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IRT Eurocard

Type MMM-4711 & MMX-4711

4 ASI to ASI Combiner / DeCombiner

Designed and manufactured in Australia

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

**IRT Eurocard
Type MMM-4711 & MMX-4711
4 ASI to ASI
Combiner / DeCombiner**

Instruction Book

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This instruction book applies to units fitted with firmware MMM-4711i6ES1V0 and MMX-4711i6ES1V1.

NOTE: This handbook incorporates S version variations (MMM-4711-S and MMX-4711-S). The only difference between an S version and a standard version is the alarm outputs are 'Switch to Ground' as opposed to 'Switch to Open Circuit'. An S version is identified by a '-S' appearing after the product number on the front panel, that is MMM-4711-S and MMX-4711-S.

Operational Safety:

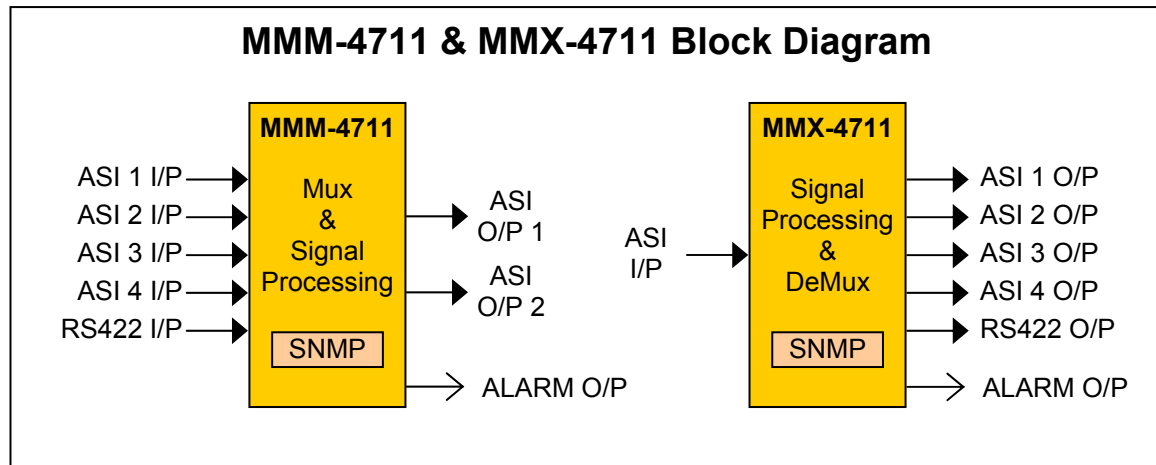
WARNING

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 MMM-4711 & MMX-4711
4 ASI to ASI
Combiner / DeCombiner

General Description



The MMM-4711 and MMX-4711 are part of a family of data transcoders for converting between the commonly used MPEG2 Transport Stream formats for video distribution in the broadcast industry.

With the MMM-4711 up to four ASI signals can be combined together and converted into a single ASI signal with a settable output payload rate.

The sum of the ASI input payload rates can be anything up to approximately 0.95 x the set ASI output payload rate. Inputs may be 188 or 204 byte packet lengths, burst or continuous, and may have energy dispersal scrambling, interleaving and/or Reed Solomon bytes included. An individual input may be up to 0.95 x the full set ASI output payload rate if the other inputs are unused.

The output ASI stream is a valid stream, which complies with all facets of ETR290.

Provided the total sum of the ASI inputs does not exceed approximately 0.95 x the set output rate, units can be cascaded to increase the number of ASI inputs into a single ASI output.

The MMX-4711 separates the combined ASI signal back into the original four ASI signals (at their original rates and without any modification of the stream, or stream timing). If more than one MMM-4711 has been cascaded then the MMX-4711's cascade in the reverse order.

Inputs are automatically equalised for lengths of up to 250m of Belden 8281 or equivalent cable.

Front panel indication and relay alarm on the MMM-4711 transmitter shows if there is an input data rate violation. Corresponding alarm on the MMX-4711 receiver shows a loss of ASI input.

The MMM-4711 and MMX-4711 are designed to fit IRT's standard Eurocard frames and may be used alongside any other of IRT's analogue or digital Eurocards.

Standard features:

- **Up to 4 ASI streams on one ASI link**
- **Units may be cascaded to increase the number of ASI inputs**
- **Automatic Input equalisation up to 250m**
- **Recovers transmitted ASI signal without any added PCR jitter and with minimal user setup.**
- **Maintains original ASI rate, packet size & coding (energy dispersal scrambling, interleaving or Reed Solomon bytes)**
- **Suitable for Single Frequency Networks (SFN)**
- **Output format is valid ASI stream compliant with ETR290**

Technical Specifications

MMM-4711:

Inputs:

Type 1	4 x ASI-C 75 Ω , 800 mVp-p, BNC connector.
Maximum Data Rate	Sum total less than 0.95 x selected output rate.
Type 2	RS232 Uni directional data input (maximum 38k4 baud).

Output:

Type	2 x ASI-C 75 Ω , 800 mVp-p, BNC connector.
Payload Rate	10 Mb/s;
Switch Settable	31.672 Mb/s;
	34.368 Mb/s (equivalent to E3 rate);
	41.227 Mb/s
	44.736 Mb/s (equivalent to Unframed DS3 rate);
	44.210Mb/s (equivalent to Framed DS3 rate);
	80 Mb/s;
	90 Mb/s;
	110 Mb/s;
	148 Mb/s (suited for STM-1); and
	213 Mb/s.

Alarm Output:	MAJOR	Open circuit ¹ on sum of ASI input payload rates in excess of set ASI output payload rate, or loss of power.
	MINOR	Open circuit ¹ on no valid input ASI streams present, or loss of power.

MMX-4711:

Input:

Type	ASI-C 75 Ω , 800 mVp-p, BNC connector.
Data Rate	Equivalent to MMM-4711 output rate.

Outputs:

Type 1	4 x ASI-C 75 Ω , 800 mVp-p, BNC connector.
Data Rate	Same as MMM-4711 input rate.
Type 2	RS232 Uni directional data output.

Alarm Output:	MAJOR	Open circuit ¹ on no valid ASI input present, or loss of power.
	MINOR	Open circuit ¹ on no valid output ASI streams present, or loss of power.

Power Requirements

Power consumption	28 Vac CT (14-0-14) or ± 16 Vdc. MMM-4711 <5 VA, MMX-4711 <4VA.
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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, silk-screened 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.	

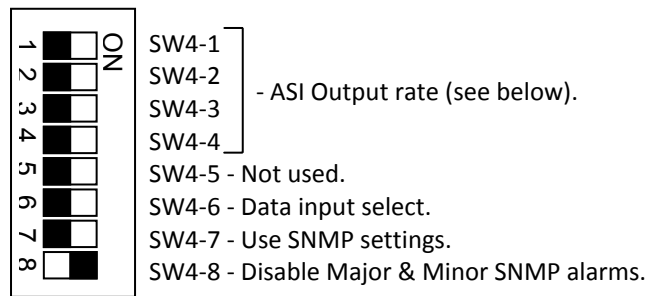
Due to our policy of continuing development, these specifications are subject to change without notice.

NOTE: 1 For S version cards (MMM-4711-S and MMX-4711-S) output alarms switch to Ground rather than Open Circuit.

Configuration

MMM-4711:

The only user settings on the MMM-4711 is on the DIP switch SW4 as shown below:



SW4-4	SW4-3	SW4-2	SW4-1	Output ASI Payload Rate
OFF	OFF	OFF	OFF	34.368 Mb/s (equivalent to E3 rate).
OFF	OFF	OFF	ON	44.736 Mb/s (equivalent to DS3 rate).
OFF	OFF	ON	OFF	44.209 Mb/s (equivalent to DS3 framed rate).
OFF	OFF	ON	ON	148 Mb/s (suited for STM-1).
OFF	ON	OFF	OFF	10 Mb/s.
OFF	ON	OFF	ON	80 Mb/s.
OFF	ON	ON	OFF	110 Mb/s.
OFF	ON	ON	ON	213 Mb/s (full rate).
ON	OFF	OFF	OFF	90 Mb/s.
ON	OFF	OFF	ON	31.672 Mb/s (equivalent to 188/204 x E3 rate).
ON	OFF	ON	OFF	41.227 Mb/s (equivalent to 188/204 x DS3 rate).
ON	OFF	ON	ON	213 Mb/s (full rate).
ON	ON	OFF	OFF	213 Mb/s (full rate).
ON	ON	OFF	ON	213 Mb/s (full rate).
ON	ON	ON	OFF	213 Mb/s (full rate).
ON	ON	ON	ON	213 Mb/s (full rate).

SW4-5 Not used.

SW4-6 OFF Data input disabled.
ON Data input enabled².

SW4-7 OFF Uses DIP switch settings.
ON Uses SNMP settings.

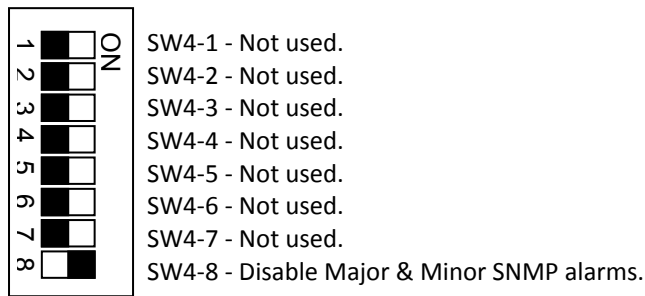
SW4-8 OFF Enable major and minor SNMP alarms to the frame Agent (CDM card)³.
ON Disable major and minor SNMP alarms to the frame Agent (CDM card)³.

NOTE: 2 With "Data input" enabled maximum sum of ASI inputs is reduced by 0.6Mb.
With "Data input" disabled front panel "Data LED" is also disabled.

3 When using TRAPS via SNMP, depending on how system is set up, in order to avoid double reporting of alarms via the MMM-4711 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.

MMX-4711:

The only user settings on the MMX-4711 is on the DIP switch SW4 as shown below:



SW4-1 Not used.

SW4-2 Not used.

SW4-3 Not used.

SW4-4 Not used.

SW4-5 Not used.

SW4-6 Not used.

SW4-7 Not used.

SW4-8 OFF Enable major and minor SNMP alarms to the frame Agent (CDM card)⁴.
 ON Disable major and minor SNMP alarms to the frame Agent (CDM card)⁴.

NOTE: 4 When using TRAPS via SNMP, depending on how system is set up, in order to avoid double reporting of alarms via the MMX-4711 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.

Connections:

MMM-4711:

ASI Inputs:

Four ASI inputs each with any payload rate up to a maximum combined total payload of 0.95 x the settable ASI output payload rate, for 188 byte input signals, or 0.88 x the settable output payload rate for 204 byte input signals (see *Configuration* section of this manual). That is,

$$\begin{aligned} \text{Combined Total Payload} &= \text{ASI 1 rate} + \text{ASI 2 rate} + \text{ASI 3 rate} + \text{ASI 4 rate} \\ &\leq 0.95 \times \text{Set Output Payload Rate, for 188 byte input signals, or} \\ &\leq 0.88 \times \text{Set Output Payload Rate, for 204 byte input signals.} \end{aligned}$$

WARNING: If the total maximum input payload rate is exceeded, all ASI channels will be corrupted. With "Data input" enabled (SW4-6 ON) maximum sum of ASI inputs reduces by 0.6Mb.

ASI inputs may be of 188 or 204 byte packet length and may have energy dispersal scrambling / interleaving and Reed Solomon bytes if desired. Streams with conditional access may also be passed.

ASI inputs are by BNC connectors each terminated in 75Ω. Input cable equalisation is automatic for up to 250m of high quality 75Ω coaxial cable (Belden 8281 or equivalent). No adjustments are required.

ASI Outputs:

Two identical ASI outputs are provided by BNC connectors with a 75Ω characteristic output impedance. The output ASI payload rate is set via a dual in line switch (SW4), see *Configuration* section of this manual. Only high quality 75Ω coaxial cable (Belden 8281 or equivalent) should be used. No adjustments are required, but cable must be terminated in 75Ω at the connected load.

Alarm Outputs:

Two relay alarm output states are provided via a phoenix style 4-pin plug. Pin 3 is designated as Major, pin 4 is designated as Minor, and both pins 1 & 2 are ground. Both alarms are referenced to ground.

Alarm conditions are as follows:

- Major switch to Open Circuit⁵ on sum of ASI input payload rates in excess of maximum allowable;
 - Minor switch to Open Circuit⁵ on no valid input ASI streams present.
- Both Major and Minor alarms switch to Open Circuit on power failure.

When using TRAPS via SNMP, depending on how system is set up, in order to avoid double reporting of alarms via the MMM-4711 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 with DIP switch SW4-8 set to ON.

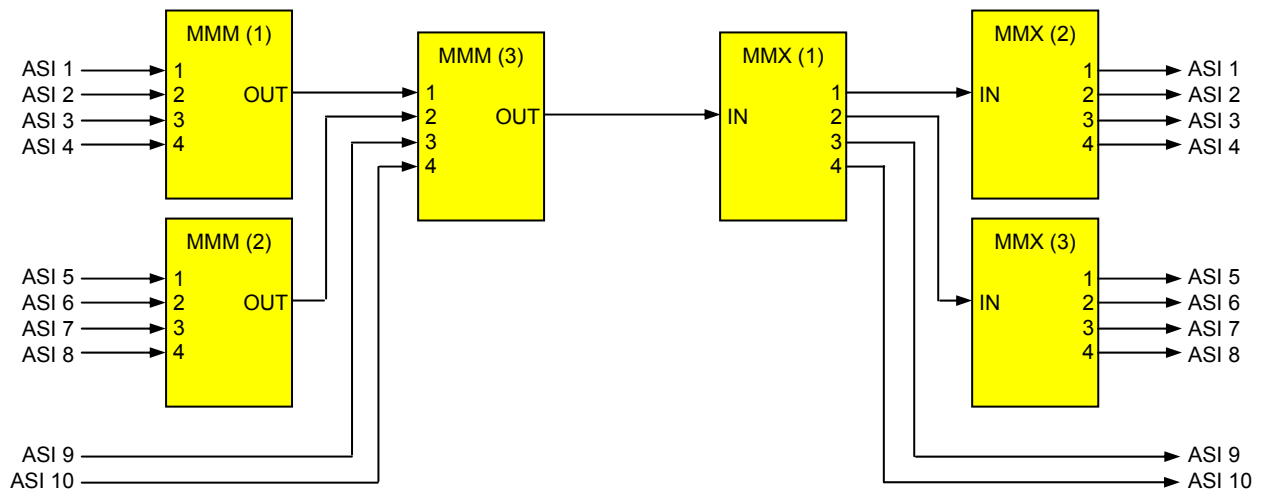
NOTE: ⁵ For S version cards (MMM-4711-S and MMX-4711-S) output alarms switch to Ground rather than Open Circuit.

Cascading:

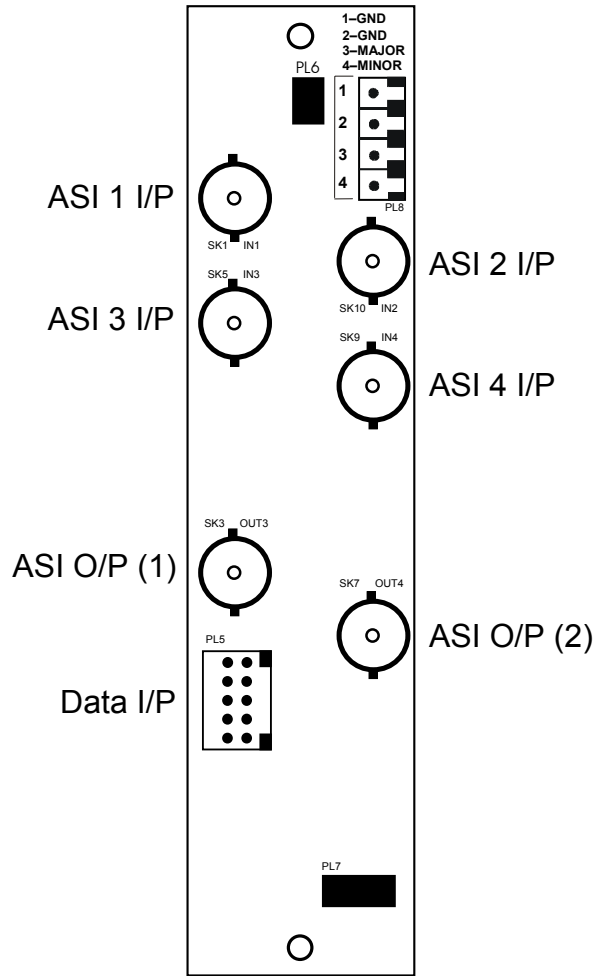
It is possible to cascade the output from one or more MMM-4711's into the inputs of another MMM-4711 provided the total sum of the ASI inputs of the final MMM-4711 does not exceed its set ASI output rate.

For example, it is possible to have, say, four 2Mb/s ASI streams combined together with one MMM-4711 with its output rate set to 10Mb/s and use this combined 10Mb/s ASI stream and feed it into one of the input ports of another MMM-4711, thus allowing more ASI streams to be combined at the output of the second MMM-4711. It is even possible to cascade this output into yet another MMM-4711, providing that the sum of the inputs into this unit does not exceed its set output ASI rate.

At the receiving end the MMX-4711's are arranged in the reverse order to give the original ASI streams. For example:



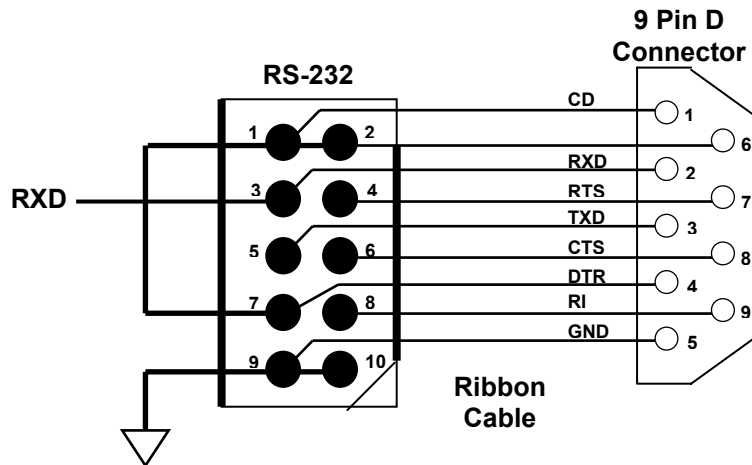
MMM-4711 Rear Assembly Connections



RS-232 Data Input:

The RS-232 data input port is via a 10 pin HE14 style of header. Pins 1, 2 and 7 are connected together on the PCB. Pins 9 and 10 are both earthed. Pin 3 is the RS-232 *receive data* (RXD) connection. Data rates may be up to 38k4 baud. Note that data transfer is unidirectional only, i.e. there is no direct data return path.

For connection to a standard RS-232 9 pin D connector, wire as per the diagram below:



MMX-4711:

ASI Input:

The ASI input port on the rear assembly is a 75Ω terminated BNC connector for an MMM-4711 encoded signal only. Use of high quality 75Ω coaxial cable (Belden 8281 or equivalent) is recommended.

ASI Outputs:

Four ASI outputs are provided as 75Ω output BNC connectors. Each ASI output has a payload rate and packet size equivalent to the corresponding ASI input on the matching MMM-4711.

Alarm Outputs:

Two relay alarm output states are provided via a phoenix style 4-pin plug. Pin 3 is designated as Major, pin 4 is designated as Minor, and both pins 1 & 2 are ground. Both alarms are referenced to ground.

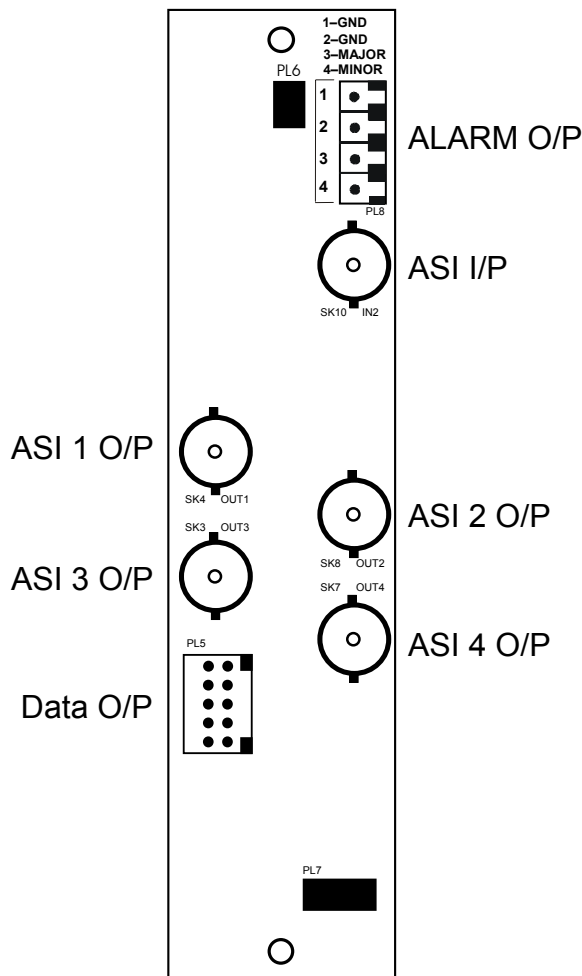
Alarm conditions are as follows:

- Major switch to Open Circuit⁶ on no valid ASI input present;
- Minor switch to Open Circuit⁶ on no valid output ASI streams present.
- Both Major and Minor alarms switch to Open Circuit on power failure.

When using TRAPS via SNMP, depending on how system is set up, in order to avoid double reporting of alarms via the MMX-4711 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 with DIP switch SW4-8 set to ON.

NOTE: 6 For S version cards (MMM-4711-S and MMX-4711-S) output alarms switch to Ground rather than Open Circuit.

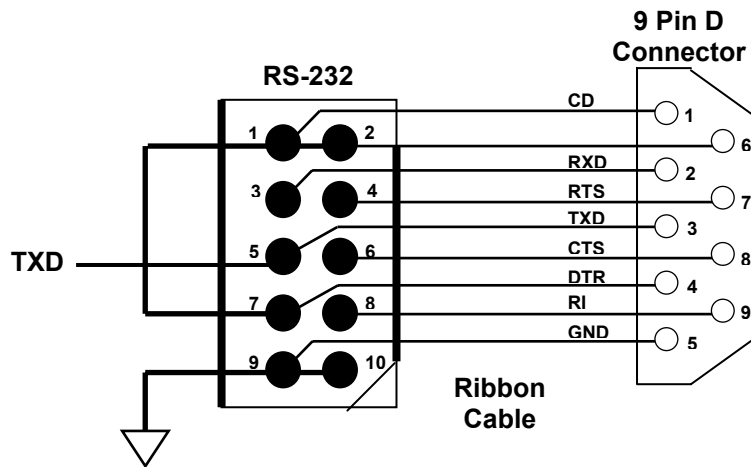
**MMX-4711
Rear Assembly Connections**



RS-232 Data Output

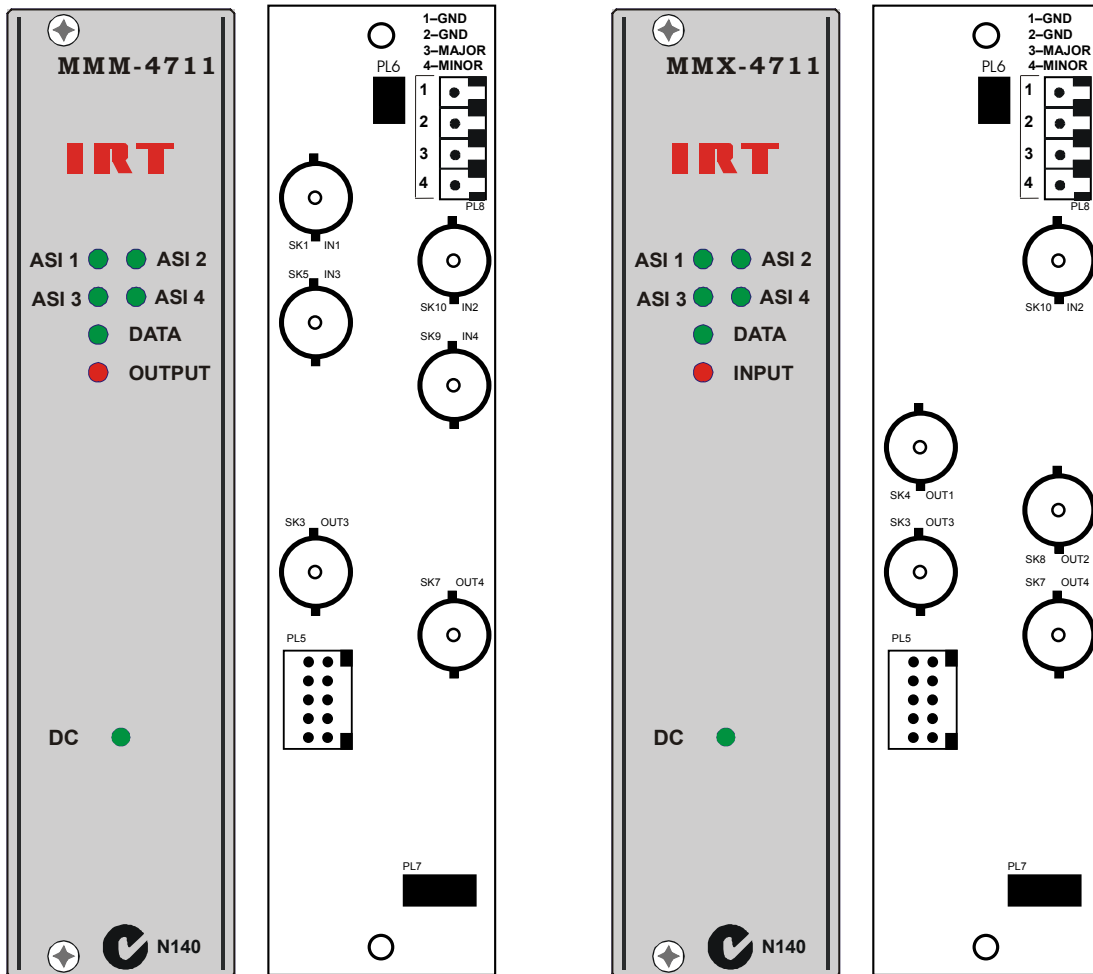
The RS-232 data output port is via a 10 pin HE14 style of header. Pins 1, 2 and 7 are connected together on the PCB. Pins 9 and 10 are both earthed. Pin 5 is the RS-232 *transmit data* (TXD) connection. Data transfer is unidirectional only, this is a receive path only.

For connection to a standard RS-232 9 pin D connector, wire as per the diagram below:



Front & rear panel connector diagrams

The following front panel⁷ and rear assembly drawings are not to scale and are intended to show connection order and approximate layout only.



NOTE: 7 For S version cards the front panels are designated as MMM-4711-S and MMX-4711-S.

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 *NMSs* 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.

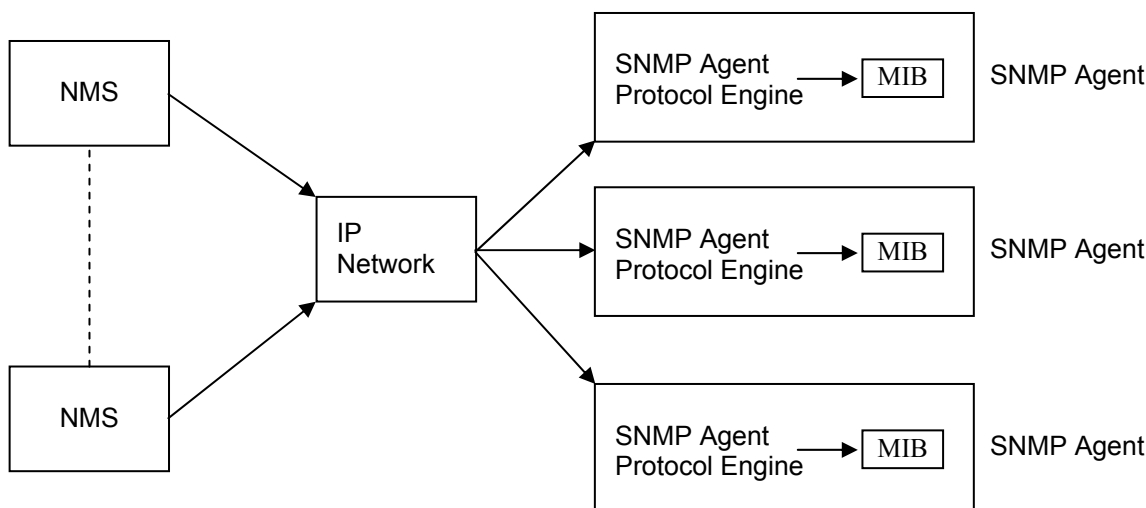
An *NMS* polls, or communicates with, an *agent*. An *agent* is a network management software module that resides in a *managed device*. An *agent* has local knowledge of management information and translates that information into a form compatible with SNMP. The *agent*, therefore, acts as an interface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

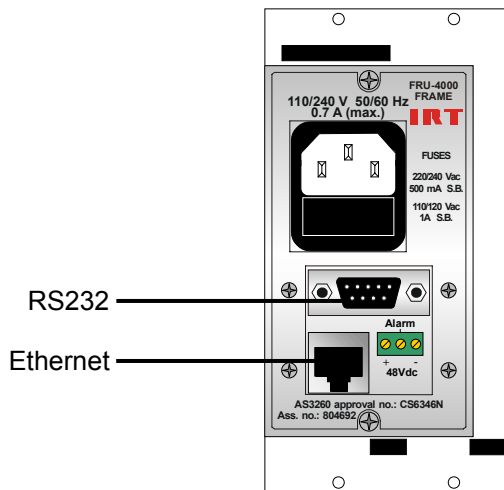
IRT Electronics currently employs SNMPv1 with its SNMP capable frames. The frame acts as an *agent* when fitted with a CDM-xxxx module. This module has its own designated slot next to the power supply so as to not affect the number of modules that the frame will take. Communication between the *NMS*,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

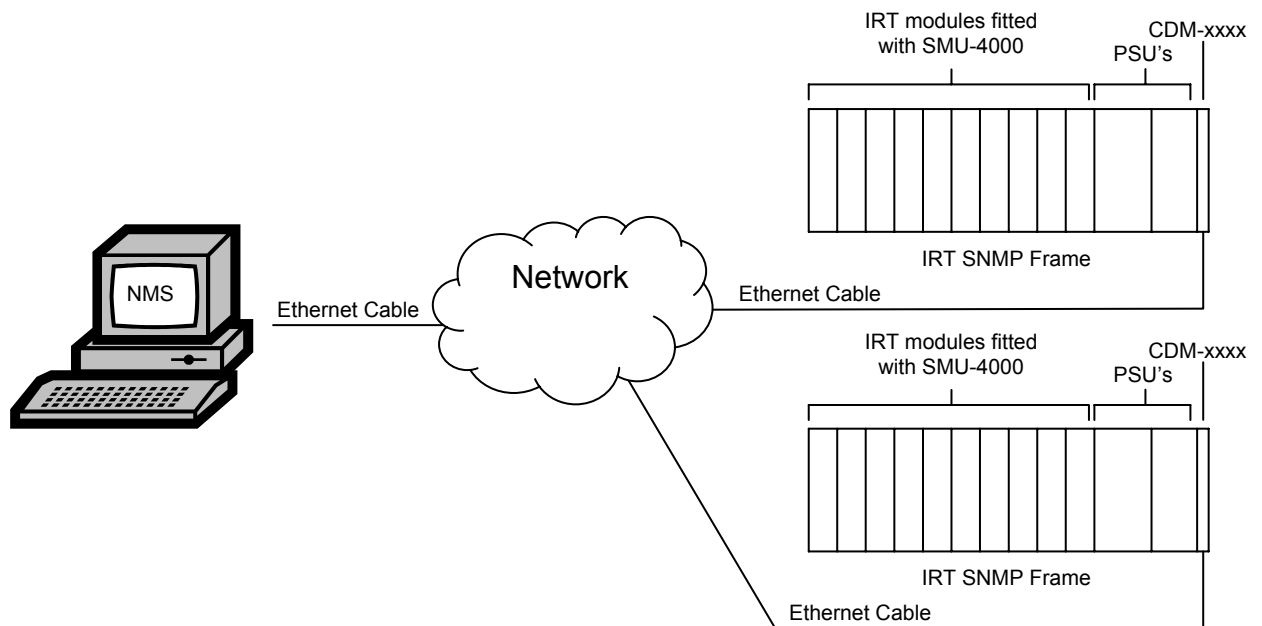
Frame parameters, such as Name, Address and Location, are set via an RS232 interface, a D9 connector on the rear of the frame below the mains inlet. A software terminal emulator, such as Tera Term or HyperTerminal, is used for setting and reading the parameters of the frame.

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

MMM-4711 & MMX-4711 SNMP Functions:

With the MMM-4711 and MMX-4711 installed in an IRT frame with SNMP capability, the units can be interrogated by an SNMP Network Management System (NMS).

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

MMM-4711:

An indication of the current state of the Urgent and Non Urgent alarms

[noAlarms (1), UrgentAlarms (2), nonUrgentAlarms (3);

Information about each channel:

An indication that the channel input signal is present [notPresent (1), present (2)];

An indication whether the channel is enabled or not⁸ [notEnabled (1), enabled (2)];

An indication of the packet size [bytes188 (1), bytes204 (2)];

An indication of the approximate data rate of the channel;

A 15 byte maximum Alias (name) for the channel can be read and set;

The current output setting's control source [localDIPsw (1), remoteSNMP (2)];

The desired output data rate⁹ (set here by SNMP, if enabled, or local DIP switch control);

An indication that the Data Channel is set [notEnabled (1), enabled (2)];

An indication of the firmware version of the FPGA in the format x.y where x is the major revision number and y is the minor revision number;

An indication of the software version of the FPGA in the format x.y where x is the major revision number and y is the minor revision number;

Whether "Trap" functions are enabled [notEnabled (1), enabled (2)];

Trap automatically sent, if enabled, when an alarm condition changes [notEnabled (1), enabled (2)];

Trap automatically sent, if enabled, when a channel is first present and when it is first absent [notEnabled (1), enabled (2)]; and

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

NOTE: 8 When a channel is disabled via SNMP, if ASI signal is present at this channel input to MMM-4711, front panel LED corresponding to disabled channel will flash. This gives visual indication that channel is disabled. Corresponding LED on MMX will not illuminate.

9 When setting channel rates the total sum must not exceed 0.95 x the output rate for 188 byte input signals, or 0.88 x the output rate if 204 byte input signals.

MMX-4711:

An indication of the current state of the Urgent and Non Urgent alarms

[noAlarms (1), UrgentAlarms (2), nonUrgentAlarms (3), urgAndNonUrgentAlarms (4)];

An indication of the presence of a valid ASI input [notPresent (1), present (2)];

Information about each channel:

An indication that the channel signal is present [notPresent (1), present (2)];

An indication whether the channel is enabled or not¹⁰ [notEnabled (1), enabled (2)];

An indication of the packet size [bytes188 (1), bytes204 (2)];

An indication of the approximate data rate of the channel;

A 15 byte maximum Alias (name) for the channel can be read and set;

An indication of the approximate data rate of the ASI input;

An indication of the software version of the FPGA in the format x.y where x is the major revision number and y is the minor revision number;

Trap automatically sent, if enabled, when an alarm condition changes [notEnabled (1), enabled (2)];

Trap automatically sent, if enabled, when a channel is first present and when it is first absent [notEnabled (1), enabled (2)]; and

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

NOTE: 10 When a channel is disabled via SNMP, front panel LED corresponding to disabled channel will flash. This gives visual indication that channel is disabled.

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