



Flashing System Installation

Types FCU-3-in-1 and FCU-1-in-1

User Manual

UM-4018_AM02-620e, Rev. 3.1, 2024/03/06



A.0 Disclaimer / Standard Warranty

CE certification

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

ETL certification

The equipment listed as ETL certified means that the product complies with the essential requirements concerning safety and C22.2 No.180:13 (R2018) regulations. The CSA directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

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ADB SAFEGATE will correct by repair or replacement per the applicable guarantee below, at its option, equipment or parts which fail because of mechanical, electrical or physical defects, provided that the goods have been properly handled and stored prior to installation, properly installed and properly operated after installation, and provided further that Buyer gives ADB SAFEGATE written notice of such defects after delivery of the goods to Buyer. Refer to the Safety section for more information on Material Handling Precautions and Storage precautions that must be followed.

ADB SAFEGATE reserves the right to examine goods upon which a claim is made. Said goods must be presented in the same condition as when the defect therein was discovered. ADB SAFEGATE further reserves the right to require the return of such goods to establish any claim.

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Note

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

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Note

See your sales order contract for a complete warranty description.

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

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WARNING

Use of the equipment in ways other than described in the catalog leaflet and the manual may result in personal injury, death, or property and equipment damage. Use this equipment only as described in the manual.

ADB SAFEGATE cannot be held responsible for injuries or damages resulting from non-standard, unintended uses of its equipment. The equipment is designed and intended only for the purpose described in the manual. Uses not described in the manual are considered unintended uses and may result in serious personal injury, death or property damage.

Unintended uses, includes the following actions:

- Making changes to equipment that have not been recommended or described in this manual or using parts that are not genuine ADB SAFEGATE replacement parts or accessories.
- Failing to make sure that auxiliary equipment complies with approval agency requirements, local codes, and all applicable safety standards if not in contradiction with the general rules.
- Using materials or auxiliary equipment that are inappropriate or incompatible with your ADB SAFEGATE equipment.
- Allowing unskilled personnel to perform any task on or with the equipment.

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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 Laser Safety Information

Safedock system is an Advanced Visual Docking Guidance System, an aircraft parking aid for airport and aircraft safety and efficiency. The design is according to strict airport industry standards for the safety of, and use by authorized airport personnel.



CAUTION

The chapter [Operating Procedures](#) must be distributed to all airlines using the system.

- Airport Operations, Maintenance and other Authorized Personnel
- This information is a summary of the safety requirements on operation and maintenance personnel based on general electrical and laser safety precautions.



CAUTION

It is very important for authorized personnel to study this section before any operation or maintenance work on the system is commenced.

- Safedock system should only be used by airport operations and maintenance personnel who have been properly trained in the use of the system. ADB SAFEGATE takes no responsibility for incorrect use of the system. All warnings contained in the text of this manual must be strictly observed.
- Airport operations and maintenance personnel are strongly advised to observe the following symbols and safety advisories.



CAUTION

Laser Safety

Store this equipment properly

- Safedock system is a Class 1 laser product, which means that it is safe under foreseeable conditions of operation, including the use of optical instruments for infra beam viewing.
- The Laser Scanning Unit compartment of the Pilot Display unit contains a Laser Range Finder, which is a Class 1M laser product. A Class 1M laser product is safe under foreseeable conditions of operation, but may be hazardous, if the user employs optical instruments within the beam, e.g. binoculars or telescope.

Failure to follow this instruction can result in permanent eye injury.



CAUTION

Invisible Laser Radiation

Store this equipment properly

- The laser output from this system is within Class 1 limits (USA FDA 21 CFR 1040.10 – 11 and IEC 60825-1:2014 (Third Edition) as long as the range finder is installed and operated as specified by ADB SAFEGATE.
- If operated in any other fashion than described, the range finder is capable of emitting radiation up to Class 1M limits.

Failure to follow this instruction can result in permanent eye injury.



CAUTION

Eye Safety

Store this equipment properly

- ADB SAFEGATE accepts no liability for the misuse of its equipment or for the consequences of this misuse.
- ADB SAFEGATE recommends that eye safety procedures be followed in accordance with ANSI Z136.1 – 1993 or IEC 60825-1 during maintenance.
- The laser beam exiting the window of the Safedock enclosure is within Class 1 limit for eye safety, when the product is operated as specified by ADB SAFEGATE.
- To provide eye safety the user is advised to treat this laser unit as a Class 1 M laser product. Class 1 M denotes lasers or laser systems that can produce a hazard if viewed through light collecting optics such as binoculars.

Failure to follow this instruction can result in permanent eye injury.

Table 1: Laser Information

For the laser the following values apply:

- Pulse width ~ 10 ns
- Wavelength 905 nm



CAUTION

If the laser by any reason should be switched on and used outside the docking system, safety procedures may include, but are not necessarily limited to the following:

- Do not stare into the laser beam.
- Do not view the beam with binoculars or other devices that collect light.
- Do not point the laser at people.



CAUTION

Do not point the laser range finder at the sun.

1.1.8 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

1.1.9 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 About this manual

This document includes information with focus on safety, installation and maintenance procedures.

For more information, see www.adbsafegate.com.



Note

It is very important to read this document before any work is started.

The manual covers installation of the following:

- FCU-1 and FCU-3

If in the manual the term equipment used, this refers to both the FCU-1 and FCU-3.

2.1 How to Work with the Manual

1. Familiarize yourself with the structure and content.
2. Carry out the actions completely and in the given sequence.

2.2 Abbreviations and Terms

Table 2: Terms and abbreviations

Abbreviation and term	Description
AC	Alternating Current
ALFS-1	Flashing mode: Approach Light System with Sequenced Flasher heads (ILS Cat- I configuration)
ALFS-2	Flashing mode: Approach Light System with Sequenced Flasher heads (ILS Cat-II configuration)
AWG	American Wire Gauge
Binary notation	All data in the digital circuits is treated using "1" and "0". Thus, all decimal notations are transcribed into binary notations.
CPU	Central processing unit
DC	Direct Current
E ² PROM	Electronically Erasable Programmable Read-Only Memory
Equipment	Both FCU-1 and FCU-3, if the information is the same
FAA	Federal Aviation Administration
Fastener	Generic term for an item that holds the equipment together or that holds the equipment on its mounting support, e.g. nut, bolt, washer
FCU	Flasher Control Unit
FE-LiYCY	A type of flexible multi-core cable
FFL	ADB type inset flashing head
Flasher head	An elevated or inset flashing light
Flasher unit	A combination of flashing electronics and flasher head
Flashing rhythm	The rhythm in which the flashing system flashes. The flashing rhythm consists of two elements: cycle time and sequence time.
Flashing system	A number of flashing units operating as an RTILS or sequenced flashing system

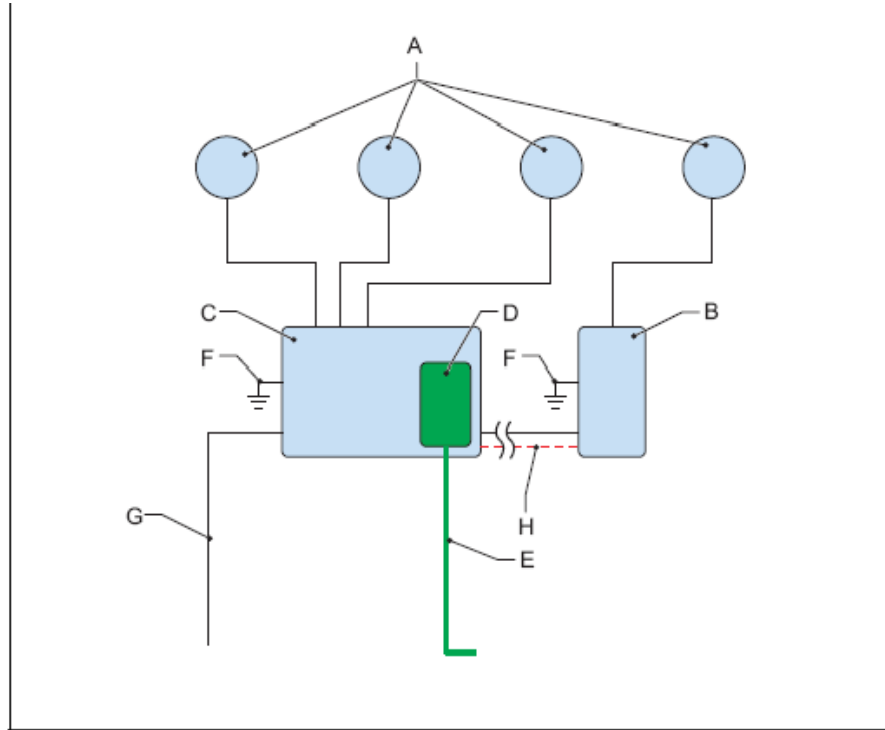
Table 2: Terms and abbreviations (Continued)

Abbreviation and term	Description
Hexadecimal notation	This is a way to write numbers in base of 16, instead of the standard 10. In the manual, it is used for bits and addresses, because it identifies better the active data address or data lines (16 or 8-bit large).
ICAO	International Civil Aviation Organisation
IGBT	Isolated Gate Bipolar Transistor
LMC	Local Master Controller
Local bus	The communication bus, which exchanges data and control signals between the FCUs and the LMC.
MALSF	Flashing mode: Medium-intensity Approach Lighting System with Sequenced Flasher heads
MALSR	Flashing mode: Medium-intensity Approach Lighting System with Runway alignment indicator
Mod bus	The communication bus, which communicates with the customer control system.
MOV	Metal-Oxide Varistor
MW	Multiwire
ODALS	Omni Directional Approach Lighting System
PC	Personal Computer
PCB	Printed Circuit Board
PCMCIA	Personal Computer Memory Card International Association
PE	Protective Earth
PU	PolyUrethane
RC circuit	Circuit wit a resistance and a capacity
REILS	Runway End Identification Lighting System
RTILS	Runway Threshold Identification Lighting System
SMPS	Switched Mode Power Supply
SSALR	Flashing mode: Simplified Short Approach Lighting System with Runway alignment indicator
SSALS	Flashing mode: Simplified Short Approach Lighting System with Sequenced flasher heads
TWAVBI	Type of armored multiwire underground signalization cable
UEL	Unidirectional Elevated Light type (ADB type elevated flashing head)
WAGO	Brand of spring leaf connectors

3.0 Introduction

3.1 Flashing System Overview

The illustration shows a schematic overview of the components of a flashing system. The design plan shows the actual lay-out. A flashing system can contain up to 32 flashing heads.

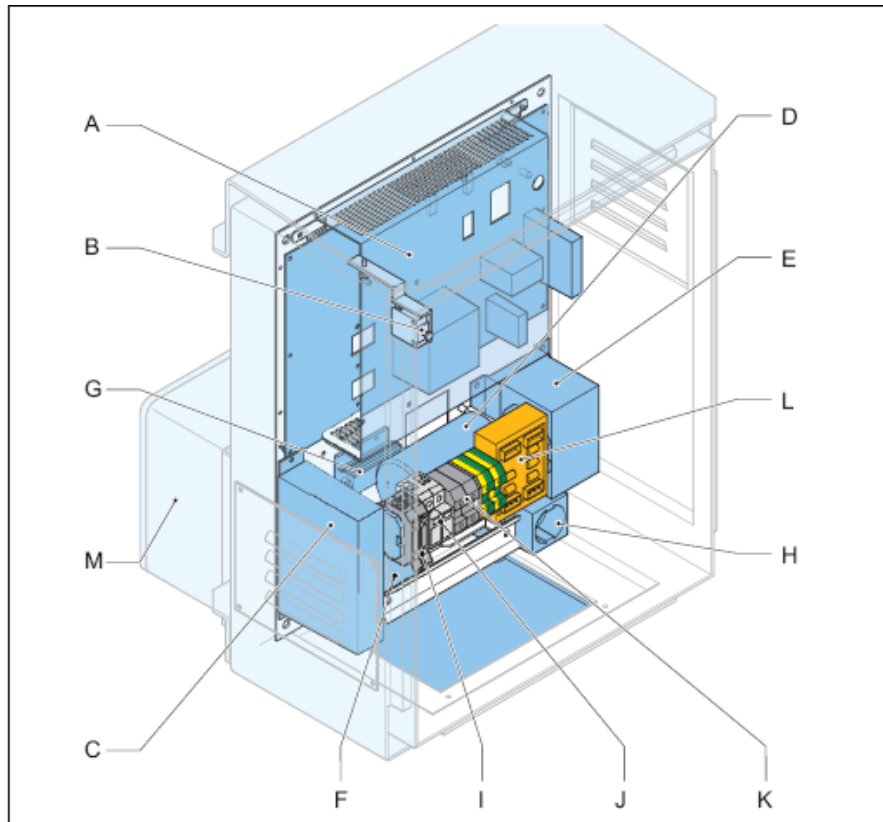


Main items	A Flashing head
	B FCU-1
	C FCU-3
	D Local Master Controller (LMC) PCB
	E Interface to remote control
	F Earthing/Counterpoise system connection
	G Power cable (parallel system)
	H Local bus

Every flashing system has one LMC. The LMC can be installed in an FCU-1 cabinet or in a FCU- 3 cabinet.

3.2 Lay-out of the Equipment Cabinets

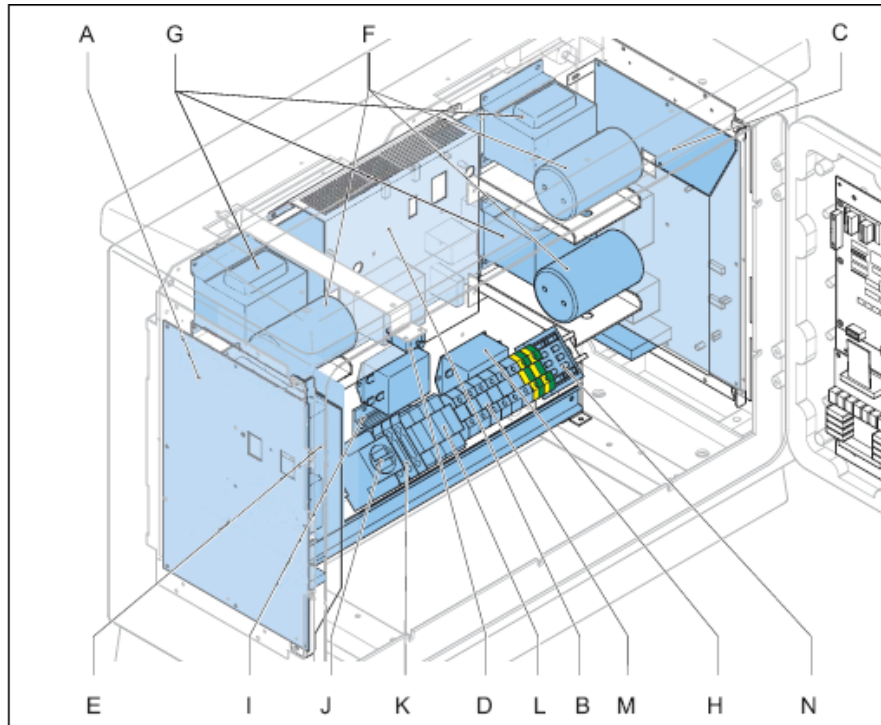
3.2.1 FCU-1



Main items

- A FCU PCB
- B Door micro switch
- C DC power supply module
- D Capacitor
- E Choke
- F Mains filter
- G Heater resistance
- H Mains socket outlet (option)
- I Fused input switch (F1)
- J Over-voltage protection modules (MOV)
(option)
- K Power input terminals
- L Local bus connection board
- M Junction box (option)

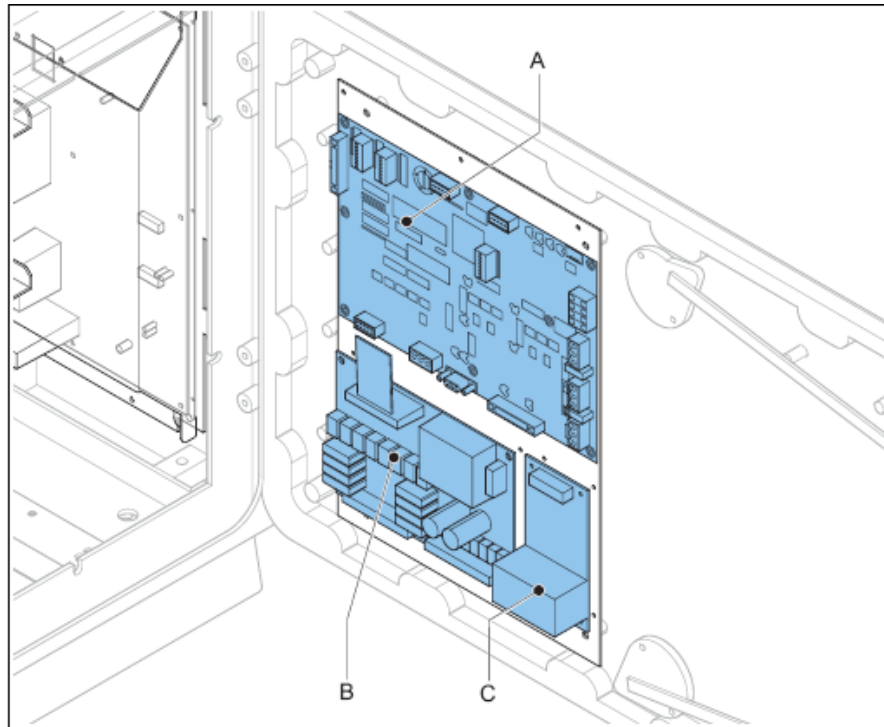
3.2.2 FCU-3



Main items

- A FCU PCB left
- B FCU PCB middle
- C FCU PCB right
- D Door micro switch
- E DC power supply module
- F Capacitor (x3)
- G Choke (x3)
- H Mains filter (x3)
- I Heater resistance
- J Mains socket outlet (option)
- K Fuses (F1, F2 and F3)
- L Over-voltage protection modules (MOV) (option)
- M Power input terminals
- N Local bus connection board

3.2.3 LMC



Main items

- | | | | |
|---|--|---|------------------------------|
| A | Local Master Controller (one per complete flashing system) | B | Multiwire interface (option) |
| | | C | J-Bus interface (option) |

3.3 Intended Use

The equipment is designed to control flashes of UEL or FFL type flasher heads.

The flasher heads operate at an approach or a threshold area in sequenced flashing approach lighting systems or RTILS (REILS) at airports.

The flasher heads flash in a predefined sequence, interval and repetition rate.

Each flash unit that has a fitting needs a separate FCU PCB.

3.4 Description

Introduction

The equipment cabinets in the flashing system exist in two variants:

- FCU-1: one cabinet with one FCU for a single flash unit; single-phase power supply;
- FCU-3: one cabinet with three FCUs for 3 flash units: three-phase power supply.

It is possible to combine these two types of cabinets in one system. Then, FCU-1 cabinets must have a separate junction box (option) to connect to the three-phase power supply.

It is possible to connect the FCU-3 in a single-phase power supply. Then the number of flash units is limited to an RTILS.

Each equipment is an autonomous device and receives an unique sequence number that serves as a logical address.

The maximum number of equipments in a flashing system that is controlled by one LMC is 32.

Frangibility

The mounting support of the equipment is not frangible, due to the mass of the equipment cabinet and the electrical cables. Install the equipment outside the safety area of the approach. This means there is an increase in distance between the equipment and the flasher head. The equipment compensates for losses in the cable between the flasher head and the equipment, provided that that you use cables with the correct cable cross sections.

FCU PCB

The FCU PCB in every equipment:

- Receives input messages from the LMC and is connected with the separate equipments through the local bus connection;
- Charges the flash capacitor;
- Monitors the discharge current and misfires through the lamp;
- Enables three lamp brightness levels to be adjusted.

LMC

Each equipment operates as a slave and is connected to a LMC. For a description of the LMC, see § [Local Master Controller \(LMC\) Description](#) .

Lightning Protection

The equipment cabinets may have an over-voltage protection (option). All metal parts are interconnected and the cabinet includes earthing lugs for an earthing connection. You can add an optional overvoltage protection for areas with a high risk of lightning.

Local Bus Connection Board

The local bus connection board interconnects all the devices of a system as a part of an RS-485 protocol. Inside the equipment cabinets, the equipments are pre-connected at delivery. The interconnection of all equipment cabinets in a flashing system must be realized with a screened dual twisted pair connection.

The local bus connection board has a set of gas arresters that provide over-voltage protection for the local bus wiring.

3.5 Local Master Controller (LMC) Description

The LMC controls a complete flashing system and interfaces to remote controls. The LMC is the interface between the control system and the flashing system.

The LMC makes it possible to:

- Monitor and configure the whole flashing system from any cabinet in the system with a configuration software tool and PC, if you purchased this option.
- Measure and control the temperature of each cabinet.
- Receive a signal if the micro switch of the flasher unit or the cabinet door is open. In this case, the flasher capacitor is also discharged.
- Receive MOV signals.
- Regulate the flashing rate and intensity.
- Control the status of all the connected equipments.

An internal temperature probe is installed on the LMC connector.

Location

The LMC is a PCB installed in the cabinet door of any equipment cabinet in the flashing system. It is recommended to install the LMC in an equipment that you can easily access for maintenance.

Rotary Switch

The LMC has a rotary switch that makes it possible to switch between:

- Remote control;
- Local control.

For more information on the rotary switch, see § [Local Master Controller \(LMC\) - PCB1513](#) .

External Temperature Probe

One external temperature probe per flashing system must be installed onto any equipment cabinet in the system. The LMC reads the data from the external temperature probe and uses the data to control the anti-condensation heating resistors. The temperature probe reads the actual ambient temperature.

Start-up and Scanning

At start-up, the LMC reads its local memory to find the system configuration. Then, the LMC contacts all the FCU PCBs in the flashing system through the local bus. Then, the LMC sends system configuration data to each equipment to program them for normal operation.

After the start-up sequence, the LMC continues to scan all the FCUs sequentially to ensure correct operation. If the system has RTIL flashers, they are scanned at a higher rate because it is required to switch one OFF if the other fails (misfires).

Synchronization

The LMC synchronizes all equipments to make sure that they flash in a correct flashing rhythm.

To do this, the LMC sends a message to all equipments at regular intervals.

3.6 Options

Remote Control between Flashing System and Tower

Each equipment can be controlled remotely with Multiwire, J-Bus, or a combination of the above. See § [Remote Control Description \(option\)](#) .

Over-voltage Protection

The equipment can be supplied with an extra over-voltage protection. When an overvoltage is supplied to the individual equipment cabinets, the over-voltage protection activates. An alarm can be generated through the feedback of the LMC. When the origin of the problem is solved, it is necessary to replace the MOV cartridge.

Dongle

The dongle enables you to connect the equipment directly to a PC. A special configuration software tool makes it possible to monitor and control the complete flashing system that one LMC controls.

When the dongle is connected between the system and a PC, the PC takes over the control of the flashing system. In this case, the dongle collects all the necessary data from the LMC and the individual equipments. When the dongle is connected, it also provides the synchronization messages instead of the LMC.

3.7 Remote Control Description (option)

J-Bus

The J-Bus interface uses a single or dual databus(es) to allow remote monitoring of a bigger quantity of parameters.

- With a single databus, the equipment has only one communication channel.
- With a dual databus, the equipment has two communication channels: Bus A and Bus B.

The communication channels must take different routes to avoid a communication failure if one cable is interrupted.

Multiwire PCB

A multiwire PCB has 2 times 12 terminals. The terminals handle the maximum 8 incoming and maximum 8 outgoing signals between the equipment and the remote control system.

There is only one multiwire PCB possible per LMC, so also one multiwire PCB per flashing system.

The multiwire interface provides control and back-indication signals for basic remote control functions between the equipment and a remote control system.

The terminals of the multiwire PBC handle the incoming and outgoing signals between the equipment and the remote control system.



Note

The factory settings apply a specific signal to one terminal. If you want to make changes, this is possible when you commission with the configuration software tool. It is necessary to configure a specific signal only to one terminal.

Control Signals

The control signals feed relay coils. An RC circuit protects the relay coils for transient over- voltage.

Table 3: Multiwire Options

Multiwire	48 VDC remote control	24 VDC remote control
Minimum voltage	40 VDC	21.6 VDC
Maximum voltage	65 VDC	35 VDC
Current consumption	Approximately 9 mA at 48 VDC	Approximately 16 mA at 24 VDC

The multiwire 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

4.0 Inspection and Transport

4.1 Inspect Equipment upon Delivery

Each equipment cabinet and flash unit comes in a crate.

1. Check if the crate is not damaged.
2. If the crate is damaged, tell the carrier immediately.
3. Unpack the crates.
4. Check if the equipment corresponds to your order.
5. Check the equipment for damage.
6. If the equipment is damaged or does not correspond to your order, tell the carrier immediately.



Note

The LMC is packed separately.

4.2 How to transport the Crate



CAUTION

- **The maximum weight of the equipment is approximately 47 kg (FCU-3) or 19.4 kg (FCU-1).**
- **Keep the crate in a vertical position at all times.**
- **Do not let the crate tilt or fall.**
- **The center of gravity of the crate is not the same as the physical center of the crate.**

4.3 Unpack at Installation Area

Before you take the equipment out of the crate, make sure that the equipment is at the installation area.

1. Remove the cover and side panels of the crate.
2. Make a visual inspection on the external side of the equipment.
3. Move the equipment carefully to the applicable location. *Two persons are required to lift the equipment.*

5.0 Pre-Installation

5.1 How to pre-install - general Procedure

1. Check the design of the flashing system lay-out.



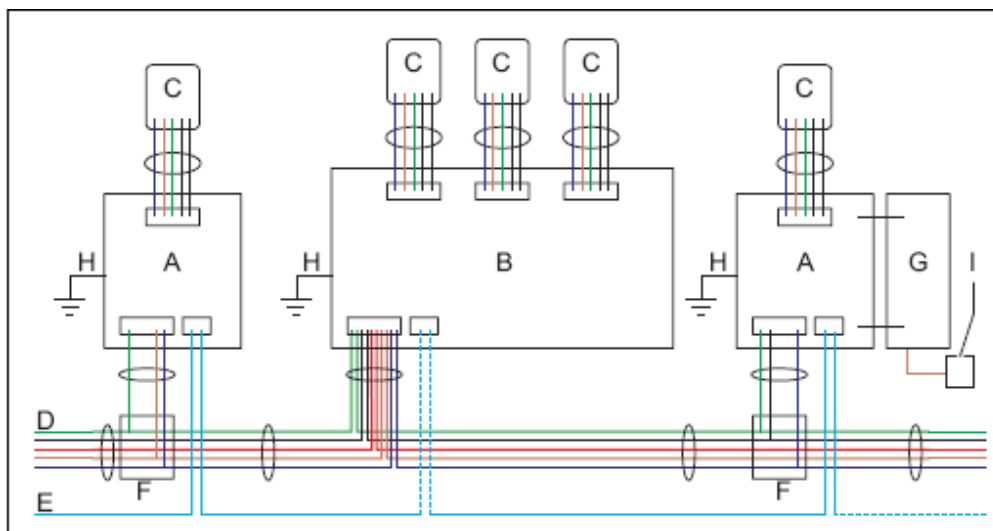
CAUTION

Make sure the installation of the equipment is not planned in an area that can get flooded.

2. Plan the cables and the lay-out of the cables. See § [Plan Cables and Lay-out of Cables](#) .
3. Design and cast the concrete foundations. See § [Design and cast Concrete Foundations](#) .
4. Install the cables on site. See § [Install Cables on Site](#) .

5.2 Plan Cables and Lay-out of Cables

The cables are not part of the standard equipment delivery.



- A FCU-1 cabinet
- B FCU-3 cabinet
- C Flasher head
- D Power supply cable
- E Local bus cable
- F Junction box
- G LMC
- H Earthing wire
- I Remote control interface

5.2.1 Power Supply Cable to Equipment Cabinets

- Plan an energy distribution cable suitable for the supply voltage range and for underground installation.
- Calculate the cross section of the cable. Use the power supply cable calculation tool. This tool is available from ADB upon request.
 - When you carry out the calculations, make sure that the last FCU PCB receives at least 190 VAC between the phase and neutral conductor;
 - Calculate maximum 1.5 A per FCU PCB.
- Make sure the cable is suitable for 415 V AC.

- Make sure that the cable is screened: PVC covered, flexible metallic conduit.
- Calculate the number of conductors:

Type	Number of conductors
one-phase	3: phase, neutral and protective earth. The voltage between the ground and the protective earth conductor must be 0 V.
three-phase	5: 3 phases, neutral and protective earth



Note

In a system with a combination of FCU-1 and FCU-3 cabinets, all equipment cabinets must have a three-phase power supply. This means that all FCU-1 cabinets must have a separate junction box for the phases.

5.3 Connection between Equipment and Flasher Heads

- Define the cross-section of the wires in the cable. See the table below:

Table 4: Power supply cable cross-sections and length

Cross-section [mm ²]	Maximum cable length [m]
1.5	30
2.5	50
4.0	80
6.0	100

5.3.1 Earthing Wires for Equipment Cabinets

- Plan an earthing wire to earth each equipment cabinet with an individual earthing rod at each equipment cabinet.
- Use standard earthing wires, with a resistance to earth of maximum 10 Ohms at each point of the earthing network.
- Make sure that you apply the earthing wires according to the local regulations.

5.3.2 Local Bus Cables

- Plan the necessary local bus communication cables.

Table 5: Recommended local bus communication cables

Type	Number of conductors	Diameter [mm]
JE-LiYCY with armoring type R, B, Q or Z	two pairs twisted	0.5
TWAVB	two pairs twisted	0.8

5.3.3 Cables to Remote Control Interface



WARNING

Only earth the remote control cable at one location. Only earth the local bus connection at the first equipment cabinet. Only earth the remote control bus at the tower level.

Multiwire Cables (Option)

- Plan screened cables with the screen connected to the ground at only one end.
- Plan the signal wires:
 - Plan one paired wire for the signal and the other wire of that pair as a return. Bundle all returns to the same terminal to minimize the voltage drop.
 - Do not combine the remote control and back-indication signals in one cable, except when these signals do not require more than low-level isolation. The latter is the case if the remote control and back-indication signals use one common energy source.
- Calculate the wire sections. Take into account these items:
 - The tolerances of the power supply;
 - The maximum permitted voltage drop on the line. This is the minimum available power supply voltage minus the minimum required voltage for the load. The coils of the relays have a resistance of 1700 Ohm;
 - The typical resistance;
 - The required load current in each line;
 - The number of signals that may exist at the same time.

Table 6: Recommended multiwire cables

Type	Number of conductors	Diameter [mm]
JE-LiYCY with armouring type R, B, Q or Z	number of signals + return(s)	0.5
TWAVB	number of signals + return(s)	0.8

Table 7: Wire sections and cable lengths for multiwire cables

Diameter [mm]	Typical resistance at 55 °C [Ohm/m]	Power supply tolerance [%]	Maximum cable length 48 V DC [km]	Maximum cable length 24 V DC [km]
0.5	0.1	-5	3	0.65
		-10	1.7	-
0.8	0.04	-5	7.5	1.5
		-10	4	-

J-Bus cables (option)

- For a Tx+/Tx- and Rx+/Rx- connection plan a twisted-pairs cable.
- Provide screened (armoured) data cable according to the selected protocol:
 - RS485 (2 wire communication).
 - RS422 (4 wire communication).
 - One cable for a single J-bus, two cables for a dual J-Bus.

Table 8: Wire sections for J-Bus cables

Cable type	Number of wires	Diameter [mm]
JE-LiYCY (with armouring type R, B, Q or Z)	2 or 3 pairs twisted	0.5
TWAVB	4 or 6 x 0.8mm (0 V wire)	0.8

Ideally, the maximum length of a J-Bus cable is 1200 m.



CAUTION

Do not mix J-bus A and J-bus B signals in one pair.

5.4 Design and cast Concrete Foundations

Install the equipment cabinets on concrete slabs. Take into account these requirements:

- The slab must rest in firm soil, below the frost line.
- The slab must protrude slightly above the ground level.
- Protrusion must be limited to the minimum, which is necessary to avoid possible flooding.



CAUTION

If the cabinets are installed in a critical zone, make sure that the concrete slabs do not protrude above the ground. For more regulations, see the ICAO Aerodome Design Manual (Annex 14, Volume I, chapter 5).



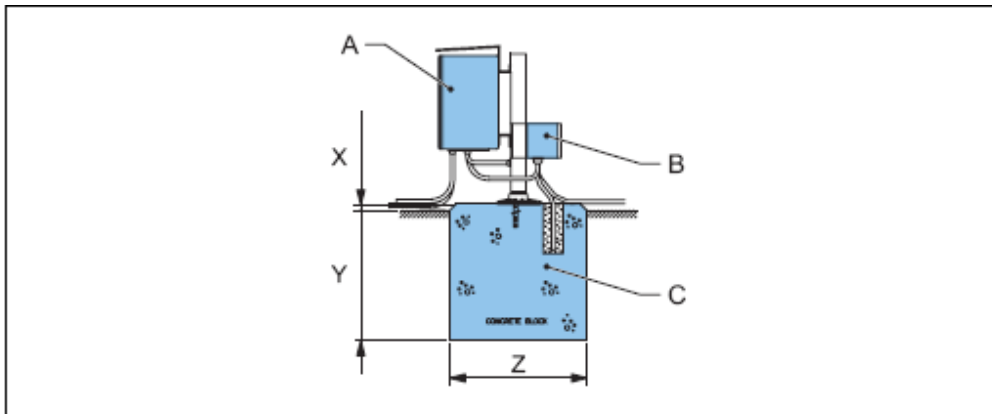
Note

The illustrations show typical dimensions. Adjust the dimensions of the concrete foundation to the actual soil conditions

Jet Blast

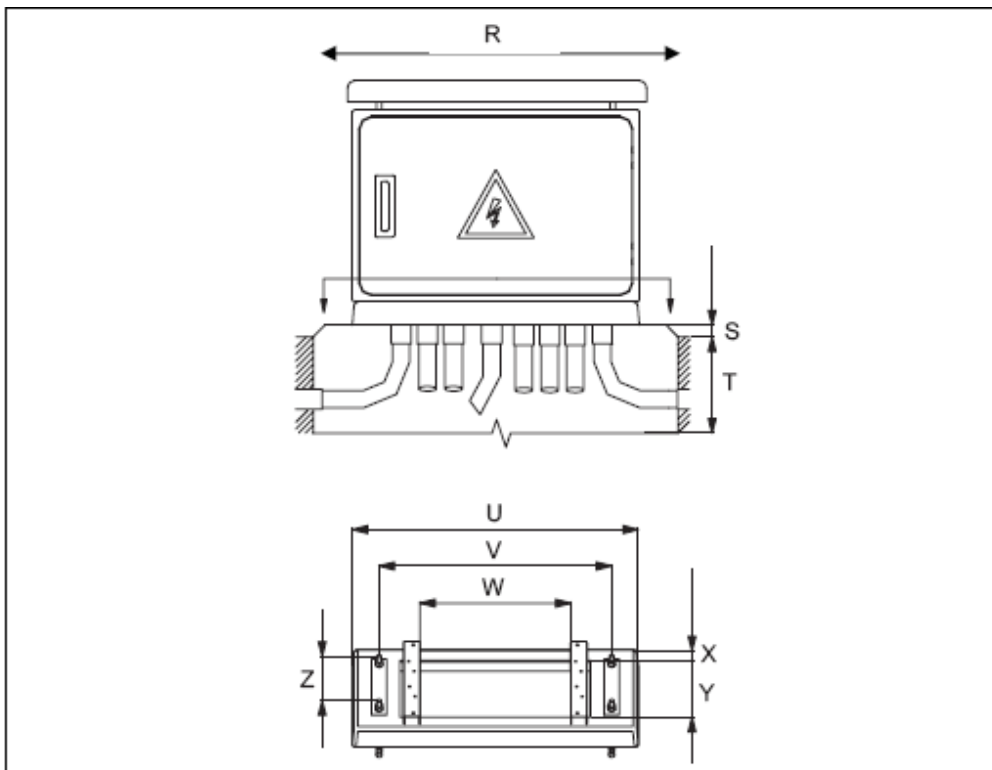
To limit the effects of jet blast, make sure the equipment cabinets face the largest vertical surface parallel to the approach axis.

FCU-1



- A Equipment cabinet
- B Flash unit
- C Junction box
- D Concrete slab
- X 25 mm
- Y 525 mm
- Z 750 mm (square)

FCU-3



- R 800 mm
- S 25 mm
- T 50 mm
- U 750 mm
- V 610 mm
- W 400 mm
- X 160 mm
- Y 50 mm
- Z 200 mm

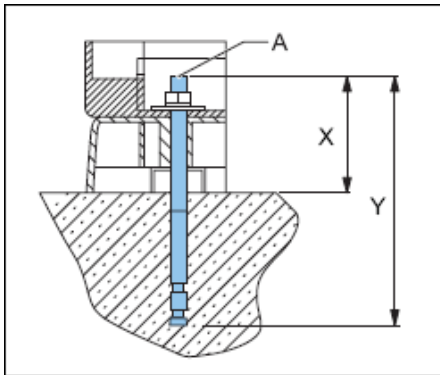
Each cable enters the cabinet via its own duct trough the concrete slab:

- FCU-3 without LMC: 7 cables (power in, power out, local bus in, local bus out, flasher head 1, flasher head 2, flasher head 3);
- FCU-3 with LMC: up to 9 cables (same as without LMC and additionally multiwire, Bus A, Bus B).

5.4.1 Cast Concrete Foundations

Cast

1. Cast the concrete on site.
2. Cast the concrete around the empty cable ducts.
3. Install anchor bolts for the equipment cabinets into the concrete.
4. Protect all openings in the slabs from ingress of vermin, insects and water
 - A: anchor bolt;
 - X must be between 95 and 100 mm;
 - Y must be 180 mm.



5.4.2 Install Earthing / Counterpoise System



CAUTION

Take all necessary precautions to limit the damage caused by lightning strikes. However, even all the recommended precautions cannot guarantee that a lightning strike does not cause any damage.



Note

The earthing wire system balances the ground tension between the equipment cabinets. The counterpoise is an earthing wire you install above the rest of the cables to protect the rest of the cables in a + and - 45 degrees angle.

1. Connect a bare-copper conductor according to local regulations to the earth terminal of each equipment cabinet.
2. Make sure that the resistance complies with all local regulations.
3. Install an earthing rod at each equipment cabinet.
4. Use the MOV over-voltage protection (option) in all areas where lightning occurs frequently.
5. ADB strongly recommends to install one earthing rod with each equipment cabinet to achieve a local direct overvoltage drain to the ground.

5.5 Install Cables on Site

1. Make sure the cables comply with the local rules and regulations.
2. Provide sufficient mechanical protection for the actual conditions on site.
3. Provide adequate earthing of the cable screening/armoring.
4. Allow for one meter cable slack above ground for all cables.

6.0 Installation

6.1 Installation - general Procedure

1. Check the pre-installation. See § [Check Pre-installation](#) .
2. Check the required tools. See § [Required Tools](#) .
3. Transport the cabinet to the correct location. See § [How to transport the Crate](#) .
4. Unpack the equipment. See § [Unpack at Installation Area](#) .
5. Install the equipment. See § [Install](#) .
6. Install the electrical connections. See § [Install electrical Connections](#) .
7. Install the remote control connections. See § [Install Remote Control Connections](#) .

6.2 Check Pre-installation

Table 9: Table: 6.1 Check list

Checked	Item
	There is a sufficiently detailed flashing system layout.
	Cables are installed according to the designed layout.
	All cables have approximately one meter slack above ground.
	All concrete foundations are cast according to the applicable design specifications.
	All anchor bolts are present and installed according to the applicable design specifications.

6.3 Required Tools

- True RMS Multimeter;
- Standard electrical and mechanical tool kit;
- Screwdrivers with protection up to 1000 V;
- One gland with an inside diameter of 17mm (to install a temperature probe). This gland is not supplied with the equipment;
- Cable binders (to install the temperature probe);
- WAGO tool (6112.32.500) to open the individual contractors of the WAGO cage-clamp terminals;
- Door key, to open the equipment cabinets;
- PU foam;
- Watertight sealant.

If you want to configure the system through software:

- PC with serial port connection:
- Dongle with connection cables and Flasher Configuration Software.Installation

6.4 Install

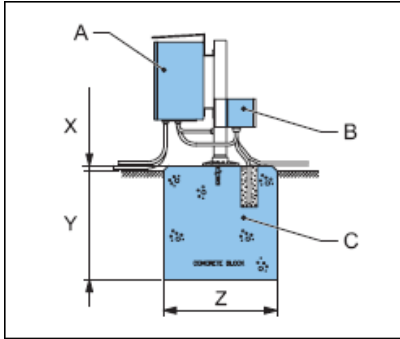
6.4.1 Install Equipment Cabinets

Identify

1. Identify the equipment cabinet with the serial number.

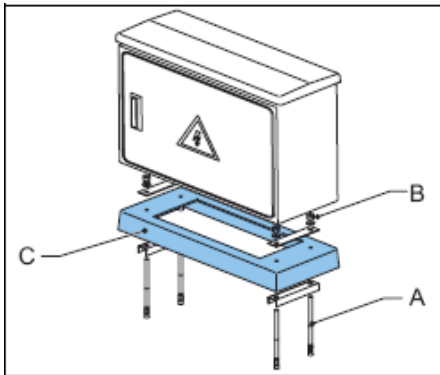
FCU-1 cabinet

2. Install the pole on the concrete slab (C). *Use the mounting kit.*
3. Install the cabinet (A) on the pole.
4. In the case of a three-phase power supply:
 - Deviate the cable to the junction box (B) or use an underground T-junction.
 - Install a two-core and an earthing cable between the junction box and the FCU-1 cabinet.
5. Through the bottom, put the cables in the FCU-1 cabinet.



FCU-3 cabinet

6. Install the cabinet base (C) on the anchor bolts (A).
7. Tighten the nuts (B).
8. With PU foam, top of the cable ducts.
9. Apply a watertight seal:
 - between the cabinet base and the concrete;
 - between the cabinet base and the equipment cabinet.



6.4.2 Install Local Master Controller (LMC)

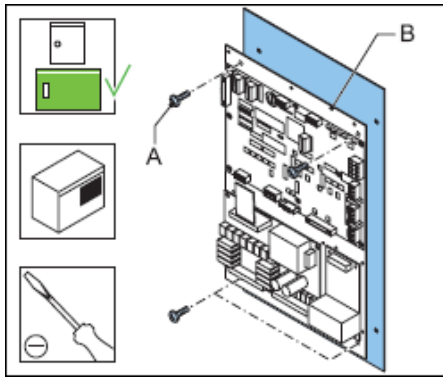


Note

It is recommended to install the LMC in an equipment that you can easily access for maintenance.

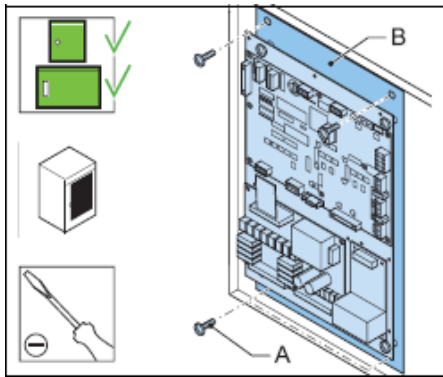
Remove the outer mounting plate (FCU-3 only)

1. Remove the screws (A).
2. Remove the outer mounting plate (B).
3. Dispose of the outer mounting plate.



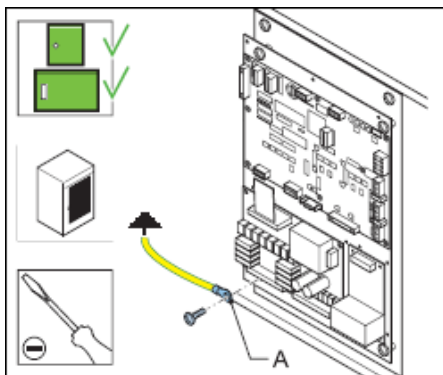
Install (FCU-1 and FCU-3)

4. Open the door. Use the door key .
5. Install the LMC PCB on the inside of the door (B).
6. Install the screws (A).



Connect and finish (FCU-1 and FCU-3)

7. Connect the earthing wire between the fixation point (A) and the earthing of the cabinet. .
 - Use the short or long cable that is supplied with the equipment.
 - The fixation point can be located at the lower right corner of the equipment cabinet
8. Close the door.



6.4.3 Install external Temperature Probe

Per flashing system, one temperature probe is supplied. You can find in the package with the LMC master PCB.

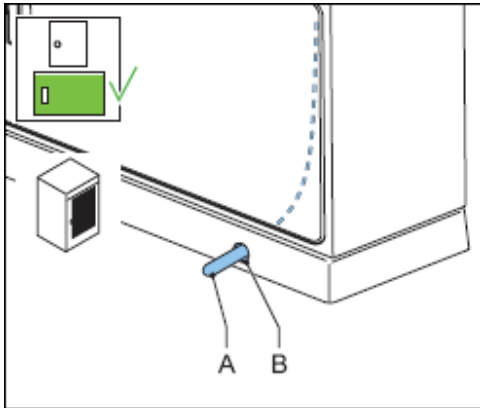


Note

Install the temperature probe outside the equipment, outside the influence of direct sunlight and shielded from any other influence than the actual ambient temperature.

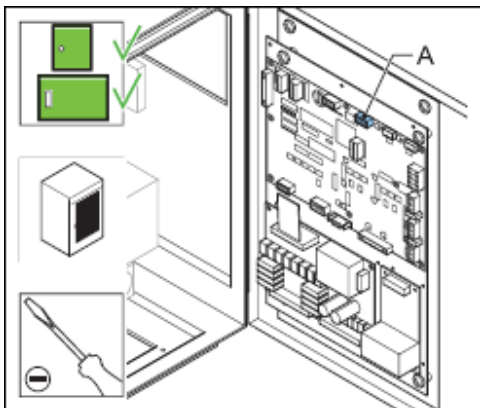
Install

1. Make a hole:
 - in the cabinet bottom or in the gland plate (FCU-1 only);
 - or in the cabinet base (FCU-3 only) *See the illustration* ;
 - or in the cabinet top below the sunshield (FCU-1 or FCU-3);
2. If you made an extra hole, install the 17 mm gland.
3. Put the temperature probe (A) through the gland (B).
4. Make sure the temperature probe is just outside the hole.
5. Make sure the temperature probe is tightened.
6. Apply a watertight gland to protect the equipment from ingress of vermin, insects and water.



Connect

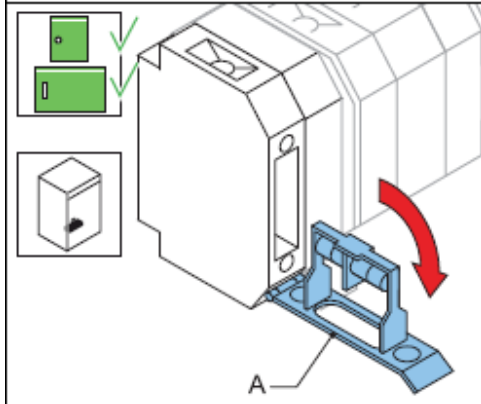
7. Connect the cable of the temperature probe to the LMC PCB at (A).



6.5 Install electrical Connections

6.5.1 Switch OFF Power Supply

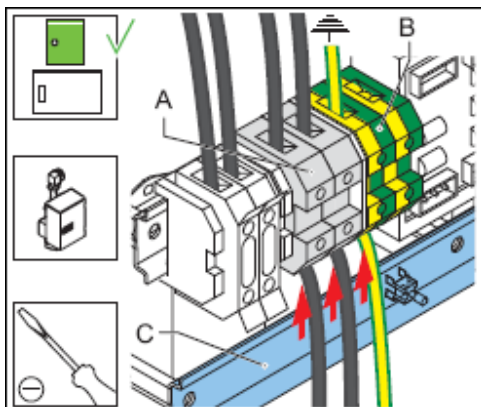
1. Switch OFF the main power supply at the substation.
2. Open the fused input switches (A).
 - FCU-1: fuse holders F1 and F2;
 - FCU-3: fuse holders F1, F2 and F3;



6.5.2 Connect Power Input Supply

FCU-1 cabinet with one-phase cable

1. Strip the cables at the end.
2. Connect the input power cables to the terminal L1 and N (A). *Make sure you connect the neutral cable to the blue connector.*
3. Connect the earthing wire to the terminal (B).
4. Attach the cable screens to the stress relief rail (C). *Use a clamp.*
5. Connect the earthing wire to the earthing network of the substation.



FCU-1 cabinet with three-phase cable

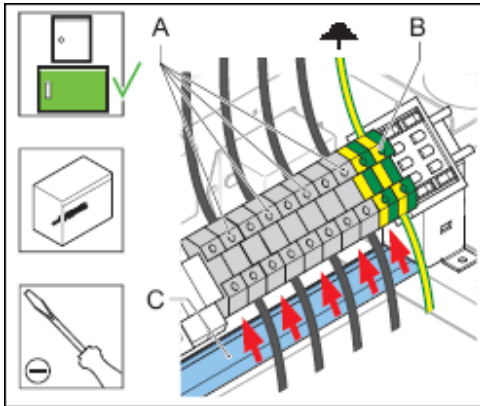
6. Split the three phase cable to one phase in a junction box.
7. Connect the one phase cable. See the previous paragraph.

FCU-3 cabinet

Connect - 1

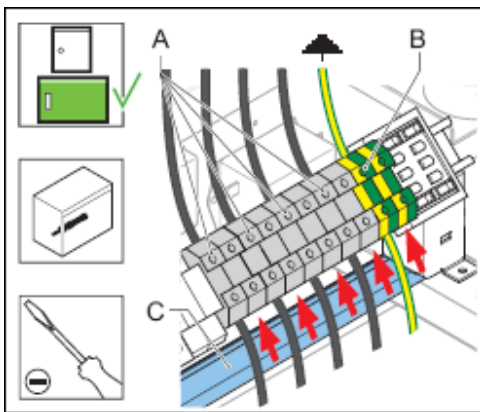
8. Strip the cables at the end.

9. Connect the input power cables to the terminals L1, L2, L3, N (A).
10. Connect the earthing wire to the earthing terminal (B).
11. Attach the cable screens to the stress relief rail (C). Use a clamp.



Connect – 2

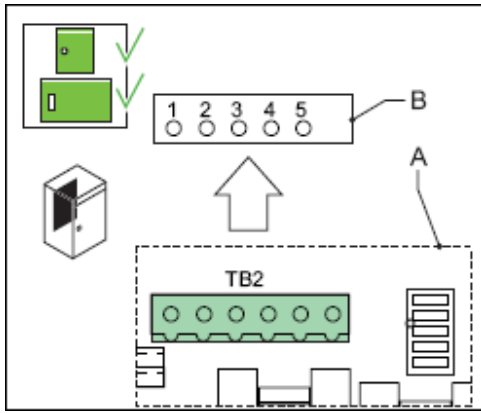
12. Connect the power cable to the next cabinet. Connect the cables to the screw terminals L1, L2, L3, N.
13. Connect the earthing wire to the earthing terminal (B).
14. Connect the earthing wire to the earthing network of the substation.'



6.5.3 Connect Power Output to Flash Units

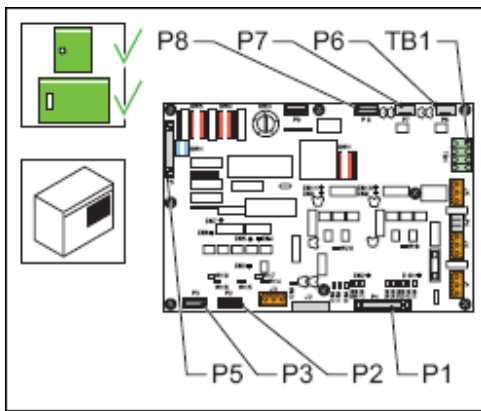
Connect to TB2

1. Strip 9 mm off the wire ends.
2. Connect the wires to connector TB2 of the FCU PCB (A) with the flasher head (B). *For the connection schema, see § [Connectors](#) .*
3. Attach the cables to the strain relief rail. *Use an strain relief clamp.*



6.5.4 Connect LMC

1. Connect the DC power supply to connector TB1 of the LMC PCB.
2. Connect the local bus to connector P2 of the LMC PCB.
3. Connect the door switch detection to connector P7 of the LMC PCB.
 - FCU-1: black wire with label 39
 - FCU-3: black wire.
4. Connect the connector for the MOV to connector P6 of the LMC PCB.
 - FCU-1: black wire with label 41
 - FCU-3: orange wire
5. Connect the multiwire (option) to the connector P5 of the LMC PCB.
6. Connect the J-Bus (option) to the connector P1 of the LMC PCB.



6.5.5 Connect local Bus

For the cable specifications, see § [Local Bus Cables](#) .



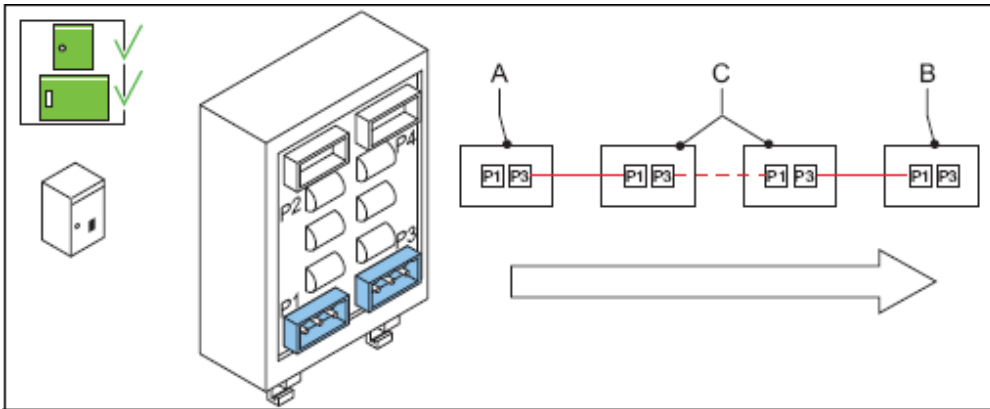
CAUTION

Make sure that the polarity of the bus connections is the same in all cabinets.



Note

Use the WAGO tool (6112.32.500) to open the individual contactors of the WAGO cage-clamp terminals.



- A First FCU PCB in the flash order
- B Last FCU PCB in the flash order
- C In-between FCU PCB in the flash order



Note

The arrow indicates the flash order.

Connection between cabinets

1. First equipment: connect the cable to P3.
2. In-between equipment:
 - Connect the cable from the previous equipment to P1;
 - Connect the cable to the next equipment to P3.
3. Last equipment: Connect the cable to P1.

Line termination



CAUTION

Only terminate the line at the first and last equipment in the flash order. If this is not the case, the bus drivers become overloaded.

4. Remove the straps W11, W25 and W28 from all equipments except the those at the first and last FCU PCBs in the flash order. See § [Layout of the Printed Circuit Board \(PCB\)](#) .
5. Remove the straps W15, W16 and W18 from the LMC if the LMC is not located on the last equipment in the flash order. See § [Layout of the Printed Circuit Board \(PCB\)](#)

6.5.6 Install Remote Control Connections

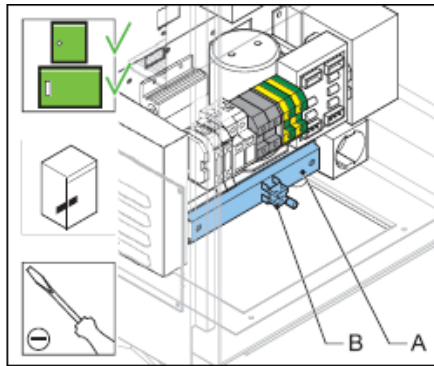


WARNING

Only earth the remote control cable at one location. Only earth the local bus connection at the first equipment cabinet. Only earth the remote control bus at the tower level.

Earth remote control cable screen

1. Attach the cable to the earthing bar (A). Use the strain release clamp (B) provided with the equipment.
2. Use one strain release clamp per cable.
3. Make sure that the cable screen is tightened with the strain release clamp.
4. Remove the cable shield above the strain release clamp.

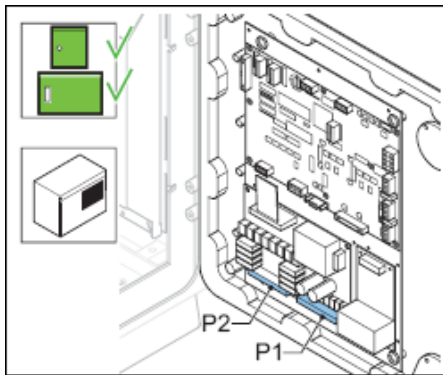


Note

- The strain release clamps can be used for cables from 7 to 16 mm diameter.
- The earthing bar also operates as a pull relief system.
- If you do not use the strain release clamp, connect the screen to terminal 12 (PE).

Connect multiwire cables (if present or purchased)

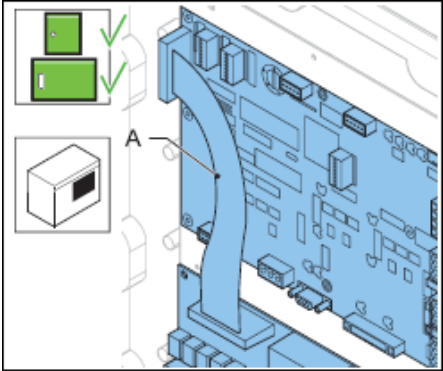
5. Connect the cables to connectors on the PCB (A). See § [Multiwire - PCB1486](#) .
6. Connect the cables for the control and back-indication signals to P1 and P2. See § [Multiwire - PCB1486](#) . *To connect the individual wires to the WAGO connectors, use WAGO tool.*
7. Make sure the multiwire is earthed.



Connect J-Bus cables (if present or purchased)

Connect

1. Connect the wires. See § [Slave Connections](#) .
 - a. Connect for a four wire connection (RS422) to the pair Tx+/Tx- and the pair Rx+/Rx-;
 - b. Connect for a two wire connection (RS485) to the pair Tx+/Tx-.
 - c. Set the straps on the LMC PCB to the correct position. See § [Straps](#) and [Straps](#) . *The setting depends on the choice of connection, RS422 or RS485.*
2. Make sure the J-Bus cable is earthed in the tower only, not in the equipment cabinet. Remove multiwire cable, if installed.
3. Disconnect the flat multiwire cable (A) from the connector P5 of the LMV PCB and P3 of the multiwire PCB.



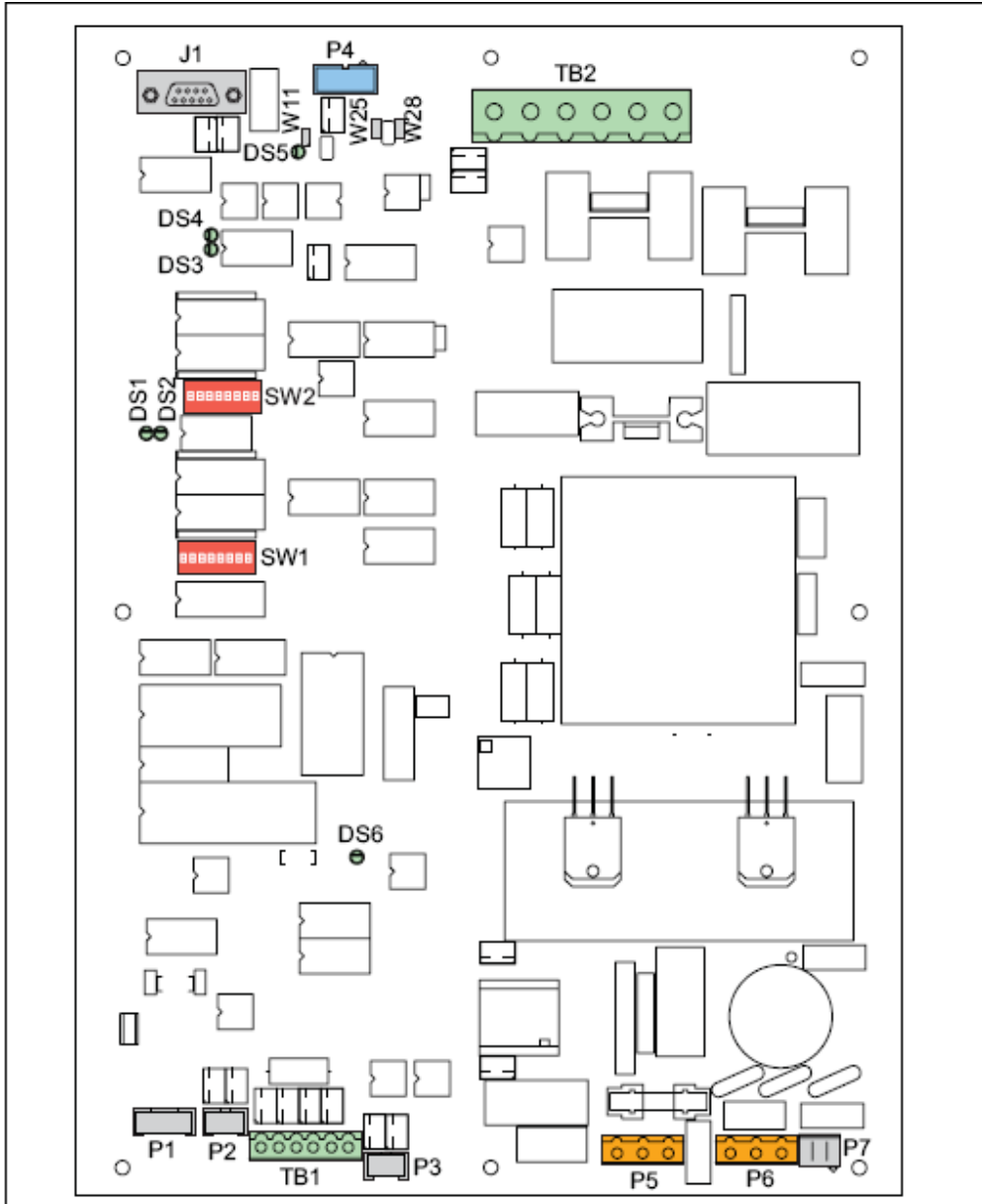
7.0 PCB Drawings and Settings

7.1 FCU - PCB1487

The FCU PCB is a CPU-controlled PCB that receives input messages from the LMC or the dongle, via the local bus interface. The FCU PCB has no direct connection to the remote control system of the user. The PCB contains a SMPS to charge the flash energy capacitor and has the necessary hardware to drive and monitor the flasher head. It counts the number of misfires and sends error messages back to the LMC. If the number of flashes exceeds the lifetime of the flasher head, an error is also sent back.

7.1.1 Layout of the Printed Circuit Board (PCB)

The board has a fuse (A) of 2AT or 2AF, 5 x 20 with 1.5 A breaking capability.



7.1.2 Connectors

Table 10: FCU PCB connectors



Name	Type	Description	Factory wiring	External wiring	Notes
P1	5-pin Stocko	To monitor the temperature sensor.	x		Only one temperature sensor per flashing system that is connected to the LMC.
P2	3-pin Stocko	To monitor the door contact.	x		
P3	3-pin Stocko	To monitor the MOV modules.	x		
P4	10-pin flat cable	To connect a local bus.	x		
P5	3-pin Wago	To connect a heater resistance.	x		Only one heater resistance per equipment cabinet.
P6	3-pin Wago	Mains supply	x		
P7	3-pin Molex	Mains supply for the DC power supply.	x		 CAUTION If the DC power supply is not connected to this board. Make sure a dummy plug on P7 is installed to avoid accidental contact with the mains supply.
J1	SUBD9	To connect the dongle (option).		x	To set parameters for the SFL.
TB1	6-pin Phoenix	To connect the DC supply.	x		A return connection from the DC power supply.
TB2	6-pin Phoenix	Connect the flasher head.		x	
J2, J3	Fast-on	To connect the capacitor.	x		 CAUTION Make sure that you connect the polarity appropriately. The red wire must go to the +).
J4, J5	Fast-on	Connect the coil.	x		

Table 11: Wire connections for TB2 for UEL type flasher head

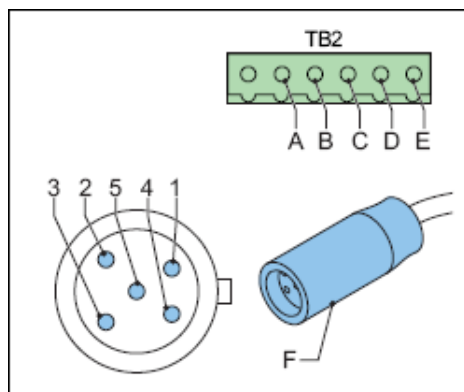
Connection number on the flasher head	Connector name on the flasher head	Connector name on TB2	Wire color
1	Trigger: Lamp cathode	TRIG	Brown
2	+400V: Lamp anode	+400V	Blue
3	PE	PE	Yellow/Green
4	Cab+	Cab+	Black
5	Cab-	Cab-	Black

Table 12: Wire connections for TB2 for FFL type flasher head

Pin-hole on the flasher head receptacle	Connector name on TB2	Wire color	Wire label
1	Cab-	White	Blue-6
2	TRIG	White	Brown
3	+400V	Black	Red
4	Cab+	Black	Orange-3
5	PE	Black	Green-Yellow54

The illustration shows the connections on TB2 (A to E) and the pin-hole numbers on the receptacle for a FFL type flasher head (F)

- A: Cab-
- B: Cab+
- C: PE
- D: +400 V
- E: TRIG



7.1.3 Straps

The straps are used to terminate the local bus, where necessary.

To set the resistors, set the straps as follows:

Table 13: FCU straps

Strap	Bus use	Resistor 680 Ohm		Terminating resistor 150 Ohm
		Pull up	Pull down	
W11	Local bus		x	
W28				x
W25		x		

Table 14: Resistor settings

Resistor [E]	Description
150	Terminates the bus.
680	There is always two types of 680 E resistors: <ul style="list-style-type: none"> • Pull-up resistor on the positive bus wire; • Pull-down resistor on the negative wire.

7.1.4 Dip-switches



CAUTION

Restart the equipment after you change the switch settings. The changes only become effective after you restart the equipment.



CAUTION

Only change the baud rate and parity of the local bus if you experience severe communication problems between units. In this case, change all the FCU PCBs to the same baud rate and parity.

Table 15: FCU PCB dip-switch settings

Dip-switch bank	Type	Setting	Use	Remarks	
SW2	Dip	xxxxxxx	Slave number of the LMC (local bus). Must be unique for each equipment.	Valid values: 1-32 (binary code)	
SW1	Dip	1	OFF	Internal use	
		2	OFF		
		3	OFF		
		4	OFF		
		5+	OFF	Baud rate local bus 9600 baud	
		6	OFF		
		5+	ON	Baud rate local bus 19200 baud	
		6	OFF		
		5+	OFF	Baud rate local bus 38400 baud	Factory settings
		6	ON		
		5+	ON	Invalid	
		6	ON		
		7+	OFF	No parity	
		8	OFF		
		7	ON	Valid (no parity)	
		8	OFF		
7	OFF	Local bus Odd parity.			
8	ON				
7	ON	Local bus Even parity	Factory settings		
8	ON				

7.1.5 LEDs

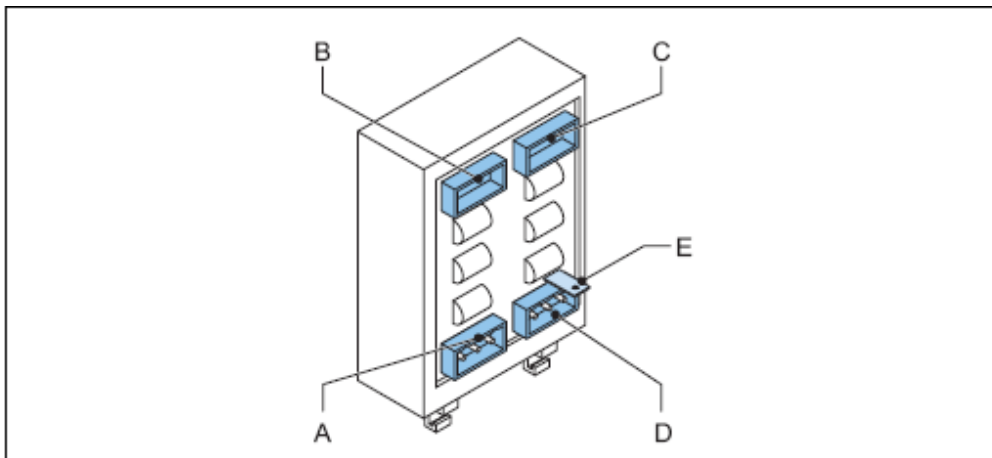
Table 16: Functions

LED	Indication	Status	Notes
DS1	FLASH command	Duration is proportional to the selected step.	
DS2	RUN	One 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 permanently OFF, there is no traffic on the corresponding bus.
DS4	Tx local bus		If one of these LEDs is permanently ON, there may be polarity inversion on the bus.
DS5	Isolated supply local bus	ON	
DS6	FLASH	ON during flash request	Hardware flash command to IGBT Driver

7.2 Local bus connection board - PCB1498

The local bus connection board is a small PCB that provides the interconnection of the local bus between the equipment cabinets.

7.2.1 Layout of the Printed Circuit Board (PCB)



- A P1
- B P2
- C P4
- D P3
- E Connection to earth

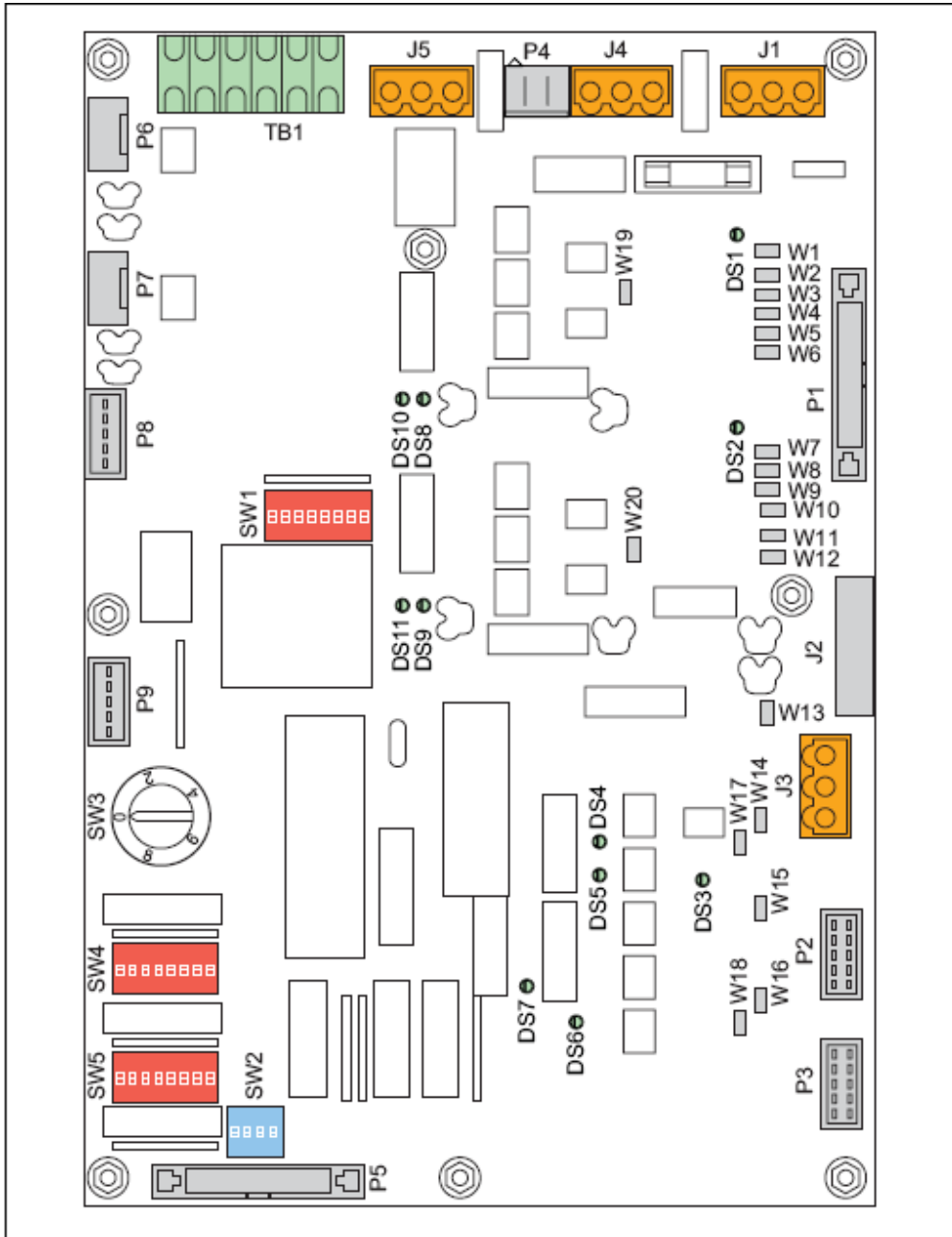
7.2.2 Connectors

Table 17: Local bus connectors

Connector	Description
P2 and P4	To distribute the internal distribution of the bus signal. The internal distribution is fixed on delivery.
P1 and P3	To connect the local bus to the other cabinets in the system.

7.3 Local Master Controller (LMC) - PCB1513

7.3.1 Layout of the Printed Circuit Board (PCB)



7.3.2 Straps

Table 18: LMC PCB straps

Strap	Bus use	Rx / Tx	Resistor 680 ohms		Terminating resistor 150 ohms
			Pull up	Pull down	
W1	Remote Bus A	TX-		x	
W2		TX+	x		
W3		TX			x
W4		Rx+	x		
W5		Rx-			x
W6		Rx			x
W7	Remote Bus B			x	
W8		TX			x
W9		TX+	x		
W10		TX-			x
W11		Rx+	x		
W12		Rx			x
W13	Reserved			x	
W14		+	x		
W15	Local bus			x	
W16		+	x		
W17	Synchro line				x
W18	Local bus				x
W19	Bus A	Between 1 and 2	Wiring of the bus: 2 wires (RS485)		
		Between 2 and 3	Wiring of the bus: 4 wires (RS422)		
W20	Bus B	Between 1 and 2	Wiring of the bus: 2 wires (RS485)		
		Between 2 and 3	Wiring of the bus: 4 wires (RS422)		

Notes

- 1 Reserved for future use.
- 2 Reserved for future use.
- 3 Reserved for future use.

7.3.3 Rotary and Dip-switches

If not specifically noted, all the switches are read only at power-up. If you change a switch setting, restart the equipment before the changed comes into effect.



CAUTION

SW4/2 clears all the parameters, including the system layout. In this case, restore the parameters with the configuration software tool, or use the dip- switches.

Table 19: LMC PCB dip-switch settings.

Dip-switch bank	Type	Setting	Use	Remarks	
SW1	Dip	xxxxxxx	Slave number of the LMC J- Bus slave address. The factory default is set to 1. Another number is also possible.	Valid values: 1-16 (binary code). This switch is only used for the remote control bus. If multiwire is used, this switch is not applicable.	
SW2	Dip	1+	2	Manual configuration SW4 /4	
		OFF	OFF		16 ms interval time
		ON	OFF		33 ms interval time
		OFF	ON		66 ms interval time
		ON	ON		Invalid
		3	ON		Declaration of REILS
		4	ON		1 cycle per s
			OFF		2 cycles per s
SW3	Rotary	0	Flashing system OFF		
		1	Step 1		
		2	Step 2		
		3	Step 3		
		9	Remote control		

Table 19: LMC PCB dip-switch settings. (Continued)

Dip-switch bank	Type	Setting		Use	Remarks
SW4	Dip	1	OFF	Enables the rotary switch SW3 to control the mode	
			ON	Hardware local kill ON	No control with SW3
		2	OFF	a	
		3	OFF	b	
		4	OFF	Set the configuration with the dongle and the configuration software tool	
			ON	Set the configuration manually with 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	Factory settings
		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		
SW5	Dip	1 > 6		Number of equipments in the system	Manual configuration SW4
		7		Not in use	
		8	OFF	To disable the use of the dongle.	
			ON	To enable the use of the dongle	

a) Initiates the data E²PROM. The LMC 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 LMC and turn it ON again after 5 s. Set the switch back to OFF. If this is not the case, the E²PROM will be cleared at the next power cycle.

b) Lock to boot. This switch is always OFF in a functioning system. Use this only if there is a major problem when you upload a new application code.PCB drawings and settings

7.3.4 LEDs

Table 20: Functions

LED	Function	Status	Notes
DS1	Isolated supply Bus A	ON	
DS2	Isolated supply Bus B		
DS3	Isolated supply local bus.		
DS4	Reserved		For future use
DS5	RUN.	One flash per s	Higher rate during software upload.

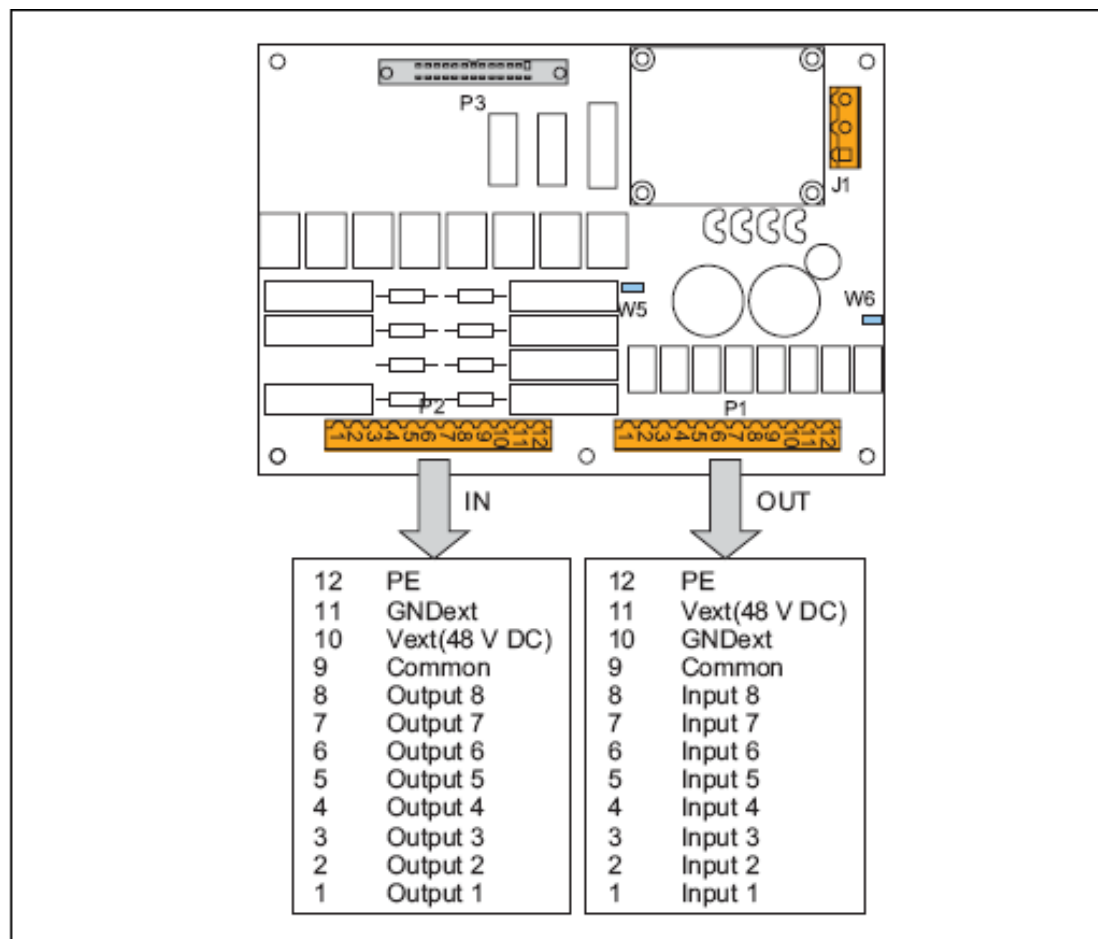
Table 20: Functions (Continued)

LED	Function	Status	Notes
DS6	Rx local bus	Normally OFF. Lights up momentarily during transmission or reception	If one of these LEDs is permanently OFF, there is no traffic on the corresponding bus.
DS7	Tx local bus		
DS8	Rx Bus A		
DS9	Tx Bus A		If one of these LEDs is permanently ON, there may be polarity inversion on the bus.
DS10	Rx Bus B		
DS11	Rx Bus A		

7.4 Multiwire - PCB1486

Note It is impossible to attribute the same function to more than one terminal.

7.4.1 Layout of the Printed Circuit Board (PCB)



7.4.2 Straps

Table 21: Multiwire PCB straps

Strap	Description
W5	Internal voltage for remote control.
W6	Internal voltage for back indication signals.

7.4.3 Connectors Table

Table 22: Multiwire PCB connectors

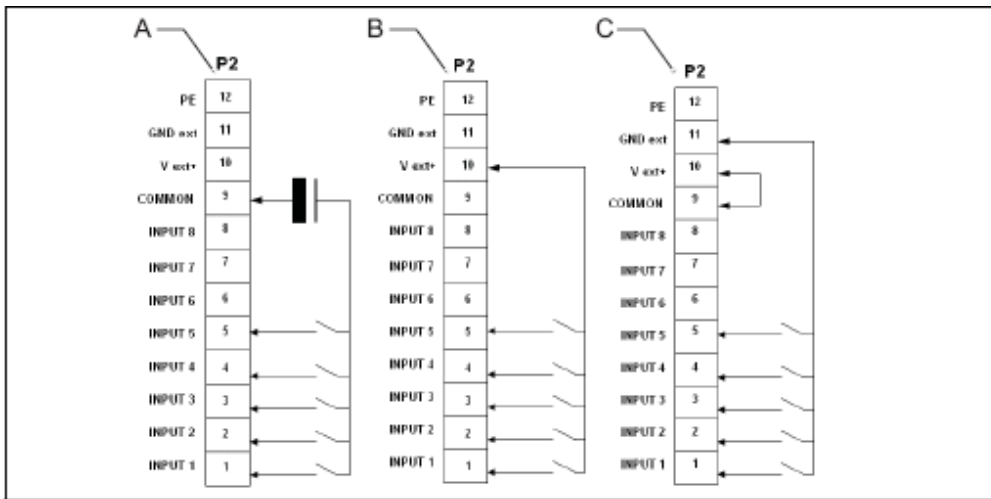
Connector	Connection to
P1	Back-indication/output signals The connector type is WAGO 231-312/026-000 cage-clamp connector. This connector can accept wires of 0.08 to 2.5 mm ² (28 - 12 AWG).
P2	Control/input signals The connector type is WAGO 231-312/026-000 cage-clamp connector. This connector can accept wires of 0.08 to 2.5 mm ² (28 - 12 AWG).
P3	Flat cable connection to the LMC.
J1	Power supply to the multiwire interface PCB

7.4.4 Input Terminals

The table shows examples of functions you can configure to the input connector P2. Each signal must have its own wire. In addition, each board must have a separate wire for a common earthing.

Table 23: Functions for connector P

Function	Description
Step 1	If one of the contacts is activated, the equipments switch ON at the selected step. If nothing is activated, the equipment goes OFF. Note that if more than 1 terminal is activated simultaneously, then the highest step takes precedence.
Step 2	
Step 3	
REILS STEP 1	When activated, this switches the REILS ON at step 1.
REILS STEP 2	Activates the REILS (RTILS) in step 2.
REILS STEP 3	Activates the REILS (RTILS) in step 3.
Reset misfire	If there was a latched misfire condition, activate this terminal to clear.
Mode Select Bit 0	It is possible to select one of the first 4 modes via the Multiwire. 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 OFF OFF Use mode 1 ON OFF Use mode 2 OFF ON Use mode 3 ON ON Use mode 4
Mode Select Bit 1	



- A With external power supply
- B With internal power supply (polarized contacts positive)
- C With internal power supply (polarized contacts negative)

Table 24: Connection P2 wires, per power supply type

Back indication	External power supply (A)	Internal power supply (polarized contacts positive) (B)	Internal power supply (polarized contacts negative) (C)
Remarks	Remove strap W5, 24 V DC (PCB 1593.13.511) 48 V DC (PCB 1593.13.521)	Install strap W5	Remove strap W5

7.4.5 Output Terminals

The table shows an example of functions you can configure to the output connector P1. Each signal must have its own wire. In addition, each board must have a separate wire for a common earthing. The functions have two custom contacts, custom 1 and custom 2. You can switch the custom contacts on or off.

Table 25: Functions for connector P1

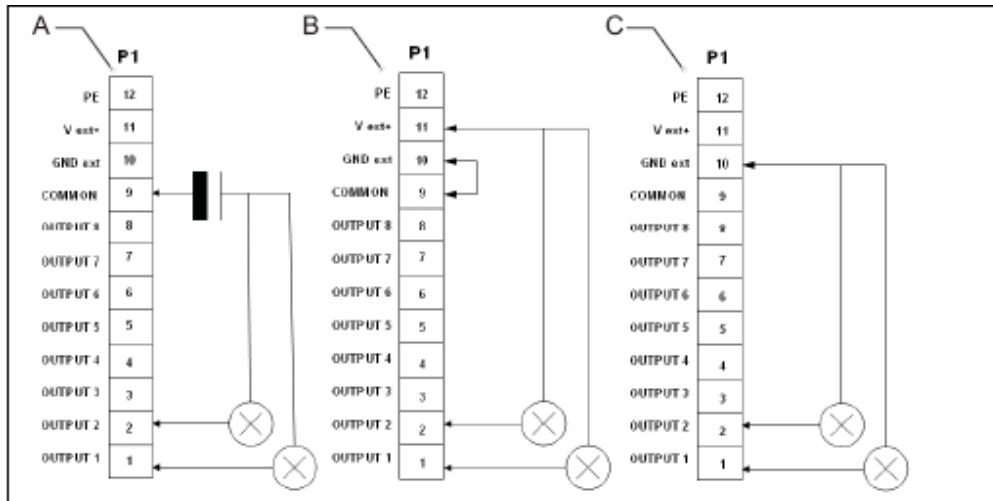
Function	Condition	Custom 1	Custom 2	Description
REILS DOWN		ON/OFF	ON/OFF	If there is a misfire on 1 of the REIL FCUs and the other one is switched OFF automatically, then this terminal is activated.
Misfire on one flasher head	Fugitive	ON/OFF	ON/OFF	The terminal contacts are activated when the misfire(s) occur(s) and are released at the next correct flash.
Misfire on at least two flashers heads	Fugitive	ON/OFF	ON/OFF	
Misfire on two consecutive flasher heads	Fugitive	ON/OFF	ON/OFF	
Misfire on one flasher head	Latched	ON/OFF	ON/OFF	The terminal contacts are activated when the error occurs. They remain active until the Reset Misfire contact is activated.
Misfire on at least two flashers heads	Latched	ON/OFF	ON/OFF	
Misfire on two consecutive flashers heads	Latched	ON/OFF	ON/OFF	
Misfire limit reached	Latched	ON/OFF	ON/OFF	This terminal is activated if the number of misfires exceeds the limit on at least one equipment. To clear the condition, activate the reset misfire function.

Table 25: Functions for connector P1 (Continued)

Function	Condition	Custom 1	Custom 2	Description
Flasher head life limit reached	Latched	ON/OFF	ON/OFF	This terminal is activated if the number of flashes exceeds the lamp life time on at least one equipment. The condition is cleared by activating the reset misfire function.
Over temperature		ON/OFF	ON/OFF	When the inside temperature of an equipment or the LMC exceeds the programmed maximum temperature, this terminal goes active. As soon as the temperature drops under the limit on all the devices, the terminal goes inactive again.
Communication problems on local bus		ON/OFF	ON/OFF	If the LMC cannot contact one of the equipments this terminal is activated. As soon as the condition is repaired and the equipment is back on line, the terminal goes inactive
Security door open		ON/OFF	ON/OFF	The security parameters check for defects in the protection of the Control units (MOV) or intrusion (DOOR open). As soon as the condition is repaired or the door closes, the terminal goes inactive again.
Security (DOOR open + MOV blown)		ON/OFF	ON/OFF	
Security (DOOR open)		ON/OFF	ON/OFF	
Security (MOV blown)		ON/OFF	ON/OFF	
Free		ON/OFF	ON/OFF	This terminal is not in use.
Flasher RUNNING		ON/OFF	ON/OFF	Contact is closed when the flasher system received a valid step + mode command.
REILS RUNNING		ON/OFF	ON/OFF	You can switch the REILS ON or OFF onto custom contact 1 or 2

The back-indication signals may be provided:

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



- A With external power supply
B With internal power supply (polarized contacts positive)
C With internal power supply (polarized contacts negative)

Table 26: Connect P1 wires, per power supply type

Back indication	External power supply (A)	Internal power supply (polarized contacts positive) (B)	Internal power supply (polarized contacts negative) (C)
Remarks	Remove strap W6, Max. 110 V DC, polarity is not important	Remove strap W6	Install strap W6

7.4.6 Control Signals

The control signals feed relay coils. An RC circuit protects the relay coils for transient over-voltage.

Table 27: Multiwire options

Multiwire	48 VDC remote control	24 VDC remote control
Minimum voltage	40 VDC	21.6 VDC
Maximum voltage	65 VDC	35 VDC
Current consumption	Approximately 9 mA at 48 VDC	Approximately 16 mA at 24 VDC

The multiwire 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.

7.4.7 Multiwire Default Settings

This section shows the default multiwire settings. These settings apply to LMC software version 1.21.

Back-indication signals

You can modify the settings at any time with the configuration software tool.

Table 28: Default back-indication signals

P1	Signal	Function
1	Output 1	SFL running - contact closed when running
2	Output 2	RTILS/REILS running - contact closed when running
3	Output 3	REILS DOWN - contact closed in case of alarm
4	Output 4	Misfire on 1 FCU (latched) - contact closed in case of an alarm
5	Output 5	Misfire on 2 consecutive FCUs (latched) - contact closed in case of an alarm
6	Output 6	Communication error on local bus + Security (Door + MOV) – contact open in case of an alarm
7	Output 7	Over temperature – contact closed in case of an alarm
8	Output 8	Custom 1
9	Common	Common output signals
10	GNDext	Earthing multiwire PCB
11	Vext+	Power supply from multiwire PCB (24 V or 48 V)
12	PE	Earth connection

Remote control signals

You can modify the settings with the configuration software tool.

Table 29: Default remote control signals

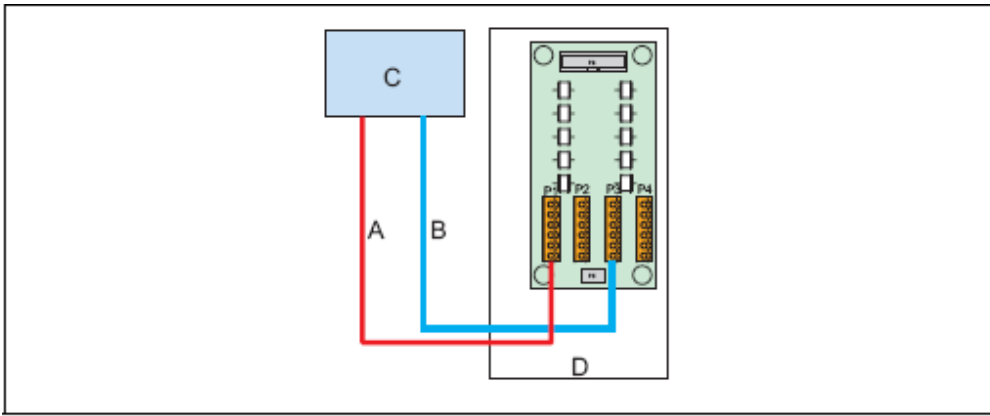
P1	Signal	Function
1	Input 1	SFL ON Step 1
2	Input 2	SFL ON Step 2
3	Input 3	SFL ON Step 3
4	Input 4	REILS/RTILS ON step 1
5	Input 5	REILS/RTILS ON step 2
6	Input 6	REILS/RTILS ON step 3
7	Input 7	Reset alarms
8	Input 8	Free
9	Common	Common input signals
10	GNDext	GND multiwire PCB
11	Vext+	Power supply from multiwire PCB (24 V or 48 V)
12	PE	Earth connection

7.5 J-Bus Connection - PCB1502

The PCB provides the connection between the user J-Bus(es) and the LMC.

The J-Bus interface uses a single or dual databus(es) to allow remote monitoring of a bigger quantity of parameters.

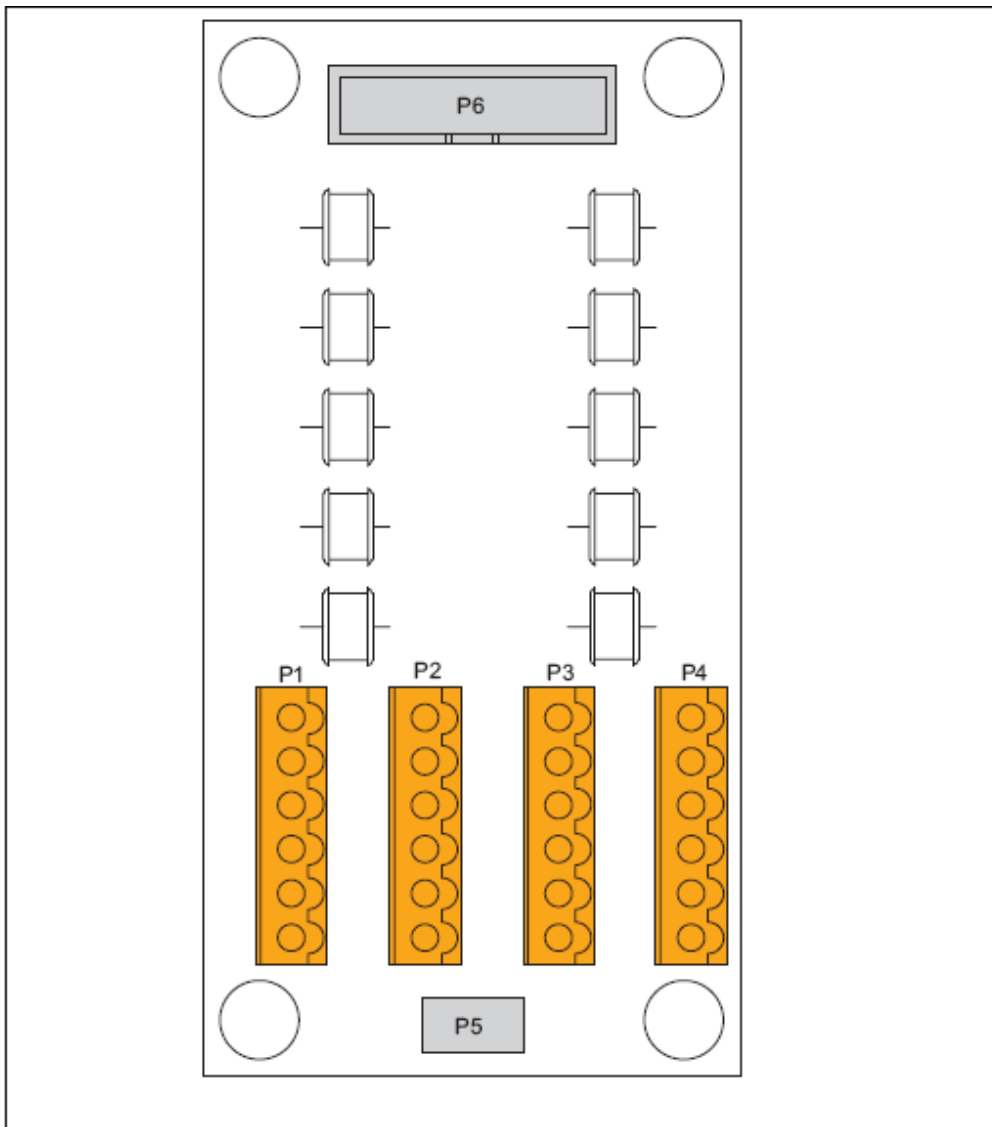
An equipment is always a slave on the J-Bus. There can be a maximum of 31 equipments on one bus section with one common bus master.



- A Bus A
- B Bus B
- C Master (in the substation)
- D Slave 000001(value set on the dipswitch bank SW1 of the LMC PCB)

7.5.1 Layout of the Printed Circuit Board (PCB)

The PCB provides the interconnection of the user J-Bus(es) with the LMC. The PCB has gas arresters for overvoltage protection.



Description:

- P1: Bus A connection to the substation on the master;
- P3: Bus B connection to the substation on the master;
- P5: PE.

7.5.2 Connectors

Table 30: J-Bus connectors

Connector	Description
P1	Meant for the connection of Bus A from the previous user on the system.
P3	Meant for Bus B.

Table 31: Wiring for connectors P1-P4

Wire	Description
1	Tx +
2	Rx +
3	Tx -

Table 31: Wiring for connectors P1-P4 (Continued)

Wire	Description
4	Rx -
5	0V
6	PE

7.5.3 Slave Connections

The figures show the wire connections for the slave side. The connections for the master side depend on the used hardware.

J-bus type	Single J-bus: Bus A P1	Dual J-bus: Bus A P1 and Bus B P3
Two wire RS485		
Four wire RS422		

- Tx+ an Tx- connections: first pair of the cable;
- Rx+ an Rx- connections: second pair of the cable (RS422);
- 0 V connections: second pair of the cable (RS485) or third pair of the cable (RS422).

7.6 Dongle

7.6.1 Dip-switches

The dip-switch bank is used to set the communication speed parameters. Set the switches to

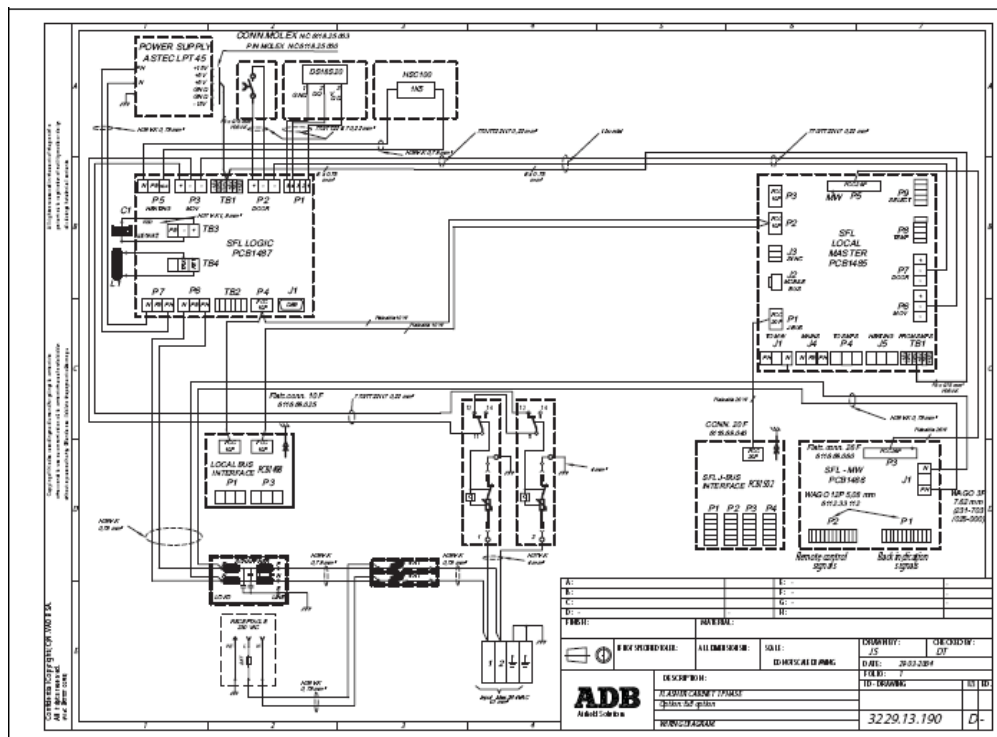
10101010 if this is not the case. In the configuration menu of the software, choose the used COM port on the PC, '38400' bd & 'EVEN' parity. This will allow proper communication between FCU/ LMC and the dongle.

7.6.2 LEDs

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

7.7 Wiring Diagrams

FCU-1



8.0 Technical Data

8.1 Technical Characteristics

Table 32: Technical characteristics

Item	FCU-1	FCU-3
Rated frequencies [Hz]	50 / 60 ($\pm 5\%$)	
Input voltage range: Nominal [V] Minimum [V]	230 - 240 3P + N 195 V 3P + N (or 1P + N)	
Minimum power supply [V]	A minimum power supply of 190 V is recommended to allow for 10 % voltage fluctuations.	
Power consumption [VA]	230- 250 at the highest brightness step, at two flashes per second, without heating	
Current for cable sizing [A]	1.5 (maximum)	
Remote control and monitoring	Multiwire, industrial field bus (J-Bus) or the two combined	
Dimensions (width x depth x height) [mm] (inc. sun roof and base)	420 x 235 x 520	790 x 340 x 650
Weight [kg]	19.4	47

8.2 Ambient Conditions

Table 33: Ambient conditions

Item	Description
Temperature	From -20 up to 55 °C
Altitude	From 0 (sea level) up to 1000 meters
Relative humidity	From 10 % RH up to 95 % RH without dewing

Appendix A: SUPPORT

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

ADB SAFEGATE Support

Live Technical Support – Americas

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

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

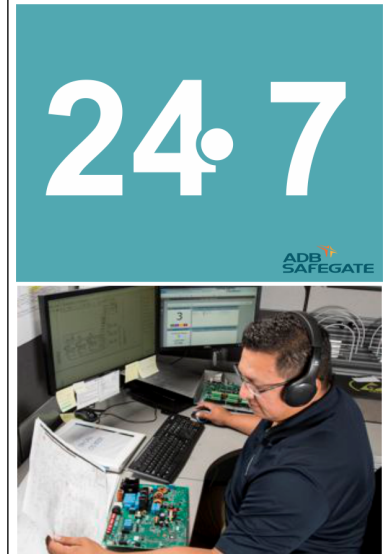
ADB SAFEGATE Americas Technical Service & Support (International): +1-614-861-1304

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

Before You Call

When you have an airfield lighting or system control system problem, it is our goal to support airfield maintenance staff as quickly as possible. To support this effort, 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.



Note

For more information, see www.adbsafegate.com, or contact ADB SAFEGATE Support via email at support@adbsafegate.com or

Europe: +32 2 722 17 11

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

China: +86 (10) 8476 0106

Middle East and Africa: +971 4 452 7575

A.1 ADB SAFEGATE Website

The ADB SAFEGATE website, www.adbsafegate.com, offers information regarding our airport solutions, products, company, news, links, downloads, references, contacts and more.

A.2 Recycling

A.2.1 Local Authority Recycling

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

A.2.2 ADB SAFEGATE Recycling

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

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

All items returned must be clearly labeled as follows:

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

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

Company Addresses

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