

3G/HD/SD-SDI, ASI, G.703, Video, Audio Relay Changeover Switch



# User Manual

**Revision History:**

Revision	Date	By	Change Description	Applicable to:
00	08/02/2011	AL	Original Issue.	S/N: $\geq 1102001$
01	25/02/2011	AL	Correction to control pin designation in specifications.	S/N: $\geq 1102001$
02	02/11/2012	AL	DIP switch SW1-5 functionality added.	Firmware version $\geq$ AMS4172F4V3S4V2

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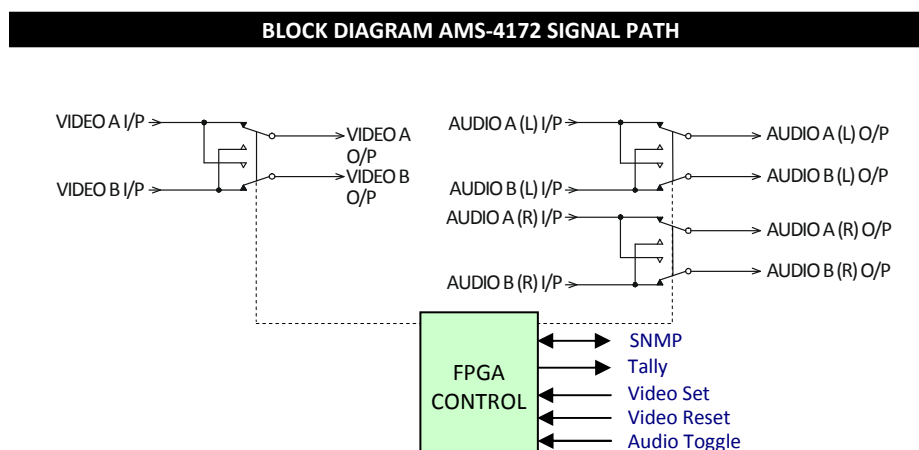
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This instruction book applies to units programmed with firmware version AMS4172F4V3S4V2 (or later).

**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.



The AMS-4172 consists of one “video” and two “balanced audio” switches arranged as a changeover set with two inputs and two outputs. No terminations are provided on the board allowing the switcher to be used in a wide variety of applications and with signals of various types and impedances.

The “video” path uses enhanced performance relays to provide switching capabilities for high-speed data signals up to 2.97 Gb/s and may be used with analogue video, 3G/HD/SD/ASI or G.703 data signals.

The “audio” path may be used for balanced or unbalanced audio or control signals (RS232, RS422, RS485 etc).

The magnetic latching characteristic of the high performance relays allows momentary control and also provides for no change of path during power loss.

The AMS-4172 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.

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

Front panel switches use a small delay to avoid accidental switching if bumped. After a period of a few minutes, the AMS-4172 automatically switches back into remote mode.

Remote indication of tally status is provided for integration into central alarm and monitoring systems.

SNMP (Simple Network Management Protocol) is available for monitoring and control when used in an IRT frame fitted with SNMP capability.

The AMS-4172 is designed to fit IRT’s 1RU and 4000 series 3RU Eurocard frames and may be used alongside any other of IRT’s analogue or digital Eurocards.

#### Standard features:

- **One video and two audio changeover switches in one package**
- **Video path suitable for 3G/HD/SD-SDI, Analogue video, ASI, G703 signals @ 2, 8, 34, 45, 144, 155 Mb/s, and unbalanced AES**
- **Audio path suitable for 2 balanced, or 4 unbalanced, audio or data signals, and balanced AES**
- **Married or independent operation**
- **Momentary Set/Reset control**
- **No path change on power fail (or board removal – video only)**
- **Local or remote control**
- **SNMP monitoring and control of module**

## TECHNICAL SPECIFICATIONS

### Video Signal path:

<b>Signal types</b>	3G-SDI/HD-SDI/SD-SDI/ASI/G.703/Video/unbalanced AES.
<b>Impedance</b>	Non-terminating, designed for 75 $\Omega$ use.
<b>Switching characteristic</b>	Magnetic latching 4 port changeover relay.
<b>Video crosstalk between channels</b>	< -75 dB to 10 MHz (measured input terminated by 75 $\Omega$ ); < -45 dB to 270 MHz; < -40 dB to 1.5 GHz; < -25 dB to 3.0 GHz.
<b>Frequency response</b>	+0/-1.5 dB 0 Hz to 3.0 GHz.

### Audio/Low speed Data:

<b>Audio Crosstalk</b>	< -90 dB (20 Hz - 20 kHz, input terminated by 600 $\Omega$ ).
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### Control:

<b>Mode</b>	Momentary ground or open circuit, switch selectable.
<b>Gnd</b>	Pin 1.
<b>Audio Toggle</b>	Pin 2 (Standby / Main).
<b>Video Reset</b>	Pin 3 (Main).
<b>Video Set</b>	Pin 4 (Standby).

**NOTE:** Separate Audio & Video controls, or Audio follows Video, switch selectable.  
Non-momentary contacts required in Toggle modes.

<b>Front panel switches</b>	Momentary illuminated push button. Automatic remote default setting after several minutes.
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<b>Tally</b>	Switch to Ground – Main; Switch to Open Circuit - Standby.
<b>Gnd</b>	Pin 1.
<b>Video Tally</b>	Pin 2.
<b>Audio Tally</b>	Pin 3.

### Connectors:

<b>Video</b>	BNC.
<b>Audio</b>	5 pin Phoenix pluggable screw block.
<b>Control</b>	4 pin Phoenix pluggable screw block.
<b>Tally</b>	3 pin Phoenix pluggable screw block.

### Relay:

<b>Contact rating</b>	30 Vdc – 0.5 A.
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### Power requirements:

<b>Voltage</b>	28 Vac CT (14-0-14) or $\pm 16$ Vdc.
<b>Power consumption</b>	< 1.5 VA.

### Other:

<b>Temperature range</b>	0 - 50° C ambient.
<b>Mechanical</b>	Suitable for mounting in IRT 19" rack chassis with input, output and power connections on the rear panel (Note: Not compatible with pre-4000 series 3RU frames).
<b>Finish</b>	<b>Front panel</b> Grey background, black lettering & red IRT logo. <b>Rear assembly</b> Detachable silk-screened PCB with direct mount connectors to Eurocard and external signals.
<b>Dimensions</b>	6 HP x 3 U x 220 mm IRT Eurocard.
<b>Supplied accessories</b>	Rear connector assembly with matching connectors for control input and tally outputs.

**NOTE:** **Main:** IN A to OUT A, IN B to OUT B;  
**Standby:** IN A to OUT B, IN B to OUT A.

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

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## CONFIGURATION

## DIP Switch Settings:



Remote Control:	SW1-1	OFF	Switch to Ground control (Default).
		ON	Switch to Open Circuit control.
Video Relay Control	SW1-2	OFF	Magnetic Latch Video relay control (Default).
		ON	Toggle Video relay control.
Audio Relay Control	SW1-3	OFF	Separate Audio relay control (Default).
		ON	Audio follows Video relay control.
SNMP Control	SW1-4	OFF	DIP switch control (Default).
		ON	SNMP control.
Local to Remote	SW1-5	OFF	Front Panel Local/Remote switch automatically reverts from Local to Remote mode after a period of 5-6 minutes (Default).
		ON	Front Panel Local/Remote switch permanently stays in its set position - i.e. does not automatically revert to Remote mode.

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 AMS-4172.

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.

With Audio follows Video control, only the video control is needed as the audio relays track what the video relay is doing. If video relay has been set for magnetic latch operation, audio relays are also set for magnetic latch operation. However, with separate audio relay control, that is audio not following video, audio relays are always operated in toggle mode.

SNMP control only relates to "Audio follows Video" control. With SW1-4 set to ON the SNMP "Audio follows Video" command over-rides the DIP switch SW1-3 setting. All other SNMP commands, other than "Audio follows Video", operate whether SW1-4 is set ON or OFF.

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

**Input termination:**

No terminations are provided on the module so that the switcher can function in changeover mode.

For 2 x 1 switcher applications the following terminations are recommended be installed:

**Video:**

Output A (Main) only is used and should be terminated at connected equipment.

Output B (Standby) should be terminated in 75Ω (or 50Ω if being used for 50Ω RF signals) using a BNC termination plug.

**Audio:**

Outputs A only are used and should be terminated at connected equipment.

Output B may be terminated if desired by connecting termination resistors to the connector on the rear assembly of the module. The resistor values should be chosen to match the characteristic impedance of the rest of the connected audio system. For example for balanced 600Ω, two 300Ω resistors should be used.

In most modern audio systems a low output impedance of approximately 40Ω and input impedances of greater than 10 kΩ are used. If this is the case no termination of the unused audio output is required.

## 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.

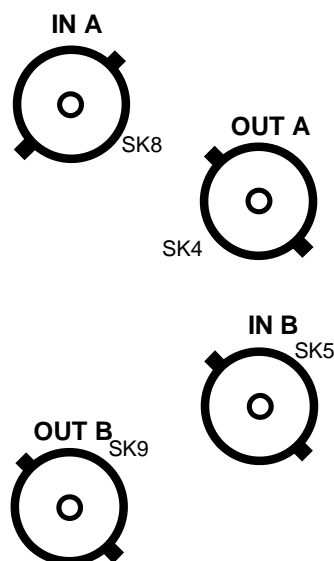
**Signal earth:** For safety reasons a connection is made between signal earth and chassis earth. No attempt should be made to break this connection.

#### Installation in frame or chassis:

See details in separate manual for selected frame type.

#### Video (analogue, 3G/HD/SD-SDI, ASI, G.703 data, unbalanced AES) Signal connections:

Signal connections are made to BNC coaxial connectors. No termination of inputs is provided on the module. When switched to the output the input load impedance is that of the load connected to the output. Where the input signal is required to be terminated, and one of the outputs is not connected to anything, then this unconnected output should be terminated by an appropriate BNC terminator of the required impedance, usually 75 Ohm.

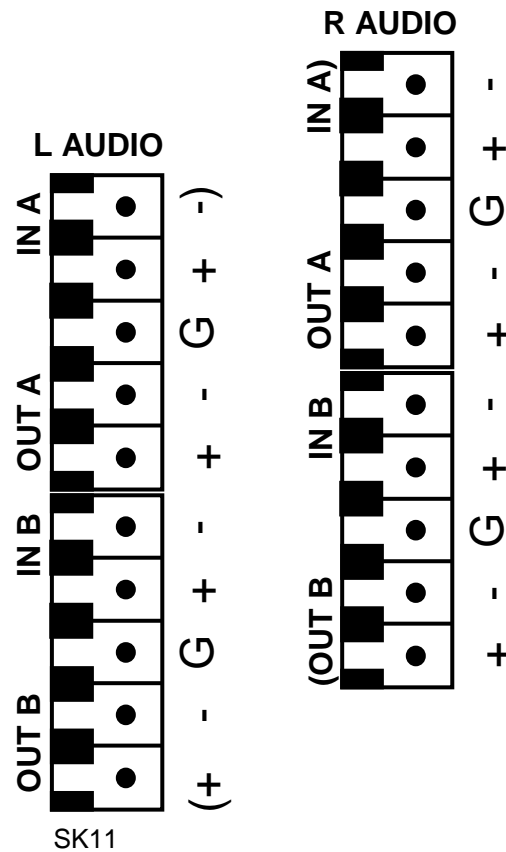




## Audio Signal connections:

Audio signal connections are made to 5-pin plug in screw terminating connectors. No termination of inputs is provided on the module. When switched to the output the input load impedance is that of the load connected to the output.

There are four 5-pin audio connectors (IN A / OUT A Left, IN B / OUT B Left, IN A / OUT A Right and IN B / OUT B Right). Common Ground between IN and OUT is shared via the middle pin (pin 3).



When wiring, be sure to keep phase of audio cables the same. The above connector will take either a balanced input, balanced output audio (or data (RS-232, RS-422, etc.)) signal, or two unbalanced audio signals, where the ground connectors are commoned together and the two unbalanced audio signals connected to each of the +/- phase connections.

## 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 SW1 settings as described in the *Configuration* section of this manual, on the 4-pin SK7 connector located on the rear assembly.

With the AMS-4172 set to operate in magnetic latch mode, the video relay will operate and cause the input/output states 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

**Note:** In magnetic latch mode, only a momentary contact (or break) is needed for the SET and RESET controls.

With the AMS-4172 set to operate in the toggle mode, the video relay will operate and cause the input/output states to cross over as follows:

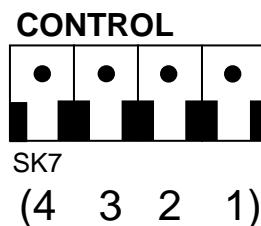
Control	Input	Output
SET (Gnd/Open Circuit) (make contact)	A (Main)	↔ B
	B (Standby)	↔ A
SET (Open Circuit/Gnd) (break contact)	A (Main)	↔ A
	B (Standby)	↔ B

**Note:** In toggle mode, a permanent contact (or break) is needed for the SET control. RESET pin is not used.

With “Audio follows Video” configuration, the audio relays change as per the video relay controls above.

With “Separate Audio” control configuration, audio control is only by toggle mode regardless of whether the video control has been set for magnetic latch mode or toggle mode.

Control input connector SK7 pin configuration is as follows:



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

**Note:** Video RESET control (SK7 pin 3) not used when configured for “Toggle Video” operation.  
 Audio Toggle control (SK7 pin 2) not used when configured for “Audio follows Video” configuration.

## Tally connections:

Switch status is made by a relay contact on the SK3 connector (Tally) located on the rear assembly.

With pins 1 & 2 short circuited together Video is in the MAIN (RESET) position:

Input A (Main) to Output A; and  
Input B (Standby) to Output B.

With pins 1 & 2 open circuited Video is in the STANDBY (SET) position:

Input A (Main) to Output B; and  
Input B (Standby) to Output A.

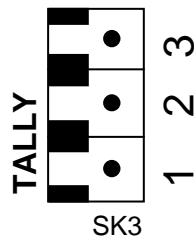
With pins 1 & 3 short circuited together Audio is in the Main (RESET) position:

Input A (Main) to Output A; and  
Input B (Standby) to Output B.

With pins 1 & 3 open circuited Audio is in the STANDBY (SET) position:

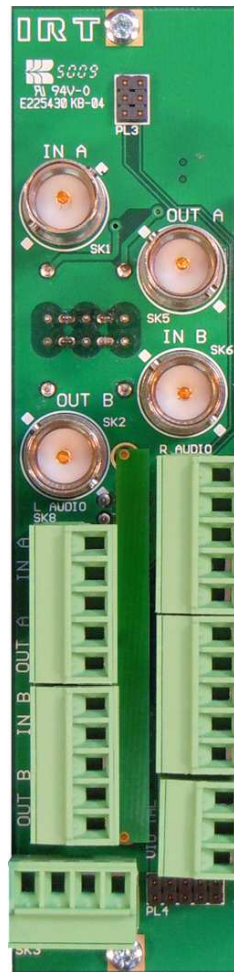
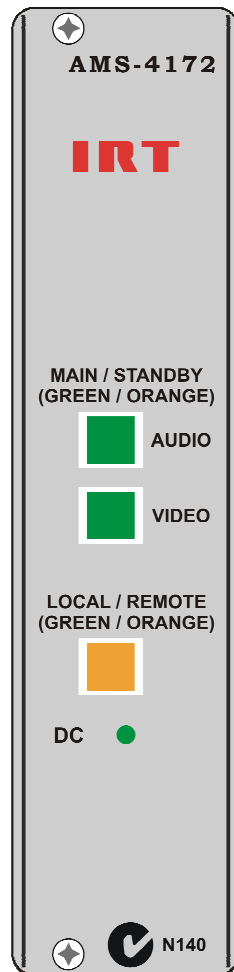
Input A (Main) to Output B; and  
Input B (Standby) to Output A.

Tally output connector SK3 pin configuration is as follows:



Pin	Description
3	Audio Tally.
2	Video Tally.
1	Ground.

Front & rear panel connector diagrams:



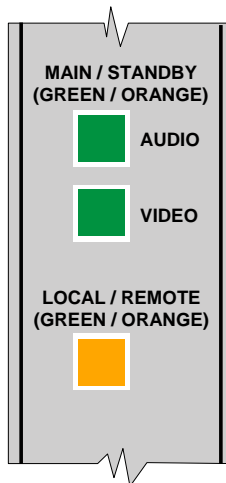
## OPERATION

The AMS-4172 can be used for a MAIN / STANDBY changeover switch, or a 2x1 switcher, application.

Switcher control is done either locally via the front panel pushbutton switches, remotely by external signals/alarms connected via the SK7 control connector on the rear assembly, or via SNMP (Simple Network Management Protocol) using a Network Management System (NMS).

### Local Control:

There are three front panel momentary pushbuttons marked LOCAL / REMOTE, AUDIO MAIN / STANDBY and VIDEO MAIN / STANDBY.



The LOCAL / REMOTE switch switches between front panel local control and remote control via the SK7 connector on the rear assembly. 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 AUDIO and VIDEO MAIN / STANDBY switches are now operational. Unless DIP switch SW1-5 is set to ON, after a period of a few minutes the LOCAL / REMOTE switch automatically reverts back to the remote setting.

The AUDIO and VIDEO MAIN / STANDBY switches independently switch the audio and video relays 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.

If, however, Audio relays have been set to follow the Video relay, either by the Sw1-3 DIP switch position or via the SNMP setting, Audio relays will follow that of the Video relay state and the AUDIO MAIN / STANDBY switch will not function except to indicate the same state as the VIDEO MAIN / STANDBY switch position.

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.

## Remote Control:

### Magnetic Latch Mode:

With SW1-2 OFF, the SET (SK7-4) and RESET (SK7-3) controls operate in the video magnetic latch mode of operation.

If switch SW1-3 has been set to ON so that the audio relays operation follows that of the video relay operation, then the audio relays effectively operate in the magnetic latch mode as well. If, however, SW1-3 has been set to OFF for independent audio and video control, the audio relays are only remotely controlled in the toggle mode, regardless of how SW1-2 has been set.

#### Switch to ground operation:

If the AMS-4172 has been set to switch to ground operation with the DIP switch SW1-1 OFF, provided the RESET pin (SK7-3) isn't already being held to ground, momentarily grounding the SET pin (SK7-4) will select Input A (Main) to Output B, and Input B (Standby) to Output A.

Provided the SET pin (SK7-4) isn't already being held to ground, momentarily grounding the RESET pin (SK7-3) will select Input A (Main) to Output A, and Input B (Standby) to Output B.

#### Switch to open circuit operation:

If the AMS-4172 has been set to switch to open circuit operation with the DIP switch SW1-1 ON, provided the RESET pin (SK7-3) isn't already being held open circuit, momentarily open circuiting the SET pin (SK7-4) will select Input A (Main) to Output B, and Input B (Standby) to Output A.

Provided the SET pin (SK7-4) isn't already being held to open circuit, momentarily open circuiting the RESET pin (SK7-3) will select Input A (Main) to Output A, and Input B (Standby) to Output B.

### Toggle Mode:

With SW1-2 ON, the SET (SK7-4) control operates in the video toggle mode of operation. The RESET (SK7-3) pin has no effect on the video relay control whilst in the toggle mode of operation.

If switch SW1-3 has been set to ON so that the audio relays operation follows that of the video relay operation, the audio control pin (SK7-2) has no effect on the audio relays control.

#### Switch to ground operation:

If the AMS-4172 has been set to switch to ground operation with the DIP switch SW1-1 OFF, grounding the SET (SK7-4) pin will select Video Input A (Main) to Video Output B, and Video Input B (Standby) to Video Output A. Removing this ground will automatically video reset Video Input A (Main) to Video Output A, and Video Input B (Standby) to Video Output B.

Unless SW1-3 has been set for audio follows video operation, the same is true for the audio control (SK7-2) pin.

#### Switch to open circuit operation:

Likewise if the AMS-4172 has been set to switch to open circuit operation with the DIP switch SW1-1 ON, open circuiting the SET (SK7-4) pin, that is removing a ground, will select Video Input A (Main) to Video Output B, and Video Input B (Standby) to Video Output A. Grounding this pin will automatically reset Video Input A (Main) to Video Output A, and Video Input B (Standby) to Video Output B.

Unless SW1-3 has been set for audio follows video operation, the same is true for the audio control (SK7-2) pin.

## 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.

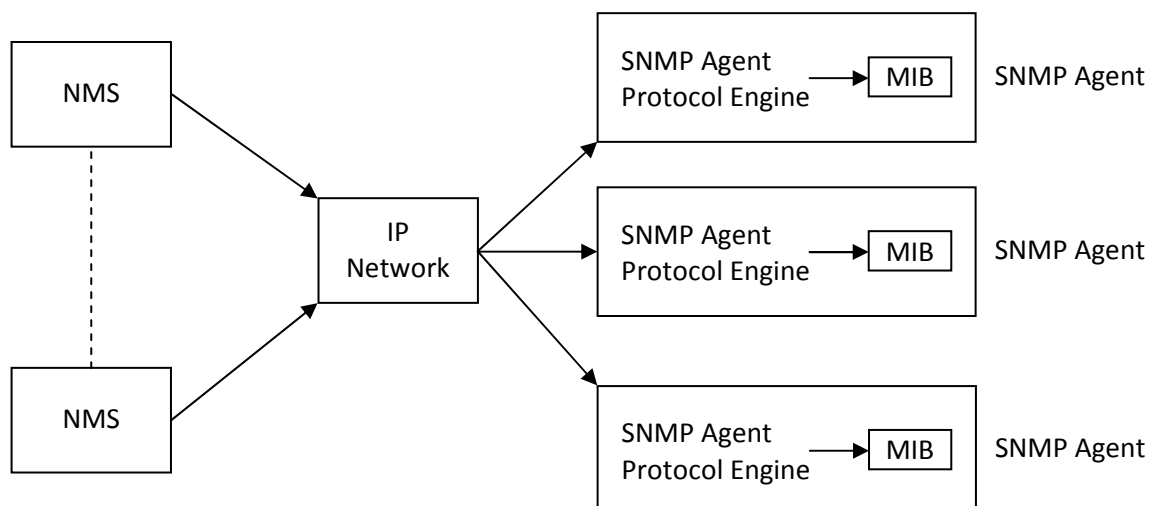
An *NMS* polls, or communicates with, an *agent*. An *agent* is a network management software module that resides in a *managed device*. An *agent* has local knowledge of management information and translates that information into a form compatible with SNMP. The *agent*, therefore, acts as an interface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

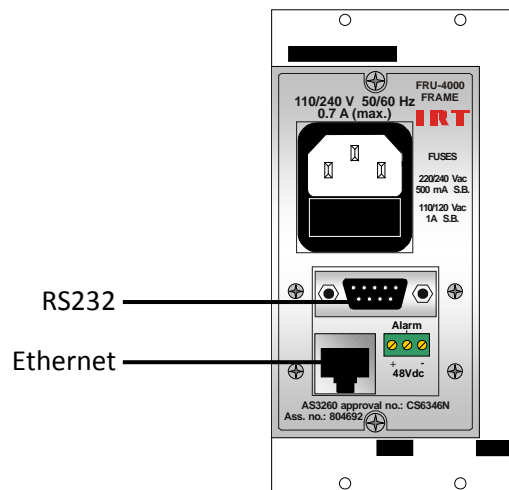
IRT Electronics currently employs SNMPv1 with its SNMP capable frames. The frame acts as an *agent* when fitted with a CDM-xxxx module. This module has its own designated slot next to the power supply so as to not affect the number of modules that the frame will take. Communication between the *NMS*,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

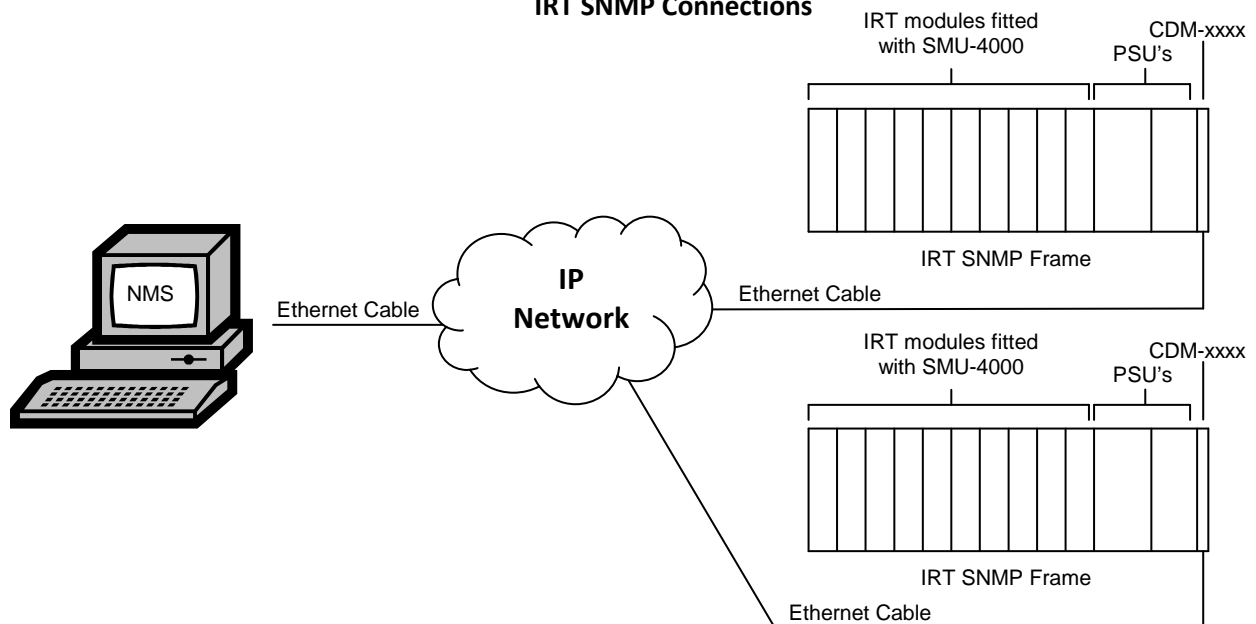
Frame parameters, such as Name, Address and Location, are set via an RS232 interface, a D9 connector on the rear of the frame below the mains inlet. A software terminal emulator, such as Tera Term or HyperTerminal, is used for setting and reading the parameters of the frame.

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



## AMS-4172 SNMP Functions:

When installed in an IRT frame with SNMP capability, the AMS-4172 can be interrogated by an SNMP Network Management System (NMS).

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

- irt4172VideoStatus - An indication and control of the state of the video relay [main (1), standby (2)].  
Main defined as Input A connected to Output A and Input B connected to Output B.  
Standby defined as Input A connected to Output B and Input B connected to Output A.
- irt4172AudioStatus - An indication and control of the state of the audio relays [main (1), standby (2)].  
Main defined as Input A connected to Output A and Input B connected to Output B.  
Standby defined as Input A connected to Output B and Input B connected to Output A.
- irt4172AuFollowVidSource - An indication of whether “Audio Follows Video” mode is controllable though SNMP or by local DIP switch [localDIPsw (1), remoteSNMP (2)].
- irt4172AuFollowVidSet - An indication and control of the “Audio Follows Video” mode [disabled (1), enabled (2)].  
If disabled – separate audio and video controls.  
If enabled – audio switching follows that of video switching.  
**NOTE:** SNMP control of this function is only available if switch Sw1-4 is set to ON position.
- irt4172FirmwareVersion - 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.
- irt4172SoftwareVersion - An indication of the software version of the processor in the format x.y where x is the major revision number and y is the minor revision number.
- irt4172Reset - Unit reset control. A set with a value of 2 sent to this OID will cause a system reset to occur. When queried returns a Null.
- irt4172VideoTrapEnable - Disables or enables a Trap to be sent when the video relay status changes.  
[disable (1), enable (2)].
- irt4172AudioTrapEnable - Disables or enables a Trap to be sent when the audio relays status changes.  
[disable (1), enable (2)].

## MAINTENANCE & STORAGE

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### **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

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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 IRT Electronics’ website.

Web address: [www.irtelectronics.com](http://www.irtelectronics.com)

Email: [sales@irtelectronics.com](mailto:sales@irtelectronics.com)