




AUTV/250LD
LDMOS - UHF TV Solid State Amplifier

User's Manual



	CODE	APT134A	TITLE	AUTV/250LD	REV	0	DATE	06/11/03
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Registration number: **IT-17686**



Registration number: **IT-24436**

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SS 96 Km 113
70027 Palo del Colle (Ba) **ITALY**
Tel. +39 (0)80 626755
Fax +39 (0)80 629262
E-mail: elettronika@elettronika.it
Web site: <http://www.elettronika.it>

WARNING

The apparatus described in this manual has been designed and manufactured with devices to safeguard the users. In any case it is recommended that during any operation of installation, maintenance, miscellaneous interventions and calibrations requiring the apparatus to be switched on,

THE USER TAKES ALL THE PRECAUTIONS AGAINST INCIDENTS

It is required to use the proper clothes and protection gloves in order to prevent damages from incidental contacts with high-voltage parts.

The manufacturer declines every responsibility in case the recommendations above are not followed.

IMPORTANT

The component lists attached to the relevant electrical diagrams indicate for each item the reference, the description and the type normally used.

The ***Eletronika S.r.l.*** though reserves the right to use or supply as spare parts components with equivalent characteristics but of a different type, assuring anyway the optimal work of the apparatus in accordance with the specifications.

The enclosed monographs are solely owned by ***Eletronika S.r.l.***

The use of anything enclosed in this technical manual without explicit authorization given by ***Eletronika S.r.l.*** will be prosecuted by the law.

The data and technical characteristics of the apparatus described in this manual are not compelling for the manufacturer.

The ***Eletronika S.r.l.*** reserves the right to make, without previous notice, modifications or updates in order to improve the quality of the product.

The general conditions of supply and sale are described in the contracts.

The delivery time are in accordance with the products and quantities ordered.

Summary of warranty

We, ELETTRONIKA S.r.l., SS096 Km 113 Z.I. PALO DEL COLLE (BA) ITALY, warrant to the ORIGINAL PURCHASER of a NEW product, for a period of one (1) year from the date of purchase by the original purchaser (the "warranty period") that the new ELETTRONIKA product is free of defects in materials and workmanship and will meet or exceed all advertised specifications for such a product. This warranty does not extend to any subsequent purchaser or user, and automatically terminates upon sale or other disposition of our product.

Items excluded from this ELETTRONIKA warranty

We are not responsible for product failure caused by misuse, accident, or neglect. This warranty does not extend to any product on which the serial number has been defaced, altered, or removed. It does not cover damage to loads or any other products or accessories resulting from ELETTRONIKA product failure. It does not cover defects or damage caused by use of unauthorized modifications, accessories, parts, or service.

What we will do

We will remedy any defect, in material or workmanship (except as excluded), in our sole discretion, by repair, replacement, or refund. If a refund is elected, then you must make the defective or malfunctioning component available to us free and clear of all liens or other encumbrances. The refund will be equal to the actual purchase price, not including interest, insurance, closing costs, and other finance charges less a reasonable depreciation on the product from the date of original purchase. Warranty work can only be performed at our authorized service centers or at our factory. Expenses in remedying the defect will be borne by ELETTRONIKA, including one-way surface freight shipping costs within the United States. (Purchaser must bear the expense of shipping the product between any foreign country and the port of entry in the United States and all taxes, duties, and other custom's fees for such foreign shipments).

How to obtain warranty service

You must notify us of your need for warranty service not later than ninety (90) days after the expiration of the warranty period. We will give you an authorization to return the product for service. All components must be shipped in a factory pack or equivalent which, if needed, may

Disclaimer of consequential and incidental damages

You are not entitled to recover from us any consequential or incidental damages resulting from any defect in our product. This includes any damage to another product or products resulting from such a defect.

Warranty alterations

No person has the authority to enlarge, or modify this warranty. The warranty is not extended by the length of time for which you are deprived of the use of the product. Repairs and replacement parts are provided under the terms of this warranty shall carry only the unexpired portion of this warranty.

Design changes

We reserve the right to change the design of any product from time to time without notice and with no obligation to make corresponding changes in products previously manufactured.

Legal remedies of purchaser

There is no warranty which extends beyond the terms hereof. This written warranty is given in lieu of any oral or implied warranties not contained herein. We disclaim all implied warranties, including without limitation any warranties of merchantability or fitness for a particular purpose. No action to enforce this warranty shall be commenced later than ninety (90) days after expiration of the warranty period.

Warranty for electronic tubes

The warranty applied for electronic tubes is the one given by the manufacturer of the tube. In the event that the product shows anomalies within the deadline of the validity of the warranty given by the manufacturer of the product itself, the buyer will have to return it to the seller with the needed documents and the written description of the defect. The seller will ship the broken tube to the manufacturer in order to effect the necessary technical tests to find out the cause of the anomaly. Meanwhile the buyer of the tube who needs to use, and as such to replace immediately the product, will have to buy a new one and provide to the relevant payment, further to the issuing by the seller of a regular commercial invoice. After the adequate tests made by the manufacturer, should the result be positive, that is confirm the defect in manufacturing, the seller will issue a regular credit note in the name of the buyer and return the amount paid. Should the result be negative, that is detect a negligence in the installation or use by the buyer, he will have no right against the seller.

INTRODUCTION

The apparatus described in this manual is the latest of this series, offering high performances, remarkable reliability and a wide range of characteristics, it all at a competitive cost.

Its is easy to install and use. It only takes to follow the installation procedure as shown in this manual: after having removed all from the package, you only have to follow step by step the description in the various sections.

Before starting to use the apparatus, remember to:

- read carefully the general safety information contained in this section;
- follow the instructions for the installation and set up of the apparatus;
- read all the remaining sections of this manual in order to know well the apparatus and learn how to obtain the best of its characteristics.

CONTENTS OF THE MANUAL

The chapter composing this manual contain all the information concerning the use of the apparatus. For more information refer to ELETTRONIKA S.r.l.

This manual is made up of different chapters, each made up of various sections.

WARNING!

The currents and voltages in this equipment are dangerous!
Personnel must at all times observe safety regulation!

This manual is intended as a general guide for trained and qualified personnel who are aware of the dangers inherent in handling potentially hazardous electrical and electronic circuits. It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

The installation, operation, maintenance and service of this equipment involves risks both to personnel and equipment, and must be performed only by qualified personnel exercising due care. Elettronika S.r.l. shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks.

During installation and operation of this equipment, local building codes and fire protection standards must be observed.

WARNING!

Always disconnect power before opening covers, doors, enclosures, gates, panels or shields.
Always use grounding nsticks and short out high voltage points before servicing. Never make internal adjustments, perform maintenance or service when alone or when fatigued.

Do not remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields.
Keep away from live circuits, know your equipment and don't take chances.

WARNING!

In case of emergency ensure that power has been disconnected.

Treatment of electrical shock

1) If victim is not responsive follow the A, B, C's of basic life support.

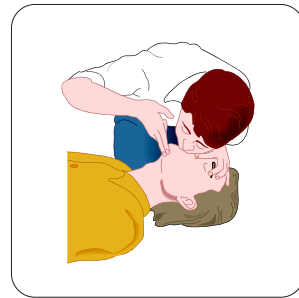
PLACE VICTIM FLAT ON HIS BACK ON A HARD SURFACE

A - AIRWAY



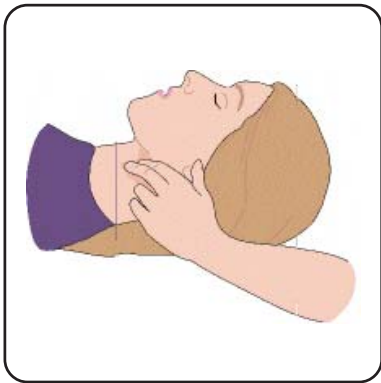
If unconscious, open airway lift up neck, push forehead back, clear out mouth if necessary, observe for breathing.

B - BREATHING

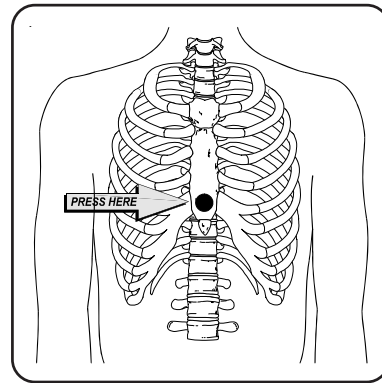


If not breathing, begin artificial breathing. Tilt head, pinch nostrils, make airtight seal, 4 quick full breaths. Remember mouth to mouth resuscitation must be commenced as soon as possible.

C - CIRCULATION



Check carotid pulse. If pulse absent, begin artificial circulation.



Approx. 80sec.: 1 rescuer, 15 compressions, 2 quick breaths.

Approx. 60sec.: 2 rescuers, 5 compressions, 1 breath.

NOTE: DO NOT INTERRUPT RHYTHM OF COMPRESSIONS WHEN SECOND PERSON IS GIVING BREATH.

Call for medical assistance as soon as possible.

2) If victim is responsive:

- keep them warm;
- keep them as quiet as possible;
- loosen their clothing (a reclining position is recommended).

FIRST-AID

Personnel engaged in the installation, operation, maintenance or servicing of this equipment are urged to become familiar with first-aid theory and practices. The following information is not intended to be a complete first-aid procedure, it is brief and is only to be used as a reference. It is the duty of all personnel using the equipment to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

TREATMENT OF ELECTRICAL BURNS

1) Extensive burned and broken skin.

- Cover area with clean sheet or cloth (cleansed available cloth article);
- 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 effected keep them elevated.

NOTE

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).

2) Less severe burns - (1st & 2nd degree).

- 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.

Communication N°1 -2002/95/CE - RoHS Directive

Further to the directives issued by the European Community, 2002/95/CE, 2002/95/CE and 2003/108/CE, and to the Italian Decree of Law n° 151 dated 25 July 2005, this is to inform the customers of Elettronika S.r.l. living within the boundaries of the European Community about the following obligations:

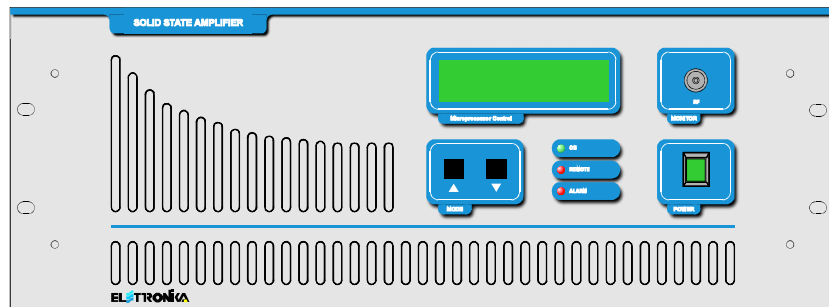
- 1) It is forbidden to trash RAEE products (which includes all broadcasting products which are not expressly labelled as lead-free) along with normal wastes;
- 2) Such devices must be brought to proper centres able to perform the adequate processing in order to recycle their parts where possible and dispose of the raw materials contained therein;
- 3) For equipment purchased from Elettronika after the 13th of August 2005, the gathering, transport, processing, recycle and disposal operations are responsibility of Elettronika who will bear all related expenses;
- 4) For equipment purchased from Elettronika before the 13th of August 2005, the gathering, transport, processing, recycle and disposal operations are responsibility of Elettronika, who will bear all related expenses, only if you are purchasing from us new equipment in substitution of the disposed one;
- 5) Electric and electronic devices contains lead in soldering, cables, etc. This substance pollutes the environment and may be accumulated in the organism of plants and mammals. It is dangerous for humans because it may affect blood, bone marrow, peripheral and central nervous system and kidneys, causing anaemia, encephalopathies (e.g., convulsions), peripheral neuropathies, cramps of the abdomen and kidney damages. Besides it affects human reproduction and growth.
These devices also contain mercury. From the environmental point of view, this substance is highly toxic for aquatic life, and can be accumulated in the organism of fish.
Long-term damages to humans can affect the central nervous system and the kidneys, producing irritability, emotional instability, tremors, damages to the mind and the memory, language disorders. It may also irritate and whiten the gums, and its effects may be cumulative. Based on tests on animals, it may affect the human reproduction or growth.
There is also chrome, which may result in irritation of the eyes and respiration system.
Cadmium is also present. In humans it may damage lungs, due to repeated or prolonged contact with its dust, and kidneys. It may cause cancer.
- 6) The symbol below marks the devices which cannot be disposed of along with normal wastes, as stated in 1) and 2) above.



- 7) The payment of fees is foreseen for the non-allowed disposal of such devices.

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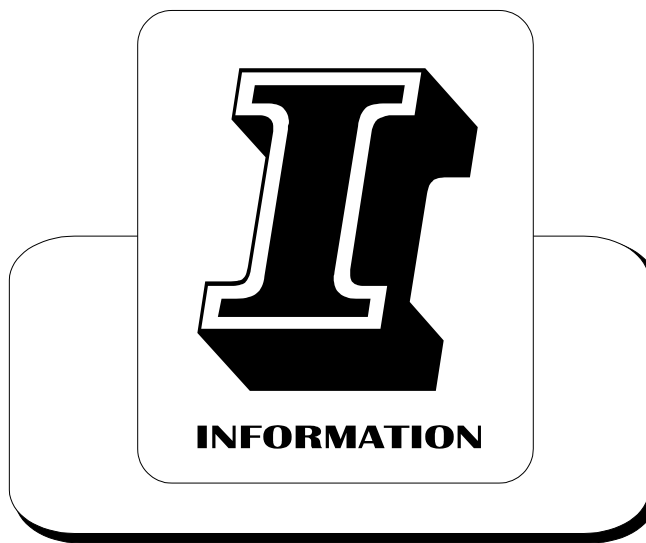
LDMOS - UHF TV AMPLIFIER



AUTV/250LD

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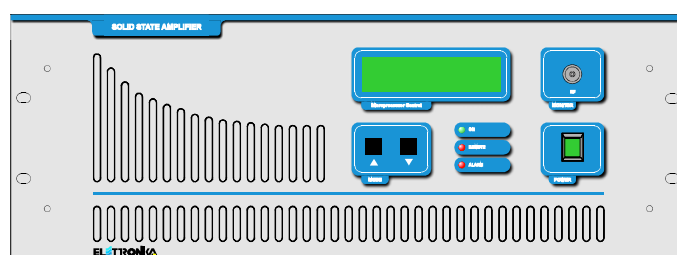
Section 1 - Information

Contents:

- 1.1 Description*
- 1.2 Technical characteristics*

AUTV/250LD

LDMOS - UHF TV AMPLIFIER



1.1 DESCRIPTION

The amplifier AUTV/250LD is an apparatus designed to be used as final power stage or driver for higher-power amplifiers in the UHF TV band.

It is able to supply a power of 250W (peak sync.) in class AB and is completely realized with LDMOS technology. The power supply of the apparatus is given by a switching power supply for the RF power module and a traditional transformer for the control board. The protection board uses all the potential of a microprocessor to check all the parameters of the amplifier module and the voltage of the power supply.

An output band-pass filter provides for the attenuation of the spurious products. The final result is a compact apparatus, it is all inside a standard 19"-4U cabinet, with a very good price-to-quality ratio.

1.2 TECHNICAL CHARACTERISTICS

RF SECTION

Frequency range	470 - 860MHz
Output power	250W
Gain	13dB +/-1
RF Input impedance	50 Ω
RF Output impedance	50 Ω
I.M.D. (3 Tones: -8, -10, -16dB)	< -54dB (with IF Pre-corrector)
RF Spurious products	Better than -60dB
Filter insertion loss	< = 0,6dB
RF Input connector	N Female
RF Output connector	N Female

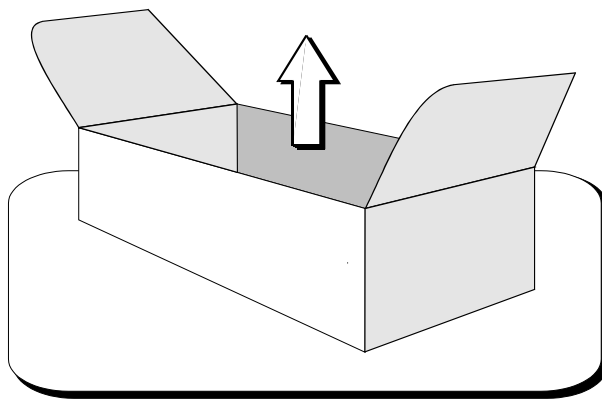
GENERAL

Power Supply	90-260VAC
Typical power consumption	600VA (Black)
RS232 Socket	DB9 Connector
Telemeasuring socket	DB9 Connector
Cabinet	Rack 19"-4U
Dimensions	421x368x178mm
Weight	25kg
Ambient temperature	-5° to +45°C
Humidity	20% - 90%

PROTECTION THR.

FWD Power	300W
REF Power	20W
Temperature	70°C
I_{DC}	14A
V_{DC}	Min 5V - Max 34V

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Section 2 - Installation

Contents:

- 2.1 Operating environment*
- 2.2 Preliminary operations*
- 2.3 Telemeasuring socket connections*
- 2.4 RS232 / RS485 Socket connections*
- 2.5 Control system*
- 2.6 Preventive maintenance*
 - Front panel*
 - Rear panel*

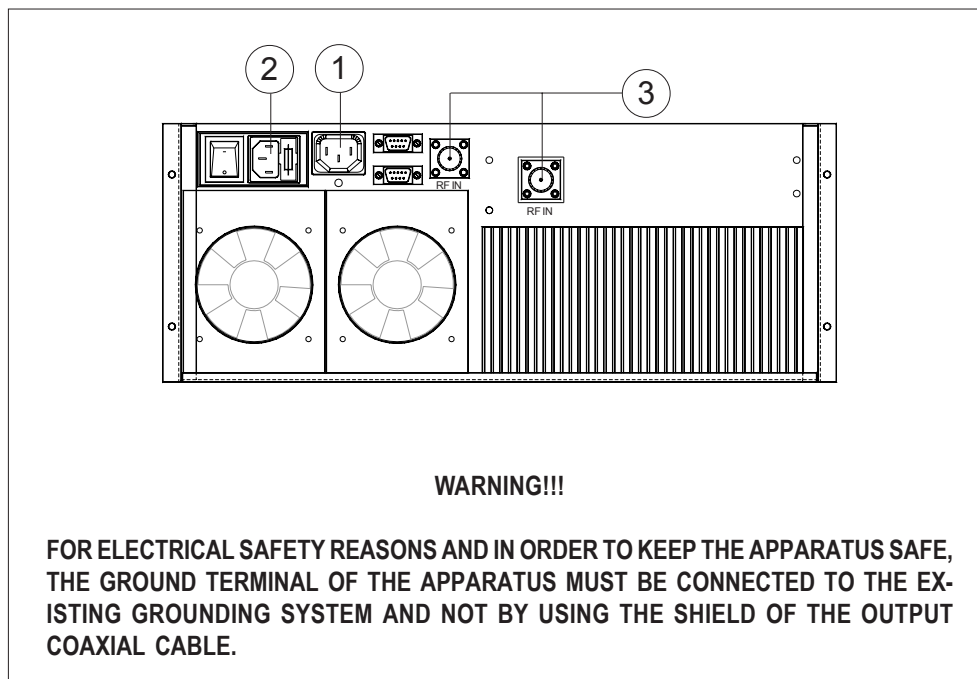
2.1 OPERATING ENVIRONMENT

You can install the apparatus in a standard component rack or on a suitable surface such as a bench or desk. In any case, the area should be as clean and well-ventilated as possible. Always allow for at least 2 cm of clearance under the unit for ventilation. If you set the apparatus on a flat surface, install spacers on the bottom cover plate. If you install the apparatus in a rack, provide adequate clearance above and below. Do not locate the apparatus directly above a hot piece of equipment.

2.2 PRELIMINARY OPERATIONS

Correct installation of the equipment is important for maximum performance and reliability. Antenna and earth connections must be installed with the greatest care. The equipment adjustment isn't need, because the unit is completely adjusted by our technical staff. This is the installation procedure:

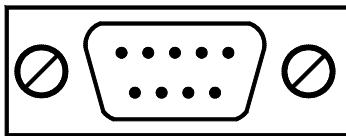
1. connect the power supply cable of the transmitter to the auxiliary socket on the rear panel of the amplifier;
2. connect the power supply cable of the amplifier to the electric network (90-260VAC);
3. connect the exciter / antenna cable to the RF IN and RF OUT on the rear panel of the amplifier.



Before powering fully the apparatus, check that the output connections of the coaxial cable to the antenna system are working.

In order to this it is possible to check the indication of the reflected power at low power levels. Only if the SWR indication on the display is 0, the output power can be slowly increased. At maximum output power, some watt might be shown as reflected power

2.3 TELEMEASURING SOCKET CONNECTIONS



DB9 Socket

PIN N°	SIGNAL TYPE	IN / OUT	FUNCTION
1	Ground	-	-
2	Analog	Output	FWD Power 0 to 5V
3	Digital	Input	Floating: ON - GND: OFF Valid only in remote (Pin 6= GND)
4	Digital	Output	0: Alarm - 1: No alarm TTL Level
5	-	-	Not used
6	Digital	Input	Floating: Local GND: Remote (Pin 3 Command accepted)
7	Analog	Output	REF Power 0 to 5V
8	Analog	Output	Temperature 0 to 5V
9	-	-	Not used

2.4 RS232 / RS485 SOCKET CONNECTIONS

The DB9 connector can be used in two modes (RS232 or RS485) depending on the position of the Dip-Switch.

SW1	1	2	3	4	5	6	7	8
RS232	Open	Open	Open	Open	Closed	Closed	Closed	-
RS485	Closed	Closed	Closed	Closed	Open	Open	Open	-

PIN N°	1	2	3	4	5	6	7	8	9
RS232	-	RX	TX	+5V	GND	+5V	-	-	-
RS485	-	RX-	RX+	+5V	GND	+5V	TX-	TX+	-

2.5 CONTROL SYSTEM

The control system allows the user to monitor the most important measures of the transmitter, voltage and current of the power supply, temperature of the RF board, forward and reflected power, by using the two keys placed on the frontal panel. The turn-on key allows to turn on and off the transmitter.

In case one of the monitored measures is in alarm, the transmitter will show this. If the value of the measure goes back to normal, the control system will turn on the transmitter again.

After 5 cycles of turning on and off the transmitter will be kept switched off until the user turns it off.

Meaning of the LEDs

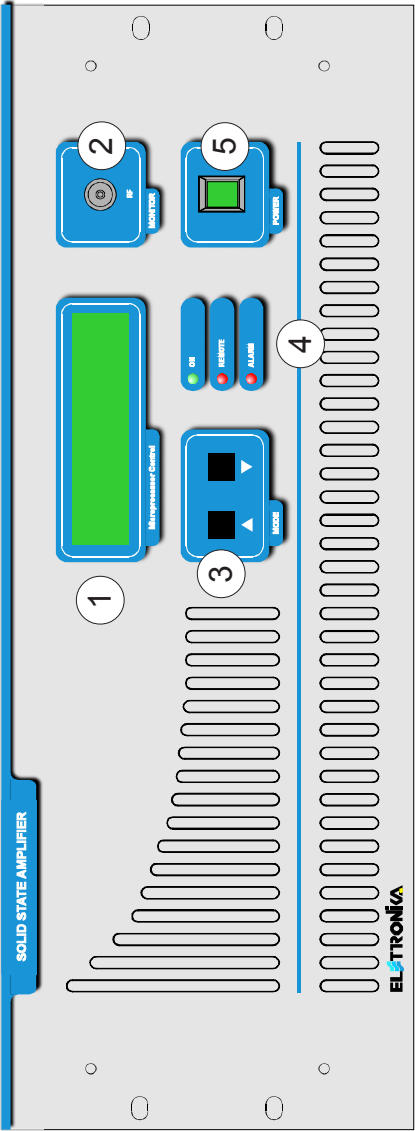
- **LED ON:** The LED ON is lit when the turn-on command of the transmitter is inserted.
- **LED REMOTE:** the LED REMOTE is lit when the remote commands have been enabled by the telemeasuring connector or when the transmitter is controlled through the RS232 port.
- **LED ALARM:** the LED ALARM is lit when the transmitter has been turned off due to a failure.

2.6 PREVENTIVE MAINTENANCE

To ensure maximum performance and minimum repair trouble, we strongly recommend you to follow the below stated headlines for preventive maintenance:

1. check antenna installation and ground connection at regular intervals;
2. keep your apparatus clean and dry externally: this will ensure continuous functioning of the front panel controls;
3. if the apparatus has not been used for a long period of time combined with exposure to extreme environmental conditions, open the unit and make a visual inspection.
Remove salt, water or ice with a moist cloth before turning the apparatus on. Check that the cooling fans are running freely.
4. for general maintenance and top performance, call an authorized service technical to give the apparatus and the complete antenna/earth connection installation a general check each 12-18 months;
5. check at regular intervals that the air intake located on the front panel is free of dust. If there is visible dust, remove it by means of a soft brush.

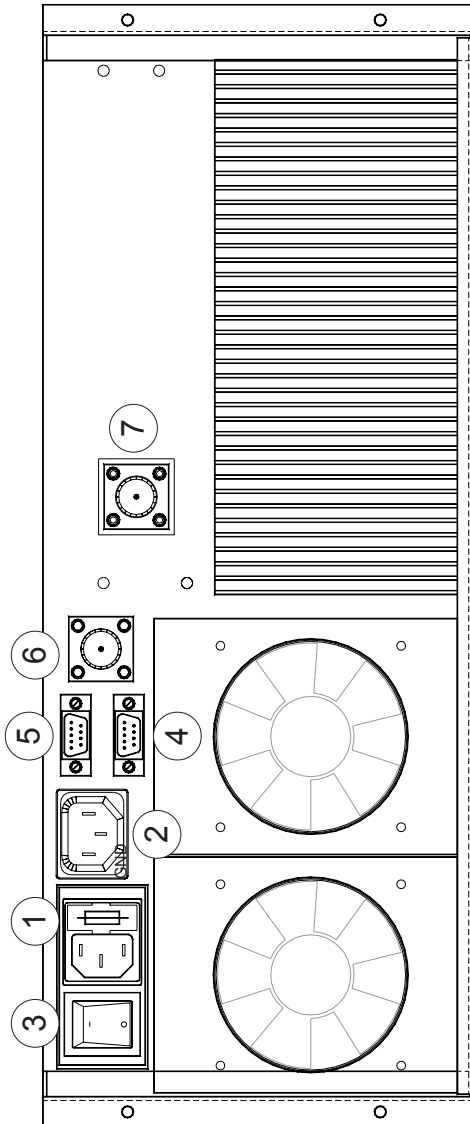
Front panel



DESCRIPTION

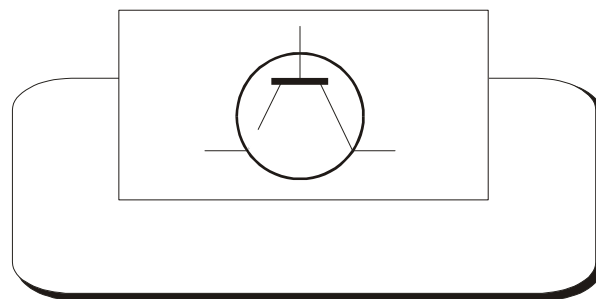
1	LCD Display
2	RF Monitor connector
3	Function keys
4	Status LEDs
5	Main switch

Rear panel



DESCRIPTION

1	Power supply socket
2	Auxiliary socket
3	Breaker
4	RS232 Socket
5	Telemeasuring socket
6	RF Output connector
7	RF Input connector

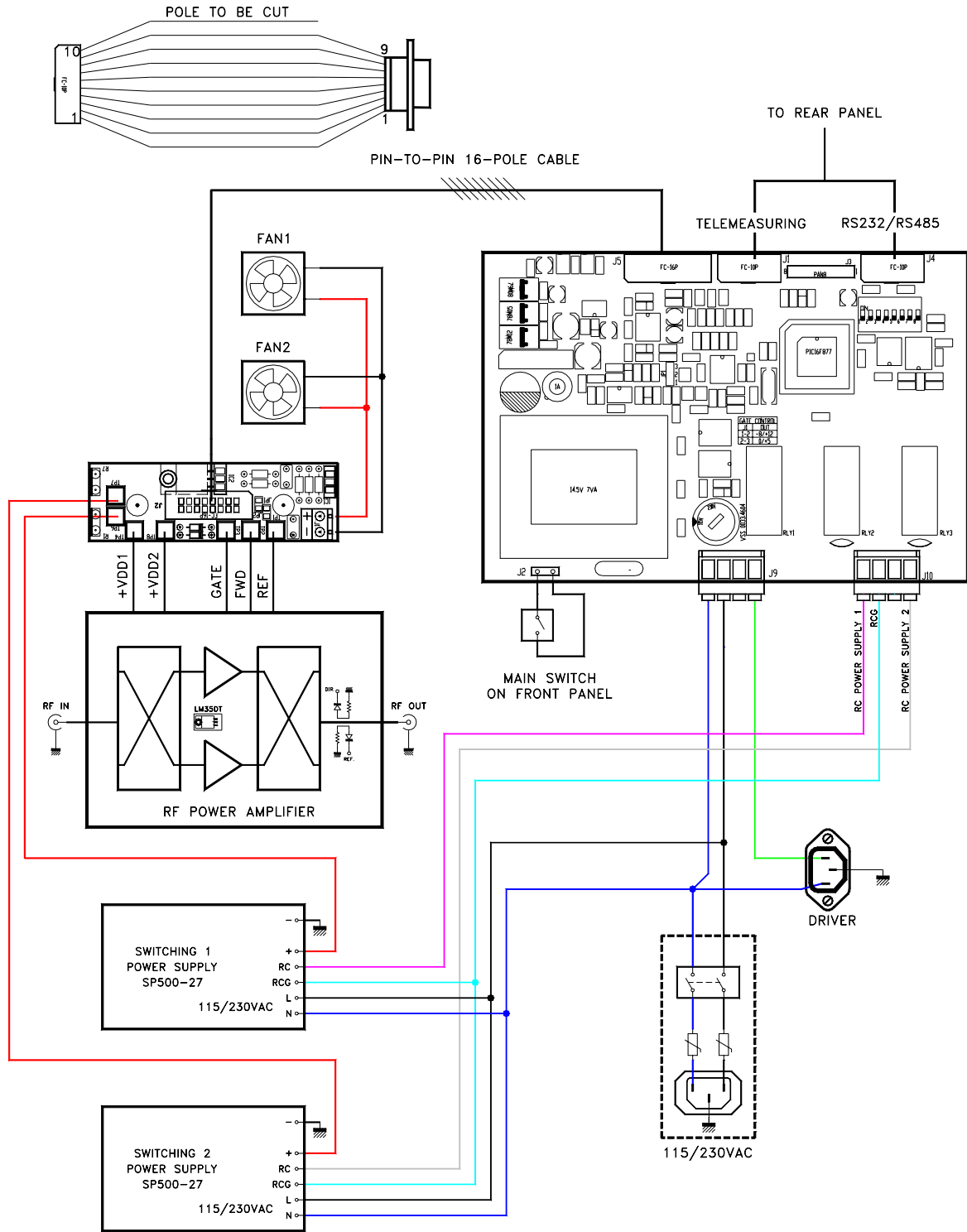



Section 3 - Diagram

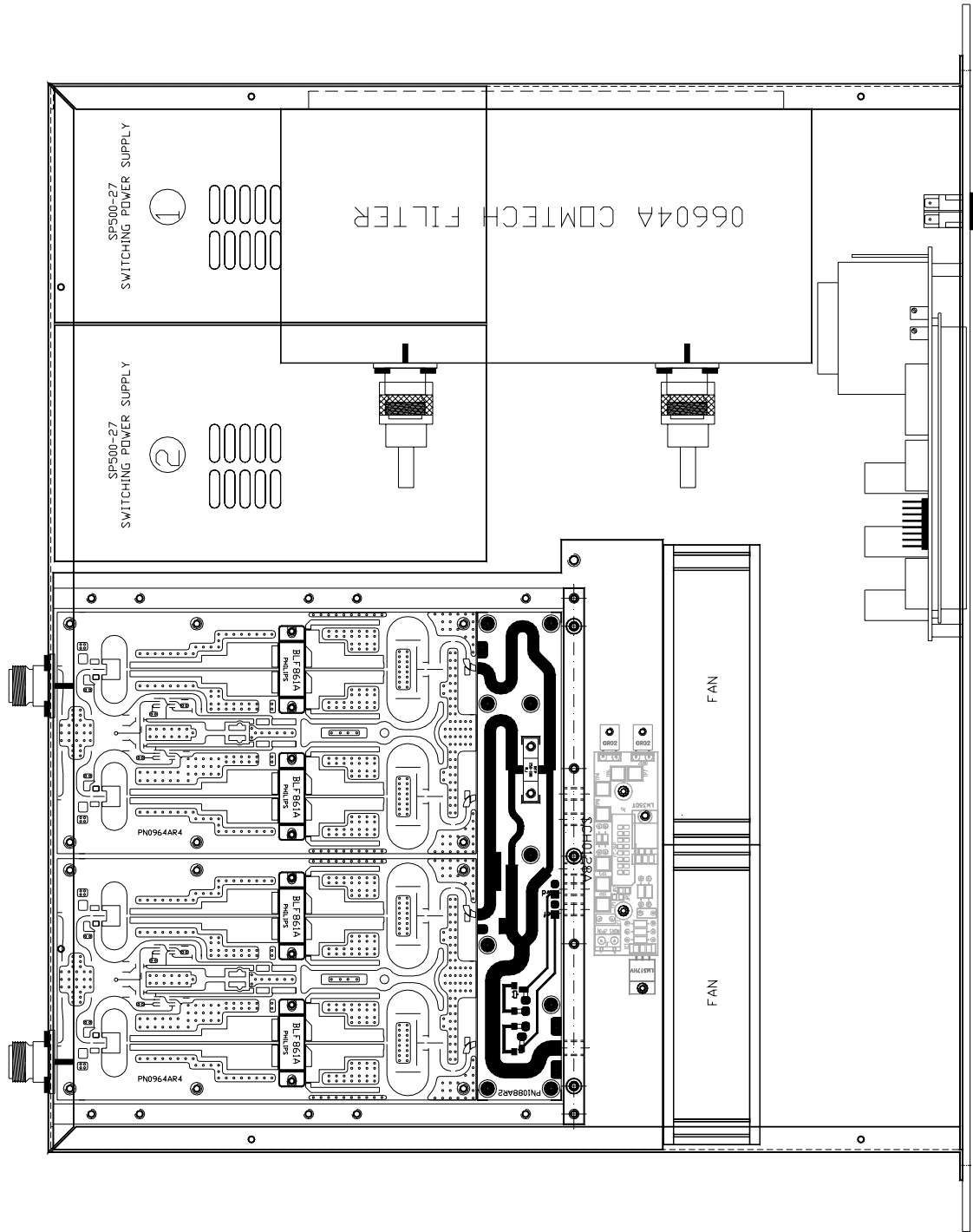
Contents:


- *Cable diagram*
- *AUTV/250LD Component layout*
- *RF Section Block Diagram*
- *SCH0192AR0 (250W UHF LDMOS Amplifier module)*
- *SCH0122BR1 (Control board and display)*
- *SCH0128AR1 (Amplifier interface)*
- *E0012 (SP500/27-48 Switching power supply)*
- *06604A (UHF TV Output Filter IMD Suppressor)*

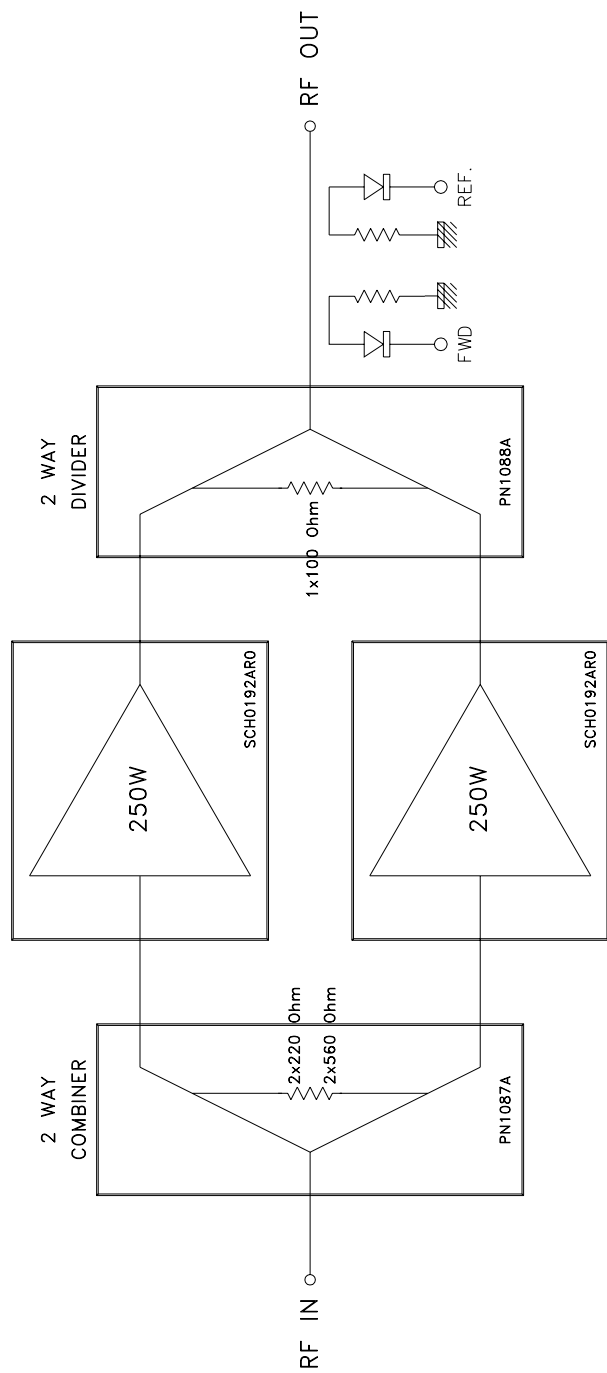
WIRING DIAGRAM FOR TELEMEASURING AND RS232/485 CABLE




	DESCRIPTION	DESIGNER	Sign.	DATE
	AUTV/250LD LDMOS UHF TV AMPLIFIER Cable Diagram	MASTORILLI		13/11/2003
CODE	TITLE	PCB DESIGNER	Sign.	REF
	APT134A	MASTORILLI		APT134A_AUTV_250LD.dwg
	Schema Cablaggio AMPLIFICATORE TV UHF LDMOS AUTV/250LD	QUALITY CONTROL	Sign.	SHEET
		RUSSO		1/1



	DESCRIPTION	DESIGNER	Sign.	DATE
	AUTV/250LD LDMOS UHF TV AMPLIFIER Component Layout	MASTORILLI		13/11/2003
CODE APT134A	TITLE	PCB DESIGNER	Sign.	REF
	Piano di Montaggio AMPLIFICATORE TV UHF LDMOS AUTV/250LD	MASTORILLI		APT134A_AUTV_250LD.dwg
		QUALITY CONTROL	Sign.	SHEET
		RUSSO		1/1



	DESCRIZIONE AUTV/250LD LDMOS UHF TV AMPLIFIER RF Section Block Diagram	PROGETTISTA MASTRORILLI	Firma	DATA 01/10/2003
		DISEGNATORE MASTRORILLI	Firma	RIF APT131A_AUTV/250LD.dwg
CODICE APT134A	DESCRIZIONE Schema a Blocchi Sezione RF AUTV/250LD AMPLIFICATORE TV UHF LDMOS	CONTROLLO QUALITA' RUSSO	Firma	N° ALLEGATI 1/1

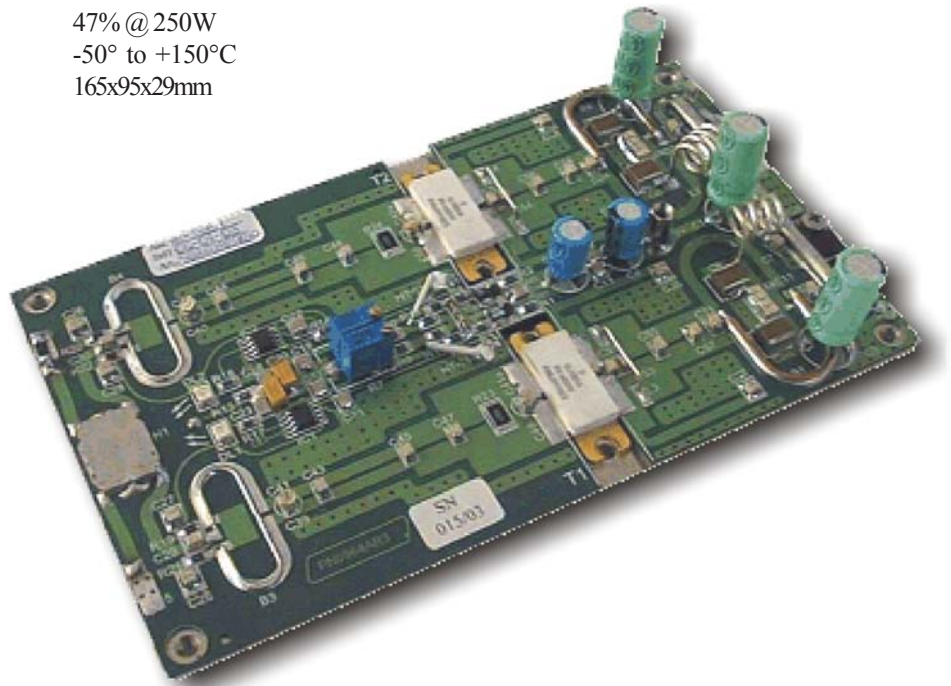
DESCRIPTION

The RF module is an integrated TV linear amplifier designed for UHF band, this module employs push-pull LDMOS technology in order to achieve very good efficiency, high linearity and reliability.

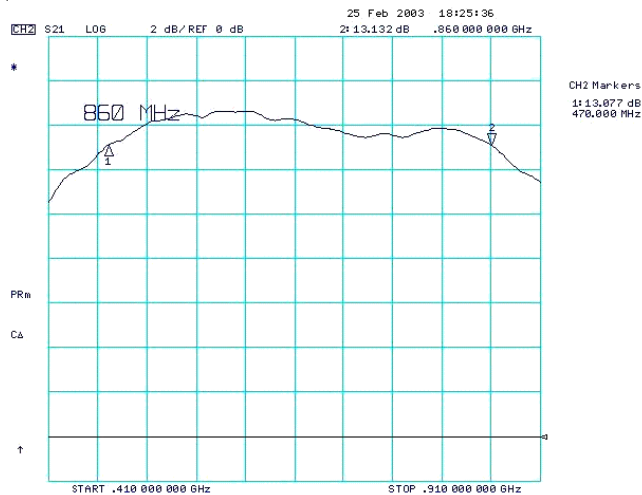
LDMOS transistors operate in AB class. It is a wideband amplifier over the full frequency, no adjustment is required for the channel change. The board includes RF section amplifier, bias circuit, protection circuit and matching networks. A silver plated copper plate is brazed with PCB in order to obtain low thermal resistance. Providing a minimum of 200W Pk sync linear power, this module is the perfect amplifier for any broadband UHF power transmitter.

TECHNICAL CHARACTERISTICS

Output power	300W max
Input power	15W max
Frequency	470 - 860MHz
Gain	> 13dB
LDMOS Power supply	32V±2%
LDMOS Bias current @+32V Vdc	2A
RF Input impedance	50Ω
RF Output impedance	50Ω
Input / Output return loss	>= 15dB
Drain efficiency	47% @ 250W
Storage temperature range	-50° to +150°C
Dimensions (LxWxH)	165x95x29mm



- Curve response graphic



Middle frequency 660MHz, span 500MHz, 2dB/div., reference to the arrow

CALIBRATION PROCEDURE

- Technical characteristics

Power supply voltage	32V ($\pm 2\%$)
Polarisation current	1.0 cold for each device (2A total), $\pm 0.1A$
Gain for low signal	Not less than 13dB in the 470-860MHz band ($\pm 1dB$) Compare to the typical curve enclosed

- Adjustment procedure

Polarisation current calibration	32V stabilised power supply 10A amperometer
Gain curve	Network analyser

- Adjustment points description

R7-R8 (Trimmers)	Adjust the current absorbed in stand-by (1.0A per device)
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- Calibration steps

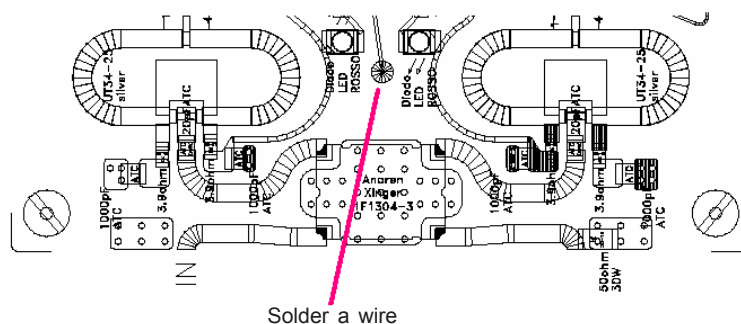
STEP 1. **Close the input and the output of the module by connecting them to a 50Ω dummy load** and connect the spectrum analyser through a directive sample, in order to look for self-oscillation of the module, if any (anyway the module has been designed so that it would not self-oscillate even if totally decoupled, without any input or output load).

STEP 2. **Check the voltages of the polarisation circuits *without assembling the transistors first*:** connect the 32V power supply to the proper turret by means of a fastening screw, then give power and check data:

- the stabilised voltage on the zener diodes DZ1 and DZ2 is about 15V compared to the ground;
- the stabilised voltage on the zener diodes DZ3 and DZ4 is about 6.8V compared to the ground;
- the voltage on the pads to which the gates of the LDMOS transistors will be soldered (R23 and R24 resistors side) changes from 0V to a maximum value of about 6V when moving the relevant trimmer (R7-R8).

STEP 3. **Check the work of the protections.**

- Set both trimmers so that there is a value of about 4.5V on the pads of the gates;
- solder some wire to the pad between the two LEDs, next to the serigraphy of the input hybrid H1;



- in order to check the work of the protections aboard, a power of about 4V has to be supplied to the wire, for example by touching with it the reophore of C23 or C24 which is not connected to ground; the two red LEDs will immediately light up and the two RF transistors will be switched off at the same time: the polarisation current (2A) will decrease to 0 and of course the gain curve displayed by the spectrum analyser will decrease;
- after this it is **important** to *restore the position of the two trimmers for the minimum voltage!* Then disconnect the 32V power supply.

STEP 4. **Fastening of the LDMOS transistors:** after properly cleaning the plate surface, smear a thin layer of silicone fat on the lower side of the flange of the MOSFETs, fasten them to the heat sink and solder the gate first, then the drain. Solder the two 13pF (ATC) chip capacitors and above them the two 1-5pF

capacitive trimmers, between the two pair of gates, as shown by the mounting plan.

STEP 5. Connect serially a c.c. amperometer to the power supply, with scale starting from more than 5A (i.e. 10A).

STEP 6. Power the module and check the MOSFET is not absorbing current; this means that the device is integral and working correctly.

STEP 7. Slowly turn the R7 trimmer until the MOSFET absorbs 1A, always checking that there are no self-oscillation; under this conditions it is possible to check by means of a digital tester that the voltage on the gate is about 5.2-5.4V.

STEP 8. Repeat the previous step for the other section of the module, this time turnign R8 and checking that the indication of the current on the amperometer increases to 2A total (which includes the current of the other device left on).

STEP 9. Check the response curve of the module by means of the *network analyser*.

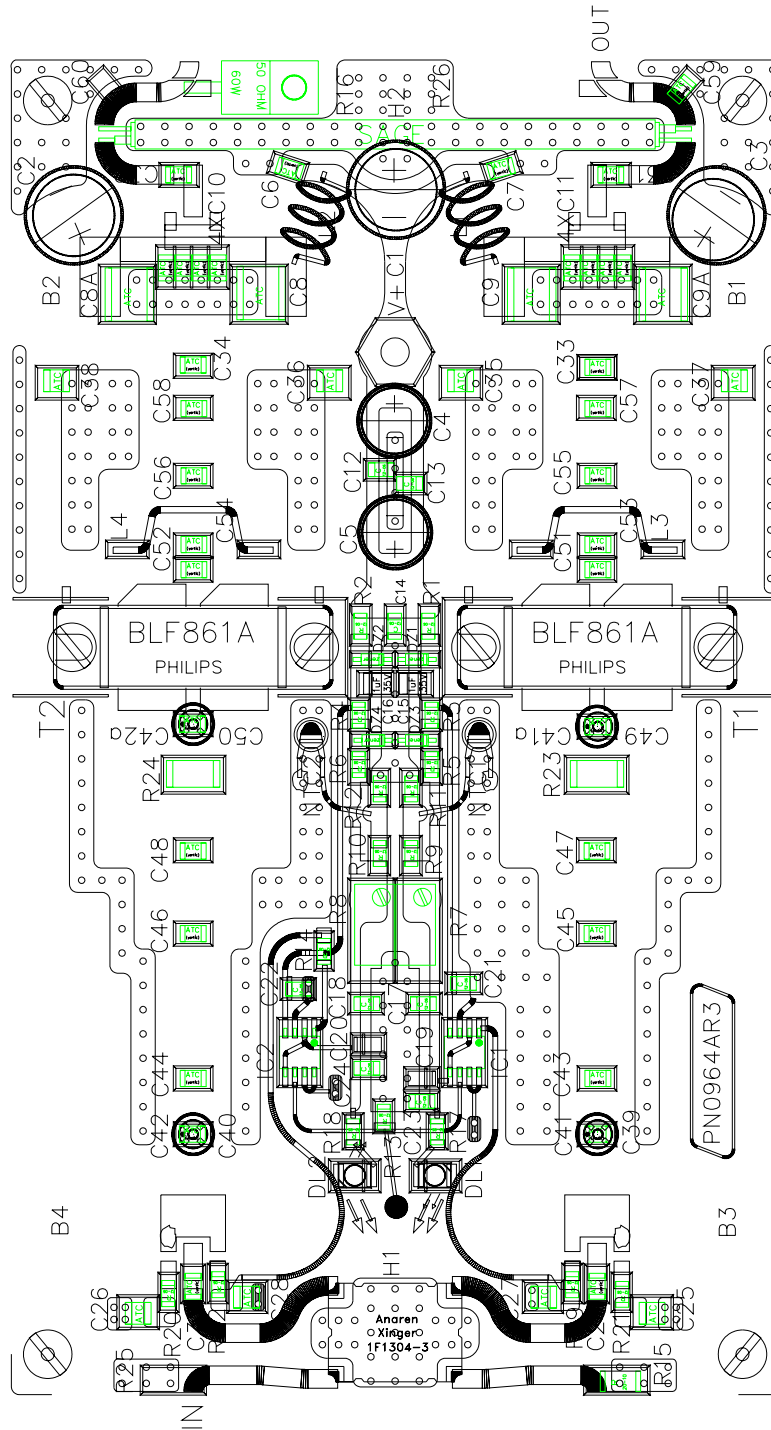
STEP 10. Check the response curve for low signal with centre 660MHz and span 500MHz, 2dB/div.

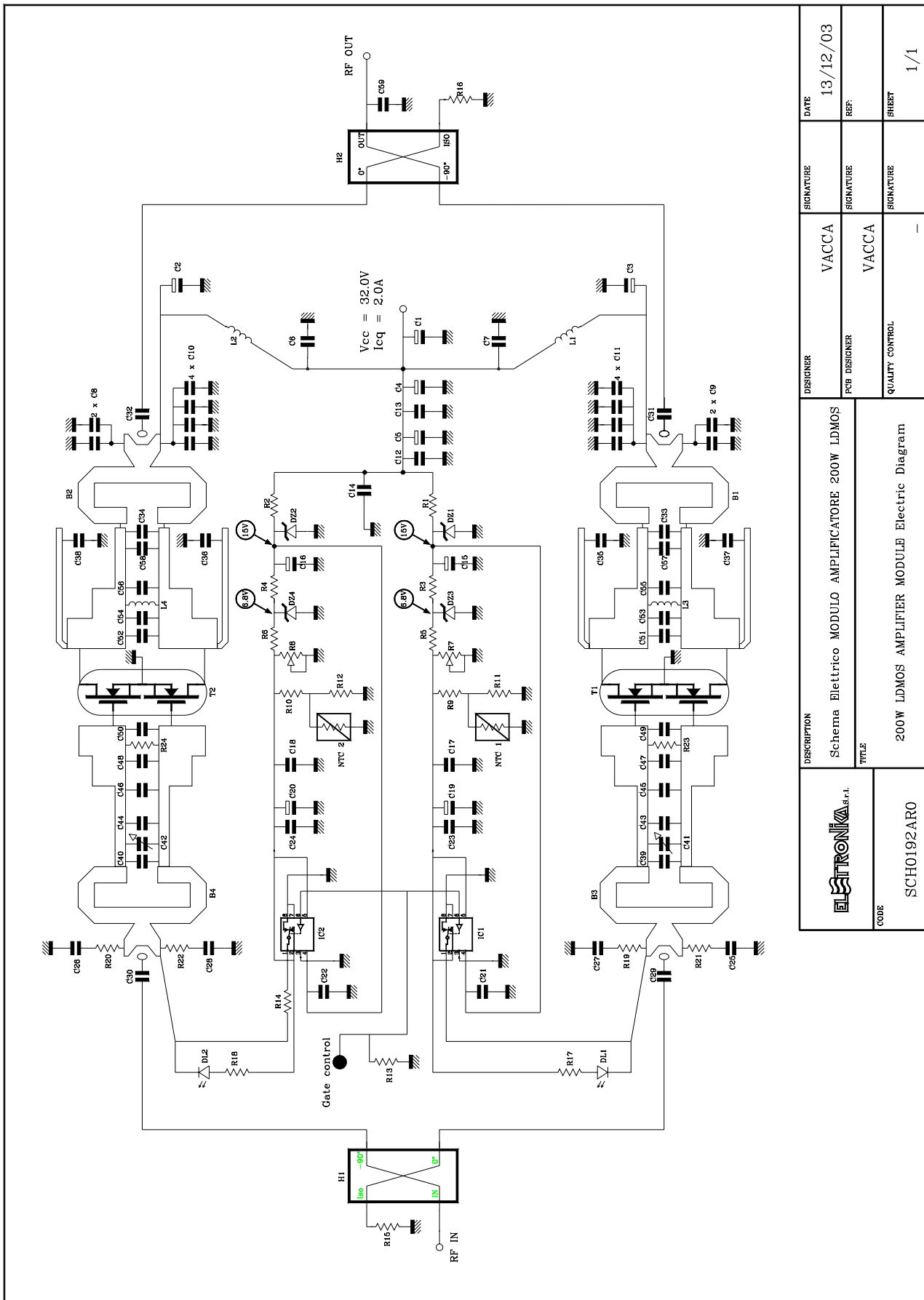
STEP 11. The curve should be similar to the one enclosed, with a tolerance of ± 0.5 dB. To obtain this, act on the four trimmers C41-C41a and C42-C42a with the proper “calibrator”, in order to flatten the curve as much as possible, especially at the edged of the band which represents the minimum values.

STEP 12. Finally, check that the current in stand-by does not increase by more than 15÷20%, reaching at worst 2.3÷2.4A when the heat sink is hot and not ventilated.

Note: when mounting-removing the PALLET on the heat sink, tightly fasten the screw of each all “N” input and output connectors. These are mounted with a single 3mm screw and if it is not properly fastened it may be detached from the PCB by a movement of the connector once it has already been soldered to the path.

Component layout SCH0192AR0





ELSTRONIKA S.p.A.	DESCRIPTION Schema Elettrico MODULO AMPLIFICATORE 200W LDMOS		DESIGNER VACCA	SIGNATURE _____	DATE 13/12/03
	CODE SCH0192ARO	TITLE 200W LDMOS AMPLIFIER MODULE Electric Diagram		PCB DESIGNER VACCA	REF. _____
			QUALITY CONTROL _____	SIGNATURE _____	SHEET 1/1

COMPONENT LIST SCH0192AR0

REF.	DESCRIPTION	ELETTRONIKACODE	Page 1/3
R1	2200Ω 1/4W 1206 SMD RESISTOR	00045A	
R2	2200Ω 1/4W 1206 SMD RESISTOR	00045A	
R3	2200Ω 1/4W 1206 SMD RESISTOR	00045A	
R4	2200Ω 1/4W 1206 SMD RESISTOR	00045A	
R5	1200Ω 1/4W 1206 SMD RESISTOR	00042A	
R6	1200Ω 1/4W 1206 SMD RESISTOR	00042A	
R7	50kΩ MULTITURNS PTH TRIMMER	00800	
R8	50kΩ MULTITURNS PTH TRIMMER	00800	
R9	1200Ω 1/4W 1206 SMD RESISTOR	00042A	
R10	1200Ω 1/4W 1206 SMD RESISTOR	00042A	
R11	18kΩ 1/4W 1206 SMD RESISTOR	00056B	
R12	18kΩ 1/4W 1206 SMD RESISTOR	00056B	
R13	680KΩ 1/4W 1206 SMD RESISTOR	00075A	
R14	0Ω 1/4W 1206 SMD RESISTOR	00001	
R15	50Ω 30W 1512EBX SMD RESISTOR	00416A	
R16	50Ω 60W	00432	
R17	4.7kΩ 1/4W 1206 SMD RESISTOR	00049A	
R18	4.7kΩ 1/4W 1206 SMD RESISTOR	00049A	
R19	3.9Ω 1/4W 1206 SMD RESISTOR	00012A	
R20	3.9Ω 1/4W 1206 SMD RESISTOR	00012A	
R21	3.9Ω 1/4W 1206 SMD RESISTOR	00012A	
R22	3.9Ω 1/4W 1206 SMD RESISTOR	00012A	
R23	1000Ω 1W 2512 SMD RESISTOR	00396	
R24	1000Ω 1W 2512 SMD RESISTOR	00396	
*R25	= R15 (da montare se si inverte l'ingresso)		
*R26	= R26 (da montare se si inverte l'uscita)		
C1	470uF 50V PTH ELECTROLYTIC CAPACITOR	01807B	
C2	470uF 50V PTH ELECTROLYTIC CAPACITOR	01807B	
C3	470uF 50V PTH ELECTROLYTIC CAPACITOR	01807B	
C4	100uF 50V PTH ELECTROLYTIC CAPACITOR	01795	
C5	100uF 50V PTH ELECTROLYTIC CAPACITOR	01795	
C6	1nF ATC 100B CAPACITOR OR EQUIVALENT	01145	
C7	1nF ATC 100B CAPACITOR OR EQUIVALENT	01145	
C8 x 2	2 x 100nF ATC CAPACITOR OR EQUIVALENT	01065H	
C9 x 2	2 x 100nF ATC CAPACITOR OR EQUIVALENT	01065H	
C10 x 4	4 x 100pF ATC 100B CAPACITOR OR EQUIVALENT	01135	
C11 x 4	4 x 100pF ATC 100B CAPACITOR OR EQUIVALENT	01135	
C12	100nF 1210 SMD CAPACITOR	1065G	
C13	100nF 1210 SMD CAPACITOR	1065G	
C14	100nF 1210 SMD CAPACITOR	1065G	
C15	1uF 35V SMD TANTALIUM CAPACITOR	01613A	
C16	1uF 35V SMD TANTALIUM CAPACITOR	01613A	
C17	100nF 1210 SMD CAPACITOR	1065G	

REF.	DESCRIPTION	ELETTRONIKA CODE	Page 2/3
C18	100nF 1210 SMD CAPACITOR	1065G	
C19	10uF 16V SMD TANTALIUM CAPACITOR	01626A	
C20	10uF 16V SMD TANTALIUM CAPACITOR	01626A	
C21	100nF 1210 SMD CAPACITOR	1065G	
C22	100nF 1210 SMD CAPACITOR	1065G	
C23	100nF 1210 SMD CAPACITOR	1065G	
C24	100nF 1210 SMD CAPACITOR	1065G	
C25	1nF ATC 100B CAPACITOR OR EQUIVALENT	01145	
C26	1nF ATC 100B CAPACITOR OR EQUIVALENT	01145	
C27	1nF ATC 100B CAPACITOR OR EQUIVALENT	01145	
C28	1nF ATC 100B CAPACITOR OR EQUIVALENT	01145	
C29	20pF ATC 100B CAPACITOR OR EQUIVALENT	01123	
C30	20pF ATC 100B CAPACITOR OR EQUIVALENT	01123	
C31	20pF ATC 100B CAPACITOR OR EQUIVALENT	01123	
C32	20pF ATC 100B CAPACITOR OR EQUIVALENT	01123	
C33	1.3pF ATC 100B CAPACITOR OR EQUIVALENT	01104	
C34	1.3pF ATC 100B CAPACITOR OR EQUIVALENT	01104	
C35	470pF ATC 100B CAPACITOR OR EQUIVALENT	01143	
C36	470pF ATC 100B CAPACITOR OR EQUIVALENT	01143	
C37	470pF ATC 100B CAPACITOR OR EQUIVALENT	01143	
C38	470pF ATC 100B CAPACITOR OR EQUIVALENT	01143	
C39	4.7pF ATC 100B CAPACITOR OR EQUIVALENT	01108	
C40	4.7pF ATC 100B CAPACITOR OR EQUIVALENT	01108	
C41 x 2	2 x 1÷5pF JOHANSON SMD TRIMMER	1485	
C42 x 2	2 x 1÷5pF JOHANSON SMD TRIMMER	1485	
C43	3.6pF ATC 100B CAPACITOR OR EQUIVALENT	01104B	
C44	3.6pF ATC 100B CAPACITOR OR EQUIVALENT	01104B	
C45	6.8pF ATC 100B CAPACITOR OR EQUIVALENT	01111	
C46	6.8pF ATC 100B CAPACITOR OR EQUIVALENT	01111	
C47	6.8pF ATC 100B CAPACITOR OR EQUIVALENT	01111	
C48	6.8pF ATC 100B CAPACITOR OR EQUIVALENT	01111	
C49	13pF ATC 100B CAPACITOR OR EQUIVALENT	01119A	
C50	13pF ATC 100B CAPACITOR OR EQUIVALENT	01119A	
C51	8.2pF ATC 100B CAPACITOR OR EQUIVALENT	01113	
C52	8.2pF ATC 100B CAPACITOR OR EQUIVALENT	01113	
C53	8.2pF ATC 100B CAPACITOR OR EQUIVALENT	01113	
C54	8.2pF ATC 100B CAPACITOR OR EQUIVALENT	01113	
C55	10pF ATC 100B CAPACITOR OR EQUIVALENT	01117	
C56	10pF ATC 100B CAPACITOR OR EQUIVALENT	01117	
C57	4.7pF ATC 100B CAPACITOR OR EQUIVALENT	01108	
C58	4.7pF ATC 100B CAPACITOR OR EQUIVALENT	01108	
C59	0.3pF ATC 100B CAPACITOR OR EQUIVALENT	01160	
T1	BLF861A RF LDMOS POWER TRANSISTOR	04034	
T2	BLF861A RF LDMOS POWER TRANSISTOR	04034	
B1	COAX 2:1 BALUN	08491	

REF.	DESCRIPTION	ELETTRONIKACODE	Page 3/3
B2	COAX 2:1 BALUN	08491	
B3	COAX 4:1 BALUN	08492	
B4	COAX 4:1 BALUN	08492	
L1	4 TURNS SILV. COP. WIRE 1.2mm WOUND ON OD 5mm	07684	
L2	4 TURNS SILV. COP. WIRE 1.2mm WOUND ON OD 5mm	07684	
L3	½ TURN COIL		
L4	½ TURN COIL		
H1	HYBRID COUPLER 3dB 90° ANAREN	05368	
H2	HYBRID COUPLER 3dB 90° SAGE	05369	
NTC1	NTC 100KΩ PTH	00661	
NTC2	NTC 100KΩ PTH	00661	
IC1	DG419DY	04583	
IC2	DG419DY	04583	
DZ1	15V SMD ZENER DIODE	03135	
DZ2	15V SMD ZENER DIODE	03135	
DZ3	6.8V SMD ZENER DIODE	03137	
DZ4	6.8V SMD ZENER DIODE	03137	
DL1	SMD LED DIODE - RED -	03056	
DL2	SMD LED DIODE - RED -	03056	
PN964AR3	PCB	0643K	
	Torretta 3x10 f/f	V0774	
	Imballo velapack 200x125x50	09983	

DESCRIPTION

The control board performs all the logic and control functions of the amplifier. Both the RF and power supply parameters are continuously monitored in order to guarantee optimal performance in every working environment:

- amplifier supply voltages	Vdc;
- amplifier supply currents	Idc;
- power module working temperature	Temperature;
- amplifier forward RF power	FWD Power.
- amplifier reflected RF power	REF Power.

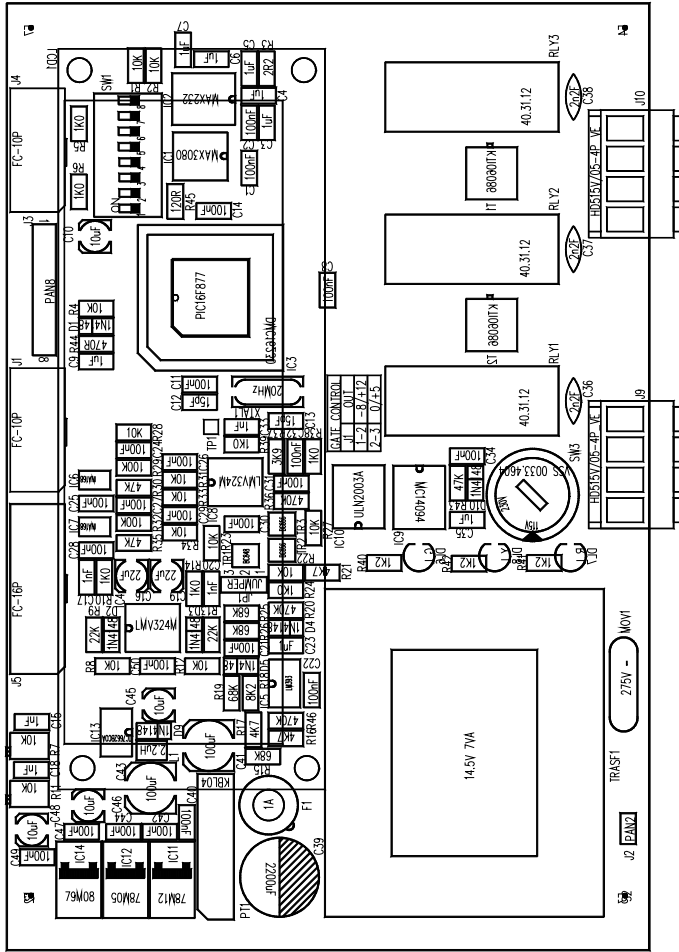
The board is based on a flash microcontroller working at a frequency of 20MHz, able to read the parameters, control the amplifier and communicate with any PC connected through RS232/RS485 line. Besides, the microcontroller is programmable, thus it is possible to change the internal program by connecting the appropriate programmer to the J3 connector and this to a computer. The boards contains a 16 characters x 2 lines display and two keys to change the parameter currently shown. There are also 3 different LEDs. The green LED indicates when the amplifier module is ON, the red one is lit when an alarm in occur and the yellow one indicates the remote control of the amplifier.

OPERATING CONTROL


As indicated in the previous section, the boards is able to read in real time all the necessary parameters to control the amplifier. When the operator turns the amplifier on the display shows the software release number. After a few seconds the amplifier is switched on and the first parameter shown on the display is the forward RF power ("**FWD Power**").

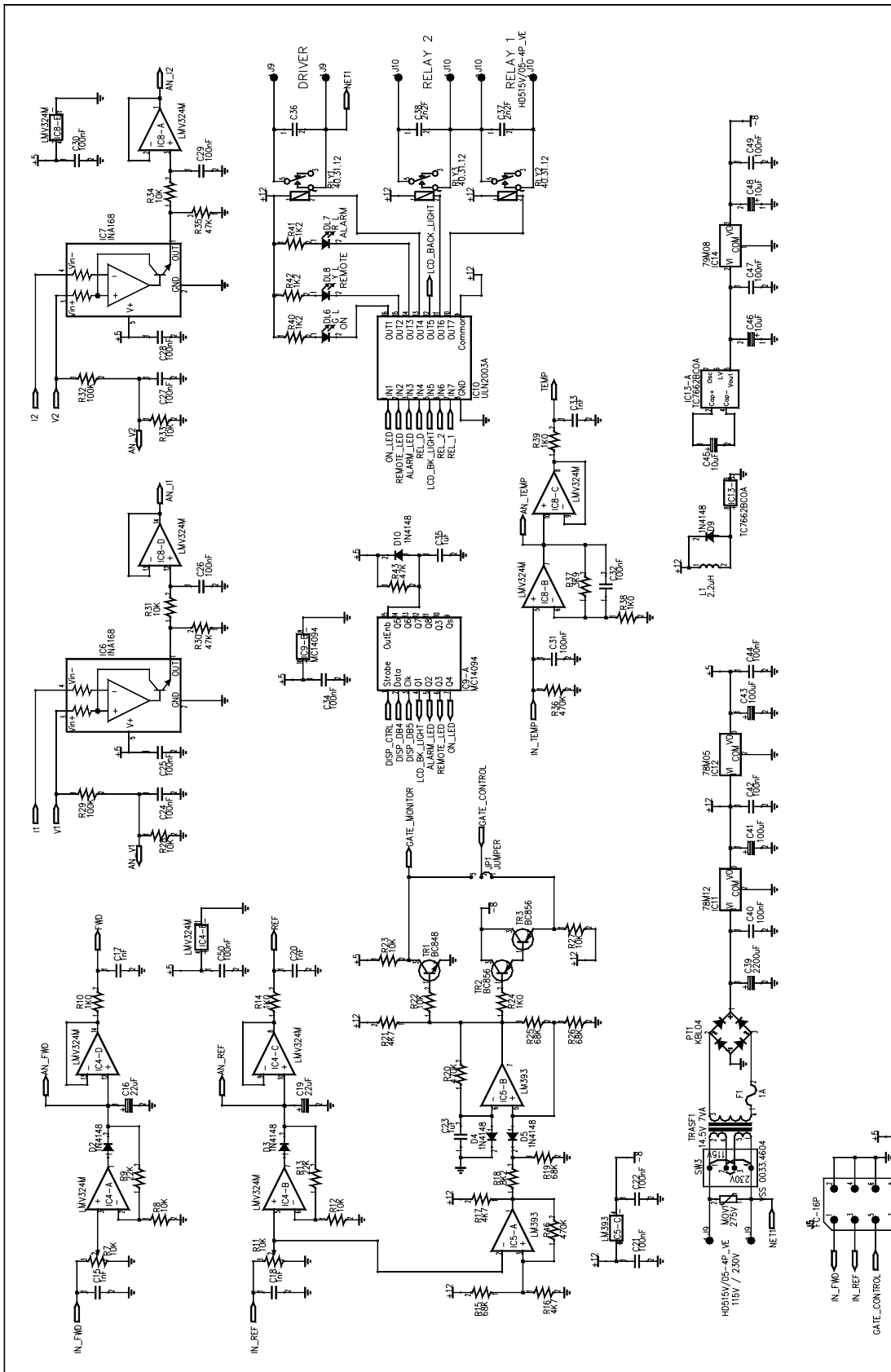
When a value read is out of the allowed boundaries, the microcontroller activates (after five scans to be sure) the corresponding alarm indicating this on the first line of the display, and showing on the second line the physical value. When the alarm is active, the microcontroller switches the amplifier off and restarts the time counter (3 and 6 seconds). The microcontroller internally stores the number of occurred alarms and if it reaches 5 the whole equipment is definitively switched off. In this case, if the operator needs to restart the machine, it is necessary to switch it off and on again (locally o by remote). When the machine is working normally on the first line shows "TV AMPLIFIER UHF" and the second line shows the parameter with the format "parameter = xx.x *unit*". The two keys on the frontal panel allow to change the currently shown parameter: the left one goes to the next parameter and the right one goes back (in sequence Vdc, Vac, Temperature, Idc, FWD, REF). If the amplifier is switched off, the "STAND BY" indication is shown on the display and the backlight is turned off.

The amplifier can be remotely controlled by serial line (contact ELETTRONIKA for details). It is configurable as RS232 or RS485.



Note: When changing the voltage of the device from 230 to 110VAC, it also takes acting on the SW3 switch on the display board. Failure to do this may result in damages to the device.

 CODE SCH0122BR1	DESCRIPTION	ELECTRICAL DIAGRAM	DESIGNER	SIGNATURE	DATE
	TITLE	AMPLIFIER CONTROL BOARD MCU SECTION	DI MODUGNO PCB DESIGNER	TULLO	
					REF: PN0894BR2.SCM
					SHEET 1/1



	DESCRIPTION	ELECTRICAL DIAGRAM		DESIGNER	DI MODUGNO	SIGNATURE	DATE	28/05/02
	TITLE	AMPLIFIER CONTROL BOARD INPUTS SECTION		PCB DESIGNER	TULLO	SIGNATURE	REF:	PN0894BR2
CODE	SCH0122BR1						SHEET 2 / 2	

COMPONENT LIST SCH0122BR1

Part Name/Number	Description	Qty.	Comps.	Page 1/2
CC 100nF-S 01065C	01065C Y5V 1206 COND	23	C1-2, C8, C11, C14, C21, C22, C24-32, C34, C40, C42, C44, C47, C49-50	
CC 15pF-S 01088	01088 SMD 1206 COND	2	C12-13	
CC 1nF-S 01096	01096 SMD 1206 COND	5	C15, C17-18, C20, C33	
CC 1uF100V-S 01760A	01760A Y5V 1206 COND	8	C3-7, C9, C23, C35	
CC 2nF2 2kV 01045A	01045A CERAMIC COND	3	C36-38	
CE 100uF25V-S 01793B	01793B ELETTR SMD COND	2	C41, C43	
CE 10uF35V-S 01778A	01778A ELETTR SMD COND	4	C10, C45-46, C48	
CE 2200uF25V 01813	01813 ELETT. COND.	1	C39	
CE 22uF16V-S	01780A ELETTR SMD COND	2	C16, C19	
D 1N4148-S 03002	03002 SMD DIODE	7	D1-5, D9-10	
DB KBL04 03042	03042 BRIDGE DIODE	1	PT1	
DIS DMC16230 03072B	03072B DISPLAY	1	LCD1	
DL LEDG5 03060	03060 GREEN LED DIODE 5mm	1	DL6	
DL LEDR5 03061	03061 RED LED DIODE 5mm	1	DL7	
DL LEDY5 03054B	03054B YELLOW LED DIODE 5mm	1	DL8	
FUSE 1A MICRO FUSE	FUS00007 + FUS00006 PORTAFUSI	1	F1	
IC 78M05 04301B	04301B SMD VOLTAGE REGULATOR	1	IC12	
IC 78M12 4307B	04307B SMD VOLTAGE REGULATOR	1	IC11	
IC 79M08 04304A	04304A SMD VOLTAGE REGULATOR	1	IC14	
IC INA168	04600A SMD INTEG CIRCUIT	2	IC6-7	
IC LM393-S 04639	04639 SMD INTEG CIRCUIT	1	IC5	
IC LMV324M-S 04658B	04658B SMD INTEG CIRCUIT	2	IC4, IC8	
IC MAX232-S 04804B	04804B SMD INTEG CIRCUIT	1	IC2	
IC MAX3080-S 04770	04770 SMD INTEG CIRCUIT	1	IC1	
IC MC14094BD 04718	04718 SMD INTEG CIRCUIT	1	IC9	
IC PIC16F877 4869	04869 + 07509C INTEG CIRCUIT	1	IC3	
IC TC7662BCOA 04758A	04758A SMD INTEG CIRCUIT	1	IC13	
IC ULN2003A 4870	04870 SMD INTEG CIRCUIT	1	IC10	
IND 2u2H-S 05020A	05020A INDUCTOR	1	L1	
J CON HD515V/05-4PVE	02881 + 02882 PANDUIT PCB CONN	2	J9-10	
J FC-10P 02697-02699	02697+02699 PCB CONNECTOR POL	2	J1, J4	
J FC-16P 02701-02700	02701+02700 PCB CONNECTOR POL	1	J5	
J PAN2 02739-40-41	02739+02740+02741 PCB CONNECTO	1	J2	
J PAN8 02716-17-18	02716+02717+02718 PCB CONNECTO	1	J3	
JU JUMP3 02707-02742	02707+02742 MASCHIO PAN3	1	JP1	
MOV 275V	00951A VARISTORE	1	MOV1	
R 100K-1%-S 00065B	00065B RES 1/4W 1% SMD 1206	2	R29, R32	
R 10K-1%-S 00053B	00053B RES 1/4W 1% SMD 1206	12	R1-2, R4, R8, R12, R22, R23, R27-28, R31, R33, R34	
R 120R-S 00030A	00030A RES 1/4W 5% SMD 1206	1	R45	

Part Name/Number	Description	Qty.	Comps.	Page 2/2
R 1K0-1%-S 00041B	00041B RES 1/4W 1% SMD 1206	7	R5-6,R10,R14,R24,R38, R39	
R 1K2-1%-S 00042A	00042A RES 1/4W 1% SMD 1206	3	R40-42	
R 22K-1%-S 00057B	00057B RES 1/4W 1% SMD 1206	2	R9,R13	
R 2R2-S	00009A RES 1/4W 5% SMD 1206	1	R3	
R 3K9-1%-S 00048B	00048B RES 1/4W 1% SMD 1206	1	R37	
R 470K-S 00073A	00073A RES 1/4W 5% SMD 1206	3	R20,R36,R46	
R 470R-1%-S 00037B	00037B RES 1/4W 1% SMD 1206	1	R44	
R 47K-1%-S 00061B	00061B RES 1/4W 1% SMD 1206	3	R30,R35,R43	
R 4K7-1%-S 00049B	00049B RES 1/4W 1% SMD 1206	3	R16-17,R21	
R 68K-1%-S 00063B	00063B RES 1/4W 1% SMD 1206	4	R15,R19,R25-26	
R 8K2-1%-S 00052B	00052B RES 1/4W 1% SMD 1206	1	R18	
RL 40.31.12 07567	07567 RELE	3	RLY1-3	
RV 10K-3266X 00807	00807 VARIABLE RESISTOR	2	R7,R11	
SW SWITCH-8DIP	07530A PCB DIP SWITCH	1	SW1	
SW VSS 0033.4604	07519A CAMBIO TENSIONE SERIALE	1	SW3	
T 06086 N 7630 7632	7630 7632 KTI06086 PULSANTE 2	2	T1-2	
TR BC848 03457	03457 NPN SMD TRANSISTOR	1	TR1	
TR BC856 03455	03455 PNP SMD TRANSISTOR	2	TR2-3	
TRASF TRASF 14V5 7VA	09597 TRASFORMATORE 110+110 PE	1	TRASF1	
XTAL 20MHz-S	CXS00001 QUARTZ	1	XTAL1	

COMPONENT LIST *SCH0128A1*

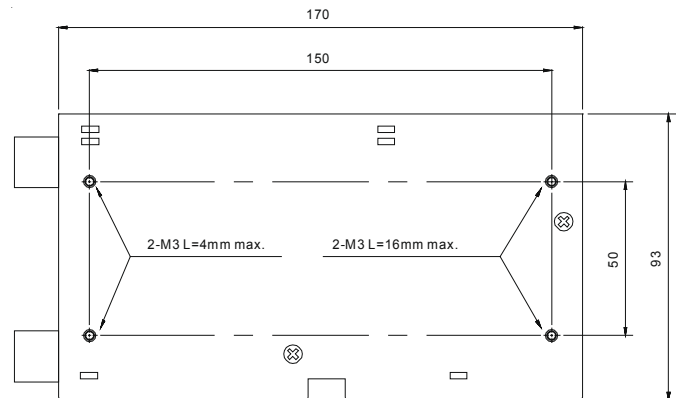
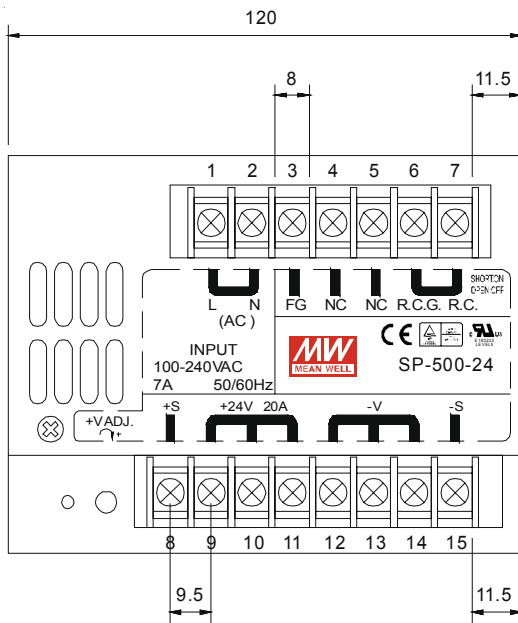
Part Name/Number	Description	Qty.	Comps.
CC 100nFAVX 01065A	01065A CERAMIC COND	4	C1-4
D 1N4007 03009	03009 DIODE	2	D1-2
IC LM317HV	04340A INTEG CIRCUIT	1	IC1
IC LM35DT 00664	00664 INTEG CIRCUIT	1	IC2
J FC-16P 02701-02700	02701+02700 PCB CONNECTOR POL	1	J2
J SCREWCONN2 02853	02853 PCB SCREW CONNECTOR	1	J1
JU JUMP2 02739-02742	02739+02742 MASCHIO PAN2	2	JP1-2
R 0R02	RES 20W 1%	2	R1 R7
R 220R 0033	0033 RES 1/4W 5%	1	R3
R 270R 0034	0034 RES 1/4W 5%	1	R2
R 4K7 0049	0049 RES 1/4W 5%	1	R4
R R400m NOT MOUNTED	NOT MOUNTED	2	R5-6



MAIN FEATURES

- Universal AC input / Full range
- Built-in active PFC function, PF>0.95
- Protections: Short circuit / Over load / Over voltage / Over temp.
- Forced air cooling by built-in DC fan
- Built-in cooling Fan ON-OFF control
- Built-in remote sense function
- Fixed switching frequency at 110kHz

MECHANICAL SPECIFICATION



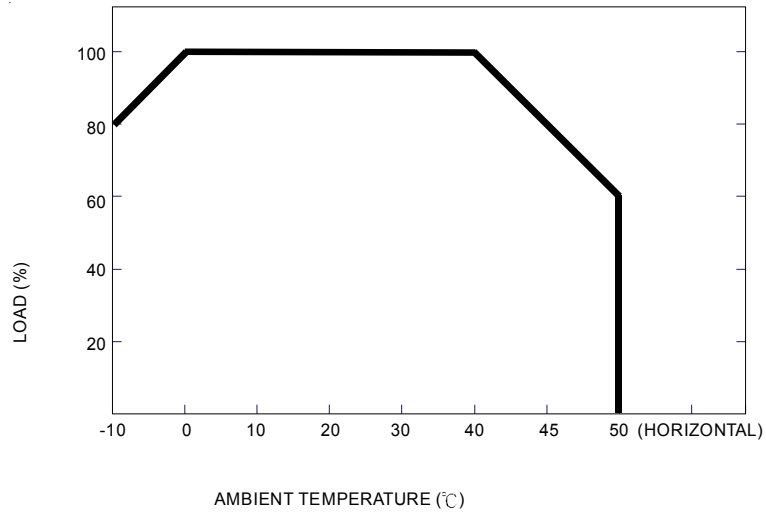
PIN N°	ASSIGNMENT	PIN N°	ASSIGNMENT
--------	------------	--------	------------

1	AC/L	7	R.C.
2	AC/N	8	+S
3	FG \perp	9 ~ 11	DC OUTPUT +V
4, 5	NC	12 ~ 14	DC OUTPUT -V
6	R.C.G.	15	-S

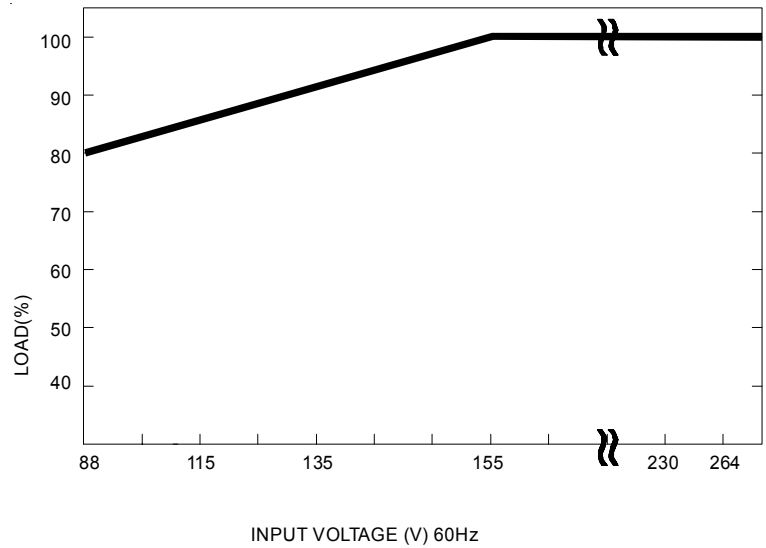
TECHNICAL CHARACTERISTICS

MODEL		SP500-27	SP500-48
OUTPUT	DC VOLTAGE	27V	48V
	RATED CURRENT	18A	10A
	CURRENT RANGE	0 ~ 18A	0 ~ 10A
	RATED POWER	486W	480W
	RIPPLE & NOISE (max.) Note 2	200mVp-p	300mVp-p
	VOLTAGE ADJ. RANGE	24 ~ 30V	41 ~ 56V
	VOLTAGE TOLERANCE Note 3	± 1.0%	± 1.0%
	LINE REGULATION	± 0.5%	± 0.5%
	LOAD REGULATION	± 0.5%	± 0.5%
	SETUP, RISE, HOLD TIME	1500ms, 50ms, 20ms at full load	
INPUT	VOLTAGE RANGE	88 ~ 264VAC 124 ~ 370VDC	
	FREQUENCY RANGE	47 ~ 63Hz	
	POWER FACTOR	PF>0.95/230VAC PF>0.95/115VAC at full load	
	EFFICIENCY (Typ.)	86.5%	87%
	AC CURRENT	7A/115VAC 3.5/230VAC	
	INRUSH CURRENT (Max.)	18A/115VAC 36A/230VAC	
	LEAKAGE CURRENT	<3.5A/240VAC	
PROTECTION	OVER LOAD	105 ~ 135% rated output power Protection type: Fold back current limiting, recovers automatically after fault condition is removed	
	OVER VOLTAGE	31 ~ 36.5V	57.6 ~ 67.2V
		Protection type: Hiccup mode, recovers automatically after fault condition is removed	
	FAN CONTROL O.T.P.	RTH1 or RTH2 >= 50°C FAN ON, <= 45°C FAN OFF, >= 70°C output shutdown	
FUNCTION	REMOTE CONTROL	RC+/RC-: Short = power on; Open = power off	
ENVIRONMENT	WORKING TEMP.	-10 ~ +50°C (Refer to output load derating curve)	
	WORKING HUMIDITY	20 ~ 90% RH non-condensing	
	STORAGE TEMP., HUMIDITY	-20 ~ +85°C, 10 ~ 95% RH	
	TEMP. COEFFICIENT	± 0.03%/°C (0 ~ 50°C)	
	VIBRATION	10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes	
SAFETY & EMC (Note 4)	SAFETY STANDARDS	UL1950, TUV EN60950 Approved	
	WITHSTAND VOLTAGE	I/P-O/P:3KVAC I/P-FG:1.5KVAC O/P-FG:0.5KVAC	
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-GD:100M Ohms/500VDC	
	EMI CONDUCTION & RADIATION	Compliance to EN55022 (CISPR22) Class B	
	HARMONIC CURRENT	Compliance to EN61000-3-2,-3	
	EMS IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11; ENV50204, Light industry level, criteria A	
OTHERS	MTBF	133.4K hrs min. MIL-HDBK-217F (25°C)	
	DIMENSION	170*120*93mm (L*W*H)	
	PACKING	1.9kg; 8pcs/15.2kg/1.06CUFT	

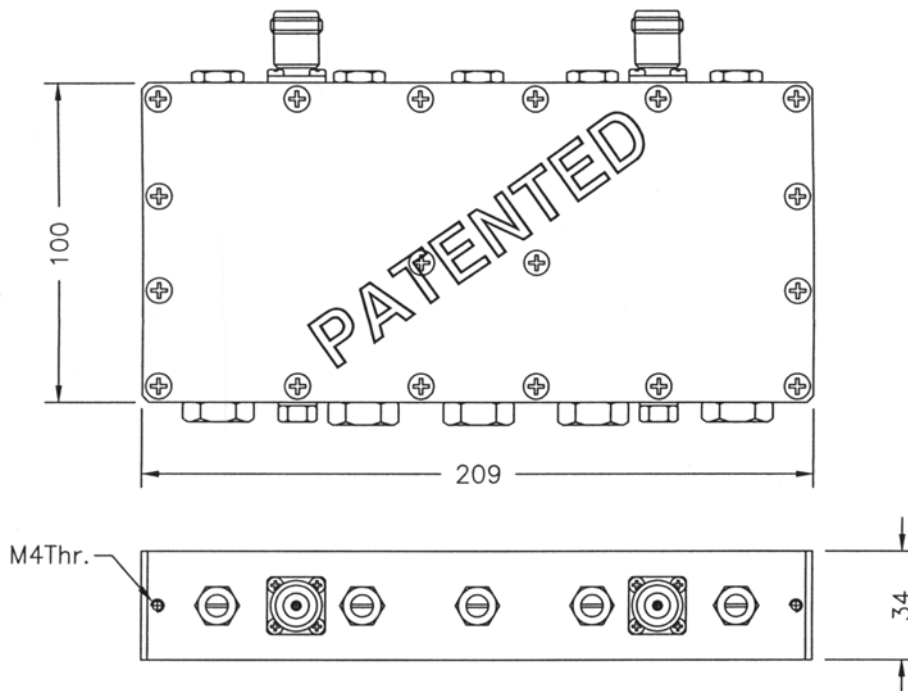
DERATING CURVE



OUTPUT DERATING VS INPUT VOLTAGE



3 SECTION BANDPASS FILTER WITH 2 NOTCH ELEMENTS - COMB-LINE STRUCTURE, INDUCTIVE COUPLING IRISES; CONSTANT BANDWIDTH, VERY EASY TO TUNE - EXACT GENERALIZED CHEBISHEV DESIGN GIVING MAXIMUM SELECTIVITY AND MINIMUM GROUP DELAY VARIATION.



SPECIFICATIONS

Frequency	470 - 860MHz
Connectors	N
Insertion loss	0.55dB Typ. @ V.C.
Return loss	26dB
Operating temperature	-10° to +50°C
Bandwidth	8MHz
Selectivity @V.C.-5.5/+11	-30dB
Selectivity @V.C.-11/+16.5	-22dB
Weight	1.2kg

TECHNICAL DESCRIPTION

The output UHF filter is made up of a resonators bandpass filter and two notches. It can be regulated on all the channels of UHF TV band (470 - 8690MHz) and according to all world-wide standards (intercarrier 4.5 - 6.5MHz). The bandpass section is composed by the three middle resonators, while the two resonators apart are the notches. The filter is symmetrical, therefore the choice of lowest and highest notch is indifferent. The bandwidth and the notch depth are predetermined, so they don't need any regulation.

The input/output coupling are regulated by means of the two screws which are in position opposed to every connector. The regulation is carried out with a screwdriver, considering that when the screw lines are parallel to the longer side of the filter the coupling is maximum, otherwise if orthogonal it is minimum. The twist friction of the couplings can be set acting on the hexagonal clamps with a no. 12 key.

TUNING INSTRUCTIONS

The advised sequence is the following:

1. Set the instrument state as follows:

- C.F. = (V.C. + S.C.) / 2
- SPAN = INTERCARRIER * 5 (E.G. 27,5MHz std. B/G)
- TRANSMISSION SCALE = 5dB/div.
- REFLECTION SCALE = 5dB/div.

2. Turn the bandpass section on the required channel, and match input and output until a correct response is achieved. During this step keep the tunings of the two notches well far away from the response. Fit the curve at the center of the screen, so as to get the same attenuation at the borders. The input/output couplings can influence the external resonators, therefore it will be necessary to repeatedly fix the former after the latter in small steps.

3. Tune the two notches to P.V.-INTERCARRIER and P.A.+INTERCARRIER frequencies. This will vary the response and matching.

4. Adjust the bandpass external tunings. The lower notch side tuning shall be a little unscrewed, whereas the upper notch side tuning will have to be screwed.

5. Enhance a little the lower notch side coupling (the coupling screw toward the filter length). Improve the calibration alternatively acting on two sides according to this sequence: regulate the couplings, re-tune

notches if it has to be moved and then the bandpass tunings. Execute the sequence in small steps aiming to improve the matching.

SPECIFICATION OVER THE UHF BAND

MEASURE	VALUE
Insertion loss @ V.C.	< 0.65dB (Typ. 0.56)
Return Loss (from V.C.-0.75 to S.C.+0.25)	> 26dB
Attenuation @ V.C.-INTERCARRIER	> 25
Attenuation @ V.C.+INTERCARRIER	> 20
Date	D.T.

SAMPLE FREQUENCY RESPONSE DIAGRAM

