

RLT-1550 D10

High power, Ultra Wide Band CATV & SAT 47-2.700 MHz

Laser Optical Transmitter

pre-correction, LAN remote control and alarms.

Operating Manual

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1 DOCUMENT VERSION

Revision	data	note
1.0	14.10.2014	Start version

2 SAFETY

2.1 SAFETY INSTRUCTIONS

Read all instruction completely before putting into operation the system for the first time and for any subsequent operation.

The device will be handled by personnel who have been trained to work with optical and electrical equipment and have received statements that comply with laser safety.



*All work should be carried out according to the prescribed sequence
Wrong operations can seriously affect the health of people or cause
damage to the devices*



2.2 CLASS 1M PRODUCT

The device class is classified according to the international standard IEC 60825-1:2007; European Version EN 60825-1:2007 and German Version DIN EN 60825:2008-05).

Class 1M

The laser radiation is emitted in the invisible infra-red spectrum range. It is potentially hazardous when viewed using an optical instrument



2.3 HAZARD LEVEL 1M

The device may be integrated in an Optical Fiber Communication System (OFCS) complying with IEC 60825-2.

The standard requires the assessment of risk levels for locations with restricted or control access in accordance with IEC 60825-1.

If installed in an OFCS the device optical output port(s) (fiber connector(s)) are assigned to the

Hazard Level 1M

The OFCS manufacturer is obliged to assign appropriate hazard levels and to install applicable laser safety measures according to IEC 60825-2.

The laser radiation is potentially hazardous when viewed using an optical instrument.



2.4 LASER SAFETY INSTRUCTIONS

Disconnect the device or put it into a state of low power before any maintenance and installation performing

- Do not look directly into the light beam and do not use magnifying glasses, microscopes and similar devices (to be used at a distance greater than 100 mm from the light source).
- Do not point fiber ends at other people.
- Check optical power in a fiber using a calibrated optical power meter.

- If the laser safety or hazard level requires the use of eye protection, only use equipment which has been tested and approved for the wavelengths and optical power involved.
- Any single or multiple fiber ends or ends found not to be terminated with power levels exceeding hazard level 1 (acc. IEC 60825-2) should be individually or collectively covered by material with sufficient attenuation of the optical power at the wavelength concerned.
- Do not make any unauthorized modifications to any optical fiber system or associated equipment.
- Replace damaged optical safety labels or attach new labels if labels are missing.

3 GENERAL DESCRIPTION

3.1 INTRODUCTION

The Ultra Wide Band 47-2.700 MHz optical Laser Transmitter, Rover “RLT” series, employs a high performance isolated and thermally stabilized DFB Laser with extreme Superior Linearity, designed for high channel Loading, Analog/Digital CATV & SAT signals.

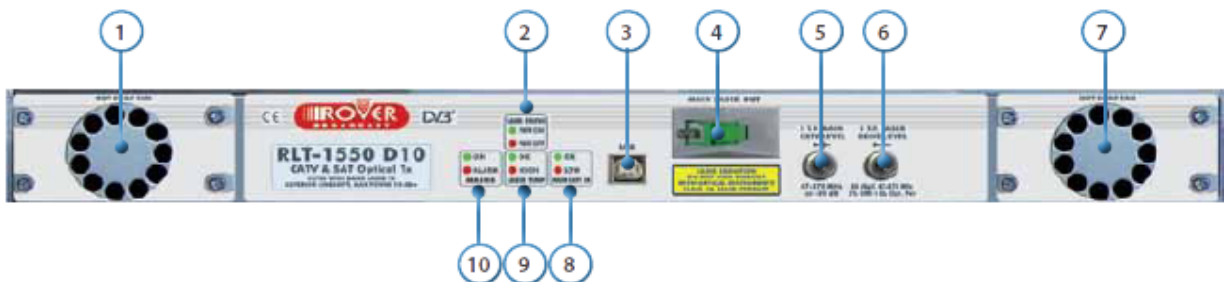


- The “RLT” series Operate at 1550 nm Wavelength according to ITU-GRID, the unit is designed for advanced single mode optical fiber networks, with DWDM ITU-grid (Dense Wavelength Division Multiplex), or CWDM grid (Coarse Wavelength Division Multiplex).

3.2 VIEWS of RLT-1550 D10

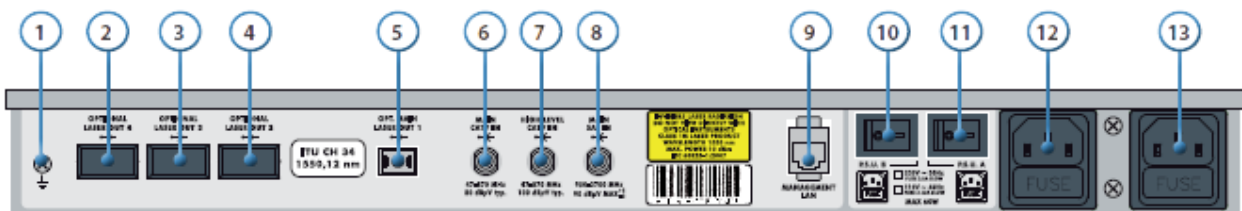
FRONT VIEW

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> 1. Hot swap fan 2. LED Laser PWR status 3. USB port 4. Main LASER OUT.
Laser radiation, do not view directly with optical instruments, class 1M laser product 5. One Test Point main CATV level: | <ol style="list-style-type: none"> 6. Two Test Point laser drive level:
80 dBμV, 47-870 MHz 5% OMI +2Δ Opt. Pwr 7. Hot swap fan 8. LED main CATV IN status 9. LED laser temp status 10. LED AC/DC mains status |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

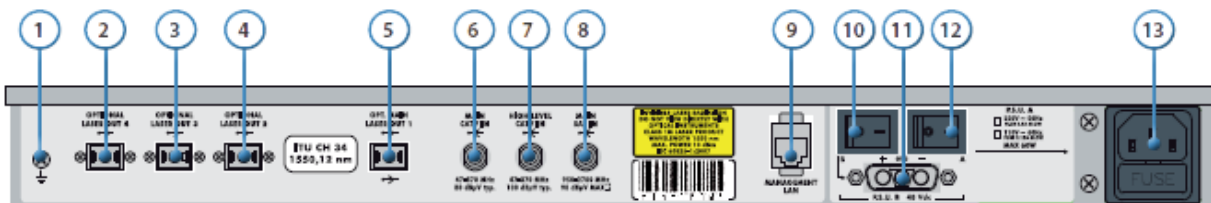


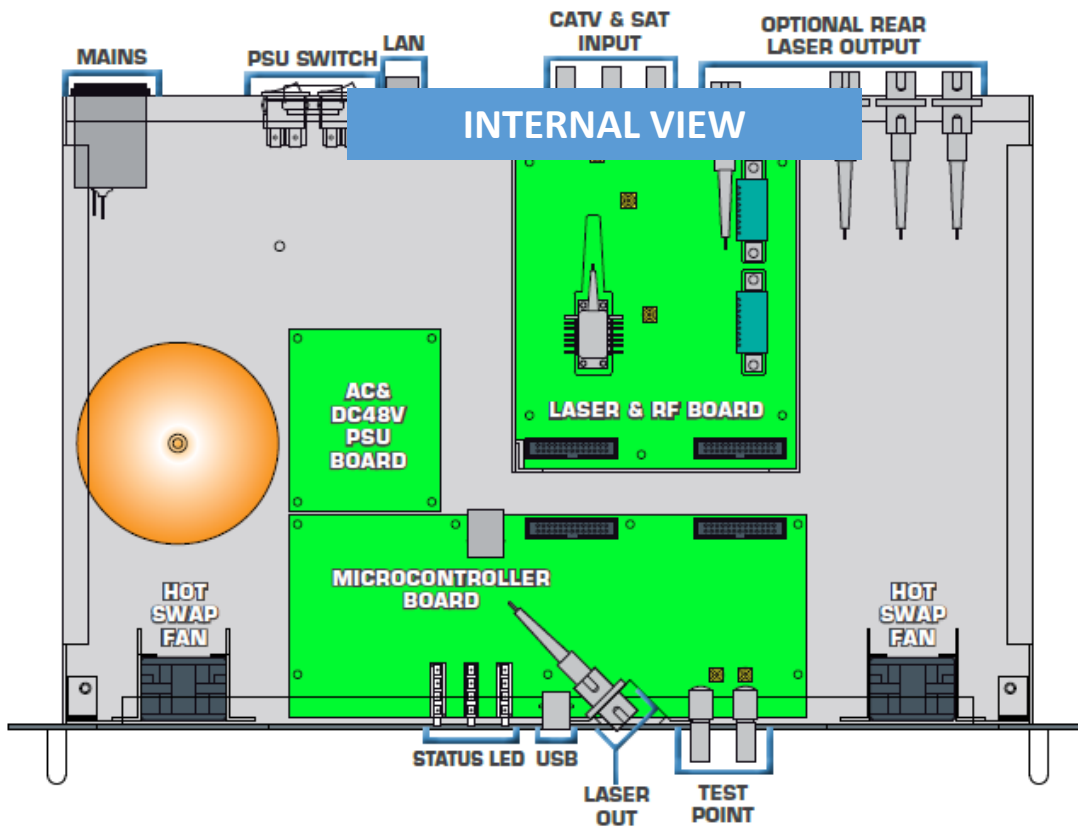
REAR VIEW

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> 1. Grounding 2. Optional rear Laser OUT 4 3. Optional rear Laser OUT 3 4. Optional rear Laser OUT 2 5. Optional main rear Laser OUT 1 6. Main CATV IN:
47-870 MHz 80 dBμV typ. 7. High level CATV IN:
47-870 MHz 100 dBμV typ. | <ol style="list-style-type: none"> 8. Main SAT IN:
950-2.700 MHz 90 dBμV MAX+2 9. Management LAN 10. P.S.U. B- Switch 11. P.S.U. A-Switch 12. AC mains & Fuse - B 13. AC mains & Fuse - A
Fuse value 230 = 2,5 A
Fuse value 110 = 3,15 A |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

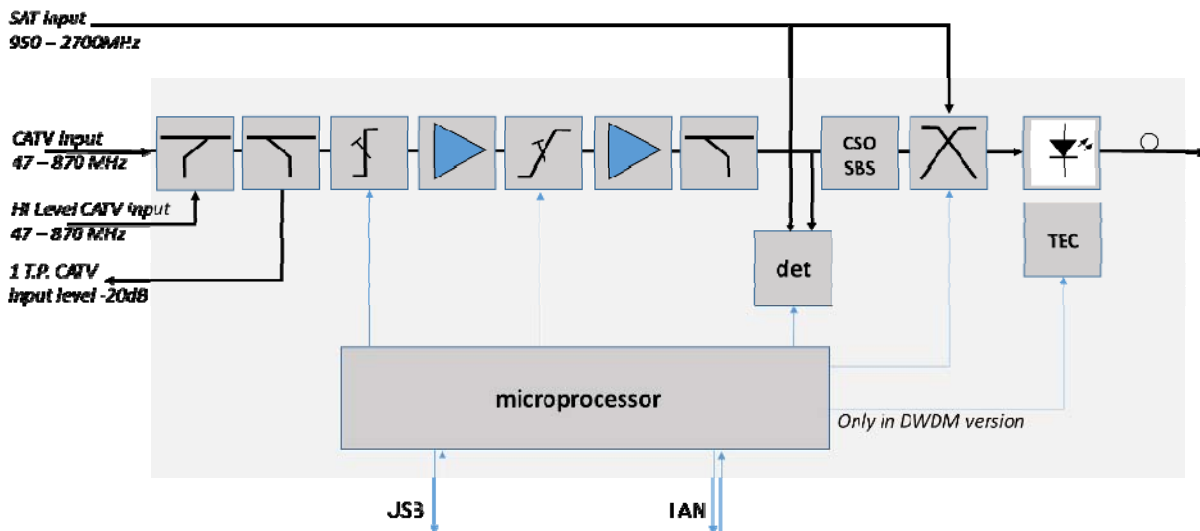


- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> 1. Grounding 2. Optional optic OUT 4 3. Optional optic OUT 3 4. Optional optic OUT 2 5. Optional main optic OUT 1 6. Main CATV IN 7. High level CATV IN 8. Main SAT IN | <ol style="list-style-type: none"> 9. Management LAN 10. P.S.U. B-Switch 11. P.S.U. B 48 Vdc 12. DC 48 V IN 13. AC MAINS & FUSE-A
Fuse value 230 = 2,5 A
Fuse value 110 = 3,15 A |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|





BLOCK DIAGRAM



3.3 INSTALLING AND STARTING RLT-1550 D10

Instruction for correctly handling device

1. The RLT-1550 D10 has be placed into operation under the specified environmental conditions. Avoid temperature shocks after module transportation and waiting sufficient time to accommodate with the environmental conditions at the operating site.
2. Check matching between used rack and mechanical RLT-1550 D10 (19", ETSI or JIS)
3. Connect power supply on the module's rear with delivered powering cable only.
4. Please observe laser safety requirements (refer to the safety instructions) and connect module RF and optical. Handle fiber carefully and remember that the smallest permissible bending radius for fiber is 30mm.
5. Turn on the module at rear power switch.
6. After start, the "Module" LED on the front is lightening green
7. Connect the transmitter by management LAN port that provides access to the complete operating parameters configurations and to alarms monitoring

4 TECHNICAL SPECIFICATION

4.1 MAIN FEATURES

The "RLT" series Operate at 1550 nm Wavelength according to ITU-GRID, the unit is designed for advanced single mode optical fiber networks, with DWDM ITU-grid

(Dense Wavelength Division Multiplex), or CWDM grid
(Coarse Wavelength Division Multiplex).

- Fine tuning (± 100 GHz)

Available for DWDM version, to enable one channel reconfiguration based on ITU grid channel number as in table

ITU Channel No.	DWDM Frequency	DWDM Wavelength
19	191.900 THz	1562.23 nm
20	192.000 THz	1561.42 nm
21	192.100 THz	1560.61 nm
22	192.200 THz	1559.79 nm
23	192.300 THz	1558.98 nm
24	192.400 THz	1558.17 nm
25	192.500 THz	1557.36 nm
26	192.600 THz	1556.55 nm
27	192.700 THz	1555.75 nm
28	192.800 THz	1554.94 nm
29	192.900 THz	1554.13 nm
30	193.000 THz	1553.33 nm
31	193.100 THz	1552.52 nm
32	193.200 THz	1551.72 nm
33	193.300 THz	1550.92 nm
34	193.400 THz	1550.12 nm
35	193.500 THz	1549.32 nm
36	193.600 THz	1548.51 nm
37	193.700 THz	1547.72 nm
38	193.800 THz	1546.92 nm
39	193.900 THz	1546.12 nm
40	194.000 THz	1545.32 nm
41	194.100 THz	1544.53 nm
42	194.200 THz	1543.73 nm
43	194.300 THz	1542.94 nm
44	194.400 THz	1542.14 nm
45	194.500 THz	1541.35 nm
46	194.600 THz	1540.56 nm
47	194.700 THz	1539.77 nm
48	194.800 THz	1538.98 nm
49	194.900 THz	1538.19 nm
50	195.000 THz	1537.40 nm
51	195.100 THz	1536.61 nm
52	195.200 THz	1535.82 nm
53	195.300 THz	1535.04 nm
54	195.400 THz	1534.25 nm
55	195.500 THz	1533.47 nm
56	195.600 THz	1532.68 nm
57	195.700 THz	1531.90 nm
58	195.800 THz	1531.12 nm
59	195.900 THz	1530.33 nm

- Low noise High Linearity DFB Laser for excellent RIN (Relatively Intensity Noise)

The spectral density of RIN standard, as approximated by thermal Gaussian light, could be obtained from combination of measurement and theory-based calculation.

It is very important because the noise figure of an optical amplifier can depend on the signal input RIN

- High stability thermoelectric Laser cooler (DWDM Version)
DWDM (Dense Wavelength Division Multiplex) modulation utilizes multiple lasers to obtain large multichannel data streams. The narrow channel spacing relies on laser wavelength is controlled within 0,1nm but temperature variation influences operation. So a typical temperature control of 0,1 °C is required to maintain laser operation within 0,1nm.
- CATV Input:
CATV input from 47 to 870 MHz (or opt. 47-1.002) for Analog TV and Digital QAM Signals
The nominal level for CATV main input varies from 72 db μ V to 80 db μ V. The nominal level for high level CATV input is 100 db μ V, but must use a separate CATV input
- SAT Input 950-2.700 MHz for Digital SAT Transponder
Nominal level for SAT input level 92 dbuV / trasp. typ, 90 minimum
- Input level Signal Test Point on Front panel
- Laser Output Power available, from +3 to + 10 dBm
- Laser output connector available on Front, or Rear Panel
- SC/APC Laser Output Connector
- Automatic channels load Control for stable OMI
The optical transmitter adjusts the optimum modulation index OMI by AGC (Automatic Gain Control) that automatically adjusts the RF gain. Typically about 5% is the optimum OMI for analog video in broadcasting application
- Laser Driver Level Test Point (for OMI measurement), on front panel
- All parameters and pre-corrections, adjustable via USB/LAN port: Output Laser Power, Slope, wavelength fine tuning, Gain (AGC), OMI, SBS, CSO pre-distortion, chirp.
The CNR is the difference, in decibels, between the amplitude of an RF signal and the amplitude of thermal noise present in the transmission path of the RF signal
CSO (Carrier to Second Order) and CTO(Carrier to Triple Beat) are distortion component caused by non-linear mixing of carrier in the transmission system as a result of laser “clipping” that occurs when the optical modulation index

(OMI) of laser is too high. This is when the peak modulating current exceeds the d.c. bias current level above threshold.

- USB and LAN-Port for local & Remote Control Interface
- Built-in 2 or 4 Way Optical splitter, opt.
- Redundancy PSU: 2 x 230 V-AC opt. or 1 x 230 V-AC+1 x 48 V-DC opt.
- Slim 1 Unit, 19” Rack

4.2 INPUT CATV & SAT

CATV Frequency range	47-870 MHz (option 47-1.000 TV only)
SAT Frequency range	950-2700 MHz
RF connectors	75 ohm type “F”
RF Return Loss	TV = > 16 dB SAT = > 12 dB
Nominal level for CATV main input	80 dbuV / typ. 72 minimum
Nominal level for high level CATV input	100 dbuV / CH
Nominal level for SAT input level	92 dbuV / trasp. typ, 90 minimum
Testpoint 1 main CATV input	input level - 20 dB
Testpoint 2 laser drive level	80 dbuV / 5% OMI
Gain mode	CATV : AGC or Manual SAT: Manual
Gain adjustment CATV	manual +11/-11 dB, AGC 30 dB Max
Slope adjustment CATV	-3 / +15 dB

4.3 LASER SPECIFICATION

	DWDM version	CWDM version
Laser type	DFB Cooled butterfly	DFB uncooled coaxial
Optical wavelegh	ITU grid 100 GHz, channels 20 to 60 availables (1.530 to 1.560 nm approx)	1.550 +/- 4 nm
Laser Output power	From +3 to +10dBm	
Power stability	+/-0.5 dB	+/-1 dB
Optical Power Adjustement	0 to -3 dB	
Wavelength fine tuning	-100 to +100 GHz, 50 GHz steps	
RIN	-155 db/Hz worst case	-150 db/Hz worst case
Optical insulation	30 db min	30 db min
Optical Return Lossv	> 45 dB	> 40 dB

4.4 POWER SUPPLY

Main power supply	230 V-AC 50 hz
Redundancy Power Supply	48 V-DC
Power consumption	< 20 W

4.5 SAFETY & ENVIRONMENT

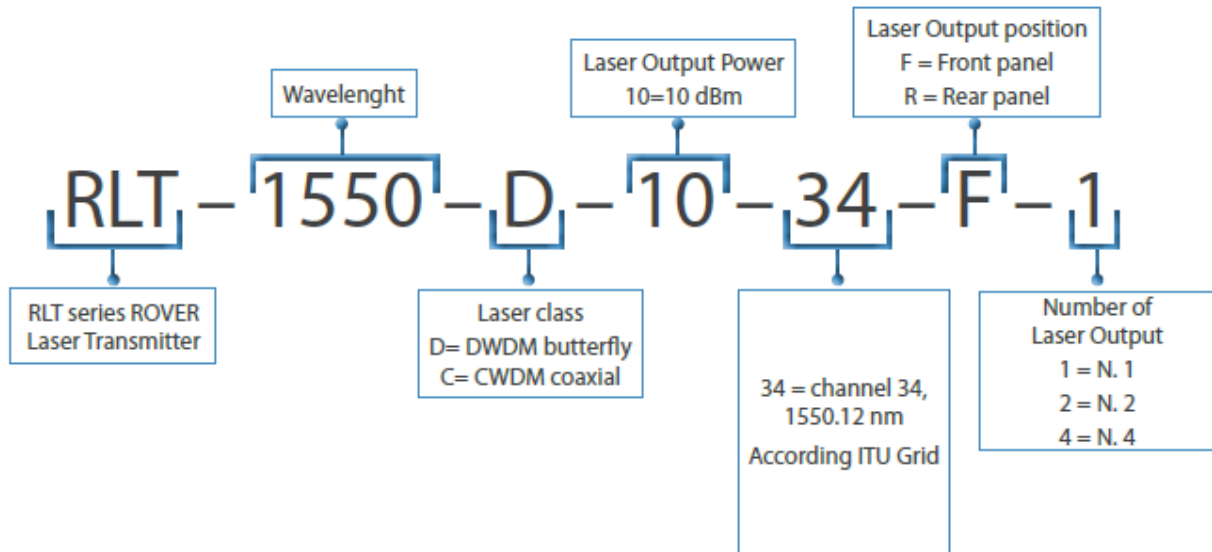
Safety	EN 50 083-1 and EN 60 950 See yellow label on the equipment.
Laser Safety	Class 1M acc. IEC 60 825-1 (eye safe for normal viewing). During normal operations laser beam is confined within optical fiber. Optical transmitter is intended to work ONLY connected to the proper optical network
Installation environment	Temperature range: -5° / + 45° According to ETS 300 019-1-3 Class 3,1 Controlled Temp. Loc.
Relative humidity	90 %
EMC	EN 50 083-2

4.6 CATV NETWORK PERFORMANCE

		Channel allocation plan (number of channel) = Cenelec 42	Channel allocation plan (number of channel 77 Analog NTSC + 75 Digital QAM *
CNR (1550 nm)	(DWDM Version)	53 dB (1) 51,5 dB (2)	52 dB (1) 51 dB (2)
	(CWDM Version)	51 (1)	50,5 (1)
CSO (1550 nm)	(DWDM Version)	> 60 dB (2)	> 60 dB (2)
	(CWDM Version)	> 58 dB (2)	> 58 dB (2)
CTB (1550 nm)	(DWDM Version)	> 62 dB (2)	> 62,5 dB (2)
	(CWDM Version)	> 64 dB (2)	> 64 dB (2)
CXM (1550 nm)	(DWDM Version)	> 58 dB (2)	> 57 dB (2)
	(CWDM Version)	> 55 dB (2)	> 55 dB (2)
* flat output, digital channels – 6db level (Analog channels below 550 MHz) (Digital channels above 550 MHz)			
LINK TYPE:			
1) Link type 1=tx+0km fiber+ optical attenuator + RX			
2) Link type 2= tx+20km fiber G652+ optical attenuator + RX			
RX: received power= 0dBm, noise current = typRX: received power= 0dBm, noise current = 7pA/√Hz			

5 ORDERING CODE

5.1 HOW READ ROVER'S CODE

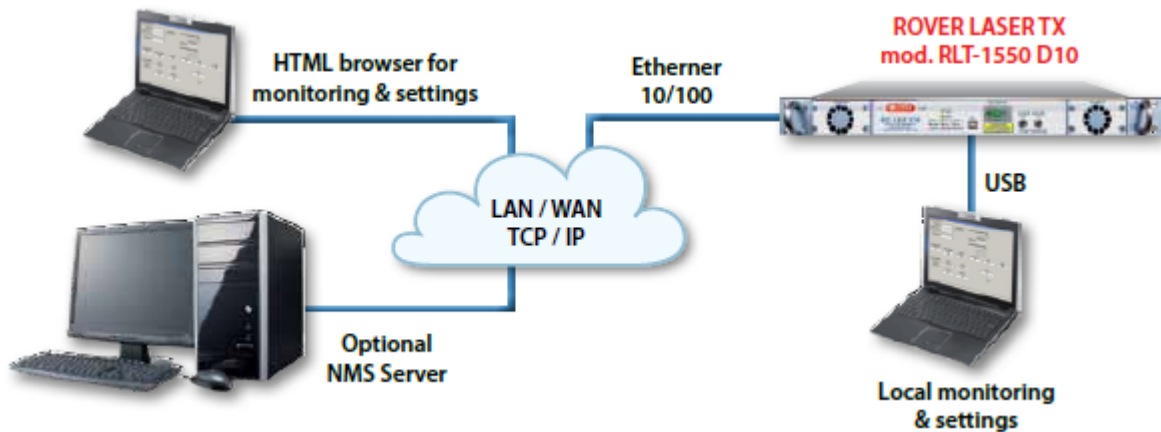


6 USB LOCAL MONITORING & SETTING

Segue descrizione dei passaggi tramite immagini delle pagine del software di configurazione

7 LAN REMOTE CONTROL

7.1 BLOCK DIAGRAM WEB CONNECTIVITY



Segue descrizione dei passaggi tramite immagini delle pagine del software di configurazione da remoto



RLT

admin

SN:0000008E7A0F

Home

Alarm

Setup

Logout

CATV SLOPE

-0.5 dB

FIBER LENGTH

0 Km

(Optical Modulation Index) OMI

18 %

Chan Plan Pre-Correct

CENELEC 42



RLT

admin

SN:0000008E7A0F

Home

Alarm

Setup

Logout

CATV SLOPE

-0.5 dB

FIBER LENGTH

0 Km

(Optical Modulation Index) OMI

- 0.5
- 0
- 1
- 2
- 4
- 6
- 8
- 10
- 12
- 14
- 16

Chan Plan Pre-Correct

CENELEC 42



RLT

admin

SN:0000008E7A0F

Home

Alarm

Setup

Logout

CATV SLOPE

-0.5 dB

FIBER LENGTH

0 Km

(Optical Modulation Index) OMI

18 %

Chan Plan Pre-Correct

CENELEC 42

10

12

15

18

20



RLT

admin

SN:0000008E7A0F

Home

Alarm

Setup

Logout

CATV SLOPE

-0.5 dB

FIBER LENGTH

0 Km

(Optical Modulation Index) OMI

18 %

Chan Plan Pre-Correct

- 0
- 5
- 10
- 15
- 20
- 25
- 30
- 35
- 40
- 45
- 50

LEC 42



RLT

admin

SN:0000008E7A0F

Home

Alarm

Setup

Logout

CATV SLOPE

-0.5 dB

FIBER LENGTH

0 Km

(Optical Modulation Index) OMI

18 %

Chan Plan Pre-Correct

CENELEC 42
CENELEC 42
77AN + 750QAM