DDT-4632 & DDR-4632

Dual 3G/HD/SD-SDI/ASI Fibre Optic Link

User Manual

Revision History:

Revision	Date	By	Change Description	Applicable to:
00	06/06/2013	AL	Original Issue.	Units fitted with firmware version ≥ Dxx463xS1V3

Table of Contents:

This instruction book applies to units fitted with firmware version ≥ Dxx463xS1V3.

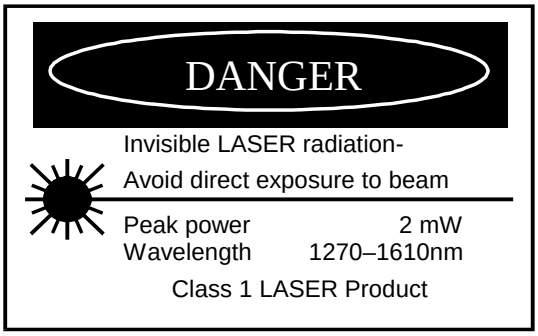
WARNING

Operation of electronic equipment involves the use of voltages and currents that may be dangerous to human life. Note that under certain conditions dangerous potentials may exist in some circuits when power controls are in the **OFF** position. Maintenance personnel should observe all safety regulations.

Do not make any adjustments inside equipment with power **ON** unless proper precautions are observed. All internal adjustments should only be made by suitably qualified personnel. All operational adjustments are available externally without the need for removing covers or use of extender cards.

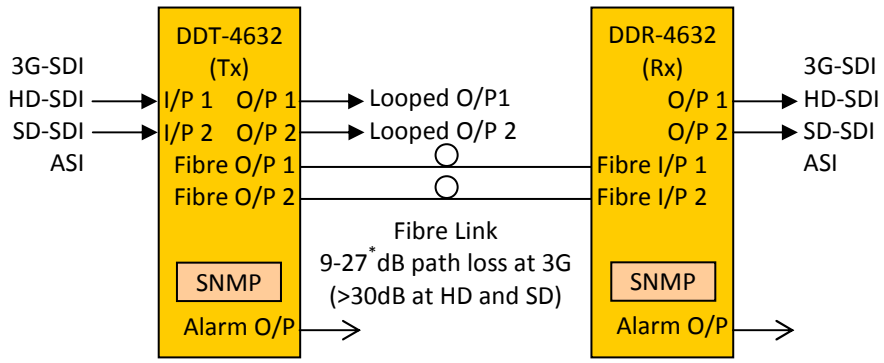
Optical Safety

The light emitted from the LASER diode used in this system is invisible and may be harmful to the human eye. Avoid looking directly into the fibre optic cable or connectors or into the collimated beam along their axis when the device is in operation. Operating the LASER diode outside of its maximum ratings may cause device failure or a safety hazard.



GENERAL DESCRIPTION

BLOCK DIAGRAM DDT-4632 & DDR-4632 SIGNAL PATH



NOTE: * Fitted with APD detector. 3-18dB when fitted with PIN detector.

The IRT DDT-4632 and DDR-4632 are dual transmit and receive modules designed principally for use as two independent serial data fibre optic transmission links for 3G-SDI, HD-SDI or SD-SDI applications conforming to SMPTE standards 424M, 292M and 259M-C using 9/125 µm single mode fibre.

In addition, the link may be used for ASI transport streams for use with MPEG compressed video streams or other 270 Mb/s type data.

The transmitter features automatic input cable equalisation and an active loop through monitoring port on each input.

Both the transmitter and receiver modules are configurable for automatic changeover to both outputs on loss of either input, if required.

The receiver uses a choice of either a PIN photodiode or APD detectors with signal conditioning and reclocking circuits. The data rates are automatically set to match the 3G-SDI, HD-SDI or SD-SDI/ASI rates dependent on the actual input data rates to the transmitter.

The transmitter and receiver modules are compatible with IRT's single channel fibre cards for use as two independent fibre paths starting from or coming to a single location.

LED indicators are provided on both modules for digital signal presence type, laser or optical failure, and power.

A link selectable "keep link alive" signal is available to maintain optical link operation when no electrical input is present.

Relay contact outputs are also provided for external use of alarm signals on both modules.

Optionally a 1310/1550nm WDM[2] optical combiner can be fitted to allow for combined use on a single fibre.

SNMP (Simple Network Management Protocol) is available for remote monitoring when used in conjunction with an IRT frame fitted with SNMP capability.

Standard features:

- **2 independent fibre links.**
- **Transports 3G-SDI, HD-SDI, SD-SDI or ASI signal rates.**
- **Path lengths up to 30 dB[1] optical path loss using 9/125µm single mode fibre.**
- **LED indicators and external alarm contacts.**
- **Transmitter (Tx) and receiver (Rx) can be used separately with 2 independent single channel fibre Rx and Tx cards.**
- **Remote monitoring via SNMP.**
- **Optional on-board WDM[2] optical combiner for use on a single common fibre.**

NOTE: **1** 27dB path loss at 3G. Typically >30dB at HD and SD. Fitted with APD detector.
2 With WDM option fitted for combined use on a single fibre, optical path loss is reduced by approximately 2dB.

TECHNICAL SPECIFICATIONS

DDT-4632:

Input serial data signal	2.97 Gb/s (3G-SDI) to SMPTE 424M; 1.485 Gb/s (HD-SDI) to SMPTE 292M; 270 Mb/s (SD-SDI) to SMPTE 259M-C and DVB-ASI.
Input impedance	75 Ω.
Input return loss	> 15 dB 5 MHz to 1.5 GHz; > 10 dB 1.5 GHz to 2.97 GHz.
Automatic cable compensation	> 100 m at 2.97 Gb/s (3G-SDI) with Belden 1694A (typ. 110m); > 100 m at 1.485 Gb/s (HD-SDI) with Belden 1694A (typ. 160m); > 250 m at 270 Mb/s (SD-SDI/ASI) with Belden 8281 (typ. >300m).
Input connector	2 x BNC on rear panel, 1 per channel.
Output connector	2 x BNC on rear panel, monitor outputs.

DDR-4632:

Number of outputs	1 per channel, data reclocked, AC coupled.
Output level	800 mV ± 10%.
Output impedance	75 Ω.
Output return loss	> 15 dB 5 MHz to 1.5 GHz; > 10 dB 1.5 GHz to 2.97 GHz.
Output rise and fall time	< 135 ps at 2.97 Gb/s and 1.485 Gb/s; > 0.4 ns and < 1.5 ns at 270 Mb/s.
Intrinsic jitter	< 0.3 UI at 2.97 Gb/s reclocked; < 0.2 UI at 1.485 Gb/s reclocked; < 0.2 UI at 270 Mb/s reclocked (typically < 0.1 UI).
Output connector	2 x BNC on rear panel, 1 per channel.

Optical:

DDT-4632 optical output	0 dBm +4.5/-0 dB CWDM DFB laser.
DDR-4632 optical input	APD detector, -9 to -27 dBm input level at 3G-SDI, typically < -30 dBm at HD/SD-SDI. PIN detector, -3 to -18 dBm input level at 3G-SDI, typically < -20 dBm at HD/SD-SDI.
Available wavelengths	CWDM DFB laser – 1310/1550nm (standard).
Optical path loss[3, 4]	9 to 27 dB at 3G-SDI, typically >30 dB at HD/SD-SDI, APD detector; 3 to 18 dB at 3G-SDI, typically >20 dB at HD/SD-SDI, PIN detector. (Optical path loss = Laser O/P power – Detector I/P power)
Optical fibre	Designed for use with 9/125 µm single mode fibre.
Optical connector	2 x SC/PC (standard) on rear – direct connection to main card, 1 per channel; 1 x SC/PC (standard) with WDM option fitted.

Power Requirements:

Voltage	28 Vac CT (14-0-14) or ±16 Vdc.
Power consumption	DDT-4632 <5.0 VA, DDR-4632 <5.0 VA.

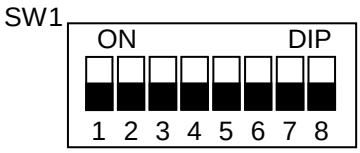
Other:

Temperature range		0 - 50° C ambient.
Mechanical		For mounting in IRT 19" rack chassis with input, output and power connections on the rear panel.
Finish	**Front panel**	Grey, black lettering & red IRT logo.
	Rear assembly	Detachable silk-screened PCB with direct mount connectors to Eurocard and external signals.
Dimensions		6 HP x 3 U x 220 mm IRT Eurocard.
Optional accessories		On-board 1310/1550nm WDM combiner.
WDM option order codes		DDT-4632/WDM & DDR-4632/WDM.

NOTE:	**3**	Typical values based using DFB laser. Optical attenuators supplied for DDR-4632 when optical path loss is less than 3dB for PIN detector and 9dB for APD detector.
	4	With WDM option fitted for combined use on a single fibre, optical path loss is reduced by approximately 2dB.

CONFIGURATION

User DIP switch settings:



DDT-4632:

	DIP Switch	
Tx1 Input Rate	**SW1-1**	**SW1-2**
3G/HD/SD (Auto detect)	OFF	OFF
SD only	ON	OFF
HD and SD only	OFF	ON
Bypass Reclocker	ON	ON

	DIP Switch	
Tx2 Input Rate	**SW1-3**	**SW1-4**
3G/HD/SD (Auto detect)	OFF	OFF
SD only	ON	OFF
HD and SD only	OFF	ON
Bypass Reclocker	ON	ON

SW1-5 OFF Enable Laser - laser is always enabled: 'keep link alive' signal when no input signal is present.

ON Auto Laser – laser is enabled only when an input signal is present.

SW1-6 OFF Enable automatic input changeover to both Tx optical outputs on loss of either input.
IN 1 → both Tx1 & Tx2 optical outputs on loss of IN 2, or
IN 2 → both Tx1 & Tx2 optical outputs on loss of IN 1).

ON Disable automatic input changeover.

SW1-7 OFF DIP switch control.

ON SNMP control.

SW1-8 OFF Enable major and minor SNMP alarms to the frame Agent (CDM card)[5].

ON Disable major and minor SNMP alarms to the frame Agent (CDM card)[5].

NOTE: 5 When using TRAPS via SNMP, depending on how system is set up, in order to avoid double reporting of alarms via the DDT-4632 card and the CDM card (SNMP Agent) of the frame, major and minor SNMP alarms that are reported to the CDM card of the frame can be disabled.

DDR-4632:

	DIP Switch	
Rx1 Output Rate	**SW1-1**	**SW1-2**
3G/HD/SD (Auto detect)	OFF	OFF
SD only	ON	OFF
HD and SD only	OFF	ON
Bypass Reclocker	ON	ON

	DIP Switch	
Rx2 Output Rate	**SW1-3**	**SW1-4**
3G/HD/SD (Auto detect)	OFF	OFF
SD only	ON	OFF
HD and SD only	OFF	ON
Bypass Reclocker	ON	ON

SW1-5 Not used.

SW1-6 OFF Disable automatic input changeover.
ON Enable automatic input changeover to both Rx outputs on loss of either optical input.
Rx 1 → both OUT 1 & OUT 2 signal outputs on loss of optical Rx 2, or
Rx 2 → both OUT 1 & OUT 2 signal outputs on loss of optical Rx 1).

SW1-7 OFF DIP switch control.
ON SNMP control.

SW1-8 OFF Enable major and minor SNMP alarms to the frame Agent (CDM card)[6].
ON Disable major and minor SNMP alarms to the frame Agent (CDM card)[6].

NOTE: 6 When using TRAPS via SNMP, depending on how system is set up, in order to avoid double reporting of alarms via the DDR-4632 card and the CDM card (SNMP Agent) of the frame, major and minor SNMP alarms that are reported to the CDM card of the frame can be disabled.

INSTALLATION

Pre-installation:

Handling:

This equipment may contain or be connected to static sensitive devices and proper static free handling precautions should be observed.

Where individual circuit cards are stored, they should be placed in antistatic bags. Proper antistatic procedures should be followed when inserting or removing cards from these bags.

Power:

AC mains supply: Ensure that operating voltage of unit and local supply voltage match and that correct rating fuse is installed for local supply.

DC supply: Ensure that the correct polarity is observed and that DC supply voltage is maintained within the operating range specified.

Earthing:

The earth path is dependent on the type of frame selected. In every case particular care should be taken to ensure that the frame is connected to earth for safety reasons. See frame manual for details.

Signal earth: For safety reasons a connection is made between signal earth and chassis earth. No attempt should be made to break this connection.

Installation in frame or chassis:

See details in separate manual for selected frame type.

Signal Connections:

DDT-4632:

The default settings of the DDT-4632 are to automatically operate at either **2.97 Gb/s 3G-SDI**, **1.485 Gb/s HD-SDI** or **270 Mb/s SD-SDI / ASI** signals and do not require any adjustment prior to use, with the exception of DIP switch options described in the *Configuration* section of this manual that also allow SD only, HD/SD only or reclocker bypass modes of operation.

The two transmitter sections of the DDT-4632 act independently from each other in that the signal rates are both independently set.

The serial digital signal connections are made to the BNC connectors on the rear panel. IN 1 is the input to the Tx1 transmitter and IN 2 is the input to the Tx2 transmitter. With DIP switch SW1-6 OFF, if either of the inputs, IN 1 or IN 2, are absent or invalid, the valid input will switch in automatically to drive both Tx1 and Tx2 optical outputs. Upon restoration of a valid signal to the absent/invalid port, the optical transmitter automatically restores back to the condition of IN 1 feeding Tx1 and IN 2 feeding Tx2. With SW1-6 ON, automatic changeover is disabled and only the transmitter with the valid signal present will be outputted.

The OUT 1 BNC connector acts as a monitor port for IN 1, whilst the OUT 2 BNC connector acts as a monitor port for IN 2.

DDR-4632:

The default settings of the DDR-4632 are to automatically operate at either **2.97 Gb/s 3G-SDI**, **1.485 Gb/s HD-SDI** or **270 Mb/s SD-SDI / ASI** signals and do not require any adjustment prior to use, with the exception of DIP switch options described in the *Configuration* section of this manual that also allow SD only, HD/SD only or reclocker bypass modes of operation.

The serial digital signal connections are made to the BNC connectors on the rear panel. Two signal outputs, OUT 1 and OUT 2, are provided. OUT 1 is the signal output of receiver Rx1, whilst OUT 2 is the signal output of receiver Rx2. With DIP switch SW1-6 ON, if either of the optical inputs, Rx 1 or Rx 2, is absent the valid input will switch in automatically to drive both OUT 1 and OUT 2 signal outputs. Upon restoration of a valid signal to the absent Rx fibre port, the receiver automatically restores back to the condition of Rx1 feeding OUT 1 and Rx2 feeding OUT 2. With SW1-6 OFF, automatic changeover is disabled and only the receiver with the valid signal present will be outputted.

Note that BNC connectors IN 1 and IN 2 are not used.

Optical Connections:

Optical connections are made to the panel adapter mounted on a bracket at the rear of the module. Care must be taken to provide a clean surface on the optical connectors and in inserting the plug of the external fibre to prevent damage to the alignment ferrule of the panel adapter. Type of fibre used must be single mode type.

The standard configuration for the DDT-4632 and DDR-4632 has separate optical connectors for the two transmitter (Tx1 & Tx2) and receiver (Rx1 & Rx2) sections. The DDT-4632 Tx1 optical output connector is the upper half of the optical connector, whilst the Tx2 optical output connector is the lower half. Likewise the DDR-4632 Rx1 input connector is the upper half of the optical connector, whilst the Rx2 optical input connector is the lower half.

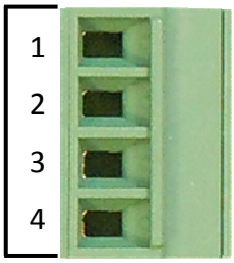
If the DDT-4632 and DDR-4632 are fitted with the optional 1300/1550nm wave division multiplexer (WDM), only one common optical connector is provided with both DDT-4632 Tx1 and Tx2 functions and DDR-4632 Rx1 and Rx2 functions occurring on a single fibre. When operating the DDT-4632 with the WDM option fitted, Tx1 is fitted with a 1310nm laser and Tx2 with a 1550nm laser.

Note that for path lengths ≤ 9 dB for APD detectors, or ≤ 3 dB for PIN detectors, an optical attenuator must be used to avoid over driving the DDR-4632.

Alarm Connections:

The external alarm contact connections are made to the 4 pin phoenix style connector on the rear assembly. On an alarm condition relay contacts go open circuit, that is switch open with respect to ground.

The connections being:



The alarms reported are designated as either Major or Minor.

DDT-4632:

A Major alarm is designated as a laser fail alarm of either Tx1 or Tx2. The relevant front panel LASER LED will also illuminate in a laser failure situation.

A Minor alarm is designated as either input is missing or invalid.

DDR-4632:

A Major alarm is designated as an optical input fail to either detector provided the relevant channel is enabled[7]. The relevant front panel OPTICAL LED will also illuminate in an 'opticalFail' or 'opticalLow' mode.

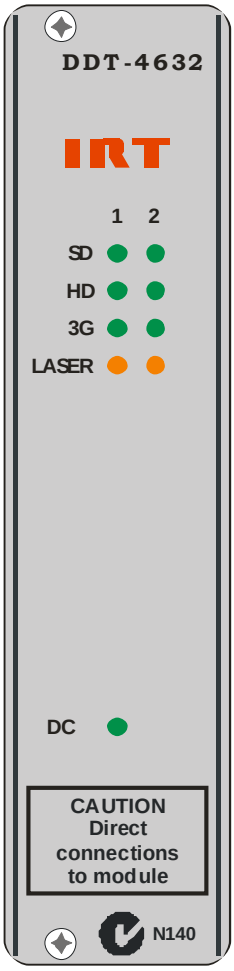
A Minor alarm is designated as the signal output is missing or invalid; OR the optic input level has been deemed to be approaching , or has gone below, its threshold limit[8].

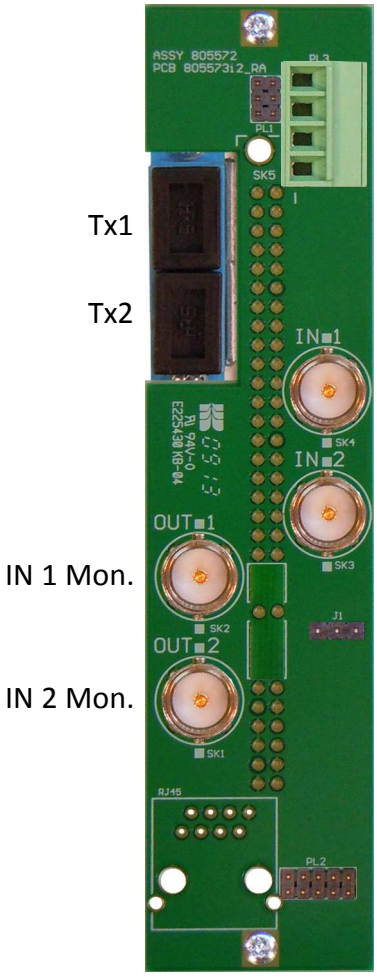
NOTE: **7** It is possible, via SNMP, to disable signal channels on both the DDT-4632 and DDR-4632.

8 This is reported as an 'opticalLow' condition via SNMP. Note that if a received electrical signal is present in this situation, it may be possible that the signal may contain errors if the optical signal level has actually gone below its minimum reliable input level before the output is muted, whence an 'opticalFail' situation would be reported. Therefore accuracy of the received electrical signal should be confirmed if a Minor alarm, or opticalLow, condition is reported by the DDR-4632.

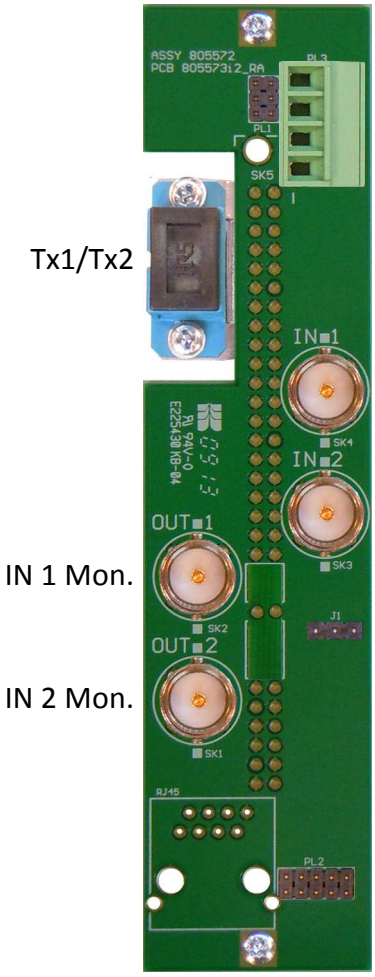
Front & rear panel connector diagrams:

DDT-4632:



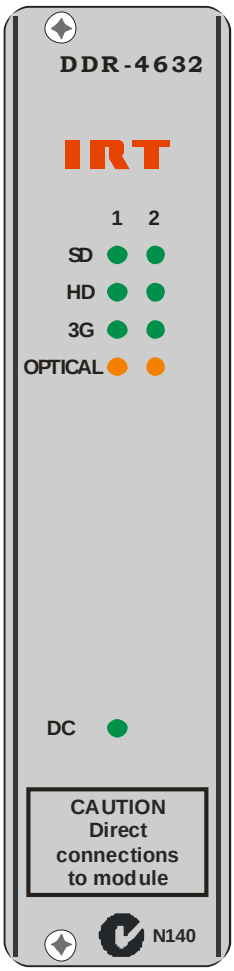


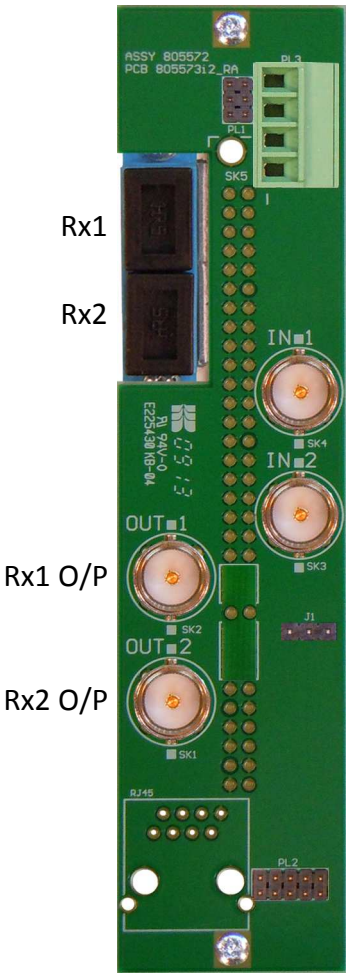
Separate
Tx1 & Tx2 Fibres
(Standard)



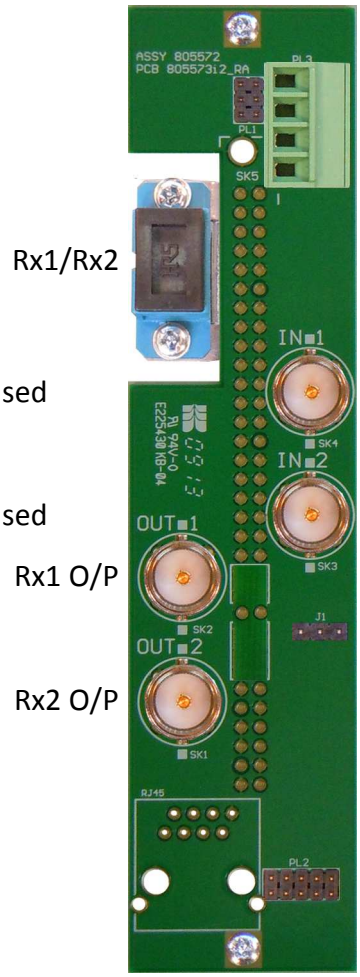
Single Fibre
WDM version
(option)

DDR-4632:





Separate
Rx1 & Rx2 Fibres
(Standard)



Single Fibre
WDM version
(option)

OPERATION

The DDT-4632 is a dual electrical to optical transmitter with two separate laser drivers on the one card. Each laser driver is independent in its operation from the other and is fed with its own independent single channel 3G-SDI, HD-SDI or SD-SDI (or ASI) electrical signal. The standard laser wavelengths are 1310 nm (corresponding to input 1) and 1550 nm (corresponding to input 2), which allow the outputs to be optically multiplexed through a wave division multiplexer (WDM), if required. Other wavelength combinations are available on request.

Likewise the DDR-4632 is a dual optical to electrical receiver with two separate optical detectors on the one card. Each optical detector is independent in its operation from the other and outputs its own independent single channel 3G-SDI, HD-SDI or SD-SDI (or ASI) electrical signal. The detector types available are either dual APD (standard) or dual PIN. The APD detector allows a greater optical path loss, which allows a farther distance optical path, compared to PIN detectors. However, for optical path lengths less than 9dB for APD detectors, or 3dB for PIN detectors, optical attenuators are required so as to not overload the detectors, else damage to the detectors themselves may also occur.

Both the DDT-4632 and DDR-4632 are fully operable with previous IRT single channel 3G, HD or SD fibre links.

Two optical SC/PC connectors (standard) are directly connected to the main card via the rear of the unit. The order of the optical connectors correspond to the same order as the electrical BNC connectors as labelled on the rear assembly.

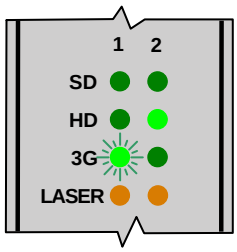
Optionally a two channel wave division multiplexer (WDM) can be directly fitted to both the DDT-4632 and DDR-4632 to allow simultaneous transmission / reception of optical signals on a single fibre.

The default settings of the DDT-4632 and DDR-4632 are set to automatically operate at either 2.97 Gb/s 3G-SDI, 1.485 Gb/s HD-SDI or 270 Mb/s SD-SDI (or ASI). However, either DIP switch or SNMP settings allow the units to be independently set for SD only, SD/HD only or reclocker bypass modes.

2.97 Gb/s 3G-SDI, 1.485 Gb/s HD-SDI or 270 Mb/s (ASI or SDI) type of signals are connected to two 75 Ω BNC connectors (IN 1 and IN 2) of the rear assembly of the DDT-4632 fibre optic transmitter. Front panel LEDs indicates the presence and data rates of valid input signals. OUT 1 and OUT 2 BNC connectors of the DDT-4632 monitor the respective IN 1 and IN 2 signals.

If one of the inputs is not present or if its rate does not match the preset rate of the channel, the other input, if valid, can be automatically switched (if enabled) to both the optical outputs. On resumption of a valid signal the optical transmitters automatically switches back to their respective inputs.

Front panel LEDs indicates the presence of a valid input signals that corresponds to the channel's set data rate. If the input does not match that of the set data rate, for example if the channel's data rate has been set to SD only and it is being fed with another rated signal such as 3G, then the corresponding LED will flash and the signal to the optical driver will be muted. This is also true of the DDR-4632 when it detects a channel signal on its optical input. In this example (shown) both input signals are present, but IN 1 does not match the channel's set data rate (or has been disabled via SNMP, see below).



With the data rate set for bypassed mode, the reclocker is bypassed allowing signals other than 3G-SDI, HD-SDI or SD-SDI to pass through.

If the laser is set for permanent operation, on loss of a valid input signal, a 54MHz oscillator is switched into the optical output so that the optical receiver still recognizes the optical link as being valid. This 54MHz signal does not affect the signal reclocking detector circuitry of the receiver, which is used in signal presence / alarm indication on detection or absence of a valid 3G, HD or SD signal.

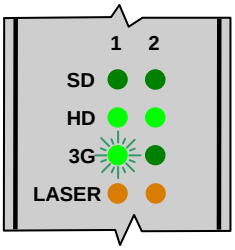
Through the use of SNMP (see separate section of manual) it is possible to remotely monitor and control various functions not available via the local DIP switch control. Such as, for example, it is possible to individually disable the channels on either the DDT-4632 and DDR-4632 locking out an end user's functionality should this be desired. When a channel has been disabled, should an electrical signal be present, the corresponding channel LED will flash - not to be confused with situation where the data rate does not match the set data rate as described above.

The BNC outputs, OUT 1 and OUT 2, of the DDR-4632 receiver are the same signals that were originally inputted to the opposite DDT-4632 transmitter. Front panel green LEDs indicate the presence of a valid locked 3G-SDI, HD-SDI, or an SD-SDI type of output signal. IN 1 and IN 2 BNC connectors of the DDR-4632 card are not used.

In the reclocker bypass mode rates other than the 3G/HD/SD-SDI rates can be sent and received. If the data rate does not match that of 3G-SDI, HD-SDI or SD-SDI all front panel signal data rate LED's will flash to indicate that an unknown data rate has been detected. Likewise an 'unknownPresent' data rate is reported via SNMP.

Front Panel LED Indicators:

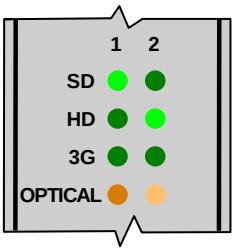
If the Tx (or Rx) input signal rate does not match the set rate the corresponding LED will flash.



In this example the Tx1 section has been set for HD/SD only with its input (IN 1) is being fed with a 3G-SDI source. The 3G LED of Tx1 will flash indicating that its input is at the 3G-SDI rate. The input (IN 2) of Tx2 is being fed with an HD-SDI signal as indicated by the Tx2 HD LED being illuminated. In this particular case the HD LED of Tx1 is also being illuminated indicating that the automatic changeover function is enabled with IN 2 feeding both Tx1 and Tx2 outputs.

Laser failure on the DDT-4632 is indicated by orange illuminated LASER LEDs. In the above example there is no laser failure as indicated by the non-illuminated LASER LEDs.

Optical Low, or optical input failure, on the DDR-4632 is indicated by orange illuminated OPTICAL LEDs. In this example the OPTICAL Rx2 LED is illuminated, but so is the HD Rx2 signal LED. This indicates that an HD signal is being received even though the OPTICAL alarm LED is illuminated, thus the OPTICAL alarm LED is likely to be indicating that the optical signal level is low, or approaching the minimum signal strength allowed before signal failure takes place, whence the receiver output will be muted. This is because the optical alarm threshold is set for the 3G rate, which has a lower optical path loss than the HD and SD rates. Note however that it is still possible for the optical signal strength to be indicating low and still allow an errorred data signal to be received before signal muting takes place. If operating at signal paths close to the recommended maximum specified threshold, signal analysis should be performed to check the accuracy of the link if the OPTICAL Rx LED is illuminated.



SD only, HD/SD only modes:

Note that it is possible to set the unit to operate as an SD rate only or HD/SD rate only mode by use of the DIP switch configuration controls. However in situations where it is desired that the end user does not have control over the intended setup, it is possible to set the unit to the desired rate via SNMP control and to lock it to SNMP only control so that the end user cannot override the setup parameters by use of the DIP switches. This is intended for situations where a link has been leased to a customer who is only paying for a certain data rate path such as SD only or HD/SD only as opposed to the full 3G rate.

SNMP

What Is It?

SNMP stands for Simple Network Management Protocol. It is an application layer protocol for managing IP (Internet Protocol) based systems. SNMP enables system administrators to manage system performance, and to find and solve system problems. SNMP runs over UDP (User Datagram Protocol), which in turn runs over IP.

Three types of SNMP exist: SNMP version 1 (SNMPv1), SNMP version 2 (SNMPv2) and SNMP version 3 (SNMPv3). It is not the intention here to discuss the differences between various versions, only to bring attention to the fact that IRT Electronics modules, fitted with SNMP capability, use SNMPv1.

An SNMP managed network consists of three key components: Network Management Systems (*NMS*), *agents*, and *managed devices*.

An *NMS* is the console through which the network administrator performs network management functions, such as monitoring status (e.g. alarm states) and remote controlling, of a set of managed devices. One or more *NMS*'s must exist on any managed network. Generally the *NMS* is a computer running third party SNMP control software. There are a number of third party SNMP software applications currently available on the market.

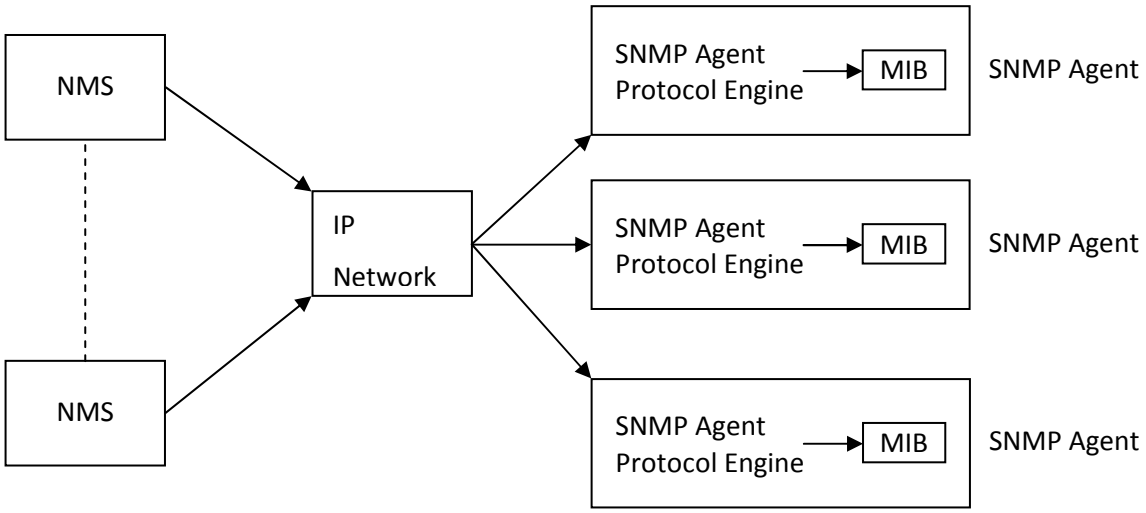
An *NMS* polls, or communicates with, an *agent*. An *agent* is a network management software module that resides in a *managed device*. An *agent* has local knowledge of management information and translates that information into a form compatible with SNMP. The *agent*, therefore, acts as an interface between the *NMS* and the managed devices. The *NMS* sends a request message, and control commands for the managed devices, to the *agent*, which in turn sends a response message, containing information about the *managed devices*, back to the *NMS*.

A *managed device* contains an SNMP *agent* and resides on a managed network. *Managed devices* collect and store management information and make this information available to *NMS*'s using SNMP.

Managed device agent variables are organised in a tree structure known as a Management Information Base (*MIB*). Within the *MIB* are parameters pertaining to the *managed device*. An Object Identifier (OID) number within the *MIB* defines the managed device type. This is a unique number specific to the model of *managed device*. Other information relating to the device is also stored, information such as alarm states, controllable settings, etc. The *MIB* tree is organised in such a way that there will be no two *MIB* files with conflicting placements.

Normally an *NMS* polls an *agent* for information relating to the *MIB* in a managed device to be sent back to the *NMS*. When certain conditions are met within the *MIB*, such as major alarm conditions, for example, the *agent* automatically sends what is known as a *trap* to the *NMS* without any prompting from the *NMS*. This allows automatic notification of a predetermined event.

SNMP Block Diagram



SNMP with IRT Products:

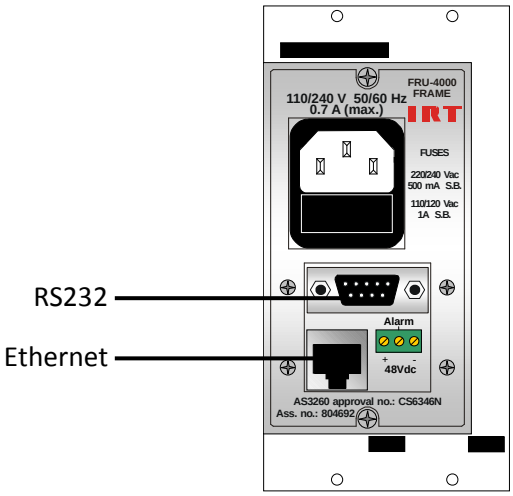
IRT Electronics currently employs SNMPv1 with its SNMP capable frames. The frame acts as an *agent* when fitted with a CDM-xxxx module. This module has its own designated slot next to the power supply so as to not affect the number of modules that the frame will take. Communication between the *NMS*, the frame and its loaded modules are via this CDM-xxxx module. Note that the *NMS* software is third party and not supplied by IRT Electronics.

Ethernet connection for SNMP operation is via an RJ45 connector on the rear of the frame, below the mains inlet. Ethernet rate runs at either 10 baseT or 100 baseT.

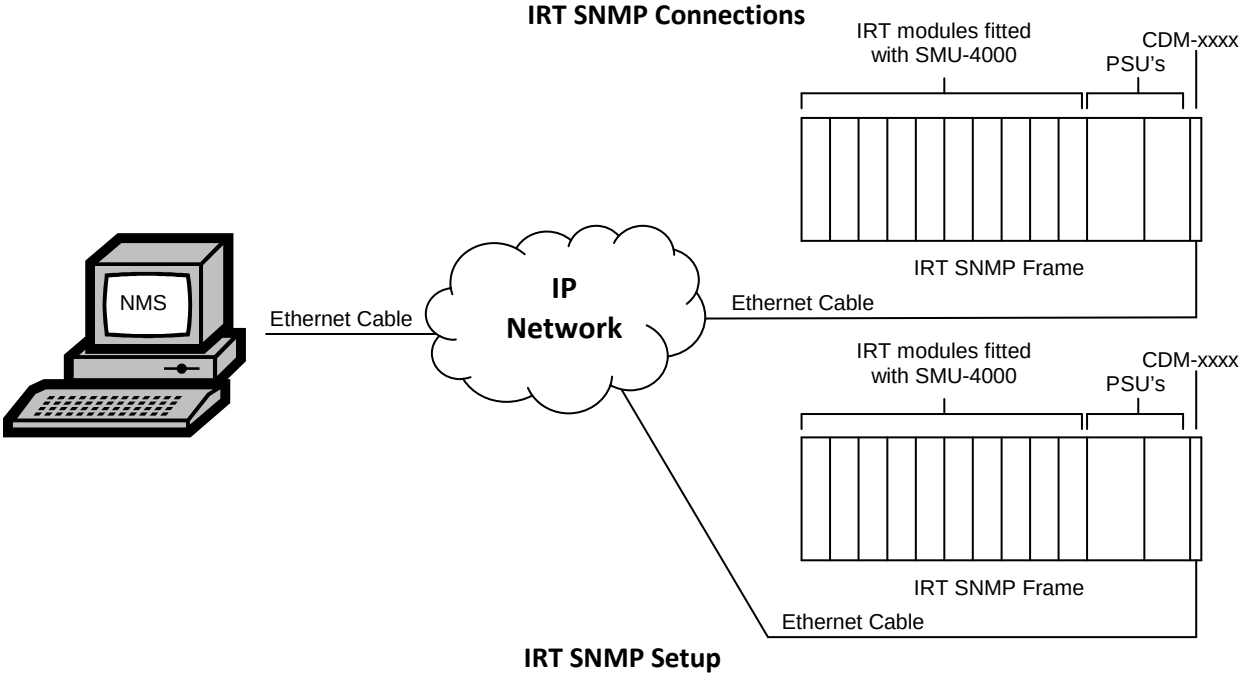
Frame parameters, such as Name, Address and Location, are set via an RS232 interface, a D9 connector on the rear of the frame below the mains inlet. A software terminal emulator, such as Tera Term or HyperTerminal, is used for setting and reading the parameters of the frame.

IRT modules that are SNMP compatible may need an optional plug-in SNMP module with a program relevant to the module that it is plugged into. Depending on the module, besides the module identification, parameters such as alarm states, inputs and controls etc. are communicated to the CDM-xxxx *agent* via a data bus on the rear of the frame. Thus the CDM-xxxx collects information on what is loaded within the frame, what positions they occupy, and their current status for communication to the *NMS* when the *NMS* sends a request for information.

In the event of a major alarm from any of the SNMP compatible modules, or power supplies, a *trap* is automatically sent by the CDM-xxxx *agent* to the *NMS* without any prompting by the *NMS*. This alerts the operator to any fault conditions that may exist that need immediate attention.



IRT SNMP Connections



IRT SNMP Setup

DDT-4632 & DDR-4632 SNMP Functions:

When installed in an IRT frame fitted with SNMP capability, the DDT-4632 and DDR-4632 can be interrogated by an SNMP Network Management System (NMS). The DDT-4632 and DDR-4632 belong to a series of fibre products that share a common framework and object identifier number (OID), when doing an SNMP 'walk' via the NMS the reported identifier in the slot position list is reported as being **irtDxx463x** where the 'x' signifies a wildcard character, in this case a 'D', 'T', 'R' and '2' as in the DDT-4632 & DDR-4632 product numbers. The specific product type and details are revealed when expanding this identifier.

The following SNMP functions are capable of being monitored by an NMS, for SNMP control DIP switch SW1-7 must be set to ON:

DDT-4632:

sysDescr - A description of the unit:
Dual Optical Transmitter

sysObjectID - Object identifier:
irtDDT4632

sysUpTime - A indication of how long the unit has been running since its last power on or reset in Days, Hours, Minutes and Seconds.

sysName - A 16 character writable system name. Default set name:
DDT-4632

irt463xType - An indication of the device type:
(1) ddt4632-Transmitter

alarms - An indication of the alarm type:
(1) noAlarm: No alarms present.
(2) urgent-1: Optical laser Tx1 is faulty.
(3) urgent-2: Optical laser Tx2 is faulty.
(4) urgent-1-2: Both optical lasers Tx1 & Tx2 are faulty.
(5) urgent-1-nonUrg2: Optical laser Tx1 is faulty and input signal IN 2 is absent or invalid.
(6) urgent-2-nonUrg1: Optical laser Tx2 is faulty and input signal IN 1 is absent or invalid.
(7) nonUrgent-1: Input signal IN 1 is absent or invalid.
(8) nonUrgent-2: Input signal IN 2 is absent or invalid.
(9) nonUrgent-1-2: Both input signals IN 1 and IN 2 are absent or invalid.

ctrlMode - The current configuration setting's source as determined by DIP switch SW1-7 position:
(1) pcbSwitches: Configuration set locally via on-board DIP switches (SW1-7 = OFF).
(2) remoteSNMP: Configuration set remotely via SNMP (SW1-7 = ON).
(3) lockToRemoteSNMP: Lock module to SNMP control – overrides SW1-7 position. Note that SW1-7 must be initially ON to be able to set to Lock to SNMP mode. To release send either a (1) or (2).

autoChangeOver - Enable or Disable Automatic Changeover to allow input changeover to both Tx optical outputs on loss of either input:
(1) disabled: Automatic Changeover mode disabled.
(2) enabled: Automatic Changeover mode enabled.
(3) na: Not applicable. Setting this parameter has the same effect as disabled.

channelInfoTable - Information and control of the DDT-4632 in table form.

channelInfoEntry - Table data entry.

channelDesignator - An indication of the channel designator:
(1) ch-1: Signal input IN 1 and Optical Transmitter Tx1 settings column designator.
(2) ch-2: Signal input IN 2 and Optical Transmitter Tx2 settings column designator.

inputStatus - An indication of the signal rate present:
(1) unknownPresent: Signal rate is not one of the 3G/HD/SD-SDI/ASI rates.
(2) sdiSD-ASI-Present: Signal is either an SD-SDI or ASI signal, or at 270 Mb/s rate.
(3) sdiHD-Present: Signal is either an HD-SDI signal, or at 1.485 Gb/s rate.
(4) sdi3G- Present: Signal is either an 3G-SDI signal, or at 2.97 Gb/s rate.
(5) notPresent: No signal is present.

dataRateSet - Control of the signal data rate setting:
(1) sdi3G-HD-SD-ASI: Reclocker set to 3G-SDI, HD-SDI or SD-SDI/ASI rates.
(2) sdiHD-SD-ASI-only: Reclocker set to HD-SDI (1.485 Gb/s) and SD-SDI/ASI (270 Mb/s) rates only.
(3) sdiSD-ASI-only: Reclocker set to SD-SDI/ASI (270 Mb/s) rate only.
(4) bypassed: Reclocker bypassed to allow other signal rates through.
(5) na: Not Applicable. If selected defaults to the *sdi3G-HD-SD-ASI* rate setting.

channelEnable - An indication and control of how and whether the channel is enabled:
(1) notEnabled: The electrical input signals are not enabled.
(2) enabledActive: Electrical signal is both Enabled and Active. Relates to IN 1.
(3) enabledMuted: Electrical signal is Enabled, but the output is Muted when no signal is present or the wrong data rate has been applied.
(4) enabledChangedOver: Reported if *autoChangeOver* is enabled and signal on current input is absent or invalid with a valid signal on opposite input indicating that opposite input is being transmitted.
(5) na: Not Applicable. If selected defaults to current applicable *enabled* setting.

channelAlias - A 16 character maximum Alias (name) for the input signals can be read and set.

blankLine - A line spacing within the table to make reading the table easier.

channelKeepAlive - A substitution of a 54 MHz signal in place of no input signal to keep the optical link active at the receiver end:
(1) on: Keep Alive signal active.
(2) off: Keep Alive signal not active.
(3) na: Not Applicable. If selected defaults to *Off* state.

chanPresTrapEnable - Enable or Disable Traps to be sent when the electrical signal condition changes:
(1) notEnabled: No Traps sent on change of electrical signal presence.
(2) enabled: Traps automatically sent on change of electrical signal presence.
(3) na: Not Applicable. If selected defaults to *notEnabled* setting.

opticalStatus - An indication of how the SFP optical component is functioning:
(1) opticalGood: Laser is present.
(3) opticalFail: Laser has failed or is not present.

waveLength - An indication of the laser wavelength.

detectorType - Applicable to the DDR-4632 only. See explanation for DDR-4632 SNMP function.
(3) na: Not Applicable.

opticalTrapEnable - Enable or Disable Traps to be sent when the optical signal condition changes:
(1) notEnabled: No Traps sent on change of optical signal presence.
(2) enabled: Traps automatically sent on change of optical signal presence.
(3) na: Not Applicable. If selected defaults to *notEnabled* setting.

fpgaVersion - An indication of the firmware version of the microcontroller in the format ‘x.y’, where x is the major revision number and y the minor.

reset - Unit reset control:
(1) normal: when queried reset control returns a ‘normal’ state.
(2) reset: system reset causes ‘sysUpTime’ counter to reset.

DDR-4632:

sysDescr - A description of the unit:
Dual Optical Receiver

sysObjectID - Object identifier:
irtDDR4632

sysUpTime - A indication of how long the unit has been running since its last power on or reset in Days, Hours, Minutes and Seconds.

sysName - A 16 character writable system name. Default set name:
DDR-4632

irt463xType - An indication of the device type:
(2) ddr4632-Receiver

alarms - An indication of the alarm type:
(1) noAlarm: No alarms present.
(2) urgent-1: Optical input is absent.
(7) nonUrgent-1: Optical input is low or received electrical signal is absent or invalid.

ctrlMode - The current configuration setting's source as determined by DIP switch SW1-7 position:
(1) pcbSwitches: Configuration set locally via on-board DIP switches (SW1-7 = OFF).
(2) remoteSNMP: Configuration set remotely via SNMP (SW1-7 = ON).
(3) lockToRemoteSNMP: Lock module to SNMP control – overrides SW1-7 position. Note that SW1-7 must be initially ON to be able to set to Lock to SNMP mode. To release send either a (1) or (2).

autoChangeOver - Enable or Disable Automatic Changeover to allow either optical input to switch to both OUT 1 and OUT 2 signal outputs on loss of other optical input:
(1) disabled: Automatic Changeover mode disabled.
(2) enabled: Automatic Changeover mode enabled.
(3) na: Not applicable. Setting this parameter has the same effect as disabled.

channelInfoTable - Information and control of the DDR-4632 in table form.

channelInfoEntry - Table data entry.

channelDesignator - An indication of the channel designator:
(1) ch-1: Optical Receiver Rx1 and signal output OUT 1 settings column designator.
(2) ch-2: Optical Receiver Rx2 and signal output OUT 2 settings column designator.

inputStatus - An indication of the signal rate present within the received optical signal:
(1) unknownPresent: Signal rate is not one of the 3G/HD/SD-SDI/ASI rates.
(2) sdiSD-ASI-Present: Signal is either an SD-SDI or ASI signal, or at 270 Mb/s rate.
(3) sdiHD-Present: Signal is either an HD-SDI signal, or at 1.485 Gb/s rate.
(4) sdi3G-Present: Signal is either an 3G-SDI signal, or at 2.97 Gb/s rate.
(5) notPresent: No signal is present.

dataRateSet - Control of the signal data rate setting:
(1) sdi3G-HD-SD-ASI: Reclocker set to 3G-SDI, HD-SDI or SD-SDI/ASI rates.
(2) sdiHD-SD-ASI-only: Reclocker set to HD-SDI (1.485 Gb/s) and SD-SDI/ASI (270 Mb/s) rates only.
(3) sdiSD-ASI-only: Reclocker set to SD-SDI/ASI (270 Mb/s) rate only.
(4) bypassed: Reclocker bypassed to allow other signal rates through.
(5) na: Not Applicable. If selected defaults to *sdi3G-HD-SD-ASI* rate setting.

channelEnable - An indication and control of how and whether the channel is enabled:
(1) notEnabled: The electrical output signal is not enabled.
(2) enabledActive: Electrical signal is both Enabled and Active.
(3) enabledMuted: Electrical signal is Enabled, but the output is Muted when no signal is present or the wrong data rate has been applied.
(4) enabledChangedOver: Reported if *autoChangeOver* is enabled and optical signal on current input is absent with a valid optical signal on opposite input indicating that opposite input is being received.
(5) na: Not Applicable. If selected defaults to current applicable *enabled* setting.

channelAlias - A 16 character maximum Alias (name) for the input signals can be read and set.

blankLine - A line spacing within the table to make reading the table easier.

channelKeepAlive - Applicable to DDT-4632 only. See explanation for DDT-4632 SNMP function.
(3) na: Not Applicable.

chanPresTrapEnable - Enable or Disable Traps to be sent when the electrical signal condition changes:
(1) notEnabled: No Traps sent on change of electrical signal presence.
(2) enabled: Traps automatically sent on change of electrical signal presence.
(3) na: Not Applicable. If selected defaults to *notEnabled* setting.

opticalStatus - An indication of how the SFP optical component is functioning:
(1) opticalGood: Optical input level is good.
(2) opticalLow: Optical input level has gone below its minimum input threshold AND electrical signal presence is also reported (may or may not contain signal errors).
(3) opticalFail: Optical input level has gone below its minimum input threshold.

waveLength - Applicable to DDT-4632 only. DDR-4632 always reports:
(16) wideband: Indicates that it is a wideband receiver.

detectorType - An indication of the detector type (PIN or APD) fitted to the DDR-4632.
(1) pin: PIN detector fitted. Suitable for path losses up to 18dB[9] at 3G-SDI rate.
(2) apd: APD detector fitted. Suitable for path losses up to 27dB[10] at 3G-SDI rate.

opticalTrapEnable - Enable or Disable Traps to be sent when the optical signal condition changes:
(1) notEnabled: No Traps sent on change of optical signal presence.
(2) enabled: Traps automatically sent on change of optical signal presence.
(3) na: Not Applicable. If selected defaults to *notEnabled* setting.

fpgaVersion - An indication of the firmware version of the microcontroller in the format 'x.y', where x is the major revision number and y the minor.

reset - Unit reset control:
(1) normal: when queried reset control returns a 'normal' state.
(2) reset: system reset causes 'sysUpTime' counter to reset.

NOTE: 9 Typically > 20dB at HD/SD-SDI rates. Optical attenuator required for optical input levels ≥ -3dBm.

10 Typically > 30dB at HD/SD-SDI rates. Optical attenuator required for optical input levels ≥ -9dBm.

MAINTENANCE & STORAGE

Maintenance:

No regular maintenance is required.

Care however should be taken to ensure that all connectors are kept clean and free from contamination of any kind. This is especially important in fibre optic equipment where cleanliness of optical connections is critical to performance.

Storage:

If the equipment is not to be used for an extended period, it is recommended the whole unit be placed in a sealed plastic bag to prevent dust contamination. In areas of high humidity a suitably sized bag of silica gel should be included to deter corrosion.

Where individual circuit cards are stored, they should be placed in antistatic bags. Proper antistatic procedures should be followed when inserting or removing cards from these bags.

WARRANTY & SERVICE

Equipment is covered by a limited warranty period of three years from date of first delivery unless contrary conditions apply under a particular contract of supply. For situations when "**No Fault Found**" for repairs, a minimum charge of 1 hour's labour, at IRT's current labour charge rate, will apply, whether the equipment is within the warranty period or not.

Equipment warranty is limited to faults attributable to defects in original design or manufacture. Warranty on components shall be extended by IRT only to the extent obtainable from the component supplier.

Equipment return:

Before arranging service, ensure that the fault is in the unit to be serviced and not in associated equipment. If possible, confirm this by substitution.

Before returning equipment contact should be made with IRT or your local agent to determine whether the equipment can be serviced in the field or should be returned for repair.

The equipment should be properly packed for return observing antistatic procedures.

The following information should accompany the unit to be returned:

1. A fault report should be included indicating the nature of the fault
2. The operating conditions under which the fault initially occurred.
3. Any additional information, which may be of assistance in fault location and remedy.
4. A contact name and telephone and fax numbers.
5. Details of payment method for items not covered by warranty.
6. Full return address.
7. For situations when "**No Fault Found**" for repairs, a minimum charge of 1 hour's labour will apply, whether the equipment is within the warranty period or not. Contact IRT for current hourly rate.

Please note that all freight charges are the responsibility of the customer.

The equipment should be returned **to the agent who originally supplied the equipment** or, where this is not possible, to IRT directly. Details of IRT's direct address can be found at IRT Electronics' website.

Web address: www.irtelectronics.com

Email: sales@irtelectronics.com