IRT

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IRT Eurocard

Type OFP-4010

Fibre Optic
2x2 Changeover Switch

Designed and manufactured in Australia

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

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Revision History

Revision	Date	By	Change Description	Applicable to:
0	19/01/2010	AL	Original Issue.	Firmware version OFP4010i3v3
1	13/07/2010	AL	4 Port Changeover Switch descriptor changed to 2x2 Changeover Switch.	Firmware version OFP4010i3v3

IRT Eurocard
Type OFP-4010
Fibre Optic
2x2 Changeover Switch

Instruction Book

Table of Contents

This instruction book applies to units fitted with firmware version OFP4010i3v3.
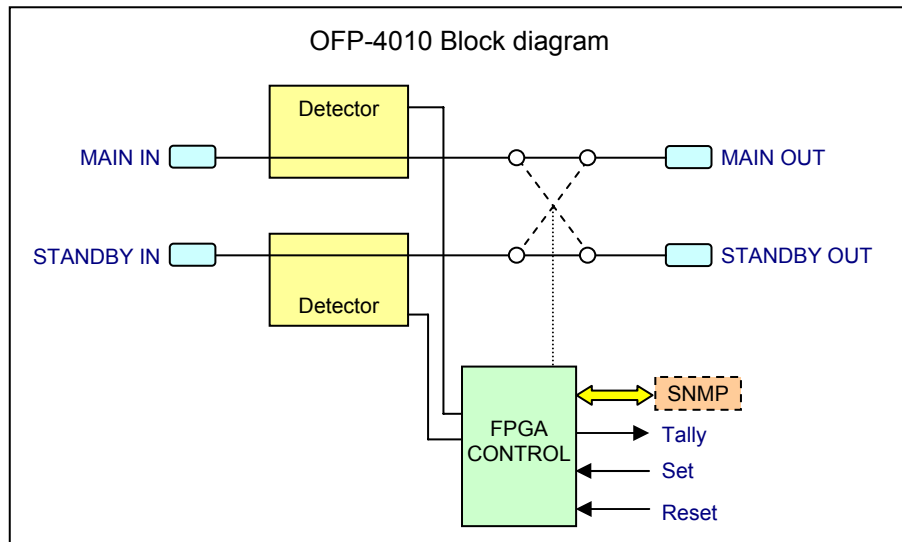
Operational Safety:

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 OFP-4010
Fibre Optic
2x2 Changeover Switch

General Description

OFP-4010 Block diagram

MAIN IN — Detector — MAIN OUT

STANDBY IN — Detector — STANDBY OUT

FPGA CONTROL — SNMP / Tally / Set / Reset

The OFP-4010 is a magnetic latching 2x2 changeover optical switcher using a high performance optical relay and optical level detectors. It is suitable for switching optical signals being run over single mode optical cable.

The OFP-4010 is arranged as a changeover switch with two inputs and two outputs. The latching characteristic of the high performance optical relay allows momentary control and also provides for no change of path during power loss.

Changeover switching is done either automatically, locally or remotely.

Optical detectors measure the optical power level and automatically switch the optical relay when signal strength falls below a dip switch selectable power level threshold set from -30 dBm to -5 dBm in 5dBm steps.

Local switching is possible using front panel push button switches. Remote switching is possible using external normally open or normally closed alarms.

The OFP-4010 is ideally suited to applications where a simple choice between two inputs or outputs is required and may be easily driven by detector circuits for automatic path selection.

Remote indication of tally and alarms are provided for integration into central alarm and monitoring systems.

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

The OFP-4010 is designed to fit IRT's 1RU and 4000 series 3RU Eurocard frames[1] and may be used alongside any other of IRT's analogue or digital Eurocards.

Standard features:

- **Automatic switching when optical level falls below a settable preset limit.**
- **External momentary Set/Reset control.**
- **No path change on power fail.**
- **Local or remote control.**
- **Front panel LED status indicators.**
- **Optional plug in SNMP monitoring and switching module.**

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[1] Not compatible with pre-4000 series 3RU frames.

Technical Specifications

IRT Eurocard module
Type OFP-4010

Signal path:

Signal type	Single Mode optical (various)
Switching characteristic	Magnetic latching 4 port changeover optical relay
Operating Wavelength	1260 nm to 1610 nm
Insertion loss	2.5 dB across full range;
	1.5 dB for 1260 nm to 1360 nm and 1510 nm to 1610 nm
Crosstalk between channels	< -60 dB
Switching speed	< 10 ms
Power threshold settings	-30 dBm to -5 dBm (±2 dBm) in 5 dB increments, dip switch selectable.

Auxilliary Data:

Tally	Main In to Main Out	Connection between pin 1 (NC) and pin 3 (COM).
	Standby In to Main Out	Connection between pin 2 (NO) and pin 3 (COM).
Alarm	Main Optical fail	Pin 2 open circuit on Main failure.
	Standby Optical fail	Pin 1 open circuit on Standby failure.
	Ground	Pin 3

Remote Control:

Control	Set	Switch to open circuit or switch to ground, DIP switch selectable.
		(Main I/P to Standby O/P, Standby I/P to Main O/P)
	Reset	Switch to open circuit or switch to ground, DIP switch selectable.
		(Main I/P to Main O/P, Standby I/P to Standby O/P)

Connectors:

Optical	SC/PC (standard).
Tally	3 pin Phoenix pluggable screw block.
Alarm	3 pin Phoenix pluggable screw block.
Control	3 pin Phoenix pluggable screw block.

Other:

Power requirements:	28 Vac CT (14-0-14) or ± 16 Vdc
Power consumption	1 VA.
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.
Supplied accessories	Rear connector assembly with matching connectors for control, alarm and tally.
Optional accessories	Instruction manual.
	SMU-4000 SNMP plug-in module for use with IRT frame fitted with SNMP "Agent".

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

Configuration

DIP Switch Settings:

```
ON
███████
1 2 3 4 5 6 7 8
```
SW3

SW3-1 OFF Remote input set for switch to open circuit control.
         ON   Remote input set for switch to ground control.

SW3-2 OFF Remote control acts in Set/Reset (magnetic latch) mode.
         ON   Remote control acts in toggle (non-magnetic latch) mode.

SW3-3 OFF Enable major and minor SNMP alarms to the frame Agent (CDM card).
         ON   Disable major and minor SNMP alarms to the frame Agent (CDM card).

SW3-4   Not used.

SW3-5   Not used.

SW3-6	SW3-7	SW3-8	Power Threshold (±2 dBm)
OFF	OFF	ON	-30 dBm
OFF	OFF	OFF	-25 dBm
OFF	ON	OFF	-25 dBm
ON	ON	ON	-25 dBm
OFF	ON	ON	-20 dBm
ON	OFF	OFF	-15 dBm
ON	OFF	ON	-10 dBm
ON	ON	OFF	-5 dBm

Remote switching control is either by switch to ground operation, or switch to open circuit. This allows for connection to either alarm type condition of external equipment being used to drive the OFP-4010.

>   **NOTE:** Open circuit control implies removing a ground contact.

Magnetic latch relay control needs a 'set' and 'reset' operation to switch between the two relay states, whilst toggle relay control only requires a 'set' and 'removal of set' to switch between the two states.

When using TRAPS via SNMP, depending on how system is set up, in order to avoid double reporting of alarms via the OFP-4010 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.

Power threshold is the level where if the optical input power drops below this level automatic switching will occur.

>   **NOTE:** Power threshold level must be set lower than the expected optical input level.
>
>   If, for example, the OFP-4010 is being used at the input to the optical receiver and the optical path loss between the transmitter and receiver is 10 dB, and if the laser output power from the transmitter is 0 dBm, then the maximum power threshold that can be set is -15 dBm.
>
>   If the OFP-4010 is being used at the output of two optical transmitters with a power output of 0 dBm, then any of the power threshold settings can be set provided, in theory, they are above the optical path loss between the transmitter and receiver plus the minimum receiver input sensitivity. If, for example, there is a 10 dB path loss between the transmitter and receiver, and the receiver has a minimum input sensitivity of -30 dBm, then the minimum power threshold level should be set to 20 dBm, or even -15 dBm allowing for tolerance variations. In practice, however, it'd be more likely a complete failure of one of the transmitters, which would cause a changeover to occur regardless of the settings, rather than a decline in laser output power.

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.

Not compatible with pre-4000 series 3RU frames such as 700 series or 3000 series.

Signal Connections:

Main and Standby input and output fibre connections are made via single mode optical connectors on the rear of the OFP-4010. The standard optical connector supplied with the OFP-4010 is the SC/PC type. Fibre connections are made directly to the main module.

Fibre connections should be removed before removing the card from the frame so as to avoid damaging the fibre cable.

Remote Control Connections:

Remote switch control is made by either a switch to ground or switch to open circuit contact, depending upon the DIP switch SW3-1 setting as described in the *Configuration* section of this manual, on the 3-pin SK2 connector located on the rear assembly.

Provided both optical input levels are above the preset power threshold, connecting the appropriate control input momentarily to ground, or open circuit, will cause the relays to operate and the output state to cross over as follows:

Control	Input		Output
SET (Gnd/Open Circuit)	A (Main)	↔	B
	B (Standby)	↔	A
RESET (Gnd/Open Circuit)	A (Main)	↔	A
	B (Standby)	↔	B

Control input connector SK2 pin configuration is as follows:

Pin	Description
1	SET control – select Input B (Standby) to Output A
2	RESET control – select Input A (Main) to Output A
3	Ground

SK2

```
1  ●  ■
2  ●  ■
3  ●  ■
```

CONTROL
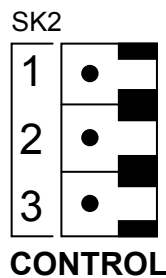
Tally connections:

Switch status is made by a relay contact on the SK5 connector (Tally) located on the rear assembly.

With pins 1 & 3 short circuited together module is in the Main (RESET) position:
Input A (Main) to Output A; and
Input B (Standby) to Output B.

With pins 2 & 3 short circuited together module is in the STANDBY (SET) position:
Input A (Main) to Output B; and
Input B (Standby) to Output A.

Tally output connector SK5 pin configuration is as follows:

Pin	Description
1	NC contact
3	NO contact
3	Relay Common

TALLY

```
1  ●  ■
2  ●  ■
3  ●  ■
```
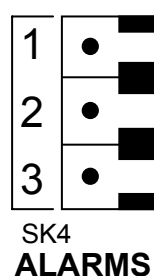
SK5
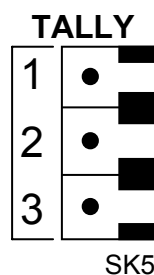
Alarm connections:

Optical fail alarm status is made by relay contacts on the SK4 connector (Alarm) located on the rear assembly.

Alarm output connector SK4 pin configuration is as follows:

Pin	Description
1	Standby Optical fail - open circuit on Standby failure
2	Main Optical fail - open circuit on Main failure
3	Ground

```
1  ●  ■
2  ●  ■
3  ●  ■
```

SK4

ALARMS

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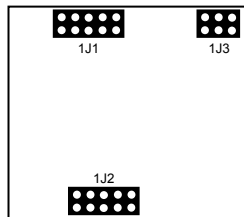
This is where the SMU-4000 plug-in SNMP management controller module is fitted. The three sets of multipins on the underside of the SMU-4000 line up with the three sets of multipin sockets on the main PCB module. Align all pins and then gently press the SMU-4000 all the way down into place.

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.
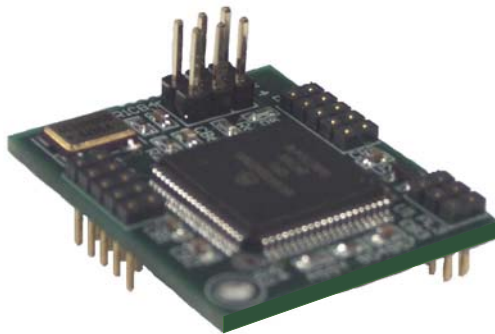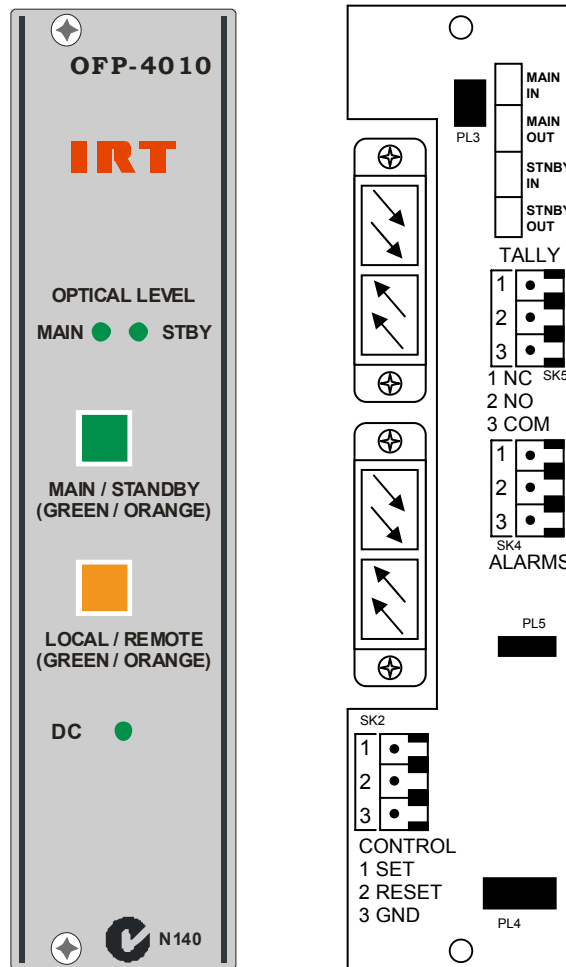

Figure 1: SMU-4000 module

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

The OFP-4010 can be used for a MAIN / STANDBY changeover switch, or a 2x1 switcher, application.

Switcher control is done either automatically, locally via the front panel pushbutton switches, remotely by external signals / alarms connected via the SK2 control connector on the rear assembly, or via SNMP (Simple Network Management Protocol) using a Network Management System (NMS).

Automatic Control:

With the power threshold value set via the SW3-6, SW3-7 and SW3-8 DIP switch settings as described in the *Configuration* section of this manual, automatic switching takes place when the optical signal strength of the optical input falls below the preset limit. Power threshold can be set from -5 dBm to -30 dBm in 5 dB steps.

> **NOTE:** 1. Power threshold must be set lower than the expected input power.
>
> 2. Automatic control overrides both local and remote controls.

Front panel green LEDs indicate whether the optical input signal power levels are above the set power threshold level. If either of the optical input power levels drops below the set power threshold level the corresponding LED is extinguished and automatic switching will take place, if appropriate.
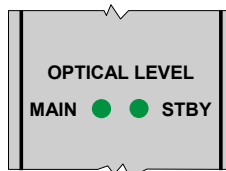
Local Control:

There are two front panel momentary pushbuttons marked LOCAL / REMOTE and MAIN / STANDBY.
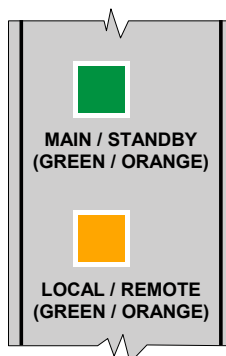
The LOCAL / REMOTE switch switches between front panel local control and remote rear assembly control. The default state is in the remote (orange) setting. To switch to front panel local control, press this button and hold for approximately a second. Switch colour then changes to green indicating that the MAIN / STANDBY switch is now operational.

Provided both the optical input signal power levels are above the set power threshold, the MAIN / STANDBY switch switches between MAIN (Input A goes to Output A, Input B goes to Output B) and STANDBY (Input B goes to Output A, Input A goes to Output B) positions. To activate, press and hold for approximately a second. Switch colour changes between green (MAIN) and orange (STANDBY) to indicate which position the changeover relays are in.

Switches need to be held down for approximately a second before activation takes place. This is so to avoid accidental switching taking place should the switches be pressed accidentally as they are momentary, not latched, contact type switches.

After approximately 3 minutes the OFP-4010 will automatically revert back to the remote setting. This is so that if the unit is left accidentally in the local setting in a remote location external alarms are not locked out from operating. If the remote input is already being held by an alarm prior to reverting to remote mode, the unit will not be set by the remote until another change in remote state occurs.

Remote Control:
For remote switching to work both the optical input signal power levels must be above the set power threshold.

Magnetic Latch Mode:
With SW3-2 OFF, the SET (SK2-1) and RESET (SK2-2) controls operate in the magnetic latch mode.

Switch to ground operation:
If the OFP-4010 has been set to switch to ground operation with the DIP switch SW3-1 ON, provided the RESET pin (SK2-2) isn't already being held to ground, momentarily grounding the SET pin (SK2-1) will select Input A (Main) to Output B, and Input B (Standby) to Output A.

Provided the SET pin (SK2-1) isn't already being held to ground, momentarily grounding the RESET pin (SK2-2) will select Input A (Main) to Output A, and Input B (Standby) to Output B.

Switch to open circuit operation:
If the OFP-4010 has been set to switch to open circuit operation with the DIP switch SW3-1 OFF, provided the RESET pin (SK2-2) isn't already being held open circuit, momentarily open circuiting the SET pin (SK2-1) will select Input A (Main) to Output B, and Input B (Standby) to Output A.

Provided the SET pin (SK2-1) isn't already being held to open circuit, momentarily open circuiting the RESET pin (SK2-1) will select Input A (Main) to Output A, and Input B (Standby) to Output B.

Toggle Mode:
With SW3-2 ON, the SET control (SK2-1) behaves in a toggle mode of operation.

Switch to ground operation:
If the OFP-4010 has been set to switch to ground operation with the DIP switch SW3-1 OFF, grounding this pin will select Input A (Main) to Output B, and Input B (Standby) to Output A. Removing this ground will automatically reset Input A (Main) to Output A, and Input B (Standby) to Output B.

Switch to open circuit operation:
Likewise if the OFP-4010 has been set to switch to open circuit operation with the DIP switch SW3-1 ON, open circuiting this pin, that is removing a ground, will select Input A (Main) to Output B, and Input B (Standby) to Output A. Grounding this pin will automatically reset Input A (Main) to Output A, and Input B (Standby) to Output B.

Whilst in the remote mode of operation, the front panel MAIN/STANDBY switch indicator will match the remote switch settings. MAIN selection (Input A goes to Output A, Input B goes to Output B) is indicated by a green indicator, whilst STANDBY selection (Input B goes to Output A, Input A goes to Output B) is indicated by an orange indicator.

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
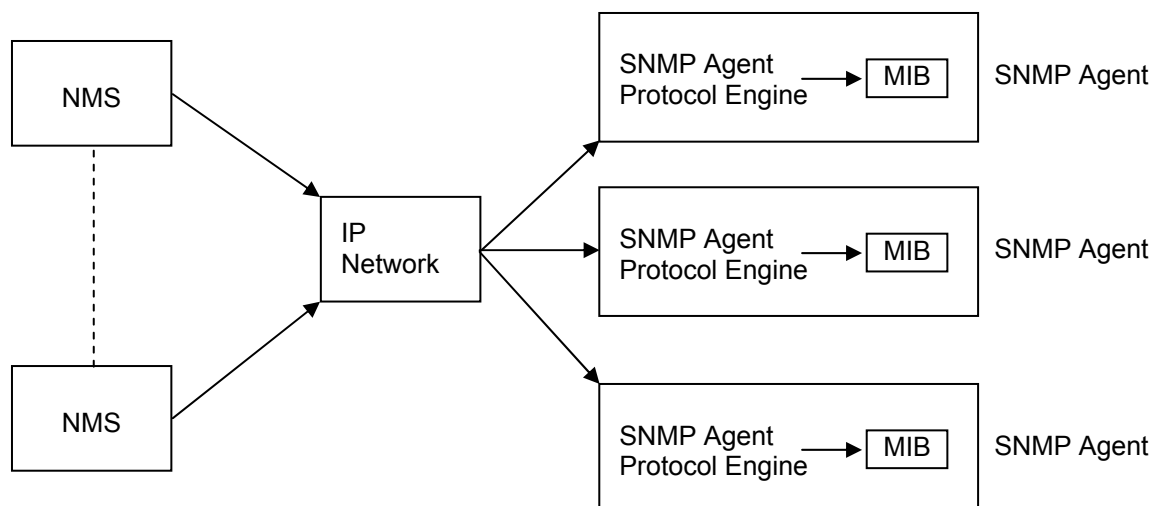
SNMP with IRT Products:

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.
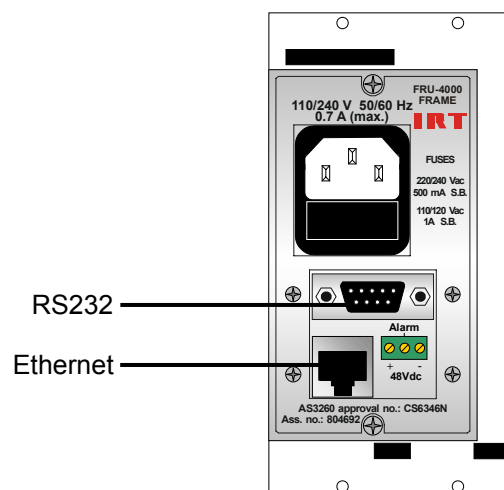
IRT SNMP Connections
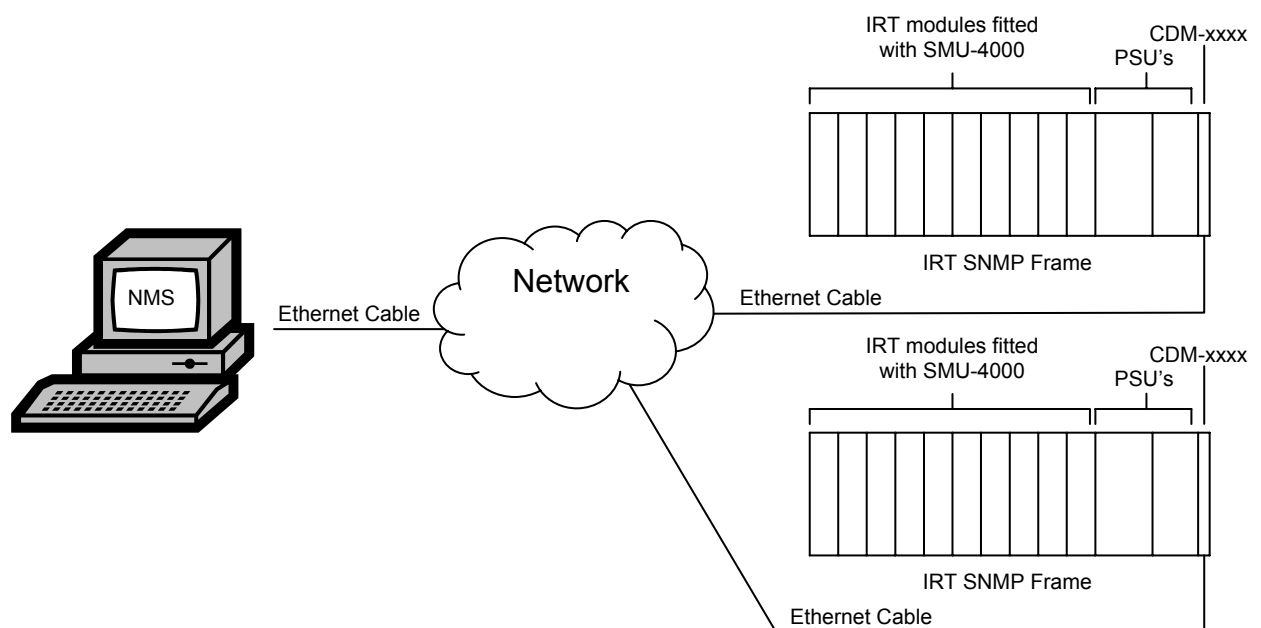
IRT SNMP Setup

OFP-4010 SNMP Functions:

With the OFP-4010 fitted with the optional plug-in SMU-4000 SNMP module, programmed with the firmware to suit and installed in an IRT frame with SNMP capability, the unit can be interrogated by an SNMP Network Management System (NMS).

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

> An indication of the current state of the Urgent and Non Urgent alarms
> > (noAlarms (1), nonUrgentAlarms (2), UrgentAlarms (3));

> Allow selection and monitoring of the input currently switched to the main output
> > (inputA (1), inputB (2));

> STATUS:
> An indication of the optical power alarm for input A (none (1), alarm (2);
> An indication of the optical power alarm for input B (none (1), alarm (2);
> An indication of the optical signal power at input A;
> An indication of the optical signal power at input B;
> An indication of the threshold power setting for optical signal alarms
> > (minus5dBm (1), minus10dBm (2), minus15dBm (3), minus20dBm (4), minus25dBm (5), minus30dBm (6), minus35dBm (7));
> An indication of local or remote operating mode (remote (1), local (2));

> CONTROL:
> A 15 byte maximum Alias for input A;
> A 15 byte maximum Alias for input B;

> 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 SMU-4000 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 the optical input power level exceeds or falls below the selected threshold (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: A nonUrgent Alarm is when one of the two optical input signal's power level is below the set power threshold.

A Urgent Alarm is when both of the two optical input signals' power levels are below the set power threshold.

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