

8-Channel HD/SD-SDI/ASI Fibre Optic Link



User Manual

Table of Contents:

Section	Page
Revision History	2
Operational Safety	4
Block Diagram	5
General Description	6
Technical Specifications	7
Configuration	8
Installation	10
Signal Connections	10
Front and rear layouts	11
Operation	12
SNMP – What Is It?	13
SNMP Functions	15
DDT-4638	15
DDR-4638	16
Maintenance & Storage	17
Warranty & Service	17

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.

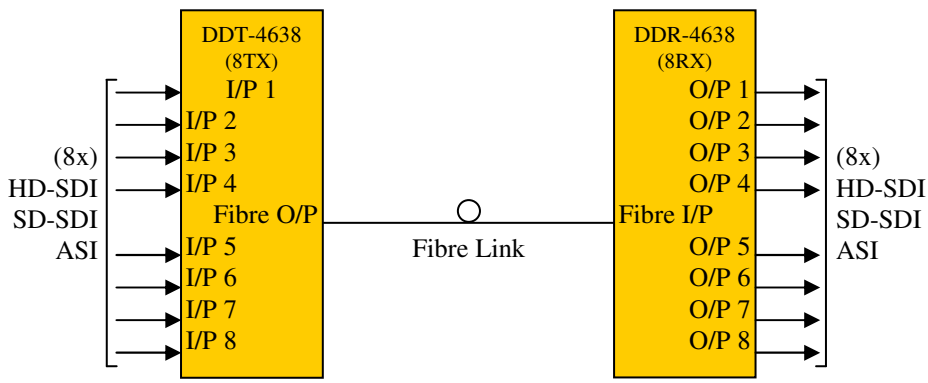
DANGER

Invisible LASER radiation-
Avoid direct exposure to beam

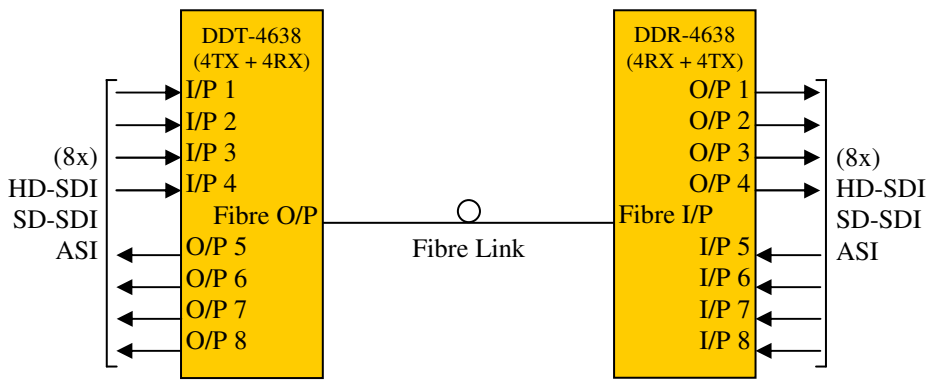
Peak power	2 mW
Wavelength	1270–1610nm

Class 1 LASER Product

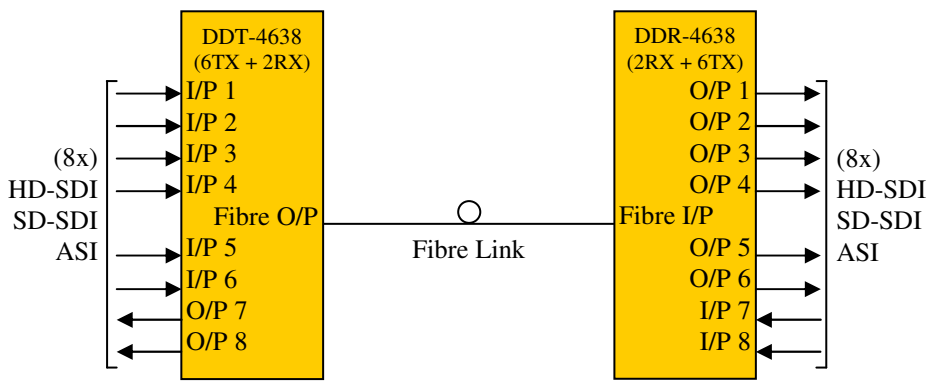
BLOCK DIAGRAM DDT-4638 & DDR-4638 SIGNAL PATH



BLOCK DIAGRAM DTR-4638/4TX+4RX & DTR-4638/4RX+4TX SIGNAL PATH



BLOCK DIAGRAM DTR-4638/6TX+2RX & DTR-4638/2RX+6TX SIGNAL PATH



GENERAL DESCRIPTION

The DDT-4638, DDR-4638 & DTR-4638 are 8 channel modules designed principally for use as eight serial data fibre optic transmission links on a single fibre for HD SDI or SD SDI applications conforming to SMPTE standards 424M, 292M and 259M-C using 9/125 μm single mode fibre. This enables the use of space saving fibre optic cable for reliable transmission of digital video signals over lengths greater than can be achieved with coaxial cable.

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

The receivers use either PIN or APD detectors with signal conditioning and reclocking circuits. The data rates are automatically set to match the HD SDI or SD SDI/ASI rates dependent on the actual input data rates to the transmitters. A PIN detector version is also available for short run applications.

The modules are compatible with IRT's single channel fibre cards for use as eight independent fibre paths starting from or coming to a single location when used in conjunction with an external 8 channel CWDM optical combiner/de-combiner.

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

The DDT-4638 and DDR-4638 are Eurocard modules designed to fit IRT's current range of standard Eurocard frames and may be used alongside any other of IRT's analogue or digital Eurocards.

Standard features:

- **Transports up to 8 independent HD-SDI, SD-SDI or ASI signal rates on a single fibre via an on-board CWDM optical combiner..**
- **Transports 1.485 Mb/s HD-SDI or 270 Mb/s SD-SDI & ASI signals.**
- **Hot pluggable fibre connections.**
- **Path lengths up to 5 to 24 dB optical path loss using 9/125 μm single mode fibre and APD receivers.**
- **Path lengths 0-17dB for PIN receivers.**
- **The DTR-4638 can be factory configured as either 8Tx, 8Rx, 4Tx+4Rx, 4Rx+4Tx, 6Tx+2Rx or 6Rx+2Tx.**
- **OLED front panel display and external alarm contacts.**
- **Remote monitoring via SNMP.**

TECHNICAL SPECIFICATIONS

DDT-4638:

Input serial data signal	1.485 Gb/s (HD-SDI) to SMPTE 292M; 270 Mb/s (SD-SDI) to SMPTE 259M and DVB-ASI.
Input impedance	75 Ω.
Input return loss	> 15 dB 5 MHz to 1.5 GHz
Automatic Cable compensation	> 30 m at 1.485 Gb/s with Belden 1694A (typ. 170m); > 50 m at 270 Mb/s with Belden 8281 (typ. > 300m).
Input Connector	8 (1 per channel), BNC on rear panel.

DDR-4638:

Number of outputs	8 (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
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	< 0.2 UI at 1.485 Gb/s reclocked; < 0.2 UI at 270 Mb/s reclocked (typically < 0.1 UI).
Output Connector	8 (1 per channel), BNC on rear assembly.

Optical:

DDT-4638 optical output	0 dBm +4.5/-0 dB CWDM DFB laser.
DDR-4638 optical input	APD detector, -5 to -24 dBm input level PIN detector, <-14 dBm input level.
Optical avelengths	CWDM DFB laser - 1610nm, 1590nm, 1570nm 1550nm, 1530nm, 1510nm, 1490nm & 1470nm.
Optical path loss¹	APD detector 5 to 24 dB, typically > 27 dB PIN detector <14 dB, typically >18 dB (Optical path loss = Laser O/P power – Detector I/P power)
Optical fibre	Designed for use with 9/125 µm single mode fibre.
Optical connectors	1, SC/PC on rear assembly.

Power Requirements:

Voltage	28 Vac CT (14-0-14) or ±16 Vdc.
Power consumption	<6.0 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	Grey background, black lettering & red IRT logo.
Front panel	
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	SMU-4000 SNMP plug in module for use with 4000 series frame fitted with SNMP "Agent".

NOTE: 1 Typical values based using DFB laser. Optical attenuator required for DDR-4638 when optical path loss is less than 9dB for APD detector.

CONFIGURATION

DIP switch settings:

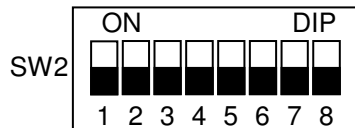
DDT/R-4638:



DATA RATE	CHANNEL 1-8	
	SW1-1	SW1-2
Any Rate	OFF	OFF
SD-SDI / ASI	ON	OFF
HD-SDI, SD-SDI / ASI	OFF	ON
Bypass Reclocker	ON	ON

- SW1-3 OFF** Enable major and minor SNMP alarms to the frame Agent (CDM card)².
- ON** Disable major and minor SNMP alarms to the frame Agent (CDM card)².
- SW1-4 OFF** Enable SNMP control.
- ON** Enable DIP switch control.
- SW1-5 OFF** Auto
- ON** Manual
- SW1-6** Not Used.
- SW1-7** Not Used.
- SW1-8** Not Used.

NOTE: ² When using TRAPS via SNMP, depending on how system is set up, in order to avoid double reporting of alarms via the DDT-4620 and DDR-4620 cards themselves 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.



- SW2-1 OFF** Channel 1 Transmitter (BNC Input)
- ON** Channel 1 Receiver (BNC Output)
- SW2-2 OFF** Channel 2 Transmitter (BNC Input)
- ON** Channel 2 Receiver (BNC Output)
- SW2-3 OFF** Channel 3 Transmitter (BNC Input)
- ON** Channel 3 Receiver (BNC Output)
- SW2-4 OFF** Channel 4 Transmitter (BNC Input)
- ON** Channel 4 Receiver (BNC Output)
- SW2-5 OFF** Channel 5 Transmitter (BNC Input)
- ON** Channel 5 Receiver (BNC Output)
- SW2-6 OFF** Channel 6 Transmitter (BNC Input)
- ON** Channel 6 Receiver (BNC Output)
- SW2-7 OFF** Channel 7 Transmitter (BNC Input)
- ON** Channel 7 Receiver (BNC Output)
- SW2-8 OFF** Channel 8 Transmitter (BNC Input)
- ON** Channel 8 Receiver (BNC Output)

NOTE: Only active when DIP1-5 is ON

DDT-4638 & DDR-4638



- SW3-1 OFF** Channel 8 Optical Transmitter Disabled (only for SFP lasers)
ON Channel 8 Optical Transmitter Enabled (only for SFP lasers)
- SW3-2 OFF** Channel 7 Optical Transmitter Disabled (only for SFP lasers)
ON Channel 7 Optical Transmitter Enabled (only for SFP lasers)
- SW3-3 OFF** Channel 6 Optical Transmitter Disabled (only for SFP lasers)
ON Channel 6 Optical Transmitter Enabled (only for SFP lasers)
- SW3-4 OFF** Channel 5 Optical Transmitter Disabled (only for SFP lasers)
ON Channel 5 Optical Transmitter Enabled (only for SFP lasers)
- SW3-5 OFF** Channel 4 Optical Transmitter Disabled (only for SFP lasers)
ON Channel 4 Optical Transmitter Enabled (only for SFP lasers)
- SW3-6 OFF** Channel 3 Optical Transmitter Disabled (only for SFP lasers)
ON Channel 3 Optical Transmitter Enabled (only for SFP lasers)
- SW3-7 OFF** Channel 2 Optical Transmitter Disabled (only for SFP lasers)
ON Channel 2 Optical Transmitter Enabled (only for SFP lasers)
- SW3-8 OFF** Channel 1 Optical Transmitter Disabled (only for SFP lasers)
ON Channel 1 Optical Transmitter Enabled (only for SFP lasers)

NOTE: Active irrespective of DIP1-5
For units with lasers, the OLED front panel display will indicate a small laser power bar graph for each laser wavelength and display “disabled” if a particular channel has been 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:

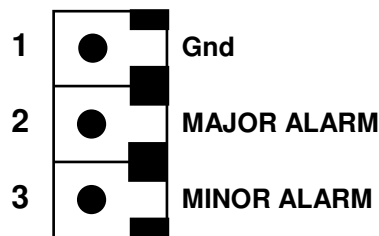
The DDT-4638 and DDR-4638 are set up to automatically or manually operate at either **HD-SDI** or **SD-SDI / ASI** signal rates and do not require any adjustment prior to use, with the exception the DIP switch options described in the *Configuration* section of this manual. There are no external controls on the front panel of the units.

Optical connections are made via the SC/PC optical connector mounted on the rear of the modules. Care must be taken to provide a clean surface on the optical connectors. Type of fibre used must be single mode type.

The serial digital signal connections are made to the BNC connectors on the rear panels.

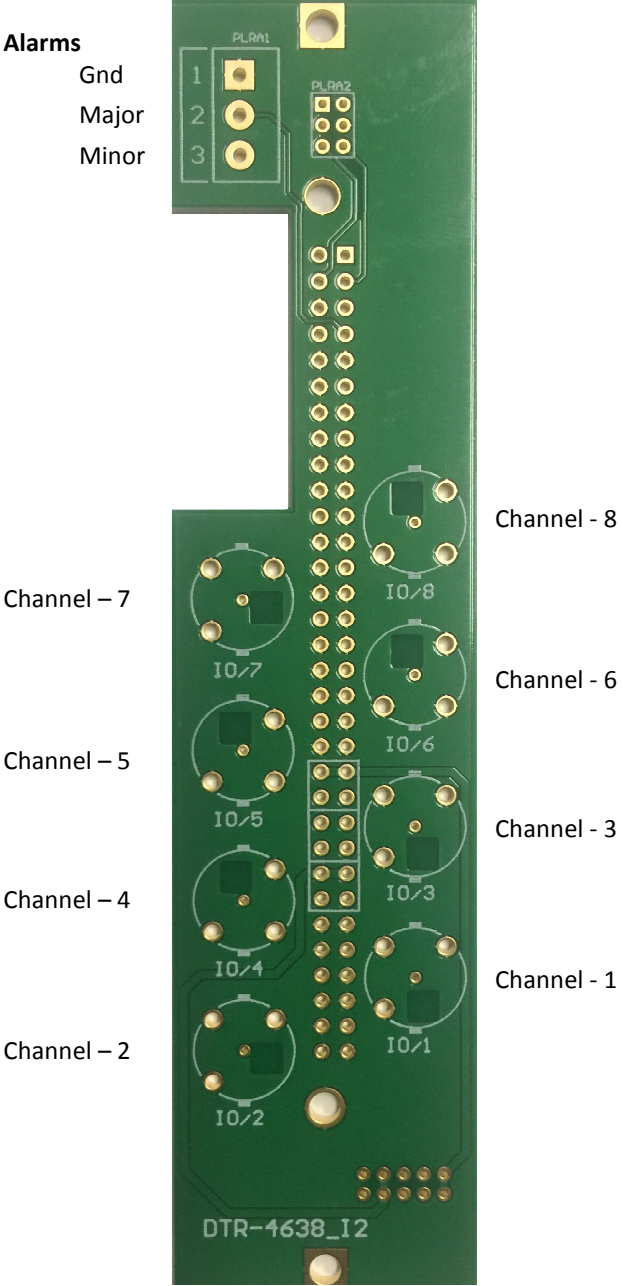
External alarm contact connections to the DDT/R-4638 are made to the 3 pin phoenix style connector at the top of the rear assembly. On an alarm condition relay contacts go open circuit, that is switch open with respect to ground, when the input optical signal level is low or not present.

The connections being:



Front & rear panel connector diagrams:

Rear Assembly for
For both DDT-4638 & DDR-4638



OPERATION

The DDT-4638 and DDR-4638 are set up to operate either automatically or at fixed rates corresponding to **HD-SDI** or **SD-SDI** (or **ASI**) rates.

Up to eight independent HD-SDI, SD-SDI or ASI signals are connected to the eight 75 Ω BNC connectors on the rear assembly of the DDT-4638 fibre optic transmitter. Front panel OLED display indicates the presence and rate of valid input signals.

The system will operate with an optical path loss from 5dB to a maximum of 24dB (Typically >26dB) when fitted with an APD detectors, and from 0dB to a maximum of 14dB (Typically >18dB) when fitted with a PIN detectors. For path lengths <9dB optical loss when using an APD detector an optical attenuator is required. The length of fibre that this corresponds to depends on the fibre loss characteristics at the relevant wavelength of the laser module chosen. For example, if the fibre loss characteristic of the chosen fibre is 0.2dB per kilometre at 1550 nm, say, then the maximum distance that can be run is 100 km (20dB/0.2dBkm⁻¹), although connector losses, such as through patch leads etc., should also be taken into consideration when calculating maximum distances. Actual attenuation versus wavelength characteristics depends upon optic fibre manufacturer's own specifications.

For each channel, both at the transmitter and receiver, the front panel OLED display shows the rate and optical power. Optical power at the transmitter will be high unless the laser channel has been disabled. The optical power at the receiver uses a three level bar graph. All three bars is good, two bars indicate amount of path loss. One bar is low optical level and no bars indicates optical loss.

Major and minor alarms are available on the rear assembly. An alarm is indicated if the alarm is not grounded which also raises an alarm if module loses power. A major alarm is associated with the optical issues and in the DDT-4638 the alarm is raised when any laser fails or for the DDR-4638 if any input optical wavelength is lost. The minor alarm is for the presence of channel data. For the DDT-4638 a minor alarm is indicated when any cable input is lost or for the DDR-4638 if any channel is lost.

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 I.R.T. Communications 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.

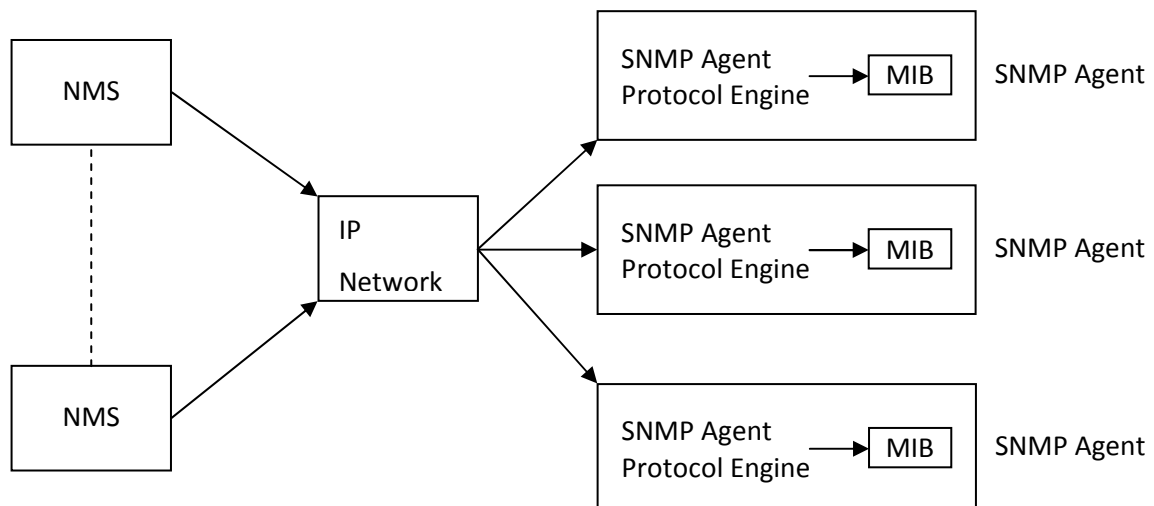
An *NMS* polls, or communicates with, an *agent*. An *agent* is a network management software module that resides in a *managed device*. An *agent* has local knowledge of management information and translates that information into a form compatible with SNMP. The *agent*, therefore, acts as an interface 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



DDT-4638 & DDR-4638

SNMP with IRT Products:

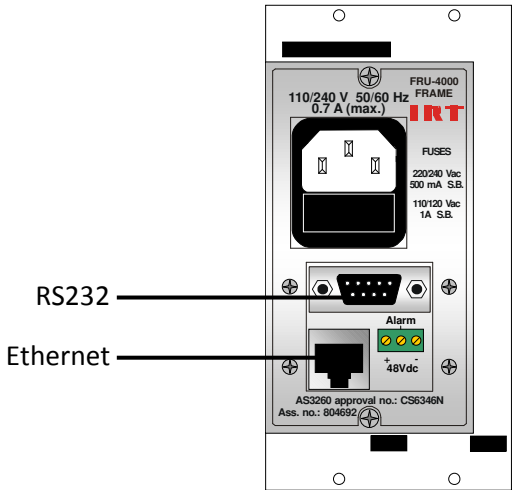
I.R.T. Communications currently employs SNMPv1 with its SNMP capable frames. The frame acts as an *agent* when fitted with a CDM-xxxx module. This module has its own designated slot next to the power supply so as to not affect the number of modules that the frame will take. Communication between the *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 I.R.T. Communications.

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.

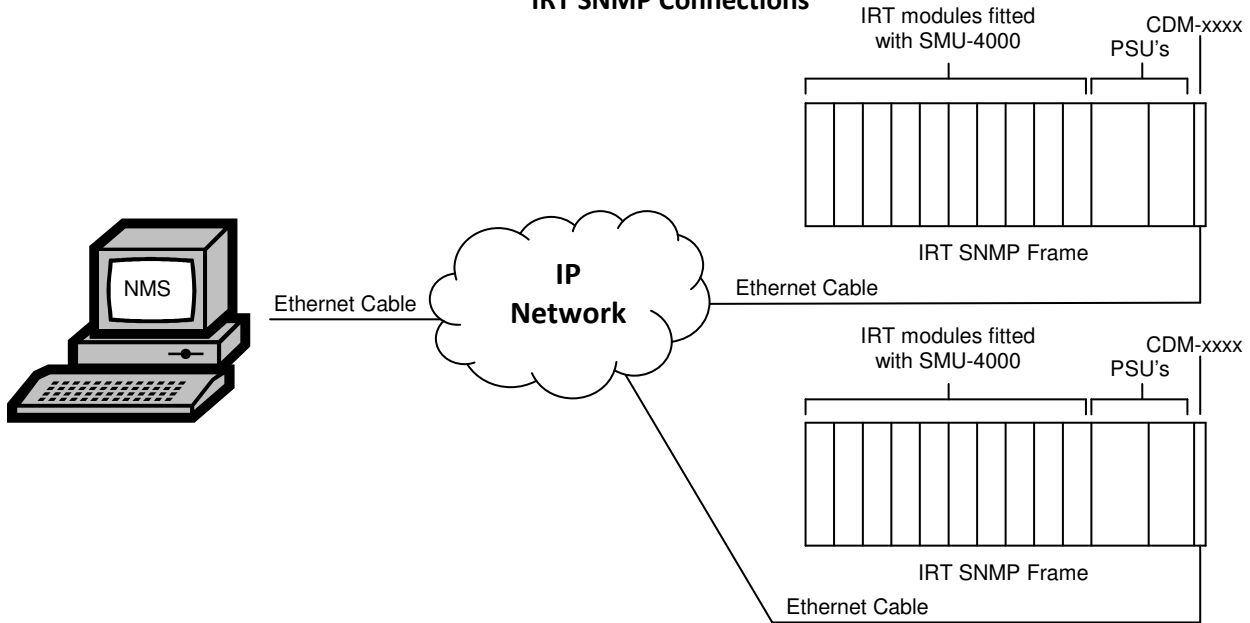
Frame parameters, such as Name, Address and Location, are set via an RS232 interface, a D9 connector on the rear of the frame below the mains inlet. A software terminal emulator, such as Tera Term or HyperTerminal, is used for setting and reading the parameters of the frame.

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

I.R.T. Communications Pty Ltd | www.irtcommunications.com

DDT-4638 & DDR-4638 SNMP Functions:

With the DDT-4638 and DDR-4638 installed in an IRT frame with SNMP capability, these can be interrogated by an SNMP Network Management System (NMS).

The following SNMP functions are capable of being monitored and controlled³ by an NMS:

DDT-4638:

- alarms** - An indication of the state of alarm,
 - (1) noAlarms: No alarms present.
 - (2) UrgentAlarm: Corresponds to a laser failure.
- controlSource** - An indication of the source for board control settings,
 - (1) localDIPsw: DIP switch control (SW1-4 ON).
 - (2) remoteSNMP: SNMP control (SW1-4 OFF).
- channelInfoTable** - Information on each input in table form:
 - channelNumber** - Input channel number (1, to 8).
 - channelPresent** - An indication that the channel input signal is present or not:
 - (1) notPresent: No input signal present on channel.
 - (2) present: Input signal is present on channel.
 - channelWavelength** - An indication of the channel laser wavelength.
 - channelAlias** - A 15 byte maximum Alias (name) for the channel can be read and set.
 - channelTrapEnable** - Trap automatically sent, if enabled, when a channel is first present and when it is first absent.
 - (1) notEnabled.
 - (2) enabled.
- fpgaVersion** - The firmware version of the main FPGA (if fitted) in the format 'x.y', where x is the major revision number and y the minor.
- softwareVersion** - The software version of the main FPGA in the format 'x.y', where x is the major revision number and y the minor.
- reset** - Unit reset control. A set with a value of 2 sent to this OID will cause a system reset to occur. When queried returns a 1.

NOTE: 3 For SNMP control, DIP switch SW1-4 of the relevant card must be in the OFF position.

DDR-4638:

ctrlMode	- An indication of the source for board control settings, (1) remoteSNMP: SNMP control (SW1-4 OFF). (2) pcbSwitches: DIP switch control (SW1-4 ON).
channelTable	- Information on each input in table form:
channelNumber	- Input channel number (1, to 8).
status	- An indication of the channel status: (1) unlocked: Reclocker cannot lock to the channel signal data rate, or no signal actually exists on the channel. (2) locked270Mbps: Signal present on channel is locked to the 270Mb/s rate (such as SD-SDI or ASI). (3) lockedSDI-HD: Signal present on channel is locked to the HD-SDI rate. (4) lockedSDI-3G: Signal present on channel is locked to the 3G-SDI rate.
opticalRx	- An indication of the received optical input power (± 3 dBm accuracy).
dataRate	- An indication, and setting, of the channel data rate reclocker. (1) autoDetect: The reclocker is automatically set to what the signal data rate is (3G, HD or SD data rate). (2) mbps270: The reclocker is set to lock at 270Mb/s rate to suit SD-SDI or ASI types of signals. (3) sdi-HD: The reclocker is set to lock at the HD-SDI rate. (4) sdi-3G: The reclocker is set to lock at the 3D-SDI rate.
reclocker	- An indication, and setting, of whether the reclocker is enabled or not. (1) enabled: The reclocker is enabled so as to lock to 3G, HD or SD data rates, dependent on the 'dataRate' setting. (2) bypassed: The reclocker is bypassed.
channelAlias	- A 15 byte maximum Alias (name) for the channel can be read and set.
statusTrapEnable	- Trap automatically sent, if enabled, when a channel status changes. (1) disabled. (2) enabled.
fpgaVersion	- The firmware version of the main FPGA (if fitted) in the format 'x.y', where x is the major revision number and y the minor.
softwareVersion	- The software version of the Microcontroller in the format 'x.y', where x is the major revision number and y the minor.
reset	- Unit reset control. A set with a value of 2 sent to this OID will cause a system reset to occur. When queried returns a 1.

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 I.R.T. Communications’ website.

Web address: www.irtcommunications.com

Email: sales@irtcommunications.com