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IRT Eurocard

Reverse Path Amplifier with SNMP Control

Type: RWA-4300

&
Frame, Power Supply & SNMP Controller
FRU-4300
PSU-4300
CDM-4300

Designed and manufactured in Australia

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

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Instruction Book

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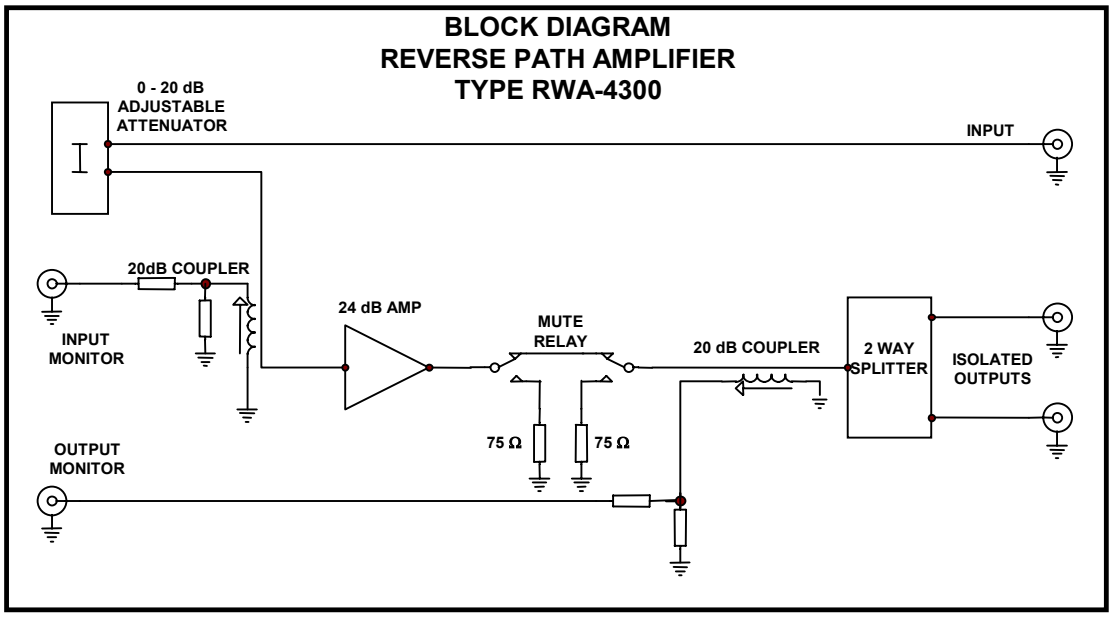
This instruction book applies to units later than S/N 0508001.

General Description



The RWA-4300 has been designed to provide amplification of signals in the reverse path of cable TV distribution systems.

An input attenuator with a 20 dB range provides gain control to optimise signal levels at the output.

The frequency response of the amplifier is tailored to give optimum low noise amplification to the reverse path signals, which normally lie between 5 and 100 MHz.

In addition the RWA-4300 is constructed with a high level of RF shielding which eliminates both ingress and egress of unwanted RF signals.

The FRU-4300 3RU frame allows 8 RWA-4300's to be mounted with two PSU's that may be either 240 Vac or -48 Vdc.

(For PSU-4300 serial numbers ≤ 0607080, AC & DC power supply types cannot be mixed. If required, contact IRT for modification instruction. PSU-4300 serial numbers > 0607080 can be mixed with AC power supplies with no modification required).

Standard features:

- 2 - 200 MHz frequency response specially contoured for use in reverse path of cable TV distribution.
- Very low noise.
- 0 - 20 dB variable input gain control.
- Local or remote muting.
- Input and output monitoring on front panel.
- Power loss alarm output.

Technical Specifications
IRT Eurocard module
Type RWA-4300

RF:

Input:

Type	DC coupled.
Number	1.
Impedance	75 Ω.
Return loss	> 16 dB (2 - 200 MHz).
Maximum input level	> +50 dBmV.

Outputs:

Type	Transformer coupled.
Number	2.
Impedance	75 Ω.
Return Loss	> 18 dB (2 - 200 MHz).
Isolation between outputs	> 20 dB (2 - 200 MHz).
Maximum output level	>+50 dBmV at 200 MHz.

Monitoring outputs:

Input monitor:		Transformer coupled.
	Impedance	75 Ω.
	Level	-20 dB
Output monitor:		Transformer coupled.
	Impedance	75 Ω.
	Level	-20 dB

Performance:

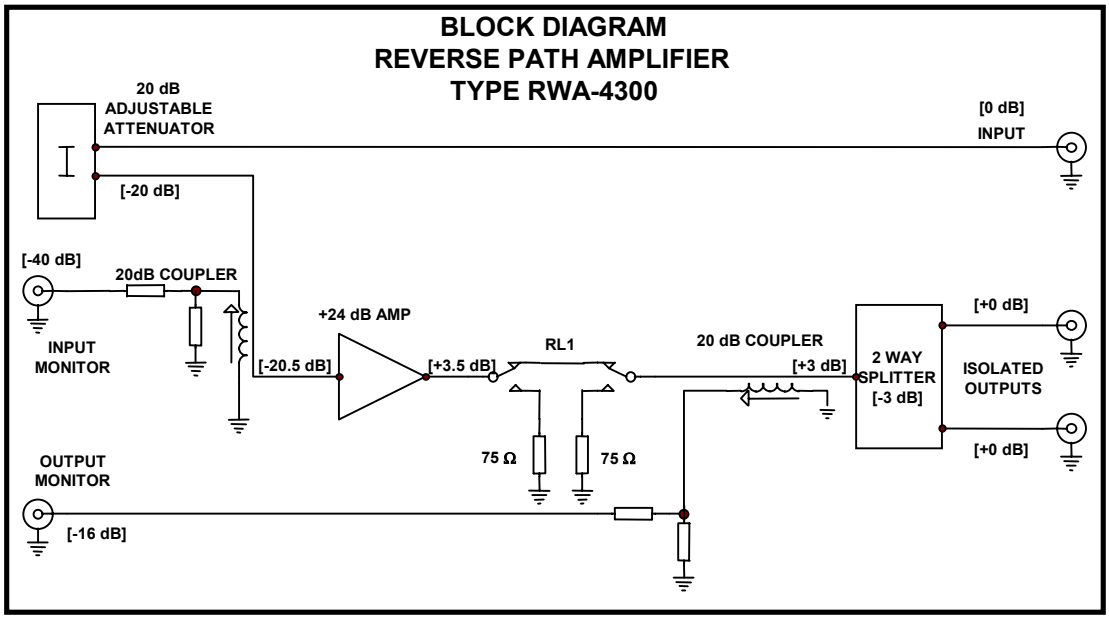
Gain		0 to +20 dB. Adjustable from front panel.
Frequency Response		2 to 200 MHz (-0.5 dB points). -3dB frequency is typically 340MHz.
Noise	Noise (f = 200 MHz)	6 dB at maximum gain
	CTB (22 channels V_o = 47 dBmV)	-67 dB
	CSO (22 channels V_o = 47 dBmV)	-67 dB
Connectors		BNC
Power requirements		28 Vac or +28 Vdc.
Power consumption		<300 mA

Other:

Temperature range		0 - 45° C ambient
Mechanical		Mounts in IRT 19" rack chassis type FRU-4300 3RU frame (8 modules)
Finish:	Front panel	Grey background, black lettering & red IRT logo
	Rear	Bright steel.
	Case	Alodine finished aluminium.
Dimensions		30 mm x 3 U x 231 mm IRT Eurocard

Technical Description

Signal Path:



The block diagram for the signal path shows the basic layout of the amplifier and its inputs and outputs. The figures in square brackets indicate the approximate signal levels at various points in the circuit when the amplifier is set to unity gain.

The input signal is taken directly to a variable attenuator (maximum 20 dB) whose control is accessible through the front panel of the module. The attenuator output is connected to the 24 dB gain amplifier via a coupler, which provides a monitoring BNC connector on the front panel with a signal of approximately -20 dB relative to the amplifier input. This signal may be used to ensure that the signal at the input of the amplifier is sufficiently low as to avoid overloading. The best level will depend on the number of carriers present in the signal and the desired operating level for the system as a whole.

The amplifier output is connected to the output splitter via a muting relay operated switch, which terminates the amplifier output and splitter input in 75 Ohms. This allows the output of the amplifier to be muted if a signal with excessive noise is present which may cause problems for other equipment downstream.

The output of the amplifier is monitored immediately prior to the passive output splitter so as to not introduce a variation in loading between outputs. When measuring output levels using this monitoring point it should be remembered that the actual output level of the amplifier will be 3 dB lower at each output connector in addition to the 20 dB loss in the coupler.

Due to the output splitter being of a passive type it is also essential that both outputs always be terminated in 75 Ohm loads. If one output is not used a termination plug should be fitted to that output.

Amplifier gain. Each coupler itself introduces approximately 0.5 dB of loss in the signal and the output splitter introduces a further 3 dB loss so that with the overall losses exclusive of the attenuator total 4 dB. The amplifier gain is therefore chosen to be 24 dB so that the gain range overall is 0 to 20 dB.

Alarms and controls:

General alarm. This alarm is generated whenever the output of the amplifier is not active due to either loss of power or muting. When no power is present the normal position for relay contacts is with a connection to ground indicating the alarm condition.

Muting. The muting relay RL 1 may be operated either by the front panel switch or by remote contact closure to ground. In its un-energised state the relay provides a connection between the amplifier and splitter and when energised mutes the output.
The grounding control inputs from the switch and external connector are isolated by diodes, which provide an OR function. This means that whilst the amplifier may be muted by either means it is not possible to return the amplifier to its normal operating mode unless both the front panel switch and the remote input are in the normal setting.

Pre-Installation

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.

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

Installation in frame:

See FRU-4300 frame section within this manual.

Maximum limits:

The enclosed construction of the RWA-4300 gives excellent immunity to electromagnetic interference, but reduces the ability of the electronics inside the casing to dissipate heat.

Adequate air flow should be ensured when modules are placed together in the 3 RU frame to prevent overheating and premature failure of the modules.

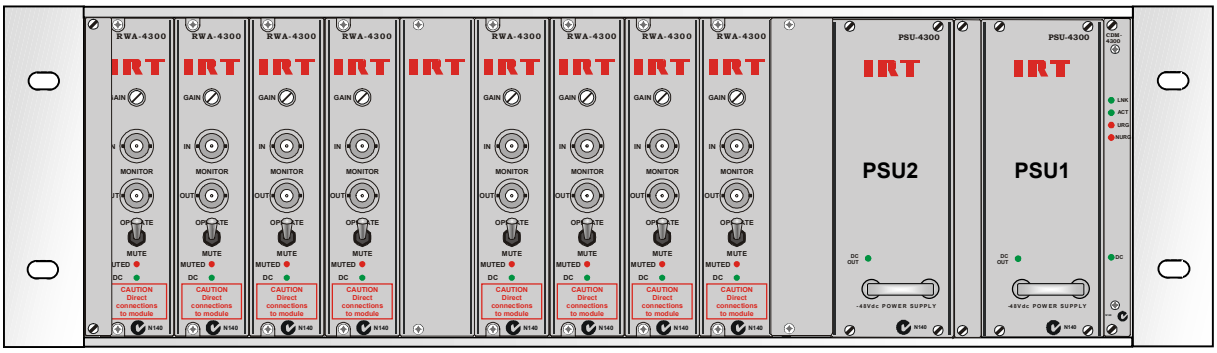
Thermal budget:

A fully equipped FRU-4300 frame of RWA-4300's with two PSU's fitted will produce approximately 95W of heat output.

As a result the following rules should be observed:

1. Frame ventilation should not be obstructed by any equipment mounted immediately above or below the FRU-4300. If possible a 1 RU blank panel should be mounted above and below the frame to ensure that adequate air flow can occur.
2. No more than 8 RWA-4300's should be mounted in an FRU-4300 when free air (unassisted) circulation is the only cooling available or where the ambient temperature exceeds 30°C.

The RWA-4300's should be mounted in the positions shown in the following diagram with front blank panels fitted to the unused positions.



3. The RWA-4300 should not be mounted in a frame above other equipment that has a high heat output as this will increase the effective ambient temperature to above 30°C.

Power Supplies:

When fitted to an FRU-4300 frame the RWA-4300 may be powered by either the PSU-4000 240 Vac PSU or the PSU-4300 -48 Vdc PSU. AC and DC fed supplies may be mixed in the same frame. **(For PSU-4300 serial numbers ≤ 0607080, AC & DC power supply types cannot be mixed. If required, contact IRT for modification instruction. PSU-4300 serial numbers > 0607080 can be mixed with AC power supplies with no modification required).**

In either case it is recommended that two PSU's be fitted at all times so that the power load is shared between the two supplies. In the event of failure of one supply the amplifiers should function within specification whilst operating on the remaining supply as long as the correct input voltage is held to within the specifications for that supply. However it is not recommended that a full frame of amplifiers be operated on a single supply for an extended period.

Connections:

RF input: This is a single connector with a 75 Ohm input impedance and should be fed from a suitably impedance matched source.

RF outputs: Two outputs are provided which are obtained by a passive output splitter.

It is recommended that the two outputs be loaded in 75 Ohm terminations at all times.

If one output is not to be connected to external equipment it should be fitted with a 75 Ohm termination plug. Failure to observe this may result in a noticeable drop in performance in the output being used.

Mute input: The external mute input presents an open circuit voltage of approximately +24 Vdc and may be operated by either a contact closure to ground or by an open collector transistor driver. The connection to this input must be capable of sinking a current of at least 15 mA.
The mute input is connected from the 9 pin 'D' connector at the rear of the module via the frame motherboard to a Krone IDC connector mounted on the rear of the frame for each module. Connection details are marked on the frame.

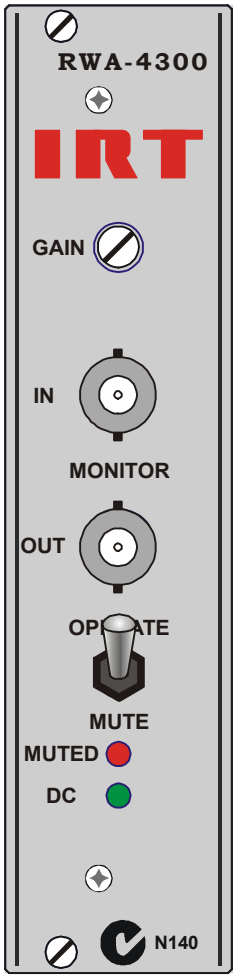
Alarm output: The alarm output makes contact to ground in the alarm condition and is open circuit in the normal condition. The maximum rating on the relay contacts is 30 V (AC or DC) @ 500 mA.
The alarm output is connected from the 9 pin 'D' connector at the rear of the module via the frame motherboard to a Krone IDC connector mounted on the rear of the frame for each module. Connection details are marked on the frame.

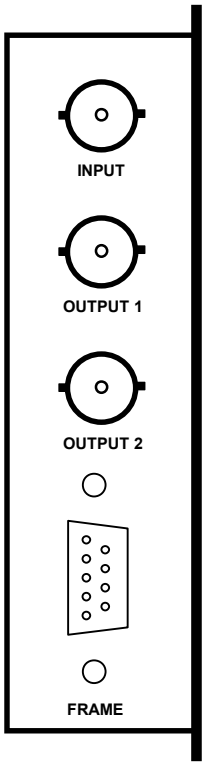
9 pin 'D' connector:
The 9 pin 'D' connector provides connection to the selected frame for power supply inputs for either one or two power supplies and for the alarm output and mute input signals.
This connector mates with a matching connector on the selected frame type and the necessary external connections for the alarm and mute signals are made to the frame and not the module.
The following pin connection details for the 9 pin connector are therefore given for service and general information purposes only.

Pin	Connection
1	Gnd
2	AC 1 or DC +ve
3	AC 1 or DC -ve
4	Signal Level Indication
5	Mute
6	AC 2 or DC +ve
7	AC 2 or DC -ve
8	Gnd
9	General Alarm

Front & rear panel connector diagrams

The following front panel and rear assembly drawings are not to scale and are intended to show relative positions of connectors, indicators and controls only.





Reverse Path Amplifier Frame

Type FRU-4300

General Description

The purpose of the FRU-4300 is to provide an economical and compact mechanical framing system for IRT RWA-4300 series reverse path amplifier modules.

The FRU-4300 frame also has provision for the addition of a Simple Network Management Protocol (SNMP) card, the CDM-4300, to act as an "Agent" when used with a third party Network Management System (not supplied). This card has its own slot position and does not affect the number of modules that can be installed in the frame.

Older version reverse path amplifiers, such as the RWA-2310, can also be housed within the FRU-4300, however SNMP will not work with these older modules.

The frame provides a power supply bus to reticulate power from one or two common low voltage power supply units to all cards in the frame. It also provides a data bus for SNMP control when the frame is fitted with a CDM-4300 SNMP Agent card (sold separately). Ethernet connection is via an RJ45 connector on the rear of the standard supplied power supply rear assembly.

A total of eight IRT RWA-4300 series reverse path amplifier modules, two power supply units and one SNMP controller card can be accommodated in one FRU-4300 3 Rack Unit Frame.

A choice of power supply units is available to provide power from either AC or DC supplies. Each supply is capable of supporting a full frame of cards on its own and AC and DC fed supplies may be mixed in the same frame.

(For PSU-4300 serial numbers ≤ 0607080, AC & DC power supply types cannot be mixed. If required, contact IRT for modification instruction. PSU-4300 serial numbers > 0607080 can be mixed with AC power supplies with no modification required).

IRT RWA-4300 series reverse path amplifier modules are fully enclosed boxes designed to prevent the ingress or egress of electromagnetic interference. The module is complete with front fascia panel and rear signal and power connectors, which provides the necessary connections to the frame PSU's other equipment.

The module can be inserted or removed from the frame from the front. When inserted one connector on the rear mates with a motherboard connector that carries the data and power supply connections.

Although the module may be inserted or removed from the front of the frame, care must be taken when doing so to ensure that the connections to the rear of the module have sufficient slack cable for this to be accomplished. If this is not the case all cables should be disconnected before attempting to remove the module from the frame.

Technical Specifications

Reverse Path Amplifier Frame

Type FRU-4300

Power:

Input power:	AC	AC mains input (240 Vac ±10%) and / or
	DC	-48 Vdc ±25%.
Input power fuses	AC	SLO-BLO 500 mA.
	DC	Fused in PSU-4300 PSU module.
Output power to module bus:	AC	28 Vac from PSU-4000 or
	DC	+28 Vdc from PSU-4300

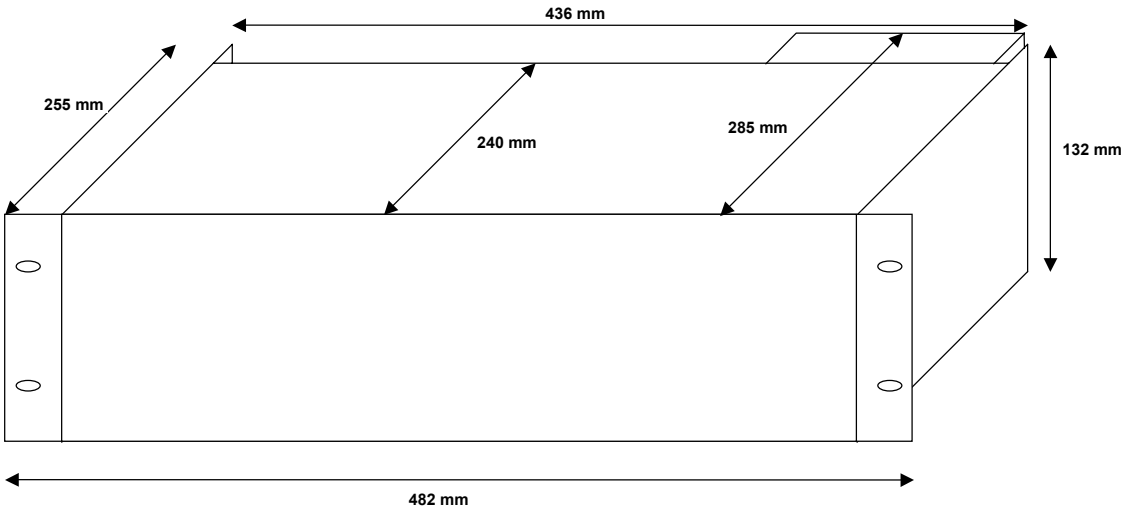
Connectors:

Modules		DB female 9 pin RF filtered.
Power module to frame		H15FP4 H15 female 4 mm PCB mounting.
Power input to frame	AC	IEC 320 with integral fuse holder.
	DC	3-pin termination block.
Alarm / control		Krone IDC (1 per module).

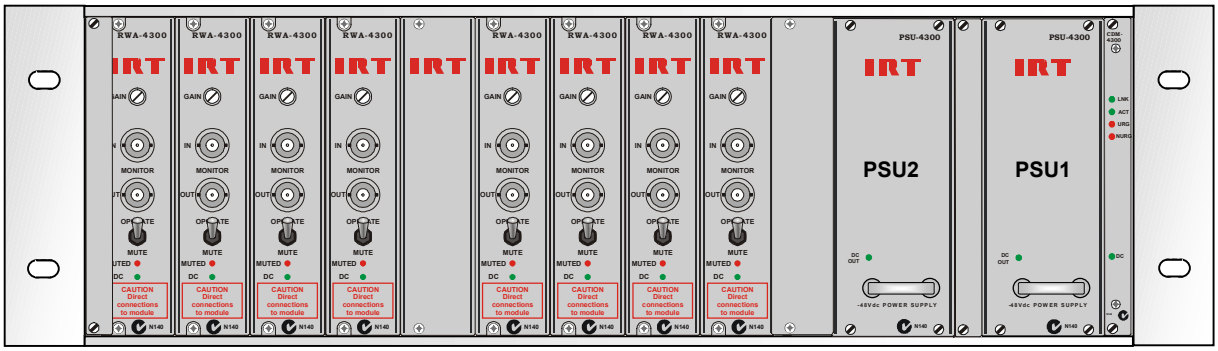
Other:

Temperature range	0 - 50° C ambient.
Mechanical	3 RU (482 mm x 132 mm) standard 19” rack frame. Suitable for mounting in standard 19" racks.
Finish:	Natural anodised aluminium frame with passivated steel rear power connection box with black silk-screened lettering.
Dimensions	482 x 132 x 253 mm (Frame empty.) Clearance width 445 mm
Optional accessories	PSU-4000 voltage selectable AC power supply module. PSU-4300 –48V DC power supply module. CDM-4300 SNMP Agent module.

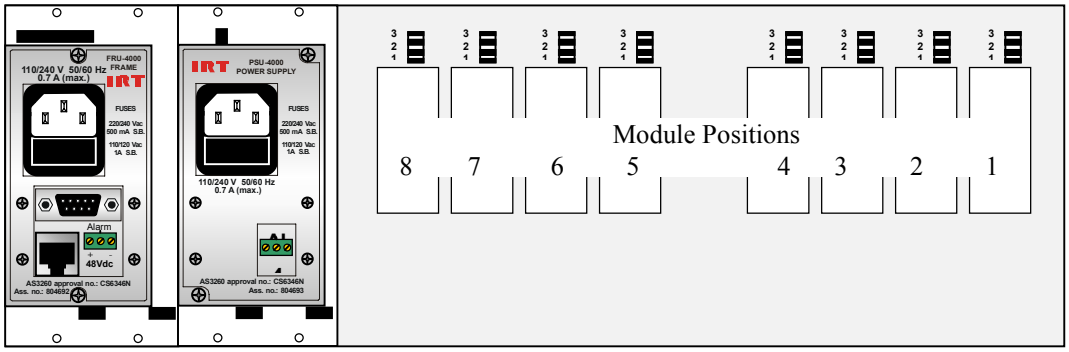
The following diagrams are not to scale and are intended only to show relative locations.



FRU-4300 Front View



FRU-4300 Rear View



Installation

FRU-4300 FRAME:

Reverse Path Amplifier Module
Slide the module into its appropriate position and tighten the two retaining screws.

Rear Assembly
Signal connections are made directly to the rear of the module. If it is desired to remove the module without accessing the rear of the frame to disconnect the cables it will be necessary to ensure that approximately 300mm of additional cable is provided on each connection, which can be readily drawn through the frame to a sufficient distance to disconnect at the front of the frame.

Data connections are made to a three way Krone IDC connector above each module. The three connections are designated to suit the RWA-4300 reverse path RF amplifier module as follows:

Pin Connection
1 Mute – connected to pin 5 of the DB9 module connector.
2 Tally* – connected to pin 9 of the DB9 module connector.
3 Ground – connected directly to chassis / PSU ground reference.

Note: * Do not use "Tally" when using CDM-4300.

Power Supply

The frame will operate with either one or two power supply modules installed.
The power supply module should be slid into either slot 11 or 12 at the right hand end of the frame. The four retaining screws on the front should be tightened. Unless an SNMP Agent card is fitted to the frame, narrow front panel blanking panels are supplied with the power supplies to fill in the space next to the power supply.

Connect power input to rear of frame. For DC input, observe the polarity markings next to each connector.

Due to its weight if the frame is to be freighted for any purpose the power supply should be removed and packed separately before shipment.

WARNING:
For PSU-4300 serial numbers ≤ 0607080, AC & DC power supply types cannot be mixed. If required, contact IRT for modification instruction. PSU-4300 serial numbers > 0607080 can be mixed with AC power supplies with no modification required.

IRT Power Supply for Eurocard
-48 Vdc to +28 Vdc
Type PSU-4300

General Description

The PSU-4300 is designed to provide complementary low voltage DC power supplies required for operation of up to 8 IRT RWA-4300 Eurocard modules.

The IRT PSU-4300 DC-DC converter converts a nominal 48V input voltage to +28V with respect to ground.

Two PSU-4300s can be operated redundantly when using an FRU-4300 Frame. The redundant power supply facility of the PSU-4300 is enabled in each IRT RWA-4300 by having the power supply circuit of each module made up of two bridge rectifier circuits with the outputs connected in parallel. This allows the +28 volts to be sourced from either PSU-4300.

A front panel LED indicator provides visual confirmation of the presence of the low voltage output.

An alarm relay is also included which will activate the alarm if the output fails.

The PSU-4300 is available in -48 Vdc only and is not configurable by the user.

Technical Specifications

IRT Eurocard Dual Power Supply Module
Type PSU-4300

Power Requirements:

Voltage	48 Vdc ± 25% Positive ground.
Power	1.5 A maximum.
Fusing	2 A

Output voltage:

+28V @ 2.8A

Connectors:

DC power input / output		H15MFAV32 male, Faston

Other:

Temperature range		0 - 50° C ambient
Mechanical		Suitable for mounting in FRU-4300 rack frame
Finish:	Front panel	Grey background, black lettering & red IRT logo
	Body	Passivated steel with silk screened black lettering.
Dimensions		6 HP x 3 U x 230 mm

Installation & Servicing

FRU-4300 Frame:

The PSU-4300 should be slid firmly into either of the two double width slots (11 & 12) at the right of the frame. The four retaining screws on the front should then be tightened. Thin front panel blanks are provided to fill the space next to the power supplies. Only one blank panel is needed if an SNMP agent card is fitted to the frame next to the power supply in slot 12.

Power to the PSU-4300 is supplied from a connector located on the rear of the FRU-4300 immediately to the rear of the modules. Care should be taken to observe the correct polarity as marked when connecting DC to this connector.

The alarm output connector is located on the rear of the FRU-4300 frame and is common to both supply units when installed. The alarms for both units are in parallel such that when a fault develops in either PSU the alarm output will be grounded.

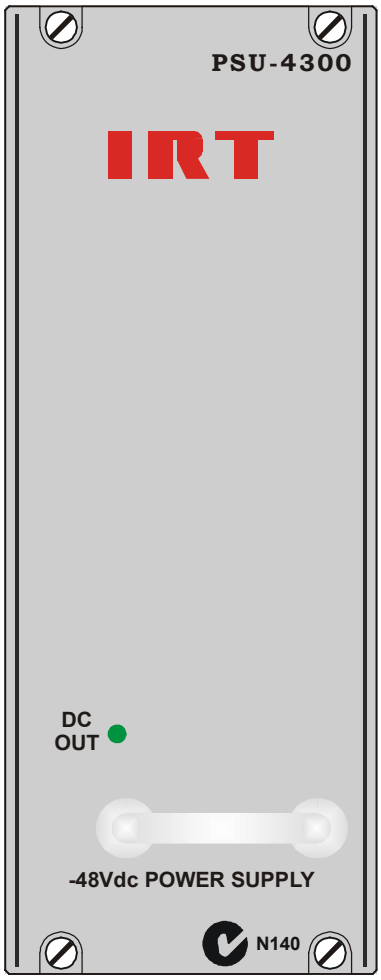
WARNING - Each PSU-4300 dissipates up to 10 Watts and a full frame of eight RWA-4300s and two PSU-4300's dissipates nearly 80 Watts. Ensure that adequate ventilation is available to keep down the operating temperature. If possible at least 44.5mm (1RU) should be left clear above each frame.

Internal adjustments:

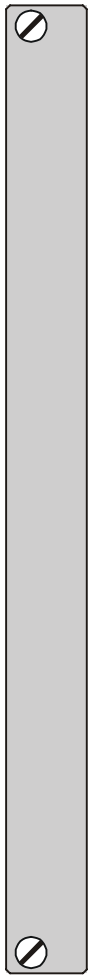
The PSU-4300 is factory set for the correct output voltage and should not require re-adjustment unless one of the DC - DC converters is replaced.

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.



Front Panel



Filler Panel

SNMP Agent
Frame Controller
Type CDM-4300

General Description

The CDM-4300 is a Simple Network Management Protocol (SNMP) Agent for use in IRT's FRU-4300 frame for reverse path amplifiers. It occupies its own designated slot within the frame, next to the power supply, so it does not affect the number of modules that can be used within the frame.

The CDM-4300 can communicate with all reverse path amplifier modules in the frame that have inbuilt SNMP facilities. The information obtained is forwarded via an Ethernet connection to any SNMP Network Management System (NMS) whose address is configured in the CDM-4300.

The CDM-4300 holds parameters such as Frame Name, Address and Location. This information may be set via an RS232 Configuration port.

The NMS third party software (not supplied by IRT) polls the CDM-4300 to remotely monitor and control the frame and its SNMP capable modules.

In the event of a major alarm from any of the modules or power supply an alarm condition, known as a Trap, is automatically sent without any prompting from the NMS.

Front panel LEDs indicate the presence of an Ethernet link, link activity and the Frame urgent & non-urgent alarm states.

Ethernet connection is via an RJ45 connector and the RS232 is via a D9 female connector on the rear of the frame. Modules that are being monitored and controlled share a common data bus on the frame.

SNMP monitoring and control finds particular use in remote or unmanned locations such as transmitter sites, or where control via a computer is desired.

As the CDM-4300 can be assigned its own IP Address, multiple sites can be monitored and controlled via the one NMS. Alternatively, multiple NMS's in different locations can be used to monitor and control the same site.

Features:

- **SNMP remote monitoring and control via Ethernet connection**
- **Automatic "Trap" transmission on major alarms**
- **Front panel LED indicators**
- **Own designated slot in FRU-4300 frame**

CDM-4300 Technical Specifications

Ethernet:

Rate	100baseT\ 10 baseT.
Connector	RJ45 (on rear of 4000 series frame).

RS232:

Rate	9600 baud
Connector	Female D9 (on rear of FRU-4300 frame)

SNMP:

Version	1
Configurable settings	SysDescr sysObjectID sysContact sysName sysLocation Agent IP address NMS IP address (max 5) Community Agent port number Trap port number Max/Min Trap Levels

Front Panel Indicators:

LINK (Green)	- Ethernet present
ACT (Green)	- Activity, Ethernet communication
URG (Red)	- Urgent Alarm detected
NURG (Red)	- Non urgent Alarm detected
DC (Green)	- Power present

Power Requirements	28 Vac or + 28 Vdc.
Power consumption	<5 VA.

Other:

Temperature range		0 - 50° C ambient.
Mechanical		Suitable for mounting in IRT 19" rack chassis with input, output and power connections on the rear panel.
Finish:	Front panel	Grey background, black lettering.
	Rear assembly	Part of FRU-4300 frame.
Dimensions		2 HP x 3 U x 220 mm IRT Eurocard

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

CDM-4300 Installation

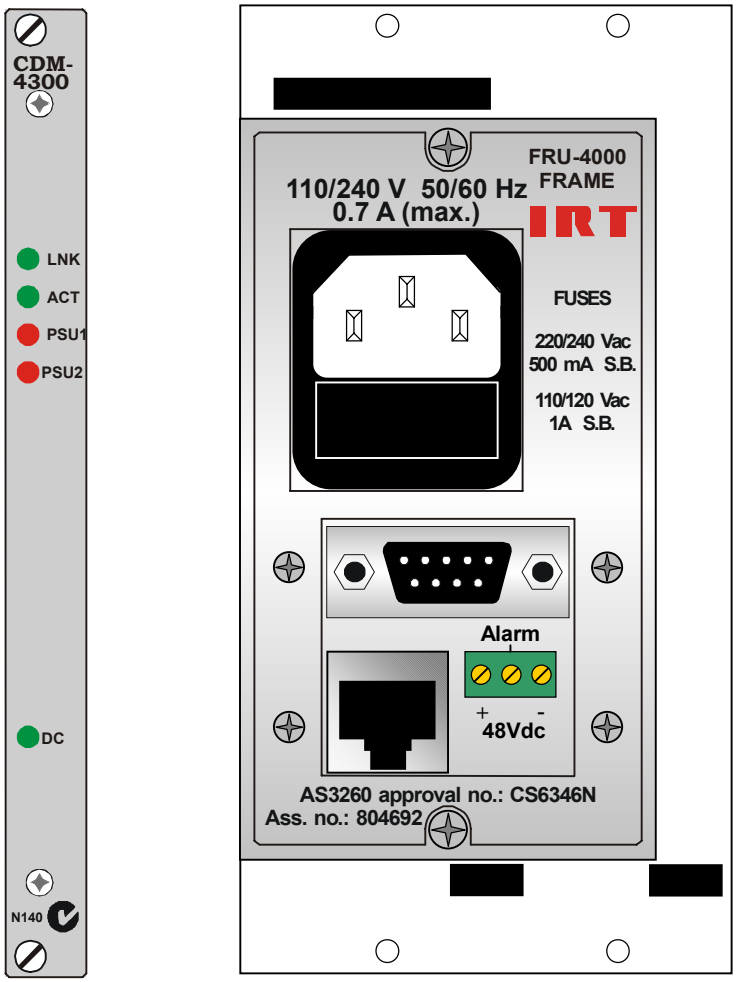
If the FRU-4300 frame is to be fitted with SNMP capability, then the CDM-4300 SNMP Agent module needs to be installed.

Looking at the front view of the FRU-4300 frame, to the right of the end power supply, there is a narrow width blank panel. Remove this blank panel and slide the CDM-4300 module into the guides behind all the way until the module mates with the 64-pin connector at the rear of the frame, then tighten the two front retaining screws.

Signal connections to this card are via the rear of the frame below the IEC mains plug input. The 9 pin female D9 connector is an RS-232 interface for connection to a computer for initial setup parameters of the frame for SNMP use. The RJ45 connector is for Ethernet connection.

Front & rear panel connector diagrams

The following front panel and rear assembly drawings are not to scale and are intended to show relative positions of connectors, indicators and controls only.



CDM-4300 Setup

The communication between the CDM-4300 and the NMSs use Ethernet at either 10 or 100Mb/s.

The SNMP protocol used is Version 1. Read and Write functions use the same Community string.

To obtain a response from a CDM-4300 the Internet Protocol (IP) Destination address must be the preconfigured Local IP Address, the IP Source Address must be one of the pre-configured NMS addresses, the UDP Port number must match the preconfigured Agent Port, and the Community string must match the pre-configured Community string.

To configure the CDM-4300 connect an ASCII serial RS-232 terminal (such as Tera Term PRO) to the Configuration port. The data rate should be 9600 baud and the byte should 8 bits data, no parity 1 stop. Upon sending 'Enter' you would typically see the following:

1.Local MAC address 12:34:56:78:9A:DF
2.Local IP address 192.168.0.100
3.NMS 1 IP Address 192.168.0.11 00:A0:CC:54:12:84
4.NMS 2 IP Address 255.255.255.255
5.NMS 3 IP Address 192.168.0.10 00:A0:CC:54:12:8E
6.NMS 4 IP Address 192.168.0.24 00:A0:CC:54:12:86
7.NMS 5 IP Address 192.168.0.9 00:09:5B:04:16:48
8.Gateway IP Address 192.168.0.1 00:09:5B:12:33:15
9. Subnet Mask 0.0.0.0
A.Community public
B.Agent Port 161
C.Trap Port 162
D.sysContact John Doe
E.sysLocation Hotham Pde
F.sysName north side

Local MAC address

This is a unique address of this particular CDM-4300 and should only be changed with great care.

Local IP address

This is the static IP address assigned to the Frame by you or your ISP.

NMS 1 IP Address

This is the IP address of one of the NMSs to which the CDM-4300 will respond. Up to 5 addresses can be used. If any one of the addresses is not required then the address 255.255.255.255 should be entered.

Once communication has been established with a particular address then the MAC address used to communicate with that IP address will be displayed after the IP address. If the IP address is not within the local subnet as defined by the Gateway address and the Subnet Mask then instead of the MAC address the label "via Gateway" will appear.

Gateway IP Address

When using subnets a Gateway is the IP address of the computer appointed to pass on all messages that are not addressed to computers that are not part of your subnet. **The Gateway IP address must be in your subnet**.

Subnet Mask

A subnet mask is used to determine if an IP address is within your subnet or not. If the IP address is within your subnet then you send messages directly to that IP address. If it is not then you send messages to the Gateway for it to pass on.
Say the mask was 255.255.0.0 – and the destination IP address was 192.168.0.54 and the Gateway address was 192.168.0.1. Using binary logic you AND the IP address and the mask which results in 192.168.0.0 . Now AND the mask and the Gateway address and you get 192.168.0.0 . These two addresses match so the destination is in your local subnet.
If you do not want to use Gateways set the Mask to 0.0.0.0

Community

This is the Community string, which must be exactly matched for a response to be obtained. It is case sensitive and you may use non-printable characters. The maximum length is 63.

Agent Port

This is the Agents UDP Port number. SNMP Protocol suggests that this should be 161.

Trap Port

When a Trap (an unsolicited message from a module to a NMS) is sent the Trap Port number is used as the destination port. SNMP Protocol suggests that this should be 162. Note that when a module generates a trap, it is sent to all of the configured NMS addresses using this Port number.

sysContact

This string is sent when a 'Get sysContact' is sent to the CDM-4300. Maximum length is 63 and only printable characters should be used.

sysLocation

This string is sent when a 'Get sysLocation' is sent to the CDM-4300. Maximum length is 63 and only printable characters should be used.

sysName

This string is sent when a 'Get sysName' is sent to the CDM-4300. Maximum length is 63 and only printable characters should be used.

IRT-MIB.my is an SNMP MIB, which contains the Object Identifier (OID) definitions of all IRT controllable modules. It also contains a small number of OIDs used by modules that do not have their own MIB.
IRT4300FRU-MIB.my is an SNMP MIB specifically for the CDM/FRU-4300. A 'Walk' command to a CDM-4300 will show (in part) a list by slot number of the type of module installed.

The CDM-4300 will issue a Trap on failure of either of the two possible PSU-4000 PSUs in the frame, and also provide individual readings for each of the RWA-4300 modules.

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.

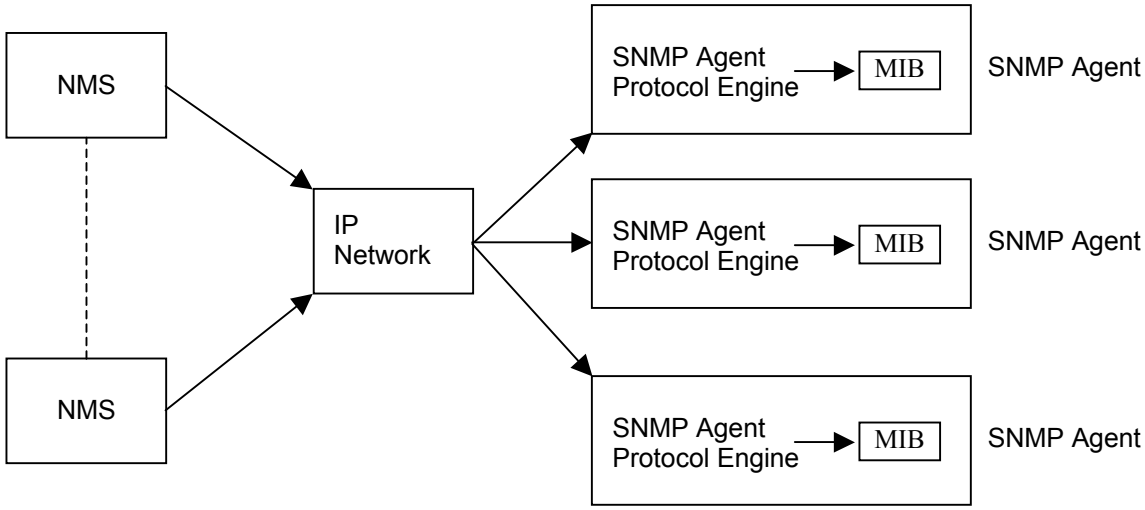
An *NMS* polls, or communicates with, an *agent*. An *agent* is a network management software module that resides in a *managed device*. An *agent* has local knowledge of management information and translates that information into a form compatible with SNMP. The *agent*, therefore, acts as an interface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

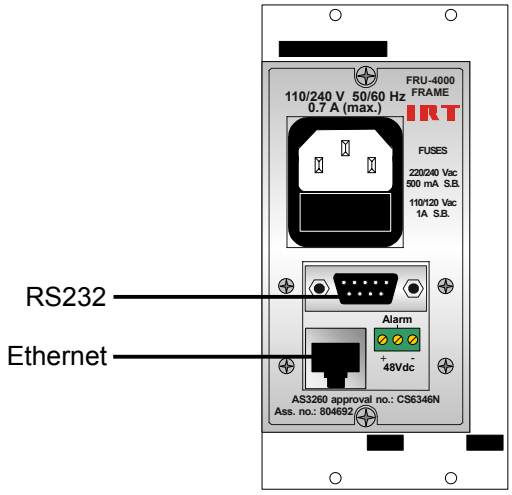
IRT Electronics currently employs SNMPv1 with its 4000 series frame. The frame acts as an *agent* when fitted with a CDM-4000 module. This module has its own designated slot next to the power supply so as to not affect the number of modules that the frame will take. Communication between the *NMS*, the frame and its loaded modules are via this CDM-4000 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.

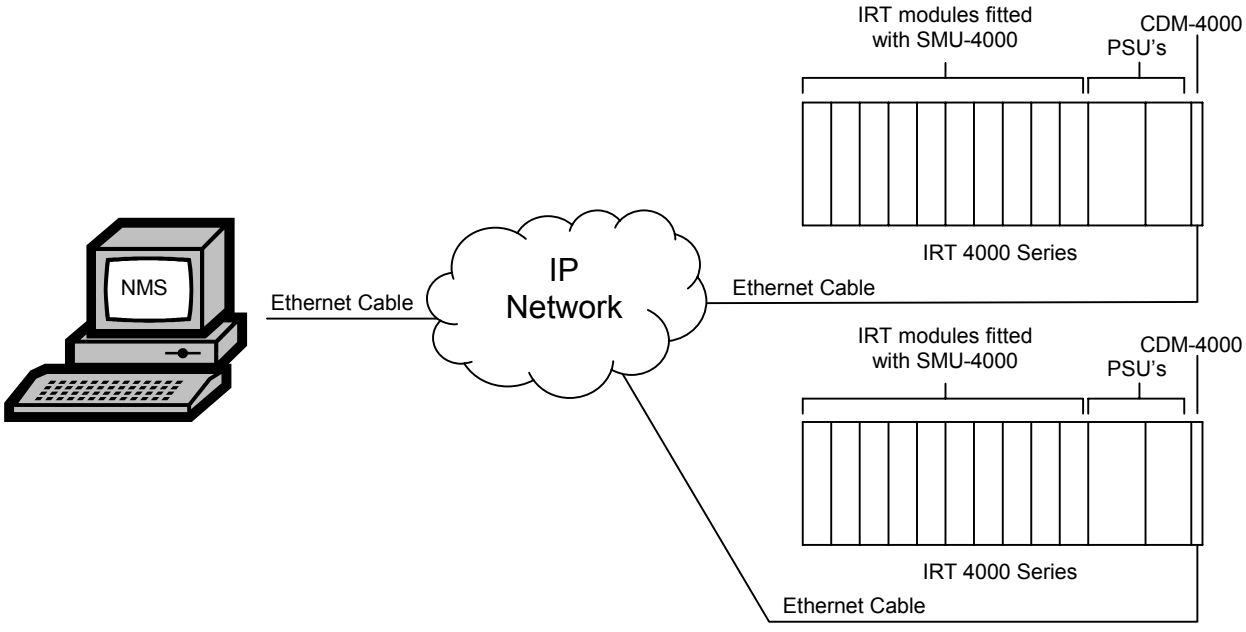
Frame parameters, such as Name, Address and Location, are set via an RS232 interface, a D9 connector on the rear of the frame below the mains inlet. A software terminal emulator, such as Tera Term or HyperTerminal, is used for setting and reading the parameters of the frame.

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-4000 *agent* via a data bus on the rear of the frame. Thus the CDM-4000 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-4000 *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 4000 Series SNMP Setup

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.

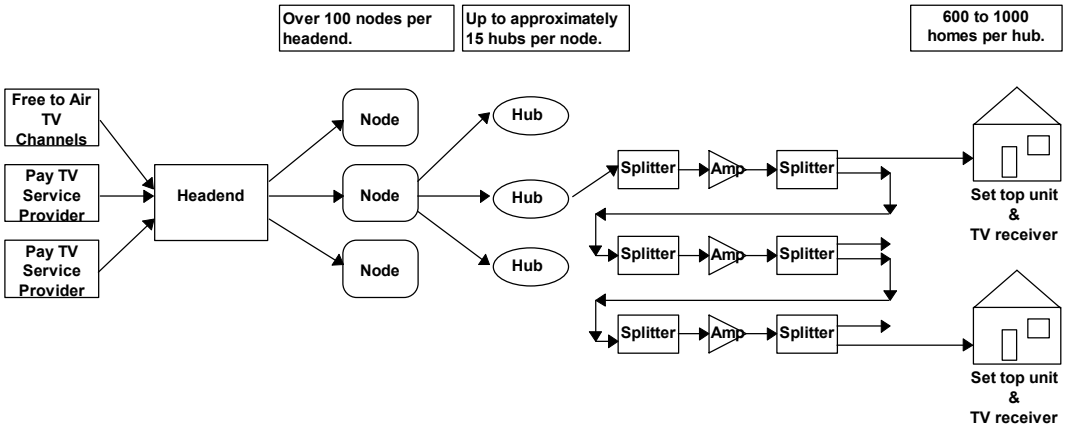
The equipment should be returned **to the agent who originally supplied the equipment or, where this is not possible**, to IRT direct as follows.

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

HFC Cable TV Network Overview

Typical Hybrid Fibre - Coaxial Pay TV Distribution System



The Forward path:
In a Hybrid Fibre Co-axial cable (HFC) network the forward path has a broadband RF capacity bandwidth from approximately 85 MHz to 750 MHz. This wide bandwidth is due to the large requirements of the pay TV application.
Signals from various program providers are concentrated at *HeadEnds* for distribution through the system on a single cable or fibre connection. The input signals to the HeadEnds may be provided over baseband coaxial cable or fibre optic links or in the case of free to air broadcast channels may be demodulated from a locally available signal off air. These signals are modulated and combined to provide a single wideband multichannel signal for distribution.

From the Headend the signals are amplified and converted into optical signals for transport down dedicated fibres to a *node*. Each node is strategically located to cater for approximately 10,000 customers.
From each node the signals are distributed to a *hub* which may service between 500 and 1000 customer sites. At the hub the signal is converted form optical to electrical and amplified before travelling down a coaxial cable for final distribution.

Currently the final distribution to the customer uses amplitude modulation (AM) for ease of interfacing with current set top decoders.

In the final distribution via coaxial cable a combination of splitters and amplifiers is employed and in any particular connection a total of three amplifiers may be present.

This forward path topology ensures that the highest quality of signal is maintained with very low noise by the use of optical fibre transport technology until the final stage of distribution. From this point the high signal level allows the signal to noise ratio to be maintained at high levels as far as the subscriber connection.

The Reverse path:
Whilst the forward path provides an adequate system for distribution of programme material to subscribers it is unidirectional due to the amplifiers and other active hardware in the system. Yet the fibre optic and coaxial cables themselves are able to carry traffic in either direction and so the opportunity is presented to make a bidirectional system which makes provides a better return on the investment in cable and fibre installation.

Provided the bandwidth is sufficient and the signal to noise ratio is kept high the reverse path can be used to provide a wide variety of services which may or may not be related to the primary signals carried in the forward path.

Examples of such services are telephony, high speed data for computer access to the Internet, ISDN services, impulse pay per view (IPPV) registration, movies on demand, home shopping and status monitoring and control (SM&C). Each of these services requires a link back to the service provider.

Whilst IPPV and SM&C services contain only small amounts of information and are suitable for a polled service occupying a minimal bandwidth of less than 1 MHz, telephony, Internet and ISDN require both a larger bandwidth and are typically connected for quite long durations. In addition, Internet, ISDN and data modem services in general require a low noise path in order to minimise date errors.

In order to provide such a reverse path it is necessary to overcome the losses introduced by the passive splitters in the forward path and at each point of amplification provide a reverse path around the forward amplifier. In addition it should be noted that whilst the forward path is a divergent system, and noise levels are relatively easy to control, that the reverse path is convergent and so the noise from every source adds to that of every other across the whole available bandwidth.

It is therefore important that the amplifiers in the reverse path have a controlled bandwidth response to exclude signals in the forward path and that the intrinsic noise of each amplifier be minimal both in band and out of band. In addition to low noise, high speed data services require a minimal group delay through the system and this must therefore be taken into account at every point in the system.

Different types of reverse path amplifier are required at different points in the reverse path.
In the cables leading from the hubs; small reverse path amplifiers with directional couplers are required to be located in the same housing as the forward path amplifiers.
At the hub the reverse path signal is separated from the forward path signal so that it may be converted to an optical signal and sent back to each node on a separate fibre to the forward path. At this point the reverse path signal occupies a bandwidth from 5 MHz to 65 MHz.

Due to the noise ingress into the hubs from the coaxial customer network it is not possible to sum all of the reverse path signals from the hubs together at the node. So at each node the signals are first converted back from optical to electrical form so that they may be combined by Frequency Division Multiplexing (FDM).
This method together with the associated out of band filtering results in minimum noise increase in the combined reverse path signals.

Before combining the signals it is important that the levels be adjusted to compensate for varying path losses from the different hubs and so variable gain reverse path amplifiers with monitoring points are required in each node input.
In addition it is desirable to be able to mute the signal from any path where a failure has occurred causing the noise level to rise to a level where it may cause interference with other signals and thus corruption of services being provided to customers on other hubs.

At each node the reverse path signal is converted back to an optical form for transmission back to the Headend on a separate fibre to the forward path.
At the Headend (or at a node if heavy usage is indicated) the reverse path signal is converted back to electrical form and delivered to decoding equipment for analysis and routing of individual signals. Not all signals will be required to be passed further than the Headend and others will be required to be routed into the public telephony network or to individual service providers.

Application of the RWA-4300 in the reverse path:

The RWA-4300 amplifier is a wideband low noise amplifier optimised for use with RF signals between 2 MHz and 200 MHz. The term reverse path amplifier arises out of its suitability for use in the reverse path of a cable TV network although its use is not limited to reverse path applications.

Nodes:
The RWA-4300 is designed to be used in the reverse path immediately after the optical signal receivers where it is required to boost the level of the signal to enable the various signals situated in the reverse path band to be split into each piece of receiving equipment at the correct level.

In addition it provides signal monitoring at this point for identifying problems in particular node or hub feeds and a muting facility to disable the output in the event of the line becoming to noisy to use.

HeadEnds:
At HeadEnds the received optical signals are once again converted from optical format to an electrical signal. The RWA-4300 may once again be used to perform the same functions as at the nodes.
The reverse path signal at this point is processed by a computer controlled system which interprets the addressing of the incoming signals and routes them to the appropriate destination, whether it be a pay TV provider, ISDN service or Internet access provider.
The router for these signals requires that the signals from various sources be adjusted to the same level so that the router output for a particular destination is held within the prescribed limits of the equipment, which converts the signal into the appropriate form for that provider.

General:
As the number of users of the reverse path grows, so does the number of amplifiers needed. The RWA-4300 provides an ideal solution to this expansion due to its modular nature. Additional amplifiers may be plugged in as required into pre-wired rack frames.
It is also vital that in the event of any failure that maintenance can be carried out as quickly as possible. The monitoring points on the RWA-4300 provide a ready access to the signals for locating faults and its modular nature allows rapid replacement of a module should its performance be in doubt.
Dual power supplies with a choice of AC or DC options and external alarms enhance the reliability of the RWA-4300 and the local and remote muting functions may be used to quickly isolate any source of noise in a given path before it is combined with other signals to their detriment.