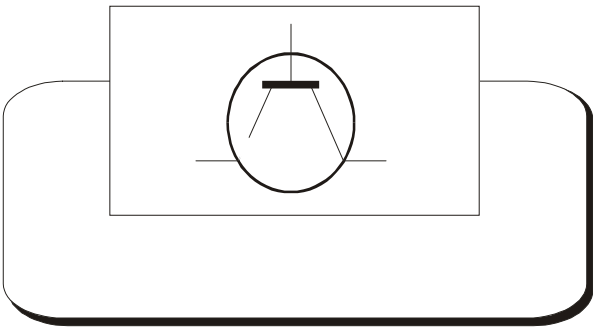
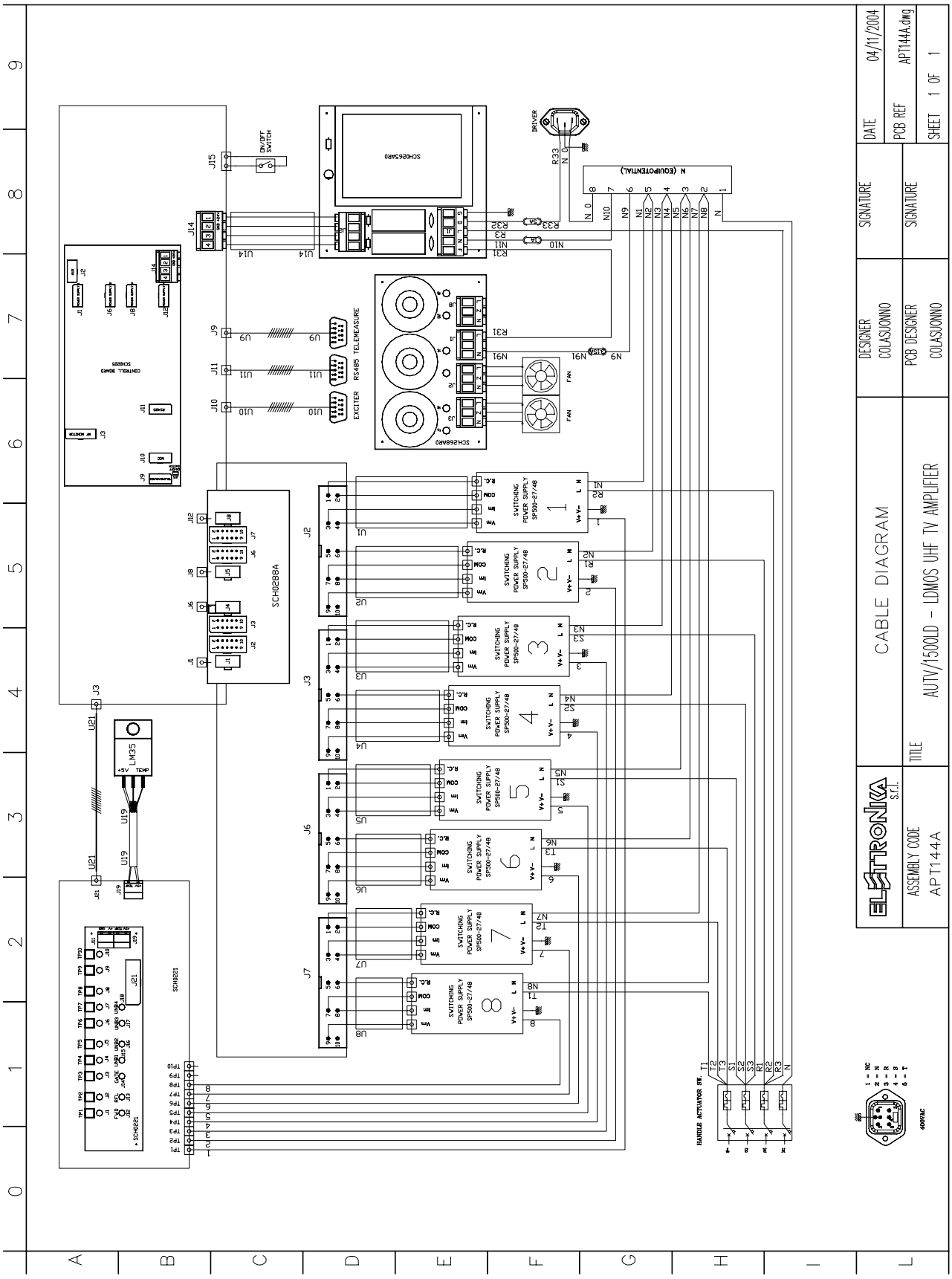
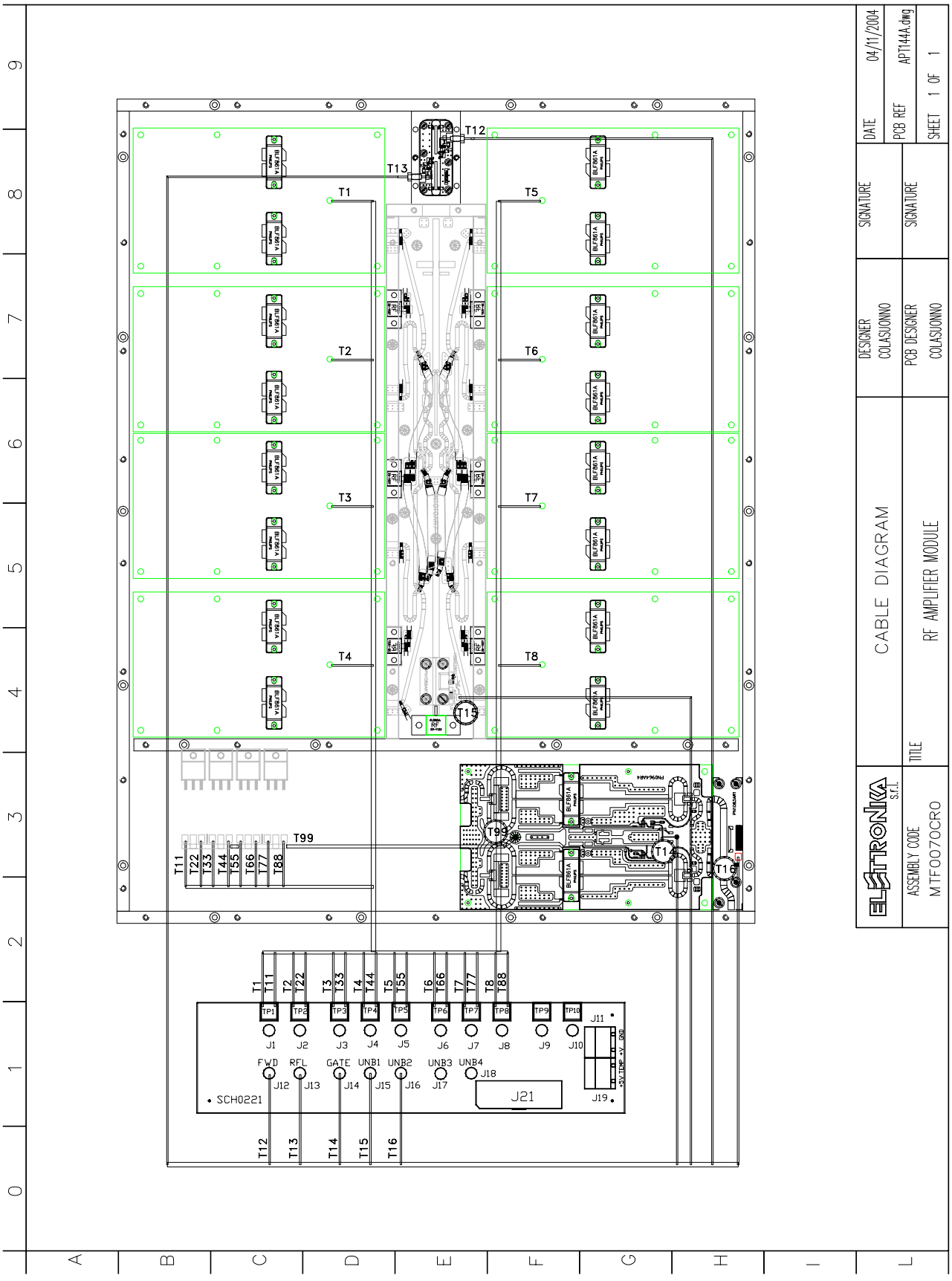


Section 4 - Diagram

Contents:

- Cable diagram
- MTF0070CR0 RF Amplifier module Cable Diagram
- MTF0070CR0 RF Amplifier module Connections Diagram
- MTF0070CR0 Amplifier module - Component list
- SCH0192AR0 (200W UHF LDMOS Amplifier module)
- SCH0223AR1 (Control board and display)
- SCH0221AR1 (Amplifier interface)
- SCH0265AR0 (Mains distribution board)
- SCH0288AR1 (Interface board)
- E0012 (SP500-27-DI Switching power supply)


CABLE DIAGRAM
AUTV/1500LD - LDMOS UHF TV AMPLIFIER
ELETTRONIKA S.r.l.
TITLE
ASSEMBLY CODE
APT144A
DESIGNER
COLASUONNO
PCB DESIGNER
COLASUONNO
SIGNATURE
SIGNATURE
DATE
04/11/2004
PCB REF
APT144A.dwg
SHEET 1 OF 1
ON/OFF SWITCH
DRIVER
N (EQUIPOTENTIAL)
SCH0265AR0
SCH2684R0
SCH0288A
SCH0221
SCH0232
SWITCHING POWER SUPPLY SP500-27/48
LM35
+5V TEMP
RS485 TELEMEASURE
EXCITER
FAN
HANDLE ACTUATOR SW.
1 - NC
2 - N
3 - R
4 - S
5 - T
400VAC


T12
T13
T1
T5
T2
T6
T3
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T4
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T11
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T66
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T16
T1
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T3
T4
T5
T6
T7
T8
T11
T22
T33
T44
T55
T66
T77
T88
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10
J1
J2
J3
J4
J5
J6
J7
J8
J9
J10
J11
FWD
RFL
GATE
UNB1
UNB2
UNB3
UNB4
J12
J13
J14
J15
J16
J17
J18
J19
J21
SCH0221
T12
T13
T14
T15
T16
ELETRONIKA S.r.l.
CABLE DIAGRAM
RF AMPLIFIER MODULE
ASSEMBLY CODE
MTF0070CRO
TITLE
DESIGNER
COLASUONNO
PCB DESIGNER
COLASUONNO
SIGNATURE
SIGNATURE
DATE
04/11/2004
PCB REF
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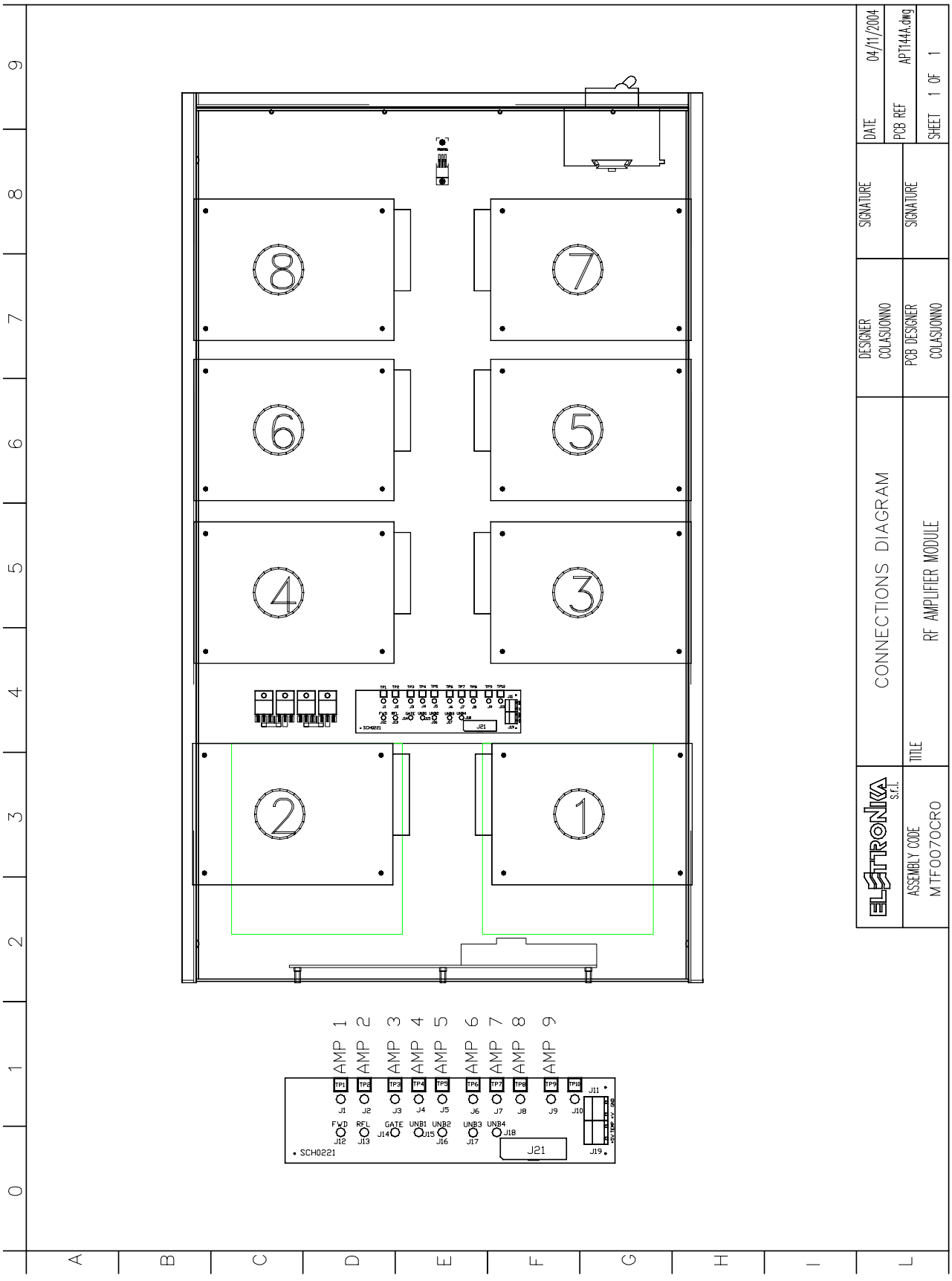
SHEET 1 OF 1


CONNECTIONS DIAGRAM
RF AMPLIFIER MODULE
ELETTRONICA S.r.l.
ASSEMBLY CODE
MTF0070CRO
TITLE
DESIGNER
COLASUONNO
PCB DESIGNER
COLASUONNO
SIGNATURE
SIGNATURE
DATE
04/11/2004
PCB REF
APT1444A.dwg
SHEET 1 OF 1
AMP 1
AMP 2
AMP 3
AMP 4
AMP 5
AMP 6
AMP 7
AMP 8
AMP 9
FWD
RFL
GATE
UNB1
UNB2
UNB3
UNB4
J21
SCH0221

Part Name Code	Description	Qty
00001	0Ω 1206 SMD RESISTOR	2
01041D	1nF 1206 2% SMD CAPACITOR	2
00221B	75Ω 1206 1% SMD RESISTOR	2
03207	HSMS-2802*L31 DIODE	2
SCH0192AR0	200W UHF LDMOS AMPLIFIER MODULE	9
SCH0221AR0	AMPLIFIER INTERFACE	1
SCH0248AR0	8 WAY WILKINSON	1
SCH0249AR0	4 WAY WILKINSON Dx	1
SCH0250AR0	4 WAY WILKINSON Sx	1
SCH0251AR0	2 WAY WILKINSON	1
SCH0252AR0	1500W UHF INPUT COUPLER	1
PN1091A	C.S. PN1091AR3 OUTPUT DIRECTIONAL COUPLER	1
02402	7/16" FEMALE CONNECTOR cod. 0142	1
02512	J01151A0531 SMA SOCKET WITHOUT BAT.	1
01400	2499-003-X5U0-102M FEED-THROUGH CAPACITOR	13
01408	5000PF FEED-THROUGH CAPACITOR	2
DET0726	DET0726R2 SIDE x 1500W UHF AMP. MOD.	2
DET0727	DET0727R1 INTERNAL FRONT SIDE x AMP. MOD.	1
DET0728	DET0728R4 INTERNAL SIDE x AMP. MOD.	2
DET0729	DET0729R2 FRONT SIDE x AMP. MOD.	1
DET0730	DET0730R2 REAR SIDE x AMP. MOD.	1
DET0732	DET0732R1 CONNECTIONS SUPPORT BOARD	1
DET0734	DET0734R0 COVER x AMPLIFIER MODULE P. 2634	1
DET0736	DET0736R6 HEATSINK x AMPLIFIER MODULE	1
DET0807	DET0807R3 SCREEN DIR. COUPLER MODULE	1
DET0810	DET0810R0 PART. x DIRECTIONAL COUPLER	1
DET0811	DET0811R1 COVER x DIRECTIONAL COUPLER	1
DET0812	DET0812R1 TEFLON RING x DIRECTIONAL COUPLER	1
DET0819	DET0819R0 SPESS. x INPUT DIR. COUPLER	1
DET0828	DET0828R0 COVER x AMPLIFIER MODULE P. 2644	1
DET0839	DET0839R2 DIRECTIONAL COUPLER	1
08502	RG316 50Ω CABLE	3,00
08527	HF-85 ENDIFORM CABLE	0,20
03017	MBR3045PT DIODE	4
PN0998A	PN998AR1 POWER SUPPLY ADDED PCB	2

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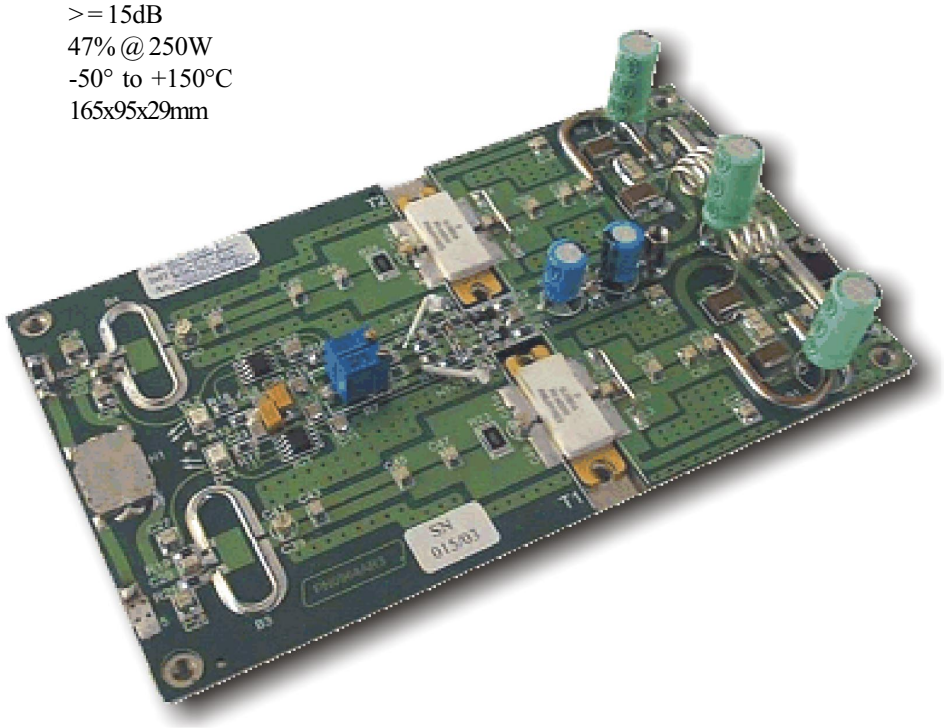
DESCRIPTION

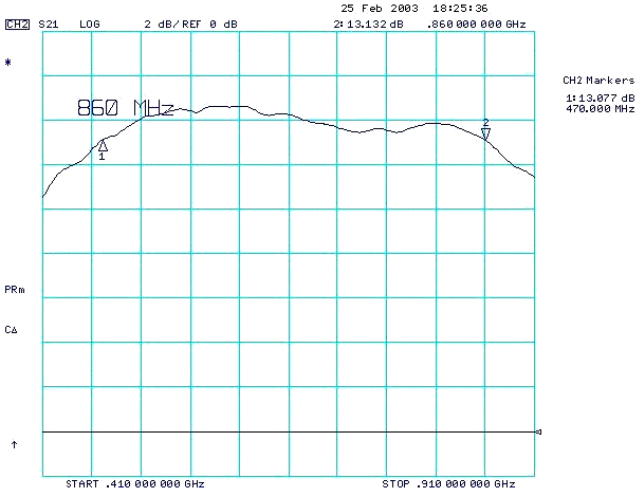
The RF module is an integrated TV linear amplifier designed for UHF band, this module employs push-pull LDMOS technology in order to achieve very good efficiency, high linearity and reliability.
LDMOS transistors operate in AB class. It is a wideband amplifier over the full frequency, no adjustment is required for the channel change. The board includes RF section amplifier, bias circuit, protection circuit and matching networks. A silver plated copper plate is brazed with PCB in order to obtain low thermal resistance. Providing a minimum of 200W Pk sync linear power, this module is the perfect amplifier for any broadband UHF power transmitter.

TECHNICAL CHARACTERISTICS

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



- Curve response graphic



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

CALIBRATION PROCEDURE

- Technical characteristics

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

- Adjustment procedure

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

- Adjustment points description

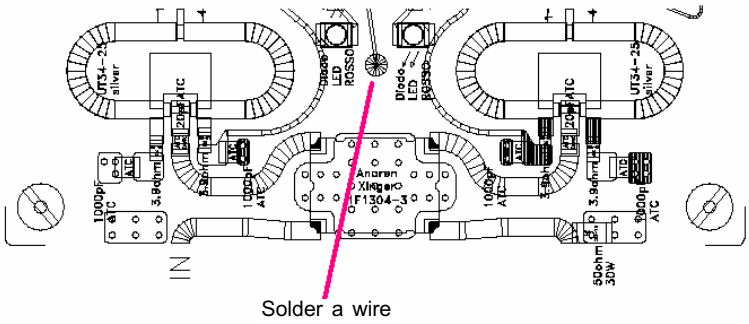
R7-R8 (Trimmers)	Adjust the current absorbed in stand-by (1.0A per device)

- Calibration steps

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

STEP 2. **Check the voltages of the polarisation circuits *without assembling the transistors first:*** connect the 32V power supply to the proper turret by means of a fastening screw, then give power and check data:
- the stabilised voltage on the zener diodes DZ1 and DZ2 is about 15V compared to the ground;
- the stabilised voltage on the zener diodes DZ3 and DZ4 is about 6.8V compared to the ground;
- the voltage on the pads to which the gates of the LDMOS transistors will be soldered (R23 and R24 resistors side) changes from 0V to a maximum value of about 6V when moving the relevant trimmer (R7-R8).

STEP 3. **Check the work of the protections.**
- Set both trimmers so that there is a value of about 4.5V on the pads of the gates;
- solder some wire to the pad between the two LEDs, next to the serigraphy of the input hybrid H1;



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

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

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

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

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

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

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

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

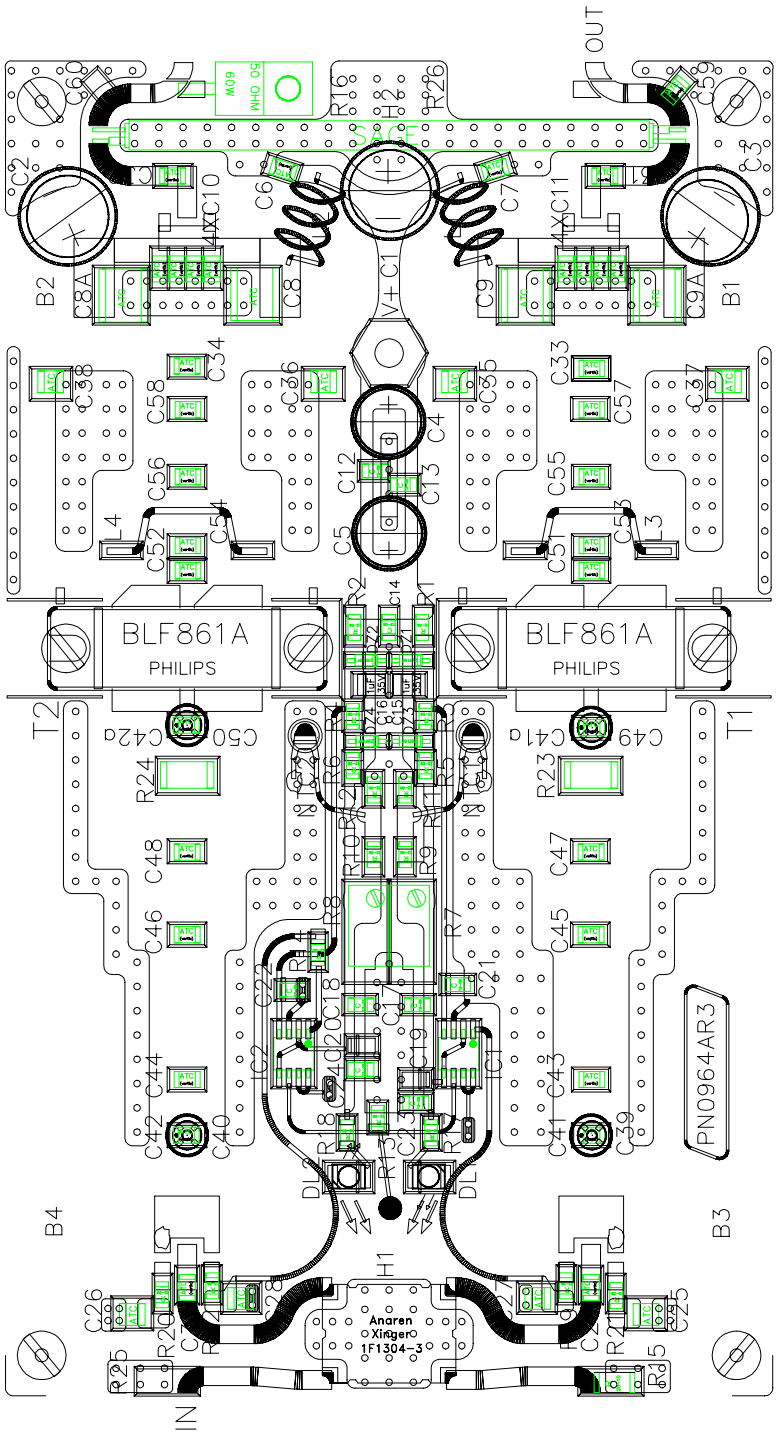
STEP 10. Check the response curve for low signal with centre 660MHz and span 500MHz, 2dB/div.

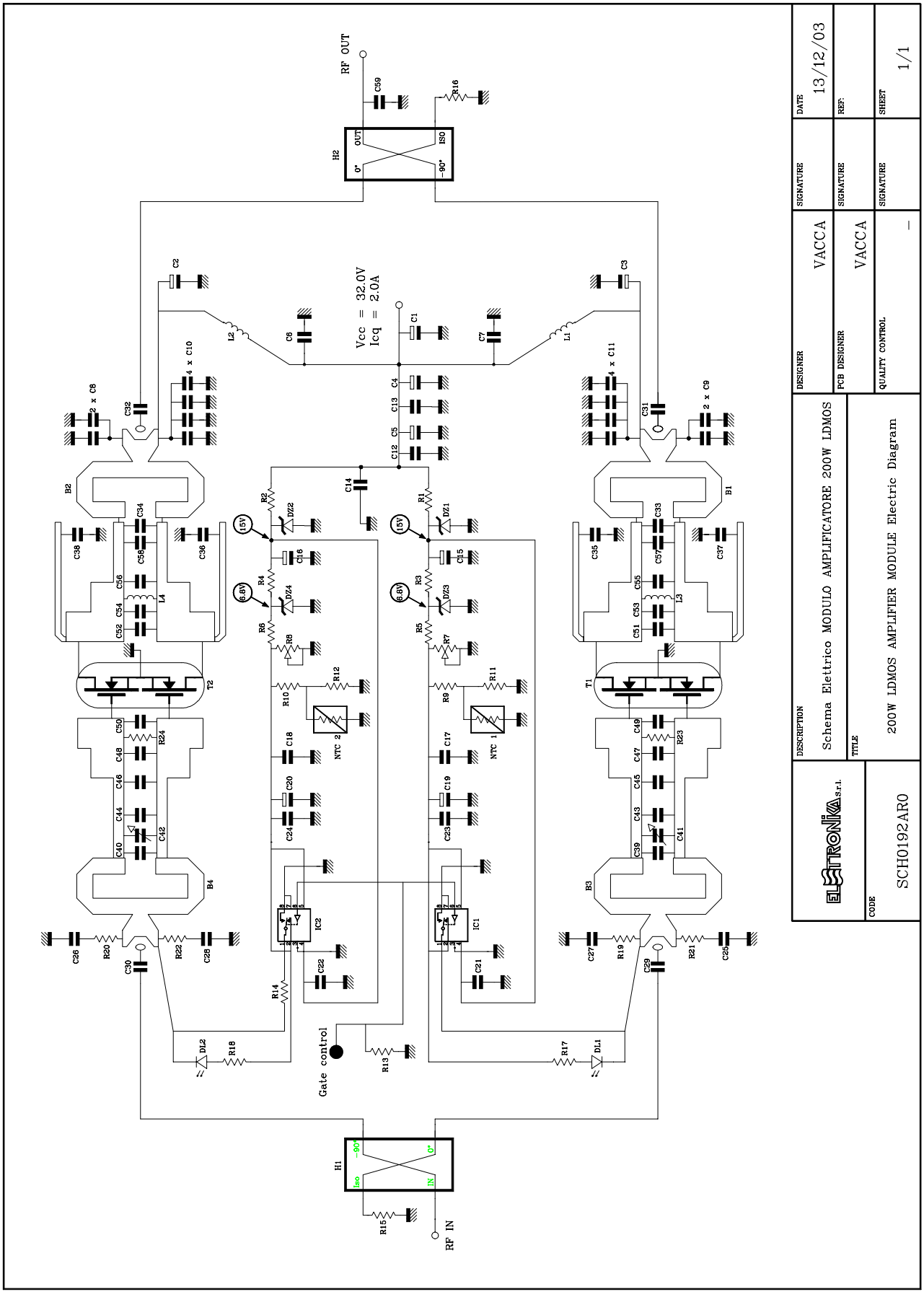
STEP 11. The curve should be similar to the one enclosed, with a tolerance of ± 0.5dB. To obtain this, act on the four trimmers C41-C41a and C42-C42a with the proper "calibrator", inorder to flatten the curve as much as possible, especially at the edged of the band which represents the minimum values.

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

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

Component layout SCH0192AR0




RF OUT
RF IN
Gate control
Vcc = 32.0V
Icq = 2.0A
Schema Elettrico MODULO AMPLIFICATORE 200W LDMOS
200W LDMOS AMPLIFIER MODULE Electric Diagram
SCH0192AR0
VACCA
VACCA
13/12/03
1/1

COMPONENT LIST *SCH0192AR0*

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

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

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

DESCRIPTION

The control board SCH0223AR1 manages the operational logic of the amplifier: switching on and off, power supply and fans, alarms and protections, remote control, human-machine interface. All of that is performed by a modern and powerful 16 bit micro-controller, which is the main part of the board.
Figure 1 shows the block diagram.

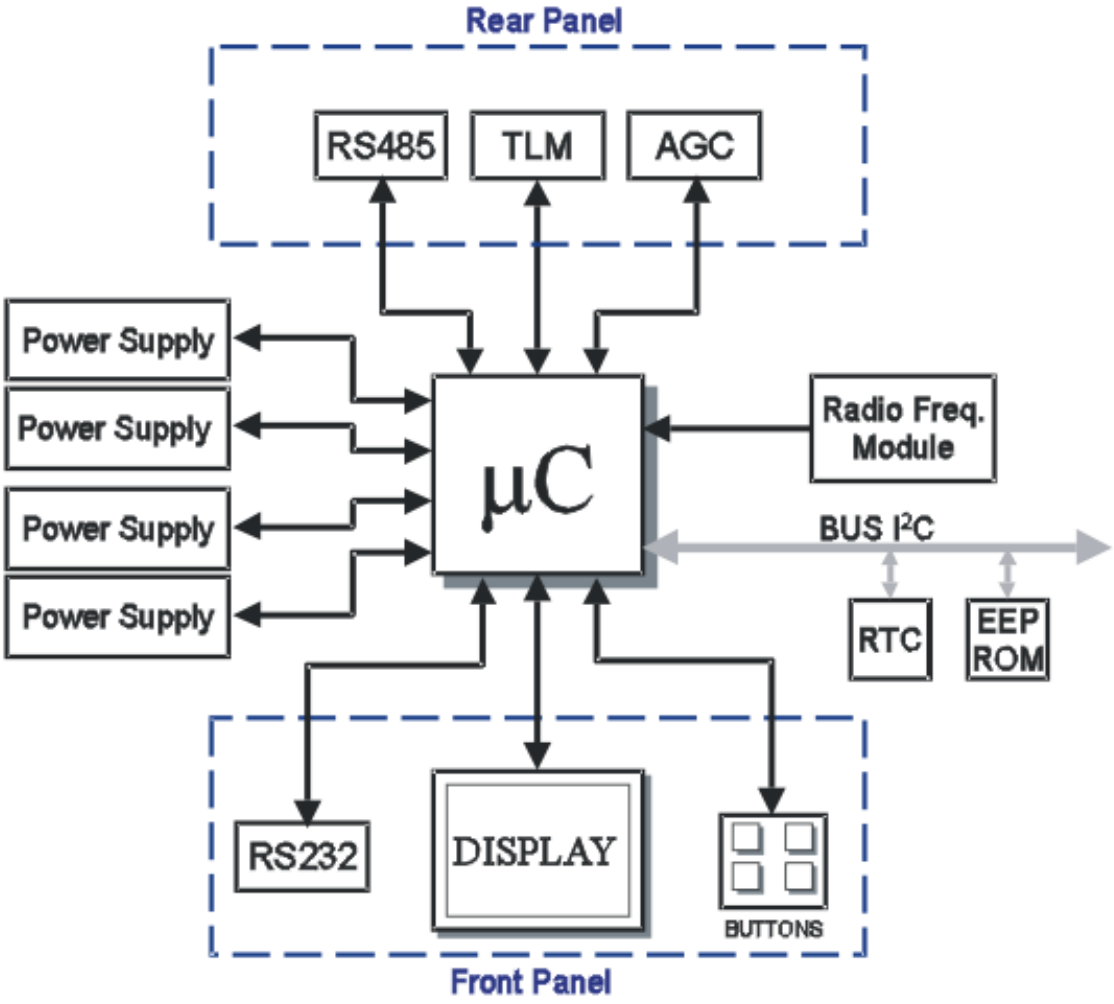


Figure 1: Simplified block diagram of the control and display board

It can be seen that the micro-controller is the heart of the control system, to which the various peripherals (power supply, serial ports, telemeasure socket, AGC port, RF amplifier module, ROM, clock, display and keys) are interfaced.

- Power Supply

The board is powered with a continuous +24V voltage applied on the J14 connector. From that the +5V voltage, powering the most of the chips (micro-controller, operational amplifiers, display, etc.) is derived by means of a switching converter (see IC19). A +12Vdc voltage is obtained from it as well, by means of a linear conversion provided by the integrated circuit IC8. From this, a -12Vdc voltage is obtained by means of the integrated circuit IC5. The -12V voltage is used to adjust the contrast of the display.

- Connectors

On the board SCH0223AR1 there are several connectors used as interfaces for the peripherals of the apparatus and the ports for external communication.

POWER SUPPLY

The connectors J1, J6, J8 e J12 are used to connect the power supply powering the RF modules. The number of power supply used changes depending on the amplifier, up to eight power supply. They are connected in the order shown in Table 1 below. Remaining connectors, if any, are left unconnected.

CONNECTOR	POWER SUPPLY N°
J1	1 - 2
J6	3 - 4
J8	5 - 6
J12	7 - 8

Table 1: Interface connectors for the power supply

Through this connection, each power supply provides the level of voltage and current acquired by the micro-controller by means of an internal ADC. Besides the connectors allow the control board to turn on or off the individual power supply (for instance when an alarm occurs).

RF AMPLIFICATION

The J3 connector interfaces the control board with the RF amplification section. Through this connector the micro-controller acquires the forward and reflected powers, unbalancing (if any), and temperature of the critic amplification area. It also allows to inhibit the transistors in case of reflected power alarm, by means of a totally hardware, thus extremely fast protection.

Depending on the apparatus, this connector may also allow to enable or disable the cooling fans of the critic area.

RS485

The J11 connector (10 pin socket) is directly wired to a DB9 female connector placed on the rear panel of the apparatus. This communication bus allows to connect the amplifier to the control (Amplifier Control) module of a high-power transmitter composed by several individual amplifiers. In this case, each amplifier and the Amplifier Control are connected to the same 4-wires RS485 bus and each of them has a unique address (which can be set by means of the keys and the display) for correct communication.

In case of single (stand-alone) amplifier, the RS485 connector can be used to interface to the Remote Control Unit (RCU) made by Elettronika S.r.l. This unit allows to monitor and control the remote transmitter from any site provided with PSTN or GSM[1] phone connection.

Table 2 shows the wiring between the J11 connector on the board and the DB9 female connector on the rear panel, along with the description of the lines.

PIN N° ON DB9	PIN N° ON J11	DESCRIPTION
1	1	Not used
2	3	Rx-
3	5	Rx+
4	7	+5V
5	9	GND
6	2	Not used
7	4	Tx-
8	6	Tx+
9	8	Not used

Table 2: Description of the RS485 connector

[1] For more details about the control system contact the distributor or the manufacturer.

TELEMEASURES

The J9 telemeasure connector (10 pins socket) is directly wired on a DB9 female connector placed on the rear panel. There are input and output digital lines (TTL level) and analog output lines on this connector, which are used to monitor and control the amplifier by means of a general-purpose remote control system.
The correspondence between the pins of the J9 connector on the board and the DB9 female connector on the rear panel, as well as the meaning of the various lines, is shown in table 3 below (the directions are in respect to the micro-controller on the board).

PIN N° ON DB9	PIN N° ON J9	TYPE	DIRECTION	DESCRIPTION
1	1	Analog	Output	Forward power (*)
2	3	Analog	Output	Reflected power (*)
3	5	Analog	Output	Temperature
4	7	Digital	Input	Interlock: 0V = Interlock Alarm 5V = Normal
5	9	-	-	Ground
6-7	2-4	Digital	Output	Free Contact (closed when amplifier is in alarm)
8	6	Digital	Input	Turning-on control (normally high, active when low)
9	8	Digital	Input	Turning-off control (normally high, active when low)

(*) You can select by means of two jumpers on the board (JP1 and JP2) RMS or peak power. If there are two jumpers on pins 1 and 2 of JP1 and JP2 connectors, RMS power is selected. Otherwise, if there are two jumpers on pins 2 and 3 of the same connectors, peak power is selected.

Table 3: Description of the telemeasures connector

The input stage of the digital pins has an internal pull-up towards the 5V power supply voltage. To use these lines it only takes setting a switch to close to earth. When closed, the relevant control (turning on or off) is enabled and the switch may be open again (impulse controls).
The interlock pin may be used as protection so that the amplifier is switched off when the digital input level is low. It is possible to use several serially connected switches to make an interlock chain. Usually all switches are closed and the interlock level is low, thus the amplifier is on. If even only one of the switches is open, the

level of the interlock signal becomes high (this line has a pull-up towards the +5V power supply voltage as well) and the interlock protection activates switching off the amplifier. Note that in case the interlock protection is not used, the pin 4 of the DB9 telemeasure connector and the earth pin (pin 5) must be short circuited. Otherwise it is possible to disable the monitoring of the interlock chain from menu (see user manual).
Figure 2 shows a typical usage for the digital input signals to turn on and off the amplifier and for the interlock alarm.

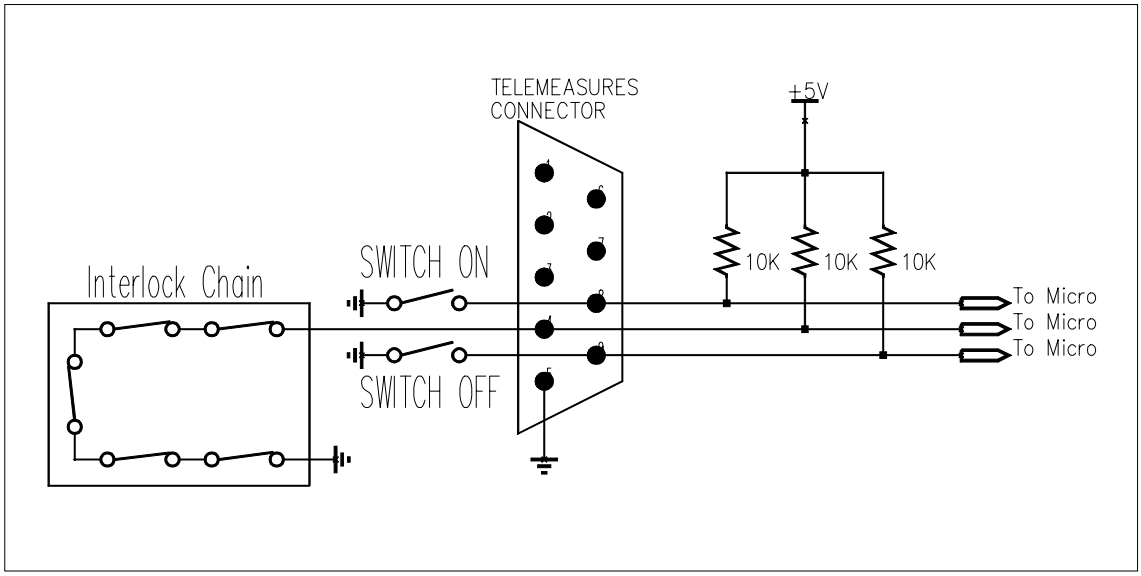


Figure 2: Usage of the digital input signals of the telemeasures connector

AGC / EXCITER

The connector called J10, as the telemeasures connector and the RS485 bus, is wired to a DB9 female connector placed on the rear panel of the amplifier. This connector allow the implementation of an automatic gain control between an exciter and the amplifier. A voltage signal related to the forward output power supplied by the amplifier is provided through two pins of the AGC connector. Connecting one of these to the relevant input pin of the exciter, this can pursuit a given voltage level, so that the output power is always constant. In order to avoid that, in case of an alarm decreasing the forward power, the exciter increases its output level due to the AGC, thus damaging the amplification stages, the connector is provided with two digital output lines called AGC Alarm. Under alarm conditions, this lines are brought by the micro-controller at a low level, so that the exciter can stop the AGC.
Table 4 shows the connection between the J10 connector on the board and the DB9 connector on the rear panel, along with the description of each pin (the direction of the pin is referred to the position of the micro-controller on the board).

PIN N° ON DB9	PIN N° ON J10	TYPE	DIRECTION	DESCRIPTION
1	1	-	-	Ground
2	3	Digital	Output	AGC Alarm 0V = Alarm 5V = Normal
3	5	Digital	Output	AGC Alarm 0V = Alarm 5V = Normal
4	7	-	-	Not used
5	9	-	-	Not used
6	2	-	-	Not used
7	4	-	-	Nout used
8	6	Analog	Output	Forward power
9	8	Analog	Output	Forward power

Table 4: Description of the AGC connector

RS232

The DB9 female connector on the front panel is an external communication RS232 serial port, through which a PC can be connected directly to the amplifier in order to perform operations such as the remote control (by means of an adequate software[2]) and the update of the microcontroller firmware.

The used communication protocol is asynchronous, at a 19200bps speed, 1 start bit, 8 data bits, 1 stop bit, no parity. No hardware flow control is used. The connector is DCE type and the pin used are shown in Table 5.

PIN N° ON DB9	1	2	3	4	5	6	7	8	9
DESCRIPTION	-	TxD	RxD	-	GND	-	-	-	-

Table 5: Description of the RS232 connector

MISCELLANEOUS

The J2 (called AUX), J4, J5 and J17 connectors are not used and are there only for future updates. The SW1 dip-switches are partially used for the configuration of the correct mode for the micro-controller. The other switches are not used. It is important that the position of the dip-switches is left unchanged, because changing it may set a wrong mode for the micro-controller, affecting the work of the whole amplifier.

[2] For more information about this application contact the distributor of the manufacturer.

FIRMWARE UPDATE

The microcontroller is provided with a built-in Flash memory containing the firmware. The firmware can be updated with a later version without removing the apparatus from the rack and/or replacing the chip.
To upgrade it, connect a PC to the RS232 socket on the front panel of the apparatus by means of a cable DB9 male - DB9 female (pin-to-pin).
Launch on the PC the EKAFlash application, select the serial port in use on the PC, choose the update file by pressing the "..." key and click on Download button.
Eventually, turn off the amplifier from the main switch and then turn it on again. The upgrade of the firmware begins on the EKAFlash window. Fifure 3 shows this window while a firmware is being updated.

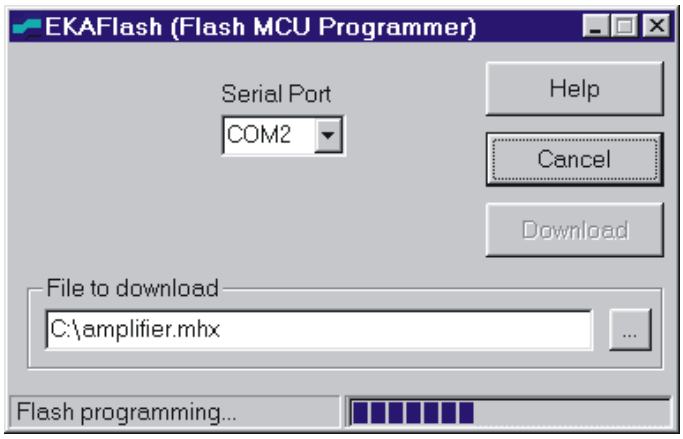
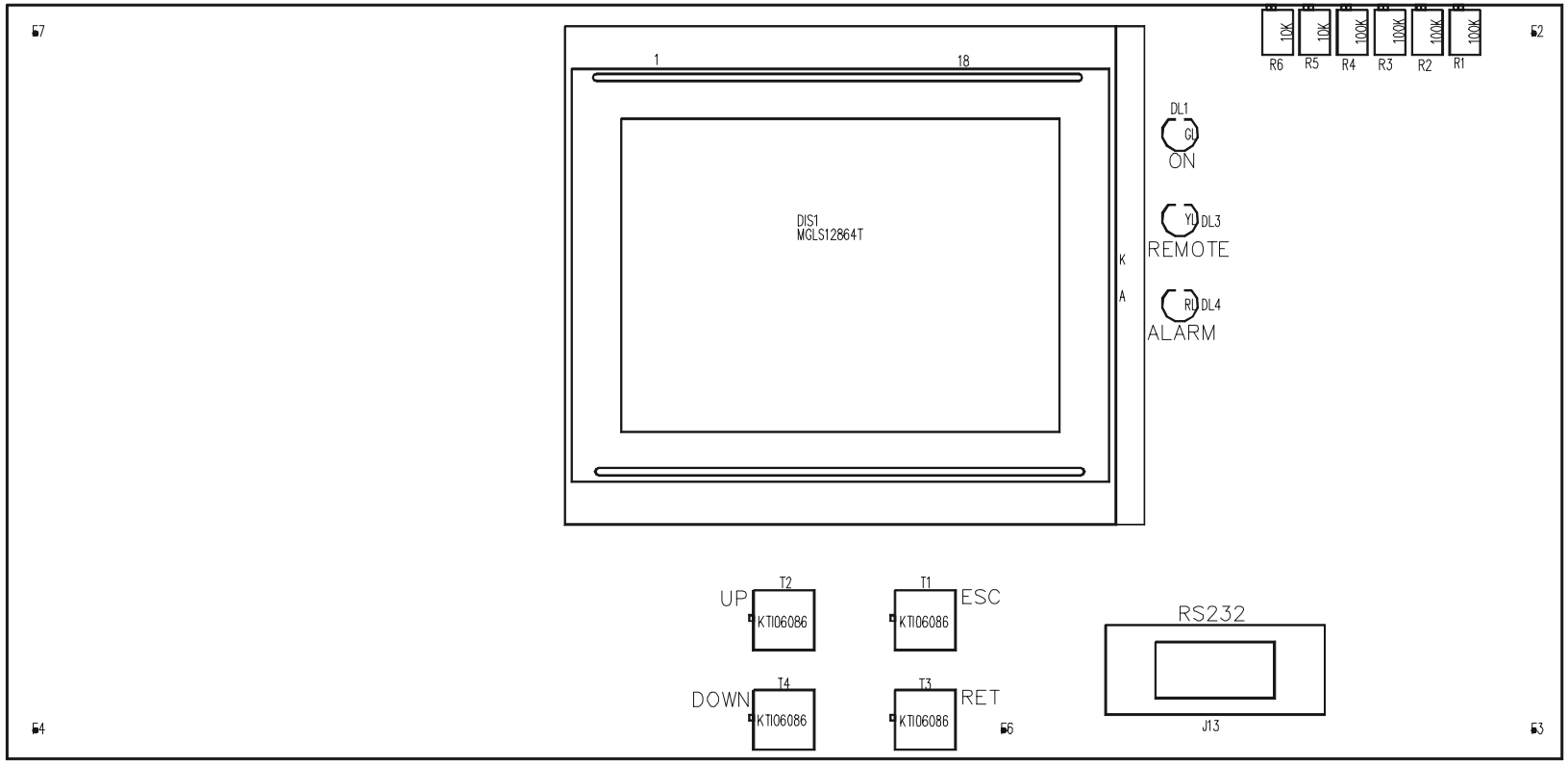


Figure 3: The EKAFlash window while updating a firmware



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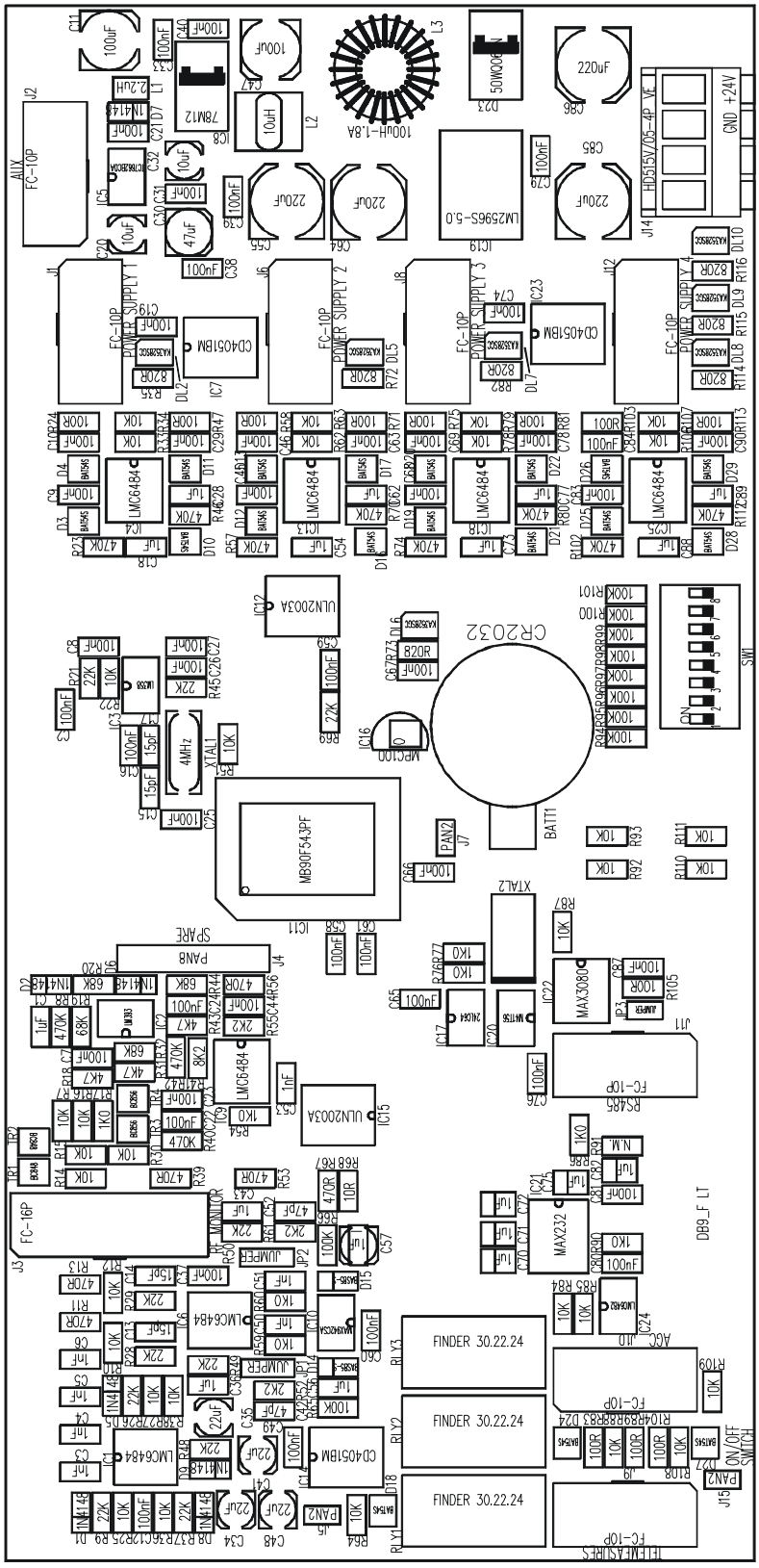
	TITLE: CONTROL BOARD AND DISPLAY Top layer Component Layout	PCB DESIGNER: TULLO D.co	SIGNATURE:	REF: PN1039AR2
CODE: SCH0223AR1		QUALITY CONTROL: _	SIGNATURE:	SHEET: 1/1



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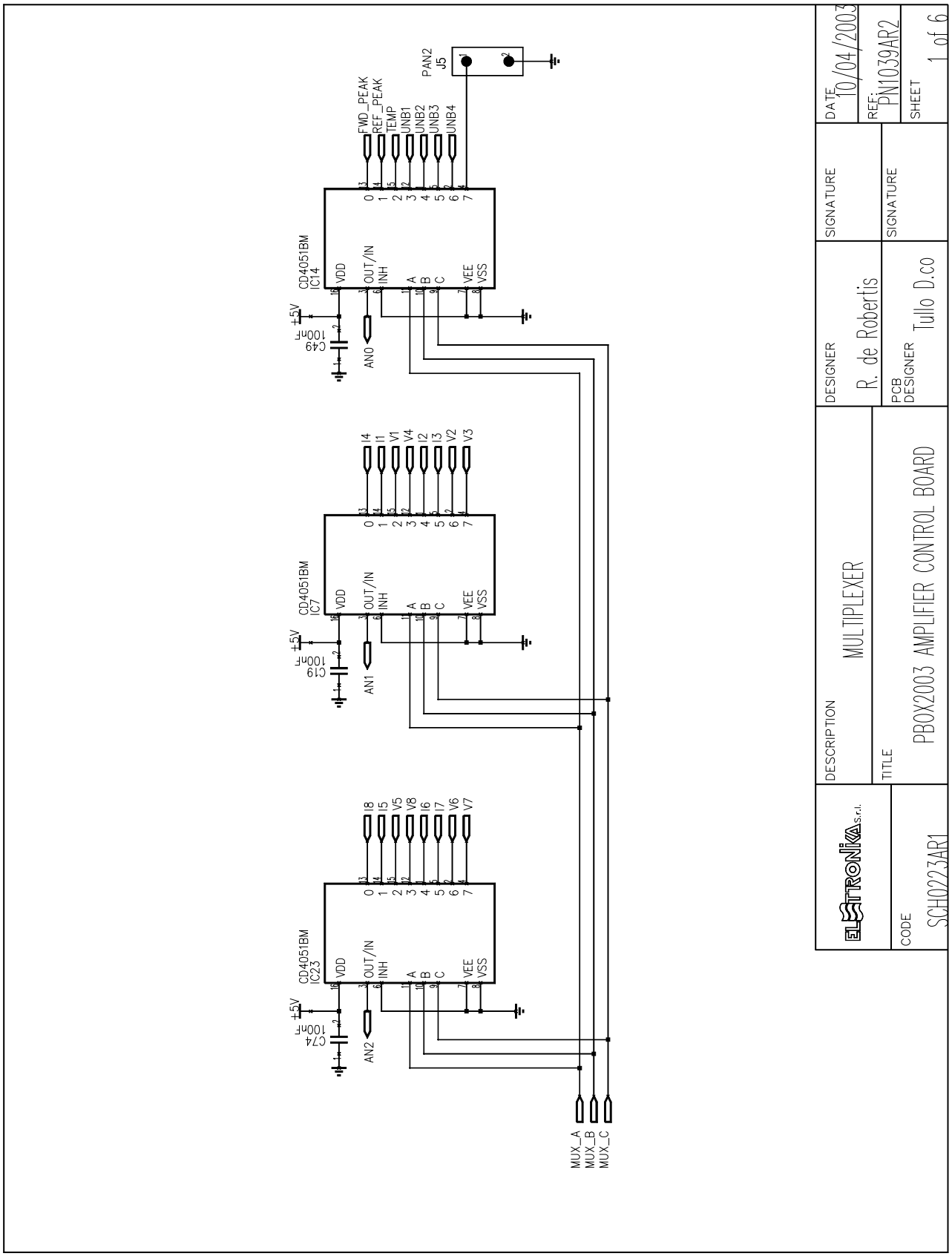
SIGNATURE	REF:	PN1039AR2
SIGNATURE	SHEET	1/1


PAN2
J5
FWD_PEAK
REF_PEAK
TEMP
UNB1
UNB2
UNB3
UNB4
CD4051BM
IC14
VDD
OUT/IN
INH
A
B
C
VEE
VSS
+5V
C49
100nF
AN0
I4
I1
V1
V4
I2
I3
V2
V3
IC7
C19
AN1
I8
I5
V5
V8
I6
I7
V6
V7
IC23
C74
AN2
MUX_A
MUX_B
MUX_C
DESCRIPTION
MULTIPLEXER
TITLE
PBOX2003 AMPLIFIER CONTROL BOARD
DESIGNER
R. de Robertis
PCB DESIGNER
Tullo D.co
SIGNATURE
SIGNATURE
DATE
10/04/2003
REF:
PN1039AR2
SHEET
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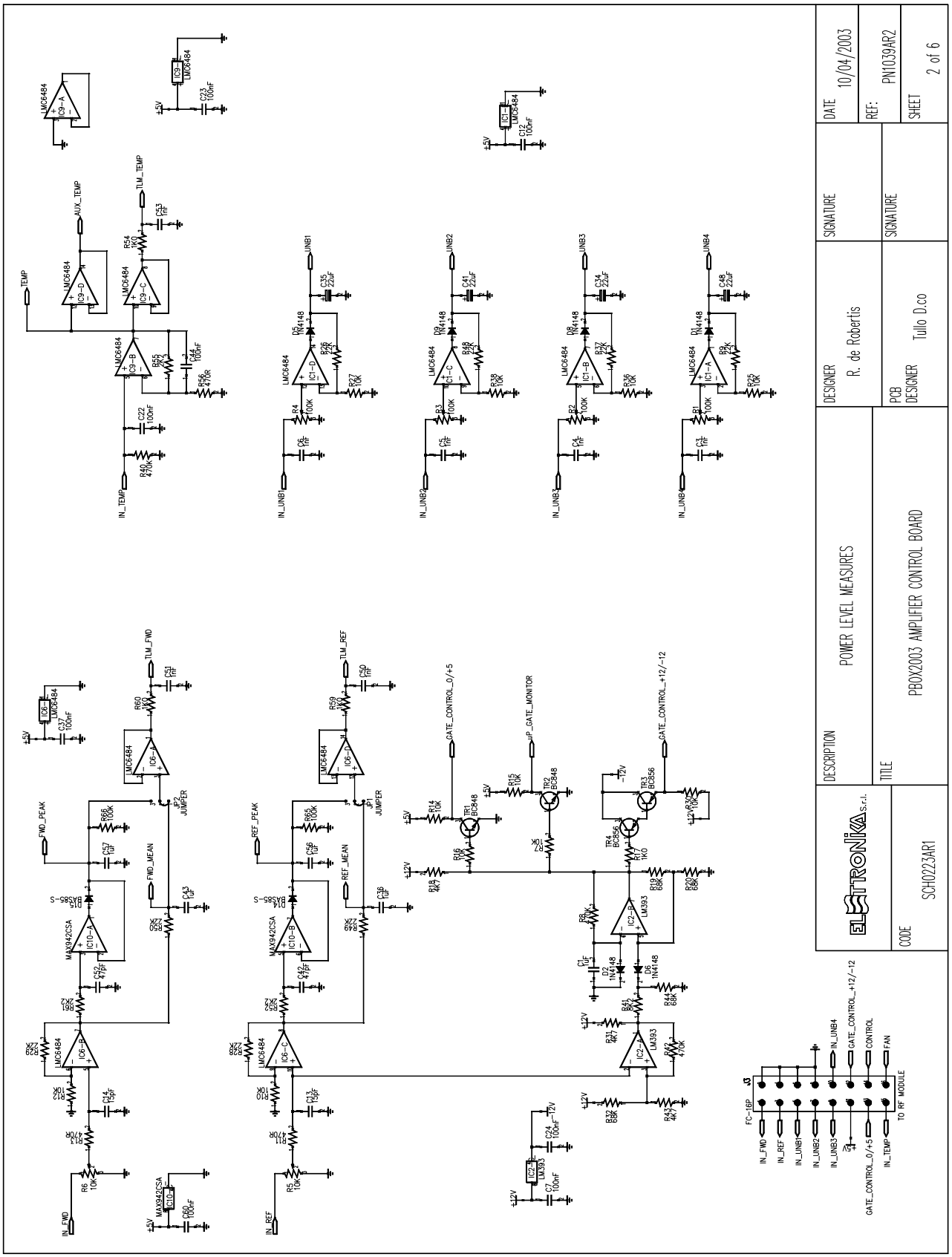
SCH0223AR1
ELETTRONIKA S.r.l.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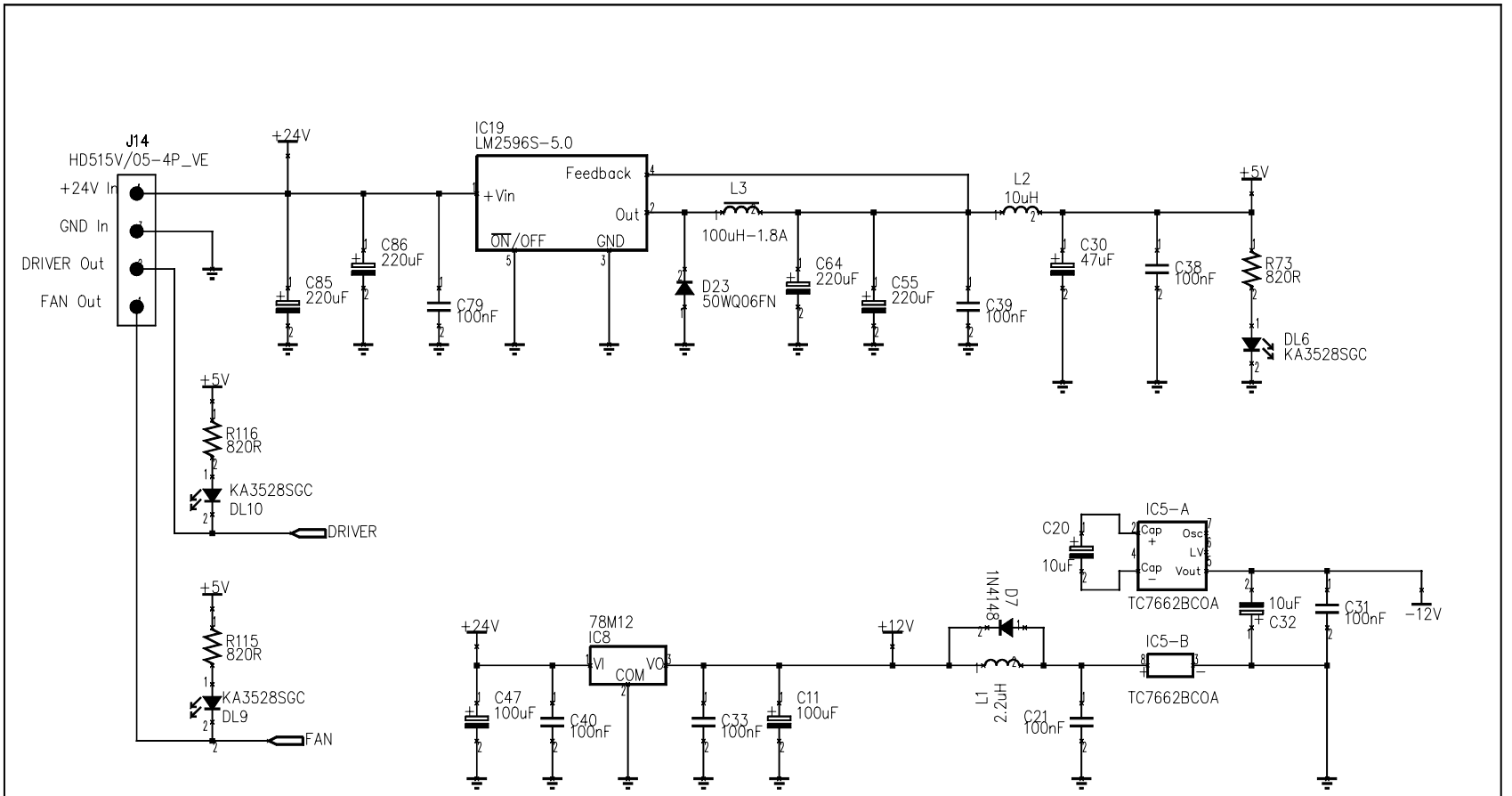
DESIGNER
R. de Robertis
PCB DESIGNER
Tullo D.co
SIGNATURE
SIGNATURE
DATE
10/04/2003
REF:
PN1039AR2
SHEET
2 of 6
CODE
SCH0223AR1
ELETRONIKA S.r.l.
TEMP
AUX_TEMP
TLM_TEMP
IN_TEMP
IN_UNB1
IN_UNB2
IN_UNB3
IN_UNB4
TLM_FWD
TLM_REF
FWD_PEAK
REF_PEAK
FWD_MEAN
REF_MEAN
IN_FWD
IN_REF
GATE_CONTROL_0/+5
GATE_CONTROL_+12/-12
µP_GATE_MONITOR
CONTROL
FAN
TO RF MODULE
FC-16P



ELETTRONIKA s.r.l.	DESCRIPTION: POWER LEVEL MEASURES	DESIGNER: R. de Robertis	SIGNATURE	DATE: 10/04/2003
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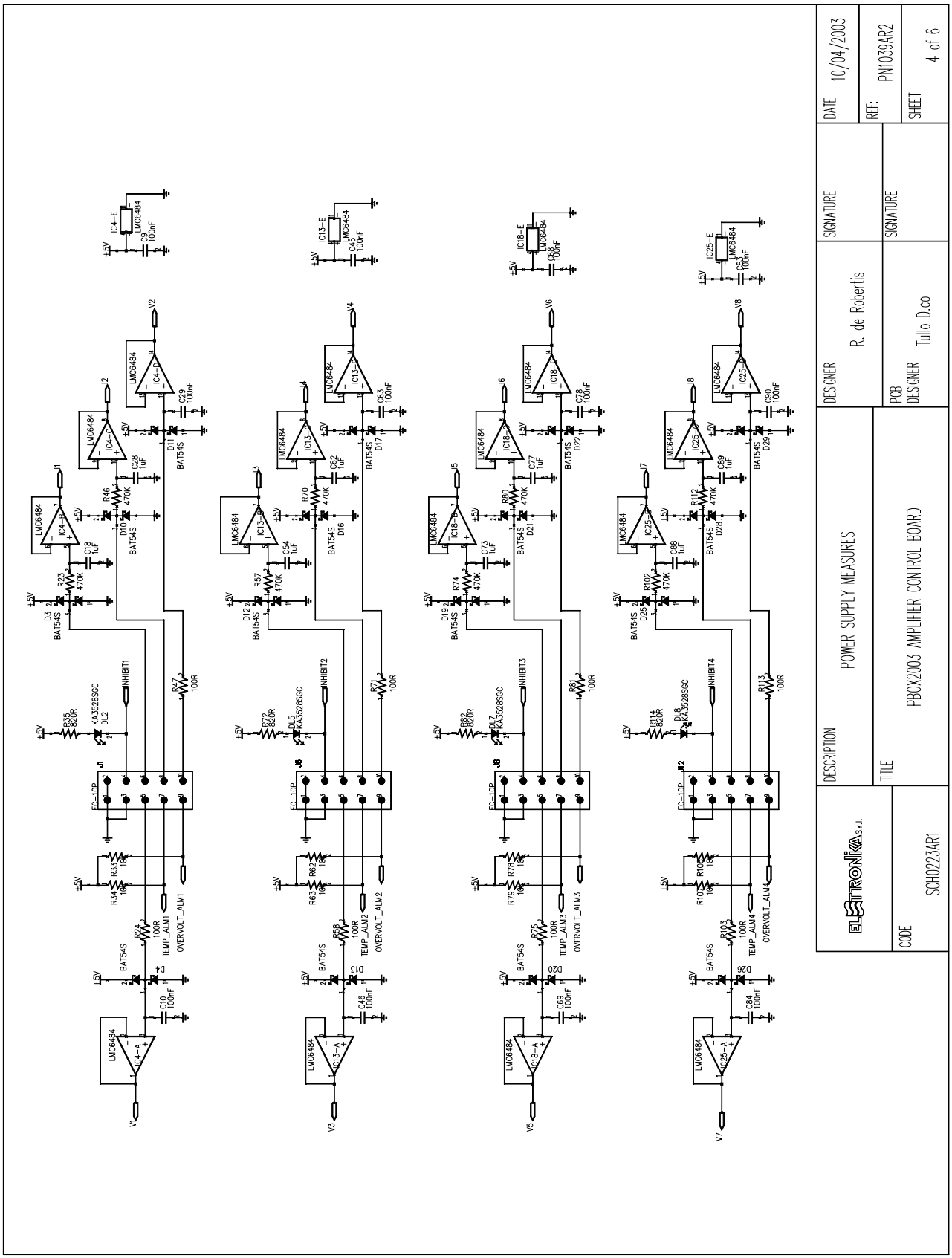
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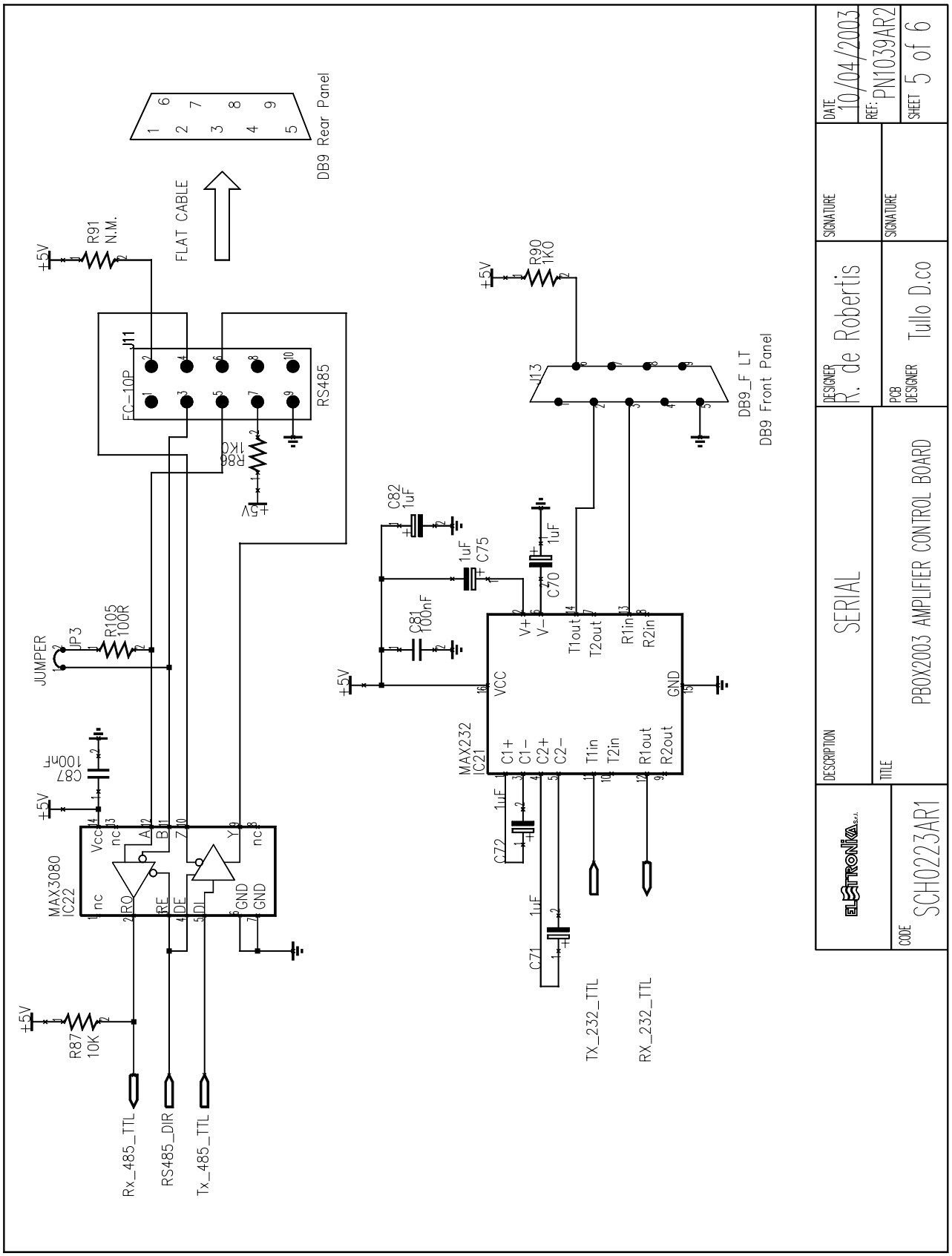
DESIGNER
R. de Robertis
PCB DESIGNER
Tullo D.co
SIGNATURE
SIGNATURE
DATE 10/04/2003
REF: PN1039AR2
SHEET 4 of 6


DB9 Rear Panel
FLAT CABLE
DB9_F LT
DB9 Front Panel
RS485
J11
FC-10P
R91
N.M.
R90
1K0
R105
100R
JP3
JUMPER
R87
10K
C87
100nF
C82
1uF
C75
1uF
C70
1uF
C81
100nF
C72
1uF
C71
1uF
MAX3080
IC22
MAX232
IC21
Rx_485_TTL
RS485_DIR
Tx_485_TTL
TX_232_TTL
RX_232_TTL
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TITLE
PBOX2003 AMPLIFIER CONTROL BOARD
DESIGNER
R. de Robertis
PCB DESIGNER
Tullio D.co
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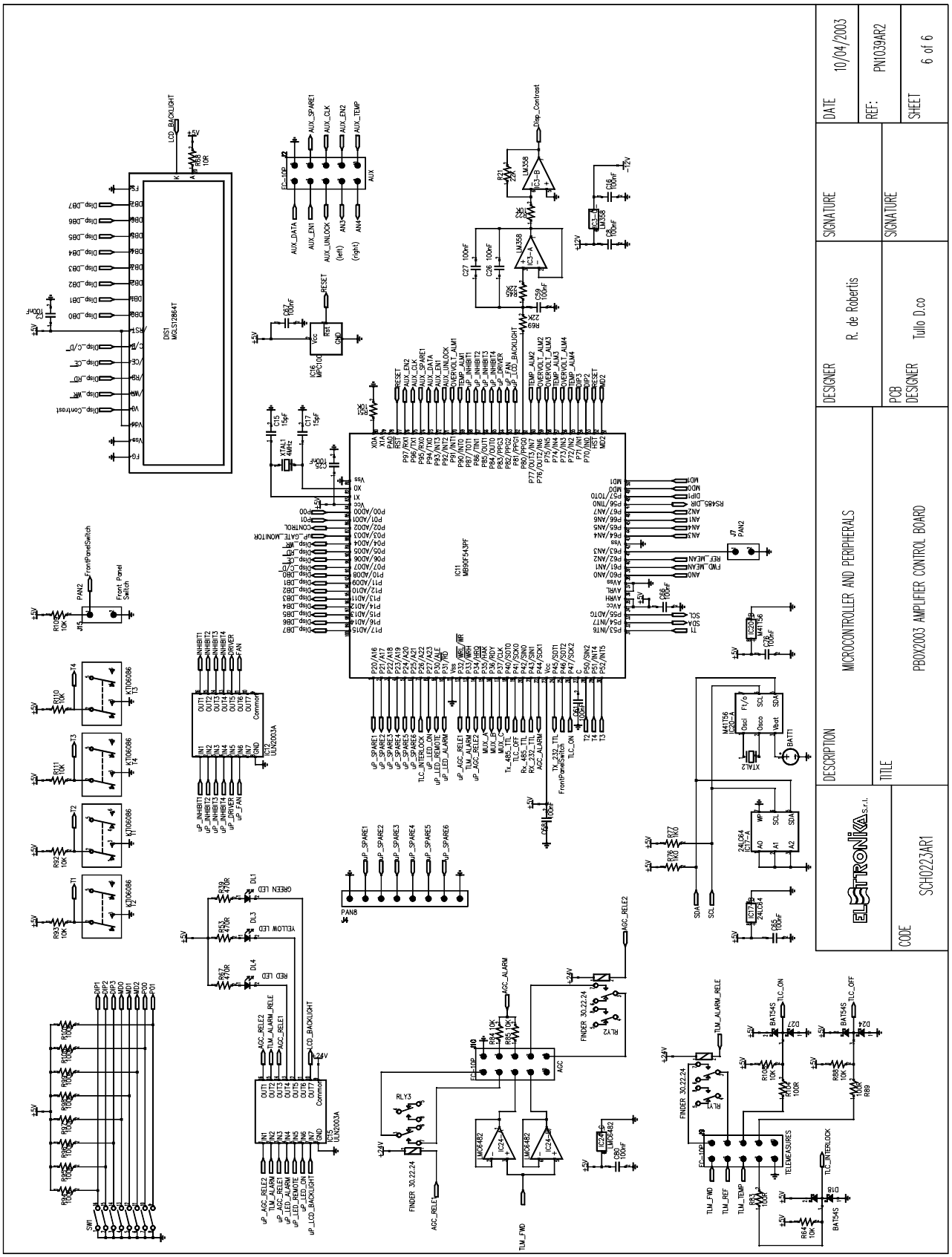
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R. de Robertis
PCB DESIGNER
Tullo D.co
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SIGNATURE
DATE
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REF:
PN1039AR2
SHEET
6 of 6

COMPONENT LIST *SCH0223AR1*

Part Name/Number	Description	Qty.	Comps. Page 1/2
BATT BH001RB 3093_90	03093 03090 BATTERY HOLDER	1	BATT1
CC 100nF-S 01065C	01065C Y5V 1206 COND	46	C2, C7-10, C12, C16, C19, C21-27 C29, C31, C33, C37-40, C44-46, C49, C58-61, C63, C65-69, C74, C76, C78-81, C83-84, C87, C90
CC 15pF-S 01088	01088 SMD 1206 COND	4	C13-15, C17
CC 1nF-S 01096	01096 SMD 1206 COND	7	C3-6, C50-51, C53
CC 1uF100V-S 01760A	01760A Y5V 1206 COND	13	C1, C18, C28, C36, C43, C54, C56-57, C62, C73, C77, C88-89
CC 47pF-S 01100	01100 SMD 1206 COND	2	C42, C52
CE 100uF25V-S 01793B	01793B ELETTR SMD COND	2	C11, C47
CE 10uF35V-S 01778A	01778A ELETTR SMD COND	2	C20, C32
CE 1uF35V-S 01613A	01613A TANTALIUM ELETTR SMD CO	5	C70-72, C75, C82
CE 220uF50V LOW ESR	1799A ELETTR SMD COND LOW ESR	4	C55, C64, C85-86
CE 22uF16V-S	01780A ELETTR SMD COND	4	C34-35, C41, C48
CE 47uF35V-S 01790A	01790A ELETTR SMD COND	1	C30
D 1N4148-S 03002	03002 SMD DIODE	7	D1-2, D5-9
D 50WQ06FN	03019A SMD DIODE SCHOTTKY 5,5A	1	D23
D BAS85-S	03024 SMD DIODE SCHOTTKY	2	D14-15
D BAT54S	03199 SMD SCHOTTKY DIODE A-K T	19	D3-4, D10-13, D16-22, D24-29
DIS MGLS12864T	03083A 128x64 DOT (BLUE-LED WH	1	DIS1
DL KA-3528SGC 03057	03057 GREEN SMD LED DIODE	7	DL2, DL5-10
DL LEDG5 03060	03060 GREEN LED DIODE 5mm	1	DL1
DL LEDR5 03061	03061 RED LED DIODE 5mm	1	DL4
DL LEDY5 03054B	03054B YELLOW LED DIODE 5mm	1	DL3
IC 24LC64 04815	04815 SMD INTEG CIRCUIT	1	IC17
IC 78M12 4307B	04307B SMD VOLTAGE REGULATOR	1	IC8
IC CD4051BM-S	04615 SMD INTEG CIRCUIT	3	IC7, IC14, IC23
IC LM2596S-5.0	04580 SMD INTEG CIRCUIT	1	IC19
IC LM358M-S 04660	04660 SMD INTEG CIRCUIT	1	IC3
IC LM393-S 04639	04639 SMD INTEG CIRCUIT	1	IC2
IC LMC6482-S	04632 SMD INTEG CIRCUIT	1	IC24
IC LMC6484-S	04634 SMD INTEG CIRCUIT	7	IC1, IC4, IC6, IC9, IC13, IC18, IC25
IC M41T56 04611	04611 SMD INTEG CIRCUIT	1	IC20
IC MAX232-S 04804B	04804B SMD INTEG CIRCUIT	1	IC21
IC MAX3080-S 04770	04770 SMD INTEG CIRCUIT	1	IC22
IC MAX942CSA-S	04572 SMD INTEG CIRCUIT	1	IC10
IC MB90F543PF	04596 SMD INTEG CIRCUIT	1	IC11
IC MPC100-450DI-TO	04608 INTEG CIRCUIT	1	IC16
IC TC7662BCOA 04758A	04758A SMD INTEG CIRCUIT	1	IC5
IC ULN2003A 4870	04870 SMD INTEG CIRCUIT	2	IC12, IC15
IND 2u2H-S 05020A	05020A INDUCTOR	1	L1

Part Name/Number	Description	Qty.	Comps.	Page 2/2
IND MS85 10uH-S	04948 INDUCTOR 2,7 A	1	L2	
IND T100uH-1.8A 4958	04958 TOROIDAL-STORAGE CHOKES	1	L3	
J CON HD515V/05-4PVE	02881 + 02882 PANDUIT PCB CONN	1	J14	
J DB9_F-0° LT	02794 PCB CONNECTOR DB9 LONG T	1	J13	
J FC-10P 02697-02699	02697+02699 PCB CONNECTOR POL	8	J1-2, J6, J8-12	
J FC-16P 02701-02700	02701+02700 PCB CONNECTOR POL	1	J3	
J PAN2 02739-40-41	02739+02740+02741 PCB CONNECTO	3	J5, J7, J15	
J PAN8 02716	02716 PCB CONNECTOR	1	J4	
JU JUMP2 02739-02742	02739+02742 MASCHIO PAN2	1	JP3	
JU JUMP3 02707-02742	02707+02742 MASCHIO PAN3	2	JP1-2	
R 100K-1%-S 00065B	00065B RES 1/4W 1% SMD 1206	10	R65-66, R94-101	
R 100R-1%-S 00029D	00029D RES 1/4W 1% SMD 1206	12	R24, R47, R58, R71, R75,R81, R83, R89, R103-105, R113	
R 10K-1%-S 00053B	00053B RES 1/4W 1% SMD 1206	32	R7, R10, R12, R14-16, R22, R25, R27, R30, R33-34, R36, R38, R51, R62-64, R78-79, R84-85, R87-88, R92-93, R106-111	
R 10R-S 00017A	00017A RES 1/4W 5% SMD 1206	1	R68	
R 1206 NOT MOUNTED	NOT MOUNTED RES 1/4W 5% SMD 12	1	R91	
R 1K0-1%-S 00041B	00041B RES 1/4W 1% SMD 1206	8	R17, R54, R59-60, R76-77, R86, R90	
R 22K-1%-S 00057B	00057B RES 1/4W 1% SMD 1206	11	R9, R21, R26, R28-29, R37, R45, R48-50, R69	
R 2K2-1%-S 00045B	00045B RES 1/4W 1% SMD 1206	3	R52, R55, R61	
R 470K-S 00073A	00073A RES 1/4W 5% SMD 1206	11	R8, R23, R40, R42, R46, R57, R70 R74, R80, R102, R112	
R 470R-1%-S 00037B	00037B RES 1/4W 1% SMD 1206	6	R11, R13, R39, R53, R56, R67	
R 4K7-1%-S 00049B	00049B RES 1/4W 1% SMD 1206	3	R18, R31, R43	
R 68K-1%-S 00063B	00063B RES 1/4W 1% SMD 1206	4	R19-20, R32, R44	
R 820R-S 00040A	00040A RES 1/4W 5% SMD 1206	7	R35, R72-73, R82, R114-116	
R 8K2-1%-S 00052B	00052B RES 1/4W 1% SMD 1206	1	R41	
RL 30.22.24 07569	07569 RELE	3	RLY1-3	
RV 100K-3266X	00814 VARIABLE RESISTOR	4	R1-4	
RV 10K-3266X 00807	00807 VARIABLE RESISTOR	2	R5-6	
SW SWITCH-8DIP	07530A PCB DIP SWITCH SMD	1	SW1	
T 06086 N 7630 7632	7630 7632 KTI06086 PULSANTE 2	4	T1-4	
TR BC848 03457	03457 NPN SMD TRANSISTOR	2	TR1-2	
TR BC856 03455	03455 PNP SMD TRANSISTOR	2	TR3-4	
XTAL 32.768k-S 05146	05146 QUARTZ	1	XTAL2	
XTAL 4MHz-S 05101A	05101A QUARTZ	1	XTAL1	