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IRT Eurocard

Type DDA-4280

2.048 Mbps (E1) G.703
Data Distribution Amplifier

Designed and manufactured in Australia

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

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Instruction Book

Table of Contents

This instruction book applies to units later than S/N 0901001.

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-4280
2.048 Mbps (E1) G.703
Data Distribution Amplifier

General Description

The DDA-4280 data distribution amplifier is intended for use with E1 data signals conforming to the ITU Rec. G.703. The DDA-4280 is primarily intended for use in pairs with a double width rear assembly for automatic path protection applications, although it is supplied as standard with its own rear assembly for stand-alone applications.

Four outputs are provided at the rear of the module with an additional output for monitoring purposes on the front panel. One output (O/P 1) is controlled by relays to provide a bypass signal from the input in the event of a power failure.

Indicators are provided on the front panel for:

Data loss
AIS detect
Module in service
Module in standby

Changeover inhibit and changeover request switches are provided on the front panel for use where modules are linked in pairs for redundancy. For this configuration the double width rear assembly is needed to link the logic sections of two modules.

When used as a distribution amplifier the DDA may be housed in any of IRT's standard Eurocard frames. When used in pairs for handshake operation only 3 RU chassis types may be used so that the double width rear assembly may be used.

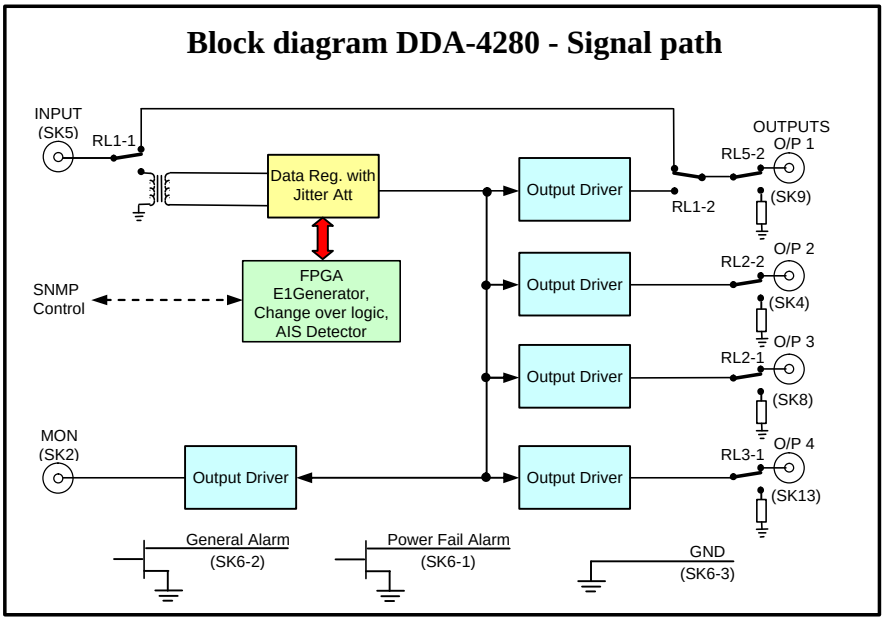
The DDA-4280 is also equipped with Simple Network Management Protocol (SNMP) monitoring so that status and alarms can be remotely monitored and controlled via an Ethernet connection. This function is only available when the unit is housed in an IRT 4000 series frame fitted with an SNMP agent module.

Standard features:

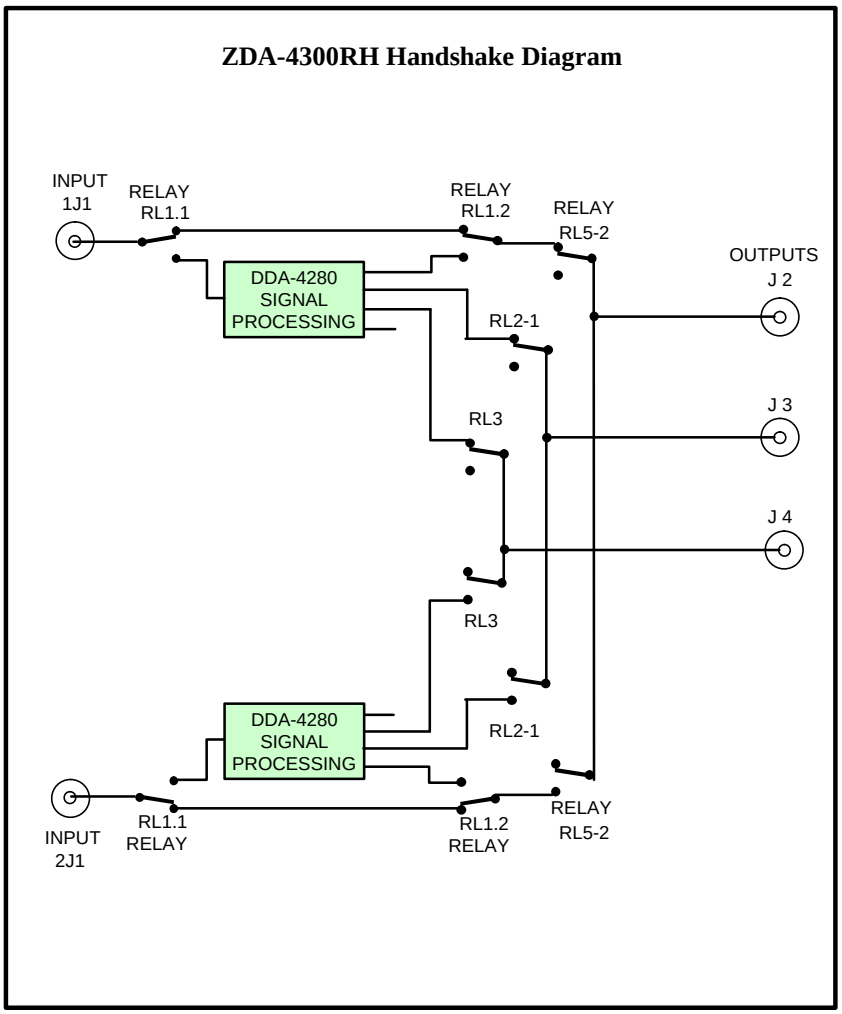
- **Data regeneration with Jitter Attenuator**
- **Front panel monitoring facility.**
- **Protection switching facility.**
- **External alarms and bypass.**
- **Redundant pair operation capability.**
- **Simple Network Management Protocol (SNMP) monitoring.**

Functional Diagrams

Block diagram DDA-4280 - Signal path



ZDA-4300RH Handshake Diagram



Technical Specifications

IRT Eurocard module
Type DDA-4280

In accord with ITU-T Rec. G.703 – see *Electrical characteristics of G.703 signals***.**

Input:

Type	Transformer coupled.
Impedance	75 Ω terminated.

Outputs:

Number	1 switched, 3 non-switched, regenerated, reclocked shaped outputs located on rear connection assembly and 1 located on front panel.
Impedance	75 Ω source terminated.

Electrical Characteristics:

Cable Type	Coaxial
Other	See G.703 Specification for 2.048Mb/s data rate

Controls & alarms:

Input:

External changeover request	A ground applied to this input will emulate the operation of the front panel switch “Change Request”.

Outputs:

Power failure	Contact to open circuit if power has failed.
General alarm	Contact to open circuit if Data Loss is detected OR AIS is detected

Connectors:	Data:	BNC
	Alarm:	Krone LSA plus
Indicators:		Data loss. AIS detect. Module in service. Module in standby.
Power requirements		28 Vac CT (14-0-14) or ± 16 Vdc.
Power consumption		< 4 VA
Temperature range		0 - 50° C ambient
Mechanical		Suitable for mounting in IRT 19" rack chassis types 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.
Optional accessories		ZDA-4300RH Double width rear assembly for handshake connection of two DDA-4280's (number of outputs drops to 3).

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

ZDA-4300RH Technical Specifications

Controls & alarms:

Outputs:

Bypass	Contact to open circuit if power has failed.
General Alarm	Contact to open circuit if:- a. Data Loss is detected OR b. AIS is detected AND the AIS disable switch (SW3-4) is not set.
In Service (Main) Path Indication	Transistor switch to ground if card is active.

Connectors:

Data:	BNC.
Alarm:	Krone LSA plus.
In Service (Main) Path:	Krone LSA plus.

Changeover logic:

A changeover to the companion module will occur under any of the following conditions:

Loss of input signal
AIS detection alarm (provided AIS is not disabled by switch SW3-4)
Loss of power

In all of the above cases switching will only occur if:

companion module is able to provide an output free of the same defects and
changeover inhibit switch is not activated on either module.

Priority logic:

The priority switching in normal mode follows non reverting logic which dictates:

In the event of failure of main then standby DDA will assume control and become *Main* causing the failed path DDA to become *Standby*.

This implies that when the failed path is restored that it will remain as *Standby* and not become *Main* unless either a failure of *Main* occurs or a manual changeover is requested.

Power on reset.

When power is applied to the pair, the *power on reset* signal will set the module which was last enabled as *Main* as *Main* and the other module will be forced to act as *Standby*.

When power is applied to a pair for the first time it may be necessary to force the desired module to become *Main* by pressing the *Change Request* button on the front panel of the desired module. The *Main* module will be indicated by the *In Service* LED being lit on the front panel.

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

Electrical characteristics ITU-T G.703 2.048 Mb/s (E1) signal:

Cable Type	Coaxial
Impedance	75 Ω
Signal level	2.37 V
Nominal pulse width	244 ns
Code conversion	HDB3
Pulse shape	Fig. 15 of ITU-T G.703 Specification (11/2001).
Jitter at input port	Section 7 of ITU-T G.823 Specification (03/2000).
Jitter at output port	Section 5 of ITU-T G.823 Specification (03/2000).
Return loss at input ports:	
51 kHz to 102 kHz	6 dB
102 kHz to 3072 kHz	8 dB

Coding characteristic of ITU-T G.703 2.048 Mb/s (E1) signal:

The **HDB3** (High Density Bi-polar of order 3) code as defined in G.703 for 2.048 Mb/s (and 34.368 Mb/s) is as follows:

Binary 1 bits are represented by alternate positive and negative pulses and binary 0 bits by spaces. Exceptions are made when strings of successive 0 bits occur in the binary signal.

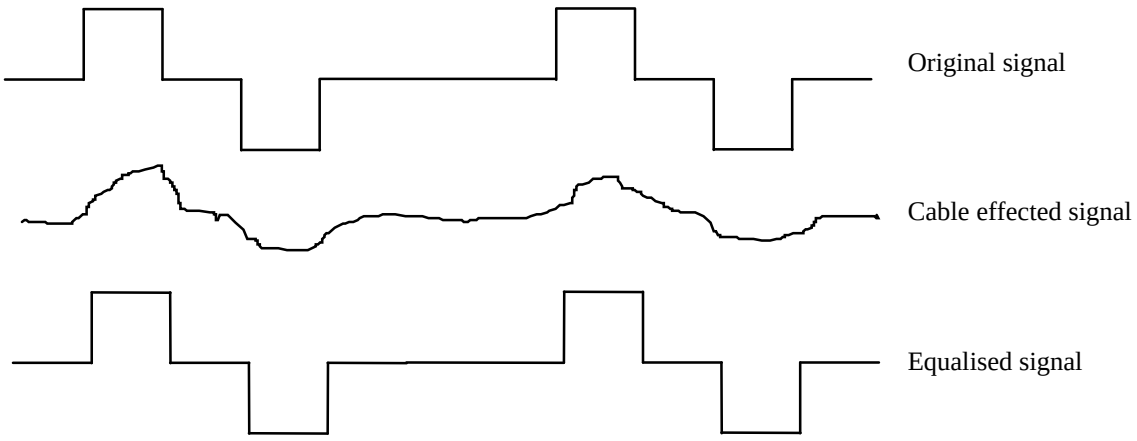
Each block of 4 successive zeros is replaced by 000V or B00V where B is an inserted pulse of the correct polarity and V is an inserted pulse violating the polarity rule. The choice of 000V or B00V is made so that the number of B pulses between consecutive V pulses is odd so that successive V pulses are of alternate polarity and so no DC component is introduced.

G.703 data signal format.

The following waveforms are intended to give some idea of the type of signal at various points in the DDA when in operation. They are not intended as accurate portrayals of either voltage levels or timing.

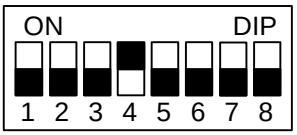
It can be seen that the original signal has both positive and negative going pulses. This format is used so that the signal does not rely on DC levels. To preserve the AC nature of the signal a coding system is used to ensure that a succession of either ‘1’s or ‘0’s in the original data does not produce a DC output. The coding system varies according to the type of G.703 signal (See specifications for each module and *Coding characteristics* above.)

It can be seen that the cable effected signal bears little resemblance to the original signal and due to the high frequency attenuation looks more like a noisy analogue signal than a digital signal. The input equaliser circuit in the DDA enhances the high frequency response and detects the rate of change of the signal to produce a squared up signal with fast rise and fall times suitable for processing and re-clocking.



Configuration

The only user settings on the DDA-4280 is on the DIP switch SW3 as shown below:



SW3

SW4-1		Not used.
SW4-2		Not used.
SW4-3		Not used.
SW4-4	OFF	Disable switching on AIS† input (when used in handshaking mode).
	ON	Enable switching on AIS† input (when used in handshaking mode).
SW4-5		Not used.
SW4-6		Not used.
SW4-7		Not used.
SW4-8		Not used.

NOTE: † AIS stands for Alarm Indication Signal.

ZDA-4300RH Link Settings:

When the ZDA-4300RH is used with a DDA-4280, *Direct* links LK1, LK3 and LK5 should be installed (default position).

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.

G.703 data connections – stand alone operation:

For use with supplied standard rear assembly.

Connect the input and as many output connections as required. Only good quality 75 Ohm connectors and cable should be used. The use of 50 Ohm BNC connectors may cause serious reflection problems with G.703 signals, causing data errors.

In general cable runs should be kept as short as possible and should not exceed 200 metres for reliable error free operation.

Stand-alone alarm connections:

A Krone type connector is provided on the rear panel of the module providing the following:

Pin	1	Connection to open circuit indicates a loss of power alarm.
	2	Connection to open circuit indicates a general signal alarm.
	3	Not used.
	4	Ground.

G.703 data connections - handshake operation:

The ZDA-4300RH is a double width rear assembly that takes the place of two standard rear assemblies that would normally be fitted side by side. The ZDA-4300RH supplies the necessary controls between the two main cards.

Connect the two separate inputs and as many output connections as required. J2 corresponds to Output 1, J3 corresponds to Output 2, and J4 corresponds to Output 3. Only 3 of the 4 outputs are switched. The 4th output does not pass through. Only good quality 75 Ohm connectors and cable should be used. The use of 50 Ohm BNC connectors may cause serious reflection problems with G.703 signals, causing data errors.

In general cable runs should be kept as short as possible and should not exceed 200 metres for reliable error free operation.

Handshake alarm connections:

Two Krone type connectors, 1SK2 and 2SK2, corresponding to each of the cards are provided on the rear panel of the module providing the following:

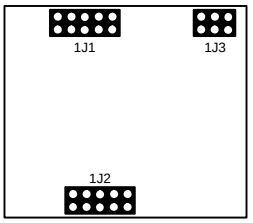
Pin	1	Connection to ground indicates module is in bypass mode (loss of power).
	2	Connection to ground indicates a general signal alarm.
	3	External changeover request – connection to ground will make this module *Main* in handshake mode.
	4	Ground.

A third Krone type connector (SK3) provides remote status of which unit is *In Service (Main).*

Pin	1	Connection to ground indicates that module 1 is the *In Service (Main)* module.
	2	Connection to ground indicates that module 2 is the *In Service (Main)* module.
	3	Ground.

SMU-4000 Installation

The SMU-4000 plug-in SNMP management controller module can only be fitted to IRT's 4000 series modules that are capable of being SNMP upgradeable. To determine whether a module is SNMP upgradeable, a square section on the main PCB is silk screened and fitted with three multipin sockets – as shown below:



This is where the SMU-4000 plug-in SNMP management controller module is fitted. The three sets of multipins on the underside of the SMU-4000 line up with the three sets of multipin sockets on the main PCB module. Align all pins and then gently press the SMU-4000 all the way down into place.

If the SMU-4000 is not already programmed with the correct firmware to match the module that it is being plugged into, it then needs to be programmed via the pins on the topside of the SMU-4000.

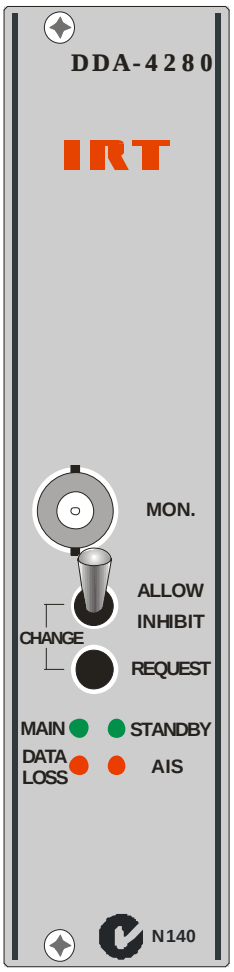
Note that installation will generally be done by IRT Electronics at the time of ordering.

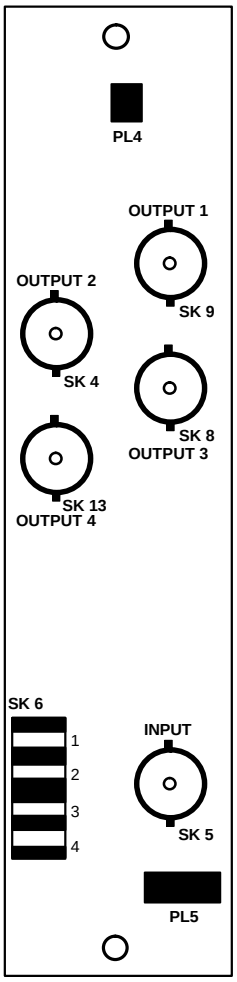
Note also that an SMU-4000 will only be functionally operational when the main module that it is plugged into is fitted into an IRT SNMP capable frame fitted with a CDM-xxxx SNMP agent and being interrogated by a suitable Network Management System.

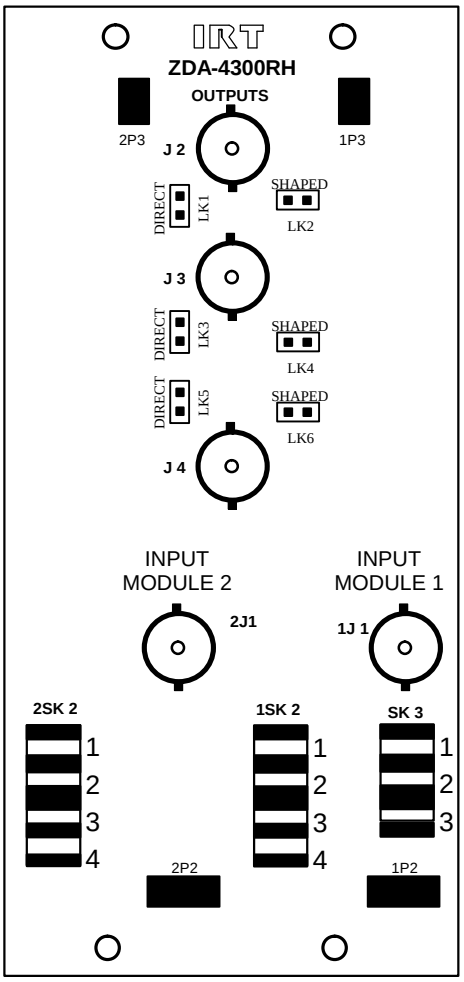
Figure 1: SMU-4000 module

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.







Operation

Stand-alone operation:

When used in a stand-alone situation, that is non-hand shaking mode, the DDA-4280 behaves as a standard 2.048 Mb/s G.703 distribution amplifier.

One input is electronically split into four outputs. On loss of power to the unit the input is automatically bypassed to output 1 via on board relays.

A loss of power alarm and general alarm (loss of signal, AIS detect) is provided by relay contacts to open circuit via the Krone connector on the rear assembly, see *Installation* section of this manual for connections.

Front panel LEDs indicate the presence of a valid input signal (In Service (Main) – green), the absence of a valid input signal (Data Loss – Red) and the detection of an alarm indication signal within the inputted signal (AIS – Red). The Standby LED (green) is not used in the stand-alone operation.

The front panel *change* switches do not work when used in a stand-alone operation.

Handshake operation:

When used in the handshake mode, two cards fit side by side plugged into a ZDA-4300RH. The ZDA-4300RH provides the necessary interconnect controls to automatically switch between the input signals to the outputs, provided that the toggle switch on the front panels of the units are set to Change Allow and not Change Inhibit. Automatic switching parameters are set by a loss of input condition and switch SW3 settings as described in the *Configuration* section of this manual.

When the toggle switch is set to *Change-Inhibit* both automatic and manual switching of the input signals is not possible.

When the units are first turned on one unit will take the responsibility of being *In Service (Main)* whilst the other will become the *Standby* unit. It may be necessary to manually swap the two states if they do not start in the required configuration by pressing the front panel manual switch on the unit that is desired to be acting as the *In Service* module. Note that in order to do so the toggle switch should also be set to the *Change-Allow* position on both modules.

Loss of power alarms and general (loss of signal, AIS detect) alarms are provided by relay contacts to open circuit via two Krone connectors on the rear assembly. External changeover request is also provided via these same Krone connectors. *In Service (Main)* tally indication is via a third Krone connector, see *Installation* section of this manual for connections.

Front panel LEDs, on both units, indicate the presence of a valid input signal (In Service (Main) – green, or Standby - green), the absence of a valid input signal (Data Loss – Red) and the detection of an alarm indication signal within the inputted signal (AIS – Red).

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.

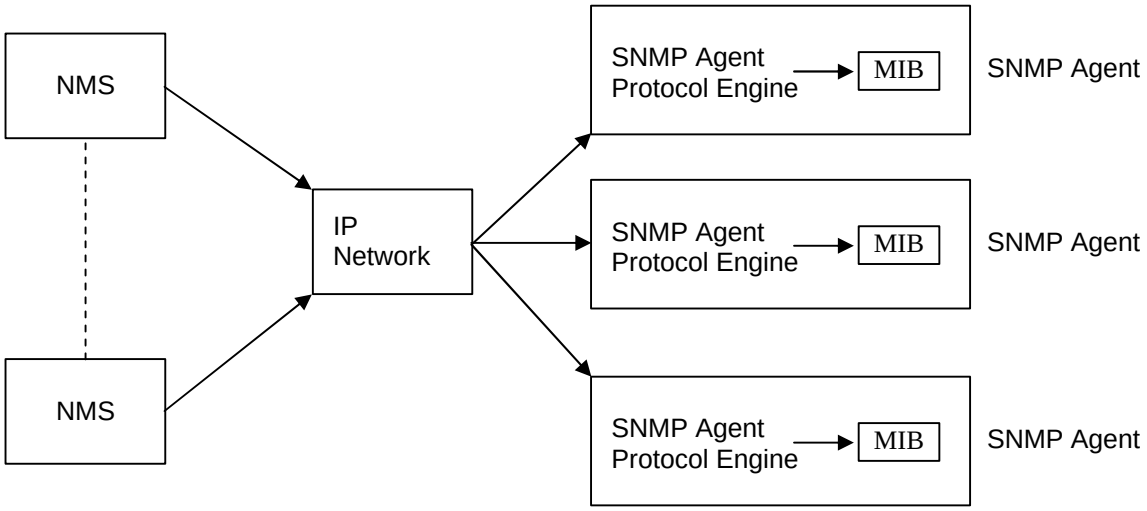
An *NMS* polls, or communicates with, an *agent*. An *agent* is a network management software module that resides in a *managed device*. An *agent* has local knowledge of management information and translates that information into a form compatible with SNMP. The *agent*, therefore, acts as an interface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

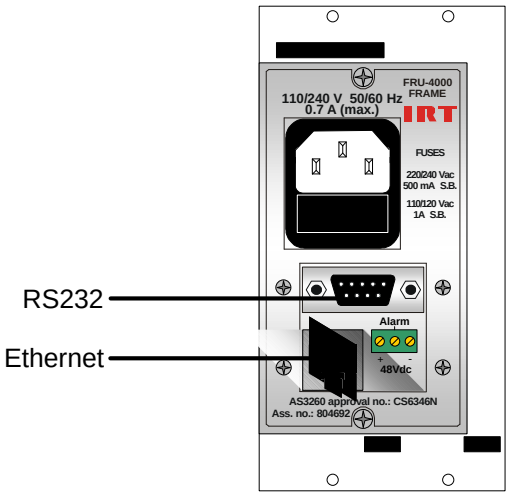
IRT Electronics currently employs SNMPv1 with its SNMP capable frames. The frame acts as an *agent* when fitted with a CDM-xxxx module. This module has its own designated slot next to the power supply so as to not affect the number of modules that the frame will take. Communication between the *NMS*,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

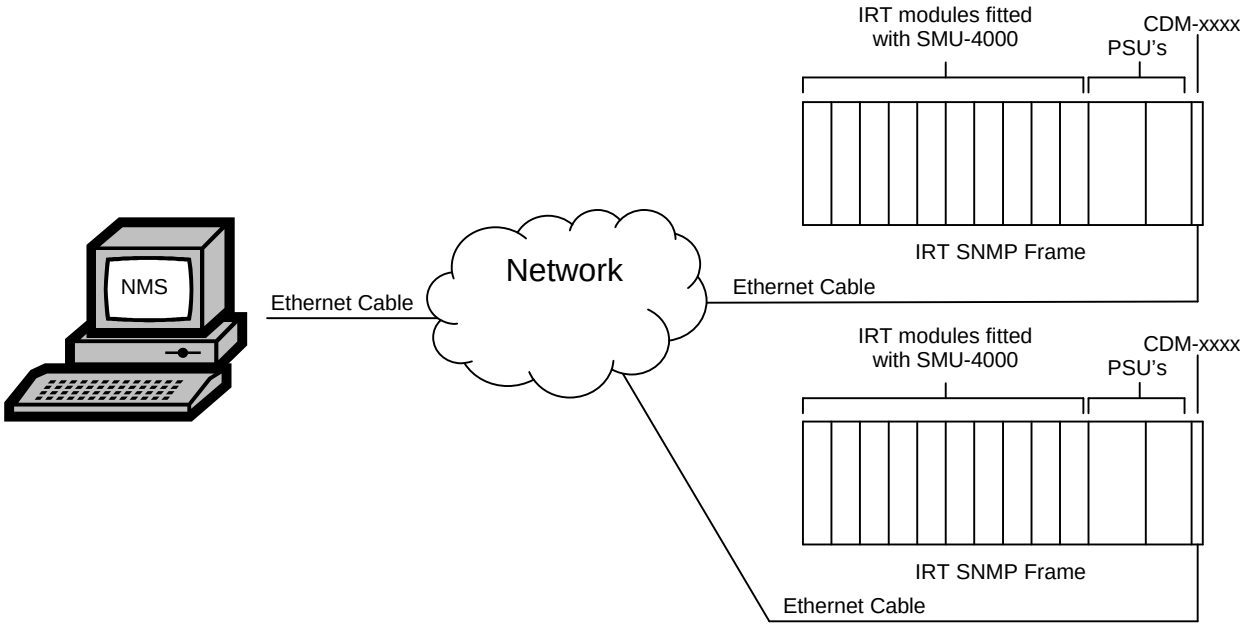
Frame parameters, such as Name, Address and Location, are set via an RS232 interface, a D9 connector on the rear of the frame below the mains inlet. A software terminal emulator, such as Tera Term or HyperTerminal, is used for setting and reading the parameters of the frame.

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-4280 SNMP Functions:

At the time of writing this manual, SNMP functions were still to be written for the DDA-4280. Contact IRT for update of status.

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 Fax: 61 2 9439 7439
Email: service@irtelectronics.com