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ODMTX series

Optical direct modulated transmitters

DRAFT VERSION



Operating Manual

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Before starting operation of the device

HINWEIS: Read this operating manual attentively! It contains important information about installation, ambient conditions and maintenance of the device. Keep this operating manual for future use and for handover in the event of a change of owner. A PDF version of this manual is available to download on the ASTRO website (there may be a more recent version). The ASTRO company confirms that the information in this manual was correct at the time of printing, but it reserves the right to make changes, without prior notice, to the specifications, the operation of the device and the operating manual.

Symbols and conventions used

Symbols used in these instructions

Pictograms are visual symbols with specific meanings. You will encounter the following pictograms in this installation and operating manual:

Warning about situations in which electrical voltage and non-observance of the instructions in this manual pose a risk of fatal injuries.

Warning about various dangers to health, the environment and material.

Warning about thermal dangers (risk of burns).

Warning about high laser radiation emitted from a device, connector or adapter (risk of eye damage).

Recycling symbol: indicates components or packaging materials which can be recycled (cardboard, inserts, plastic film and bags). Used batteries must be disposed of at approved recycling points. Batteries must be completely discharged before being disposed of.

This symbol indicates components which must not be disposed of with household rubbish.

Proper use

The ODMTX module can only be used for transmitting analogue modulated TV and Data services via optical fibre networks. Modification of the devices or use for any other purpose is not permitted, and will immediately void any guarantee provided by the manufacturer.



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Target group of this manual

Installation and starting operation

The target group for installation and starting operation of the ASTRO optical transmission technology are qualified experts who have training enabling them to perform the work required in accordance with EN 60728-11 and EN 60065. Unqualified person are not allowed to install and start operation of the device.

Device configuration

Target group for the configuration of the ASTRO transmitters are persons who have received instructions and have training enabling them to perform a configuration. Knowledge of EN 60728-11 and EN 60065 is not necessary for configuration.

Device description

The delivery consists of the following parts:

- ☐ ODMTX direct modulated transmitter
- ☐ Operating manual

Front:

- [1] optical output connector (always clean patchcord before connection)
- [2] indication LEDs (power, AGC, RF input signal, laser)
- [3] LC display for information and control
- [4] push buttons
- [5] key lock (laser off/on)
- [6] RF testport (-20 dB to RF input signal)

Back:

- [7] fan
- [8] RF main input
- [9] optional narrow cast input
- [10] grounding connection
- [11] RS232 (only for R & D purposes)
- [12] LAN interface
- [13] dual hot plug power supplies

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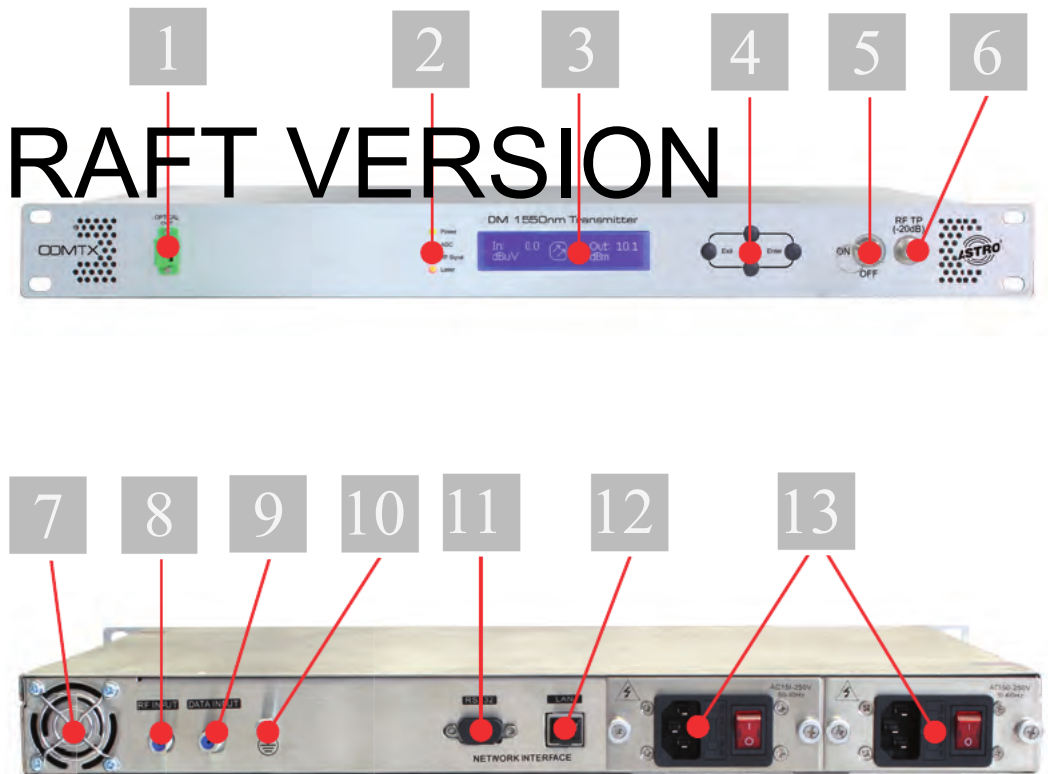


Figure 1: ODMTX front and rear side

LED indicators

- ☐ Power LED:
yellow: only one working power supply
green: both power supplies working in good condition
- ☐ AGC indicator:
green: transmitter is running in AGC mode
off: transmitter is running in MGC mode
- ☐ RF signal LED:
green: RF input in valid range (modulation normal)
flashing red: RF input not in valid range (modulation out of normal range). Please note: The transmitter only measures the total RF input power, Therefore: For a channel load with a low number of channels, the RF input power could be higher. For a channel load with very high number of channels, the RF input power per channel could be lower. If only digital channels, set the transmitter in the settings to "digital" channels only.
- ☐ Laser indicator:
green: bias current, cooling current and output power are all normal
flashing red: At least one of the following parameter is out of its working range:
 -bias current
 -cooling current
 -output power is too low

The device can be equipped with either AC power supplies or DC power supplies (see figure below).

- [1] power cord connection (150 - 250 VAC)
- [2] fuse holder with one spare fuse inside (fuse type: T3.15 A/250 V)
- [3] manual power switch
- [4] to remove the hot plug power supply, first open the screws on the left and right side of the power supply unit

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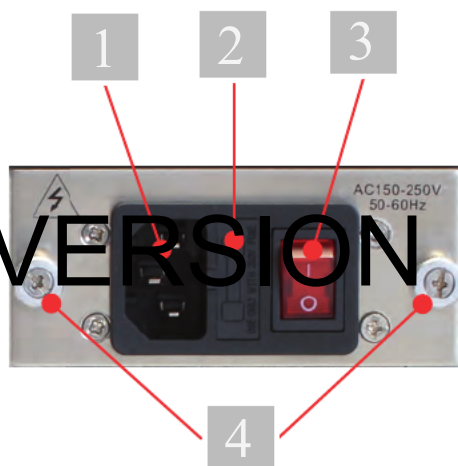


Figure 2: AC power supply (rear side)

- [1] 0 VDC connection
- [2] -48 VDC connection
- [3] to remove the hot plug power supply, first open the screws on the left and right side of the power supply unit

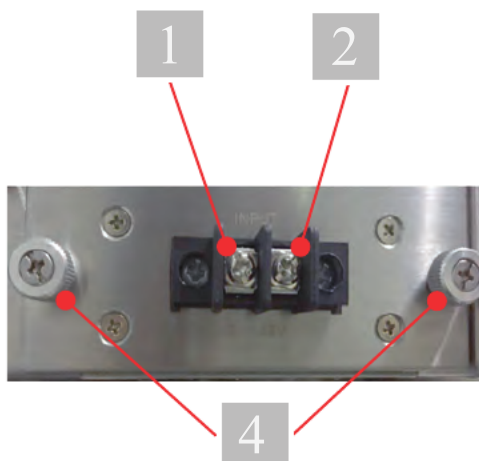


Figure 3: DC power supply (rear side)



The ODMTX module features a CE marking. This confirms that the product conforms to the relevant EC directives and adheres to the requirements specified therein.

Important safety information

To avoid any hazardous situations to the extent possible, you must adhere to the following safety information:

ACHTUNG: *Failure to observe this safety information may result in personal injury due to electrical and thermal dangers!*

Proper use

- ☐ Only use the device at the approved operating sites and in the ambient conditions allowed (as described in the following), and only for the purpose described in the section "Proper use".

Before starting operation of the device

HINWEIS: *Read this operating manual attentively! It contains important information about installation, ambient conditions and maintenance of the device. Keep this operating manual for future use and for handover in the event of a change of owner or operator. A PDF version of this manual is available to download on the ASTRO website (there may be a more recent version).*

- ☐ Check the packaging and the device for transport damage immediately. Do not start operation of a device that has been damaged.
- ☐ Transporting the device by the power cable may damage the mains cable or the strain relief, and is therefore not permitted.

Danger of optical radiation

This product is laser class 1M (according IEC 60825-1 Safety of Laser Products) and therefore several safety precautions must be applied.

- ☐ Exposure to class 1M laser radiation is possible on open connectors or connected fibre patch cords. Do not view exposed fibre or connector ends when handling or maintaining optical equipment. Do not view with optical instruments into open connectors or fibre ends on switched on devices. Make sure all wherever a fibre inspection is required, that the inspected fibre or connector is completely optical radiation free.
- ☐ Due to the high optical radiation and improper handling of optical fibre connections and devices, there could be risks for the operating and service personnel. Access should be restricted to trained personnel only.
- ☐ Never look directly or with optical inspection tools into the end of a fibre which is connected to a transmitter or optical amplifier and which is in operation. If the eyes are exposed to optical radiation, which are above the acceptable maximum, this could cause permanent damage to the eye.

Installation, operation, maintenance

- ☐ The device may only be installed and operated by qualified persons (in accordance with EN 60065) or by persons who have been instructed by qualified persons. Maintenance work may only be carried out by qualified service personnel.
- ☐ The installation site must be planned in a way that prevents children from playing with the device and its connections.
- ☐ Dangerous voltages and the threat of optical laser radiation are present within the powered on unit at all times.
- ☐ Always replace protective caps on optical connectors and patch cords when not in use to avoid dust intake. Before connecting clean connectors with lint free cloth and pure alcohol or with any professional tools for cleaning connectors and adapters. The typical connectors fitted are SC/APC 8° or LC/APC 8° (green couplers).
- ☐ The electrical connection conditions must correspond to the specifications on the device type plate.
- ☐ The ambient temperatures specified in the technical data must be complied with, even when climatic conditions change (e.g. due to sunlight). If the device overheats, the insulation used to isolate the mains voltage may be damaged.
- ☐ The device and its cable may only be operated away from radiant heat and other sources of heat.
- ☐ To avoid trapped heat, ensure there is good ventilation on all sides. Installing the device in recesses or covering the installation location, e.g. with curtains, is not permitted. Ventilation openings may not be covered.
- ☐ If the device is installed in a cabinet, ensure adequate air convection is possible to avoid exceeding the maximum ambient temperature permitted for the device.

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- ☐ No objects may be placed on the device.
- ☐ The subscriber network must be earthed in accordance with EN 60728-11, and must remain earthed even when the device is removed. Furthermore, the earth connection on the device can be used. Devices within hand's reach must be integrated into the potential equalisation together. Operating the device without an earth conductor, without earthing the device or without using device potential equalisation is not permitted.
- ☐ The device does not feature protection against water and may therefore only be operated and connected in dry rooms. It must not be exposed to spraying or dripping water, to condensation, or to similar sources of moisture.
- ☐ The electrical system supplying current to the device, e.g. a house installation, must incorporate safety devices against excessive current, earth leakages and short-circuiting in accordance with EN 60950-1.
- ☐ To operate the device (protection class I), it must be connected to mains power sockets with a protective earth conductor.
- ☐ All adhere to all applicable national safety regulations and standards.
- ☐ The mains plug is used as a mains voltage disconnect unit in the event of servicing and danger, and must therefore be accessible and be able to be operated at any time. The device is operational when connected to the mains power.
- ☐ Excess mechanical loads (e.g. falling, impacts, vibrations) may damage insulation used to provide protection from mains voltage.
- ☐ High excess currents (lightning strike, surges in the power utility grid) may damage insulation used to provide protection from mains voltage.
- ☐ Do not insert any objects through the ventilation slots.
- ☐ If there is no information about intended use (e.g. operating site, ambient conditions), or the operating manual does not include the corresponding information, then you must consult the manufacturer of this device to ensure that the device may be installed. If you do not receive any information on this from the manufacturer, do not start operating the device.

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Maintenance

- ☐ The operating display only shows whether the DC current, which supplies the device components, has been disconnected. However, operating displays (on the power supply unit or the device) that are not lit up in no way indicate that the device is completely disconnected from the mains.
- ☐ Read carefully: EN 60728 - Part 1 Safety requirements: No service work during thunderstorms.

Repair

- ☐ Repairs may only be performed by the manufacturer. Improperly performed repairs may result in considerable dangers for the user.
- ☐ If malfunctions occur, the device must be disconnected from the mains and authorised experts must be consulted. The device may need to be sent to the manufacturer.

Description of performance

The optical Transmitter ODMTX is a direct modulated 1550nm transmitter, suitable for distribution of analogue modulated TV and Data services via optical fibre networks. The device is developed and manufactured according the requirements for HFC or FTTH Networks and can be combined with optical amplifiers, such as EDFAs (Erbium Doped Fibre Amplifier or YEDFAs (Ytterbium cladding pumped high power EDFAs). It is suitable for cost effective networks within short or medium distances up to typically 30km with a very good Performance/ Price ratio.

Warranty conditions

The general terms and conditions of ASTRO Bit GmbH apply. You will find these in the current catalogue or on the Internet under "www.astro-kom.de".

Disposal



All of our packaging material (cardboard boxes, inserts, plastic film and bags) is completely recyclable. Electronic devices must not be disposed of with household waste, but rather – according to DIRECTIVE 2012/19/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL from 4 July 2012, on waste electrical and electronic equipment – must be properly disposed of. When it is no longer of use, please bring the device for disposal to one of the public collection points for this purpose.

ASTRO Bit is a member of the Elektro system solution for the disposal of packaging materials. Our contract number is 80395.

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Installing the device

To install or commission the device, please follow the steps in the sequence as mentioned below.

Mounting the device in the rack / grounding to protective earth

Mount the device in the 19" rack. Make sure that supporting bars or any shelf supports the device. Do not mount solely on the front panel.

After physical installation in the rack, connect the protective earth cable (PE) to one of the device grounding points, with an appropriate eyelet connection. 2 grounding screws on the rear side of the device are marked with the grounding symbol.

Attach power cord

Make sure that the key lock on the front is in position "off" before switching on the device. For mains power supply the power on switch is located beside the mains connector.

In case of DC Voltage connect the supply cables to the power supply. Make sure to connect the cables with the right polarity and the sufficient diameter.

Check RF input level and signal quality

Check the RF input level and signal quality at the input of the optical transmitter with an appropriate measurement equipment.

Connect the output before switching on with key lock

To prevent a possible damage to the surface of the optical output connectors, it is recommended to connect the optical patch cords to the output before the device is turned on with the key lock.

DRAFT VERSION *REVISION: If there is the need to connect any optical connector to the output ports, switch off the laser by any of the 2 different possibilities:*

- with key lock turn to off position (preferred solution !)
- switch off the complete device at the power supply

Never make any optical connection on ports, where you are not sure about the optical powers. Optical powers >16dBm may cause burn-in of the surface of the optical connection, if plugged under optical power. This connection is permanently not usable anymore, since burned connectors will have a very high attenuation.

If there is the need to test direct the optical output, before connection of the test device to the output switch off in any case. If connected you can switch on the laser again. Another method is testing after the subsequent optical splitter (normally there is low optical power).

Switching on the Transmitter with key lock

If the key lock is in position off, there is no entering with the push buttons on the front possible. With the „ESC“ button the LED display will be lightening up.

In order to protect the device, there is a time-delay function to switch it on. After turning the device on with the key lock On/Off switch, the transmitter will start to operate after about 15 to 20 seconds.

If the device operates normally, the LEDs will show the following status:

- ☐ Power LED green shows both power supplies operate normally
- ☐ Status LED blinking green indicate that the device is active and operating normally
- ☐ RF signal LED green, shows that RF input power is in the good condition and the AGC is in the working range
- ☐ To ensure that the device is running properly, with the „Enter“ button it is possible to show the device menu options on the LCD panel. Under “3. Alarm status” (selected with the ? down key and confirmed „Enter“ button) the actual present alarms can be displayed. To exit the menu, press the „Exit“ button until reaching the main display.

Check on LC Display if any alarm

Make sure that the key lock on the front is in position "off" before switching on the device. For mains power supply the power on switch is located beside the mains connector.

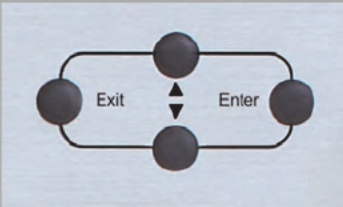
In case of DC Voltage connect the supply cables to the power supply. Make sure to connect the cables with the right polarity and the sufficient diameter.

In case of device problem

In case of any problems please contact ASTRO Bit GmbH or resend the device with the established valid RMA Procedure (RMA code/ Error description).

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LC display and settings



Using the push buttons

When pressing the “Enter” button for a short time, this will light up the display and show the different menus which are selectable with the up and down keys and confirmed by pressing “Enter” again. To exit a menu, press the “ESC” button.

To modify any value, press the up button to increase a value respectively the down button to decrease a value. Confirm your selection by pressing the „Enter“ button. In case the field shall not be modified, exit by clicking the “ESC” button.

LCD panel menus

The following flow chart shows the different screens that can be seen when stepping through the different menus:

- ☐ Boot display (start screen)
- ☐ Display parameters
- ☐ Set parameters
- ☐ Alarm status

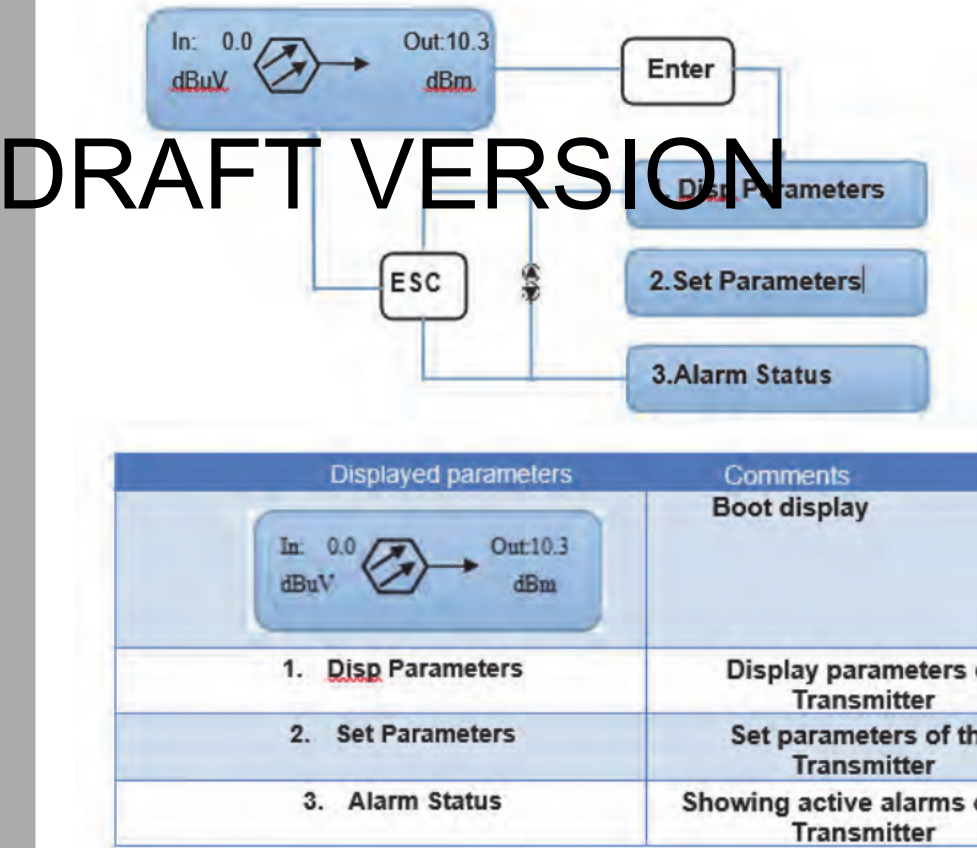


Figure 4: LCD panel

The „Display parameters“ menu

The following flow chart shows the different parameters, that can be edited via the front panel display:

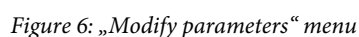


Figure 5: „Display parameters“ menu

- ☐ Laser power: laser output optical power
- ☐ OP after ATT: optical power after attenuation
- ☐ Input Power: external optical signal power
- ☐ Laser Bias: laser bias current
- ☐ Laser Temp: laser temperature
- ☐ Tec Current: cooler current
- ☐ RF Chan NO: channel number
- ☐ Laser: laser RF power
- ☐ RF Ctrl Mode: RF control mode
- ☐ MGC ATT: MGC attenuation (in MGC mode)
- ☐ AGC Ref: AGC deviator (in AGC mode)

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The following figure shows the menu entries. Press Enter to show up a submenu for changing the value. Press Exit to exit the menu without changing the values. All changes can be confirmed by pressing Enter. You can change the entries by using the up and down buttons.



HINWEIS: The parameters „Set predistortion control mode“ and „Set fibre compensation length“ are only available in the 1550 nm version of the device.

- ☐ Set LaserOutPut Unit: select the unit for optical output power
- ☐ Set Buzzer Alarm: set the buzzer alarm („yes“ is on, „no“ is off)
- ☐ Set RF Control Mode: Set the RF control mode (AGC or MGC selectable)
- ☐ Set MGC Att: set the attenuation in MGC mode (adjustable range 0...20 dB)
- ☐ Set AGC Ref: set the deviator in AGC mode (adjustable range +/- 3 dB)
- ☐ Set PredATT Mode: only in 1550 nm version available; set the predistortion control mode („Auto“: automatic control mode, recommended; „Manu“: manual control mode)
- ☐ Set FibreC Length: only in 1550 nm version available; set the transmission distance optimization length in automatic control mode
- ☐ Set Channel Number: set the channel number (set the corresponding PAL channel load with the following fomula: Channel number = Number of PAL channels + Number of FM/5 + Number of QAM64/10 + Number of QAM264/4)
- ☐ Set Local IP Address: set the IP address
- ☐ Set SubNet Mask: set the subnet mask
- ☐ Set GateWay: set the gateway
- ☐ Restore Factory: restore factory settings

The „Alarm Status“ display

The following alarm messages are displayed:

- ☐ RF Alarm: RF alarm
- ☐ Laser Temp: laser temperature alarm
- ☐ Laser Bias: laser bias current alarm
- ☐ Laser Tec: laser cooling current alarm
- ☐ Output Alarm: optical output power alarm
- ☐ +5 V Alarm: +5 V alarm
- ☐ -5 V Alarm: -5 V alarm
- ☐ +24 V Alarm: +24 V alarm

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Configuring the device via web interface

Logging in

To login in the web interface, check first the IP address of the device. The device IP address could be set or viewed via the LCD front panel.

Connect your computer to the same IP subnet as the transmitter. With a ping test make sure that physical connection via the IP Network is obtained.

With any Web browser you can type in the address line of the browser the IP address of the transmitter.

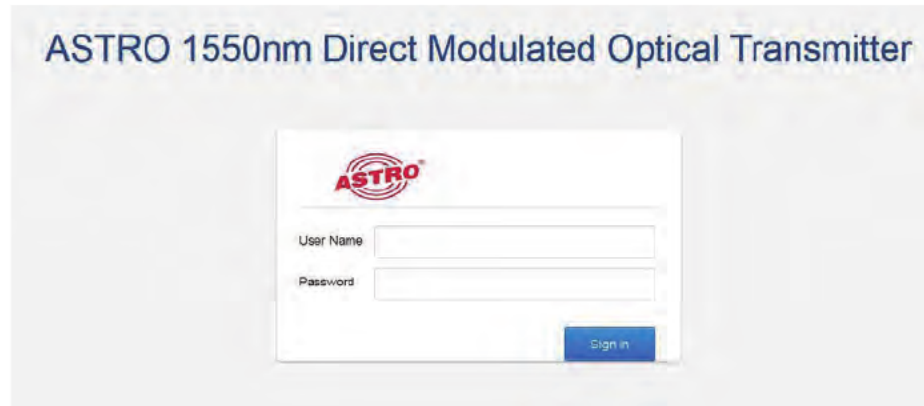


Figure 7: Login

Log in with the following data:

User name: admin
Password: 123456

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Display parameters via web interface

On the „Display Parameters“ page the device status and data will be displayed, such as:

- ☐ device indication, serial number and MAC address
- ☐ laser power and internal parameters such as Laser Bias, Laser temperature and TEC cooler current
- ☐ RF input level (Ptotrms) of the RF input signal
- ☐ laser wavelength
- ☐ internal voltage information
- ☐ device temperature

Module Parameter			
Parameter	Value	Parameter	Value
Device Model:	ODMTX-1550-10	Serial Number:	2014.11.25
Laser Power:	12.5 dBm	Laser Bias:	118.8 mA
Laser Temperature:	49.0 °C	Laser TEC:	630 mA
RF Level:	103.2 dBuV	Wavelength:	1550. nm
+5V:	3.57 V	-5V:	-2.36 V
+24V:	12.10 V	Device Temperature:	-0.1 °C
MAC Address:	00-8c-b1-67-ef-88		

Figure 8: Parameters displayed

Modify parameters via web interface

On the „Modify Parameters“ page the device setting can be changed such as:

Parameter	Current Value	New Value	press for update
Channel Num:	70		Update
RF MODE:	AGC	MGC	Update
AGC Ref:	0 dB	-3 dB	Update
MGC Att:	0 dB	0 dB	Update
Fiber Length:	25 Km	(0-50)Km	Update

Parameter	Current Value	New Value	press for update
Static IP Address:	192.168.1.190		Update
Subnet Mask:	255.255.255.0		Update
Default Gateway:	192.168.1.1		Update
Trap Address1:	192.168.1.119		Update
Trap Address2:	192.168.1.118		Update

Figure 9: Modifying parameters

- ☐ **Channel Number:** The channel number is used to calculate the correct RF total power at the LCD display or the web interface. The Channel number reflects the total equivalent PAL channels. The channel load including digital QAM or FM channels can be calculated with the formula below:

$$\text{Channel load} = (\text{Number of PAL channels}) + (\text{Number of FM} / 5) + (\text{Number of QAM64} / 10) + (\text{Number of QAM256} / 4)$$
- ☐ **RF Mode:** With this parameter the user can switch to MGC (manual gain controlled mode). In MGC mode the attenuation of the pre-RF amplifier stage must be set manually. This mode is only recommended for advanced experts, since the optical transmitter can easily be over driven (cause decrease of CSO CTB) or under driven (cause decrease of CNR).
AGC mode is the standard and recommended mode to operate the transmitter. In AGC (automatic gain control mode) the transmitter adjusts automatically the RF preamplifier stage in the correct mode. If the RF input signal is too low or too high to adopt to the optimized RF input level, an alarming will indicate this and the user shall higher or lower the RF Level at the input of the device. With the AGC mode the transmitter always will run on 19,4% OMI total, which is the optimum of the transmitter.
- ☐ **AGC Reference:** With this parameter the user could reduce the AGC reference to lower the total OMI if the Transmitter in AGC mode. AGC reference could be set to maximum -3 dB in steps of 1dB. The recommended value to operate in normal condition is 0dB.
- ☐ **MGC Att:** In MGC Mode, the user could set the input attenuation of the RF Signal manually with this parameter. This is recommended only to experts and not for normal operation.
- ☐ **Fibre Length:** Since a direct modulated transmitter can be adjusted to a certain fibre length to get his maximum performance on this length, with this parameter the typical operation length can be set. This parameter optimizes the transmitter according the real fibre length in the network. In principle direct modulated transmitters are used for networks of max.30 km length. Beyond this 30 km the performance can drop very fast. So if there is a network with users distributed between 10 and 30 km, it is recommended to set the fibre length in the middle to 20 km, or alternative at the distance where the most number of users are located.



Modifying the password

This panel is used to modify the user name or password. Type in the current user name and password to modify this.
Confirmation of the new password is required.

Change User Name and Password

Items	Value
Current User Name:	
Current Password :	
New User Name:	
New Password:	
Confirm Password:	
Modify	

Figure 106: Modifying the password

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Troubleshooting

If the device is not functioning correctly, please perform the following checks:

- ☐ Check whether the device is connected to the required mains voltage (230 V~, 50 Hz).
- ☐ Check whether the signal cable is connected correctly, and that there are no breaks or short circuits in the connectors.

If the problem cannot be resolved, please contact the ASTRO customer service.

Maintenance and repair

ACHTUNG: *The following safety information must be observed when performing maintenance and repair work. Failure to observe this safety information may result in personal injury due to electrical and thermal dangers!*

- ☐ The operating display only shows whether the DC current, which supplies the device components, has been disconnected from the mains voltage. If the operating display (for the power supply unit or the device) does not light up, this does not mean that the device has been fully disconnected from the mains voltage. There may still be voltages in the device that are dangerous to touch. You may therefore not open the device.
- ☐ The cover for the power supply unit is designed to prevent accidental contact with voltages that are dangerous to touch, and must not be removed.
- ☐ Read carefully: EN 60728 - Part 1 Safety requirements: No service work during thunderstorms.
- ☐ A defective device may only be repaired by the manufacturer to ensure that components with the original specification are used (e.g. power cable, fuse). Improperly performed repairs may result in considerable dangers for the user or installer. If malfunctions occur, the device must therefore be disconnected from the mains and authorised experts must be consulted. The device may need to be sent to the manufacturer.

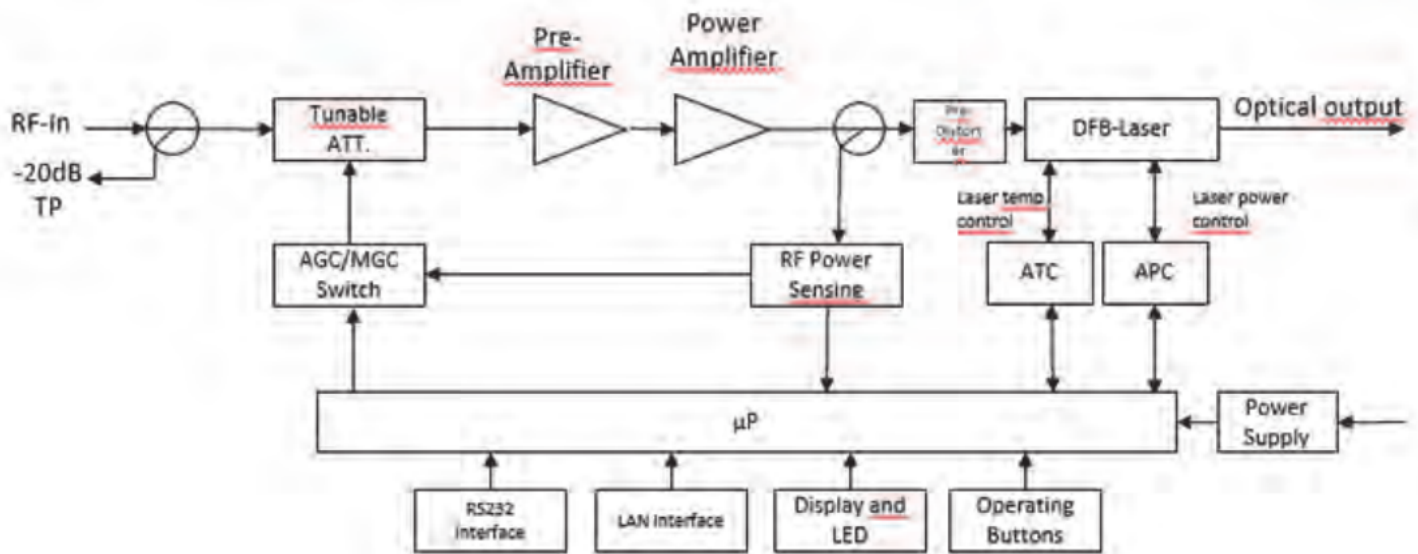
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Service tasks

HINWEIS: *The device must only be operated with the original power module!*



Block diagram



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Technical data

Type		ODMTX-1310-07	ODMTX-1310-10	ODMTX-1310-13
Order number		212 011	212 012	212 013
EAN-Code		4026187193041	4026187193065	4026187193072
RF and optical characteristics				
Optical output power	[dBm]	7,0	10,0	13,0
Optical input wavelength	[nm]	1310 ± 20		
Laser type		DFB high performance laser		
Modulation type		direct modulation		
Peak OMI/channel for PAL84 signal	[%]	3		
Number of optical output ports		1		
Flatness	[dB]	± 0,75		
Optical connector type		SC/APC (other on request)		
Frequency range	[MHz]	47 - 1006		
RF input level range (AGC working range)	[dBµV]	72 - 88		
RF input impedance	[Ω]	75		
RF input return loss	[dB]	≥ 16 (47 - 550 MHz)? ≥ 14?550 - 1006 MHz?		
CTB*	[dB]	≥ 65		
CSO*	[dB]	≥ 60		
C/N*	[dB]	≥ 51		
AGC/MGC control range	[dB]	± 5 / 0..10		
Common data				
Management		SNMP and web interface		
Chassis type		1 RU, 19" rack mounted		
Power supply	[VDC]	2 hot-plug / AC or DC		
AC Power supply	[VAC]	115V - 263V		
DC Power supply	[VDC]	-36 .. 72 (on request)		
Power consumption	[W]	≤ 30		
Dimensions (W x H x D)	[mm]	483 x 44 x 380 (1 RU)		
Ambient temperature	[°C]	-5 .. +55 (ETSI EN 300019-3 Class 3.2)		

*) measured at 10km fibre length, optical receiver input level -1 dBm, 59 PAL channels up to 550 Mhz, 30 QAM channels -10dB below PAL



Type		ODMTX-1550-10	
Order number		212 010	
EAN-Code		4026187192839	
RF and optical characteristics			
Optical input wavelength	[nm]	1550 ± 20	
Optical output power	[dBm]	10	
Laser type		DFB high performance laser	
Number of optical output ports		1	
Modulation type		direct modulation	
Peak OMI/channel for PAL84 signal	[%]	3	
Number of optical output ports		1	
Flatness	[dB]	± 0,75	
Optical connector type		SC/APC (other on request)	
Frequency range	[MHz]	47 - 1006	
RF input level range (AGC working range)	[dBµV]	72 - 85	
RF input impedance	[Ω]	75	
RF input return loss	[dB]	≥ 16 (47 - 550 MHz); ≥ 14?550 - 1006 MHz?	
CTB*	[dB]	≥ 65	
CSO*	[dB]	≥ 60	
C/N*	[dB]	≥ 51	
AGC/MGC control range	[dB]	± 5 / ± 10	
Common data			
Management		SNMP and web interface	
Chassis type		1 EU, 19" rack mounted	
Power supply	[W]	hot plug / AC or DC	
AC Power supply	[VAC]	150 - 265	
DC Power supply	[VDC]	-36 .. 72 (on request)	
Power consumption	[W]	≤ 30	
Dimensions (W x H x D)	[mm]	483 x 44 x 380 (1 RU)	
Ambient temperature	[°C]	-5 .. +55 (ETSI EN 300019-3 Class 3.2)	

*) measured at 25km fibre length, optical receiver input level 0 dBm, 59 PAL channels up to 550 Mhz, 30 QAM channels -10dB below PAL

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