

Flashlink®



USER MANUAL

MR-TR-D15xx

Multi Rate Transponder and Converter

for

Dense Wavelength Division Multiplexing

Network Electronics ASA
Thorøya
N-3204 Sandefjord, Norway
Phone: +47 33 48 99 99
Fax: +47 33 48 99 98
e-mail: support@network-electronics.com
www.network-electronics.com

Revision history

The latest version is always available in pdf-format on our web-site:

<http://www.network-electronics.com/>

Current revision of this document is the uppermost in the table below.

Revision	Replaces	Date	Change Description
B	A	13.08.02	Printing errors
A		16.05.02	Preliminary version

Index

1. General.....	4
2. Specifications.....	6
3. Format Configuration	8
3.1 Configuration Examples	9
4. Connector module.....	10
4.1 Mounting the connector module.	10
4.2 Terminal format support.....	11
5. Module status	11
5.1 GPI ALARM – Module Status Outputs	12
4.2 Front Panel - Status Monitoring.....	13
6. Laser safety precautions.....	14
Declaration of conformity with CE	15
General environmental requirements for Network flashlink® equipment.....	15

1. General

The **flashlink**® MR-TR-D15xx is a multi bit-rate converter and transponder module providing high performance media conversion for various signal formats from 19.4Mbps up to 1485Mbps. The unit can be configured as an Electrical to Optical or an Optical to Electrical converter, or as an Optical to Optical Transponder. This state of the art unit offers a high sensitivity PIN diode and narrowband ultrastabilised DWDM laser technology. Unmatched signal accuracy, even in critical applications with pathological signal patterns makes the MR-TR-D15xx the first choice for all optical transport demands.

The **flashlink**® DWDM system uses only wavelengths in accordance with the ITU-T G.692 recommendation. If the module is to be used together with existing third party DWDM systems the exact wavelength needs to be specified.

The MR-TR-D15xx can transport all HD and SD signal formats in addition to DVB-ASI and SMPTE 310. It can perform optical refreshing, reclocking and wavelength swapping for a DWDM wavelength for SDH/SONET and Gigabit Ethernet in addition to all the broadcast signal formats.

The input sensitivity is typically better than -20dBm. This will allow for a range of 50km, using high quality Single Mode fiber at 1485Mbps, for a 16 channel DWDM system.

The optical output comes with a sophisticated 1550nm DFB DWDM laser covering the demands of short, medium and long haul applications. The open system platform of Network Electronics DWDM multiplexing technology allows easy interoperability with third party fiber optical systems.

The electrical input is equipped with a multi rate cable equaliser providing an equalisation of typically 100m of high quality coax cable at 1485Mbps. A distribution amplifier with 2 outputs reduces the need for additional DA's (for DVB-ASI only one can be used).

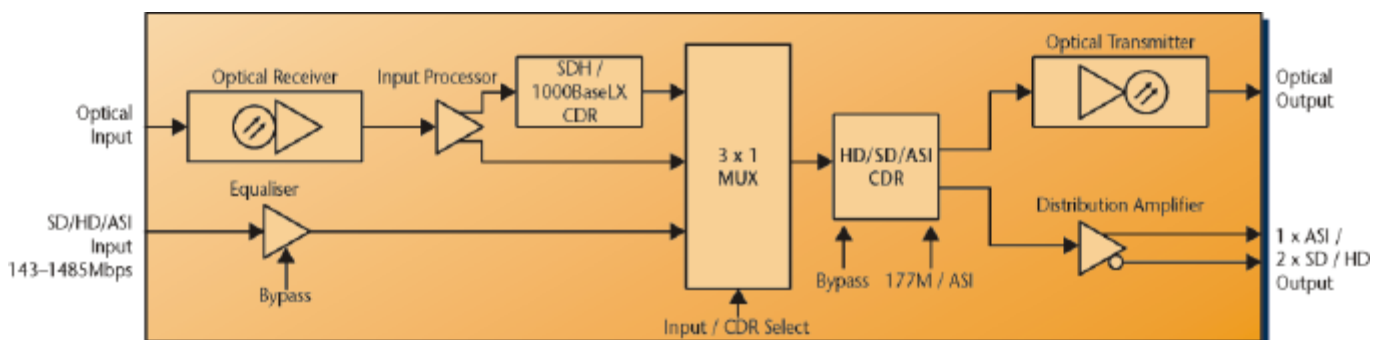


Figure 1 - MR-TR-D15xx Multi Rate Transponder for DWDM

MR-TR-D15xx is available in 16 versions:

Part number	Wavelength	Part number	Wavelength
MR-TR-D1549.32	1549.32nm laser	MR-TR -D1550.92	1550.92nm laser
MR-TR -D1552.52	1552.52nm laser	MR-TR -D1554.13	1554.13nm laser
MR-TR -D1555.75	1555.75nm laser	MR-TR -D1557.36	1557.36nm laser
MR-TR -D1558.98	1558.98nm laser	MR-TR -D1560.61	1560.61nm laser
MR-TR -D1530.33	1530.33nm laser	MR-TR -D1531.90	1531.90nm laser
MR-TR -D1533.47	1533.47nm laser	MR-TR -D1535.04	1535.04nm laser
MR-TR -D1536.61	1536.61nm laser	MR-TR -D1538.19	1538.19nm laser
MR-TR -D1539.77	1539.77nm laser	MR-TR -D1541.35	1541.35nm laser

Optionally all wavelengths in the ITU-T G.692 recommendation are available on request.

2. Specifications

Optical Input

Data rate optical:	19.4 to 1485 Mbps
Sensitivity:	
for HD-SDI (1485Mbps)	better than -20dBm
for SDI (270Mbps)	better than -25dBm
for SDH / SONET (622Mbps)	better than -25dBm
for 1000BaseLX (1250Mbps)	better than -25dBm
Detector overload threshold:	min. -3dBm
Optical wavelength:	2 nd & 3 rd opt. window 1310nm & 1550nm
Transmission circuit fiber:	Single Mode
Connector return loss:	>40dB w/SM fiber
Detector damage threshold:	>+1dBm
Connector	SC/UPC

Optical Output

Transmission circuit fiber:	Single Mode
Light source:	DFB Laser
Optical power:	0dBm
Optical centre wavelength:	According to ITU-T G.692
Max. wavelength drift:	+/- 0.16nm @
temp. range:	
0 to +40 °C	
Jitter (UI=Unit Interval):	0.135 UI max. @ 270Mbps 0.2 UI max. @ 1485Mbps
Connector return loss:	>40dB w/SM fiber
Maximum reflected power:	4%
Connector:	SC/UPC

Electrical

Power:	+5V DC / 10W Max. 5W typically
Control:	Control system for access to setup and module status with BITE (Built-In Test Equipment)

Electrical Input

Data rate NRZ:	19.4 to 1485 Mbps
Equalisation:	Automatic Cable equaliser and reclocker can be bypassed to support bitrates down to 2Mbps.
Impedance:	75 ohm
Return loss:	>15dB @ 1485MHz
Signal level:	nom. 800mV
Connector:	BNC

Electrical Output

Number of outputs:	2
Connector:	BNC
Impedance:	75 ohm
Return loss:	>15dB @ 1485MHz
Jitter:	max 0.2UI
Peak to peak signal level:	0.8V ± 0.1V
Signal polarity	1 non inverting, 1 inverting

Standards

Supported standards for electrical and optical ports:

SMPTE:	SMPTE 292, SMPTE259M, SMPTE297, SMPTE305M, SMPTE310,
DVB-ASI:	EN50083-9

Additional supported standards for the optical ports, only optical transponder configuration:

SDH / SONET:	STM1 / OC3 STM4 / OC12
Gigabit Ethernet:	IEEE 802.3 1000BaseLX for SM fiber

3. Format Configuration

The MR-TR-D15xx can support a number of different formats. The correct configuration can either be set with a DIP switch or with the GYDA Control System. The layout of MR-TR-D15xx is shown in the drawing below with the DIP switch to the upper left position.

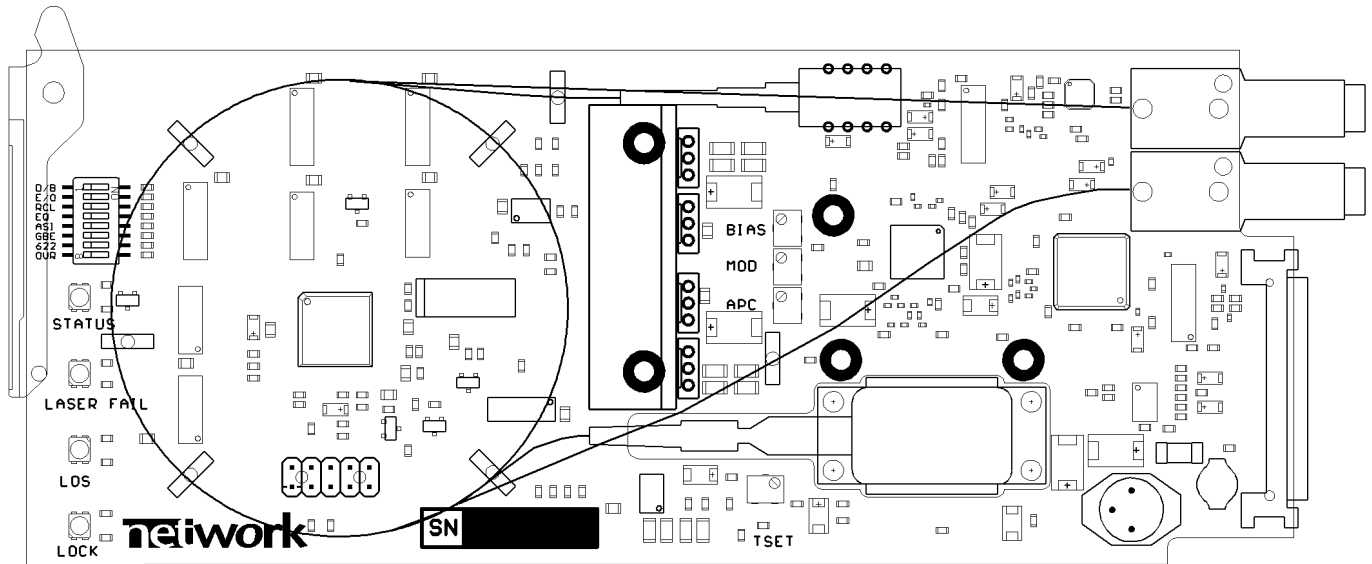


Figure 2 - MR-TR-D15xx board layout.

DIP switch configuration must be set according to the table below:

Switch #	Label	Function DIP=ON	Function DIP=OFF	Comment
1	D/B	Broadcast format support	Datacom format support	Format mode
2	E/O	Optical input selected	Electrical input selected	Transponder mode
3	RCL	Reclocker ON	Reclocker Bypass	Reclocker mode
4	EQ	Cable equaliser ON	Cable equaliser Bypass	Equaliser mode
5	ASI	DVB-ASI Reclocker support	SDI 177Mbps Reclocker support	Only when Broadcast format support selected
6	GBE	Gigabit Ethernet Reclocking Selected	SDH/SONET Reclocking Selected	Only when Datacom format support selected
7	622	STM-4 / OC-12 Reclocking (622Mbps)	STM-1 / OC-3 (optical) Reclocking (155Mbps)	Only when Datacom format support selected
8	OVR	Override GYDA control Config. with DIP switch	GYDA control Config. with GYDA	Select configuration from GYDA

All DIP switches are off when pointing towards the release handle.

When a “Broadcast format support” is selected, all clock rates for HD-SDI, SDI and DVB-ASI are automatically configured by the module itself.

3.1 Configuration Examples

Typical configurations for MR-TR:

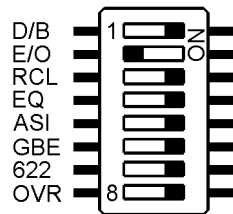


Figure 3 - HD-SDI, SDI, DVB-ASI Electrical to Optical Converter

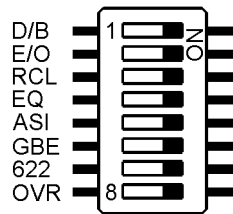


Figure 4 - HD-SDI, SDI, DVB-ASI Optical to Electrical Converter and Optical to Optical Transponder

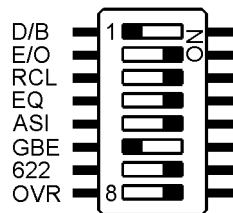


Figure 5 - SDH/SONET - STM-4/OC-12 Optical to Optical Transponder

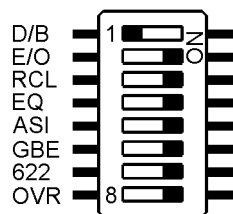


Figure 6 - Gigabit Ethernet - 1000BaseLX Optical to Optical Transponder

4. Connector module

The MR-TR-D15xx has a dedicated connector module: MR-TR-C1. This module is mounted at the rear of the sub-rack. The module is shown in figure 7.

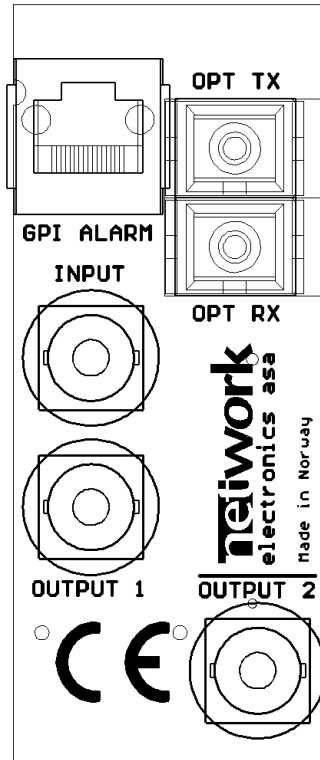


Figure 7 - Overview of the MR-TR-C1 connector module

In typical use a MR-TR / MR-TR-D15xx module at each end will be used. The electrical input signal is connected to the INPUT BNC on the transmitting MT-TR, and the electrical output is connected to the OUTPUT 1 or OUTPUT 2 BNC on the receiving MR-TR. Please note that OUTPUT 2 has an inverted signal, so formats like DVB-ASI can not use be used on this output.

4.1 Mounting the connector module.

The details of how the connector module is mounted, is found in the user manual for the sub-rack frame FR-2RU-10-2.

This manual is also available from our web site: <http://www.network-electronics.com/>

4.2 Terminal format support

The different input and output ports on MR-TR can support a number of formats. The table below shows which signal formats are supported on the selected terminals.

Terminal format support:

Terminal	Function	Supported Format	Mode
INPUT	Electrical Input	HD-SDI, SDI, DVB-ASI, SMPTE310, Transparent*	Input
OPT RX	Optical Input (Receiver)	HD-SDI, SDI, DVB-ASI, SMPTE310, STM-1 opt., STM-4, OC-3 opt., OC-12, Transparent*	Input
OUTPUT 1	Electrical Output – None inverted	HD-SDI, SDI, DVB-ASI, SMPTE310, Transparent*	Output
OUTPUT 2	Electrical Output – Inverted	HD-SDI, SDI, Transparent*	Output
OPT TX	Optical Output (Transmitter)	HD-SDI, SDI, DVB-ASI, SMPTE310, STM-1 opt., STM-4, OC-3 opt., OC-12, Transparent*	Output
GPI ALARM	Open Collector Alarms	Wired alarms	OC Output

* MR-TR has a “Transparent mode”. In this mode all reclockers and CDR’s are switched off and no jitter attenuation will be performed. This mode may be used for non-standard or unsupported bit rates over shorter distances and up to 1 Gbps.

5. Module status

The status of the module can be monitored in three ways.

1. GYDA System Controller (optional).
2. GPI at the rear of the sub-rack.
3. LED’s at the front of the sub-rack.

Of these three, the GPI and the LED’s are mounted on the module itself, whereas the GYDA System Controller is a separate module giving detailed information on the card status. The functions of the GPI and the LED’s are described in sections 5.1 and 5.2. The GYDA controller is described in a separate user manual.

5.1 GPI ALARM – Module Status Outputs

These outputs can be used for wiring up alarms for third party control systems. The GPI outputs are open collector outputs, sinking to ground when an alarm is triggered. The GPI connector is shown in figure 8.

Electrical Maximums for GPI outputs

Max current: 100mA

Max voltage: 30V

MR-TR module GPI pinning:

Signal	Name	Pin #	Mode
Status	General error status for the module.	Pin 1	Open Collector
Laser Fail	Laser Fail Alarm	Pin 2	Open Collector
LOS	Los Of Signal	Pin 3	Open Collector
LOCK	Reclocker in Lock	Pin 4	Open Collector
Ground	0 volt pin	Pin 8	0V.

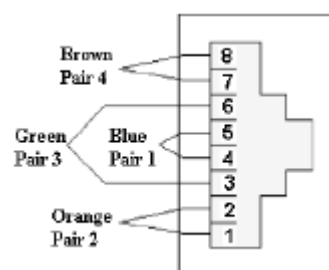
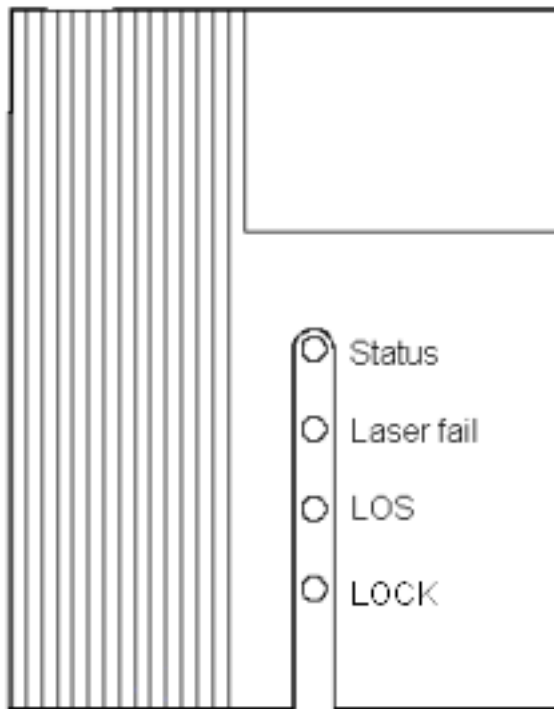


Figure 8 - GPI Outlet

5.2 Front Panel - Status Monitoring

The status of the module can be easily monitored visually by the LED's at the front of the module. The LED's are visible through the front panel as shown in figure 9 below.



(Text not printed on the front panel).

Figure 9 - Front panel indicator overview for MR-TR-D15xx and MR-TR-13T/15T

The MR-TR has 4 LED's each showing a status corresponding to the GPI pinning. The position of the different LED's is shown in figure 9.

Diode \ state	Red LED	Green LED	No light
Status	Module is faulty	Module is OK Module power is OK	Module has no power
Laser fail	Laser is malfunctioning and the APC can no longer keep the output power within range.	Laser is OK	
LOS	Loss of signal No optical input signal.	Optical input signal Present	
LOCK	Re-clocker is out of lock	Re-clocker is in lock on a supported signal format	

6. Laser safety precautions

Guidelines to limit hazards from laser exposure.

All the available EO units in the flashlink® range include a laser.

Therefore this note on laser safety should be read thoroughly.

The lasers emit light at wavelengths around 1310 nm or 1550 nm. This means that the human eye cannot see the beam, and the blink reflex can not protect the eye. (The human eye can see light between 400 nm to 700 nm).

A laser beam can be harmful to the human eye (depending on laser power and exposure time). Therefore:

!! BE CAREFUL WHEN CONNECTING / DISCONNECTING FIBER PIGTAILS (ENDS).

NEVER LOOK DIRECTLY INTO THE PIGTAIL OF THE LASER/FIBER.

NEVER USE MICROSCOPES, MAGNIFYING GLASSES OR EYE LOUPES TO LOOK INTO A FIBER END.

USE LASER SAFETY GOGGLES BLOCKING LIGHT AT 1310 nm AND AT 1550 nm

Instruments exist to verify light output power: Power meters, IR-cards etc.

flashlink[®] features:

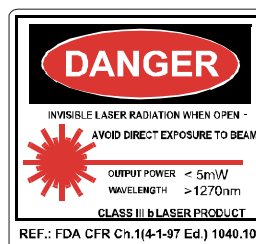
All the laser module cards in the flashlink[®] product range, are Class 1 laser products according to IEC 825-1 1993, and class I according to 21 CFR 1040.10 when used in normal operation.

More details can be found in the user manual for the FR-2RU-10-2 frame.

Maximum output power*: 5 mW.

Operating wavelengths: > 1270 nm.

**Max power is for safety analysis only and does not represent device performance.*



Declaration of conformity with CE

This apparatus meets the requirements of EN 55103-1 (November 1996) with regard to emissions, and EN 55103-2 (November 1996) with regard to immunity; it thereby complies with the Electromagnetic Compatibility Directive 89/336/EEC.

General environmental requirements for Network flashlink[®] equipment

1. The equipment will meet the guaranteed performance specification under the following environmental conditions:

- Operating room temperature range 0°C to 40°C
- Operating relative humidity range up to 90% (non-condensing)

2. The equipment will operate without damage under the following environmental conditions:

- Temperature range -10°C to 50°C
- Relative humidity range up to 95% (non-condensing)

3. Electromagnetic compatibility conditions:

- Emissions EN 55103-1 (Directive 89/336/EEC)
- Immunity EN 55103-2 (Directive 89/336/EEC)