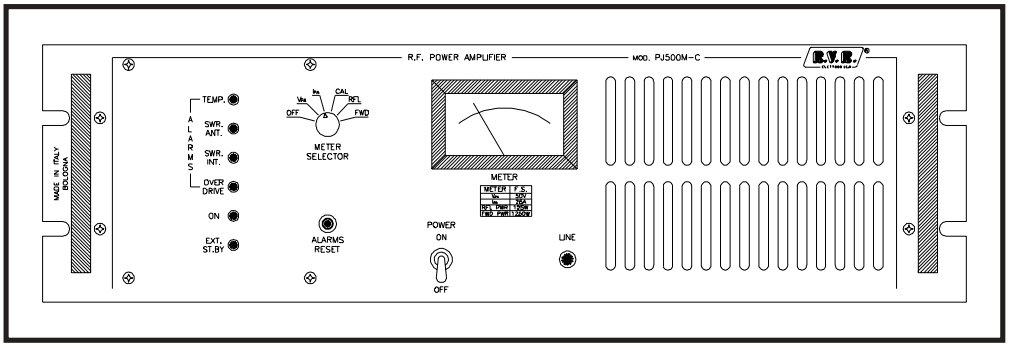
PJ500M-C



TECHNICAL AND MAINTENANCE MANUAL

Manufactured by R.V.R. Elettronica - Italy

PJ500M-C F.M. MOS-FET POWER AMPLIFIER 87.5-108 MHz RANGE

Technical and Maintenance Manual

INDEX

PRELIMINARY INSTRUCTIONS AND WARRANTY INFORMATION

WARNING: This equipment is a "CLASS A" equipment. In a residential place this equipment can cause hash. In this case can be requested to user to take the necessary measures.

Please observe safety precautions when handling this unit. This equipment contains dangerous currents and high voltages.

This manual is written as a general guide for those having previous knowledge and experience with this kind of equipment. It is not intended to contain a complete statement of all safety warnings which should be observed by personnel in using this or other electronic equipment.

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

Please observe all local codes and fire protection standards in the operations of this unit.

CAUTION: always disconnect power before opening covers or removing any part of this unit. Use appropriate grounding procedures to short out capacitors and high voltage points before servicing.

Any damage to the goods must be reported to the carrier in writing on the shipment receipt.
Any discrepancy or damage discovered subsequent to delivery, shall be reported to R.V.R. within five (5) days from its receipt.

R.V.R. extends to the original end-user purchaser all original manufacturers warranties which are transferable and all claims are to be made directly to R.V.R. per indicated procedures.

All manufacturers warranties will be supported by R.V.R. to ensure precise and speedy service where possible.

R.V.R. shall not be liable for any damage of whatsoever nature, arising out of or in connection with the product or its use thereof.

R.V.R.'s warranty shall not include:

1) Re-shipment of the unit to R.V.R. for repair purposes
2) Any unauthorized repair/modification
3) Incidental/consequential damages as a result of any defect
4) Nominal non-incidental defects
5) Re-shipment costs or insurance of the unit or replacement units/parts

Warranty shall come into force from invoice date and for the period of the manufactures warranty.

The warranty for a period of 12 months is referred to any R.V.R. product, while for products as transistors, Mos-Fet and tubes of the final stages is applied the manufacture's warranty of these devices.

To claim your rights under this warranty:

a. Contact the dealer or distributor where you purchased the unit. Describe the problem and ask if he has an easy solution. Dealers and Distributors are supplied with all the information about problems that may occur and usually they can repair the unit quicker than what the manufacturer could do. Very often installing errors are discovered by dealers.

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

c. When you receive the authorization, you can return the unit. Pack it carefully for the shipment, preferably using the original packing and seal the package perfectly. The customer always assumes the risks of loss (i.e., R.V.R. is never responsible for damage or loss), until the package reaches R.V.R. premises. For this reason, we suggest you to insure the goods for the whole value. Shipment must be effected C.I.F. (PREPAID) to the address specified by R.V.R.'s service manager on the authorization.

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

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

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

R.V.R. Elettronica S.r.l. -
Broadcasting Equipment -
Via del Fonditore, 2/2c
40138 Bologna - Italy

R.V.R. reserves the right to modify the design and specifications of the equipment in this manual without previous notice.

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.
R.V.R. ELETTRONICA 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 sticks 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

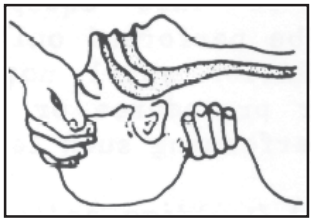
Treatment of electrical Shock

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

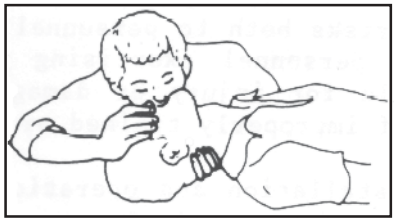
IF UNCONSCIOUS,
OPEN AIRWAY



LIFT UP NECK,
PUSH FOREHEAD BACK,
CLEAR OUT MOUTH IF NECESSARY,
OBSERVE FOR BREATHING

B BREATHING

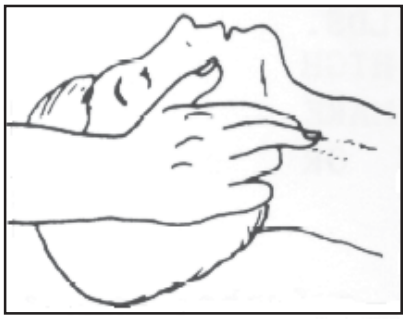
IF NOT BREATHING,
BEGIN ARTIFICIAL BREATHING.



TILT HEAD,
PINCH NOSTRILS,
MAKE AIRTIGHT SEAL,
4 QUICK FULL BREATHS.
REMEMBER MOUTH TO MOUTH RESUSCITATION MUST BE COMMENCED AS SOON AS POSSIBLE.

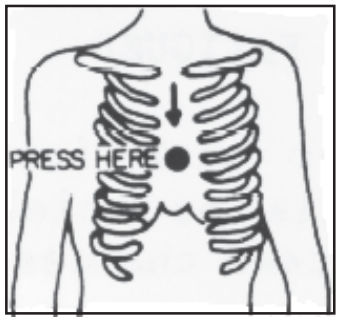
C CIRCULATION

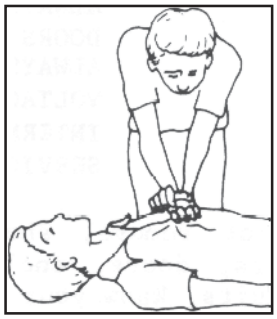
CHECK CAROTID PULSE



IF PULSE ABSENT,
BEGIN ARTIFICIAL CIRCULATION

DEPRESS STERNUM 1 1/2" TO 2"





APPROX. 80 SEC. : ONE RESCUER, 15 COMPRESSIONS, 2 QUICK BREATHS.

APPROX. 60 SEC. : TWO 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:
   a. Keep them warm.
   b. Keep them as quiet as possible.
   c. 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.

   a. Cover area with clean sheet or cloth. (Cleansed available cloth article).
   b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply any salve or ointment.
   c. Treat victim for shock as required.
   d. Arrange transportation to a hospital as quickly as possible
   e. If arms or legs are affected 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)

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

SECTION 1
GENERAL DESCRIPTION

1.1 EXTERNAL DESCRIPTION

The PJ500M-C is housed in a 3U 19" rack, each single module are wired with connectors allowing easy servicing and replacement.
On the front panel the alarm indicators are placed in a left position, the mains switch and the meter for the principal parameters in a central position.
On the rear panel the R.F. INPUT and R.F. OUTPUT connectors are located, together with the telemetry connector, the R.F. output test connector (directional coupler), the mains socket the fuses and an auxiliary mains line output for the supply of other exciters of a different design and make.

1.2 ELECTRICAL DESCRIPTION

PJ500M-C is a MOSFET power amplifier working on the 87.5-108 MHz band with an output power in excess of 500W and a drive level of about 16W.
This amplifier uses two R.F. modules able to deliver more than 300W each, with one switching power supplies for high efficiency.
A built in low pass filter suppresses the harmonic content below the FCC and CCIR requirements.
A protection system takes care of the amplifier against thermal problems, excessive input drive power and excessive SWR inside the amplifier or along the feeder.
This system provides an automatic reset to initial conditions when the problem ceases.

1.3 METERS AND INDICATORS

The principal parameters of the amplifier are read by the analog multimeter (9 Fig.1) and selected by the rotary switch (8 Fig.1) on the front panel.
On the front panel are presents two different sections of signalling leds.
In the first section there are four red alamrs leds (Temp., S.W.R. Ant., S.W.R. Int., Over Drive), one green led for the signalling of On/Off status and one yellow led for an External Stand By. In the second section there are four green led for the signalling of each single R.F. power amplifier module's protection fuse status.

1.4 AUTOMATIC GAIN CONTROL

An unused characteristic of this amplifier is the outstanding power gain; indeed without preamplifiers we have an output power of 500W with a drive of only 8W.
A power limiter stabilizes the output power against input drive fluctuations.

1.5 PROTECTION CIRCUITS

The protection circuits set the amplifier in stand-by in the case of a fault condition.
After 10 seconds the protection reactivates the amplifier if the fault has disappeared.
If not, this process is repeated 4 times at the end of which the amplifier stays disabled for 90 sec.; after 90 sec, if the trouble persists the protection performs other four cycles and then disable the amplifier indefinitely.
If during these cycles the anomaly disappears and the amplifier works regularly for more than 90 sec. the counting system is reset and the original conditions established.
(NOTE The intervals described are indicative)
The protection acts for excessive SWR, over-temperature and overdrive, indicates the problem with warning lights and disables the pilot exciter.

1.6 R.F. AMPLIFIERS

The amplifier employs two broadband modules with 50 Ohm input/output impedance.
The output power of each module is 300W with 4-5W of drive.

1.7 DEVICE SPECIFICATIONS

Refer to Table (A) for electrical specifications, and to Table (B) for dimensional and environmental specifications.

SECTION 2
ELECTRICAL DESCRIPTION

TABLE A

TECHNICAL SPECIFICATIONS

A.C. Supply	100-130 V, 50-60Hz 198-250 V, 50-60 Hz
Cooling	Forced Ventilation
Frequency Range	from 87.5 to 108 MHz
Power Output	500 W
R.F. Drive Power	approximately 8W for Pout=500W
R.F. Input Connector	Standard "N" type connector
R.F. Input Impedance	50 Ohm
R.F. Output Connector	Standard "N" type connector
R.F. Output Impedance	50 Ohm
Spurious & Harmonic Suppression requirements	meets or exceeds all FCC and CCIR

TABLE B

DIMENSIONAL AND ENVIRONMENTAL SPECIFICATIONS

Cabinet Dimension	*129.0 mm (5.07") H* *445.0 mm (17.52") W* *504.0 mm (19.84") D*
Panel Size	*483.0 mm (19") W* *132.5 mm (5.22") H*
Operating Temperature	*-10°C to 50°C*
Humidity	*95% Max, Non Condensing*
Weight	*30Kg*

This section describes the overall working theory of the PJ500M-C.
For case of description the amplifier is subdivided into subassemblies that will be discussed in detail below.
The block diagram is illustrated in Fig.3.

2.1 POWER SUPPLY

The power supply are housed in the left side of the amplifier as shown in Photo 1. The Switching Power Supply is mounted on a heats that allows its cooling through forced ventilation.
Housed inside to the PJ500M-C the are two transformer, all transformers have a selectable input for voltages between 110 and 240 Volt.
The first has one output, 61-0-61 Volt for Switching Power Supply.
The second have tree outputs: A 18-0-18 Volt, B 0-15 Volt, C 0-15V, the output A drive the Alarms Card and the Soft Card, the outputs B and C supply the Control Section of Switching Power Supply.
Inside the Alarms Card a rectifying and stabilization circuit provides the +15 and -15 Volt needed by the electronics.
The 50Volt switchers regulate the R.F. output power using a voltage detected by a directional coupler mounted on the low pass filter's output.

2.2 R.F. POWER AMPLIFIER

The R.F. Power amplifier section is composed of the two power modules coupled through with a Wilkinson Splitter and Combiner realized with "Strip Line Technology".
The four R.F. modules, splitter card and cobiner card are housed in the top side of the equipment.
All R.F. section is mounted on a heat-sink that allows its cooling through forced ventilation.
Every module delivers 300W with 4-6W of drive and is supplied by an switching power supply.
The quiescent parameters of each module are:

$$VDC=50V \qquad V_{gs}=3.5V \qquad I_{dq}=200mA$$

The active device employed is a Mosfet (BLF278).

2.3 WILKINSON SPLITTER AND COMBINER

The Wilkison Splitter and Combiner are realized with "Strip-Line Technology".
The Splitter Card is used to splitt exciter's driving power of each R.F. Power Amplifier moudules.
The Combiner Card is used to combine the output powers of each R.F. Power Amplifiers moudules.
These two circuit garantees equal phases on the input and ouput power of each R.F. Power Amplifiers modules. A power resistor placed on each circuits used

to absorb any unabalanced powers in case of faulty.

2.4 BIAS CARD

This card has the function to control and if necessary to correct the polarization current of each single Mos-Fet of the R.F. section.
Then it's able to supply external measures as: currents, volatges for each R.F. amplifier module, total current and average voltage.

2.5 ALARMS CARD

This card is housed on the front panel, on left position, as showed in Photo 1. On this board, the electronics detect any system anomaly such as excessive SWR, internal or antenna, over-temperature etc.
This module will also, whenever possible, reset the system to its original conditions, after a fault has accused.

2.6 TELEMETRY TERMINALS

The telemetry connector (11 Fig.2) is placed on the rear panel in the right side as shown in Fig.2.
Thanks to this connector the essential parameters of the amplifier are externally available for remote measurements purposes.

SIGNALS	*PIN N°*	*VOLTAGE LEVEL*
OFF	*1*	*N.C.*
Power Amplifier Current	*2*	*2.0V for 20A*
Reflected Power	*4*	*1.4V for 100W*
Inhibit Tx	*5*	*12V*
Internal SWR	*6*	*15V when fault*
Operate	*8*	*15V*
Power Amplifier Voltage	*14*	*2.0V for 50V*
Calibration	*15*	*2.0V for f.s.*
Forward Power	*16*	*1.6V for 1000W*
Temperature	*17*	*15V when fault*
Antenna SWR	*18*	*15V when fault*
Over Drive	*19*	*15V when faul*
Stand By	*20*	*15V*
Ground	*3,7,21*	*0V*

The other pin are not used.

2.7 SOFT START

The soft start is mounted on a board placed on the left side of the amplifier in the position shown in Photo 1.
This circuit eliminates the current spikes generated by the transformer when it is powered.

2.8 LOW PASS FILTER

This filter is housed in the right side of the equipment as showed in Photo 1.
The Low Pass Filter and R.F. section are mounted on a heat-sink that allows its cooling through forced ventilation. Thanks to this low pass filter we have a harmonic suppression better than 75 dB.

SECTION 3

INSTALLATION OPERATIONS

FRONT PANEL VIEW DESCRIPTION (FIG. 1)

1 EXT. ST. BY — Led indicating an External Stand-By

2 ON — A.C. ON Power indicator

3 ALARMS RESET — Press-button to reset the alarm status

4 ON/OFF POWER — On/Off Power Switch

5 LINE — A.C. Line Indicator

6 AIR GRID — Air Grid for forced ventilation

7 ALARMS — Leds indicating the PJ500M-C's alarms status

8 METER SELECTOR — Selector to monitor operating parameters:

OFF	Not Used
Vpa	PJ500M-C's Volatge
Ipa	PJ500M-C's Current
CAL	Calibration
RFL	Reflected Power
FWD	Forward Power

10 METER — Analog meter used to monitor the operating parameters of the amplifier

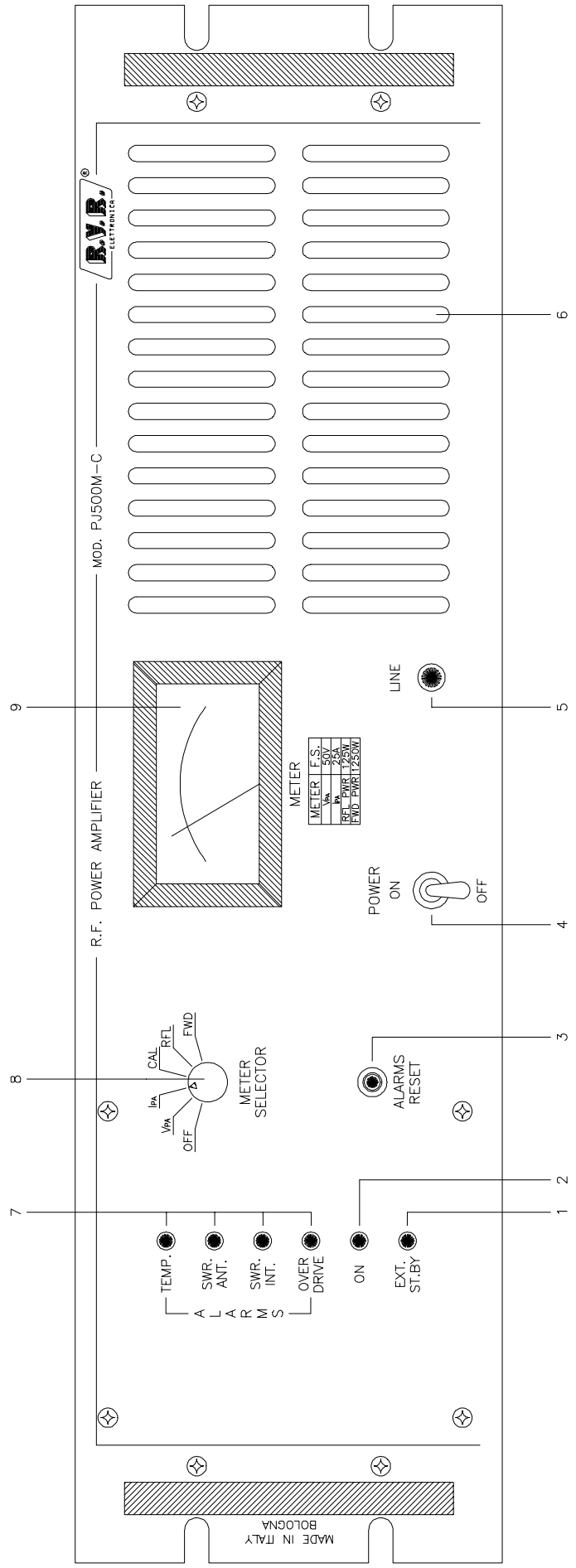

R.V.R. ELETTRONICA
MOD. PJ500M-C
R.F. POWER AMPLIFIER
MADE IN ITALY
BOLOGNA
METER
METER F.S.
VPA 50V
IPA 25A
RFL PWR 125W
FWD PWR 125W
LINE
POWER
ON
OFF
METER SELECTOR
CAL
RFL
FWD
IPA
VPA
OFF
ALARMS RESET
TEMP.
SWR. ANT.
SWR. INT.
OVER DRIVE
ON
EXT. ST.BY
ALARMS
1
2
3
4
5
6
7
8
9

FIG. 1

REAR PANEL VIEW DESCRIPTION (FIG. 2)

1	FAN	Fan for Forced Ventilation
2	FAN	Fan for Forced Ventilation
3	AUX. OUT. A.C. LINE FUSE	Auxiliary Output A.C. Line Fuse
4	A.C. LINE FUSE	A.C. Line Protection Fuse
5	MODULE R.F. FUSE	Protection Fuse for Module R.F.
6	MAINS VOLTAGE SOCKET	Mains Volatge Socket
7	VOLTAGE CHANGER	Mains Volatge Changer & Service Volatge Changer: Voltage Mains 110 Vac 1-2 / 3-4 220 Vac 2-3
8	R.F. OUTPUT	Output R.F. connector ("N" type)
9	R.F. TEST -60dB	-60dB with respect to the Output Level
10	AUX. OUT. A.C. LINE	Auxiliary Output A.C. Line
11	TELEMETRY CONNECTOR	Connector for remote measurement of operating parameters
12	ALARMS/INTERLOCK	BNC connector which permits the exciter to be put in stand-by, by grounding the central contact, in case of amplifier overload
13	R.F. INPUT	Input R.F. connector ("N" type)

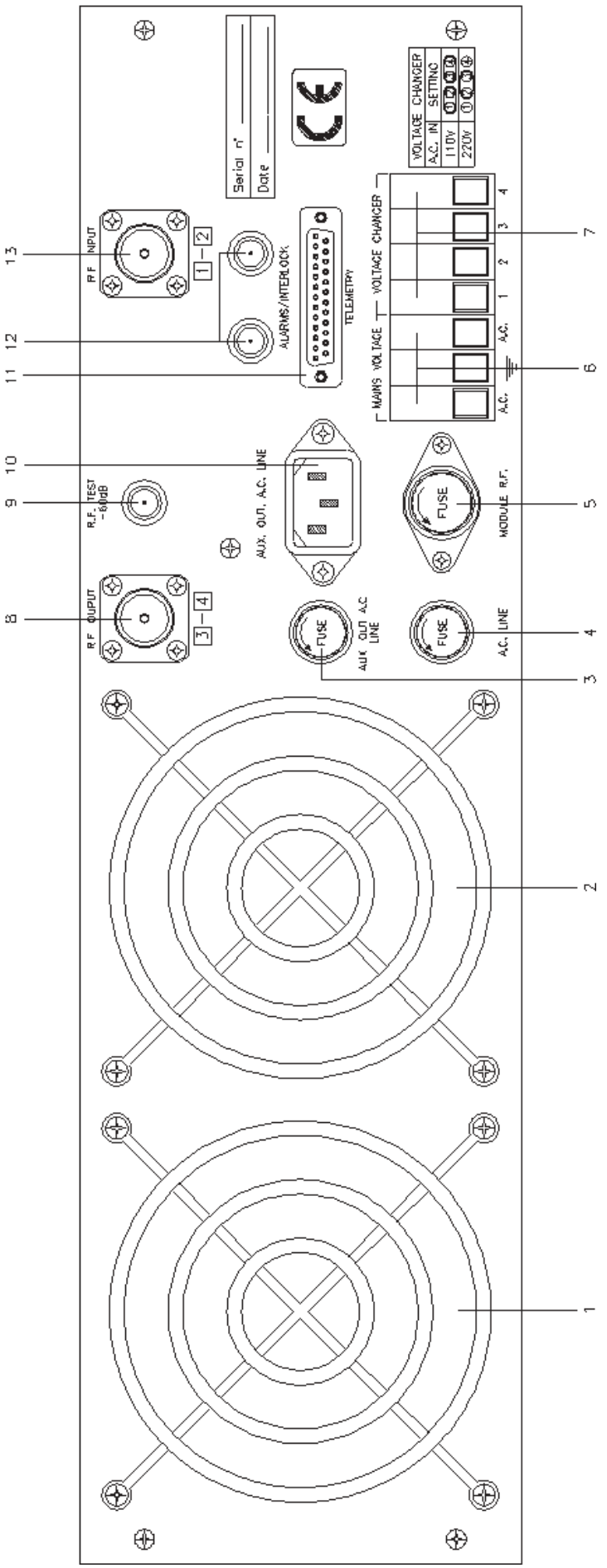

Serial n°
Date
VOLTAGE CHANGER
A.C. IN
SETTING
110v
220v
RF INPUT
1 - 2
ALARMS/INTERLOCK
TELEMETRY
MAINS VOLTAGE
VOLTAGE CHANGER
A.C.
1
2
3
4
R.F. TEST -60dB
AUX. OUT. A.C. LINE
FUSE
MODULE R.F.
RF OUPUT
3 - 4
AUX OUT A.C LINE
A.C. LINE
13
12
11
10
9
8
7
6
5
4
3
2
1

FIG. 2

TOP VIEW DESCRIPTION (PHOTO 1)

1 ..... Soft Start Card

2 ..... Alarms Card

3 ..... Switching Power Supply

4 ..... Wilkinson "2-Way" Power Coupler

5 ..... R.F. Modules

6 ..... Low Pass Filter

7 ..... Service Transformer

8 ..... Main Transformer

9 ..... Wilkinson "2-Way" Power Divider

10 ..... Directional Coupler

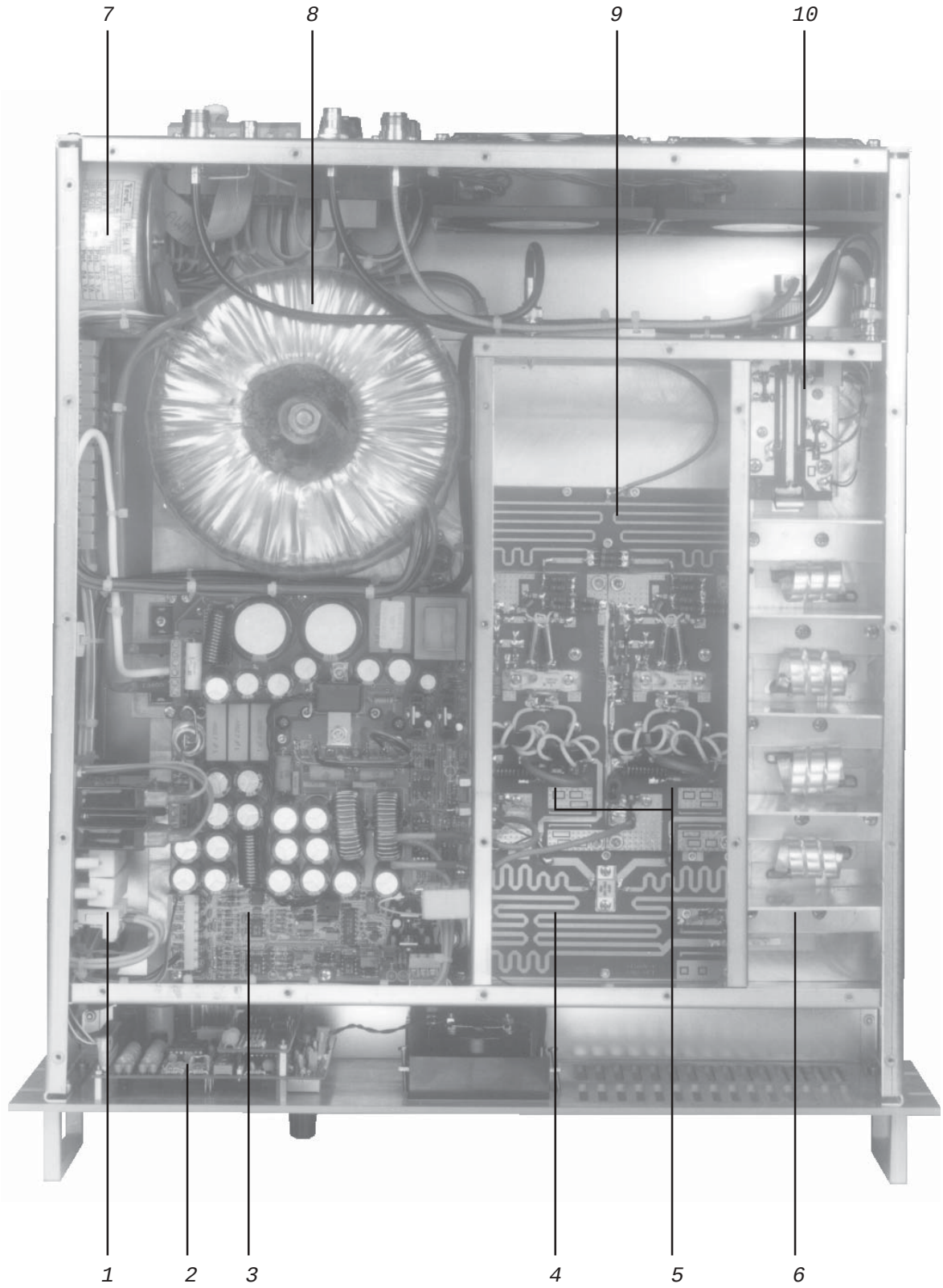


PHOTO 1

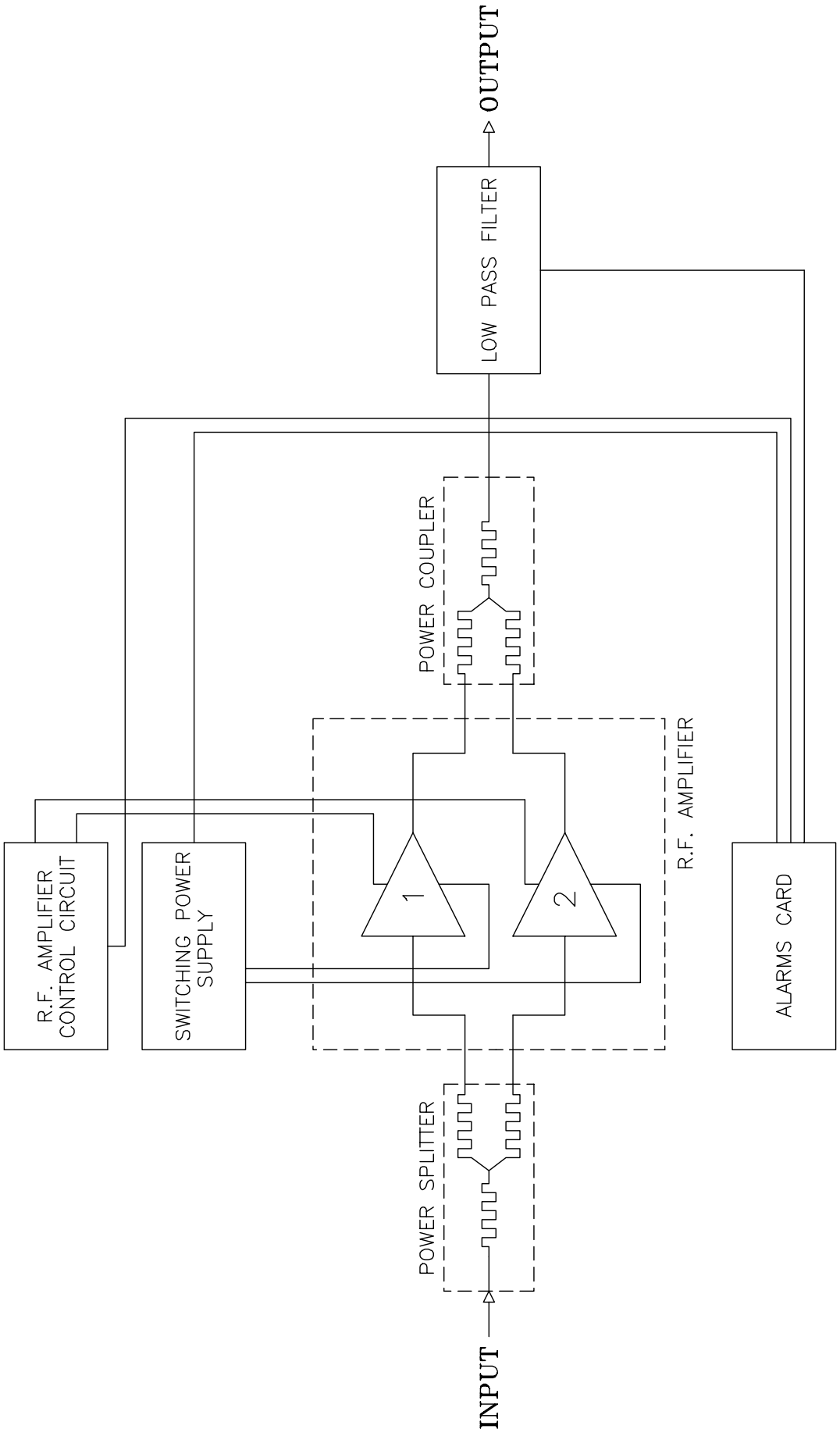
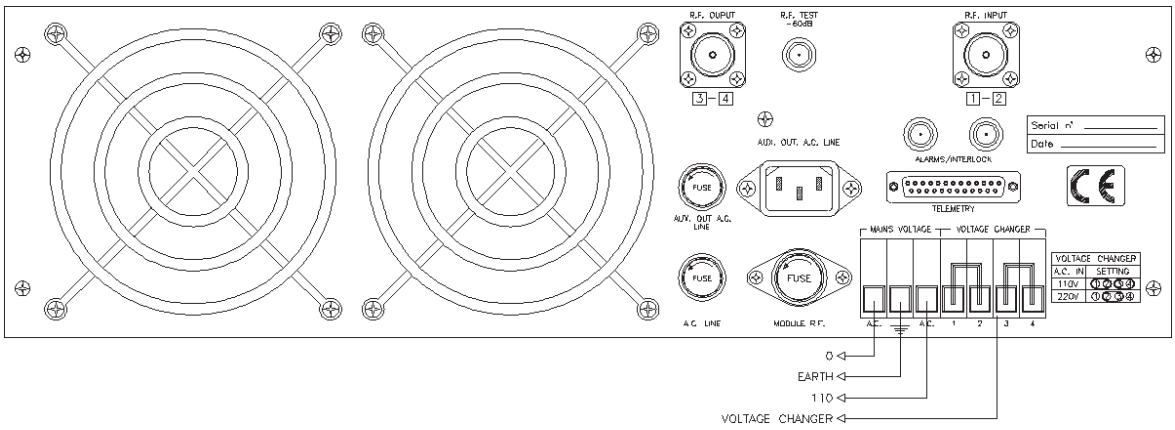

OUTPUT
LOW PASS FILTER
POWER COUPLER
R.F. AMPLIFIER
1
2
R.F. AMPLIFIER CONTROL CIRCUIT
SWITCHING POWER SUPPLY
ALARMS CARD
POWER SPLITTER
INPUT

FIG. 3

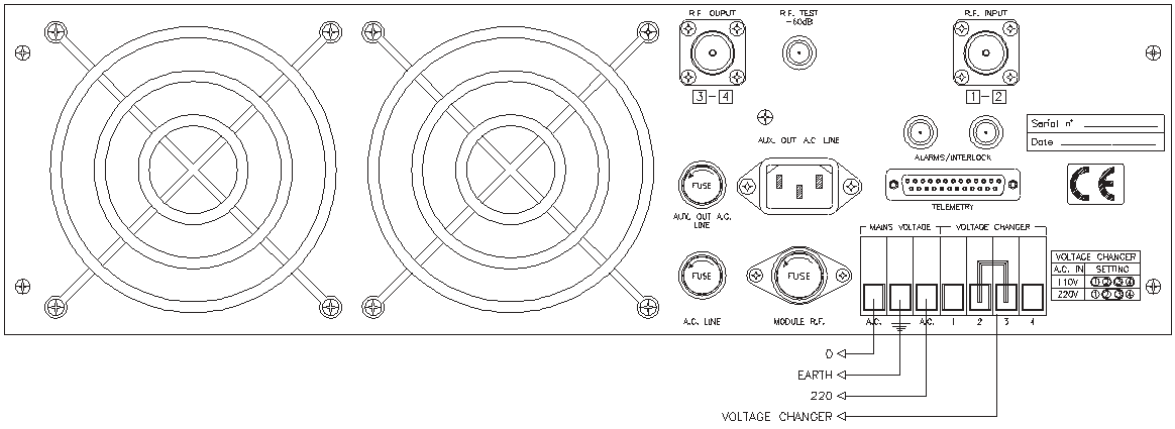
TABLE C

RECOMMENDED TEST EQUIPMENT

INSTRUMENT	MODEL	SPECIFICATIONS
Oil Dielectric Loads	Bird Mod. 8251	Power Rating 1000W continuous Impedance 50Ohms nominal
Truline R.F. Power Analyst	Bird Mod. 4391	Power Range 100mW to 10KW Freq. Range 0.45 to 2300MHz
Plug-In-Elements	Bird Mod. 100B	Power Rating 100W Freq. Range 50 to 125MHz
Plug-In-Elements	Bird Mod. 1000B	Power Rating 1000W Freq. Range 50 to 125MHz
Spectrum Analyzer	H.P. Mod. 8591E	9KHz-1.8GHz
Network Analyzer Mod. 8753A	H.P.	300KHz-3.0GHz
S-Parameter Test Set	H.P. Mod. 85046A	300KHz-3.0GHz
Digital Multimeter	Fluke Mod. 73	
Electronic Load Resistor	R.V.R.	Min. Work Voltage: 50Vdc Min. Work Current: 20A



100VAC - 130VAC



198VAC - 250VAC

VOLTAGE SETTINGS

TABLE D

PROTECTION FUSE TABLE

MAINS VOLTAGE 198-250V

REFERENCE	***CURRENT***	***SIZE***	***TYPE***
Aux. Out. A.C. Line	*6A*	*6.3x32*	*FAST*
R.F. Module	*25A*	*10x38*	*FAST*
A.C. LINE	*10A*	*6.3x32*	*NORMAL*

MAINS VOLTAGE 100-130V

REFERENCE	***CURRENT***	***SIZE***	***TYPE***
Aux. Out. A.C. Line	*6A*	*6.3x32*	*FAST*
R.F. Module	*25A*	*10x38*	*FAST*
A.C. LINE	*16A*	*6.3x32*	*NORMAL*

3.1 INTRODUCTION

This chapter contains necessary information for the preliminary checks and installation of the PJ500M-C.

3.2 UNPACKING

Unpack the amplifier and, before any other operation, check that the amplifier isn't damaged and that all controls on the front and rear panel are in good condition.

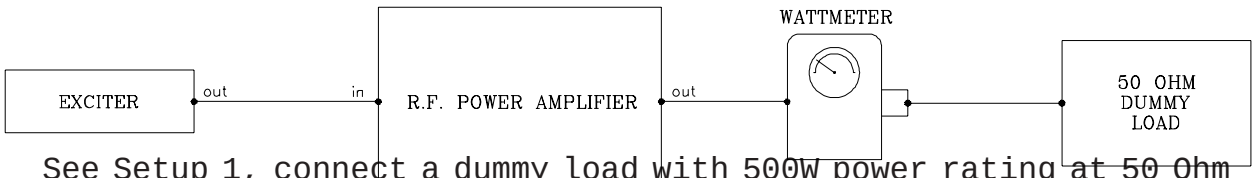
3.3 INSTALLATION

1) On the rear panel check the setting of the mains voltage selector for the proper value, referring to serigraph.
Connect the mains cable screwing the three headers (2 Fig.2).

NOTE For 110V supply 25A a cable with a 6.0mm section is needed; for a 220V voltage, a 2.5mm section is sufficient.

2) Place the mains switch in the off position (4 Fig.1).

3) Check the A.C. Line fuse for the proper value (5 Fig.2) 16A for 220V supply or 25A for 110V supply.



SETUP 1

4) See Setup 1, connect a dummy load with 500W power rating at 50 Ohm to the R.F. Output connector (8 Fig.2) with a through wattmeter.

5) Switch on the mains switch and check the proper led is on.

6) Internal parameters control.
Select with the Meter Selector (8 Fig.1) the Power Amplifier supply voltage (Vpa) and check the value of 50Vdc.
Select the current "Ipa" and check that the value of 800mA.
In the same way check FWD and RFL powers are zero.

7) Connect to the R.F. Input connector (13 Fig.2) a suitable exciter able to deliver a power of between 0 and 30W.

8) Connect the Alarms/Interlock Connect. (12 Fig.2) to the appropriate connector of the exciter.

9) Switch on the exciter with the output power set to the minimum value.
Tune the exciter to a middle band frequency e.g. 98Mhz, wait for the P.L.L. to lock then gradually raise the output power of the exciter.
Verify the increase in the output power the of PJ500M-C and simultaneously monitor the current Ipa; they should increase proportionally and assume about the some final value.
Continue this operation until a 500W output value is obtained.
At this condition the working parameters are:
V1=V2=Vpa= about 50V
Ipa= about 18A (typ.)

10) Check the reading of the internal wattmeter with that of the external one (a discrepancy of about 10% is tolerable).

11) With the amplifier at full power, push and keep pushed the Reset switch, and check that output power, Vpa and Ipa, go to zero and that the output power of the exciter goes to zero too.
Release the switch and all the previous parameters will go back to their original values.

12) Increase the drive power until the Over Drive led lights.
At this point, the lock condition should disable the amplifier and exciter for about 10 sec, after which the amplifier will try to restart. If the drive power setting has not changed, another lock condition will occur, otherwise the amplifier will restart normally.
In the case of another lock condition, the protection circuit will make 4 attempts at a restart. Should this fail the amplifier will wait for a longer periods and make 4 more attempts. Should this not be successful, the amplifier will remain disabled indefinitely.

SECTION 4
MAINTENANCE

This section provides general maintenance information and electrical

adjustment procedures for the P500M-C Amplifier.
Maintenance is divided into categories dependent upon the complexity of the procedure and the test equipment required to complete the maintenance.

4.1 SAFETY CONSIDERATIONS

WARNING! WARNING! WARNING! WARNING! WARING! WARNING! WARNING!

When the amplifier is operated with the top cover removed, hazardous voltages are accessible on the AC line voltage selector and heavy currents are accessible on the exposed terminals of the power supply filter capacitor and power transistors mounted on the RF amplifier heat sink assembly. Use the insulated tuning tool provided for any adjustment and do not touch any component within the amplifier when power is applied.
Ensure all primary power is disconnected from the amplifier before attempting equipment maintenance.

FIRST LEVEL MAINTENANCE

4.2 ORDINARY MAINTENANCE

The only regular maintenance needed by PJ500M-C, is the periodic replacement of the blowers, and the cleaning of dust filters and any dust accumulated inside the amplifier.
The time between overhauling of the blowers depends upon several environmental factors, temperature, humidity, dust pollution etc.
Blowers should be checked every 6 months and replaced if noisy. They should be replaced any way after 18 months of service.

SECOND LEVEL MAINTENANCE

4.3 CARDS SUBSTITUTION

This section contains useful information for card replacement.

WARNING! TO RE-INSTALL THE CARDS IS ENOUGH TO EXECUTE OPERATIONS SEQUENCE IN THE OPPOSITE WAY.

4.4 POWER SUPPLY REPLACEMENT

1) Open the top cover.
2) Take note of the cable position inside the terminal boards J1, J2, J3, J4, J5, J6.

3) Disconnect the external terminal boards loosening just the screws of the connectors mounted on the board.

4) Remove the nine screws that fix the Power Supply to the heat sink.

5) Carefully remove the Power Supply

4.5 R.F. POWER AMPLIFIER MODULE REPLACEMENT

1) Open the top cover.

2) Take note of the wiring.

3) Disconnect all wire (Supply, Gain Control, Input R.F. and Output R.F.).

4) Remove the five screws that fix the R.F. Power Amplifier Module to the heat sink.

5) Carefully remove the R.F. Power Amplifier Module.

4.6 WILKISON SPLITTER CARD

1) Open the top cover.

2) Unsolder the wire that connect the input of the splitter to R.F. Input Connector of R.F. section.

3) Unsolder the two wire that the connect the four output of the splitter to the inputs of R.F. Power Amplifier Modules.

4) Remove the screw that fix the card to the heat sink.

5) Carefully extract the card.

4.7 WILKISON COMBINER CARD

1) Open the top cover.

2) Unsolder the wire that connect the output of the combiner to the Low Pass Filter.

3) Unsolder the two wire that the connect the four input of the combiner to the outputs of R.F. Power Amplifier Modules.

4) Take note of the wiring of the directional coupler.
5) Unsolder the three wires of the Directional Coupler.

6) Remove the screws that fix the four Power Resistor to the heat sink.

7) Remove the screws that fix the combiner card to the heat sink.

8) Carefully extract the card.

4.8 DIRECTIONAL COUPLER CARD REPLACEMENT

1) Open the top cover.

2) Take note of the wiring.

3) Unsolder the wires of the Directional Coupler.

4) Unsolder the wire connecting the Directional Coupler card to R.F. output connector.

5) Unsolder the wire connecting the Directional Coupler card to Low Pass Filter output.

6) Remove the four screws that fix the Directional Coupler card to the hex standoffs and remove the board.

4.9 SOFT START REPLACEMENT

1) Open the top cover.

2) Disconnect M1 and M2 Soft-Start's connectors.

3) Disconnect the faston placed on pin 6 on relay K1.

4) Dismount the four securing screws and remove the board.

4.10 ALARM CARD REPLACEMENT

1) Open the top cover.

2) Remove the knob of the Meter Selector loosening the screw inside the knob.

3) Dismount the screws of the Meter Selector switch and Alarms Reset push-button.

4) Disconnect CN1 and CN3 Alarms Card's connectors.

5) Disconnect CN2 Telemetry Card's connector.

6) Remove the screws securing the board to the front panel.

7) Carefully extract the card.

4.11 BIAS CARD REPLACEMENT

1) Open the top cover.

2) Take note of the wiring.

3) Disconnect all Bias Card's connectors.

4) Remove the screw that the fix the Bias Control Card.

5) Carefully extract the card.

SECTION 5

INTERNAL ADJUSTMENTS

5.1 POWER SUPPLY ADJUSTMENT (Vers. PSSW5020)

After changing the power supply module and having reconnected all the connectors, make the following tests and adjustments:

1) Disconnect the connector of the cable that connects the Switching Power Supply to R.F. section.

2) Connect a suitable dummy load (50 Ohm, P>500W) to the amplifier output, switch the amplifier on.

3) Check the 50V output of the new power supply using the analog meter and selecting the appropriate reading with the Meter Selector switch. Confirm the measuring of the output voltage with a digital multimeter connected to pins 1-2 and 3-4 of the J3 Power Supply connector; if needed adjust the value with R79.

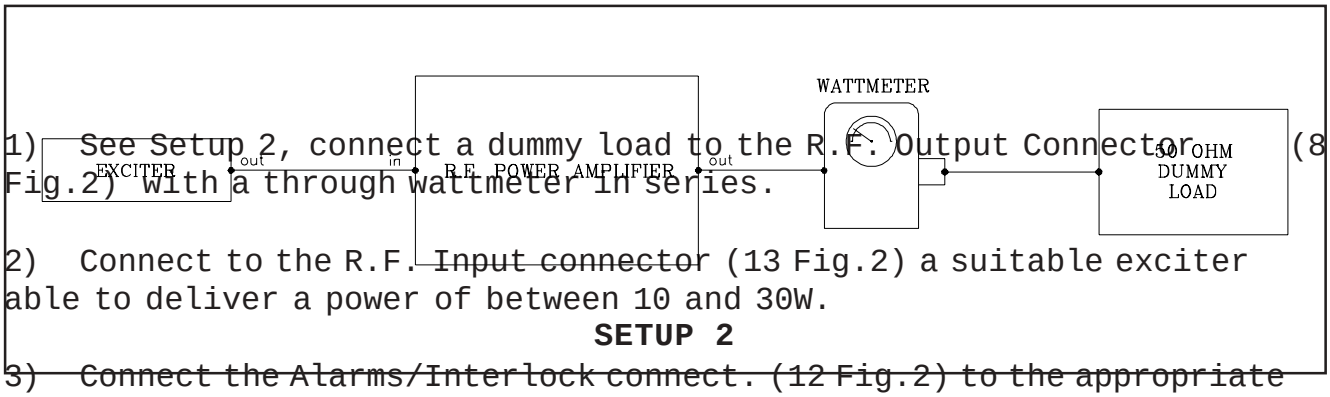
4) Verify that the test point TP2 is present a voltage of 1.6V; if this value is different, adjust R71 to obtain the correct voltage.

5.1A POWER SUPPLY ADJUSTMENT (Vers. PSSW5020B)

No adjustments are required on this module.

5.2 R.F. POWER AMPLIFIER ADJUSTMENT

After you have changed the module and you have connected again all cables, perform the following operations.



SETUP 2

1) See Setup 2, connect a dummy load to the R.F. Output Connector (8 Fig.2) with a through wattmeter in series.

2) Connect to the R.F. Input connector (13 Fig.2) a suitable exciter able to deliver a power of between 10 and 30W.

3) Connect the Alarms/Interlock connect. (12 Fig.2) to the appropriate connector on the exciter.

4) Set the output power of the exciter to its minimum value.

5) Switch on the PJ500M-C and the exciter and wait for the PLL to lock.

6) Now slowly increase the drive checking that the output power rises progressively, with an increase of Ipa current.

NOTE: with P_{out}=500W we have 4.5W < P_{in} < 6W and 15A < Ipa < 18A

Some differences in the currents drawn are related to the different gains of the Mos-Fet devices (BLF 278) and must be compensated with the trimmers R15 placed on each RF power amplifier board. The trimmer to be adjusted will be the one related to the RF module that has a higher current consumption. This one must be adjusted turning it counter clockwise to obtain the same current consumption in each RF module.
Differences of less than 800mA between the four modules are acceptable.

5.3 WILKINSON SPLITTER CARD ADJUSTMENT

No adjustments are required on this module.

Be very careful to correctly reconnect the splitter card, since incorrect connections will destroy the R.F. Power Modules.

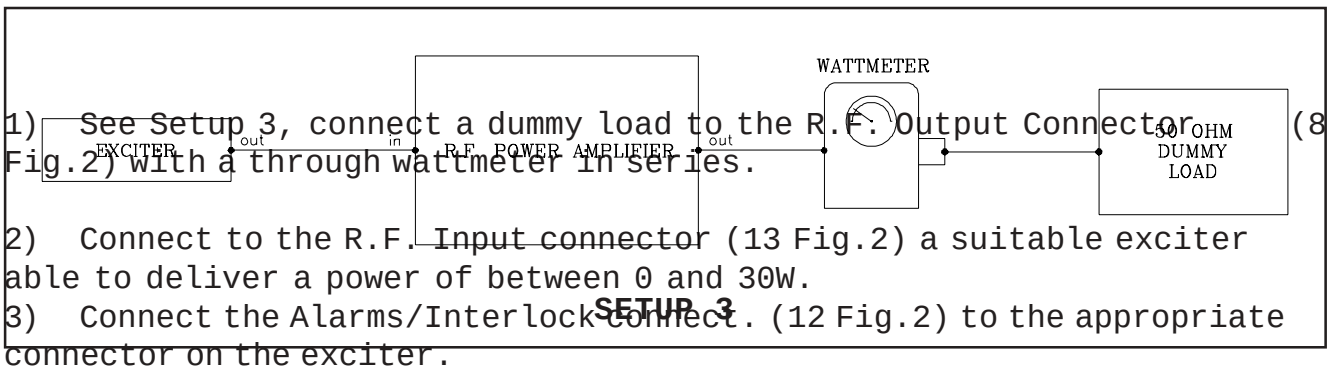
5.4 WILKINSON COMBINER CARD ADJUSTMENT

No adjustments are required on this module.

Be very careful to correctly reconnect the splitter card, since incorrect connections will destroy the R.F. Power Modules.

5.5 AGC CONTROL ADJUSTMENT

After you have changed the Directional Coupler Card or the Low Pass Filter, perform the following operations.



SETUP 3

1) See Setup 3, connect a dummy load to the R.F. Output Connector (8 Fig.2) with a through wattmeter in series.

2) Connect to the R.F. Input connector (13 Fig.2) a suitable exciter able to deliver a power of between 0 and 30W.

3) Connect the Alarms/Interlock connect. (12 Fig.2) to the appropriate connector on the exciter.

4) Turn the "AGC Control" trimmer TR1 completely counter-clockwise.

5) Set the output power of the exciter to its minimum value.

6) Switch on the amplifier PJ500M-C and the exciter and wait for the PLL to lock.

7) Slowly increase the drive power to obtain 500W of output power.

8) Adjust the "AGC Control" trimmer TR1 until you obtain a slight output power drop in the PJ500M amplifier.
This power drop tells us that the power limit system is acting.

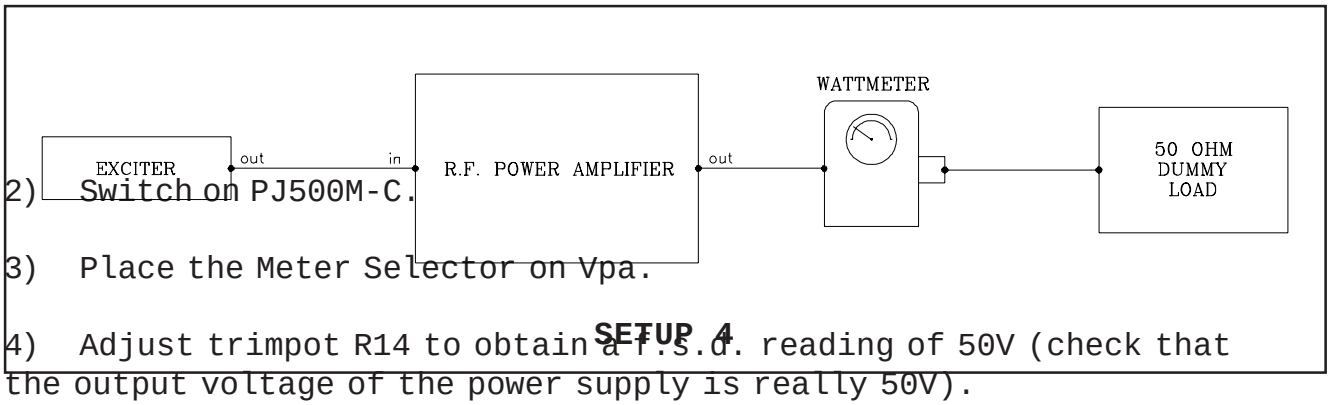
9) Now increase again the drive until Vpa decrease and you obtain a lock condition of the amplifier due to the Over-Drive Protection; this protection is adjustable by means of trimpot R26 on the Alarms Card.
This protection must come on when Vpa voltage is at about 48Vdc.

10) Verify that for an output power of 500W the readings on the internal wattmeter (9 Fig.1) and the external wattmeter coincide (if not, adjust R11 on the Alarms Card).

5.6 ALARMS CARD ADJUSTMENT

NOTE: Make sure that this replacement is really necessary.

1) After changing the board, connect the amplifier as shown in the SETUP 4 schematic.



SETUP 4

2) Switch on PJ500M-C.

3) Place the Meter Selector on Vpa.

4) Adjust trimpot R14 to obtain a f.s.d. reading of 50V (check that the output voltage of the power supply is really 50V).

5) Switch on the exciter and wait for PLL lock.
6) Increase the output power to a level of 500W.

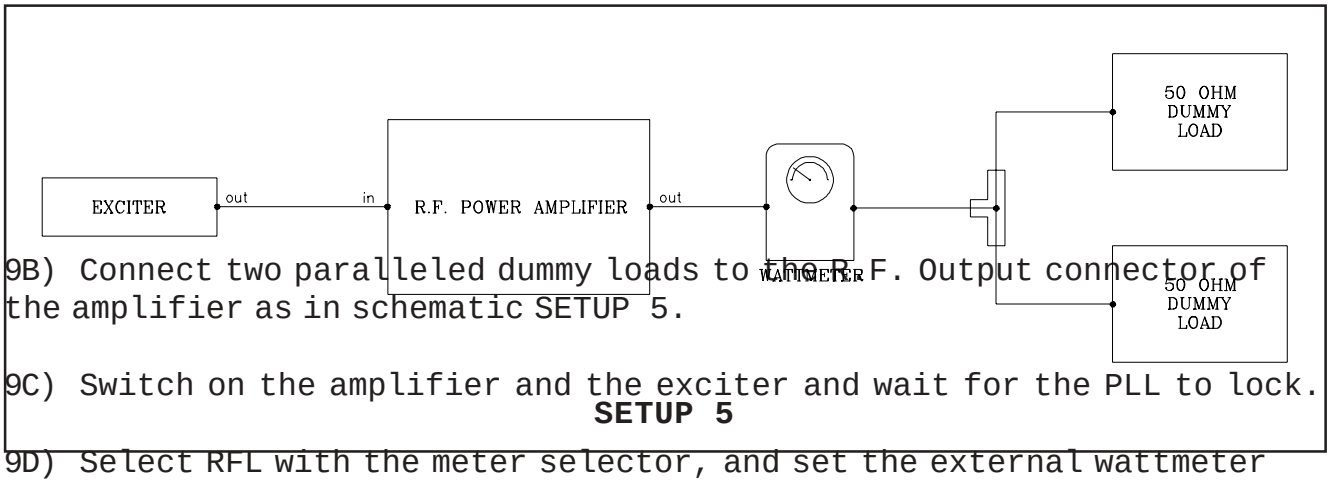
7) Adjust the FWD reading with trimpot R11.

8) Perform the adjustment of the Over Drive trip point as indicated in step 9 of "AGC Control" adjustment.

NOTE: If the Low Pass Filter and Directional Coupler Card has not been changed, don't move "AGC Control" trimmer TR1.

9) INTERNAL S.W.R. CALIBRATION (S.W.R. INT.)

9A) Reduce the drive power to the minimum value, switch off the amplifier and the exciter.



SETUP 5

9B) Connect two paralleled dummy loads to the R.F. Output connector of the amplifier as in schematic SETUP 5.

9C) Switch on the amplifier and the exciter and wait for the PLL to lock.

9D) Select RFL with the meter selector, and set the external wattmeter for reflected power reading.

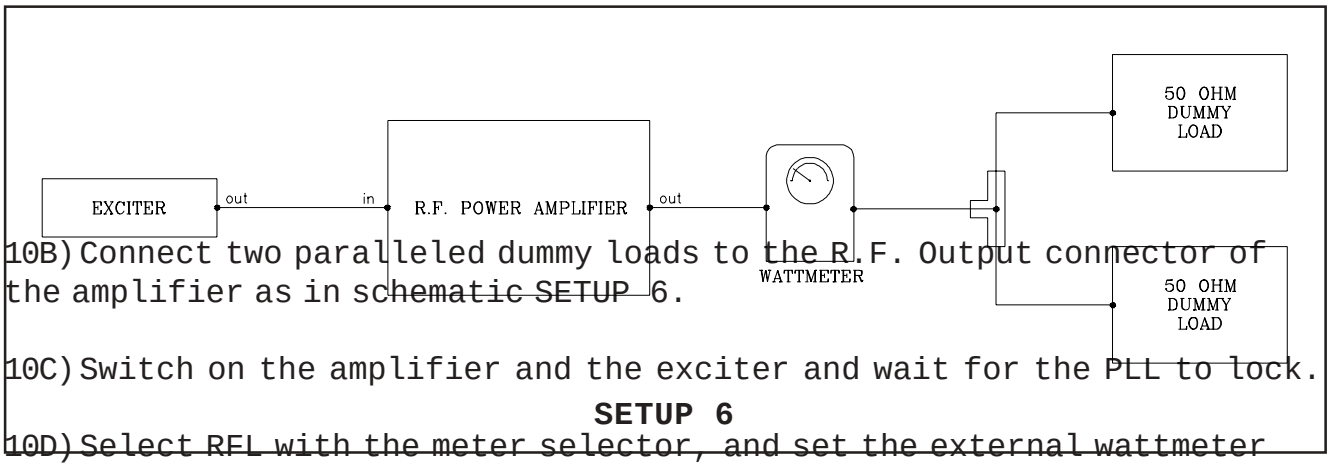
9E) Increase the output power to obtain a reading of 50W RFL on the external wattmeter.
Now adjust trimpot R40 on the alarms card until the SWR-INT protection acts.

9F) With a voltmeter, measure the voltage on the central pin of R40 or U2A pin 2 or U1D pin 13.
Multiply this value by 2 and adjust R40 to obtain this new value.

NOTE: This setting may vary with the working frequency, it’s preferable to make this adjustment at the operating frequency.

10) ANTENNA S.W.R. CALIBRATION (S.W.R. ANT.)

10A) Reduce the drive power to the minimum value, switch off the amplifier and the exciter.



SETUP 6

10B) Connect two paralleled dummy loads to the R.F. Output connector of the amplifier as in schematic SETUP 6.

10C) Switch on the amplifier and the exciter and wait for the PLL to lock.

10D) Select RFL with the meter selector, and set the external wattmeter for reflected power reading.

10E) Increase the output power to obtain a reading of 100W RFL on the external wattmeter. Now adjust trimpot R13 on the Alarms Card to obtain the same reading on the PJ500M-C meter.

10F) Increase again the power, until you read 50W of reflected power, adjust R56 on the Alarms Card (remove the metallic shield that covers the alarm cards) until the SWR ANTENNA protection acts.

NOTE: This setting may vary with the working frequency, it’s preferable to make this adjustment at the operating frequency.

11) OVER-TEMPERATURE ALARM CHECK (TEMP.)

11A) Check the over-temperature protection by short circuiting the terminals of the temperature sensor placed on the R.F. Section heat sin (or on Power Supply heat sink); the appropriate led will light, and the amplifier will stop.

12) EXTERNAL STAND BY CHECK (EXT.ST.BY)

12A) Check the EXT.ST.BY protection by short circuiting the Pin 20 of Telemetry Connector, and verify that the EXT.ST.BY led lights and the amplifier will stop.

12B) Short circuiting the Pin 8 of Telemetry Connector will regularly restart.

5.7 DIRECTIONAL COUPLER CARD ADJUSTMENT

The Directional Coupler Card don't need any adjstment, perhaps it's necessary to execute the following checkings after the replacing of the card:

1) Verify the "AGC Control".

2) Verify Antenna S.W.R. Calibration.

3) Verify FWD PWR lecture.

4) Verify RFL PWR lecture.

5.8 SOFT-START CARD ADJUSTMENT

No adjustments are needed after this board has been changed.

NOTE: Pay attention to the correct insertion of the connectors.

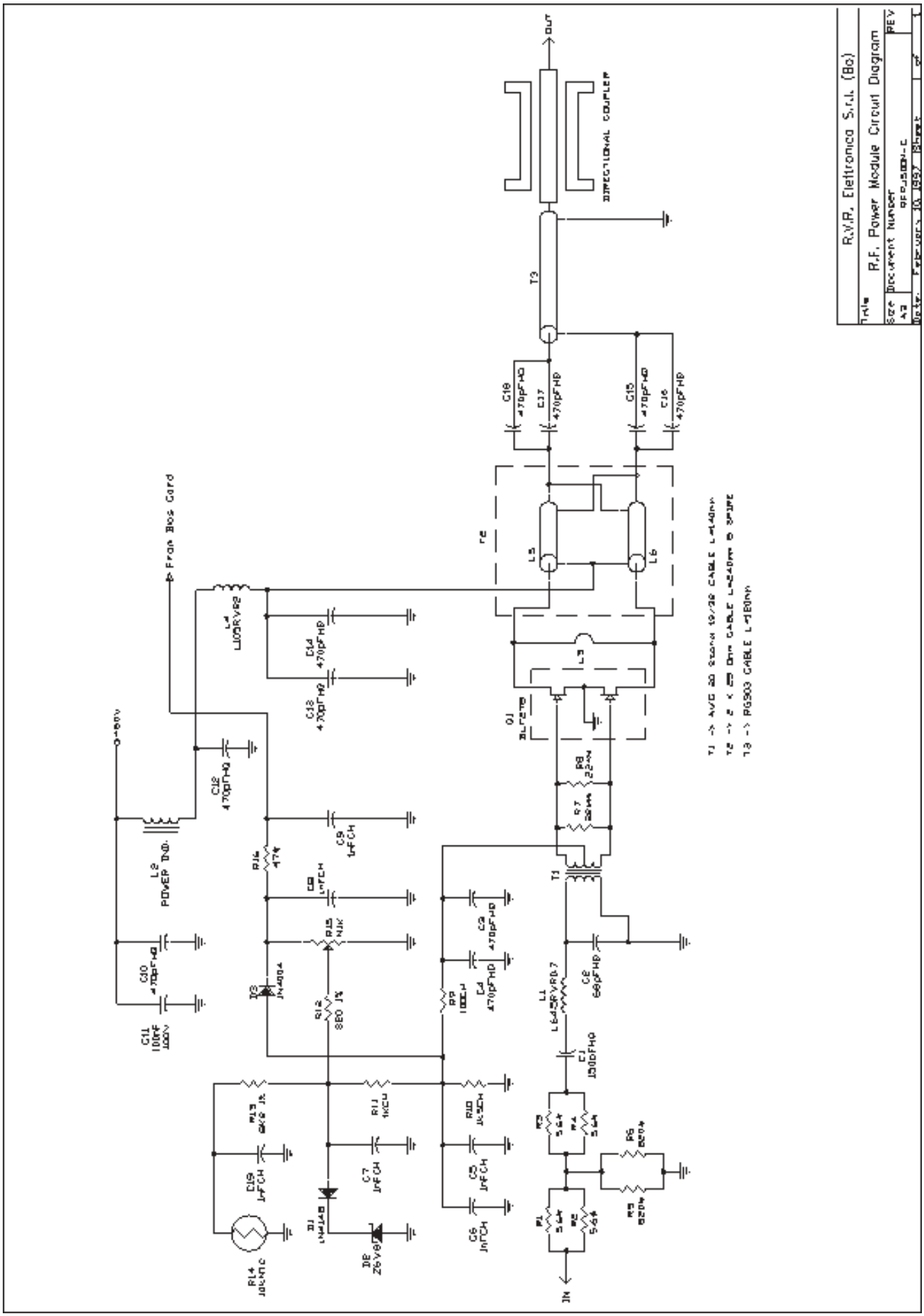
5.9 BIAS CARD ADJUSTMENT

No adjustments are required inside the Bias Card because it's a factory adjusted device.

APPENDIX A
CIRCUIT
DIAGRAMS, LAYOUTS AND BILLS OF MATERIAL

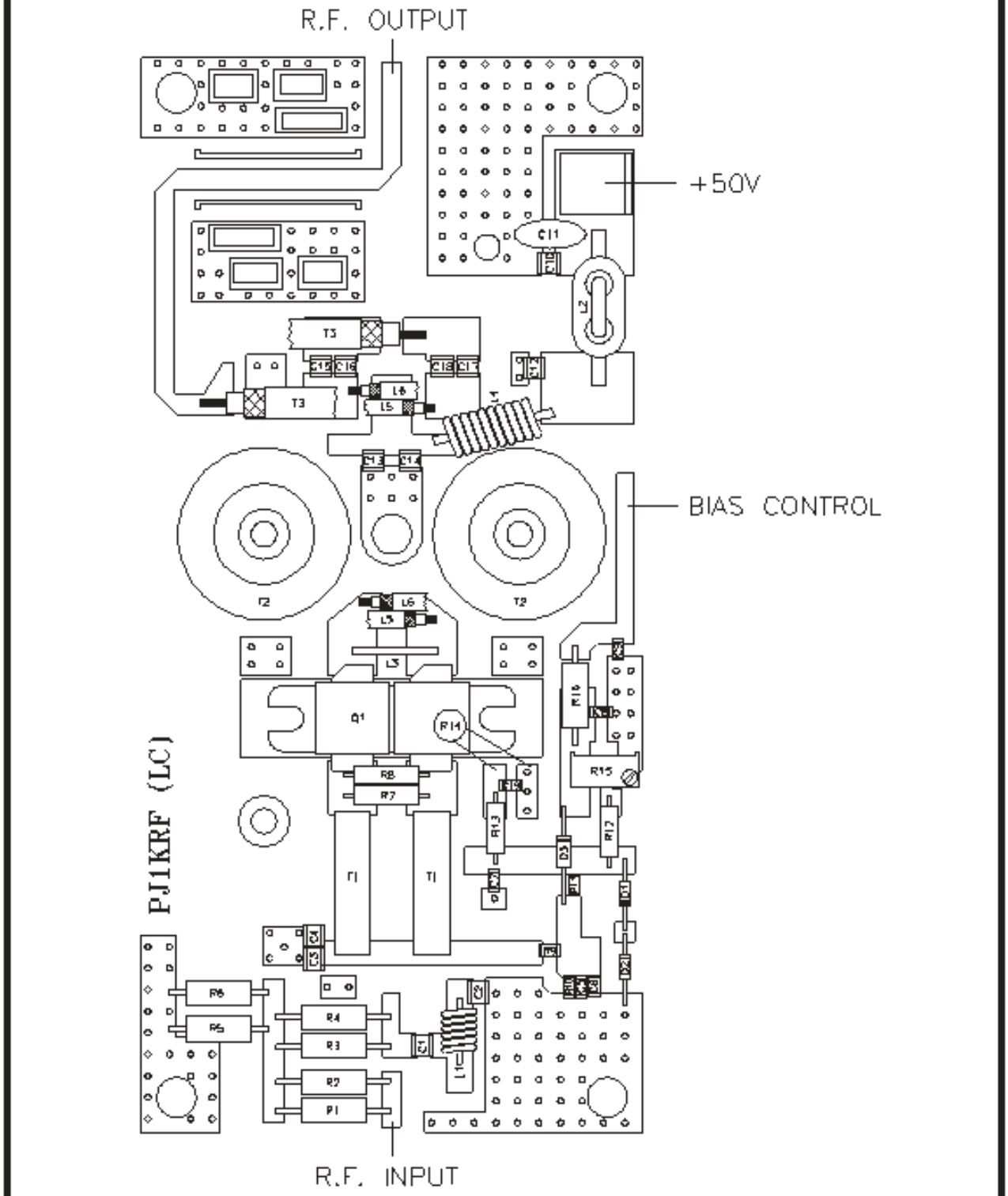
This section contains circuit diagrams, layouts and bills of material of the modules which composing the equipment.
For more information about each module see as reference Section 2.

R.F. POWER AMPLIFIER MODULE

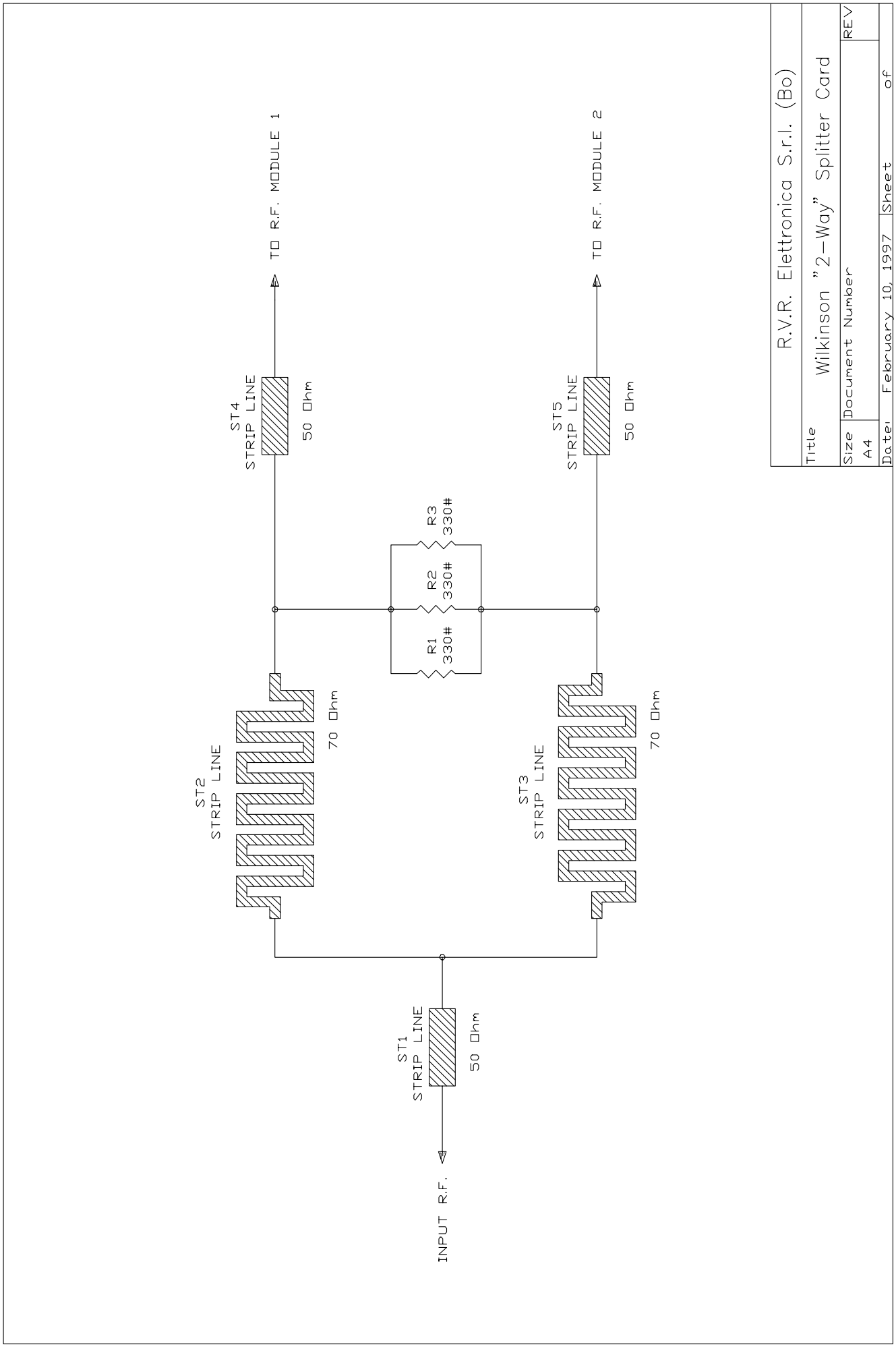

R.V.R. Elettronica S.r.l. (Bo)
R.F. Power Module Circuit Diagram
OUT
IN
From Bos Card
DIRECTIONAL COUPLER
T1 -> AVG 20 Ohm 10/30 CABLE L=140mm
T2 -> 2 x 50 Ohm CABLE L=240mm in SPIRE
T3 -> RG503 CABLE L=180mm

R.F. Module Amplifier Bill of Materials/Lista Componenti Pag. 1

Item	Quantity	Reference	Part	Description	Part Order Code
1	4	R1,R2,R3,R4	5.6#	RESISTOR 2W	RSC002JH05,6
2	2	R7,R8	22**	RESISTOR 1W 5%	RSC001JH0022
3	1	R16	47#	RESISTOR 2W	RSC002JH0047
4	1	R9	100CH	CHIP RESISTOR	RCC1/4JH0100
5	1	R12	820 1%	RESISTOR 1/4W 1%	RSM1/4FH0820
6	2	R5,R6	820#	RESISTOR 2W	RSC002JH0820
7	1	R11	1KCH	CHIP RESISTOR	RCC1/4JH0001
8	1	R10	1K5CH	CHIP RESISTOR	RCC1/4JH01,5
9	1	R13	8K2 1%	RESISTOR 1/4W 1%	RSM1/4FK08,2
10	1	R14	10KNTC	NTC	RNTCPAKK0010
11	1	R15	M1K	TRIMMER MULTIGIRI	RVTMULAK0001
12	1	C2	68pFHQ	HIGHT Q CAPACITOR	CHQ680AJ500
13	1	C1	150pFHQ	HIGHT Q CAPACITOR	CHQ151AJ500
14	10	C3,C4,C10, C12,C13,C14, C15,C16,C17, C18	470pFHQ	HIGHT Q CAPACITOR	CHQ471AJ500
15	6	C5,C6,C7, C8,C9,C19	1nFCH	CERAMIC CHIP CAPACITOR	CCC102AJ500
16	1	C11	100nF	CERAMIC CAPACITOR	CKM104BK600P
17	1	L2	POWER IND.	RF BINOC. CHOCKE	
18	1	L1	L64.5RVR0.7	6 SP DIA 4.5 R.S. 0.7mm	BFS070064.5
19	1	L4	L105RVR2	10 SP DIA 5 F 2mm	BFS20001005
20	1	L3	BU6012RVR2	BOB U L60MM D12 F.A. 2mm	
21	1	T1	4:1	TRASF. RF. CAVO 25 OHM	CAV7612/78
22	1	T3	RG303	COAX CABLE RG303	CAVRG303V
23	2	L5,L6	RG316-25	COAX CABLE RG316 25 Ohm	CAVRG31625
24	1	D1	1N4148	SILICON DIODE	DIS1N4148
25	1	D3	1N4004	SILICON DIODE 400V	DIS1N4004
26	1	D2	Z6V8	ZENER DIODE 6.8V 0.4W	DIZ6V80W4
27	1	Q1	BLF278	VHF PUSH-PULL POWER MOS	TRNBLF278

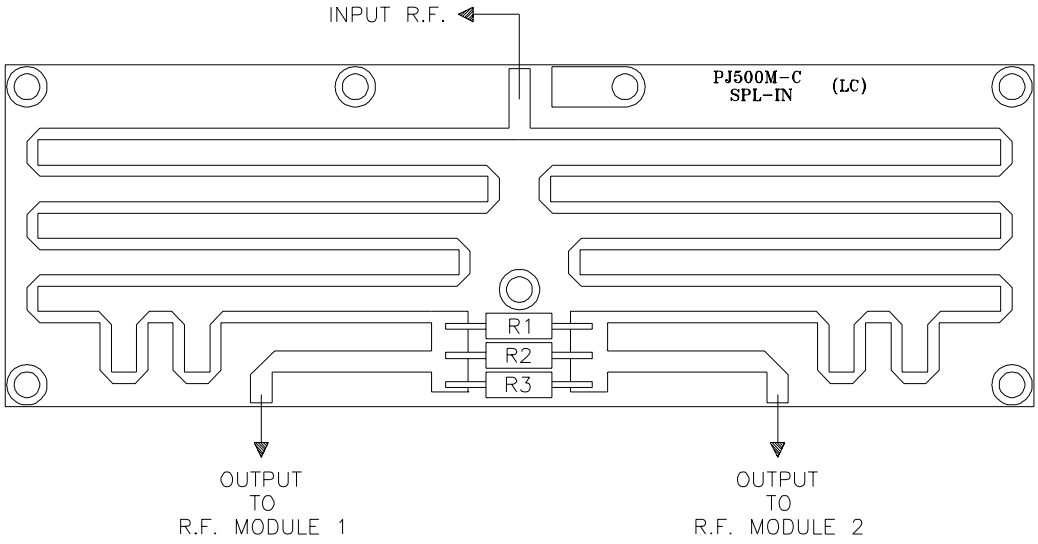

R.F. OUTPUT
+50V
BIAS CONTROL
PJ1KRF (LC)
R.F. INPUT
DENOMINAZIONE
R.F. Power Amplifier Module Component Layout – Piano di Montaggio
DISPOSITIVO
SEMILAVORATO
MATERIALE
TRATTAMENTO
DISEGNATO
D'Alessio D. 10/02/97
SCALA
DISEGNO
TAVOLA n
di

WILKINSON "2-WAY" SPLITTER CARD


TO R.F. MODULE 1
TO R.F. MODULE 2
ST4
STRIP LINE
50 Ohm
ST5
STRIP LINE
50 Ohm
R3
330#
R2
330#
R1
330#
ST2
STRIP LINE
70 Ohm
ST3
STRIP LINE
70 Ohm
ST1
STRIP LINE
50 Ohm
INPUT R.F.
R.V.R. Elettronica S.r.l. (Bo)
Title
Wilkinson "2-Way" Splitter Card
Size
A4
Document Number
REV
Date: February 10, 1997
Sheet
of

Splitter Card Bill of Materials/Lista Componenti Pag. 1

Item	Quantity	Reference	Part	Description	Part Order Code
1	3	R1,R2,R3	330#	RESISTOR 2W	RSC002JH0330
2	5	ST1,ST2, ST3,ST4,ST5	STRIP LINE	STRIP LINE	



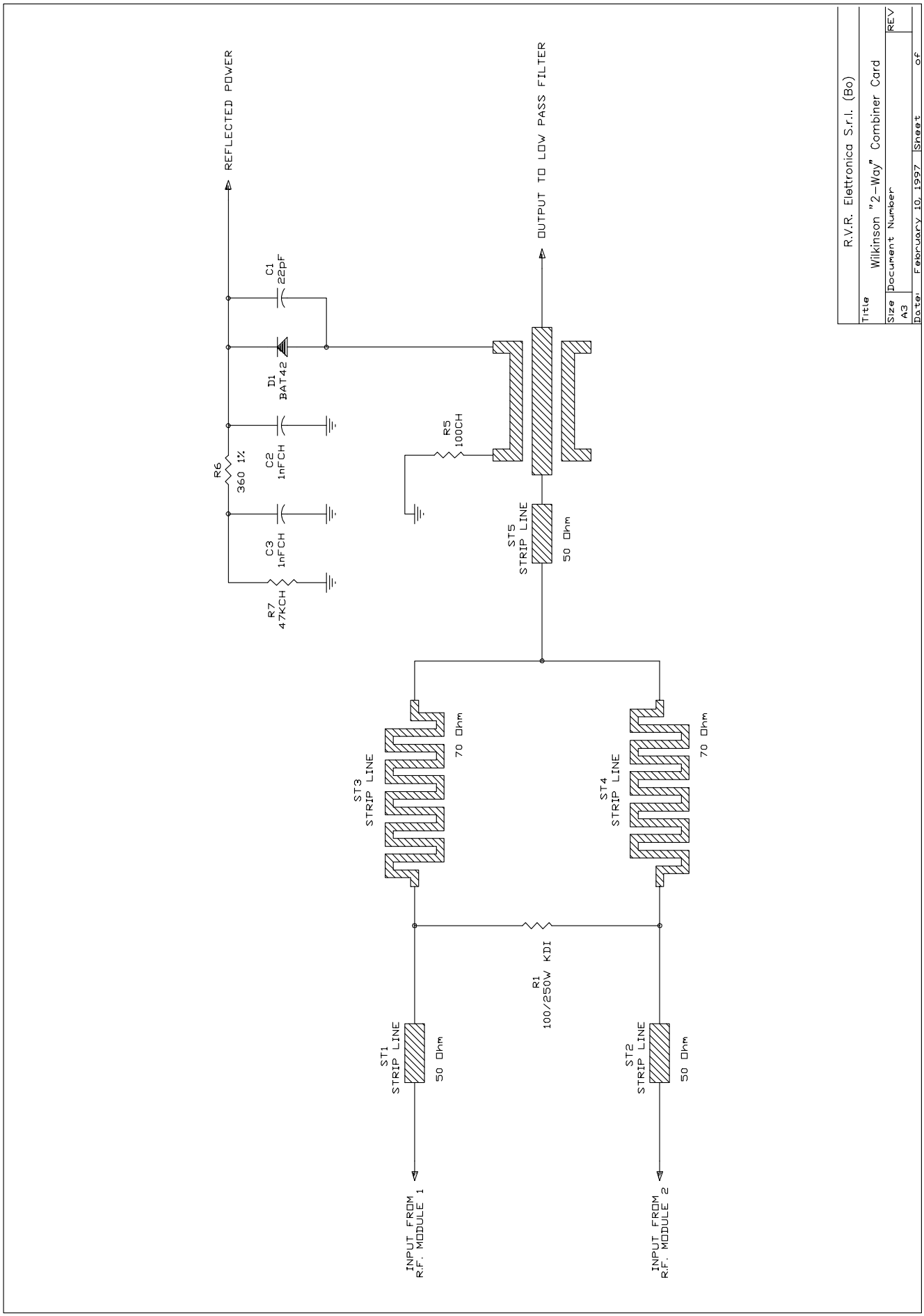
R.V.R. ELETTRONICA ®

DENOMINAZIONE
Wilkinson "2-Way" Splitter Card Component Layout / Piano di Montaggio

DISPOSITIVO

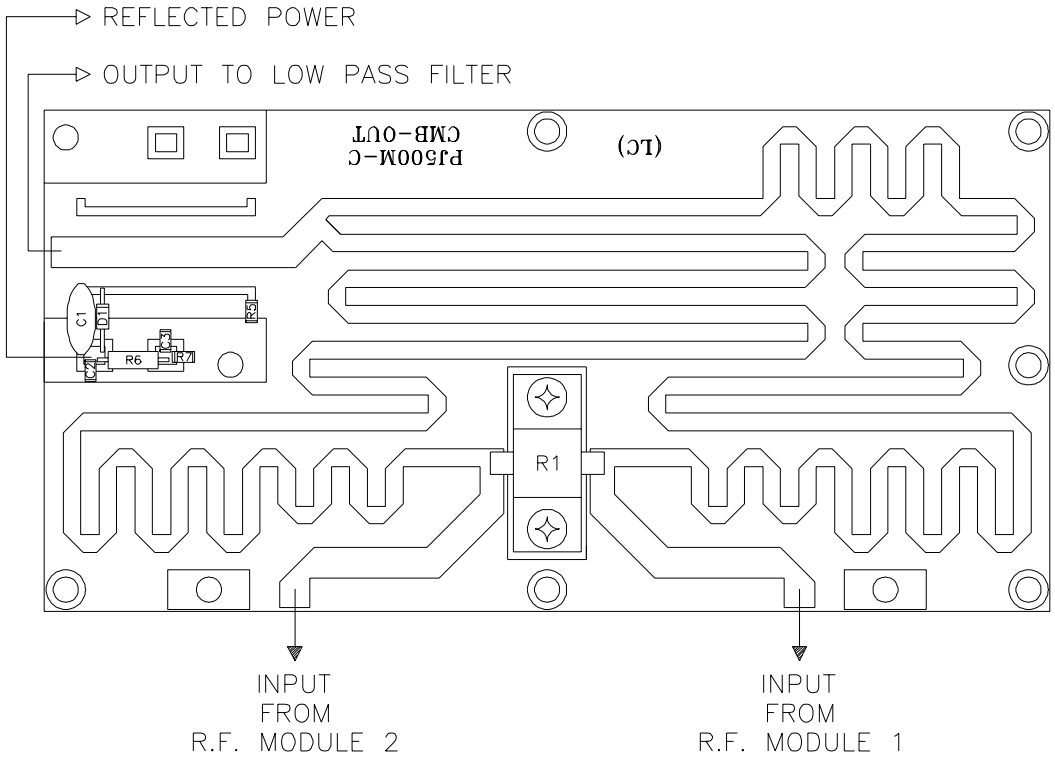
SEMILAVORATO	DISEGNATO D'Alessio D. 10/02/97	DISEGNO
MATERIALE	SCALA	
TRATTAMENTO		TAVOLA n di

WILKINSON "2-WAY" COMBINER CARD


REFLECTED POWER
OUTPUT TO LOW PASS FILTER
C1
22pF
D1
BAT42
C2
1nFCH
R6
360 1%
C3
1nFCH
R7
47KCH
R5
100CH
ST5
STRIP LINE
50 Ohm
ST3
STRIP LINE
70 Ohm
ST4
STRIP LINE
70 Ohm
R1
100/250W KDI
ST1
STRIP LINE
50 Ohm
ST2
STRIP LINE
50 Ohm
INPUT FROM
R.F. MODULE 1
INPUT FROM
R.F. MODULE 2
R.V.R. Elettronica S.r.l. (Bo)
Title
Wilkinson "2-Way" Combiner Card
Size
A3
Document Number
REV
Date:
February 10, 1997
Sheet
of

Combinerer Card Bill of Materials/Lista Componenti Pag. 1

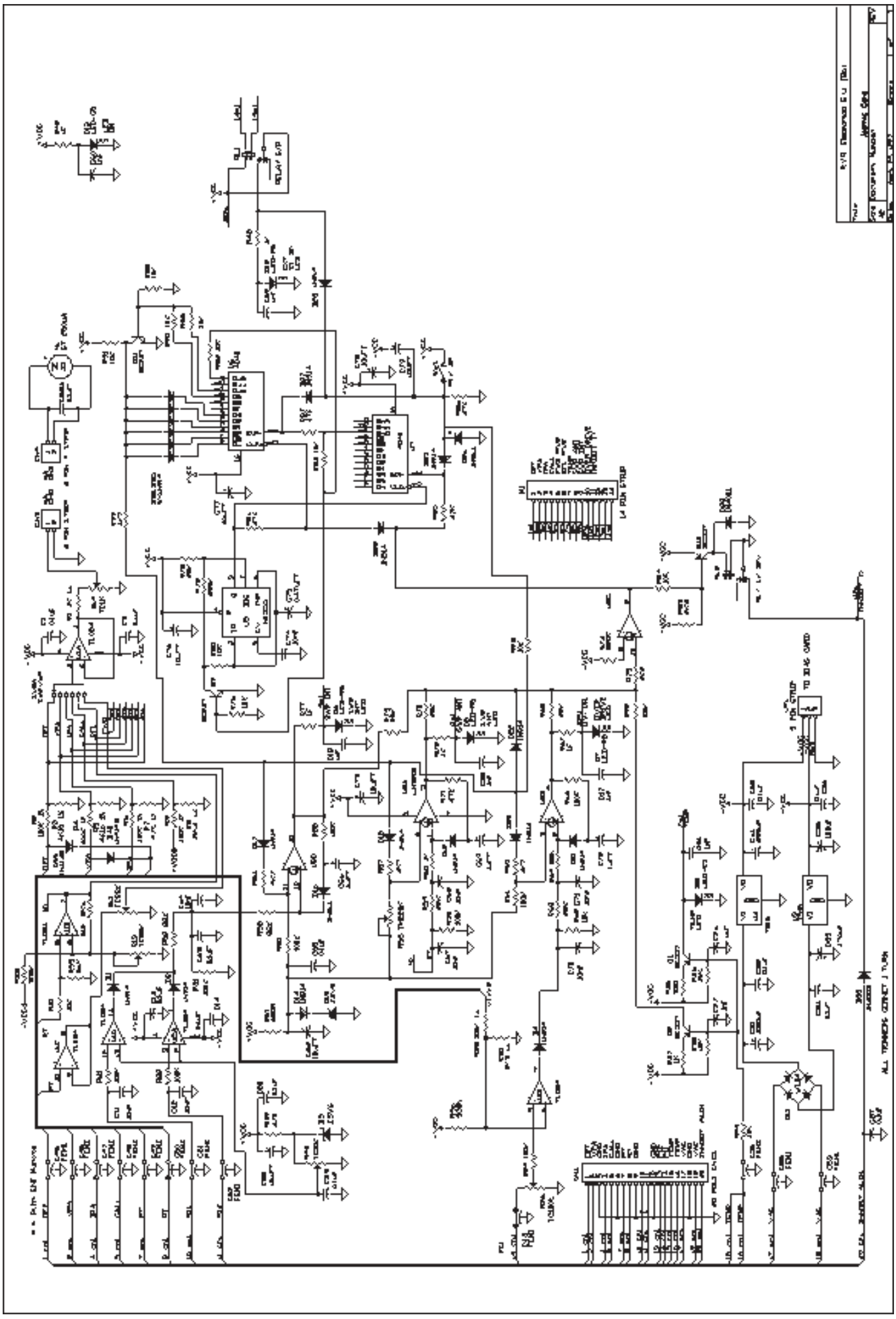
Item	Quantity	Reference	Part	Description	Part Order Code
1	1	R5	100CH	CHIP RESISTOR	RCC1/4JH0100
2	1	R1	100/250W	RESISTENZA KDI 250W	RDT250H0100
3	1	R6	360 1%	RESISTOR 1/4W 5%	RSM1/4FH0360
4	1	R7	47KCH	CHIP RESISTOR	RCC1/4JK0047
5	1	C1	22pF	CERAMIC CAPACITOR NP0	CKM220BJ600C
6	2	C2,C3	1nFCH	CERAMIC CHIP CAPACITOR	CCC102AJ500
7	1	D1	BAT42	HOT CARRIER DIODE	DHCBAT42
8	6	ST1,ST2, ST3,ST4, ST5,ST12	STRIP LINE	STRIP LINE	



R.V.R. ELETTRONICA	DENOMINAZIONE: Wilkinson "2-Way" Combiner Card Component Layout / Piano di Montaggio
	DISPOSITIVO:

SEMILAVORATO	DISEGNATO: D'Alessio D. 10/02/97	DISEGNO
MATERIALE	SCALA	
TRATTAMENTO		TAVOLA n. di

ALARMS CARD



Alarms Card Bill of Materials/Lista Componenti Pag. 1

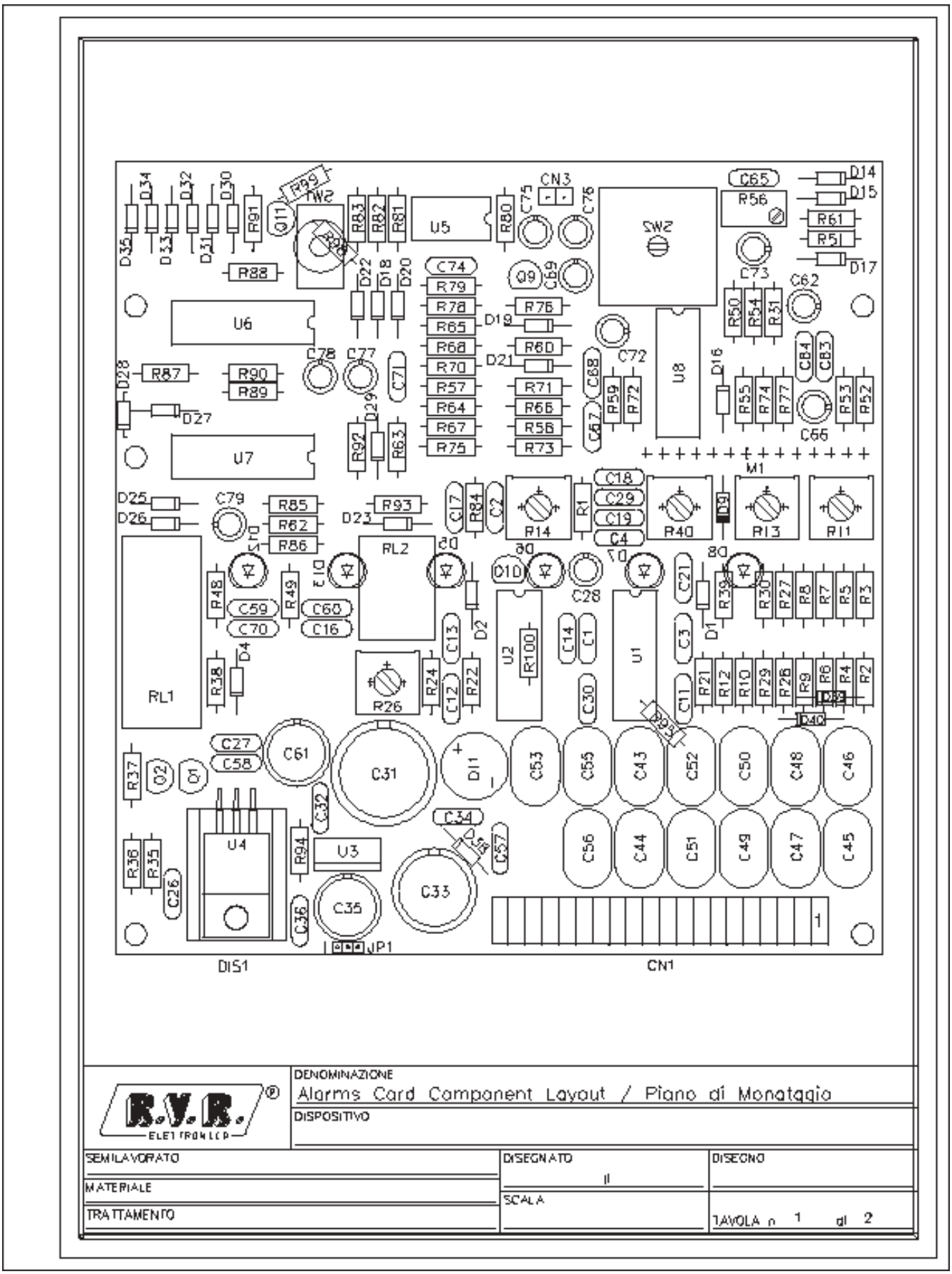
Item	Quantity	Reference	Part	Description	Part Order Code
1	1	R35	330	RESISTOR 1/4W 5%	RSC1/4JH0330
2	1	R39	470	RESISTOR 1/4W 5%	RSC1/4JH0470
3	1	R51	680*	RESISTOR 1/2W 5%	RSC1/2JH0680
4	1	R1	1K 1%	RESISTOR 1/4W 1%	RSM1/4FK0001
5	7	R37,R48, R49,R60, R67,R72,R77	1K	RESISTOR 1/4W 5%	RSC1/4JK0001
6	2	R75,R93	2K2	RESISTOR 1/4W 5%	RSC1/4JK02,2
7	1	R30	3K3 1%	RESISTOR 1/4W 1%	RSM1/4FK03,3
8	2	R3,R5	4K16 1%	RESISTOR 1/4W 1%	RSM1/4FK4,16
9	4	R54,R57, R65,R99	4K7	RESISTOR 1/4W 5%	RSC1/4JK04,7
10	1	R12	5K6	RESISTOR 1/4W 5%	RSC1/4JK05,6
11	13	R10,R62, R76,R80,R82, R83,R84,R88, R89,R90,R91, R94,R98	10K	RESISTOR 1/4W 5%	RSC1/4JK0010
12	2	R36,R38	15K	RESISTOR 1/4W 5%	RSC1/4JK0015
13	1	R8	15K4 1%	RESISTOR 1/4W 1%	RSC1/4FK15,4
14	8	R52,R59, R63,R68, R70,R73, R78,R92	22K	RESISTOR 1/4W 5%	RSC1/4JK0022
15	1	R7	47K 1%	RESISTOR 1/4W 1%	RSM1/4FK0047
16	5	R71,R81, R85,R86,R87	47K	RESISTOR 1/4W 5%	RSC1/4JK0047
17	1	R95	56K	RESISTOR 1/4W 5%	RSC1/4JK0056
18	2	R53,R64	82K	RESISTOR 1/4W 5%	RSC1/4JK0082
19	5	R2,R4,R6, R9,R29	100K 1%	RESISTOR 1/4W 1%	RSM1/4FH0100
20	9	R21,R22, R24,R31,R50, R55,R58,R61, R66	100K	RESISTOR 1/4W 5%	RSC1/4JK0100
21	2	R74,R79	220K	RESISTOR 1/4W 5%	RSC1/4JK0220
22	2	R96,R100	330K	RESISTOR 1/4W 5%	RSC1/4JK0330

Alarms Card Bill of Materials/Lista Componenti Pag. 2

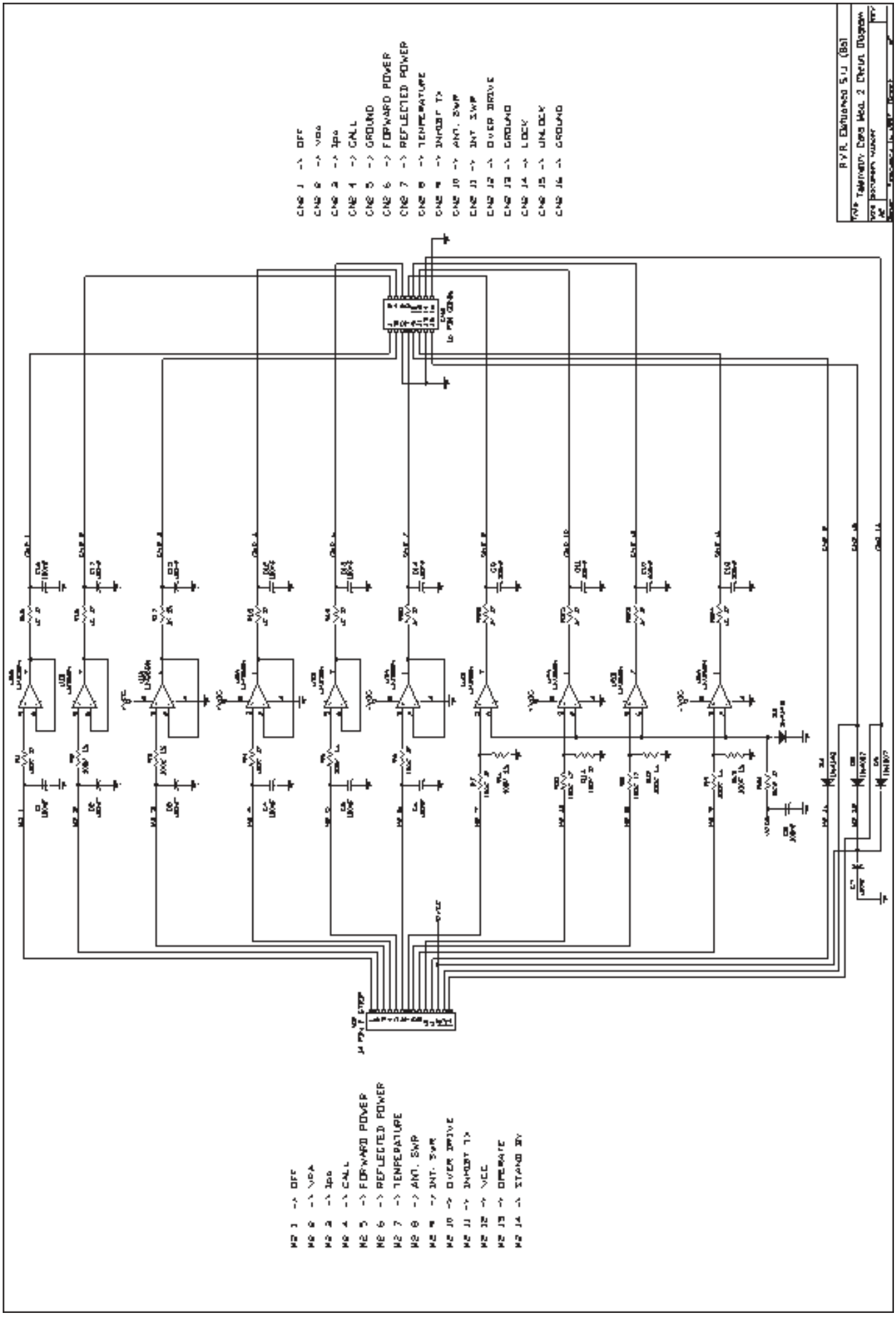
Item	Quantity	Reference	Part	Description	Part Order Code
23	1	R14	TC1K	TRIM. REG. VERT. CERMET	RVTCERVK0001
24	1	R40	TC10K	TRIM. REG. VERT. CERMET	RVTCERVK0010
25	2	R11,R13	TC22K	TRIM. REG. VERT. CERMET	RVTCERVK0022
26	1	R26	TC100K	TRIM. REG. VERT. CERMET	RVTCERVK0100
27	1	R56	TM220K	TRIM. MULT. REG. VERT.	RVTMULVK0220
28	8	C17,C18, C19,C21,C26, C27,C59,C60	1nF	CERAMIC CAPACITOR	CKM102BK600P
29	8	C11,C12, C64,C67,C68, C70,C71,C74	10nF	CERAMIC CAPACITOR	CKM103BK600P
30	14	C1,C3,C13, C14,C29,C30, C32,C34,C36, C57,C58A,C58, C63,C65	0.1µF	CERAMIC CAPACITOR	CKM104BK600P
31	1	C75	0.47µFT	TANTALIUM CAPACITOR	CET474AM350
32	3	C66,C69,C72	1µFT	TANTALIUM CAPACITOR	CET105AM350
33	7	C28,C62, C73,C76,C77, C78,C79	10µFT	TANTALIUM CAPACITOR	CET106AM350
34	1	C35	100µF	ELECTROLYTIC CAPACITOR	CEA107BM350
35	1	C61	220µF	ELECTROLYTIC CAPACITOR	CEA227BM350
36	1	C33	470µF	ELECTROLYTIC CAPACITOR	CEA477BM350
37	1	C31	1000µF	ELECTROLYTIC CAPACITOR	CEA108SCM350
38	1	M1	ST 250UA	STRUMENTO 250uA	SMABM42RQ251
39	1	CN3	2 PIN STRIP	STRIP M P 2.54 2 PIN	CNTSTRIPMCS
40	1	JP1	3 PIN STRIP	STRIP M P 2.54 3 PIN	CNTSTRIPMCS
41	1	M1	14P STRIP	STRIP M P 2.54 14 PIN	CNTSTRIPMCS
42	1	CN4	2P F STRIP	STRIP F P 2.54 2 PIN	CNTSTRIPFCS
43	1	CN1	20P CN.CS.	CON.STRIP 20P M. CS P.	CNTSRMCS20PO
44	12	C43,C45, C46,C47,C48, C49,C50,C51, C52,C53,C55, C56	FEMI	FILTRO EMI MURATA	FEAY5S223500

Alarms Card Bill of Materials/Lista Componenti Pag. 3

Item	Quantity	Reference	Part	Description	Part Order Code
45	1	RL2	RLY 1V 12V	RELAY 1 VIA 12V	RLD112
46	1	RL1	RELAY S/R	RELAY SET / RESET 12V	RLDMZP-R2
47	1	SW1	P1V 2P	PULSANTE 1 VIA 2 POS	PLS1V11M03CS
48	1	SW2	SW2V6P	COM. 2 VIE 6 POS FEME	COMR2V6PCS
49	2	D39,D40	1N4148	SILICON DIODE	DIS1N4148
50	22	D1,D2,D4, D14,D16,D17, D18,D19,D20, D21,D22,D25, D26,D27,D28, D29,D30,D31, D32,D33,D34, D35	1N914	SILICON DIODE	DIS1N914
51	1	D23	1N4001	SILICON DIODE 50V	DIS1N4001
52	1	D38	1N4003	SILICON DIODE 200V	DIS1N4003
53	1	D11	WL04	DIODE BRIDGE 1.5A	PNRWL04
54	5	D5,D6,D7, D8,D12	LED-R5	RED LED DIODE	LEDRO05
55	1	D13	LED-G5	GREEN LED DIODE	LEDVE05
56	1	D15	Z3V9	ZENER DIODE 3.9V 0.4W	DIZ3V90W4
57	1	D9	Z5V6	ZENER DIODE 5.6V 0.4W	DIZ5V60W4
58	1	U4	7815	POS. STABILIZER 1A	CIL7815P
59	1	U3	7915	NEG. STABILIZER 1A	CIL7915P
60	2	Q9,Q11	BC237	NPN TRANSISTOR	TRNBC237
61	3	Q1,Q2,Q10	BC557	PNP TRANSISTOR	TRNBC557
62	2	U1,U2	TL084	QUAD OP. AMP.	CILTL084
63	1	U5	NE555	TIMER	CIL555
64	2	U6,U7	4040	CMOS DIVIDER	CID4040
65	1	U8	LM3900	NORTON QUAD AMP.	CILLM3900

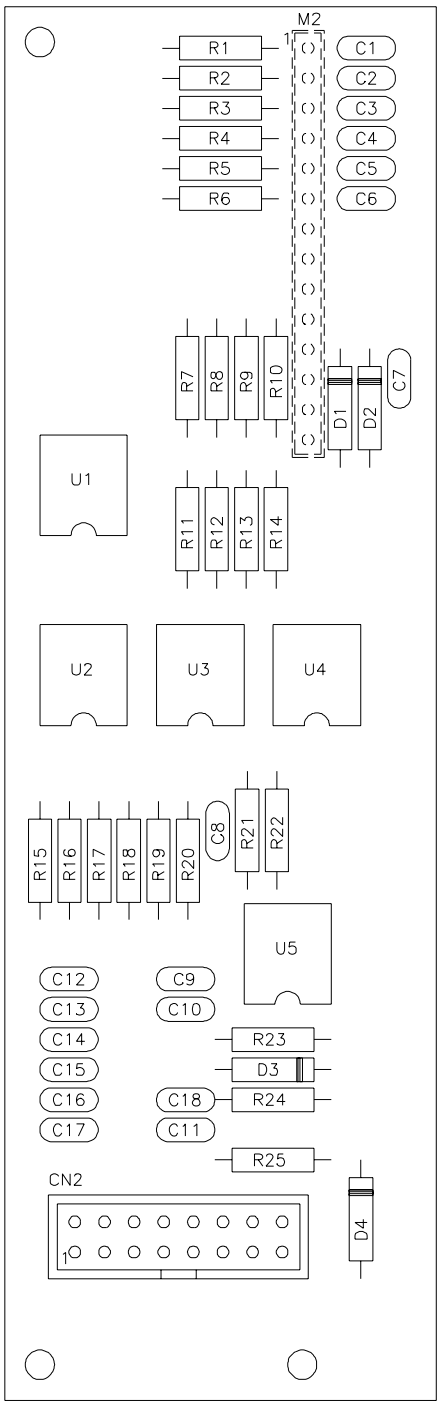

DIS1
CN1
JP1
U1
U2
U3
U4
U5
U6
U7
U8
RL1
RL2
R.V.R.
ELETTRONICA
DENOMINAZIONE
Alarms Card Component Layout / Piano di Montaggio
DISPOSITIVO
SEMILAVORATO
MATERIALE
TRATTAMENTO
DISEGNATO
SCALA
DISEGNO
TAVOLA n 1 di 2

TELEMETRY CARD



Telemetry Card Mod.2 Bill of Materials/Lista Componenti Pag. 1

Item	Quantity	Reference	Part	Description	Part Order Code
1	10	R15,R16, R17,R18, R19,R20, R22,R23, R24,R25	1K	RESISTOR 1/4W 5%	RSC1/4JK0001
2	1	R21	2K2	RESISTOR 1/4W 5%	RSC1/4JK02,2
3	10	R1,R2,R3, R4,R5,R6, R7,R8,R9, R10	100K 1%	RESISTOR 1/4W 1%	RSM1/4FH0100
4	4	R11,R12 R13,R14	150K 1%	RESISTOR 1/4W 5%	RSM1/4JK0150
5	18	C1,C2,C3, C4,C5,C6, C7,C8,C9, C10,C11, C12,C13, C14,C15, C16,C17, C18	100nF	CERAMIC CAPACITOR	CKM104BK600P
6	1	M2	14P F STRIP	STRIP F P 2.54 14 PIN	CNTSTRIPFCS
7	1	CN2	16P CONN.	CONN. M 2*8 P 2.54	CNTMCSFC16P
8	2	D3,D4	1N4148	SILICON DIODE	DIS1N4148
9	2	D2,D3	1N4007	SILICON DIODE 1000V	DIS1N4007
10	5	U1,U2,U3, U4,U5	LM358N	DOUBLE OP. AMP.	CILLM358N



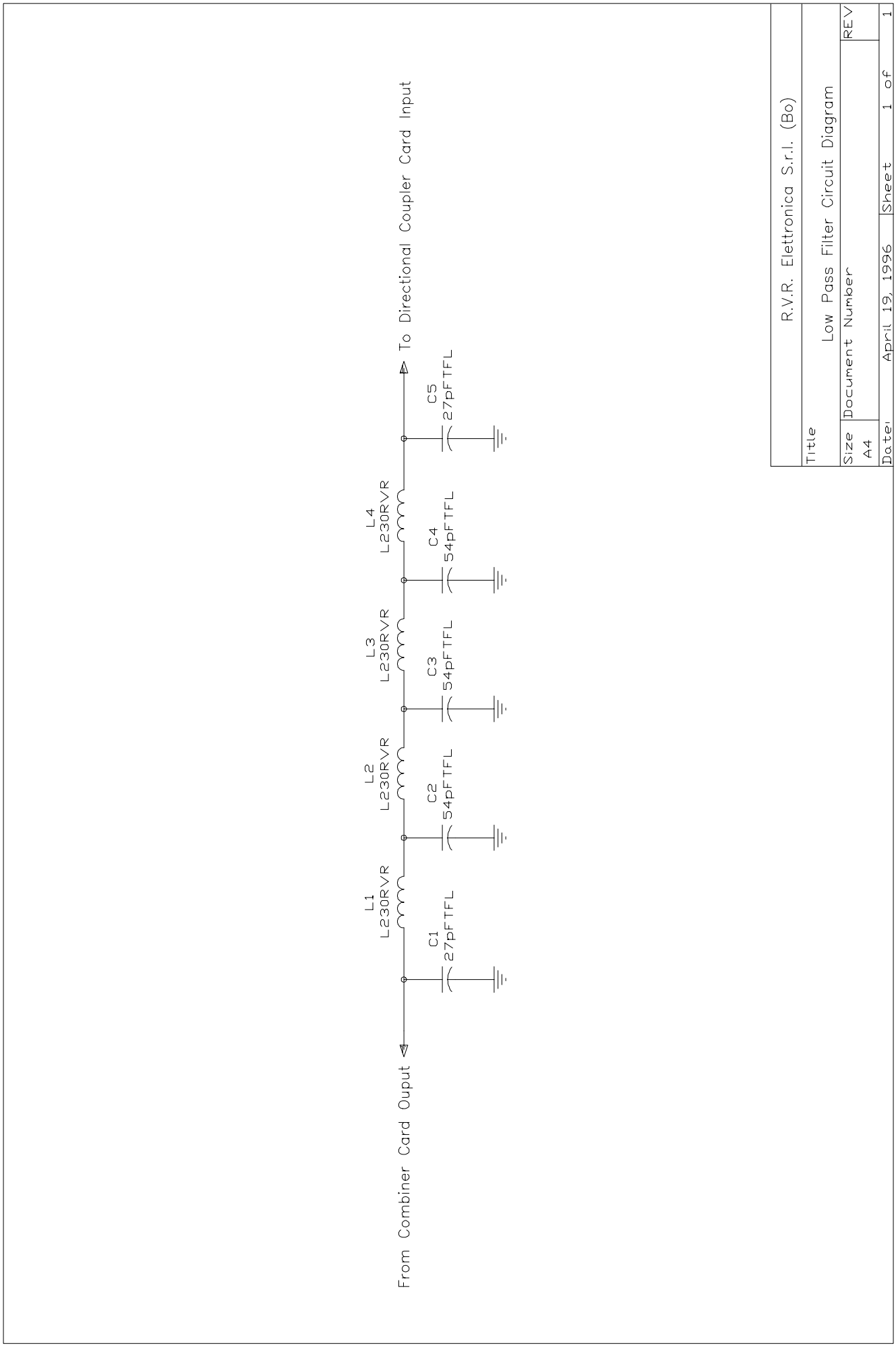
R.V.R. ELETTRONICA

DENOMINAZIONE
Telemetry Card Mod.2 (Ver. PROT-A2) Component Layout / Piano di Montaggio

DISPOSITIVO

SEMILAVORATO	DISEGNATO D'Alessio D.	DISEGNO
MATERIALE	SCALA	
TRATTAMENTO		TAVOLA n di

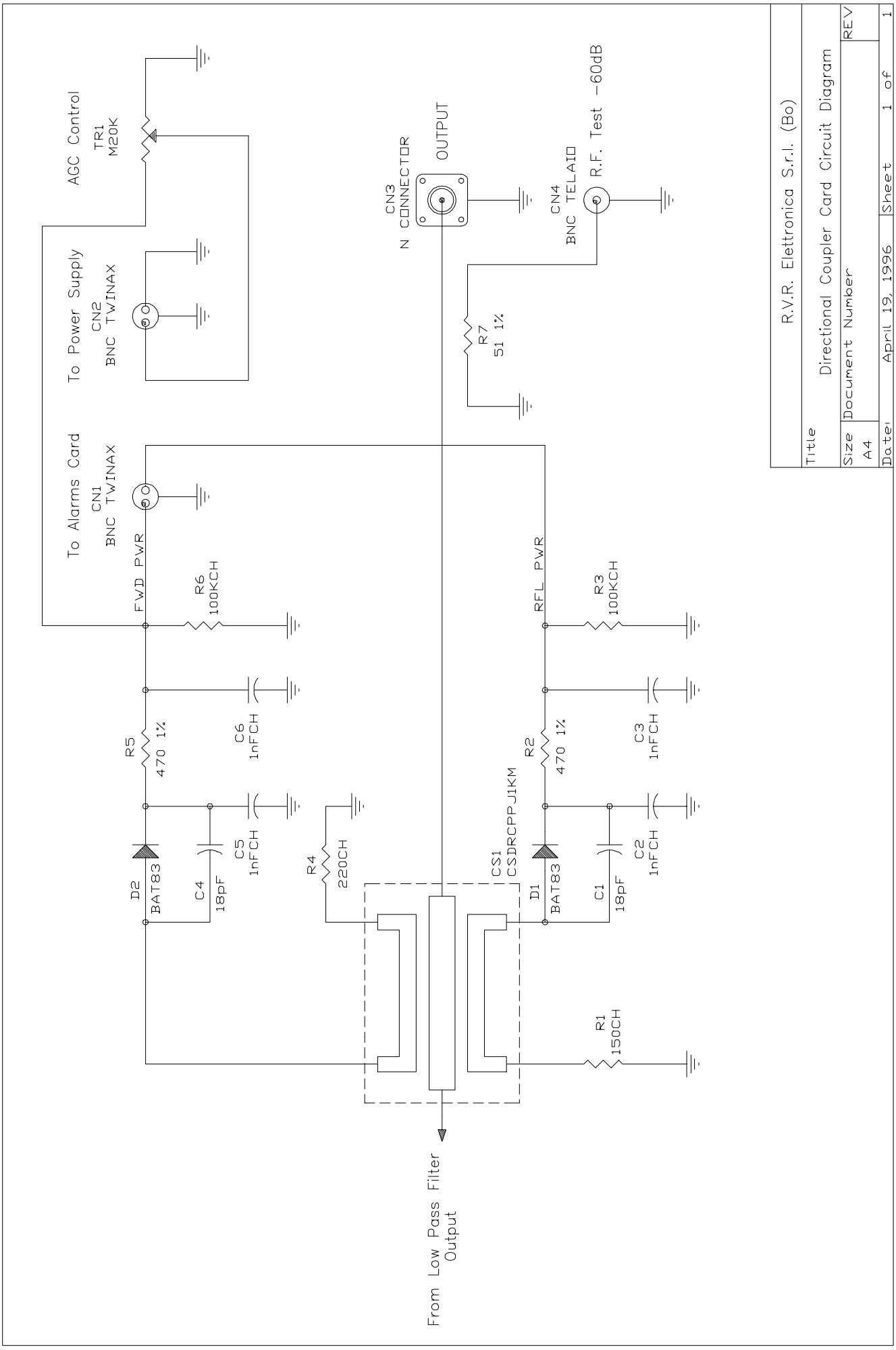
LOW PASS FILTER


From Combiner Card Ouput
To Directional Coupler Card Input
L1 L230RVR
L2 L230RVR
L3 L230RVR
L4 L230RVR
C1 27pFTFL
C2 54pFTFL
C3 54pFTFL
C4 54pFTFL
C5 27pFTFL
R.V.R. Elettronica S.r.l. (Bo)
Title
Low Pass Filter Circuit Diagram
Size A4
Document Number
REV
Date: April 19, 1996
Sheet 1 of 1

Low Pass Filter Bill of Materials/Lista Componenti Pag. 1

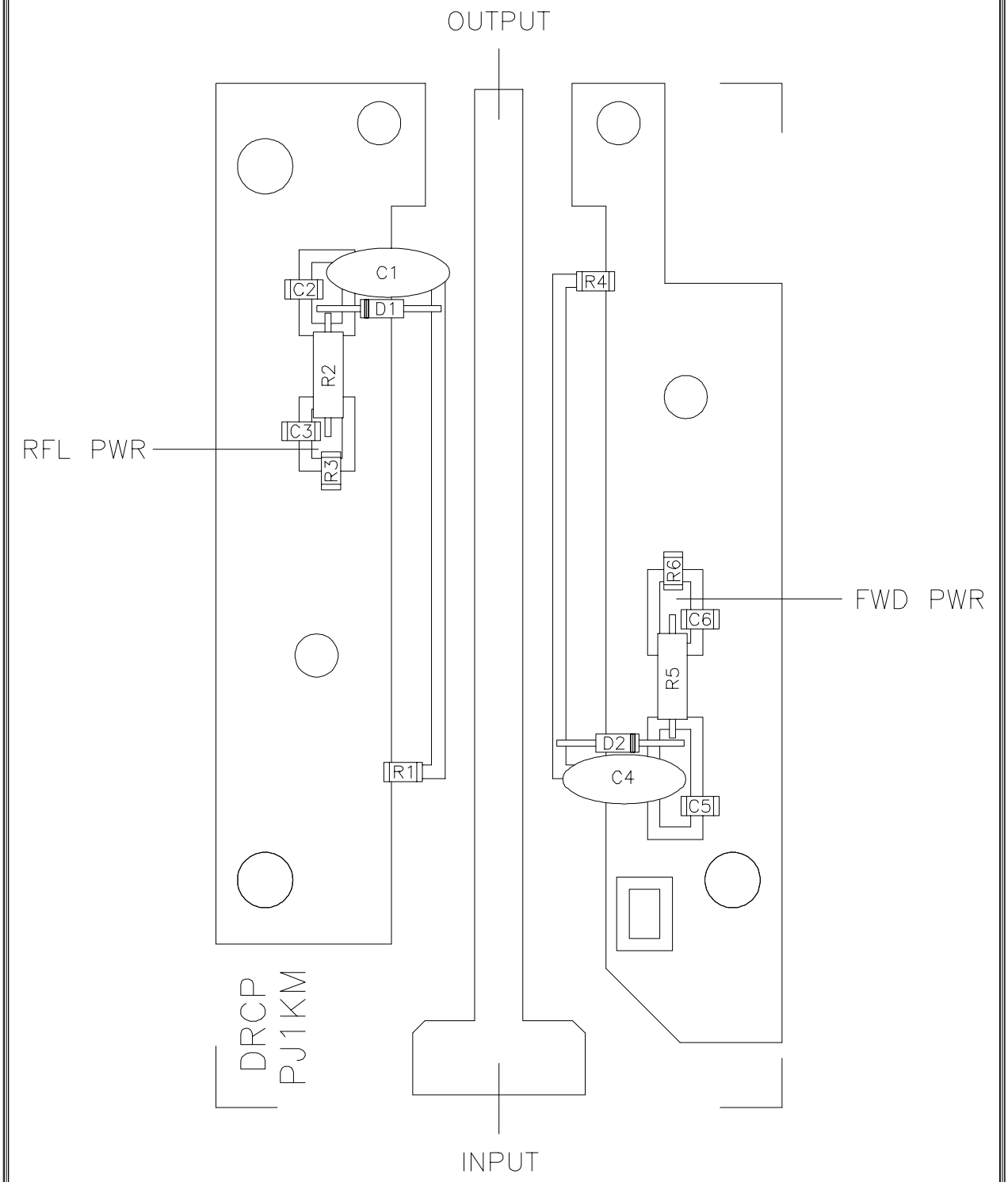
Item	Quantity	Reference	Part	Description	Part Order Code
1	2	C1,C5	27pFTFL	COND. BAND. RAME TEFLON	CBRT270RVR
2	3	C2,C3,C4	54pFTFL	COND. BAND. RAME TEFLON	CBRT540RVR
3	4	L1,L2,L3,L4	L230RVR	2 SP DIA 30 BAND. RAME	BBR5000230

DIRECTIONAL COUPLER CARD


R.V.R. Elettronica S.r.l. (Bo)
Title
Directional Coupler Card Circuit Diagram
REV
Size
A4
Document Number
Date:
April 19, 1996
Sheet
1 of
1
AGC Control
TR1
M20K
To Power Supply
CN2
BNC TWINAX
To Alarms Card
CN1
BNC TWINAX
CN3
N CONNECTOR
OUTPUT
CN4
BNC TELAID
R.F. Test -60dB
R7
51 1%
FWD PWR
R6
100KCH
RFL PWR
R3
100KCH
R5
470 1%
C6
1nFCH
R2
470 1%
C3
1nFCH
D2
BAT83
C4
18pF
C5
1nFCH
R4
220CH
CS1
CSDRCPPJ1KM
D1
BAT83
C1
18pF
C2
1nFCH
R1
150CH
From Low Pass Filter
Output

Directional Coupler Card Bill of Materials/Lista Componenti Pag. 1

Item	Quantity	Reference	Part	Description	Part Order Code
1	1	R7	51 1%	RESISTOR 1/4W 1%	RSM1/4FH0051
2	1	R1	150CH	CHIP RESISTOR	RCC1/4JH0150
3	1	R4	220CH	CHIP RESISTOR	RCC1/4JH0220
4	2	R2,R5	470 1%	RESISTOR 1/4W 1%	RSM1/4FH0470
5	2	R3,R6	100KCH	CHIP RESISTOR	RCC1/4JK0100
6	1	TR1	M20K	TRIMMER MULTIGIRI	RVTMULAK0020
7	2	C1,C4	18pF	CERAMIC CAPACITOR NP0	CKM180BJ600C
8	4	C2,C3,C5,C6	1nFCH	CERAMIC CHIP CAPACITOR	CCC102AJ500
9	1	CN4	BNC TELAIO	CONN. BNC A TELAIO	CNTBNCFPV
10	2	CN1,CN2	BNC TWINAX	CONN. BNC PER CAVO TWIN	CNTBNCTWINAX
11	1	CN3	N CONNECTOR	CONN. N A TELAIO	CNTNFPFL
12	2	D1,D2	BAT83	HOT CARRIER DIODE	DHCBAT83
13	1	CS1	CSDRCPPJ1KM	CS DIR. COUPLER PJ1KM	CSDRCPPJ1KM



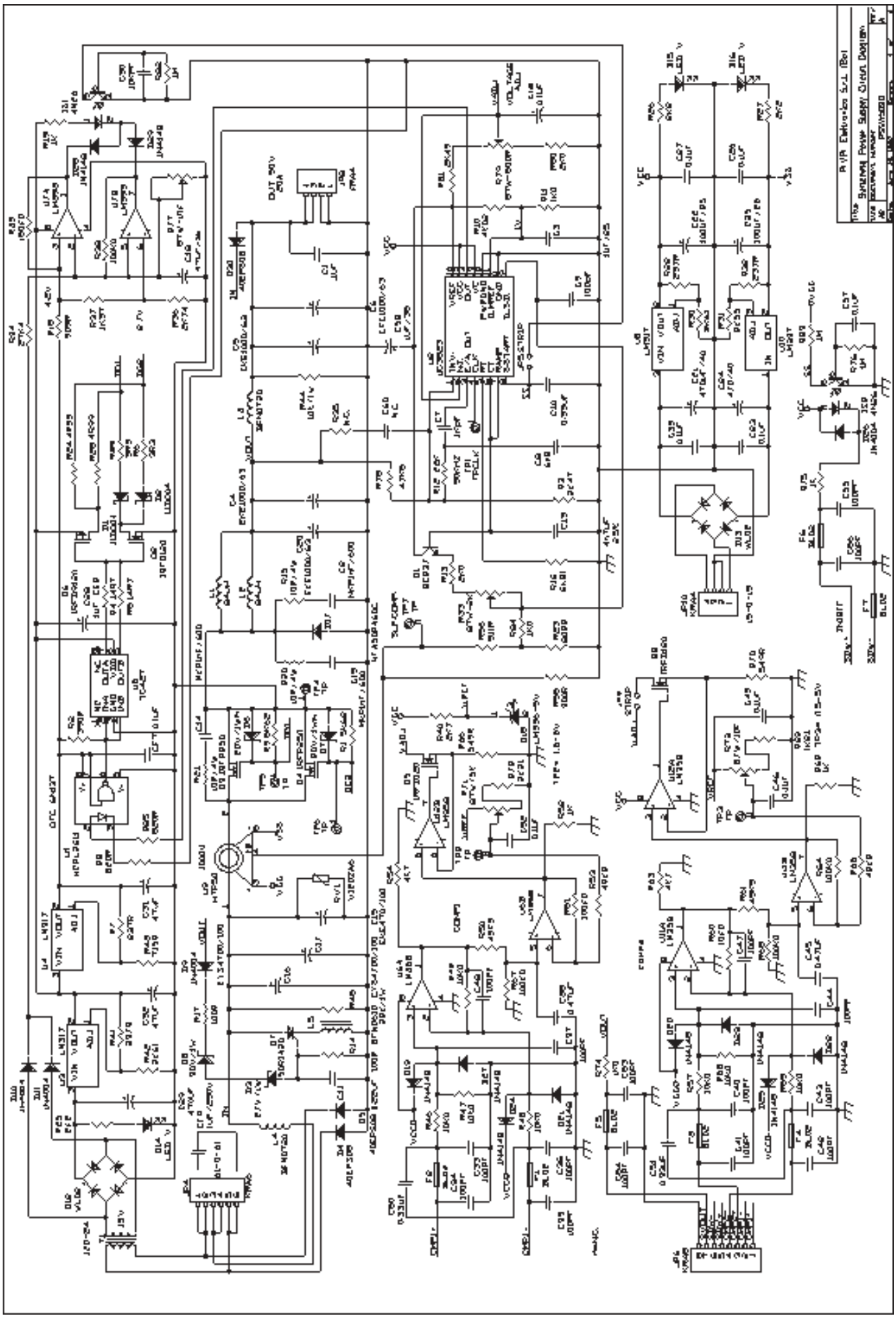
R.V.R. ELETTRONICA ®

DENOMINAZIONE
Directional Coupler Card Component Layout / Piano di Montaggio

DISPOSITIVO

SEMILAVORATO	DISEGNATO D'Alessio D. 19/04/96	DISEGNO
MATERIALE	SCALA	
TRATTAMENTO		TAVOLA n di

SWITCHING POWER SUPPLY MOD. PSSW5020



Switching Power Supply Bill of Materials/Lista Componenti Pag. 1

Item	Quantity	Reference	Part
1	1	CFP	1µF/250V
2	10	CF7,C12,C23,C26,C27, C39,C46,C49,C52,C57	0.1µF
3	1	C1	0.1µF
4	3	C2,C14,C19	MKP1nF/600
5	1	C3	1µF/25
6	4	C4,C5,C6,C20	EKE1000µF/63
7	1	C7	1KpF
8	1	C8	6n8
9	17	C9,C33,C34,C35,C36,C37, C40,C41,C42,C43,C44, C47,C48,C53,C54,C55,C56	100pF
10	3	C10,C50,C51	0.33µF
11	1	C11	0.22µF
12	1	C13	4n7UF
13	1	C15	EKE470µF/100
14	2	C16,C17	EYS4700µF/100
15	1	C18	47µF/16
16	1	C21	470µF/40
17	2	C22,C25	100µF/25
18	1	C24	470/40
19	1	C28	0.1µF CER
20	1	C29	470µF
21	1	C30	10KpF
22	2	C31,C32	47µF
23	2	C38,C45	0.47µF
24	1	C58	1µF/35
25	2	R35,C60	N.C.
26	2	D1,D2	11DQ04
27	1	D3	27V/1W
28	3	D4,D5,D30	40EPS08

Switching Power Supply Bill of Materials/Lista Componenti Pag. 2

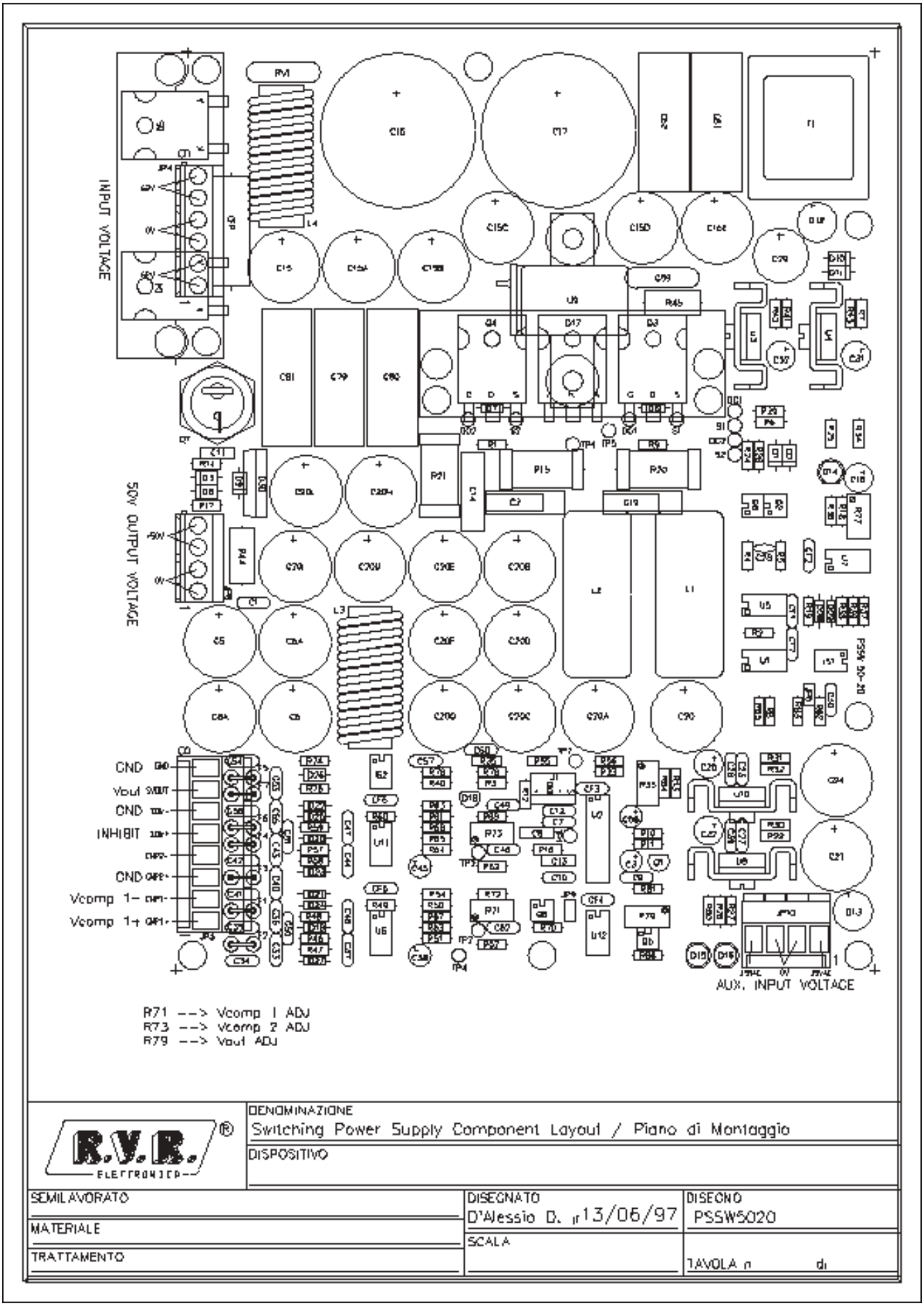
Item	Quantity	Reference	Part
29	2	D6,D7	20V/1W*
30	1	D8	30V/1W
31	4	D9,D10,D11,D26	1N4004
32	2	D12,D13	WL02
33	3	D14,D15,D16	LED V
34	1	D17	HFA50PA60C
35	1	D18	LM336-5V
36	10	D19,D20,D21,D22,D23, D24,D25,D27,D28,D29	1N4148
37	7	F1,F2,F3,F4,F5,F6,F7	BL02
38	2	IS1,IS2	4N26
39	1	JP4	KRA6
40	2	JP5,JP9	STRIP
41	1	JP6	KRA8
42	2	JP8,JP10	KRA4
43	2	L1,L2	84µH
44	2	L3,L4	BFN0720
45	1	L5	BFN0610
46	1	Q1	BC237
47	3	Q2,Q5,Q8	IRFD120
48	2	Q3,Q4	IRFP250
49	1	Q6	IRFD9120
50	1	Q7	50RIA20
51	1	RV1	V120ZA6
52	2	R1,R9	5K62
53	1	R2	390R
54	1	R3	2K47
55	2	R4,R5	14R7
56	2	R6,R29	3R3
57	4	R7,R22,R32,R41	237R

Switching Power Supply Bill of Materials/Lista Componenti Pag. 3

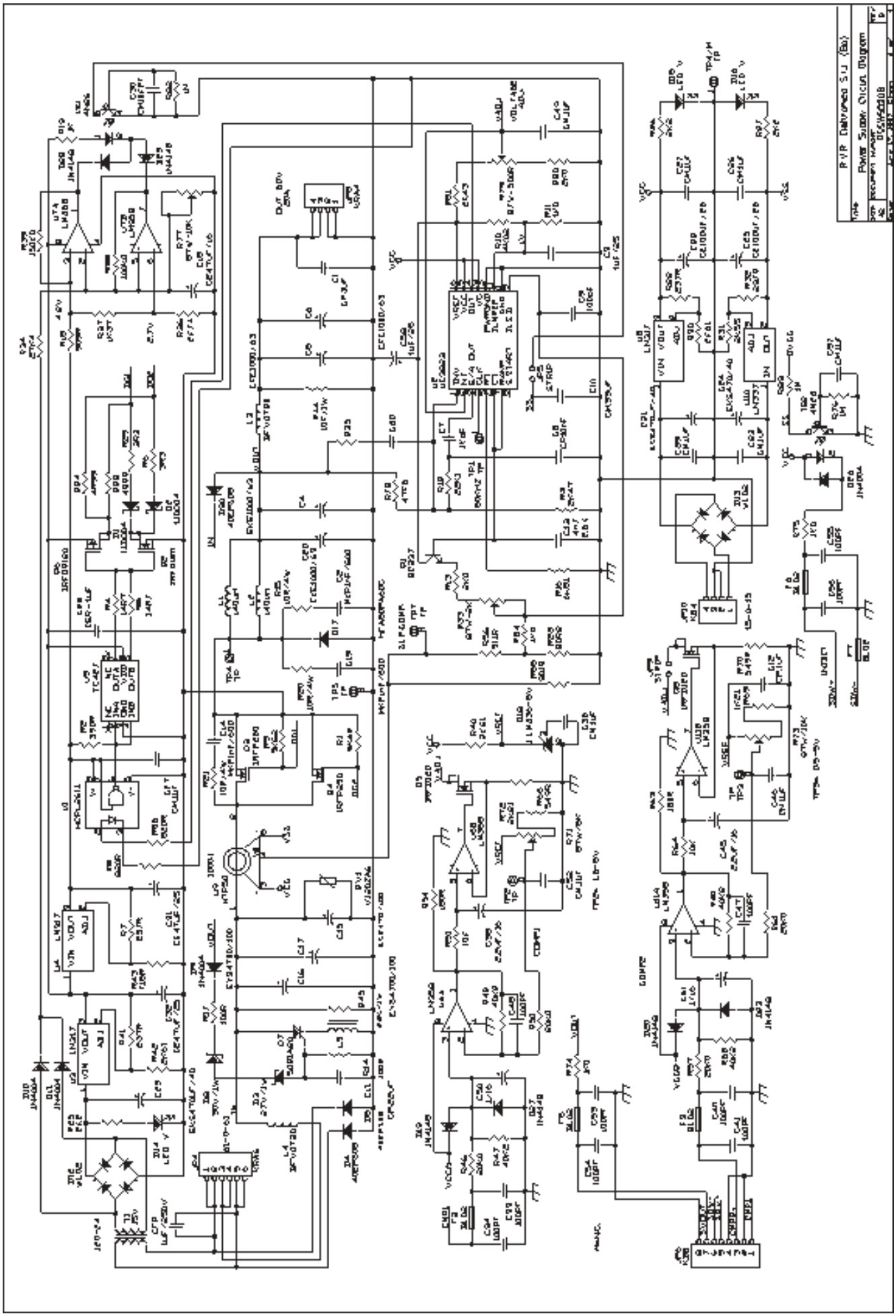
Item	Quantity	Reference	Part
58	2	R8,R85	820R
59	1	R10	4K02
60	3	R11,R74,R84	1K0
61	1	R12	22K
62	2	R13,R80	2K0
63	2	R14,R17	100R
64	3	R15,R20,R21	10R/4W
65	1	R16	6K81
66	1	R18	909R
67	4	R19,R52,R62,R75	1K
68	1	R23	80R2
69	2	R24,R28	4R99
70	3	R25,R26,R27	2K2
71	2	R30,R42	2K61
72	1	R31	2K55
73	1	R33	87W-2K
74	1	R34	27K4
75	1	R36	2K74
76	1	R37	1K37
77	5	R38,R51,R64,R67,R68	100K0
78	1	R39	150K0
79	1	R40	2K7
80	1	R43	715R
81	1	R44	10K/1W
82	1	R45	22K/1W
83	8	R46,R47,R48,R49,R57, R58,R59,R60	10K0
84	4	R50,R53,R61,R65	49K9
85	2	R54,R63	4K7
86	1	R55	300R

Switching Power Supply Bill of Materials/Lista Componenti Pag. 4

Item	Quantity	Reference	Part
87	1	R56	511R
88	2	R66,R70	549R
89	1	R69	1K21
90	1	R71	87W/5K
91	1	R72	2K21
92	1	R73	87W/10K
93	3	R76,R82,R83	1M
94	1	R77	87W-10K
95	1	R78	47K5
96	1	R79	87W-500R
97	1	R81	2K49
98	1	TP1	TPCLK
99	6	TP2,TP3,TP4,TP5,TP6,TP7	TP
100	1	T1	15V
101	1	U1	HCPL2611
102	1	U2	UC3823
103	3	U3,U4,U8	LM317
104	1	U5	TC427
105	3	U6,U11,U12	LM358
106	1	U7	LM393
107	1	U9	HTP50
108	1	U10	LM337


INPUT VOLTAGE
50V OUTPUT VOLTAGE
GND
Vout
GND
INHIBIT
GND
Vcomp 1-
Vcomp 1+
AUX. INPUT VOLTAGE
R71 --> Vcomp 1 ADJ
R73 --> Vcomp 2 ADJ
R79 --> Vout ADJ
R.V.R. ELETTRONICA
DENOMINAZIONE
Switching Power Supply Component Layout / Piano di Montaggio
DISPOSITIVO
SEMILAVORATO
MATERIALE
TRATTAMENTO
DISEGNATO
D'Alessio D. 13/06/97
SCALA
DISEGNO
PSSW5020
TAVOLA n di

SWITCHING POWER SUPPLY MOD. PSSW5020B



Switching Power Supply Bill of Materials/Lista Componenti Pag. 1

Item	Quantity	Reference	Part
1	1	CFP	1µF/250V
2	10	CF7,C23,C26,C27,C35, C39,C46,C49,C52,C57	CM.1µF
3	2	C1,C12	CP.1µF
4	3	C2,C14,C19	MKP1NF/600
5	2	C3,C58	1µF/25
6	4	C4,C5,C6,C20	EKE1000/63
7	1	C7	1KpF
8	1	C8	CP10nF
9	11	C9,C33,C34,C40,C41,C47, C48,C53,C54,C55,C56	100pF
10	1	C10	CM.33UF
11	1	C11	CP.22UF
12	1	C13	4N7
13	1	C15	EKE470/100
14	2	C16,C17	EYS4700/100
15	1	C18	CE47µF/16
16	2	C21,C29	EKS470µF/40
17	2	C22,C25	CE100µF/25
18	1	C24	EKS470/40
19	1	C28	CER-.1µF
20	1	C30	CM10KpF
21	2	C31,C32	CE47µF/25
22	2	C38,C45	2.2µF/16
23	2	C50,C51	1/16
24	2	R35,C60	
25	2	D1,D2	11DQ04
26	1	D3	27V/1W
27	3	D4,D5,D30	40EPS08
28	1	D8	30V/1W

Switching Power Supply Bill of Materials/Lista Componenti Pag. 2

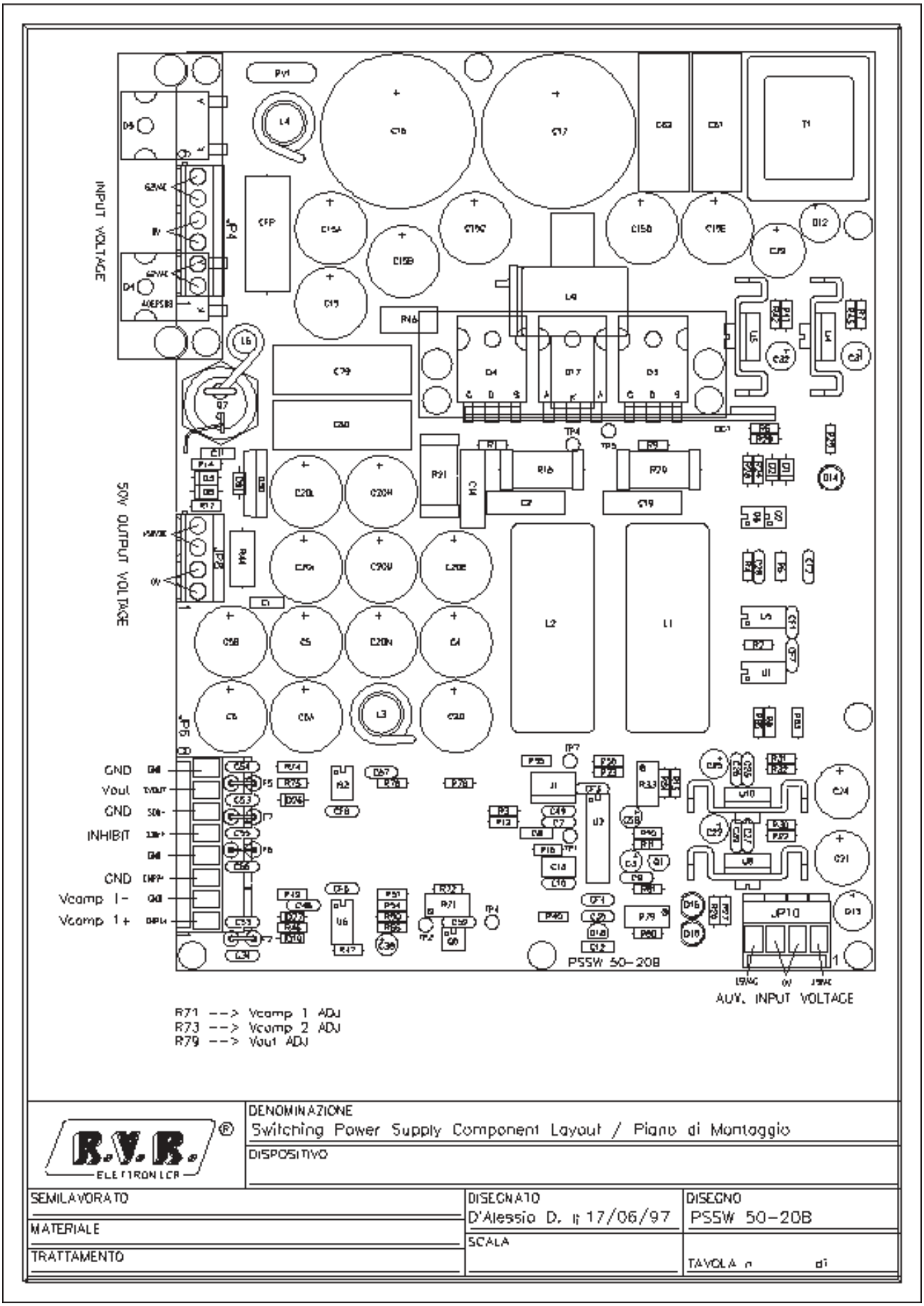
Item	Quantity	Reference	Part
29	4	D9,D10,D11,D26	1N4004
30	2	D12,D13	WL02
31	3	D14,D15,D16	LED V
32	1	D17	HFA50PA60C
33	1	D18	LM336-5V
34	6	D19,D20,D23,D27,D28, D29	1N4148
35	5	F2,F3,F5,F6,F7	BL02
36	2	IS1,IS2	4N26
37	1	JP4	KRA6
38	2	JP5,JP9	STRIP
39	1	JP6	KB8
40	1	JP8	KRA4
41	1	JP10	KB4
42	2	L1,L2	140UH
43	2	L3,L4	BFV0720
44	1	L5	BFV0710
45	1	Q1	BC237
46	3	Q2,Q5,Q8	IRFD120
47	2	Q3,Q4	IRFP250
48	1	Q6	IRFD9120
49	1	Q7	50RIA20
50	1	RV1	V120ZA6
51	2	R1,R9	5K62
52	1	R2	390R
53	1	R3	2K47
54	2	R4,R5	14R7
55	2	R6,R29	3R3
56	4	R7,R22,R32,R41	237R
57	2	R8,R85	820R

Switching Power Supply Bill of Materials/Lista Componenti Pag. 3

Item	Quantity	Reference	Part
58	1	R10	4K02
59	4	R11,R74,R75,R84	1K0
60	1	R12	22K1
61	2	R13,R80	2K0
62	2	R14,R17	100R
63	3	R15,R20,R21	10R/4W
64	1	R16	6K81
65	1	R18	909R
66	1	R19	1K
67	1	R23	80R2
68	2	R24,R28	4R99
69	3	R25,R26,R27	2K2
70	3	R30,R40,R42	2K61
71	1	R31	2K55
72	1	R33	87W-2K
73	1	R34	27K4
74	1	R36	2K74
75	1	R37	1K37
76	1	R38	100K0
77	1	R39	150K0
78	1	R43	715R
79	1	R44	10K/1W
80	1	R45	22K/1W
81	4	R46,R50,R57,R61	20K0
82	4	R47,R49,R58,R60	40K2
83	2	R51,R64	10K
84	2	R54,R63	180R
85	1	R55	301R
86	1	R56	511R

Switching Power Supply Bill of Materials/Lista Componenti Pag. 4

Item	Quantity	Reference	Part
87	2	R66,R70	549R
88	1	R69	1K21
89	1	R71	87W/5K
90	1	R72	2K21
91	1	R73	87W/10K
92	3	R76,R82,R83	1M
93	1	R77	87W-10K
94	1	R78	47K5
95	1	R79	87W-500R
96	1	R81	2K43
97	7	TP1,TP2,TP3,TP4/M,TP4, TP TP5,TP7	
98	1	T1	15V
99	1	U1	HCPL2611
100	1	U2	UC3823
101	3	U3,U4,U8	LM317
102	1	U5	TC427
103	3	U6,U7,U11	LM358
104	1	U9	HTP50
105	1	U10	LM337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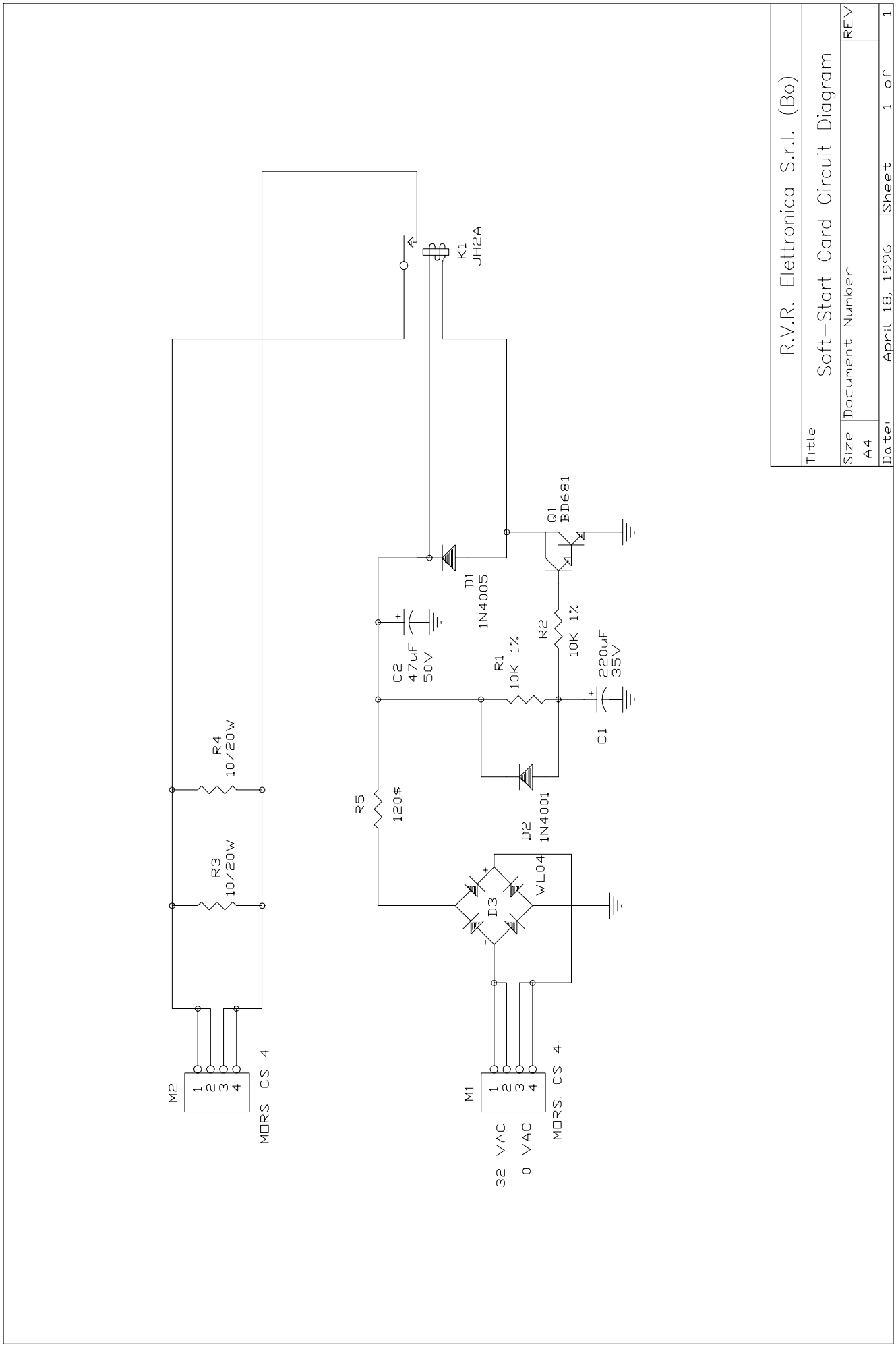
50W OUTPUT VOLTAGE
GND
Vout
GND
INHIBIT
GND
Vcamp 1-
Vcamp 1+
PS5W 50-20B
AUX. INPUT VOLTAGE
R71 --> Vcamp 1 ADJ
R73 --> Vcamp 2 ADJ
R79 --> Vout ADJ
R.V.R.
ELETTRONICA
DENOMINAZIONE
Switching Power Supply Component Layout / Piano di Montaggio
DISPOSITIVO
SEMILAVORATO
MATERIALE
TRATTAMENTO
DISEGNATO
D'Alessio D. ; 17/06/97
SCALA
DISEGNO
PS5W 50-20B
TAVOLA n
di

SOFT START CARD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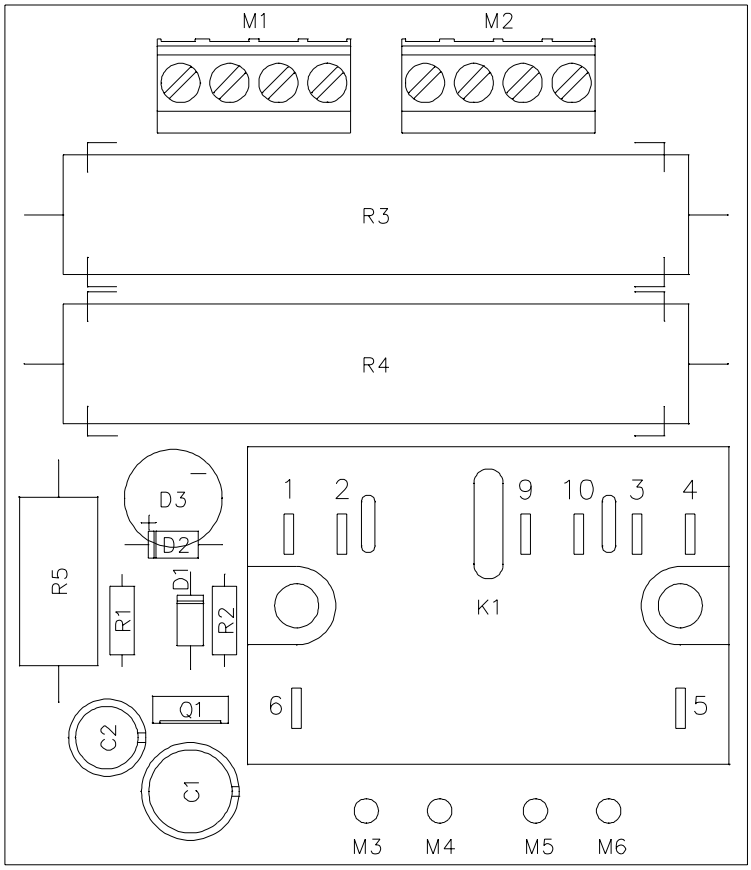
Size
A4
Document Number
REV
Date:
April 18, 1996
Sheet
1 of
1
K1
JH2A
Q1
BD681
D1
1N4005
C2
47uF
50V
R1
10K 1%
R2
10K 1%
C1
220uF
35V
R5
120$
D2
1N4001
D3
WL04
R4
10/20W
R3
10/20W
M2
1
2
3
4
MORS. CS 4
M1
1
2
3
4
32 VAC
0 VAC
MORS. CS 4

Soft-Start Card Bill of Materials/Lista Componenti Pag. 1

Item	Quantity	Reference	Part	Description	Part Order Code
1	2	R3,R4	10/20W	RESISTOR 20W 10%	RAF020KH0010
2	1	R5	120$	RESISTOR 5W	RSC005JH0120
3	2	R1,R2	10K 1%	RESISTOR 1/4W 1%	RSM1/4FK0010
4	1	C2	47µF	ELECTROLYTIC CAPACITOR	CEA476BM630
5	1	C1	220µF	ELECTROLYTIC CAPACITOR	CEA227BM350
6	2	M1,M2	MORS. CS 4	MORSETTIERA CS 4 CONT.	MORSKB04PPO
7	1	K1	JH2A	RELAY MATHSUSH. 2CA1CC	RLDJH2AB24
8	1	D2	1N4001	SILICON DIODE 50V	DIS1N4001
9	1	D1	1N4005	SILICON DIODE 600V	DIS1N4005
10	1	D3	WL04	DIODE BRIDGE 1.5A	PNRWL04
11	1	Q1	BD681	NPN DARLINGTON	TRNBD681



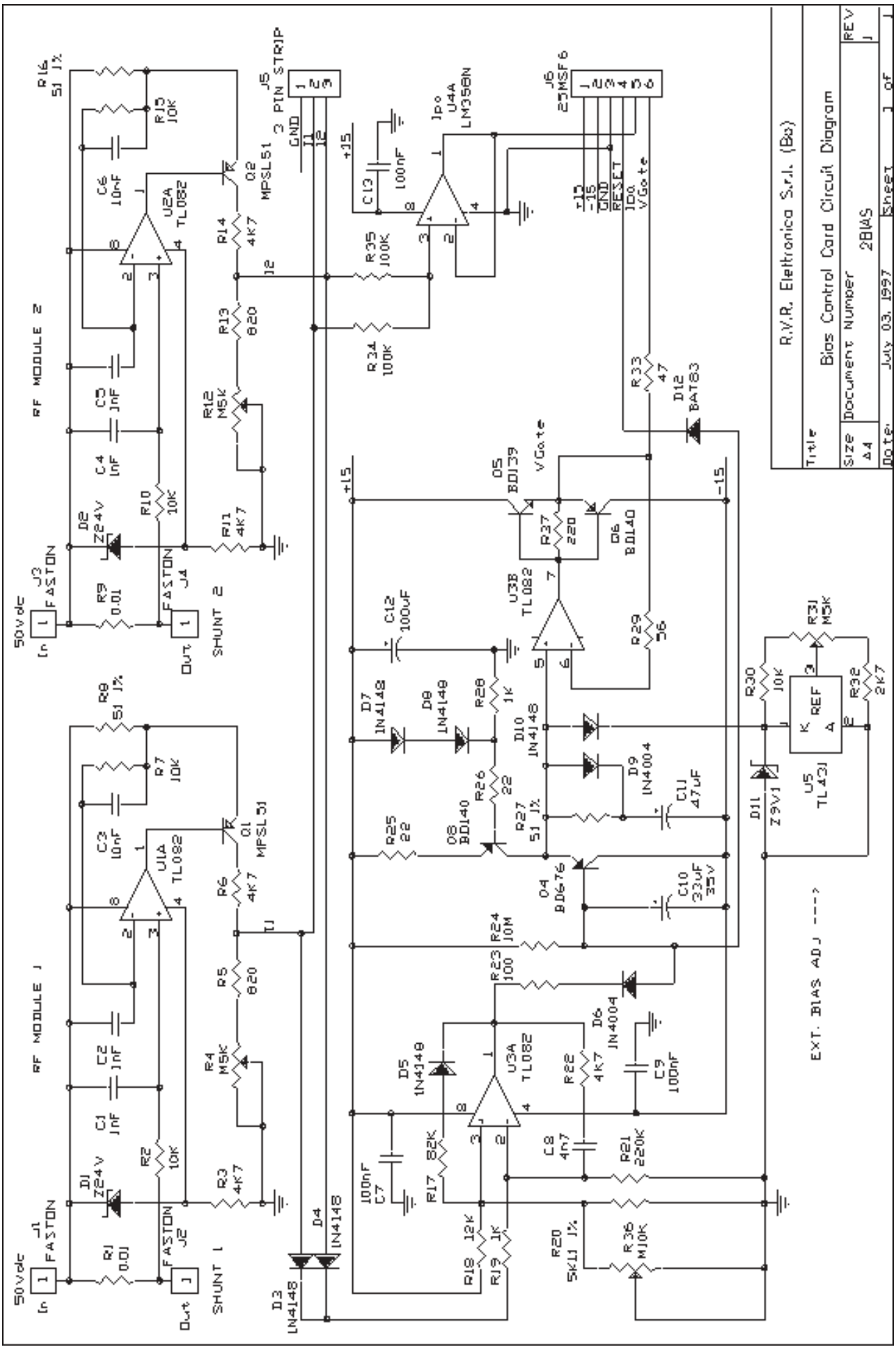
R.V.R. ELETTRONICA ®

DENOMINAZIONE
Soft–Start Card Component Layout / Piano di Montaggio

DISPOSITIVO

SEMILAVORATO	DISEGNATO li 01/08/95	DISEGNO
MATERIALE	SCALA	
TRATTAMENTO		TAVOLA n di

BIAS CONTROL CARD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Document Number
2BIAS
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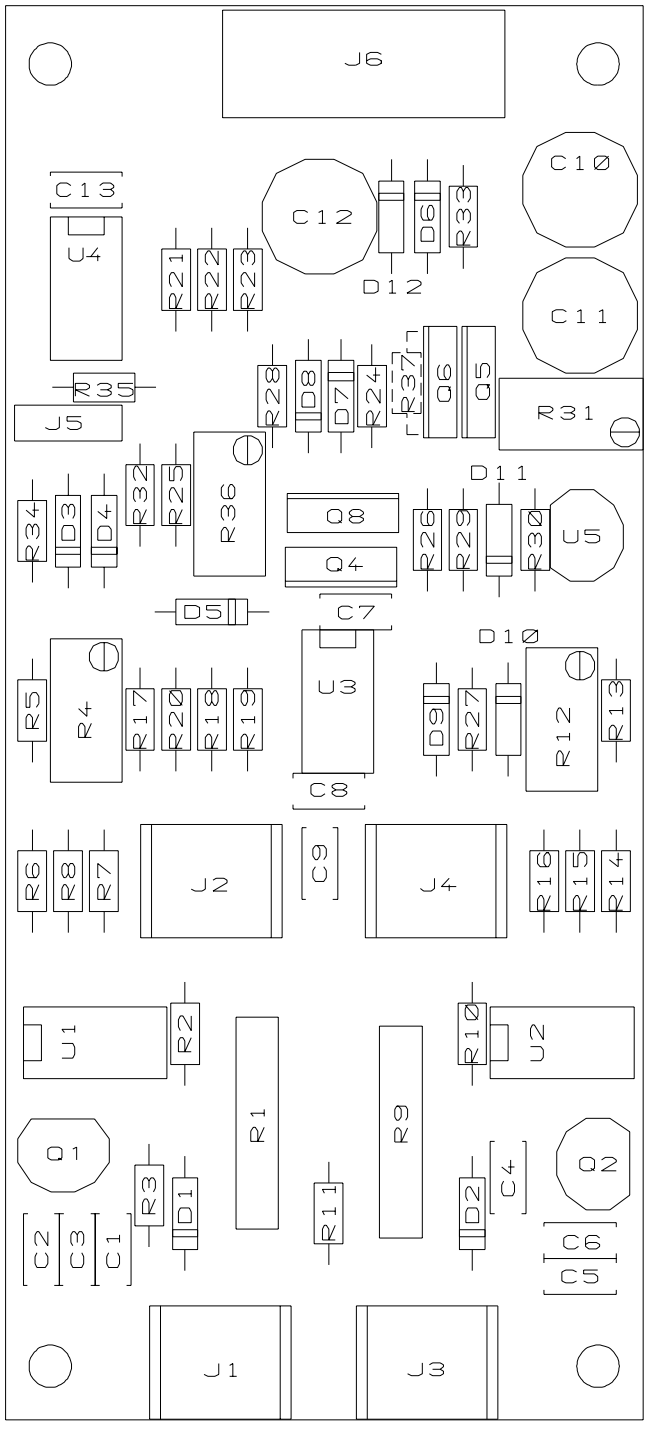
Date:
July 03, 1997
Sheet
1 of 1
RF MODULE 1
RF MODULE 2
SHUNT 1
SHUNT 2
50Vdc
In
Out
FASTON
J1
J2
J3
J4
J5
3 PIN STRIP
GND
J1
J2
J6
25MSF6
-15
GND
RESET
IDO
VGate
+15
-15
Q1
MPSL51
Q2
MPSL51
Q4
BD676
Q5
BD139
Q6
BD140
Q8
BD140
U1A
TL082
U2A
TL082
U3A
TL082
U3B
TL082
U4A
LM358N
U5
TL431
REF
D1
Z24V
D2
Z24V
D3
1N4148
D4
1N4148
D5
1N4148
D6
1N4004
D7
1N4148
D8
1N4148
D9
1N4004
D10
1N4148
D11
Z9V1
D12
BAT83
R1
0.01
R2
10K
R3
4K7
R4
M5K
R5
820
R6
4K7
R7
10K
R8
51 1%
R9
0.01
R10
10K
R11
4K7
R12
M5K
R13
820
R14
4K7
R15
10K
R16
51 1%
R17
82K
R18
12K
R19
1K
R20
5K11 1%
R21
220K
R22
4K7
R23
100
R24
10M
R25
22
R26
22
R27
51 1%
R28
1K
R29
56
R30
10K
R31
M5K
R32
2K7
R33
47
R34
100K
R35
100K
R36
M10K
C1
1nF
C2
1nF
C3
10nF
C4
1nF
C5
1nF
C6
10nF
C7
100nF
C8
4n7
C9
100nF
C10
33uF
35V
C11
47uF
C12
100uF
C13
100nF
EXT. BIAS ADJ --->

Bias Control Card Bill of Materials/Lista Componenti Pag. 1

Item	Quantity	Reference	Part	Description	Part Order Code
1	2	R1,R9	0.01	RESISTOR 1/4W 5%	RSC1/4JH0,01
2	2	R25,R26	22	RESISTOR 1/4W 5%	RSC1/4JH0022
3	1	R33	47	RESISTOR 1/4W 5%	RSC1/4JH0047
4	3	R8,R16,R27	51 1%	RESISTOR 1/4W 1%	RSM1/4FH0051
5	1	R29	56	RESISTOR 1/4W 5%	RSC1/4JH0056
6	1	R23	100	RESISTOR 1/4W 5%	RSC1/4JH0100
7	1	R37	220	RESISTOR 1/4W 5%	RSC1/4JH0220
8	2	R5,R13	820	RESISTOR 1/4W 5%	RSC1/4JH0820
9	2	R19,R28	1K	RESISTOR 1/4W 5%	RSC1/4JK0001
10	1	R32	2K7	RESISTOR 1/4W 5%	RSC1/4JK02,7
11	5	R3,R6,R11, R14,R22	4K7	RESISTOR 1/4W 5%	RSC1/4JK04,7
12	1	R20	5K11 1%	RESISTOR 1/4W 1%	RSM1/4FK5,11
13	5	R2,R7,R10, R15,R30	10K	RESISTOR 1/4W 5%	RSC1/4JK0010
14	1	R18	12K	RESISTOR 1/4W 5%	RSC1/4JK0012
15	1	R17	82K	RESISTOR 1/4W 5%	RSC1/4JK0082
16	2	R34,R35	100K	RESISTOR 1/4W 5%	RSC1/4JK0100
17	1	R21	220K	RESISTOR 1/4W 5%	RSC1/4JK0220
18	1	R24	10M	RESISTOR 1/4W 5%	RSC1/4JM0010
19	3	R4,R12,R31	M5K	TRIMMER MULTIGIRI	RVTMULAK0005
20	1	R36	M10K	TRIMMER MULTIGIRI	RVTMULAK0010
21	4	C1,C2,C4,C5	1nF	CERAMIC CAPACITOR	CKM102BK600P
22	1	C8	4n7	CERAMIC CAPACITOR	CKM472BK600P
23	2	C3,C6	10nF	CERAMIC CAPACITOR	CKM103BK600P
24	3	C7,C9,C13	100nF	CERAMIC CAPACITOR	CKM104BK600P
25	1	C10	33µF	ELECTROLYTIC CAPACITOR	CEA336BM350
26	1	C11	47µF	ELECTROLYTIC CAPACITOR	CEA476BM630
27	1	C12	100µF	ELECTROLYTIC CAPACITOR	CEA107BM350
28	1	J5	3 PIN STRIP	STRIP M P 2.54 3 PIN	CNTSTRIPMCS

Bias Control Card Bill of Materials/Lista Componenti Pag. 2

Item	Quantity	Reference	Part	Description	Part Order Code
29	1	J6	25MSF6	MINIMOD. CON. 2.5MM 6P	CNT25MSF6
30	4	J1,J2,J3,J4	FASTON	CONN. FASTON M C.S.	CNTFSTMCSGR
31	6	D3,D4,D5, D7,D8,D10	1N4148	SILICON DIODE	DIS1N4148
32	1	D12	BAT83	HOT CARRIER DIODE	DHCBAT83
33	2	D6,D9	1N4004	SILICON DIODE 400V	DIS1N4004
34	1	D11	Z9V1	ZENER DIODE 9.1V 0.4W	DIZ9V10W4
35	2	D1,D2	Z24V	ZENER DIODE 24V 0.4W	DIZ24V0W4
36	1	U5	TL431	VOLT. PRECISION REFER.	CILTL431
37	2	Q1,Q2	MPSL51	PNP HIGH VOL. AMP. TR.	TRNMPSL51
38	1	Q5	BD139	NPN TRANSISTOR	TRNBD139
39	2	Q6,Q8	BD140	PNP TRANSISTOR	TRNBD140
40	1	Q4	BD676	PNP DARLINGTON	TRNBD676
41	1	U4	LM358N	DOUBLE OP. AMP.	CILLM358N
42	3	U1,U2,U3	TL082	DOUBLE OP. AMP.	CILTL082



R.V.R. ELETTRONICA ®	DENOMINAZIONE: Bias Cotrol Card Component Layout / Piano di Montaggio	
	DISPOSITIVO:	
SEMILAVORATO	DISEGNATO: D'Alessio D. li 03/07/97	DISEGNO
MATERIALE	SCALA	
TRATTAMENTO		TAVOLA n di

Second Edition - July '97
Created By D'Alessio D. & Morotti M.

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