



**ARF230 2 Port HG
Line Extender**

**Quick Reference
Guide**

Revision A

ACT ARF230 2-Port Line Extender

Quick Reference Guide

ACT Document Number: ARF230 QRG

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This document is produced to assist professional and properly trained personnel with installation and maintenance issues for the product. The capabilities, system requirements and/or compatibility with third-party products described herein are subject to change without notice.

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Revision History

| Revision | Date | Reason for Change |
|----------|------------|-------------------|
| A | 02/01/2012 | Initial Release |

Table of Contents

| | | |
|-------|--|----|
| 1 | Precautions..... | 4 |
| 2 | Introduction | 5 |
| 2.1 | Overview..... | 5 |
| 2.2 | Features..... | 5 |
| 2.3 | System Diagram | 6 |
| 2.4 | Models and Options | 6 |
| 2.5 | Specifications | 7 |
| 2.6 | Accessories..... | 8 |
| 3 | Installation | 9 |
| 3.1 | Equipment Inventory..... | 9 |
| 3.2 | Packaging and Transportation..... | 9 |
| 3.3 | Opening the Unit..... | 9 |
| 3.4 | Unit Installation Points..... | 10 |
| 3.5 | Power and RF Port Connectors | 10 |
| 3.6 | RF Connectors..... | 11 |
| 3.7 | Closing the Unit..... | 11 |
| 3.8 | Mounting..... | 14 |
| 3.8.1 | Strand Mounting | 14 |
| 3.8.2 | Shelf Mounting..... | 16 |
| 3.8.3 | Wall Mounting | 19 |
| 4 | Basic Operation & Configuration | 21 |
| 4.1 | Applying AC power | 21 |
| 4.2 | Setting the forward-path RF output level..... | 22 |
| 4.3 | Setting the return-path RF output level..... | 22 |
| 4.3.1 | ARF230 with one RF output port..... | 22 |
| 4.3.2 | ARF230 with two RF output ports..... | 23 |
| 4.4 | Enabling Automatic Gain Control (AGC Optional Only)..... | 23 |
| 4.5 | Internal Layout..... | 24 |
| 4.5.1 | Port layout..... | 24 |
| 4.5.2 | Plug-in module layout..... | 25 |
| 4.5.3 | EoC(Ethernet Over Cable) Passive Return Setup | 26 |
| 5 | Technical Description | 27 |
| 5.1 | Overview..... | 27 |
| 5.2 | Block Diagrams | 27 |
| 6 | Product Warranty | 28 |

1 Precautions

- Ensure adequate cooling and ventilation as specified.
- The installation and operation manual should be read and understood before units are put into use.
- Dangerous voltages are present within the unit at all times. **Mains power kills.**
- Do not operate unit without all covers and panels properly installed. **Mains power kills.**

Cleaning

Use only a damp cloth for cleaning front panel. Use a soft dry cloth to clean top of unit. Do not use spray cleaner of any kind.

Overloading

Overloading wall outlets and extension cords can result in a risk of fire or electric shock. Use approved electrical cords.

Damage requiring service

Unplug unit and refer servicing to Ascent Communication Technology qualified service personnel only.

Servicing

Do not attempt to service this unit yourself. Refer all servicing to Ascent Communication Technology qualified service personnel only.

2 Introduction

2.1 Overview

ARF230 Series 2-port two way Trunk/Line Amplifier is part of ACT Advanced 1GHz HFC solution, which has been designed to deliver interactive CATV, high capacity DOCSIS and other advanced services. The cost effective amplifier platform helps operators expand bandwidth of their existing HFC network while minimizing capital investment. The ARF230 compact Trunk/Line Amplifier has IP67 rated housing and is suitable for MDU, FTTB or FTTC applications with two high outputs up to 110dBuV each.

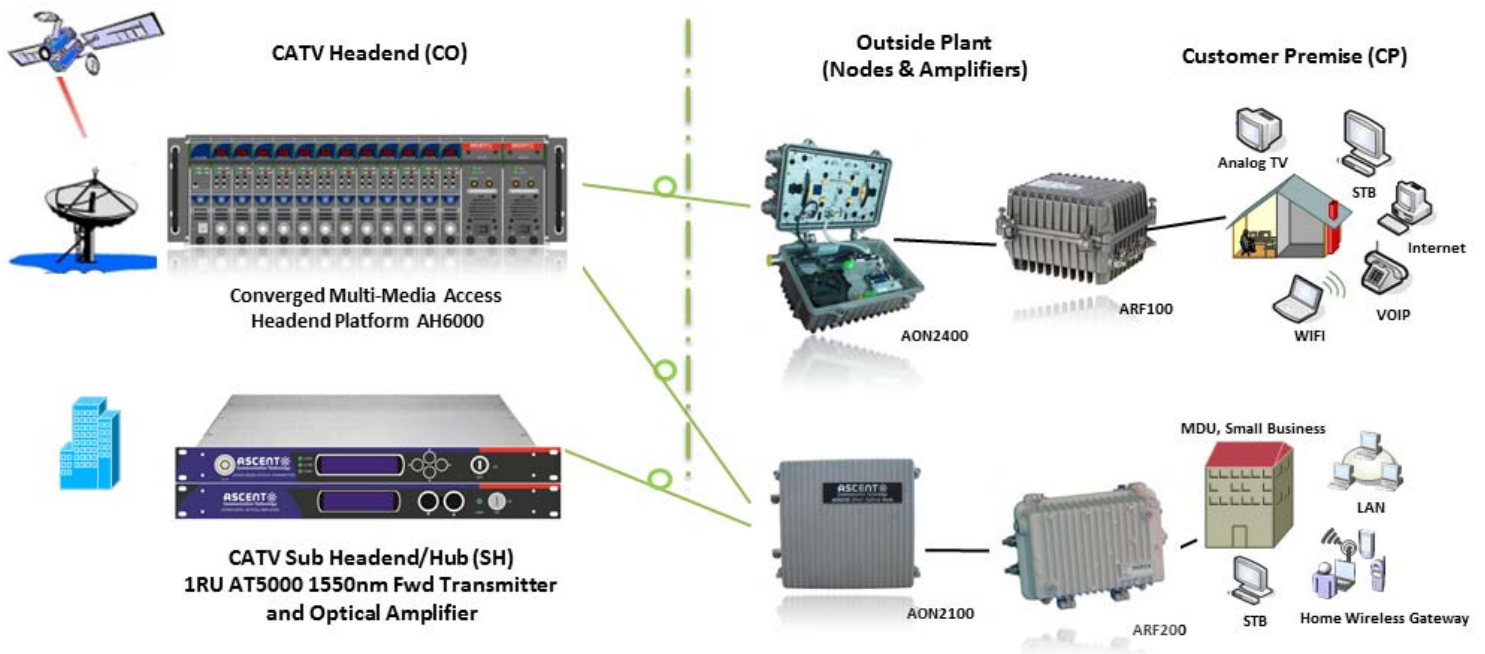
The ARF230 1GHz Trunk/Line Amplifier has the modular design with removable RF module, plug-in diplex filter, and accessories (Pads and Eqs). Combined with ACT's converged headend AH6000 optical system and AON node series, ARF230 series is an ideal product platform to provide MSOs with an economical, flexible HFC access solution.

ARF230 Trunk/Line Amplifier suits the last mile fiber deep access networks and offers high output power with flexibility to be put in either trunk amplifier or line extender location.

2.2 Features

- High performance 1GHz RF Spectrum for both analog and digital video
- Advanced GaAs RF hybrid technology for PAL, CENELEC and NTSC standards up to 110 analog channels
- Two high outputs up to 110dBuV each to eliminate last amplifier
- Field upgradeable diplexers and filters with plug-in JXP PADs and EQs
- Wide operation temperature range -40~+65 degree C
- Compact housing with grounding point and low power consumption
- 15AMP current passing capacity and 25 AMP surge survivability with fuse protection
- Sturdy die-cast housing is IP67 rated.

2.3 System Diagram



2.4 Models and Options

ARF230 Series 2 Outputs, Trunk/Line Amplifier Ordering Information

| ARF2X | | X- | | X- | | X- | | XX- | | X | | | | | |
|----------|----------------------|------------|----------|----|----------------|-------------|-------------|-----|--|--------------|--------------------|--|--|--|--|
| | | RF Outputs | | | | Return Path | | | | Power Supply | | | | | |
| | | 1 | 1 RF Out | | | 0 | No Return | | | 1 | 35 to 75 VAC Line | | | | |
| | | 2 | 2 RF Out | | | R | With Return | | | 2 | 90 to 270 VAC Main | | | | |
| LE Types | | Bandwidth | | | | Band Split | | | | | | | | | |
| 3 | Trunk/Line Amplifier | 0 | 862MHz | 33 | 33/45MHz Split | | | | | | | | | | |
| | | 1 | 1002MHz | 42 | 42/54MHz Split | | | | | | | | | | |
| | | | | 65 | 65/85MHz Split | | | | | | | | | | |

2.5 Specifications

ARF230 Deep Fibre 1 or 2-Port Trunk/Line Amplifier

RF Specifications

| | |
|----------------------|--|
| RF Forward Bandwidth | 54~ 1002MHz |
| RF Return Bandwidth | 5 to 42, 5 to 65MHz (Diplex Filter) |
| RF Output Port | 2 |
| RF Gain Forward | 38dB |
| RF Gain Return | 23dB |
| Output Level | 112dBuV @ 862MHz, 100dBuV @ 87MHz |
| Gain Adjustment | 0-24dB Pads |
| Slope Adjustment | 0-20dB EQs |
| Frequency Response | +/-0.5 dB |
| RF Return Loss | >18dB @ 5-65MHz; >16dB@85MHz~862MHz, -1.5dB/oct, > 12dB @1GHz |
| RF Input Impedance | 75 Ω |
| Insertion loss | <6 dB when pass through return path |
| RF Test Point | -20 dB +/-1 |

Link Performance

| | |
|---------------------------|--|
| Noise Figure | Forward <8dB @ highest gain; Return <5dB |
| CTB | -70dBc |
| CSO | -67dBc |
| Carrier to HUM Modulation | 65dB |
| Cross Modulation | 60dB |

General Specifications

| | |
|--------------------------------|--|
| Operating Temp, °C | -40 to 65 |
| Power Supply | 35~75VAC line power or 90 to 270 VAC |
| Operating relative humidity, % | 5 to 95 non condensing |
| Power Consumption W | 33 (full config) |
| Current Passing | 15A , Surges and Transients: >6kA - 8/20 μ s |
| Dimensions (W x D x H) | 257x203x142mm |
| Weight kg | 3.6 |

2.6 Accessories

| | |
|------------------------|--|
| ARF230-ATT-[dB] | JXP Forward and return path plug-in attenuator or EQ pad <i>Where [dB] is the desired attenuation in dB. Available in 1 dB increments from 0~12 dB.</i> |
| ARF230-DPL-4254 | 5~42/54~1003 MHz frequency split diplexer pad ⁽³⁾ |
| ARF230-DPL-5570 | 5~55/70~1003 MHz frequency split diplexer pad ⁽³⁾ |
| ARF230-DPL-6585 | 5~65/85~1003 MHz frequency split diplexer pad ⁽³⁾ |

(3) Diplexer pads are supplied with each ARF230 unit, as specified at time of purchase. Separate diplexer pads can be ordered to reconfigure the unit if requirements change.

Examples

ARF200-ATT-11

Forward and return path plug-in attenuator pad, 11 dB attenuation.

3 Installation

3.1 Equipment Inventory

On receiving your new ARF230, you should carefully unpack and examine the contents for loss or damage that may have occurred during shipping. Refer to warranty registration if loss or damage has occurred. The ARF230 should consist of the following:

| Qty | Description |
|-----|---|
| 1 | ARF230 unit |
| 1 | Product user manual (Optional) |
| 1 | Certificate of performance (includes test result sheet) |

3.2 Packaging and Transportation

Keep all packing boxes and packaging of the ARF230 for future transport.

Use only the original packaging of the ARF230 when transporting. This packaging has been specifically designed to protect the equipment.

3.3 Opening the Unit

After undoing all four lid bolts, lift the lid of the unit and fold it open. If the case will not open with normal force, a flat-bladed screwdriver can be used to lever the case apart. The screwdriver must be carefully inserted between the case halves AT THE TWO POINTS IN THE TOP CORNERS OF THE UNIT ONLY (see below).



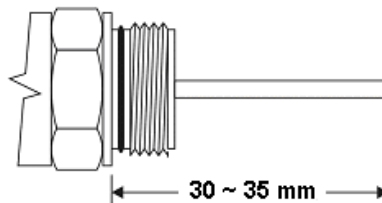
Leverage point

3.4 Unit Installation Points

- The unit must always be mounted with the heat dissipating fins vertical and nothing obstructing the flow of air through the fins.
- A clearance of 50 mm must be left between the sides of the unit and any obstruction.
- The unit **MUST** be grounded.
- If attenuator and or equaliser plug-in modules are incorrectly installed, the frequency response of the unit may be negatively affected. Ensure that the plug-in modules are installed in the correct orientation and are pushed in firmly.

3.5 Power and RF Port Connectors

When plugging the RF and power adaptors into ports 1 to 3 (**Section 3.6**), please make sure that the centre pin is between 30 mm and 35 mm when measured from the seating area of the connector to the tip of the centre pin (see below). If the pin is any longer there is a risk of not achieving a proper seal and/or damaging the ARF230.



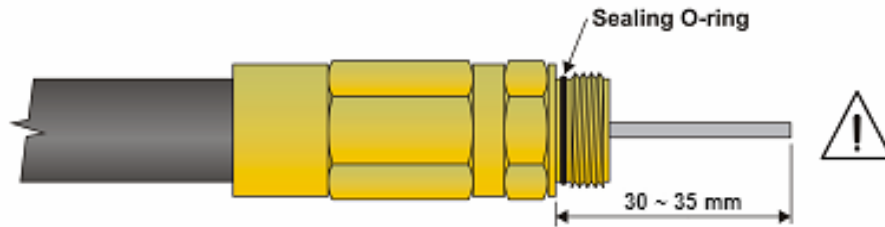
Centre pin length

Note:

RF adaptors are factory installed.

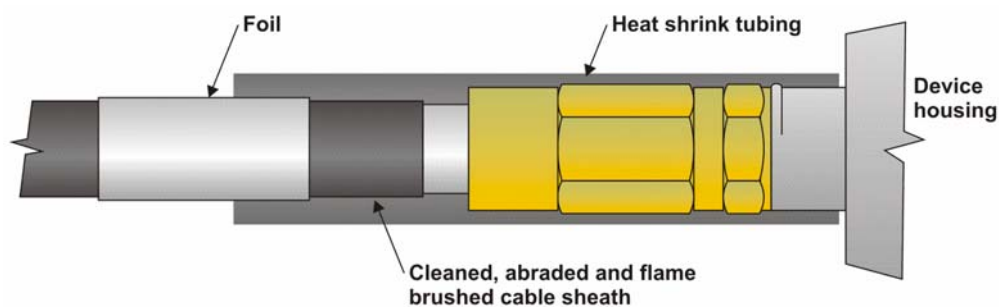
3.6 RF Connectors

When plugging the RF and power adaptors into ports 1 through to 3, ensure that the centre pin is between 30 mm and 35 mm long. If the pin is any longer there may be a risk of damaging the unit. The sealing O-ring must be on the connector and in good condition (see below).



Sealing O-ring location and centre pin length

Apply water-tight, adhesive-lined heat shrink tubing (as per manufacturer's instructions) to cover the whole connection from the unit flange to the cable jacket (see below). Failure to do so will result in water ingress into the amplifier inside.



RF connector sealing

3.7 Closing the Unit

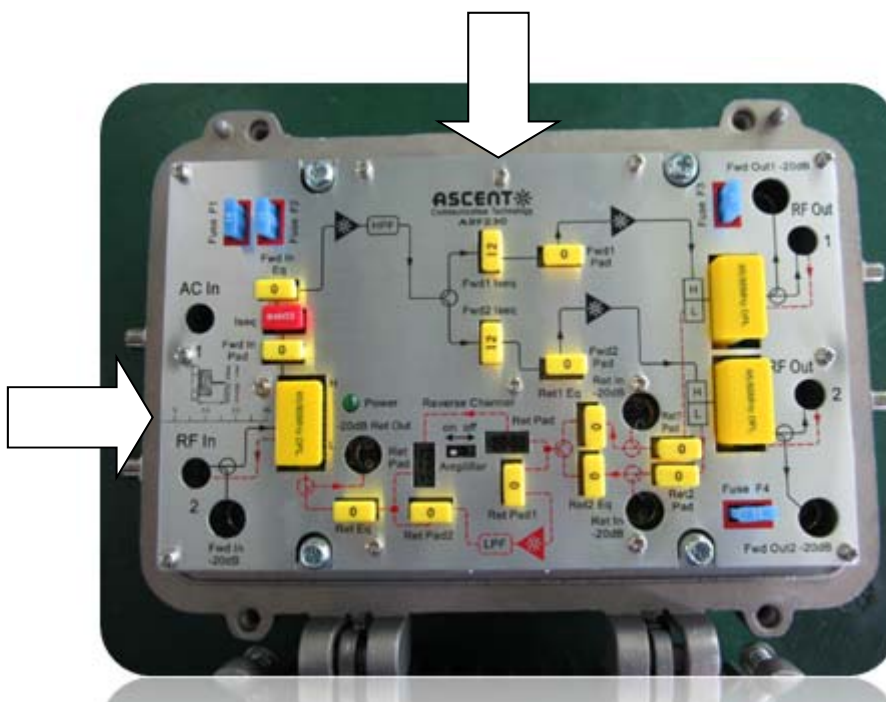
Note:

Prior to closing the unit, refer to **Section 4** for configuration instructions.

Prior to closing the unit, inspect the mating surfaces of the sealing edge. The ridge (see opposite) must be continuous and not damaged or scratched in any way, and the sealing gasket must be in good condition.

IMPORTANT:

The IP67 rating of the ARF230 is dependent on the proper sealing of all external unit interfaces. This includes all RF connectors.



Mating ridge of unit - must be continuous and not damaged or scratched in any way

CAUTION:

Equipment installers are responsible for the correct sealing of the product against water ingress. Failure to properly adhere to the instructions and recommendations shown may cause damage or complete failure of the product. This will void ALL warranties provided by Ascent Communication Technology. Any repairs required will be charged at commercial repair rates.

Before operating or closing the ARF230 please check that all internal screws are firmly and evenly tightened. When closing the ARF230 housing after installation, be sure to tighten all of the outer screws using the cross pattern as shown overleaf. Avoid tightening adjacent screws.

| Item | Initial Torque | Final Torque |
|----------------------------------|--------------------|---------------------------------------|
| Lid to Base bolts (4) | 3.4 Nm (30 in/lbs) | 6.8 Nm to 9.0 Nm (60 to 80 in/lbs) |
| Aerial/Strand mounting bolts (2) | 3.4 Nm (30 in/lbs) | 6.8 Nm to 9.0 Nm (60 to 80 in/lbs) |
| Pedestal mounting bolts (2) | 3.4 Nm (30 in/lbs) | 6.8 Nm to 9.0 Nm (60 to 80 in/lbs) |
| RF Connectors | | 6.8 Nm to 9.0 Nm (60 to 80 in/lbs) |
| RF cable seizures | | 0.5 Nm (5.5 in/lbs) |



Screw-tightening order

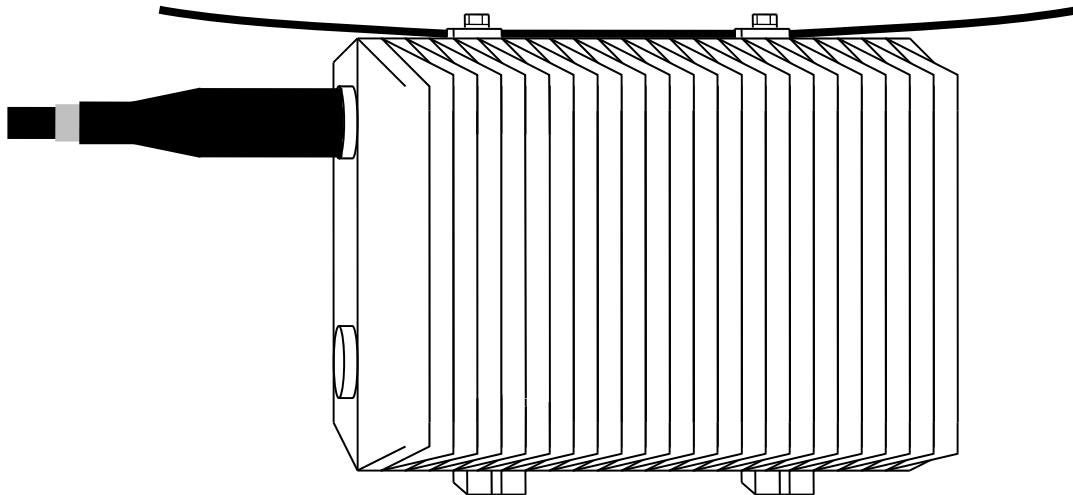
3.8 Mounting

Avoid installing the unit under any sources of water (rain excluded), such as air-conditioning drain outlets or roof guttering. If it must be installed as such, a waterproof board should be installed 35 cm above the unit.

The unit must always be mounted with the heat-dissipating fins vertical and nothing obstructing the flow of air through the fins.

A clearance of 50 mm must be left between the sides of the unit and any obstruction.

3.8.1 Strand Mounting



Strand mounting

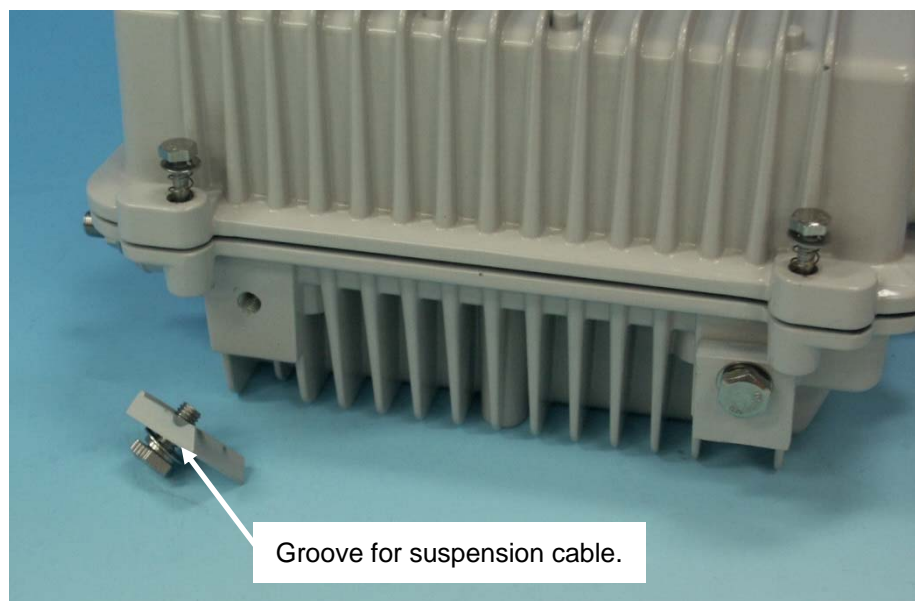
Clamp the unit to the strand (suspension cable) using the strand clamps on top of the unit, as shown above and overleaf.

CAUTION:

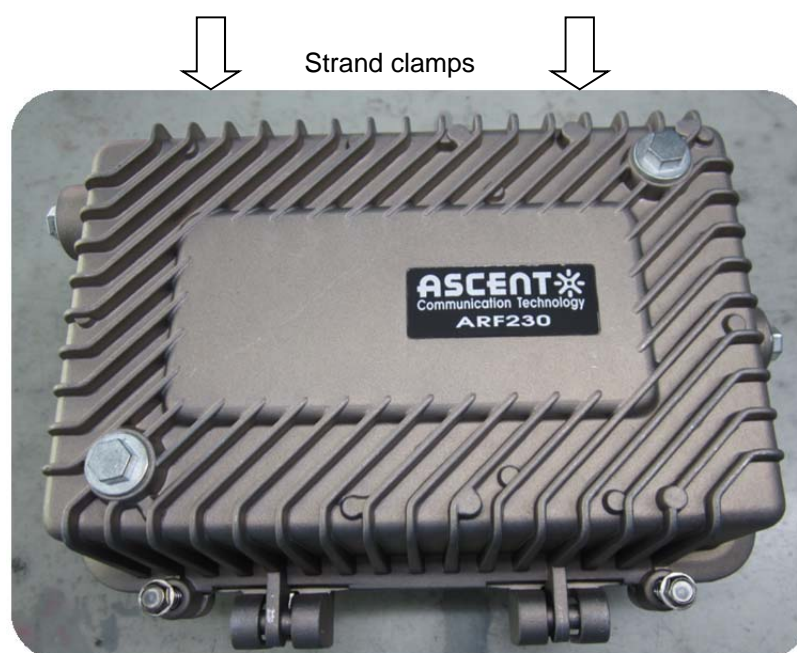
Do not hang the unit from the signal or electrical cable.

Only dedicated suspension cable which is rated to hold the weight of the unit should be used.

The strand clamps have a groove for appropriate seating of the suspension cables. Check that the cable is well seated in the clamp grooves to ensure that the unit is securely attached.



Strand-clamp groove



Strand clamps (front view of unit)

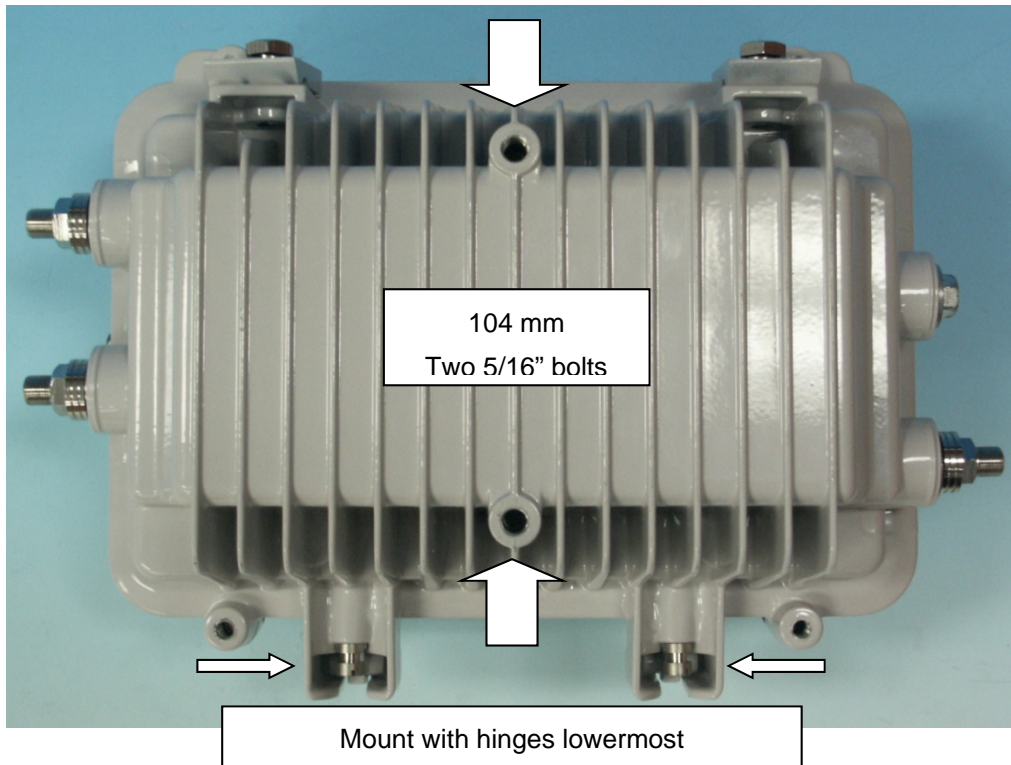
3.8.2 Shelf Mounting

If the unit is to be shelf mounted, then appropriate mounting brackets rated to hold the weight of the unit must be used and securely attached via the pedestal mounts on the rear of the unit (see below).

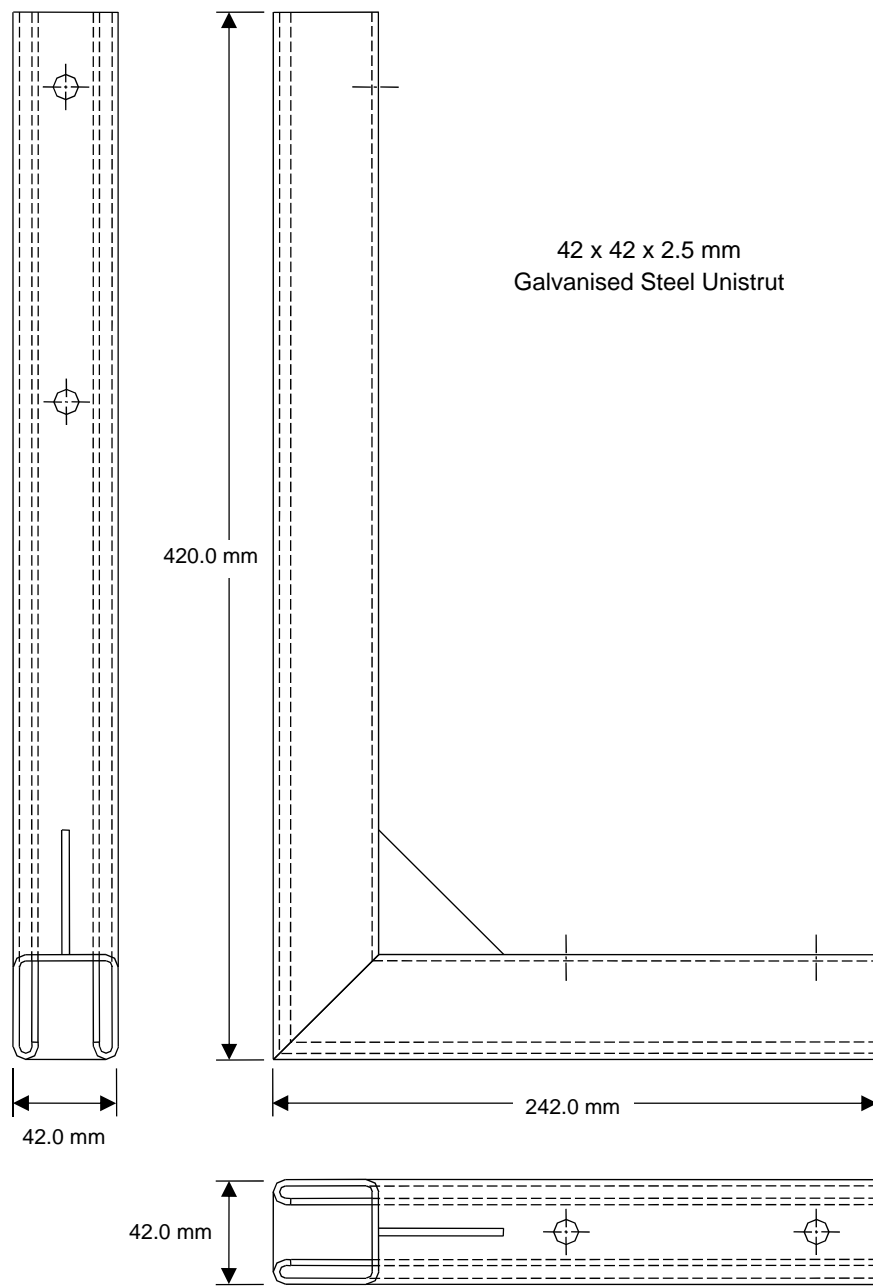
The unit must be securely mounted on the shelf with the heat-dissipating fins vertical and the hinges at the bottom. Enough clearance should be left below the unit to allow the lid to be opened fully (see page 17).

Note:

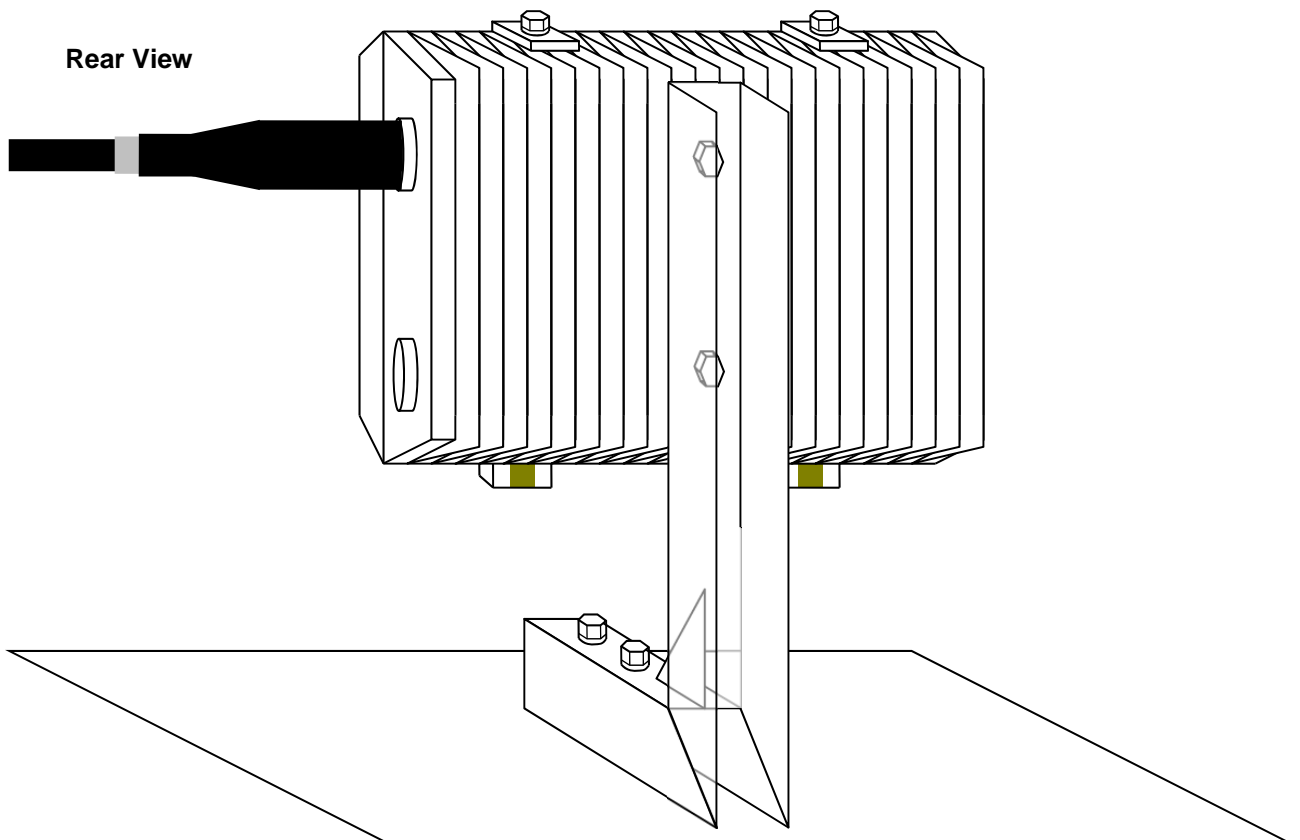
Mounting brackets and associated hardware are NOT supplied by ACT.



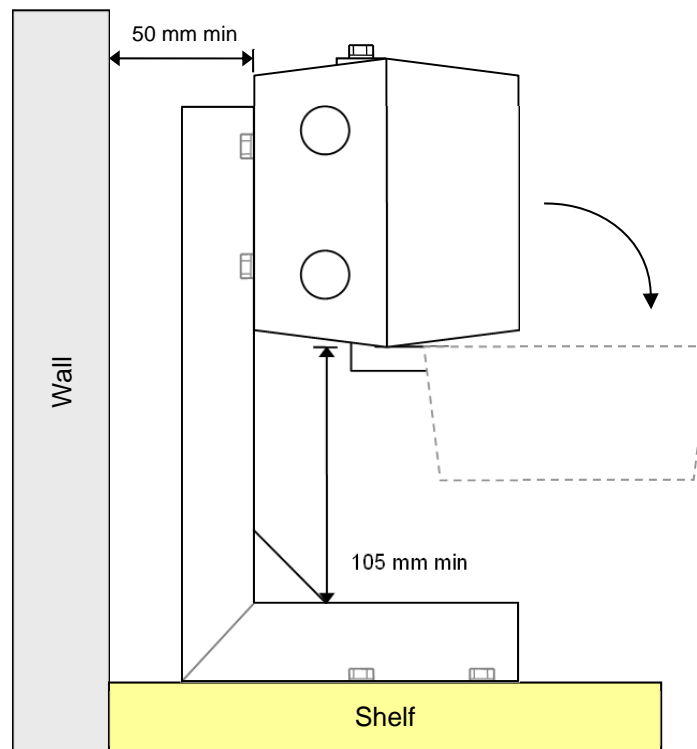
Pedestal mounts (rear view of unit)



Recommended shelf-mount bracket dimensions



Side View



Notes:

50 mm minimum must be left between the sides of the ARF230 and anything that may obstruct air flow (such as a wall).
105 mm minimum should be left below the ARF230 so that the front can be opened to 90°.

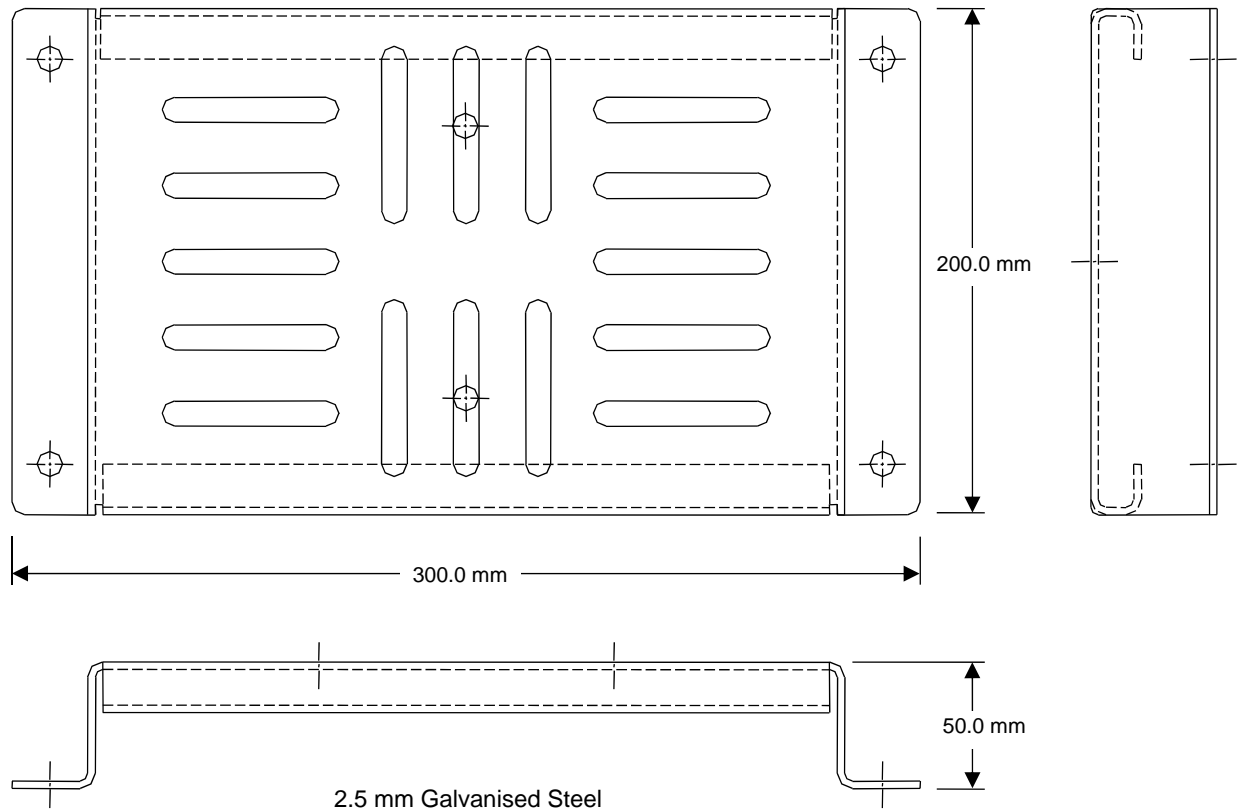
Recommended configuration for shelf mounting (not to scale)

3.8.3 Wall Mounting

If the unit is to be wall mounted, then an appropriate mounting plate, rated to hold the weight of the unit, must be used and securely attached via the pedestal mounts on the rear of the unit (see page 15). The unit must be mounted on the wall securely with the heat-dissipating fins vertical and the hinges at the bottom. Enough clearance should be left below the unit to allow the lid to be opened fully (see opposite).

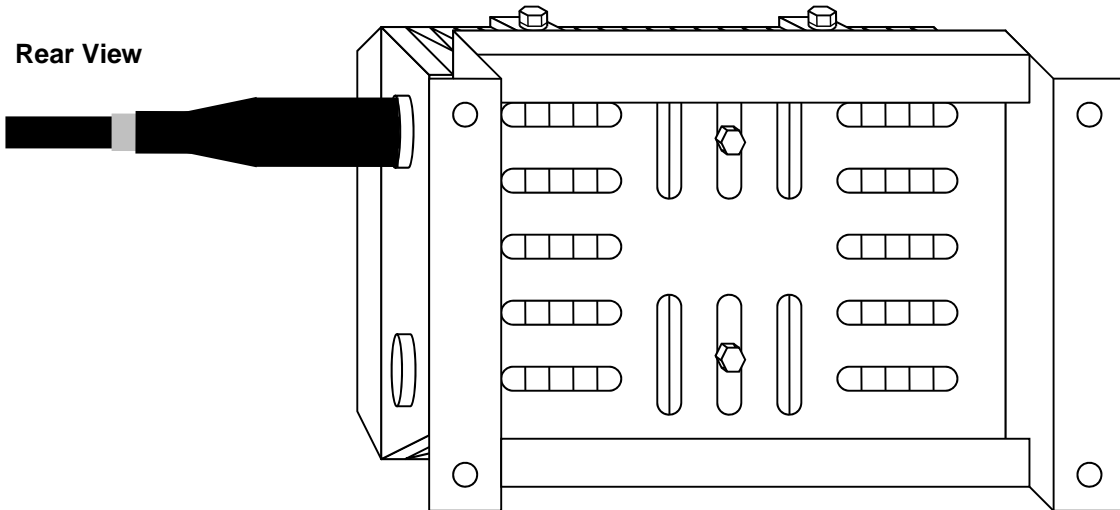
Note:

Mounting plates and associated hardware are NOT supplied by ACT.

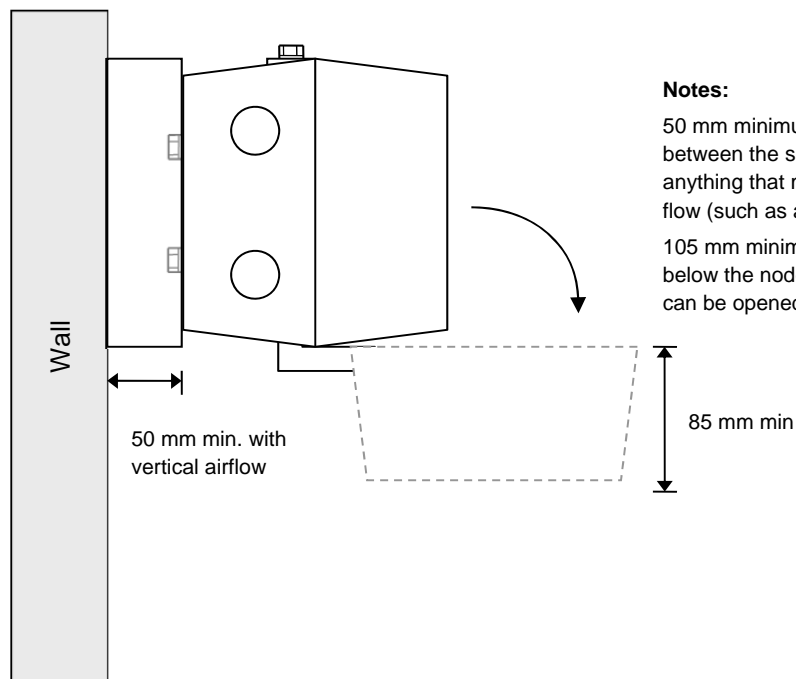


Recommended wall-mount plate dimensions

Rear View



Side View



Notes:

50 mm minimum must be left between the sides of the unit and anything that may obstruct air flow (such as a wall).

105 mm minimum should be left below the node so that the front can be opened to 90°.

4 Basic Operation & Configuration

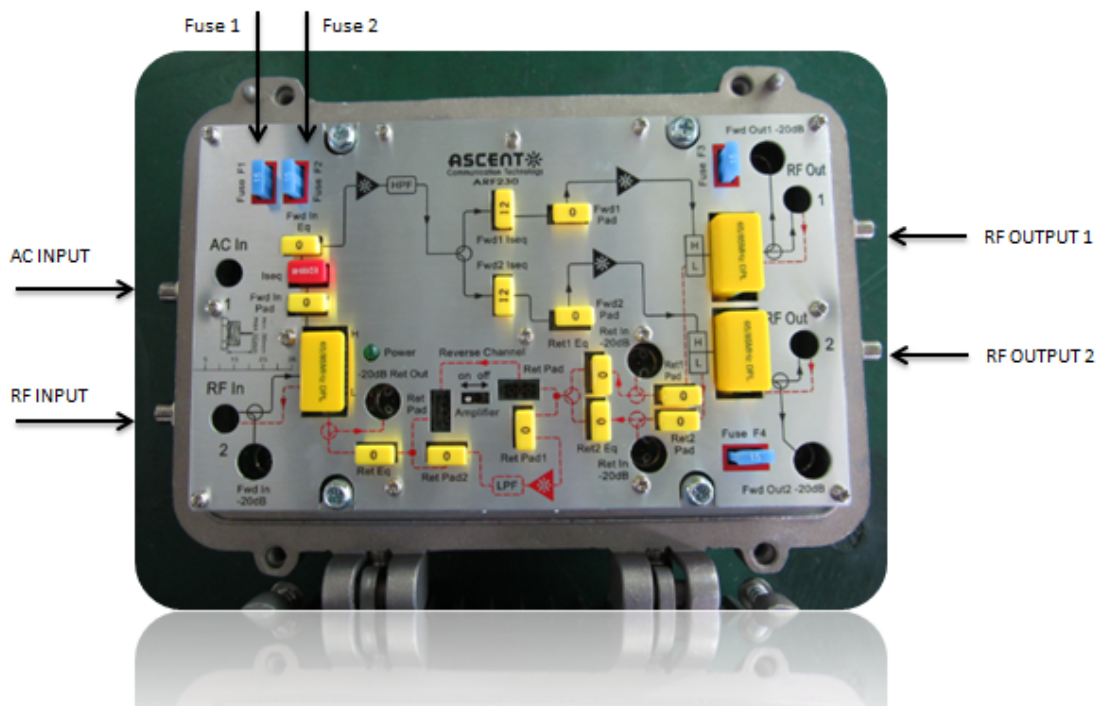
4.1 Applying AC power

The ARF230 may be line-powered directly using an appropriate RF connector and power supply via the dedicated AC power input. The remaining RF ports can be used to supply power to other units.

Note:

External power supplies are NOT supplied by ACT.

1. Determine which ports, if any, should be power-passing.
2. To enable power-passing on the **RF IN PORT**, plug the supplied fuse into location **F1**.
3. To enable power-passing on the **RF OUT PORT**, plug the supplied fuse into location **F2**.
4. The **AC PORT** fuse is factory-fitted for powering the unit.
5. Apply 60 Vac (nominal) to the **AC PORT**. If power has been applied correctly, the **POWER** LED will be on.



Location of power ports

4.2 Setting the forward-path RF output level

1. Determine the desired forward-path equalisation and install the appropriate equaliser pads* at the forward input equaliser pad locations (FWD IN EQ & ISEQ). Measurements can be made at the FWD IN -20 dB and FWD OUT -20 dB test points.
If no equalisation is required, install 0 dB equaliser pads* in these locations.
2. Determine the desired forward-path input attenuation and install an attenuator pad* at the forward input pad location (FWD PAD1).
If no attenuation is required, install a 0dB attenuator* pad in this location.
3. Determine the desired forward-path output attenuation and install an attenuator pad* at the forward output pad location (FWD PAD2).
If no attenuation is required, install a 0 dB attenuator* pad in this location.

Note:

If the ARF230 has two RF output ports, the FWD PAD3 and FWD PAD4 attenuator pads can be installed to determine the desired attenuation.

4.3 Setting the return-path RF output level

4.3.1 ARF230 with one RF output port

1. Determine the desired return-path equalisation and install the appropriate equaliser pad at the return path equaliser pad location (RET EQ).
If no equalisation is required, install a 0 dB equaliser pad* in this location.
2. Determine the desired return-path amplifier input attenuation and install an attenuator pad* at the return input pad location (RET PAD1). Measurements can be made at the RET IN A. -20 dB test point.
If no attenuation is required, install a 0 dB attenuator* pad in this location.
3. Determine the desired return-path output attenuation and install an attenuator pad* at the return output pad location (RET PAD2). Measurements can be made at the RET OUT. -20dB test point.
If no attenuation is required, install a 0 dB attenuator* pad in this location.

Note:

The ARF230 is factory fitted with a plug-in duplex filter pad, with frequency splits of either 42/54, 55/70, or 65/85 MHz, depending on customer requirements (see order details).

** Attenuator and equaliser pads are sold separately. See order details.*

4.3.2 ARF230 with two RF output ports

1. Determine the desired return path equalisation and install the appropriate equaliser pad at the return path equaliser pad location (RET EQ).
If no equalisation is required, install 0 dB equaliser pads* in these locations.
2. Determine the desired return path amplifier Port 1 input attenuation and install an attenuator pad* at the return input pad location (RET PAD1). Measurements can be made at the RET IN A. -20 dB test point.
If no attenuation is required, install a 0 dB attenuator* pad in this location.
3. Determine the desired return path amplifier Port 2 input attenuation and install an attenuator pad* at the return input pad location (RET PAD2). Measurements can be made at the RET IN A. -20 dB test point.
If no attenuation is required, install a 0 dB attenuator* pad in this location.
4. Determine the desired return path output attenuation and install an attenuator pad* at the return output pad location (RET PAD3 and RET PAD4). Measurements can be made at the RET OUT. -20 dB test point.
If no attenuation is required, install a 0 dB attenuator* pad in this location.

Note:

The ARF230 is factory fitted with a plug-in duplex filter pad, with frequency splits of either 42/54, 55/70, or 65/85 MHz depending on customer requirements (see order details).

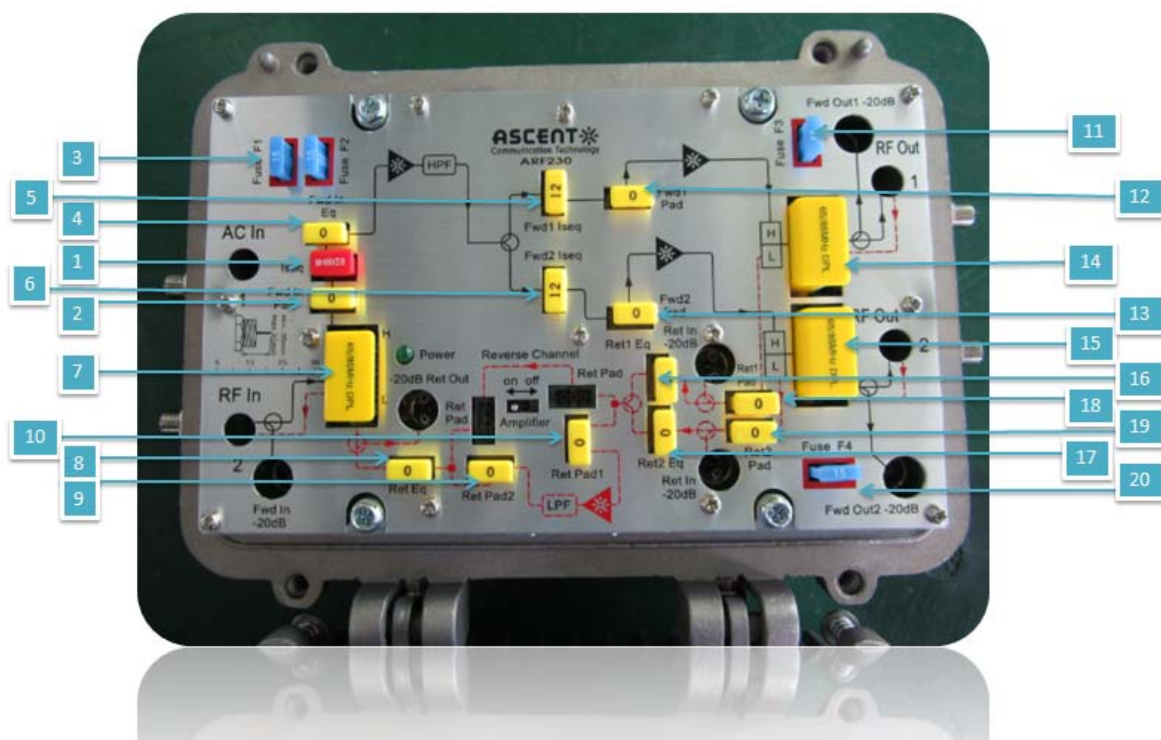
4.4 Enabling Automatic Gain Control (AGC Optional Only)

To enable automatic gain control insert the required attenuator pad* into the AGC pad location (AGC PAD). If AGC is required but no attenuation, use a 0 dB pad. If correctly enabled, the **AGC/MGC** LED will be on.

If no pad is inserted, the ARF230 will operate with manual gain control (MGC), and the **AGC/MGC** LED will be off.

** Attenuator and equaliser pads are sold separately. See order details.*

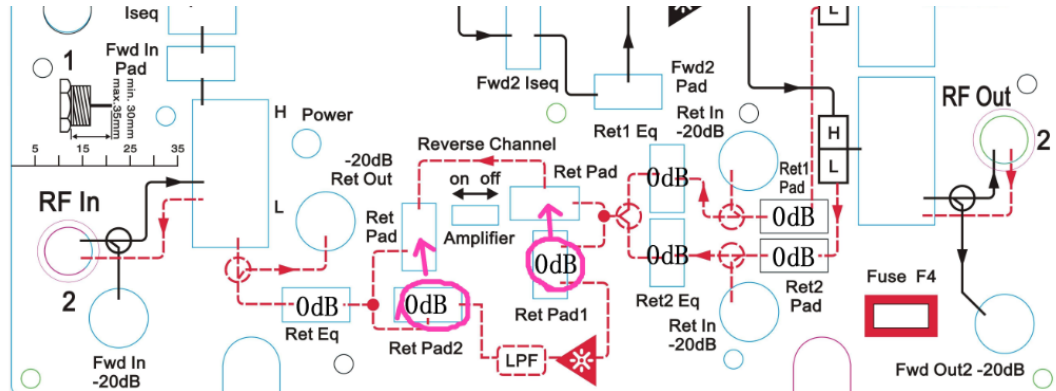
4.5.2 Plug-in module layout



Layout of plug-in modules

| Number | Label | Description |
|--------|-------------|---|
| 1 | ISEQ | Inter-stage equaliser (reverse EQ, when there's a high forward tilt at the input level, use this reverse EQ to lower the high end of level to make the RF signal remain flat) |
| 2 | FWD PAD | Forward-path output attenuator pad |
| 3 | F1, F2 | Fuse1 & 2 |
| 4 | FWD IN EQ | Forward-path equaliser (forward tilt EQ, to adjust the flatness for the high frequency section) |
| 5 | FWD ISEQ 1 | Forward-path inter-stage EQ 1 |
| 6 | FWD ISEQ 2 | Forward-path inter-stage EQ 2 |
| 7 | DPL | Plug-in diplexer pad |
| 8 | RET EQ | Return-path equaliser |
| 9 | RET PAD2 | Return-path output attenuator pad 2 |
| 10 | RET PAD1 | Return-path output attenuator pad 1 |
| 11 | F3 | Fuse3 |
| 12 | FWD PAD1 | Forward-path output attenuator pad 1 |
| 13 | FWD PAD1 | Forward-path output attenuator pad 1 |
| 14/15 | DPL | Plug-in diplexer pad |
| 16/17 | RET EQ 1/2 | Return-path equaliser 1/2 |
| 18/19 | RET PAD 1/2 | Return-path output attenuator pad 1/2 |
| 20 | F4 | Fuse4 |

4.5.3 EoC(Ethernet Over Cable) Passive Return Setup



ARF230 reverse channel has two kinds of options:

- **Option 1:** the reverse path with amplification gain (active channel)
- **Option 2:** reverse path without gain (passive channel, for application such as EOC data uplink)

See diagram, reverse channel at this 0db position means this is a return path with amplification gain

If you want to passive return path, then move the circled 0dB pad to the arrow position, it becomes option 2 for passive return path.

5 Technical Description

5.1 Overview

The ARF230 with one RF output port contains two bi-directional RF ports, with two plug-in diplexers for separation of forward and return path signals*. The stop frequency point is 1003 MHz.

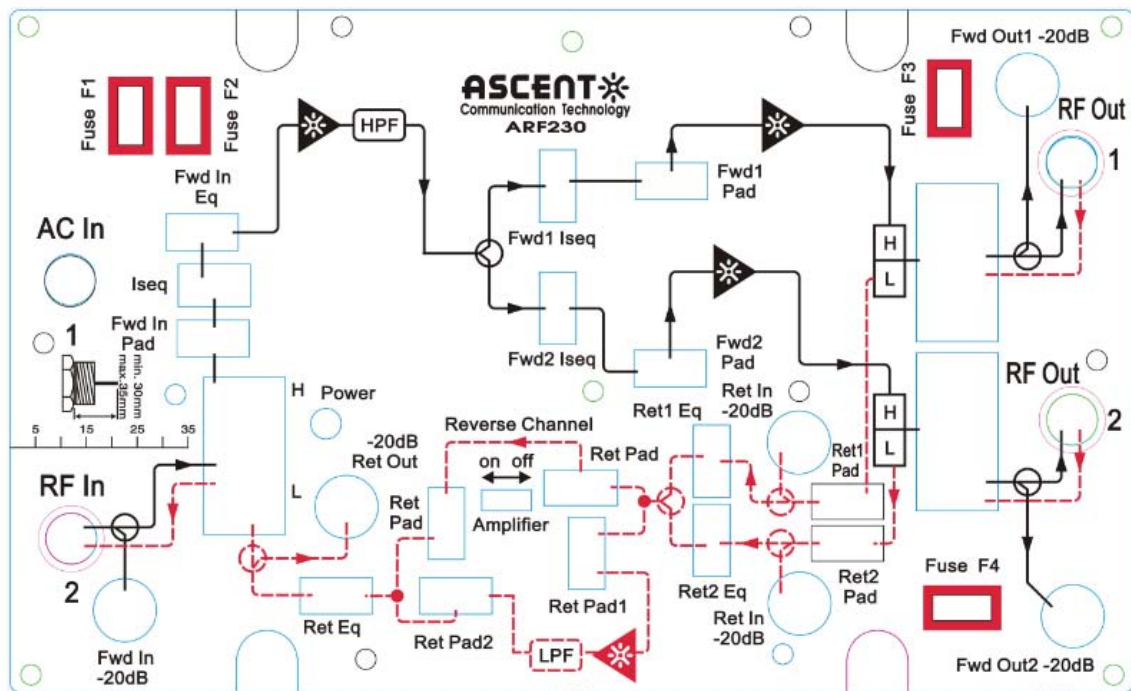
The ARF230 with two RF output ports contains three bi-directional RF ports, with three plug-in diplexers for separation of forward and return path signals*. The stop frequency point is 1003 MHz.

The ARF230 uses a two stage amplifier. The second stage employs a GaAs FET amplifier, which allows for high output level and superior distortion characteristics. This gives the ARF230 excellent performance, with high output level, low distortion, and frequency response to 1003 MHz.

It uses plug in equalizer, attenuator and diplexer pads which allow for simple user configuration.

The ARF230 can be powered by either a 35~70 Vac or 55~110 Vac source, depending on local conditions. See order details for options.

5.2 Block Diagrams



ARF230 with two RF ports

6 Product Warranty

Ascent Communication Technology warrants its equipment to be free of manufacturing defects in material and workmanship for a period of one year from date of shipment, provided it is installed and operated in accordance with factory recommendations.

The liability of Ascent Communication Technology under this warranty is solely limited to repairing; replacing or issuing credit provided that:

The warranty does not cover the following:

1. Products purchased from someone other than an authorised Ascent Communication Technology dealer.
2. Damage caused by accident, negligence, misuse, abuse, improper operation or failure to operate the equipment within the manufacturer's specifications.
3. Damage caused by fluctuation in electrical current, lightning, power surges, etc.
4. Damage resulting from overhaul, repair or attempt to repair caused by someone other than Ascent Communication Technology's qualified service personnel.
5. Any product, in which the serial number has been defaced, modified or removed.
6. Any product that has been opened or modified without prior written permission from ACT.
7. Replacement of parts necessitated by normal wear and tear.
8. Any consequential or implied damages.



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Specifications and product availability are subject to change without notice.

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