC. Wait 1 minute before working on ICC cabinets. Visually inspect lighting arrestors. Check that all terminal connections and cable connections are tight and clean. Replace or tighten all connections that show signs of heating.
	Check for obstruction in in-pavement output channel.	Clean channel and prism surface.
	(Elevated) Check for dirty lens.	Clean with glass cleaner.
	Check fuse holders, circuit breakers, door switches and relays.	Repair or replace.
Every 3 Years	Check conductor and insulation resistance of all power and control cables.	Record all measurements and compare with previous readings.

Table 65: 400 Vdc Flashing Light and MALSR Steady Burning Lights Performance Checks (Continued)

Interval	Check	Action
During Lamp Changes	Check for interior cleanliness or presence of moisture inside light fixture.	Open the light assembly. Clean fixtures, if necessary, to maintain full light output. If Moisture present- In-pavement: Replace O-rings and other parts found defective. Use pressure test plug to verify no leakage is present. Perform meg check. Elevated: Replace either gasket if defective
After 900 hours of operation in High intensity	It is recommended to replace all xenon flash lamps systematically when, at full intensity, 90% of the useful life has been reached.	Replace the lamps.
If heavy snowfall predicted		During winter months, permanently mark location of low mounted elevated fixtures on either side of the runway using red flags or sticks to facilitate snow removal and lessen the risk of damage to the fixtures by snow removal equipment.
After snow removal	Check for damaged in- pavement light fixtures.	Replace damaged fixtures. Use broom for snow removal. Follow recommended snow removal techniques described in AC 150/5200-30.

5.6 Troubleshooting and Fault Correction



DANGER

Only qualified personnel may install or repair electrical equipment in accordance with NFPA 70B, Electrical Equipment Maintenance and NFPA 70E, Electrical Safety Requirements for Employee Workplaces.

Disconnect and tag out the sources supplying electrical power to this device before making or repairing connections to this device in accordance with airport lockout and tagout procedures.

Use approved testing equipment to test that the circuit is deenergized.

All applicable regulations in accordance with local codes and FAA standards must be followed.

Review the "Safety" on page 1 prior to performing any maintenance steps.

Please read the following paragraphs for a description of the system:

- General description
- Technical description, selection and range of applications
- Technical data, operation limits
- Please read the safety notices and handling precautions at the beginning of this manual
- Refer to the wiring diagrams at the end of this manual

5.6.1 General Troubleshooting Tips

Preparation

1. Read technical documentation provided with the system
2. Have 2 copies of ADB SAFEGATE equipment manual number 96A0400, "400 V Medium Intensity Approach Lighting System (MALSR) and Approach Lighting System with Sequenced Flashers (ALSF)"
 - One master copy stored in a permanent location
 - One copy in work area
 - Additional copies of manuals can be downloaded from the ADB SAFEGATE web site at <http://www.adbsafegate.com>

3. Attend manufacturer training classes
4. Insure adequate supply of spare parts are available
5. Make sure you have proper tools
 - True RMS multi-meter
 - Current Clamp
 - Full set of hand tools

5.6.2 Gather information about the problem

1. What are symptoms?
2. When did failure occur?
3. Is the failure intermittent?
4. Is the failure in remote control only?

5.6.3 Do the easy checks first

1. Visual examination
2. Turn off, then back on
3. Operate in local remote (if applicable)
4. Check fuses
5. Check inputs and outputs
6. Cut problem in half
7. Use manufacturer's troubleshooting guidelines for assistance
8. Call equipment manufacturer for assistance

5.6.4 Troubleshooting: System fails to flash

At the Master Control Cabinet, verify that:

The input power supply is within tolerance (190Vac - 260Vac)



Note

Standard FAA tolerances are 240 ± 12 volts (228Vac - 252Vac)

- No circuit breaker has tripped
- No fuses are blown
- The LMC board is operational (RUN LED DS5 blinks at a 1 Hz rate)
- Remote control signals are present and correct

5.6.5 Verify that communication is present on the local bus

- On the LMC board, verify that Rx LED DS6 and Tx LED DS7 are blinking (which verifies that communication is occurring)
- At each failing ICC cabinet verify that Rx LED DS3 and Tx LED DS4 are blinking (which verifies that communication is occurring)

5.6.6 At each ICC cabinet, verify that:

- The FCU board is operational (RUN LED DS2 blinks at a 1 Hz rate)
- The lamp trigger command is being generated (FLASH LED DS1 flashes twice per second)

5.6.7 If the optional Modbus control is present:

- Verify that the remote control bus communication is operational (LMC, Bus A/LEDs DS8 and DS10 are blinking) (LMC, Bus B/LED DS9 and DS11 are blinking)

5.6.8 Troubleshooting: Several units fail to flash

Verify at the first failing ICC cabinet that:

- The input power supply is within tolerance (190Vac - 260Vac)



Note

Standard FAA tolerances are 240 ±12 volts (228Vac - 252Vac)

- No fuses are blown
- The FCU board is operational (RUN LED DS2 blinks at a 1 Hz rate)
- The lamp trigger command is being generated (FLASH LED DS1 flashes twice per second)
- The FCU PCB coding on dipswitch SW1 and SW2 is correct

5.6.9 Verify that communication is present on the local bus

- At each failing ICC cabinet verify that Rx LED DS3 and Tx LED DS4 are blinking (which verifies that communication is occurring)

5.6.10 Troubleshooting: One unit fails to flash

Verify on the failing ICC cabinet that:

- The input power supply is within tolerance (190Vac - 260Vac)



Note

Standard FAA tolerances are 240 ±12 volts (228Vac - 252Vac)

- No fuses are blown
- The FCU board is operational (RUN LED DS2 blinks at a 1 Hz rate)
- The lamp trigger command is being generated (FLASH LED DS1 flashes twice per second)
- The FCU board coding on dipswitch SW1 and SW2 is correct
- The door switch is properly closed and that the safety switch in the flashing lamp fixture is properly closed
- The flash energy capacitor charges at about 400V DC (Use laptop to measure voltage)
- The choke is correctly connected to the FCU board

5.6.11 Verify that communication is present on the local bus

- At the failing ICC cabinet, verify that Rx LED DS3 and Tx LED DS4 are blinking (which verifies that communication is occurring)

Then:

- Replace the lamp *or*
Replace the entire fixture (which replaces the trigger circuitry)
- Replace the FCU board

5.6.12 Troubleshooting: One unit flashes incorrectly (intensity or timing)

Verify on the failing ICC cabinet that:

- The input power supply is within tolerance (190Vac - 260Vac)



Note

Standard FAA tolerances are 240 ±12 volts (228Vac - 252Vac)

- The FCU board is operational (RUN LED DS2 blinks at a 1 Hz rate)
- The lamp trigger command is being generated at same rate that flashing should occur (FCU board/FLASH LED DS1 blinks twice per second for systems that flash twice per second)
- The FCU board coding on dipswitch SW1 and SW2 is correct
- The flash energy capacitor charges at about 400V DC (Use laptop to measure voltage)
- The choke is correctly connected to the FCU board

5.6.13 Verify that communication is present on the local bus

- At the failing ICC cabinet, verify that Rx LED DS3 and Tx LED DS4 are blinking (which verifies that communication is occurring)

Then:

- Replace the FCU board
- Replace the flashing fixture

5.6.14 UEL Light Assemblies

Table 66: Troubleshooting the UEL Lights

Problem	Possible cause	Solution
Lamp does not energize.	Lamp defective	Replace lamp.
	Loose or broken contact or connector	Tighten or replace the contacts or connector.
	Moisture present in fixture	Open up and dry, inspect lens for cracks. Check the gaskets.
	Deteriorated wire insulation	Replace wires.
Short lamp life	Moisture in assembly	Open up and dry out the assembly. Inspect the lens for cracks. Check the gaskets.

5.7 Wiring Diagrams

Figure 56: Local Bus Control

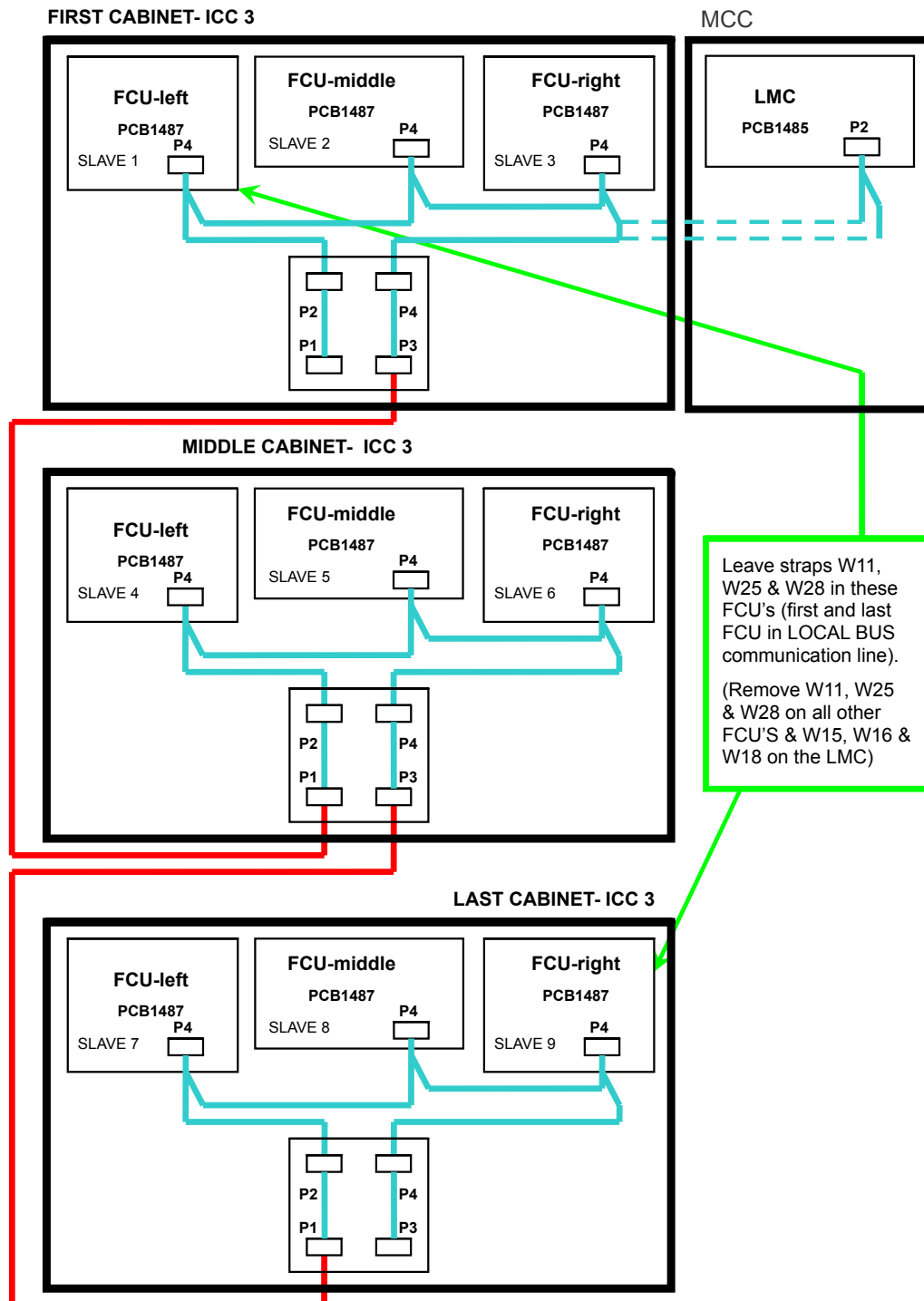


Figure 57: External Wiring Diagram, 400V Sequenced Flasher System- FAA MALSR diagram 1of2

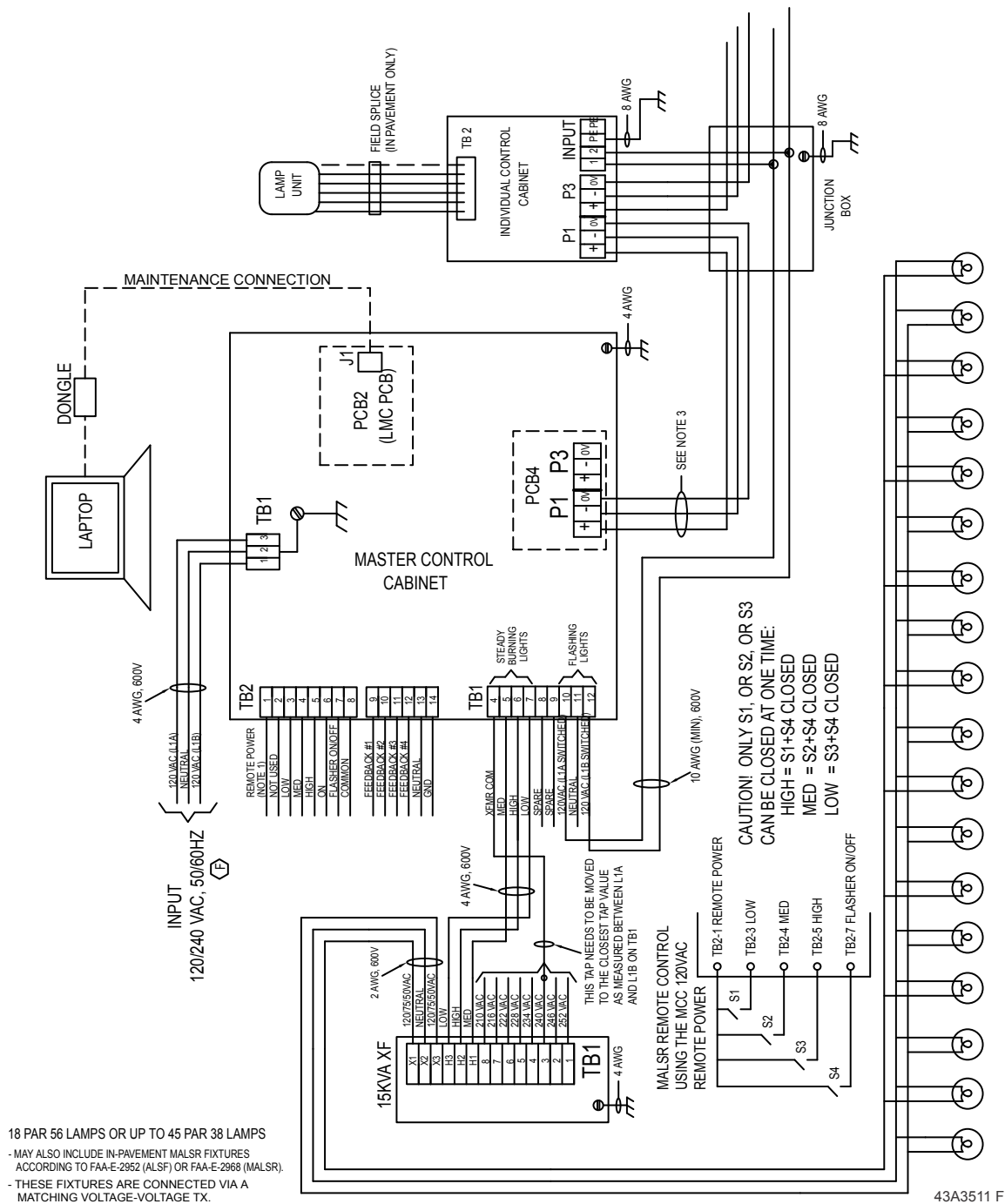
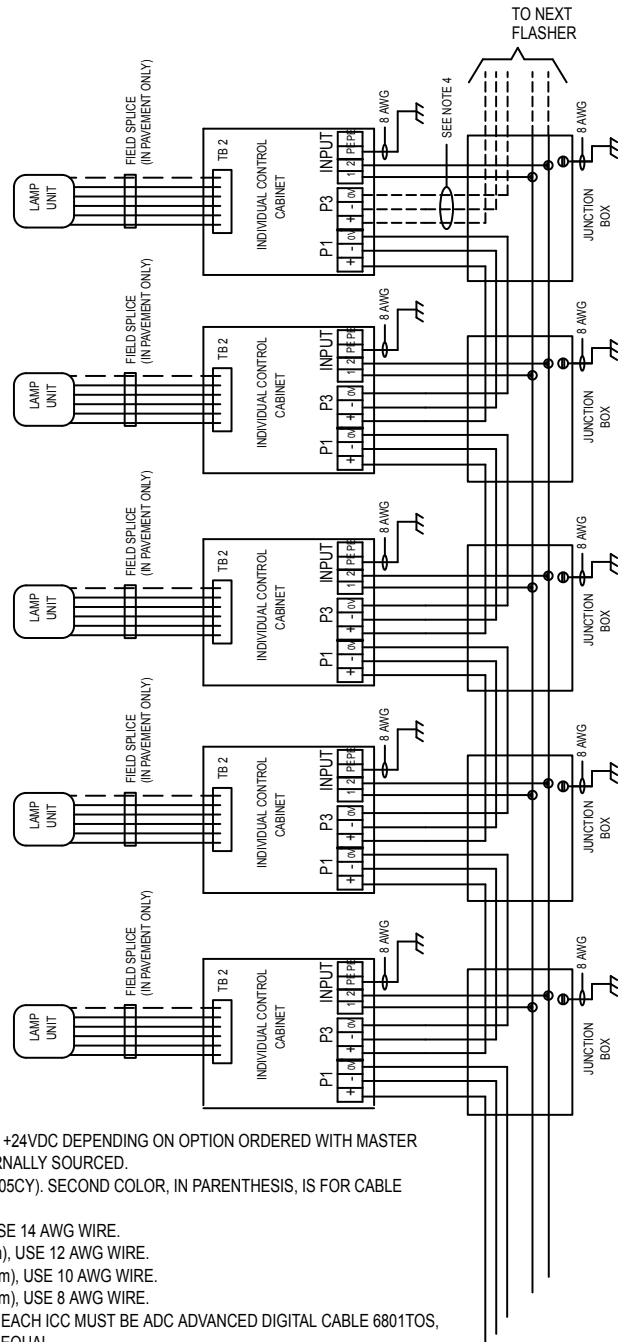


Figure 58: External Wiring Diagram, 400V Sequenced Flasher System- FAA MALSR diagram 2of2



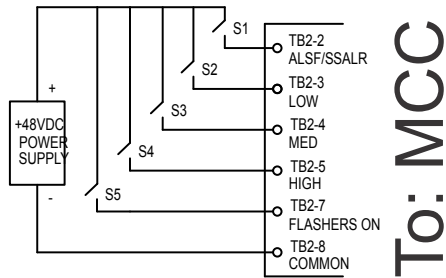
NOTES:

1. REMOTE POWER SOURCE IS EITHER 120 VAC, +48VDC, OR +24VDC DEPENDING ON OPTION ORDERED WITH MASTER CONTROL CABINET. REMOTE POWER MAY ALSO BE EXTERNALLY SOURCED.
2. FIRST COLOR IS FOR CABLE 89A0290/5 (ALPHA WIRE # 65405CY). SECOND COLOR, IN PARENTHESIS, IS FOR CABLE 6104.22.820, 5C+SHIELD, 14AWG, 600V.
FOR FIXTURE TO FCU LINE LENGTH UP TO 131 FT (40m), USE 14 AWG WIRE.
- FOR FIXTURE TO FCU LINE LENGTH UP TO 213 FT (65m), USE 12 AWG WIRE.
- FOR FIXTURE TO FCU LINE LENGTH UP TO 328 FT (100m), USE 10 AWG WIRE.
- FOR FIXTURE TO FCU LINE LENGTH UP TO 393 FT (120m), USE 8 AWG WIRE.
3. SERIAL COMMUNICATION WIRING BETWEEN MASTER AND EACH ICC MUST BE ADC ADVANCED DIGITAL CABLE 6801TOS, 18AWG, TRIAD, SHIELDED, 600V CABLE or ADB-APPROVED EQUAL.
4. LAST INDIVIDUAL CONTROL CABINET (FARTHEST FROM MASTER) WILL NOT HAVE ANY WIRES CONNECTED TO P3.

43A3511 F

Figure 59: ALSF External Wiring Diagram, 400V Sequenced Flasher System- ALSF/SSALR diagrams 1of2

ALSF REMOTE CONTROL USING AN
EXTERNAL 48VDC SOURCE



CAUTION! ONLY S2, OR S3, OR S4,
CAN BE CLOSED AT ONE TIME:

CLOSE S1 FOR ALSF MODE
OPEN S1 FOR SSALR MODE
LOW = S2+S5 CLOSED
MED = S3+S5 CLOSED
HIGH = S4+S5 CLOSED

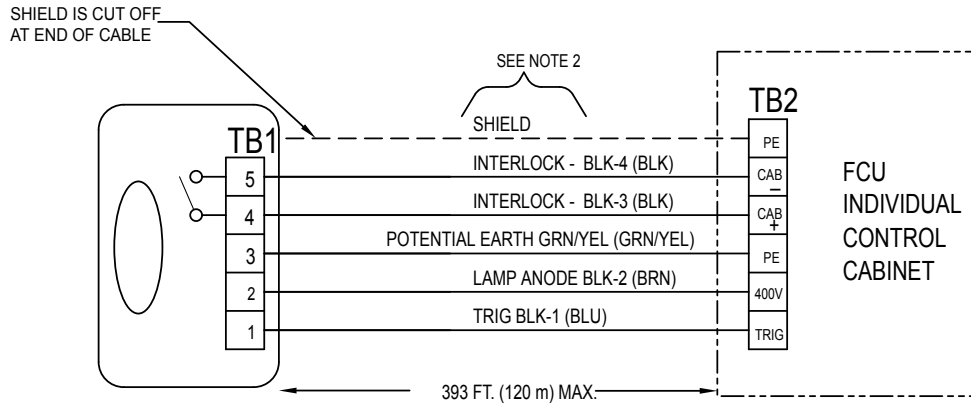
NOTE: FOR ALSF MODE ONLY, DELETE
EXTERNAL SWITCH S1 AND CONNECT
A JUMPER FROM TB2-2 TO TB2-7.

NOTES:

1. REMOTE POWER SOURCE IS EITHER 120 VAC, +48VDC, OR +24VDC DEPENDING ON OPTION ORDERED WITH MASTER CONTROL CABINET. REMOTE POWER MAY ALSO BE EXTERNALLY SOURCED.
2. FIRST COLOR IS FOR CABLE 89A0290/5 (ALPHA WIRE # 65405CY.). SECOND COLOR, IN PARENTHESIS, IS FOR CABLE 6104.22.820 5C+SHIELD, 14AWG, 600V.
- FOR FIXTURE TO FCU LINE LENGTH UP TO 131 FT (40m), USE 14 AWG WIRE.
- FOR FIXTURE TO FCU LINE LENGTH UP TO 213 FT (65m), USE 12 AWG WIRE.
- FOR FIXTURE TO FCU LINE LENGTH UP TO 328 FT (100m), USE 10 AWG WIRE.
- FOR FIXTURE TO FCU LINE LENGTH UP TO 393 FT (120m), USE 8 AWG WIRE.
3. SERIAL COMMUNICATION WIRING BETWEEN MASTER AND EACH ICC MUST BE ADC ADVANCED DIGITAL CABLE 6801TOS, 18AWG, TRIAD, SHIELDED, 600V CABLE or ADB-APPROVED EQUAL.
4. CONNECTIONS SHOWN ON THIS PRINT ASSUME THAT THE MASTER IS PHYSICALLY LOCATED AT EITHER END OF THE ROW OF ICC'S. IF THE MASTER IS PHYSICALLY LOCATED IN THE MIDDLE AREA OF THE ICC'S, CONNECT P1 TO ONE SECTION OF ICC's (AS SHOWN) AND THEN CONNECT P3 TO THE OTHER SECTION OF ICC's.
5. LAST INDIVIDUAL CONTROL CABINET (FARTHEST FROM MASTER) WILL NOT HAVE ANY WIRES CONNECTED TO P3.

DRAWING TITLE:		
EXTERNAL WIRING DIAGRAM, 400V SEQUENCED FLASHER SYSTEM- FAA ALSF/SSALR		
SCALE: N/A	SHEET NUMBER: 1 OF 1	REV:
DRAWING NUMBER: 43A3546		F

Figure 62: ALSF/MALSR External: UEL Wiring



UEL ELEVATED FLASHING FIXTURE INTERCONNECTING WIRING

Figure 63: ALSF/MALSR External: Junction Box Wiring

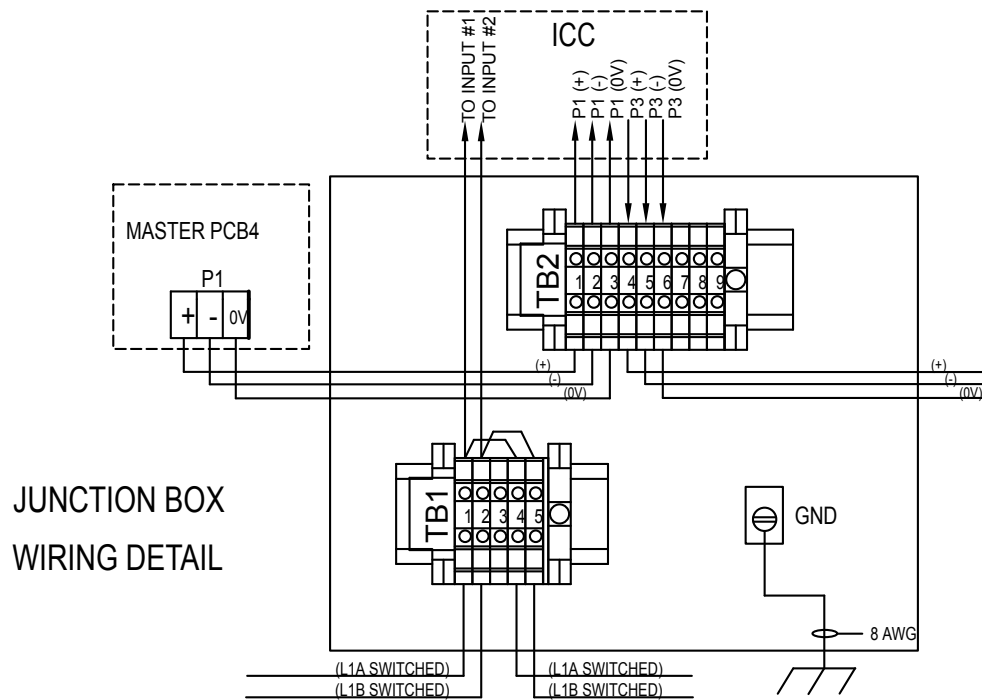


Figure 64: Internal MALSR Wiring Diagram 400 V MCC 1of3

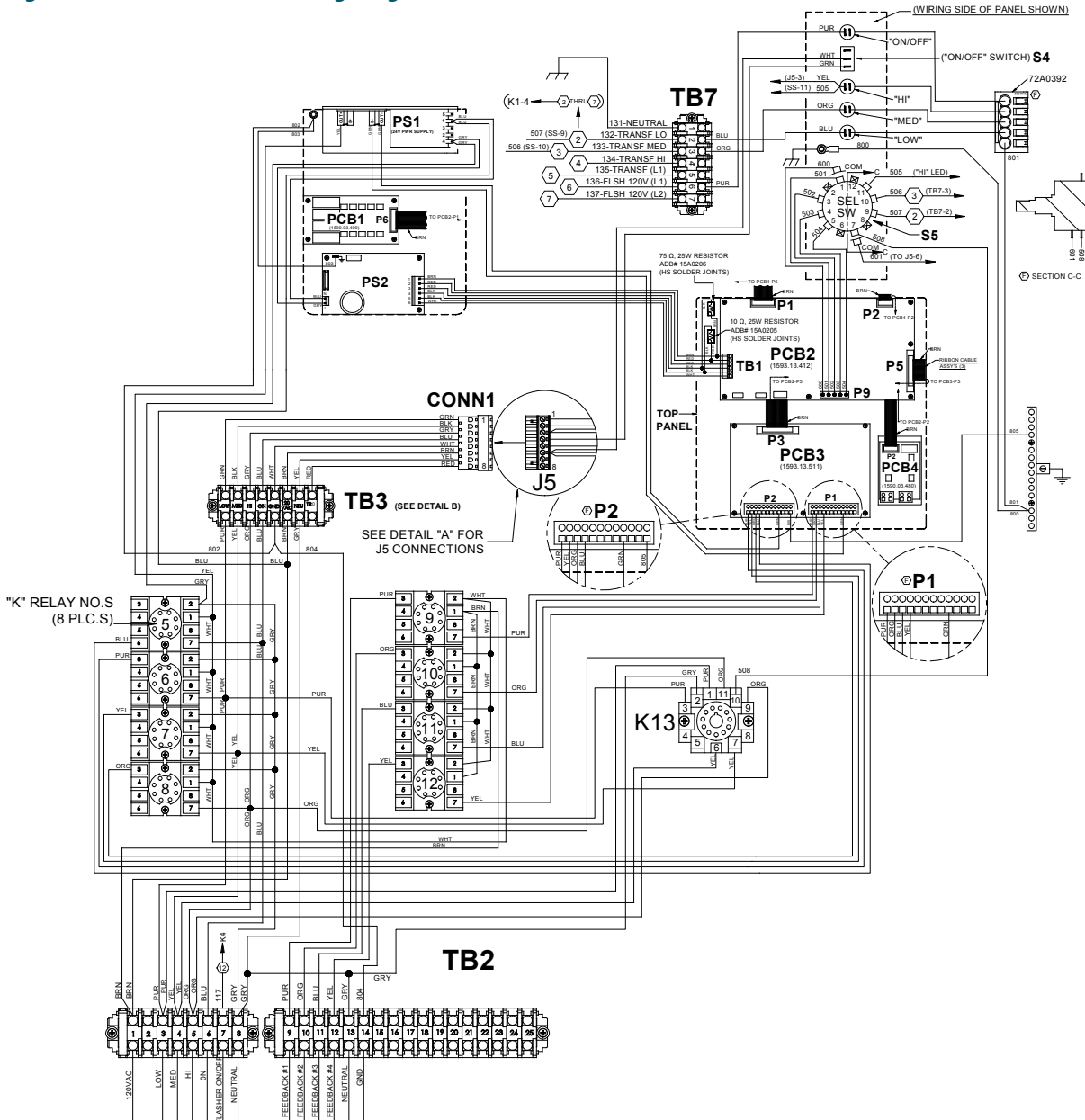


Figure 65: Internal MALSR Wiring Diagram 400 V MCC 2of3

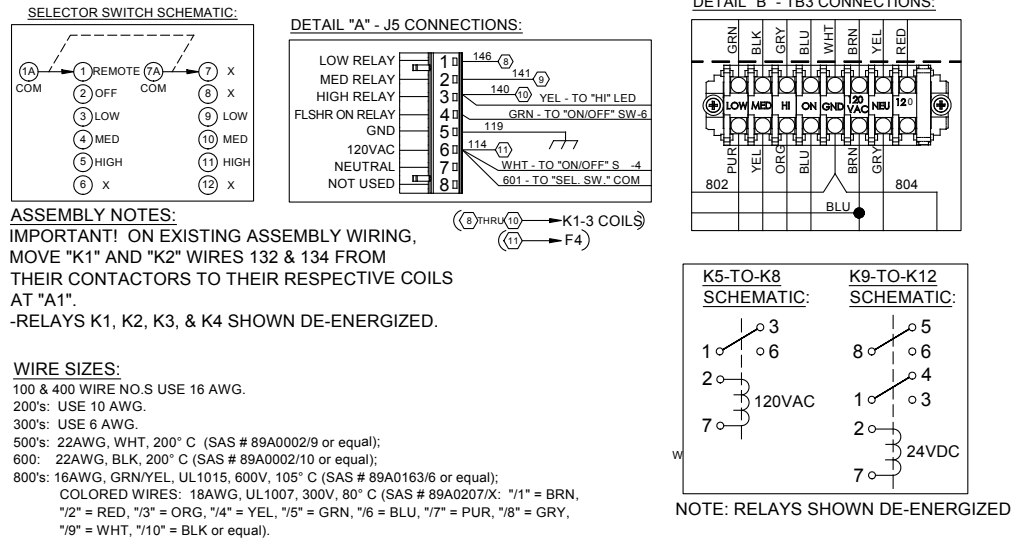




Figure 67: 400V, ALSF/SSALR, 48 VDC CONTROL

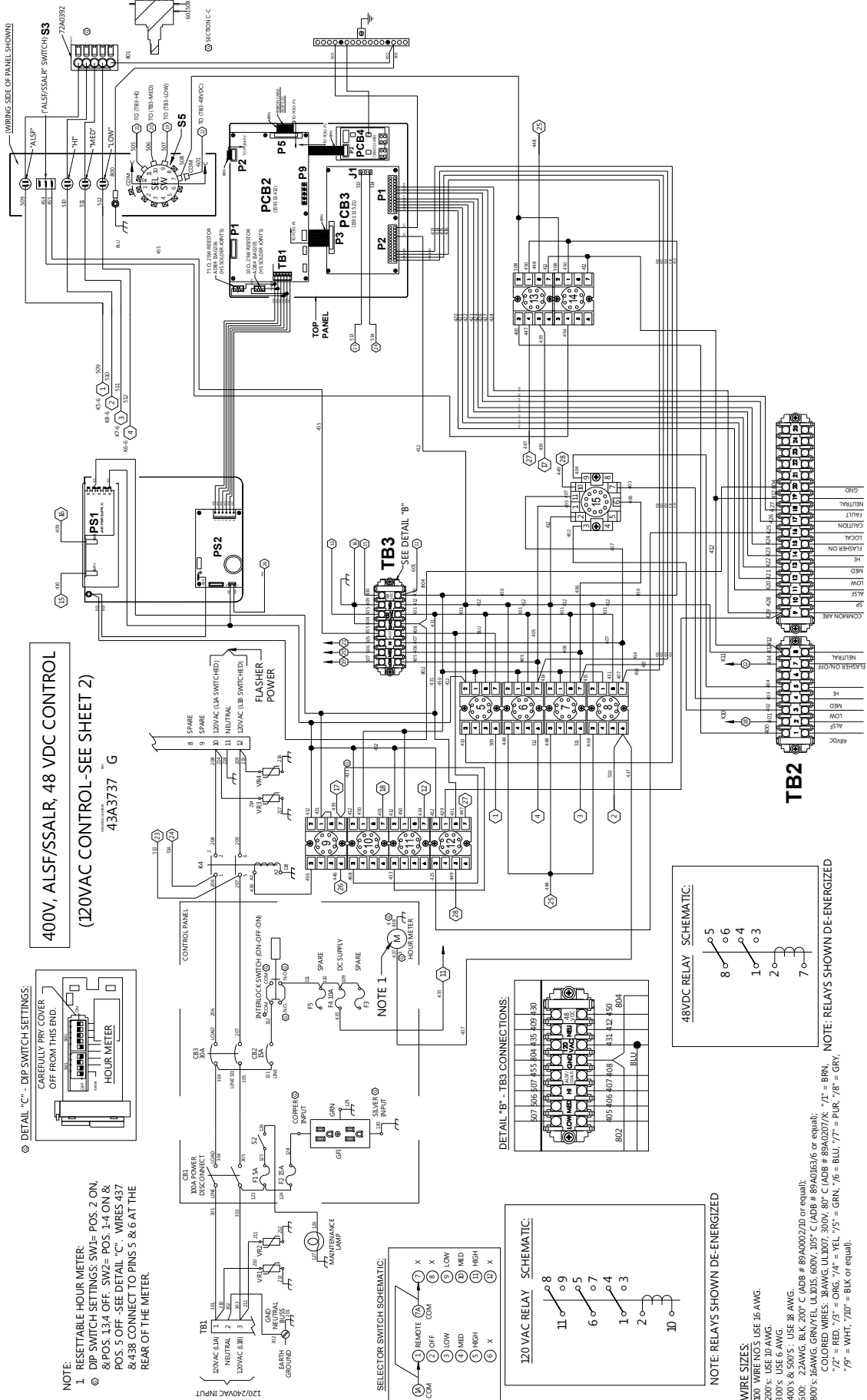




Figure 69: Internal Wiring Diagram 400 V ICC (43A3512)

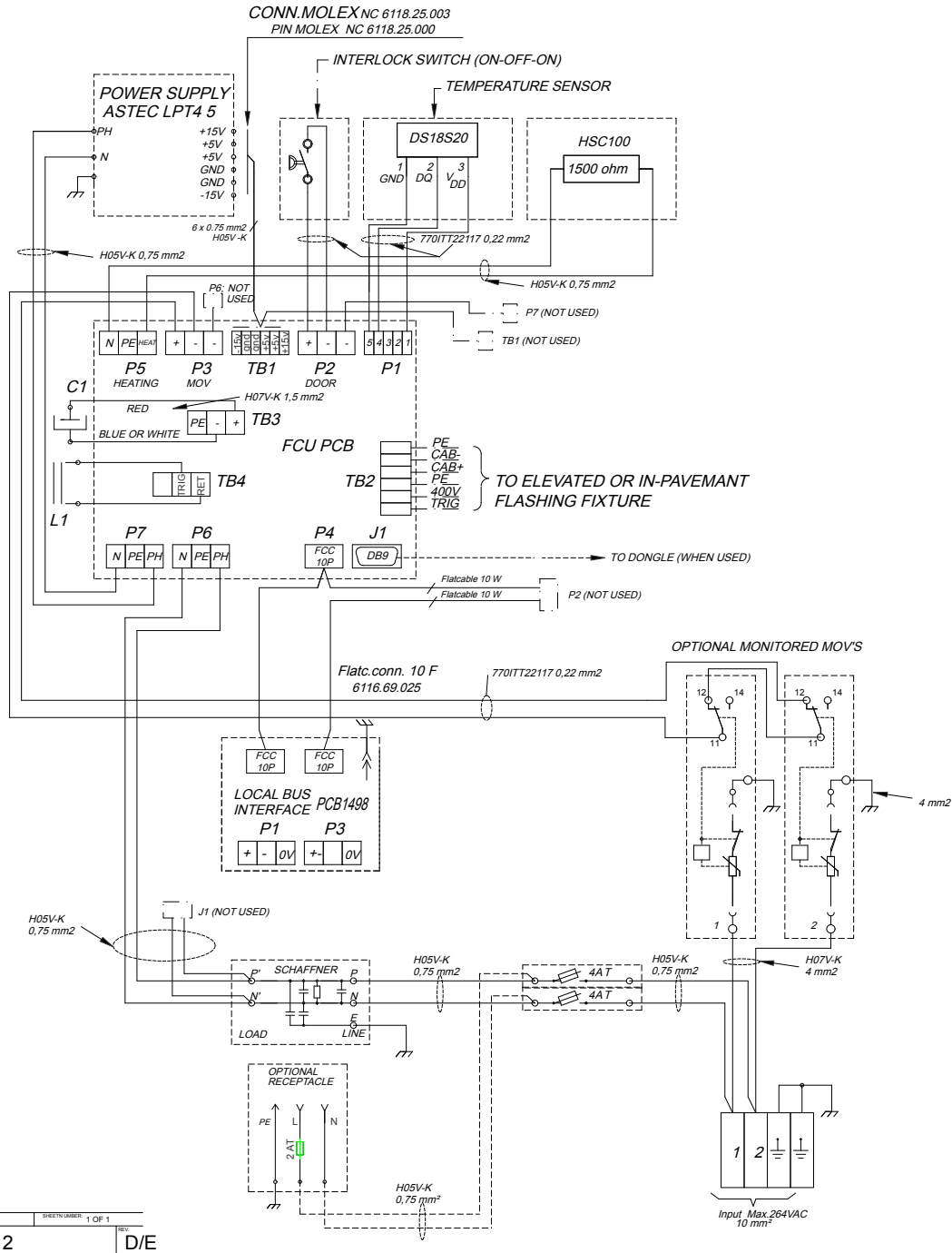


Figure 70: Elevated Flash Head Assembly

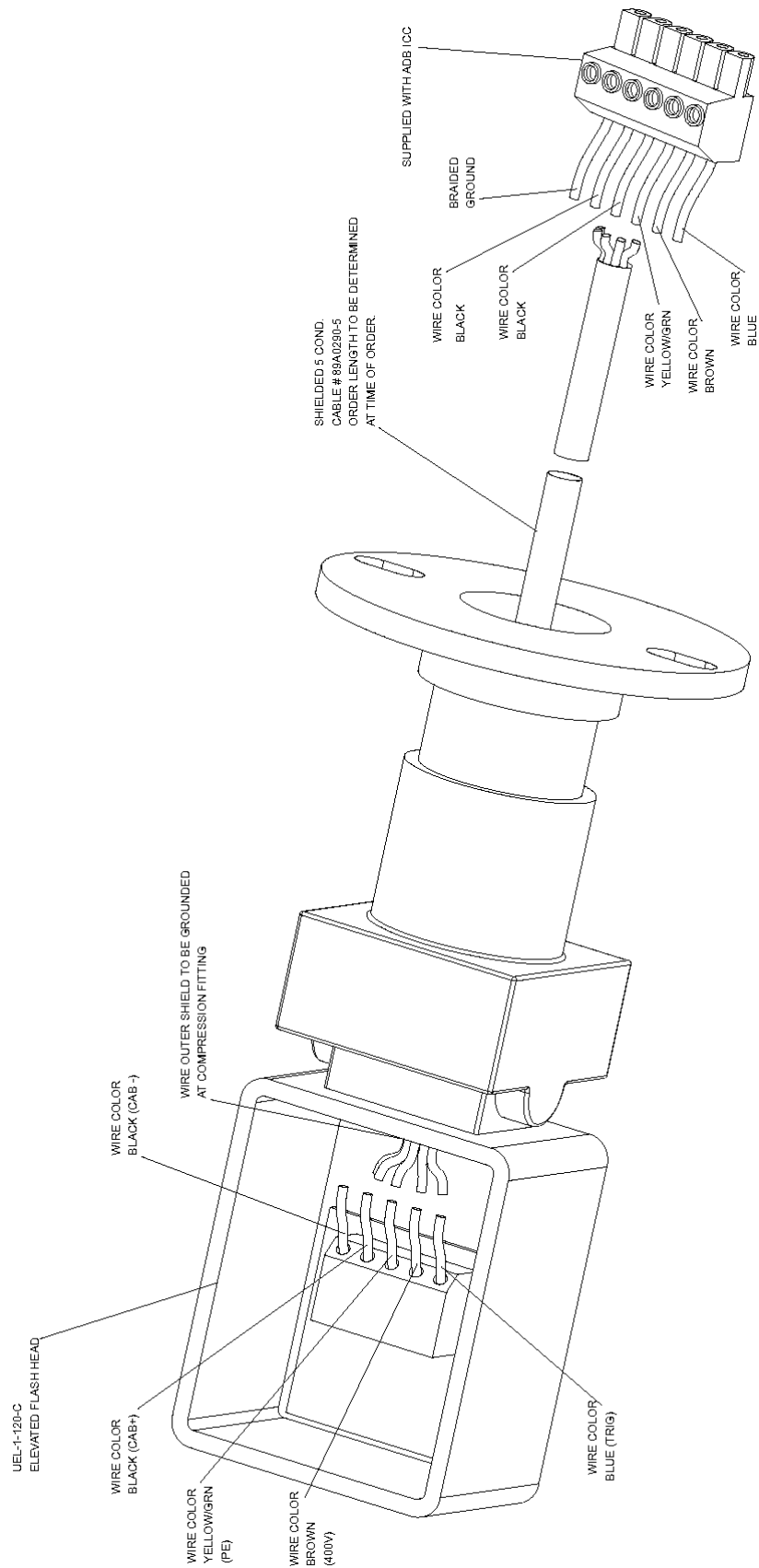
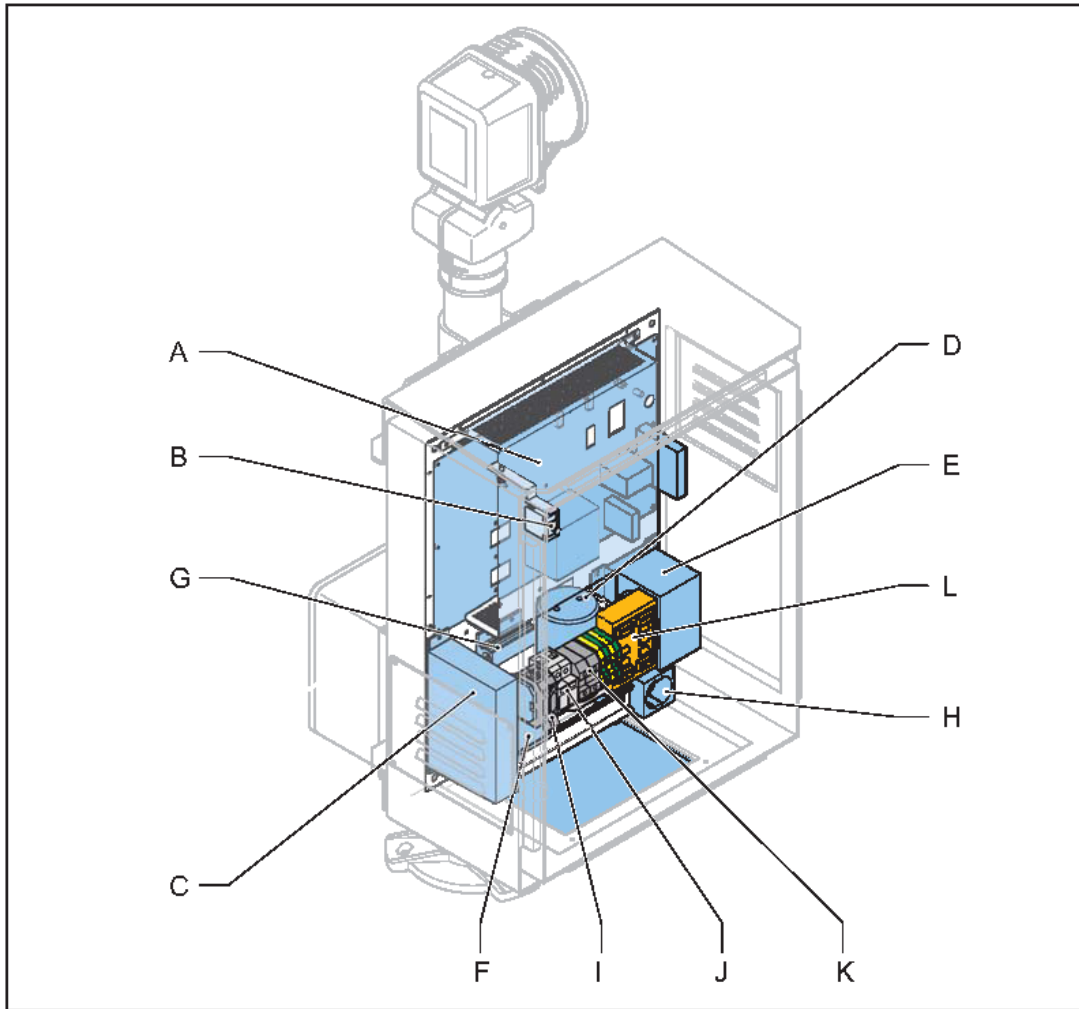


Figure 72: ICC-1



Main items

A FCU PCB 1487, 1590.03.464

B Door microswitch 6150.49.010

C DC power supply module 6341.80.230

D Capacitor, 1200 μ f, +30 -10%, 415 V, 6323.61.120

E Choke, 1.5 mH, 150 A, 6166.50.150

F Mains filter, 6115.18.020

G Heater resistance, 1500 Ω , 100 W, 6310.51.620

H Mains socket outlet, (option), 240 Vac only

I Fused input switch (F1)

J Over-voltage protection modules (MOV) (option), 6134.03.050

K Power input terminals,

- Phase terminal , 6112.45.170
- Earth Ground, 6112.45.007

L Local bus connection board, PCB 1498, 1590.03.480

6.0 Parts

400V ALSF / MALSR

MCC Ordering Code 44A6763 - X X X X X 0 X

System

- 1 = ALSF per FAA-E-2628 or ICAO
- 2 = MALSR per FAA-E-2325
- 3 = MALSR per FAA-E-2980
- 4 = UDAL¹
- 5 = ALSF per 2628 Stainless Steel

Flashers

XX = Maximum number of flashers

Examples:

08 = 8 flashers

21 = 21 flashers

30 = 30 flashers (ICAO applications)

Monitoring²

- 1 = Without monitoring
- 2 = With monitoring

Input Voltage

- 1 = 120/240 VAC (standard)

Surge Protection

- 2 = Monitored surge protection³

0

Remote Connection – Hardwired

- 0 = None
- 1 = +24 VDC
- 2 = +48 VDC
- 3 = 120 VAC

Notes

¹ A special Unidirectional Approach Lighting (UDAL) system can also be configured. Contact the ADB SAFEGATE Sales Department for details. A UDAL consists of 5 unidirectional sequenced flashers and 2 unidirectional REILs.

² Monitoring required for ALSF systems per FAA-E-2628

³ Includes 40 kA surge protection devices in each ICC. Surge protection status monitored electronically.

6.1 ALSF/MALSR Master Control Cabinet Parts List

The MALSR/ALSF MCC part number is 44A6850/XXXXXXXX.

Figure 73: Master Control Cabinet Parts and Diagram

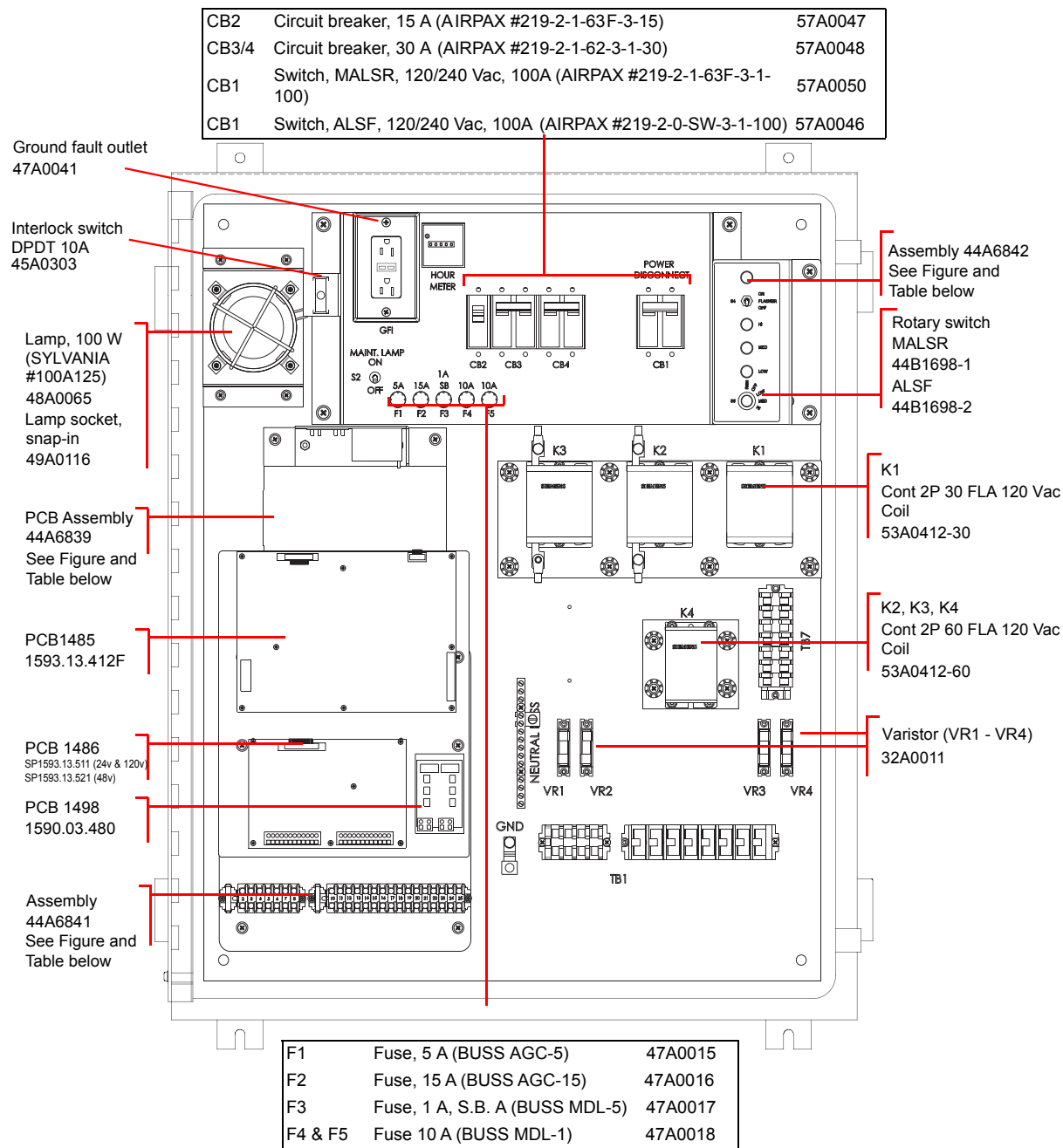


Table 67: MCC Assembly 44A6839 Parts

Item	Part Number	Description	Qty
1	1590.03.490	Master J-Bus Board, PCB 1502	1
2	60A4008	Mounting Plate Power Supply MALSR	1
3	60A4009	XFMR Mounting Plate MALSR	1
4	64A0199-4	6-32 X 1/4 Pan Head Phillips	8

Table 67: MCC Assembly 44A6839 Parts (Continued)

Item	Part Number	Description	Qty
5	64A0177-8	10-32 X 1/2 Pan Head Phillips	2
6	64A0245/8	8-32 X 1/2 Hex Head Self Tap	2
7	65A0015-19	10-32 Hex Nut	4
8	66A0026/11	#6 Split Lockwasher	2
9	66A0026/15	#8 Split Lockwasher	4
10	66A0026/17	#10 Split Lockwasher	2
11	66A0039-6	#10 External Lockwasher	2
12	66A0129	Standoff Hex M-F 3/4 X 6-32	8
13	78A0775	Wire to PCB Multipole Connector, 6 Contacts, 3.96mm	1
14	78A0776	Wire to PCB Crimp Housing Connector, 3 Contacts, 3.96mm	1
15	72A0399	Crimp Pin	8
16	97A0001	Power Supply 48VDC 1.0 A	1
16	97A0010	Power Supply 24VDC 1.2 A	1
17	97A0028	LPT45 Switch Mode Power Supply	1

Figure 74: MCC Assembly 44A6839 Diagram

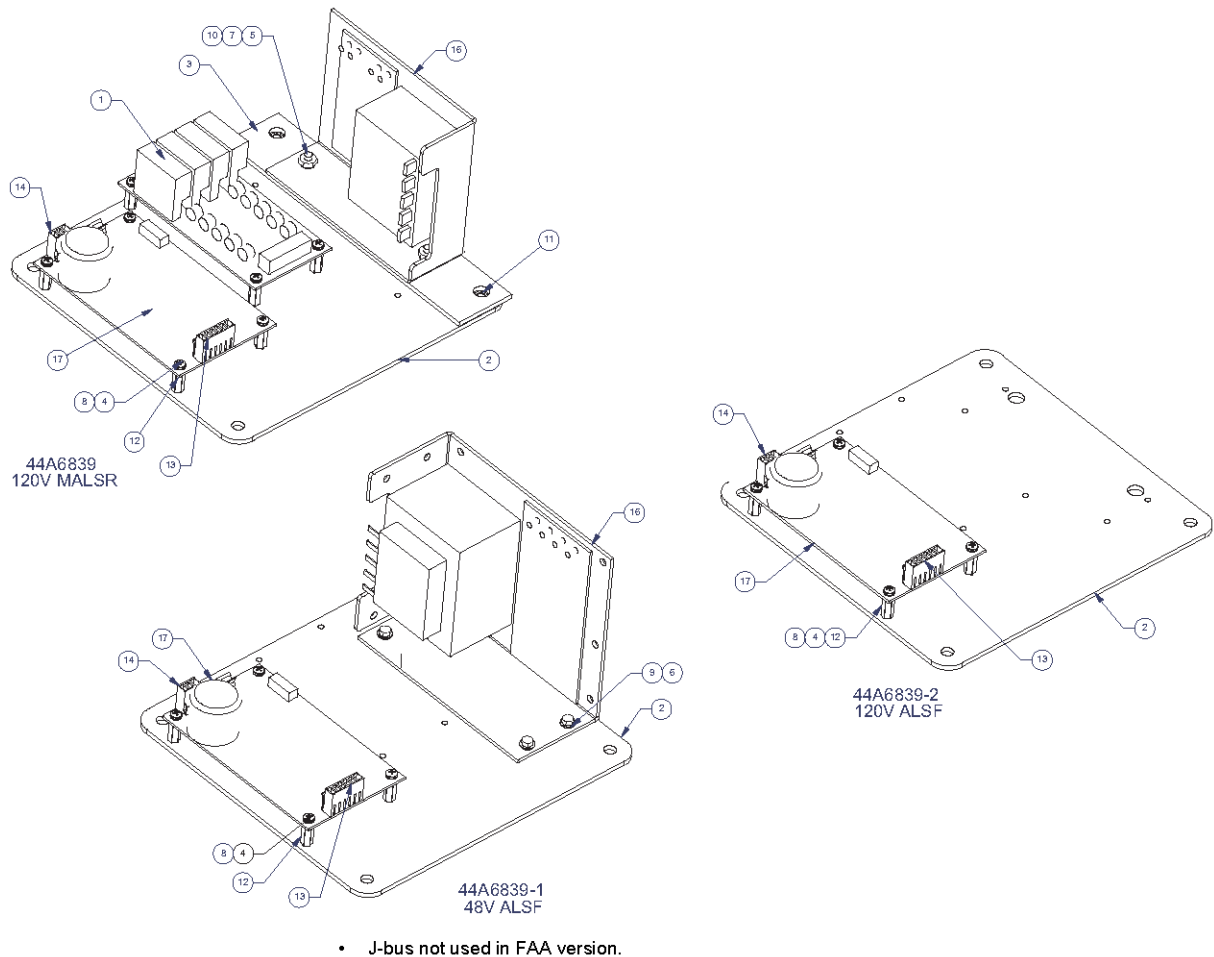


Table 68: MCC Assembly 44A6842 (MALSR) and 44A6842/1 (ALSF) Parts

ITEM	PART NUMBER	DESCRIPTION	QTY.
1	42A0587	MALSR Switch / Light Panel Label	1
1	42A0609	ALSF Switch / Light Panel Label	1
2	45A0468	Switch Toggle SPDT SLDR LUG 5PCS	1
3	46A0092-6	Rotary SW 30DEG SP 6POS.	1
3	61A0454	Knob, Phenolic, 1/4" Shaft, Pointer	1
4	48A0406	Neon Lamp, Neon IND 110V AMB	4
5	60A4010	Switch / Light Panel BRKT MALSR	1
6	63A0255	Cable Tie Mount Metal	1
6	64A0198-6	6-32 X 3/8 Pan Head Phillips	1
6	66A0026-11	#6 Split Lockwasher	1
6	65A0015-11	#6-32 HX NUT	1

Figure 75: MCC Assembly 44A6842 Diagram (MALSR Light Panel Label Shown)

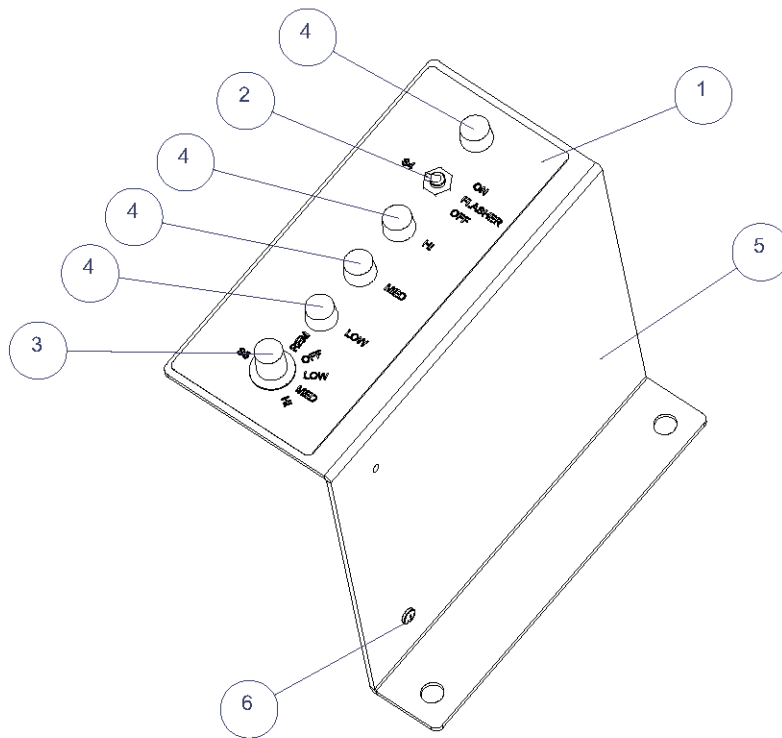


Table 69: MCC Assembly 44A6841 Parts

ITEM	PART NUMBER	DESCRIPTION	QTY.
1	49A0361	Socket Relay 8 Pins	10
2	49A0363	Socket Relay 11 Pins	1
3	53A0436	120 Vac 50/60HZ 12 AMP SPDT	1
4	53A0437	24 Vdc 10 AMP DPDT	4
5	53A0442	Relay, 11 Pin, 3DPDT, 12A	1
6	53A0443	Relay Time Delay	3

Table 69: MCC Assembly 44A6841 Parts (Continued)

ITEM	PART NUMBER	DESCRIPTION	QTY.
7	53A0447	Relay DPDT, 48VDC Coil, 8 Pins	10
8	53A0450	Relay DPDT 120VAC 50/60HZ 12AMP	10
9	60A4007	Relay Mounting Plate MALSR	1
10	64A0169-16	4-40 X 1" Pan Head Phillips	22
11	64A0169-6	#4-40 X 3/8 Pan Head Phillips	6
12	66A0015-7	#4 Flatwasher SS	6
13	66A0026-7	#4 Split Lockwasher	24
14	72A0066	Term BLK 22-10AWG 600V 50A,Use W/72A0067	33
15	72A0067	Term BLK End, Flat Base, Mates W/72A0066	3

Figure 76: MCC Assembly 44A6841 ALSF/MALSR 120V Diagrams

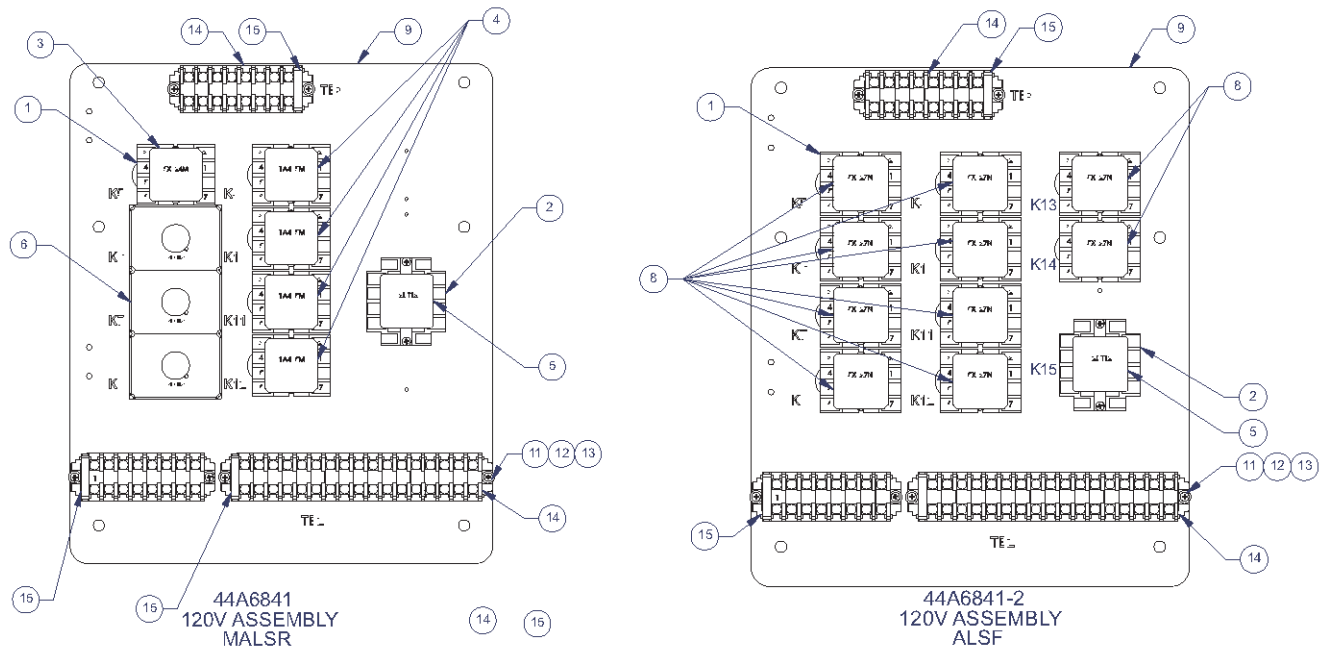
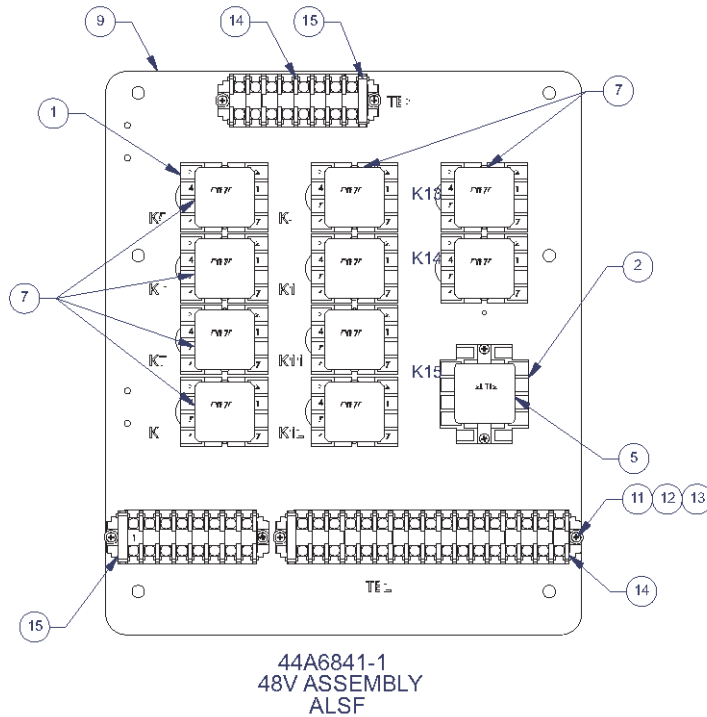


Figure 77: MCC Assembly 44A6841 ALSF 48V Diagram



6.1.1 MALSR Master Control Cabinet Specific Parts List

See [Table 70](#). This subsection provides master control cabinet parts applicable only to the MALSR system.

The MALSR master control cabinet part number is 44A6850/XXXXXXXX.

Table 70: MALSR MCC Specific Parts List

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

6.1.2 Steady Burning Elevated Light Assembly Parts List

MALSR PAR-56 Lampholder Assembly Parts List

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

MALSR PAR-38 Lamp-holder Assembly Parts List

PAR-38 parts apply only to the MALSR system.

Table 71: MALSR PAR-38 Lamp-holder Assembly Parts List

Item	Description	Part Number	Quantity	Note
1	Lamp (150W PAR-38)	48A0447	1	
2	PAR-38 lamp-holder, PAR/SP	44A0094	1	
3	Slip-fitter	62B0528-2	1	

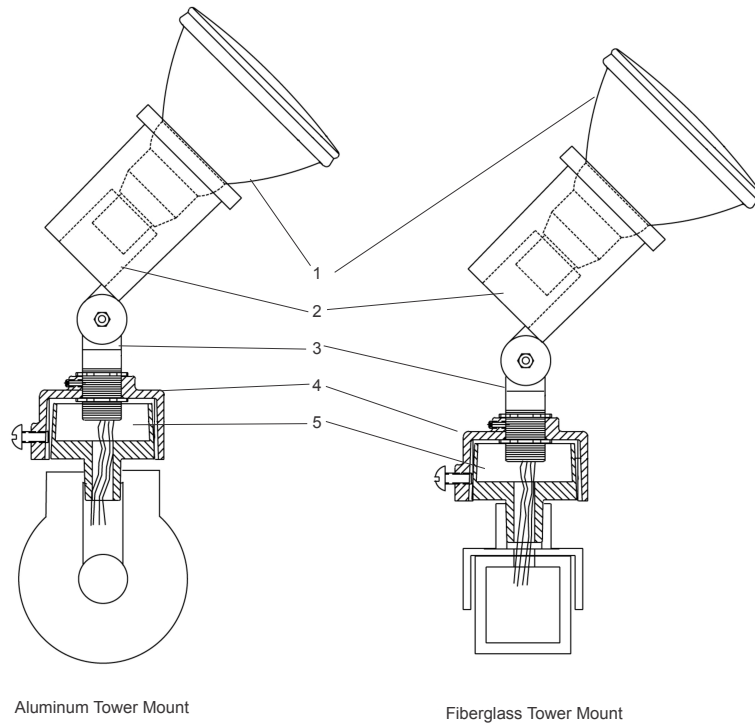
Table 71: MALSR PAR-38 Lamp-holder Assembly Parts List (Continued)

Item	Description	Part Number	Quantity	Note
4	PAR-38 tower mounting adapter (FAC)	62B0537	1	B
5	Lamp-holder assembly	44C1683	1	A

1. NOTE A: The lamp-holder assembly includes the PAR-38 lamp-holder (Item 2) and the slip fitter (Item 3). The lamp (item 1) is a separate line item and is not supplied with the lamp-holder assembly (item 5).

2. NOTE B: The mounting adapter (FAC) (item 4) is used in conjunction with the slip-fitter (item 3), when mounting the PAR-38 holder to a fiber glass or aluminum tower cross arms hub.

Figure 78: PAR-38 Lampholder



6.1.3 MALSR/ALSF In-pavement Flasher Parts List

It is recommended to create a sufficiently large stock of spare parts to maintain the fittings. It will mainly consist of consumables like lamps, O-ring gaskets, etc. Other components that may need replacement, such as prisms, prism gaskets, terminal blocks and hardware even as sub-assemblies should be stocked in smaller quantities. It is recommended to store at least one complete fitting, 44A7445.

The table below gives for each screw used in the 44A7445 12", the reference to the type of screw, the tool to use, and the type of "Loctite" when needed:

Table 72: MALSR/ALSF In-pavement Flasher Parts Requirements

Screw	Tool	Loctite	Torque
A1/A2	Socket hex, 3/8", J.9/16LA	Loctite 270 7870.05.110	190 in-lb (21 Nm)
B5 - screw TFC M5X10 DIN 965-Z INOX A2	Pozidriv2, RD.2	Loctite 270 7870.05.110	31 in-lb (3.5 Nm)
C2 - Screw TFC M5X10 DIN 965-Z INOX A2	Pozidriv2, RD.2	No	31 in-lb (3.5 Nm)
C4 - Screw TFC M4X10 DIN 965-Z INOX A2	Pozidriv2, RD.2	No	30 in-lb (3.3 Nm)
D7 - screw TFC M5X10 DIN 965-Z INOX A2	Pozidriv2, RD.2	No	31 in-lb (3.5 Nm)
Screws delivered for installation of adapter ring on deep base	Socket hex, 3/8", J.9/16LA	No	190 in-lb (21 Nm)

In the table below you will find the commercially available spare parts and main assemblies of the 44A7445 light fitting (the part numbers refer to [Figure 79](#))

Table 73: MALSR/ALSF In-pavement Flasher Parts List

Ref.	ADB part number	Description	Qty used in fitting	Order quantity (Per xx)
B	1440.02.300	Cover assy, including:	1	1
B1	4072.02.010	Machined cover	1	1
B2	MS00001-376-01	F-range 12 O-ring gasket	1	1
B3	4072.06.720	Prism kit consisting of	1	1
B3a	4072.02.030	Sleeve gasket for prism	1	1
B3b	4072.01.520	Prism	1	1
B3c	4072.02.060	Flat seal for Prism	1	1
B4	4072.02.070	Prism keeper plate	1	1
B5	64A0936-13	Pan head screw M5 x 13 - Stainless Steel -DIN 7985-Z	10	100
C1	2990.82.674	Flashing lamp 60J - 400V (see note 1.)	1	1
C2	64A0936-13	Pan head screw M5 x 13 - Stainless Steel - DIN 7985-Z	5	100
C3	4072.20.810	Trigger PCB (see Note 2.)	1	1
C4	4072.02.181	Lamp PCB (see Note 2.) - does not include the lamp	1	1
C5	64A0964-10	Screw THRD M4X10 Stainless Steel	5	100
D	1440.02.310	FFL inner inner cover assembly including :	1	1
D1	4072.02.010	Machined FFL inner cover	1	1
D2	7080.90.650	O-ring seal between top cover and shallow base, for F- Range 12"	1	10
D3	6126.01.330	PG16 cable entry IP54 cable diameter 10.5 to 16 mm	1	10
D4	4072.03.980	5-pole plug assembly	1	1

Table 73: MALSR/ALSF In-pavement Flasher Parts List (Continued)

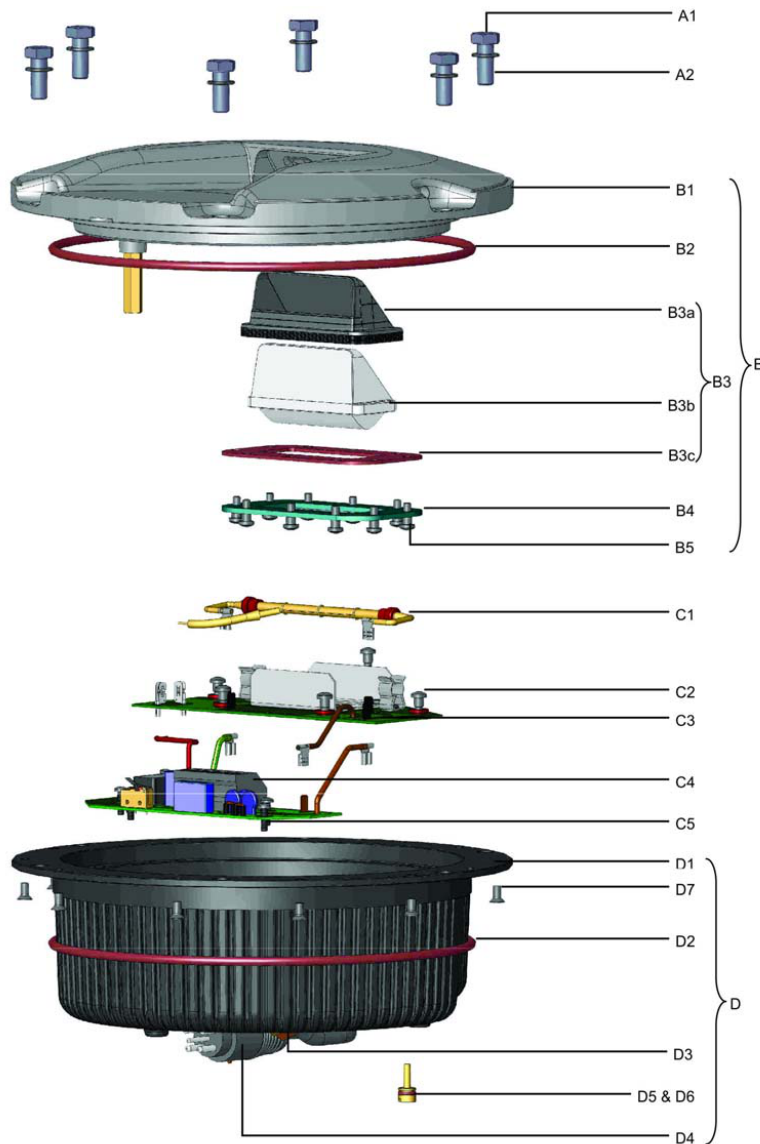
Ref.	ADB part number	Description	Qty used in fitting	Order quantity (Per xx)
D5	4072.20.981	Pressure release screw	1	10
D6	63B0267-011	O-ring for the pressure release screw	1	100
D7	64A0925-10	Screw TFC M5 X 10 Stainless Steel - DIN 965-Z	10	100



Note

Former version of the lamp, with fast-on connector on the trigger wire: 2990.82.671.
Order one Trigger PCB and one Lamp PCB to replace former FFL PCB ref. 4072.16.690.

Figure 79: Exploded Inset Light



6.2 Spare Parts

Refer below for optional parts.

Table 74: Parts: In-pavement Flasher

Item	Description	Part Number	Quantity	Note
NS	6-core cable ¹	6104.90.206	AR	
NS	Connector kit, in-pavement flasher, male plug	70A0618	1	
NS	Connector kit, in-pavement flasher, female receptacle	70A0619	1	

Notes

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

NS: Not shown

AR: As required

Table 75: Parts: PAR-56 or PAR-38 elevated lights

Item	Description	Part Number	Quantity	Note
NS	Adapter sleeve ¹	62B0537	1	
NS	Flasher tester	44D1686-1	1	
NS	EMT Frangible coupling	44B0180	AR	
NS	Frangible coupling (Type F2)	62B0064	AR	
NS	Lightning arrestor	47A0019	2	
NS	Power transformer, 15 kVA for MALSR only	44D1685-1	1	
NS	Flasher Assembly with PCB, for Elevated Flasher 1UE9C2Y0X001	SP011868	AR	Qty 1 = 5 lamps

Notes

¹ Used only on aluminum-tower cross arms to mount PAR-56 or PAR-38 lights, or on fiberglass tower for PAR-38 lampholders.

NS: Not Shown

AR: As required

Table 76: Parts: Optional

Reference	Description	Code number	Order qty
	Over-voltage protection cartridge for supply phase VAL-MS230ST	6134.03.050	1
	Over-voltage protection cartridge for supply neutral F-MS 12T	6134.03.060	1
	Temperature Sensor	1440.21.000	1

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

We can also be reached via email during regular business hours:

Airfield and Gate: **techservice.us@adbsafegate.com**

Gate: **gateservice.us@adbsafegate.com**

We look forward to working with you!

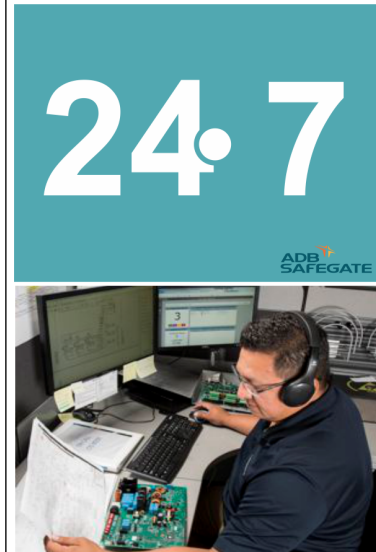
Before You Call

When you have an airfield lighting or system control system problem, prior to calling, please ensure the following:

- Review the product's manual and troubleshooting guide.
- Be located with the product ready to troubleshoot.
- Have all necessary information available: airport code/company name, customer id number, contact phone number/email address, product/part number.
- Have a *True RMS* meter available and any other necessary tools.

When calling about an issue with Safedock A-VDGS, we can serve you better if you collect the following information before you call:

- Relevant information regarding the issue you are calling about, such as gate number, flight number, aircraft type and time of the event.
- What, if any, actions have been taken to resolve the issue prior to the call.
- If available, provide a CCTV recording of the incident to aid in aligning the information from the Safedock log file.



Note

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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.

Company Addresses

ADB SAFEGATE, Belgium	ADB SAFEGATE BV Leuvensesteenweg 585, B-1930 Zaventem Belgium
Contact: Tel.: +32 2 722 17 11 Fax: +32 2 722 17 64	Email: marketing@adbsafegate.com Internet: www.adbsafegate.com
ADB SAFEGATE, Americas	ADB SAFEGATE Americas LLC 700 science Blvd, Colombus OH 43230, USA
Contact: Tel.: +1 (614) 861 1304 Fax: +1 (614) 864 2069	Email: sales.us@adbsafegate.com Internet: www.adbsafegate.com
ADB SAFEGATE, Sweden	ADB SAFEGATE Sweden AB Djurhagegatan 19 SE-213 76 Malmö Sweden
Contact: Tel.: +46 (0)40 699 17 00 Fax: +46 (0)40 699 17 30	Email: marketing@adbsafegate.com Internet: www.adbsafegate.com
ADB SAFEGATE, China	ADB SAFEGATE Airfield Technologies Ltd. China Unit 603, D Block, CAMIC International Convention Center, No 3, Hua Jia Di East road, ChaoYang district, Beijing 100102 P.R. China
Contact: Tel.: +86 (10) 8476 0106 Fax: +86 (10) 8476 0090	Email: china@safegate.com Internet: www.adbsafegate.com
ADB SAFEGATE, Germany	ADB SAFEGATE Germany GmbH Konrad-Zuse-Ring 6, D-68163 Mannheim Germany
Contact: Tel.: +49 (621) 87 55 76-0 Fax: +49 (621) 87 55 76-55	Email: marketing@adbsafegate.com Internet: www.adbsafegate.com



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