

# MFL User Manual

## RF over Fiber System

- ✓ Up to 4 ch's in a single mode fiber
- ✓ Diversity reception antenna remoting
- ✓ IFB transmissions remoting
- ✓ Integrated tunable filters
- ✓ Optical & RF power meter
- ✓ Ethernet conn. for remote control



rev.06 (ref. FW 1.15)

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## Summary

|   |    |
|---|----|
| Front Panel Control and Functions .....         | 2  |
| Rear Panel .....                                | 3  |
| System Description .....                        | 4  |
| Optical receiver and transmitter modules .....  | 6  |
| Optical Receiver Module .....                   | 7  |
| Optical Transmitter Module .....                | 8  |
| TRANSMISSION SYSTEM (MODE: IFB) .....           | 8  |
| RECEPTION SYSTEM (MODE: ANT) .....              | 9  |
| Filter option .....                             | 10 |
| Link without MUX/DEMUX Module .....             | 11 |
| Optical MUX/DEMUX Module .....                  | 11 |
| OMX option .....                                | 11 |
| OMS option .....                                | 12 |
| DC Option .....                                 | 14 |
| N48 Option .....                                | 14 |
| V48 Option .....                                | 14 |
| SPL option .....                                | 15 |
| Double OMS option .....                         | 15 |
| Optical link budget .....                       | 16 |
| Failsafe mode .....                             | 17 |
| Configuration examples: .....                   | 18 |
| IFB TRANSMISSION – MODE: IFB .....              | 18 |
| RECEPTION - MODE: ANT .....                     | 19 |
| MULTI-CARRIERS TRANSMISSION – MODE:<n>ifb ..... | 20 |
| OLED Display .....                              | 21 |
| MFL Info screen .....                           | 21 |
| Main screen .....                               | 21 |
| Menu Tree .....                                 | 22 |
| Main menu .....                                 | 25 |
| TX Link menu .....                              | 26 |
| RX Link menu .....                              | 27 |
| Alarm List .....                                | 28 |
| Troubleshooting .....                           | 30 |
| Safety instruction .....                        | 31 |
| ITALY ONLY .....                                | 32 |
| TECHNICAL SPECIFICATION .....                   | 33 |

## FRONT PANEL CONTROL AND FUNCTIONS

MFL allows an easy and quick configuration using buttons, push knobs and display.



The front panel is functionally divided in the following section:

### A – LINK STATUS



Transmitter / Receiver configurations

- ①
- ②
- ③

#### ① Connection status:

- The first column of LEDs indicate Alarms
- The ON column indicate if a module is ON
- The FAILSAFE column indicate if the Failsafe option is enabled
- STATUS and CONN, showing the LED indications of the Ethernet module on the rear panel

#### ② Display (64 x 256 pixels yellow OLED display)

③ 3 push buttons (membrane). The function of each button (upper, middle and lower) will be readable from the contextual menu on the display.

#### ④ Warning (YELLOW) and Alarm (RED) light indicator

#### ⑤ Push rotary knob. Rotate and push to select.

### B – LINK DIAGRAM

This part shows the block diagram of one complete channel and the BOOSTER supply if enabled from the transmitters

### C – TEMPERATURE ALARMS & CONFIGURATION LABEL

**TEMP. ALARM:** indicate eventually high temperature on the device.

**FAN1/FAN2:** these LEDs turn on if faults occur to the cooling system.

**CONFIGURATION LABEL:** name and configuration of the device.

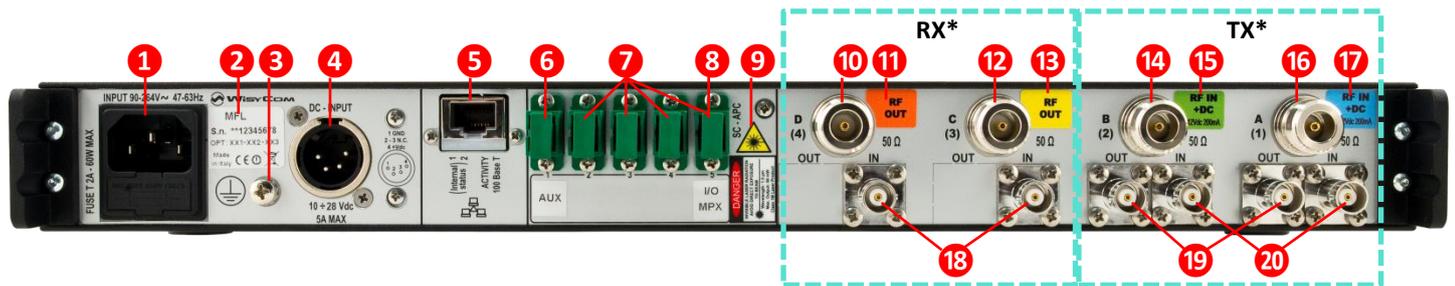
### D - LOCK & POWER

**LOCK:** it locks the editing of the display.

**POWER:** ON/OFF square powering button turns on/off the MFL. Above the power button, there are two LEDs to indicate the type of power supply.

*NOTE: If both AC/DC power are supplied, both LEDs turn on but the device uses only AC power supply*

## REAR PANEL



- 1 AC Power Plug** AC mains power input, IEC Connector 90-264 Vac
- 2 Product label** with Serial Number and Options installed
- 3 Ground point** To connect the MFL rack frame to ground
- 4 DC Power Plug (only with MFL-DC option)** DC power input, 10-28Vdc, Max 5A
- 5 Ethernet socket** (RJ45) for connection to a network or computer
- 6 Auxiliary optical Input/Output Connector**
- 7 Optical Input/Output Connectors** where the optical signals are divided by wavelength
- 8 Optical Input/Output Connector** where the optical signals are multiplexed (*only with MFL-OMX option*)
- 9 Optical safety label**
- 10 Output N connector female 50Ω (\*)**
- 11 Orange label:** relative laser wavelength = 1570 nm
- 12 Output N connector female 50Ω (\*)**
- 13 Yellow label:** relative laser wavelength = 1550 nm
- 14 Input N connector female 50Ω** with switchable 12V boosting power (*only on transmitter modules*) (\*)
- 15 Green label:** relative laser wavelength = 1530 nm
- 16 Input N connector female 50Ω** with switchable 12V boosting power (*only on transmitter modules*) (\*)
- 17 Blue label:** relative laser wavelength = 1510 nm
- 18 BNC-F connector 50Ω** for failsafe option (*on receivers modules*) (\*)
- 19 BNC-F connector 50Ω** to connect the output of an external filter (*on transmitters modules*) (\*)
- 20 BNC-F connector 50Ω** to connect the input of an external filter or for failsafe option (*on transmitters modules*) (\*)

\* In this example. Other configurations on request.

## SYSTEM DESCRIPTION

MFL provides wideband optical link for up to 4 RF channels combined in one single mode fiber thanks to CWDM technology. It is designed to allow for a flexible and modular configuration thanks to a mainboard that can be fitted with up to 4 plug-in boards that can be chosen any combination of two types:

- TX: Laser optical transmitter, (CDWM) plug-in board
- RX: Optical-receiver plug-in board

To simplify the usage we give a name of the final configuration that easy identify the CWDM channels and a color code for the RF connectors (N type). We use as default 4 laser wavelength although the CWDM standard can allow to use much more with a 20nm wavelength separation:

- Channel 51 short name for wavelength 1510 nm
- Channel 53 short name for wavelength 1530 nm
- Channel 55 short name for wavelength 1550 nm
- Channel 57 short name for wavelength 1570 nm

### Wavelength and Color Coding:

| Channel | Wavelength                            | Color Identifier |
|---------|---------------------------------------|------------------|
| 51      | Wavelength 1510 nm laser, single mode | Blue             |
| 53      | Wavelength 1530 nm laser, single mode | Green            |
| 55      | Wavelength 1550 nm laser, single mode | Yellow           |
| 57      | Wavelength 1570 nm laser, single mode | Orange           |

Example of some possible configurations:

- MFL-TTTT is a 4 laser transmitters on channel 51/53/55/57 ( $\lambda = 1510/1530/1550/1570$  nm)

| NAME     | Ch. 51 | Ch. 53 | Ch. 55 | Ch. 57 |
|----------|--------|--------|--------|--------|
| MFL-TTTT | T      | T      | T      | T      |

- MFL-RRTT has 2 receivers on ch. 51/53 and 2 transmitters ch. 55/57 (it works with MFL-TTRR)

| NAME     | Ch. 51 | Ch. 53 | Ch. 55 | Ch. 57 |
|----------|--------|--------|--------|--------|
| MFL-RRTT | R      | R      | T      | T      |

- MFL-TTRR has 2 transmitters on ch51/53 and 2 receivers on ch. 55/57 (it works with MFL-RRTT)

| NAME     | Ch. 51 | Ch. 53 | Ch. 55 | Ch. 57 |
|----------|--------|--------|--------|--------|
| MFL-TTRR | T      | T      | R      | R      |

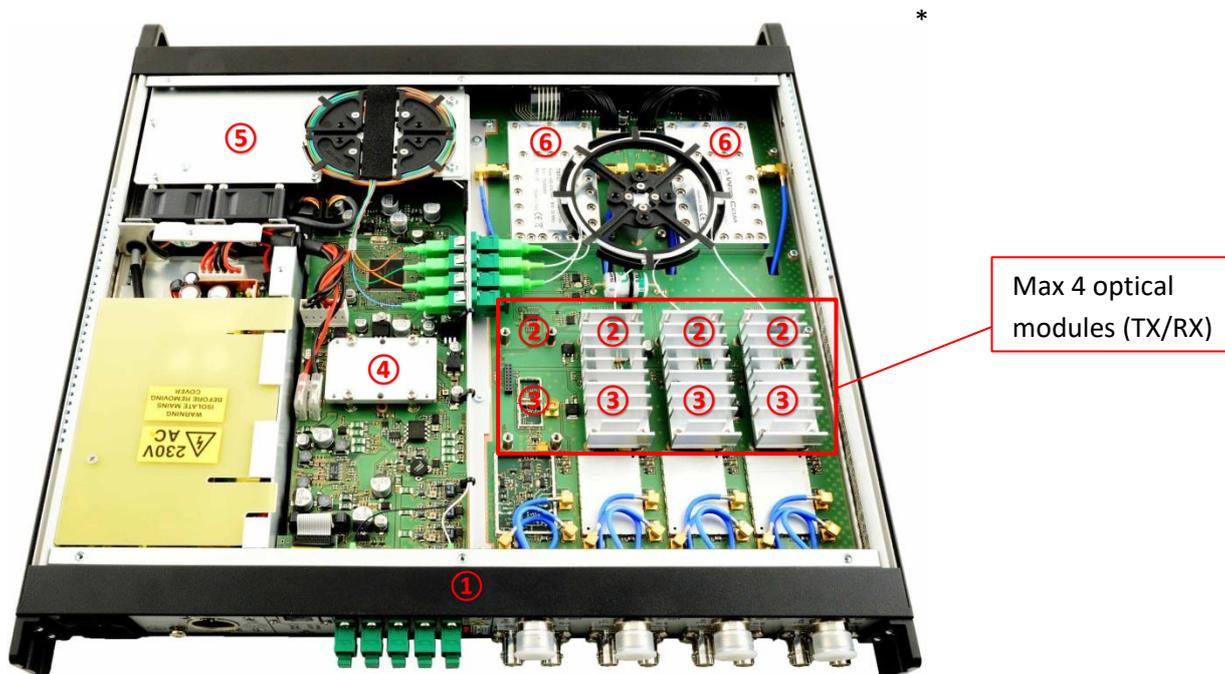
- MFL-TT-- has 2 transmitters on ch51/53

| NAME     | Ch. 51 | Ch. 53 | Ch. 55 | Ch. 57 |
|----------|--------|--------|--------|--------|
| MFL-TT-- | T      | T      | -      | -      |

Following the main code and option that can build up a MFL system:

|     |   | Code         | Description  |           |   |
|-----|---|--------------|--|-----------|---|
|     |   | ① MFL [BASE] | WIDEBAND RF OVER FIBER MAINBOARD<br>19' 1U Rack units , aluminium frame<br>Oled display - Ethernet - failsafe switch - realtime clock<br>AC Powered 230V |           |   |
|     |   | ② RX Module  | Optical RX module for MFL (CWDM)   |           |   |
|     |   | ③ TX Module  | Laser TX module for MFL (CWDM), wavelength 1510/1530/1550/1570 nm  |           |   |
|     |   | ④ DC         | DC power supply (10÷28Vdc) on XLR-4M connector   |           |   |
|     |   | N48          | Neutrik OPTICAL DUO connector for fiber and DC power supply (15÷48Vdc)   |           |   |
|     |   | V48          | DC power supply (15÷48Vdc) on XLR-4M connector   |           |   |
|     |   | SPLxx        | Optical splitter option [1:2],[1:3],[1:4]  |           |   |
|     |   | Optional     | MUX  | ⑤ OMX     | Module Mux/Demux for 1:4 CWDM                 |
|     |   |              |  | OMS       | Module Mux/Demux for 1:6 CWDM                 |
|     |   |              | Filter   | BF1 (old) | RF filter 25MHz tuning range over 404÷788 MHz |
| F41 | Tunable filter 430-730MHz, 40MHz of Bandwidth,<br>Selectable Filter HP: 410/470/510 MHz + LP: 600/700/810 MHz,<br>Fixed Filter 940 ÷ 960 MHz (Europe/Usa) |              |  |           |   |
| F42 | Tunable filter 430-730MHz, 40MHz of Bandwidth,<br>Selectable Filter HP: 470/520/550 MHz + LP: 617/662/698 MHz,<br>Fixed Filter 940 ÷ 960 MHz (Europe/Usa) |              |  |           |   |
| F45 | Tunable filter 430-730MHz, 40MHz of Bandwidth,<br>Selectable Filter HP: 410/470/510 MHz + LP: 600/714/810 MHz,<br>Fixed Filter 806 ÷ 810MHz (for Japan)   |              |  |           |   |

To verify the installed options list,turn on the unit keeping pressed the front panel knob.



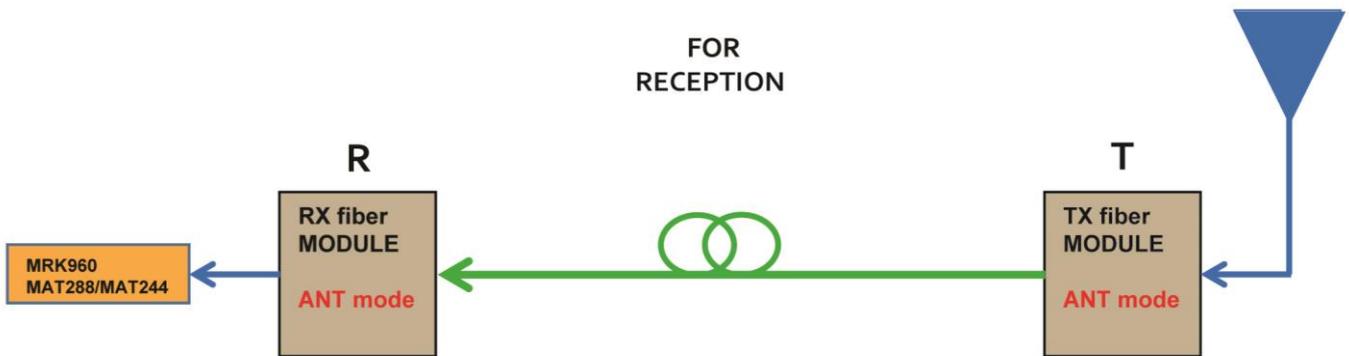
\* The images are purely for information. This represent one of

## Optical receiver and transmitter modules

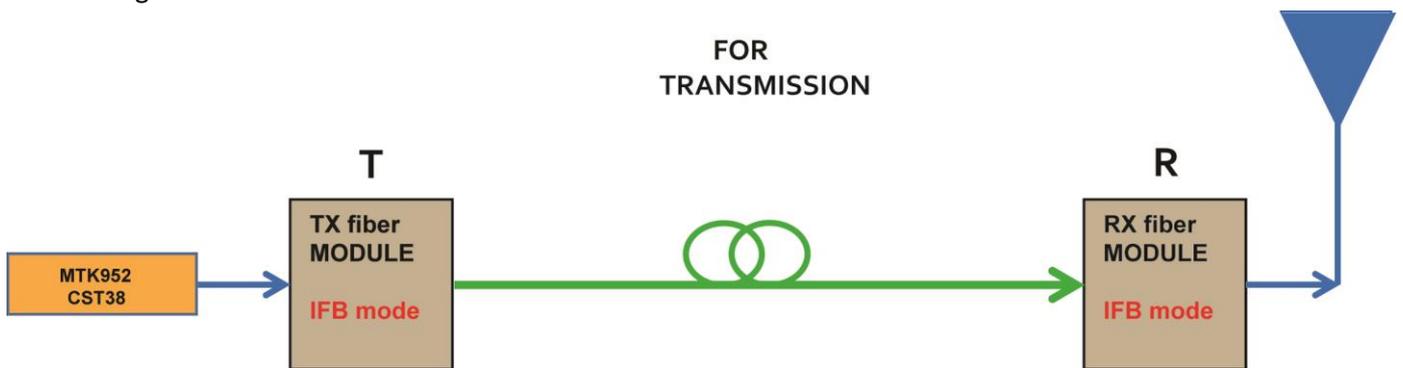
Optical RX module is designed to convert optical signal into RF signal while Optical TX module converts RF signal to optical signal.

RX and TX modules can be used for both RECEPTION AND TRANSMISSION SYSTEMS.

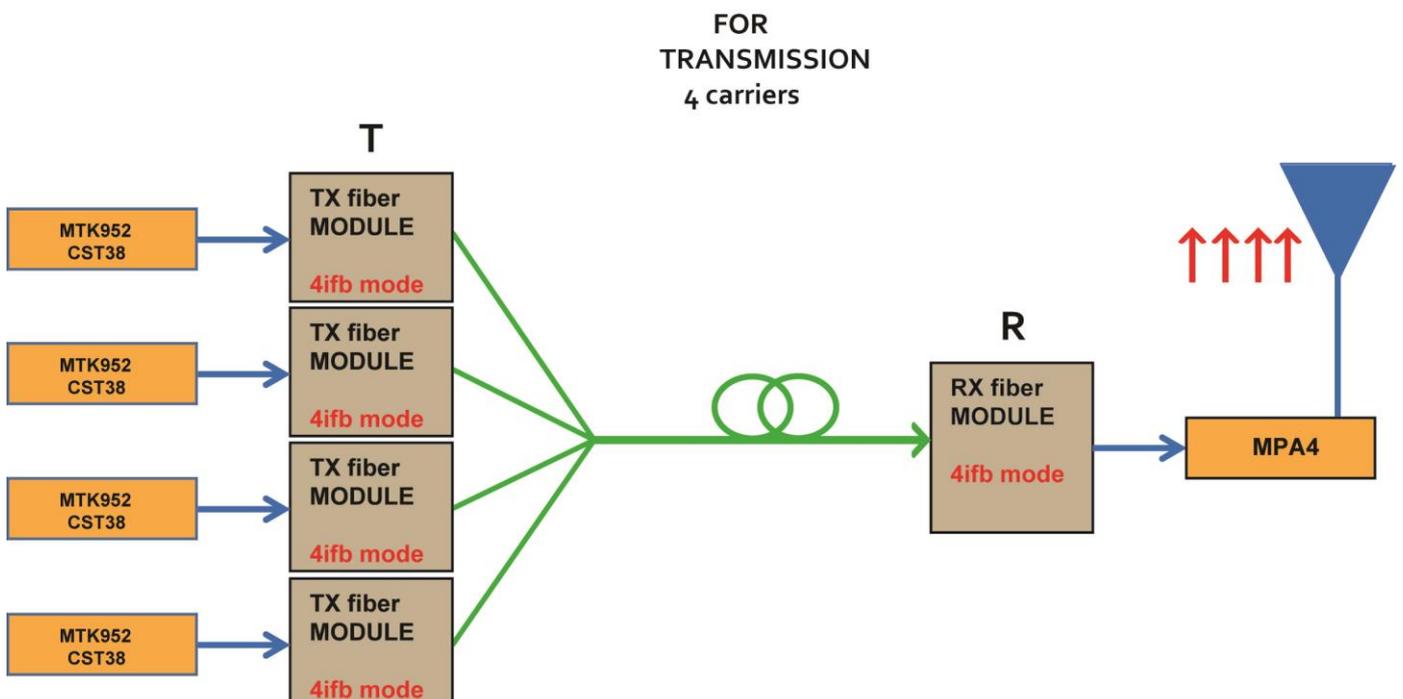
When they are used for reception of RF signal from one receiving antenna to a receiver or combiner, both RX and TX modules have to be configured in **“ANT” mode**



When they are used for transmission of RF signal from one transmitter to an antenna, both RX and TX modules have to be configured in **“IFB” mode**

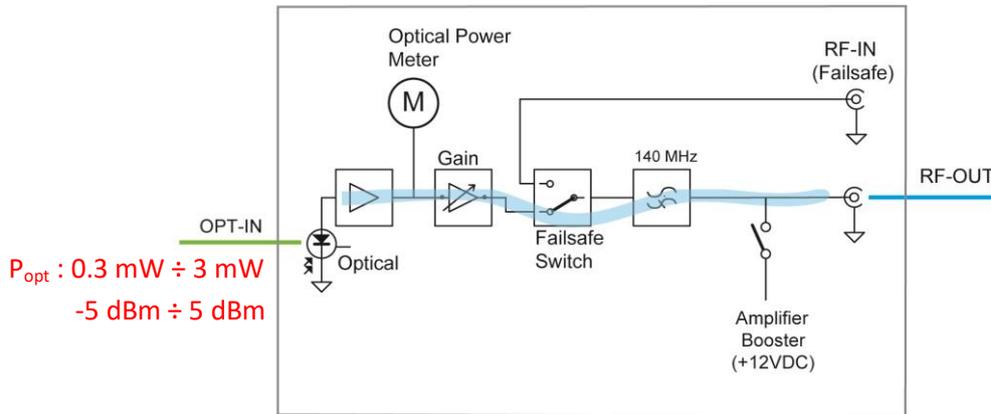


When they are used for transmission of RF signal from <n> transmitters to an antenna, both RX and TX modules have to be configured in **“<n>ifb” mode**. Below the example for 4 carriers (4ifb mode)



## Optical Receiver Module

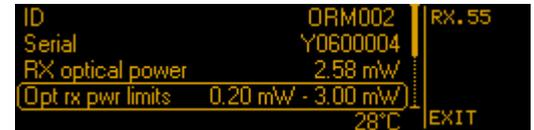
Optical RX module is designed to convert optical signal into RF signal.



The module is equipped with a **Optical Power Meter** which measures in real time the received optical power.

Receiver module is designed to work in a range approx. 0.3mW ÷ 3mW (-5dBm÷5dBm). Optical power limits of RX module can be verify in the menu “RX Link > Receiver param”.

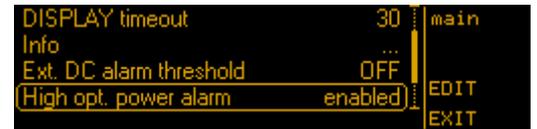
It is advisable to work in this range to minimize the noise generated by the fiber system and reduce intermodulation issue.



An alarm occurs on the display if detected power is out of this range. If the optical power received is too high, we suggest to add an optical attenuator as show below:

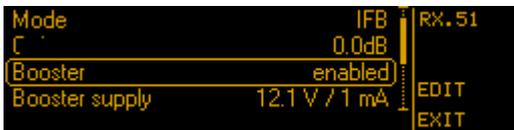
| Wisycom code   | description                  |
|--|------------------------------|
|  CNFTGT01 | 2dB ATTENUATOR SC/APC-SC/APC |

By MAIN menu, it is possible to disable the High opt. power alarm. This parameter is set to *enabled* as default settings.



Internal **RF amplifier** allows to adjust gain in 0.5dB steps. Gain range depends on the hardware revision of the module and configuration set (ANT/IFB/<n>IFB).

In TRANSMITTING IFB mode **DC power for external amplifier** can be enabled (only if RXB option is installed, verify on MFL menu)

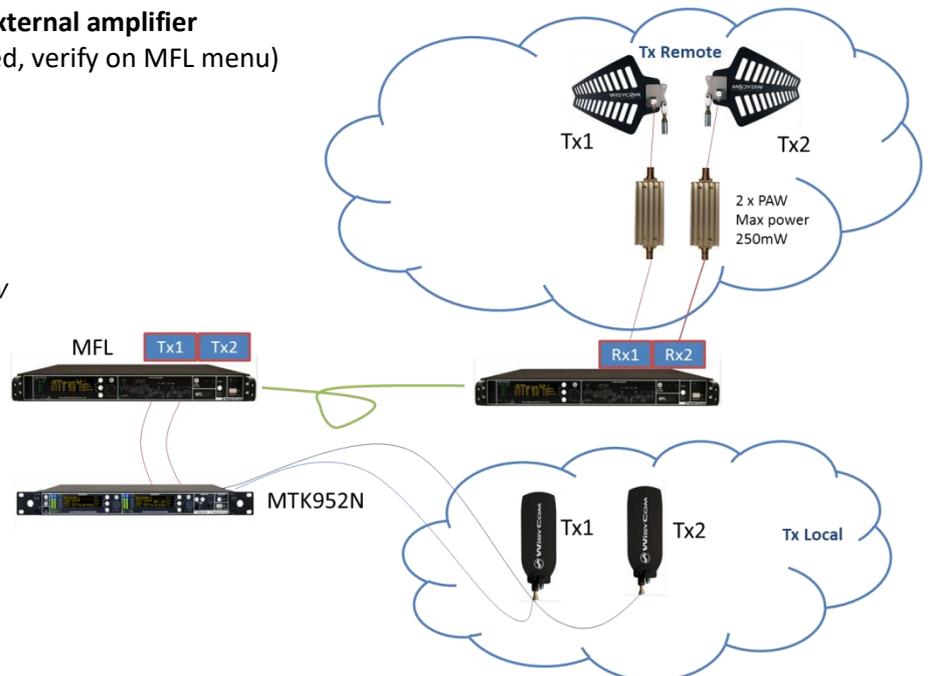


i.e. PAW:

PAW powered by MFL, provides from 10mW to 200mW according to the MFL-RX module gain setting

Common settings:

| PAW output power | MFL gain dB setting |
|------------------|---------------------|
| 10 mW            | -10 dB              |
| 50 mW            | -3 dB               |
| 100 mW           | 0 dB                |
| 200 mW           | +3 dB               |

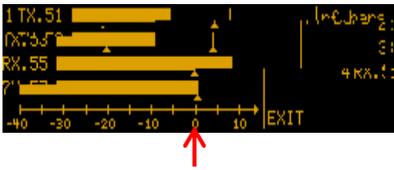


## Optical Transmitter Module

Optical TX module is designed to modulate RF signal to optical fiber.

The module is equipped with a **RF Power Meter** which measures in real time the RF power input.

A dedicate RF BAR menu gives indication of **average RF level** for each modules.



**0dB is the reference level**

“0” is the reference level

For TRANSMISSION SYSTEM (MODE: IFB), “0” level means 0dBm

For RECEPTION SYSTEM (MODE: ANT), “0” level means -20dBm ( $\approx 87 \text{ dB}\mu\text{V}$ )

**WARNING:**

RF LEVELS HAVE TO REMAIN < “10” in order to avoid intermodulation issue.

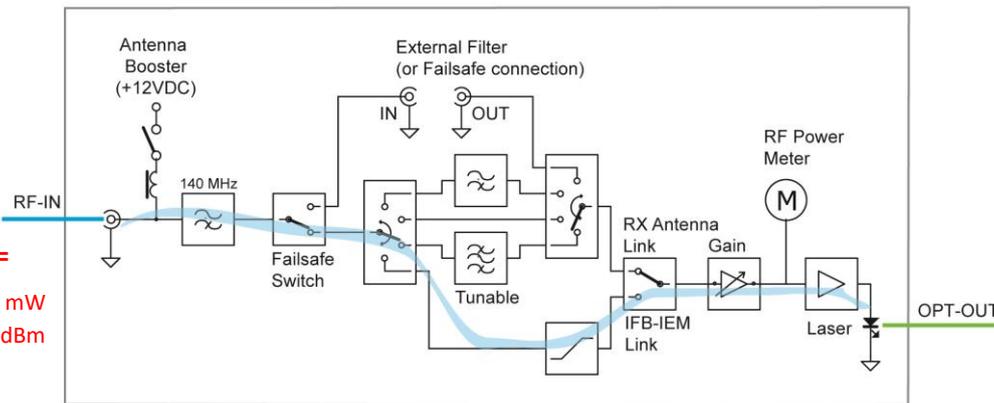
NOTE: RF level depends on the band setting (filter).

RF bar are disabled in TRANSMISSION MODE: <n>ifb

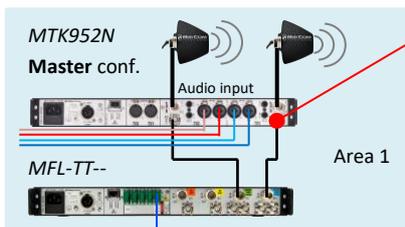
### TRANSMISSION SYSTEM (MODE: IFB)

When the module is configured for TRANSMISSION SYSTEM (MODE: IFB), input RF power has to remain with in the range 0.25mW ÷ 4mW (-6dBm ÷ 6dBm).

**P<sub>ref</sub> reference =**  
 $P_{ref} : 0.25 \text{ mW} \div 4 \text{ mW}$   
 -6 dBm ÷ 6 dBm

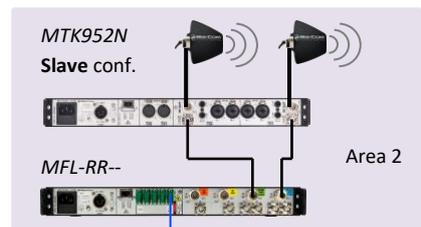


Wisycom MTK952 transmitter with MS option provides a dedicated port at 0dBm of reference to connect directly into the MFL TX module.

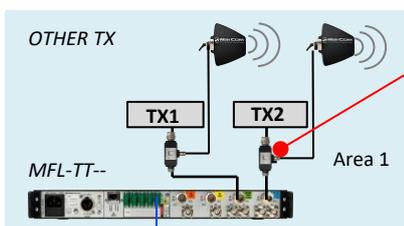


**0dBm**

**Fiber optic cable**  
 up to several tens of kilometers  
 (depending on the fiber)

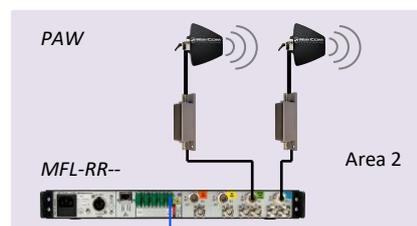


With different transmitters than MTK952, the user has to make sure that input RF power is within the range, by adding RF attenuators if input RF power is too high.

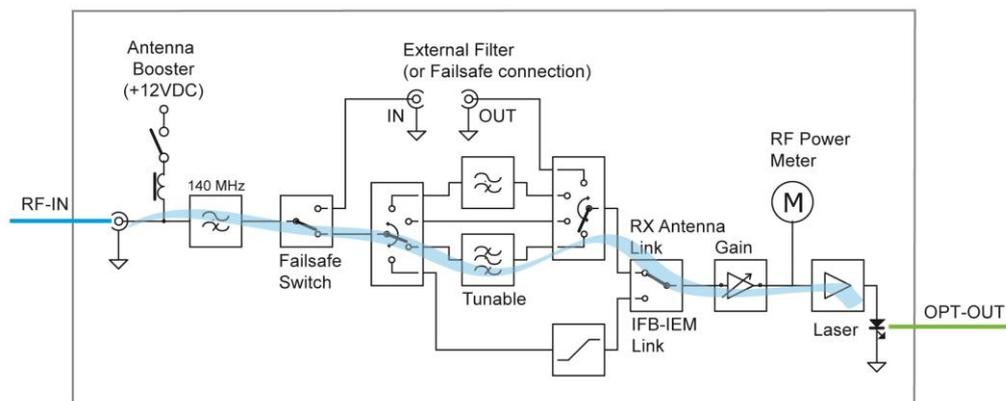


**Directional Coupler**

**Fiber optic cable**  
 up to several tens of kilometers  
 (depending on the fiber)



## RECEPTION SYSTEM (MODE: ANT)



When the module is configured for RECEPTION SYSTEM (MODE: ANT), it is advisable to filter the RF signal in input and to set the Gain in order to work at 0dB as maximum level (e.g. when the transmitter is close to the antenna).



Wisycom supplies different RF filters models:

- integrated in the MFL (BF1, F41, F45... option)
- integrated in antenna (LFA or ADFA antennas)
- integrated in the booster (BFA booster)

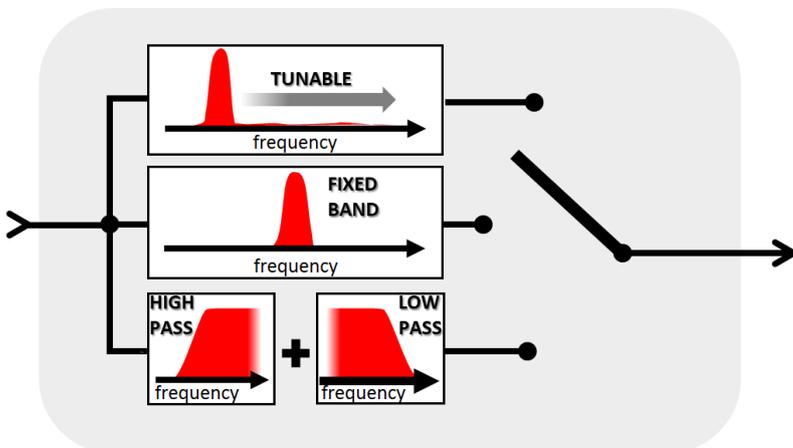
Enabling booster on the menu provides DC power supply to external booster or active antenna.



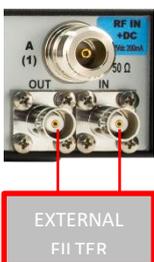
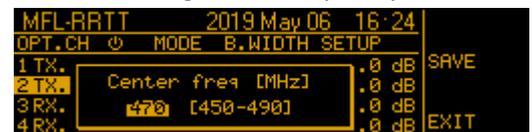
## Filter option

When optical TX module is used in RECEPTION SYSTEM (MODE:ANT) a filter option is recommended.

| Option      | Filter type       | Range                          |
|-------------|-------------------|--------------------------------|
| BF1         | Tunable Filter    | 404-788MHz, 25MHz of Bandwidth |
|             | Tunable Filter    | 430-730MHz, 40MHz of Bandwidth |
|             | Fixed Filter      | 940 ÷ 960 MHz (Europe/Usa)     |
| F41         | Selectable Filter | 410-600 MHz                    |
|             |                   | 410-700 MHz                    |
|             |                   | 410-810 MHz                    |
|             |                   | 470-600 MHz                    |
|             |                   | 470-700 MHz                    |
|             |                   | 470-810 MHz                    |
|             |                   | 510-600 MHz                    |
|             |                   | 510-700 MHz                    |
| F42         | Selectable Filter | 470-617 MHz                    |
|             |                   | 470-662 MHz                    |
|             |                   | 470-698 MHz                    |
|             |                   | 520-617 MHz                    |
|             |                   | 520-662 MHz                    |
|             |                   | 520-698 MHz                    |
|             |                   | 550-617 MHz                    |
|             |                   | 550-662 MHz                    |
| F45         | Tunable Filter    | 430-730MHz, 40MHz of Bandwidth |
|             | Fixed Filter      | 806 ÷ 810MHz (for Japan)       |
|             | Selectable Filter | 410-600 MHz                    |
|             |                   | 410-710 MHz                    |
|             |                   | 410-810 MHz                    |
|             |                   | 470-600 MHz                    |
|             |                   | 470-710 MHz                    |
|             |                   | 470-810 MHz                    |
|             |                   | 510-600 MHz                    |
|             |                   | 510-710 MHz                    |
| 510-810 MHz |                   |                                |



Select on the TX menu the more appropriate filter according to the frequency in use

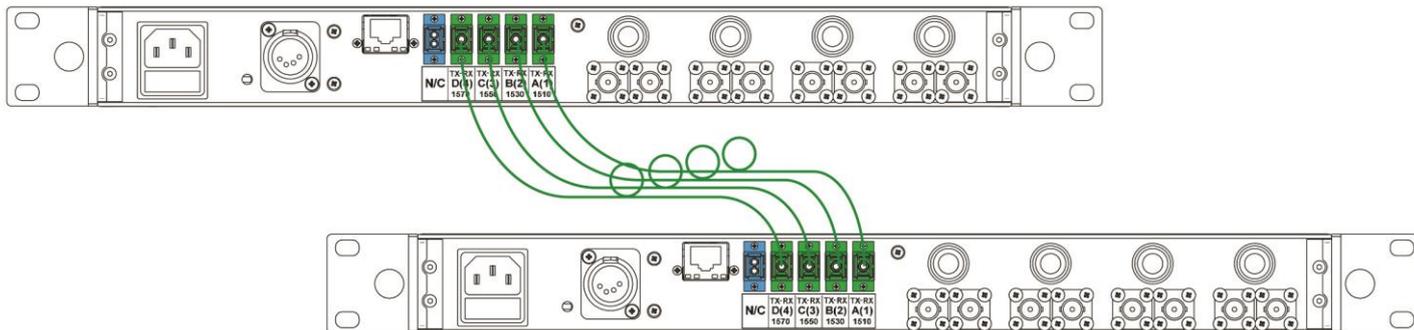


It is possible to use also an EXTERNAL filter connected it on BNC connectors in the rear panel. The attenuation of external filter can be set in the OPT. CH. menu



### Link without MUX/DEMUX Module

Optical link without MUX/DEMUX Module requires one SC/APC single mode fiber to link each TX/RX module (up to 4 fibers)



### Optical MUX/DEMUX Module

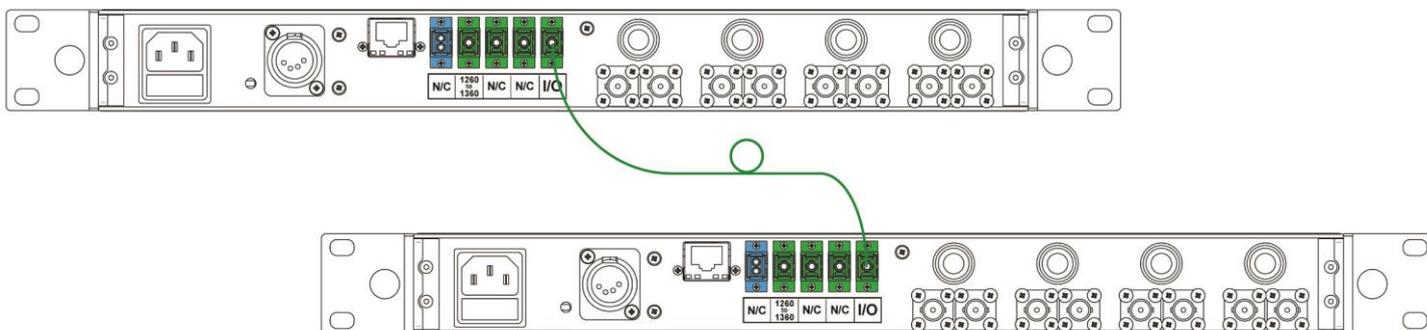
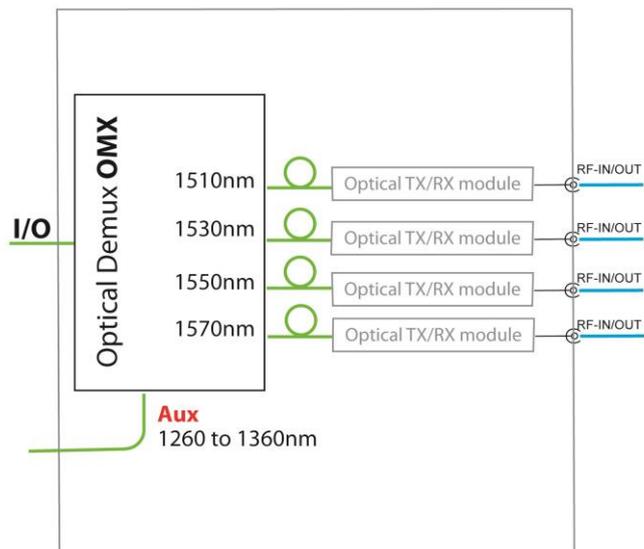
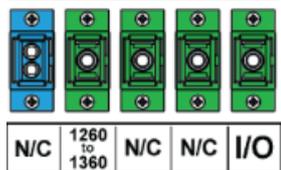
Thanks to the optical MUX/DEMUX module it is possible to carry with a single fiber several optical signals.

#### OMX option

With OMX option the MUX/DEMUX module combine/split

- 4 optical signals related to RF over fiber (1510nm/1530/1550/1570nm)
- auxiliary optical signal in the second window “1300 WideBand” to embed other optical signal in range 1260÷1360nm (e. g. Optical signal from Camera)

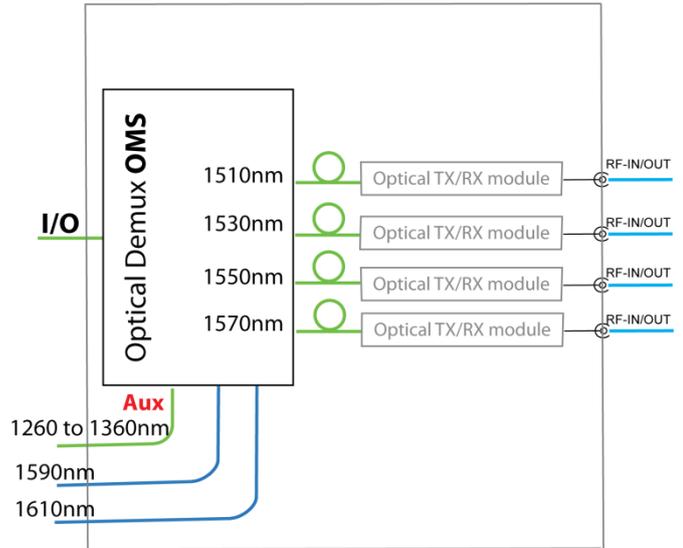
#### Optical connections:



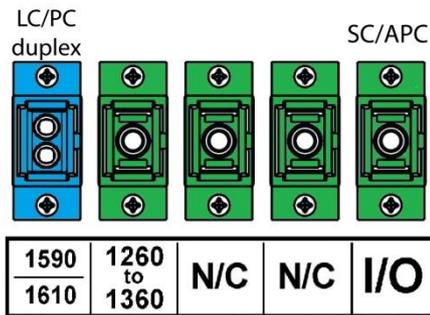
**OMS option**

With OMS option the MUX/DEMUX module combine/split

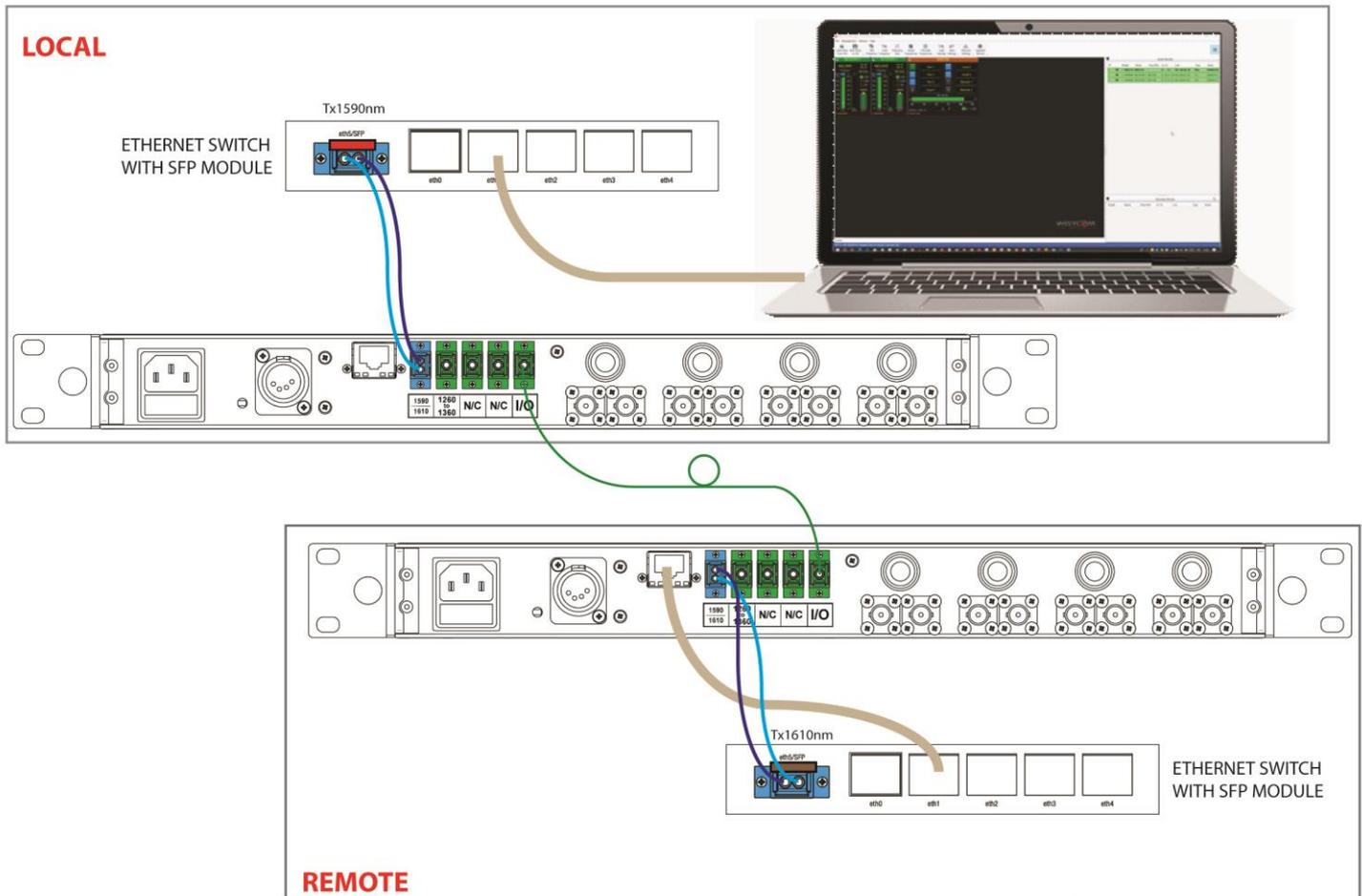
- 4 optical signals related to RF over fiber (1510nm/1530/1550/1570nm)
- auxiliary optical signal in the second window “1300 WideBand” to embed other optical signal in range 1260÷1360nm (e.g. Optical signal from Camera or Etehernet traffic throught Media Converter)
- optical signals at 1590nm & 1610nm to manage Data (Ethernet traffic throught Media Converter)



**Optical connections:**



With OMS option it is possible to manage remote devices connected throught Ethernet interface to an Ethernet Switch with SFP input.



NOTE of Ethernet Data connection with OMS:

Use LC/PC-LC/PC patches to connect 1590nm and 1610nm data ports of MFL to the SFP modules of Ethernet switch. Please, pay attention on TX or RX wavelength. For a proper use, it is necessary to cross one of the LC/PC-LC/PC blue patch cords.

Fiberbox BX2 system uses SFP module TX@1610nm therefore Wisycom suggests to use the SFP module with TX@1590nm in the LOCAL AREA.



| Wisycom code  | description  |
|---|--|
|    | <p><b>BRE16021204</b> patch duplex LC-PC to LC-PC length 3mt</p>   |
|    | <p><b>MDT16012101</b> SWITCH 5 PORTS 10/100/1000 + SFP slot, UBIQUITY ER-X-SFP<br/>DO NOT connect ethernet cable Ubiquity switch port [eth0] as it is for monitoring (not switched)</p>  |
|  | <p><b>MDT14100302</b> CWDM SFP MODULE 1610nm <b>BROWN</b> 1000BASE BI-DIRECTIONAL</p>  |
|  | <p><b>MDT14100301</b> CWDM SFP MODULE 1590nm <b>RED</b> 1000BASE BI-DIRECTIONAL</p>  |

## DC Option

This option adds a DC power supply module on MFL.

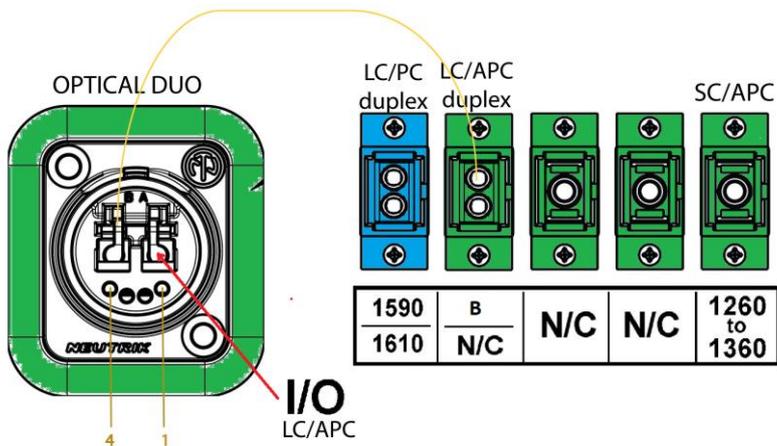


Connector: XLR-4M  
 pin1: GND  
 pin2: NC  
 pin3: NC  
 pin4: VDC (10-28Vdc, max 5A)

## N48 Option

Option N48 mounts an Neutrik opticalCON DUO connector for fiber and DC power supply.

Optical connections:



DC input  
 18÷50Vdc  
 pin 1: -Vdc  
 pin 4: +Vdc

OPTICAL DUO connector:  
 “A” is connected to the main fiber (I/O)  
 “B” is linked to the LC/APC connector in the rear panel (as aux port)



## V48 Option

Option V48 allows to power the MFL with DC input 18÷50Vdc.

To sum up:

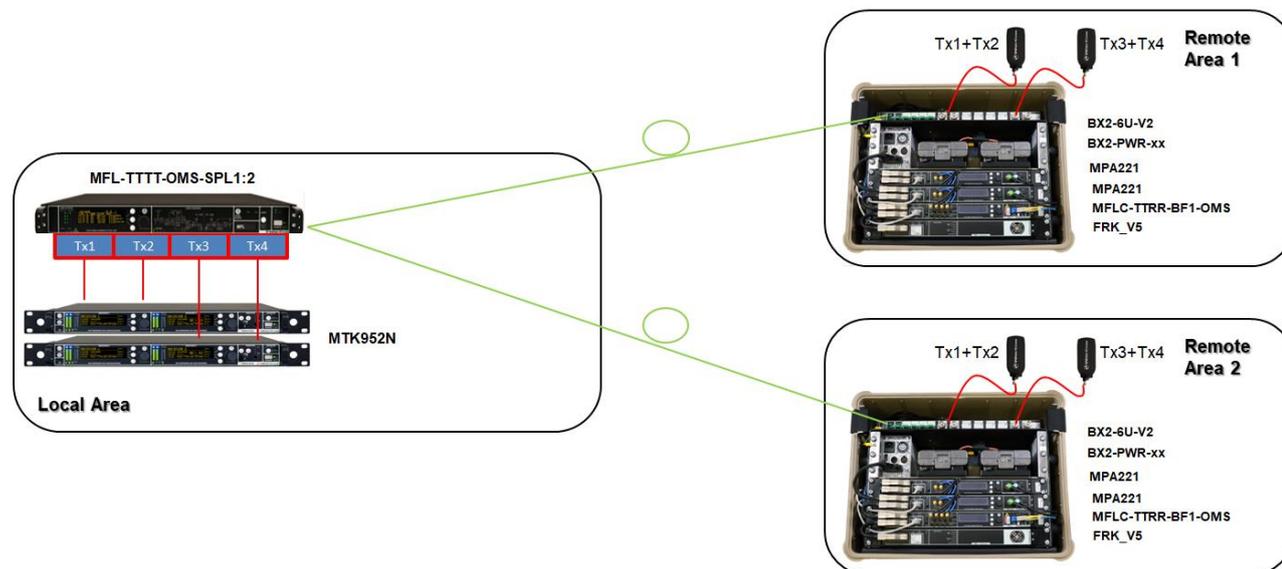
- option **DC**: DC input 10÷28Vdc, XLR-4 connector
- option **V48**: DC input 18÷50Vdc, XLR-4 connector
- option **N48**: DC input 18÷50Vdc, opticalCON DUO Neutrik connector for fiber and DC power supply

### SPL option

SPL option mounts an optical splitter inside MFL. It can be used when it is required to carry the same optical signal to several remote zones. Different type of splitters are available [1:2], [1:3] or [1:4].

NOTE: Splitter module is NO BI-DIRECTIONAL, it can be used only if all the optical signals go on the same way.

Example of application: transmission of 4 IEM channels on 2 remote areas

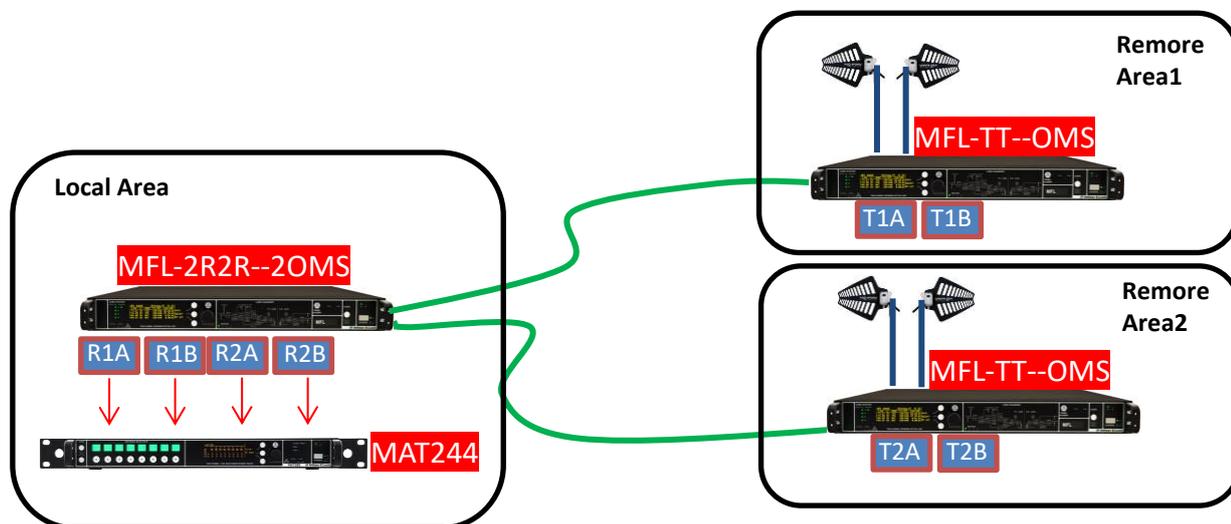


### Double OMS option

A double OMS option can be installed on MFL. It can be useful to receive 2 remote areas in a single MFL (as on the below example). This configuration

- reduces the number of the fiber cable
- reduce the MFL in the LOCAL area
- allows remote management of both the remote areas

Example of application: reception from 2 remote areas



## Optical link budget

Optical link depends budget on the amount of losses along the fiber route. These losses vary according to the MFL configuration and the type of fiber connection.

Calculating optical link budget refers to the following values:

- Single Mode Fiber attenuation is 0.2/0.4 dB/Km,
- optical TX laser power is 4mW (6dBm) and
- sensitivity of receiver module is 0.3mW (-5,22dBm)



- attenuations according to MFL configuration

| Device          | Attenuation* |
|-----------------|--------------|
| multiplexer OMX | 1,4 dB       |
| multiplexer OMS | 1,7 dB       |
| splitter 1:2    | 3,7 dB       |
| splitter 1:3    | 5,5 dB       |
| splitter 1:4    | 7,9 dB       |
| junction        | 0,2 dB       |

\*Note that these are indicative values

Example: Fiber system with MFL-TTRR-OMS and MFL-RRTT-OMS

|                                 |           |
|---------------------------------|-----------|
| TX laser                        | 6 dBm     |
| multiplexer OMS                 | -1,7 dB   |
| demultiplexer OMS               | -1,7 dB   |
| Internal junctions              | -1 dB     |
| Received power with short fiber | =-1,6 dBm |

Fiber link maximum length is 17 Km ( $=6.8/0.4$ ) since receiver module sensitivity is -5,22dBm (considering 0.4dB/Km).

Example: Fiber system with MFL-TTTT-OMS-SPL1:2 and MFL-RRRR-OMS

|                                 |           |
|---------------------------------|-----------|
| TX laser                        | 6 dBm     |
| multiplexer OMS                 | -1,7 dB   |
| demultiplexer OMS               | -1,7 dB   |
| Splitter 1:2                    | -3,7 dB   |
| Internal junctions              | -1 dB     |
| Received power with short fiber | =-2,1 dBm |

Fiber link maximum length is 7,8Km ( $=3.12/0.4$ ) since receiver module sensitivity is -5,22dBm (considering 0.4dB/Km).

## Failsafe mode

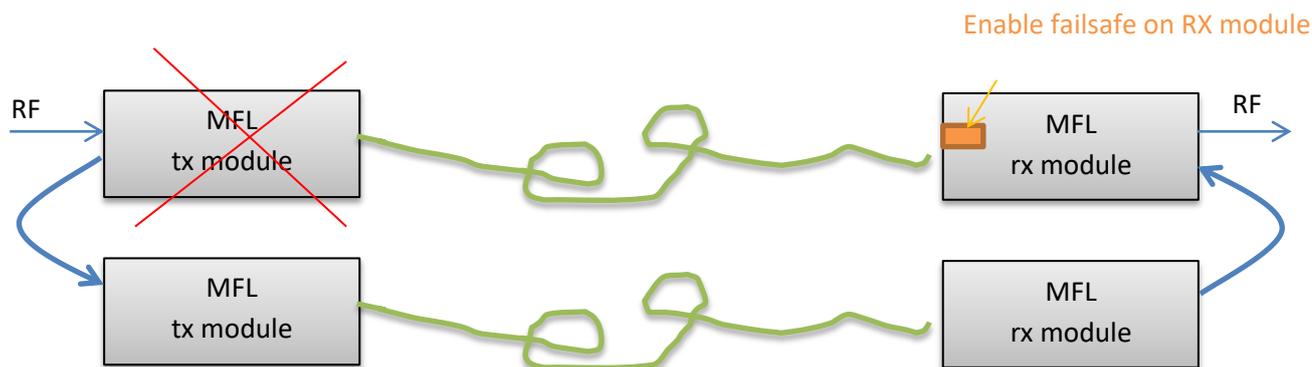
MFL is equipped with failsafe ports to connect a redundant additional MFL link.

Failsafe switches in MFL allow RF re-routing if a fault happens (i.e. no power supply, no RF power or no optical power). All RF and optical signals are then re-routed on the redundant links automatically.

To keep safe the system against PSU fault:

Connect TX module of MFL link2 to failsafe port of TX module Link1.

Connect RX module of MFL link2 to failsafe port of RX module Link1.



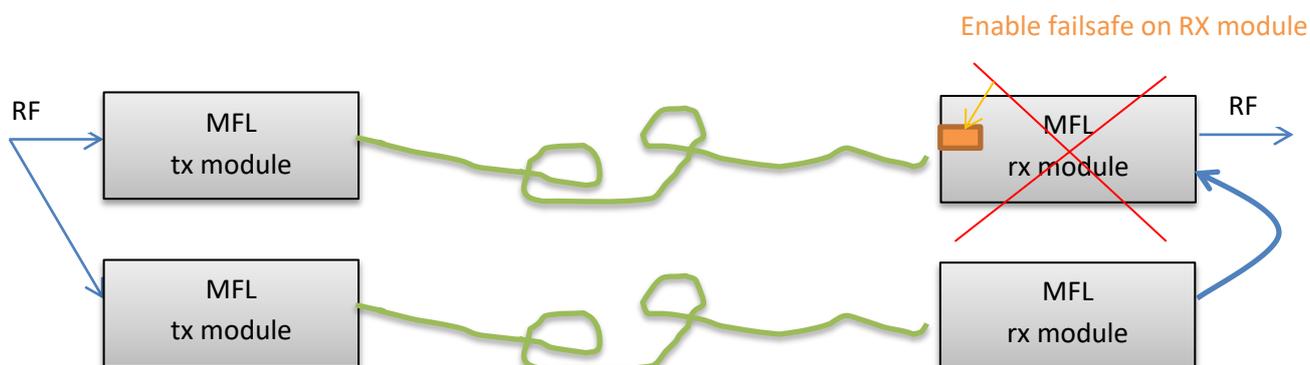
If a **fault** occurs on **PSU** (power supply unit) of **MFL Link1**, RF signal in input of MFL link1 is switched automatically to the failsafe port as RF input of MFL Link2.

So when RX module of MFL Link1 recognizes that there is no optical power in input, it takes the signal from failsafe port. **Pay attention to enable failsafe on RX module of MFL Link1.**

To keep safe the system against fault on RX module:

Split RF signal in input to TX modules of Link1 and Link2.

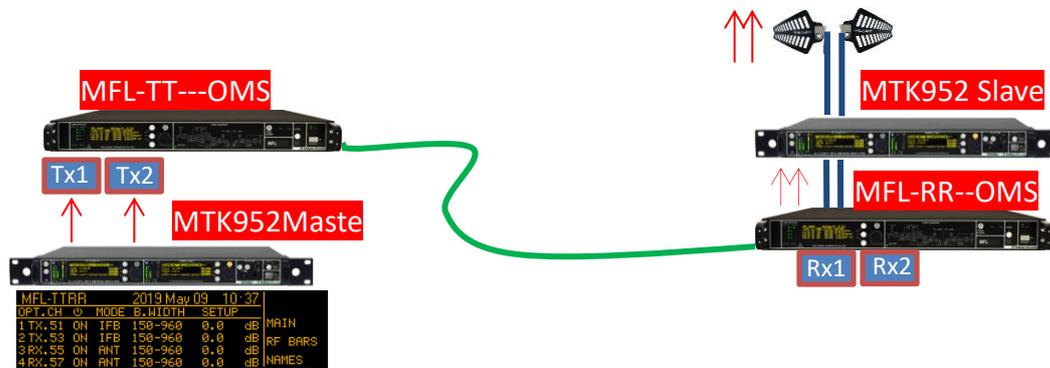
Connect RX module of MFL link2 to failsafe port of RX module Link1.



**CONFIGURATION EXAMPLES:**

**IFB TRANSMISSION – MODE: IFB**

This configuration allows to transmit IFB signals to a remote area.



Above an example of 2 IFB transmission.

In this configuration in the local area each transmitter is connected to a single Tx optical module and the MUX combines the optical signal in one fiber. In the remote area the DEMUX split the optical signal to 2 RX opt. modules which convert it into RF. Next, the RF signals are amplified with MTK952 in Slave configuration.

NOTE: Other amplifiers type can be used like PAW, MPA221. Verify if they need DC power and enabled it on the RX modules.

**System setup and configuration:**

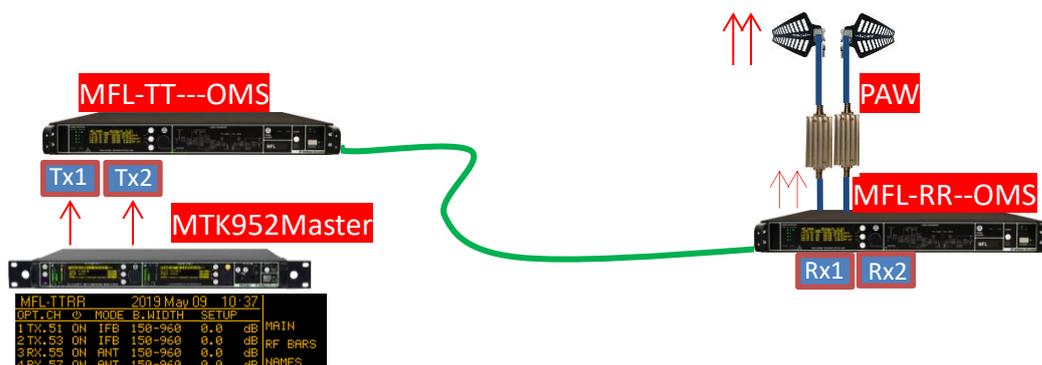
**LOCAL AREA**

- Connect the 2 transmitters to the 2 TX optical modules (RF input power approx. 0dBm)
- Configure the 2 TX opt. modules in **MODE IFB**, Gain = 0dB
- Connect the single mode fiber SC/APC between local MFL and remote MFL

**REMOTE AREA**

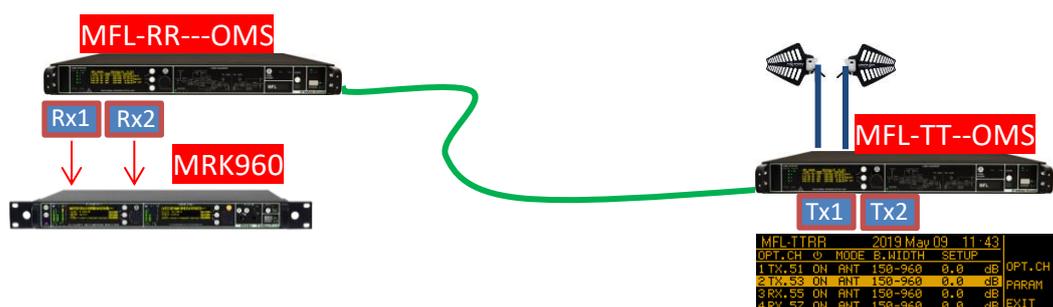
- Configure the 2 RX opt. module in **MODE IFB**, Gain = 0dB
- Set RF power on the MTK952 Slave.
- ✓ If used PAW amplifiers:
  - enabled Booster in the “**OPT. CHANNEL > Booster**” menu
  - set the RF **Gain** using “**OPT. CHANNEL > Gain**” o “**SETUP**” menu

| PAW output power | MFL gain dB setting |
|------------------|---------------------|
| 10 mW            | -10 dB              |
| 50 mW            | -3 dB               |
| 100 mW           | 0 dB                |
| 200 mW           | +3 dB               |



## RECEPTION - MODE: ANT

This configuration allows to receive RF signals from remote antennas.



Above an example of reception of 2 diversity remote antennas.

In this configuration in the remote area 2 antennas are connected to 2 Tx optical module and the MUX combines the optical signal in one fiber. In the local area the DEMUX split the optical signal to 2 RX opt. modules which convert it into RF. Next, the RF signals are connected to the receiver.

### System setup and configuration:

#### REMOTE AREA

- Connect the 2 antennas to the 2 TX optical modules
- Configure the 2 TX opt. modules in **MODE ANT**
- Enabled filter on each TX opt. modules using “**OPT. CHANNEL > Filter**” or “**B.WIDTH**” menu.
- connect the single mode fiber SC/APC between local MFL and remote MFL
- ✓ If used antennas with booster or booster:
  - enabled Booster in the “**OPT. CHANNEL > Booster**” menu
  - set the RF **Gain** using “**OPT. CHANNEL > Gain**” o “**SETUP**” menu

NOTE: set the Gain in order to work at 0dB as maximum level in the RF BAR (e.g. when you have the microphone close to the antenna).

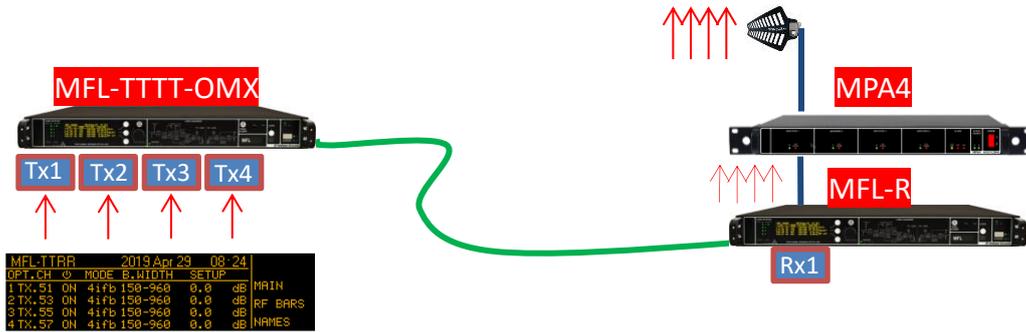


#### REMOTE AREA

- Configure the 2 RX opt. modules in **MODE ANT**

## MULTI-CARRIERS TRANSMISSION – MODE:<n>ifb

This configuration allows to transmit IFB signals to one or more remote areas reducing the number of fiber modules in the remote areas. On the remote area it is necessary to use a performing amplifier to amplify more carriers (as the new MPA4 amplifier).



Above an example of 4-carriers IFB transmission.

In this configuration in the local area each transmitter is connected to a single Tx optical module and the MUX combines the optical signal into one fiber. In the remote area one single optical RX module converts optical signal into RF signal (no DEMUX is required). Next the RF signal is amplified with MPA4.

### System setup and configuration:

#### LOCAL AREA

- Connect the 4 transmitters to the 4 TX optical modules (RF input power approx. 0dBm)
- Configure all TX opt. modules in **MODE 4ifb**, Gain = 0dB
- Connect the single mode fiber SC/APC between local MFL and remote MFL

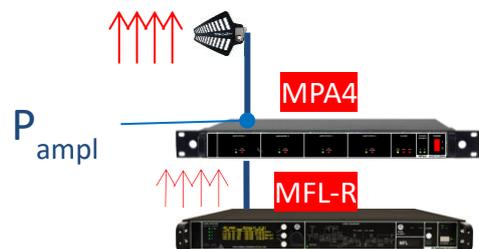
#### REMOTE AREA

- Configure RX opt. module in **MODE 4ifb**
- Configure the type of amplifier using the menu “**OPT. CHANNEL > EXT\_IFB amplifier**”. Some Wisycom amplifier are available in the menu (PAW, MPA4), otherwise select “Custom” and insert the amplifier gain in the “Custom amplifier gain” parameter.
- Select the RF output power after the amplifier using the RF Gain menu on the MFL (“**OPT. CHANNEL > Gain**” o “**SETUP**”)

Example MODE 4ifb and MPA4  
with gain = 0dB →  $P_{\text{ampl}} = 31.6\text{mW}$



with gain = 5,5dB (max) →  $P_{\text{ampl}} = 112.2\text{mW}$



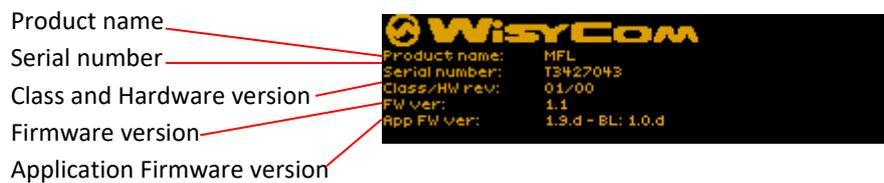
NOTA: In <n>ifb MODE :

- RF bar is disabled
- If TX opt. module is set to OFF, no RF signal is converted but the optical laser is active and optical power remain ON

## OLED DISPLAY

### MFL Info screen

Switch on the MFL and by pushing the rotary knob (at the right of the display) all the basic information are displayed:



Turning the rotary knob the list of the modules is displayed:

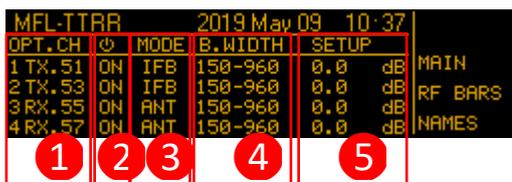


Turning the rotary knob again the list of the options installed is displayed:



Push the rotary knob to enter the Main screen

### Main screen



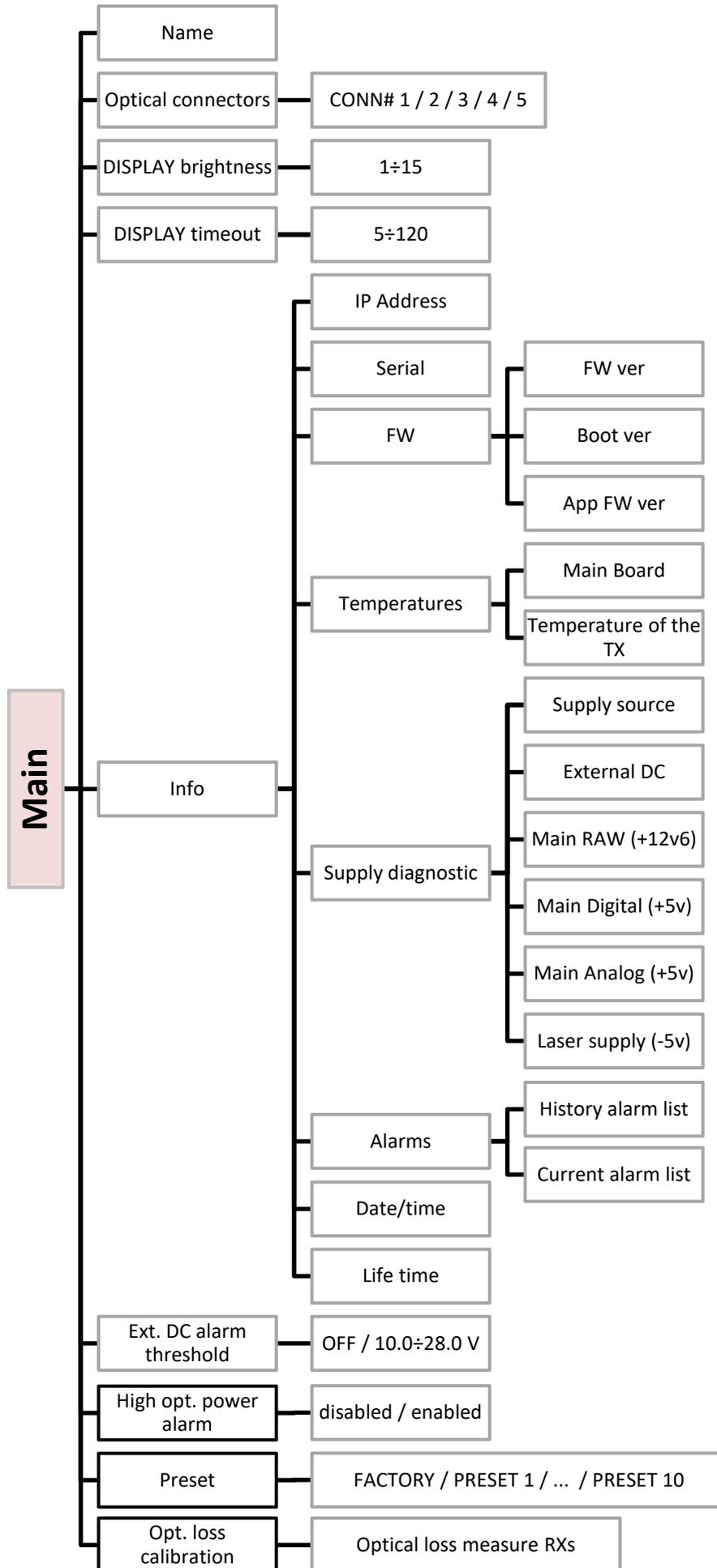
In the left top side of the main screen there is the "NAME" of the MFL that is settable in the [Main menu](#). At the right of "NAME", date and time are displayed.

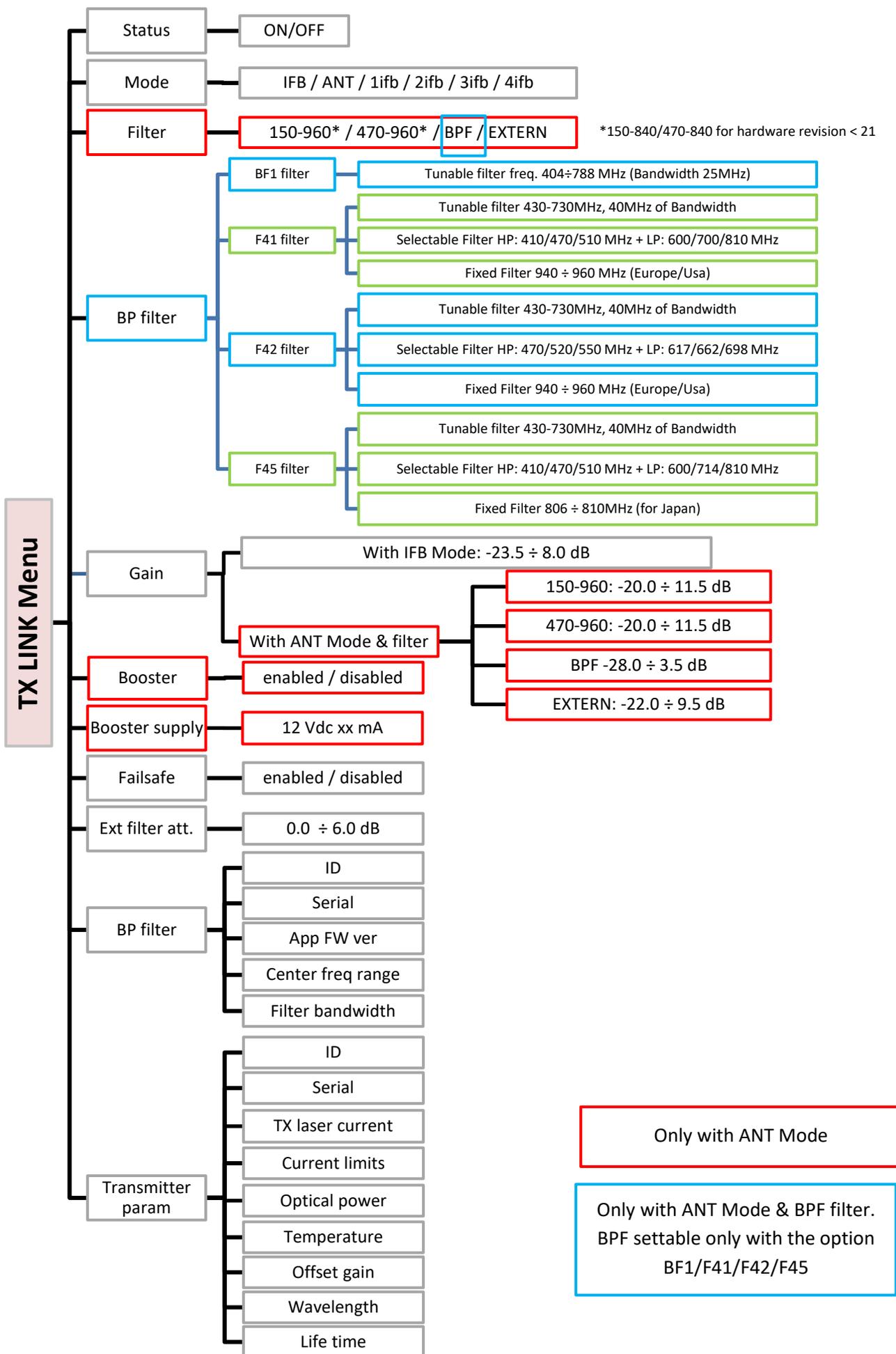
- 1 The first number (1 to 4) identify the link (same reference on back-side connectors).  
TX or Rx if that link has a laser transmitter or a receiver, respectively.  
The last number after the dot, 51/53/55/57 refers to the CWDM link frequency: 1510/1530/1550/1570nm.
- 2 ON/OFF status of specific link
- 3 There are 3 possible modes:
  - ANT as remote antenna link
  - IFB as remote intercom link optimized on a 0dBm reference input
  - <n>ifb as remote intercom link optimized for <n>carriers
- 4 on TX opt. modules (i.e. 1 TX.51) ANT configuration there are several bandwidth configuration according to the filter installed in the MFL (see [filter option](#))
- 5 Pushing on lower right button the last column shows:
  - CUR/PWR show the RF/optical power in reception or the laser current in TX module
  - RF LEV shows the value of the RF power level
  - "GAIN" that is the relative gain of the link. Here it is possible to change the gain in the operating range.

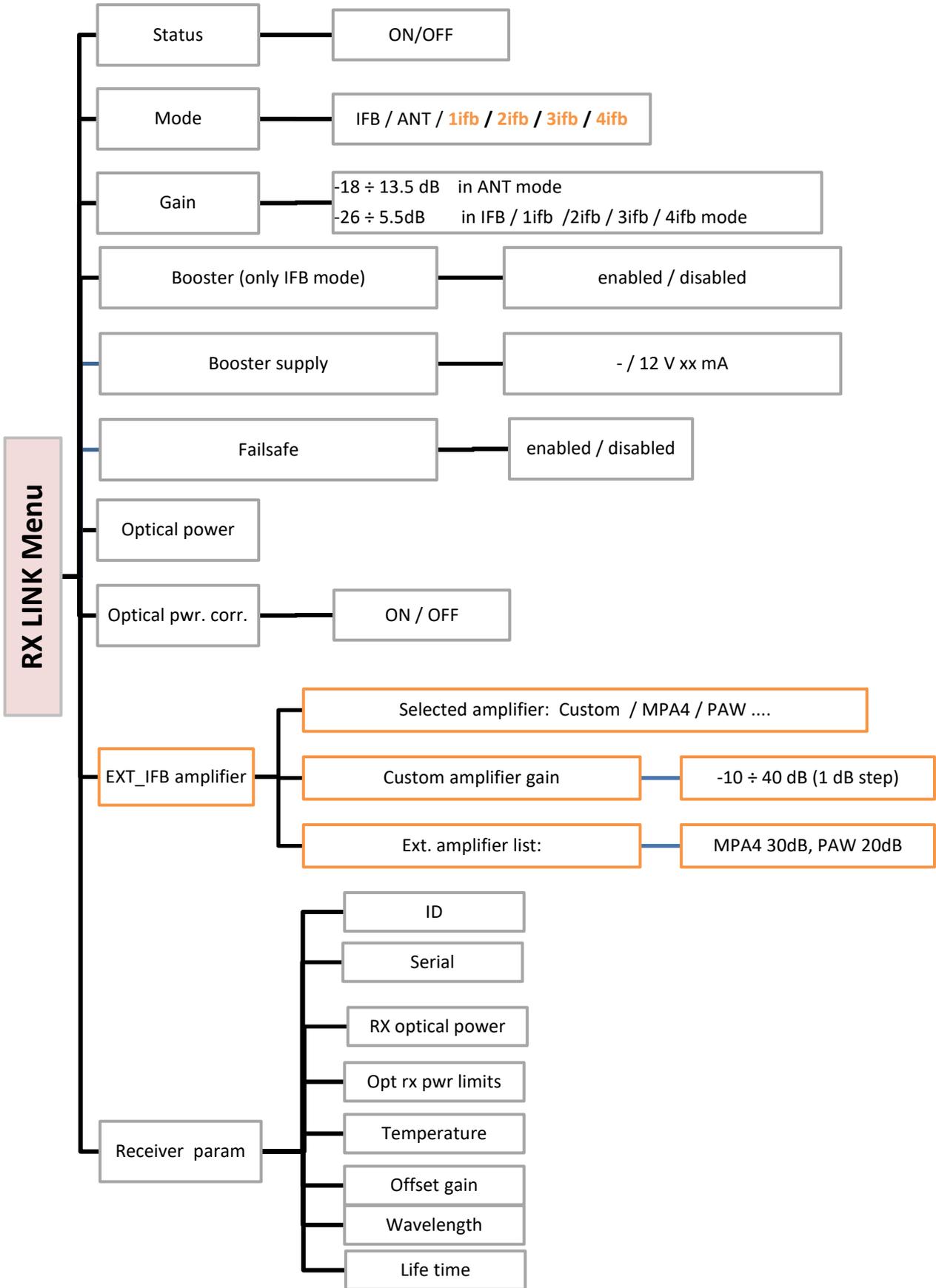


**NOTE: unless you have special needs we recommend to keep GAIN to 0 dB and enable the optical power correction on the receiver side, since this is already optimized for most applications!**

**MENU TREE**







## Main menu

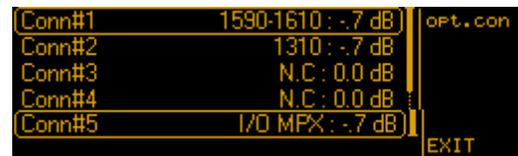
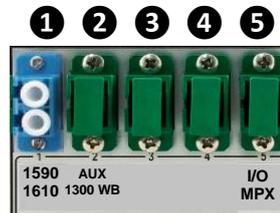
From the [Main screen](#), pushing the upper right button, it's possible to enter on the main menu options:

**Name:** to change the name of the MFL shown in the Main screen  
12 alphanumeric characters (A-Z, a-z, 0-9, case-sensitive)



shows the configuration and the optical attenuation of the 5 optical connectors

**Optical connectors:**



**DISPLAY brightness:** to set the brightness of the OLED display. 0÷15 step 1 (default 0)

**DISPLAY timeout:** to set the display timeout before decrease the brightness of the OLED display and before returning to Main screen (default 30 seconds)

**Info:**

*Example*

|                          |  |   |        |
|--------------------------|--|---|--------|
| <b>IP address</b>        | IP address of the device                           | 192.168.1.10.240  |        |
| <b>Serial</b>            | The serial number composed by 1 letter + 7 numbers | T3427043  |        |
| <b>FW</b>                | FW ver   | Firmware version  | 1.1    |
|                          | Boot ver   | Bootloader version  | 1.0.d  |
|                          | App FW ver   | Application version   | 1.9.d  |
| <b>Temperature</b>       | Main Board   | Main board temperature  | 31°C   |
|                          | x TX.5x  | Transmitter module temper.  | 38°C   |
| <b>Supply diagnostic</b> | Supply source                                      | Type of power supply (AC/DC)  | AC     |
|                          | External DC  | DC voltage supply   | 12.40V |
|                          | Main RAW (+12v6)                                   | Main RAW voltage measured   | 12.82V |
|                          | Main Digital (+5v)                                 | Main Digital voltage measured   | 5.20V  |
|                          | Main Analog (+5v)                                  | Main Analog voltage measured  | 5.21V  |
| <b>Alarms</b>            | Laser supply (-5v)                                 | Laser voltage supply  | -5.21V |
|                          | Current alarm list (ENTER)                         | Number and type of alarms for the general apparatus and for each module | 0      |
|                          | History alarm list (HIST)                          | Alarms memory   | -      |
| <b>Date/time</b>         | Date and time                                      | 28/04/14 14:02  |        |
| <b>Life time</b>         | Life time of the device                            | 3d - 00h - 01m  |        |

**Ext. DC alarm threshold:** this menu item allows to enable and set a threshold for the alarm of low external DC power supply. If it is enabled, the threshold can be set from 10.0V to 28.0V with 0.1V step. (default OFF)

**High optical power alarm:** with this option it is possible to disable the alarm when the optical power on the RX modules is out of the limits (see Receiver parameter > Opt, rx pwr limits range). The alarm is enabled as default setting.

**Preset:** with this menu it's possible to load a PRESET or a FACTORY configuration into the MFL .  
The **Factory configuration** resets the following :

|              |                                   |                        |                        |
|--------------|-----------------------------------|------------------------|------------------------|
| MAIN         | Display brightness: 0             |                        |                        |
|              | Display timeout: 30 seconds       |                        |                        |
| TX/RX MODULE | Ext. DC alarm threshold: OFF      |                        |                        |
|              | High optical power alarm: enabled |                        |                        |
|              | Status: ON                        | <u>For TX Links:</u>   | <u>For RX Links:</u>   |
|              | Mode: ANT                         | Filter: 470-960        | Optical pwr. corr.: ON |
|              | Gain: 0.0dB                       | Booster: disable       |                        |
|              | Failsafe: disabled                | Ext filter att.: 2.0dB |                        |

**Opt. loss calibration:** the menu shows the Optical Loss measure by RX modules. It required to perform a calibration first with a short patch as explained in the Optical Loss Calibration paragraph.

## TX Link menu

From the [Main screen](#), pushing the rotary knob, it's possible to enter on the selection screen and then, pushing the upper right button on the desiderate transmitter module, it's possible to enter on the TX Link menu:

**Status:** status of the transmitter (ON or OFF) [default ON]

**Mode:** working mode selection:

- ANT for remote antenna reception
- IFB for remote intercom for iso-frequency areas

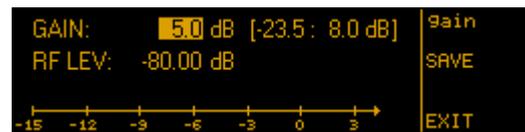
NOTE: set the transmitter module and the receiver module with the same working mode (as in the [third configuration example](#))  
(default ANT mode)

**Filter:** Type of RF filter (**only for ANT mode**)  
There are 4 possible configurations:

- 150-840: to have a fixed 150-840 MHz band-pass filter
- 470-840: to have a fixed 470-840 MHz band-pass filter
- BPF: tunable Band-Pass Filter (**only with MFL-BF1 option**)
- EXTERN: to connect an external RF filter between IN and OUT BNC connectors  
(default 470-840)

**BP filter center freq:** allows to set the center frequency of the 25MHz Band Pass filter.  
It is selectable only if the optional tunable BP filter (opt: MFL-BF1) is mounted and the Filter selection is set to the tunable Band-Pass Filter (BPF).  
Allowed range: center frequency 404÷788, 1MHz step.

**Gain:** Settable gain with step of 0.5dB.  
With IFB Mode: -23.5 ÷ 8.0 dB (typ.)  
With ANT Mode & filter: - 150-840: -20.0 ÷ 11.5 dB (typ.)  
- 470-840: -20.0 ÷ 11.5 dB (typ.)  
- BPF: -28.0 ÷ 3.5 dB (typ.)  
- EXTERN: -22.0 ÷ 9.5 dB (typ.)  
(default 0.0dB)



**Booster:** To enable or disable the 12V boosting power (**only for TX module in ANT mode**)  
(default disabled)

**Booster supply:** shows the voltage and current on the output connector, supplied with the booster option (**only for TX module in ANT mode & Booster set to enabled**)

**Failsafe:** To enable or disable the Failsafe option  
(default disabled)

**Ext filter att.:** Attenuation of the external filter, that can be set by user from 0.0 to 6.0dB with step of 0.5dB.  
(default 2.0dB)

**BF filter:** here it's possible to see all the Band-Pass filter information:

| <i>Example</i> |   |          |
|----------------|---|----------|
| ID             | ID of the RF filter                           | TBF01    |
| Serial         | Serial number of the RF filter                | T1541322 |
| HW Rev         | Hardware revision                             | 0        |
| App FW ver.    | Application firmware version of the RF filter | 1.0      |
| Model          | Model of filter                               | TBF04-F1 |

|                           |   |                  |                                  |                   |
|---------------------------|---|------------------|----------------------------------|-------------------|
| <b>Transmitter param:</b> | here it's possible to see all the transmitter parameters: | <i>Example</i>   |                                  |                   |
|                           |   | ID               | ID of the transmitter            | OTM001            |
|                           |   | Serial           | Serial number of the transmitter | T1845210          |
|                           |   | TX laser current | Current measured                 | 34.08 mA          |
|                           |   | Current limits   | Laser current working range      | 10.0mA - 50.0mA   |
|                           |   | Optical power    | Transmission optical power       | 2.0 mW            |
|                           |   | Temperature      | Working temperature              | 39°C              |
|                           |   | Offset gain      | Offset gain correction           | 0.0 dB            |
|                           |   | Wavelength       | Optical wavelength               | 1510nm            |
|                           |   | Life time        | Life time of the device          | 3 d - 00 h - 49 m |

## RX Link menu

From the [Main screen](#), pushing the rotary knob, it's possible to enter on the selection screen and then, pushing the upper right button on the desiderate receiver module, it's possible to enter on the RX Link menu:

| <b>Status:</b>             | status of the transmitter (default ON)   |                   |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
|----------------------------|--|-------------------|--|----------------|----|--------------------|--------|--------|-------------------------------|----------|-------------------|------------------------------|---------------|-------------|---------------------|----|-------------|---------------------------|--------|------------|--------------------|--------|-----------|-------------------------|-------------------|
| <b>Mode:</b>               | working mode selection: <ul style="list-style-type: none"> <li>- ANT for remote antenna reception</li> <li>- IFB for remote intercom in isofrequency areas applications</li> <li>- 1ifb/2ifb/3ifb/4ifb for multicarriers IFB transmission</li> </ul> (default ANT mode)  |                   |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
| <b>Gain:</b>               | settable gain from -13.5 to 18.0dB with step of 0.5dB. (typ.)<br>(default 0.0dB) <div style="text-align: center;">  </div>   |                   |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
| <b>Failsafe:</b>           | to enable or disable the Failsafe option (default disabled)  |                   |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
| <b>Optical power:</b>      | this parameter show the received optical power   |                   |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
| <b>Optical pwr. corr.:</b> | this option can be enabled to ensure that, in case in changes of optical power, the overall gain of the system remains unchanged (to keep the gain in the RF output at 0dB). (default ON)  |                   |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
| <b>Receiver param:</b>     | here it's possible to see all the receiver parameters: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th></th> <th style="background-color: #e0f2f1;"><i>Example</i></th> </tr> </thead> <tbody> <tr> <td>ID</td> <td>ID of the receiver</td> <td>ORM001</td> </tr> <tr> <td>Serial</td> <td>Serial number of the receiver</td> <td>T1841930</td> </tr> <tr> <td>Opt rx pwr limits</td> <td>Optical power working limits</td> <td>0.3mW – 3.0mW</td> </tr> <tr> <td>Temperature</td> <td>Working temperature</td> <td>NA</td> </tr> <tr> <td>Offset gain</td> <td>Offset gain of the module</td> <td>0.0 dB</td> </tr> <tr> <td>Wavelength</td> <td>Optical wavelength</td> <td>1550nm</td> </tr> <tr> <td>Life time</td> <td>Life time of the device</td> <td>3 d - 00 h - 49 m</td> </tr> </tbody> </table> |                   |  | <i>Example</i> | ID | ID of the receiver | ORM001 | Serial | Serial number of the receiver | T1841930 | Opt rx pwr limits | Optical power working limits | 0.3mW – 3.0mW | Temperature | Working temperature | NA | Offset gain | Offset gain of the module | 0.0 dB | Wavelength | Optical wavelength | 1550nm | Life time | Life time of the device | 3 d - 00 h - 49 m |
|                            |  | <i>Example</i>    |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
| ID                         | ID of the receiver   | ORM001            |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
| Serial                     | Serial number of the receiver  | T1841930          |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
| Opt rx pwr limits          | Optical power working limits   | 0.3mW – 3.0mW     |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
| Temperature                | Working temperature  | NA                |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
| Offset gain                | Offset gain of the module  | 0.0 dB            |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
| Wavelength                 | Optical wavelength   | 1550nm            |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |
| Life time                  | Life time of the device  | 3 d - 00 h - 49 m |  |                |    |                    |        |        |                               |          |                   |                              |               |             |                     |    |             |                           |        |            |                    |        |           |                         |                   |

## Alarm List

When an alarm occurs, the MFL can show one or more of the following warnings:

- A. Show a message on the display



- B. Turn on the yellow or red alarm led

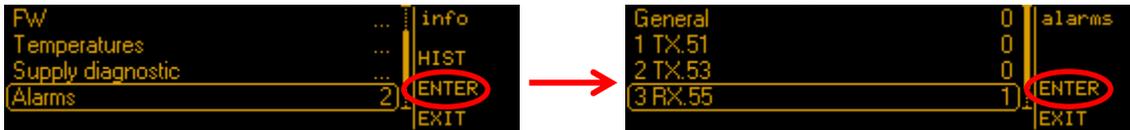


- C. Light up an auxiliary LED (in some cases)



- D. Insert the alarm on the current alarm list and in the “history” alarm list (in [MAIN>Info>Alarms menu](#))

- **Current alarm list:** pushing the rotary knob, it’s possible to enter in the current alarm list where are displayed the number and type of current alarms in the general apparatus or in each module



- **History alarm list:** pushing the upper right button, it’s possible to enter in the “history” alarm list where the alarm previously stored is displayed



The informations that are displayed in the history alarm screen are:



- 1 Progressive number of the alarm
- 2 Alarm CODE
- 3 Type of alarm:
  - open: when the alarm started
  - close: when the alarm stopped
- 4 Alarm description
- 5 Where the alarm occurred
- 6 When the alarm occurred
- 7 Other informations

**NOTE:** with the center right button it's possible to delete all alarms in the history alarm list (DEL ALL)

The alarm can be related to a specific transmitter/receiver or general.

Shown below the complete alarms list:

|                                | Name                | Code                                   | Message on display (A)                     | Alarm LED (B)                          | Auxiliary LED (C)                    | Alarm list (D)            |
|--------------------------------|---------------------|--|--|--|--------------------------------------|---------------------------|
| GENERAL ALARM                  | E2_INVALID          | 0x06                                   | Invalid int memory                         | FIXED RED                              | -                                    | -                         |
|                                | E2_INVALID_COPY1    | 0x80                                   | Calibration data copy #1 invalid           | FIXED YELLOW                           | -                                    | Cal data copy1 invalid    |
|                                | E2_INVALID_COPY2    | 0x81                                   | Calibration data copy #2 invalid           | FIXED YELLOW                           | -                                    | Cal data copy2 invalid    |
|                                | E2_CRC_DIFF         | 0x07                                   | Calibration data copies differ             | FIXED RED                              | -                                    | -                         |
|                                | E2_ERROR_UPDATE_CRC | 0x08                                   | Error updating calibration copy crc        | FIXED RED                              | -                                    | cal copy crc update error |
|                                | HW_INIT_FAILED      | 0x09                                   | System boot failed.                        | FIXED RED                              | -                                    | -                         |
|                                | NO_LINKS            | 0x0A                                   | No links declared in calibration memory    | FIXED RED                              | -                                    | -                         |
|                                | NO_LINKS_FOUND      | 0x0B                                   | No links hw detected                       | FIXED RED                              | -                                    | -                         |
|                                | PWR_SUPPLY          | 0x0C                                   | Power supplies failure                     | FIXED YELLOW                           | -                                    | power supplies failure    |
|                                | TEMP                | 0x04                                   | Internal high temperatur                   | -                                      | "TEMP. ALARM"<br>RED SLOWLY BLINKING | high temperature          |
|                                | I2C0                | 0x0D                                   | Communication error on I2C bus #0          | FIXED RED                              | -                                    | I2C bus #0                |
|                                | I2C1                | 0x0E                                   | Communication error on I2C bus #1          | FIXED RED                              | -                                    | I2C bus #1                |
|                                | FAN1                | 0x02                                   | Fan #1 does't work properly                | YELLOW SLOWLY BLINKING                 | FAN 1                                | fan #1                    |
|                                | FAN2                | 0x03                                   | Fan #2 does't work properly                | YELLOW SLOWLY BLINKING                 | FAN 2                                | fan #2                    |
|                                | LINK ALARM          | TEMP_SENS                              | 0x0F                                       | Temperature sensor doesn't communicate | RED SLOWLY BLINKING                  | -                         |
| LOW_BATT                       |                     | 0x10                                   | Backup battery low                         | RED SLOWLY BLINKING                    | -                                    | backup battery low        |
| LINK_NOT_FOUND                 |                     | 0x0B                                   | HW not found                               | FIXED RED                              | *                                    | HW not found              |
| LINK_NOT_CONSISTENT            |                     | 0x11                                   | Link type doesn't match                    | FIXED RED                              | *                                    | Link type match           |
| LINK_LASER_E2_INVALID          |                     | 0x12                                   | Laser calibration data invalid             | FIXED RED                              | *                                    | Laser cal data invalid    |
| LINK_LASER_E2_INVALID_COPY1    |                     | 0x13                                   | Laser calibration data copy 1 invalid      | FIXED RED                              | *                                    | Laser cal copy1 invalid   |
| LINK_LASER_E2_INVALID_COPY2    |                     | 0x14                                   | Laser calibration data copy 2 invalid      | FIXED RED                              | *                                    | Laser cal copy2 invalid   |
| LINK_LASER_E2_CRC_DIFF         |                     | 0x15                                   | Laser calibration crc mismatch             | FIXED RED                              | *                                    | Laser cal crc mismatch    |
| LINK_LASER_E2_ERROR_UPDATE_CRC |                     | 0x16                                   | Laser calibration crc update error         | FIXED RED                              | *                                    | Laser cal crc update      |
| LINK_RF_FIL_NOT_FOUND          |                     | 0x17                                   | RF filter not found                        | FIXED RED                              | *                                    | RF filter not found       |
| LINK_RF_FIL_E2_INVALID         |                     | 0x18                                   | RF filter invalid calibration data         | FIXED RED                              | *                                    | RF filter invalid E2      |
| LINK_RF_E2_INVALID_COPY1       |                     | 0x19                                   | RF filter calibration data copy #1 invalid | FIXED RED                              | *                                    | RF fil cal copy #1 inval. |
| LINK_RF_E2_INVALID_COPY2       |                     | 0x1A                                   | RF filter calibration data copy #2 invalid | FIXED RED                              | *                                    | RF fil cal copy #2 inval. |
| LINK_RF_FIL_E2_UNCAL           |                     | 0x1B                                   | RF filter not calibrated                   | FIXED RED                              | *                                    | RF filter not calibrated  |
| LINK_RF_FIL_E2_DIFF            |                     | 0x1C                                   | RF filter calibration copies differ        | FIXED RED                              | *                                    | RF fil cal copies differ  |
| LINK_ON_OFF                    |                     | 0x20                                   | On/Off procedure failure                   | FIXED RED                              | *                                    | On/Off procedure failure  |
| LINK_FAILSAFE_RX               |                     | 0x1D                                   | ALARM: optical power lost                  | YELLOW SLOWLY BLINKING                 | FAILSAFE FAST BLINKING + *           | failsafe active           |
| LINK_FAILSAFE_TX               |                     | 0x1D                                   | ALARM: laser current out of range          | YELLOW SLOWLY BLINKING                 | FAILSAFE FAST BLINKING + *           | failsafe active           |
| LINK_BOOSTER                   |                     | 0x1E                                   | ATTENTION: booster over current            | YELLOW SLOWLY BLINKING                 | BOOSTER FAST BLINKING + *            | booster overcurrent       |
| LINK_LASER_EOL                 |                     | 0x1F                                   | ATTENTION: laser life terminating          | FIXED YELLOW                           | *                                    | laser life terminating    |
| LINK_TEMP_SENS                 | 0x0F                | Temperature sensor doesn't communicate | RED SLOWLY BLINKING                        | *                                      | temperature sensor comm.             |                           |

\* In the "ALARM" column in the front panel, appears a blinking red LED in correspondence at the link on which the alarm is being

## Troubleshooting

|               | Alarms                          | Alarm description   | Troubleshooting  |
|---------------|---------------------------------|---|--|
| GENERAL ALARM | E2_INVALID                      | None of the two calibration copies of the internal E2 memory is valid   |  |
|               | E2_INVALID_COPY1                | Has not been validated the CRC of the copy #1 of the data of calibration of E2 memory   |  |
|               | E2_INVALID_COPY2                | Has not been validated the CRC of the copy #2 of the data of calibration of E2 memory   |  |
|               | E2_CRC_DIFF                     | The two copies of the data in the internal E2 memory, have a valid CRC but different from each other  |  |
|               | E2_ERROR_UPDATE_CRC             | There was an error while updating the CRC of the calibration data in the internal E2 memory   |  |
|               | HW_INIT_FAILED                  | There was an error during the initialization phase of the machine   |  |
|               | NO_LINKS                        | In the internal E2 memory are not declared the Links (Rx or Tx) to manage   |  |
|               | NO_LINKS_FOUND                  | The Links to manage are declared, but physically it was not possible to communicate with any module, so it is assumed that they haven't been installed  |  |
|               | PWR_SUPPLY                      | Abnormalities were noted in the power supply of the machine.  |  |
|               | TEMP                            | One of the temperature sensors measures a temperature > 60°C  | <ul style="list-style-type: none"> <li>- check if the two fans work properly (check alarms code 0x02 or 0x03 on the alarm list)</li> <li>- switch off the MFL for cooling and check the location temperature</li> <li>- clean the ventilation grids</li> </ul> |
|               | I2C0                            | Error on I2C0 bus   |  |
|               | I2C1                            | Error on I2C1 bus   |  |
|               | FAN1                            | The fan on the left (#1) doesn't turn   | - switch off and switch on the MFL   |
|               | FAN2                            | The fan on the right (#2) doesn't turn  | - switch off and switch on the MFL   |
|               | TEMP_SENS                       | Communication error with the temperature sensor of the main board   |  |
|               | LOW_BATT                        | This message informs that the backup battery is running low   |  |
| LINK ALARM    | LINK__NOT_FOUND                 | I-th link not found. The error is detected in the initialization phase when attempting to communicate with the E2 memory on the module to establish if the module is present or not.<br><i>Note: The link is not considered valid and therefore will not be present among those available</i>     |  |
|               | LINK__NOT_CONSISTENT            | I-th link of type different from that stated in the E2 memory.<br><i>Note: The link is not considered valid and therefore will not be usable</i>  |  |
|               | LINK__LASER_E2_INVALID          | The I-th link doesn't have a valid calibration memory (none of CRC of the two copies is correct).<br><i>Note: The link is not considered valid and therefore will not be present among those available</i>  |  |
|               | LINK__LASER_E2_INVALID_COPY1    | The copy #1 of the I-th link is not valid   |  |
|               | LINK__LASER_E2_INVALID_COPY2    | The copy #2 of the I-th link is not valid   |  |
|               | LINK__LASER_E2_CRC_DIFF         | The CRC of the calibration data of the laser module are valid but different from each other.<br><i>Note: The link is not considered valid and therefore will not be present among those available</i>   |  |
|               | LINK__LASER_E2_ERROR_UPDATE_CRC | There was an error while updating the CRC of the calibration data of the i-th laser module  |  |
|               | LINK__RF_FIL_NOT_FOUND          | Is declared the presence of the internal RF filter, but is failed the communication.<br><i>Note: The filter is considered not present, therefore the BPF filter is not present in the items of the transmitters menu (the other filters are available)</i>  |  |
|               | LINK__RF_FIL_E2_INVALID         | The internal RF filter has no valid calibration data<br><i>Note: The filter is considered not present, therefore the BPF filter is not present in the items of the transmitters menu (the other filters are available)</i>  |  |
|               | LINK__RF_E2_INVALID_COPY1       | The copy #1 of the calibration data of the RF filter is not valid   |  |
|               | LINK__RF_E2_INVALID_COPY2       | The copy #2 of the calibration data of the RF filter is not valid   |  |
|               | LINK__RF_FIL_E2_UNCAL           | The two copies of the internal RF filter are valid and the CRC equal to each other but there are no valid calibration data.<br><i>Note: The filter is considered not present, therefore the BPF filter is not present in the items of the transmitters menu (the other filters are available)</i> |  |
|               | LINK__RF_FIL_E2_DIFF            | The two copies of the internal RF filter are valid but the CRC are different from each other<br><i>Note: The filter is considered not present, therefore the BPF filter is</i>  |  |

|                   |   |  |
|-------------------|---|--|
|                   | <i>not present in the items of the transmitters menu (the other filters are available)</i>  |  |
| LINK__ON_OFF      | There was an error in the phase of power ON/OFF of a link   |  |
| LINK__FAILSAFE_RX | This alarm appear when the Failsafe is activated in a receiver and the optical signal is lost   |  |
| LINK__FAILSAFE_TX | This alarm appear when the Failsafe is activated in a transmitter and the laser current goes out of range (the TX module doesn't work properly) |  |
| LINK__BOOSTER     | It was detected a malfunction in the power of the booster   |  |
| LINK__LASER_EOL   | The laser has terminated its life time  |  |
| LINK__TEMP_SENS   | It was detected a communication problem with the temperature sensor of the laser module   |  |

If a problem not listed in the above table occurs or if the problem cannot solved with the proposed troubleshooting, please contact support service at [support@wisyscom.com](mailto:support@wisyscom.com) or [sales@wisyscom.com](mailto:sales@wisyscom.com).

## SAFETY INSTRUCTION

- Read this safety instruction and the manual first
- Follow all instructions and information.
- Do not lose this manual.
- Do not use this apparatus under the rain or near the water.
- Do not install the apparatus near heaters or in hot environments, do not use outside the operating temperature range.
- Mount the apparatus as indicated in the instruction, do not block side grids for air ventilation
- **ATTENTION:** supply the apparatus with a correct mains voltage and with the ground connection. Check the power cord integrity.
- The power cord must be protected from damage
- Do not install the apparatus near heaters or in hot environments, do not use outside the operating temperature range.
- Do not open the apparatus, only qualified service technician are enabled to operate on it. The apparatus needs servicing when it is not properly working or is damaged by liquids, moisture or other objects are fallen inside the apparatus.
- Use only accessories or replacement parts authorized or specified by the manufacturer.
- Clean the apparatus only with dry cloths, do not use liquids.
- The ON/OFF is a double pole circuit breaker, but to ensure the complete disconnection of the apparatus, disconnect the power cord.
- Report the serial number and the purchasing date in front of the manual. It is needed to have proper replacement parts or accessories from the manufacturer.
- When replacement parts are needed, use only replacement parts authorized from the manufacturer. Substitution with not authorized parts could result in electric shock, hazards or fire.
- Keep attention on all the labels with warnings or hazards on the apparatus.

### ***Optical Safety!!!***

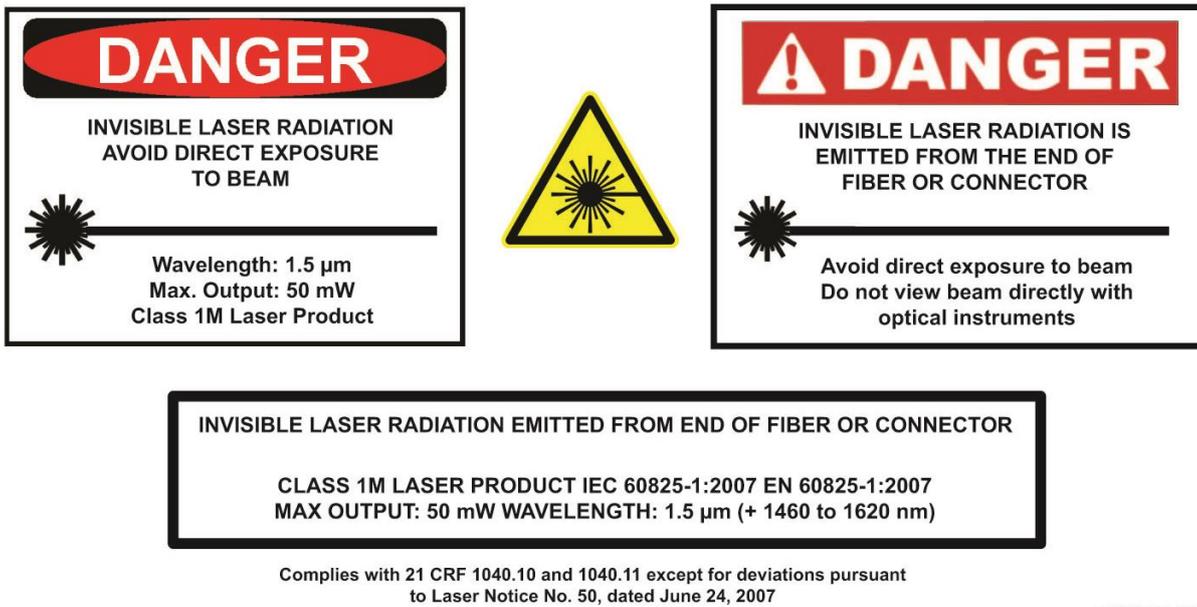
Never look into the end of an optical fiber directly or by reflection either with the naked eye or through an optical instrument. Never leave equipment with radiating bare fibers accessible – always cap the connectors.

Do not remove equipment covers when operating.

Adjustment, maintenance and repair of the equipment should only be carried out by suitably qualified personnel.

This product is supplied with angle-polished connectors and these must not be confused with standard flat, spherical or "super" polished connectors. These connector types are not interchangeable and mating one with the other will damage both the cable and the equipment.

The specification of the optical connector is critical to the performance of the complete fiber optic link. System performance can only be guaranteed with fiber optic cables and connectors supplied by Wisycom.



Wisycom MFL contains laser diode sources operating at 1460 to 1620 nm.

These devices are rated at under IEC 60825-1:2007 as CLASS 1M LASER PRODUCT

**ENVIRONMENTAL INFORMATION**

**Applicable in the European Union and other European countries with separate collection systems**

**Disposal of Old Electrical & Electronic Equipment (2002/96/EC)**



This symbol indicates that this products shall not be treated as household waste. Instead it shall be handed over to the appropriate collection point for the recycling of electrical and electronic equipment. The recycling of material will help to conserve natural resources.

ITALY ONLY

**Obblighi di informazione agli utilizzatori**

ai sensi dell'art. 13 del Decreto Legislativo 25 luglio 2005, n. 151 "Attuazione delle Direttive 2002/95/CE, 2002/96/CE e 2003/108/CE, relative alla riduzione dell'uso di sostanze pericolose nelle apparecchiature elettriche ed elettroniche, nonché allo smaltimento dei rifiuti"

**Smaltimento di apparecchiature elettriche ed elettroniche di tipo professionale**



Il simbolo del cassonetto barrato riportato sull'apparecchiatura o sulla sua confezione indica che il prodotto alla fine della propria vita utile deve essere raccolto separatamente dagli altri rifiuti.

La raccolta differenziata della presente apparecchiatura giunta a fine vita è organizzata e gestita dal produttore. L'utente che vorrà disfarsi della presente apparecchiatura dovrà quindi contattare il produttore e seguire il sistema che questo ha adottato per consentire la raccolta separata dell'apparecchiatura giunta a fine vita.

L'adeguata raccolta differenziata per l'avvio successivo dell'apparecchiatura dismessa al riciclaggio, al trattamento e allo smaltimento ambientalmente compatibile contribuisce ad evitare possibili effetti negativi sull'ambiente e sulla salute e favorisce il reimpiego e/o riciclo dei materiali di cui è composta l'apparecchiatura. Lo smaltimento abusivo del prodotto da parte del detentore comporta l'applicazione delle sanzioni amministrative previste dalla normativa vigente.

Iscrizione al Registro A.E.E. n. IT09100000006319

## TECHNICAL SPECIFICATION

### Mainframe

|                                   |   |   |
|-----------------------------------|---|---|
| RF to Optical modules (TX module) | : | 1 to 4  |
| Optical to RF modules (RX module) | : | 1 to 4  |
| Maximum number of modules         | : | 4   |
| RF to fiber link working modes    | : | ANT, IFB, 4ifb, 3ifb, 2ifb, 1ifb                |
| Rear optical connectors           | : | 4 SC/APC, 1 LC/PC duplex, other type on request |
| Internal optical CWDM MUX/DEMUX   | : | 2 max (option <b>OMS</b> or <b>OMX</b> )        |

### "ANT" mode – optical TX module

|   |   |  |
|---|---|--|
| Typical application                       | : | RX antenna remoting  |
| Frequency ranges (front panel selectable) | : | 140 to 960 MHz (flat)<br>470 to 960 MHz<br>25MHz BW tunable band-pass filter 404-788MHz ( <b>BF1</b> )<br>40MHz BW tunable band-pass filter 430-730MHz ( <b>F41/F42/F45</b> )<br>940-960MHz ( <b>F42/F45</b> )<br>806-810MHz ( <b>F45</b> )<br>Other selectable filters (see section <a href="#">Filter option</a> )<br>External user band-pass filter |
| External filter loss compensation         | : | 0 to 6 dB  |
| TX Gain                                   | : | 0dB (user adjustable +6 to -20dB typ.)   |
| Input IP3                                 | : | > 16 dBm typ.  |
| Noise figure                              | : | < 20dB typ. (*)  |
| SFDR                                      | : | > 116 dB/Hz <sup>2/3</sup> typ.  |
| RF input connector                        | : | N female 50 Ω  |
| Antenna booster supply                    | : | 12Vdc 200mA max  |
| External filter connectors                | : | BNC female 50 Ω  |

### "ANT" mode – optical RX module

|                     |   |                                   |
|---------------------|---|-----------------------------------|
| RX Gain             | : | 0dB (user adjustable ± 14dB typ.) |
| Failsafe option     | : | yes, standard option              |
| RF output connector | : | N female 50 Ω                     |
| Failsafe connector  | : | BNC female 50 Ω                   |

### "IFB" mode – optical TX module

|  |   |  |
|--|---|--|
| Typical application                      | : | "IFB" signal remoting (isofrequency systems) |
| Frequency range                          | : | 140 to 960 MHz                               |
| RF input level                           | : | - 6 to 6 dBm [0.25mW to 4mW]                 |
| RF input level for 0dBm out (@ 0dB gain) | : | from -3dBm to + 10dBm                        |
| RF input connector                       | : | N female 50 Ω                                |

### "IFB" mode – optical RX module

|                                 |   |  |
|---------------------------------|---|--|
| RX output level                 | : | 0 dBm (user adjustable +6 to -20dB typ.) |
| Failsafe option                 | : | yes, standard option                     |
| RF output connector             | : | N female 50 Ω                            |
| DC power for external amplifier | : | 12V@ 200mA                               |
| Failsafe connector              | : | BNC female 50 Ω                          |

### Optical TX module

|               |   |                                     |
|---------------|---|-------------------------------------|
| Optical power | : | 6dBm [4mW] (other on request)       |
| Wavelengths   | : | 1511 or 1531 or 1551 or 1571 nm     |
| Laser         | : | low noise, low distortion DFB laser |

### Optical RX module

|                           |   |                                |
|---------------------------|---|--------------------------------|
| Input optical power range | : | -5 dBm to 5 dBm [0.3mW to 3mW] |
| Wavelengths               | : | 1490 to 1610 nm                |

### Temperature

|                       |   |               |
|-----------------------|---|---------------|
| Operating temperature | : | -20 to +55 °C |
|-----------------------|---|---------------|

### Powering

|                    |   |                            |
|--------------------|---|----------------------------|
| AC mains           | : | 90 to 240 Vac, 60VA max    |
| DC (option MFL-DC) | : | 10-28Vdc 5A frame floating |

### Dimensions and weight

|            |   |   |
|------------|---|---|
| Dimensions | : | 19"/1U, 430x44x370mm (Width x Height x Depth) |
| Weight     | : | 4,5 kg  |

(\*) Measured with "Ant" mode and 0 dB gain (standard "factory preset") at 25 °C



## EU DECLARATION OF CONFORMITY

We,

WISYCOM S.r.l.  
via Tiepolo, 7/E  
35019 Tombolo (PD) – Italy

declare under our sole responsibility that the product

*Description*  
*Model*

**MFL, MFLC**  
**RF over Fiber system**

conforms to the essential requirements of the following European Directives and their associated norms:

| Directive                        | Applicable Standards | Description   |
|----------------------------------|----------------------|---|
| RADIO Directive 2014/53/EU (RED) | EN 300 422-1 v2.1.2  | Wireless Microphones; Audio PMSE up to 3 GHz; Part 1: Class A Receivers; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU   |
| EMC                              | EN 301 489-1 v2.1.1  | “ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU  |
|                                  | EN 301 489-9 v2.1.1  | ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 9: Specific conditions for wireless microphones, similar Radio Frequency (RF) audio link equipment, cordless audio and in-ear monitoring devices; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU |
| Safety                           | EN 62368-1 2014      | Audio/video, information and communication technology equipment — Part 1: Safety requirements (IEC 62368-1:2014, modified)  |
| RoHS                             | EN IEC 63000:2018    | Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances  |

Date: 22 September 2021

Franco Maestrelli, Managing director

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