MEM-4551

Ethernet to ASI Network Interface Adapter

User Manual

Revision History:

Revision	Date	By	Change Description	Applicable to:
00	26/07/2006	AL	Original Issue.	S/N ≥ 0603001
01	19/01/2008	AL	SNMP parameter descriptions updated.	S/N ≥ 0603001
02	01/05/2008	AL	Return loss specification corrected.	S/N ≥ 0603001
03	21/01/2011	AL	Program Numbers 4551 and 4552 DIP switch settings swapped round to match firmware.	S/N ≥ 0603001
04	20/04/2011	AL	Equalisation specification updated to >250m.	S/N ≥ 0603001
05	26/08/2016	AL	Upgraded to I.R.T. Communications company name.	S/N ≥ 0603001

Table of Contents:

This instruction book applies to units with serial numbers S/N ≥ 0603001.

OPERATIONAL SAFETY

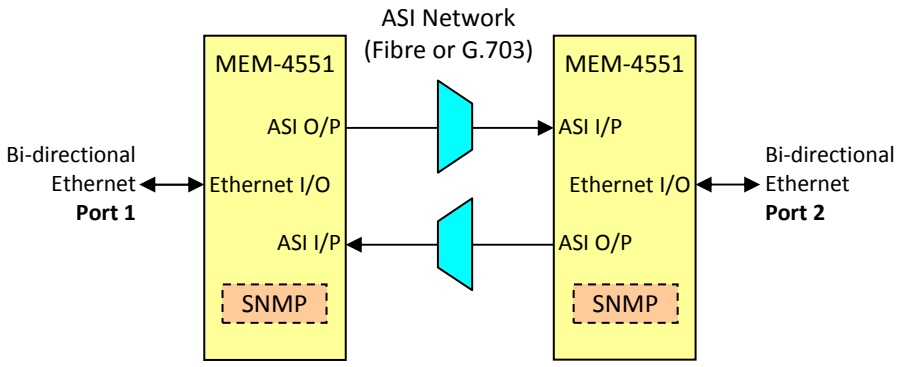
WARNING

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.

GENERAL DESCRIPTION

BLOCK DIAGRAM MEM-4551 SIGNAL PATH



The MEM-4551 acts as a gateway between an Ethernet network and an ASI environment.

The MEM-4551 generates an ETR-290 compliant ASI transport stream, with a settable Program Number identifier, at a fixed settable data rate. When Ethernet data is available to send it is encapsulated into ASI packets. When there is no Ethernet data available, NULL packets are used to stuff the ASI stream to the selected rate.

On the receive side packets containing Ethernet data are extracted from the ASI stream by reference to the assigned Program Number.

The MEM-4551 acts as an Ethernet bridge. A dynamic MAC address table is formed over time, which allows filtering of the Ethernet packets being forwarded through the ASI link.

The Ethernet port is set up automatically to accommodate most network environments. The ASI output rate is switch selectable to operate at a payload data rate of between 1 Mb/s and 108 Mb/s.

The Ethernet port has automatic MDI/MDI-X detection. This detects whether the Ethernet interconnect cable is a straight through or cross over type and automatically switches itself to accommodate.

The output ASI stream is suitable for transfer by any ASI type of signal path, such as IRT's ASI single and MUX fibre link cards. Also G.703 rates are available on the output to cooperate with ASI-G.703 products. For full duplex action a return link is required.

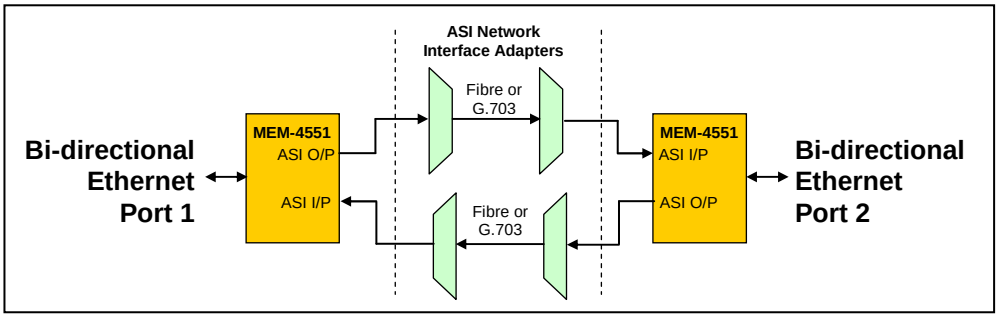
An optional SNMP (Simple Network Management Protocol) plug in module is available for remote monitoring and control when used in conjunction with IRT's 4000 series frame fitted with SNMP capability.

The MEM-4551 is designed to fit IRT's standard Eurocard frames as well as IRT's 4000 series frame for use with IRT's SNMP system and may be used alongside any other of IRT's analogue or digital Eurocards.

Standard Features:

- **Ethernet to ASI / ASI to Ethernet conversion.**
- **Ethernet port automatically set for 10/100/Half/Full operation.**
- **Automatic MDI/MDI-X port.**
- **32 ASI rates between 1 Mb/s and 108 Mb/s.**
- **Optional plug-in SNMP monitoring and control module.**

Application Diagram:



TECHNICAL SPECIFICATIONS

Ethernet:

Type		Standard IEEE 802.3
Data Rate		10/100 Mb/s.
Connector		RJ-45.

ASI Output:

Type		1 x ASI-C 75Ω, 800 mVp-p, BNC connector.
Payload Rate	**32 settings**	1 to 25 (in 1Mb steps), 30, 34.368, 36, 44.736, 54, 72, or 108 Mb/s (set by on board switch settings).
Program Number		4550, 4551, 4552 or 4553 (set by on board switch settings).
Signal level		800 mV ± 10%.
Impedance		75Ω.
Return loss		> 15 dB 5 MHz to 270 MHz.

ASI Input:

Type		1 x ASI-C 75Ω, BNC connector.
Return Loss		> 15 dB 5 MHz to 270 MHz.
Equalisation		> 250 metres at 270 Mb/s for Belden 8281 or equivalent cable.

Alarms:

Minor	Open circuit on loss of ASI.
Major	Open circuit on loss of Ethernet link.

Front Panel Indicators:

Ethernet:	**LINK**	Ethernet link connected – Green.
	10/100	Rate - 10 Mb/s Orange, 100 Mb/s Green.
	FDX	Full Duplex Mode – Green.
	ACT	LAN Activity – Green.
ASI:	**INPUT**	ASI Carrier detected – Green.
	ERR	Error in ASI input – Red.
	188	Input ASI 188 byte – Green.

Power Requirements:

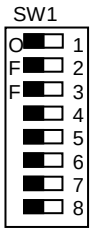
Voltage	28 Vac CT (14-0-14) or ±16 Vdc.
Power consumption	< 5 VA.

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.
Optional accessories		SMU-4000 plug in SNMP Management Information Base (MIB) module.

CONFIGURATION

Switches SW1 is an 8 way Dual-In-Line (DIL) switch used for selecting the Program Number of the ASI output (/input) stream, the ASI output payload rate, and whether SNMP control is enabled or not.



Program Number:

Program Number	Switch Setting	
	SW1-1	SW1-2
4550	OFF	OFF
4551	OFF	ON
4552	ON	OFF
4553	ON	ON

ASI Output Rate:

ASI Rate (Mb/s)	Switch Setting				
	SW1-3	SW1-4	SW1-5	SW1-6	SW1-7
1	OFF	OFF	OFF	OFF	OFF
2	OFF	OFF	OFF	OFF	ON
3	OFF	OFF	OFF	ON	OFF
4	OFF	OFF	OFF	ON	ON
5	OFF	OFF	ON	OFF	OFF
6	OFF	OFF	ON	OFF	ON
7	OFF	OFF	ON	ON	OFF
8	OFF	OFF	ON	ON	ON
9	OFF	ON	OFF	OFF	OFF
10	OFF	ON	OFF	OFF	ON
11	OFF	ON	OFF	ON	OFF
12	OFF	ON	OFF	ON	ON
13	OFF	ON	ON	OFF	OFF
14	OFF	ON	ON	OFF	ON
15	OFF	ON	ON	ON	OFF
16	OFF	ON	ON	ON	ON
17	ON	OFF	OFF	OFF	OFF
18	ON	OFF	OFF	OFF	ON
19	ON	OFF	OFF	ON	OFF
20	ON	OFF	OFF	ON	ON
21	ON	OFF	ON	OFF	OFF
22	ON	OFF	ON	OFF	ON
23	ON	OFF	ON	ON	OFF
24	ON	OFF	ON	ON	ON
25	ON	ON	OFF	OFF	OFF
30	ON	ON	OFF	OFF	ON
36	ON	ON	OFF	ON	OFF
54	ON	ON	OFF	ON	ON
72	ON	ON	ON	OFF	OFF
108	ON	ON	ON	OFF	ON
34.368	ON	ON	ON	ON	OFF
44.736	ON	ON	ON	ON	ON

SNMP Control:

SNMP Control ON	SW1-8 ON
SNMP Control OFF	SW1-8 OFF

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.

Ethernet Connection:

The Ethernet port on the rear assembly is for a standard non-crossover Ethernet cable fitted with an RJ-45 connector. This port connects directly to an Ethernet link, or via an Ethernet router or Ethernet switch.

ASI Connections:

Both ASI input and output is a 75 Ω BNC type for connection with high quality 75 Ω coaxial cable.

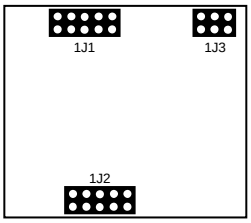
Alarm Output Connections:

Two opto-coupled alarm outputs, major and minor, are via a 4 pole Phoenix style screw terminal block, on the rear connector assembly. Pin 2 switches from ground when a minor alarm status has been raised. Pin 3 switches from ground when a major alarm status has been raised. Pins 1 and 4 are grounds. In other words, pins 1 and 2 become open circuit in the event of a minor alarm; pins 3 and 4 become open circuit in the event of a major alarm.

A minor alarm occurs on loss of the ASI input or loss of power.
A major alarm occurs on the loss of the Ethernet link or loss of power.

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 4000 series frame fitted with a CDM-4000 SNMP agent and being interrogated by a suitable Network Management System.

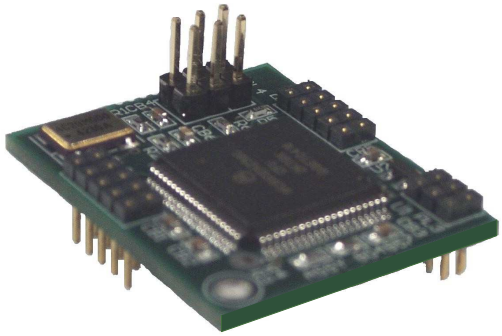
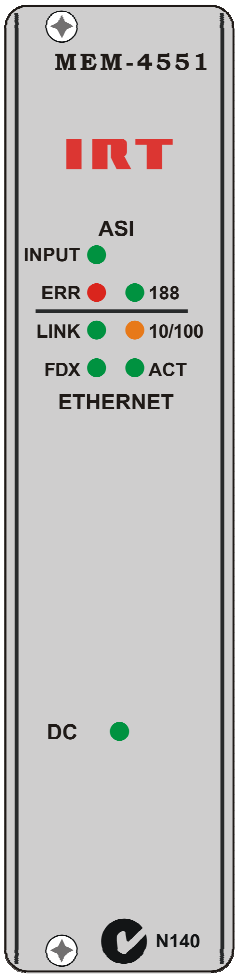
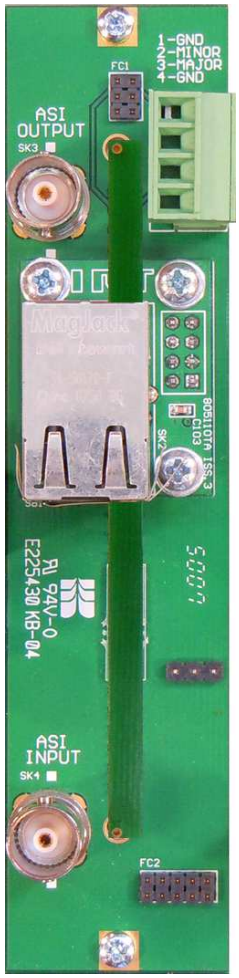


Figure 1: SMU-4000 module

Front & rear panel connector diagrams





OPERATION

The MEM-4551 is designed to operate as a pair with a second MEM-4551. Each unit does the Ethernet to ASI conversion and the reciprocal ASI to Ethernet conversion.

The MEM-4551 Ethernet port will automatically configure itself to match the Ethernet link whether it be 10 Base-T or 100 Base-T, half or full duplex operation. It also automatically sets itself up for MDI or MDI-X operation, so there are no setup options required for connecting to an Ethernet link.

In order for the output ASI signal to be distinguishable from other ASI signals in an ASI environment it is given a choice of program number, either 4550, 4551, 4552 or 4553, as set by the on board SW1 Dual-In-Line (DIL) switch positions SW1-1 and SW1-2 as described in the program number table in the *Configuration* section of this manual.

The output ASI payload data rate must be set to the desired rate by the use of the SW1 Dual-In-Line (DIL) switch positions SW1-3 to SW1-7 as described in the ASI rate table in the *Configuration* section of this manual. There is a choice of 32 ASI rates available from 1Mb/s to 108 Mb/s. Two of the rates available match the E3 (34.368 Mb/s) and DS3 (44.736 Mb/s) rates for direct ASI conversion to the Telco G.703 standard by a suitable ASI to G.703 converter if needed.

As previously mentioned, the MEM-4551 is designed to operate as a pair with a second MEM-4551. Both units must be configured with the same program number setting otherwise the unit that is acting as the decoding unit will not recognize the incoming ASI signal and hence not convert it back to the existing Ethernet stream.

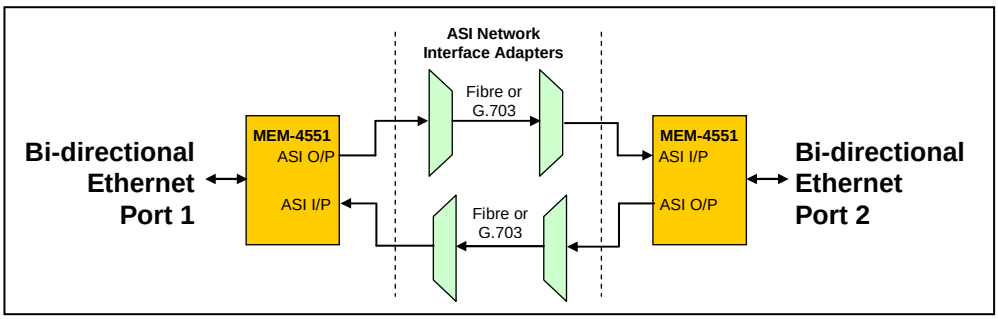
Front Panel LEDs give an indication of Ethernet and ASI settings and attributes, as described below:

Ethernet:	LINK	Ethernet link connected – Green
	10/100	Rate - 10 Mb/s Orange, 100 Mb/s Green
	FDX	Full Duplex Mode - Green
	ACT	LAN Activity - Green
ASI:	INPUT	ASI Carrier detected - Green
	ERR	Error in ASI input – Red
	188	Input ASI 188 byte – Green

Each MEM-4551 is able to act concurrently as an encoder and decoder. For bi-directional Ethernet traffic a bi-directional ASI path is needed, that is a separate forward and reverse ASI path, to allow data to flow both ways.

The ASI path can be a direct ASI path, such as is the case with an ASI to fibre link, or the ASI signal could be converted to another format such as G.703 for transmission on a Telco G.703 link. The ASI signal can even be included within a multiplexed ASI stream to make use of existing spare capacity within an ASI link.

Application Diagram:



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 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.

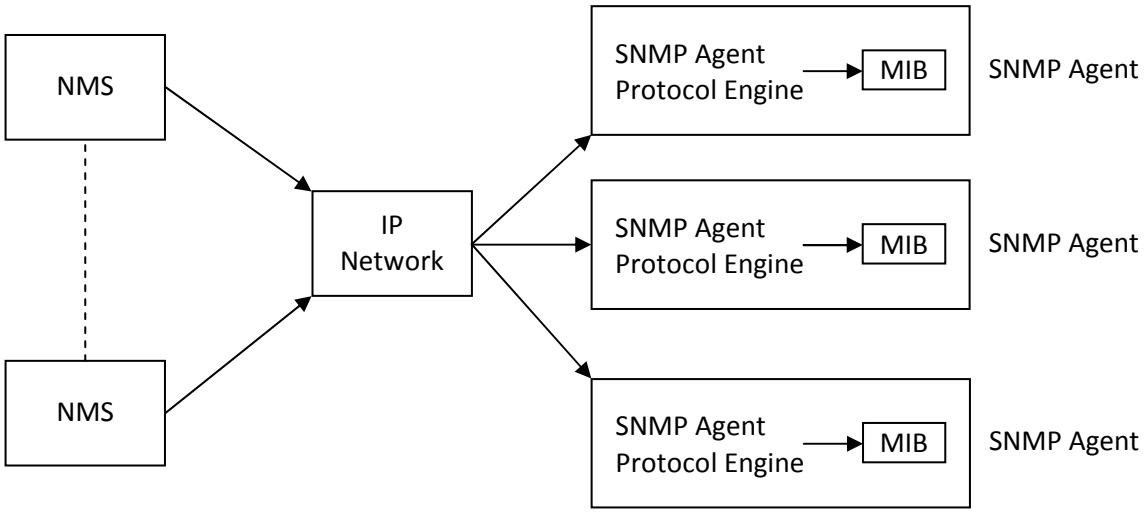
An *NMS* polls, or communicates with, an *agent*. An *agent* is a network management software module that resides in a *managed device*. An *agent* has local knowledge of management information and translates that information into a form compatible with SNMP. The *agent*, therefore, acts as an interface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

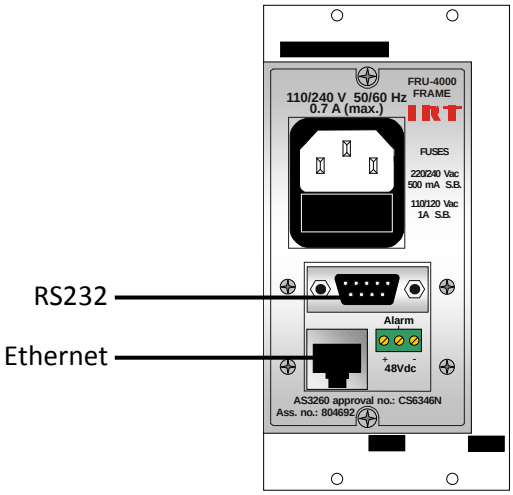
I.R.T. Communications currently employs SNMPv1 with its SNMP capable frames. The frame acts as an *agent* when fitted with a CDM-xxxx module. This module has its own designated slot next to the power supply so as to not affect the number of modules that the frame will take. Communication between the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

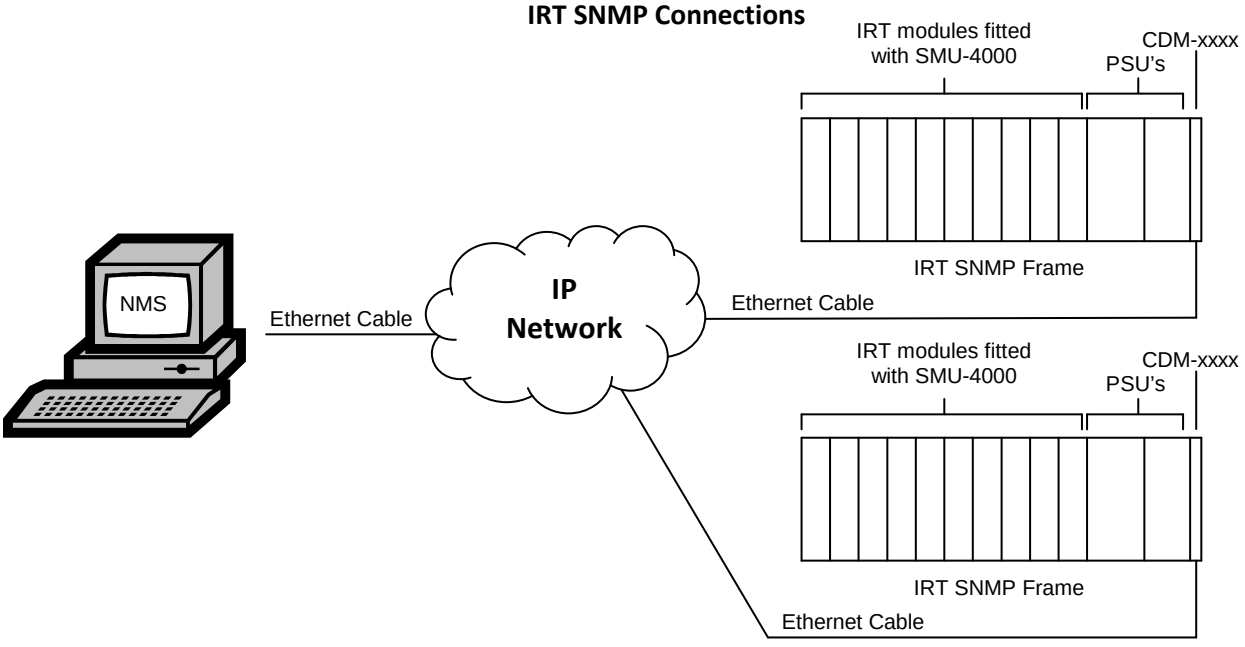
Frame parameters, such as Name, Address and Location, are set via an RS232 interface, a D9 connector on the rear of the frame below the mains inlet. A software terminal emulator, such as Tera Term or HyperTerminal, is used for setting and reading the parameters of the frame.

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

MEM-4551 SNMP Functions:

With the MEM-4551 installed in an IRT 4000 series frame with SNMP capability, the MEM-4551 can be interrogated by an SNMP Network Management System (NMS).

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

- An indication of the current state of the Major (Ethernet) and Minor (ASI) Alarms;
- An indication that the ASI signal is present;
- An indication of the ASI data rate received on the ASI input;
- An indication if there is an error within the ASI input;
- An indication of the size of the ASI packets being received on the ASI input (Note: indicates 204 byte when no ASI signal present);
- An indication of the program number that is being used for the ASI streams (Note: when in remote mode the ASI program number says, “see config”. This corresponds to the remotely set program number that is entered).
- An indication that a link has been established on the Ethernet port;
- An indication of which of the two available speeds that the Ethernet port is operating, 10 or 100;
- An indication if the Ethernet port is in full or half duplex operation;
- An indication of activity on the Ethernet port;
- An indication if remote setting by SNMP is allowed for the operating parameters (must be set for SNMP remote via switch position SW1-8);
- An indication of what the ASI payload rate has been set to;
- Trap automatically sent, if enabled, when an Urgent Alarm occurs or is cleared;
- An indication of the firmware version of the FPGA;
- Unit reset control.

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