

## Optical transmitter OT301

## Optical receivers OR301, OR301M

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### Product description

The optical transmitters series OT and the optical receivers series OR are intended to distribute SAT IF and DTT (Digital terrestrial TV) signals through a fibre optic.

The transmitter OT301 converts 2 SAT IF sub-bands and DTT band into an optical signals.

AGC (automatic gain control) provides for automatically controlled constant RF level to the laser.

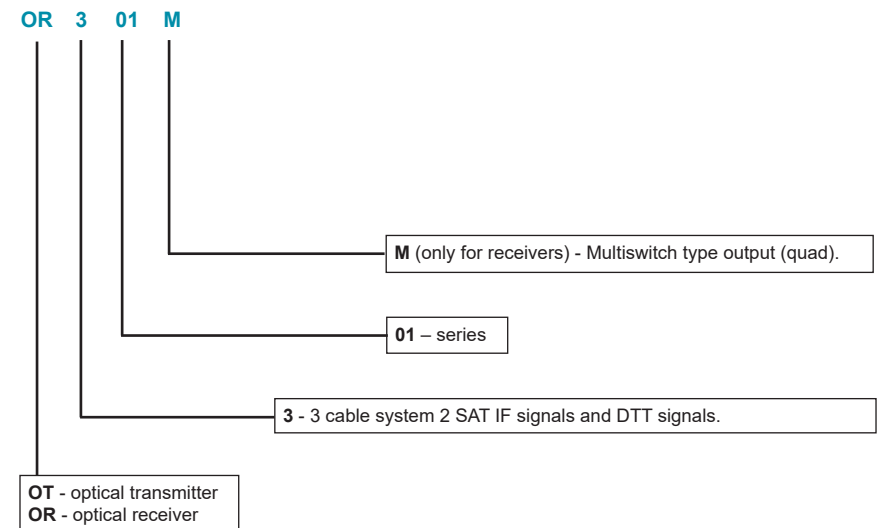
The receivers OR301, OR301M convert optical signals into 2 SAT IF sub-bands and DTT band.

OLC (optical level control) provides for fixed RF output level at different level of optical input.

Receiver with letter **M** (OR301M) have built-in multiswitch (quad outputs).

The product is intended for indoor usage only.

### Coding explanation of receiver



### Safety instructions

The equipment must be installed in accordance with IEC 60728-11 and national safety standards.  
The transmitter is powered from a 12 V power supply unit (PSU), the receiver - 12-20 V. This voltage is not dangerous to life.

PSU must have a short circuit protection.

Any repairs must be done by a qualified personnel.

Do not plug the PSU into the mains socket until all cables have been connected correctly.

The mains socket of PSU must be easily accessible.

To disconnect the equipment power completely, remove the PSU cable from the mains socket. For receivers additionally all RF cables must be disconnected.

The equipment must not be exposed to dripping or splashing water. Make sure no liquid filled objects are placed near or on top of the unit.

Avoid placing the equipment near heat sources, e.g. central heating components and in areas of high humidity. Keep the equipment away from naked flames.

If the equipment has been stored in cold conditions for a long time, bringing it into a warm environment may cause condensation. In such cases let it warm up for at least 2 hours before plugging it into the mains.

**IMPORTANT:** Mounting of the equipment is allowed vertical only and the free flow of air through the unit must be not restricted. Always leave 10 cm of free space from the top, front and bottom of the unit to allow heat dissipation.



### Safety of laser product

Optical Transmitter module contains laser diode sources. These devices are rated under IEC60825-1:2007 "Safety of Laser Products", Part 1: Equipment classification and requirements as CLASS 1M laser product.

When operating the equipment note the following:

Most fiber optic laser wavelengths are totally invisible to the eye and will cause permanent eye damage.

Never look into the end of a fiber on a powered device through a magnifying device (microscope, eye loupe, magnifying glass, etc.). Before using such devices always double check that power is disconnected or, if possible, completely disconnect the unit from any power source.

To verify the light output always use an instrument, such as an optical power meter.

Operate only with the proper optical fiber installed in the device optical connector.

Whenever the optical connector is empty the laser transmitter should be turned off.

Before applying power always connect a fiber to the output of the device.


Never leave equipment with radiating bare fibers accessible - always cap the connectors.



## INSTALLATION

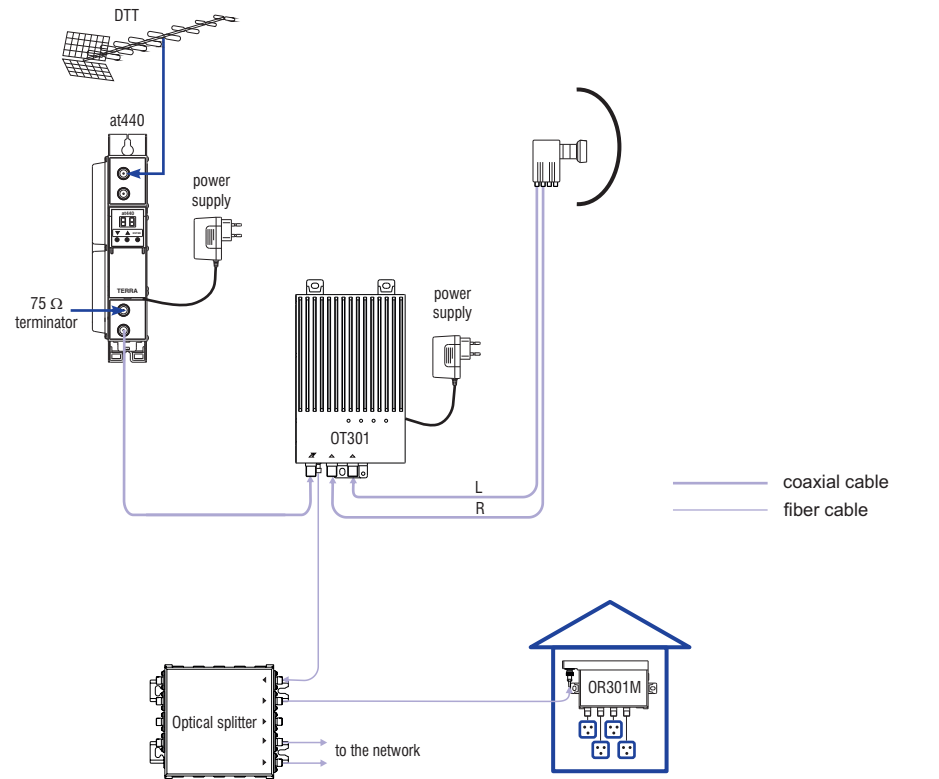
### Requirements for external power supply unit (PSU)

	Transmitter	Receiver
Output voltage range	+12 V $\pm$ 1 V	+12 V min ...+20 V max
Output current	> 1.25 A	> 0.5 A
Output connector	pin (range 0.5...0.75 mm <sup>2</sup> )	type 3.5/1.35 (+) plug

- Short circuit protection
- Double insulated (marked )
- Meet EN 55022 class B conducted emissions requirements, measuring with grounded load

Application diagram

Application example of transmitting SAT IF signals from 2 sub-bands and up to 4 DTT multiplexes through fiber.



**OT301** - optical transmitter  
**at440** - UHF TV channel amplifier  
**OR301M** - optical receiver with 2x4 multiswitch

Mounting

It is very important to ensure the free flow of air through the units.  
Always leave 10 cm of free space from the top, front and bottom of the unit to allow heat dissipation.

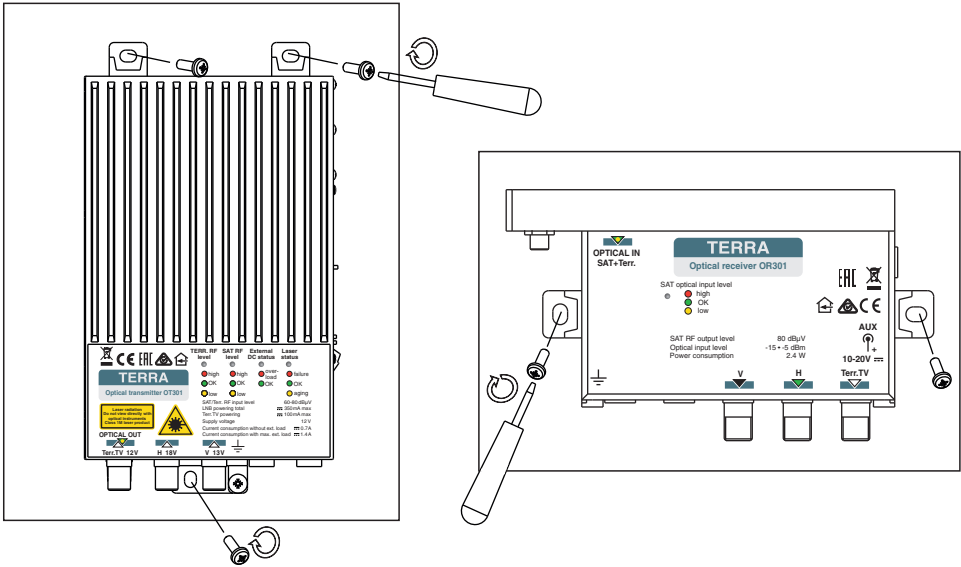


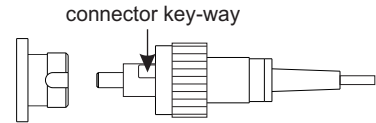
Figure 1. Mounting of the transmitter

Figure 2. Mounting of the receiver

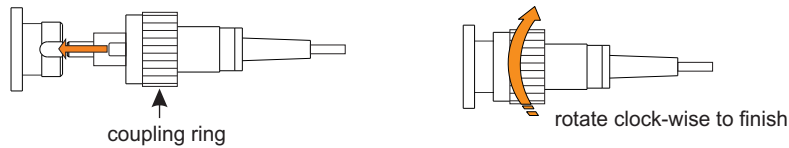
Transmitters must be fixed with 3 steel screws, receivers – with 2 steel screws Ø 4-4.5 mm.  
The screws are not included in a package.

Optical connections

1. Align the FC/APC connector key-way (type R) with the receptable key-way.

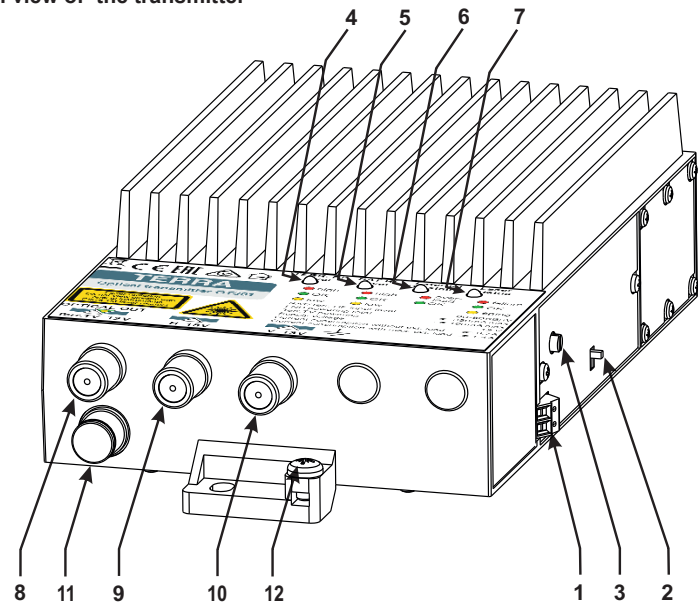


2. Push firmly to locate the key-ways and then rotate the coupling ring.



3. During the operation each fiber connector may be contaminated by dust or dirt. Even tiny particles of dust will affect the transmission quality. Dusty fiber optic connector will contaminate other connected optic parts. If optical reception power of the receiver decrease, fiber connection should be cleaned and maintained. Always clean all the fiber optic connectors before setting. Reel cleaners or prepackaged lint free wipes or swabs with alcohol are the most convenient means of cleaning optical connectors. Fiber connectors should never be left uncovered.
4. Do not exceed the minimum bending radius when connecting optic cable to the system.

External view of the transmitter










OT301

Figure 3. External view of the transmitter

Technical specifications

Type	OR301	OR301M
Optical input		
Optical wavelength	1100 - 1650 nm	
Optical input level (OLC range)	-15...-5 dBm	
Optical return loss	> 40 dB	
RF outputs		
Numer of outputs	3	4
Bandwidth	950...2150 MHz (V, H) 47...862 MHz (DTT)	47...790 MHz, 950...2150 MHz
Output return loss / impedance	> 10 dB / 75 Ω	
DTT RF output signal level for 8 transponders (optical -5 ÷ -15 dBm)	80 dBμV (per transponder)	75 dBμV (per transponder)
SAT RF output level for 30 transponders (optical -5 ÷ -15 dBm)	80 dBμV (per transponder)	75 dBμV (per transponder)
SAT IF output control	-	14 V / 18 V
Powering		
Supply voltage	DC AUX	10 V ÷ 20 V
range	SAT IF output	10 ÷ 20 V                      13 V / 18 V
Power consumption	2.4 W	2.7 W
Main characteristics		
Operating temperature range	-20 ÷ + 50 °C	
Dimensions/Weight (packed)	145x86x37 mm/0.42 kg	

-  INVISIBLE LASER RADIATION DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS. Wave length 1270-1610 nm, IEC60825-1:2007
-  This product complies with the relevant clauses of the European Directive 2002/96/EC. The unit must be recycled or discarded according to applicable local and national regulations.
-  Equipment intended for indoor usage only.
-  Functional grounding. Connect to the main potential equalization.
-  This product is in accordance to following norms of EU: EMC norm EN50083-2, safety norm EN60065 and RoHS norm EN50581.
-  This product is in accordance with Custom Union Technical Regulations: "Electromagnetic compatibility of technical equipment" CU TR 020/2011, "On safety of low-voltage equipment" CU TR 004/2011.
-  This product is in accordance with safety standard AS/NZS 60065: 2012 and EMC standards of Australia.

Optical input level to the receiver

The operational optical input level of the receiver is -15...-5 dBm. In this region OLC (optical level control) is working and provides for fixed RF output levels. The optical output level from transmitter is 6 dBm. It means, that possible optical attenuation range from transmitter to receiver is 11...21 dB.

RF output levels from the receiver

The receiver has optical level control (OLC), which allows to have a fixed level of RF output signals at different level of input optical signal. OLC range is -15...-5 dBm. RF output level remains constant while optical input power fluctuates in mentioned region. However, RF output level depends on number of transmitted signals through the fibre.

SAT

The RF signal level at receiver SAT outputs depends on RF signal level at transmitter inputs and optical input power at receiver input. By typical application conditions

RF level at the transmitter input 60...80 dBµV per transponder (75...95 dBµV total power).

Optical input level at the receiver -15...-5 dBm.

Output RF levels of the receiver are:

Receiver OR301 - typ. 80 dBµV.

Receiver with quad outputs OR301M - typ. 75 dBµV.

DTT

The RF signal level at receiver DTT output depends on RF signal level at transmitter input, optical input power at receiver input and number of channels. By typical application conditions

RF level at the transmitter input 60...80 dBµV per transponder (69...89 dBµV total power).

Optical input level at the receiver -15...-5 dBm.

Number of channels 8.

Output RF level of the receiver is:

Receiver OR301 - typ. 80 dBµV.

Receiver with quad outputs OR301M - typ. 75 dBµV.

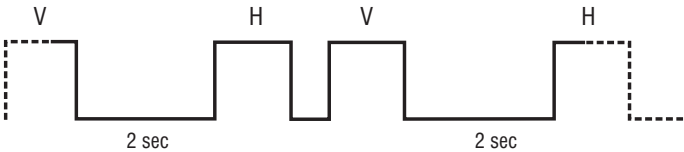
If the actual number of channels is not 8, set the switch on transmitter in appropriate position (see description with table above).

Technical specifications

Type	OT301
Satellite inputs	
Number of inputs	2
Bandwidth	950-2150 MHz
Input return loss / impedance	> 10 dB / 75 Ω
RF input level (AGC range) for 30 transponders	60-80 dBµV (per transponder); 75-95 dBµV (total level)
LNB remote feeding	13 / 18 V; 350 mA max. total
Terrestrial input	
Bandwidth	47-862 MHz
Input return loss / impedance	> 10 dB / 75 Ω
RF input level (AGC range) for 8 transponders	60-80 dBµV (per transponder); 69-89 dBµV (total level)
Number of transponders	1...16
Preamplifier feeding	12 V 100 mA max.
Optical output	
Wavelength SAT & Terr	1310 nm
Optical output power	6 dBm
Optical return loss	> 45 dB
Main characteristics	
Supply voltage	12 V ± 1 V
Current consumption without external load	0.7 A max.
Current consumption with max. external load	1.25 A max.
Operating temperature range	-20 ÷ + 40 °C
Dimensions/Weight (packed)	108x190x54 mm/1.4 kg

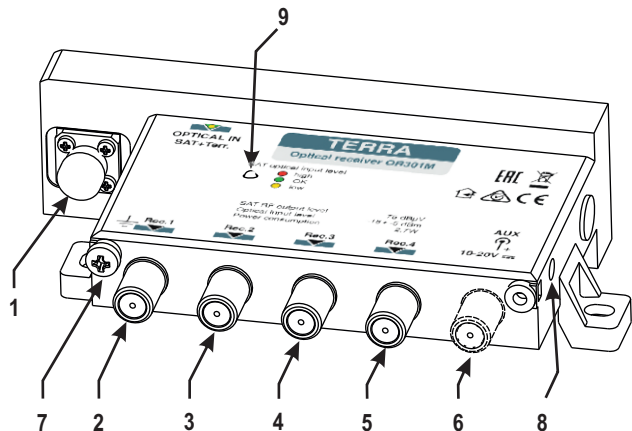
- 1 - +12 V DC powering input. Screw terminal.
- 2 - Switch for Terr.TV preamplifier powering ON/OFF.
- 3 - Switch for selecting appropriate number of terrestrial transponders in your area.
- 4 - LED indicator for Terrestrial RF input level
  - red – to high
  - green – correct (AGC range)
  - yellow – to low
- 5 - LED indicator for SAT RF input level.
  - red – to high
  - green – correct (AGC range)
  - yellow – to low

The status of four SAT IF inputs (H and V) is shown in next way :



- 6 - LED indicator of LNB and terrestrial preamplifier powering status.
  - red – short circuit occurred or overload on LNB or terrestrial preamplifier
  - green – works correctly
- 7 - LED indicator of laser status.
  - red - laser is damaged
  - green - works correctly
  - yellow - laser ageing
- 8 - RF input of DTT signal, DC output for preamplifier +12 V switchable. F socket.
- 9 - RF input of SAT IF H polarity, DC output +18 V. F socket.
- 10 - RF input of SAT IF V polarity, DC output +13 V. F socket.
- 11 - Optical output. FC/APC socket.
- 12 - Functional grounding clamp.

External view of the receiver



OR301(M)

Figure 4. External view of the receiver

1. OPTICAL IN SAT - optical input. FC/APC socket.

2, 3, 4, 5, 6 - RF outputs. F sockets.
- | RF output number | OR301 | OR301M |
|------------------|-------|--------|
| 2                | -     | Rec.1  |
| 3                | -     | Rec.2  |
| 4                | V     | Rec.3  |
| 5                | H     | Rec.4  |
| 6                | DTT   | -      |
7. Functional grounding clamp

8. AUX - +10...+20 V DC powering input (3.5/1.3 mm DC jack).

9. LED indicator of optical input power

red – to high

green – correct (AGC range)

yellow – to low

OPERATING AND SETTINGS

General notes

Read the safety instruction first.  
All unused optical connectors must be covered with a clean protective caps.  
All unused F type connectors must be terminated with 75 Ω loads. SAT IF and DTT inputs on transmitter due to DC voltage must be terminated with 75 Ω loads with DC voltage blocking coupler (VBC).  
Before connecting to the receiver, check the optical level of the signal on the optical fibre using an optical power meter. The optical input signal higher than 0dBm may damage the device. To avoid overload, an optical attenuator must be connected to the input of the receiver.

Powering

For transmitters: connect DC voltage +12 V to the DC powering input. Within 5-30 seconds the module will run in normal operation mode and is ready to work.  
**Note:** If external terrestrial preamplifier is used, switch the Terr.TV preamplifier powering to „ON“. On RF input of DTT signal appears DC voltage +12 V with max load 100 mA.

The receivers can be powered in next ways:

	OR301	OR301M
from PSU	10 V...20 V	10 V...20 V
from set-top box	no	yes
from multiswitch	yes	no

RF input levels to the transmitter

The transmitter has automatic RF gain control (AGC) on every input for constant laser load. This makes configuration much easier.  
However, the RF signals at the inputs of transmitter must meet the following requirements:

SAT

RF level at the input must be 60...80 dBμV per transponder for 30 transponders (75...95 dBμV total power); in this range AGC works correctly.

DTT

To ensure an optimal operating of the optical transmitter, the DTT input signals should be adjust at the same high level.  
RF level at the DTT input must be 60...80 dBμV per transponder for 8 transponders (69...89 dBμV total power); in this range AGC works correctly.  
The number of DTT channels may be not the same at different areas. To achieve the same output level at receiver output, the switch for selecting number of DTT channels is used. It allows to keep constant output level at the receiver by changing number of DTT transmitters from 1 to 8. At higher number of transmitters the output level is decreasing.  
Below some reference level values (for receivers with quatro output) are given to show how the switch is functions; output levels of receivers with quad output (with letter „M“, e.g. OR301M) are 5 dB lower.

	Switch position				
Number of ch.	1	2	4	6	8
1	80 dBμV	83 dBμV	86 dBμV	88 dBμV	89 dBμV
2	77 dBμV	80 dBμV	83 dBμV	85 dBμV	86 dBμV
4	74 dBμV	77 dBμV	80 dBμV	82 dBμV	83 dBμV
6	72 dBμV	75 dBμV	78 dBμV	80 dBμV	81 dBμV
8	71 dBμV	74 dBμV	77 dBμV	79 dBμV	80 dBμV
16	68 dBμV	71 dBμV	74 dBμV	76 dBμV	77 dBμV

Note, that all above given RF levels values are approximate, supposing that all channels levels are equalised, and frequency response of equipment is ignored.