

SFLS SEQUENCED FLASHING LIGHTING SYSTEM

Instruction Manual for Operation and Maintenance

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I. MODIFICATIONS

Rev.	Editor	Check	Date	Description	Pages
1.00	Y.M	A.M	02/11/2023	First Edition	-
2.00					
3.00					
4.00					

The manual shows the information necessary to:

- *Commission*
- *Operation*
- *Maintenance*
- *Troubleshooting*
- *Installation*

Control Unit:

Power Supply *220VAC, 1Ph., 50-60Hz*

Power consumption *~ 1,4 kVA*

How to work with this manual:

Be sure to read the safety section before doing anything.

If you are starting up the device for the first time, read the Safety section, technical specifications, Installation, and Commissioning.

Otherwise, based on your issue, find and read the relevant chapter

II. SUMMARY

Abbreviation	Definition
SFLS	SEQUENCED FLASHING LIGHTING SYSTEM
LED	Light Emitting Diode
ICAO	International civil aviation organization
EL-AP	Elevated Approach
CCR	Constant current regulator
FAA	Federal Aviation Administration
FSU	Flash System Unit
IEC	International Electrotechnical Commission
EASA	European Union Aviation Safety Agency
CASA	Civil Aviation Safety Authority
STANAG	Standardization Agreement

1. SAFETY

Important Safety information:

1. Follow these guidelines during installation, use and repair of the apparatus
2. Ensure proper and safe use of the device by adhere to the instructions provided
3. Take necessary precautions to prevent any injuries while using the apparatus
4. Strictly follow the recommended procedures for installation, usage and repair to minimize risks

- For safety precautions, make sure to consult IEC 61821¹ . This document provides important guidelines to ensure the safety of lighting circuits used in aerodromes. It is recommended to refer to this standard to understand and implement necessary safety measures.

- Please exercise caution when dealing with low voltage equipment 230VAC. It is important to take necessary safety measures when working with such equipment to avoid any potential hazards. Prioritize safety by following proper procedures and using appropriate protective gear. Stay vigilant and ensure that you are aware of the risks associated with handling low voltage equipment.

- Please refrain from performing any installation or maintenance tasks on apparatus connected to energized circuits. To prevent accidental contact with voltage or current source, always disconnect the power supply before working on the equipment. This step is crucial for ensuring your safety and minimizing the risk of electrical accidents. Prioritize your well-being by following this guideline and only work on the apparatus when it is safely disconnected from any power source.

- Under no circumstances should you remove any protections or safety devices. These safeguards are in place to ensure your safety and the proper functioning of the equipment. Removing them can lead to serious risks, including electrical hazards and equipment malfunctions. Always keep the protections and safety devices intact and operational. If you encounter any issues or concern, consult a qualified professional or the manufacturer for assistance.

- Ensure safety by carefully reading and following the instructions for all used equipment. Adhere to the safety guidelines of you company and regulatory agencies. These instructions and guidelines are in place to minimize risks and create a safe working environment. Prioritize safety instructions and guidelines.

When performing installation or maintenance operation on the apparatus, it is important to:

- Adhere to general safety rules and guidelines
- Ensure that environmental conditions, transportation methods, and animal presence do not pose a risk to the electrical system
- Avoid touching energized voltage or current source to prevent electrical accidents

¹ Electrical installations for lighting and beaconing of aerodromes – Maintenance of aeronautical ground lighting circuits)

- Exercise caution when operating electrical equipment in high humidity environments
- Remember that using unapproved equipment will void the warranty

NOTE:

if safety device has been removed, it is essential to promptly restore it to its proper positions. Do not operate the apparatus if it is not functioning correctly or if alarms are enabled. When conducting maintenance, ensure that only approved spare parts are used. Using unapproved or modified spare parts can pose safety hazards and also invalidate the warranty. Prioritize safety by adhering to these guidelines and consulting authorized source for the appropriate spare parts.

When device is Out of Service:

When dismantling, decommissioning, destroying, or disposing of the apparatus, it is crucial for the user to allow all necessary precautions for the elimination of components and materials. This should be done in accordance with local regulations and applicable laws. Proper handling and disposal of components and materials are important to prevent environmental contamination and ensure compliance with legal requirements. Prioritize responsible disposal practices by adhering to the required precautions and following the relevant rules and laws in your local area.

1-1. Liability

AVIASAFE Company 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 include the following actions:

- Making changes to equipment that have not been recommended or described in this manual or using parts that are not genuine AVIASAFE 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 is inappropriate or incompatible with your AVIASAFE equipment.
- Allowing unskilled personnel to perform any task on or with the equipment.

1-2. QUALIFIED PERSONNEL

When we mention “Qualified personnel” in this context, we are referring to individuals who possess in-depth knowledge of the equipment and its safe installation, operation, maintenance, and repair. These individuals should have a thorough understanding of the equipment’s functionality and be capable of

performing the necessary tasks. Additionally, they should be familiar with all relevant safety rules and regulations about the equipment.

Qualified personnel are expected to have received proper training to ensure they can safely handle the installation, operation, maintenance, and repair of the equipment. It is the responsibility of the company responsible for installing, operating, or maintaining the equipment to ensure that its personnel meet these qualifications. By meeting these requirements, the company can ensure the equipment's optimal performance, as well as the safety of both the personnel and the surrounding environment.

1-3. INTENDED USE

Any utilization of this equipment that deviated from the instructions outlined in the datasheet and manual carries the potential risk of causing personal injury, loss of life, or property damage. AVIASAFE cannot be held accountable for any injuries or damages that may arise from non-standard or unintended application of its equipment.

This equipment has been specifically designed and intended for the purpose explicitly described in this manual. Any usage not expressly detailed in the manual is considered unintended use. Unintended use may occur as a result of the following actions:

- Making modifications to the equipment that have not been recommended or described in this manual, or utilizing parts that are not genuine AVIASAFE replacement parts or accessories.
- Using materials or auxiliary equipment that are unsuitable or incompatible with your AVIASAFE equipment.
- Allowing unqualified personnel to undertake any task related to the equipment.

It is of utmost importance to strictly adhere to the instructions provided in the manual to ensure the safe and proper functioning of the equipment. Failure to comply with these guidelines can lead to serious consequences and may void any warranties or guarantees provided by AVIASAFE.

1-4. INSTALLATION

To ensure the safe and efficient installation of your AVIASAFE equipment, it is crucial to familiarize yourself with the safety and installation sections of all system component manuals. This will provide you with a comprehensive understanding of the system components and their specific requirements. Failure to follow these safety procedures can have severe consequences, including personal injury or even loss of life.

Here are some important guidelines to adhere to during the installation process:

1. Only allow qualified personnel to carry out the installation of AVIASAFE equipment and auxiliary equipment. Utilize approved equipment exclusively. The use of unapproved equipment within an approved system may void agency approvals and warranties.
2. Verify that all equipment used is appropriately rated and approved for the specific environment in which it will be deployed.
3. Follow all instructions provided for the installations of components and accessories.
4. Avoid holding or carrying light assemblies by their cables to prevent damage.
5. Adhere to local codes and regulations when installing electrical connections, as long as they do not contradict general rules.
6. Employ electrical wire with sufficient gauge and insulation to handle the rated current and voltage demands. All wiring must comply with local codes.
7. Route electrical wiring along protected path to safeguard against damage caused by moving equipment or animals such as rodents.
8. Take measures to protect components from damage, wear, and harsh environmental conditions.
9. Ensure sufficient space is allocated for maintenance, panel accessibility, and cover removal.
10. Install safety devices as specified by relevant safety regulations to safeguard the equipment.
11. If safety devices need to be temporarily removed for maintenance purposes, promptly re-install them once the work is completed, and verify their proper functioning.

By diligently adhering to these guidelines, you can enhance the safety and longevity of your AVIASAFE equipment.

1-5. OPERATION

Only individuals who are qualified personnel should operate this equipment. Prior to operating the equipment, it is essential to thoroughly read and understand all system components manuals. This comprehensive understanding of the system components and their operation will facilitate safe and efficient operation.

Here are important guidelines to observe when operating the equipment:

1. Before starting the equipment, carefully inspect all safety interlocks, fire-detection systems, and protective devices such as panels and covers. Ensure that these devices are fully operational. If any of these devices are not functioning properly, refrain from operating the system. Do not deactivate or bypass automatic safety interlocks, locked-out electrical disconnects, or pneumatic valves.
2. It is imperative never to operate the equipment if a malfunction is known to exist. Additionally, avoid attempting to operate or service electrical equipment if there is standing water present.

3. Ensure that this equipment is used solely in the environments for which it has been rated. Operating the equipment in humid, flammable, or explosive environments is strictly prohibited unless it has been explicitly rated for safe operation in such conditions.
4. Under no circumstances should exposed electrical connections on the equipment be touched while the power is ON. This precaution is vital for personal safety.
5. While the power is ON, never directly look at the light source to prevent potential harm to your eyes.

By strictly adhering to these guidelines, you can ensure the safe operation of the equipment. Prioritizing the well-being and safety of personnel is of utmost importance when operating this equipment.

1-6. ACTION IN THE EVENT OF A SYSTEM

It is important to prioritize safety and follow proper procedures to ensure the well-being of personnel and the equipment. Here is a summary of the key points:

1. If a component malfunctions, turn the system OFF immediately.
2. Disconnect and lock out electrical power.
3. Repair or replace the malfunctioning component according to the instructions provided in its manual.
4. Only permit qualified personnel to perform maintenance, troubleshooting, and repair tasks.
5. Ensure that only individuals who are properly trained and familiar with AVIASAFE equipment service the equipment.
6. Follow the recommended maintenance procedures outlined in the equipment manuals.
7. Reconnect all disconnected equipment ground cables and wires after servicing the equipment. Ground all conductive equipment.
8. Utilize approved AVIASAFE replacement parts. Using unapproved parts or making unapproved modifications to equipment may void agency approvals, impair specified performance, and create safety hazards.
9. Periodically check interlock systems to ensure their effectiveness.
10. Refrain from servicing electrical equipment if standing water is present.
11. Exercise caution when servicing electrical equipment in a high-humidity environment.
12. When working with electrical equipment, use tools with insulated handles.

2. INTRODUCTION

2-1. Uses and Conformity

The SFLS can be used as:

1. Approach Sequential Flash Light (AFL)
2. Runway Threshold Identification Light (RTIL)

The SFLS is compliant to:

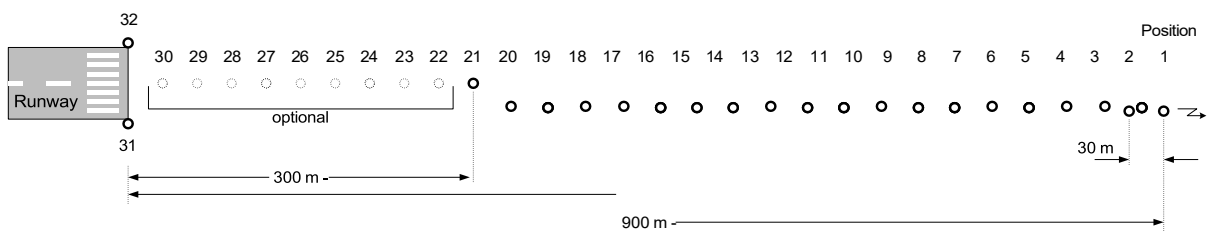
1. ICAO: Annex 14, Volume I para 5.3.4
2. IEC: TS 61827
3. NATO: STANAG 3316
4. EASA: CS-ADR-DSN Book1
5. CASA: Manual of Standard Part 139

2-2. System Description

Typically, SFLS is composed by:

1. Flash Master Control Unit (FMCU), including a touch pad for local HMI and an interface to remote system
2. FSU
3. Elevated light fixture
4. Inset light fixture

This unit allows you to control and monitor as system that has up to 30 approach flash lights (AFL) and 2 threshold identification lights (TIL) without needing separate control cables. The AFL lights start blinking when you begin approaching the runway's starting point. If TIL lights are installed, they will blink at the same time as the last lights in a row. You can choose to have the lights blink either once or twice every second. You can choose to have the lights blink either once or twice every second. The brightness control is done in the AFL lights themselves, so there are no big power components or resistors in the controller.



2-3. Control Unit Characteristics

Control Unit Characteristics	
Power supply	220 VAC, 1 Ph., 50-60 Hz
Power consumption	~ 1,4 kVA
Fuse	Internal fuse automat 32A
Communication interface remote control	MODBUS RTU / MODBUS TCP 12x 24VDC Input parallel interface 14x 24VDC Output parallel interface
Communication interface service computer	Ethernet
Communication interface flash lights	2-wire RS-485
Environmental temperature	-25°C +45 °C
Relative humidity, not condensed	10% - 90%
Altitude over NIN (operation)	IP 43
International Protection class	-100m + 2.500 m
Housing	Metal housing wall mounted
Dimensions	710 x 500 x 270 mm (W x H x D)
Weight	~ 36 kg

2-4. FSU Characteristics

FSU Characteristics	
Power circuit	Input: 220 VAC, 50-60 Hz Output: Constant Current supply (up to 48 VDC)
Data communication	2-wire RS-485
Environmental temperature	-25°C +55 °C
Relative humidity, not condensed	10% - 100%
International Protection class	IP 67
Altitude over NIN	-100m + 2.500 m
Housing	Aluminum Die-cast
Dimension	140x200x90 mm (W x H x D)
Weight	~ 1,8 kg

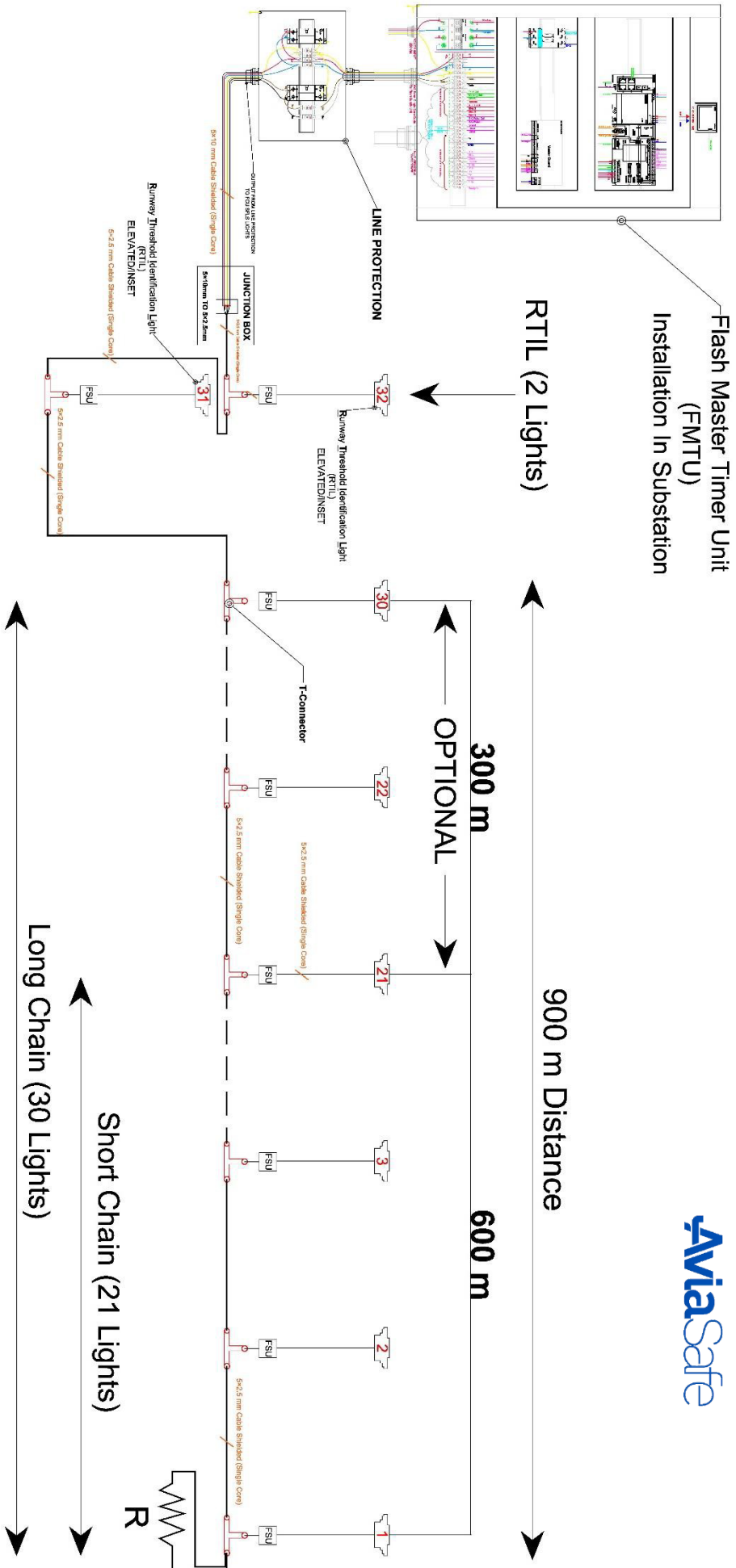
2-5. Flash Light Characteristics

Flash Light Characteristics		
Power supply	Constant current Supply (up to 48VDC - SELV)	
Max Power consumption	LEFL 15 VA	LIFL 15 VA
Communication interface control unit	2-wire RS-485	
Environmental temperature	-25°C +55 °C	
Relative humidity	10% - 100%	
International Protection class	IP67	
Altitude over NIN	-100m +2500 m	
Dimension	LEFL 280x160x140 mm	LIFL 304x304x106 mm
Weight	LEFL ~3.8 kg	LIFL ~8 kg
Light Intensity Normal High	LEFL 23,000 cd 23,000 cd	LIFL 8,500 cd 12,000 cd
Nominative life time	> 50000 h	
Color temperature, typical	4.750 K	

2-6. Benefits

- Two standard flashing frequencies (1-2Hz)
- Variable number of synchronized flashing lights
- Three Configurable Luminance Levels: High (100%), Medium (10%), Low (3%)
- Single light monitoring function in any state
- Adjustable light intensity
- Local Control with Industrial Grade Touch Screen
- Remote Control is Integrated into AVIASAFE Lighting Control and Monitoring System (ALCMS) or easily interfaces with other platforms.
- Simple and quick installation

2-7. System Configuration



2-8. Functional Description

2-8-1. SELV Power Supply

For supplying power to the flash chain, the control unit feeds 220 V AC voltage at 50-60Hz to the supply cable. In the FSU unit, the primary supply voltage for powering the flashing lights is transformed down to a dependably isolated safety extra-low voltage of approx. 48 VAC. An overvoltage protection feature in the isolating unit protects the system against voltage spikes.

2-8-2. Brightness

AVIASAFE SFLS have 2 brightness type, High & Normal.

AVIASAFE LED SFLS Intensity (Cd)						
Light Name	Standard Value	Normal Intensity Test Result			High Intensity Test Result	
		≥	≥	≥	≥	≥
	Ave.	Ave.	Max.	Ave.	Max.	
1 Elevate SFLS Light	20,000	23,000	30,500	23,000	30,500	
2 Inset SFLS Light	6,500	8,500	11,000	12,000	16,000	

2-8.3 Brightness Adjustment

The flashing lights have been designed for operation in the following steps: 100%, 10% and 3% of the nominal brightness. You use the control system to switch over between them.

2-8-4. Addressable Light

Each of the flashing lights is assigned to its installation position by means of an address, where the first light of the chain is Number 1. The lights at the threshold accordingly have Numbers 31 and 32. The addresses are used to ensure that the flashes are triggered in the specified temporal sequence. Each Light can monitor faults, communication status and even LED current from Master control unit.

2-8-5. Ready Mode

Output Power line of Master timer to Light is power off until ready Mode activated. This feature is to increase the safety of maintenance and also increase the useful life of FSUs.

2-8-6. Test Reports

To view the lighting tests of lights Inset and Elevate and their brightness levels, you can refer to section [APPENDIX C](#) and review the information there.

3. DESCRIPTION

3-1. Flash Master Control Unit (FMCU)

The FMCU serves as the intermediary between the control system and the Flashing System. Its primary responsibilities include providing power to the flashing units in the field and overseeing the operation of the entire system.

The FMCU utilize power line communication to establish a connection with the Flashing System, enabling it to perform various functions such as control and monitoring of all the FSUs.

- Control and monitoring the Flashing System from both a local interface and a remote system
- Regulate Flashing System parameters, such as brightness level and flashing frequency of the light fixtures.
- Synchronize all the FSUs for coordinated operation.
- Receive diagnostic information from FSU, including LED status and fault notifications.



3-1-1. FMCU Interface

1. Power supply
2. Five terminals for service cable to configure a single FSU
3. Siemens PLC CPU for Digital I/O Control
4. Siemens PLC CM1241 for RS485 Communication
5. Siemens PLC Switch RJ45 female Ethernet part for remote control connection
6. VinaXs03 PCB for FSUs Control

3-1-2. FMCU Front External Components

1. Touch Pad

3-2. Touch Pad

The Touch Pad is touching screen interface located in the FMCU cabinet. It serves several important functions related to the Flashing System. Here's a breakdown of its main functions:

1. **Configuration Parameter Setup:** The Touch Pad allows users to set up the configuration parameters of the Flashing System directly from the FMCU. This means that users can customize various settings and parameters according to their requirements or specific flashing tasks.
2. **Command Execution:** Users can provide commands to the Flashing System through the Touch Pad. These commands can include initiating Flashing processes, pausing or resuming operation, and other actions necessary for controlling the Flashing System.
3. **FSU Unit Management:** The Touch Pad facilitates the installation and de-installation of new FSU units. FSUs are firmware packages used to update or modify the software on devices. With the Touch Pad, users can easily manage the installation and removal of these units as needed.
4. **Diagnostic Information:** The Touch Pad provides diagnostic information about every flashing unit in the field. This feature allows users to monitor the status and performance of the flashing units, identify any potential issues or errors, and troubleshoot problems effectively.

In summary, the Touch Pad serves as a user-friendly interface for configuring the Flashing System, issuing commands, managing FSU units, and obtaining diagnostic information about the flashing units. It enhances the usability and functionality of the Flashing System, making it easier for users to perform flashing operations efficiently.

3-3. FSU

The FSU performs several important functions related to the Flashing System. Here are the main functions of the FSU:

1. **Command Execution**
2. **Power Supply**
3. **Diagnostic Information**

3-4. PROTOCOL COMMUNICATION

1. **TCP/IP (RJ45 Connector)**
2. **Modbus (CR-A / CR-B)**
3. **RS-485 (PLC-A / PLC-B)**
4. **Multiwire**

3-5. Master timer - Main Bord

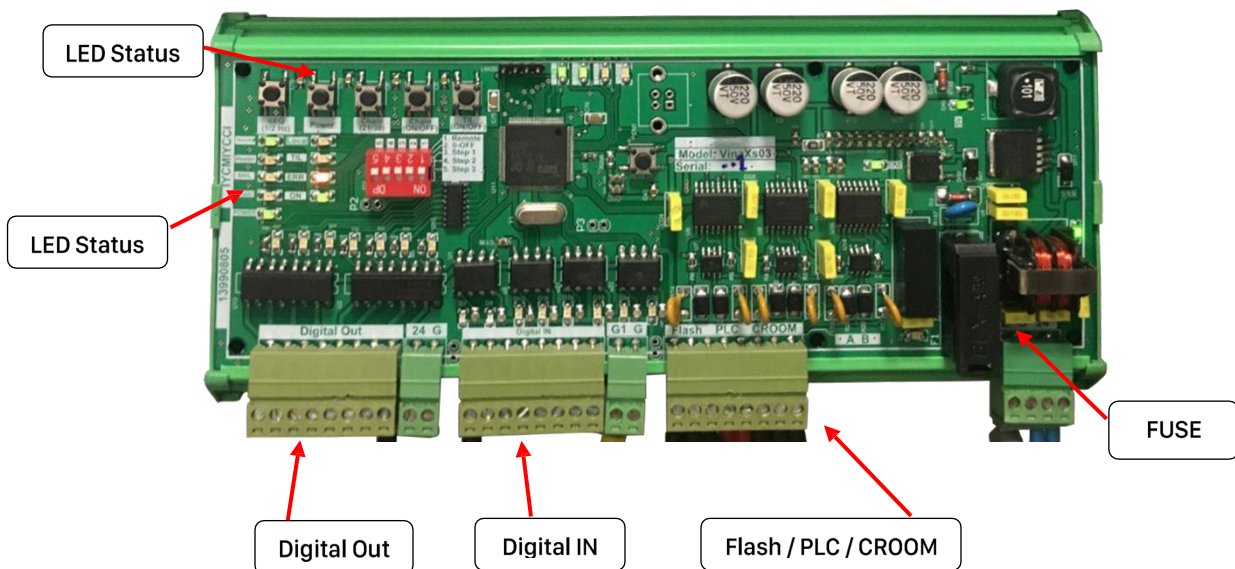
A Master Timer Board in a SFL System for Approach typically refers to a central control unit responsible for synchronizing and coordinating the flashing of LED lights used for approach lighting systems in aviation.

It receives input from various sensors and instruments, such as aircraft position, altitude, and other relevant data, and uses that information to determine the appropriate timing and sequencing of the LED lights.

The specific functionalities of a Master Timer Board can vary depending on the design and requirements of the SFLS. However, some common features may include:

1. **Timing Control:** The board controls the duration of the LED flashes, the intervals between flashes, and the synchronization of multiple lights.
2. **Sequencing:** It determines the specific order in which the LED lights should flash, ensuring the lights provide the desired visual guidance for pilots.
3. **Input Interface:** The board may interface to receive input signals from sensors or other devices, providing real-time data for the timing and sequencing calculations.
4. **Monitoring and Diagnostics:** The master timer board may have built-in monitoring and diagnostic features for detecting and reporting any faults or errors in the system.

- AviaSafe Master Timer – VinaXs03



3-6. HMI

Our LED Flashing System for Approach's HMI goes beyond the basics, with a plethora of features, it's a tool that truly surpasses. Behind the device, there's a world of innovation and power, Let's explore further, and witness its capabilities tower. Equipped with a USB port, file transfer becomes a breeze,

Connect your flash drive, and access data with ease. Save logs and records, ensuring information security, The SD card slot provides ample storage capacity.

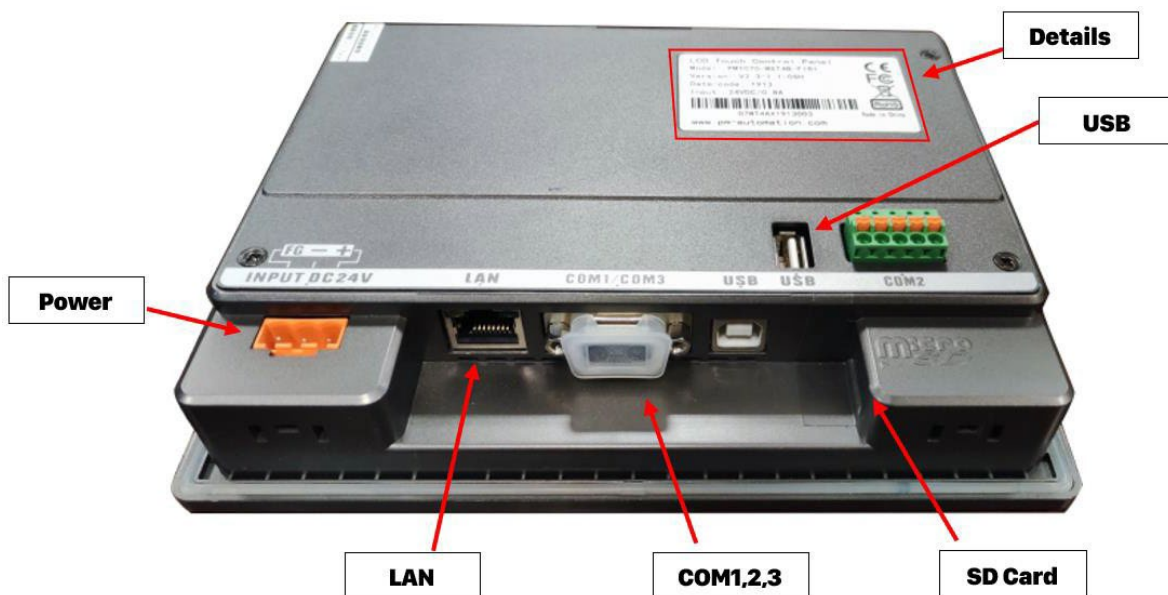
Not just limited to data storage, this system excels, its power-packed features make it a cut above the rest as well. With LAN connectivity, remote access is at your command, effortlessly control and monitor, no matter where you stand.

The COM port opens up a world of communication, seamlessly integrate with other devices, creating synchronization. Interact with external systems, exchange data in real-time, The LED flashing system takes efficiency to its prime.

Approach's HMI LED Flashing System, a technological marvel, designed to meet your needs, it truly excels and dazzles.

Whether it's for industrial applications or research endeavors, count on its reliability and features that it delivers. Experience the convenience, the power, and the efficiency, With Approach's HMI LED Flashing System, you'll be in harmony.

Stay ahead of the curve with this cutting-edge solution, unlocking new possibilities, revolutionizing your execution.



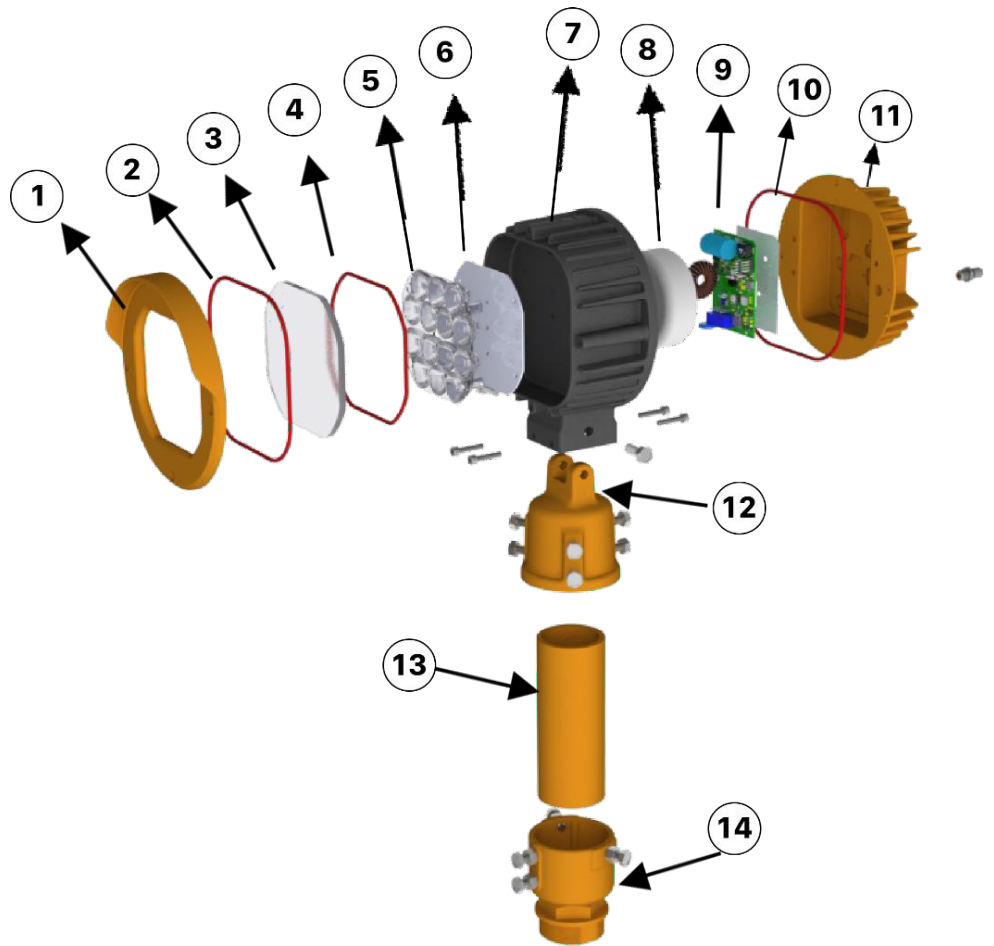
Please read the operating instructions for this device in section [4-4-1](#), as described above.

3-8. ELEVATED LIGHT FIXTURE EL-AP

The LEFL fixture is an elevated LED flash light, unidirectional steady burning type.

The light assembly is designed with a body that is carefully balanced on a specialized support system, ensuring precise horizontal and vertical aiming. This support system enables direct mounting either on a breakable coupling or on the top of a supporting pole with a diameter of 60mm. This versatile design ensures stability and flexibility in installation options for the light assembly.

1. Front Body
2. O-Ring
3. Front Glass
4. O-Ring
5. TIR
6. LED PCB
7. LED Module
8. Trans
9. PCB
10. O-Ring
11. Back Body
12. Aiming Support
13. Pipe
14. Breakable Coupling

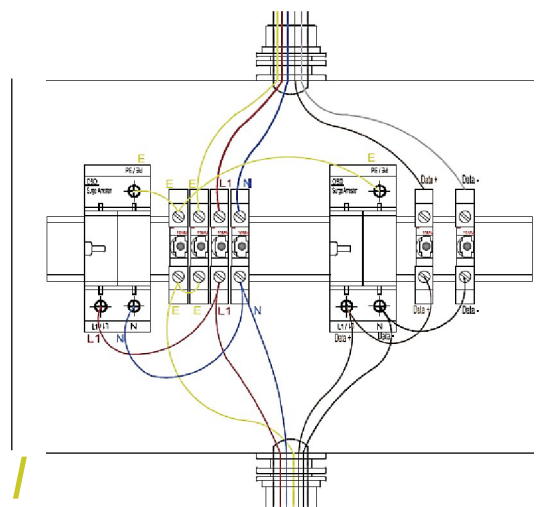


3-9. LINE PROTECTION

To protect the SFLS system against lightning effects, distortion, and EMI, it is necessary that after installing the FMSU inside the power substation, an additional cabinet with specified dimensions be placed outside the FMCU cabinet, between the FMCU cabinet and the entrance door to the airport's power substation, where the Line Protection equipment is located.

The cabinet should include two surge arresters with two poles, having specific characteristics, and should be mounted on a miniature rail using five terminals of size 10. This cabinet should be connected in series between the FMCU cabinet output and the last FCU.

Please note that for that SFLS system, a dedicated grounding system (earth electrode) should be implemented using a copper rod in undisturbed soil, with resistance less than 20.



4. OPERATION

4-1. Conditions for correct adjustment

Ensure that the SFL is connected to the appropriate power supply voltage (230 VAC) with the correct phases noted. Make sure the remote-control address is set to the correct value. Test the power lines to ensure they have acceptable isolation vale and continuity. Lastly, connect the remote-control cable.

4-2. Assembling

Start by setting the Key switch on the power. Ensure that there are no blinking lights on the display. Finally, turn Key switch to "Manual" for local operation.

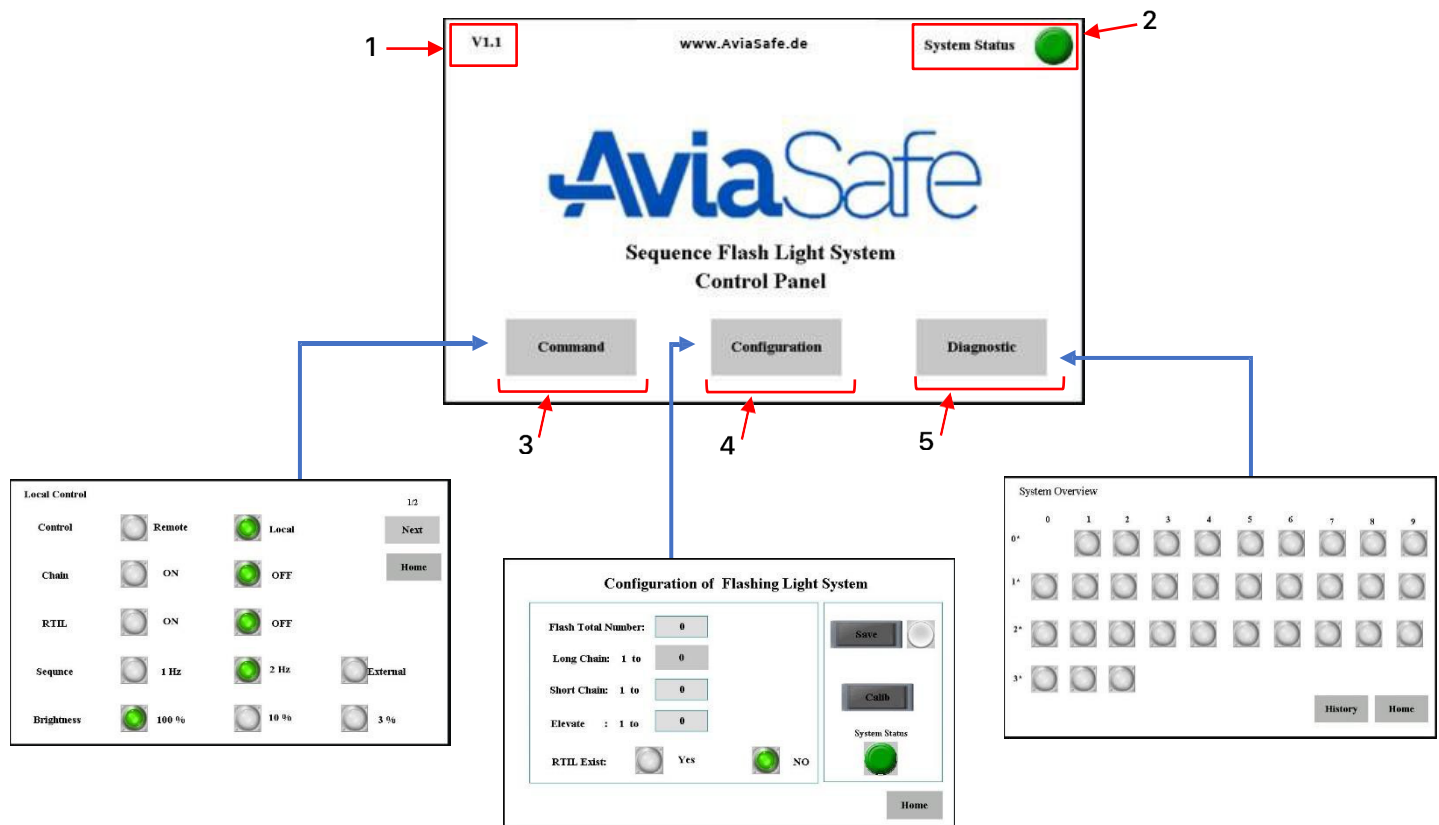
4-4. Use of the System

The SFLS comes equipped with a selection of predetermined settings that can be modified once the installation process is complete. The subsequent sections outline the steps involved in configuring and utilizing the system.

4-4-1. Touch Pad Main Page

WARNING

Every time the operator uses the Touch Pad, he has to wear the wrist-strap against electrical discharge that can be provided to the panel.



1. Software version
2. System Status: it reports the state of communication between the Touch Pad and the master board based on RS-485 protocol.
 - Green – All of the lights operate correctly
 - Yellow – 1 to 30% of all lights have problem
 - Red – more than 30% of all lights have problem
3. Operation Menu
4. Initial Setting
5. Fault Monitoring

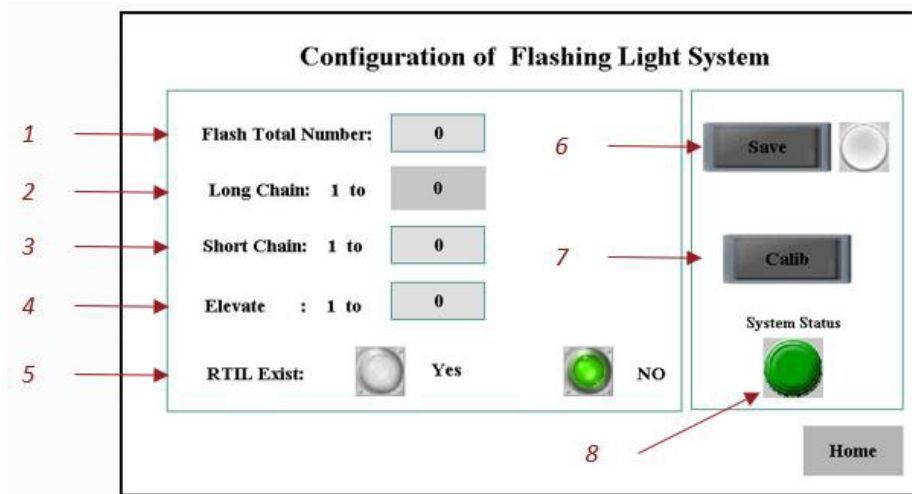
4-4-2. Configuration Page

NOTE:

The subsequent set of instructions needs to be carried out prior to configuration a new FSUs. Typically, this procedure is conducted at the factory, and the FSUs are supplied with preconfigured settings. In such instances, each FSU is labeled based on its respective ID, group, and position within the flashing sequence.

NOTE:

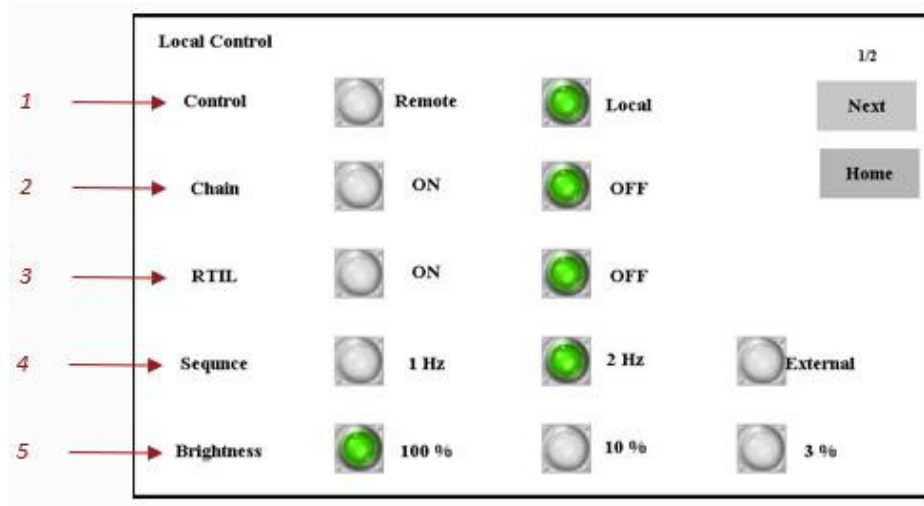
once the initial configuration of the FSUs has been completed, any subsequent changes made to the parameters will be automatically propagated to all the interconnected FSUs within the system. This ensures that the new configuration values are seamlessly distributed across all the FSUs.



- | | | | | | | |
|---|---|------------------------------------|--------------------------|----------------------------------|--|--|
| <ol style="list-style-type: none"> 1. Total number of SFLS main chain: 2. Number of lights in long chain mode: 3. Number of lights in short chain mode: 4. Number of elevate light exist in main chain: 5. RTIL Lights exist or not. | <table border="0"> <tr> <td style="border-left: 1px solid black; padding-left: 5px;">1 to 30 – when we have SFLS Lights</td> </tr> <tr> <td style="border-left: 1px solid black; padding-left: 5px;">0 – when only RTIL exist</td> </tr> <tr> <td style="border-left: 1px solid black; padding-left: 5px;">It is same as flash total number</td> </tr> <tr> <td style="border-left: 1px solid black; padding-left: 5px;">When we have 30 total lights, it set on 21</td> </tr> <tr> <td style="border-left: 1px solid black; padding-left: 5px;">Please set it correctly, it is important in high intensity mode.</td> </tr> </table> | 1 to 30 – when we have SFLS Lights | 0 – when only RTIL exist | It is same as flash total number | When we have 30 total lights, it set on 21 | Please set it correctly, it is important in high intensity mode. |
| 1 to 30 – when we have SFLS Lights | | | | | | |
| 0 – when only RTIL exist | | | | | | |
| It is same as flash total number | | | | | | |
| When we have 30 total lights, it set on 21 | | | | | | |
| Please set it correctly, it is important in high intensity mode. | | | | | | |

6. Save button for save the setting
7. Calibration button, the system status will update after click on this button.
8. System status: Green – No problem, Yellow – Problem detected, Red – More than 30% of total lights have problem

4-4-3. Command First Page

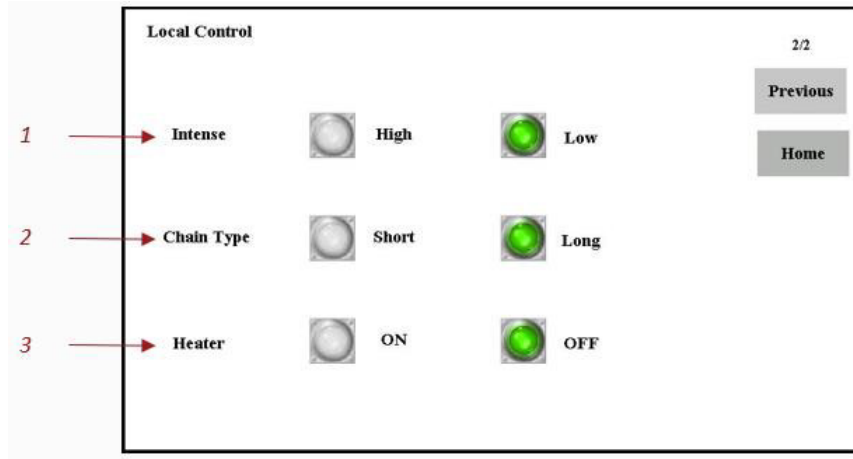


- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Control: 2. Chain (local command): 3. RTIL (local command): 4. Sequence (local command): 5. Brightness (local command): | <ul style="list-style-type: none"> Local – maintenance mode (local command) Remote – Remote control Command Turn on or off the main SFLS chain lights Turn on or off the RTIL lights Set the flashing frequency (1 or 2 Hz) or External flashing brightness level (100% - High, 10% Medium, 3% - Low) |
|--|---|

NOTE:

- If you choose Remote in control command, you cannot change the other setting in command page. Commands will set by control tower.
- When the input power interrupt, Master control unit will turn on automatically on remote control.

4-4-4. Command 2nd Page

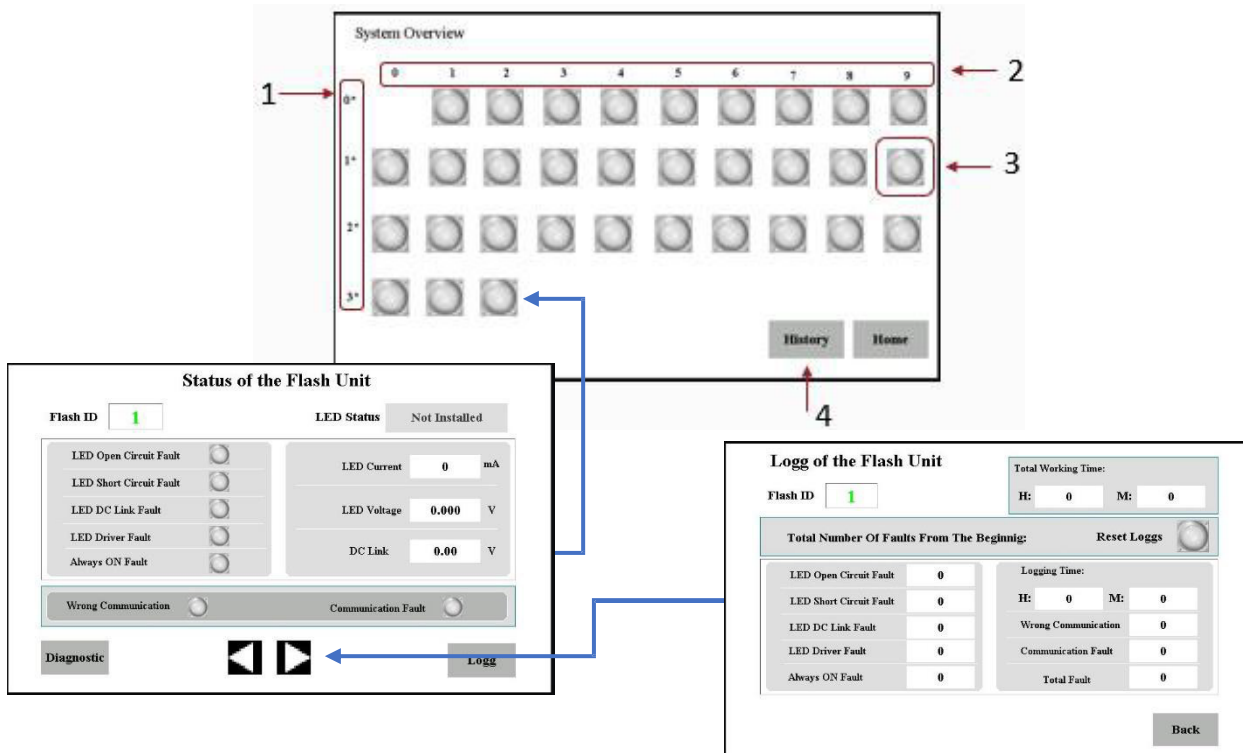


1. Intense (local command):
 - Low (Normal) – Standard Light brightness
 - High – The Inset lights intensity increase (don't choose this mode for long period because the inset lights life decrease).
2. Chain Type (local command):
 - Long chain – all of the SFLS light flashing
 - Short Chain – Only the numbers that you set on configuration page will flash.
3. Heater (Optional):
 - Heater will defrost the ice in low temperature.

NOTE:

- The distance from FSU to light should be lower than 25 m. (more distance will effect on light performance specially on High intensity mode).

4-4-5. Diagnostic Page



1. Light ID: Ten's digit
2. Light ID: Units digit
3. Status of each light: (No. 19)

Green	No problem
Red	Problem detected
Gray	Not Luminaire Installed
4. System Log

NOTE:

- By clicking one of the colored circles representing the installed units, it is possible to visualize the diagnostic frame of every single unit, where are reported the parameter of that unit.

4-4-6. Light Status Page

Status of the Flash Unit

Flash ID: 1 | LED Status: Not Installed

LED Current: 0 mA
LED Voltage: 0.000 V
DC Link: 0.00 V

LED Open Circuit Fault
LED Short Circuit Fault
LED DC Link Fault
LED Driver Fault
Always ON Fault
Wrong Communication
Communication Fault

Buttons: Diagnostic, Previous/Next, Logg

Light ID No. → Flash ID

Connection between FSU & light missed FSU output or light short circuit detected → LED Open Circuit Fault

FSU have Problem → LED Short Circuit Fault

FSU have Problem → LED Driver Fault

FSU have Problem → Wrong Communication

Status of each light :
Green – Correctly Working
Red – Have Problem
Gray – Not Installed

LED Current of each light measure be FSUs → LED Current

LED Voltage of each light measure be FSUs → LED Voltage

DC Link of FSUs → DC Link

Communication Fault detected : The connection between FSU and master control missed. → Communication Fault

Previous or Next Light ID Status Page

4-4-7. Light Logg Page

Logg of the Flash Unit

Flash ID: 1 | Total Working Time: H: 0 M: 0

Total Number Of Faults From The Beginnig: Reset Loggs

LED Open Circuit Fault	0
LED Short Circuit Fault	0
LED DC Link Fault	0
LED Driver Fault	0
Always ON Fault	0

Logging Time: H: 0 M: 0

Wrong Communication: 0
Communication Fault: 0
Total Fault: 0

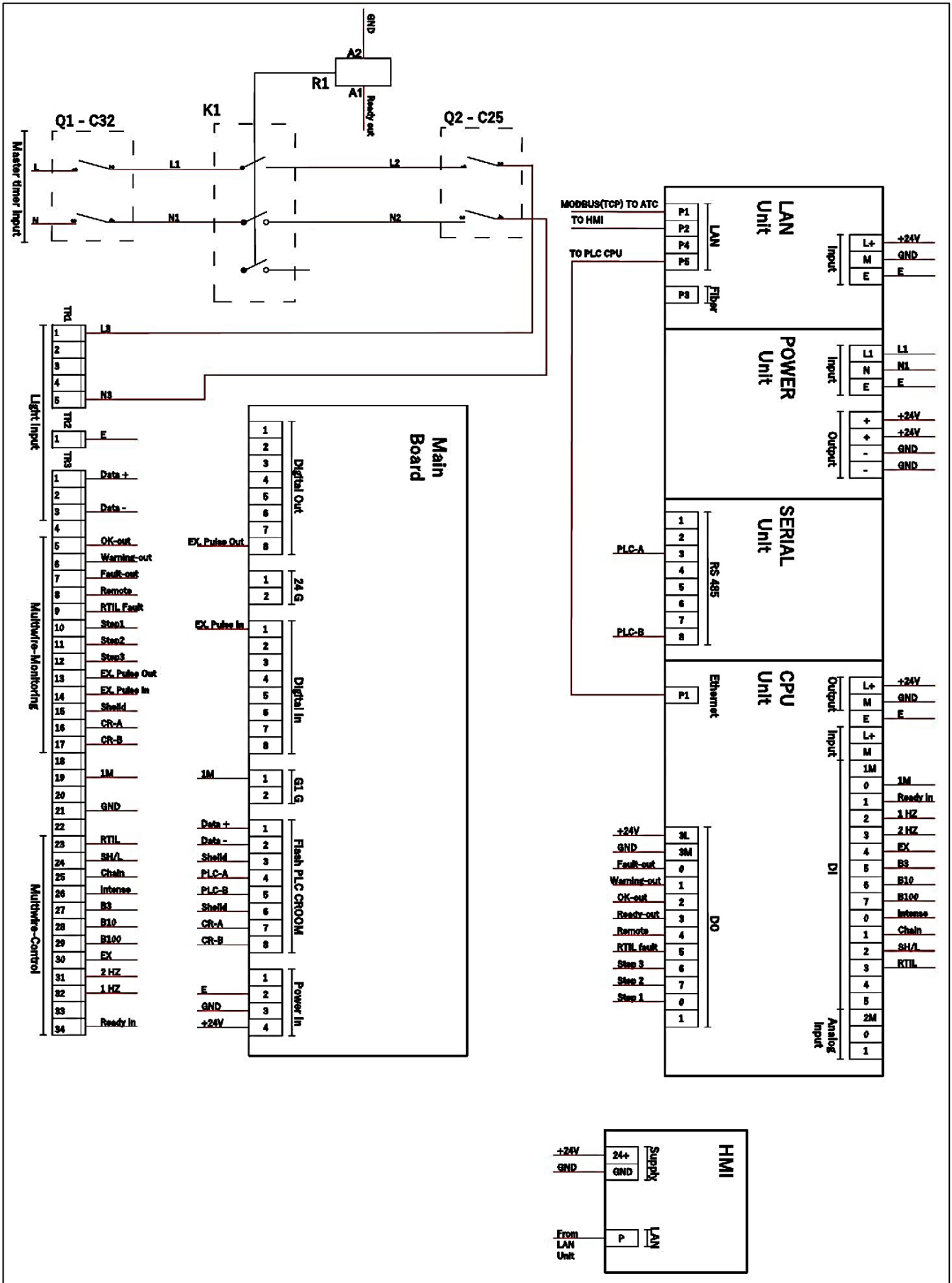
Buttons: Back

Light working time & Fault history until last reset. → Total Number Of Faults From The Beginnig

Total working time of Master timer: H – Hour , M - Minutes → Total Working Time

Reset Logg: All of the light faults will reset. → Reset Loggs

5. DRAWING



6. INSTALLATION

6-2. Cable Size

Cable length (m)	Cable cross-sectional area (mm ²)				
	2.5	4	6	10	16
100	0.7	0.4	0.3	0.2	0.1
200	1.4	0.9	0.6	0.4	0.2
300	2.1	1.3	0.9	0.5	0.3
400	2.9	1.8	1.2	0.7	0.4
500	3.6	2.2	1.5	0.9	0.6
600	4.3	2.7	1.8	1.1	0.7
700	5	3.1	2.1	1.3	0.8
800	5.7	3.6	2.4	1.4	0.9
900	6.4	4	2.7	1.6	1
1000	7.1	4.5	3	1.8	1.1
1100	7.9	4.9	3.3	2	1.2
1200	8.6	5.4	3.6	2.1	1.3
1300	9.3	5.8	3.9	2.3	1.5
1400	10	6.3	4.2	2.5	1.6
1500	10.7	6.7	4.5	2.7	1.7
1600	11.4	7.1	4.8	2.9	1.8
1700	12.1	7.6	5.1	3	1.9
1800	12.9	8	5.4	3.2	2

1900	13.6	8.5	5.7	3.4	2.1
2000	14.3	8.9	6	3.6	2.2
2100	15	9.4	6.3	3.8	2.3
2200	15.7	9.8	6.5	3.9	2.5
2300	16.4	10.3	6.8	4.1	2.6
2400	17.1	10.7	7.1	4.3	2.7
2500	17.9	11.2	7.4	4.5	2.8
2600	18.6	11.6	7.7	4.6	2.9
2700	19.3	12.1	8	4.8	3
2800	20	12.5	8.3	5	3.1
2900	20.7	12.9	8.6	5.2	3.2
3000	21.4	13.4	8.9	5.4	3.3
3100	22.1	13.8	9.2	5.5	3.5
3200	22.9	14.3	9.5	5.7	3.6
3300	23.6	14.7	9.8	5.9	3.7
3400	24.3	15.2	10.1	6.1	3.8
3500	25	15.6	10.4	6.3	3.9
3600	25.7	16.1	10.7	6.4	4
3700	26.4	16.5	11	6.6	4.1
3800	27.1	17	11.3	6.8	4.2
3900	27.9	17.4	11.6	7	4.4
4000	28.6	17.9	11.9	7.1	4.5

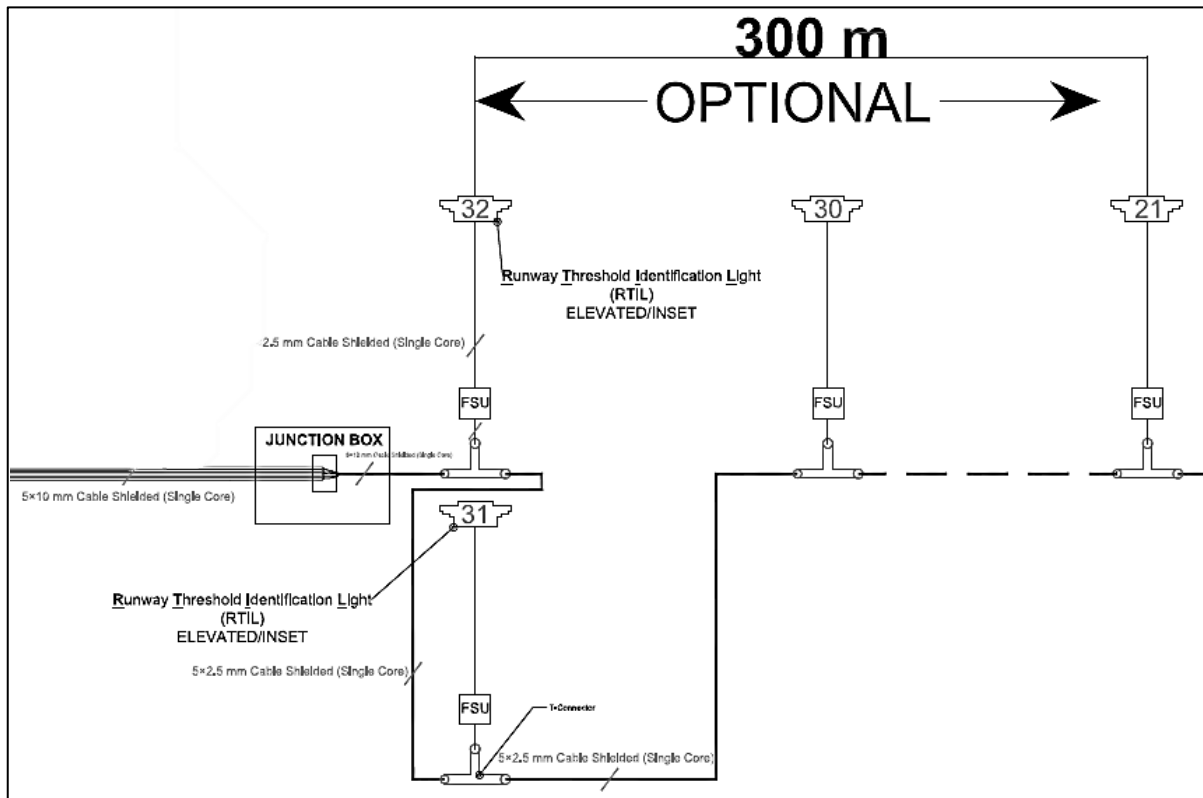
Cable length (m)					
1 to 32	Master to 32				
1000	1000				
Cable size (mm ²)					
2.5	2.5	4	6	10	16
Total (Ω)					
7.1	7.1	4.5	3	1.8	1.1
Report					
Cable size		Total Ohm		Situation	
2.5 & 2.5		14.2		FALSE	
2.5 & 4		11.6		TRUE	
2.5 & 6		10.1		TRUE	
2.5 & 10		8.9		TRUE	
2.5 & 16		8.2		TRUE	

Choose Cable length of each section
 Resistance of each section according to cable size and length
 Cable Resistance Report, Choose the cable sizes that the situation is True

NOTE:

- Before fulfilled the above table please check your cable resistance with criteria's table.
- Only you need to change cable lengths, software will calculate the appropriate cable size for you.
- The cable size between the FSUs should be $5 \times 10 \text{ mm}^2$.
- The cable size between the FSUs and light should be $5 \times 2.5 \text{ mm}^2$.

6-3. Cable Configuration



The cables between the Line Protection and Junction Box are $5 \times 10 \text{ mm}^2$, and the cable between the Junction Box and T connector is also $5 \times 10 \text{ mm}^2$

All cables from T to FSU and those connecting to the lights are $5 \times 2.5 \text{ mm}^2$

NOTE:

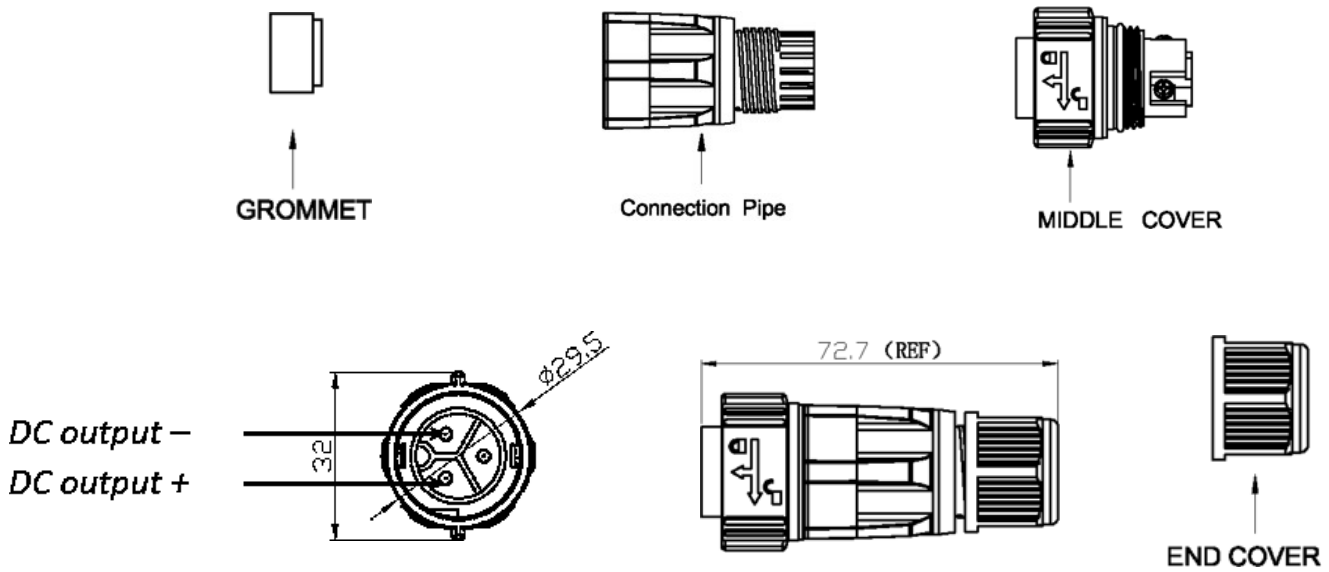
The maximum length of the connecting between FSU & Light cable must not exceed 25m.

6-4. Connector Connection

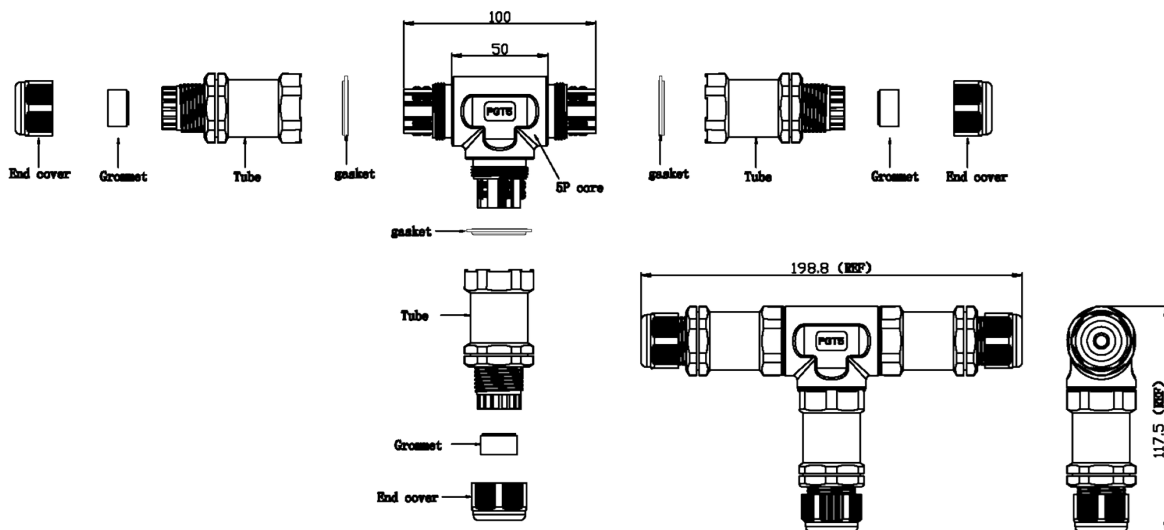
- FSU Input & T connector wire arrangement:
 1. Phase
 2. Null
 3. Data + (RS+)
 4. Data - (RS-)
 5. Earth

- FSU Output wire arrangement:
 1. DC output – (connect to bigger plug of light lead wire)
 2. DC output + (connect to thinner plug of light lead wire)
- Caution:
 1. After cabling, the connection between master & FSU must be checked. Any connection between RS-/RS+ & power line causes the FSU burn.
 2. The watertightness of FSUs & connectors must be checked

6-5. FSU Input & Output Connector



6-6. T Connector



6-6-1. Connector Specification

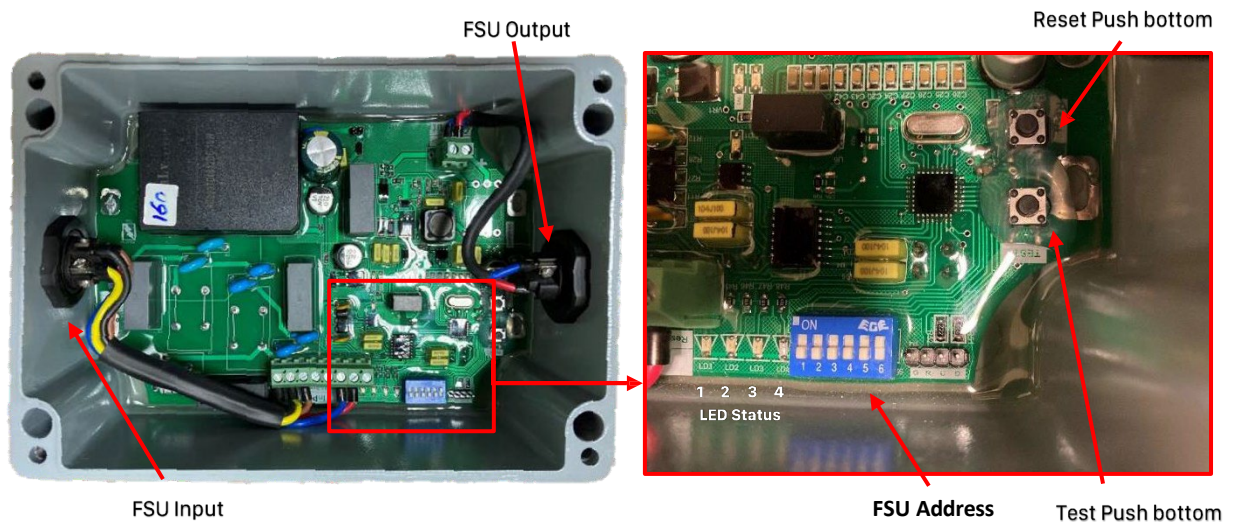
Connector Specification:

- Environmental Temperature: -40°C to 105°C
- Relative humidity: up to 90% (40°C)
- Voltage Rating: 250VAC
- Current Rating: 15A
- Contact resistance: 5mΩ (max)
- High voltage: 3 KV
- Insulation resistance: more than 500MΩ at 500 VDC
- Ingress protection (IP): 67

6-7. Connector Specification

- Connector Specification:
 1. Environmental Temperature: -40 C to 105 C
 2. Relative humidity: up to 90% (40 C)
 3. Voltage Rating: 250V AC
 4. Current Rating: 15 A
 5. Contact resistance: 5 m ohm (max)
 6. High voltage: 3 KV
 7. Insulation resistance: more than 500 M ohm at 500 VDC
 8. Ingress protection (IP): 67

6-8. FSU Detail



LED Status:

LED 1: Sync indicator

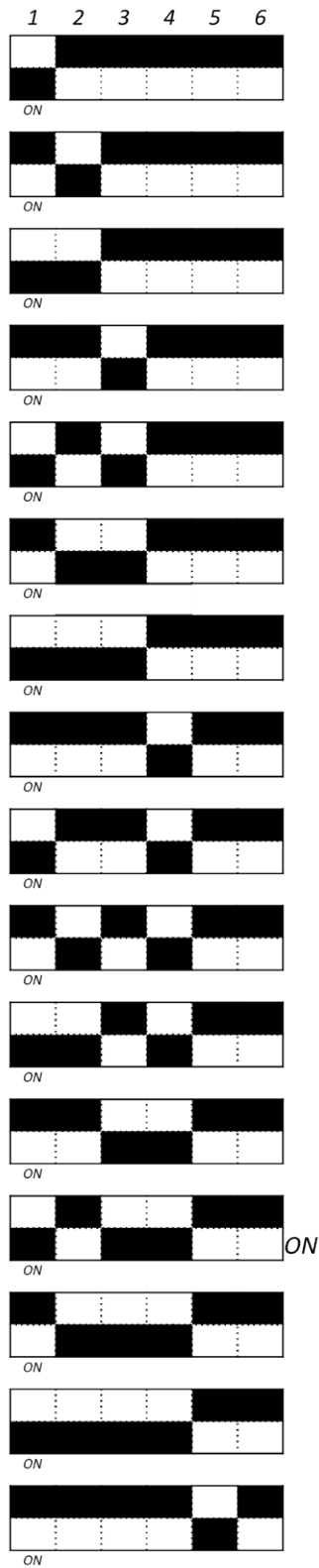
LED 2: Modbus Packet Received

LED 3: Modbus Packet Send

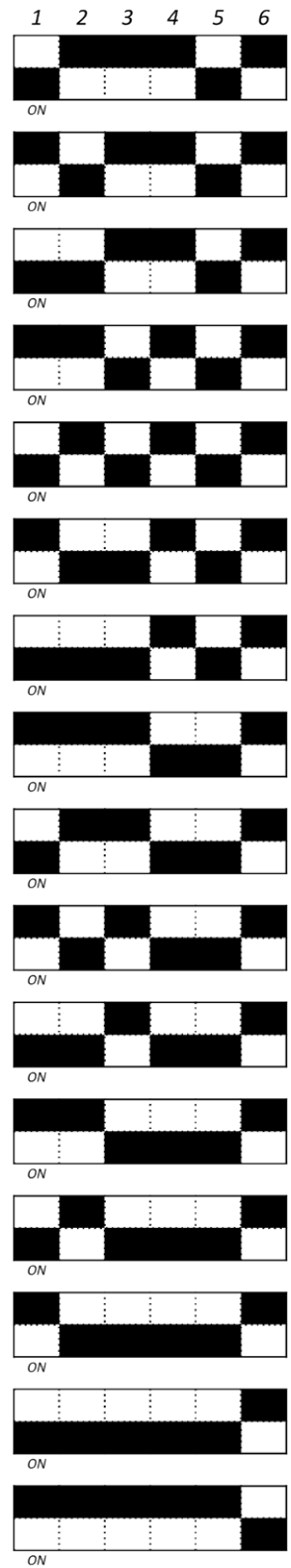
LED 4: Error (1Hz: Lamp Error, 2Hz: Communication Error)

FSU Address:

De.	Bi
1	000001
2	000010
3	000011
4	000100
5	000101
6	000110
7	000111
8	001000
9	001001
10	001010
11	001011
12	001100
13	001101
14	001110
15	001111
16	010000



De.	Bi
17	010001
18	010010
19	010011
20	010100
21	010101
22	010110
23	010111
24	011000
25	011001
26	011010
27	011011
28	011100
29	011101
30	011110
31	011111
32	100000



7. MAINTENANCE

WARNING:

Before any maintenance work is done in the SFLS, the power supply must be switched OFF.

If measurements have to be done with power on, the measurement must be via a measuring transformer. Before any work is done on the series circuit:

- The key selector on the SFLS must be set to "OFF".
- The SFLS front door must be clearly marked with a sign "Work is being done on the circuit".

7-1. Flash Master Control Unit (FMCU)

7-1-1. Periodical Maintenance

- Every six month
 1. To ensure the safe and efficient operation of the unit, it is essential to conduct a thorough inspection of the input and output power cables. Carefully verify that these cables are correctly connected to their respective terminal boards, namely 1 to 32. Additionally, pay close attention to the grounding connections of the unit, confirming that they are properly secured to the grounding terminal of terminal boards 1 to 32. Taking the time to double-check these connections will help maintain the device's safety and optimal performance.
 2. Check the mechanical fixation of the components and the electrical connections.
 3. Check the main circuit breakers Q1, Q2, case of dusty place, clean the equipment by means of compressed air.
 4. Make sure that A1 and A2 are properly placed on terminal K.

7-2. Elevated Light Fixture EL-AP

7-2-1. Periodical Checks

- Monthly
 1. Cleaning of the transparent front protections
 2. Correct setting of the lights
- Annual
 1. Stability of the civil works
 2. Stability and assembly of lights
 3. Electrical connections and insulation degree
 4. Luminous efficiency of luminous source
 5. Condition of all the gaskets

- **Unscheduled**

1. **After unusual atmospheric precipitation, Check the light condition and remove any luminous beam obstructions**

7-2-2. Snowplow Operation

Attention should be paid by snowplow operators to prevent any contact between the snowplow blades and the light fixtures. It is essential to conduct a thorough inspection of all light fixtures following snow removal operations in order to identify and replace any light assemblies that may have been damaged. For recommended snow removal techniques, please consult the Airport Service Manual ICAO - Part 9 - Airport Maintenance Practices or FAA AC 150/5200-30.

7-2-3. Light fixture replacement

Loosen the screws that hold the support with the device for adjusting the light's direction and unscrew the nut of the connector on the wall; (refer to figure 17)

Take out the light unit from the part that can be easily disconnected, like the coupling, the pole it is attached to, or the mast that can be lowered without breaking; (refer to figure 17)

If there is any wiring for grounding, remove it too. This way, you can reuse the existing electrical connections.

Install the new light unit and make sure to connect the wires properly.

Adjust the aim of the light according to the instructions provided in the specific manuals.

7-2-3. Electronic board replacement

To remove the electronic board, operate as follows:

- On the backside, remove the two screws that are held in place.
- Disconnect the wires for power supply, grounding, and the connector for the LED module.
- Swap out the defective electronic board with a new one that is equivalent.
- Reconnect the wires for power supply and grounding.
- Fasten the two screws back into their original position.

NOTE:

No further adjustments are required.

7-2-4. LED module replacement

Remove the light fixture as described in par 4.3.2, then:

- Remove the transparent cover and its holder plate by unscrewing the four screws at the front of the light fixture.
- Unscrew the two pairs of M4 screws that secure both the lens arrays and the LED module, and then remove the central screw.
- Disconnect the wires supplying power to the LED module.

- Replace the faulty LED module and reconnect the power supply wires.
- Adjust the position of the LED module using the central screw (do not tighten the screw completely).
- Adjust the position of the two lens arrays using the four M4 screws.
- Finally, tighten the central screw securely.

8. TROUBLESHOOTING

8-1. Requirement

1. Due to the presence of hazardous voltages within the FMCU, it is imperative that only qualified individuals familiar with 230VAC circuits undertake any interventions. These personnel should possess thorough knowledge of resuscitation techniques, which are extensively detailed in first aid manuals.
2. Prior to conducting any inspection or maintenance procedures, it is essential to take the following steps: deactivate the FMCU, disable the input circuit breaker, and disconnect the power supply to the FMCU. This can be accomplished by opening the circuit breaker or switch located on the distribution board of the main power supply line that energizes the FMCU.
3. It is recommended to wait for a minimum of 5 minutes to ensure that the power capacitors installed on the Input Filter Board are fully discharged.

8-2. Master Board Replacement

In case of substitution of a damaged Master board, follow the steps described below:

1. Power down the system
2. Open the door
3. Disconnect the electrical connections of the board
4. Exert a pressure on the pins that fix the board on the FMCU cabinet
5. Remove the board
6. Replace the damaged board with the new one
7. Restore the electrical connections
8. Close and power up the FMCU

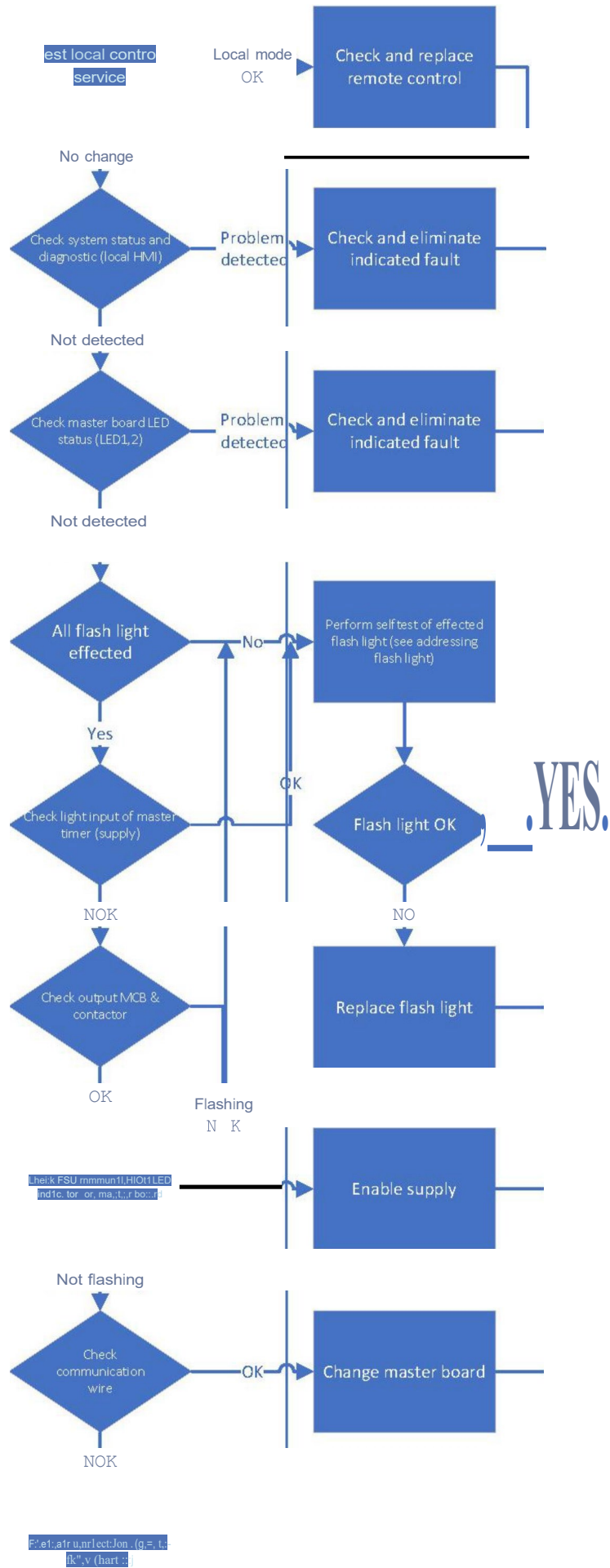
The subsequent step involves reinstating the system's configuration and preserving it on the new master board. This process can be accomplished using a specialized application called the Flash Remote Configuration, which is supplied by AVIASAFE.

8-3. Touch Pad Replacement

If the Touch Pad need a replacement because it does not work properly or it is damaged, follow the steps described below:

1. Power down the system
2. Open the door
3. Disconnect physically the supply and Ethernet cables
4. Unlock the eight pins in the rear of the Touch Pad form the fixed frame on the internal front door
5. Removing the SD card
6. Remove the damaged Touch Pad
7. Fix the new Touch Pad provided by AVIASAFE to the frame
8. Restore the electrical connections
9. Inserting the SD card
10. Close and power up the FMCU

Flash light system fault

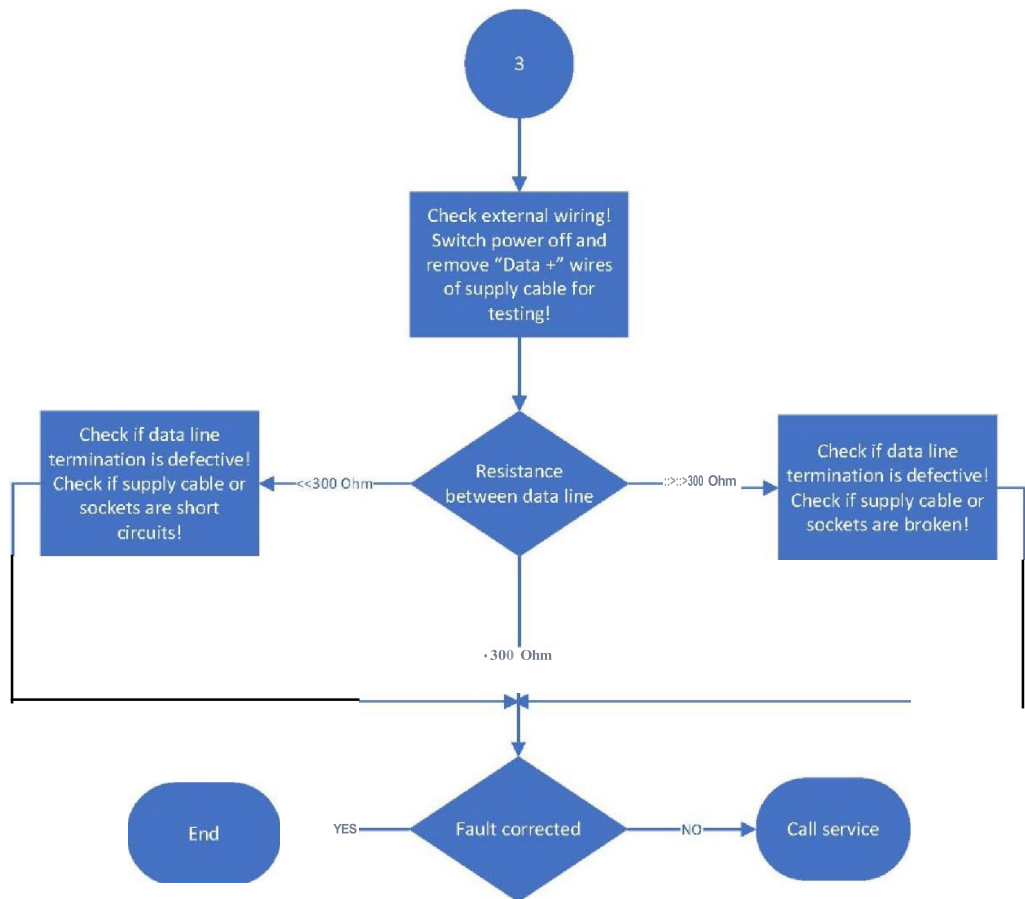
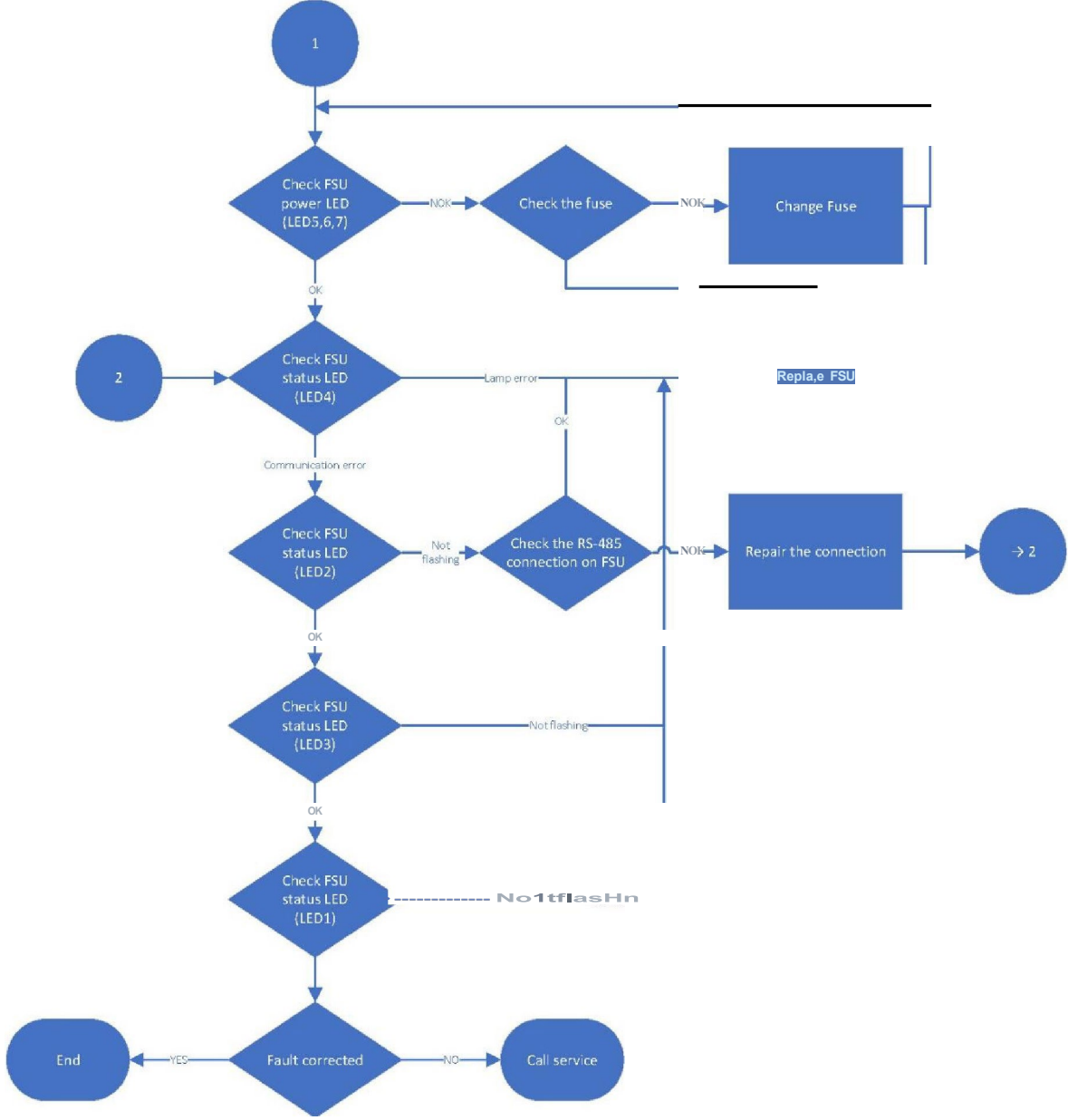


End

YES

Fault corrected

NO.



8-5. EL-AP Troubleshooting

PROBLEM	POSSIBLE CAUSE	SOLUTION
Distorted light beam output	Broken or damaged lens	Replace lens
Weak light output	Primary loop with partial short circuit	Check cable assembly
	Defect in the isolation transformer	Replace transformer
	More than 25% LED in short circuit	Replace the LEDs board
	Wrong power PCB installed	Check parts list and install the correct PCB
Luminous source not working	LEDs defective	Replace the LEDs board
	Power PCB defective	Replace the power PCB
	No connection of primary circuit	Check transformer output current with A-meter
	Defective isolation transformer or secondary wiring	Check power line between the light fixture and the transformer, including connectors
	Monitoring device locked	Unlocked monitoring device
Water or moisture inside the fixture	Lens gasket	Replace the gasket
	Pinched fixture power cables	Replace fixture leads

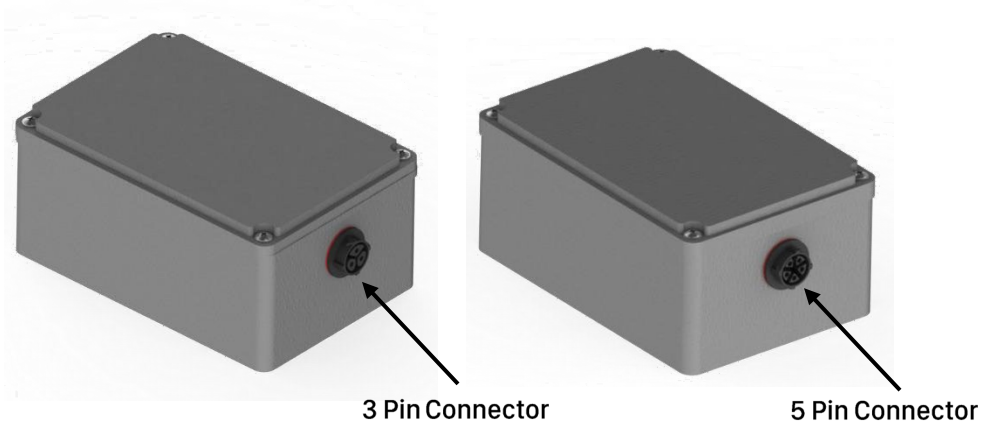
9. COMMISSIONING

9-1. Configuration

This page is for the initial system settings. It is used for cases where the system is being set up for the first time and requires complete initial configuration, or if changes need to be made to the number of lights after the initial setup.

9-1-1. Procedure:

1. Keeping the FMCU powered (Q1 = ON), open the circuit breaker "Q2" to power down the lights in the field
2. Insert the supplied service cable in the power connector of the FMCU
3. Connect the other end of the service cable to the 5-pole connector of the new FSU



4. Press the arrow (section [4-4-5](#))
5. Install the new FSU from the Touch Pad as described in the paragraph [4-4-6](#).
6. Disconnect the service cable from both the ends
7. Repeat the steps above starting from point 5 for all the FSUs that need to be configured

At this point, the configured FSUs can be connected to the power line in the field. Now, it's possible to:

8. Close the circuit breaker "Q2";

9. Power up the lights in the field by using commands described in the paragraph [4-4-5](#).

9-1-2. Main Configuration

1. On this page, by referring to the mentioned section [4-4-2](#) and the accompanying image, we can determine the total number of lights. We can change the number of lights from 1 to 32. And if we set it to 0, we command the system to use only RTIL lights.

NOTE

Remember that the number of long Chain should always be greater than the number of Short Chain lights.

For example, if the number of Long Chain lights is 30, the number of Short Chain lights should be 21.

2. Another section is the number of Elevate Lights, which is a very important part of these settings. These lights have the highest intensity.
3. There is also a section for RTIL lights, where we can inform the system about the presence of these type of lights by changing the YES/NO option.
4. By pressing the Save button, we can save the settings we have applied to the system. When the settings saved, Save Button's LED turns Green.
5. And by using the calibration option, the saved settings are applied to the system.
6. If there are any problems with applying these changes or not, we can identify these issues using the system status section.
 - If the color is Green, there are no issues, and the changes are applied to the system.
 - If the color is Yellow, the system detects and identifies any issues.
 - If the color turns Red, the system informs us that more than 30% of the lights have problems.
7. When the light was green and the settings were saved and applied to the system, you can return to the previous menu by pressing the "Home" button.

9-1-3. Configuration Test

We can use section Diagnostic [4-4-5](#) for testing the lights after the initial setup of the device. By pressing button "Diagnostic" on the First Page, we can view the status of the lights, whether they are active or inactive. The status of the lights is indicated by three colors:

- Green: No problem
- Red: Has a problem
- Gray: No setting applied to this light

By clicking on each light on this page, we can view the status of each light in detail. For better understanding, you can refer to section [4-4-6](#).

It is recommended to refer to this section after the initial setup to promptly resolve any issues that may arise.

9-2. Remote Control

9-2-1. Multi Wire Control

Terminal	Wire Code	Note	Art
34	Ready In	Main Contactor switched on	IN +24 V DC
32	1 HZ	1 HZ frequency activated	IN +24 V DC
31	2 HZ	2 HZ frequency activated (preset)	IN +24 V DC
30	EX	External pulse input for synchronization mode switched on	IN +24 V DC
29	B100	Brightness preselection Step 3 (100%) (Preset)	IN +24 V DC
28	B10	Brightness preselection Step 2 (10%)	IN +24 V DC
27	B3	Brightness preselection Step 1 (3%)	IN +24 V DC
26	Intense	High Intensity activated (Standard intensity preset)	IN +24 V DC
25	Chain	Chain switched on	IN +24 V DC
24	SH/L	Short Chain activated (Long Chain preset)	IN +24 V DC
23	RTIL	Threshold identification lights switched on	IN +24 V DC
19	1M	Control COM	IN COM DC

NOTE:

If the control and monitoring unit exist in the same room as master timer of SFLS, you can connect GND & 1M together

Terminal	Wire Code	Note	Art
10	Step 1	Brightness Step 1 (3%) is switched on.	Out +24 V DC
11	Step 2	Brightness Step 2 (10%) is switched on.	Out +24 V DC
12	Step 3	Brightness Step 3 (100%) is switched on.	Out +24 V DC
9	RTIL Fault	<p>OFF: TIL is working faultlessly or RTIL off.</p> <p>ON: At least one of the threshold identification lights (TILs) has been detected as faulty and the threshold identification lights have been positively switched off.</p>	Out +24 V DC

8	Remote	The flash lighting system has been connected to the remote-control system by the ATC.	Out +24 V DC
7	OK-Out	ON: no lamp fault in the chain	Out +24 V DC
6	Warning-Out	ON: less than 10% of total flashing light in the chain has been detected as faulty.	Out +24 V DC
5	Fault-Out	ON: more than 10% of total flashing light in the chain has been detected as faulty.	Out +24 V DC
21	GND	Monitoring COM	Out COM DC

9-2-2. Serial Communication

Terminal	Wire Code	Note
17	CR-A	RX/TX Data +
16	CR-B	RX/TX Data -
15	Shield	cable Shield

9-2-3. EXTERNAL PULSE

Terminal	Wire Code	Note	Art
13	EX. Pulse Out	could be connected to "EX. Pulse In" of another master timer (in that case GND also should be connected to 1M of another master timer)	IN +24 V DC
14	EX. Pulse In	In case, master timer operates as slave, the input pulse should be connected to the "Ex. Pulse out" of another master timer.	IN +24 V DC
30	EX	External pulse input for synchronization mode switched on	IN +24 V DC