MCLO

Monitor Control Lamp Optical

MCLO
Monitoring Module

Monitoring Module **MCLO** (**M**onitor **C**ontrol **L**amp **O**ptical) is a modular field device of **MIA System** devoted to the smart management of AVL lights and it is connected through Optical Fiber communication technology.

The Monitoring Module, depending on the model, manages from 1 up to 5 runway lights and it is the instrument through which it is possible to remote control the ON/OFF switch of a specific light or group of lights and detects single burnt lamp. By means of fault tolerance optical fiber technology, the Monitoring Modules can receive in just few milliseconds the state of each single lamp of the runway and eventually turn it off or on through the custom designed firmware with which they are supplied.
The system is developed with 2 types of cables: a copper one for the power supply and a second one in optical fiber dedicated to data transmission, in order to guarantee the monitoring functionality and the exact runway lights breakdown analysis, even in case of AVL circuits' malfunctioning. The use of different cables allows the optical split of data communication from the electrical vault to the field, eliminating any kind of noise generated by medium or low voltage circuits.

Features of Optical Monitoring Module

- Even if AVL plants are switched off the module transmits: state, functioning voltages, temperature and other diagnosis data of the module itself;
- The module has a galvanic insulation and it is not affected in case of low insulation on main circuits;
- Manufactured in compliance with IP68 standards and completely resin-filled, the device can guarantee the perfect waterproofing even in case of installation into brackish immersion;
- Burnt lamp time detection on a channel of 100 modules: 15 ms;
- Managing time for on/off command on a channel of 100 modules: 15 ms;
- Military connectors type IP 68 immersion standards;
- The fault tolerance monitoring technology allows to reduce the CAT non-availability in case of channel malfunctioning;
- The module detects exactly the burnt lamps' position;
- The module switches on and off the AVL lights;
- The module electronically shortcircuits the burnt lamps;
- If it is not powered, the module MCLO does not interfere with the main circuit.

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IT 102019000003889
EU EP 3 769 591
USA 11.459.119 B2

FAA L-890 (Intertek) certificate nr. 69010327-001-1

Automatic Functioning Features

The loss of power supply to MCLO1/2/3/4/5 does not compromise the optimal plant functioning.
If the MCLO1/2/3/4/5 is powered, in case of one or more burnt lamps, the system guarantees the functioning of the remaining lamps in the following sequence:

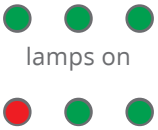
- In case of one or more burnt lamps - in whatever position - MCLO1/2/3/4/5 guarantees the switch on of the remaining lamps managed by **MCLO 2, MCLO 3, MCLO 4, MCLO 5**;

powered MCLO 2

lamps on

one of the two lamps burnt,
guarantees the switch on of the functioning one

powered MCLO 3



lamps on

one of the three lamps burnt, guarantees
the switch on of the other two

two of the three lamps burnt, guarantees
the switch on of the remaining one

powered MCLO 4

lamps on

one of the four lamps burnt, guarantees
the switch on of the other three

two of the four lamps burnt, guarantees
the switch on of the other two

three of the four lamps burnt, guarantees
the switch on of the remaining one

powered MCLO 5

lamps on

one of the five lamps burnt, guarantees
the switch on of the other four

two of the five lamps burnt, guarantees
the switch on of the other three

four of the five lamps burnt, guarantees
the switch on of the remaining one

- MCLO 1/2/3/4/5 can be programmed in pre-set ON or in pre-set OFF:
  pre-set ON: at plant switch on with powered MCLO 1/2/3/4/5 the lamps are on
  pre-set OFF: at plant switch on with powered MCLO 1/2/3/4/5 the lamps are off
  In any case, the pre-set on and pre-set off mode can be remote controlled and changed if MCLO 1/2/3/4/5 has no power supply; when MCLO 1/2/3/4/5 is not powered the system reset automatically the previous mode.

Model	Transformer / Lamp	
MCLO 1	1 / 1	Lamp detection and ON–OFF remote control management
MCLO 2	1 / 2	
MCLO 3	1 / 3	
MCLO 4	1 / 4	
MCLO 5	1 / 5	

Technical Features

MECHANICAL SPECS MCLO 1-2-3-4-5

Weight	**MCLO 1, MCLO 2:** 2,9 kg **MCLO 3, MCLO 4, MCLO 5:** 5,8 kg
Dimensions (L x P x H)	**MCLO 1, MCLO 2:** (220x120x90) mm **MCLO 3, MCLO 4, MCLO 5:** (260x160x90) mm
Manufacturing	IP68, Polyester completely resin-filled
Completely resin-filled	Polyurethane elastic resin
Operating temperature range	Extended temperature range from -20 up to +70 °C

ELECTRONIC AND OPTICAL SPECS POWER SUPPLY AND DATA

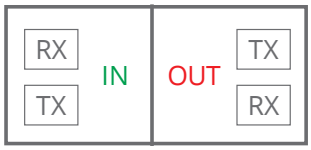
Voltage	Dc: (25 ÷ 60) Volt
Consumption	1 Watt
Communication Protocol	Optical communication
Max for each channel	100
Baud rate	230.4 Kbps
Configuration	E, 8 bit, 1 stop-bit
Software	Update available through connector (IN)
Address	EEPROM editable through connector (IN)
ON/OFF Command Timing for each channel (N°100)	15mS
Detection time of burnt lamp for each channel (N°100)	15mS
Detection of burnt lamps or leds	status ON
Power connectors and cable	~ FAA style 7 female connector, vulcanized on 300 mm bipolar cable 2xAWG12, TPE insulating material ~ FAA style 1 male connector, vulcanized on 300 mm bipolar cable 2xAWG12, TPE insulating material
Optical Connectors	PUSH-PULL Nr. 2 fibers OM2 Multimode OM2 50/125 IP68 Mate/Un-mate with one hand High optical stability Low back reflection Easy field cleaning
Power supply connectors to MCLO1-2 modules	Series 103 2 poles IP68 10.000 cycles PUSH-PULL 13 Amp each contact

ELECTRICAL GENERAL SPECS

Maximum power input	300W

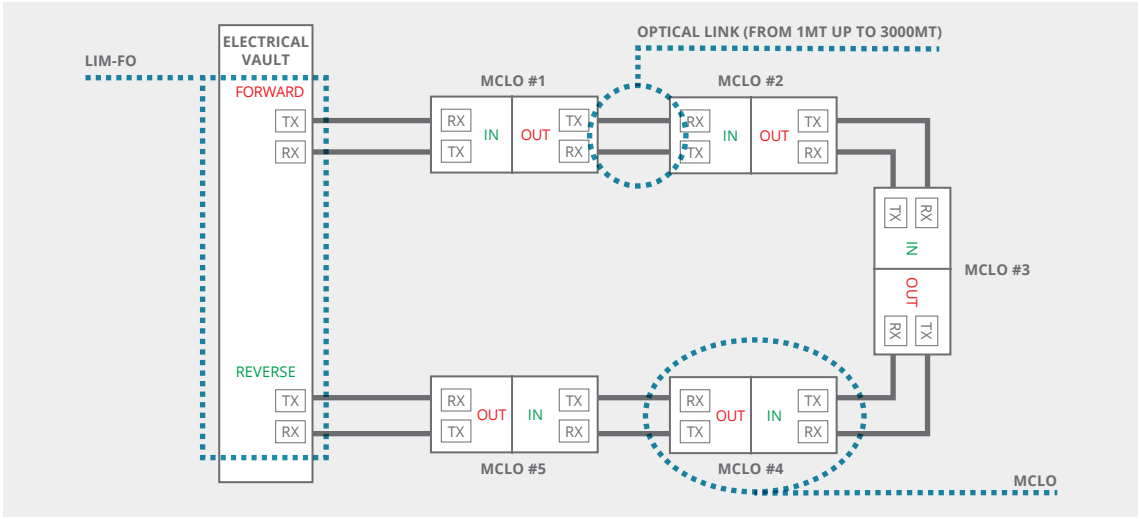
Software specs

MCLO is made of two optical connectors (**IN** and **OUT**) with two fibers inside (**TX** and **RX**)



MCLO channel (data)

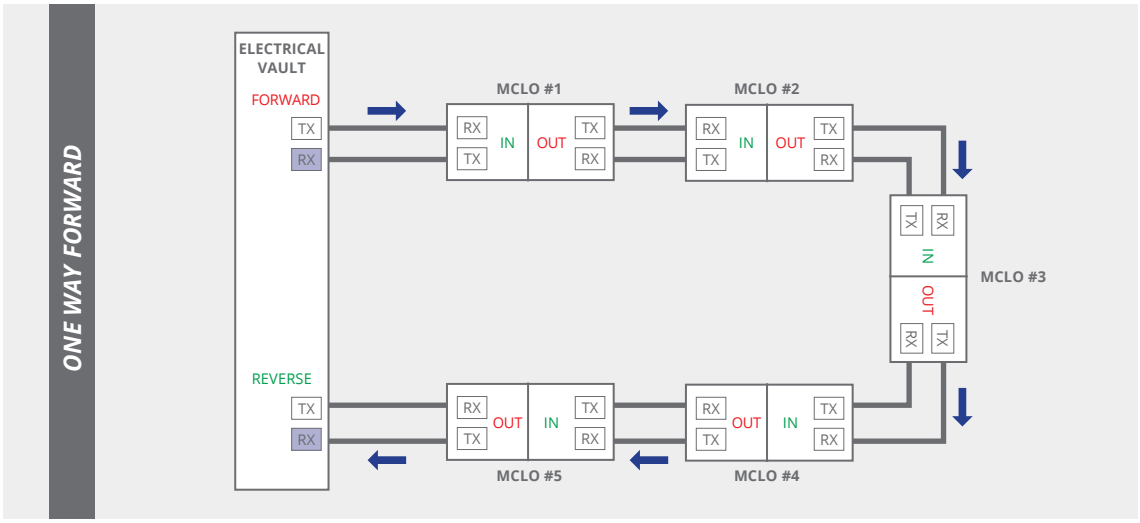
Data connection model between MCLO and electrical vault:

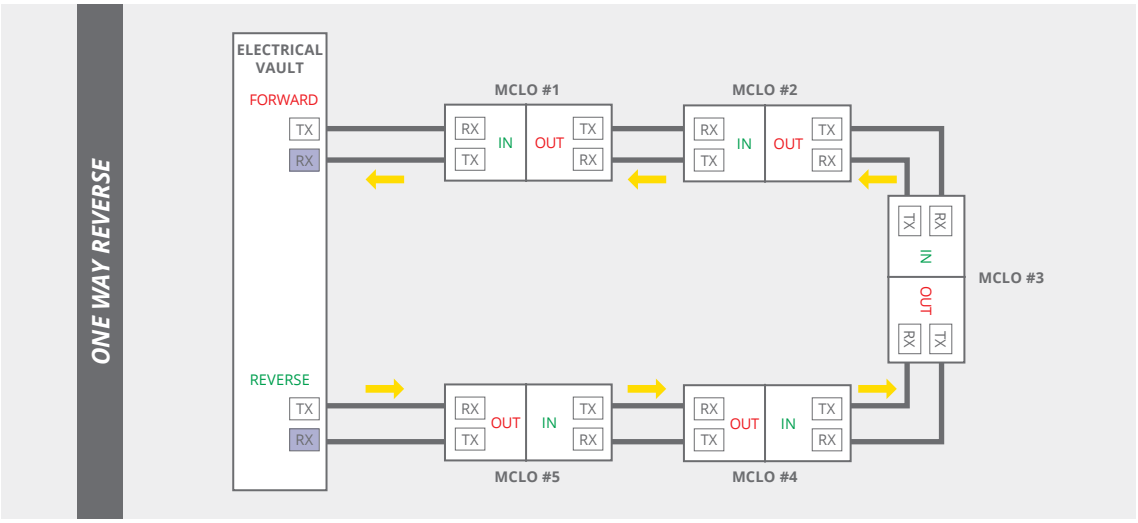


Communication on MCLO channel

ONE WAY

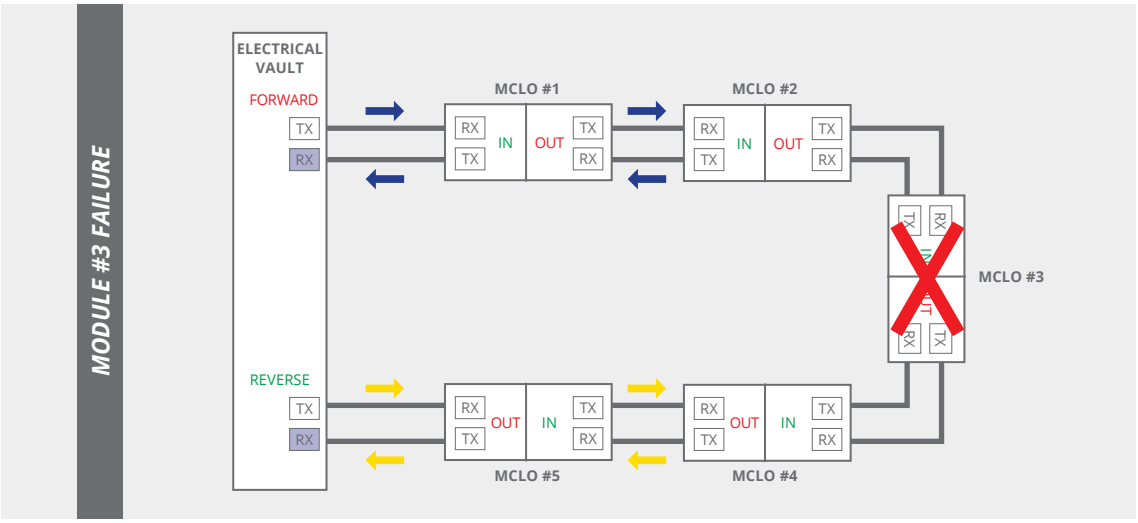
The *ONE WAY* communication is active when the whole MCLO channel is operating. The communication among modules and electrical vault is in one way mode. The data package, that is generated by the module management software, is transmitted from the Forward door of the FO electrical vault LIM to the first module. This one uploads its information and send the package to the ensuing module and so on for each module of the channel. The last module sends the package to the Reverse door of the FO electrical vault Lim with all the information of every module belonging to that channel. ONE WAY communication can be Forward to Reverse (*ONE WAY FORWARD*) as well as Reverse to Forward (*ONE WAY REVERSE*).
The electrical vault software alternates *ONE WAY FORWARD* and *ONE WAY REVERSE* for each channel check.



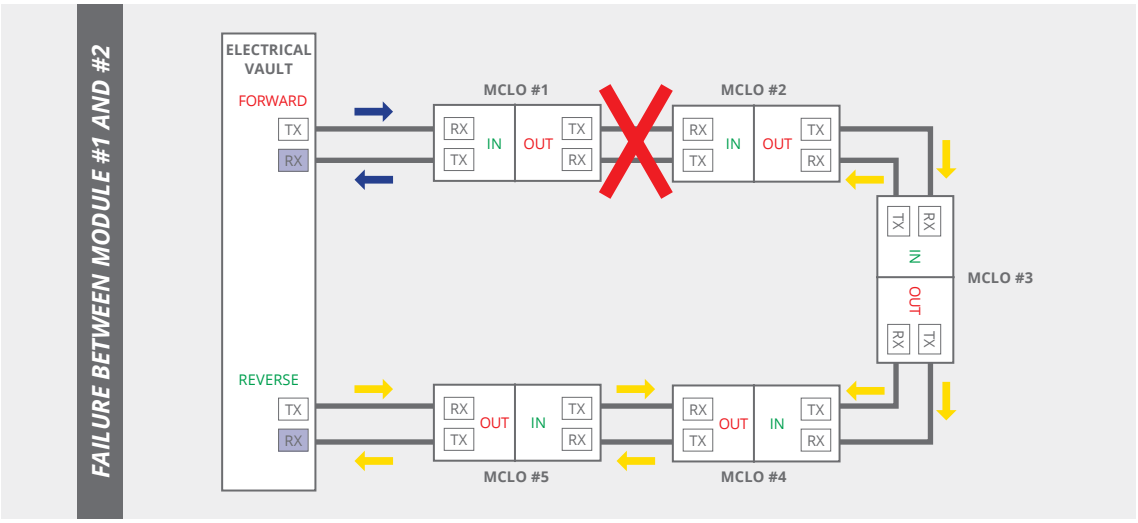


ROUND TRIP

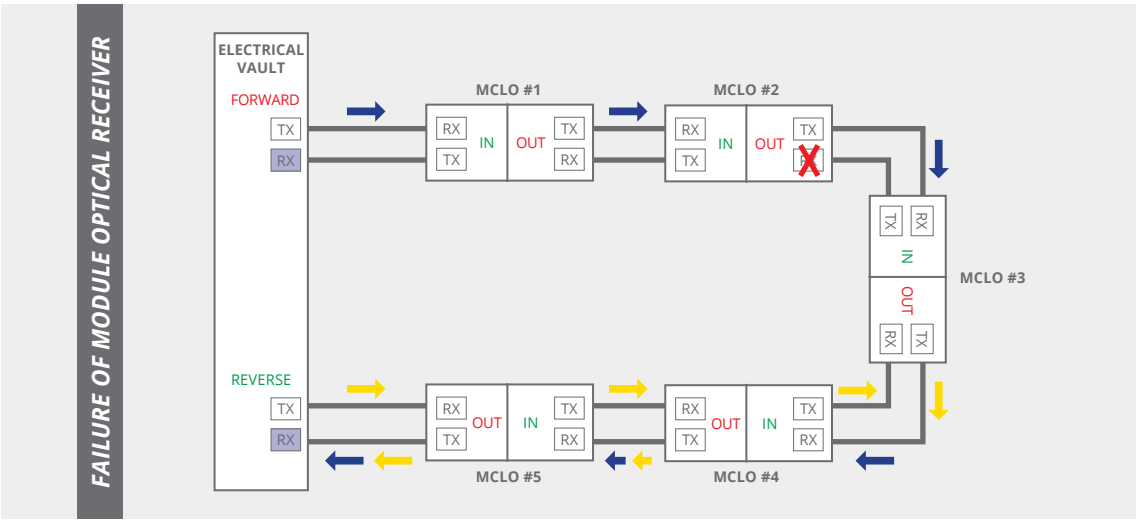
Round Trip communication activates only when a malfunctioning occurs on the channel. The data package generated by the module managing software is transmitted from the Lim Forward of electrical vault FO, that uploads its information, to the ensuing module until the communication reaches the last functioning module. If the last module, due to a failure, cannot go on with transmission, it sends the package backwards with all the information of the previous modules to the Lim Forward door of the electrical vault FO. The same procedure is active from Lim Reverse door of electrical vault FO. Failure Examples:



In this case it lacks just the information from module #3. The lamps connected to the module #3 are considered malfunctioning by the system



In this case the channel information flow is complete.



In this case the information flow of the channel is complete. The blue arrows on the scheme indicate the output communication from Forward door, the yellow ones the communication output flow from Reverse door. In this case the scheme highlights that the Forward communication – whose path is not compromised by failures – remains in ONE WAY status, whereas the Reverse communication has shifted into ROUND TRIP mode.

Data package info of MCLO channel

The required time to check the status of a MCLO channel with 100 modules and the successive elaboration as well as the input into MIA System of the answer received from the field is about 200 ms.

Information contained in each channel interrogation

Request:

- Command (ON/OFF)

Answer:

- Lamp status (burned/working)
- Power supply status of the lamp (power ON/power OFF)
- Command feedback (checking the current of the secondary circuit transformer of all the lamps that are connected to the single module)

Additional information that can be requested to a single module or simultaneously to all the modules:

- Address of the single module
- Module temperature
- Module power supply (48V)
- Power supply of the module microprocessor (5V)
- Measurement of the current of the secondary circuit transformer of all the lamps that are connected to the single module
- Firmware version

Moreover, it is possible to execute the below listed commands while the channel is operative:

- Modules redirection
- Firmware update

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BR60-MCLO-EN_04