



I R T Electronics Pty Ltd A.B.N. 35 000 832 575
26 Hotham Parade, ARTARMON N.S.W. 2064 AUSTRALIA
National: Phone: (02) 9439 3744 Fax: (02) 9439 7439
International: +61 2 9439 3744 +61 2 9439 7439
Email: sales@irtelectronics.com
Web: www.irtelectronics.com

IRT Eurocard

Type DDA-4009

**Dual 1 In, 4 Out 3G/HD/SD/ASI/STM-1
Reclocking / Non-Reclocking
Distribution Amplifier**

Designed and manufactured in Australia

**IRT can be found on the Internet at:
<http://www.irtelectronics.com>**

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Distribution Amplifier****Revision History**

Revision	Date	By	Change Description	Applicable to:
0	12/10/2010	AL	Original Issue.	Firmware version \geq DDA4009F1V3S1V1
1	20/10/2010	AL	Block diagram and rear assembly diagram changed slightly to better reflect how outputs are associated with inputs.	Firmware version \geq DDA4009F1V3S1V1

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Instruction Book

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This instruction book applies to units fitted with firmware version \geq DDA4009F1V3S1V1.

Operational Safety:

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.

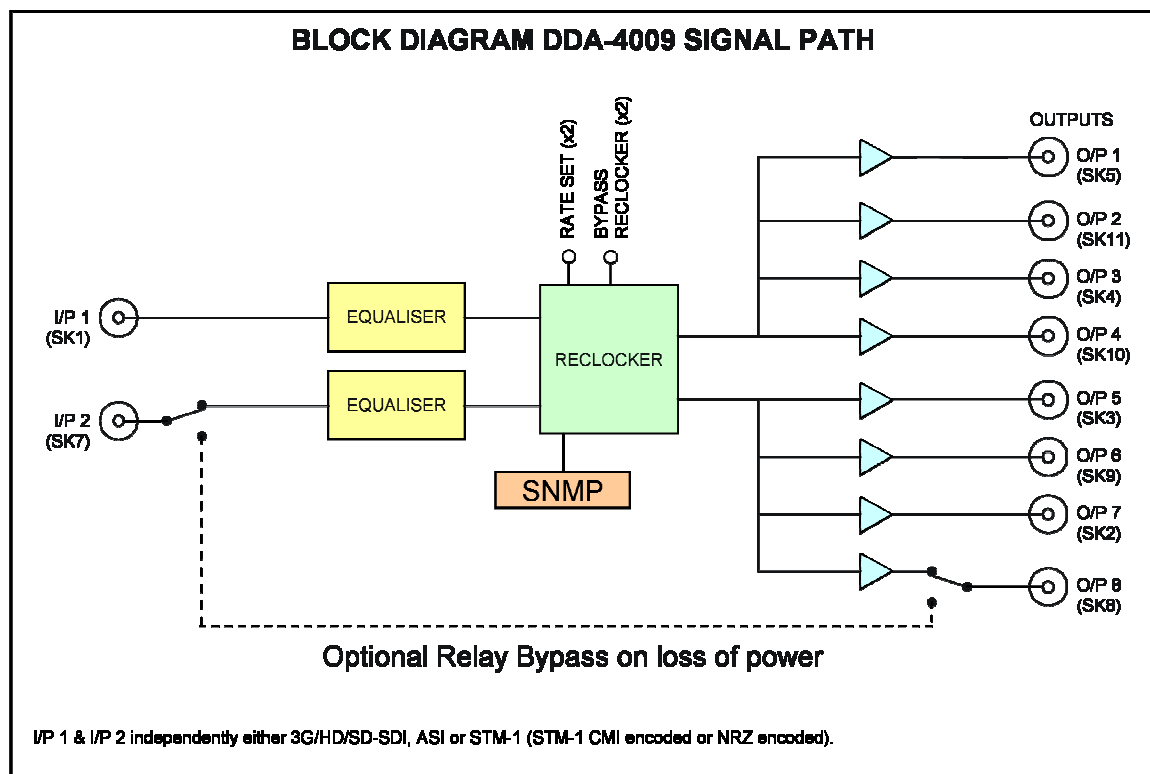
Do not make any adjustments inside equipment with power **ON** unless proper precautions are observed. All internal adjustments should only be made by suitably qualified personnel. All operational adjustments are available externally without the need for removing covers or use of extender cards.

IRT Eurocard

Type DDA-4009

Dual 1 In, 4 Out 3G/HD/SD/ASI/STM-1 Reclocking / Non-Reclocking Distribution Amplifier

General Description



The DDA-4009 serial digital data distribution amplifier provides the user with a single module to cover a wide range of distribution and monitoring functions for 3G/HD/SD-SDI, ASI or STM-1 signals.

Two quad output reclocking / non-reclocking distribution amplifiers are provided on the one card. On board switch settings allow either of the inputs to feed all outputs to create a one in, eight out distribution amplifier.

Where non-reclocking is required, on-board switch settings select between reclocking and non-reclocking modes.

The DDA-4009 will automatically reclock to match the input at either 3G-SDI, HD-SDI, SD-SDI, ASI or STM-1 rates, or can be fixed to operate at any one of these rates. Both sides of the DDA-4009 can be run independently allowing a mixture of signal types to be used.

Front panel LEDs indicate when input signals are present and whether the outputs are locked to the inputs.

An optional relay bypass rear assembly is available to switch one of the Inputs to one of the Outputs in the event of a power failure.

Simple Network Management Protocol (SNMP) is available for remote setup and monitoring of input status and alarm states when used in an IRT frame fitted with SNMP capability.

The DDA-4009 is designed to fit IRT's 4000 series 3RU frame for use with IRT's SNMP system as well as being suitable with IRT's 1000 series 1RU Eurocard frames and may be used alongside any other of IRT's Eurocards.

Standard features:

- 4 in-phase reclocked / non-reclocked outputs on each amplifier.
- Switch selectable for 1 in, 8 out single distribution amplifier operation.
- Selectable for either 3G/HD/SD-SDI, ASI or STM-1 applications.
- Automatic output muting on no input.
- Optional relay bypass on loss of power.
- Front panel indicators provide monitoring of presence of inputs and lock status.
- SNMP monitoring and control.

DDA-4009 Technical Specifications

Data inputs:

Number	2.
Impedance	75 Ω , BNC.
Type	2.97Gb/s 3G-SDI, 1.485Gb/s HD-SDI, 270Mb/s SD- SDI / ASI, or 155Mb/s STM-1 (CMI or NRZ encoded).
Return loss	15dB 5 MHz to 1.485 GHz, 10dB from 1.485 GHz to 2.97 GHz.
Equalisation	Automatic
	100 m at 2.97 Gb/s with Belden 1694A ¹ , 100 m at 1.485 Gb/s with Belden 8281 ¹ , 300 m at 270 Mb/s with Belden 8281 ² .
	NOTE: 1 Reduces to 50m with optional bypass relay.
	2 Reduces to 150m when SW1-4 (I/P 1), SW2-4 (I/P 2) is ON).

Data outputs:

Number	8 (1 in, 8 out; or (2x) 2 in, 4 out)
Type	Reclocked or non-reclocked, switch selectable.
Level	800 mV \pm 10% (3G/HD/SD-SDI / ASI / STM-1 NRZ encoded) or 1.6 V \pm 10% (3G/HD/SD-SDI & ASI only), switch selectable for use with passive splitters; 1.0 V. \pm 10% into 75 Ω (STM-1 CMI encoded).
Impedance	75 Ω , BNC.
Return loss	15dB 5 MHz to 1.485 GHz, 10dB from 1.485 GHz to 2.97 GHz.

Performance:

Reclocking	Automatic or selectable for 2.97Gb/s 3G-SDI, 1.485Gb/s HD-SDI, 270 Mb/s SD-SDI / ASI, or 155 Mb/s STM-1 operation.
Rise Time	3G/HD ~ 100ps; SD ~ 600ps.
Intrinsic jitter	<0.1 UI (measured with up to 300m of Belden 8281 or equivalent cable – reclocked mode).

Indicators:

DC	LED (green) for module power.
CH1 PRES	LED (green) when signal present on channel 1 input.
CH 1 LOCK	LED (green) when channel 1's outputs locked to incoming signal.
CH 2 PRES	LED (green) when signal present on channel 2 input.
CH 2 LOCK	LED (green) when channel 2's outputs locked to incoming signal.

Power requirement:

Voltage	28 Vac CT (14-0-14) or \pm 16 Vdc
Consumption	6 VA

Other:

Temperature range	0 - 50° C ambient.
Mechanical	Suitable for mounting in IRT 19" rack chassis with input, output and power connections on the rear panel.
Finish:	Front panel Grey background, 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.
Standard accessories	Rear connector assembly with matching connector for alarm output.
Optional accessories	ZDA-4009RL relay bypass rear assembly.

Due to our policy of continuing development, these specifications are subject to change without notice.

Configuration

Switch Settings:

SNMP/Local settings:

- SW2-7** ON Configuration of DDA-4009 is controlled via the DIP switch settings as described below;
OFF Configuration of DDA-4009 is controlled through SNMP³.
- SW2-8** ON Disable SNMP alarms⁴;
OFF Enable SNMP alarms⁴.

Inputs to Outputs:

The DDA-4009 can be configured to act as either dual 1 IN, 4 OUT distribution amplifiers or as a single 1 IN, 8 OUT distribution amplifier. DIP switch settings SW1-7 and SW1-8 set the input to output configuration.

Distribution Mode	SW1-7	SW1-8
Input 1 to Outputs 1-4 Input 2 to Outputs 5-8	OFF	OFF
Input 1 to Outputs 1-8	ON	OFF
Input 2 to Outputs 1-8	OFF	ON

Input 1 settings:

Input signal type (rate set)	SW1-1	SW1-2	SW1-3
Auto Detect ⁵	OFF	OFF	OFF
270 Mb/s SD-SDI / ASI	ON	OFF	OFF
1.485 Gb/s HD-SDI	OFF	ON	OFF
2.97 Gb/s 3G-SDI	ON	ON	OFF
STM-1 CMI	OFF	OFF	ON
STM-1 NRZ	ON	OFF	ON

- SW1-4** ON Reduced⁶ cable equalisation;
OFF Normal cable equalisation.
- SW1-5** ON Non-Reclocking mode (Reclocker bypassed). DA behaves as a Non-Reclocking DA;
OFF Reclocking mode. DA behaves as a Reclocking DA.
- SW1-6** ON Output level boost⁷ to 1.6V ± 10% (3G/HD/SD-SDI & ASI only);
OFF Standard output level.

Input 2 settings:

Input signal type (rate set)	SW2-1	SW2-2	SW2-3
Auto Detect ⁵	OFF	OFF	OFF
270 Mb/s SD-SDI / ASI	ON	OFF	OFF
1.485 Gb/s HD-SDI	OFF	ON	OFF
2.97 Gb/s 3G-SDI	ON	ON	OFF
STM-1 CMI	OFF	OFF	ON
STM-1 NRZ	ON	OFF	ON

- SW2-4** ON Reduced⁶ cable equalisation;
OFF Normal cable equalisation.
- SW2-5** ON Non-Reclocking mode (Reclocker bypassed). DA behaves as a Non-Reclocking DA;
OFF Reclocking mode. DA behaves as a Reclocking DA.
- SW2-6** ON Output level boost⁷ to 1.6V ± 10% (3G/HD/SD-SDI & ASI only);
OFF Standard output level.

NOTE: 3 When running in SNMP (Simple Network Management Protocol) mode, DDA-4009 is required to be installed in an IRT frame fitted with SNMP capability.

- 4 When using TRAPS via SNMP, depending on how system is set up, in order to avoid double reporting of alarms via the DDA-4009 card itself 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.
- 5 Auto Detect mode automatically locks reclocker to the correct input signal's clock rate. Automatic rate selection typically takes 0.5 to 2.0 seconds to correctly lock onto the input signal.
- 6 For use with shorter cable runs or use in a noisy environment.
- 7 Output boost applicable to 3G/HD/SD-SDI signals only. Intended for use with a passive splitter only. Generally SW1-6 and SW2-6 should be set to OFF, else over-driving of the following equipments' input circuitry may result.
- 8 When using TRAPS via SNMP, depending on how system is set up, in order to avoid double reporting of alarms via the DDA-4009 card itself 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.

Inputs & Outputs:

For use with supplied standard rear assembly (ZDA-4009) or optional relay bypass rear assembly (ZDA-4009RL).

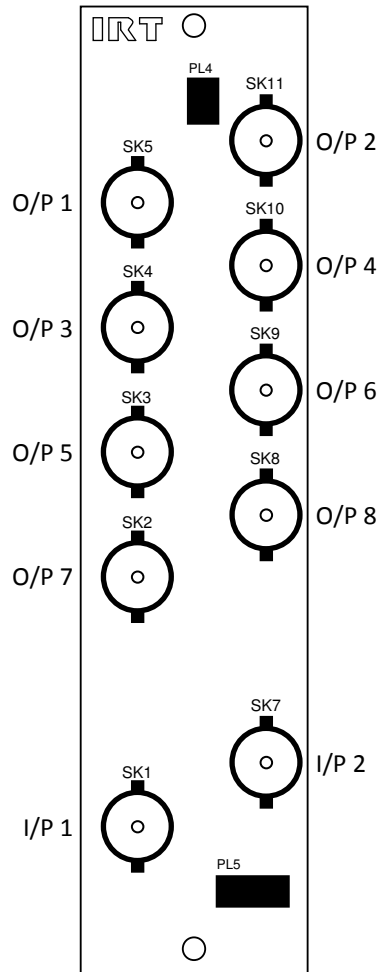
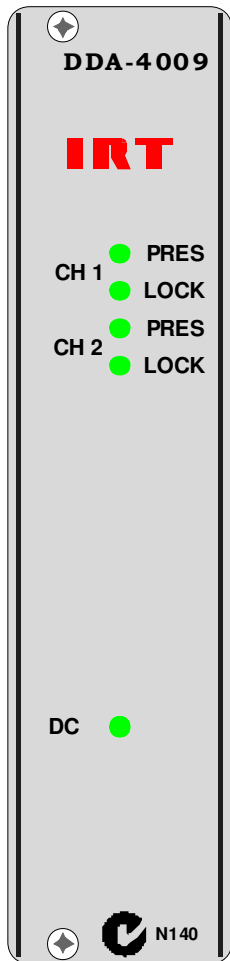
The DDA-4009 can be configured as dual 1 IN, 4 OUT distribution amplifiers, or as a single 1 IN, 8 OUT distribution amplifier as described in the *Configuration* section of this handbook. If set up for a 1 IN, 8 OUT distribution amplifier, either input can be configured as the '1 IN' input. The other input is not used.

Inputs and Outputs are 75 Ω BNC type for connection with high quality 75 Ω coaxial cable. Inputs are self-terminating.

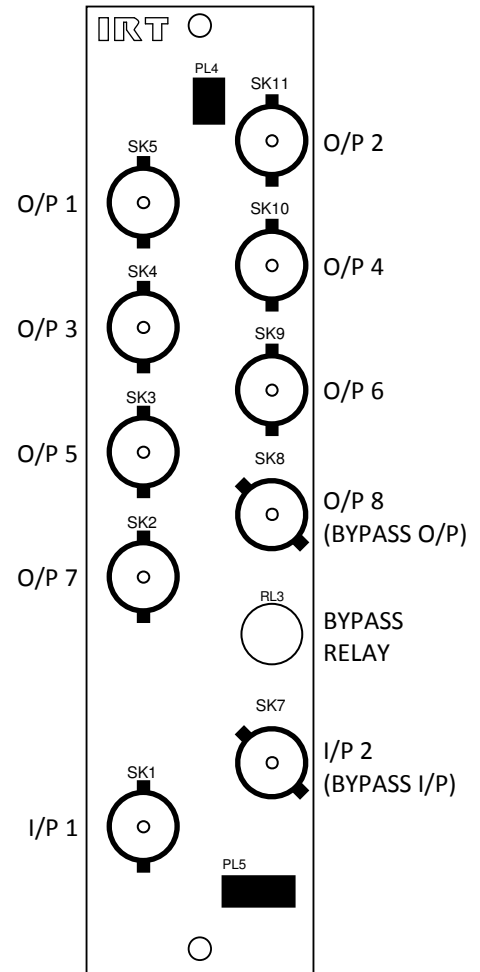
An optional relay bypass rear assembly (ZDA-4009RL) is available where the input 2 (SK7) is outputted to one of the outputs (SK8) on loss of power or removal of the card from the rear assembly itself. The bypass relay is suitable for all specified signals up to 3G-SDI. Note however that the cable equalisation at the 3G/HD-SDI rates is reduced through this relay.

Front & rear panel connector diagrams

The following front panel and rear assembly drawings are not to scale and are intended to show connection order and approximate layout only.



Standard Rear Assembly
(ZDA-4009)



Optional Bypass Rear Assembly
(ZDA-4009RL)

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.

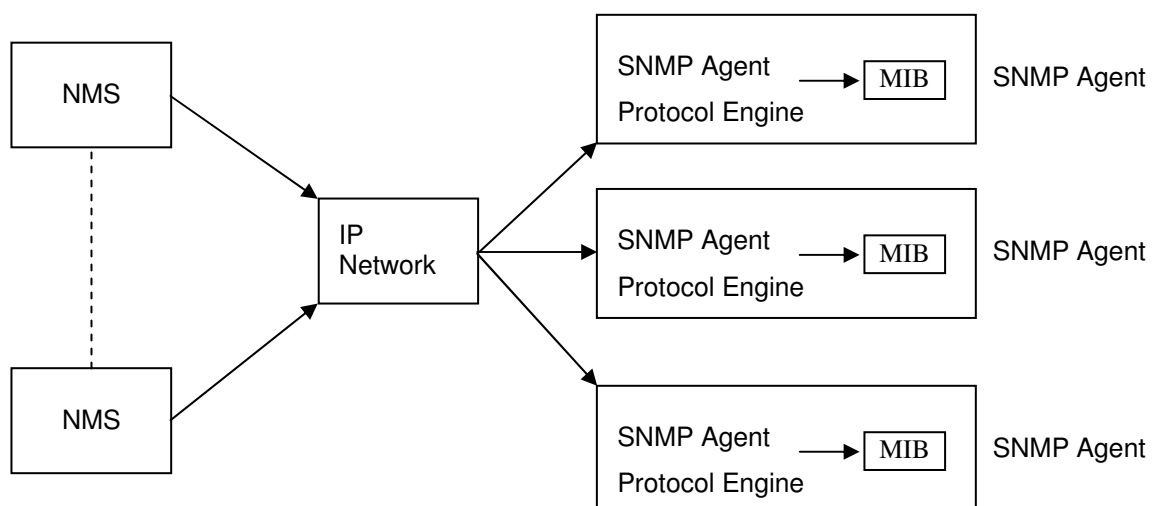
An *NMS* polls, or communicates with, an *agent*. An *agent* is a network management software module that resides in a *managed device*. An *agent* has local knowledge of management information and translates that information into a form compatible with SNMP. The *agent*, therefore, acts as an interface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

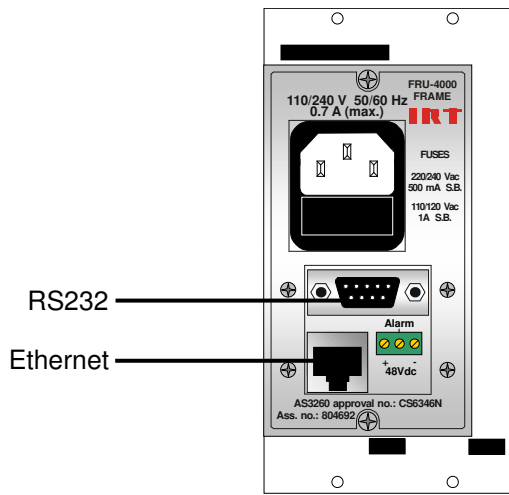
IRT Electronics currently employs SNMPv1 with its SNMP capable frames. The frame acts as an *agent* when fitted with a CDM-xxxx module. This module has its own designated slot next to the power supply so as to not affect the number of modules that the frame will take. Communication between the *NMS*,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

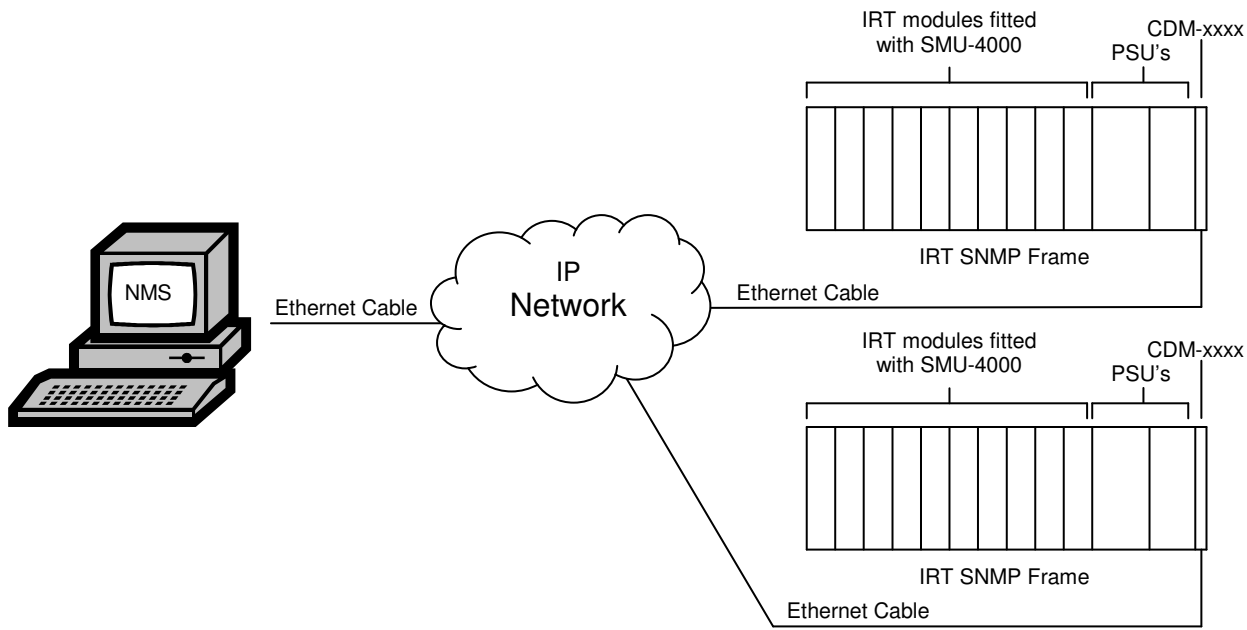
Frame parameters, such as Name, Address and Location, are set via an RS232 interface, a D9 connector on the rear of the frame below the mains inlet. A software terminal emulator, such as Tera Term or HyperTerminal, is used for setting and reading the parameters of the frame.

IRT modules that are SNMP compatible need a plug-in SMU-4000 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

DDA-4009 SNMP Functions:

With the DDA-4009 installed in an IRT frame fitted with SNMP capability, the following SNMP functions can be monitored and controlled by an SNMP Network Management System (NMS):

Alarm States:

- irt4009ddaAlarms
- Read the status of the Urgent and Non-Urgent alarms:
 - (1) noAlarm.
 - (2) nonUrgentAlarm: When used in dual 1 IN, 4 OUT mode a non-urgent alarm is defined as either loss of lock⁹ of input 1 OR loss of lock⁹ of input 2, but not both. When used in a single 1 IN, 8 OUT mode non-urgent alarm is not applicable.
 - (3) urgentAlarm: When used in dual 1 IN, 4 OUT mode an urgent alarm is defined as loss of lock⁹ of input 1 AND loss of lock of input 2, that is on both inputs at the same time. When used in a single 1 IN, 8 OUT mode an urgent alarm is defined as loss of lock⁹ of input.

Modes:

- irt4009ctrlMode
- Read the method of user interaction:
 - (1) snmp: SNMP setting is active.
 - (2) pcbSwitches: Switches SW2-7 set to ON overrides SNMP settings.
- irt4009distMode
- Read and set the distributor mode of configuration of the DDA-4009:
 - (1) ch1x4-ch2x4: DDA-4009 set up to operate as dual 1 IN, 4 OUT DA's.
 - (2) ch1x8: DDA-4009 set up to operate as a single 1 IN, 8 OUT DA with the main input being input 1 (input 2 is not used).
 - (3) Ch2x8: DDA-4009 set up to operate as a single 1 IN, 8 OUT DA with the main input being input 2 (input 1 is not used). If using optional bypass relay rear assembly (ZDA-4009RL), use this setting if a 1 IN, 8 OUT setting is required.

Status:

- channelNo
- Read the input channel number, input 1 or input 2.
- Status
- Read the status of the selected input channel.
 - (1) Unlocked: No input present or input data rate does not match set data rate.
 - (2) lockedSDI-SD—ASI: Input signal present is either an SD-SDI signal or an ASI signal.
 - (3) lockedSDI-HD: Input signal present is an HD-SDI signal.
 - (4) lockedSDI-3G: Input signal present is a 3G-SDI signal.
 - (5) lockedSTM-1e: Input signal is an STM-1 signal conforming to the electrical CMI standard.
 - (6) lockedSTM-1o: Input signal is an STM-1 signal (in electrical form) corresponding to the optical NRZ standard.

Configuration:

- dataRate
- Read and set the reclocker data rate. To set via SNMP DIP switch SW2-7 must be OFF.
 - (1) autoDetect: Input data rate automatically detected and reclocker set to match.
 - (2) sdi-SD--ASI: Reclocker data rate set to 270Mb/s to match either an SD-SDI or ASI data rate. Note, ASI data rate does not refer to ASI payload data rate, but to the 270 Mb/s transport stream carrier.
 - (3) sdi-HD: Reclocker data rate set to 1.485 Gb/s to match an HD-SDI data rate.
 - (4) sdi-3G: Reclocker data rate set to 2.97 Gb/s to match a 3G-SDI data rate.
 - (5) stm-1e: Reclocker data rate set to match an STM-1 signal conforming to the electrical CMI standard.
 - (6) stm-1o: Reclocker data rate set to match an STM-1 signal (in electrical form) corresponding to the optical NRZ standard.
- reclocker
- Read and set the reclocker bypass. To set via SNMP DIP switch SW2-7 must be OFF.
 - (1) enabled: Reclocker enabled. DDA-4009 behaves as a reclocking DA.
 - (2) bypassed: Reclocker bypassed. DDA-4009 behaves as a non-reclocking DA.
- alias
- A 15 byte maximum Alias (name) for the channel can be read and set.
- statusTraps
- Trap automatically sent, if enabled, whenever a channel status changes.

Firmware Version:

irt4009ddaFirmwareVer - The firmware version of the main FPGA in the format 'x.y', where x is the major rev. no. and y the minor.

irt4009ddaSoftwareVer - The software version of the processor in the format 'x.y', where x is the major rev. no. and y the minor.

Other:

irt4009ddaReset - Unit reset control. A set with a value of 2 sent to this OID will cause a system reset to occur. When queried returns 1.

NOTE: 9 Loss of lock can either be a complete loss of input signal, or input signal does not match set reclocker rate.

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 direct as follows.

Equipment Service
IRT Electronics Pty Ltd
26 Hotham Parade
ARTARMON
N.S.W.2064
AUSTRALIA

Phone: 61 2 9439 3744
Email: service@irtelectronics.com

Fax: 61 2 9439 7439