



# MON-110

## INSTALLATION AND OPERATING MANUAL

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## 1. Basic information

### 1.1 About the manual

This manual contains information necessary for proper installation and operation of the MON-110 optical node manufactured by GZT Telkom-Telmor Sp. z o.o. with its registered office in Gdańsk, ul. Schuberta 104.

GZT Telkom-Telmor reserves the right to make changes to the content of the MON-110 manual without notice.

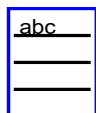
This manual is intended for qualified and properly trained personnel assigned to carry out installation, configuration and operation of the MON-110 optical node

### 1.2 Copyright

This manual may not be copied or reproduced, in whole or in part, in any form or manner and may not be distributed without the express written permission of GZT Telkom-Telmor.

GZT Telkom-Telmor shall not be liable for errors resulting from ambiguous interpretation of the contents of this manual. Possession and use of this manual does not convey a license or right under copyright or patent law. In case of any doubts, the users of this manual may contact the Sales Department of GZT Telkom-Telmor tel via phone or e-mail. +48 58 3823 309, e-mail [handlowy@telmor.pl](mailto:handlowy@telmor.pl)

### 1.3 Icons



— Additional information;



— CAUTION! Special attention must be paid to the information marked with this icon;



— CAUTION! Source of laser radiation. The laser beam emitted in the infrared range is invisible. When directed toward the eyes, it can lead to permanent visual impairment;



— Indicates a risk of damage to the unit due to electrostatic discharge (ESD);

## 2. Important safety instructions

### 2.1 General information

The MON-110 optical node by GZT Telkom-Telmor has been designed and manufactured taking into account all applicable safety standards, protection against harmful laser radiation and electromagnetic compatibility.

GZT Telkom-Telmor guarantees proper functioning of MON-110 if its installation and operation are in accordance with the conditions specified in this manual. GZT Telkom-Telmor shall not be liable for any damages to persons or property resulting from improper installation, modification or operation inconsistent with the manual and intended use of the MON-110 optical node. Therefore, GZT Telkom-Telmor strongly recommends reading and understanding this manual before installation.

### 2.2 Pre-installation inspection

In order to avoid problems that may occur during the installation of MON-110, the manufacturer strongly advises checking the unit before installation. In case of any questions, contact GZT Telkom-Telmor.

We recommend not discarding the original packaging until the unit is commissioned.

### 2.3 Storage

The MON-110 optical node can be stored, without degradation of its performance, under the conditions specified in IEC 60068-2-48:

- temperature -10..+50 °C,
- humidity 25..70%,
- pressure 860..1060 hPa,

for a period of 24 months from the date of manufacture

### 2.4 Installation and operation

The MON-110 optical node is powered by electricity. For safety reasons, the following rules should be strictly observed:

- installation and replacement, complying with local laws and regulations, shall only be performed by authorized, trained and qualified service personnel,
- only qualified and trained service personnel shall be authorized to remove covers and access components inside the unit,
- a protective ground should be connected to device.

In order to ensure long-term trouble-free operation, it is recommended that:

- MON-110 is mounted in an easily accessible location,

- MON-110 is not installed near heat sources such as radiators, heat pipes, boilers, gas and electric stoves, etc,
- the installation location is close to a power outlet,
- all network cables have been laid in a manner ensuring they are free from mechanical stress, pressure, stretching, bending, etc,
- MON-110 is fixed to a mounting plate or rack in a secure and stable manner,
- the mounting surface or rack was anchored according to the manufacturer's specifications.
- To ensure appropriate ventilation, keep any items at least 5 cm away from the unit.
- Don't cover the unit with items such as newspapers, tablecloths, curtains, etc.
- Do not place any sources of open flame (such as burning candles) or strong heat near the unit.
- Do not put any containers with fluid on top of or near the unit.

## 2.5 Warnings and safety information

### 2.5.1 Electrostatic discharge



During installation and service works, it is recommended that personnel authorized to perform these works use the grounding tape as a preventive measure in order to protect the MON-110 optical node against electrostatic discharges (ESD).

To prevent damage due to ESD, it is advisable to:

- always use a grounded ESD ground bracelet on wrist or leg that is in good contact with the skin,
- connect the grounding tape to the MON-110 enclosure,
- handle MON-110 without touching the circuit boards or connectors,
- avoid contact between the circuit board and clothing. The ground bracelet on the wrist protects the elements from charges accumulated on the body, while electrical charges accumulated on clothing can still cause damage,
- never remove the circuit board from its enclosure.

### 2.5.2 Radiation



To avoid exposure to hazardous laser radiation from a fiber optic cable:

- avoid looking at the bare end of the fiber optic cable or at surfaces that may reflect light from an open fiber optic cable;
- avoid looking at the fiber optic cable during operation with optical instruments (magnifying glass, microscope, etc.);

- use an approved fiber optic cable to comply with applicable laser safety requirements.

### 2.5.3 Fiber optic cables



Wearing safety glasses is advised. Maximum caution is recommended when handling fiber optic cables, especially when splitting or terminating the cable. The inner glass core of the optical fiber is brittle when the sheath and buffer material are removed. It easily breaks into small pieces that can injure the human body. Using tweezers, remove the filings immediately, place them in a sealed waste container, and dispose of them according to local regulations.

## 2.6 Modifications

Any modifications to the optical node will void the warranty.

No modifications are allowed. These can reduce the level of protection built into the MON-110 optical node, exposing people and objects to an increased risk of injury or damage. The persons making modification exposes themselves to penalties resulting from non-compliance with legal requirements and civil lawsuits for resulting damages or injuries.

## 3. General information

### 3.1 Introduction

The MON-110 optical node described in this manual is a unit designed and manufactured by GZT TELKOM-TELMOR and is intended for use in HFC networks.

### 3.2 Features of the MON-110

MON-110 is a modern optical node dedicated for operation in HFC, FTTH and FTTB networks, with one optical input/output, one RF output and a TP port for RF output. It is equipped with electronic uninterruptible forward channel control, and the built-in AGC system maintains stable high RF output level.

MON-110 is equipped with a three-state input optical power range LED indicator. With AGC enabled, it is possible to keep the output signal at a constant level over a wide range of optical input power. Automatic gain control (AGC) is in the range of -6..0 dBm optical input power. The units are available with 12V DC power supply, a dedicated power supply with a European plug is included in the set.

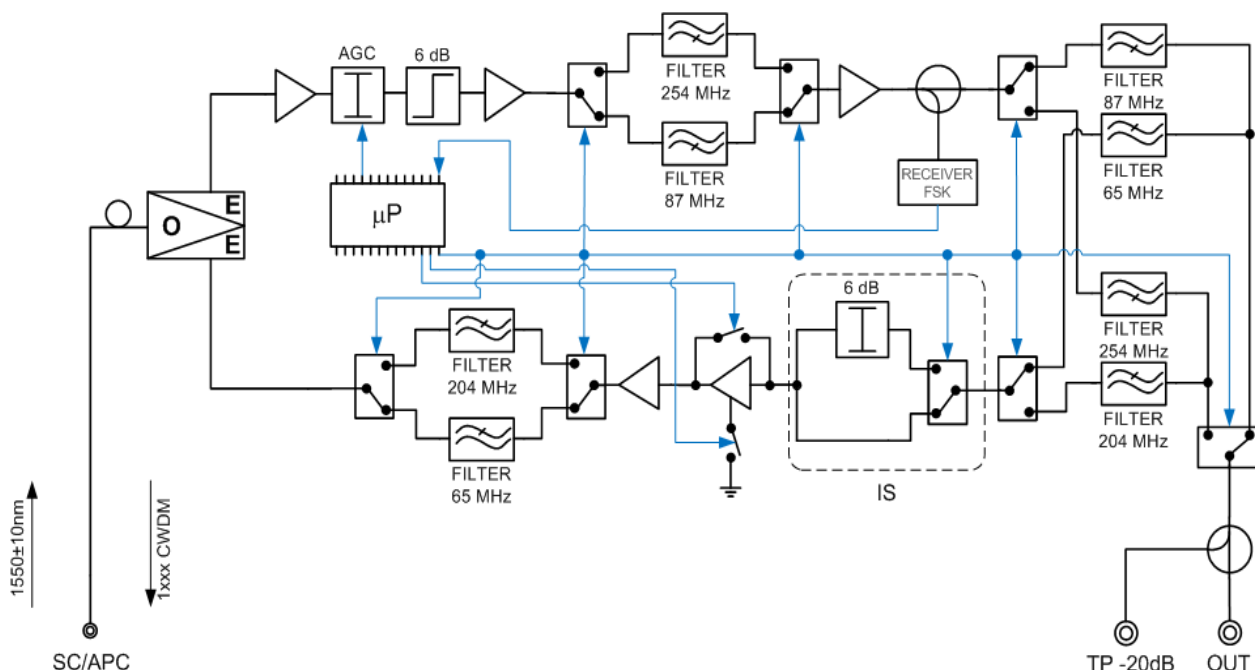
MON-110 is equipped with an optical transmitter module. By using a fast input gain detector for the return channel, it is possible to use the transmitter operating in continuous mode as well as the same transmitter operating in burst mode.

Features of the MON-110:

- dedicated for HFC, FTTB and FTTH networks
- operating bandwidth up to 1218MHz,
- dual diplex filter technology, controlled also remotely
- wide range optical input power -10..+2 dBm.
- Return path gain control
- ECO mode
- Ingress Switch (remotely managed attenuator (0/6)) + US
- Remote control using HDTIP (more information on our website)
- three-state LED input optical power level indicator,
- built-in AGC (Automatic Gain Control),
- two modes of operation of the optical return channel transmitter — continuous and burst mode,
- local power supply 9..12 V<sub>DC</sub>, max 6 W.
- AC adapter included: 195..253 V<sub>AC</sub> — 50..60Hz
- diecast enclosure.

MON-110 complies with CENELEC EN 50083-3 and ensures electromagnetic compatibility in accordance with IEC 60728-2.

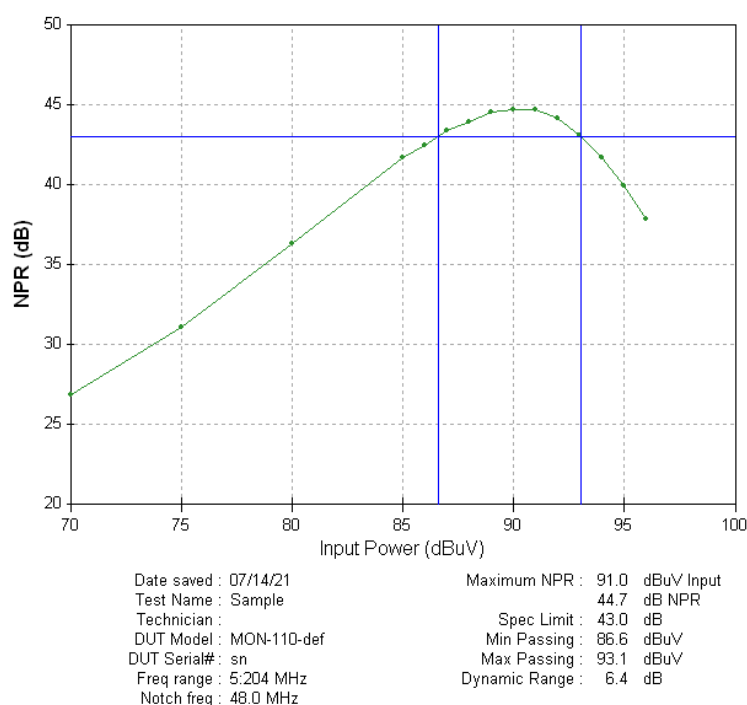
### 3.3 Block diagram



*Filtered frequencies may differ according to MON-110 version. Check technical specs table and device markings for proper range values.*



### 3.4 Noise Power Ratio (NPR) graphs



## 4. Installation

### 4.1 Tools, accessories, tightening torques

The unit does not include mounting screws and bolts. To attach the optical node to the surface, use screws and bolts no larger than 4 mm in diameter.

### 4.2 Installation location requirements

The enclosure protects the electrical unit from environmental impact and overheating. The aluminum enclosure, which dissipates heat, allows the optical node to operate over a wide temperature range (-10 ÷ +55 °C). The degree of protection of the MON-110 is classified as IP54. A rubber gasket in the cover prevents moisture from entering the unit.

### 4.3 Installation of the MON-110



The MON-110 optical node should be mounted vertically so that the signal cables exit downward. If this condition is not met, proper air circulation may be impaired and the optical node may overheat.

The compact optical node enclosure requires a small installation space. The node can be mounted in both free-standing and building cabinets. The shape of the node's enclosure ensures easy installation directly into the surface. MON-110 features a single SC/APC adapter to provide input optical power and to connect to the return channel transmitter. Transmission is always on two different wavelengths (version table). External RF output in the form of type F

female connector. Next to it there is a TP connector (-20dB) used for measuring return and forward channels. The 9..12 VDC power connector is on the right side.



Fig. 4.1. View of MON-110 optical receiver enclosure.

## 4.4 Assembly method

### 4.4.1 Preparation for installation

Before commencing the installation of the MON-110 optical node, carefully inspect its enclosure and check for any possible damage.

### 4.4.2 Installation

MON-110 should be fixed to the surface using two screws with a diameter no larger than  $\varnothing 4$  mm with a head no larger than 12 mm in diameter, using the existing mounting holes in the node's enclosure.

### 4.4.3 Opening and closing the enclosure

Opening the enclosure is not necessary to operate the MON-110. Opening the unit's enclosure will void the warranty. All functional elements are found on the outside of the enclosure.

### 4.4.4 Grounding the optical node

For safe operation of the MON-110 optical node it is necessary to properly ground it. The ground wire attachment screw is on the right side of the optical node, next to the mounting hole. MON-110 should be grounded with 4 mm<sup>2</sup> copper wire.

## 5. Operation

### 5.1 Module configuration

#### 5.1.1 RF path adjustment

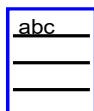
The node features AGC (automatic gain control), which keeps the output power of RF signals at an appropriate level. No additional adjustment is necessary.

In addition, the node has been equipped with a constant 6 dB forward channel equalizer. This value is the level difference between the frequencies 85 MHz and 1218 MHz. It allows for passive distribution of the signal to subscriber outlets and preservation of proper transmission characteristics.

### 5.1.2 Input and optical path



The input optical power level delivered to the optical input should not be higher than +2 dBm. Exceeding the level of +3 dBm of optical power at the optical input may result in irreversible damage to the node!



To optimally utilize the capabilities of the optical receiver, it is recommended to operate in the -6..0 dBm range of input optical power.

Every MON-110 unit is equipped with an optical filter at the input. To properly connect the unit, connect the transmitter with the wavelength corresponding to the marking on the unit's enclosure. Example marking is presented below, value marked with red square.



### 5.1.3 Automatic gain control (AGC)

The user can select the operation mode of the AGC circuit. It is turned on and off remotely using the HDTIP system. If the optical input power gain is within the -6..0dBm range then when AGC is enabled, it maintains a constant output power level regardless of changes of input power within the indicated range. The AGC operates in a six-decibel window, giving the maximum range of the high frequency attenuator of 12 dB.

### 5.1.4 Test point

The optical node is equipped with a TP test point with a type F connector with attenuation of -20 dB. The test point supports the forward and the return channels.



Test Point (TP) for DS and US

[www.telmor.pl](http://www.telmor.pl)

### 5.1.5 Adjusting the ECO mode for the return channel

The return channel gain is adjusted using the ECO mode. This feature allows to skip one of the gain stages or disable the return channel and, consequently, also the transmission of the optical signal. This attenuator is located before the RF signal detector, which determines when the laser is turned on (Burst Mode), so we can force a higher signal level necessary to start the laser.

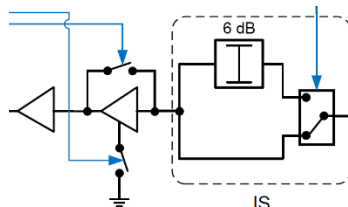


Fig. 5.14. ECO mode adjustment system — block diagram.

### 5.1.6 Return channel operating mode

The return channel can operate in one of two modes: continuous and burst mode. The burst mode for modem transmission activates and deactivates the optical signal transmission depending on whether modem transmission in the RF path exists. This option is set to ON by default. If the node is to operate in continuous transmission mode, independent of modem transmission, then it must be switched to CW (constant wave) mode via the HDTIP system or local TIP URC programmer.

### 5.1.7 Power supply

Optical node MON-110 is DC powered by means of the included 12 V power supply offering maximum current of 2 A. The use of a dedicated power supply guarantees correct operating parameters of the unit.

## 5.2 Output level adjustment

Adjustment of the return channel of the MON-110 optical node is performed according to the following procedure:

1. Measure the input optical power level with an optical power meter.
2. Connect the RF power meter to the TP output and check if the signal has the correct level and slope.
3. Check if the level of RF signals for the RF output are correct.

## 6. Technical parameters

### 6.1 Optical parameters

Input optical power range	dBm	-10..+2
AGC operating range	dBm	-6..0
Mismatch attenuation	dB	≥ 40

Received wavelength range	nm	1550 or 1310 +/-10 (depending on version)
Maximum input power level	dBm	+3
Optical power level indicator	-	LED
Equivalent input noise current	pA/(Hz) <sup>1/2</sup>	6.5
Type of optical connector	-	SC/APC

## 6.2 Forward channel

Operating frequency range	MHz	87/110/256..1218
Flatness	dB	±1.0
Output Level (CENELEC 42) 1550 nm@ -3 dBm EQ=6 dB, 3.5% OMI, AGC OFF, CTB ≤ 60 dBc, CSO ≤ 60 dBc	dBμV	95
Interstage equalizer	dB	Constant — 6 dB
Test point	dB	-20 ±1
RF output mismatch attenuation	dB	18 (40MHz) -1.5 dB / oct.

## 6.3 Return channel

Operating frequency range	MHz	5..65/85/204
Flatness	dB	±1.0
Ingress switch	dB	0/6dB
Test point	dB	-20 ±1
RF output mismatch attenuation	dB	18 (40MHz) -1.5 dB / oct.

## 6.4 Other

Local supply	V/Hz	195..253/ 50–60 (power supply unit)
Power consumption	W	7
Output connectors	-	Type F, female
Ingress protection code	IP	54
Operating temperature range	°C	-20..55
Weight	kg	1.3
Dimensions	mm	205x127x44

## 7. Markings

The hardware configuration of the MON-110 optical node can be identified based on the following:

**MON-110 xxxx/yyyy DPF L(aa/bb) H(aa/bb)**

**1) Wavelengths** — where xxxx is the wavelength for the optical receiver and yyyy is the wavelength for the optical transmitter expressed in nm units. Wavelengths range of transmitting and receiving optical signals are compatible with the CWDM channel layout.

**2) Diplex filter**

L — filter A — the default enabled filter for a new unit. The aa/bb value means:

aa — the end of the RF range of the return channel provided in MHz, by default the return channel operates from 5 MHz (according to the unit's specification)  
 bb — the beginning of the RF range of the forward path provided in MHz. The maximum forward path frequency is 1218 MHz (according to the unit's specification)

H — filter B — an additional DPF type filter according to the principle extending the operating range of the return channel. The numeral designations describe the operating frequency ranges in the same way as in the example above.

Additionally, in order to specify the type of the ordered unit, the following designations defining the operating ranges of the forward and return channels can be used:

M — Forward channel (DS) — 85..1218 MHz, Return channel (US) — 5..65 MHz  
 P — Forward channel (DS) — 110..1218 MHz, Return channel (US) — 5..85 MHz  
 P1 — Forward channel (DS) — 102..1218 MHz, Return channel (US) — 5..85 MHz  
 V — Forward channel (DS) — 256..1218 MHz, Return channel (US) — 5..204 MHz

## 8. Standards conformity

**MON-110** is in conformity with the following standards:

EN 60728-11:2017

Cable networks for television signals, sound signals and interactive services

Part 1: Safety

EN 62368-1:2014+AC:2015

Audio/video, information and communication technology equipment

Part 1: Safety requirements (IEC 62368-1:2014, modified)

EN 50083-2:2012+A1:2015

Cable networks for television signals, sound signals and interactive services

Part 2: Electromagnetic compatibility for equipment

EN 61000-3-2:2014

Electromagnetic compatibility (EMC) - Part 3-2: Limits for harmonic current emissions (equipment input current up to and including 16A per phase)

EN 61000-3-3:2013

Electromagnetic compatibility (EMC) - Part 3: Limits - Section 3:

Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current up to 16A per phase

EN 50563:2011/A1:2013

External a.c. - d.c. and a.c. - a.c. power supplies – Determination of no-load power and average efficiency of active modes

following the provisions of Directives:

Directive 2014/30/EU of the European Parliament and of the Council (EMC Directive)

Directive 2014/35/EU of the European Parliament and of the Council (Low Voltage Directive)

Directive 2011/65/EU of the European Parliament and of the Council (RoHS Directive)

Directive 2009/125/EC of the European Parliament and of the Council and Commission Regulation (EU) 2019/1782 of 1 October 2019 laying down ecodesign requirements for external power supplies pursuant to Directive 2009/125/EC

## 9. Technical support

If this manual does not contain the information needed or does not fully answer additional questions, please contact us via e-mail: [handlowy@telmor.pl](mailto:handlowy@telmor.pl).

## Disposal of disused electrical and electronic equipment.



The crossed bin symbol on a product or its packaging means that it is subject to the directive 2002/96/EC.

According to this directive the electrical or electronic equipment may not be treated as household waste but should be referred to a proper collection facility for recycling and recovery.



Proper handling of waste equipment helps prevent potential adverse effects on the natural environment and human health.

Contact your local authority for more details on the recycling and recovery of electronic materials in this product.