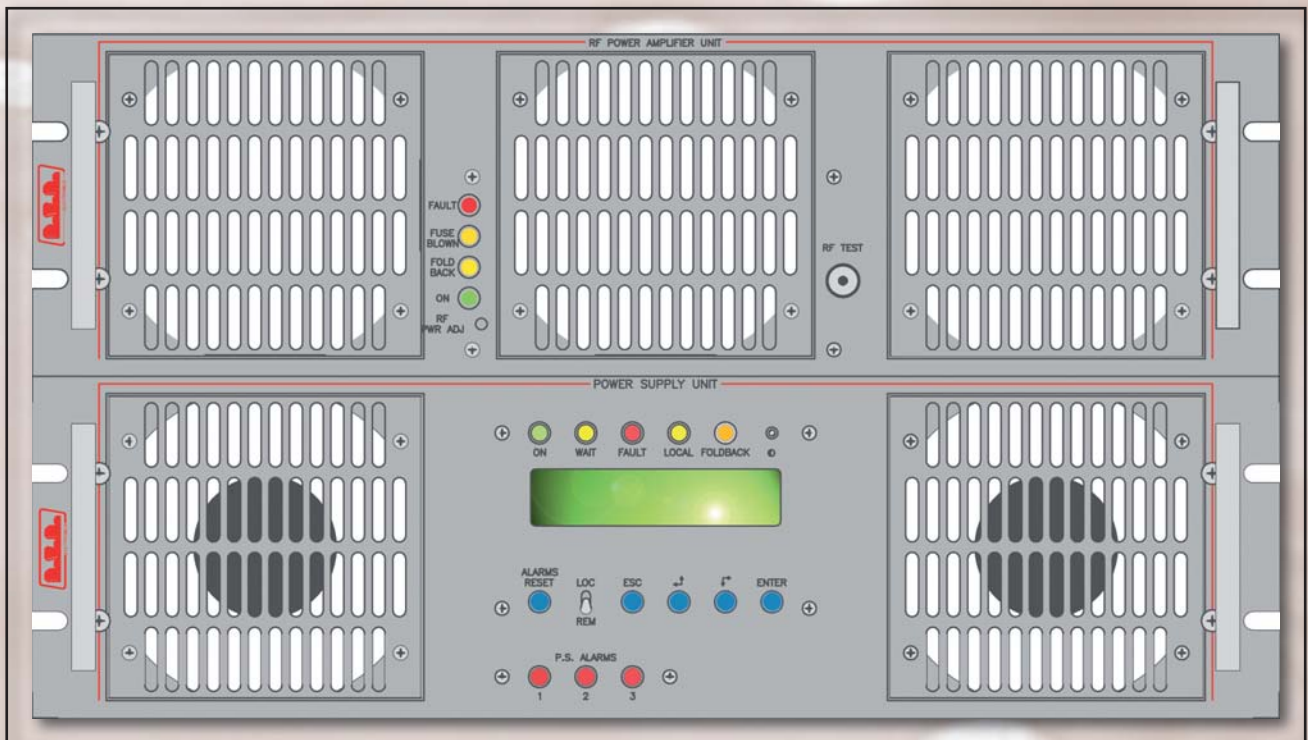




# ATVPA

## USER MANUAL VOLUME 1



**File Name:** 03\_ATVPA\_ING\_1.1.indd

**Version:** 1.1

**Date:** 11/03/2010

**Revision History**

Date	Version	Reason	Editor
13/05/2009	1.0	First Version	J. H. Berti
11/03/2010	1.1	Graphic restyle, resuming content and new system of chapters	M. Ucelli

ATVPA - User Manual  
Version 1.1

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### IMPORTANT



The symbol of lightning inside a triangle placed on the product, evidences the operations for which is necessary gave it full attention to avoid risk of electric shocks.



The symbol of exclamation mark inside a triangle placed on the product, informs the user about the presence of instructions inside the manual that accompanies the equipment, important for the efficacy and the maintenance (repairs).


## 1. Preliminary Instructions

### • General foreword

The equipment in object is to considering for uses, installation and maintenance from "trained" or "qualified" staff, they conscious of the risks connected to operate on electronic and electrical circuits electrical.


The "trained" definition means staff with technical knowledge about the use of the equipment and with responsibility regarding the own safety and the other not qualified staff safety place under his directed surveillance in case of works on the equipment.

The "qualified" definition means staff with instruction and experience about the use of the equipment and with responsibility regarding the own safety and the other not qualified staff safety place under his directed surveillance in case of works on the equipment.


 **WARNING:** The machine can be equipped with an ON/OFF switch which could not remove completely voltages inside the machine. It is necessary to have disconnected the feeding cord, or to have switched off the control panel, before to execute technical operations, making sure himself that the safety connection to ground is connected.

The technical interventions that expect the equipment inspection with circuits under voltage must be carry out from trained and qualified staff in presence of a second trained person that it is ready to intervene removing voltage in case of need.


R.V.R. Elettronica SpA doesn't assume responsibility for injury or damage resulting from improper procedures or practices by untrained/unqualified personnel in the handling of this unit.


 **WARNING:** The equipment is not water resistant and an infiltration could seriously compromise its correct operation. In order to prevent fires or electric shocks, do not expose the equipment to rain, infiltrations or humidity.

Please observe all local codes and fire protection standards during installation and use of this unit.

 **WARNING:** The equipment has to its inside exposed parts to risk of electric shock, always disconnect power before opening covers or removing any part of this unit.

Fissures and holes are supplied for the ventilation in order to assure a reliable efficacy of the product that for protect itself from excessive heating, these fissures do not have to be obstructed or to be covered. The fissures doesn't be obstructed in no case. The product must not be incorporated in a rack, unless it is supplied with a suitable ventilation or that the manufacturer's instructions are been followed.

 **WARNING:** This equipment can irradiate radio frequency energy and if it's not installed following the instructions contained in the manual and local regulations it could generate interferences in radio communications.

 **WIRING:** This device has a connection to ground on the power cord and on the chassis. Check that they are correctly connected.

Operate with this device in a residential ambient can cause radio disturbs; in this case, it can be demanded to the user to take adequate measures.

Specifications and informations contained in this manual are furnished for information only, and are subject to change at any time without notice, and should not be construed as a commitment by R.V.R. Elettronica SpA.

The R.V.R. Elettronica SpA assumes no responsibility or liability for any errors or inaccuracies that may appear in this manual, including the products and software described in it; and it reserves the right to modify the design and/or the technical specifications of the product and this manual without notice.

• **Warning regarding the use designated and the use limitations of the product.**

This product is an transmitter radio indicated for the audio broadcasting service in frequency modulation. It uses working frequencies that are not harmonized in the states of designated user.

The user of this product must obtain from the Authority for spectrum management in the state of designated user the appropriate authorization to use the radio spectrum, before putting in exercise this equipment.

The working frequency, the transmitter power, let alone other specifications of the transmission system are subject to limitation and defined in the authorization obtained.

## 2. Warranty

R.V.R. Electronics S.P.A. guarantees absence of manufacturing defect and the good operation for the products, within the provided terms and conditions.

Please read the terms carefully, because the purchase of the product or acceptance of order confirmation, constitutes acceptance of the terms and conditions.

For the last legal terms and conditions, please visit our web site ([WWW.RVR.IT](http://WWW.RVR.IT)) wich may also be changed, removed or updated for any reason without prior notice.

Warranty will be void in cases of opened products, physical damage, misuse, modification, repair by unauthorised persons, carelessness and using the product for other purpose than its intended use.

In case of defect, proceed like described in the following:

1 Contact the dealer or distributor where you purchased the unit. Describe the problem and, so that a possible easy solution can be detected.

Dealers and Distributors are supplied with all the information about problems that may occur and usually they can repair the unit quicker than what the manufacturer could do. Very often installing errors are discovered by dealers.

2 If your dealer cannot help you, contact R.V.R. Elettronica and explain the problem. If it is decided to return the unit to the factory, R.V.R. Elettronica will mail you a regular authorization with all the necessary instructions to send back the goods;

3 When you receive the authorization, you can return the unit. Pack it carefully for the shipment, preferably using the original packing and seal the package perfectly. The customer always assumes the risks of loss (i.e.,

R.V.R. is never responsible for damage or loss), until the package reaches R.V.R. premises. For this reason, we suggest you to insure the goods for the whole value. Shipment must be effected C.I.F. (PREPAID) to the address specified by R.V.R.'s service manager on the authorization



**DO NOT RETURN UNITS WITHOUT OUR AUTHORIZATION AS THEY WILL BE REFUSED**

- 4 Be sure to enclose a written technical report where mention all the problems found and a copy of your original invoice establishing the starting date of the warranty.

Replacement and warranty parts may be ordered from the following address. Be sure to include the equipment model and serial number as well as part description and part number.



R.V.R. Elettronica SpA  
Via del Fonditore, 2/2c  
40138 BOLOGNA ITALY  
Tel. +39 051 6010506

### 3. First Aid

The personnel employed in the installation, use and maintenance of the device, shall be familiar with theory and practice of first aid.

#### 3.1 Treatment of electrical shocks

##### 3.1.1 If the victim is not responsive

Follow the A-B-C's of basic life support.

- Place victim flat on his back on a hard surface.
- Open airway: lift up neck, push forehead back (Figure 1).

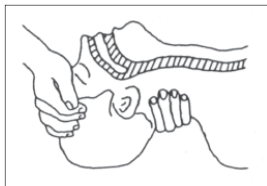


Figure 1

- clear out mouth if necessary and observe for breathing
- if not breathing, begin artificial breathing (Figure 2): tilt head, pinch nostrils, make airtight seal, four quick full breaths. Remember mouth to mouth resuscitation must be commenced as soon as possible.



Figure 2

- Check carotid pulse (Figure 3); if pulse is absent, begin artificial circulation (Figure 4) depressing sternum (Figure 5).

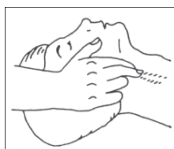


Figure 3



Figure 4

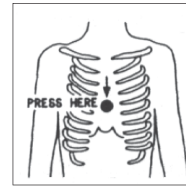


Figure 5

- In case of only one rescuer, 15 compressions alternated to two breaths.
- If there are two rescuers, the rythm shall be of one brath each 5 compressions.
- Do not interrupt the rythm of compressions when the second person is giving breath.
- Call for medical assistance as soon as possible.

##### 3.1.2 If victim is responsive

- Keep them warm.
- Keep them as quiet as possible.
- Loosen their clothing (a reclining position is recommended).
- Call for medical help as soon as possible.

#### 3.2 Treatment of electrical Burns

##### 3.2.1 Extensive burned and broken skin

- Cover area with clean sheet or cloth.
- Do not break blisters, remove tissue, remove adhered particles of clothing, or apply any salve or ointment.
- Treat victim for shock as required.
- Arrange transportation to a hospital as quickly as possible.
- If arms or legs are affected keep them elevated.

If medical help will not be available within an hour and the victim is conscious and not vomiting, give him a weak solution of salt and soda: 1 level teaspoonful of salt and 1/2 level teaspoonful of baking soda to each quart of water (neither hot or cold).

Allow victim to sip slowly about 4 ounces (half a glass) over a period of 15 minutes.

Discontinue fluid if vomiting occurs.

DO NOT give alcohol.

##### 3.2.2 Less severe burns

- Apply cool (not ice cold) compresses using the cleansed available cloth article.
- Do not break blisters, remove tissue, remove adhered particles of clothing, or apply salve or ointment.
- Apply clean dry dressing if necessary.
- Treat victim for shock as required.
- Arrange transportation to a hospital as quickly as possible.
- If arms or legs are affected keep them elevated.

## 4. General Description

The **ATVPA** is an amplifier for TV broadcasting. It is a fully solid-state apparatus of modern design that use MOSFET as active devices in the amplifying modules. This chapter briefly describes the machine's main features.

### 4.1 Assembly

The **ATVPA** is composed of two parts included in two boxes of equal size, PS module (it does mean Power Supply module) and RF module (Radio Frequency module). For a quick identification, PS module is that one installing LCD display in the front panel. RF module must be placed on top of PS module.

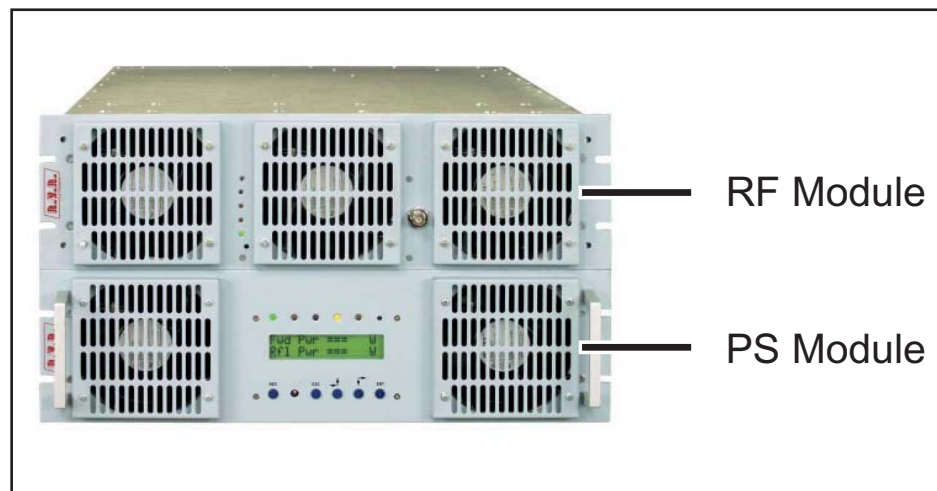


Figure 4-1: ATVPA modules

The front panels of each part, point out that the amplifier may be housed in a 19" standard cabinet. In such a case, brackets and screws have to be provided in order to prepare the whole seating. The right accommodation expects that these modules must be wholly closed each other.



The amplifier is a forced air cooled equipment, both parts house inside lots of fans. All fans are supplied by the same feeder placed in PS module. Each fan has its own protection consisting of an auto-resettable fuse, so no broken fan can halt the overall cooling system.

Each box accommodates a set of fans in the front panel and a second in the rear panel. Both parts of the amplifier breathe cooling air from the front panel and expel it from the rear panel, as a rule air pressure inside each box is higher than outside.

### 4.2 Features

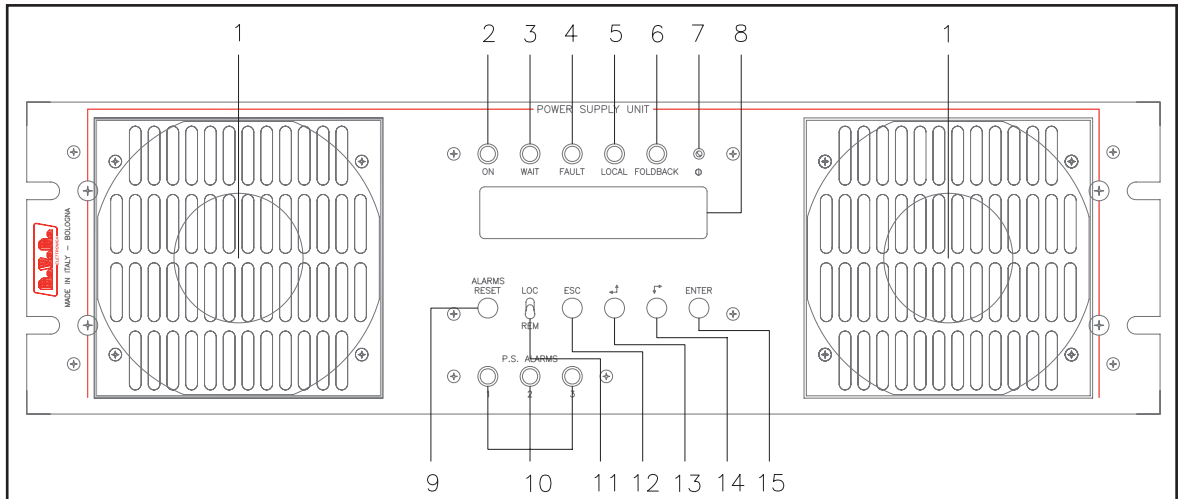
The amplifier is controlled by a microprocessor-based system that includes a LCD which carries out these following functions:

- Measuring and displaying all working parameters of the amplifier.
- Activating and deactivating RF output power delivery.
- Protecting the amplifier from potentially harmful situations for instance, excessive RF output power, excessive VSWR, excessive RF input power and excessive temperature.
- Detecting each warning threshold set by the user (e.g. RF output power below a specific threshold), which are given available to the user via the telemetry connector.
- Communicating with external devices.

The amplifier's control software is based on a menu system through which the user may navigate using the following four buttons: **ESC**, , , and **ENTER**. A fifth button is provided for resetting any triggered alarms.

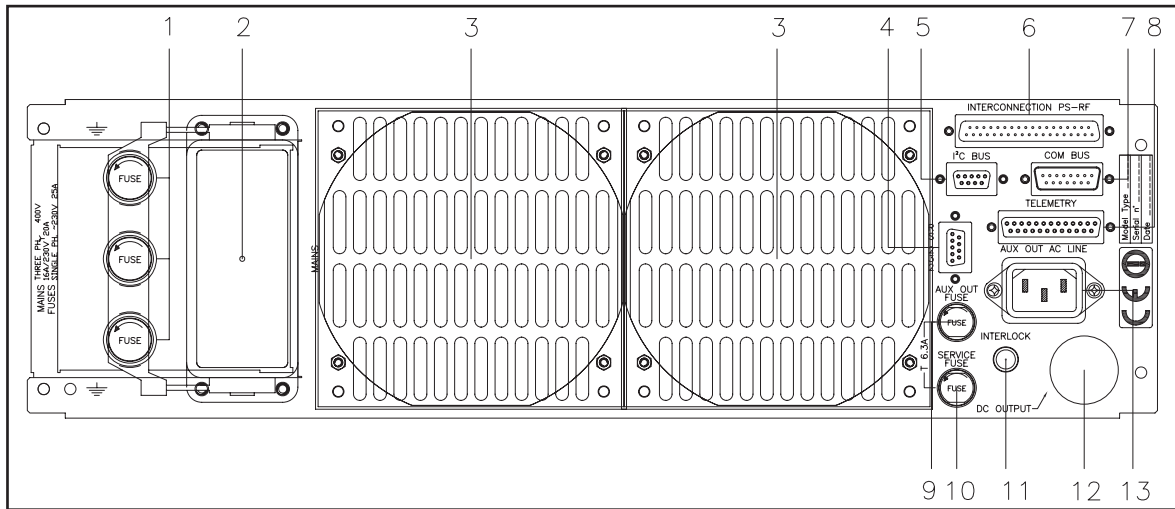
The PS module of this amplifier houses three rectifier/power supply switching mode units that normally are connected to each of the three phases, its output works in parallel mode. So three phases mains are nearly equally balanced.

## 4.2 PS Module Frontal Panel Description



- |                  |  |
|------------------|--|
| [1] AIR FLOW     | Grill for the ventilation flow passage   |
| [2] ON           | Green LED indicating the amplifier is switched on  |
| [3] WAIT         | Yellow LED indicating the amplifier is waiting for a condition that is blocking the power output to be removed   |
| [4] FAULT        | Red LED indicating that a fault that cannot be automatically reverted  |
| [5] LOCAL        | Yellow LED, indicating that the amplifier is in local control mode   |
| [6] FOLDBACK     | Yellow LED, indicating that the foldback function is active (automatic reduction of RF output power). PLEASE READ CAREFULLY CHAPTER 6.3 FOR MORE INFORMATIONS. |
| [7] CONTRAST     | Trimmer to regulate the contrast of the LCD display  |
| [8] DISPLAY      | LCD display  |
| [9] ALARM RESET  | Button used to manually reset the protection system  |
| [10] P.S. ALARMS | Yellow LEDs, indicating the presence of a anomaly on one or more power supply boards   |
| [11] LOC/REM     | Switch to select the local or remote control modes   |
| [12] ESC         | Button used to exit from a menu  |
| [13] LEFT/UP     | Button used to navigate in the menu system and to modify the changeable parameters   |
| [14] RIGHT/DOWN  | Button used to navigate in the menu system and to modify the changeable parameters   |
| [15] ENTER       | Button used to accept a parameter's value or to enter into a menu  |

### 4.3 PS module Rear Panel Description

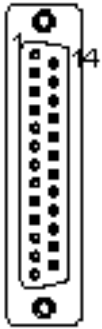


- |                           |   |
|---------------------------|---|
| [1] MAINS FUSE            | Protection fuses of the power supplies 1,2 and 3  |
| [2] MAINS CONECTOR        | Plug for mains power supply   |
| [3] AIR FLOW              | Grill for the ventilation flow passage  |
| [4] RS232                 | DB9 connector to interface with external devices or factory programming   |
| [5] I <sup>2</sup> C BUS  | DB9 connector for I <sup>2</sup> C bus networking   |
| [6] INTERCONNECTION PS-RF | DB37 connector for interfacement with RF part   |
| [7] COM BUS               | DB15 connector for interfacement with other equipment   |
| [8] TELEMETRY             | DB25 telemetry connector  |
| [9] AUX OUT FUSE          | Protection fuse of the auxiliary plug   |
| [10] SERVICE FUSE         | Protection fuse for the service section   |
| [11] INTERLOCK            | BNC connectors to inhibit an external device, as an exciter. In case of fault, the inner connector is shorted to ground |
| [12] DC OUTPUT            | Power socket for RF section   |
| [13] AUX OUT AC LINE      | Auxiliary VDE plug to supply external devices (typically an exciter)  |

## 4.4 Connector Description

### 4.4.1 Telemetry Connector

Type: DB25 Female



1	Internal SWR	Disabled
2	RF power amplifier voltage	3,9V x 50V
3	GND	GND
4	Reflected Power	4.3V x 150W
5	Interlock	
6	Set 4	
7	GND	GND
8	“On” Command	
9	Set 1	
10	WAIT	
11	Reset alarm	
12	OFF	
13	Interlock	
14	Temperature	3.9V x 80°
15	RF power amplifier current	3.9V x 110A
16	Forward Power	4.3V x F.S.
17	FAULT	
18	Set 3	
19	Input power	4.3V x 10W
20	“OFF” Command	
21	GND	GND
22	Set 2	
23	LOC	
24	+Vcc	
25	ON	

### 4.4.2 RS 232

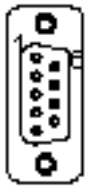
Type: DB9 female



1	NC
2	TX_D
3	RX_D
4	Internally connected with 6
5	GND
6	Internally connected with 4
7	Internally connected with 8
8	Internally connected with 7
9	NC

### 4.4.3 I<sup>2</sup>C Connector

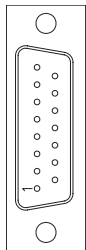
Type: DB9 Female



1	NC	
2	SDA	Serial Data
3	SCL	Serial Clock
4	NC	
5	GND	GND
6	NC	
7	NC	
8	NC	
9	NC	

### 4.4.4 Com Bus

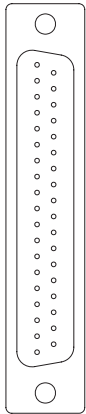
Type: DB15 male



1	GND
2	485+
3	485-
4	GND
5	ON OFF C
6	INP PWR
7	ST BY
8	IRQ
9	GND
10	PWR REG
11	GND
12	NC
13	NC
14	NC
15	NC

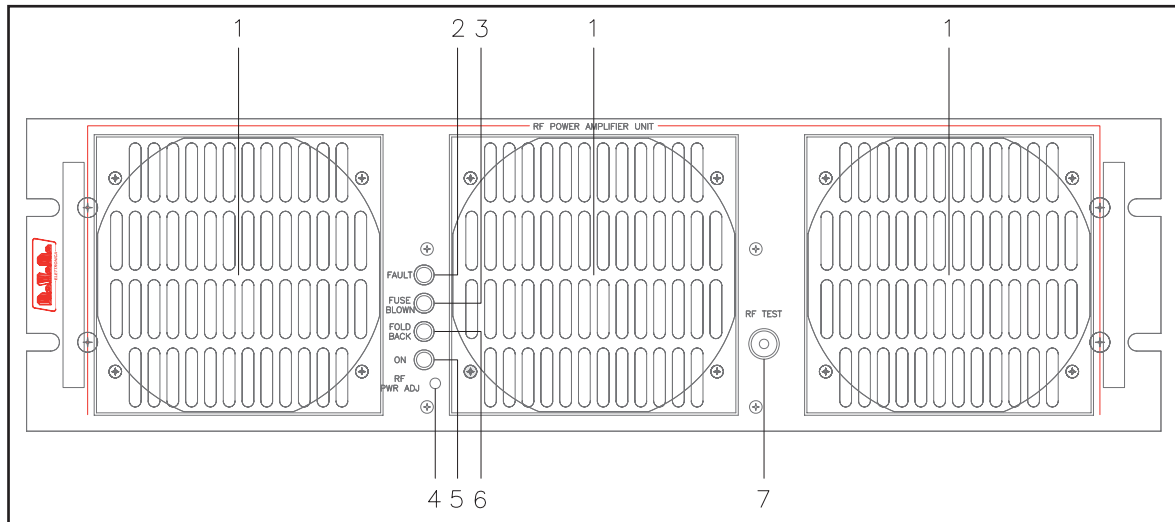
#### 4.4.5 Interconnection PS-RF

Type: DB37 female



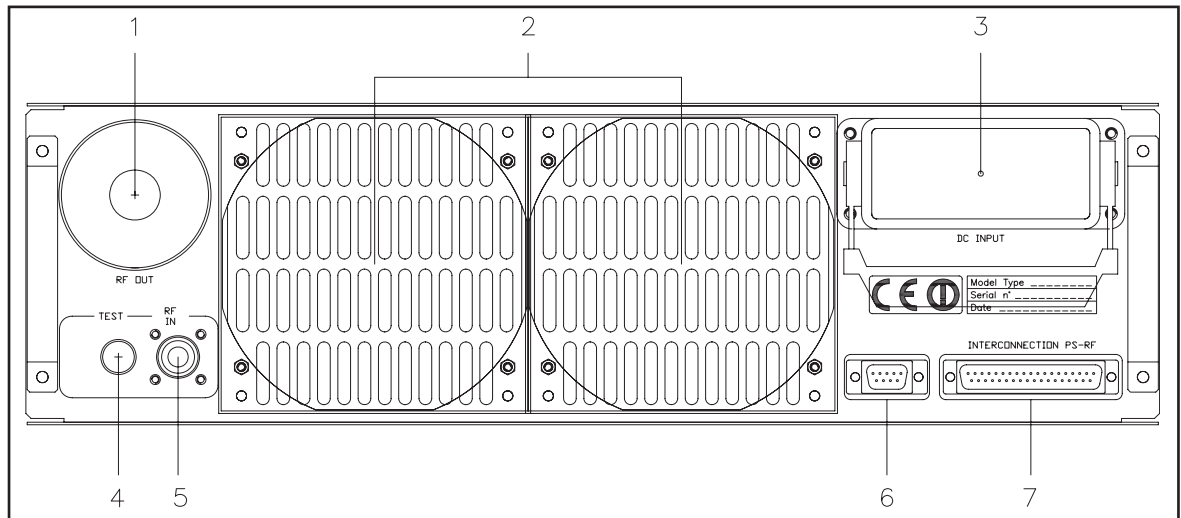
- |    |   |
|----|---|
| 1  | GND, Internally connected with 12/14/15/23/25/26/28/31/33 |
| 2  | V TOT   |
| 3  | R PWR   |
| 4  | TEMP  |
| 5  | PS OFF  |
| 6  | PS REG  |
| 7  | PWR REG   |
| 8  | ON OFF  |
| 9  | IRQ   |
| 10 | CLIX  |
| 11 | RESET AL  |
| 12 | GND, Internally connected with 1/14/15/23/25/26/28/31/33  |
| 13 | 485+  |
| 14 | GND, Internally connected with 1/12/15/23/25/26/28/31/33  |
| 15 | GND, Internally connected with 1/12/14/23/25/26/28/31/33  |
| 16 | NC  |
| 17 | AC3, Internally connected with 35                         |
| 18 | NC  |
| 20 | I TOT   |
| 19 | AC4, Internally connected with 37                         |
| 21 | F PWR   |
| 22 | INP PWR   |
| 23 | GND, Internally connected with 1/12/14/15/25/26/28/31/33  |
| 24 | PS STATUS   |
| 25 | GND, Internally connected with 1/12/14/15/23/26/28/31/33  |
| 26 | GND, Internally connected with 1/12/14/15/23/25/28/31/33  |
| 27 | ST BY   |
| 28 | GND, Internally connected with 1/12/14/15/23/25/26/31/33  |
| 29 | FAULT   |
| 30 | FUSE PS   |
| 31 | GND, Internally connected with 1/12/14/15/23/25/26/28/33  |
| 32 | 485-  |
| 33 | GND, Internally connected with 1/12/14/15/23/25/26/28/31  |
| 34 | NC  |
| 35 | AC3, Internally connected with 17                         |
| 36 | NC  |
| 37 | AC4, Internally connected with 19                         |

### 4.5 RF Module Frontal Panel Description



- |                |  |
|----------------|--|
| [1] AIR FLOW   | Grill for the ventilation flow passage   |
| [2] FAULT      | Red LED that indicates a fault that cannot be automatically reverted                                       |
| [3] FUSE BLOWN | Red LED that indicates the presence of one or more broken fuses  |
| [4] RF PWR ADJ | Not used   |
| [5] ON         | Green LED indicating that the amplifier is switched on   |
| [6] FOLDBACK   | Yellow LED indicating that the foldback function is active (automatic reduction of the distributed power)  |
| [7] RF TEST    | BNC connector for RF monitor output. The output level is referred to the power output in 174-230 MHz range |

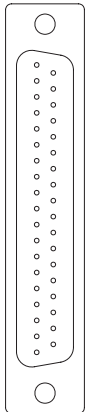
## 4.6 RF module Rear Panel Description



- |                           |  |
|---------------------------|--|
| [1] RF OUT                | RF output connector (7/8" EIA flange)                            |
| [2] AIR FLOW              | Grill for the ventilation flow passage                           |
| [3] PLUG                  | Plug for the supply of 50V <sub>DC</sub> incoming from module PS |
| [4] RF IN TEST            | Not used.  |
| [5] RF IN                 | RF input connector ("N" type)                                    |
| [6]                       | DB9 connector reserved for future uses                           |
| [7] INTERCONNECTION PS-RF | DB37 connector for interfacement with PS part                    |

### 4.6.1 Interconnection PS-RF

Type: DB37 female



- 1 GND, internally connected with 12/14/15/23/25/26/28/31/33
- 2 V TOT
- 3 R PWR
- 4 TEMP
- 5 PS OFF
- 6 PS REG
- 7 PWR REG
- 8 ON OFF
- 9 IRQ
- 10 CLIX
- 11 RESET AL
- 12 GND, internally connected with 1/14/15/23/25/26/28/31/33
- 13 485+
- 14 GND, internally connected with 1/12/15/23/25/26/28/31/33
- 15 GND, internally connected with 1/12/14/23/25/26/28/31/33
- 16 NC
- 17 AC3, internally connected with 35
- 18 NC
- 20 I TOT
- 19 AC4, internally connected with 37
- 21 F PWR
- 22 INP PWR
- 23 GND, internally connected with 1/12/14/15/25/26/28/31/33
- 24 PS STATUS
- 25 GND, internally connected with 1/12/14/15/23/26/28/31/33
- 26 GND, internally connected with 1/12/14/15/23/25/28/31/33
- 27 ST BY
- 28 GND, internally connected with 1/12/14/15/23/25/26/31/33
- 29 FAULT
- 30 FUSE PS
- 31 GND, internally connected with 1/12/14/15/23/25/26/28/33
- 32 485-
- 33 GND, internally connected with 1/12/14/15/23/25/26/28/31
- 34 NC
- 35 AC3, internally connected with 17
- 36 NC
- 37 AC4, internally connected with Internamente connesso con 19

## 4.7 Technical Description

		<b>ATVPA1K3LV1</b>		<b>ATVPA1K5LV1</b>		
<b>Parameters</b>	<b>Conditions</b>	<b>U.M.</b>	<b>GENERALS</b>			<b>Notes</b>
Frequency range		MHz	170-230			
Rated output power		W	1300WPS			170-230
Input power for rated output		Wps	1,2			1500WPS
Power supply type			monophase/biphase			1,5
AC Supply Voltage	Mains input voltage range	VAC	230 +10%-15%(*) or 115/400 +10%-15% (**)			monophase/biphase
DC Supply Voltage	CPU backup Input Voltage	VDC				230 +10%-15%(*) or 115/400 +10%-15% (**)
AC Apparent Power Consumption		VA	about 3500			(*) monophase (**) Threephases Y
Active Power Consumption		W	about 3600			Measured on threephases 400V
RF Fan active Power consumption		W	100			Measured on threephases 400V
RF module efficiency		%	24			Measured on threephases 400V
Overall efficiency		%				30
Input device			5 pushbutton			Measured on threephases 400V
Display			Alphanumerical LCD - 2 x 16			5 pushbutton
Overall Physical Dimensions	Front panel width	mm	483 (19")			Alphanumerical LCD - 2 x 16
	Front panel height	mm	3+3			483 (19")
	Overall depth	mm	695			
Ambient working temperature		°C	0 to + 45			
Spurious & harmonic suppression		dBc	In according to output filter			In according to output filter
<b>RF INPUT</b>						
RF Input	Connector		N type			N type
Driver power for rated output	Impedance	Ohm	50			50
Max input power before protection		W	1,2			1,5
			50			50
<b>RF OUTPUTS</b>						
RF Output	Connector		7/8"flange type			7/8"flange type
	Impedance	Ohm	50			50
RF Monitor	Connector		BNC			BNC
	Impedance	Ohm	50			50
	Output Level	dB	approx. -60			approx. -60
<b>AUXILIARY CONNECTIONS</b>						
Interlock Output	Connector		BNC			BNC
RS232 Serial Interface	Connector		DB9F			DB9F
Com Bus	Connector		DB15M			DB15M
I <sup>2</sup> Cbus	Connector		DB9F			DB9F
Telemetry Interface	Connector		DB25F			DB25F
RS485 Serial Interface	Connector					
Remote Interface	Connector					
AUX power supply	Connector		VDE F			VDE F
<b>POWER REQUIREMENTS</b>						
AC Power Input	AC Supply Voltage	VAC	230 +10%-15%(*) or 115/400 +10%-15% (**)			230 +10%-15%(*) or 115/400 +10%-15% (**)
	AC Apparent Power Consumption	VA	about 3500			about 3000
	Active Power Consumption	W	about 3600			about 3000
	Power Factor		0,98			0,98
DC Power Input	Connector		ILME CFX 4/2			ILME CFX 4/2
	DC Supply Voltage	VDC				
	DC Current	mADC				
<b>FUSES</b>						
On Mains			3 External fuses F16T 10x38 (Threephases 400V) 3 External fuses F20T 10x38 (Threephases 230V) 3 External fuses F25T 10x38 (Monophase 230V)			3 External fuses F16T 10x38 (Threephases 400V) 3 External fuses F20T 10x38 (Threephases 230V) 3 External fuses F25T 10x38 (Monophase 230V)
On services			1 External Fuse F 6,3 T 5 x 20			1 External fuse F 6,3 T 5 x 20
On AUX Power supply			1 External fuse F 6,3 T 5 x 20			1 External fuse F 6,3 T 5 x 20
On P.A. Supply			8 Internal fuses F 16 LCT 10 x 38			8 Internal fuses F 16 LCT 10 x 38
On fans Supply			1 Internal fuse F 10 T 5 x 20			1 Internal fuse F 10 T 5 x 20
<b>MECHANICAL DIMENSIONS</b>						
Physical Dimensions	Front panel width	mm	483			483
	Front panel height	mm	2 x 132			2 x 132
	Overall depth	mm	695			695
	Chassis depth	mm	650			650
Weigh		kg	about 55			about 55
<b>OPTIONS</b>						
Internal Driver		code	/LD			/LD
		code				
		code				
		code				
<b>TELEMETRY / TELECONTROL</b>						
Telemetry connector inputs	Pulse		Command ON			Command ON
	Pulse		Command OFF			Command OFF
	Pulse		Alarm Reset			Alarm Reset
Telemetry connector outputs	Analogical level		FWD power			FWD power
	Analogical level		REF power			REF power
	Analogical level		Internal SWR			Internal SWR
	Analogical level		Input power			Input power
	Analogical level		VPA			VPA
	Analogical level		IPA			IPA
	Analogical level		Temperature			Temperature
	Open Collector		Status ON			Status ON
	Open Collector		Status OFF			Status OFF
	Open Collector		Power Good 1			Power Good 1
	Open Collector		Power Good 2			Power Good 2
Open Collector		SWR			SWR	
Open Collector		Wait			Wait	
Open Collector		Fault			Fault	
Open Collector		Local			Local	
ON / OFF level			Interlock			Interlock
<b>TELEMETRY-TELECONTROL SW</b>						
Telecon						
<b>VARIOUS</b>						
Cooling type			Forced with internal fans			Forced with internal fans
Potenza dissipata in calore		W	1930			1930
Acoustic Noise		dB(A)	78			78
<b>STANDARD COMPLIANCE</b>						
Safety			EN60215:1989			EN60215:1989
EMC			EN 301 489-11 V1, 2, 1			EN 301 489-11 V1, 2, 1
Spectrum Optimization						

## 5. Setting

### 5.1 Setting on air

1. Connect the RF output power of a suitable TV exciter (e.g. the DTVPE of R.V.R. Elettronica) to the RF input (**RF** module) using a cable fitted with N type connectors. The exciter should be set to minimum output power and switched OFF.
2. Connect the amplifier's INTERLOCK connector (on the back of the PS module) to the exciter's Interlock input, if available (it is available in all RVR Elettronica exciters) using a twin wire with BNC connectors.



**Note:** the amplifier's INTERLOCK connector is an output signal on coaxial BNC type connector. The operating logic is as follows: the internal conductor is floating when the amplifier works correctly, else is closed to GND. When INTERLOCK signal is closed to GND, RF output power from exciter **MUST** shut down.

3. Connect the RF output to the antenna system cable suitable to stands the RF output power of the amplifier (antenna system means RF output filter and antenna feeder).

### 5.2 Setting on lab

1. Perform connections described in the previous chapter from point 1 to point 2.
2. Connect the RF output to a dummy load suitable to stands the RF output power of the amplifier.

## 6. Start Up

### 6.1 Important to Know

The amplifier must be laid-on firmly before its switch-on. Mechanical tension and mobility of some parts can stress sensitive electrical connections, some of these are tuned accurately for the working RF channel and so, their fixing may be a demanding job. User should take care about RF output connection, grip all screws fairly and secure RF output filter and its interconnecting transmission lines.

The amplifier is composed of two parts electrically interconnected by three cables (see description section 6.2 for a more detailed information about the amplifier's composition). User must not supply mains voltage until all interconnection between parts of the amplifier are fully inserted and locked.

The air for cooling plant must be sufficiently available; temperature and humidity of the environment also are very important variables to take account for. Reliability of the amplifier and all partnered equipments is largely dependent by environment's physical parameters, amplifier is equipped with a complete set of protection remedies and these remedies are essential in the acute phases but, in the long run, aging in advance will arrive. Usually the amplifier is housed inside a 19" standard cabinet, enclosed in its turn in a working room. User should design the overall placing in order to avoid air flow suffering and so, the adequate quantity of air needed by the amplifier.

The amplifier takes its cooling air from the room where it is placed in. Cooling air must be clean, presence of thick dust, smoke, steam, fog, small insects and inflorescence, may compromise life's expectation of the equipments. The amplifier is equipped with grilles in the air intake, these grilles must be periodically inspected and, in case, cleaned. Frequency of maintenance is directly subordinate to air's quality; a three months period is the recommended rate.

The amplifier's cooling plant maintains temperature of inside parts at an admissible level to work. When the amplifier shutdown, whether by intervention of circuit protection or user's decision, cooling system does not arrest immediately, it runs for a more time after main service stop. This operating procedure prevents temperature rebounding, a well-known phenomenon that affects all compact equipments. We recommend user do not break mains voltage without having put in 'OFF' state the amplifier and before the end of the autonomous fan arrest time.

The amplifier is provided with lots of fans, in both PS and RF module. Each fan is equipped with an auto-resettable fuse connected in series, this acts as an overload protection. Fan is the most subject to usury component of whole equipment so, failure during the normal life's time expectative of the amplifier is unavoidable. When a fan fails, a related auto-resettable fuse isolates it from the common fans feeder preventing a complete halt of the equipment. The amplifier works anyhow, but the margin of temperature balance is reduced and no indication is offered to the user. The short period of maintenance recommended (around three months) warrants that such an occurrence may not become an annoying trouble-shooting section.

Concerning mains voltage wires, these must be assured with their terminals. Neutral and Ground connection particularly is a very worrying matter. A well made Ground connection assures safe interaction between users and equipments. In a three phase star configured mains voltage connection, Neutral wire is very important. In such a configuration, when Neutral connection is precarious or even worse broken, permanent serious damage occur certainly to the amplifier. Mains voltage supply of electrical plant must be provided with an adequate line breaker, and this breaker must assure that Neutral connection become interrupted simultaneously the other lines. The worst case occurs when in a three phase star configuration, two (or three) electric lines are connected and Neutral is not. In the electrical supply plant, Ground and Neutral connection ever must be wired without fuse in series. For user's safe, Ground connection must be marked by very low impedance toward Earth. User must take account that, when mains connector is inserted in the receiving PS module, mains voltage is available to all equipment and so it is practically ready to run.



**Note:** Factory recommends customer to specify in advance his preferred mains voltage option. The changing of mains voltage configuration is not a so demanding job, but final measurement section in factory's laboratory reflects better the real state of things if nothing has been modified after.

## 6.2 Quick Start

The scope of this chapter is to summarize the procedures for installing the machine. If any point is not fully comprehensible, such as how to operate the machine the first time, it is advisable to read the entire manual very carefully.

In this description it is assumed that the amplifier is not supplied pre-installed in a rack inside a transmission system. In this case most of the operations outlined herein (for instance the wiring ones) are obviously not necessary.

After having plugged in the power supply socket at the back of the machine, power on the amplifier via the switchboard. The ON LEDs on both modules will turn on and the forced cooling fans will start running. The LCD shows the introductory screenful and then switches to a screenful that indicates the forward and reflected power values.

Turn on the exciter (at lowest power) and wait for its complete bootstrap routine. Once ready, increase RF power output gradually and check on amplifier's LCD display. Increase the exciter's power until the amplifier's RF output power attains the planned value.

All machine's operating parameters may be checked remotely via a remote hardware/software control system.

As a rule, the amplifier operates automatically. If any alarm conditions occur, they will be managed automatically by the protection system and notified to the user by means of LEDs on the panel and messages on the display.

Unpack the amplifier and firstly check that it has not been damaged in any way during transport. Check that all connectors, in front and rear panel of the equipment, are undamaged and controls on the front and back panels are in good order.

Check the default setting of the type of power supply for this machine on the back of the **PS** module, which may be:

- single-phase            208 V, +15% -10%
- single-phase            230 V, +10% -15%
- three-phase             208 V, +15% -10%
- three-phase             230 V, +10% -15%
- three-phase             400 V, +10% -15%



**Suggestion:** Specify the type of power supply at order placement: the machine will be delivered to you configured according to your requirements.

Check, if required, that the fuses are installed, in good working order and accessible on the back panel of the PS module. The required fuse values are as follows:

	@208/230V single phase	@208/230V three phase	@400V three phase
AUX OUT FUSE <i>(chap. 6.2 - position [9])</i>	(1x) F6,3T type 5x20	(1x) F6,3T type 5x20	(1x) F6,3T type 5x20
SERVICE FUSE <i>(chap. 6.2 - position [10])</i>	(1x) F6,3T type 5x20	(1x) F6,3T type 5x20	(1x) F6,3T type 5x20
MAINS FUSE <i>(chap. 6.2 - position [1])</i>	(3x) F25T type 10x38	(3x) F20T type 10x38	(3x) F16T type 10x38

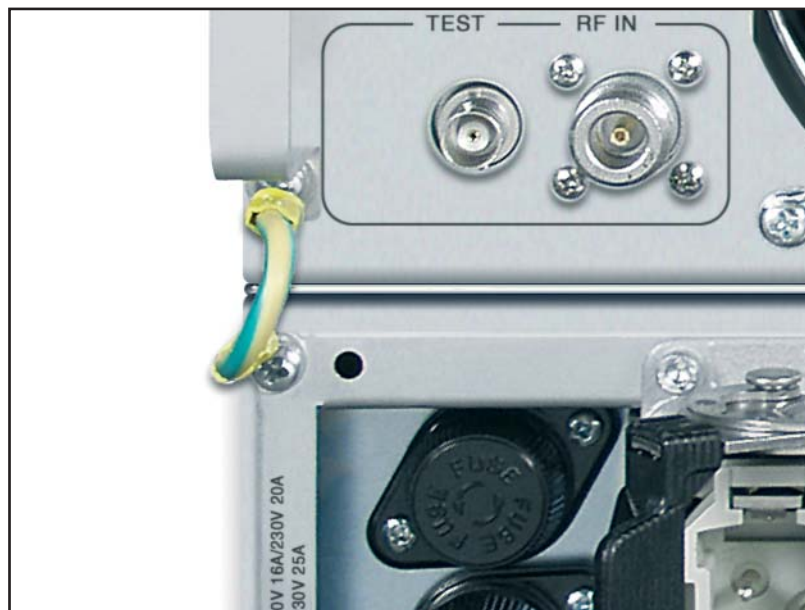
Put the amplifier in a 19" standard cabinet and place RF module on top of PS module.

The two parts of the amplifier should electrically connected by three cables.

- The first is a short cable headed in both its ends with two 37 pins connectors (male plus female). No confusion should arise about insertion of this cable because the unmistakable configuration of its connectors. This connection carries low level signals, such as measurement, control signals, serial communication and low power supplies.



- The second is a short wide wire is provided for Grounding connection between two boxes. This connection is achieved tightening both terminals of the wire under a screw of the PS and a screw of the RF module.



- The third is an interconnected cable indivisibly comes out from PS module and ends headed with a large power connector. RF module is equipped with the complementary connector that receives DC high power supply, the necessities of all RF active units and all cooling fans. All connectors described before are lockable (mandatory condition) and no wrong insertion is possible.



Mains voltage is connected only to PS module through ILME model CXF4/2 multipole socket; ; RF module gets high power stabilized DC voltage from its partner. Mains voltage may be configured in several modes: The preferred is three phase star but, single phase is easy settable, three phase triangle is available by factory set. On PS module, a wide connector expects its complementary plug wired to mains voltage consignment and three fuses protect all electrical lines. User should take account that no general switch is provided inside the amplifier and Neutral connection is not guarded by fuse.

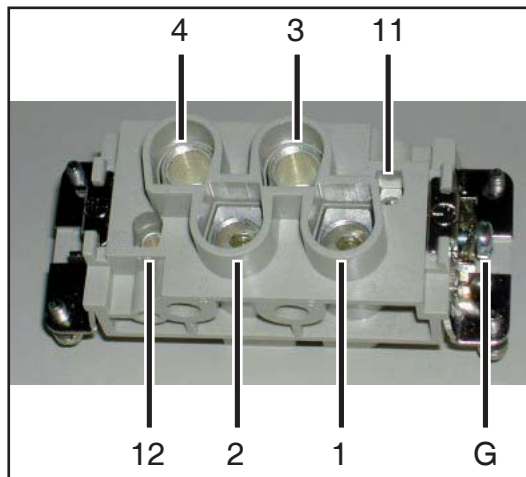


**Danger:** to avoid any risk of shock make ABSOLUTELY sure that the power supply cable is NOT powered when the multipole socket is connected to the cable itself.

Connect the multipole socket to the power supply cable as described below and refer to figure below.

Three-phase power supply:

- G      Ground
- 1      Neutral
- 2      R-Phase
- 3      S-Phase
- 4      T-Phase
- 11,12 Not connected



View of the mains multipole socket - terminals side (internal)

Single-phase power supply:

- G Ground
- 1 Not connected
- 2 Phase
- 3 Neutral
- 4 Not connected
- 11,12 Not connected



**Danger:** avoid the **risk of damaging the machine** by grounding it correctly. As such, connect the ground conductor of the power supply cable to the specific terminal in the multipole socket and check the efficiency of your own grounding system.

### 6.3 On Air

The amplifier always must be connected to antenna (or dummy load), also when in absence of RF excitation. Above all, risky occurrence comes up when the amplifier is put in 'ON' state putting DC power supply available to RF units. When the amplifier is connected to an RF output filter, as mostly, and its output can't find a receiving outlet, self oscillations in RF field may arise so strongly that permanent damage in the RF output filter may occur.

The amplifier must work at a precise level of RF Output power, admitted tolerance is within +/- 0.5 dB. The amplifier and its own exciter are mutually fine tuned in order to comply the RF signal quality requirements of Communications Supervisory Authority. These adjustment, linear and non-linear pre-correction for understanding, are greatly dependent by RF output power, so this output level cannot be freely modified after having reached the satisfactory result.

It would be better that the amplifier do not work bordering its limit of any protection. If an environment's parameter reaches the protection threshold, the amplifier may fall in Foldback protection modality that is an improper working mode. No permanent damage will occur to the amplifier, also when operating for a long time in this state, but RF signal integrity and lawfulness are not certainly warranted. The right work load for the amplifier is a careful user's choice, although amplifier is ever self-protecting, some available operating margin can compensate environment's parameters fluctuation, avoiding invalid transmission times.

RF output power of the amplifier must be leveled, always and only, by its RF Input excitation. Although in the front panel of the RF module there is an accessible regulation labeled 'RF PWR ADJ', this regulation must be considered for service or maintenance use only. No damage occurs to the amplifier when this regulation is changed, but RF signal integrity and lawfulness come certainly compromised. In complex equipments, for instance amplifiers joined in a combiner, it is present a similar overall RF power handler located in the Combiner Unit. In such cases also, RF output power must be set by RF Input excitation.

The antenna is the natural outlet of RF power supplied by the amplifier. Working stability of the antenna is prominent in order to warrant the quality of transmitted RF signal and for equipment's reliability. Amplifier can manage antenna's anomalies but, its duty is to defend itself only. Nothing is set in action by the amplifier in order to remedy about integrity of RF transmitted signal, so it is a customer's liability to warrant antenna's working stability or, otherwise, to provide an arrangement that deals with this consequence.

About user interface, the amplifier can be set in two modalities, 'LOCALE' or 'REMOTE'. This double option is selectable by a switch labeled 'LOC' and placed in the front panel of PS module. We suggest customer to set this switch in 'REMOTE'. No damage occur to the amplifier also if it operates continuously in 'LOCAL' set, but user has faculty to set unintentionally the amplifier to operate in a different mode then planed, especially when navigating amid menus with a not firm skill. When amplifier is a part of a complex system, for instance a transmitter employing several items combined, the 'REMOTE' set is the strongly recommended, also in order to allow the System Manager Unit to best interacts with all other partners joined.

Amplifier(s) and an exciter (synonymous of Modulator) complete a transmitter equipment. Both these units work in synergy but operate independently by their own Hardware/Software endowment. The exciter unit supplies RF modulated signal to the amplifier, the amplifier interacts with a feedback signal, often referred as 'INTERLOCK'. Interlock signal can arrest RF supply from exciter, this occur when protection circuit or user's action has imposed a general stop. Interlock action is not a safety issue about the amplifier integrity, but when RF is still supplied during a stop phase by the exciter, a residual RF signal flows through the amplifier' circuits till the antenna. In many countries such an occurrence is unlawful.

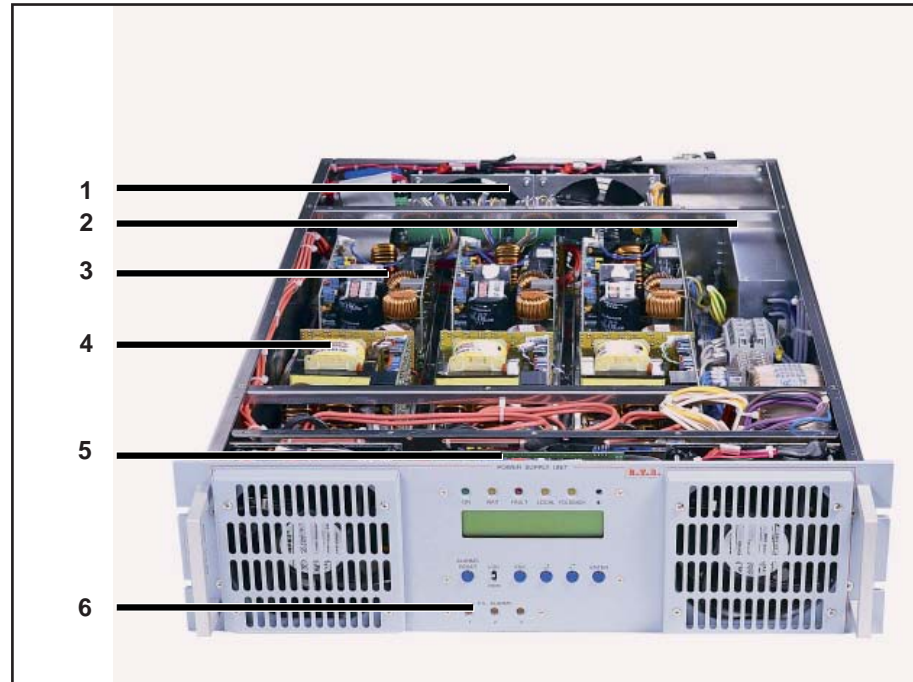
The amplifier is equipped with an autonomous circuitry that manages entirely every working state and defends all amplifiers' parts by means of protection routines. No equipment joined with the amplifier cans by-pass a protection action. This restriction is essential when an amplifier is included as a 'slave' partner in a combined system. In such a system, a wider interaction among all partners is put

into action by the main equipment and so, some contradictory settings may be set followed then by incoherent behaviors. Because the high power handled, an overall incoherent behavior may damage some part of the plant or, as frequently, the transmitted signal may not comply all recommendations of Communications Supervisory Authority. In this case, user must follow all technical information related to the complete system.

## 7. Hardware

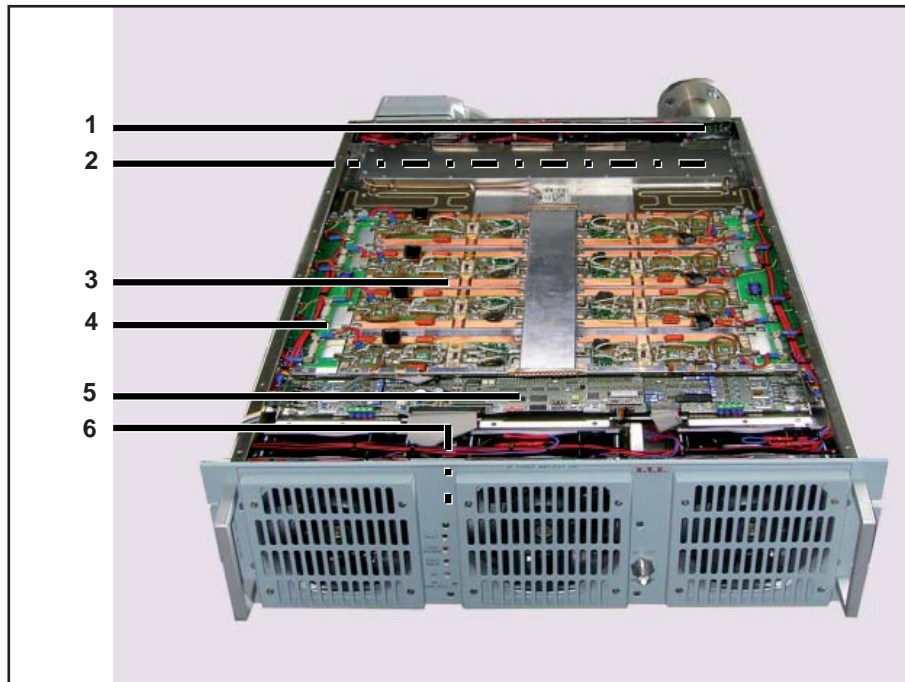
The figure shows the PS and the RF part of amplifier seen from above. The various cards are described in this chapter.

- Top View of PS section with PFC:



- 1) Interface Power Supply Board
- 2) Varistors Board
- 3) PFC Board
- 4) Power Supply Board
- 5) CPU Board + Protection Interface Board
- 6) LEDs Board

- Top view of RF section

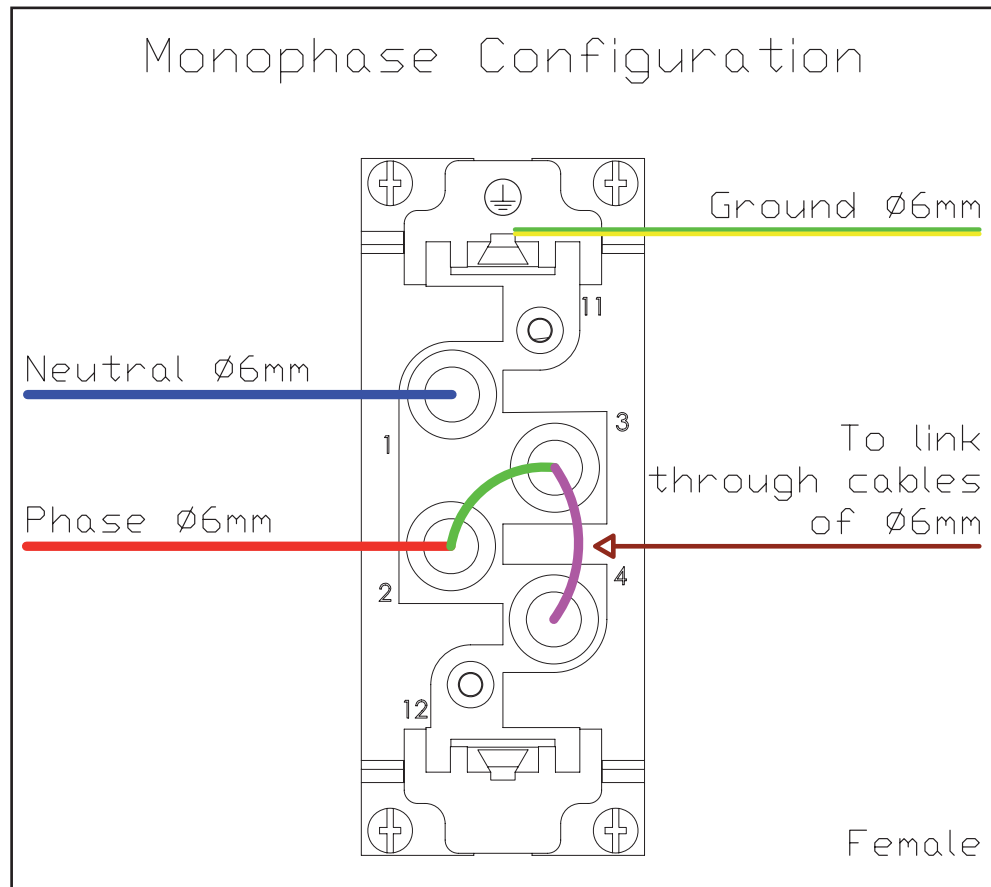


- 1) Input Power Measure
- 2) Driver Board + Driver Bias Board
- 3) Amplifier Modules
- 4) Fuses Board
- 5) Bias Boards + CPU Board
- 6) LEDs Boards

## 7.1 Power Supply Change

To use the amplifier with different types of power supply you should connect the mains power supply socket as outlined in chapter 5. Also modify the connections inside as explained below.

### 7.1.1 Single-Phase Wiring

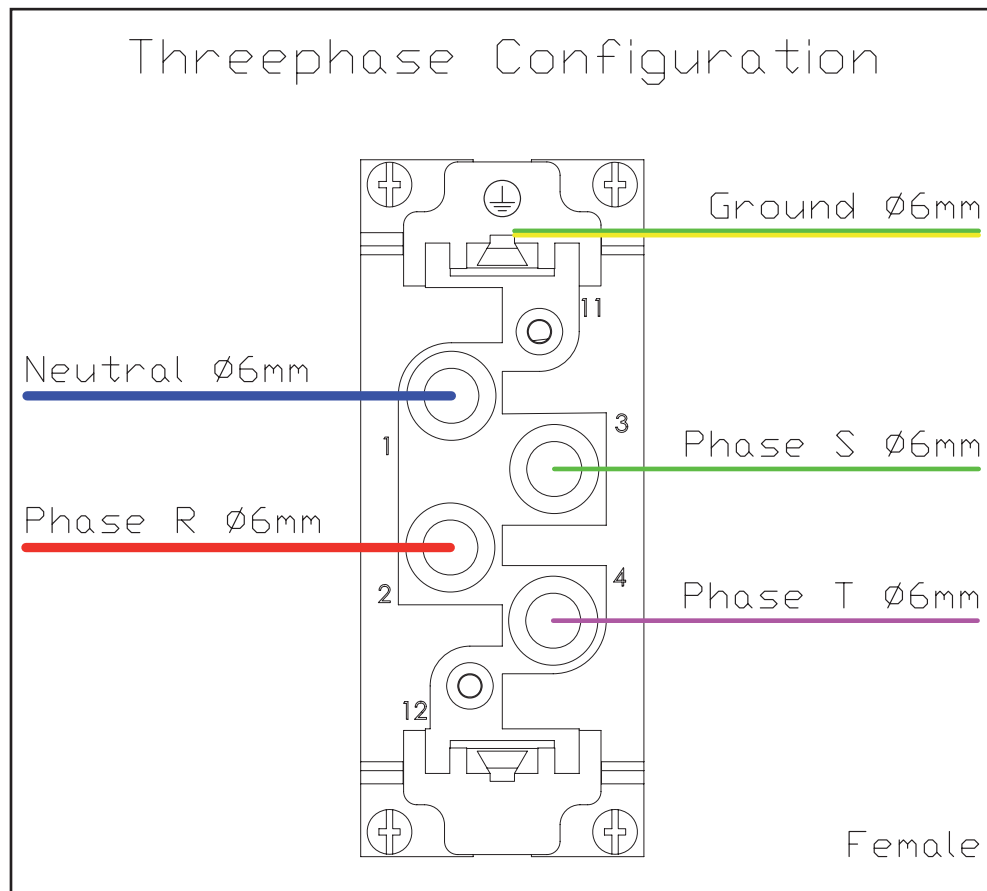


**WARNING:** the single-phase power supply may be used only with 208/230 Volts.

The single-phase wiring must have the following characteristics:

- PIN1 of the main connector is directly connected to neutral wire.
- PIN2 of the main connector is directly connected to phase wire and internally connected to PIN3.
- PIN3 of the main connector is internally connected via cable to the PIN4 and PIN2.
- PIN4 of the main connector is internally connected via cable to the PIN3.
- PIN5 of the main connector is directly connected to ground.

## 7.1.2 Three-Phase Wiring



The three-phase wiring must have the following characteristics:

- PIN1 of the main connector is directly connected to neutral wire.
- PIN2 of the main connector is directly connected to R-phase wire.
- PIN3 of the main connector is directly connected to S-phase wire.
- PIN4 of the main connector is directly connected to T-phase wire..
- PIN5 of the main connector is directly connected to ground.

### 7.1.3 Voltage Change



**WARNING:** the single-phase power supply may be used only with 208/230 Volts.

Proceed as follows to change voltage inside the machine:

- Make the JP3 connection, on the Rectifier card, between PIN 1 and 2 to select 230 Volts, or between PIN 2 and 3 for 115 Volts.

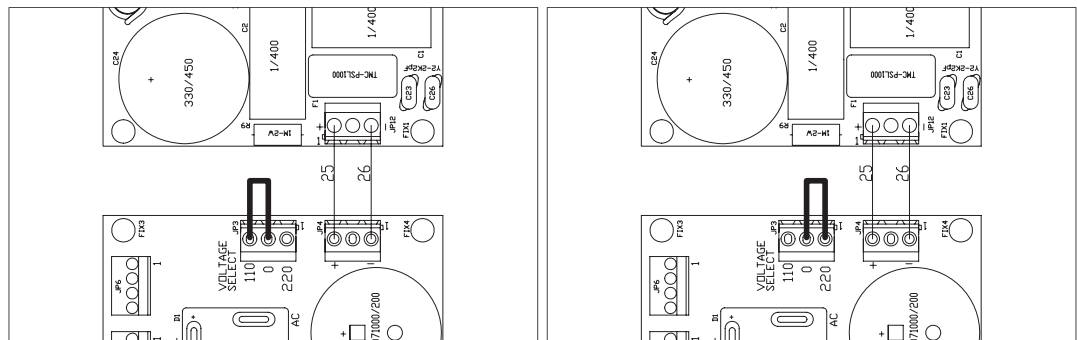
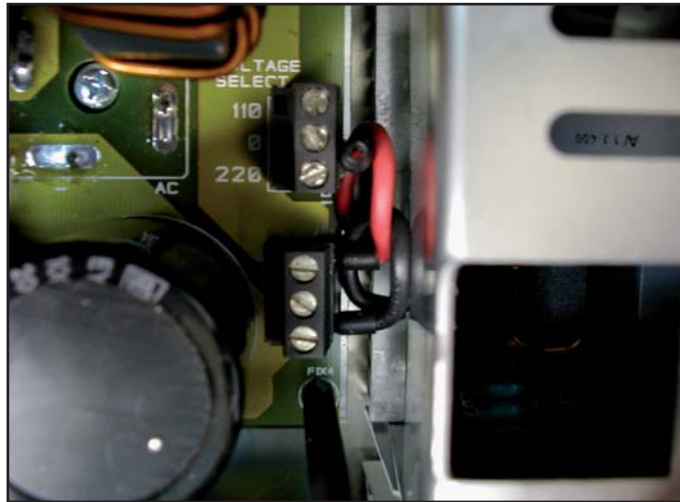


Figure 8-1: Connection for the selection of 115 or 208/230 Volts

- In order to select the 230 Volts on the connector inside the PS section near the transformer, make the connection between PIN 3 and 4 and PIN 6 and 7, or between PIN 2 and 3 and PIN 5 and 6 for 115 Volts.



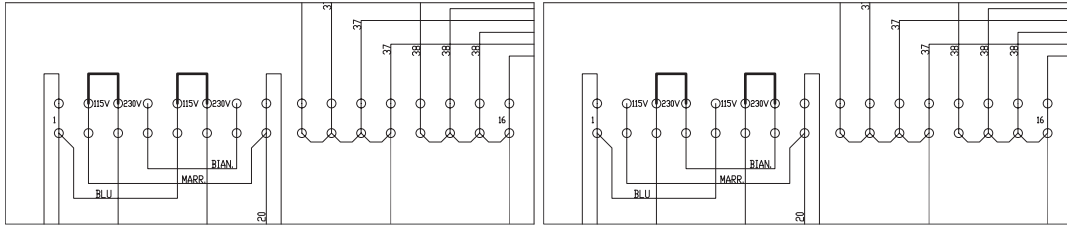


Figure 7-2: Connection for the selection of 115V or 208/230V three phase with neutral wire

## 7.2 PS Part

The PS module houses inside three high power supply units that deliver energy for RF components, each supply unit is composed by a Power Factor Corrector and a Voltage Stabilizer circuit. These three pairs of parts collaborate equally dividing its engagement and are connected in accordance with the chosen option, each unit is connected to one of the three phases and Neutral, or all units are connected to the same (single) line. The equal engagement is supervised by a director circuit linked with the overall protection plant. PS module also supplies power necessities of all service circuits housed as well as in PS and RF module.

User interface circuit is placed in the front panel of PS module and expose an LCD display, many push buttons, a switch and many signalling LEDs.

PS module do not handle RF signals inside its box. In the rear panel of PS module are available further connectors, they are useful for many arrangements like remote control, telemetry and combine set. A 'BNC' plug here also provides a feedback signal 'INTERLOCK' toward the Exciter.

### 7.2.1 Surge Protection

This card's main function is to avoid any damage to the internal cards by blocking the contact before current reaches the equipment in case overvoltages occur.

### 7.2.2 Power Supply

The three power supply modules are located in the middle part of the amplifier. The power supply units are mounted on a cooling fin to cool the amplifier by forced ventilation.

The amplifier houses a transformer the input voltage of which may be selected between 115 and 230 Volts.

The transformer is fitted with three secondary wires: A) 18-0-18 V, B) 0-17 V, C) 0-11.5 V that supply power to the cards inside the equipment.

### 7.2.3 PFC (Power Factor Corrector) Unit

The PFC unit is a rectifier that modulates the current absorbed so that the wave shape is the most possible sinusoidal, obtaining a factor of power of 99%.

The PFC can work with input supply voltages from 90 V to 250 V. A rectified voltage of 350 V is present on the output.

This card also applies a resistive load when the amplifier is turned on and excludes said load after a short time to reduce current peaks in the transformer on turning it on (*SOFT-START*).

### 7.2.4 PS-RF Interface Board

This interface board is installed at the back of the amplifier for collecting the main signals of the machine and making them available on the connectors. This interface is connected to the three rectifiers, the CPU, the fans, the transformer from which it receives the signals and to which it issues commands.

This interface card is designed to make the PS part communicate with the RF part and making available the dedicated signals at the specific connector for each part.

### 7.2.5 LEDs Board

Three LEDs are present on this board for indicating the operating status of the three power supply modules.

The lighting up of a LED indicates a malfunction in the associated module.

### 7.2.6 CPU

This subsystem is made up of three cards: the CPU card, the display card and the analog card.

The CPU subsystem implements all the software functions (measurements, protection, control, data display, communications) outlined in the previous chapters.

This card carries the signals to the DB25 telemetry connector that is on the machine's back panel. The connector is fitted with 7 analog outputs, 8 open-collector digital outputs and 4 digital inputs. It also manages the DB9 signals associated with the RS232 connector, for interfacing with other equipment and for the default programming functions, and the DB9 connector for communications in I<sup>2</sup>C standard.

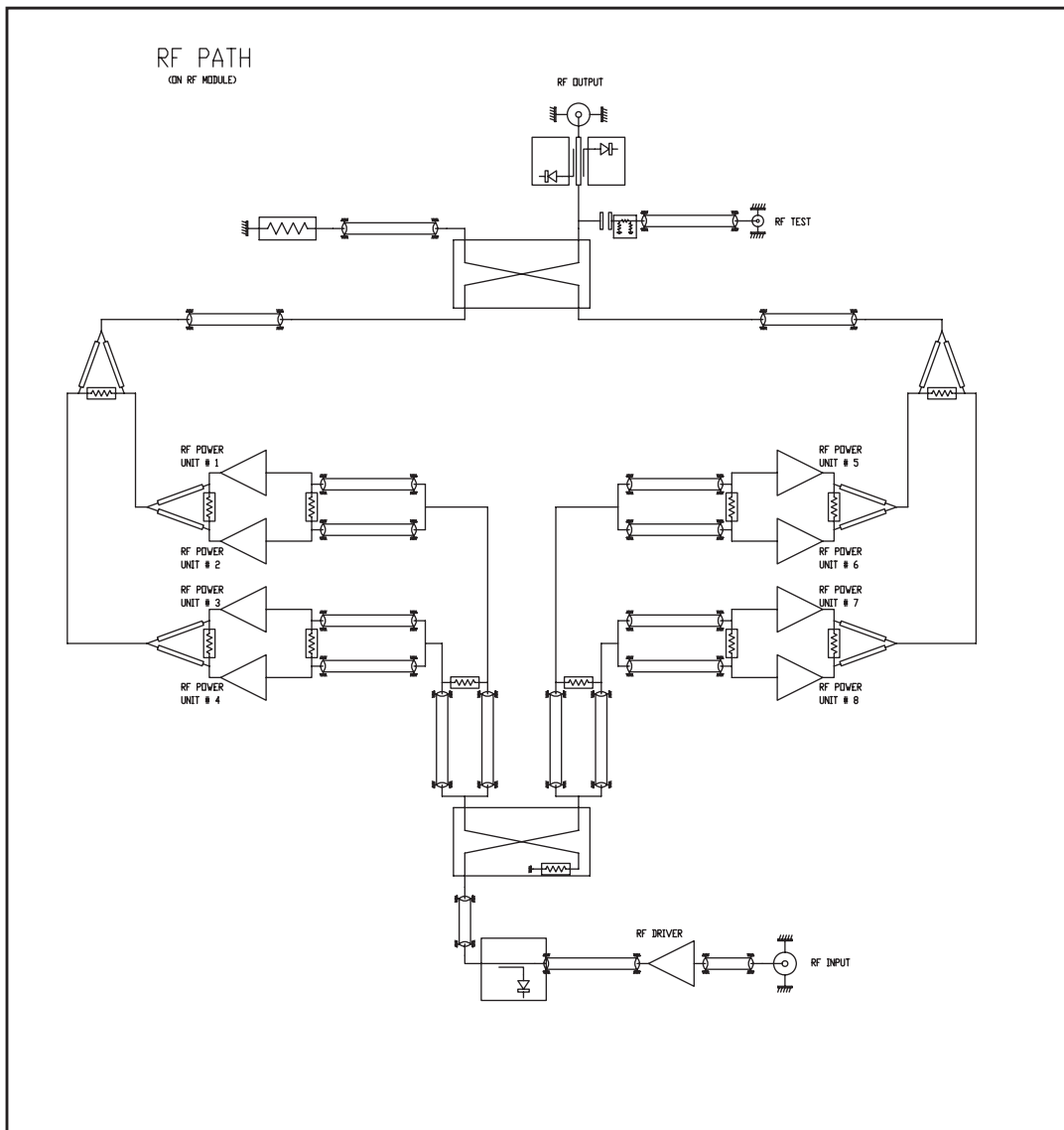
### 7.3 RF Part

The RF module, house all RF circuitry as well as active devices, passive devices and their interconnection. Service circuits in RF module are specialized to measure, control, protect RF circuits and to signal some working states by the use of a limited set of LED warnings.

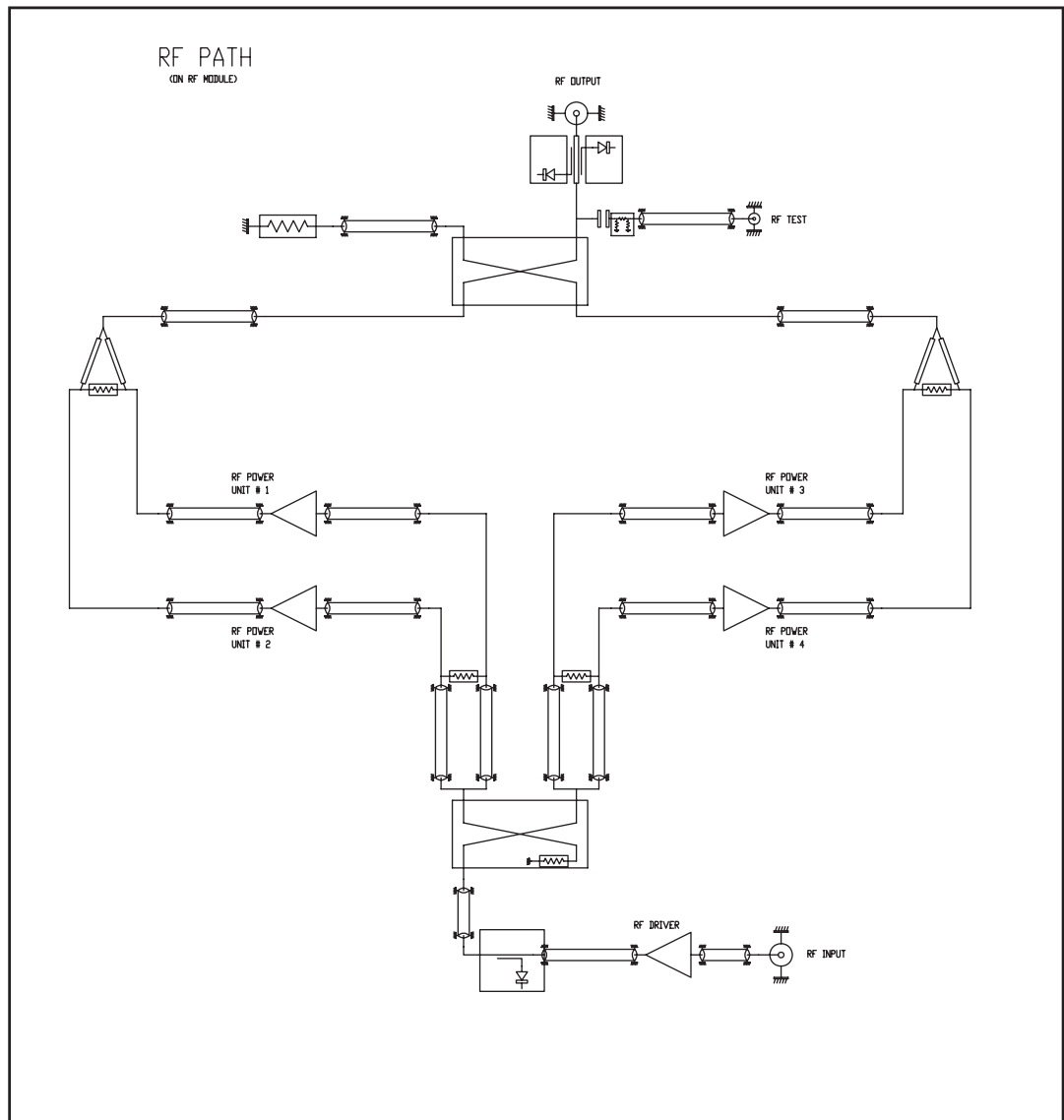
The interconnection between RF and PS module defers all measures and working states from RF module to user interface placed in PS module. RF Input Connector ('N' type) and RF Output Connector ('7/8"' EIA type) are placed in the rear panel.

An output RF monitor connector ('BNC' Type) is available in the front panel. The most amount of heat is generated by RF module, that is to say 80% so a great number of precaution measures must be take in account for this module.

A schematic view of the operating theory of RF path is shown in the figure:



Theory of operation for ATVPA1K3LV1



*Theory of operation for ATVPA1K5LV1*

### 7.3.1 RF Power Amplifier

The RF power amplifying section consists in 4 or 8 power modules (depending the model) combined by Wilkinson and hybrid -3dB 90° splitter and combiner and implemented in strip-line and micro-strip technology.

The RF modules, the splitter and the combiner are housed inside the top part of the equipment.

The whole RF section is mounted on the fin that cools the equipment by means of forced ventilation.

Each RF module supplies 125 (mod. ATVPA1K3LV1) or 380 (mod. ATVPA1K5LV1) watts with 4 to 6 pilot power watts and is powered by the switching PSU.

The modules' operating parameters in standby are as follows:

VDC=50V    Vgs=2,9-3,7V    Idq=1,4A (mod. ATVPA1K3LV1)

VDC=50V    Vgs=2,0-2,5V    Idq=2,2A (mod. ATVPA1K5LV1)

The active device used in the amplifier modules is a SD2942 (mod. ATVPA1K3LV1) or MRF6VP2600HR5 LD (mod. ATVPA1K5LV1) Mosfet.

### 7.3.2 Wilkinson Splitter and Combiner

Both the splitter and the combiner are made in strip-line and micro-strip technology and hybrid -3dB 90°.

The splitter is used for splitting power arriving from the driver unit and supplying one part to each of the RF modules.

The combiner is then used to combine power output from each module to obtain the amplifier's total power.

The two cards ensure equal phases among the powers generated by the RF modules in two groups of "4+4" or "2+2" (depending the model). One RF power resistance is used for absorbing the unbalanced RF power that might be present in case a module breaks down.

### 7.3.3 Bias Board

The task of this card is to check and to intervene the bias voltage of the Mosfets in the RF section.

This card also supplies the following measurements: current and voltage of each module, total current and average voltage.

The bias card is also fitted with the temperature sensor which is monitored by the software.

This card also manages signal coming from directional coupler:

- Forward RF Power.
- Reflected RF Power.
- Input RF Power.

### 7.3.4 Directional Coupler

The task of these two cards is to supply the RF power measurement. They are installed on the input RF connector on the inside of the machine. One card supplies the amplifier's RF forward power whereas the other one supplies the RF reflected power.

### 7.3.5 Control Board

The control board acts as an auxiliary card for the PROTF card in the PS section should the latter fail to trip due to a malfunction. It implements all the functions associated with measurements, protection, control and communications and is even capable of detecting the individual voltages or currents inside the machine, in addition to the overall ones.

If pre-arranged, this Board can carry the signals to the DB9 connector located on the machine's back panel in RS485 standard.

NOTE: Both bias board and control board act as protection circuit alternately. Typically control board is the main, in this case bias board works as assistant. In different cases the roles are inverted.

### 7.3.6 LEDs Board

This card is fitted with 4 warning LEDs that indicate the machine's general operating status.

It also has a trimmer for adjusting power (useful only for service or maintenance), PLEASE READ CAREFULLY CHAPTER 6.3 FOR MORE INFORMATIONS. When the amplifier is on air the trimmer must be set fully clockwise.

### 7.3.7 Driver Board

The driver board contains an RF amplifier with only one stage that, with a power of about 1-2W, can supply an output power of approximately 60W suitable to pilot **ATVPA**, with a total gain of approximately 28dB (for **ATVPA1K3LV1**) or 33dB (for **ATVPA1K5LV1**).

The active device installed in the amplifier modules is a Mosfet (SD2942) and uses for the feeding the same voltage of 50VDC used from the four/eight RF amplifiers modules.

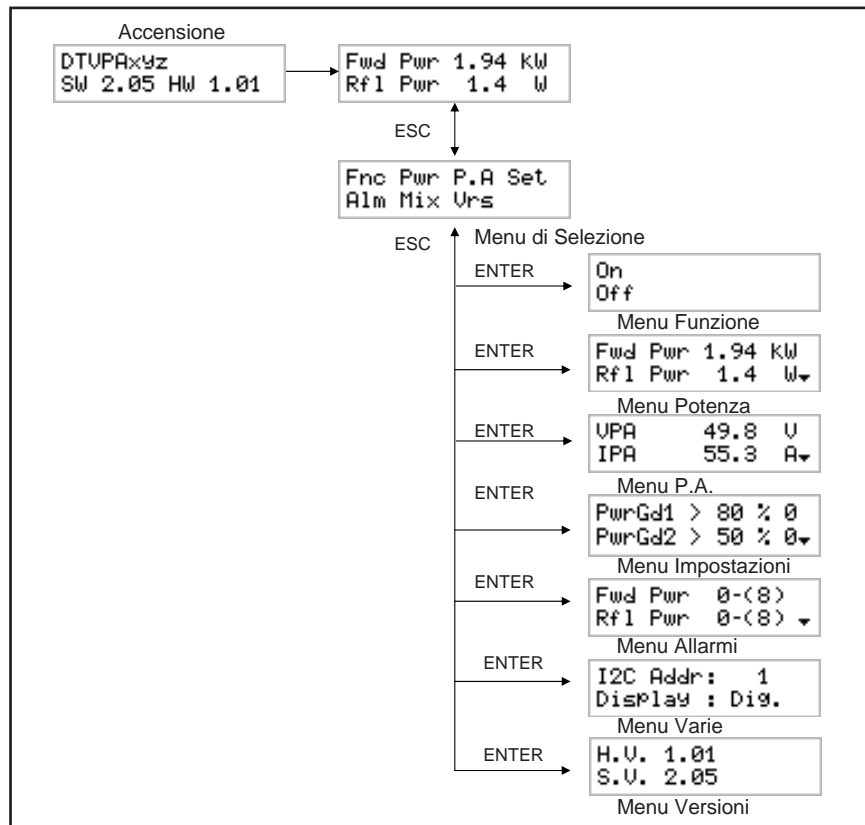
On the output stage of this board is present a directional coupler that measure the input power.

## 8. Firmware

### 8.1 Descriptions

This chapter describes the ways in which the microprocessor controls the amplifier and how the user may interact by software.

The figure in the follow shows the overall software user interface diagram.



*Figure: Flow diagram of the software*



**Note:** the user may interact with the equipment only when in LOCAL mode by means of the selector. When not in LOCAL mode, the user may only read parameters and not change them.

When turned on, the LCD shows the introductory screen with the equipment's software and hardware versions.

```
DTUPAxyz
SW 2.05 HW 1.01
```

A few seconds later the main screen shows RF output forward and reflected power values:

```
Fwd Pwr 1.94 kW
Rfl Pwr 1.4 W
```

Press the ESC key to view the selection screenful from which to access all the menus:

```
Fnc Pwr P.A Set
Alm Mix Urs
```

To access one of the submenus select its name (which is underlined by a blinking cursor) using the RIGHT or LEFT keys and then press the ENTER key.

Take note that certain parameters are named but their values are not available. This occurs when a parameter is useless for control software internal use.

When the value of a parameter is not available for the aforesaid reason, symbol “==” appears on the display in lieu of the value.

### 8.1.1 Operating Menu (Fnc)

```
On
Off
```

Turn the power amplifier ON or OFF via this menu.

Furthermore, when amplifier is turned OFF, the internal conductor of the INTERLOCK connector is set to ground so as to force the connected exciter to a stand-by condition (this takes place only if the exciter features the interlock option, like those produced by RVR, and if the associated connector is connected to the amplifier).

When the amplifier is turned OFF the software program waits a few seconds for the machine to cool down and then fans turn OFF too.

### 8.1.2 Power Menu (Pwr)

This screen, made up of several lines that may be scrolled through using UP and DOWN keys, it displays all the measurements associated with the behaviour of the amplifier's power section:

- Forward Power (Fwd Pwr)
- Reflected Power (Rfl Pwr)
- SWR (Standing Wave Ratio)
- Input Power (Inp Pwr)
- Internal SWR (Int SWR)

Depending on the machine's configuration a few measurements might be disabled.

The figure below shows the complete aspect of this screen (only two lines can be seen at a time, use UP and DOWN keys to scroll through it):

```
Fwd Pwr 2.94 KW
Rfl Pwr  1.4  W
SWR      Off
Inp Pwr 21.2  W
Int SWR  Off  W
```

### 8.1.3 Power Amplifier Menu (P.A.)

This screen, consists of several lines that may be scrolled through by using UP and DOWN keys, displays all measurements associated with RF amplifier of the equipment:

- Voltage (VPA)
- Current (IPA)
- Efficiency
- Temperature
- Power Supply Voltage (Mains - percentage variation as compared to the nominal voltage)

The figure below shows the complete aspect of this screen (only two lines can be seen at a time, use UP and DOWN keys to scroll through it):

VPA	49.8	V
IPA	55.3	A
Eff.	68.3	%
Temp.	38.3	C
Mains	+1	%

#### 8.1.4 Warning threshold setting menu

As mentioned in the introduction the amplifier offers three settable warning thresholds. Each one is compared with the level of one of the machine's operating parameters. The results of the comparison are available on the telemetry connector, on the contacts of the optional external telemetry card and may be read on the display as "O" (open, i.e. false result) or "C" (closed, i.e. real result).

Two of the settable thresholds (**Power Good**) refer to the emitted power level whereas the reflected power quantity (**Reflected Warning**) is checked for the third one.

Proceed as follows to set the values of the warning thresholds:

- Select the line to be changed (with the UP and DOWN keys)
- Press the ENTER key
- Change the threshold value (UP and DOWN keys)
- Press ENTER to confirm

The figure below shows a configuration example of this menu.

PwrGd1	>	80	%	0
PwrGd2	>	50	%	0
RflWar	>	40	%	0

In this example the alarm thresholds are as follows:

- PwrGd1                      80%
- PwrGd2                      50%
- RflWar                        40%

### 8.1.5 Alarm Menu

This menu provides information about the status of the amplifier's built-in protection system.

It consists of a certain number of lines each of which contains the name of the variable controlled by the protection logic and the type of intervention carried out by the system.

Each intervention may be as follows: **X - (Y)**, **Wait**, or **Dis.** (Disabled).

The aspect of this menu is as follows (only two lines can be seen at a time, use UP and DOWN keys to scroll through):

```

Fwd Pwr  0-(8)
Rfl Pwr  0-(8)
Inp Pwr  0-(8)
U.P.A.   Dis.
I.P.A.   0-(8)
Temp.    Wait
Int SWR   Dis.
Mains    Wait
SWR       Dis.
Eff.      Dis.
  
```

The task of this menu is essentially to help technician to identify the possible causes of any malfunction.

### 8.1.6 Miscellaneous Menu

In this menu the user can do:

- To set address in the serial bus connection, type I<sup>2</sup>C
- To set main menu display mode

```

I2C Addr:  1
Display :  Di9.
  
```

The network address I<sup>2</sup>C is very important when the amplifier is connected to an RVR transmission system that envisages the use of this protocol. Never change it.

The main menu may be displayed either in **Digital** mode (this is the standard mode) or **Analog** mode:



In the analog display mode a small triangle indicates the reflected power level set in the Alarm Threshold Setting Menu (RflWar), whereas the bar at the bottom shows the instant reflected power level.

This type of display might be useful when a tunable item is connected to the amplifier's output such as an RF cavity filter.

### 8.1.7 Version Menu

This screen shows the hardware version (H.V.) and the software version (S.V.) of the equipment.



## 8.2 Working Logic

### 8.2.1 Protection System

The protection system implemented inside the amplifier is based on two types of intervention.

Foldback or Shut Down. The first action operates an RF output power pegging, due to the reaching of a maximum value of a parameter involved. A front panel yellow LED shows this state. The second action is a sharp RF Output Power suspension.



**Note:** The Foldback action is a safety intervention that must not be considered a lawful working condition. This is because the RF emitted spectrum can't respect the legal mask provided. Only if the overall transmitter includes an Adaptive Precorrector Unit, then the Foldback working mode becomes allowed.

The second type of reaction consists in turning OFF the equipment's amplifying section when a specific variable exceeds a set value.

Depending on the type of event occurred, and after the amplifier has been turned OFF, it will be reactivated after a set length of time or only after the sharing,

which caused the locking, has been cleared. In the alarm menu the first type of configuration is indicated by **X - (Y)**, whereas the second one is indicated by **Wait**. The third possibility is that the system does not trigger the protection conforming to a specific parameter: this is indicated by **Dis.** (Disabled).

While the amplifier is OFF temporarily owing to an alarm, the yellow WAIT LED lights up and the reason the protection was triggered is shown on the display.

When the protection system trips due to a “cyclic” type parameter, a counter begins counting up (the X value in the alarm menu). If the counter reaches the max admissible cycle value (Y), the amplifier turns OFF definitely and the red “FAULT” LED lights up on the front panel.

The user may press the ALARMS RESET key to interact with the protection system. The effect differs depending on the machine’s status when the key is pressed:

- If the equipment is off, waiting for the cycle time to be reached, or if it is definitively off in FAULT state, press the ALARMS RESET button to immediately turn the amplifier ON and reset the alarm counters.
- If the system is transmitting but alarms were triggered earlier causing certain counters not to be at “0”, pressing the key will have no effect unless it is pressed while inside the alarm menu. As such, the system will be sure that the user takes note of the alarms that were triggered before resetting them.

The system resets the alarm counters automatically after thirty minutes of operation, i.e. the user need not do anything, if the amplifier does not trigger any alarms or after the machine the machine has been turned OFF and then back ON.

### 8.2.2 RF module auxiliary protection

The amplifier’s RF module contains a second microcontroller that manages local measurements and carries out auxiliary protection functions of the machine together with the main protection system. This microcontroller card indicates its interventions via the LEDs of the RF module.

A delivered power automatic back-off mechanism is envisaged for excess temperature, SWR or current absorbed by a MOSFET module. The yellow FOLDBACK LED indicates this case.

A FAULT signal is triggered (red LED) when a fault occurs that stops the power amplifier. This situation is signaled to the machine’s main microcontroller as well and triggers a lock situation (FAULT).

The LED FUSE BLOWN indicates that one of the fuses that protects the power supply of the MOSFET modules has blown. In this case the machine keeps running as usual (obviously without the contribution of the module) even if it is advisable to single out and clear the cause for the malfunction and replace the fuse as soon as possible to fully restore the machine's working efficiency.



**Note:** The RESET button on PS module, resets the auxiliary protections of the RF module too.

### 8.2.3 Power Supply Units

Three power supply units, which work in parallel mode, power the machine. Should one of the power supply units malfunction, the machine automatically reduces the delivered power down to a value compatible with the current deliverable from the surviving power supply. This situation is indicated by the "P.S. ALARMS" LEDs on the front panel of the PS module.

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