I R T

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IRT Eurocard

Type DVS-4040

5x1 ASI / SDI Switcher

Designed and manufactured in Australia

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

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5x1 ASI / SDI Switcher

Revision History

Revision	Date	By	Change Description	Applicable to:
0	10/09/2004	AL	Original Issue.	S/N: ≥ 0404001
1	08/03/2011	AL	Link 4 information updated in *Configuration* section and SNMP parameter explanation expanded upon.	S/N: ≥ 0404001

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Type DVS-4040

5x1 ASI / SDI Switcher

Instruction Book

Table of Contents

This instruction book applies to units with serial number ≥ 0404001.

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 DVS-4040

5x1 ASI / SDI Switcher

General Description

The DVS-4040 digital video switcher is part of a family of "smart" switchers in Eurocard format that may be linked and configured by the user to cover a wide range of switching and monitoring functions.

The DVS-4040 supersedes the DVS-3041 and provides all of its predecessor's functions together with the added option of a plug-in Simple Network Management Protocol (SNMP) monitoring and control module for use with IRT's SNMP system frame.

On board configuration is possible to allow up to four switchers to be joined for up to 20 x 1 operation[1].

The switcher may be slaved to operate in conjunction with similar switchers for analogue & digital video and audio or similar control signals.

This makes the switchers ideally suited to situations where a mixture of analogue and digital signals are present.

The CPS-3050 local control switch panel kit converts the switcher for stand-alone operation.

The CPS-9001 provides a 5-button remote control in a panel the same size as the CPS-3050.

The CPS-1050 and 1052 1RU remote control panels allow formation of 10 x 1, 15 x 1 or 20 x 1 combinations[1].

All panels have tally LED's and switch label inserts. Multiple panels may be used with tally to each panel.

The DVS-4040 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:

- **5 x 1 270 Mb/s SDI or ASI.**
- **Input equalisation to 200 metres.**
- **Automatic muting of inputs with no signal.**
- **May be cascaded[1] to 20 x 1.**
- **Local or remote control options.**
- **Universal wire per crosspoint or binary coded remote control.**
- **Optional plug-in SNMP monitoring and control module.**
- **Compatible with other 3000 & 4000 series digital & analogue switchers.**

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[1] On board component configuration necessary for cascading together for > 5x1 operation.

Technical Specifications

IRT Eurocard module
Type DVS-4040

Signal inputs:

Number		5.
Type		270 Mb/s SDI or ASI
Equalisation		Automatic to 200 metres on each input.
		Automatic muting of inputs without signal.
Impedance		75 Ω.

Signal outputs:

Type	SDI/ASI	2 x 800 mV ±10% into 75 Ω.

Control inputs/outputs:

Type		5 bit BCD coded parallel TTL level.
		or
		individual grounding contacts.
Number		1 input & 1 output.

Performance:

Switching	Timing derived from a local monostable signal.
Return loss	>15 dB 5 MHz to 270 MHz.
DC offset	0 V ±0.5 V.
Rise time	between 0.75 and 1.5 ns.
Power Requirements	28 Vac CT (14-0-14) or ± 16 Vdc.
Power consumption	<125 mA.

Connectors:

	SDI/ASI	BNC.
	Control	Plug in 10 pin HE14 dual IDC.

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.
Supplied accessories		Rear connector assembly including matching connectors for control inputs & outputs.
Optional accessories		TPD-3010 front panel LED tally panel.
		CPS-3050 local control conversion with 5 pushbuttons & tally LED's.
		CPS-9001 remote control panel with 5 pushbuttons & tally LED's.
		CPS-1050 remote control panel with 10 pushbuttons & tally LED's.
		CPS-1052 remote control panel with 20 pushbuttons & tally LED's.
		SMU-4000 plug-in SNMP Management Information Base (MIB) module.

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

Configuration

Interconnecting modules:

The DVS-4040 control buss can be daisy chained with other types of IRT 3000 and 4000 series switchers, such as analogue video, audio and data switchers, and control panels. Modules are looped by joining PL5 (data out) on one module to PL4 (data in) on the next.

Power is supplied to IRT remote control panels via the control buss. PL4 supplies the +12Vdc needed to power the remote control panel. PL5 does not share this power rail, hence when connecting to an IRT remote control panel, PL4 on the first switcher module in the switcher chain must be connected to PL5 on the remote control panel.

Switch pulses:

The DVS-4040 switcher has a free running switch pulse generator for executing a crosspoint change. The period is approximately 25 ms. When the switcher is configured as *Inputs 1-5* (using LK's 1 & 2), it uses its own switch pulses. If configured for any other input range (e.g. *Inputs 6-10*), it defaults to using the switch pulses incoming on its PL 4 connector -- *switch pulse in*, and also passes these on to *switch pulse out* on its PL 5.

The default switcher sync pulse type, for inputs 1-5, is the internal sync. This corresponds to link LK4 being in the "B" position. Always leave link LK4 (if fitted) in the "B" position. The "A" position has no relevance.

> **LK4-A**   **Not Applicable** (external sync).

> **LK4-B**   **Internal sync.** (default position – leave in this position).

Power on reset:

Power on reset is needed so that at power on only one switcher or control panel drives the buss. LK3 on each of the *Switcher Group* or the remote control panel is used to select which unit is in control at power on.

If LK3-B is **not** installed and the switcher/control panel is configured to be for *Inputs 1-5* then at power on that unit will take control of the buss and select input 1.

In the case of a multi-level set up, such as a 5x1 video with a 5x1 audio as a slave, all the slaves should have LK3-B installed.

LK3 has another function. If LK3-A is **not** installed then any CPS-3050 switcher panel installed on the front of the module will act as tally only -- the operation of any of its buttons will have no effect. This also applies to the remote control panel.

Switcher set ups larger than 5x1

10x1, 15x1 and 20x1 switchers can be made up of multiple switchers.

In order to achieve this connections have to be made between modules for both control and signal purposes. In addition, links on each module need to be configured to set the address range for the module.

These three operations are dealt with separately below.

Control settings:

LK 1 and LK 2 on the switchers are used to assign the group of inputs that a module will switch. See *Link Settings* section below.

NOTE: Always have one at least one switcher configured as *'Inputs 1-5'* otherwise there will be no switch pulses and consequently no switching action at all.

Connector PL 5 (data out) on switcher 1 - 5 connects to PL 4 (data in) on switcher 6 - 10 and so on.

Cables may be wired using the connectors provided or may be ordered from IRT using the following part numbers:
GDW-3010   150 mm cable for joining adjacent modules in 3 RU frame.
GDW-3011   300 mm cable for joining modules in 1 RU frames.

Signal settings:

When a DVS-4040 is to be used for inputs greater than 1-5 output 1 needs to be configured as an expansion output on modules designated as 6-10, 11-15 and 16-20, and output 2 needs to be reconfigured to act as an expansion input on the modules designated as 1-5, 6-10, and 11-15.

To configure output 1 as an expansion output, remove C37 and replace with a short circuit (either a solder bridge, wire link or a zero ohm resistor). This DC couples the output for connection to the preceding switcher expansion input. Output 1 on the first switcher designated 1-5 stays as is with the capacitor C37 in place.

To configure output 2 as an expansion input, remove C38 and replace R27 with a short circuit (either a solder bridge, wire link or a zero ohm resistor) and wire, using thin 75 coax, on the back of the main PCB from R27 to R17. Pads exist on the PCB for this purpose.

When the data buss value is outside the range of inputs for which the module is configured the module selects the expansion input on its motherboard as its input. Therefore, the module with the highest input range should have its expansion output connector linked to the expansion input of the module with the next lower input range.

Note that this is a re-entrant form of switching. For example, inputs in the range 16-20 on a 20x1 configuration actually pass through four active modules, consequently being subjected to a slight increase in jitter and delay. Hence, although the DVS-4040 can be configured for up to 20x1 operation, maximum expansion to 10x1 only is recommended.

Link Settings:

Links LK 1 & LK 2:   These set the crosspoint range of the switcher or control panel as follows:

Inputs	LK 1	LK 2
1 - 5		
6 - 10	IN	
11 - 15		IN
16 - 20	IN	IN

Link LK 3:   Local / remote control selection. If the switchers on the front of this unit are to be active, then install LK3-A, otherwise install LK3-B.

Link LK 4:   LK4-A: Not Applicable.
(if fitted)   LK4-B: Normal selection of switch pulses (default position – leave in this position).

Wire per crosspoint operation

In most cases, the BCD encoded remote control system offers the most satisfactory way of controlling one or more switchers. There are however, situations where it is necessary to provide a wire per crosspoint access for control and / or a line per crosspoint tally system. Both of these facilities may be made available on the DVS-4040 in a number of ways.

To change to WPX mode the WPX links should be installed on the PCB where indicated on the PCB overlay and all of the "Universal" links should be removed or cut.

A momentary contact closure to ground on the relevant control input will now cause the switcher to operate in the same way as it would have if the switch on the local control panel type CPS-3050 had been depressed.

Pin connections are as follows:

	PL 4	PL 5
1A	+12 Vdc out.	N/C.
1B	Ground.	Ground.
2A	Switch 5 contact.	Switch 5 contact.
2B	Switch 4 contact.	Switch 4 contact.
3A	Switch 3 contact.	Switch 3 contact.
3B	Switch 2 contact.	Switch 2 contact.
4A	Switch 1 contact.	Switch 1 contact.
4B	N/C.	Vert. out
5A	N/C.	N/C.
5B	N/C.	N/C.
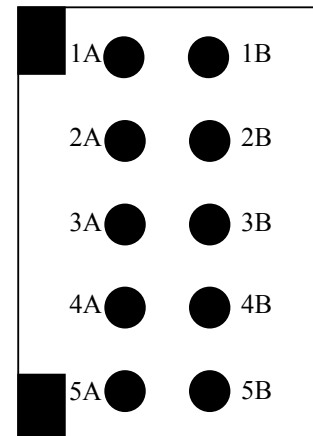
Note that no tally is available on the switch lines.

Location of links & user settings

The following location diagram is not to scale and is intended only to assist in finding the location of links and other settings, which may need to be changed by the user during *Configuration*.
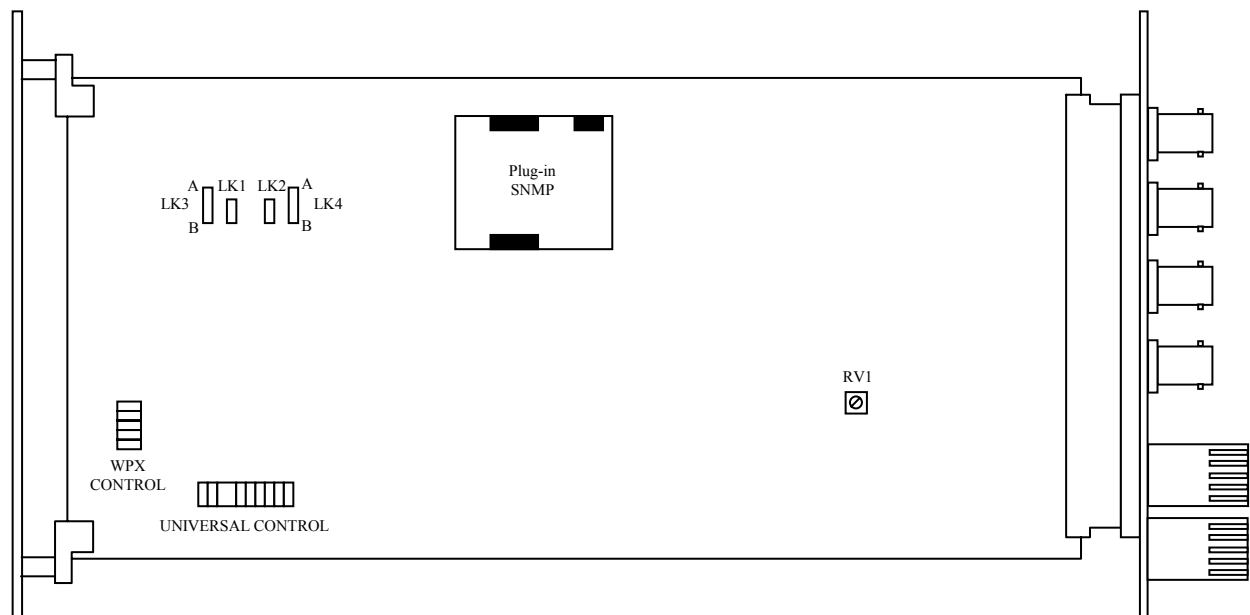
Installation

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.

Digital Video Connections:
Inputs and outputs are 75 Ω BNC type for connection with high quality 75 Ω coaxial cable. Inputs are self-terminating. No loop through facility is available. For applications requiring multiple destinations, a 270 Mb/s digital type distribution amplifier should be used.

CPS-3050 - Local control:
All switchers are sold with a plain front panel with DC power LED and printed with the switcher type number and IRT logo. The CPS-3050 provides the necessary components to add control buttons and tally to the front panel.

Before fitting the CPS-3050, the original front panel and LD 1, LED DC indicator, must be removed.

The CPS-3050 PCB should then be pressed carefully into place making sure that the pins on the CPS-3050 plug mate correctly with the socket on the main module PCB. The front plate is then fitted using the screws and spacers provided.

For local switching, to take effect link LK 3 must be placed in the "A" position. See *Configuration* for details.

TPS-3010 - Local tally panel:
All switchers are sold with a plain front panel with DC power LED and printed with the switcher type number and IRT logo. The TPS-3010 provides the necessary components to add tally LED indicators to the front panel. This is desirable when switchers are controlled only by remote connections that are distant from the switcher.

The TPS-3010 provides confidence that a slave switcher has responded to the master command and can therefore greatly assist in finding faults in inter-module wiring.

Before fitting the TPS-3010, the original front panel and LD 1, LED DC indicator, must be removed.

The TPS-3010 PCB should then be pressed carefully into place making sure that the pins on the TPS-3010 plug mate correctly with the socket on the main module PCB. The front plate is then fitted using the screws and spacers provided.

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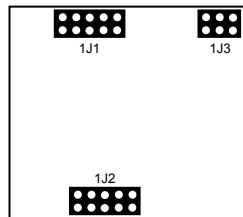
This is where the SMU-4000 plug-in SNMP management controller module is fitted. The three sets of multipins on the underside of the SMU-4000 line up with the three sets of multipin sockets on the main PCB module. Align all pins and then gently press the SMU-4000 all the way down into place.

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.
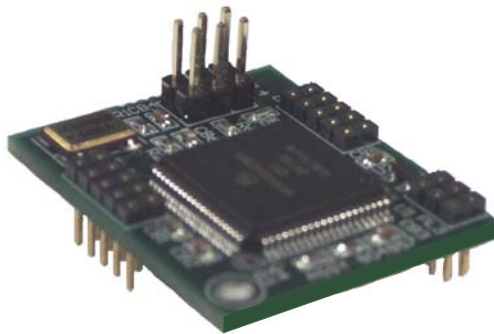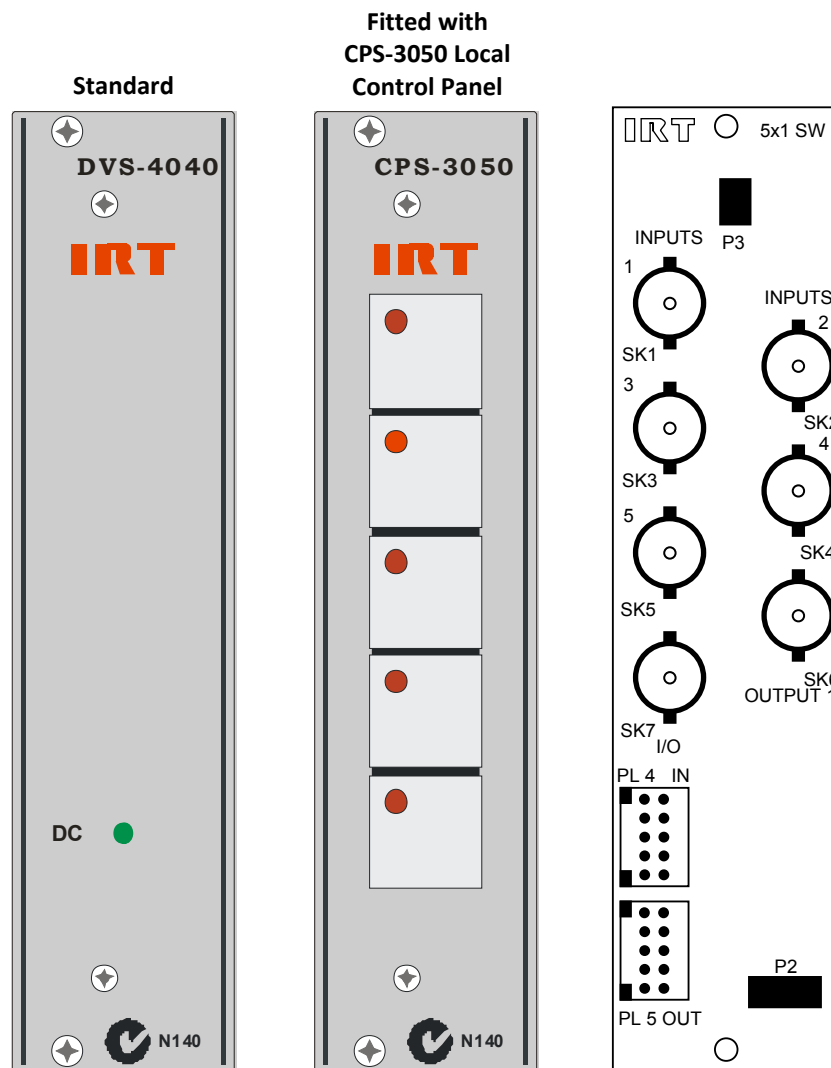

Figure 1: SMU-4000 module

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.

Standard

Fitted with CPS-3050 Local Control Panel

DVS-4040

IRT

DC ●

N140

CPS-3050

IRT

N140

IRT ○ 5x1 SW

INPUTS   P3
1
SK1
INPUTS
2
3
SK2
SK3
4
5
SK4
SK5
SK6
SK7   OUTPUT 1
I/O
PL 4 IN

PL 5 OUT

P2

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
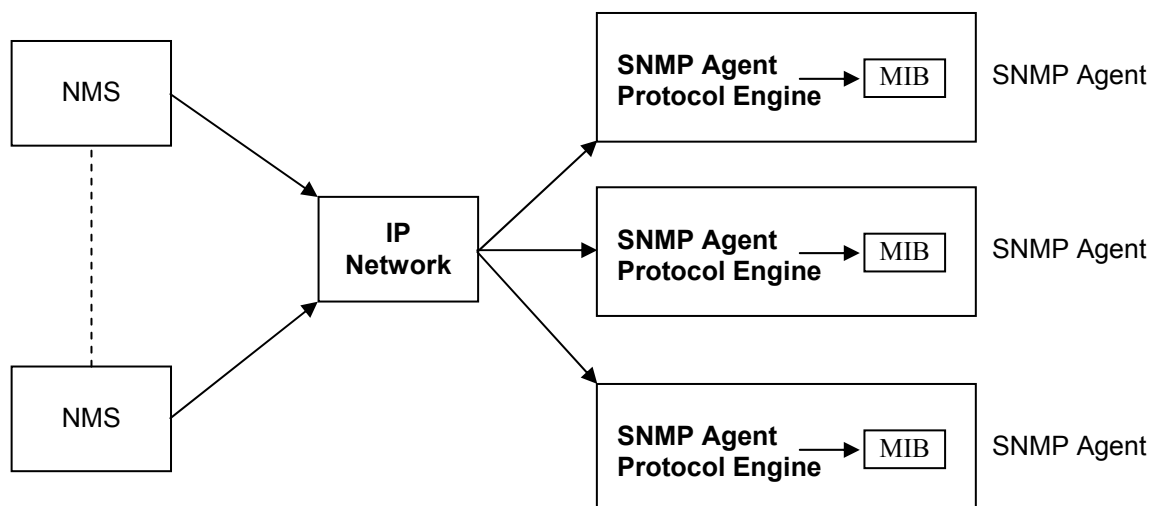
SNMP with IRT Products:

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.
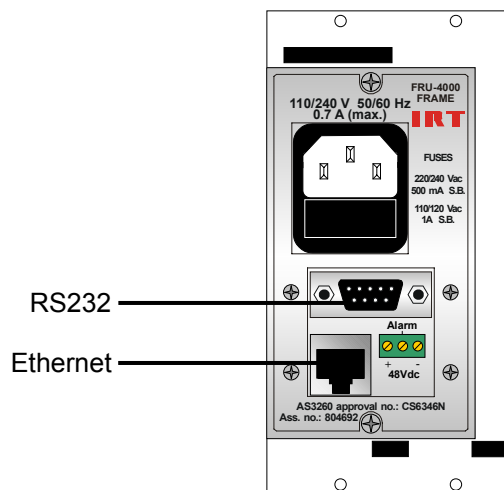
IRT SNMP Connections
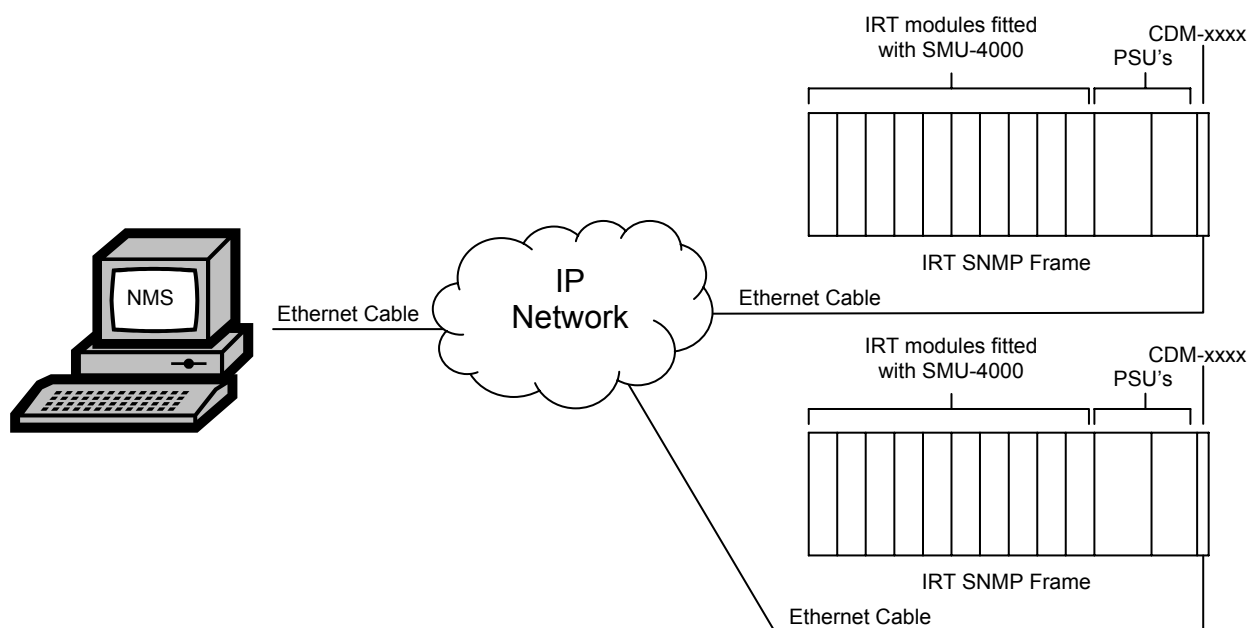
IRT SNMP Setup

DVS-4040 SNMP Functions:

With the DVS-4040 fitted with the optional plug-in SMU-4000 SNMP module, programmed with firmware to suit, and installed in an IRT frame with SNMP capability, it is possible to remotely monitor the presence of inputs and which input is currently switched to the output, as well as to remotely select desired input to output, using an NMS.

Alarm States:

irt4040InputsPresent   - Read the status of the inputs present:
- (1) axxxx: Input 1 present only. Inputs 2, 3, 4 & 5 not present.
- (2) xbxxx: Input 2 present only. Inputs 1, 3, 4 & 5 not present.
- (3) abxxx: Inputs 1 and 2 present only. Inputs 3, 4 & 5 not present.
- (4) xxcxx: Input 3 present only. Inputs 1, 2, 4 & 5 not present.
- (5) axcxx: Inputs 1 and 3 present only. Inputs 2, 4 & 5 not present.
- (6) xbcxx: Inputs 2 and 3 present only. Inputs 1, 4 & 5 not present.
- (7) abcxx: Inputs 1, 2 and 3 present only. Inputs 4 & 5 not present.
- (8) xxxdx: Input 4 present only. Inputs 1, 2, 3, & 4 not present.
- (9) axxdx: Inputs 1 and 4 present only. Inputs 2, 3 & 5 not present.
- (10) xbxdx: Inputs 2 and 4 present only. Inputs 1, 3 & 5 not present.
- (11) abxdx: Inputs 1, 2 and 4 present only. Inputs 3 & 5 not present.
- (12) xxcdx: Inputs 3 and 4 present only. Inputs 1, 2 & 5 not present.
- (13) axcdx: Inputs 1, 3 and 4 present only. Inputs 2 & 5 not present.
- (14) xbcdx: Inputs 2, 3 and 4 present only. Inputs 1 & 5 not present.
- (15) abcdx: Inputs 1, 2, 3 and 4 present only. Input 5 not present.
- (16) xxxxe: Input 5 present only. Inputs 1, 2, 3 & 4 not present.
- (17) axxxe: Inputs 1 and 5 present only. Inputs 2, 3 & 4 not present.
- (18) xbxxe: Inputs 2 and 5 present only. Inputs 1, 3 & 4 not present.
- (19) abxxe: Inputs 1, 2 and 5 present only. Inputs 3 & 4 not present.
- (20) xxcxe: Inputs 3 and 5 present only. Inputs 1, 2 & 4 not present.
- (21) axcxe: Inputs 1, 3 and 5 present only. Inputs 2 & 4 not present.
- (22) xbcxe: Inputs 2, 3 and 5 present only. Inputs 1, & 4 not present.
- (23) abcxe: Inputs 1, 2, 3 and 5 present only. Input 4 not present.
- (24) xxxde: Inputs 4 and 5 present only. Inputs 1, 2 & 3 not present.
- (25) axxde: Inputs 1, 4 and 5 present only. Inputs 2 & 3 not present.
- (26) xbxde: Inputs 2, 4 and 5 present only. Inputs 1 & 3 not present.
- (27) abxde: Inputs 1, 2, 4 and 5 present only. Input 3 not present.
- (28) xxcde: Inputs 3, 4 and 5 present only. Inputs 1 & 2 not present.
- (29) axcde: Inputs 1 and 5 present only. Inputs 2, 3 & 4 not present.
- (30) xbcde: Inputs 2, 3, 4 and 5 present only. Input 1 not present.
- (31) abcde: All inputs 1, 2, 3, 4 and 5 present.
- (127) xxxxx: No inputs present.

irt4040InputSelected   - Read and set the number of the currently selected input (1 to 20).

irt4040Reset   - Unit reset control. A set with a value of 2 sent to this OID will cause a system reset to occur.

irt4040Trap   - A Trap is sent , if enabled, when an alarm occurs or clears, or when an input selection changes
- (1) enabled: Traps enabled.
- (2) disabled: Traps 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