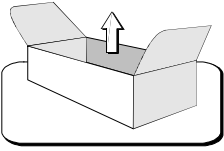


Section 2 - Installation

Contents:

- 2.1 Operating environment*
- 2.2 Preliminary operations*
- 2.3 Telemeasuring socket connections*
- 2.4 RS232 and RS485 socket connections*
- 2.5 SCH0005AR1 Calibration procedure*
- 2.6 Preventive maintenance*
 - Front panel*
 - Rear panel*



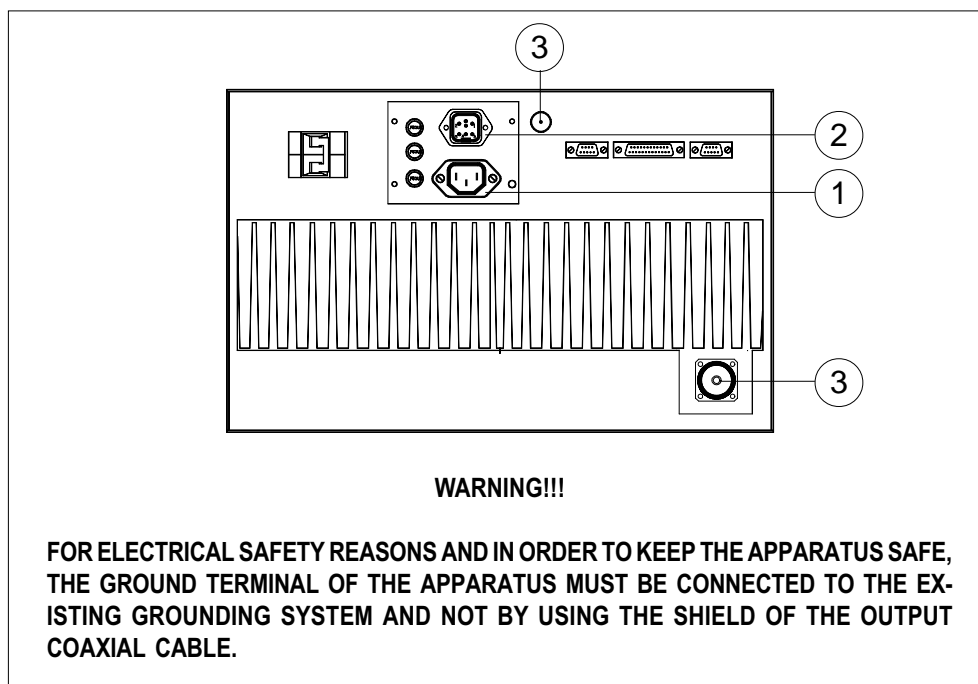
2.1 OPERATING ENVIRONMENT

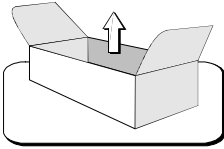
You can install the apparatus in a standard component rack or on a suitable surface such as a bench or desk. In any case, the area should be as clean and well-ventilated as possible. Always allow for at least 2 cm of clearance under the unit for ventilation. If you set the apparatus on a flat surface, 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 (230VAC). If there is the Isolator Transformer, the amplifier is provided with cable and plug;
3. connect the exciter / antenna cable to the RF IN and RF OUT on the rear panel of the amplifier.





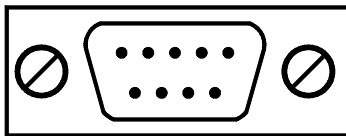
When the apparatus is put within a combined system it is directly connected to the input splitting and output combining systems.

Before fully powering 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 watts might be shown as reflected power.

2.3 TELEMEASURING SOCKET CONNECTIONS

The following table summarizes the Telemeasuring pin connections.



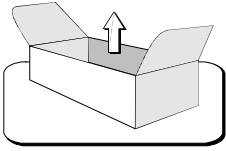
DB9 Socket

N° Pin	SYGNAL TYPE	IN/OUT	FUNCTION
1	Ground		
2	Logical	Input	5V= On - 0V= Off
3	Analog	Output	Dir Power
4	Analog	Output	Ref Power
5	Analog	Output	Unbalancing
6	Analog	Output	Temperature
7	Analog	Output Alarm	5V= On - 0V= Off
8	N.C.		
9	N.C.		

2.4 RS232 AND RS485 SOCKET CONNECTIONS

The connector DB25 may be configured as RS232 or RS485 socket, depending on the position of the jumpers on the board. In case it is used as RS232 socket, the jumpers JP3, JP4, JP5 and JP6 have to be positioned towards the serigraphy “RS232”. If the jumpers JP1 and JP2 are placed in “N” position, the following configuration is obtained:

PIN	2	3	5	6	7	8	20
FUNCTIONS	RxD	TxD	RTS	12V	GND	12V	12V



If the jumpers JP1 and JP2 are put in “M” position, the following configuration will be obtained:

PIN	2	3	4	5	6	7	20
FUNCTIONS	TxD	RxD	RTS	CTS	12V	GND	12V

In order to use the connector as RS485 socket, the jumper JP3, JP4, JP5 and JP6 have to be positioned towards the serigraphy “RS485”. In this way, the following configuration will be obtained:

PIN	2	3	4	5	6	7	20
FUNCTIONS	Rx+	RX-	TX-	TX+	12V	GND	12V

2.5 SCH0005AR1 CALIBRATION PROCEDURE

WARNING: this procedure is very delicate, so be **VERY CAREFUL** in order to avoid damaging the equipment !!!

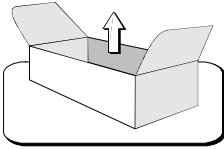
First of all turn on the equipment with the correct antenna connection, and then perform the following steps:

- *Power supply voltages and currents calibration*

Measure with a tester the voltage V_{dr1} on the power supply of the first driver transistor without loading the power supply (this can be done by disconnecting the six supply wires from the RF power modules). Verify that it is 29V. Then take the *calibration load* (consisting of five $47\Omega/20W$ resistors connected in parallel) and connect it between the positive power supply terminal (corresponding to V_{dr1}) and ground. Turn the trimmer R1 until you read on the display V_{dr1} equal to the value measured before with the tester. Then turn the trimmer R22 until you read on the display $I_{dr1} = 3.1A$.

Repeat the procedure above for the power supply of the second driver stage: measure with the tester the voltage V_{dr2} and turn the trimmer R3 and R27 until you read on the display the correct values.

Measure with a tester the voltage V_1 on the power supply of the first final power transistor. Verify that it is



around 32V. Then take the *calibration load* and connect it between the positive power supply terminal (corresponding to V1) and ground. Turn the trimmer R5 until you read on the display V1 equal to the value measured before with the tester. Then turn the trimmer R33 until you read on the display $I_{dr1} = 3.4A$.

Repeat the procedure above for the power supplies of the remaining three power transistors: measure with the tester the voltages V2-V3-V4 and turn the trimmers R7-R9-R11 until you read on the display the correct values measured.

To calibrate the remaining currents readings, you have to connect the calibration load to the other three power supplies (not all together, but one at a time!) and then turn the trimmers R39-R45-R51 until you read on the display $I_2=I_3=I_4= 3.4A$.

- Temperature calibration

Measure with a tester the voltage of the OUT pin of the integrated temperature sensor mounted on the heat dissipating element. Then perform the operation explained in this example:

- voltage measured (for example) = 2.93V
- fixed number = 2.73
- perform subtraction: $2.93-2.73 = 0.20$

If you get a result of 0.20, it means that the temperature is 20°C, so you have to turn the trimmer R102 until you read TEMP = 20°C.

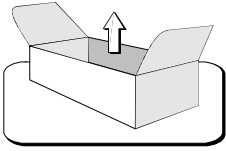
- Forward power calibration

Disconnect the antenna and connect a wattmeter (with a suitable dummy load!) to the antenna connector. Put the cover on the amplifier module and then give power to the equipment until you read 1000W on the wattmeter. Then turn the trimmer R96 until you read FWD = 1000W (approximately).

- Reflected power calibration

To perform the reflected power calibration just disconnect the REF SMB (J6) and the FWD SMB (J7) connectors from the control board and connect the forward power reading cable to J6 (REF). Give 50W of forward power to the equipment and turn the R97 trimmer until you read on the display REF = 50W.

Note: When you have completed this calibration be sure to restore the original connections on the control board!



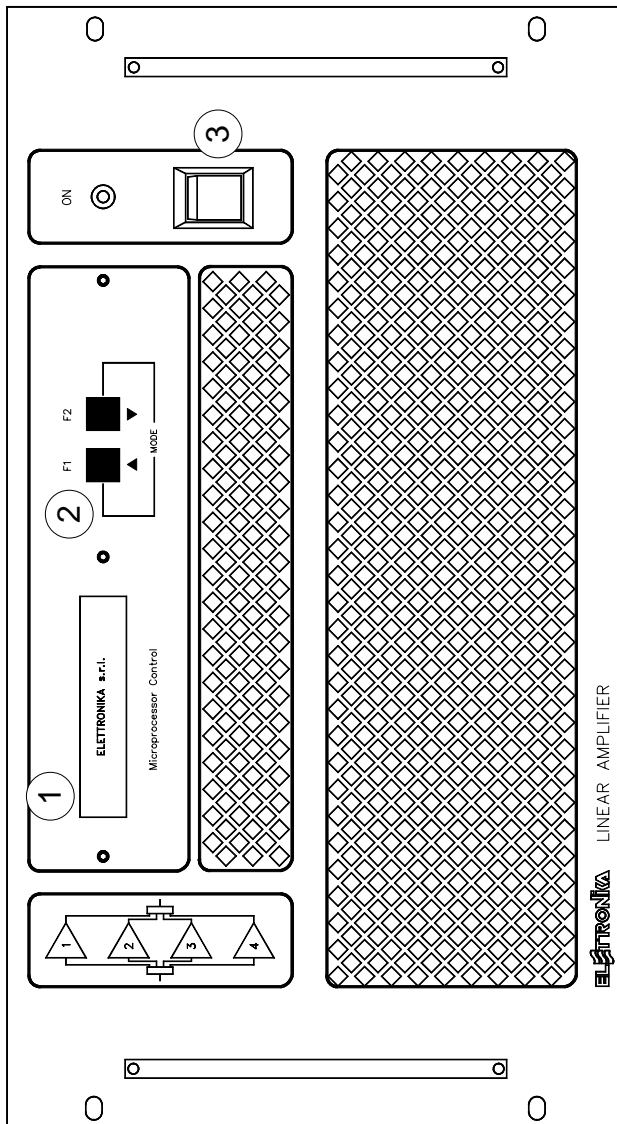
To ensure the best reliability for the board operations it is advisable that you turn the unused trimmers (those corresponding to the unused readings connectors) counterclockwise until they reach the zero position (you will hear a click).

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 technician to give the apparatus and the complete antenna/earth connection installation a general check every 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.

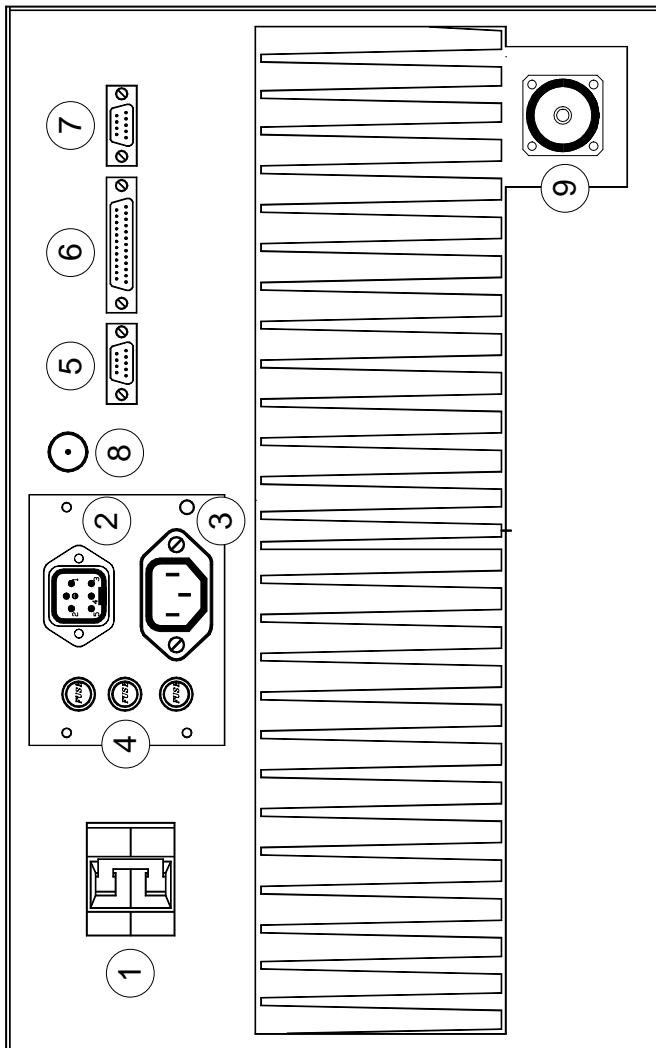
Front panel



DESCRIPTION

1	LCD Display
2	Function keys
3	Main switch

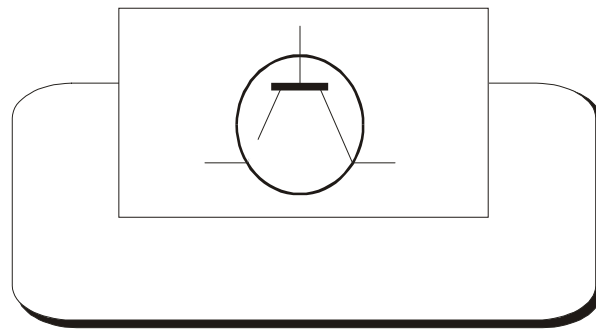
Rear panel



DESCRIPTION

1	Breaker
2	Power supply socket *
3	Driver supply
4	Fuse
5	I ² C BUS Socket
6	RS232 Socket
7	Telemeasuring socket
8	RF Input connector
9	RF Output connector

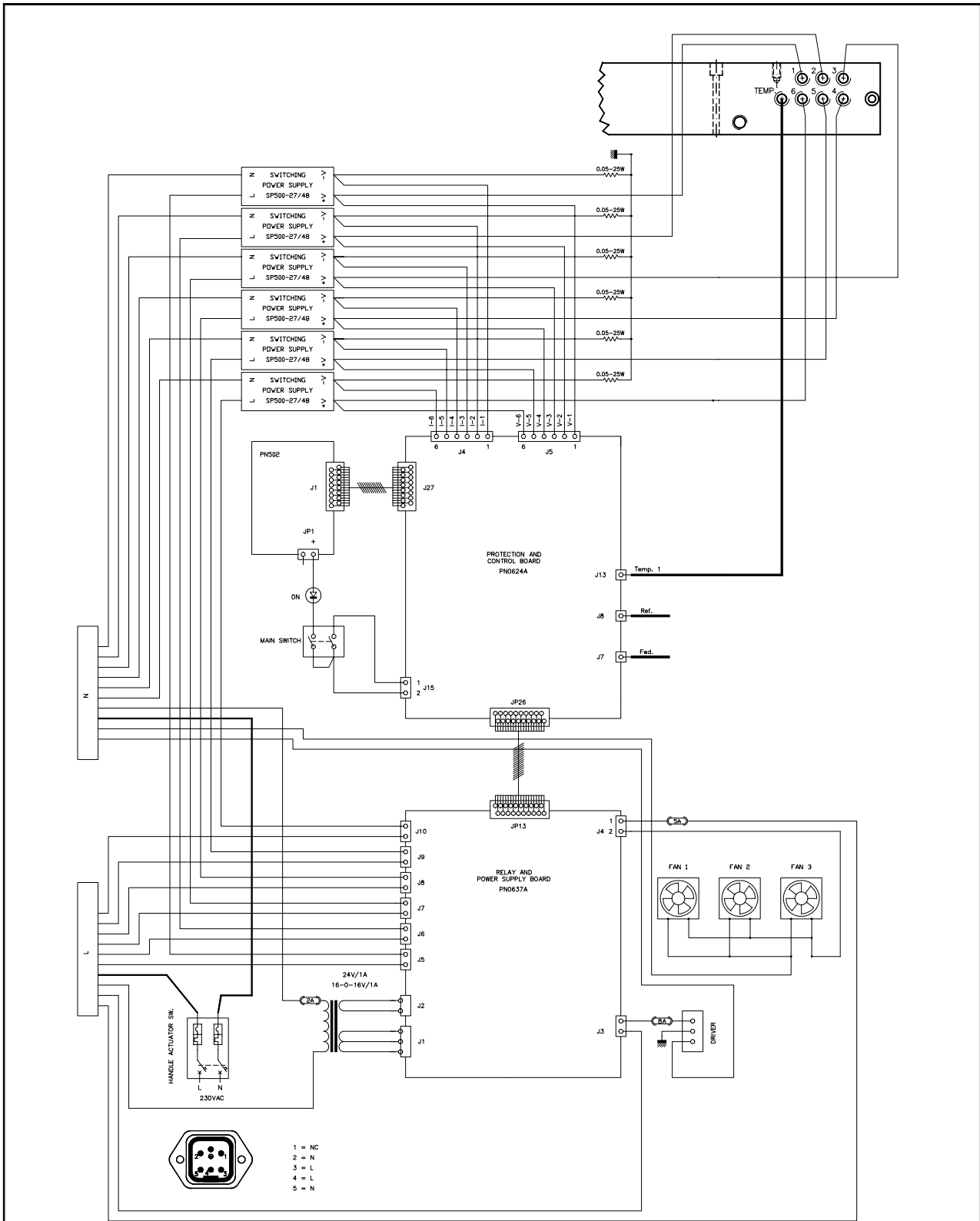
If there is the Isolator Transformer, the amplifier is provided with cable and plug.




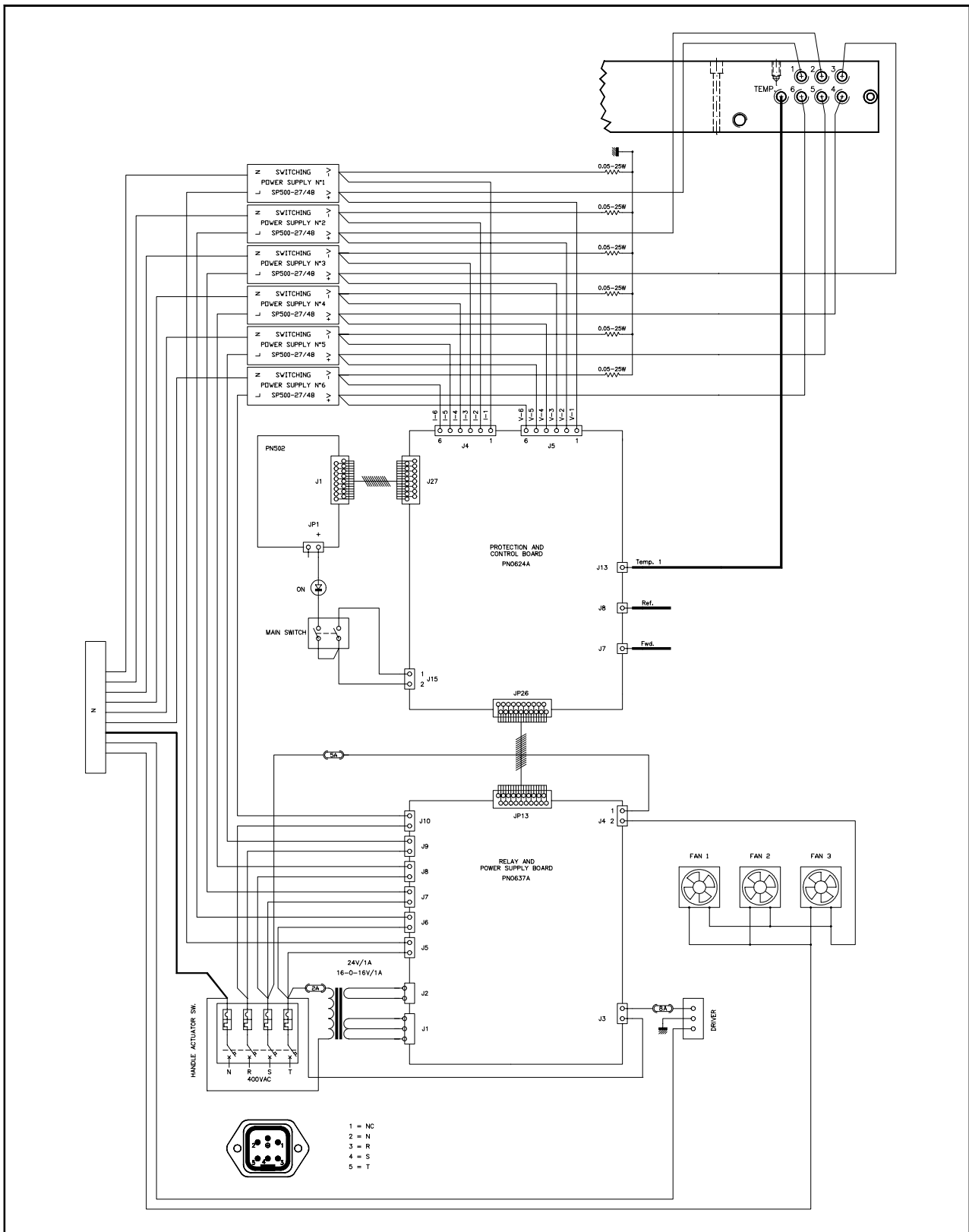
Section 3 - Diagram


Contents:

- *Cable diagrams*
- *SCH0005AR1 (Protection board)*
- *SCH0004AR0 (Relay board)*
- *PN502 (Display board)*
- *MTF0050AR0 (1kW LDMOS Power module)*
- *SP500-27/48 (Switching power supply)*
- *06641 (UHF Band-pass filter)*



	DESCRIPTION	DESIGNER	Sign.	DATE
	TITLE	PCB DESIGNER	Sign.	REF
CODE		QUALITY CONTROL	Sign.	SHEET
APT084ASF	WIRING DIAGRAM	MASTORILLI		04/12/01
	1000W LDMOS	LAPIETRA		-----
				1 OF 1



	DESCRIPTION	DESIGNER	Sign.	DATE
	TITLE	MASTROILLI		04/12/01
CODE APT084AST	WIRING DIAGRAM 1000W LDMOS - 3P+N	PCB DESIGNER	Sign.	REF
		QUALITY CONTROL	Sign.	SHEET
		LAPIETRA		----

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Component list**APT084ASF - AUTV/1000LD**

Part Name Code	Description	Qty
MTF0050AR0	MODULO 1kW UHF LDMOS	1
16009	SCHEDA DISPLAY x 1kW FM A MOSFET	1
SCH0005AR1	SCHEDA CONDIZ. PROTEZ. PIC PN624AR2	1
SCH0004AR0	SCHEDA UNITÀ 8 RELAYS PN637A	1
E0012	ALIM. SWITCHING SP-500-27	6
07522	INTERRUTTORE LUM. cod. I4715	1
07541	PORTAFUS. 10A PANN. cod. P1820	3
02830	PRESA VDE 10A cod. PX675 A63	1
Z0081	TAV... SUPPOR. GUIDA DIN INT. MAG.	1
07527	INTERR. MAGNETOTERM. 25A cod. 23867	1
Z0021	TAV. 635/A TOND. OTT. x INT. MAGNET.	2
03065	PORTALED 5mm INNESTO A VITE 443.1613	1
03060	LED VERDE DIAM. 5mm	1
09546	TOR. P. 110/220 S.24V 1.5A 16/0/16 1A	1
02518	R114082000 PRESA SMB x RG174	3
08500	CAVORG174 50Ω	4
02876	PRESA VOLANTE ILME 16A PENTAPOLARE 3mt	1
02877	SPINA A PANNELLO ILME 16A PENTAPOLARE	1
02228	GE 15145 D/60 NF A VITONE	1
02502	J01150A0041 SMA x RG58/c	1
08503	CABLE RG303 50Ω	1,40
V0962	MORSETTIERA/GIUNZIONE ELECO E806	2
07925	PROTEZIONE IN GOMMA PVC PG 075	1
V0970	MORSETTIERA/EQUIPOTENZIALE 44672	2
07605C	VENTOLA D2E097-CB01-02	3
07605D	COND. 1,5uF 400V	3
FUS8A	FUSIBILI 8A 5x20 RITARDATI CT520280	1
FUS5A	FUSIBILI 5A 5x20 RITARDATI ST520250	1
FUS02A	FUSIBILI 2A 5x20 RITARDATI ST520220	1
CON0109	CON0109R1 LAT. 6U SX PROF. 755 x 1kW LDMOS	1
CON0110	CON0110R1 LAT. 6U DX PROF. 755 x 1kW LDMOS	1
CON0014	CON0014R5 POSTERIORE 6U 1.5kW FM ZN	1
05861	PANN. 6U TAV. 970/A AMPL. FM GRIGIO	1
05553B	KIT MANIGLIE 5-6U cod. 235.013	2
Z0673	TAV. 1199 CHIUS. CONT. PROF. 775 ZN	2
CON0015	CON0015R5 CONVOGLIATORE 1.5kW FM ZN	1
DET0135	DET0135R0 SUPPORTO SCHEDA PN624	1
DET0516	DET0516R0 SUPPORTO PRESE ZN	1
DET0513	DET0513R0 SUPPORTO COND. VENTOLE	1
DET0514	DET0514R0 ANGOLARE x VENTOLE	1
DET0515	DET0515R1 PART. FISSAGGIO VENTOLE	6
CON0111	CON0111R0 SOSTEGNO VENTOLE ZN	1
DET0575	DET0575R1 BARRA FISSAGGIO ALIM. SP500	6
SCH0168AR1	PATCH PER PN0624A	1

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DESCRIPTION

(Stand-alone configuration)

The SCH0005AR1 board is a microprocessor-based board designed to perform all the control functions inside the amplifier module.

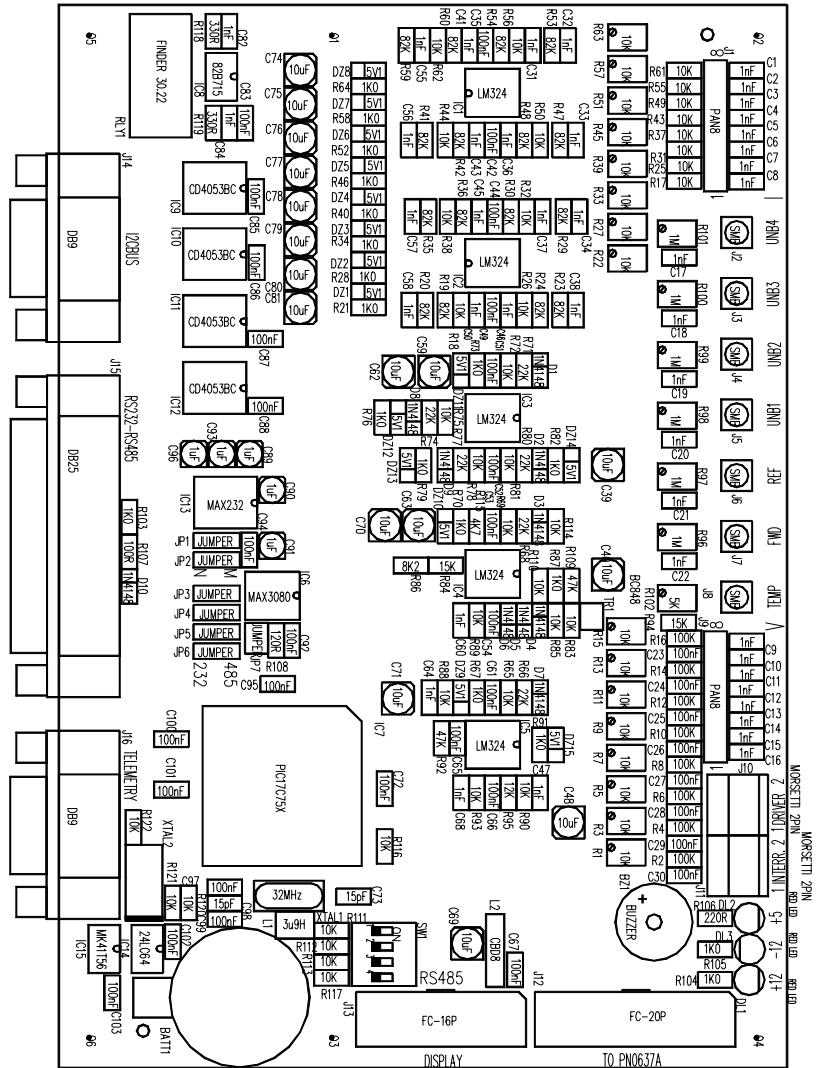
Both RF and power supply parameters are continuously monitored in order to guarantee optimal performance in every working environment.

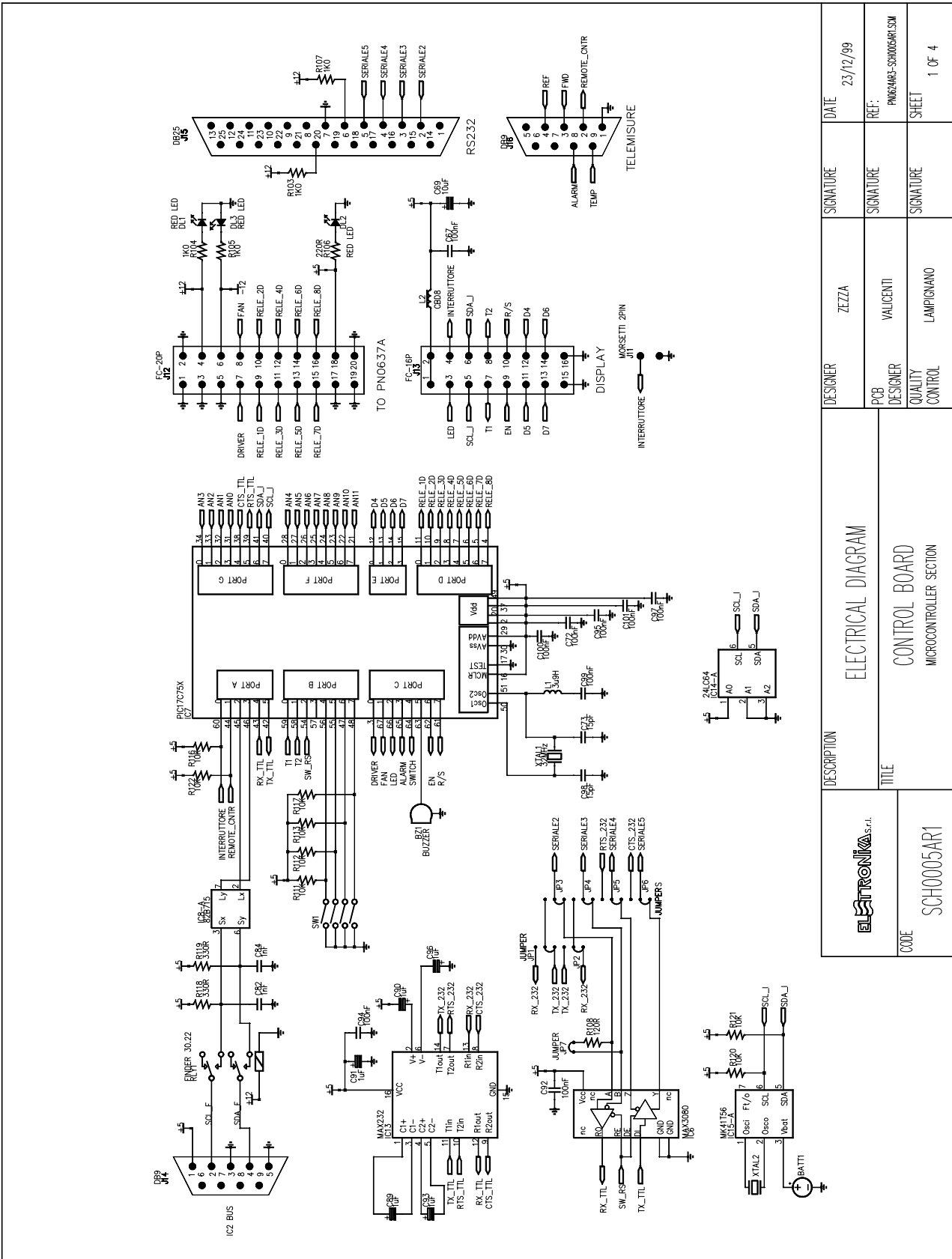
The board checks the power supply voltages and currents, the working temperature of the power modules, the forward and the reflected RF power of the amplifier.

Various alarm conditions can be detected by the board due to possible electrical failures during normal operation of the amplifier module.

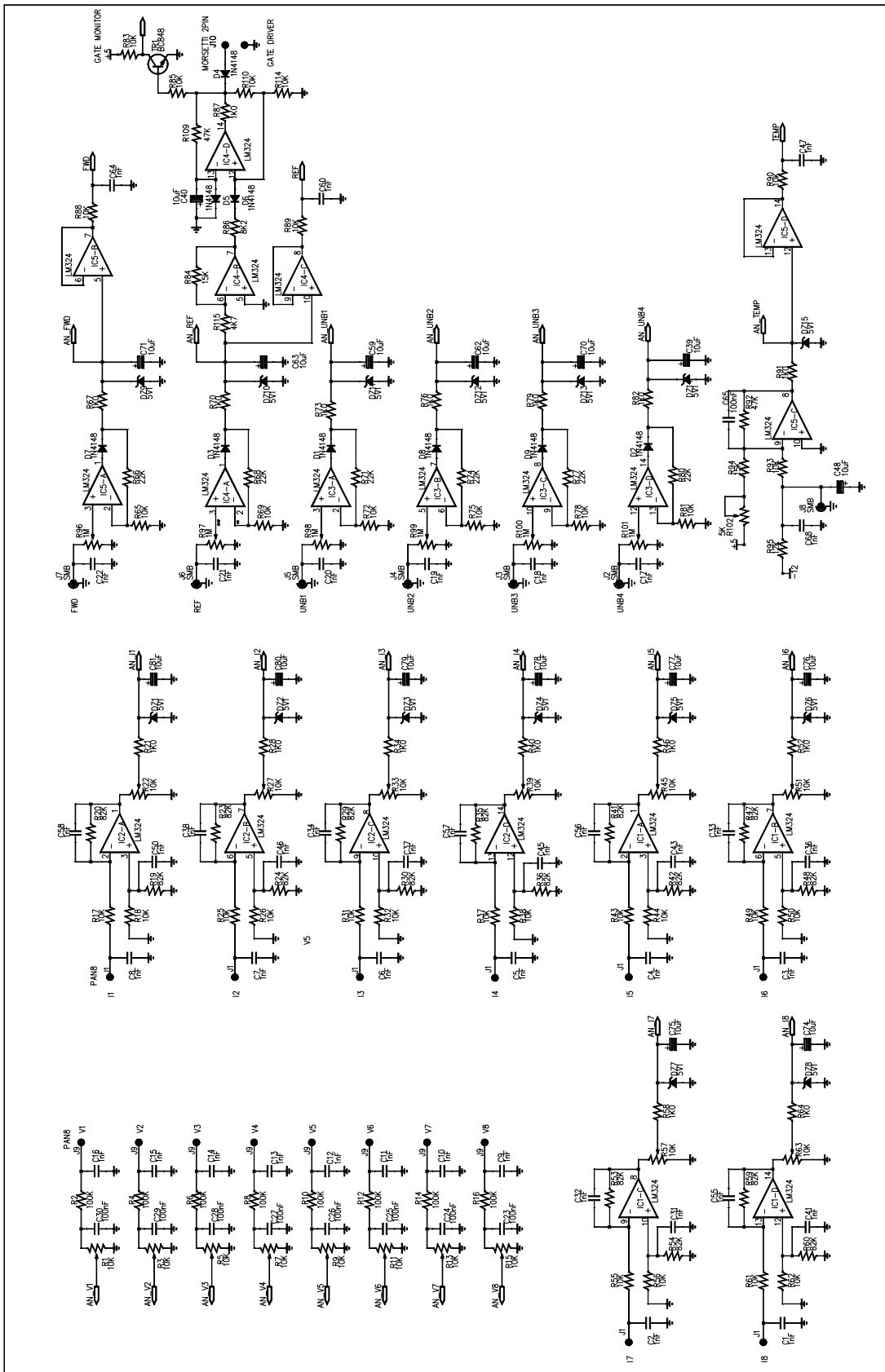
The board automatically turns off the amplifier or part of it when abnormal parameters are detected and restores the initial working conditions if all the parameters return to allowed values. The board is also

equipped with a serial port connector which, in a near future, will allow the remote control operation through a local PC or a modem connection.

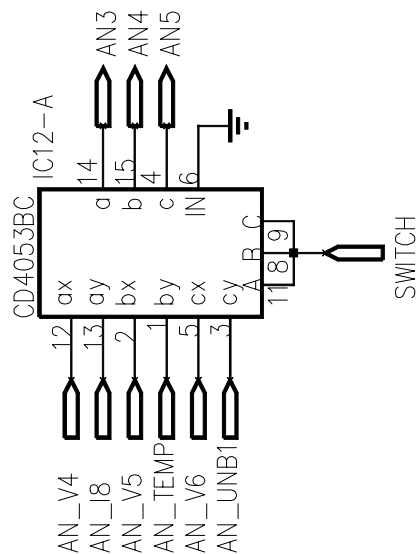
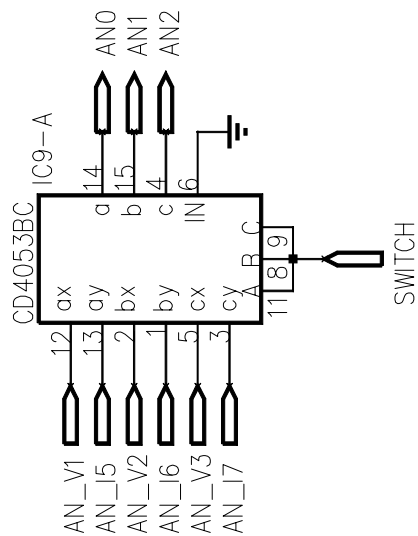
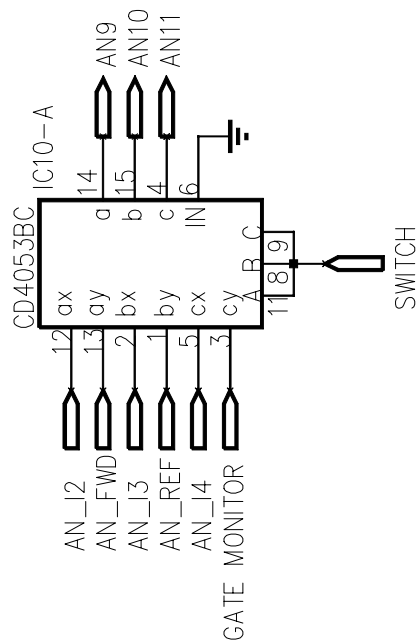
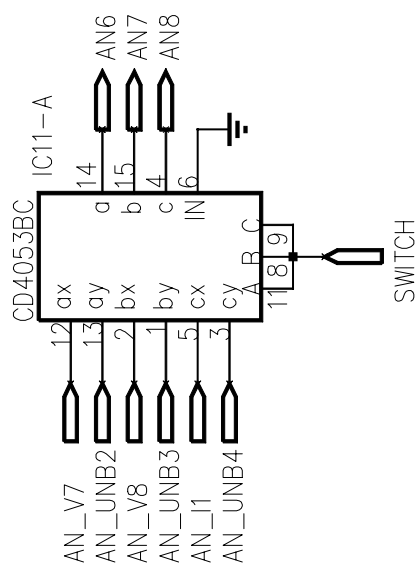




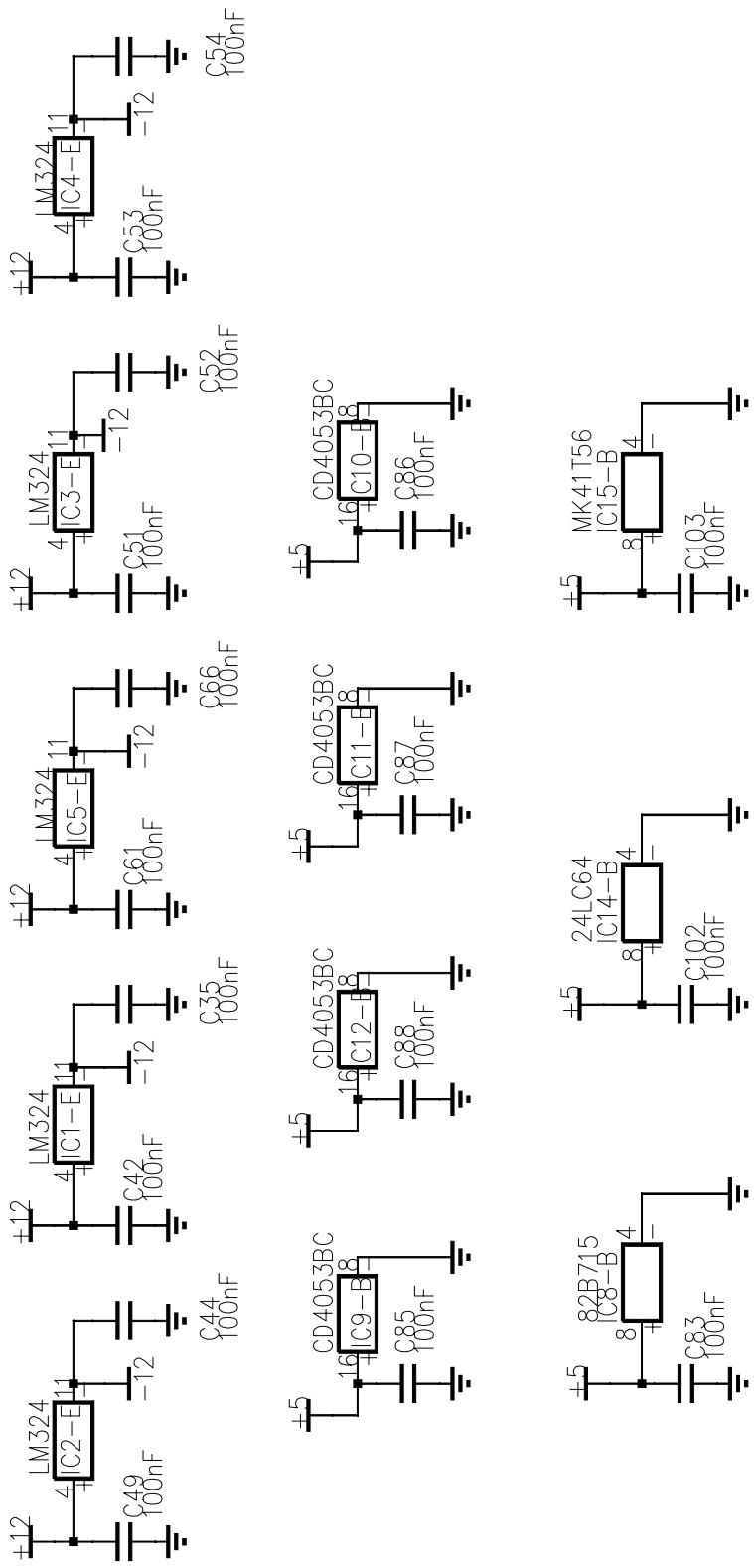
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	TITLE	CONTROL BOARD MICROCONTROLLER SECTION	
CODE	SCH0005AR1	DESIGNER	ZEZZA
		PCB DESIGNER	VALCENTI
		QUALITY CONTROL	LAMPIGNANO
		SIGNATURE	SIGNATURE
		SIGNATURE	SIGNATURE
		DATE	23/12/99
		REF:	PNK0493-SCH0005AR1.SCM
		SHEET	1 OF 4




DESCRIPTION	ELECTRICAL DIAGRAM		DESIGNER	ZEZZA	SIGNATURE	DATE	12/10/99
	TITLE		PCB DESIGNER	VALICENTI	SIGNATURE	REF:	PM0624AR3-SCH005AR1.SDM
CODE	SCH005AR1		QUALITY CONTROL	LAMPIGNANO	SIGNATURE	SHEET	2 OF 4



	DESCRIPTION	ELECTRICAL DIAGRAM			DESIGNER	ZEZZA	SIGNATURE	DATE	12/10/99
	TITLE	CONTROL BOARD MULTIPLEXER SECTION			PCB DESIGNER	VALICENTI	SIGNATURE	REF:	PM02AR3-SCH005AR1.SCM
CODE	SCH0005AR1			QUALITY CONTROL	LAMPIGNANO	SIGNATURE	SHEET	3 OF 4	



 CODE SCH0005AR1	DESCRIPTION	ELECTRICAL DIAGRAM		DESIGNER	ZEZZA	SIGNATURE	DATE	12/10/99
	TITLE	CONTROL BOARD POWER SUPPLY		PCB DESIGNER	VALICENII	SIGNATURE	REF:	PN0624R3-SCH0005AR1.SCM
				QUALITY CONTROL	LAMPIGNANO	SIGNATURE	SHEET	4 OF 4

COMPONENT LIST SCH005ARI

Part Name/Number	Description	Qty.	Comps.	Page 1/4
BATT BH-001RB 03093	BATTERY HOLDER	1	BATT1	
BZ AI-155 03705	5VDC BUZZER	1	BZ1	
CC 100nF-S 01065B	Y5V 1206 COND	35	C23-30 C35 C42 C44 C49 C51-54 C61 C65-67 C72 C83 C85-88 C92 C94-95 C97 C99-103	
CC 15pF-S 01088	SMD 1206 COND	2	C73 C98	
CC 1nF-S 01096	SMD 1206 COND	44	C1-22 C31-34 C36-38 C41 C43 C45-47 C50 C55-58 C60 C64 C68 C82 C84	
CE 10uF35V-S 01778A	ELETTR SMD COND	17	C39-40 C48 C59 C62-63 C69-71 C74-81	
CE 1uF50V-S 01763A	ELETTR SMD COND	5	C89-91 C93 C96	
D 1N4148-S 03002	SMD DIODE	9	D1-9	
DL LEDR3 03058	RED LED DIODE 3mm	3	DL1-3	

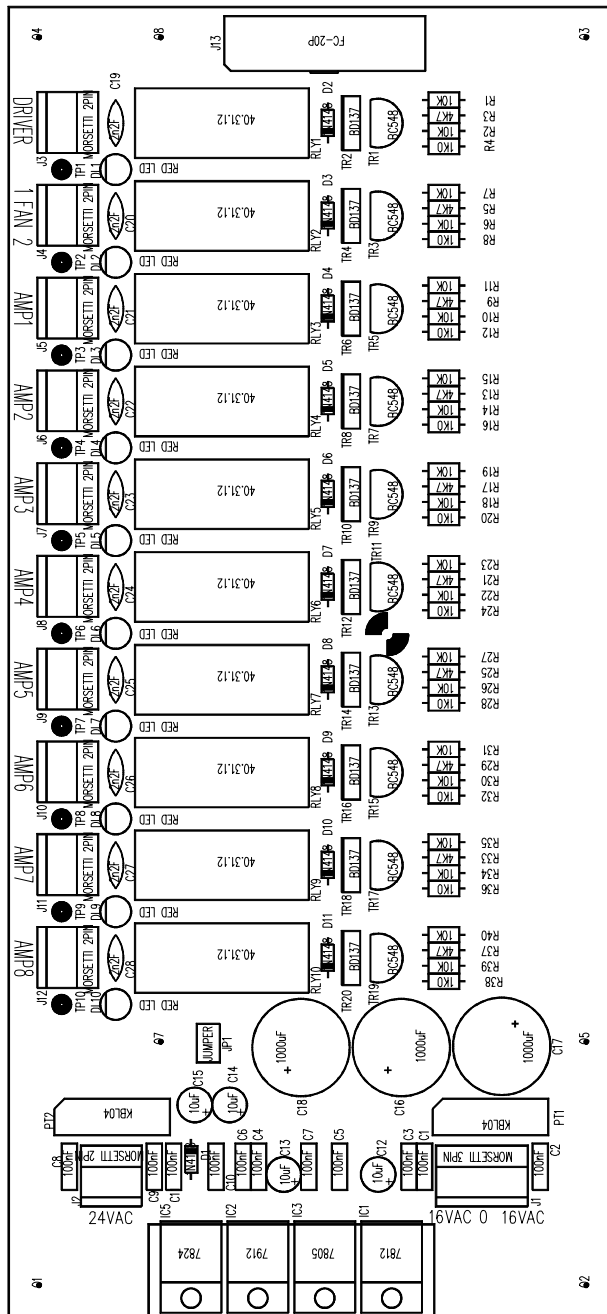
Part Name/Number	Description	Qty.	Comps.	Page 2/4
DZ 5V1-S 03128	SMD ZENER DIODE	15	DZ1-15	
IC 24LC64 04815	SMD INTEG CIRCUIT	1	IC14	
IC 82B715-S 04734A	SMD INTEG CIRCUIT	1	IC8	
IC CD4053BC-S 04710A	SMD INTEG CIRCUIT	4	IC9-12	
IC LM324M-S 04658A	SMD INTEG CIRCUIT	5	IC1-5	
IC MAX232-S 04804B	SMD INTEG CIRCUIT	1	IC13	
IC MAX3080-S 04770	SMD INTEG CIRCUIT	1	IC6	
IC MK41T56 04611	SMD INTEG CIRCUIT	1	IC15	
IC PIC17C75X 04807A	SMD INTEG CIRCUIT	1	IC7	
IND 3u9H-S 05030	INDUCTOR	1	L1	
IND CBD8 05072	INDUCTOR	1	L2	
J DB25-90G 02688	PCB CONNECTOR	1	J15	
J DB9-90G 02797	PCB CONNECTOR	2	J14	
			J16	
J FC-16P 02701-02700	PCB CONNECTOR POL	1	J13	
J FC-20P 02868-02867	PCB CONNECTOR POL	1	J12	
J PAN8 02716-17-18	PCB CONNECTOR	2	J1	
			J9	
J SCREWCONN2 02853	PCB SCREW CONNECTOR	2	J10-11	
J SMB-PCB 02516	PCB CONNECTOR	7	J2-8	
JU JUMP2 02739-02742	MASCHIO PAN2	1	JP7	
JU JUMP3 02707-02742	MASCHIO PAN3	6	JP1-6	
R 100K-S 00065A	RES 1/4W 5% SMD 1206	8	R2	
			R4	
			R6	
			R8	
			R10	
			R12	
			R14	
			R16	
R 10K-S 00053A	RES 1/4W 5% SMD 1206	38	R17-18	
			R25-26	
			R31-32	
			R37-38	
			R43-44	
			R49-50	
			R55-56	
			R61-62	
			R65	
			R69	
			R72	
			R75	
			R78	
			R81	
			R83	

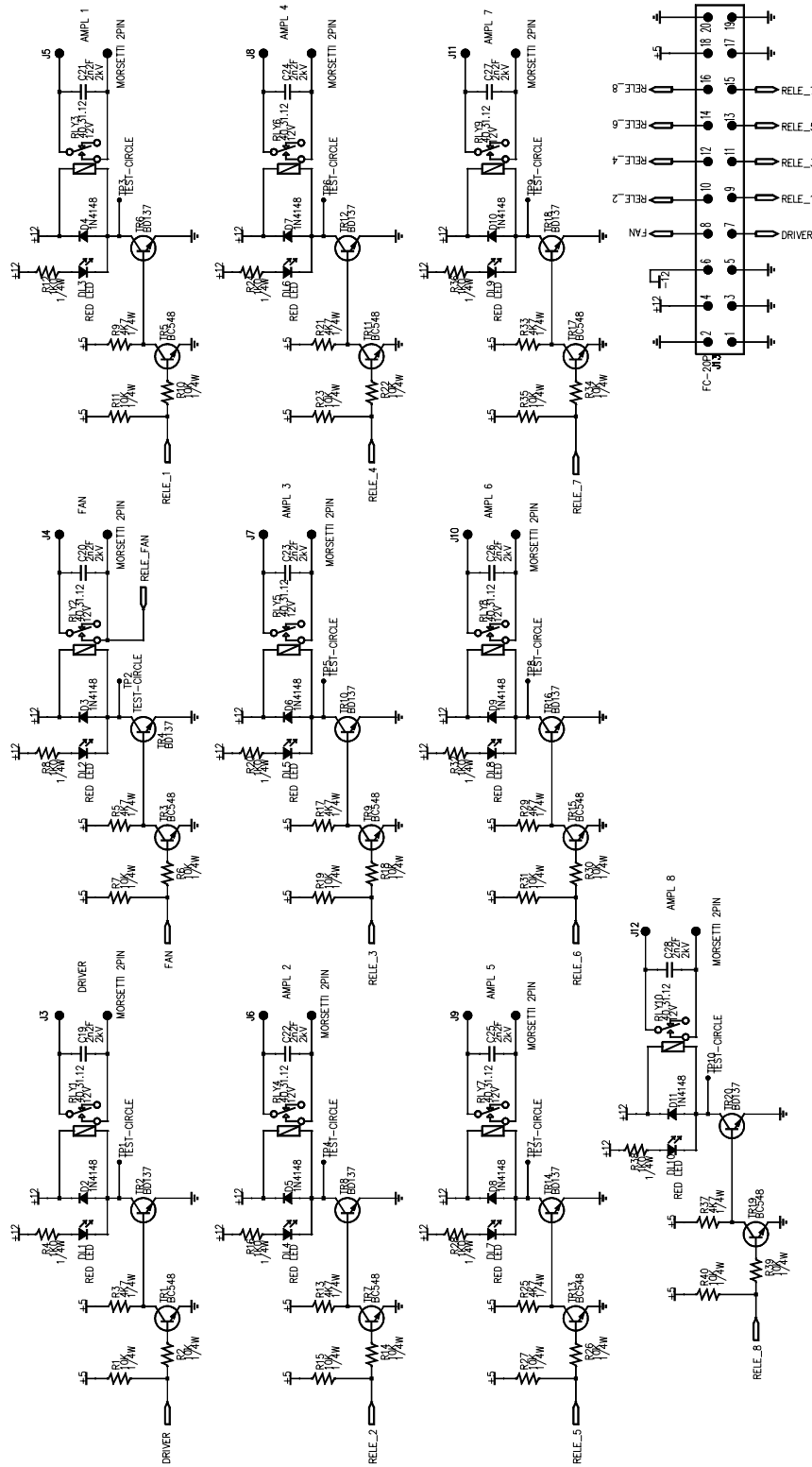
Part Name/Number	Description	Qty.	Comps.	Page 3/4
			R85	
			R88-90	
			R93	
			R110-114	
			R116-117	
			R120-122	
R 120R-S 00030A	RES 1/4W 5% SMD 1206	1	R108	
R 12K-S 00054A	RES 1/4W 5% SMD 1206	1	R95	
R 15K-S 00055A	RES 1/4W 5% SMD 1206	2	R84	
			R94	
R 1K0-S 00041A	RES 1/4W 5% SMD 1206	20	R21	
			R28	
			R34	
			R40	
			R46	
			R52	
			R58	
			R64	
			R67	
			R70	
			R73	
			R76	
			R79	
			R82	
			R87	
			R91	
			R103-105	
			R107	
R 220R-S 00033A	RES 1/4W 5% SMD 1206	1	R106	
R 22K-S 00057A	RES 1/4W 5% SMD 1206	6	R66	
			R68	
			R71	
			R74	
			R77	
			R80	
R 330R-S 00035B	RES 1/4W 5% SMD 1206	2	R118-119	
R 47K-S 00061A	RES 1/4W 5% SMD 1206	2	R92	
			R109	
R 4K7-S 00049A	RES 1/4W 5% SMD 1206	1	R115	
R 82K-S 00064A	RES 1/4W 5% SMD 1206	16	R19-20	
			R23-24	
			R29-30	
			R35-36	
			R41-42	
			R47-48	

Part Name/Number	Description	Qty.	Comps.	Page 4/4
			R53-54	
			R59-60	
R 8K2-S 00052A	RES 1/4W 5% SMD 1206	1	R86	
RL FINDER30.22 07564	RELE	1	RLY1	
RV 10K-3266W 00810	VARIABLE RESISTOR	16	R1	
			R3	
			R5	
			R7	
			R9	
			R11	
			R13	
			R15	
			R22	
			R27	
			R33	
			R39	
			R45	
			R51	
			R57	
			R63	
RV 1M-3266W 00811	VARIABLE RESISTOR	6	R96-101	
RV 5K-3266W 00809	VARIABLE RESISTOR	1	R102	
SW SWITCH-4DIP 07531	PCB DIP SWITCH	1	SW1	
TR BC848 03457	NPN SMD TRANSISTOR	1	TR1	
XTAL 32.768k-S 05146	QUARTZ	1	XTAL2	
XTAL 32MHz-S 05291	QUARTZ	1	XTAL1	

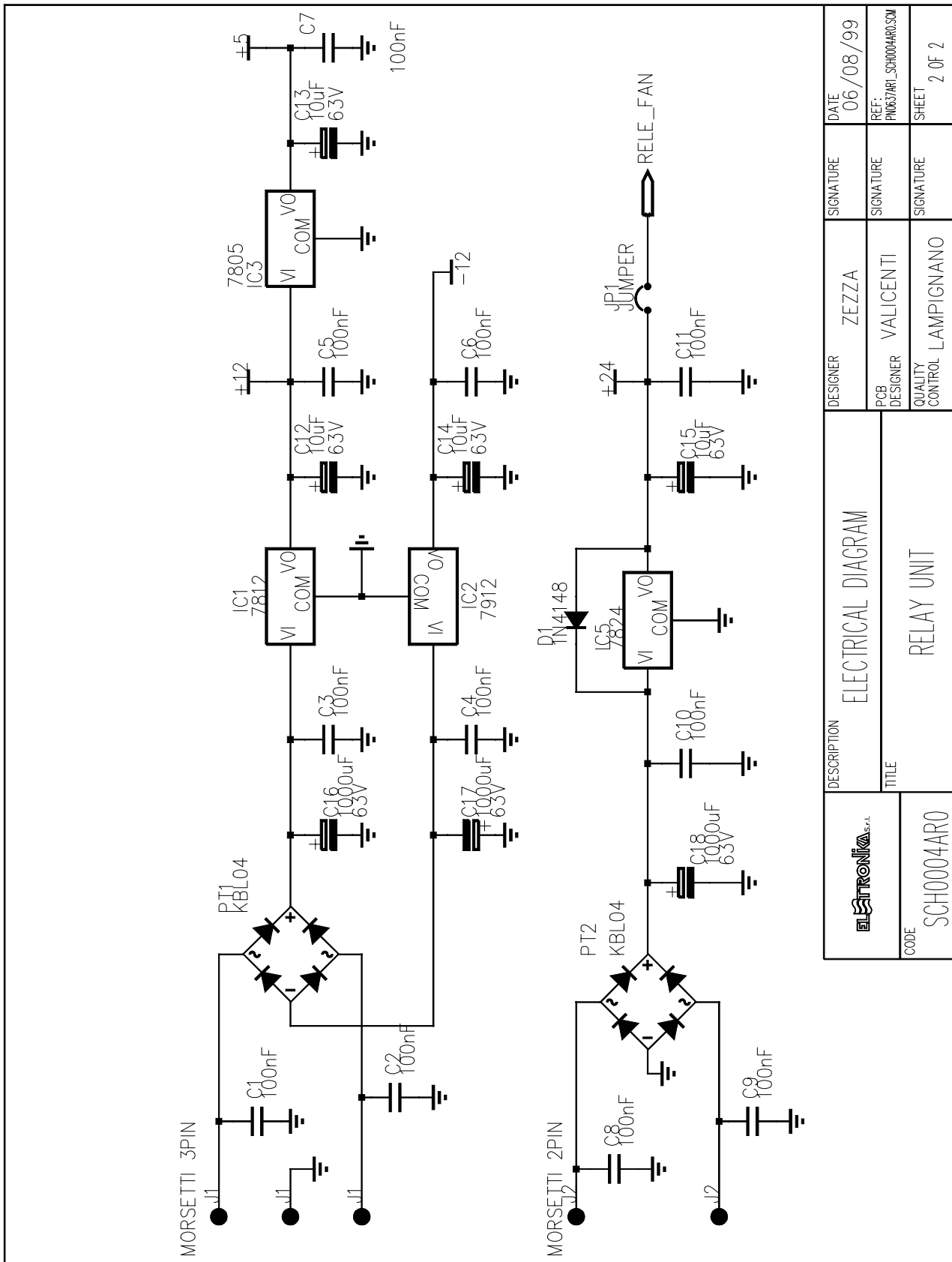
Component layout SCH0004AR0

Note: solder the two terminals of JP1 connector.





	DESCRIPTION	ELECTRICAL DIAGRAM		DESIGNER	ZEZZA	SIGNATURE	DATE	06/08/99
	TITLE	RELAY UNIT		PCB DESIGNER	VALICENTI	SIGNATURE	REF:	PN0637ARI_SCH00044RO.SCM
CODE	SCH00044RO	QUALITY CONTROL	LAMPIGNANO	SIGNATURE		SIGNATURE	SHEET	1 OF 2



	DESCRIPTION	ELECTRICAL DIAGRAM		DESIGNER	ZEZZA	SIGNATURE	DATE	06/08/99
	TITLE	RELAY UNIT		PCB DESIGNER	VALICENTI	SIGNATURE	REF:	PNUG37ARI_SCH0004ARO.SDM
CODE	SCH0004ARO		QUALITY CONTROL	LAMPIGNANO	SIGNATURE	SHEET	2 OF 2	

COMPONENT LIST SCH0004AR0

Part Name/Number	Description	Qty.	Comps.	Page 1/2
CC 100nF 01065	CERAMIC COND	11	C1-11	
CC 2nF2 2kV 01045A	CERAMIC COND	10	C19-28	
CE 1000uF63V 01811	ELETT. COND.	3	C16-18	
CE 10uF63V 01779	ELETT. COND.	4	C12-15	
D 1N4148 03001	DIODE	11	D1-11	
DB KBL04 03042	BRIDGE DIODE	2	PT1-2	
DL LEDR3 03058	RED LED DIODE 3mm	10	DL1-10	
IC 7805 04315	VOLTAGE REGULATOR	1	IC3	
IC 7812 04321	VOLTAGE REGULATOR	1	IC1	
IC 7824 04331	VOLTAGE REGULATOR	1	IC5	
IC 7912 04322	VOLTAGE REGULATOR	1	IC2	
J FC-20P 02868-02867	PCB CONNECTOR POL	1	J13	
J SCREWCONN2 02853	PCB SCREW CONNECTOR	11	J2-12	
J SCREWCONN3 02860	PCB SCREW CONNECTOR	1	J1	
JU JUMP2 02739-02742	MASCHIO PAN2	1	JP1	
R 10K 0053	RES 1/4W 5%	20	R1-2 R6-7 R10-11 R14-15 R18-19 R22-23 R26-27 R30-31 R34-35 R39-40	
R 1K0 0041	RES 1/4W 5%	10	R4 R8 R12 R16 R20 R24 R28 R32 R36 R38	
R 4K7 0049	RES 1/4W 5%	10	R3 R5 R9 R13 R17 R21 R25 R29	

Part Name/Number	Description	Qty.	Comps.	Page 2/2
RL 40.31.12 07567	RELE	10	R33 R37 RLY1-10	
TR BC548 03423	NPN TRANSISTOR	10	TR1 TR3 TR5 TR7 TR9 TR11 TR13 TR15 TR17 TR19	
TR BD137 03408	NPN TRANSISTOR	10	TR2 TR4 TR6 TR8 TR10 TR12 TR14 TR16 TR18 TR20	

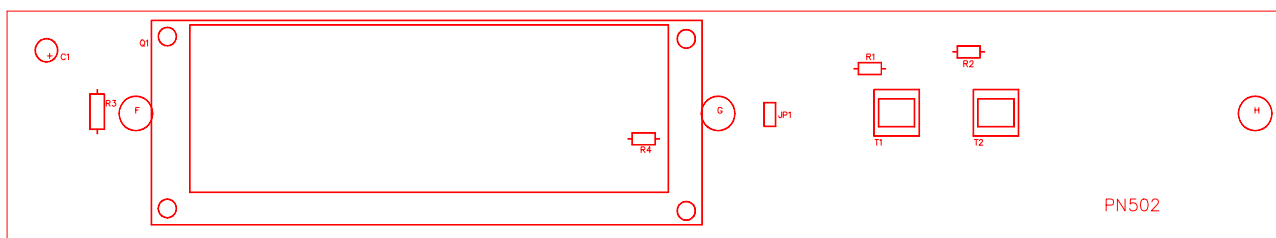
DESCRIPTION

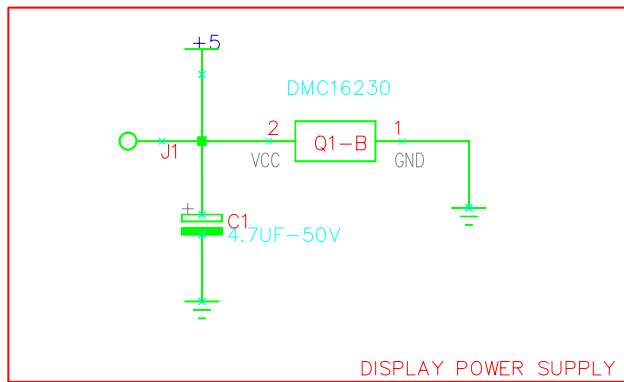
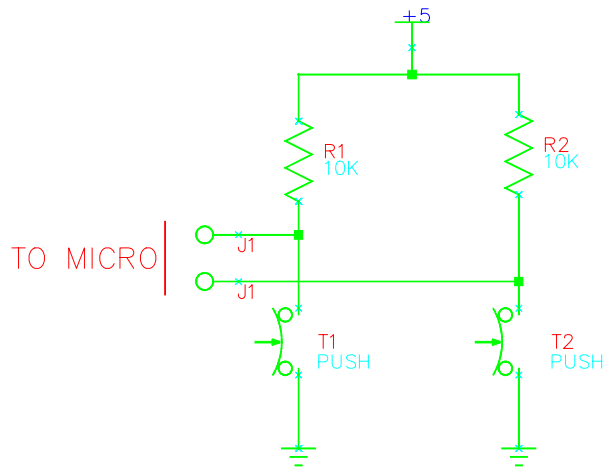
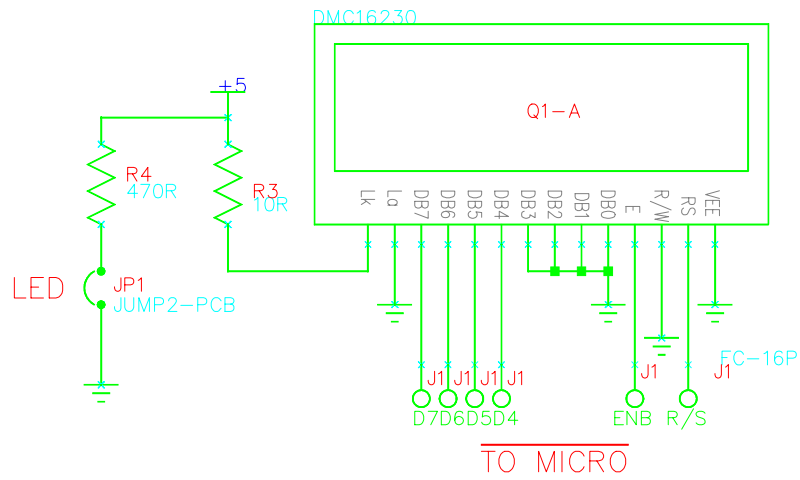
The display board, PN502, is used to display the main operating parameters of the amplifier module. The two keys on the right of the LCD display are used to scroll the list of parameters which can be displayed. These parameters are:

- | | |
|--------------------------------|---------------|
| 1. Temperature | (TEMP) |
| 2. Direct Power | (FWD PWR) |
| 3. Reflected Power | (REF PWR) |
| 4. Max 6 Power supply voltages | (V1...V6) |
| 5. Max 6 Power supply currents | (I1...I6) |
| 6. Max 4 Unbalancing powers | (UNB1...UNB4) |

Depending on the apparatus in which the board is, the parameters 4, 5 and 6 may be less than the ones listed. The first line of the display shows the type of amplifier or the number of the amplifier module, referring to the whole apparatus, if this is composed by more than one amplifier. It also shows alarm conditions, if any, inside the amplifier module. If the amplifier module is turned off by a protection device, the first line displays “AMPLIFIER OFF”.

Component layout PN502





ELATRONIKA
s.r.l.

DISPLAY BOARD

DATE:

REF: SE502

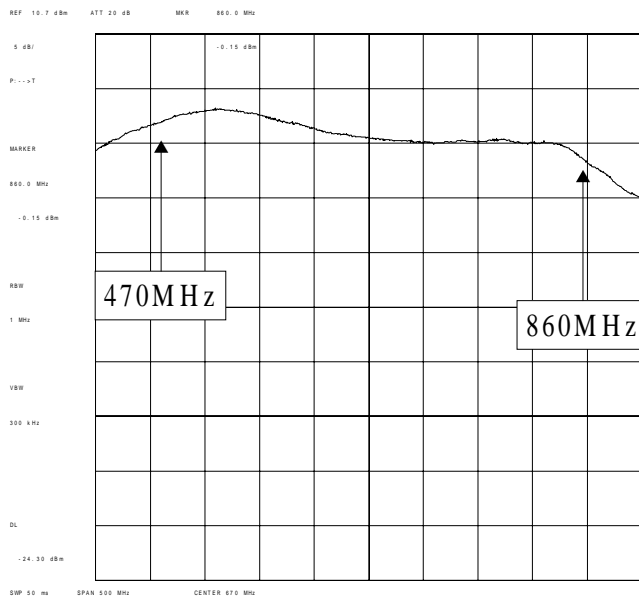
SHEET: 1 OF 1

COMPONENT LIST *pn502*

REFER.	DESCRIPTION	ELETTRONIKA CODE
R1	10k Ω 1/4W RESISTOR	00053
R2	10k Ω 1/4W RESISTOR	00053
R3	10 Ω 1/2W RESISTOR	00127
R4	470 Ω 1/4W RESISTOR	00037
C1	4.7 μ F 35V ELECTROL. CAPACITOR	01775
Q1-A	DISPLAY	03072B
	PN502 PRINTED CIRCUIT BOARD	09502

DESCRIPTION

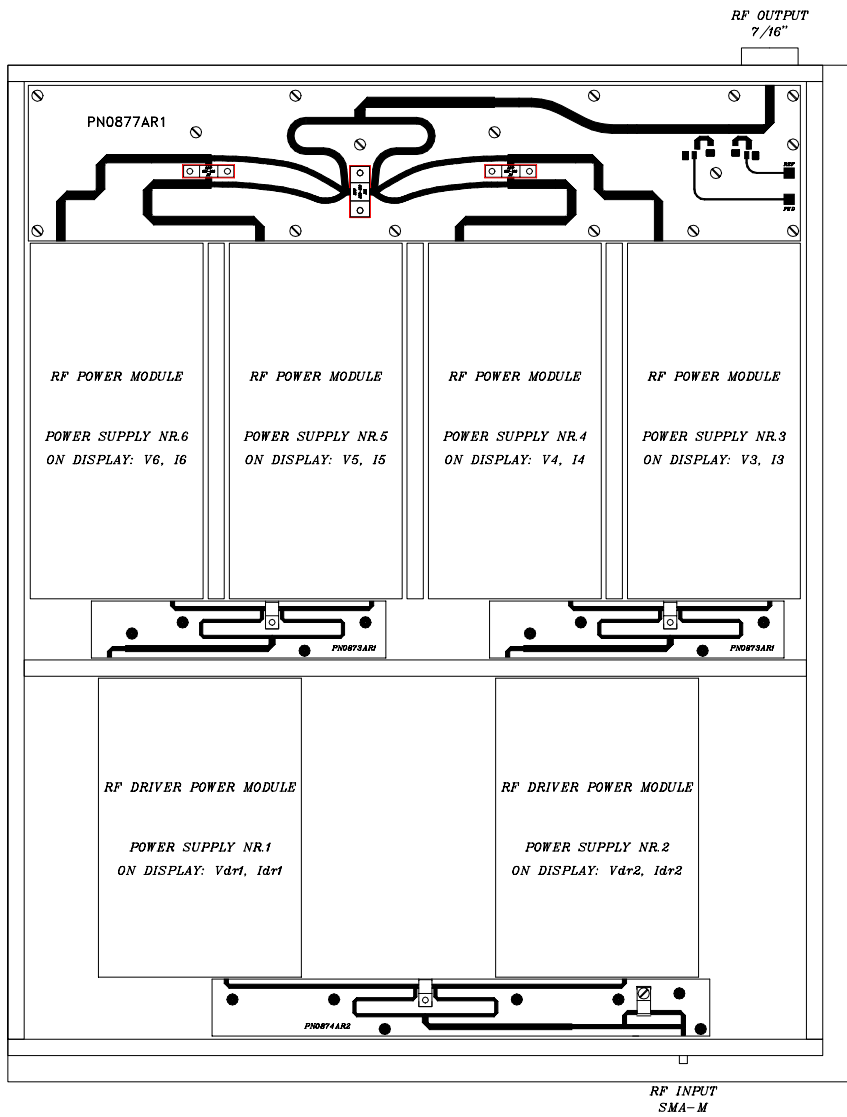
The 1000W output power PEP amplifier module has been realized by coupling four 250W Video power modules. A 4-way Wilkinson coupler, completely balanced by means of power resistors, has been used in output. This way an excellent de-coupling between the amplifier is obtained, as well as the possibility to work even with only one active module. The high extension of the IV/V UHF band and the presence of parasitic capabilities towards ground, along with the resistors, required an accurate design of the couple which has been possible thanks to the use of sophisticated simulation software. The module also has two 40W class A drivers realized with LDMOS technology, one for each couple of final modules. All the amplification chain is then realized LDMOS technology. The high gain of the output stages allows to drive them with class A drivers, thus giving the module high linearity characteristics, which can be especially appreciated in DVB-T applications. The module is completed by two directional couplers for the reading of Forward and Reflected power. Besides the by-pass capacitors by TUSONIX used on power supply allow an excellent de-coupling with RF stages.



Small signal gain with 5dB/div.

TECHNICAL CHARACTERISTICS

Output power	1000W Sync. Peak
Frequency	470 - 860MHz
Input impedance	50Ω
Input R.L.	15dB min
Output impedance	50Ω
Power Supply	32V Power module and 29V Driver module



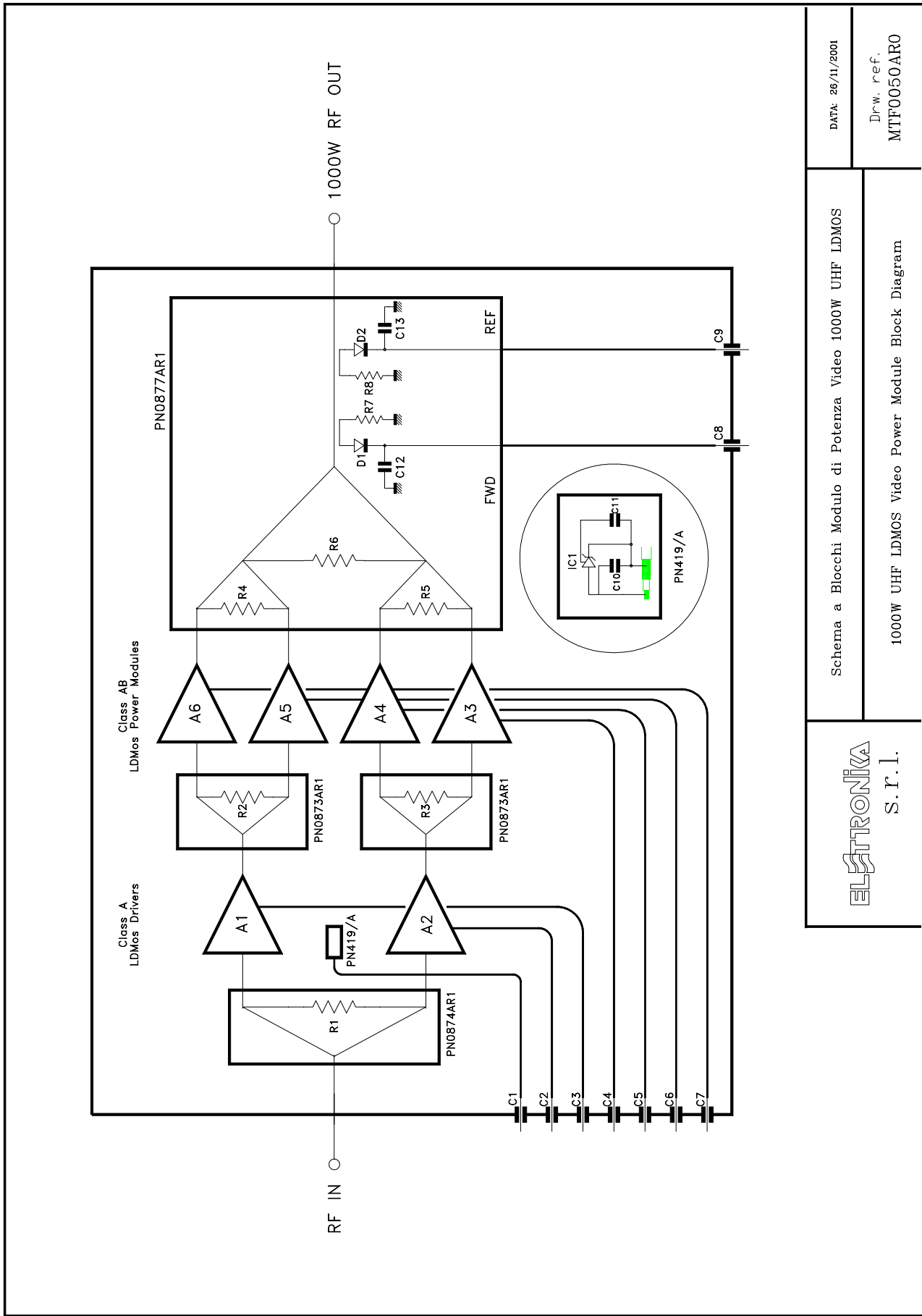
DATA: 26/11/2001

Draw. ref.
MTF0050AR0

Modulo di Potenza Video

Video Power Module

ELETRONIKA
S.R.L.



DATA: 28/11/2001

Dr.w. ref.
MTF0050ARO

Schema a Blocchi Modulo di Potenza Video 1000W UHF LDMOS

1000W UHF LDMOS Video Power Module Block Diagram

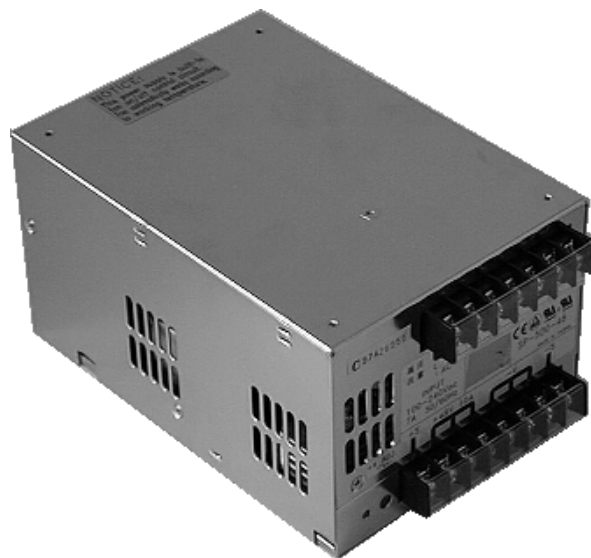
ELETRONIKA
S. R. L.

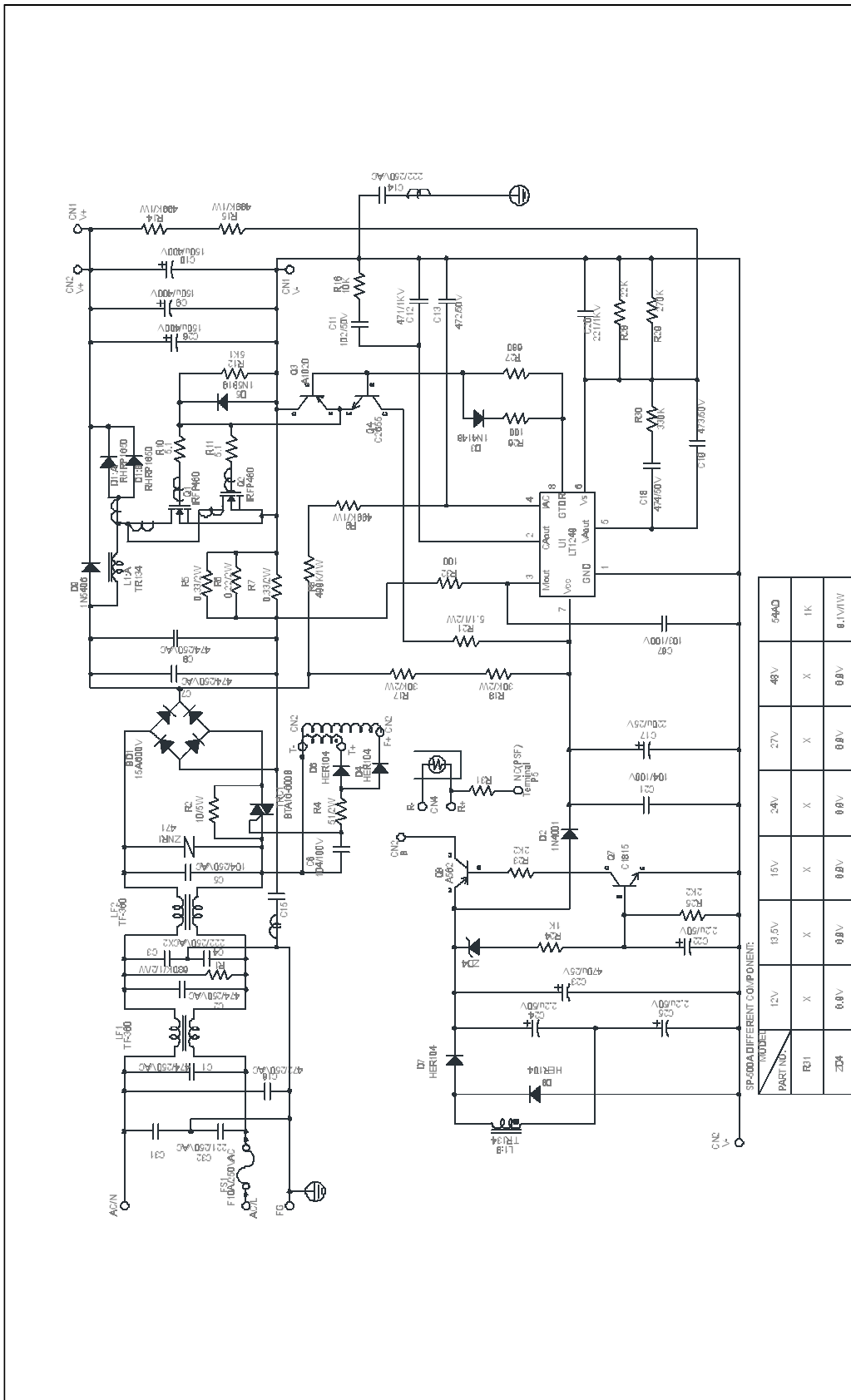
COMPONENT LIST *MTF0050AR0*

REFER.	TYPE	ELETTRONIKA CODE
R1	100Ω 20W RESISTOR	00444
R2	100Ω 20W RESISTOR	00444
R3	100Ω 20W RESISTOR	00444
R4	100Ω 150W RESISTOR	00428
R5	100Ω 150W RESISTOR	00428
R6	100Ω 250W RESISTOR	00429
R7	82Ω 1206 SMD RESISTOR	00028A
R8	82Ω 1206 SMD RESISTOR	00028A
C1	1nF Feed-Thru TUSONIX CAPACITOR	01400
C2	1nF Feed-Thru TUSONIX CAPACITOR	01400
C3	1nF Feed-Thru TUSONIX CAPACITOR	01400
C4	1nF Feed-Thru TUSONIX CAPACITOR	01400
C5	1nF Feed-Thru TUSONIX CAPACITOR	01400
C6	1nF Feed-Thru TUSONIX CAPACITOR	01400
C7	1nF Feed-Thru TUSONIX CAPACITOR	01400
C8	1nF Feed-Thru TUSONIX CAPACITOR	01400
C9	1nF Feed-Thru TUSONIX CAPACITOR	01400
C10	1nF 1206 SMD CAPACITOR	01096
C11	1nF 1206 SMD CAPACITOR	01096
C12	1nF 1206 SMD CAPACITOR	01096
C13	1nF 1206 SMD CAPACITOR	01096
A1	UHF 40W Class A LDMOS Driver M.	SCH0052AR0
A2	UHF 40W Class A LDMOS Driver M.	SCH0052AR0
A3	UHF LDMOS Power Module	04900
A4	UHF LDMOS Power Module	04900
A5	UHF LDMOS Power Module	04900
A6	UHF LDMOS Power Module	04900
D1	HSMS-2800 DIODE	03207
D2	HSMS-2800 DIODE	03207
IC1	LM335 TEMPERATURE SENSOR	00663

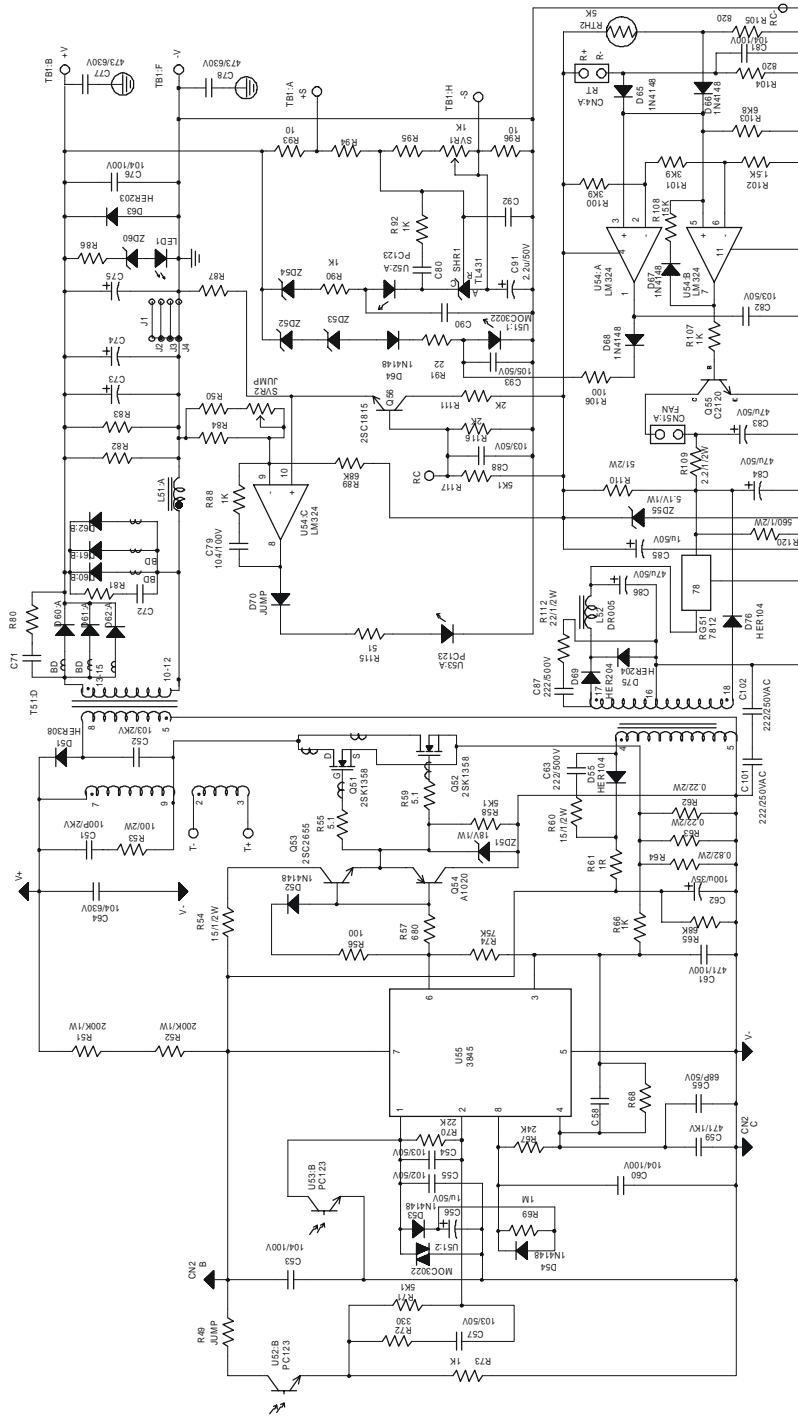
SPECIFICATION

MODEL	SP-500-27	SP-500-48
DC Output Voltage	27Vdc	48Vdc
Output Rated Current	18A	10A
Output Current Range	0-18A	0-10A
Ripple & Noise (p-p)	200mVp-p	240mVp-p
DC Output Power	486W	480W
Efficiency	87%	87%
DC Voltage Adj.	24-30V	41-56V
Over V. Protection	31V-36.5V	57.6V-67.2V
Input Voltage Range	88-264Vac	
Input Frequency	47-63Hz	
Power Factor	0.95/100-240Vac	
Overload Protection	105%-135%	
	Type: Foldback current limiting	
	Recovery: Auto	
Over Temp. Protection	> =70°C Output Shutdown	
Fan Control	Temp. > =60°C Fan On	
	< =50°C Fan Off	
Working Temp., Humidity	-10°C/+50°C, 20%-90% RH	
Dimension	185x120x93	
Weight	1.8Kg.	





DESIGNER	SIGNATURE	DATE	04/09/02
PCB DESIGNER	SIGNATURE	REF:	
QUALITY CONTROL	SIGNATURE	SHEET	1/2
DESCRIPTION	ELECTRICAL DIAGRAM		
TITLE	SP-500A-R3		
CODE	SWITCHING POWER SUPPLY		



SP-500B DIFFERENT COMPONENT:

MODEL	C71.72	R80.81	D86.01	L51	R82.83	C73.74	R86	R84	R85	C80	R87	T51	U40	ZD32	ZD53	ZD54	ZD60	R84	R80	C82
12V	22	100W	100W	22	22	100W	1K	6K8	1K5	1u/50V	910	TF407	J1,J2	12.3V	JUMP	JUMP	JUMP	10K	10K	X
13.5V	22	100W	100W	22	22	100W	1K	10K	1K8	1u/50V	1K2	TF400	J1,J2	16.1V	JUMP	JUMP	JUMP	1K8	1K8	X
15V	22	150W	150W	27	27	100W	1K	10K	1K5	1u/50V	1K2	TF401	J1,J2	18.0V	JUMP	JUMP	JUMP	1K5	1K5	X
24V	47	1K	100W	680	680	100W	2K2	20K	2K	1u/50V	910	TF402	J1,J2	15.0V	12.3V	15.0V	10.6V	1K2	10K	X
27V	33	1K	100W	470	470	100W	2K2	24K	2K	2.2u/50V	820	TF403	J1,J2	18.0V	15.0V	15.0V	10.6V	1K1	6K8	X
48V	22	1K	380W	1K	1K	380W	39K	1K5	1K5	2.2u/50V	910	TF404	J2,J3	33.0V	27.0V	33.0V	16.1V	820	10K	2.2/1K

	DESCRIPTION	ELECTRICAL DIAGRAM		DESIGNER	SIGNATURE	DATE
	TITLE	SP-500A-R3		PCB DESIGNER	SIGNATURE	REF:
CODE	QUALITY CONTROL	SWITCHING POWER SUPPLY		QUALITY CONTROL	SIGNATURE	SHEET
						2/2

COMPONENT LIST SP-500-27-C

SPECIFICATIONS	QUANTITY	POSITION
CASE910-D-R3	1	
CASE910-T-R3	1	1
1208PTB1;L:20cm+TUBE/TYPE:B;	1	CASE
PINKS-1	3	+S+V -S-V G-RC
MYLAR FILM 910-R1	2	
BOXPS-300 194x127x103mm	1	1
SCREW P 3x6 ISO NI	4	PCBA PCBB
SCREW F 5.0x12 TP1 NI	2	FAN
SCREW F 3x6 TP2 NI	5	CASE
LABEL UP SP-500-27-R2	1	
LABEL INDCON ULE010-R2 FAN CONT.	1	
CARTON PS-300 1CUFT	1	8
261x18mm	1	1 TB1
327x18mm	1	TB2
BOM FOR SP-500-27A ON PCB	1	
R/C 1/4W 5.1Ω 5% HP=10 T-52mm	2	R10,R11
R/C 1/4W 100Ω 5% HP=10 T-52mm	2	R26,R32
R/C 1/4W 680Ω 5% HP=10 T-52mm	1	R27
R/C 1/4W 1kΩ 5% HP=10 T-52mm	1	R24
R/C 1/4W 2.2kΩ 5% HP=10 T-52mm	2	R23,R25
R/C 1/4W 5.1kΩ 5% HP=10 T-52mm	1	R12
R/C 1/4W 10kΩ 5% HP=10 T-52mm	1	R16
R/C 1/4W 270kΩ 5% HP=10 T-52mm	1	R29
R/C 1/4W 330kΩ 5% HP=10 T-52mm	1	R30
R/C 1/2W 5.1Ω 5% T-52mm	1	R21
R/C 1/2W 680kΩ 5% T-52mm	1	R1
R/MO 2W 51Ω 5%	1	R4
R/MO 2W 30kΩ 5%	2	R17,R18
R/M 1/4W 22kΩ 1% T-52mm	1	R28
R/M 1W 499kΩ 1% MFR-1WS	4	R14,R15,R8,R9
R/NW 2W 0.22Ω 5%	1	R6
R/NW 2W 0.33Ω 5%	2	R5,R7
R/FS 5W 10Ω 10% T=130°C	1	R2
NTC 5kΩ 10% TSC-502	1	RT
MOV 0.6W 470V 14 TNR15G471K	1	ZNR1
C/Y2 221/250VAC 20% P=7.5 AC	1	C32
C/Y2 222/250VAC 20% P=7.5 AC	3	C14,C3,C4
C/Y2 472/250VAC 20% P=7.5 AC	1	C16
C/X2 104/250VAC 20% P=15 KNB153X	1	C5
C/X2 474/250VAC 20% P=22 KNB153X	4	C1,C2,C17,C8
C/M 104/63V 10% P=5	1	C21
C/M 104/100V 10% P=5	1	C6
C/M 474/50V 10% P=5	1	C18

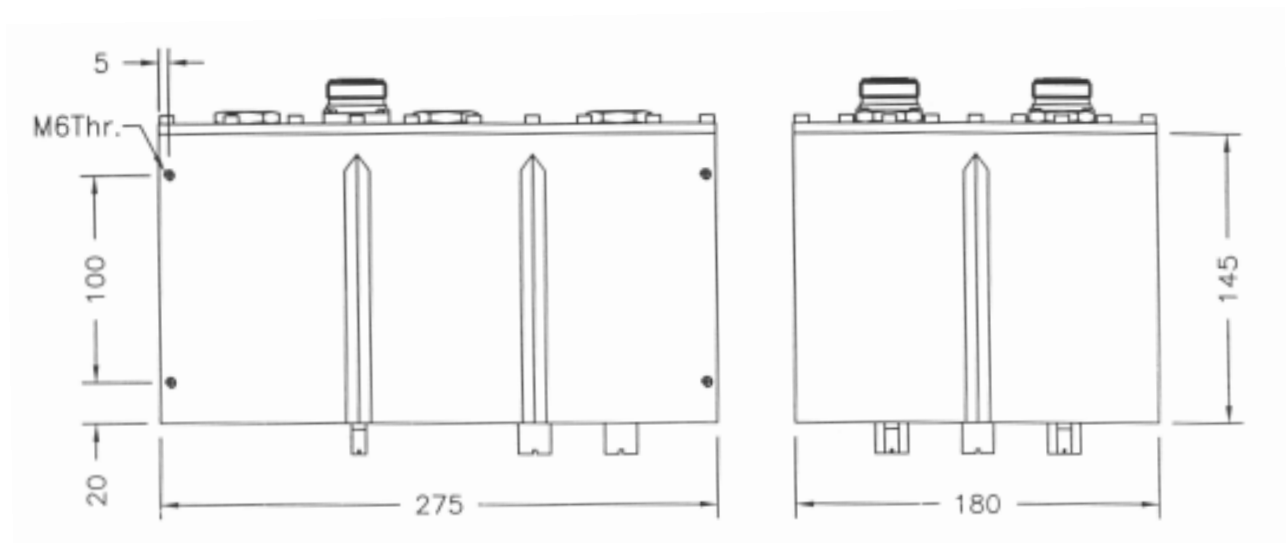
SPECIFICATIONS	QUANTITY	POSITION
C/C 221/1KV 10% P=5 Y5P	1	C20
C/C 471/1KV 10% P=5 Y5P	1	C12
C/ML 102/100V 5% P=3	1	C11
C/ML 472/100V 5% P=3	1	C13
C/ML 103/100V 5% P=3	1	C67
C/ML 473/100V 5% P=5	1	C19
C/E 150u/400V 85°C 22x30 HP3	3	C10, C26, C9
C/E 2.2u/50V 105°C 5x11 KM	3	C22, C24, C25
C/E 220u/25V 105°C 8x11.5 KM	1	C17
C/E 470u/25V 105°C 10x16 MHA	1	C23
RD 15/A/600V GLASS D15XB60	1	BD1
RD 1A/50V 1N4001 T-52mm	1	D2
RD 3A/600V 1N5406 DO-201	1	D9
SFRD HER104 1A/300V T-52mm	4	D4, D6, D7, D8
SFRD RHRP1560 15A/600V TO220	1	D1
SBD 1N5819 1A/40V T-52mm	1	D5
HIGH-SPEED DIODE 1N4148 T-52mm	1	D3
ZD 1/2W 8.9V 2% 9B3 T-52mm	1	ZD4
BJT 2SA1020 -2A/50V TO92M	1	Q3
BJT 2SA562Y -0.5A/-30V TO92	1	Q8
BJT 2SC1815GR 0.1A/40V TO92	1	Q7
BJT 2SC2655 2A/50V TO92M	1	Q4
FET IRFP460 20A/500V TO3P	2	Q1, Q2
TRIAC BTA16-600B 16A TO220	1	TRC1
CONTROL LT1249CN8	1	U1
TR134-R2 Ku130125x2	1	L1
LF TF360 ET-28 3.12mH	2	LF1, LF2
BEAD CORE BD-001A-M4S RH3.5x3x1.5	5	C14F, D1A, Q1D, Q1G, Q2D
BEAD CORE BD-001A-M4S RH3.5x3x1.5	1	Q2G
FUSE F10 L 250 5x20 G- U GFE	1	FS1
FUSE CLIP 5x20	2	FS1
TB DT-4C-B14W(1171)-07	1	TB1
WAFER 8822-02 P=2.5	2	CN2, CN3
WAFER 8822-04 P=2.5	1	CN4
WAFER JS-1120-03N2 UL P=3.96	1	CN1
WIRE 07#18 90mm 52Tx2	2	F-F
HS YS032W-048 71431W-048	2	HS1, HS3
HS YS032W-070B 71431W-070B	1	HS2
MHS013-R1 SP-500	1	RT
TO220-A 11.4x21.5x5.8	1	RT
TO3P-A 17.5x28.5x5.9	1	RT
CORE MS-130125 HKH-130	2	L1
PCB SP-500A-R9 FR-4 2OZ DS	1	PCB
TW 3.0 NI	1	RT

SPECIFICATIONS	QUANTITY	POSITION
SCREW P 3x8 ISO NI	2	D1, TRC1
SCREW P 3x10 ISO NI	3	BD1, Q1, Q2
SCREW P 3x6 TP2 ZN	6	HS1, HS2, HS3
SCREW P 3x16 TP2 ZN	1	RT
10 1M(20mm)	20/100	RT
BOMFOR SP-500-27B ON PCB	1	
R/C 1/4W 1Ω 5% HP=10 T-52mm	1	R61
R/C 1/4W 5.1Ω 5% HP=10 T-52mm	2	R55, R59
R/C 1/4W 10Ω 5% HP=10 T-52mm	2	R93, R96
R/C 1/4W 22Ω 5% HP=10 T-52mm	1	R91
R/C 1/4W 51Ω 5% HP=10 T-52mm	1	R115
R/C 1/4W 100Ω 5% HP=10 T-52mm	2	R106, R56
R/C 1/4W 330Ω 5% HP=10 T-52mm	1	R72
R/C 1/4W 680Ω 5% HP=10 T-52mm	1	R57
R/C 1/4W 820Ω 5% HP=10 T-52mm	3	R104, R105, R87
R/C 1/4W 1kΩ 5% HP=10 T-52mm	5	R107, R66, R73, R88, R90
R/C 1/4W 1kΩ 5% HP=10 T-52mm	1	R92
R/C 1/4W 1.1kΩ 5% HP=10 T-52mm	1	R84
R/C 1/4W 1.5kΩ 5% HP=10 T-52mm	1	R102
R/C 1/4W 2kΩ 5% HP=10 T-52mm	3	R111, R116, R95
R/C 1/4W 2.2kΩ 5% HP=10 T-52mm	1	R86
R/C 1/4W 3.9kΩ 5% HP=10 T-52mm	2	R100, R101
R/C 1/4W 5.1kΩ 5% HP=10 T-52mm	3	R117, R58, R71
R/C 1/4W 6.8kΩ 5% HP=10 T-52mm	2	R103, R50
R/C 1/4W 15kΩ 5% HP=10 T-52mm	1	R108
R/C 1/4W 22kΩ 5% HP=10 T-52mm	1	R70
R/C 1/4W 24kΩ 5% HP=10 T-52mm	1	R94
R/C 1/4W 68kΩ 5% HP=10 T-52mm	2	R65, R89
R/C 1/4W 75kΩ 5% HP=10 T-52mm	1	R74
R/C 1/4W 1MΩ 5% HP=10 T-52mm	1	R69
R/C 1/2W 2.2Ω 5% T-52mm	1	R109
R/C 1/2W 15Ω 5% T-52mm	2	R54, R60
R/C 1/2W 22Ω 5% T-52mm	1	R112
R/C 1/2W 560Ω 5% T-52mm	1	R120
R/C 1W 27Ω 5%	2	R80, R81
R/C 1W 200kΩ 5% CFR-1WS	2	R51, R52
R/MO 2W 51Ω 5%	1	R110
R/MO 2W 100Ω 5%	1	R53
R/MO 2W 1kΩ 5%	2	R82, R83
R/M 1/4W 24kΩ 1% T-52mm	1	R67
R/NW 2W 0.22Ω 5%	2	R62, R63
R/NW 2W 0.82Ω 5%	1	R64
MVR 0.W 1kΩ 10% 6 VP=5x2.5	1	SVR1
NTC 5kΩ 10% TSC-502	1	RTH2

SPECIFICATIONS	QUANTITY	POSITION
JUMP 0.6 P=5	1	SVR2
JUMP 0.6 P=10	2	D70, R49
JUMP 1.4 P=10 9A	3	J1, J2, J3
C/Y2 222/250VAC 20% P=7.5 AC	2	C101, C102
C/M 473/630V 10% P=15	2	C77, C78
C/M 104/63V 10% P=5	5	C53, C60, C76, C79, C81
C/M 104/630V 10% P=15	1	C64
C/M 224/63V 10% P=5	1	C80
C/C 68P/50V 10% P=5 NPO	1	C65
C/C 331/1KV 10% P=5 Y5P	2	C71, C72
C/C 471/100V 10% P=5 Y5P	1	C61
C/C 471/1KV 10% P=5 Y5P	1	C59
C/C 222/500V 20% P=5 Z5U	2	C63, C87
C/C 103/100V 20% P=5 Z5U	1	C88
C/ML 102/100V 5% P=3	1	C55
C/ML 103/100V 5% P=3	3	C54, C57, C82
C/MC 105/50V80, -20%P=5 Y5V	1	C93
C/C 101/2KV EPOXY 10% P=5 Y5P	1	C51
C/C 103/2KV EPOXY 80, -20% P=10 Y5V	1	C52
C/E 1u/50V 105°C 5x11 KM	2	C56, C85
C/E 2.2u/50V 105°C 5x11 KM	1	C91
C/E 47u/50V 105°C 6.3x11 KM	3	C83, C84, C86
C/E 100u/35V 105°C 8x11.5 KM	1	C62
C/E 470u/50V LL5K 12.5x25 YXG	3	C73, C74, C75
SFRD ESAD92-02 20A/200V TO3P	3	D60, D61, D62
SFRD HER104 1A/300V T-52mm	2	D55, D76
SFRD HER203 2A/200V T-52mm	1	D63
SFRD HER204 2A/300V T-52mm	2	D69, D75
SFRD HER308 3A/1KV	1	D51
HIGH-SPEED DIODE 1N4148 T-52mm	5	D52, D53, D54, D64, D65
HIGH-SPEED DIODE 1N4148 T-52mm	3	D66, D67, D68
ZD 1/2W 10.6V 2% 11B2 T-52mm	1	ZD60
ZD 1W 5.1V 2% 1N4733 T-52mm	1	ZD55
ZD 1W 15V 2% 1N4744 T-52mm	1	ZD53
ZD 1W 18V 2% 1N4746 T-52mm	3	ZD51, ZD52, ZD54
LED A264B/G A264B/G/F14-9	1	LED1
BJT 2SA1020 -2A/50V TO92M	1	Q54
BJT 2SC1815FGR 0.1A/40V TO92	1	Q56
BJT 2SC2120 0.8A/30V TO92	1	Q55
BJT 2SC2655 2A/50V TO92M	1	Q53
FET 2SK1358 9A/900V TO3P	2	Q51, Q52
SHR 431 2.5V 2% MM1431AT	1	SHR1

SPECIFICATIONS	QUANTITY	POSITION
RG MC7812CT 1.0A/12V TO220	1	RG51
PHOTO-TRIAC MOC3022	1	U51
PHOTO PC123 TLP721F(04-GR)	2	U52, U53
PWM TL3845P TI	1	U55
OP LM324 LA6324N	1	U54
DR-COIL DR005A 9x12 0.35 498uH	1	L52
TR131-R4 Ku130125x2 91.6u SP500-27	1	L51
MT TF403-R1 ETD-44 SP-500-27	1	T51
BEAD CORE BD-001A-M4S RH3.5x3x1.5	10	D60, D61, D62, Q51, Q52
TB DT-4C-B14W(1172)-08	1	TB1
WAFER 8822-02 P=2.5	1	CN51
I/O WIRE PSP300-CN1-R1	1	CN1
I/O WIRE PSP300-CN6-R2	1	CN3
I/O WIRE SP500-CN1-R1	1	CN2
I/O WIRE SP500-CN2-R3	1	CN4
HS YS021W-3 72020-3 h=25m/m	1	HS53
HS YS032W-070 71431W-070	2	HS51, HS52
CORE MS-130125 HKH-130	2	L51
PCB SP-500B-R10 FR4 20Z DS	1	PCB
TW 30. NI	1	RTH2
SCREW P 3x10 ISO NI	5	D60, D61, D62, Q51, Q52
SCREW P 3x6 TP2 ZN	5	HS51, HS52, RTH2
SCREW T 3x6 TP2 NI H	1	HS53

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



SPECIFICATIONS

Frequency	470 - 860MHz
Connectors	7/16"
Power handling	1200W CW
Insertion loss	0.28dB Typ. @ V.C.
Return loss	28dB
Operating temperature	-10° to +50°C
Bandwidth	6 to 8MHz
Selectivity @V.C.-5.5/+11	-50dB
Selectivity @V.C.-11/+16.5	-35dB
Weight	8kg

TESTING AND CALIBRATION INSTRUCTIONS

The output filter Mod. CL4NL22 is made up by a 4-resonator band-pass section and two “notch” resonators. It can be adjusted on all the channels of the TV UHF band (470 ÷ 860MHz) and on all the world standards (intercarrier 4.5 - 6.5MHz). The pass-band section is made up by the group of the four resonators, while the two separate resonator are the notches. The filter is symmetrical, thus there is no difference between the upper and lower notch.

The band width is adjusted by changing the insertion of the lower Post Screws which are placed between the band-pass resonators; inserting the post screws it is increased. In order to perform this adjustment, loose the bolt of each post screws by means of a wrench n° 19. The first and third post screws have to be adjusted for the same protrusion from the body of the filter, while the middle one should usually be adjusted in a slightly different manner in order to obtain an equiripple response.

The input and output coupling, which can be reached by removing the protection cups, can be adjusted by means of the two lower Coupling Stubs next to the connectors. The adjustment is made by means of a flat wrench n° 18, taking into consideration that when the maximum coupling is obtained when the command cuts are parallel to the longer side of the filter, the minimum when they are orthogonal to it.

The response symmetry is determined by the protrusion of the above mentioned stubs; these are set by loosening the relevant lower clamps by means of a tube wrench n° 16. The clamps, once tightened, also determine the friction of the rotatio of the couplings.

The suggested calibration sequence os the following:

set the measuring instrument on

- C.G. = (P.V. + P.A.) / 2
- SPAN = INTERCARRIER * 5 (Es. 27,5MHz std. B/G)
- RESPONSE = 5dB/div.
- ADAPTATION = 10dB/div.

Center Frequency [MHz=]	Coupling Stub [mm=]	Post Screw [mm=]
474	2	6
570	16	15
666	29	17
762	38	17
858	40	17

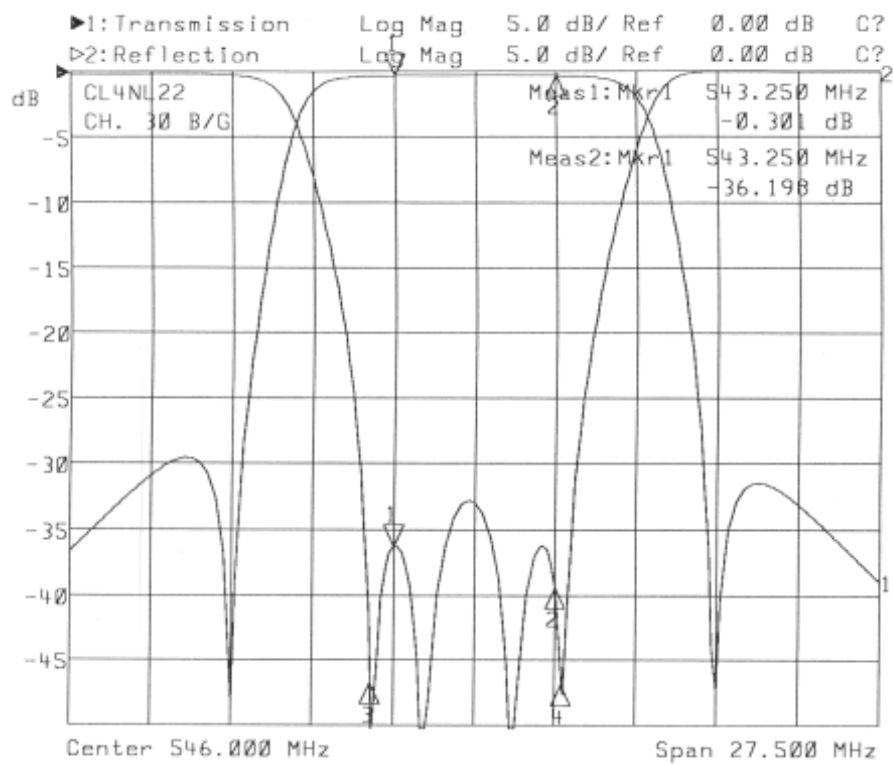
-
- Set the coupling stubs and the post screws according to the indicative protrusion from their edge to the body of the filter listed in the table.
 - Tune the band-pass section on the wanted channel and load input and output correctly to obtain an optimal response. At this stage the tuning of the two notches have to be kept distant from one another. Adjust the band width to -35dB at the limits of the screen (Es. std. B/G: BW (-35dB) = 27,5MHz). The input and output couplings may affect the tuning of the resonators, as such they have to be adjusted in small steps, one after another. The equiripple response is obtained by adjusting the middle Post Screws.
 - Tune the two notches bringing them to the frequencies P.V.-INTERCARRIER and P.A.+INTERCARRIER. This will cause a change in the response and the adaptation of the band-pass. Correct the response by acting on the band-pass tuning.
 - Complete the calibration on both sides in this sequence: adjust the coupling, re-tune the notch in case it has moved and then the band-pass tuning. If needed, adjust the middle Post Screws to obtain the best equiripple adaptation. Perform this sequence in little steps trying to obtain the best adaptation.
 - Check the symmetry of the obtained response, and correct it if needed according to the following criterion: if the lower notch is more accentuated than the other one, insert the coupling stubs, otherwise, if the upper one is more accentuated, extract them.
 - Once the symmetry of the response has been corrected, complete the calibration as explained above.

Once the calibration has been completed, put again the protection cups on the coupling regulators.

Insertion loss @ P.V. (dB)	< -0.40 (typ. -0.32)
R.L. (from P.V.-0.75 to P.A.+0.25) (dB)	> 28

Attenuation @ P.V. -INTERCARRIER (dB)	> 40
Attenuation @ P.V. +INTERCARRIER (dB)	> 40

FREQUENCY RESPONSE



1: Mkr (MHz)	dB	2: Mkr (MHz)	dB
1> 543.25	-0.301	1> 543.25	-36.198
2: 548.75	-0.305	2: 548.75	-39.359
		3: 542.50	-46.694
		4: 549.00	-46.810