broadcast experience

USE AND MAINTENANCE MANUAL

RADIO LINK RECEIVER

ELR 100A	600 to 1000 MHz	6W
ELR 200A	1700 to 1850 MHz	5W
ELR 200B	2300 to 2500 MHz	5W

TECHNICAL SECTION

broadcast experience
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Edition 1
Rev. 1 - 15/12/2005
Code MAN0112

broadcast experience

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C.C.I.A.A. 101 216 - C.Fisc. e P.IVA IT00415540384

CE

AVVISO IMPORTANTE

Il presente apparato è utilizzabile solo da
titolari di Concessioni Governative
e/o Autorizzazioni Ministeriali

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WARNING

The use of this device
is subject
to National Regulations.

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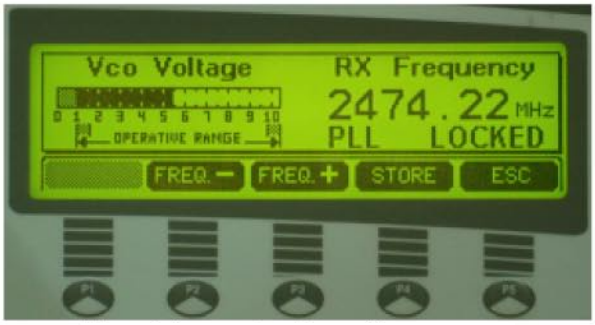
ELR100 - ELR200 RECEIVER SOFTWARE MENU

Main menu

Rx signal level menu



Frequency setting menu

Composite deviation menu

Audio level menu

Subcarrier deviation menu

Squelch level menu

VIEW OF THE RECEIVER

View of the receiver with sliding chassis

View of the extractable chassis with modules

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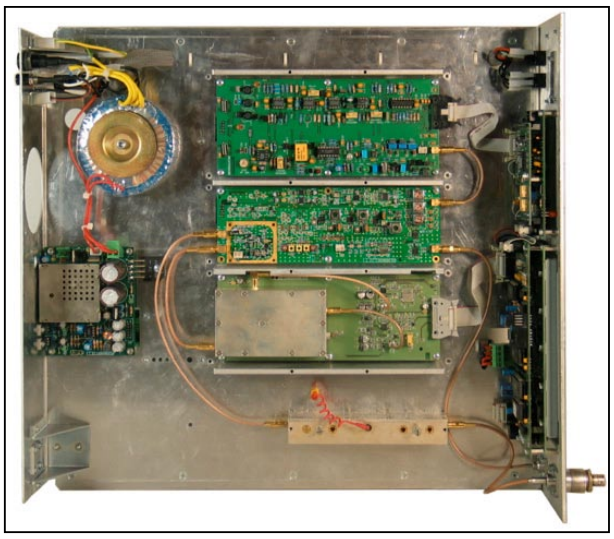
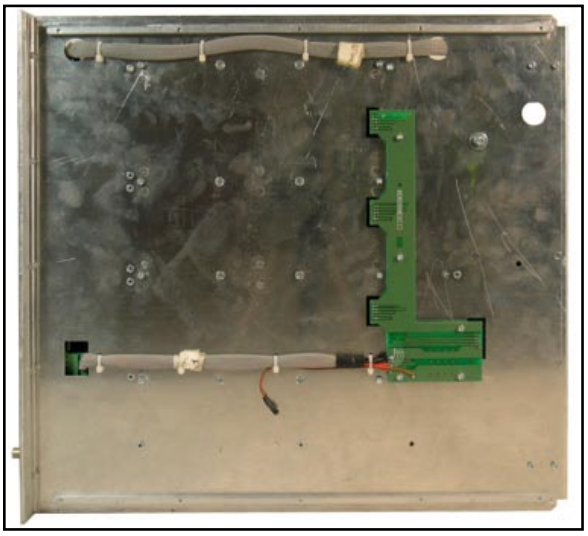
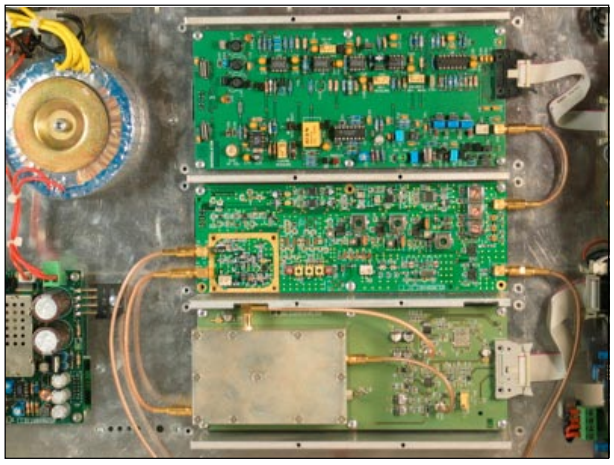


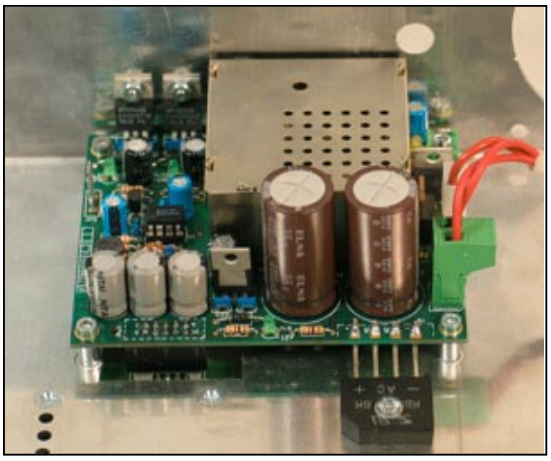
RECEIVER: extractable chassis with mounted boards overview



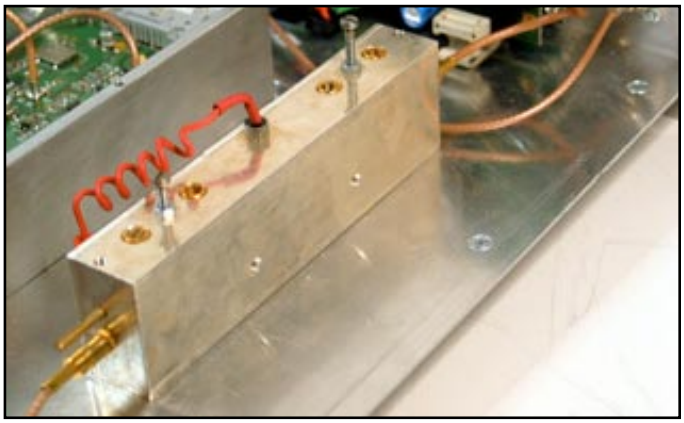
RECEIVER: chassis with bus connection mounted underview



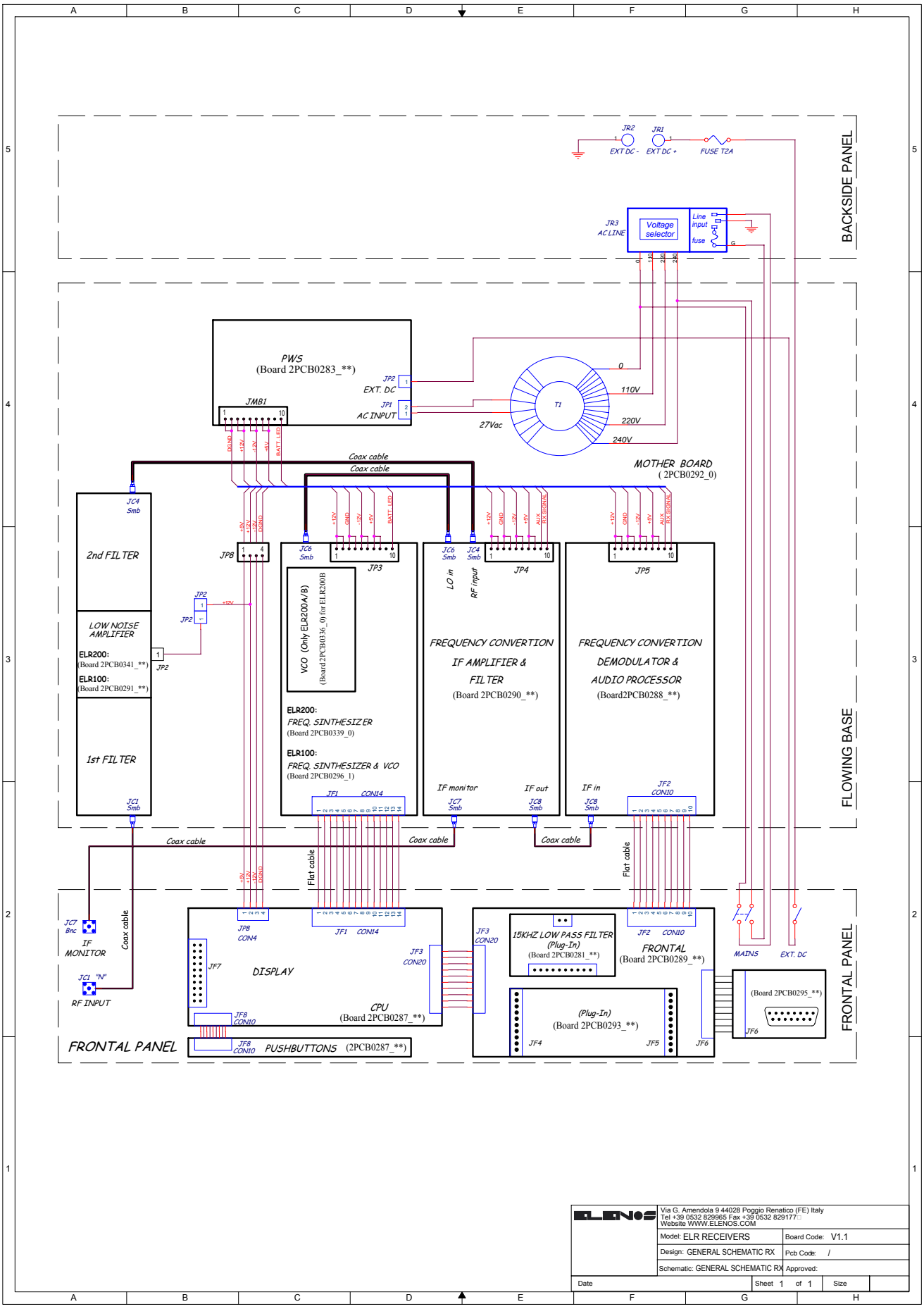
RECEIVER extractable chassis: mounted boards in particular



RECEIVER extractable chassis: power supply board in particular



RECEIVER: ELR200 Front-end box view



ELENOS	Via G. Amendola 9 44028 Poggio Renatico (FE) Italy Tel +39 0532 829965 Fax +39 0532 829177 Website WWW.ELENOS.COM	
	Model: ELR RECEIVERS	Board Code: V1.1
	Design: GENERAL SCHEMATIC RX	Pcb Code: /
	Schematic: GENERAL SCHEMATIC RX	Approved:
Date	Sheet 1 of 1	Size

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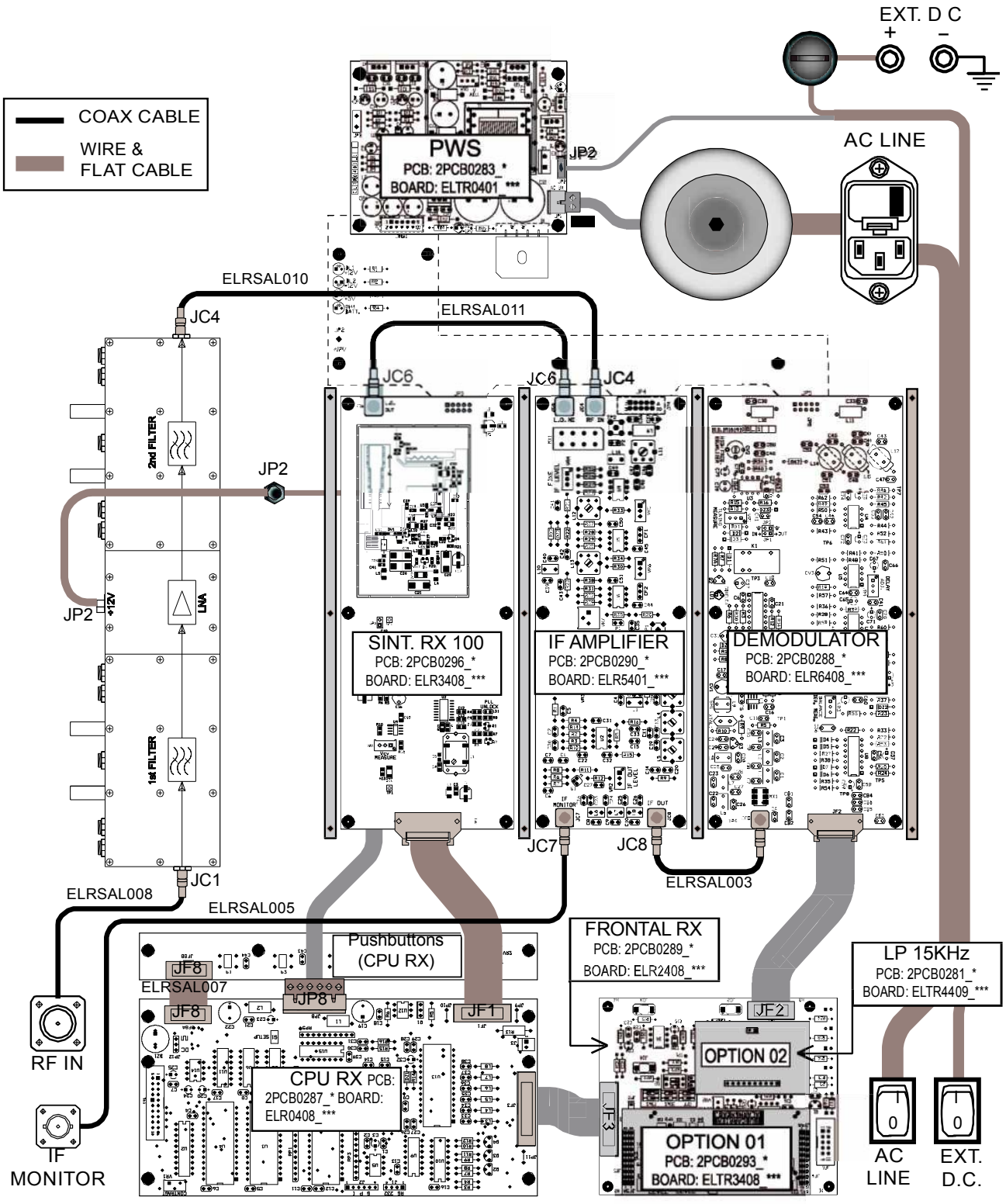
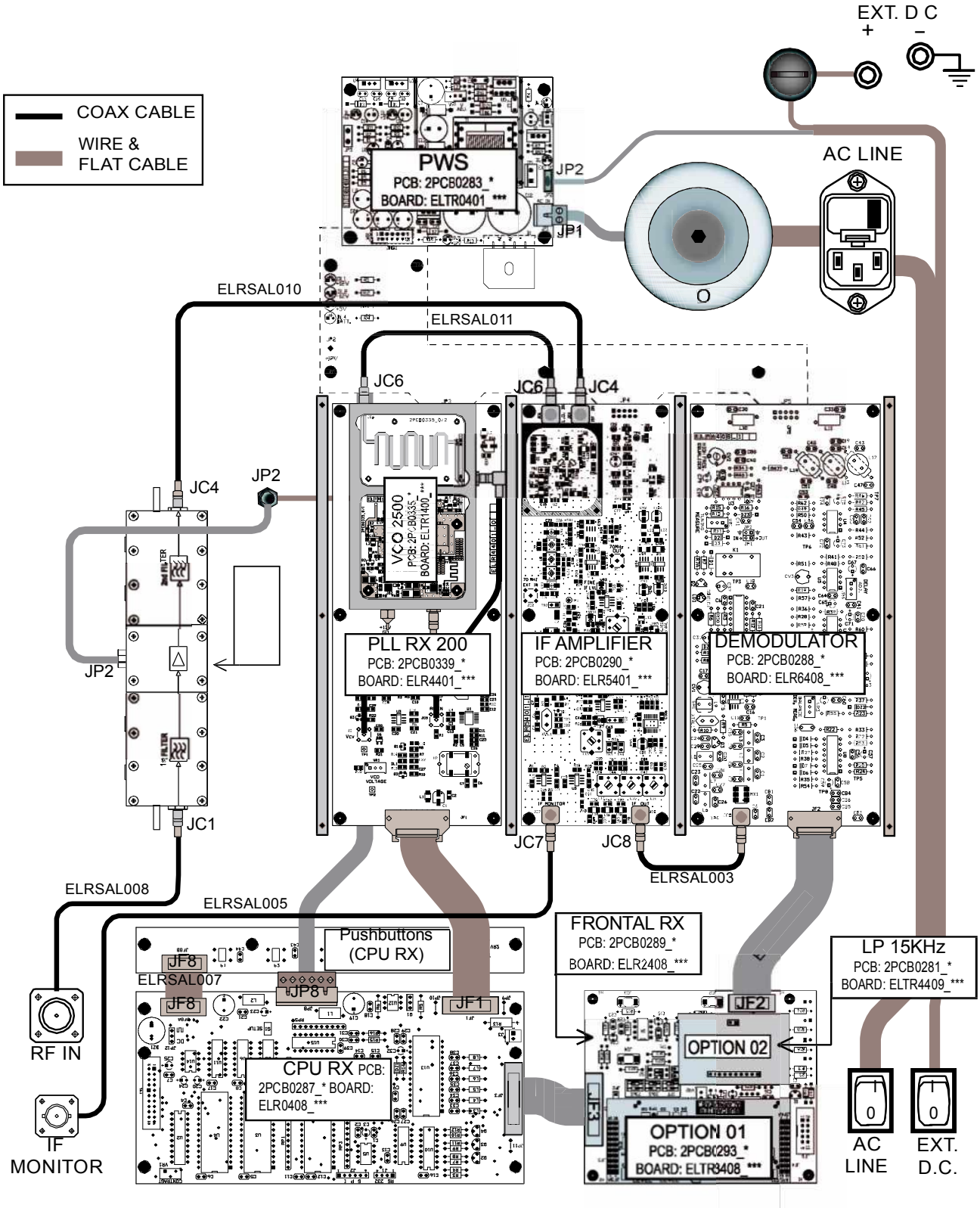
ELR 100A RECEIVER CABLINGS



ELR 200B RECEIVER CABLINGS



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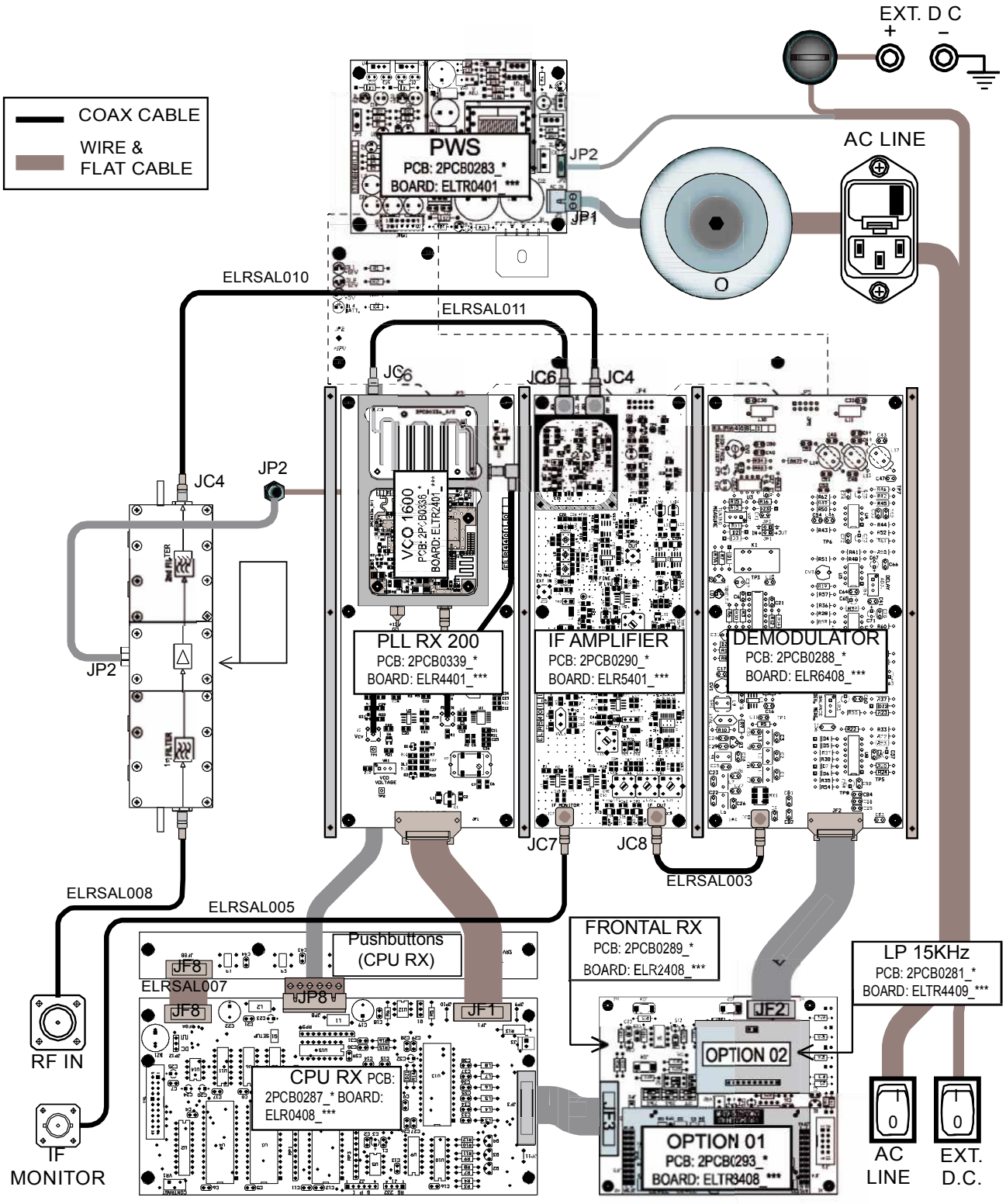
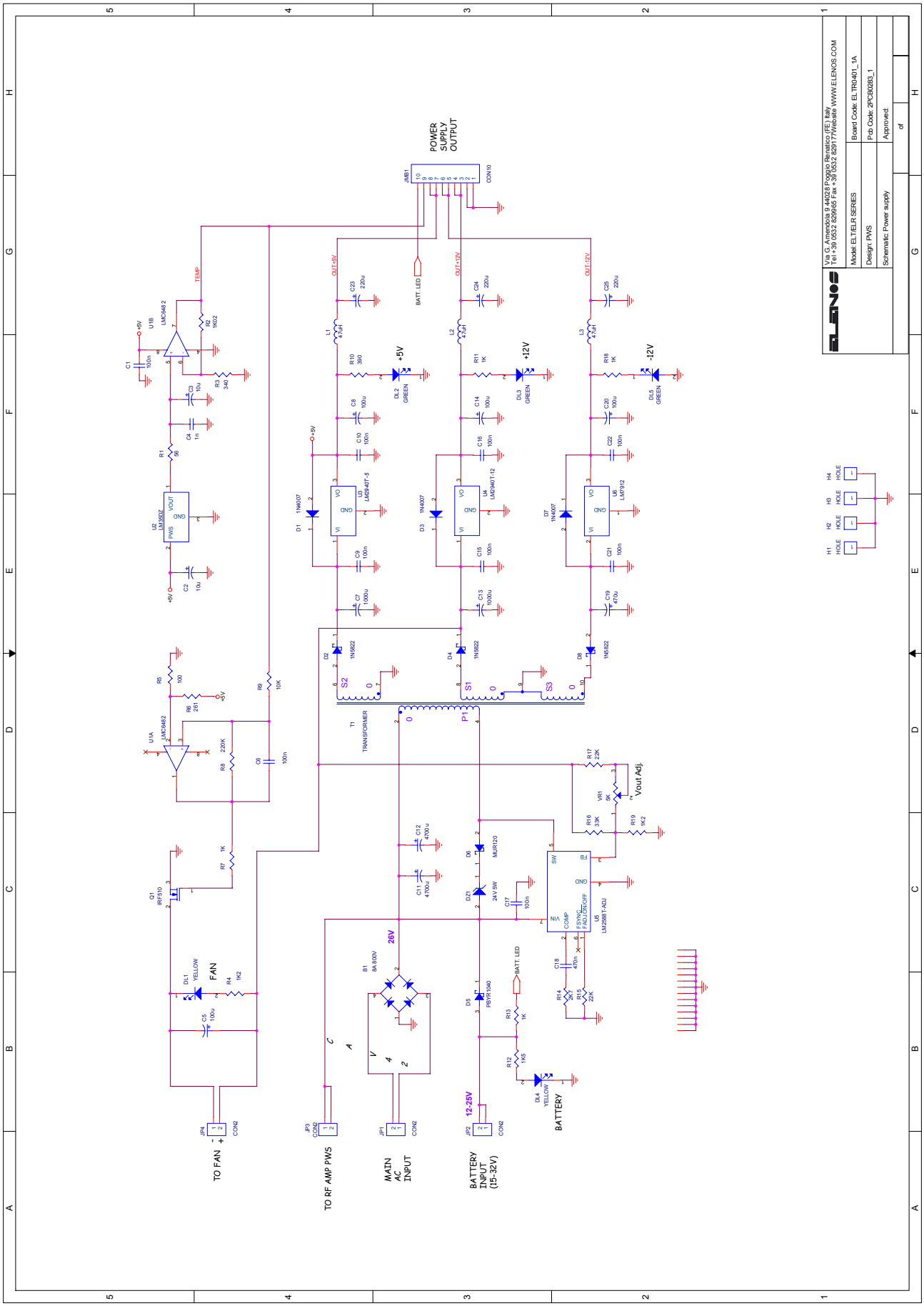
E-Mail: eng_dept@elenos.com

ELR 200A RECEIVER CABLINGS





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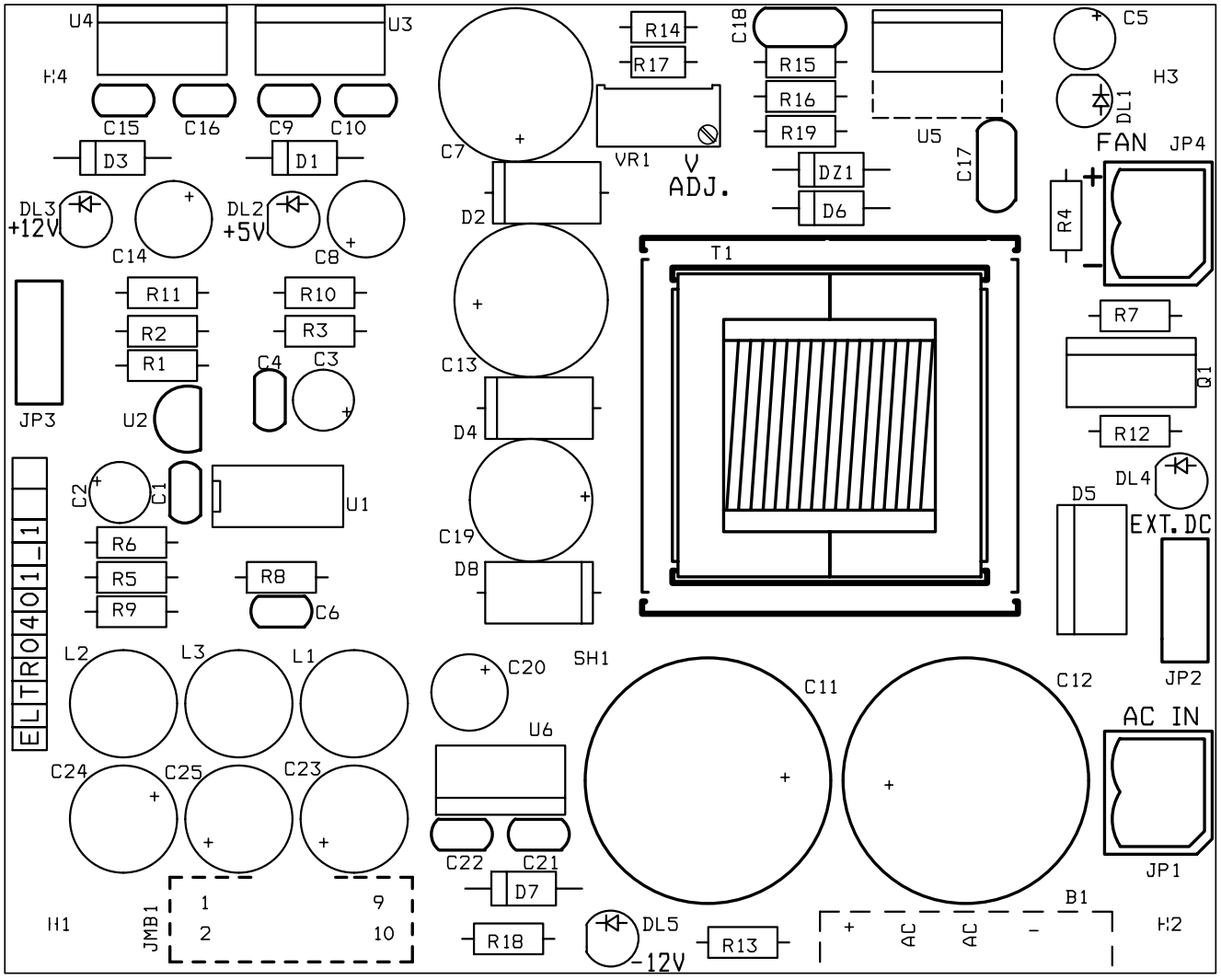
POWER SUPPLY Board Description (ELTR0401_1 - 2PCB0283_1)

The ELTR0401_1 POWER SUPPLY BOARD is used to supply all receivers ELR Series together with RF PA power supplies.

From the JP1 connector comes the alternate voltage from the secondary of the power supply transformer (ca. 27Vac) that is rectified by the diodes bridge B1 and smoothened by electrolytic capacitors C11 and C12. Through the D5 diode the external battery voltage is connected at the output of the bridge, and it enters from the JP2 connector.
These voltages (mains or batteries) enters in a SWITCHING circuit that haas U5 and T1 as main components; the T1 transformer has three outputs supply the three voltages supplying the whole equipment - once they have been rectified and stabilized with the U3 U4 and U6 regulators. These three voltages are: +5V, +12V and -12V.
The presence of these votlages is indicated by the DL1 DL3 and DL5 diode leds mounted on the power supply, and by the led munted on the front panel of the equipment.
The DL4 led and the "EXT. DC" led on the front panel indicates the presence of the external battery voltage.
The circuit for temperature measurement and thermostaic control of the fan is mounted only on transmitters.

ADJUSTJMENTS:

Adjust the VR1 trimmer in order to obtain a voltage of 14,5-15V at the U4 regulator input (pin 1).



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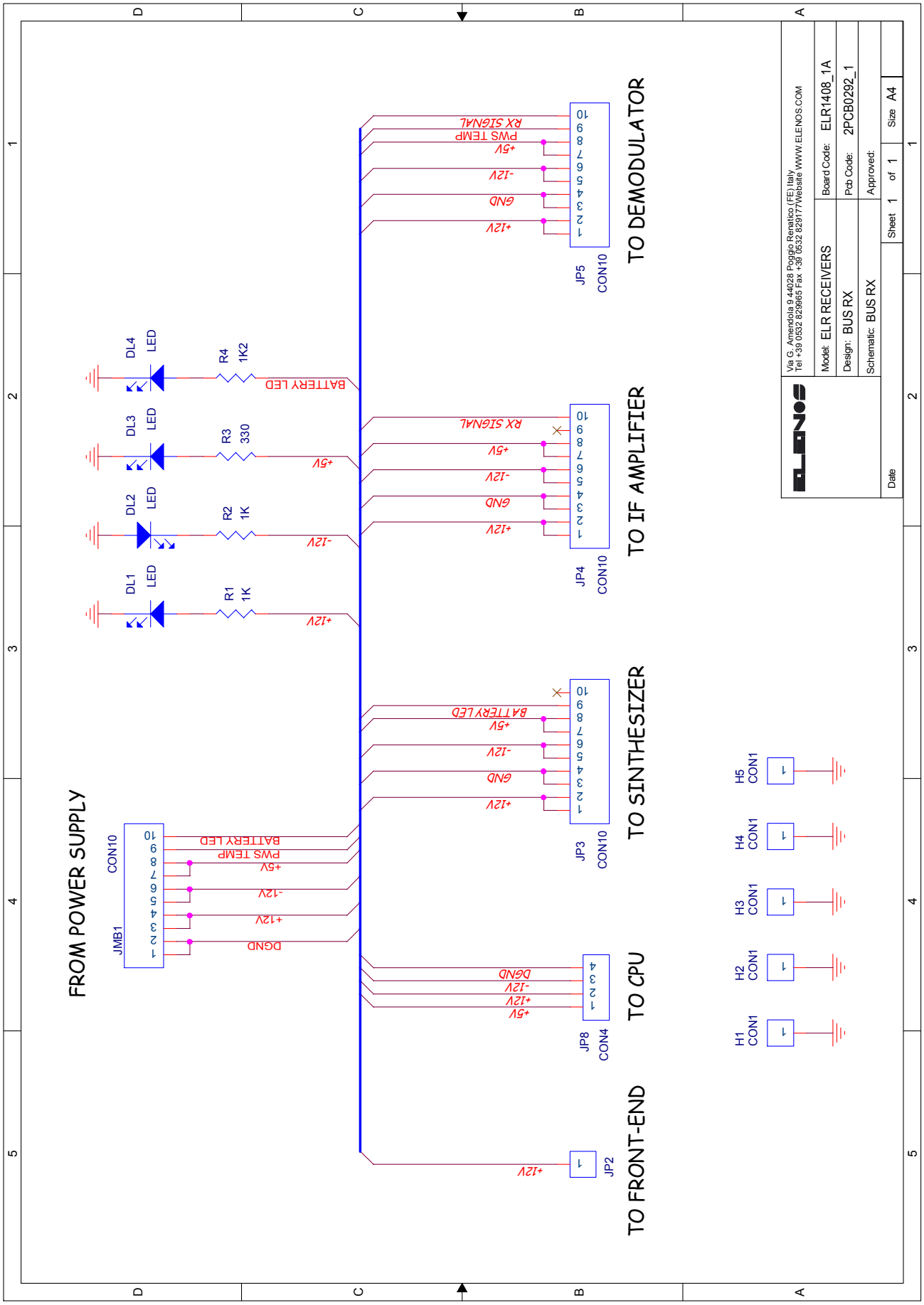
TO DEMODULATOR
TO IF AMPLIFIER
TO SINTHESIZER
TO CPU
TO FRONT-END
FROM POWER SUPPLY
JP5 CON10
JP4 CON10
JP3 CON10
JP8 CON4
JP2
JMB1 CON10
DL4 LED
DL3 LED
DL2 LED
DL1 LED
R4 1K2
R3 330
R2 1K
R1 1K
BATTERY LED
RX SIGNAL
PWS TEMP
+5V
-12V
GND
+12V
DGND
H1 CON1
H2 CON1
H3 CON1
H4 CON1
H5 CON1
Via G. Amendola 9 44028 Poggio Renatico (FE) Italy
Tel +39 0532 829965 Fax +39 0532 829177Website WWW.ELENOS.COM
Model: ELR RECEIVERS
Design: BUS RX
Schematic: BUS RX
Board Code: ELR1408_1A
Pcb Code: 2PCB0292_1
Approved:
Sheet 1 of 1
Size A4
Date

BUS RX board Description
(ELR1408_1 - 2PCB0292_1)

The BUS RX board secures interconnections between boardsand supplies them with power. These boards are:

ELT100 RECEIVERS (600 1100 MHz)

1.	PWS board	(ELTR0401_1 - 2PCB0283_1)
2.	SINTHESIZER RX 100 board	(ELR3408_1 \ 2PCB0296_1)
3.	IF AMPLIFIER ELR100 board	(ELR5400 \ 2PCB0290_0)
4.	DEMODULATOR	(ELR6408_1 \ 2PCB0288_1)

ELT200 RECEIVERS (1400 2500MHz)

1.	PWS board	(ELTR0401_1 - 2PCB0283_1)
2.	PLL RX 200 Board	(ELR4401_0 \ 2PCB0339_0)
3.	IF AMPLIFIER ELR200 Board	(ELR5401 \ 2PCB0290_1)
4.	DEMODULATOR	(ELR6408_1 \ 2PCB0288_1)

ADJUSTMENTS:

Su questa scheda non ci sono punti di taratura.

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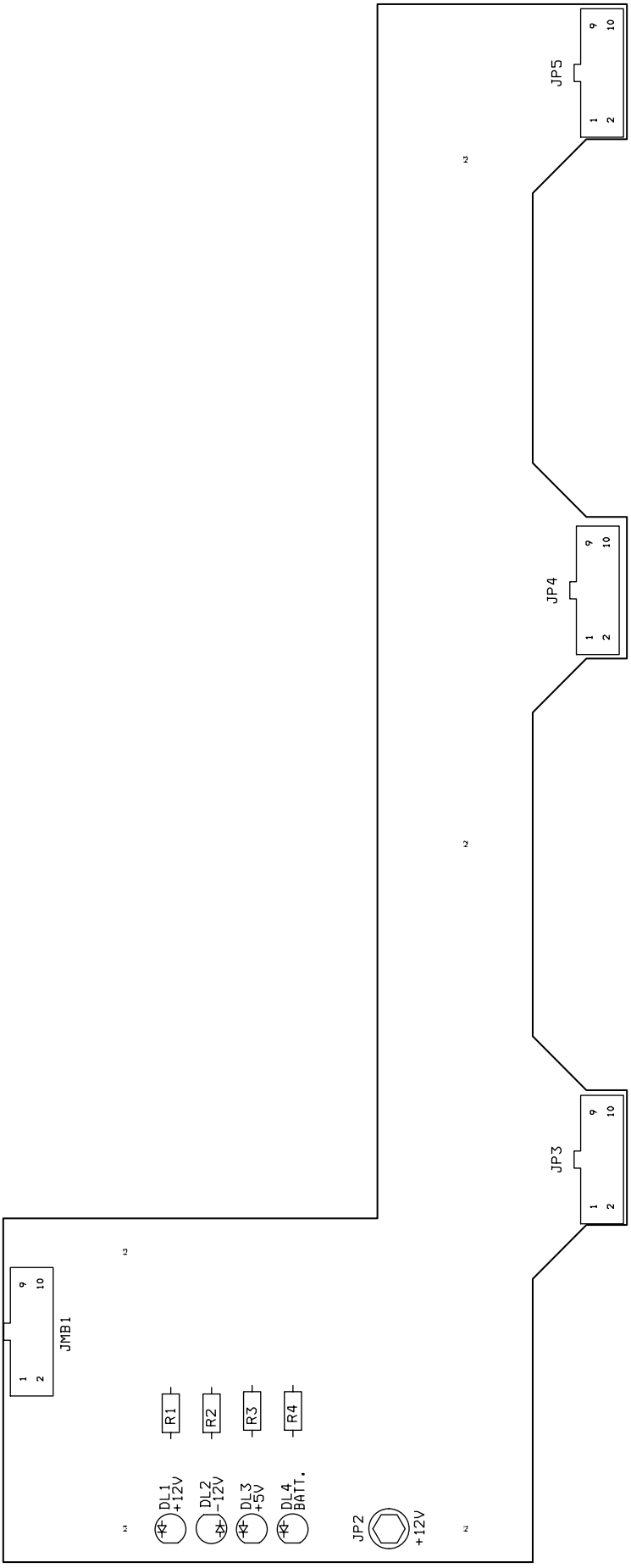
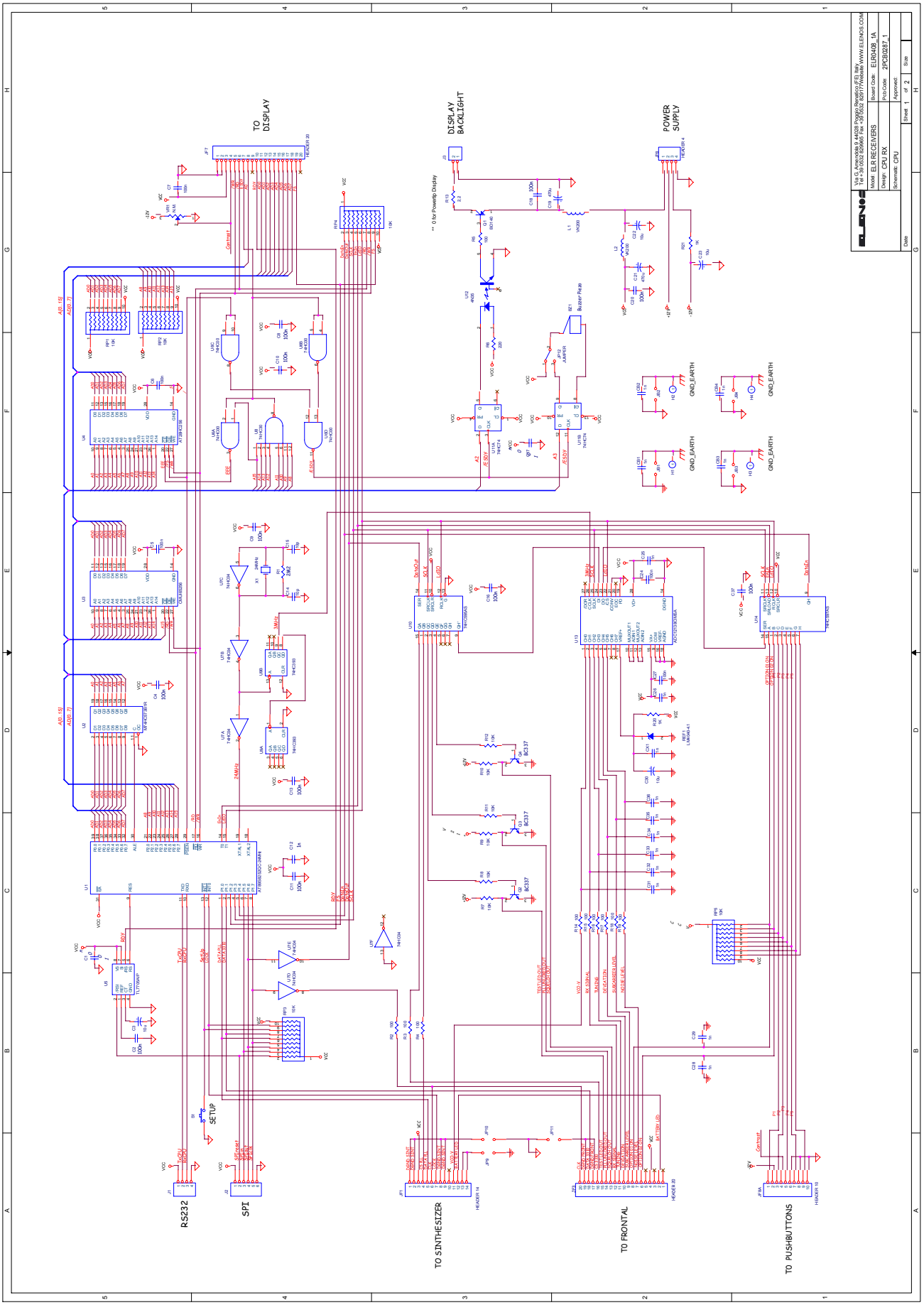

JP5
JP4
JP3
JMB1
R1
R2
R3
R4
DL1 +12V
DL2 -12V
DL3 +5V
DL4 BATT.
JP2 +12V



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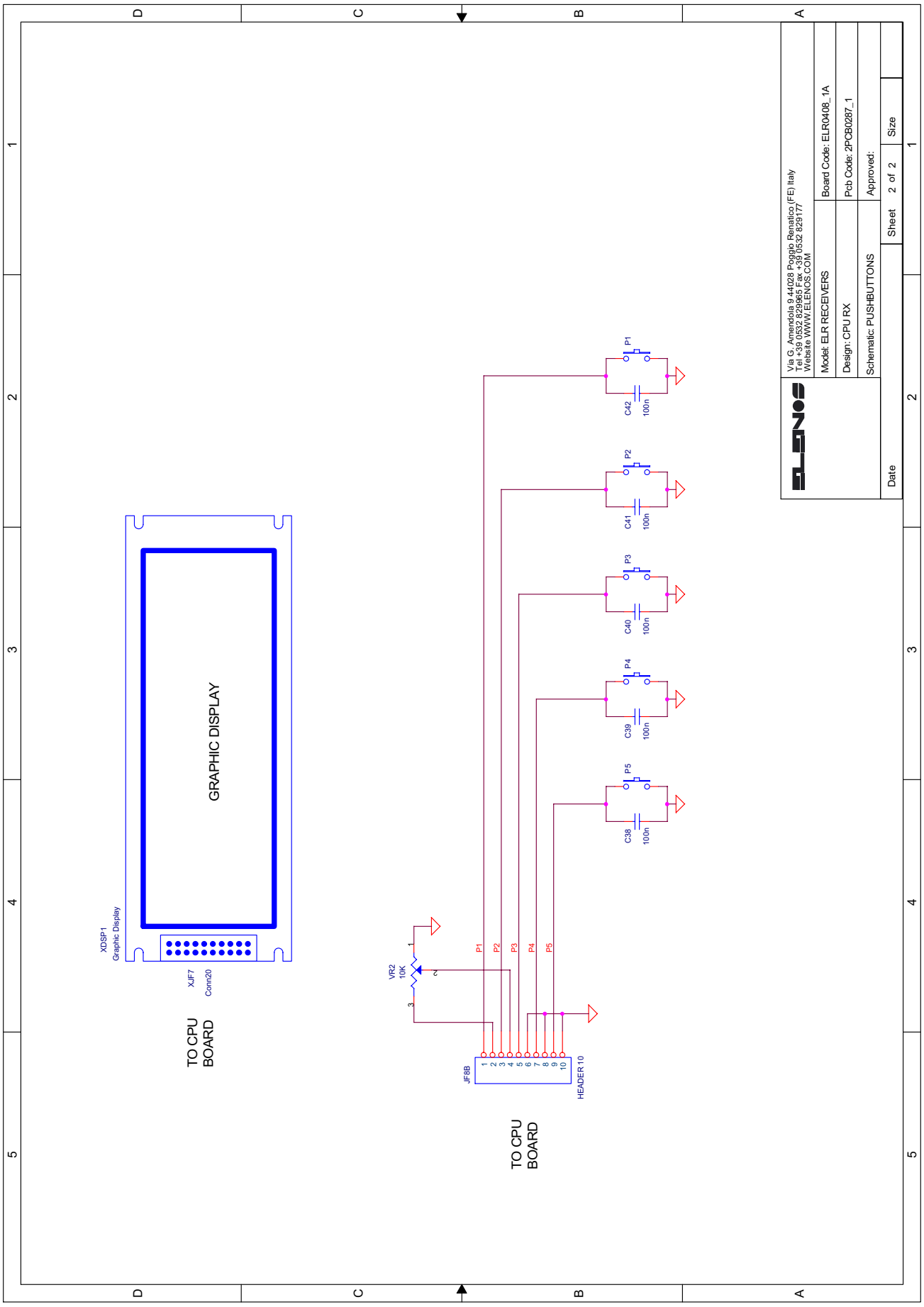
GRAPHIC DISPLAY
XDSP1
Graphic Display
XJF7
Conn20
TO CPU
BOARD
VR2
10K
P1
P2
P3
P4
P5
C42
C41
C40
C39
C38
100n
JF8B
HEADER 10
TO CPU
BOARD
Via G. Amendola 9 44028 Poggio Renatico (FE) Italy
Tel +39 0532 829965 Fax +39 0532 829177
Website WWW.ELENOS.COM
Model: ELR RECEIVERS
Design: CPU RX
Schematic: PUSHBUTTONS
Board Code: ELR0408_1A
Pcb Code: 2PCB0287_1
Approved:
Date
Sheet 2 of 2
Size

CPU RX Board Description
(ELR0408_1 - 2PCB0287_1

The CPU RX controls the main parameters of the receiver and manages the functionning of the graphic LCD.
On this board are: a 8 Bit microprocessor (U1), a 12 bit analog/digital converter with an 8 channel multiplexer (U13), a 256K EPROM (U4) and a 256K RAM (U3).
The microprocessor controls the graphic display and gives the timings and signals for the functionning of the whole board. It controls also the frequency synthesizer (U2) installed onthe SYNTHESIZER RX 100 board (ELT3408) for the ELR 100 models, the frequency synthesizer (U1) installed on the PLL RX 200 board (ELR4401) for the ELR 200 models, and the audio amplifier at programmable gain (U1) on the FRONTAL RX (ELR2408).
The board is supplied through the JP8 connector with three voltages : +12V, -12V and +5V.

ADJUSTMENTS:

This board doesn't need adjustments.

NOTE: The JP9, JP10, JP11 e JP12 jumpers are adjusted in the factory and must not be moved.

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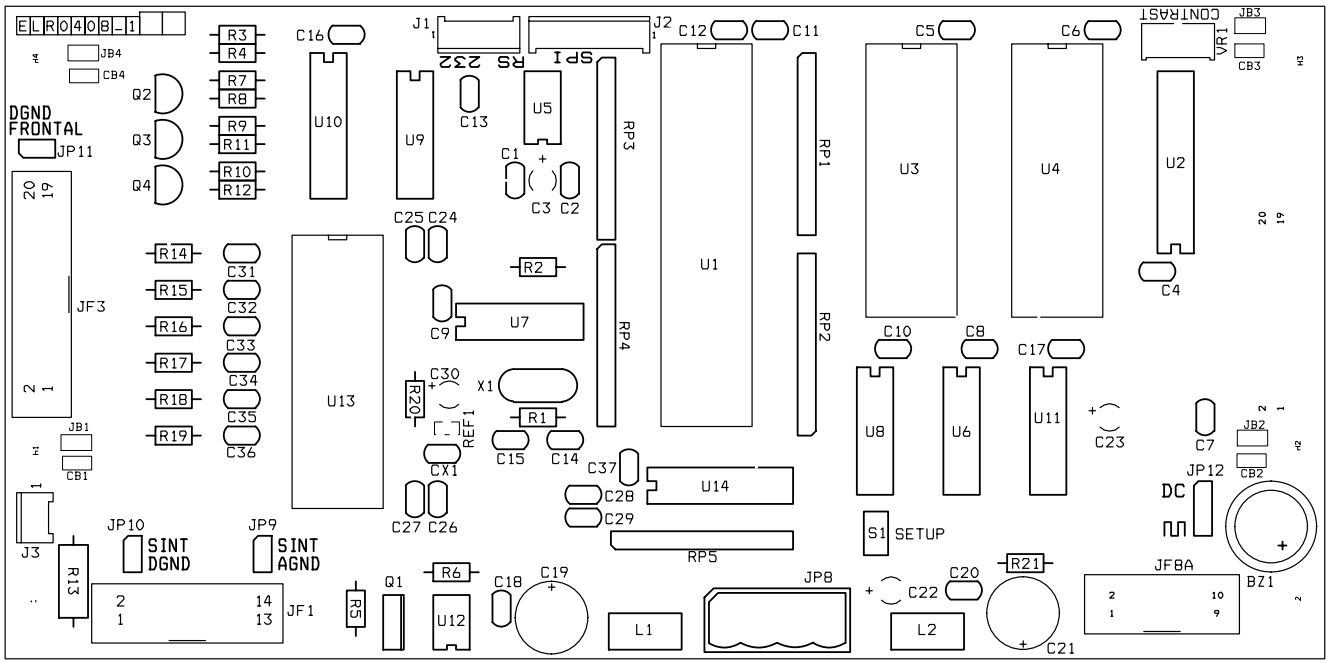
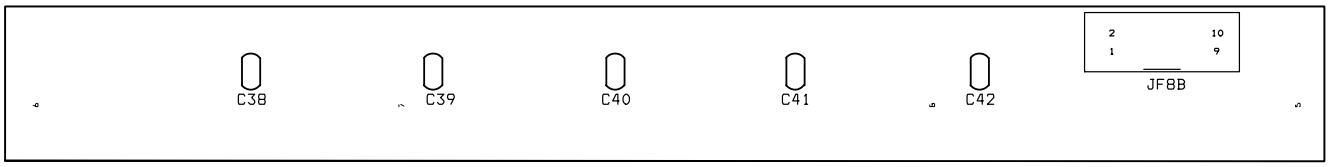
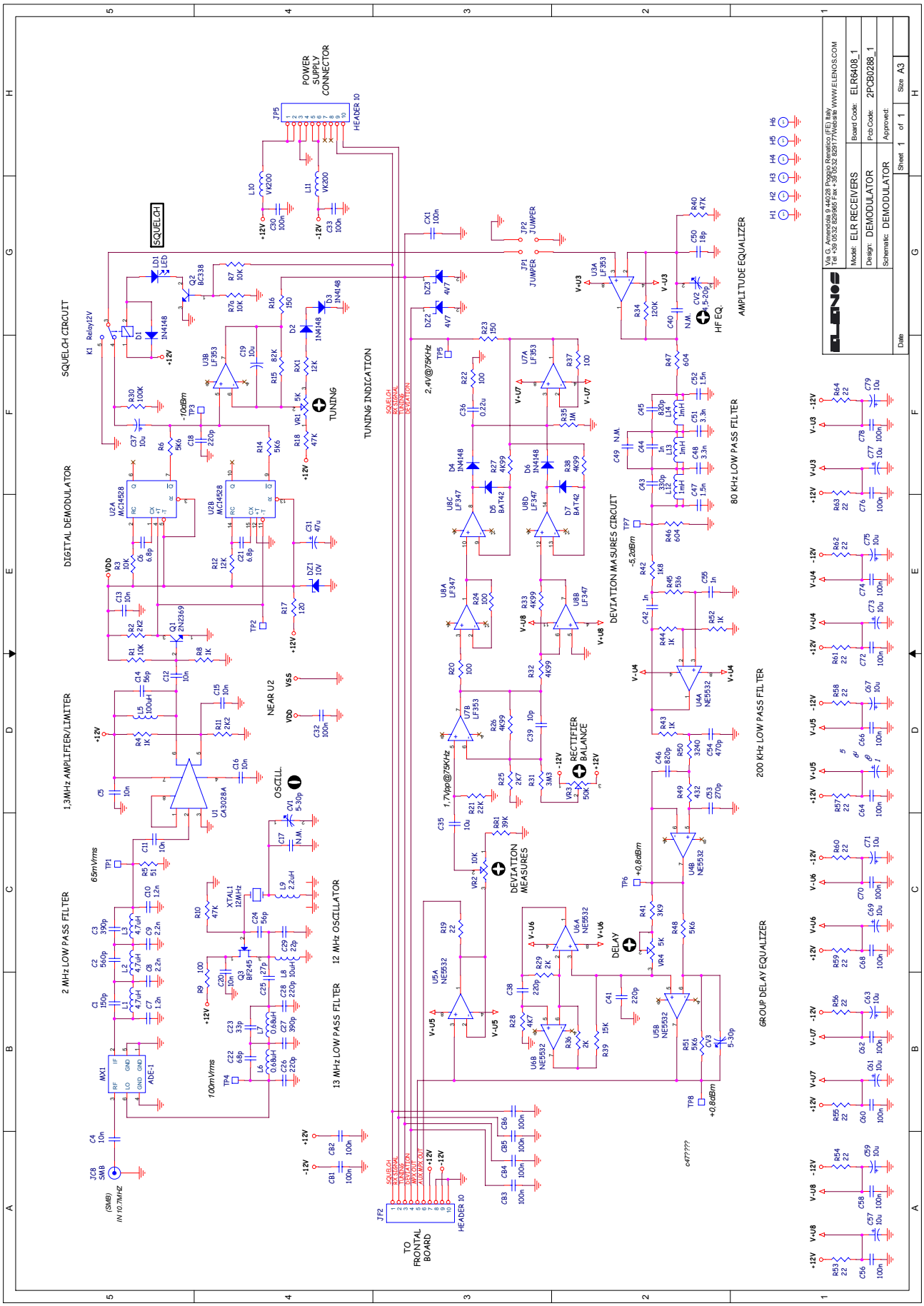

ELR0408_1
JB4
CB4
DGND
FRONTAL
JP11
Q2
Q3
Q4
R3
R4
R7
R8
R9
R11
R10
R12
C16
U10
J1
RS 232
SPI
J2
U9
C13
U5
C1
C3
C2
RP3
C12
C11
RP1
U1
C5
U3
C6
U4
CONTRAST
JB3
VR1
CB3
U2
C4
C25
C24
R2
C9
U7
RP4
RP2
C10
C8
C17
U8
U6
U11
C23
C7
JB2
CB2
JP12
DC
R14
R15
R16
R17
R18
R19
C31
C32
C33
C34
C35
C36
JF3
U13
C30
X1
R20
REF1
R1
C15
C14
CX1
C37
C28
C29
U14
RP5
JB1
CB1
J3
JP10
SINT
DGND
JP9
SINT
AGND
S1
SETUP
JF8A
BZ1
R13
JF1
RC5
Q1
R6
U12
C18
C19
L1
JP8
C22
C20
L2
R21
C21
C27
C26


C38
C39
C40
C41
C42
JF8B



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DEMODULATOR Board description (ELR6408_1 - 2PCB0288_1)

The DEMODULATOR board contains the second convetion at 1.3MHz, the impulse discriminator, the audio MPX processor and the circuits for deviation and centre tuningmeasurements.
The IF signal at 10,7 dBm with 0 dBm evel comes from the JC8 connector and, together with the 12MHz ocillator signal, is inserted inthe MX1 mixer; the product of the 1.3MHz mixing going throgh a low-pass filter at 2MHz is applied to the input of the U1 amplifier and the Q1 transistor that adapt it to the CMOS levels.
The stage that follows is the impulse discriminator (U2) that supplies the demodulated audio signal on TP3; after passing through the K1 relay that silences it in case of squelch, the audio signal is amplified in amplitude (U3A), filteres with an 80KHz and a 200KHz low-passes in order to go through a stage that equalize the group delay. The stage with the U7 and U8 integrated supply the the rectification of the audio signal for thje deviation measurement whilst the U3B integrate supplies the voltage or the tuning centre.

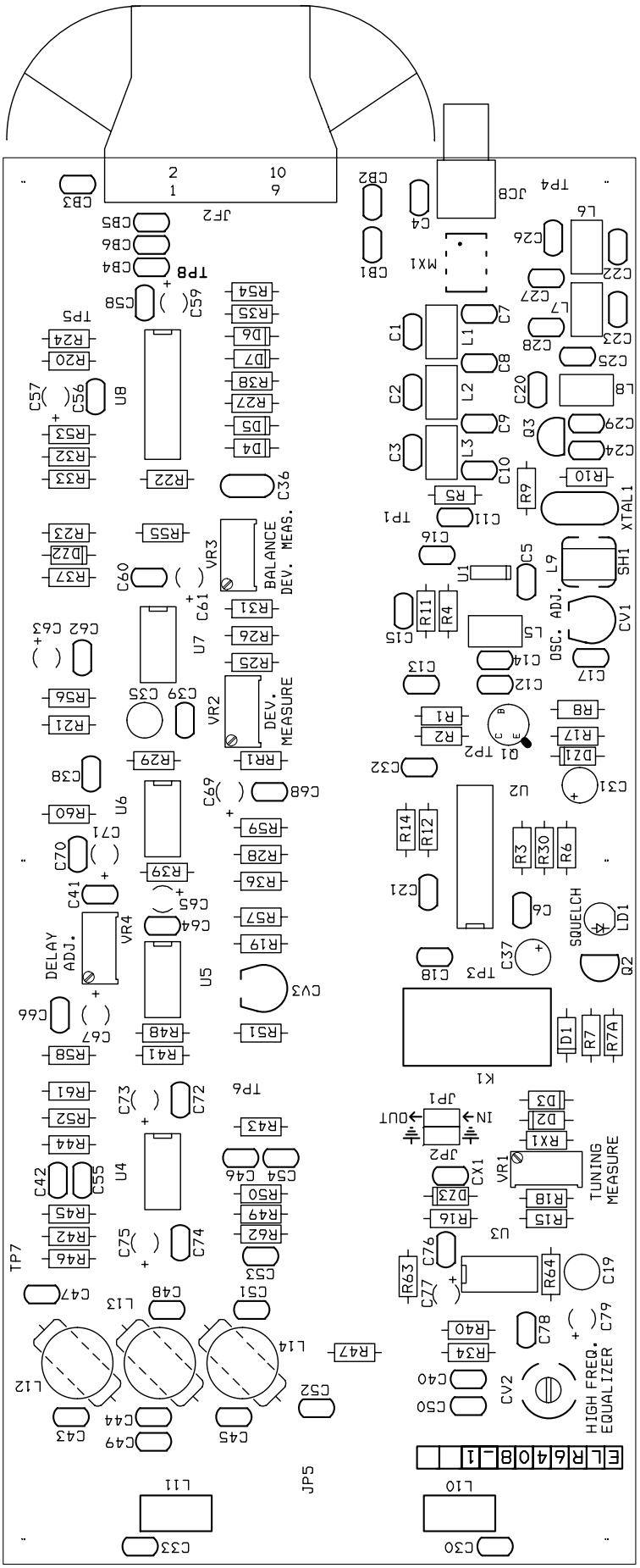
ADJUSTMENTS:

1. The VR1 variable resistor adjusts the tuning centre; proceed as follows to adjust it correctly:
   1.1. Enter the "MEASURES>>TUNING INDICATION" menu.
   1.2. Apply to the "RF INPUT" connector a signal with a frequncy equal to the reception and amplitude frequency at -50 dBm. With a spectrum analyzer check that on the "IF MONITOR" font panel connector ther is the IF signal with -12dBm amplitude and frequency of 10.7MHz +/- 10 KHz.
   1.3. Slowly turn the VR1 variable resistor until the nearest value to 0KHz is red.
2. The VR2 variable resistor adjusts the deviation measurement; proceed as follows to adjust it correctly:
   2.1. Enter the "MEASURES>>FREQUENCY DEVIATION>>COMPOSITE DEVIATION"" menu.
   2.2. On the "RF INPUT" apply a signal with a frequency equal to the reception and amplitude frequency of -50 dBm and modulated +/- 75MHz with a 1KHz note. Check that the set squelch level is comprehended between -55 dBm and -100 dBm (Menù "SETUP>>SQUELXCH")
   2.3. Adjust the VR3 variable resistor until the display shows a 75.0 KHz value.

NOTA: The CV1 and CV2 capacitive variable resistors and the VR3 an VR4 variable resistors are adjusted in the factory and must not be touched, since they directly influence the receiver performances.

TEST POINTS:

1. TP1: First IF signal check point; 10.7MHz 50 -90mV RMS
2. TP2: Second IF signal check point; 1.3MHz 9V Peak-Peak
3. TP3: Audio singal check point (for factory adjustment)
4. TP4: 12MHz oscillator check point; 12 MHz 80-150mV RMS
5. TP5: Deviation meaasurement voltage check point; from 0 to 4 Vdc
6. TP6: Audio singal check point (for factory adjustment)
7. TP7: Audio singal check point (for factory adjustment)
8. JP1, JP2, JP3: Check points for factory adjustments



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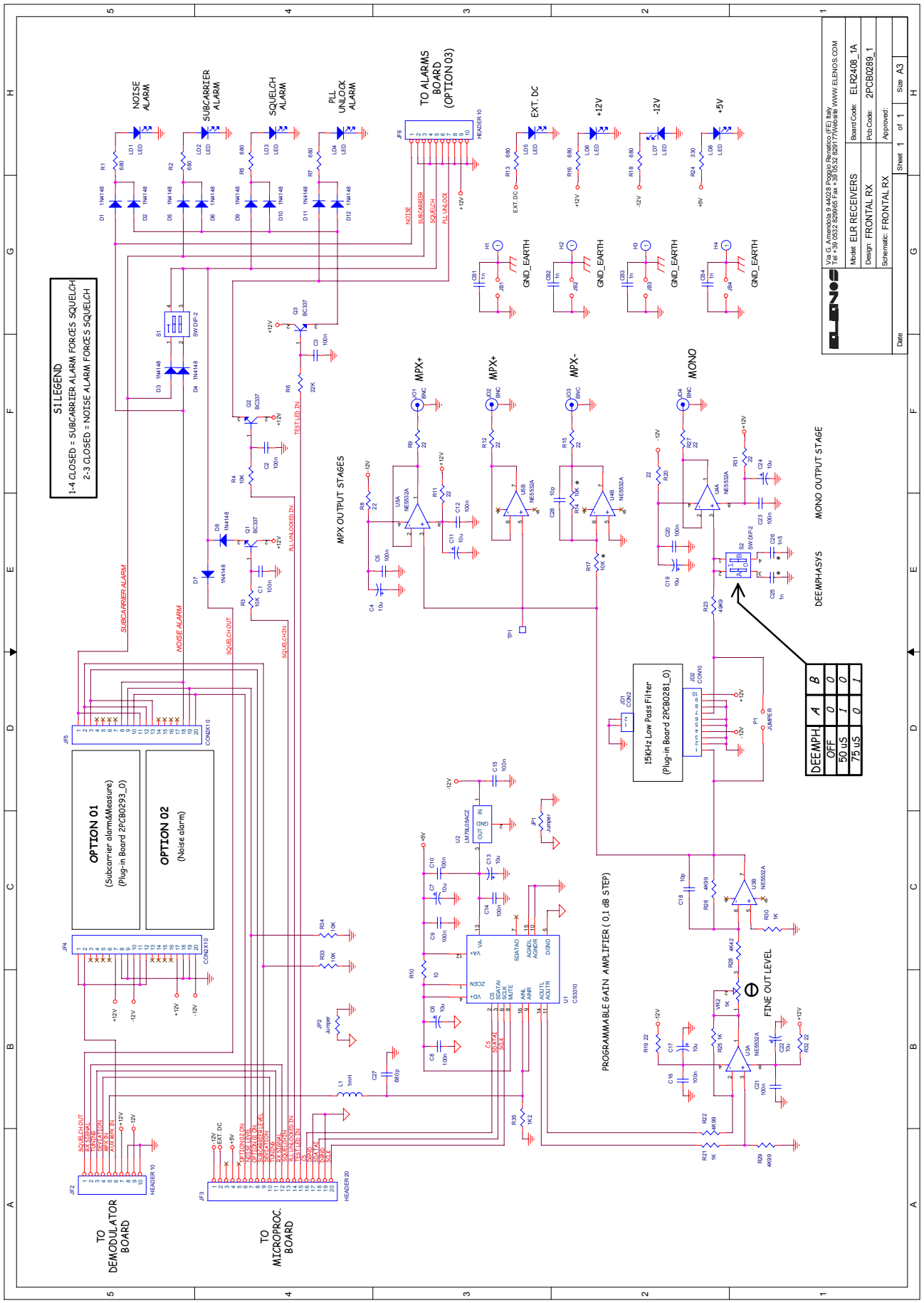
S1 LEGEND
1-4 CLOSED = SUBCARRIER ALARM FORCES SQUELCH
2-3 CLOSED = NOISE ALARM FORCES SQUELCH
NOISE ALARM
SUBCARRIER ALARM
SQUELCH ALARM
PLL UNLOCK ALARM
TO ALARMS BOARD (OPTION 03)
EXT. DC
+12V
-12V
+5V
GND_EARTH
MPX+
MPX+
MPX-
MONO
MPX OUTPUT STAGES
MONO OUTPUT STAGE
DEEMPHASYS
OPTION 01
(Subcarrier alarm&Measure)
(Plug-in Board 2PCB0293_0)
OPTION 02
(Noise alarm)
15KHz Low Pass Filter
(Plug-in Board 2PCB0281_0)
PROGRAMMABLE GAIN AMPLIFIER (0,1 dB STEP)
FINE OUT LEVEL
TO DEMODULATOR BOARD
TO MICROPROC. BOARD
DEEMPH A B
OFF 0 0
50 uS 1 0
75 uS 0 1
Via G. Amendola 9 44028 Poggio Renatico (FE) Italy
Tel +39 0532 829965 Fax +39 0532 829177 Website WWW.ELENOS.COM
Model: ELR RECEIVERS
Board Code: ELR2408_1A
Design: FRONTAL RX
Pcb Code: 2PCB0289_1
Schematic: FRONTAL RX
Approved:
Sheet 1 of 1
Size A3
Date

FRONTAL RX Board description
(ELR2408_1 - 2PCB0289_1)

On the FRONTAL RX board are the final stages of the output audio signal, the alarms leds and the power supply presence leds.
The demodulated and processed audio signal coming from the DEMODULATOR board (ELR6408) enters in the digital level control at 0.1dB (U-U3) steps and is applied on the U5A, U5B and U4B buffers that supply the MPX signals.
Furthermore the signal - after the level control - enters the U4A buffer going through a 15KHz low-pass filter (ELR4409_0 board) and a deemphasis stage (0-50-75nS). This buffer send a MONO signal to the output.
The LD5, LD6 , LD7 and LD8 leds indicate the presence of power supply voltages to the equipment (EXT. DC, +12, -12V and +5V).
The LD1, LD2 , LD3 and LD4 leds indicates the respective alarm if alighted.

On JF4 and JF5 conectors on the FRONTAL RX board an optional board can be inserted, that is the ELTR3408: 19KHz MPX-Subcarrier deviation measure and alarm.

ADJUSTMENTS:

1. The VR2 variable resistor regulates the final stage of the MPX and MONO output signal final level.
2. With the S1 dip-switch, inserting the squelch can be forced in case of “Subarrier” and “noise” alarms (See the legenda on the electrical schematics).
3. With the S2 dip-switch, the deemphasis can be adjusted or excluded, according to the legenda on the electrical schematics.

TEST POINTS:

1. TP1: Audio signal check point
2. P1: Insert the bordge if the ELR4409_0 board is not installed.
3. Disinsert the bridge if the board is installed.

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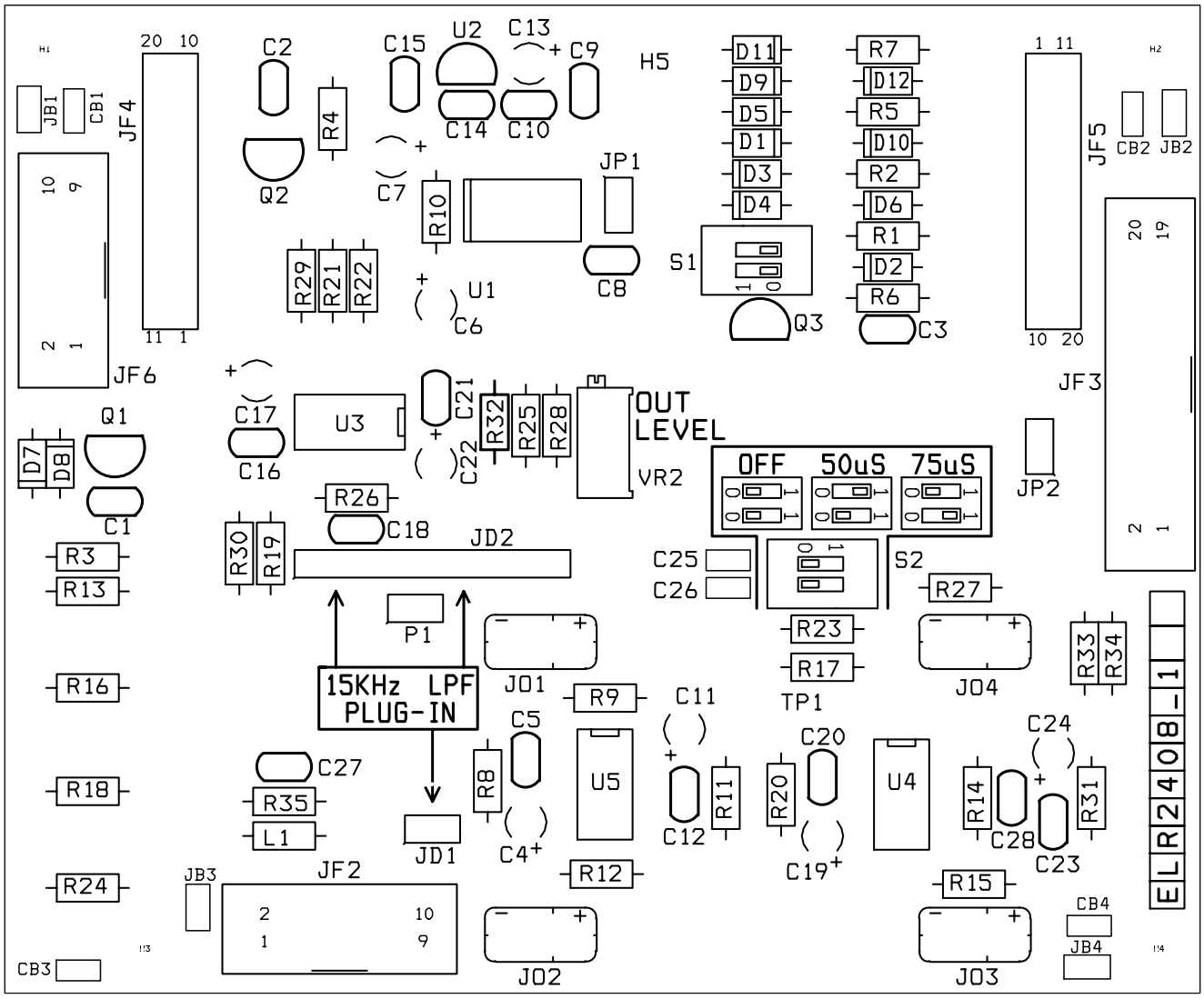
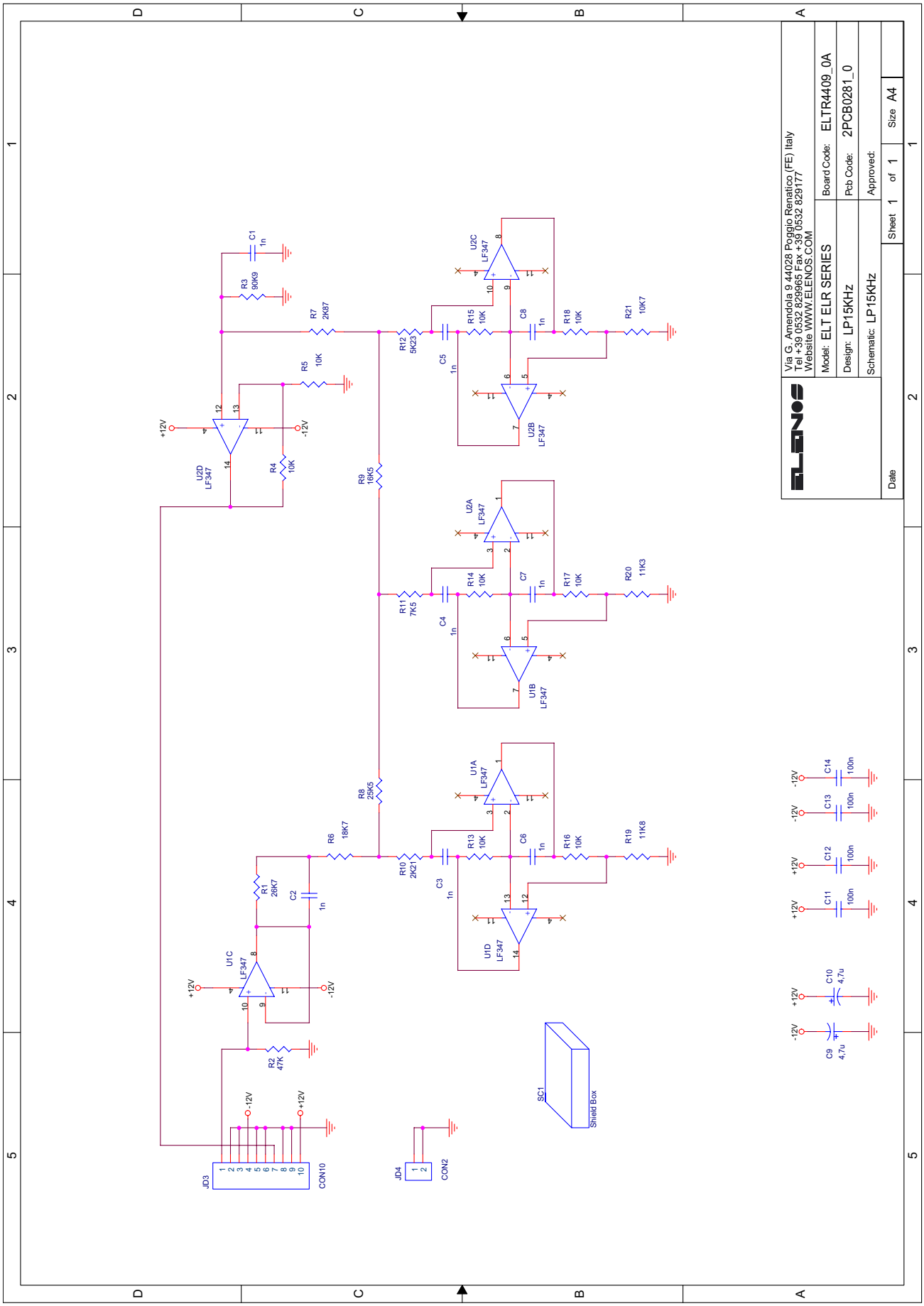

EL R2408_1
OUT LEVEL
OFF 50uS 75uS
15KHz LPF PLUG-IN
JF1
JF2
JF3
JF4
JF5
JF6
JB1
CB1
JB2
CB2
JB3
CB3
JB4
CB4
JD1
JD2
JO1
JO2
JO3
JO4
JP1
JP2
H5
S1
S2
VR2
P1
TP1
U1
U2
U3
U4
U5
Q1
Q2
Q3
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
C22
C23
C24
C25
C26
C27
C28
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
L1
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35



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LP15KHz Board description
(ELTR4409_0 - 2PCB0281_0)

The ELTR4409 board contains an elliptical-low-pass-active filter with cutoff frequency of 15KHz that limits the MONO signal band.

The board is standard supplied with the unit.

ELR RECEIVER SERIES:

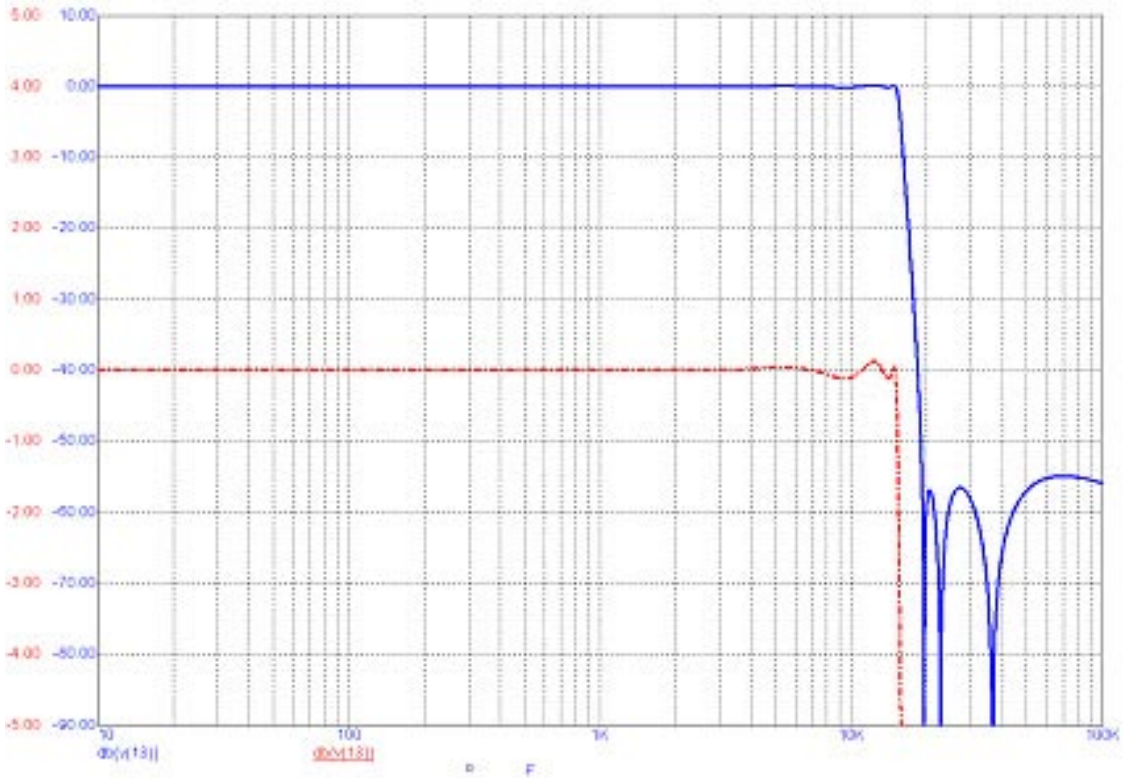
On the FRONTAL RX board (ELR2408), take off the P1 bridge and insert JD2 and JD1 in the correspondent connectors. If the PLUG-IN ELTR4409 board is uninstalled, re-connect the P1 bridge.

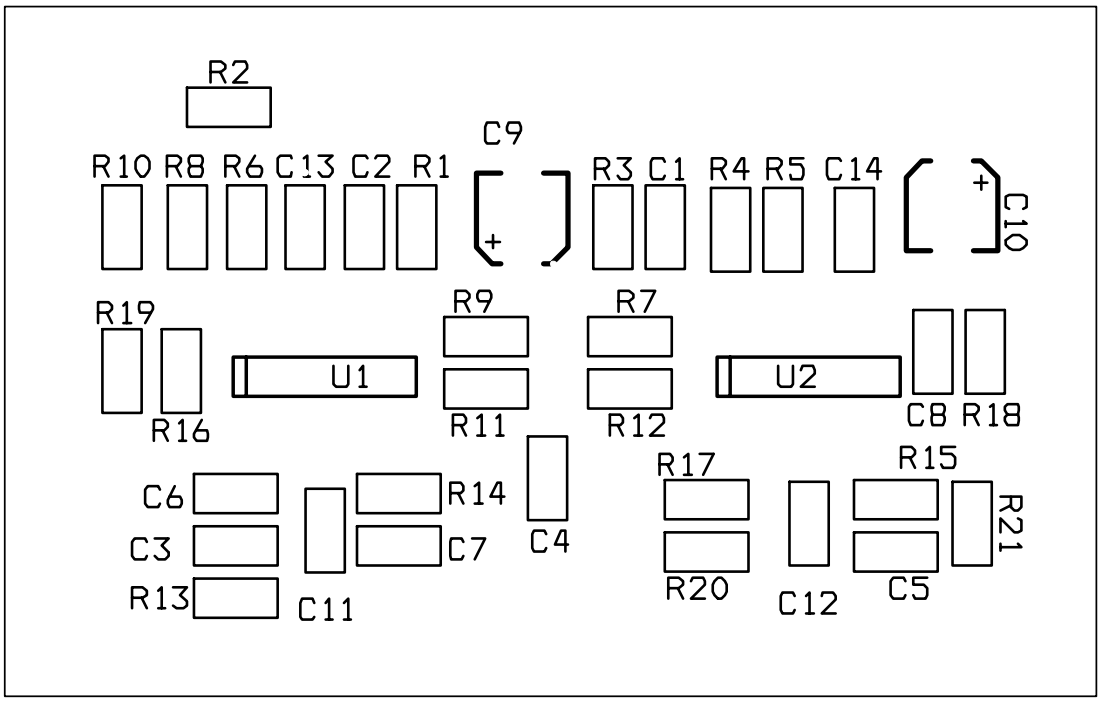
Board Functionning Description:

The board is supplied with +12V and -12V throught pin 10 and 4 of JD3 connector.
The input signal applied on pin 1 of JD3 is buffered by U1C to be sent to the alliptical active filter FDNR (Frequency Dependent Negative Resistance) and then to the U2D amplifier. Thi amplifier compensate the loss of the filter and total gain response at 0 dB. The output filtered signal is on pin 7 of JD3.

The frequency response stays between ± 0,5dB from 30Hz to 15 KHz whilst the attenuation at 19KHz is more than 45dB.

Frequency response of the ELTR4409_0 board





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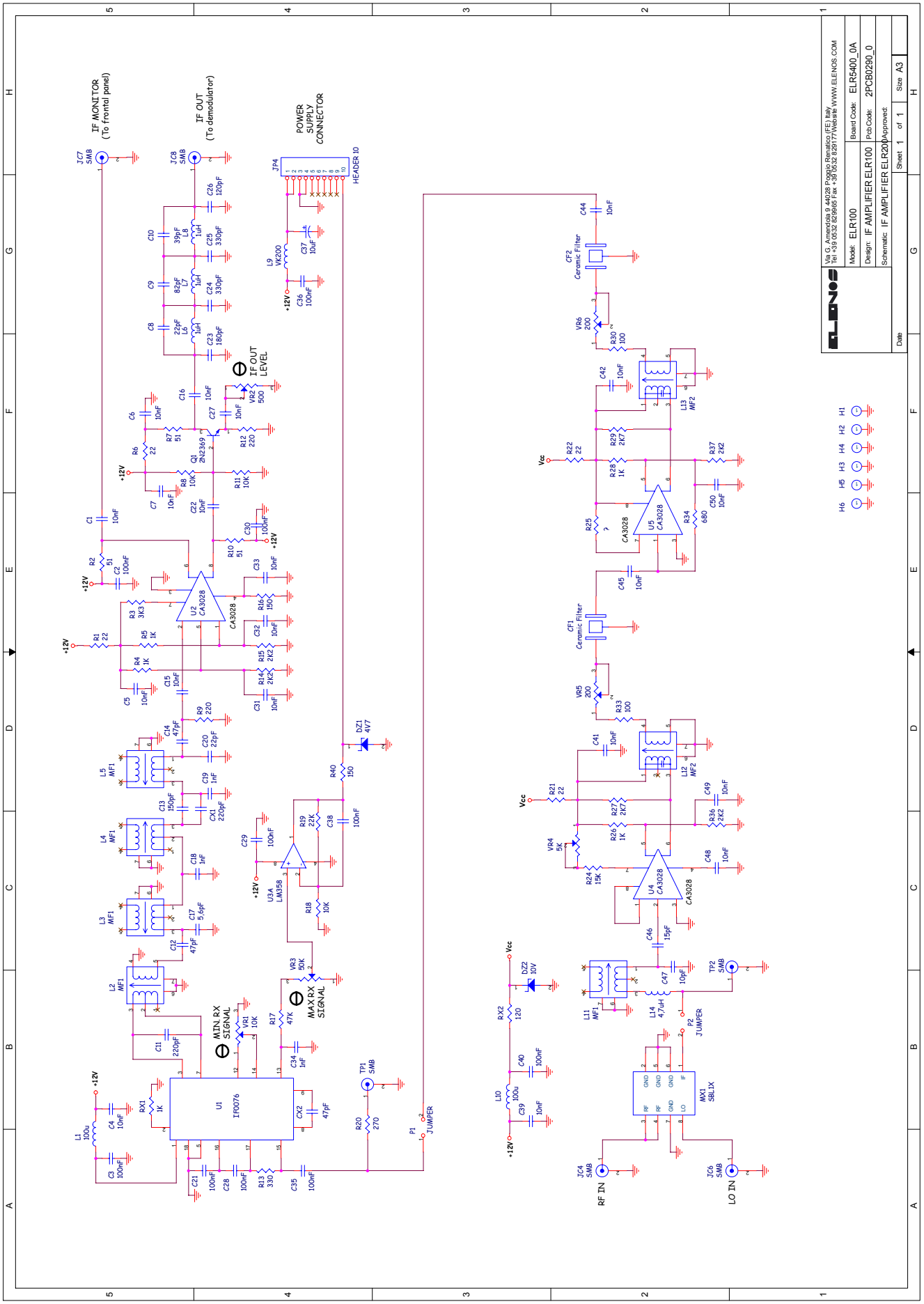
IF MONITOR
(To frontal panel)
IF OUT
(To demodulator)
POWER
SUPPLY
CONNECTOR
HEADER 10
IF OUT
LEVEL
MIN RX
SIGNAL
MAX RX
SIGNAL
JUMPER
RF IN
LO IN
Via G. Amendola 9 44028 Poggio Renatico (FE) Italy
Tel +39 0532 829965 Fax +39 0532 829177 Website WWW.ELENOS.COM
Model: ELR100
Board Code: ELR5400_0A
Design: IF AMPLIFIER ELR100
Pcb Code: 2PCB0290_0
Schematic: IF AMPLIFIER ELR200
Approved:
Date:
Sheet 1 of 1
Size: A3

IF AMPLIFIER ELR100 Board desription (ELR5400_0 - 2PCB0290_0)

The ELR 5400_0 board is installed on the ELR model receivers.
On this board are the first conversion stages of frequency, filtering and IF amplifier.
If the RF signal coming from the front-end on the JC4 connector and the local oscillator on the JC6 connector are mixed by MX1; the product of this mixing is applied on the amplifying chain and filtering made of U4,CF1, U5 and CF2. At itsw output there is a 10,7 MHz signal.
Once filtered and amplified, the 10,7 MHz signal enter into the U1 limiter. Its output is filtered again and applied at the U2 input whose functions are as IF final amplifier, supplying the IF output for the demodulator on the JC8 connector, and the IF MONITOR output on the JC7 connector.

ADJUSTMENTS:

1. The VR1 and VR2 variable resistors adjust the correct reading of the reception signal displayed on the "MEASURES>>RX SIGNAL" menu.
Proceed as follows for a correct adjustment:
    1.1. Enter the "MEASURES>>RX SIGNAL" menu. On the "RF INPUT" connector apply a signal with frequency equal to the one of -99dBm amplitude and reception. Adjust the VR1 until a value of -99dBm is displayed.
    1.2. On the "RF NPUT" connector a signal with a frequency equal to the one of -50dBm amplitude and reception.Adjust the VR3 variable resistor until a value of -50dBm is displayed.
    1.3. Repeat point 1 and 2 many times if necessary.
    1.4. Vary the amplitude of the -50dBm input signal to -100dBm and check that the measure error is within +/- 2dB.
2. The VR2 variable resistor adjusts the singnal amplitude on the IF OUT connector; this amplitude must be 0dBm on 50 ohm impedance.

NOTE: The VR4, VR5,VR6 variable resistors and L2, L3,L4,L5, L11, L12 and L13 coils are adjusted in the factory and must not be touched, as they directly influence the receiver's performances.

TEST POINTS:

The TP1 and TP2 test points and P1 and P2 jumpers are used during the final test in the factory.

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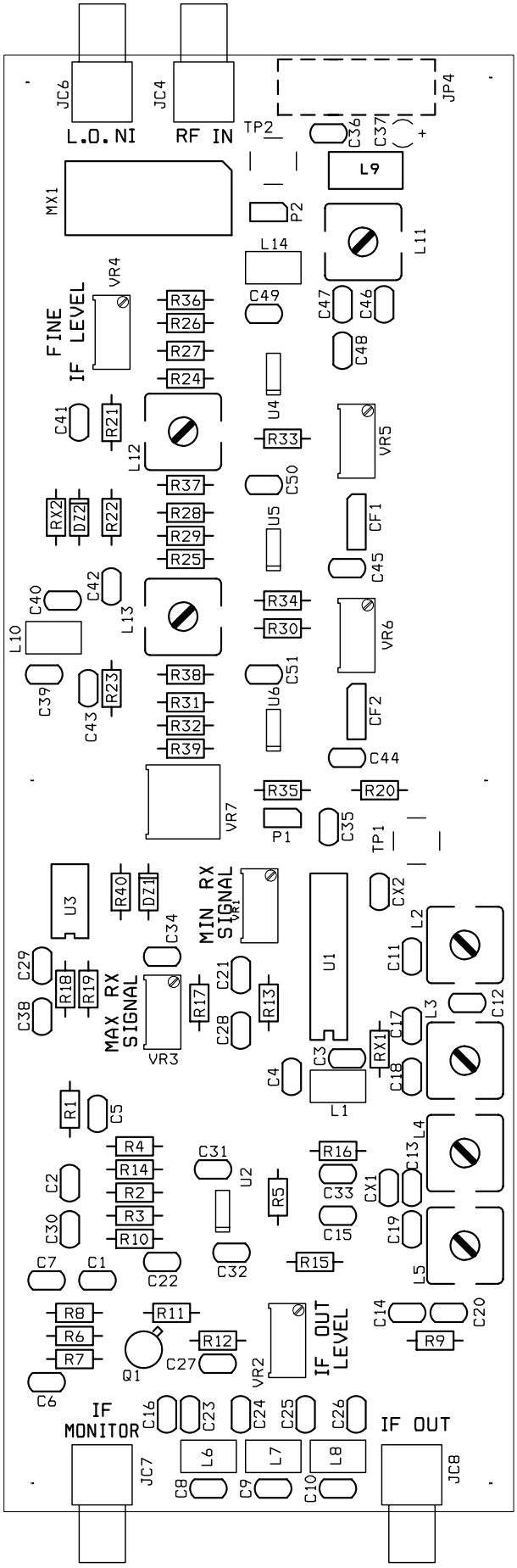
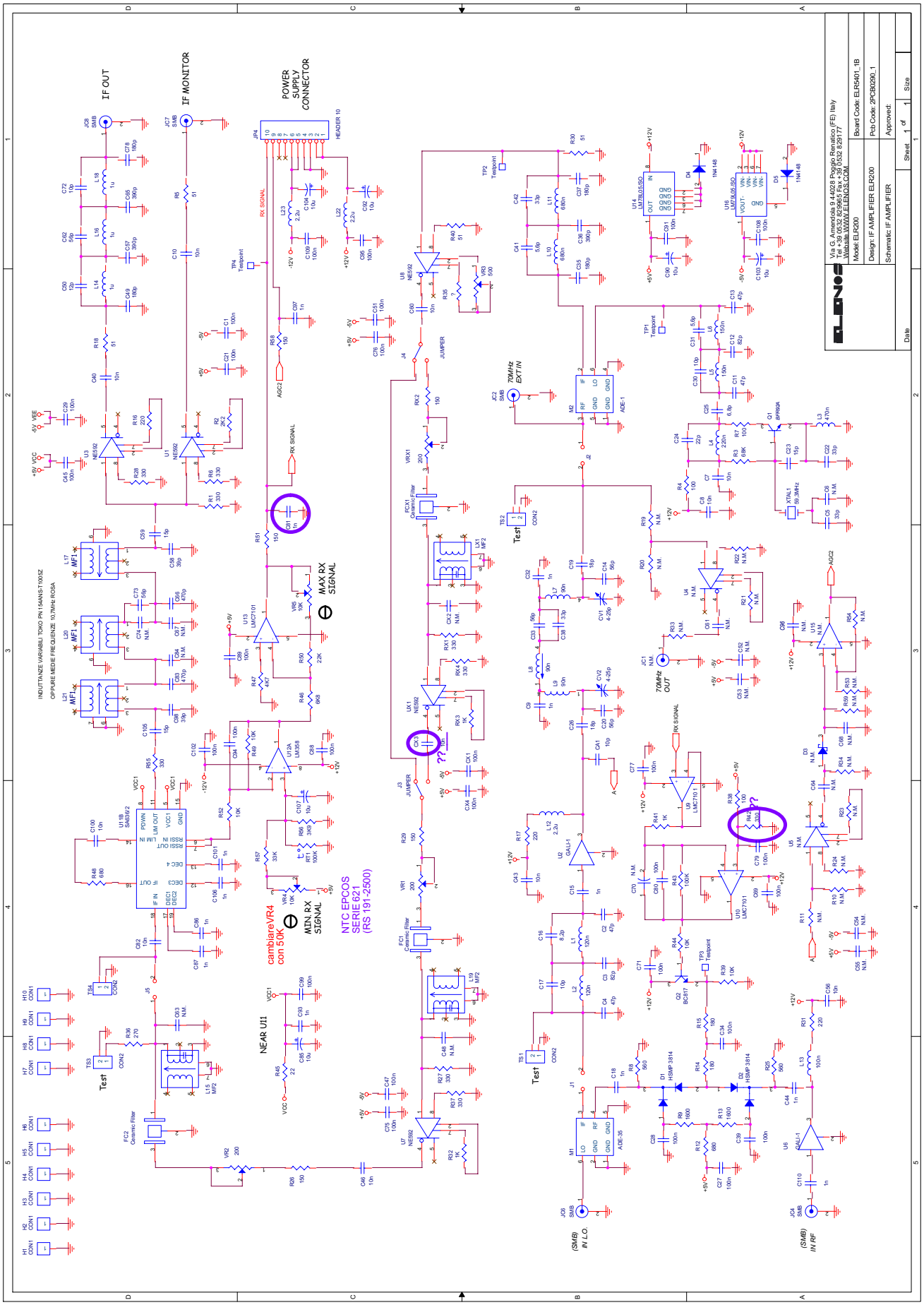

JC6
JC4
JP4
L.O. NI
RF IN
TP2
C36
C37
L9
MX1
P2
L11
L14
VR4
FINE
IF LEVEL
C49
C47
C46
C48
R36
R26
R27
R24
U4
C41
R21
L12
R33
VR5
C50
R37
R28
R29
R25
U5
RX2
DZ2
R22
CF1
C45
C40
C42
L10
L13
R34
R30
VR6
C51
R38
R31
R32
R39
U6
C39
C43
R23
CF2
C44
R35
R20
VR7
P1
C35
TP1
U3
R40
DZ1
MIN RX
SIGNAL
VR1
CX2
L2
C34
C29
R18
R19
C38
MAX RX
SIGNAL
VR3
R17
C21
R13
C28
U1
C11
C12
L3
RX1
C17
C3
C18
C4
L1
R1
C5
R4
R14
R2
R3
R10
C31
U2
R5
R16
C33
C15
CX1
C13
L4
C19
L5
C2
C30
C7
C1
C22
C32
R15
R8
R6
R7
C6
R11
Q1
C27
R12
VR2
IF OUT
LEVEL
C14
C20
R9
IF
MONITOR
C16
C23
C24
C25
C26
IF OUT
JC7
L6
L7
L8
JC8
C8
C9
C10



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IF AMPLIFIER ELR200 Board description (ELR5401_1 - 2PCB0290_1)

On this board are the first two frequency conversions (70MHz and 10,7MHz), the 70MHz pre-filtering chain, 10,7 MHz filtering chain and the limiter with the reception signal measurement.

The RF signal coming from the front-end, on the JC4 connector, is amplified by U6 to go through voltage pin diode attenuator;when the input signal overpasses the -35 dBm value, the U10 comparator start a loop which keeps constant the M1 Mixer input level, by checking the voltage check on pin diode attenuator. This prevents the its intermodulation. This consent the functionning and maintenings of the characteristics of the equipment even with very strong antenna signals. This signal so treated enters the M1 Mixer that makes a mix with the local oscillator signallocated on JC6; the 70 MHZ result is then filteres, amplified and applied to the M2 Mixer input.

The 59,3 MHz quartzed local oscillator is applied on the other mixer input in order to produce a 10,7MHz signal that is low-pass filtered and amplified by U8. Its output enters in the 10,7MHz filtering chain.
This filtering chain is formed by 3 delayed ceramic filters of controlled group with bandwidth of +/- 250KHz @ -1dB and two amplifiers that compensate the loss; the result is an excellent selectivity on the adiacent channeland an optimum linearity in phase to keep an optimum stereo separation.

The first stag of this filtering chain fomrmed by FCX1 and UCX1 can be excluded or included by moving the weldings of the J4 and J3 bridges. Consequently the total selectivityis increased or reduced according to necessities.
The FC ceramic filter output (last of the chain) is applied to the U11 input that operates as amplitude limiter and as logaritmic RSSI (received signal measurement) with an 80dB dynamic. The RSSI on U11 pin 6 and 7 is thermocompensated and normalized by U12 and U13 and then sent to JP4 pin 10 for display.

The 10,7MHz filtered and limited signal on U11 pin 11 goes through a further filter with a band of +/- 1MHz band to join the buffers/amplifier U3 and U1. The U3 output is filtered to reduce the harmonics. It's then sent to the IF OUT JC8 connector, whilst the U1 output is sent to the JC7 IF MONITOR.

ADJUSTMENTS:

On this board are a lot of adjustments that directly influence the global performances of the equipment; therefore it is recommended to make only the adjustments for those whose procedure is indicated. The other point of adjustment not described are made in the factory and must not be modified.

1. Adjustment of the received signal:
   Proceed a follows for a correct adjustment:
   - 1.1. Enter the "MEASURES>>RX SIGNAL" menu. On the "RF INPUT" connector apply a signal with frequency equal to the one received and amplitude of -99dBm and adjust the VR4 variable resistor until the display shows a -99dBm value.
   - 1.2. On the "RF INPUT" connector apply a signal with frequency equal to the one received and amplitude of -40dBm and adjust the VR5 variable resistor until the display shows a -40dBm value.
   - 1.3. Repeat the points 1 and 2 many times if necessary.
   - 1.4. Vary the input signal amplitude from -50dBm to -100dBm and check that the masure error stays within +/- 2dB.

2. Adjustment of the distortion and separation according to the IF filters insertd:
   The IF filtering is normally supplied (FCX 3rd ceramic filter exclueded)in order to guarantee the best stereo separation and distortion performances.
   In case of very strong adiacent signal, a third ceramic filter can be inserted by moving the weldings on J4 and J3 jumpers. The selectivity will be better to the prejudice of the frequency separation and distortion.

TEST POINTS:

1. The TS1, TS2 TS3 and TS4 check point are used during tha adjustment in the factory.
2. TP1: 59,3MHz local oscillator check point (200-500mV RMS)
3. TP2 : 10,7MHz signal check point before the ceramic filters.
4. TP3 : Pin diode attenuator control voltage check point (o-11V)
5. TP4 : Received signal measure voltage check point (0-4V)

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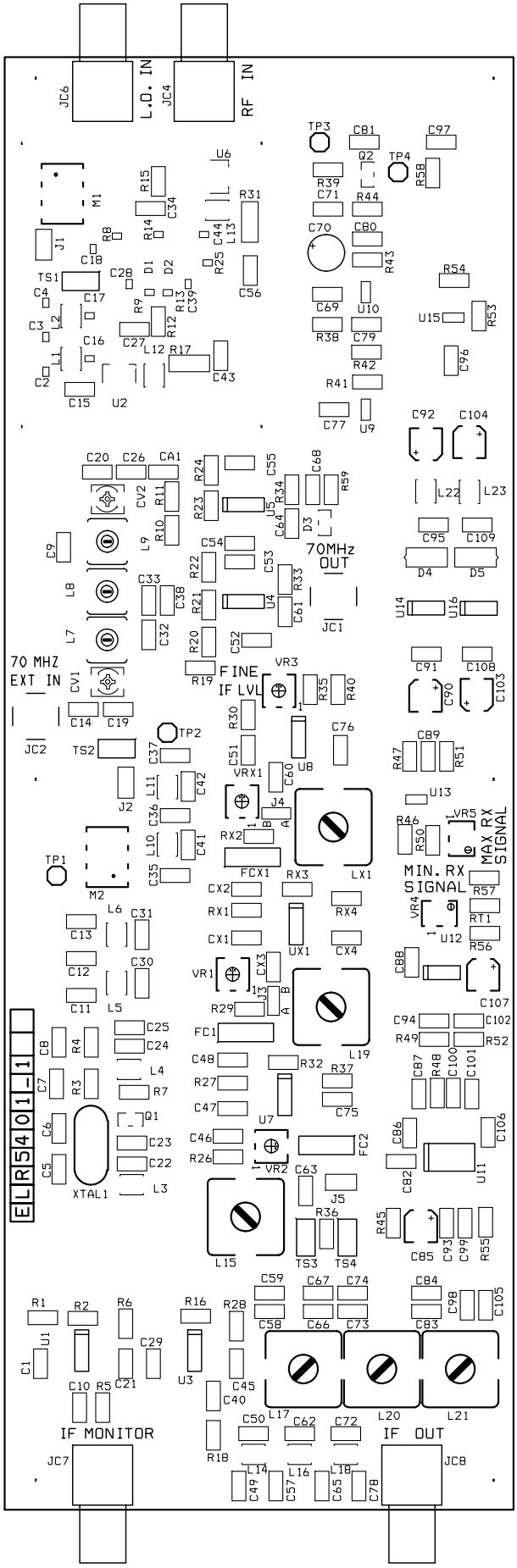
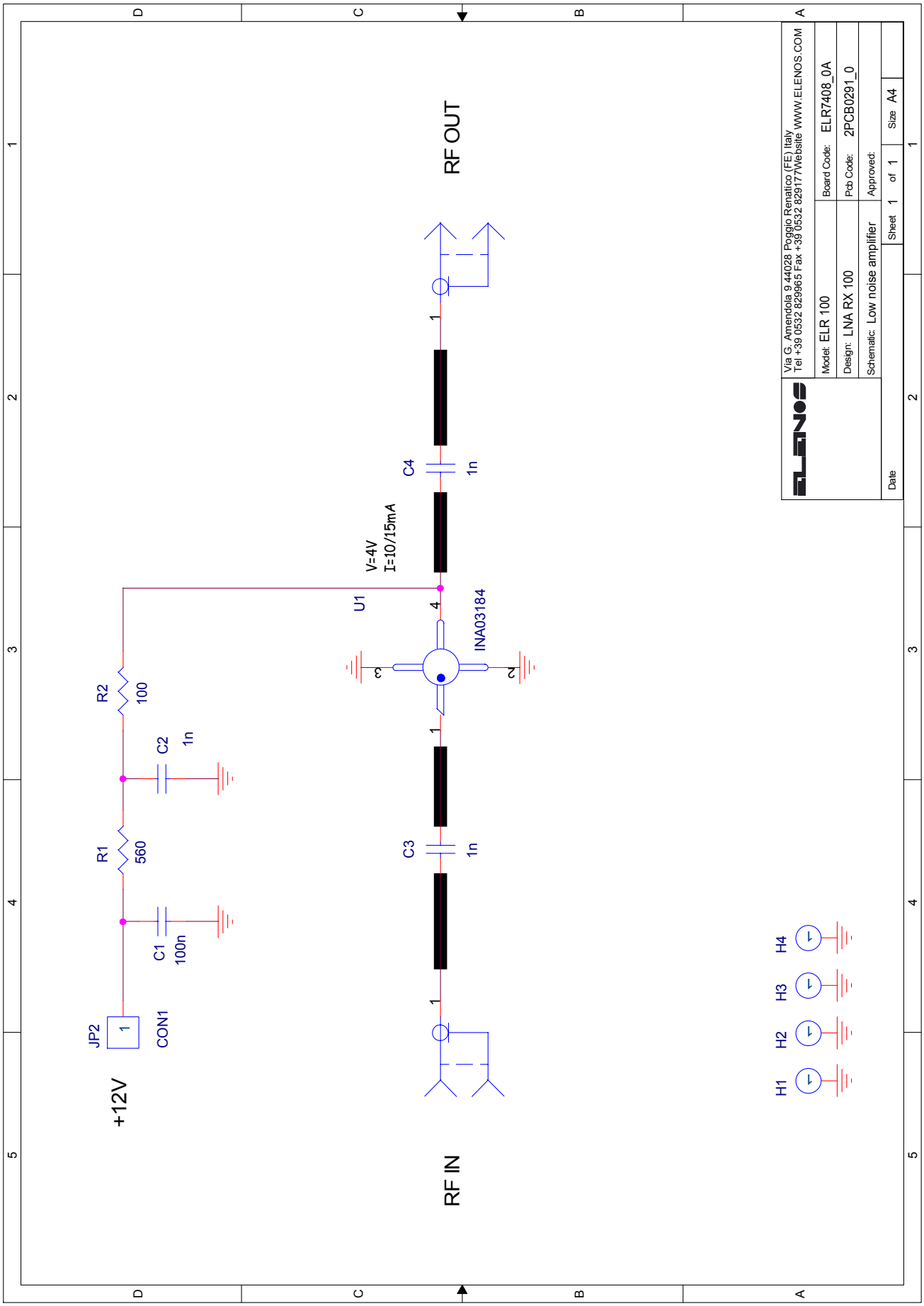

L.O. IN
RF IN
70MHz OUT
70 MHZ EXT IN
FINE IF LVL
MAX RX SIGNAL
MIN. RX SIGNAL
IF MONITOR
IF OUT
ELR5401-1



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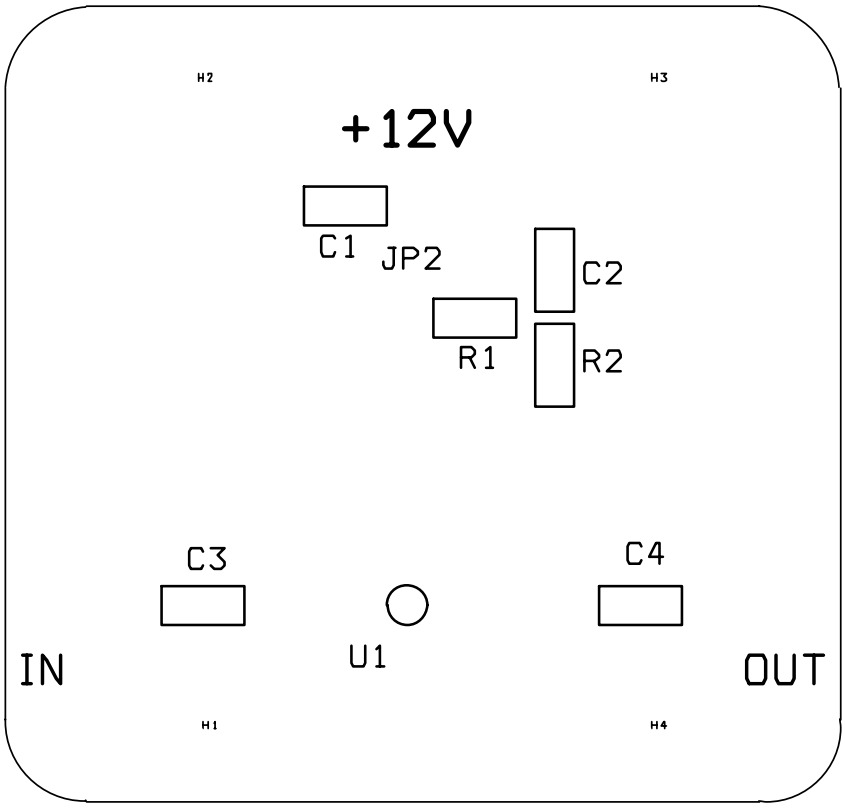
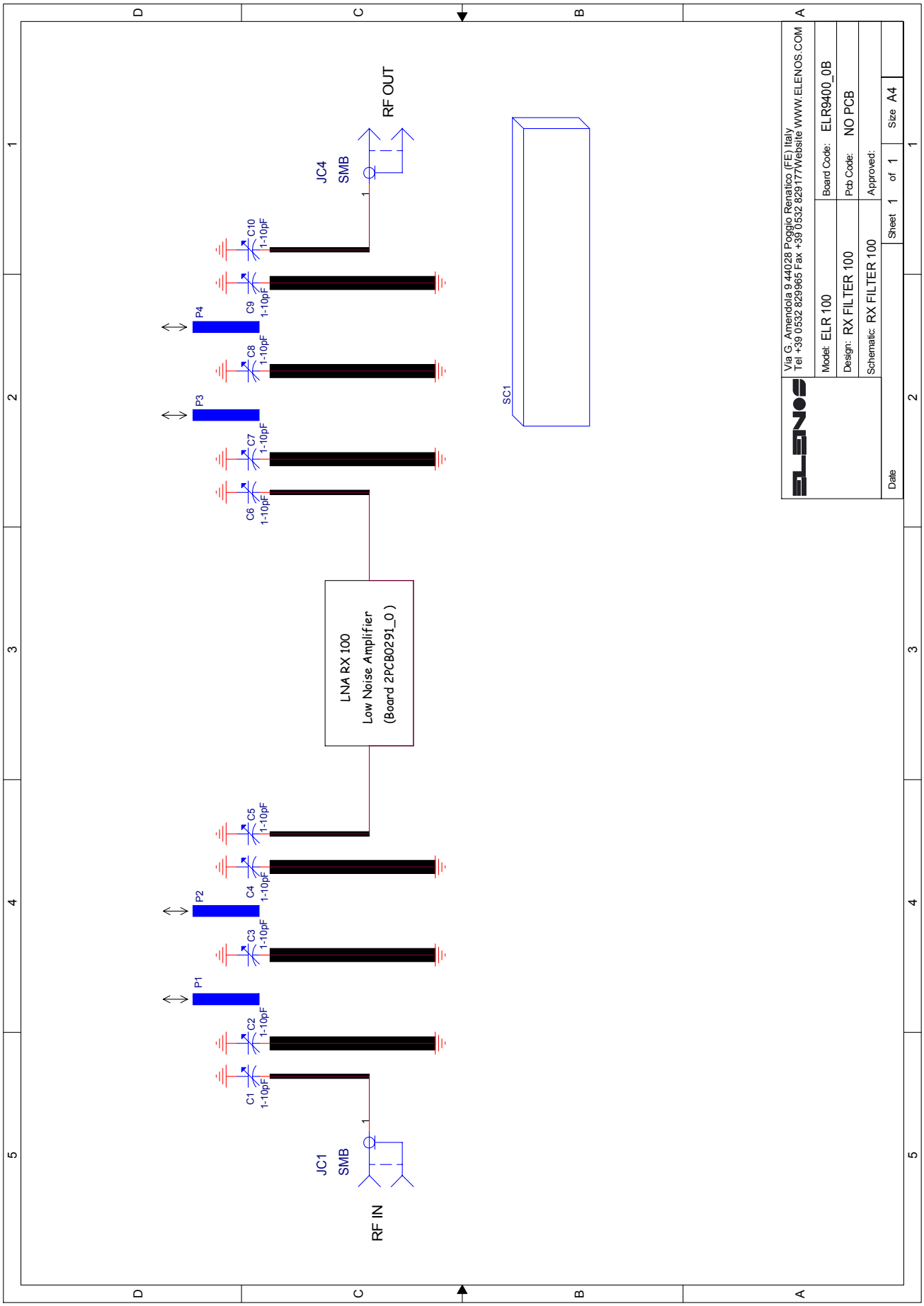

H2
H3
+12V
C1
JP2
C2
R1
R2
C3
C4
U1
IN
OUT
H1
H4



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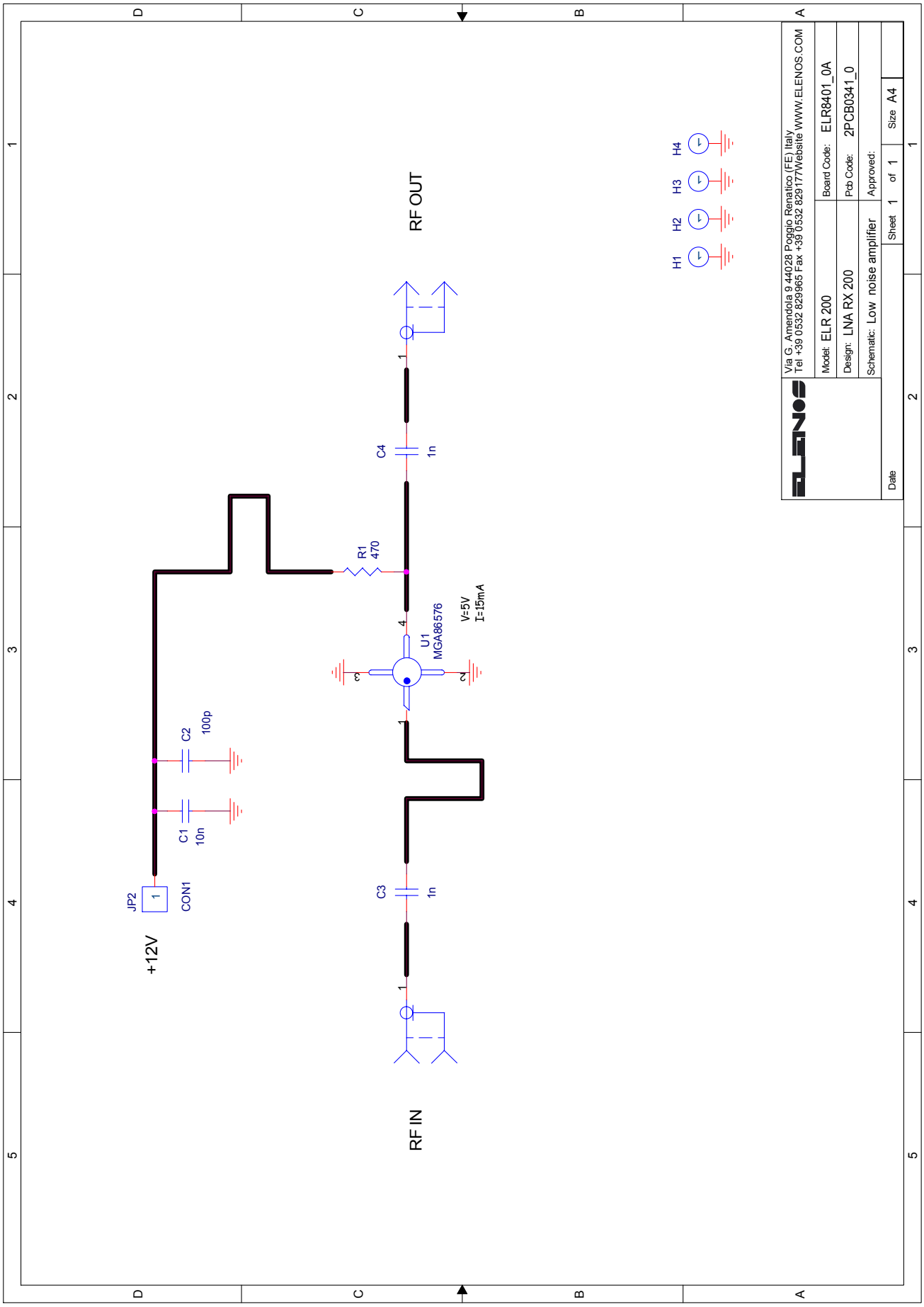
ELR100 FRONT-END Description (RX FILTER 100 & LNA RX 100 Board)
(ELR 9400 \ ELR7408_0 - 2PCB0291_0)

The FRONT-END of the receiver is made of an alluminium double input filter "Combline" and a low-noise preamplifier. The signal coming from the antenna is applied to the inut of the first three-cell filter that makes a pre-filter in order to be applied to the low-noise preamplifier input (ELR7408). After being amplified, the signal goes through the the second three-cell filter which improves the signal and assures a high rejection of the frequency image.
The front-end total gain is around 20dB and the rejection of the image frequency at 21,4MHz from the central band is better than 75 dB.
The entire front-end can be tuned without opening from 500 MHz to 1100 MHz and its bandwidth can be adjusted from around 2MHz @-1dB up to around 6MHz @-1dB according to the frequency.

ADJUSTMENTS:

1. Connect the "TRAKING GENERATOR" output of a level analyzer of -40dBm to the receiver "RF INPUT".
2. Connect the front-end output (JC4 connector)to the spectrum analyzer input and set a frequency centre equal to the frequency centre on which the filter has to be adjusted.
3. Set a " FREQUENCY SPAN " on the spectrum analyzer, so to display the current filter curve.
4. Adjust the C2,C3,C4,C7,C8 and C9 variable capacitors to tune the filter on the desired frequency; seen the high filter selctivity it is necessary to proceed with light movements not to lose the curve visibilty.
5. Adjsut the "SPAN" and the vertical scale division of the spectrum analyzer for a detailled visualization of the curve.
6. Regulates the C1, C5, C6, C10 variable capacitor to obtain the maximum simmetry and maximum gain of the curve.
7. Adjust the P1, P2, P3 and P4 pistons pushing them towards the inside or pulling them towards the outside in order to obtain the desired bandwidth.
8. Repeat the points 4, 6 and 7 many times if necessary.



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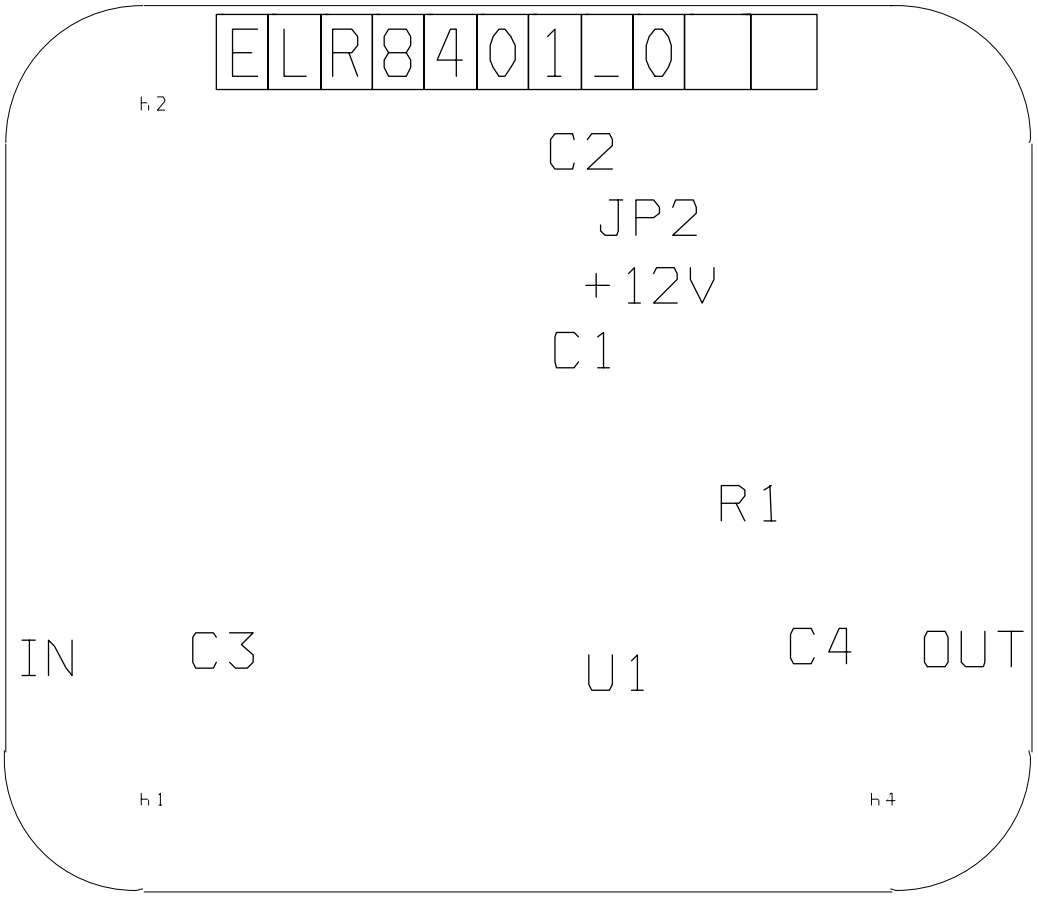
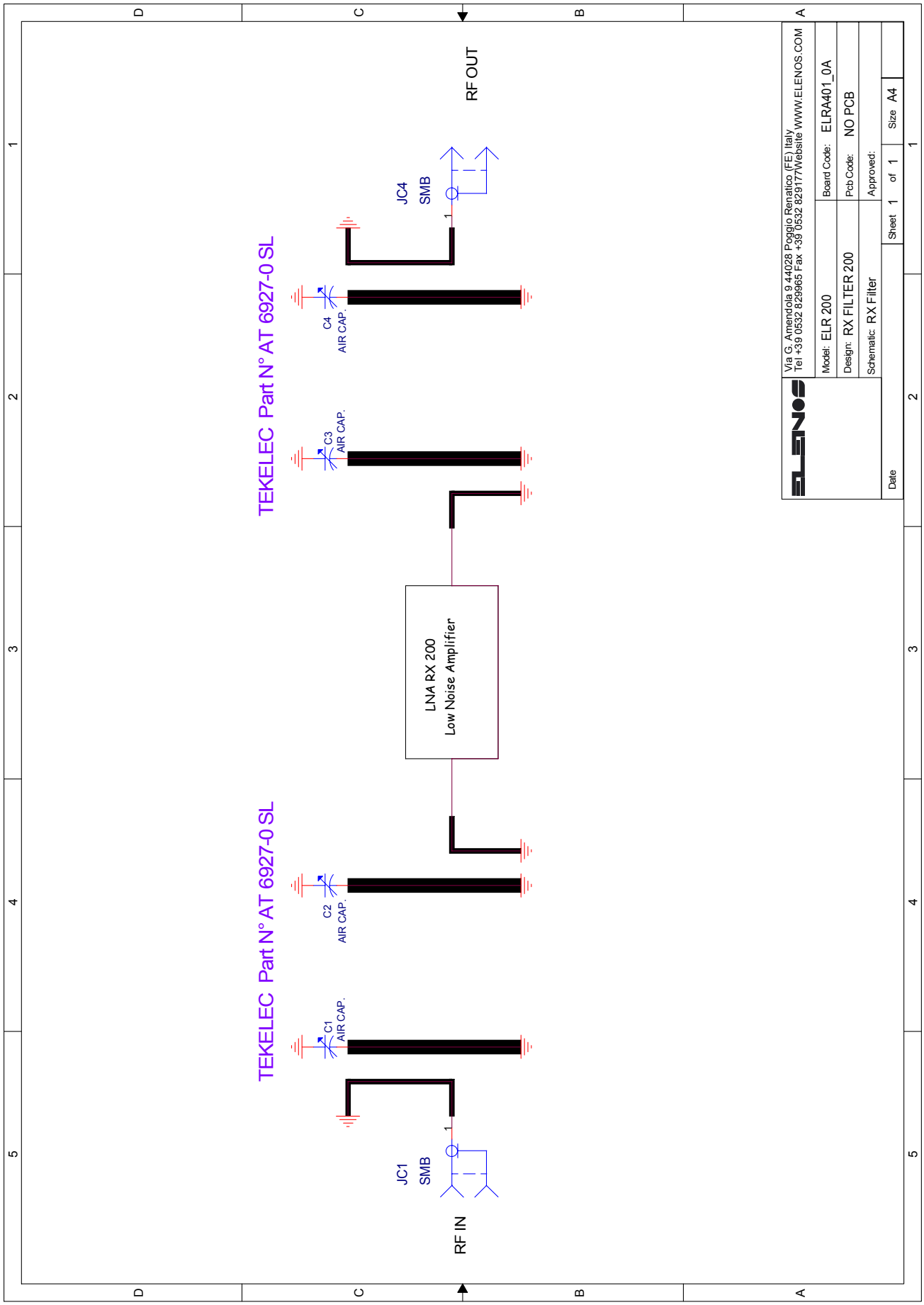

ELR8401_0
h2
C2
JP2
+12V
C1
R1
IN
C3
U1
C4
OUT
h1
h4



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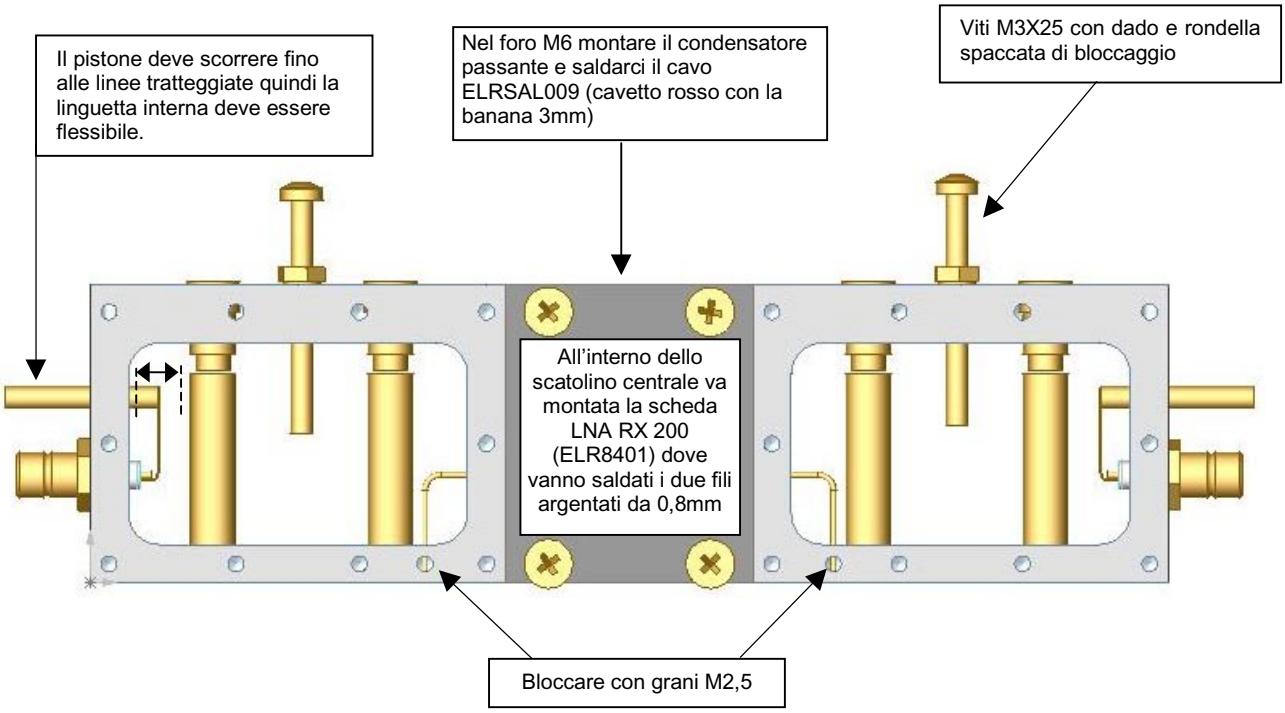
ELR200 FRONT-END (RX FILTER 200 & LNA RX 200 Board)
(ELR A401 \ ELR8401_0 - 2PCB0341_0)

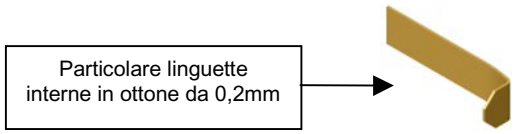
The FRONT-END of the receiver is made of an alluminium double input filter "Combline" and a low-noise preamplifier. The signal coming from the antenna is applied to the inut of the first three-cell filter that makes a pre-filter in order to be applied to the low-noise preamplifier input (ELR8401). After being amplified, the signal goes through the the second three-cell filter which improves the signal and assures a high rejection of the frequency image.
The front-end total gain is around 22dB and the rejection of the image frequency at 140MHz from the central band is better than 75 dB.
The entire front-end can be tuned without opening from 1500 MHz to 2500 MHz and its bandwidth can be adjusted from around 4MHz @-1dB up to around 20MHz @-1dB according to the frequency.

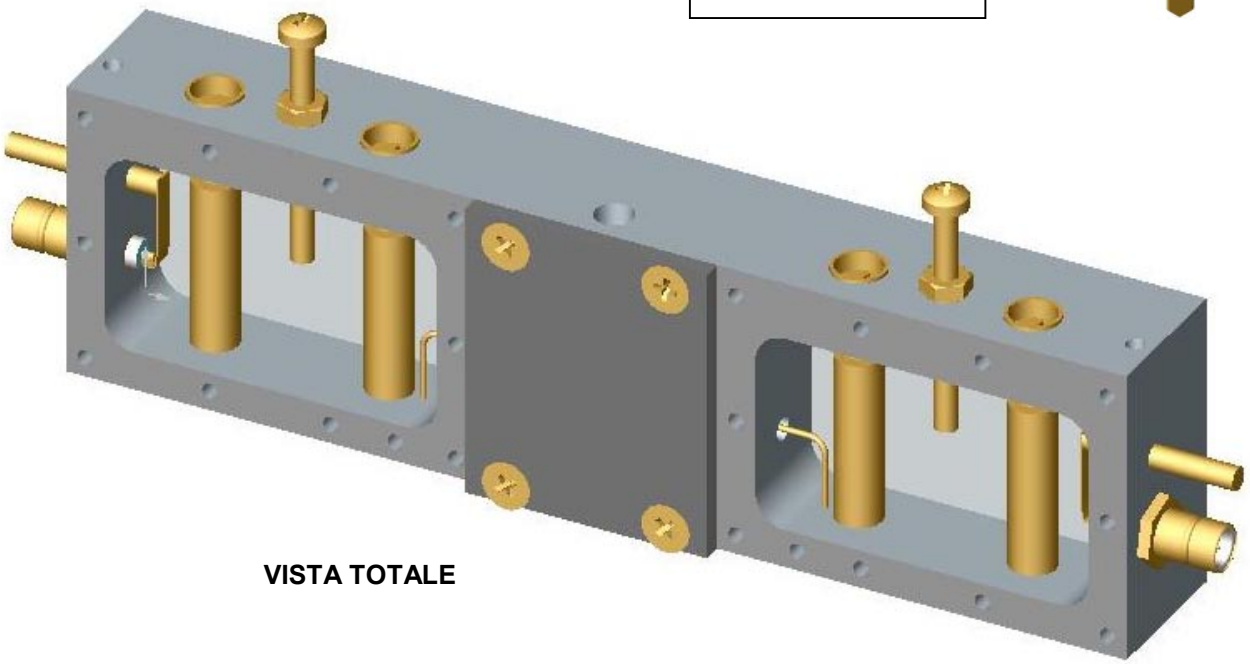
ADJUSTMENTS:

1. Connect the "TRAKING GENERATOR" output of a level analyzer of -40dBm to the receiver "RF INPUT".
2. Connect the front-end output (JC4 connector)to the spectrum analyzer input and set a frequency centre equal to the frequency centre on which the filter has to be adjusted.
3. Set a " FREQUENCY SPAN " on the spectrum analyzer, so to display the current filter curve.
4. Adjust the C1, C2,C3,C4,C7and C8 variable capacitors to tune the filter on the desired frequency; seen the high filter selctivity it is necessary to proceed with light movements not to lose the curve visibilty.
5. Adjsut the "SPAN" and the vertical scale division of the spectrum analyzer for a detailled visualization of the curve.
6. Adjust the pistons pushing them towards the inside or pulling them towards the outside in order to obtain the desired bandwidth.
7. Repeat the points 4 and 6 many times if necessary.

PARTICOLARI DI MONTAGGIO DEL FILTRO RX 200.







VISTA TOTALE

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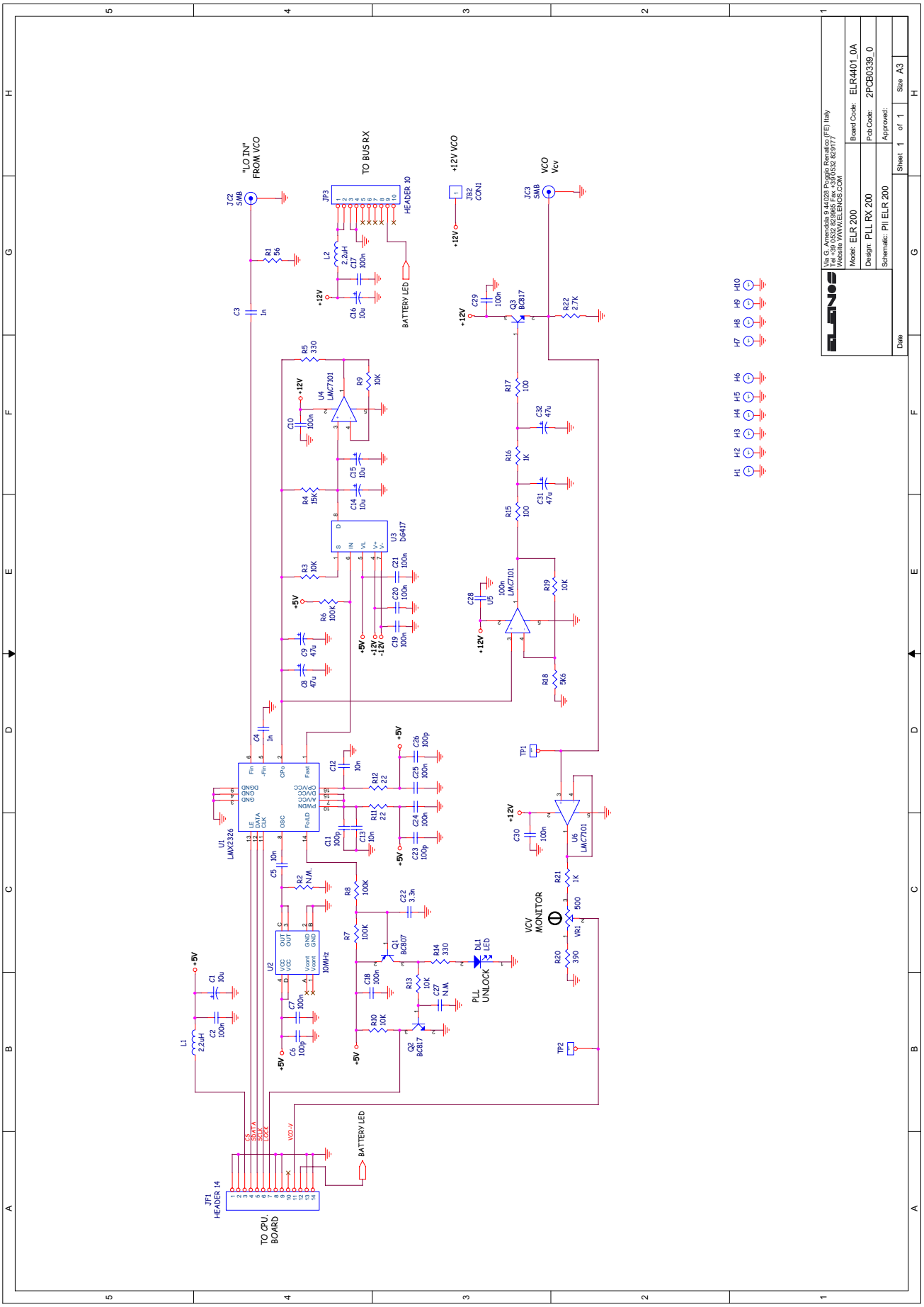
"LO IN" FROM VCO
TO BUS RX
+12V VCO
VCO Vcv
BATTERY LED
PLL UNLOCK
VCV MONITOR
TO CPU BOARD
Via G. Amendola 9 44028 Poggio Renatico (FE) Italy
Tel +39 0532 829965 Fax +39 0532 829177
Website WWW.ELENOS.COM
Model: ELR 200
Design: PLL RX 200
Schematic: PII ELR 200
Board Code: ELR4401_0A
Pcb Code: 2PCB0339_0
Approved:
Sheet 1 of 1
Size A3
Date

PLL RX 200 Board description
(ELR4401_0 - 2PCB0339_0)

The PLL RX 200 Board containsthe PLL and its connected circuits. On the PCB is the aluminium box containing the various VCOs whose frequency is controlled by the PLL.
The VCO munted on the PLL RX 200 board varies according to the equipment:

1. ELR 200B Frequency 2300-2500MHz :VCO 2500 (ELTR1400_0 - 2PCB0335_0)
2. ELR 200A Frequency 1500-1800 MHz :VCO 1600 (ELTR2401_0 - 2PCB0336_0) Other VCOs on different frequencies can be mounted on the PLL RX 200.

The integrated circuit U1 comprehends the frequancy synthesizer that is controlled by the CPU. The auxiliary VCO output is brought on the board, through the JC2 connector; this frequency is divided by the dividers programmable inside the PLL and locked in phase to the reference frequency obtianed dividing the TCXO by 10MHz U2. The phase comaprator output of U1 (pin 2) enters the ring filter that produces the continuous voltage needed to bring the VCO in frequency.
The ring filter is of the double bandwith kind, controlled by software; in phase of lock of through the pin 1 of U1, it ischanged over on the maximum bandwidth in order to have a quick locking. As the PLL islocked, the filter is changed over the mimimum bandwidth for good. This method assures a phase noise reduction caused by the PLL, and in the modulator a flat response on the low modulating frequency down to 4 Hz.
The DL1 led indicates the PLL locking stage, whilst U6 buffers the VCO control voltage to send it to the CPU which will dispaly it.

ADJUSTMENTS:

1. The synthesizer has only one adjustment point made of the VR variable resistor, which regulates the readings of the VCO control voltage value on the "SETUP>>FREQUENCY" menu.
   Variable resistors adjustment:

   1.1. Enter the "SETUP>>FREQUENCY" menu
   1.2. Connect trhe voltmeter on TP1 test point
   1.3. Set a frequency until 10,0V is red on the voltmeter.
   1.4. Adjust the VR1 variable resistor until an indication of 10V appears on the "VCO Voltage" bar.
   1.5. Set a frequency 10MHz higher and check that the writing "OUT OF RANGE" alights.
   1.6. Reset the desired frequency inside the VCO range.

TEST POINTS:

1. On the TP1 test point the VCO (Vcv) control voltage can be measured between 0,5V and 10V.
2. On the TP2 test point is the Vcv valu measurement voltage between 0 and 4V.

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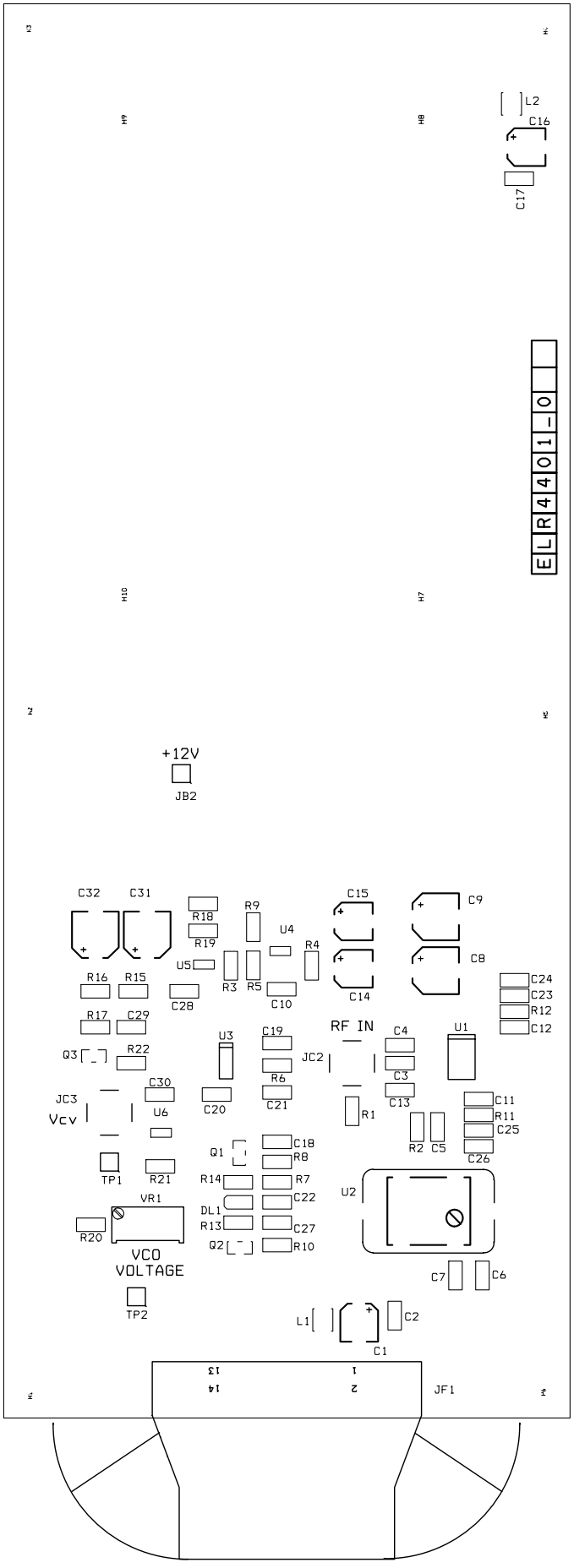
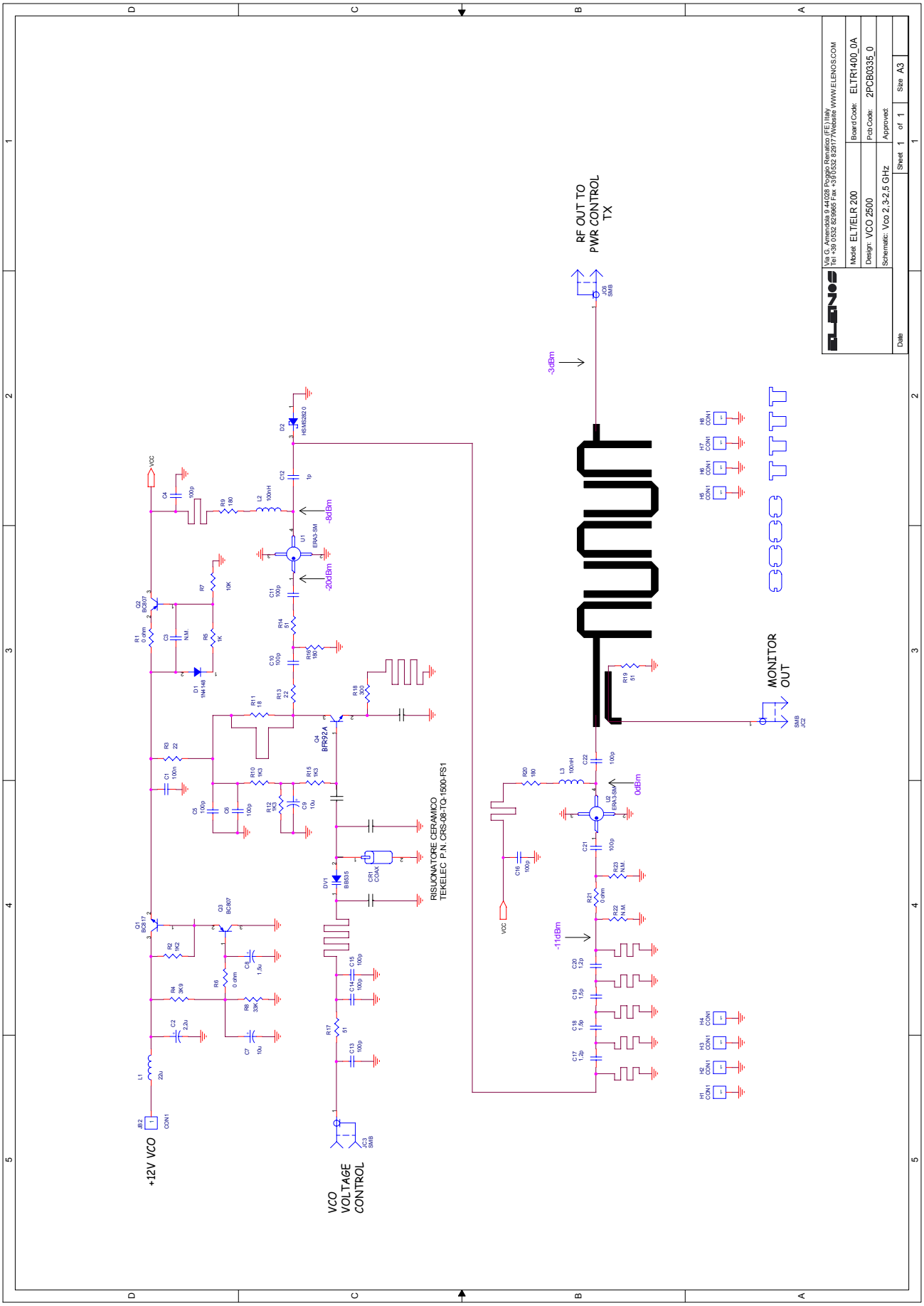

L2
C16
C17
EL R 4401_0
+12V
JB2
C32
C31
R18
R19
R9
U4
R4
U5
R3
R5
C15
C14
C9
C8
C24
C23
R12
C12
R16
R15
C28
C10
R17
C29
Q3
R22
U3
C19
R6
C20
C21
JC3
Vcv
C30
U6
RF IN
JC2
C4
C3
C13
U1
R1
C11
R11
C25
C26
R2
C5
TP1
R21
Q1
C18
R8
R14
R7
C22
DL1
R13
C27
Q2
R10
VR1
R20
VCO
VOLTAGE
TP2
U2
C7
C6
L1
C2
C1
JF1
13
14
1
2



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VCO 2500 Board Description
(ELTR1400_0 - 2PCB0335_0)

The VCO board is mounted inside the ELT-200B transmittersa and ELR-200B receivers.
This board is made of two PCBs inside a small alluminium box to assure its shielding. In all transmitters, inside this box is also the power control circuit (PWR CONTROL TX). All alluminium boxes are fixed to the PCB underneath them with antivibration rubber rings to reduce the VCO microphone effect.

The first PCB of the VCO 2500 (A part) contains the voltage controlled oscillator that oscillating at a frequency that is half the output frequncy, the frequency duplicator and a high-pass filter. On the second part of the PCB (B part) is an "Hairpin" band-pass filter, realized on special material for low-losses microwaves.

The oscillator circuit is made of the Q4 transistor, of a CR1 coaxial resonator, of a varicap DV1 and capacitors realized in "distributed constants" technology. It oscillates in 1150-1250MHz frequancy range. The oscillator is followed by the first amplifier stage U1, and then a D2 diode, a high-pass filter and the U2 amplifier that form the frequancy duplicator.

At its output is the oscillator second harmonic, it's alrady pre-filtered. The Hairpin band-pass filter, with passing band 2250-2550, is inside a totally shielded cavity. Its use is to clean the carrier from the sub-harmonic and harmonic products. At the input of this filter, the JC2 connector takes a portion of signal and lead it to the PLL. The VCO output signal is available on JC6 connector. All VCO circuits are supplied by active filters that have to minimize the power supply line noise.

ADJUSTMENTS:

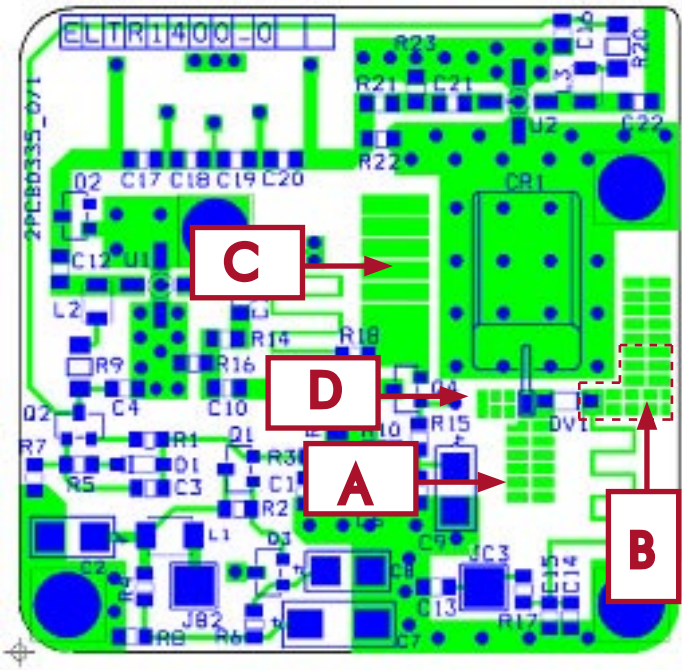
The VCO is normally supplied on the required frequency and can cover a band of 25-30MHz thereabouts without need of adjustments. It is possible to move this band inside the 2350-2500 MHZ range without replacing or adding components. Only in case the VCO is set at the most high frequencies of its range, it could be necessary to replace the CR1 resonator with one at a lower frequency.

Information for moving the operating band:

1) The pad A and B determine the VCO operating band. In particular the A pads determine the frequency, and the B pads determine the frequency excurtion (range).

2) To decrease frequency it is necessary to de-solder some of the A pads disconnecting them from the central CR1 and then soldering or desoldering some B pads to adjust the frequency excurtion. As the two parameters are partly independent it is necessary to repeat the operations more than once to reach the desired setting. To prevent malfunctions it is better not to solder B pads farther the indicated outline.

3) On the contrary, to raise in frequency, it is necessary to solder some of the A pads connecting them to the CR1 central and act soldering or de-soldering some of the B pads to adjust the frequency excurtion. As these two parametrs are partly independent it is necessary to repeat the operation a few times before reaching the desired setting. To prevent malfunctions it is better not to solder B pads farther the indicated outline.



4) During the operation of modify of the operating band, keep in mind that:

a) The C pads are the positive reaction capacitor; if the capacitor is too big (too many pads to solder together to the R19 pin) the oscillator phase noise increases, whilst if the capacitor is too small (few pads soldered together with R19 pin) the reaction could not be enough to strike the oscillation.
b) The D pads determine the combining between the CR1 resonator and the Q4 transistor base; too many pads soldered to CR1 pin make the oscillator phase noise worse, whilst too less pads soldered to CR1 pin could make the oscillation stop.
c) To make the oscillator raise in frequency, further to the A pads, one can intervene also on the CR1 taking off by scratch small parts of the external metallization.

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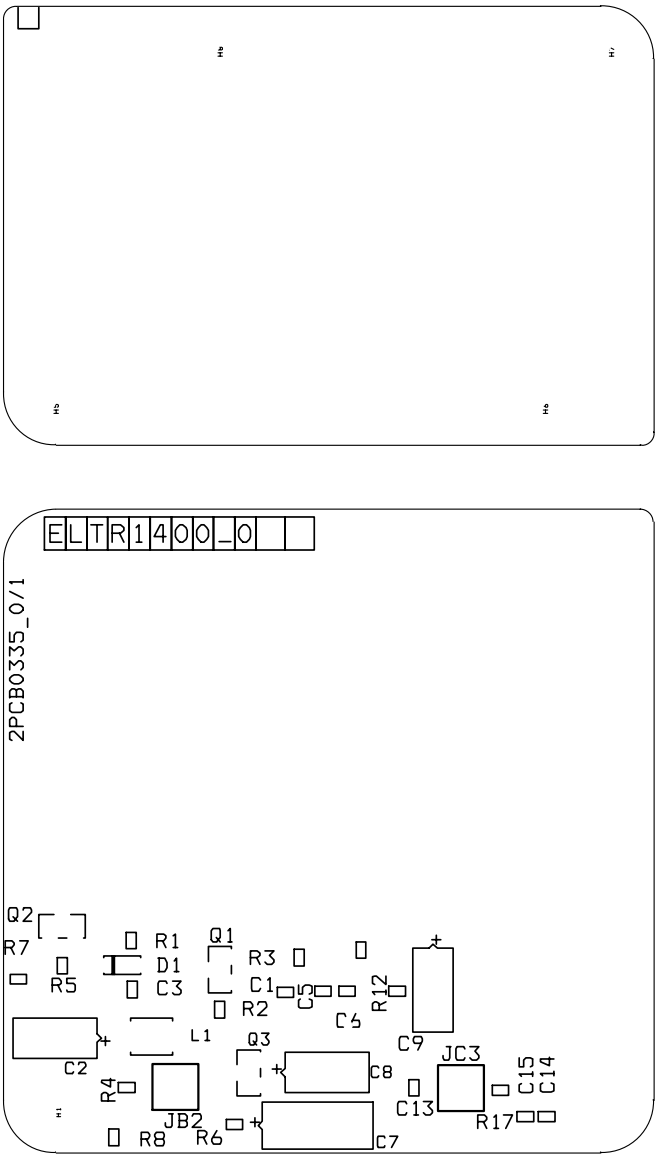
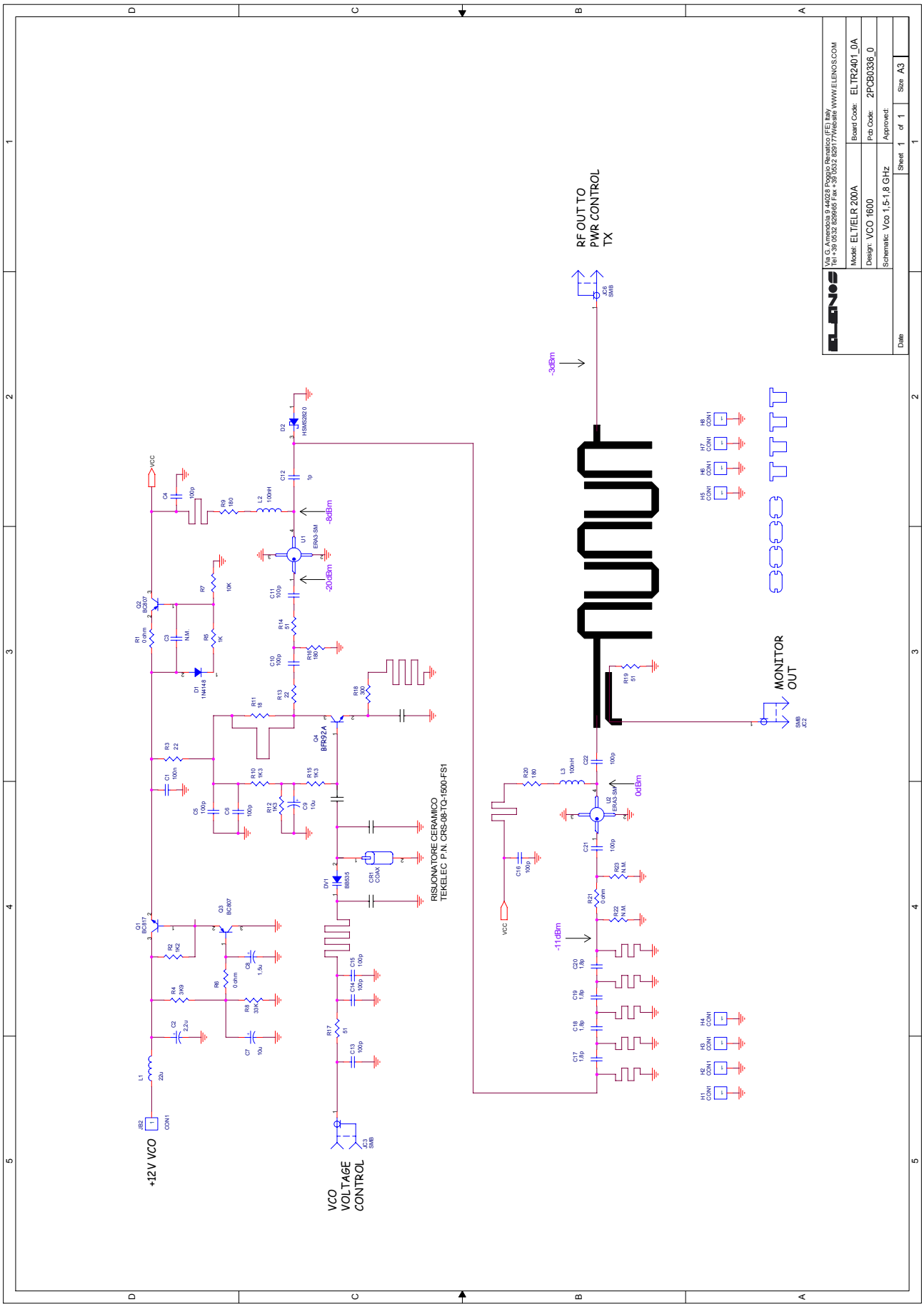

ELTR1400_0
2PCB0335_0/1
Q2
R7
R5
R1
D1
C3
Q1
R3
C1
R2
C5
C6
R12
C9
JC3
C15
C14
L1
Q3
C8
C13
R17
C2
R4
JB2
R8
R6
C7



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VCO 1600 Board Description
(ELTR2401_0 - 2PCB0336_0)

The VCO board is mounted inside the ELT-200A transmittersa and ELR-200A receivers.

This board is made of two PCBs inside a small alluminium box to assure its shielding. In all transmitters, inside this box is also the power control circuit (PWR CONTROL TX). All alluminium boxes are fixed to the PCB underneath them with antivibration rubber rings to reduce the VCO microphone effect.

The first PCB of the VCO 1600 (A part) contains the voltage controlled oscillator that oscillating at a frequency that is half the output frequncy, the frequency duplicator and a high-pass filter. On the second part of the PCB (B part) is an "Hairpin" band-pass filter, realized on special material for low-losses microwaves.

The oscillator circuit is made of the Q4 transistor, of a CR1 coaxial resonator, of a varicap DV1 and capacitors realized in "distributed constants" technology. It oscillates in 750-900MHz frequancy range. The oscillator is followed by the first amplifier stage U1, and then a D2 diode, a high-pass filter and the U2 amplifier that form the frequancy duplicator.
At its output is the oscillator second harmonic, it's alrady pre-filtered. The Hairpin band-pass filter, with passing band 1500-1800, is inside a totally shielded cavity. Its use is to clean the carrier from the sub-harmonic and harmonic products. At the input of this filter, the JC2 connector takes a portion of signal and lead it to the PLL. The VCO output signal is available on JC6 connector. All VCO circuits are supplied by active filters that have to minimize the power supply line noise.

ADJUSTMENTS:

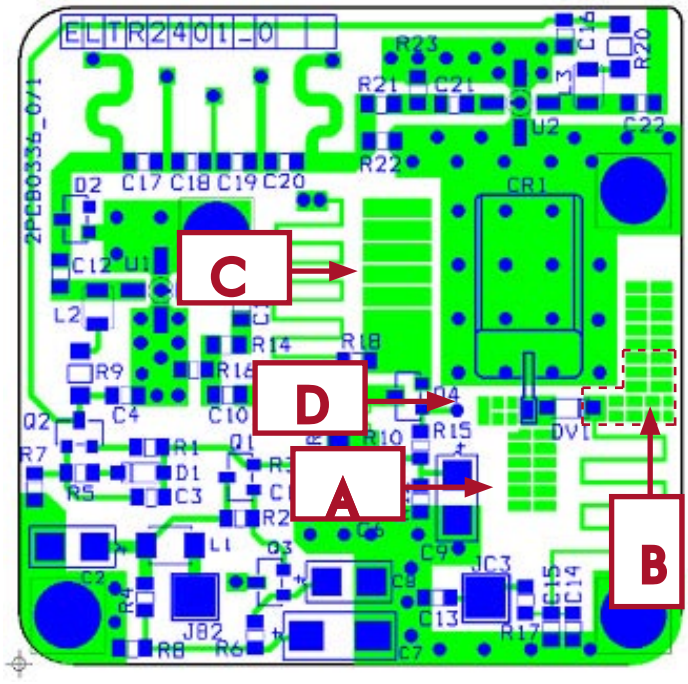
The VCO is normally supplied on the required frequency and can cover a band of 25-30MHz thereabouts without need of adjustments. It is possible to move this band inside the 1500-1800 MHZ range without replacing or adding components. Only in case the VCO is set at the most high frequencies of its range, it could be necessary to replace the CR1 resonator with one at a lower frequency.

Information for moving the operating band:

1) The pad A and B determine the VCO operating band. In particular the A pads determine the frequency, and the B pads determine the frequency excurtion (range).

2) To decrease frequency it is necessary to de-solder some of the A pads disconnecting them from the central CR1 and then soldering or desoldering some B pads to adjust the frequency excurtion. As the two parameters are partly independent it is necessary to repeat the operations more than once to reach the desired setting. To prevent malfunctions it is better not to solder B pads farther the indicated outline.

3) On the contrary, to raise in frequency, it is necessary to solder some of the A pads connecting them to the CR1 central and act soldering or de-soldering some of the B pads to adjust the frequency excurtion. As these two parametrs are partly independent it is necessary to repeat the operation a few times before reaching the desired setting. To prevent malfunctions it is better not to solder B pads farther the indicated outline.



4) During the operation of modify of the operating band, keep in mind that:

a) The C pads are the positive reaction capacitor; if the capacitor is too big (too many pads to solder together to the R19 pin) the oscillator phase noise increases, whilst if the capacitor is too small (few pads soldered together with R19 pin) the reaction could not be enough to strike the oscillation.
b) The D pads determine the combining between the CR1 resonator and the Q4 transistor base; too many pads soldered to CR1 pin make the oscillator phase noise worse, whilst too less pads soldered to CR1 pin could make the oscillation stop.
c) To make the oscillator raise in frequency, further to the A pads, one can intervene also on the CR1 taking off by scratch small parts of the external metallization.

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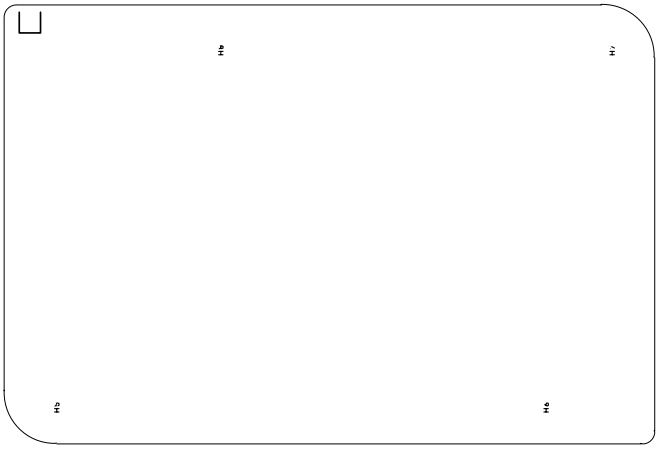
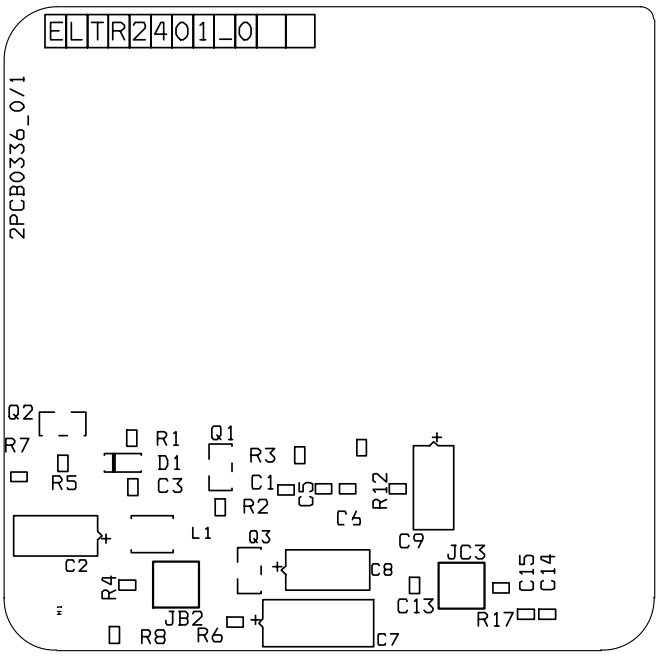
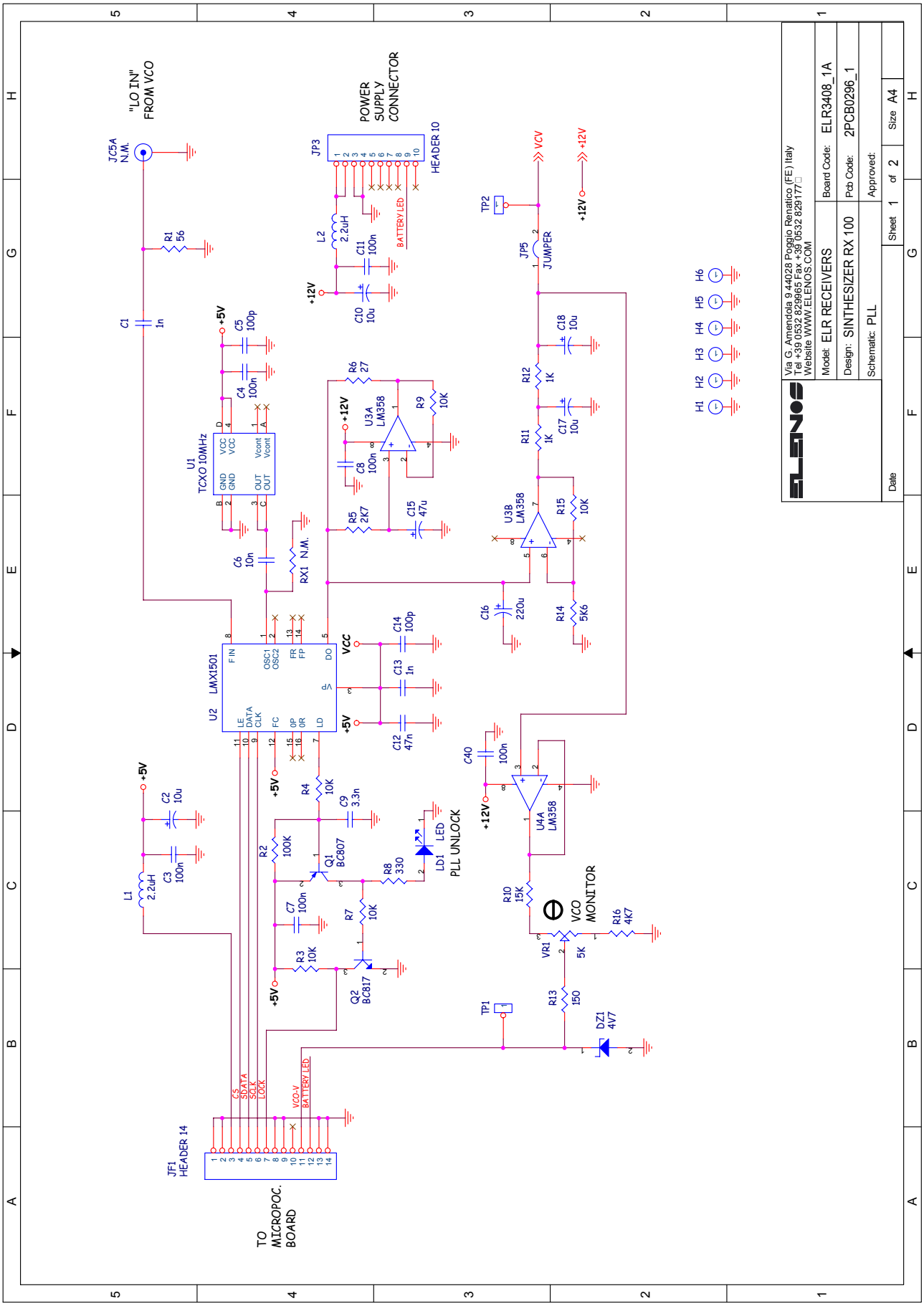



ELTR2401_0
2PCB0336_0/1
Q2
R7
R1
D1
C3
Q1
R3
C1
R2
C5
C6
R12
C9
R5
L1
Q3
C2
R4
JB2
R8
R6
C8
C7
JC3
C13
R17
C15
C14



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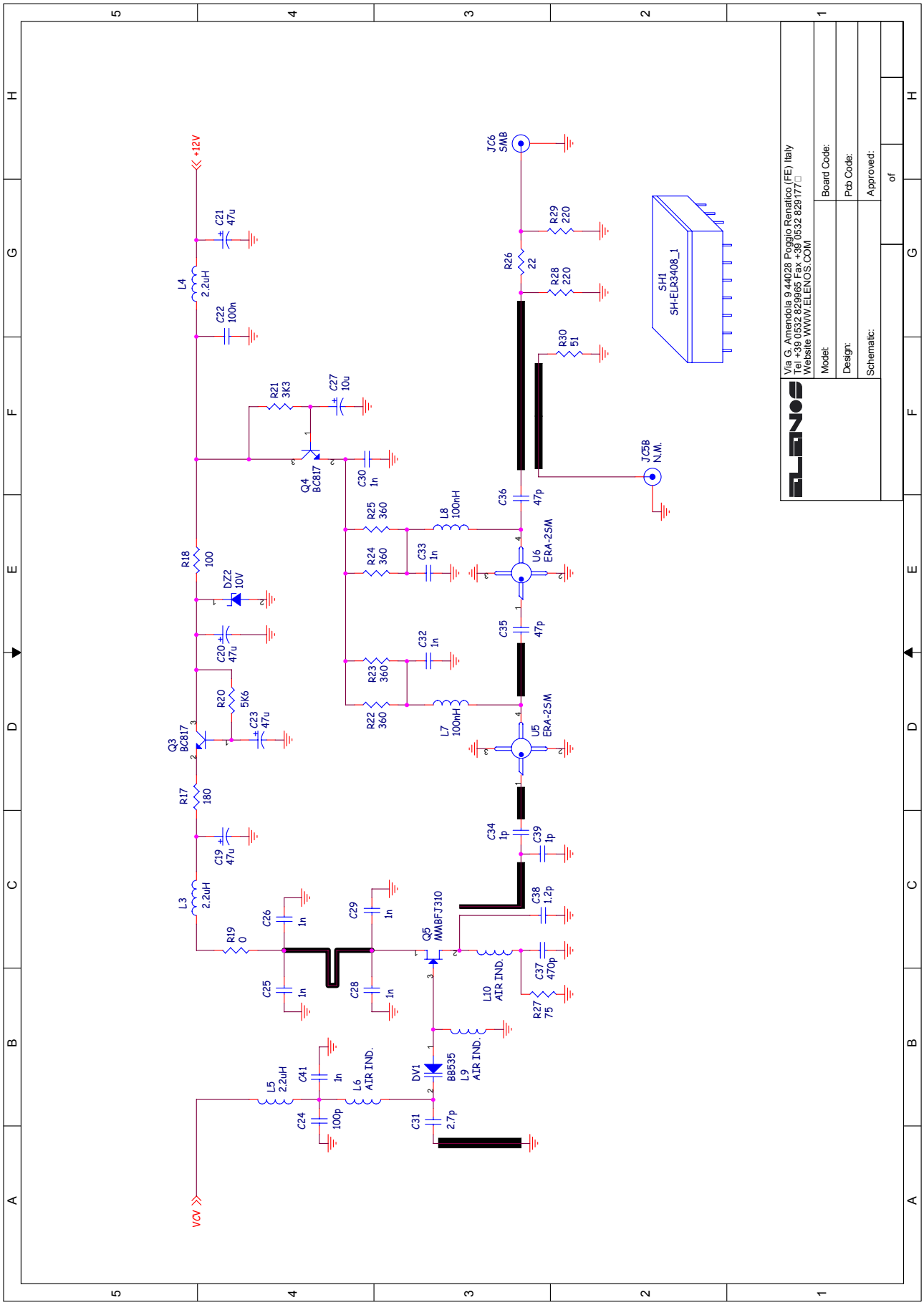
+12V
VCV
JC6 SMB
JC5B N.M.
SH1 SH-ELR3408_1
C21 47u
L4 2.2uH
C22 100n
R21 3K3
C27 10u
Q4 BC817
C30 1n
R18 100
DZ2 10V
C20 47u
R20 5K6
C23 47u
Q3 BC817
R17 180
C19 47u
L3 2.2uH
R19 0
C26 1n
C29 1n
C25 1n
C28 1n
L5 2.2uH
C41 1n
L6 AIR IND.
C24 100p
DV1 BB535
C31 2.7p
L9 AIR IND.
Q5 MMBFJ310
L10 AIR IND.
C37 470p
R27 75
C38 1.2p
C34 1p
C39 1p
U5 ERA-2SM
U6 ERA-2SM
R22 360
R23 360
C32 1n
L7 100nH
R24 360
R25 360
C33 1n
L8 100nH
C36 47p
C35 47p
R26 22
R28 220
R29 220
R30 51
Via G. Amendola 9 44028 Poggio Renatico (FE) Italy
Tel +39 0532 829965 Fax +39 0532 829177
Website WWW.ELENOS.COM
Model:
Board Code:
Design:
Pcb Code:
Schematic:
Approved:
of

SINTHESIZER RX 100 Board Description
(ELR3408_1 - 2PCB0296_1)

This board, installed on the ELR100 receivers, contains the VCO (that functions as 1st local oscillator of the receiver), the frequency synthesizer and the frequency reference (TCXO).
The VCO, inside a metallic box in order to prevent its shielding, uses the Q5 fet as oscillator and the resonant circuit is made by a DV1 varicap diode, by a C31 capacitor and by a microstrip technology inductance. On JC6 connector is the local oscillator output with a 7dBm level whilst on JC5B connector is the PLL signal.
The U2 integrated circuit is the frequency synthesizer controlled by the CPU; the pahse comaprator output of U2 (pin 5) enters into the ring filter producing a continuous voltage necessary to bring the VCO in frequency.
The synthesizer frequency reference is made of the TCXO U1.

ADJUSTMENTS:

2. The VCO is supplied already adjusted on the desired frequancy with a frequency excursion of 40 MHz approx. In case the operating frequency has to be changed of some tens of MHz, it is enough to move the microstripline shortcircuit bridge; to raisethe frequency, solder the shortcircuit pads toward C31, whilst to decrease the frequency, desolder the pads.
3. The synthesizer has only one adjustment point that is the VR1 variable resistor, that regulates the VCO control voltage value reading on the "SETUP>>FREQUENCY" menu. The VR1 adjustment is made in the factory and it is recommended not to change it.

TEST POINTS:

3. On the TP2 test point is the VCO (Vcv) control voltage can be measured between 0,5V and 10,5V.
4. On the TP1 test point is the Vcv value measurement voltage between 0 and 4V.

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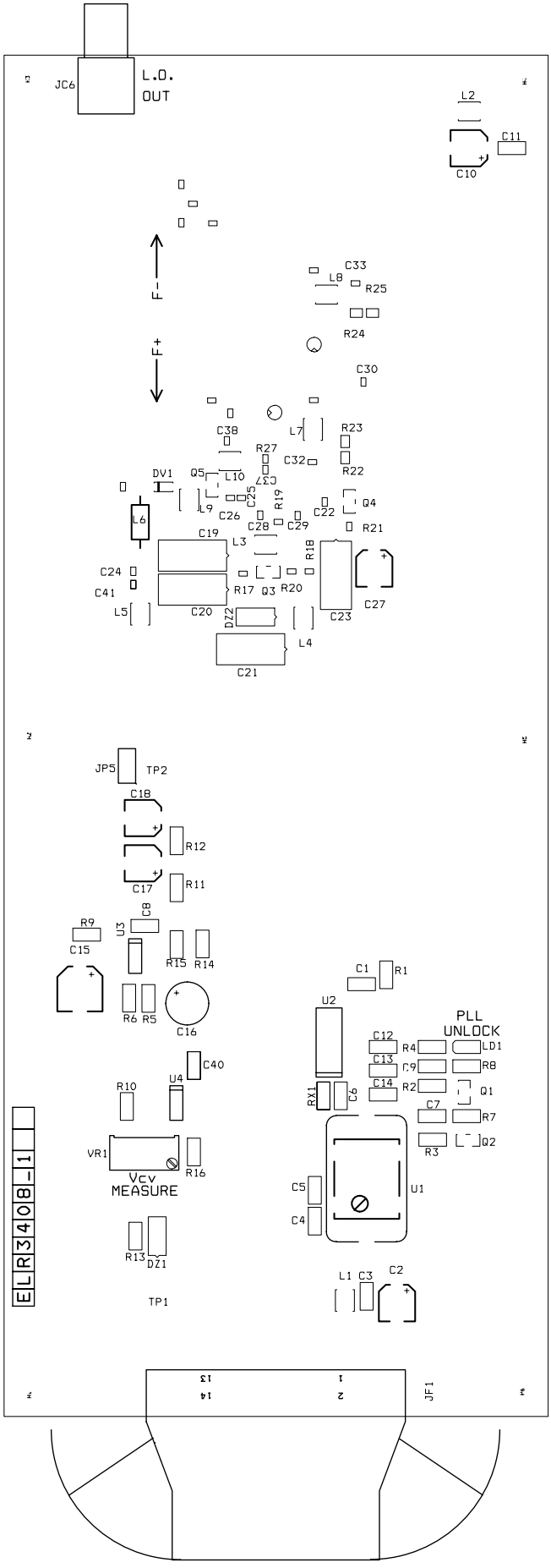
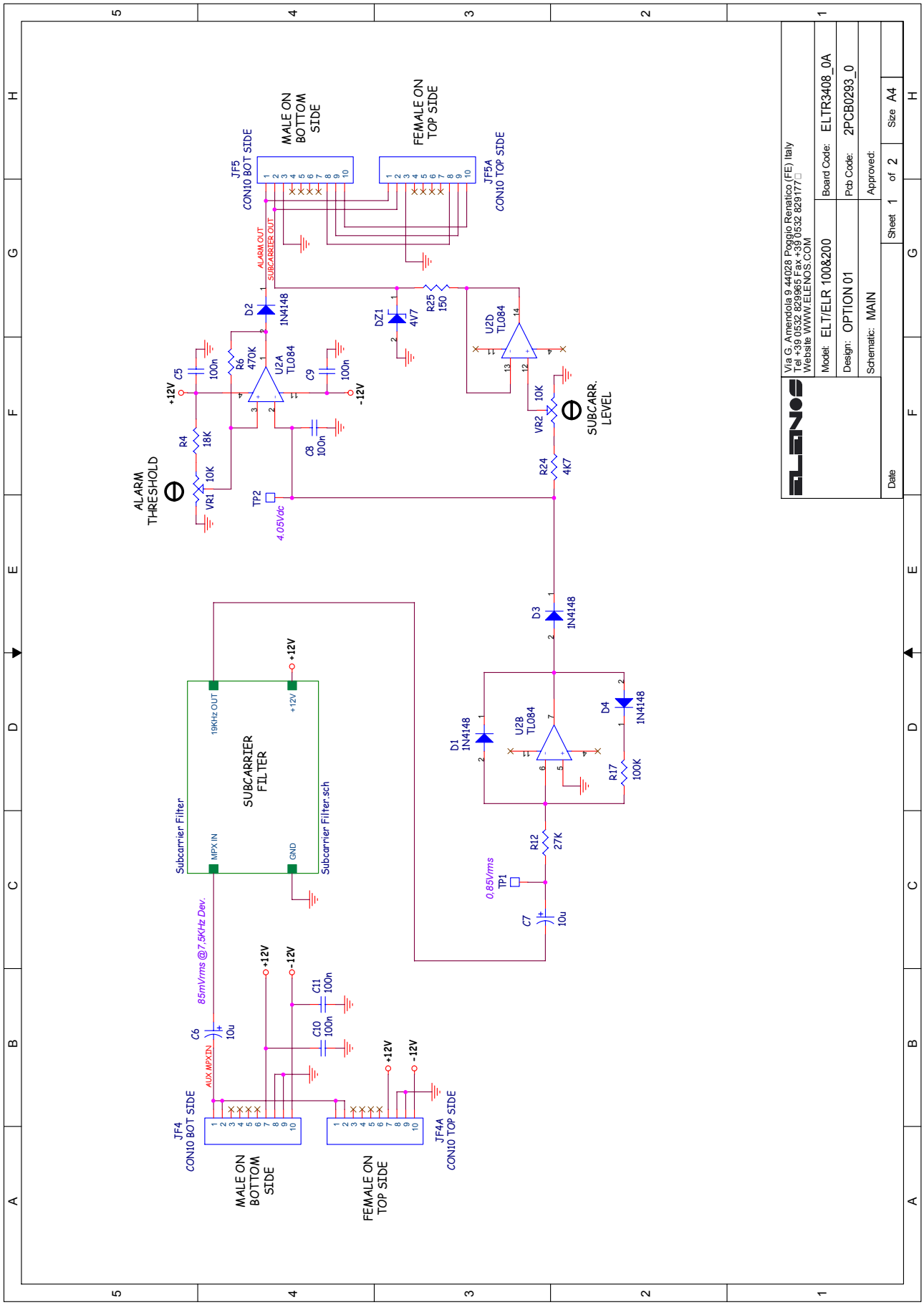

JC6
L.O.
OUT
L2
C11
C10
F-
F+
C33
L8
R25
R24
C30
C38
L7
R23
R27
C32
R22
DV1
Q5
L10
C37
C25
R19
L9
C26
C28
C29
C22
Q4
R21
L6
C19
L3
R18
C24
C41
R17
Q3
R20
C27
L5
C20
DZ2
C23
L4
C21
JP5
TP2
C18
R12
C17
R11
C8
R9
U3
C15
R15
R14
R6
R5
C16
C40
U4
R10
VR1
R16
Vcv
MEASURE
R13
DZ1
TP1
EL R3408_1
C1
R1
U2
PLL
UNLOCK
C12
R4
LD1
C13
R9
R8
C14
R2
Q1
RX1
C6
C7
R7
R3
Q2
C5
U1
C4
L1
C3
C2
JF1



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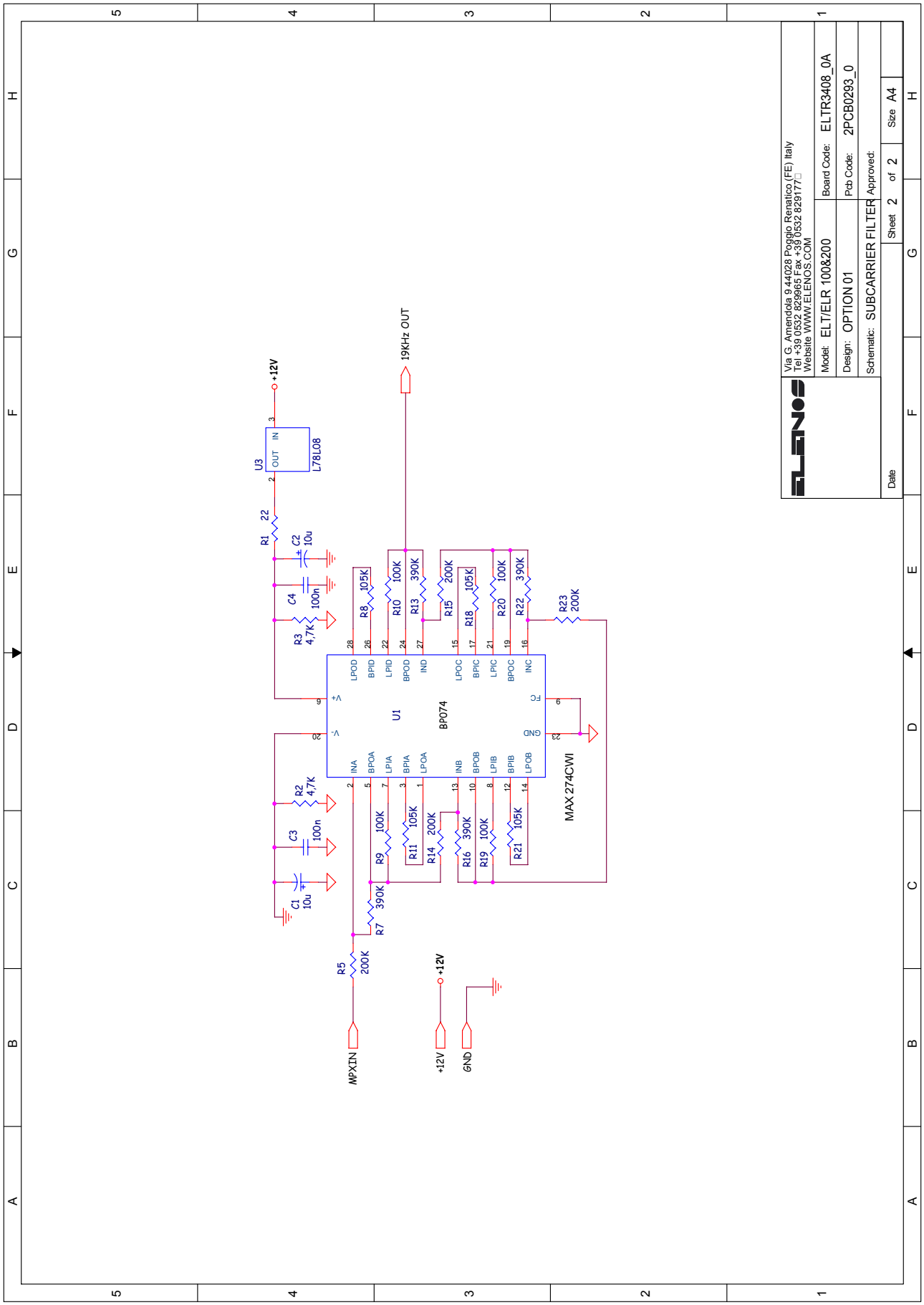
Via G. Amendola 9 44028 Poggio Renatico (FE) Italy
Tel +39 0532 829965 Fax +39 0532 829177
Website WWW.ELENOS.COM
Model: ELT/ELR 100&200
Board Code: ELTR3408_0A
Design: OPTION 01
Pcb Code: 2PCB0293_0
Schematic: SUBCARRIER FILTER
Approved:
Sheet 2 of 2
Size A4
Date
+12V
19KHz OUT
U3
L78L08
U1
BP074
MAX274CWI
MPXIN
GND

19KHz subcarrier alarm/measure (OPTIONAL) Board description (ELTR3408_0 - 2PCB0293_0)

This board is an exclusive function of Elenos links: the 19KHz MPX-Subcarrier measure and alarm.

The ELTR3408_0 board is a quick-joint Plug-in and can be installed on all versions of transmitters and receivers. The MPX signal enters the JP4 pin1 and is sent to U1 that is opportunely polarized and formatted so to have a high Q band-pass filter temperature compensated . This filters ensures that only the 19KHz MPX-subcarrier goes through, and with a L+Rsignal attenuation better than 70dB.

At the U1 output the 19Khz signal is rectified by U28 and sent to the U2D buffer which makes it available on the F5 pin 2 for the measurement of the subcarrier level.

Furthermore, the rectified signal is sent to the U2A comparator determining the turning on of the alarm if the MPX subcarrier is missing (through the VR1 variable resistor that regulates the threshold).

in the stereo modulated signals, the 19KHz MPX subcarrier has a fixed level which corresponds to 10% approx. of the total deviation. By measuring the sybcarrier level once the signal has been demodulated, it is very easy to measure the frequency deviation andrealize an alarm for the missing modulation that intervences immediately and precisely if the subcarrier level goes below a prefixed threshold. All these functions are exclusive of Elenos radio links.

ADJUSTMENTS:

1. The VR1 variable resistor regulates the intevenience threshold of the !19KHz MPX SUBCARRIER" alarm and the led alighting on the front panel (funtion available only on receivers)

2. The VR2 variable resistor regulates the deviation of the 19KHz MPX subcarrier frequancy.

NOTICE! : The adjustment of VR1 and VR2 needs the use of specified precision measuring equipment. For this reason these adjustments are made in the factory during the final test and must not be modified. If necessary, refer to the ELENOS technical department for more detailles information.

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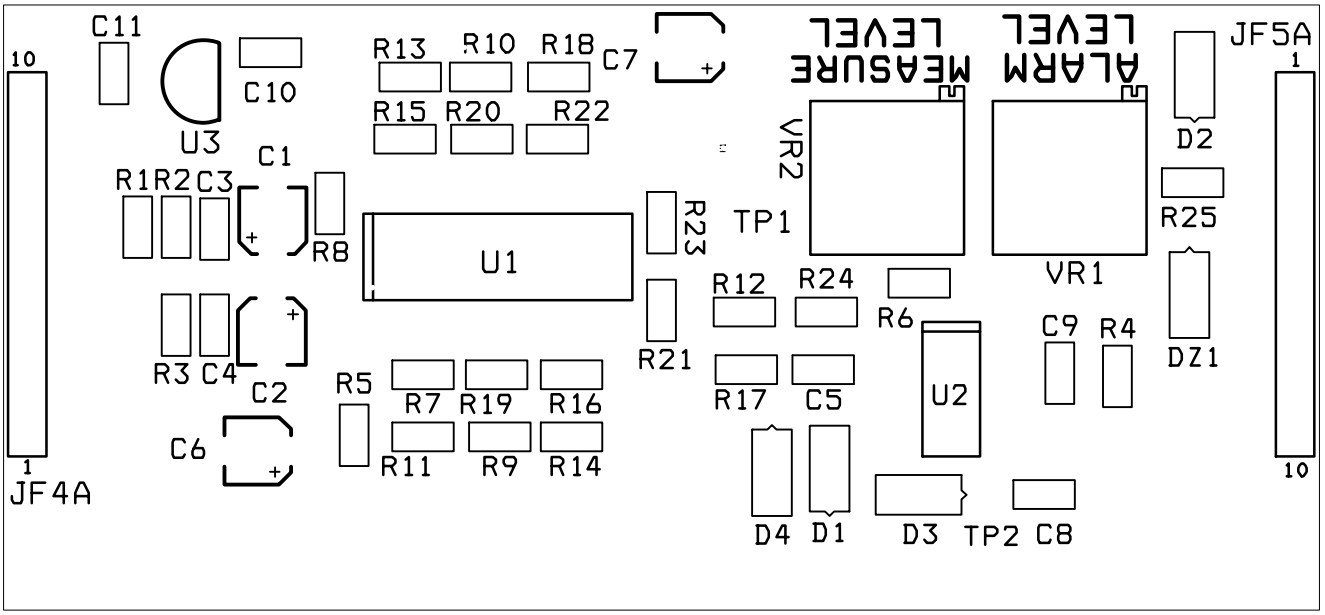
C11
10
U3
C10
R13
R10
R18
C7
R15
R20
R22
MEASURE LEVEL
ALARM LEVEL
JF5A
1
VR2
D2
C1
R1
R2
C3
R8
U1
R23
TP1
R25
VR1
R12
R24
R6
R21
C9
R4
DZ1
R3
C4
C2
R5
R7
R19
R16
R17
C5
U2
C6
R11
R9
R14
D4
D1
D3
TP2
C8
1
JF4A
10