EXC/RTX18B
SHF BROADCAST STL
200 ÷ 960 & 1300 ÷ 2500 MHz

USER AND MAINTENANCE MANUAL

CONTENTS

EU Declaration of Conformity (DoC)
Prot. 16/105/2016

We, SIELCO s.r.l,   via Toscana 59 - 20090 - BUCCINASCO (MILANO) - ITALIA

declare under our sole responsibility that the product:

Apparatus product:	**STL Audio Radio Link analog transmitter and receiver**
trade name:	**SIELCO or SIEL**
type or model:	**EXC18B and RTX18B**

with the variants:

EXC18B/2, EXC18B/3, EXC18B/4, EXC18B/8, EXC18B/9,
EXC18B/13, EXC18B/15, EXC18B/16, EXC18B/17, EXC18B/18, EXC18B/23, EXC18B/24

RTX18B/2, RTX18B/3, RTX18B/4, RTX18B/8, RTX18B/9,
RTX18B/13, RTX18B/15, RTX18B/16, RTX18B/17, RTX18B/18, RTX18B/23, RTX18B/24

To which this declaration relates is in conformity with the essential requirements and other relevant requirements of the R&TTE Directive (1999/5/EC).
The product is in conformity with the following standards and/or other normative documents:

HEALTH & SAFETY (Art. 3(1)(a)):	EN 60215: 1989+A1 : 1992+A2 : 1994
EMC (Art. 3(1)(b)):	EN 301 489-1 V1.9.2, EN 301 489-9 V1.4.1
SPECTRUM (Art. 3(2)):	EN 300 454-2 V1.1.1
OTHER (inc. Art. 3(3) and voluntary specs:	not applicable
Limitation of validity (if any)	Equipment Class 2, subject to restriction of use

Supplementary information:

Notified body involved:	**2051 - NEMKO SpA, via Del Carroccio, 4 - Biassono (MB) - Italy**
Technical file held by:	**SIELCO Srl, via Toscana 59 - 20090 Buccinasco (MI) - Italy**

Signed for and on behalf of:

Place of issue:	Date of issue	Name, function, signature
	(yyyy/mm/dd)	ing. Salvatore Cosentino
Buccinasco - Italy	2016/05/05	SIELCO technical Manager

EXC/RTX18 rev.B

BROADCAST STL FAMILY SERIES
VHF/UHF (200 ÷ 960 MHz) & SHF (1300 ÷ 2500 MHz)

INTRODUCTION

The EXC/RTX18B series stls are the result of experience gained by SIELCO (formerly SIEL) during years of producing FM broadcast equipment, transmitters, stl and stereo encoders.

These radio links were specifically designed to comply with the latest international standards and the requirements of advanced broadcasters, meeting tighter specifications than usually required, at an affordable cost.

Great care was spent into producing a Hi-Fi-quality modulated signal, with low residual noise and distortion. The RF signal is also free from spurious and harmonic components to a higher degree than required by CCIR, European, USA and most other national standards.

To obtain this outstanding performance, SIELCO strongly recommend to rely on qualified personnel to install and verify the equipment which makes up the radio station, i.e. the stl, the transmitters and the power amplifiers, the corresponding antennas, cables and connectors. This will assure to achieve the best performance and stability in time.

To this aim, SIELCO especially recommend that their equipment should not be tampered with by unskilled personnel and its after-sale service is available to customers for any technical problem. Before proceeding to installation, please carefully read at least the general installation part of this manual, to gain confidence with the equipment.

These equipment are very stable and changes to the internal pre-setting other than frequency and few other options are not usually required but, if they are, once again they must be done by skilled personnel, with proper instrumentation and service documentation. Improperly tampering with the settings may harm the apparatus or jeopardize the guaranteed performance.

THIS EQUIPMENT COMPLIES WITH ALL RELEVANT $C\epsilon$ EMI/EMC AND SAFETY REQUIREMENTS, **ETSI EN 300454-1/2, EN 301489-01/9** and **EN 60215** STANDARDS.

NO INTERNAL ADJUSTMENT OR PRESETTING IS REQUIRED DURING NORMAL OPERATIONS. THE APPARATUS SHALL BE PROPERLY EARTHED AND BE OPERATED WITH ALL THE COVERS CLOSED TO PREVENT ELECTRICAL HAZARDS AND COMPLY WITH EMC STANDARDS.

——— **MAINS VOLTAGE MAY KILL** ———

GENERAL DESCRIPTION

The EXC18B transmitter and its companion RTX18B receiver are the core of a high quality, synthesised studio-to-transmitter link (stl), to be used for broadcast repeaters in conjunction with any standard FM or AM transmitter. They are an evolution of the previous extablished EXC/RTX18 series stl whose main circuitry is still extensively used here with a new controller, user interface and software and more advanced oscillators in a compatible 2u 19" case.

They allow the reception of mono or stereo signal and its retransmission without using any additional stereo-coder on the receiving end: in both cases the LF output signal from the receiver must be sent to the stereo input (linear or not pre-emphasised) of the local FM rebroadcast transmitter.

The stl is built for several different frequency slots from VHF to the SHF range. Two main models are built: one for the 200÷960 MHz and the other for the 1300÷2500 MHz range. While the exterior cabinet, the controls, the basic circuitry and the performances are the same, some internal components vary or are specifically tuned as required to cover this wide frequency band. Usually these components are the local oscillator, the power amplifier and the input/output filters The factory adjusted frequency slots are 10 to 50 MHz wide and must be specified in the order. In the preset sub-range, the frequency and power of the transmitter may be freely changed on the field. The receiver may require some more adjustment for wider frequency displacement: in fact the adoption of narrow, low loss input filters permitted to achieve the best possible rejection of interfering signals in the band at the expense of some frequency agility. So nearly 8-10MHz may be used without any retouching but wider variation up to 50-60MHz will require retuning of the input filter.

Being the apparatuses completely digitally controlled, they are extensively on field programmable by front panel or remotely in every respect. The alphanumeric display permits easy and accurate metering, adjustment and continuous monitoring of modulation levels, power, operation and internal parameters. All these information are externally available on the same RS232 I/O port that may be used to remotely control the transmitter. In addition to the serial I/O, some signals and controls are available on a parallel I/O socket for easy interfacing with others analog controllers or supervisory systems. A powerful 3-levels password management permits a very high degree of security and privacy as may be required in different situations.

The LF input and output levels are precisely adjustable over a broad range, by means of 0.5dB stepwise variable attenuators. The transmitter has also an auxiliary input, specifically designed for RDS and SCA encoders. A modulation monitor output permits to control other transmitters or STL's with the same internally processed high-quality mpx signal. Furthermore, the system is optimised to be compatible with external digital companding encoder/decoders and to provide RDS and SCA signals, with almost no attenuation.

Optional top-quality stereo encoder/decoder boards may be factory installed on the transmitter/ receiver or field retrofitted with minimum required technical skill. The powerful internal software and monitoring functions recognise their presence and enable the functions. A universal switch-mode power supply permits operation in the extended 95-250 Vac range with no intervention and a 24 V back-up battery input is provided too.

TECHNICAL FEATURES

TRANSMITTER REVIEW

The transmitter and receiver set are fitted in the same sized cabinet and are nearly identical on the front view. In fact they differ for the name on the front panel and the display and for the rear panel connector's accommodation.

Both the equipment are clean and easy to control from the front panel through a single knob. The wide alphanumeric display and a simple self-explanatory menu drives navigation through the various options. A single fast push on the jog knob acts as an "Enter" or confirmation while pushing for a longer time is interpreted as "Escape".

Some leds signal at a glance proper functioning and warning states. Two red led signal warning status, "*Alarm*" and "*Limiter*". A bi-stable yellow/green led signals "*On the air*" while a fourth one signals "*PLL Lock*": both these two should be green in correct operation.

A RF Monitor output connector is located also on the front panel for easy test on the field
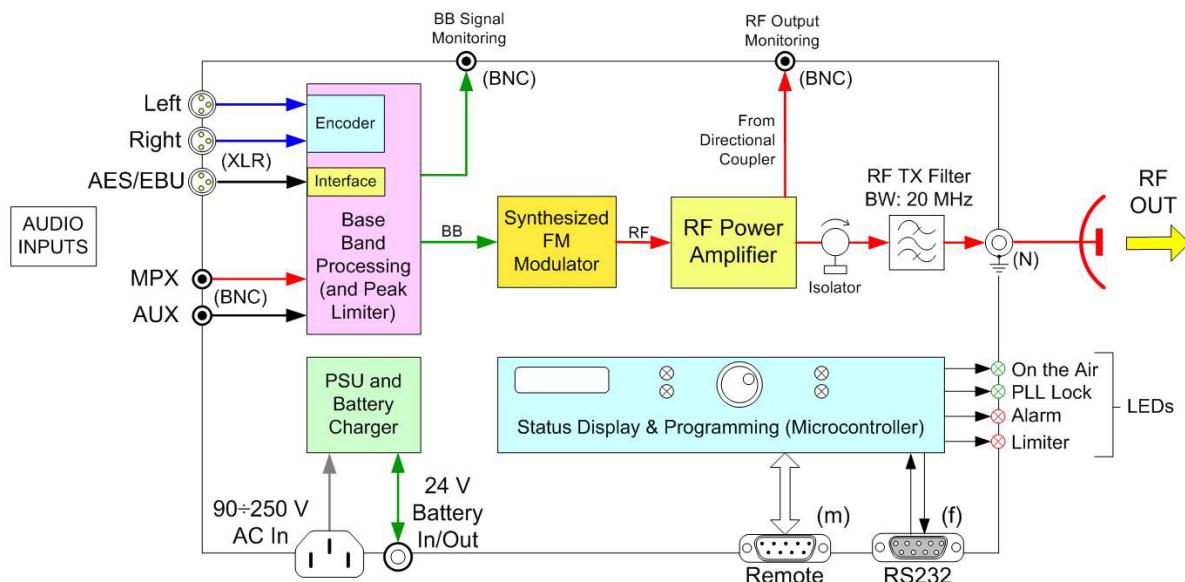
Transmitter's block diagram. The Isolator is not present on the VHF/UHF models
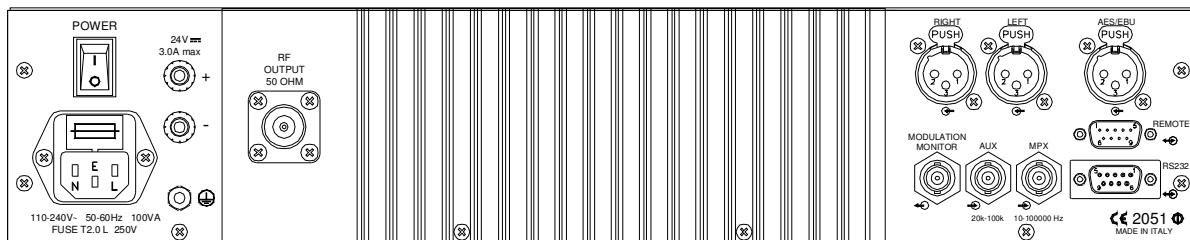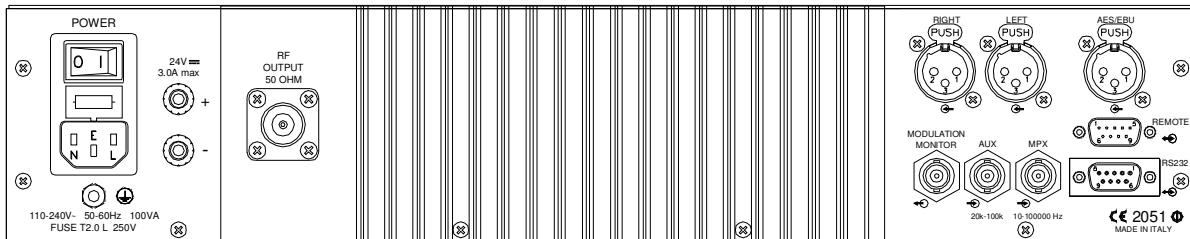
Alternative Transmitter rear panels

All equipment inputs and outputs but RF monitor are allocated on the rear panel. They are:

- The mains supply IEC320-type outlet, which incorporates the mains switch and the fuses. An additional earth screw for system earthing and a 24V= battery backup socket pair. In alternative the mains outlet with fuse-holder and the mains switch may be separate components
- The RF antenna connector, N-type
- The L & R stereo analog audio channels input on balanced XLR-type connectors (L input is used only with internal Stereo Encoder option).
- The AES/EBU stereo digital audio input on a balanced XLR-type connector which may be used as an alternative to the analog input (this is a special option and may be used only in conjunction with the internal Stereo Encoder option).
- The wide-band external processed stereo or composite signal input on a grounded unbalanced BNC connector
- A frequency limited (20k ÷ 100kHz) auxiliary channel input on a grounded, unbalanced BNC connector for a RDS or SCA signal.
- A LF modulation output for monitoring, RDS external synchronisation or re-broadcasting purpose, BNC-type.
- A RS232 Dsub9 female remote serial control port, inverted wired.
- A parallel control port, Dsub9 male type

No internal or external preset is needed to correctly perform on 110 - 240V~ mains range

RECEIVER REVIEW

Like the Transmitter, the Receiver front panel accommodates the single control knob, the display, four leds for immediate status control and a single output connector for IF monitoring.

Here too regular operation is signallized by green leds: "*PLL Lock*" and "*Field*". This latter is a bi-stable and lights in yellow when RF field is too low or absent. As in the Transmitter red leds signals improper operation. The first one, "*Modulation*", is activated by low or absent modulation; the last one is the general "*Alarm*" led.
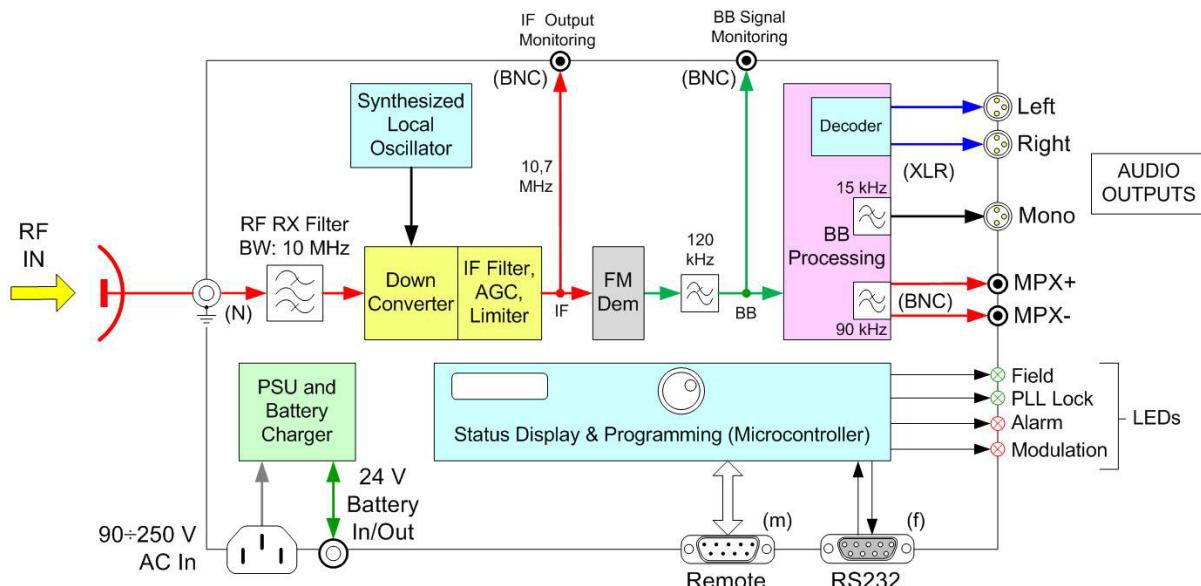
Receiver block diagram
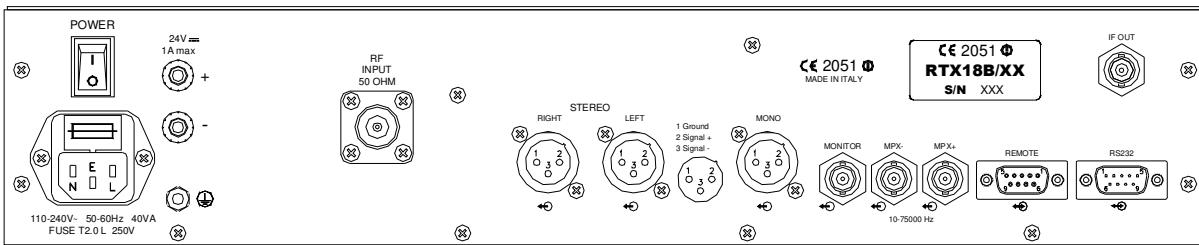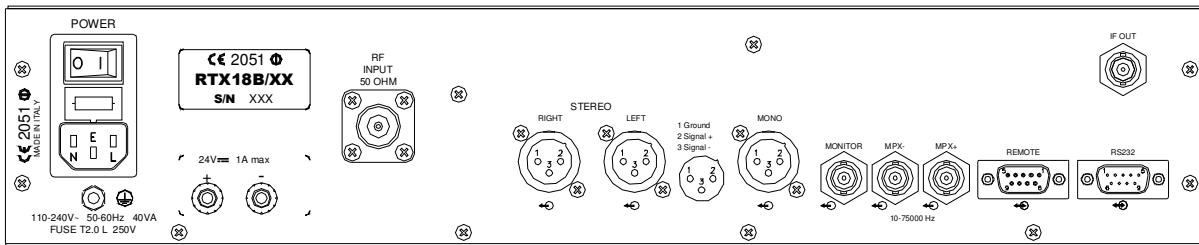
Alternative Receiver rear panels

The Receiver I/O connectors on the rear panel are:

- The mains supply IEC320-type outlet, which incorporates the mains switch and the fuses. An additional earth screw for system earthing and a 24V-battery backup socket pair. In alternative the mains outlet with fuse-holder and the mains switch may be separate components
- The RF antenna connector, N-type
- The main composite signal output (Mpx+, Mpx-) on two BNC-type connectors in antiphase, permitting direct drive of two separate transmitters or one in balanced mode.
- A buffered LF monitor, BNC-type connector that may be internally connected as an additional composite or wide-band or mono signal output.
- The filtered/de-emphasised mono signal on a balanced male XLR-type connector.
- The L & R audio channels output sockets on balanced XLR-type connectors (only with internal Stereo Decoder option).
- A RS232 Dsub9 female remote serial control port, inverted wired.
- A parallel control port, Dsub9 male type

TECHNICAL SPECIFICATIONS

- Factory preset frequency ranges

  215÷245 Mhz 240÷270 Mhz
  300÷340 Mhz 340÷380 Mhz
  400÷440 Mhz 430÷470 Mhz
  810÷850 Mhz 850÷890 Mhz
  890÷930 Mhz 930÷960 Mhz
  1350÷1375 Mhz   1370÷1390 Mhz
  1429÷1433MHz   1510÷1530MHz
  1660÷1670MHz   2367.5÷2372.5MHz
  2440÷2.450MHz   2468.1÷2483.3MHz
  Other sub-ranges on request

- Modulation: FM, 75 kHz peak dev.
                    180kF3E mono
                    256kF3E stereo

- Synthesis step: 10kHz   (215÷960 Mhz)
                    25kHz (1.3÷2.5 Ghz)

- Composite Mpx output response:
                    15 Hz ÷ 67 kHz +0.1/-0.5dB
                    <-6 dB   @ 100 kHz
                    <-20 dB @ 125 kHz

- Monitor output wide-band response:
                    15 Hz ÷ 100 kHz +0.1/-1.5dB
                    -3 dB typ.   @ 125 kHz
                    -6 dB typ.   @ 160 kHz

- Mono/stereo decoded response:
                    30 Hz ÷ 15 kHz ±0.2dB

- S/N ratio (30÷20000Hz rms):

                    >75 dB, 80 typ. mono
                    >72 dB, 76 typ. stereo

- Modulation distortion (100% dev.):
    @ 1 kHz/
        mono   ≤0.1%   0.03% typ.
        stereo, 1ch ≤0.30% 0.20% typ.

    @ 30÷7500 Hz
        mono   ≤0.25% 0.12% typ.
        stereo, 1ch ≤0.30% 0.20% typ.

- Stereo crosstalk (typical):>50 dB (400÷10000 Hz)
                             >40 dB (100÷15000 Hz)

- I/O lines: Alarm, RF/LF disable, Low RF field
                remote control/lock
                RS232 for monitoring and control

- Mains requirements:

                110 - 240 V~ 50/60 Hz
                24V=

- Operating temperature range:
                0÷35° C recomm.
                -10÷45 °C max.

EXC18B TRANSMITTER ONLY

- Frequency error: <2,5 ppM
- Frequency drift: <1 ppM/year

- RF output power: 7W / 15W (215÷960 Mhz)
                    2W / 5W (1.4÷2.6 Ghz)
- Max allowed reflected power: 1W / 2W

- RF harmonic products: <-60 dBc
- RF spurious products: <-70 dBc, -80 dBc typ.
- RF output: 50 ohm, N connector

- Audio/Mpx input level: -3.5 ÷ +12.5dBm
                          @ ± 75kHz deviation
- Audio/Mpx input:
        10k ohm/600 ohm, bal./unbalanced

- Common mode rejection:
            >50 dB, >60dB typ. (20÷15000 Hz)

- Audio input connectors: female XLR type

- Auxiliary channel input level:
            -12.5 ÷ +3.5dBm @±7.5 kHz dev.
              -24 ÷ -8dBm @±2 kHz dev.

- Aux channel input: 10k ohm / BNC-type

- Monitor LF output:
            0 ÷ +10 dBm @ ±75kHz dev.

- Pre-emphasis time constant: 0/50/75 μs ±2%

- S/N noise ratio (30÷20000Hz rms):
  >77 dB, 82 typ. (mono)
  >74 dB, 77 typ. (stereo)

- Modulation distortion, 30÷15000 Hz:
  <0.02% @ 75kHz dev.

- Stereo crosstalk: >50 dB (100÷5000 Hz)
  >45 dB (50÷15000 Hz)

- Audio channels response:
  30 Hz ÷ 15 kHz ±0.1dB
- Out of band audio attenuation:
  >50 dB @ F≥19 kHz

- Deviation limiter: 0 ÷ +7.1 dB, adjustable

- Mpx composite response:
  10 Hz÷100kHz ±0.1dB

- Auxiliary channel response:
  10÷ 100 kHz ±0.2dB

- I/O lines: RF disable, RF power, On-the-Air,
  Alarm, RS232 control and monitoring

- Mains absorption:
  50 Wmax @ 110 - 240 V~ (Po= 5W)
  80 Wmax @ 110 - 240 V~ (Po= 15W)
- Battery absorption:≤1.8A @ 24 V= (Po= 5W)
  ≤3.0A @ 24 V= (Po= 15W)

- Dimensions, without handles: 19" 2 un. std. rack
  483 x 88 x 330mm

RTX18B RECEIVER ONLY

- Noise figure: ≤9 dB

- Image frequency rejection:≥60 dB 70 typ.

- Dynamic selectivity: >+10dB typ @ δF=300 kHz
  >+35dB typ @ δF=500 kHz
  >+45dB typ @ δF=1.0 MHz

- AM suppression: >45 dB

- Usable input level: -90÷-10dBm
  (7μV÷70mV)

- Sensitivity (typical): Sin= -90dBm (7μV) mono
  (S/N=60dB) Sin= -70dBm (70μV) stereo

- IF monitor output: 10.7 MHz / 0dBm

- Wide-band demodulated output response:
  15 Hz ÷ 120 kHz +0.1/-3dB

- Wide-band demodulated output level: +6dBm

- MPX output level: -1.5 ÷ +12 dBm,
  0.5dB/step

- Mpx output response:
  15 Hz ÷ 67 kHz +0.1/-0.5dB

- mono or stereo decoded response:
  30 Hz ÷ 15 kHz ±0.1dB

- Out-of-band mono or stereo audio response:
  >50 dB @ F≥19 kHz

- De-emphasis time constant: 0/50/75μs ±2%

- S/N ratio (30÷20000 Hz. rms):
  >72 dB, 76 typ. mono
  >70 dB, 73 typ. stereo

- Modulation distortion @ 1kHz / 100% dev.:
  mono ≤0.1% 0.03% typ.
  stereo, 1ch ≤0.30% 0.20% typ.

- Stereo crosstalk: >50 dB (100÷5000 Hz)
  >45 dB (50÷15000 Hz)

- I/O lines: LF disable, Low RF field,
  Alarm.
  RS232 control and monitoring

- Mains absorption: 15 Wmax @ 110 - 240 V~
- Battery absorption: ≤0.4A @ 24 V=

- Dimensions, without handles: 19" 2 un. std. rack
  483 x 88 x 330 mm

REMOTE CONTROL FUNCTIONS

Both the Stl transmitter and receiver are completely presettable and controllable by the front panel keyboard and display. The same functions are remotely possible through the serial RS232 port, which is located on the rear of each equipment. To control the equipment is anyway required some purposely developed software which is not available at the present as a standard option. Some simple demonstration program may be given only as a start point to development.

In addition to the serial port, a parallel one is provided on the rear, on which are wired some signal and control wires. Both the 2 ports are described in the following paragraphs.

RS232 port

The RS232 port manages only Tx, Rx and Return data signals, with no handshake. Being the two former signals inverted wired to the port, it needs a simple straight wired serial cable with appropriate connectors to connect to a PC. Usually a female DB9 or DB25 female goes to the PC port and a male DB9 connector at the transmitter end. Appropriate software is needed for communication: simple tests may be performed with standard Windows "Hyperterminal". Do not connect the cable with either transmitter or PC on.

Parallel remote control port

This port accommodates some lines for simple direct control/monitor on a DB9 male connector. Many lines may be optionally assigned to differnt functions and logic polarity may be reseversed from a dedicate setup menu. Default assignation is:

TRANSMITTER:

- Pins 1, 5, 8 *Ground*.
- Pin 2, *On The Air* output. Open collector transistor circuit with a resistive pull-up: a +12V/ 10kΩ signals that the transmitter delivers substantial RF power. It is not granted that the output power is exactly as preset.
- Pin 3, *Direct power* output. A signal proportional to direct power is present, with a pseudo square law. Range is 0-5Vdc / 1kΩ impedance. Full power voltage usually ranges 3,5 to 4 V.
- Pin 6, *RF enable* input. Base input of a common emitter transistor with a resistive pull-up. A shorted circuit to ground disables RF. Maximum voltage and current available are roughly +10V and 1mA.
- Pin 7, *Alarm* output. Open collector transistor circuit with a resistive pull-up: logic low signal means alarm condition. Correct functioning is signalled by +12V with10kΩ impedance. Maximum current sinking capability <10mA.
- Pins 4 & 9: future upgrades

RECEIVER:

- Pins 1 & 5 *Ground.*
- Pin 2, *"modulation ok"* output. Open collector transistor circuit with a resistive pull-up: a low logic state signals modulation is present on the received signal. On the contrary, a high logic state, + 12V / 10kΩ, warns on modulation loss. As alternate function the pin may be assigned to signal *"remote lock"* status.
- Pins 3 & 8, *"field good"*. The insulated contacts of a relay are wired to these pins: the relay is default driven by the received RF. When the field trespass the preset threshold, the relay is excited. The contacts may be chosen through an internal bridge to be *"normally open (n.o.)"* or *"normally closed (n.c.)"*. Factory default is *"n.o."*. Alternatively the relay may be assigned to *"Alarm"*
- Pin 6, *"LF disable"* input. Base input of a common emitter transistor with a resistive pull-up. A shorted circuit to ground disables main LF outputs. Maximum voltage and current available are nearly +10V and 1mA. Alternate function is *"Remote lock"*: when choosen, a shorted circuit disables front panel setup functions.
- Pin 7, *Alarm* output. Open collector transistor circuit with a resistive pull-up: a logic low signal means alarm condition. Correct functioning is signalled by +12V with10kΩ impedance. Maximum current sinking capability <10mA. This pin may be alternatively assigned to signal *"Field good"*
- Pins 4 & 9: future upgrades

Transmitter serial and parallel remote control I/O ports
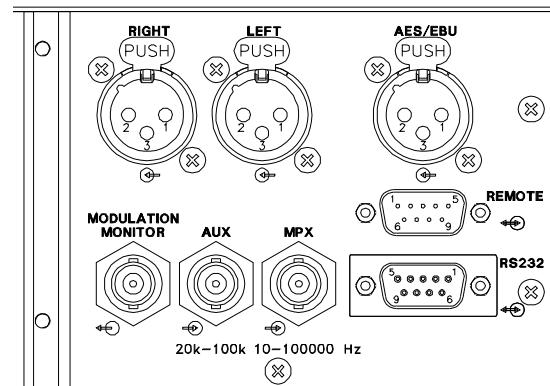
Receiver serial and parallel remote control I/O ports
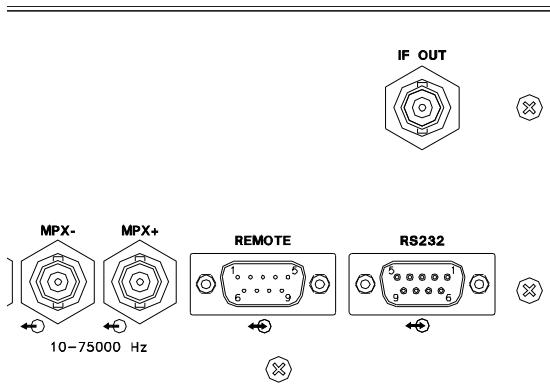
BATTERY OR D.C. SUPPLY

The EXC/RTX18B include a low voltage d.c. power supply input with battery management, to permit continuous d.c. power supply or back-up in case of mains failure. This input, whose nominal voltage is 24 V negative grounded, accepts a dc supply which may range 22 ÷ 28 V in absence of mains supply. It delivers a regulated +27.6V to permit battery charging, when mains supply is present.

Front panel switch do not acts on d.c. supply, which is always on when applied to its terminals on the rear panel. There is no switch in series to this supply but only a diode and a self-reset fuse to protect from polarity reversal.

Voltage higher than 28Vdc applied to or current sunk from this input for different purpose than battery charging may seriously impair the equipment power supply.

Notes on battery and wiring

Any kind of battery may be used, provided it has the correct voltage (24 V, nominal) and an adequate capacity. Price / performance considerations may suggest plumb batteries, regular or sealed.

We suggest using sealed batteries for small systems, 20 to 40 A/hour rated. Higher capacities, like 40 ÷ 100 A/hour and more, may be achieved at low cost from car-type batteries: in this case always install the batteries in a well vented place, because acid gas produced during battery charging may damage the electronic equipment.

The battery inputs may be wired together to the same battery array, provided they both are internally preset to 27.6V, as regular. In this case the power supplies appear to be in parallel (with some redundancy) and they both charge the battery array at a higher rate.

Plumb batteries are usually made up to 12 V nominal voltage, so two batteries are required in series. Wire them with proper section wire: 1 sq. mm is usually enough to connect them to the transmitter and/or the receiver; bigger sections may be used in case of long wiring.

Install batteries capable of sustaining the system for the maximum foreseen period of mains failure. Avoid to completely discharging the batteries or permanent damage may occur to them. Even if the battery manager disconnects the battery when the voltage is lower than 22V, a small test current, nearly 10-15mA is sunk by the circuitry in absence of mains power. This current is capable to deeply discharge the battery array in case of prolonged mains absence. Always remove the battery array if the system is off-line

Battery life

A discussion of correct installation and maintenance of the battery system goes beyond the purpose of this manual: we suggest not to underestimating the problem and to refer to specialised literature and to the suggestions of qualified battery manufacturers.

Our advises may be summarised in the followings:

- Use batteries whose capacity is at least $2.5 \div 10$ times higher than the maximum expected power absorption, on prolonged mains loss.

- Never permit batteries to undergo below minimum safe voltage, on prolonged discharges.

Following these rules, battery life expectation may range from 2 to 5 years, depending on duty factor and temperature (low temperature decreases the capability but increases the life).

Back-up and recharge time

An estimate of the backup time, i.e. the capability of the batteries to power up the equipment in case of mains failure, may be done by considering that:

- The manufacturers usually specify the nominal capability of a battery, discharged in a period of 10 or 20 hour.

- For discharge faster than 10 hour, the capability will be reduced. For slower discharges, it may be increased. Typical values are 70 % for discharge in 2 hours and 110 %, for discharges in 50 hours.

- The capability will diminish with time and usage: typical derating may be $10 \div 30$ % /year.

- Taking in count all previously said, with a real capability which is derived from the nominal one with the suggested corrections, the backup time is given by the capacity in A/hour divided the absorption of the equipment which makes up the load, in A.

- The supplied recharge current delivered by the equipment is nearly 0.5-1.0 A by the EXC18B and 1.5-2.0A by the RTX18B, when the batteries are almost discharged.

- While the charge voltage is roughly constant, the charge current is not. The charge time may be rather long, even some day, especially in case of deep discharge and heavy load on the equipment.

As reference we give the following table with an estimate of the maximum backup time for some combinations of equipment and batteries, which is valid only for new, fully charged batteries. The current absorption for EXC18 transmitter is typical for a 2400MHz version @ 5W output power or a 900MHz version @ 10W.

Higher output power will increase this absorption up to 20-30%, while lowering the output power will reduce the current absorption to roughly the same 20-30%.

	EXC18B	RTX18B	EXC18B + RTX18B	APPARATUS TYPE
Mean absorbtion	1.95	0.45	2.4	[A]
Backup time with 20 A/hour battery	9	44	7.5	[hour]
Backup time with 40 A/hour battery	20.5	50	16.5	[hour]
Backup time with 100 A/hour battery	52	250	42	[hour]

SERVICE AND MAINTENANCE

Since the STL equipment is cooled by natural convection in air, it is not subject to clogging by dust. If needed it may be externally cleaned with a soft brush and a wet cloth, **with the apparatus turned off and removed from mains**.

It is very important to install the apparatus on a stable stand/rack, in such a way to permit good ventilation to the rear heatsink.

Other than this, because of the high-quality materials used in their manufacture, if it is correctly installed in an adequately protected environment it will not require special maintenance for quite some time.

After a few years of continuous service, it is recommended that the apparatus is overhauled in the factory or in a specialised laboratory, where the characteristics can be checked against the initial ones and re-calibration can be done when needed. Internal presets are extremely stable and we don not recommend tampering with them if not in specially equipped laboratories.

Never change the internal calibrations to avoid altering the transmitter and receiver declared performances.

It is especially important that the power supply be over-hauled when the apparatus have been working for years at high temperatures, over 30 / 35 °C.

GUARANTEE

Like all SIELCO's solid state equipment, the STL carries a one-year guarantee on all their components with the exclusion of the final RF power transistor, which may be damaged by faulty output connections.

This guarantee is null and void if the apparatus is tampered with or if failure is due to improper use, wrong installation or external causes, such as mains overvoltage.

This guarantee covers work done exclusively in our laboratories and in those of our agreed representatives.

The goods shall be delivered carriage prepaid to the laboratory and shall be returned freight forward.

This guarantee does not cover any consequential damage due to non-operation or faulty operation.

SERVICE MANUAL

✋ **WARNING !**

THIS SECTION IS ONLY AIMED TO GENERAL EXPLANATION, REFERENCE AND SERVICE PURPOSE BY SKILLED PERSONNEL. AS EXPLAINED IN THE PREVIOUS SECTIONS, INTERNAL ADJUSTMENTS ARE NOT REQUIRED DURING NORMAL OPERATION. TAMPERING WITH INTERNAL SETTINGS VOIDS THE WARRANTY, MAY HARM THE APPARATUS AND JEOPARDIZE THE GUARANTEED PERFORMANCE. COMPONENT VALUES SHOWN MAY ACTUALLY VARY FOR PRODUCTION REQUIREMENTS.

DUE TO THE TECHNOLOGY USED, MOST MODULES AND ESPECIALLY THOSE IN SMT ARE NOT INTENDED TO BE REPAIRED IN CASE OF FAILURE AND MUST BE REPLACED WITH NEW ONES.

INTERNAL TRANSMITTER DESCRIPTION

The EXC18B transmitter comprises 7 internal modules, as can be seen in the drawing "General view" and in the "General wiring diagram", both comprised in this manual. Some of these modules vary according to the preset frequency range.

- The CPU controller and display board
- The LF and RF control main-board
- The stereo-encoder module (optional)
- The synthesised oscillator module, $220 \div 960$ MHz version
- The synthesised oscillator module, $1300 \div 2600$ MHz version
- The RF power amplifier, $220 \div 960$ MHz version
- The RF power amplifier, $1300 \div 2600$ MHz
- The regulated power supply
- The auxiliary regulator and battery charger board

For the detailed description of each module on the following pages, refer to the corresponding electrical diagram, in the relevant section of the manual.

INTERNAL RECEIVER DESCRIPTION

The RTX18B receiver comprises as much as 8 internal modules, as can be seen in the drawing "General view" and in the "General wiring diagram". As in the case of the transmitter, some of these modules vary according to the preset frequency range. All possible modules are:

-The regulated power supply
-The auxiliary regulator and battery charger board
-The CPU controller and display board
-The synthesised local oscillator module, 1300 ÷ 2600 MHz version
-The synthesised local oscillator module and IF converter, 220 ÷ 960 MHz version
-The LNA, FI amplifier and FM demodulator board
-The LF interface and control main-board
-The RF input filter (optional in the 220 ÷ 960 MHz version)
-The stereo-decoder module (optional)

The first 4 modules are identical to those of the transmitter and their description is not replied. For the rest of them refer to the corresponding electrical diagram, in the relevant section of the manual.

While the CPU control board is identical to that of the transmitter, the internal microcontroller incorporates its own different firmware for this task.

TX/RX18 - rev. 2.00
BROADCAST STL MANAGEMENT FIRMWARE

INTRODUCTION

A modern microcontroller (CPU) controls all internal functions of the EXC/RTX18B stl family as required by customer's preset, supervises the equipment and manages all the necessary tasks of measure, process and remote control.

The internal microcontroller software or "*firmware*", is periodically revised to correct possible defects or to incorporate new functions and peripheral module control. The firmware updating can be done only at factory or at specially equipped laboratories by flashing a new progam over the old one on the microcontroller without substituing any component. A special interface is required.

The EXC18B stl transmitter and the RTX18B receiver adopt different, incompatible firmware, because of the different tasks required. Hence, particular care must be paid to install a correctly programmed CPU for the transmitter or the receiver (TX18B or RX18B firmware).

With the exception of some specific transmitter or receiver menus, the user interface is identical for both. The same applies to most of display functions and the operating system. As far as possible great care was spent to simplify the software operations, to make it intuitive and not to change the basic functions in case of new added features.

NOTE: new software releases may be provided to take advantage of experience and to add new functions. Factory supplied equipment incorporate the latest stable firmware available at the time being. The customer of an equipment which do not incorporate the latest release do not need to change it unless there are explicit functional defects or needing of the new functions added.

SIELCO WILL NOT IN ANY CASE BE RESPONSIBLE OF POSSIBLE DAMAGES DUE TO THE DIFFERENT OPERATING MODE OF THE EQUIPMENT DUE TO CHANGE OF ITS INTERNAL CPU AND FIRMWARE RELEASE. WARRANTY, IN THIS CASE, IS LIMITED TO SUBSTITUTION OF THE CPU CONSIDERED AS NOT-FUNCTIONAL OR TO ITS REFUND.

PASSWORD ORGANISATION

The equipment software controls a complete password system, which permits to restrict the functions allowed at any level. A greater or lesser privacy is granted on information and equipment presets. The managing of these restricted functions is optional and we recommend its use only were strictly needed. As factory default, the equipment is delivered without any access restriction.

The password organisation is set in 3 security levels, each with its own password. A higher level permits to change the lower levels authorisations and passwords.

The password is composed by 4 alphanumeric characters, including extended capital and lower case ones and several special symbols. We suggest using a wide range of characters as the security level raises, to increase the possible combinations. No password is ever shown: it is always masked by dummy characters as "...." or "****". Nevertheless it may be always changed with the higher level authorisation. Here is the purpose of each level:

Level 1:   Lower security level. It is needed to access to most of the monitoring and control menu fields, not permitting to alter or programming any operating parameter. As factory default it is set to "off" state, permitting to anybody to freely navigate through equipment's monitoring menu information. We suggest leaving it in this state if a high privacy level is not needed.
If the level is set to "on" it will show the default menu field #00 (cf. menu tree), requiring password for any other information or pre-set. Failure to insert a correct password of any level will impede any other access to the commands for the time-out length (usually 3 minutes). No change to the functioning mode is done in case of incorrect password input. No information is available on the display regarding the equipment functions.

Level 2:   Service level. This password is needed for any functioning set-up as frequency and power, sensitivities, output level etc. Its use is reserved to service technicians who need wide access to the equipment presets and functions.
While the default factory state is "off", SIEL suggests changing the default state and password immediately at the first power on, to prevent to unauthorised people to tamper with commands, if the default word is known or the state is set to "off".

Level 3:   Highest security level. It is always "on" by default and anyway reset to "on" after the display time-out, for security purpose. Its knowledge is deserved only to **very few** people and must be immediately registered after setup and kept in a secure place: **there is no way to read it** after you have setup and confirmed on the transmitter.
This password must be **immediately** changed at the first pre-set of the apparatus: if any unauthorised people tampers with it or you loose it, there is no way to change it if you do not know the correct word for security reasons and the apparatus may become unmanageable. **Gaining again access to the apparatus will require factory reprogramming or changing the internal CPU**.

For practically any parameters that may require some setting in the field, the 2nd level password is enough and may be used for any standard service requirement. The main purpose of the existence of the 3rd level is a security assurance for the user if he looses control on the lower password levels.

Only very few critical parameters, usually factory presets, require this password.

FACTORY DEFAULT PASSWORDS

These are the factory default password:

Level 1: **P001**

Level 2: **P002**

Level 3: **ABCD**

For what previously said, be sure to change at least the 3rd and possibly the 2nd level as soon as you receive and turn on the apparatus.

WARNING!

PASSWORD ENABLING MAY LEAD TO SERIOUS EQUIPMENT ACCESS LIMITATION TO ANYBODY WHO IS NOT CUSTOMED TO INSERT AND MANAGE THE PASSWORD SYSTEM. WE RECOMMEND HENCE TO LIMIT THE PASSWORD USE ONLY WHERE STRICTLY REQUIRED.

MENU AND COMMANDS DESCRIPTION

The menu tree is composed by two separate parallel branches. Navigation through the menu fields is straightforward and natural, with the jog knob. Rotating the knob counterclockwise or clockwise will scroll up and down the menu fields in both the measure and setup branch. A quick push on the knob will act as "enter" or confirm while a longer push will be interpreted as "escape", aborting the operation.

Choosing between the measure and setup branch is immediately proposed after the display of the default field, which reports the equipment model and the firmware revision. At any time, repeatedly "escaping" will return back to the default field. It is not possible to pass from the measure branch directly to the setup without passing through this field.

In the setup menu, the "enter" key changes from scrolling to program mode. Program mode is signalised by highlighting and flashing of the variable words. When in program mode, rotating the knob will change the characters or the options in the local field. Pushing "enter" will confirm the input data while "escaping" will abort it.

A local input time-out will automatically escape the command mode resetting input data if this is not confirmed in 60 seconds after the last variation. In the same manner, 3 minutes later of the last input in the setup menu, a local time-out will reset the menu and enter into the modulation control field.

Navigation on the menu tree is subjected to the security authorisation by the password management system. In order to navigate in the measure/control branch, only the first level of authorisation is required. If the security option is enabled, at least the first password must be input. Factory default preset state is "disabled".

In the same manner, to access to the setup branch, the second level of authorisation is required or the input of the second level password. Again, factory default preset state is "disabled". Only some hardware or factory presets require the third level authorisation. This is also the case of the edition of the Organisation name on the first row of the default menu field.

Few minutes of experiments will enable most users to gain confidence with control keys and menu and to be able to access all main features of the transmitter, without any previous training.

The hierarchical trees of the menus are shown in a table before detailing each submenu field of both the transmitter and the receiver, with a small number near the left side of each field for easy reference. In the following pages we will examine each menu field and option, with reference to these numbers.

TRANSMITTER MENU

Transmitter menu tree

```
                          TX18B S/W - ver.2.00        20    ENTER PASSWORD
                          STEREO ENCODER: YES                    CODE


ESCAPE                00  SIELCO  -  ITALY                                   ESCAPE
                          TX TYPE - Vers. 1.XX

         OPERATION                                              SETUP

  02   DIR POWER   5.0W    01      SETUP           22    FREQUENCY SETUP
       REF POWER   0.0W            OPERATION

  03  MPX   75KHz    +7.1dB                        23    RF POWER SETUP
      ########   0   |

  04   LEFT   level   -3.0dB                       24    LF INPUT SETUP
       RIGHT  level   -4.0dB

  05  L########   0   |                            25    AUX INPUT SETUP
      R######## 0     |

  06  AUX  2.0kHz  -31.2dB                         26    MPX LIMITER SETUP
      #########       |

  08  VS2    Vs+      Vs-                           27    MODE & PREEMPHASYS
      27.5V +12.5V -12.7V                                     SETUP

  09   T(A/H): +30°C  n.a.                         29    DISPLAY CONTRAST
       01 JAN 10  17:22:00                                     SETUP

                                                   30    DATE & CLOCK SETUP

                                                   31    ELAPSED TIME COUNTER

                                                   32    PASSWORD SETUP

                                                   40    MODEL SETUP
```

Start menu

The start menu field is the unnumbered one on the top of the menu tree. It is shown only at the initialisation step, when the apparatus is turned on from mains or software reset and all the leds and the display will be turned on and off for testing purpose. It will show the kind of the apparatus, the software release and the presence of some particular internal options.

```
STEREO ENCODER: YES
 TX18 SW rev. 2.XX
```

In this case, immediately after the inizialisation, the transmitter will briefly show the presence (YES) or not (NO) of the internal Stereo Encoder, avoiding to open the apparatus to visually inspect. From this field, if the security allows, it will pass directly to the next menu field.

Field #00: Default Message

```
   SIELCO -ITALY
EXC18B  -  rev. 2.XX
```

This field shows again the apparatus model, the software release and the manufacturer's name. This is the field to which we always return back if we will press the escape key once or twice.

If the 3rd level authorisation is granted (see later "password setup and input"), by previously input "enter", it is possible to change the Manufacture's name to any user defined alphanumeric 20 characters string, as in the following example:

```
  NORTH-WEST RADIO
EXC18B  -  rev. 2.XX
```

If the security authorisation is granted at least for the first level, rotating the jog will give access to the subsequent menu field #01. Otherwise a valid password will be requested (see #20).

Field #20: Initial Password

```
┌─────────────────────────────┐
│      ENTER PASSWORD         │
│                             │
│            ....             │
└─────────────────────────────┘
```
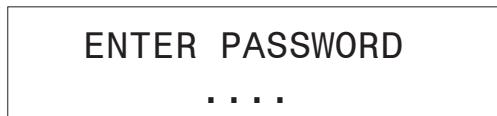
This field requests to input a valid password code. When the input is confirmed by "enter", the word will be compared with the memorised password table and, if recognised, the corresponding security level will be allowed. If the password is incorrect or the input is terminated by an "escape", the password will be signalised as invalid and the security level allowed will be that actually in memory, i.e. 0 (no permission at all), 1 or 2.

The security level is as factory pre-set to "off" for the 1st and the 2nd level: in this case, which is the most common, there is no need to input any password to freely navigate in the menu tree and to change most parameters. This field will not be displayed if not expressly required by setup field #32 (see later).

When the password is recognised as valid and the corresponding level is displayed, press on the escape key to turn on the first menu field #01.

Field #01: Operation and setup menus

```
┌─────────────────────────────┐
│           SETUP             │
│        ┌──────────┐         │
│        │OPERATION │         │
│        └──────────┘         │
└─────────────────────────────┘
```

As the title suggests, this field permits to chose to operation (default choice) or setup menu branches. Pressing the "enter", the highlighted one will be chosen.

Field #02: Direct & Reflected Power

```
┌─────────────────────────────┐
│   Dir  Power:  4.0 W        │
│   Refl Power:  0.0 W        │
└─────────────────────────────┘
```

This field shows the direct and reflected power actually delivered. Not all the transmitter models and especially those on the SHF 1300-2600 MHz range shows the reflected power.

Field #03: Multiplex Signal Level (Output Modulation)

```
MPX  75.0kHz + 0.0dB
############ O|
```

This field shows the actual peak modulation in dB referred to 75kHz and as deviation in kHz. A pseudo-analog moving bar will contemporary change according with the modulation, leaving a peak mark at its end for 1 or 2 seconds. A vertical bar (|) on this line marks the 0dB position.

Field #04: Left & Right Signal Level in dB

```
 LEFT level - 3.0dB
RIGHT level - 4.5dB
```

This field shows the actual left and right peak modulation in dB referred to 75kHz. The left channel level has no meaning in case of absence of an internal stereo-encoder.

The reading is adequately accurate with real audio signals. Some steady state test tone especially at very low audio frequency may beat with the discrete ADC conversion sometimes producing reading uncertainty (*aliasing*). In this case the MPX level reading will anyway produce correct overall modulation measure.

Field #05: Left & Right Signal Level as analog moving bar

```
L########### O   |
R#########  O    |
```

This field shows the actual left and right peak modulation as two moving bars. A vertical line marks 0dB position and the same considerations as in the previous menu are still valid.

Field #06: RDS or SCA auxiliary channel modulation level

```
AUX  2.0kHz  -31.2dB
########0       |
```

This field shows the actual modulation due to an auxiliary SCA or RDS signal in dB referred to 7.5kHz or 10% of max peak modulation. Usual level for SCA signal is 0dB (7.5kHz) while standard RDS modulation needs to be set at -11.5dB (2kHz).

Field #8: Internal Voltages

```
 Vbat    Vs+     Vs-
+27.8V +12.5V -12.4V
```

This field shows the internal regulated voltages. Voltages on the EXC19 transmitter's family are nominally equal to: Vs+ = +12.5 ±0.3V, Vs- = -12.4V (+1/-2V).

The battery voltage usually reads Vbat= +27.4 ±0.4V, when the battery is completely charged and mains is on. In case of battery operation, the equipment works satisfactory at any level comprised in 22 to 28V.

Field #09: Temperature, Data and Clock

```
T(A/H): +30°C   n.a.
31 JAN 10   13:45:00
```

This field shows the internal temperature in Celsius centigrade (°C). The ambient temperature sensor is placed just behind the front panel. It may even be up to 5 - 6°C higher than the external temperature at full output power: i.e. nearly +50 to + 51 °C assuming an external temperature of +45 °C (the maximum allowed). The field supports heatsink temperature reading (Th) which is not measured on these equipment.

There is not a Temperature management: only an alarm is issued since reduction in power do not permit power saving, so user is full advised to not trepass temperature limits.

Bear in mind that the higher the ambient temperature, the lower the MTBF. As rule of thumb the life is halved each 10 °C the temperature is increased. Assuming 10 years operating life at +25°C, which is not unrealistic, it may become 2.5 years at +45°C.

TRANSMITTER SETUP MENU

From this submenu section all equipment parameters may be preset or changed. To enter this section 2nd level administration rights are requires, as by default it is. Some parameters requires higher password rights. Turning the jog knob permits to navigate into menus while pushing the knob will outline the parameter to be preset. Pushing quickly will confirm the edited paramenter while pushing for a longher time permits to abort the operation.

Field #22: Transmission Frequency setup

```
FREQUENCY  SETUP
   2470.00 MHz
```

In this field the transmission frequency may be preset, by editing it in two steps. In the first one only the integral part of the frequency, that one on the left side of the decimal point, will be edited. In the second step, the decimal part will.

Field #23: Output Power setup

```
RF POWER SETUP [W]
Set:  4.0  Out:  4.0
```

This field shows and permits to vary the RF output level. Two values are shown: the requested one (Set) and the actual one. When the transmitter is on the air, the output power will vary in real time. If the transmitter is in stand-by conditions, the power shown is purely theoretical. Small variations may be allowed between the Set and the Out power.

Care must be paid not to exceed the licensed value or the maximum power allowed on the transmitter's model.

Field #24: LF Modulation Input level setup

```
MPX 75.0kHz + 0.0dB
Nom.input = + 6.0dBm
```

This field permits to vary the main LF input channels sensitivity, i.e. multiplex, left and right channel. Take present that the multiplex and the right signals share the same circuitry and the sensitivity is set to the same value for both right (or multiplex) and left channel, with a negligible differential error (<0.2dB) at any level.   Allowed range is -3.5 ÷ +12.5 dBm.

The first line of the display shows the actual modulation, while the bottom line shows the nominal input level for 100% modulation. Increasing the nominal input level will accordingly decrease the modulation, if a steady state test signal is applied on the inputs.

Field #25: Auxiliary channel Input level setup

```
AUX  2.0kHz -31.5dB
Nom.input = + 0.0dBm
```

As the previous one, this field permits to preset the auxiliary channels input sensitivity. Allowed range is -12 ÷ +4 dBm to produce 10% modulation, i.e. 7.5kHz deviation or 0dB in the upper line of the display.

The bottom line shows the nominal value at which this occurs, in dBm.

Field #26: Limiter setup

```
MPX limiter  + 7.1dB
          ON
```

This field permits to set the limiter action. They may be separately adjusted the threshold level and the enabling or disabling of the circuit.

Based on local regulations, the limiter may be preset at the maximum allowed modulation level, internationally set to 75kHz-peak deviation (or 0dB), so that the transmitter effectively limits modulation signals which slightly trespass this value. If the regulation is more tolerant, the limiting value may be slightly higher to allow for some dynamical room to occasional modulation peaks: a valid level may be +2.5dB, which corresponds to 100kHz-peak deviation. The maximum presettable level may be so high as +7.1dB, which means 170kHz deviation: in this case there is no difference with the limiter on or off.

It is wise to not frequently trespass the limiter threshold with the modulation or a heavy audible distortion may occur.

Field #27: Transmission Mode, and Pre-emphasis setup

```
MODE/PREEMPH. SETUP
STEREO      PR=50us
```

Here it is possible to setup the transmission "modes" (MONO R, STEREO, MONO L+R, EXT MPX), and the pre-emphasis time-constant (0, 25, 50 & 75 µs).

Everywhere in Europe and in most other countries, the standard pre-emphasis is 50 µs. In the USA and in Latin American countries is 75 µs. Be sure to setup to the correct standard for your area. The pre-emphasis is active only on the audio channels and do not acts on external multiplex signal.

Field #29: Display contrast setup

```
DISPLAY CONTRAST
   SETUP 3
```

From here it is possible to vary the display contrast to permit the best reading in different environment situation or to compensate variation with components, temperature and aging. A number 0 to 7 shows the preset level.

Field #30: Time & date setup

```
DATE & CLOCK SETUP
31 JAN 11   13:45:00
```

This field permits to edit either date and time

Field #31: Elapsed Time

```
   ELAPSED TIME
   000356 HOURS
```

This field shows the elapsed time for service purpose whether the transmitter is on the air or in stand-by with the mains applied. There is no way to change the reading.

Field #32: Password Management

```
 PASSWORD   LEVEL X
code=**** status=OFF
```

This field shows the password status and permits to change the code and/or the status in command mode, when in possession of the necessary level authorisation for that level or a higher one. No code is ever shown and no access is permitted to a level higher than the current authorisation.

Hence, if the password is unknown, lost or tamperers changed it, it is possible to change status and code when in possession of the higher password. In this case the lower level password code must be changed and confirmed: no possibility still being to know what was the old password. This means that it is always possible to change the 1st or 2nd level password, even if they are unknown, if respectively the 2nd or 3rd level passwords are correctly set when requested.

If the code or the status is changed, it is always required to confirm the correct password for that level:

```
 CONFIRM PASSWORD
       ....
```

When the 3rd level password is input, the operation with that security level is allowed as long as 3 minutes after the last key input. So it prolongs as soon as navigation and action is performed on the display and keyboard, but will be reset anyway later the last command.

When even the first security level is enabled, the equipment stops every access following the time-out. This is explicitly done to impede to unauthorised personnel to display equipment parameters, if required. The functioning of the equipment is not influenced by this state. Any attempt to access to the equipment will cause the request of a correct password. Failure to do so will cause a time-out process

during which no command will be recognised by the equipment. At the end of this time, it will be possible to retry to input a valid password.

This display stops input mode for 5 second and than permits to exit (and possibly to try again) by escaping.

```
INVALID PASSWORD!
....
```
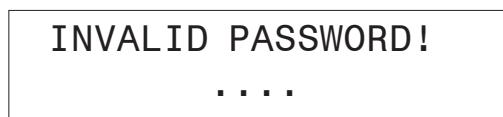
Field #33: Alarm setup and display

This menu permits to show various alarm conditions which may be associated to the general alarm line, either the front panel led and the remote I/O signalling line. Some of them may be edited for their threshold level while other are factory fixed. The following table indicates all them:

```
        ALARM SETUP
TEMPERATURE:     ON
PLL UNLOCK:      ON
HIGH VSWR:       ON
LOW POWER:      ON/OFF
NO MODULATION:  ON/OFF
OVERMODULATION: ON/OFF
TEMP. AMBIENT:  55°C
TEMP. HEATSINK: XX°C
MAX REFL.PW:   XX.X W
MIN DIR. PW:   XX.X W
NO MOD. LEV.:-15.9dB
NO MOD. TIME:  90sec
UNLOCK TIME:   60sec
```

Due to any alarm condition, if the kind of the alarm is enabled, the red front panel *"Alarm"* led and the corresponding remote signal line will turn on. At the same time a flashing line will superimpose on the display specifing which is the highest priority pending alarm. This alarm line will stop to flash whenever the control jog knob is moved to permit to navigate in the control and setup menus; at timeout, i.e. 2 or 3 minutes from the last access it will superimpose again till alarm resets. The alarm reset is automatic and requires no action from the user. The apparatus has no alarm historical memory.

Here following is a list of all the transmitter alarms as shown on the display line:

```
TEMPERATURE ALARM!
  UNLOCK  ALARM!
 HIGH VSWR ALARM!
 LOW POWER ALARM!
NO MODULATION ALARM!
OVERMODULATION ALARM
```

Field #34: I/O pin allocation and logic level setup

```
 I/O PIN ALLOCATION
& LOGIC LEVELS SETUP
```

As described in the proper section, there are 3 I/O lines which may be associated to corresponding pins of the parallel remote I/O connector on the rear panel. This submenu permits to vary the corresponding function associated to each pin with the following options ("NOT DEFINED" means that no alternate function is still assigned):

Inputs:

```
PIN 6: RF ENABLE
       NOT DEFINED
```

Outputs:

```
PIN 2: ON THE AIR
       REMOTE LOCKED
```

```
PIN 7: ALARM
       NOT DEFINED
```

The factory default is the first line for each pin. All of these lines may be preset active high or low in the same menu. When "Remote Locked", the apparatus cannot be changed in its presets from front panel knob before exciting from this condition.

FACTORY MENU

Factory menu enables some internal presets, which are not permitted to the user and must not be altered. There is only one distinct exception, in the case the CPU control board is changed with a new one or the internal firmware is upgraded with a new version. In this unique case, it is possible to choose the equipment model to control, with its specific frequency range, as further described.

Field #40: Model and Frequency range setup

```
EQUIPMENT MODEL SET
SHF STL Tx 2468-2484
```

In this field it is possible to choose either the type of the transmitter to control and its frequency range. There is no need to access here on normal use, but it is important to correctly set the model to which the apparatus corresponds. Service personnel may access to this field with 3rd level keyword permission.

The equipment model set is limited to an internal list for which the controller is preset. This field proposes about ten frequency ranges. Choosing an incorrect frequency range **will surely impede** the equipment to work.

RECEIVER MENU

Receiver menu tree

The receiver menu is mostly similar to that of the transmitter and is organized in the same manner. Many fields are identical and we will not deal with these. Following is a brief description of the new and the revised ones.

	RX18B S/W -ver.2.XX **STEREO DECODER: YES**	20	ENTER PASSWORD CODE

ESCAPE 00 `SIELCO - ITALY` `RX TYPE - Vers. 1.XX` **ESCAPE**

OPERATION		**SETUP**	
03	TUNING +1.2kHz FREQ: 2470.000MHz	01 SETUP OPERATION	21 LOCAL / REMOTE CONTROL SETUP
04	FIELD: -58dBm MUTING: OFF		22 FREQUENCY SETUP
05	MPX 75KHz +7.1dB ######## 0			23 LF OUTPUT LEVEL SETUP
06	LEFT level -3.0dB RIGHT level -4.0dB		24 MUTING SETUP
07	L######## 0 | R######## 0			25 DEEMPHASIS TIME CST SETUP
08	PILOT TONE LEVEL DEV. 7.5kHz -20.0dB		26 DEEMPHASIS ON/OFF SETUP
09	VS2 Vs+ Vs- 27.5V +12.5V -12.7V		28 OPTIONS DETECTION
10	TEMPERATURE: +27°C 01 JAN 10 17:22:00		29 DISPLAY CONTRAST SETUP
			30 DATE & CLOCK SETUP
			31 ELAPSED TIME COUNTER
			32 PASSWORD SETUP
			33 ALARMS SETUP
			34 I/O PIN ALLOCATION & LOGIC SETUP
			40 MODEL SETUP

Field #03: Reception Frequency setup

```
 TUNING   +1.2kHz
FREQ. 2470.000MHz
```

This is the first control field and shows the receiver preset frequency and the centre tuning of the received signal. In case of absence or very weak received signal (<-90dBm), the tuning indication is casual. The received signal is correctly tuned when its centre frequency is comprised in ±6.0 kHz.

Field #04: Received RF field and muting

```
 FIELD    -58dBm
 MUTING    OFF
```

Here are shown the received signal field in dBm and the possible muting intervention in case of weak field or severe mistuning.

Field #05: LF Output level

```
MPX  75.0kHz + 0.0dB
#############O|
```

This field shows the actual frequency deviation of the received signal due to the whole multiplex modulation, as shown on the corresponding transmitter field.

Take care that while deviation reading is very precise with clean channel reception, in the absence of received field or with very week field a big amount of noise will be displayed which will show up a much wide deviation than real.

Fields #06 & #07: Left and Right decoded Output levels

```
 LEFT level - 3.0dB
RIGHT level - 4.5dB
```

```
L########## O  |
R######### O   |
```

As in the previous field, here are shown the modulation level separately due to the Left and Right stereo channels. expressed in dB, where 0dB refers to 75kHz-peak deviation. The bottom field shows the same information as an analog moving bar.

These fields are shown only if the optional internal stereo decoder is present.

Field #08: Stereo Pilot Frequency level

```
 PILOT TONE LEVEL
DEV.  7.5kHz -20.0dB
```

This field too is shown only in case of presence of the optional stereo decoder board. Here it is shown the modulation due only to the stereo pilot 19kHz tone embedded in the multiplex signal, in any moment and with excellent precision. There is no need to mute the modulation or to do any special action to measure it.

RECEIVER SETUP MENU

Field #21: Local/Remote control setup

```
SETUP CONTROL
LOCAL & REMOTE
```

The apparatus may be controlled either locally from the front panel or remotely from the I/O lines and RS232 serial port. It is possible to permit concurrently control as default shown (remote I/O lines may be prevalent in case of any function disable) or only local or by remote. So the highlighted line may be changed in:

```
LOCAL ONLY
```

or

```
REMOTE ONLY
```

In case the apparatus is remotely locked, any temptative to access to setup menu will show the following message:

```
REMOTELY LOCKED
PRESET TO LOCAL!
```

Pushing twice "Enter" on the control jog will select the "SETUP CONTROL" menu and highlight the upper field ("REMOTELY LOCKED") permitting to change it to "LOCAL & REMOTE" or "LOCAL ONLY" if required.

Field #22: Frequency setup

```
FREQ. 2470.175 MHz
F= -55dBm T=+ 1.2kHz
```

Here it is possible to preset the received frequency in a similar manner as in the transmitters. In the receiver the frequency is changed in real time with editing, whenever possible.

The bottom line shows the associated received field and center tuning. Bear in mind that very often major frequency changes requires several seconds to be effective and during this time the infomation on the bottom line is meaningless.

Field #23: LF Output level setup

```
LF out lev. + 2.5dBm
Nom. level: + 6.0dBm
```

It is here possible to vary at the same time the level of the main LF outputs, either the Multiplex (Mpx) and Mono signals. In the first row it is shown the actual level in dBm, while in the bottom row it is shown and may be preset the nominal output level referred to 75kHz deviation. Preset range is comprised in -1.5 and +12dBm.

Field #24: Useful Received Field and Muting setup

```
   MUTING  SETUP
level:-75dBm  / OFF
```

From this field the user may vary the insertion level of the muting circuit and its intervention. Suitable levels are -70 to -80dBm for stereo signals and -85 to -90dBm for mono signals, depending on the received signal strength. The muting level is unrelated to the field alarm level which may be differently preset by its own menu (see alarm setup, menu #32)

By pre-setting "ON" or "OFF", the muting circuit may be enabled or disabled either by "mistuning alarm" or remote control function.

Fields #25 & #26: De-emphasis setup

```
DEEMPHASIS TIME CST.
      50 us
```

```
 DEEMPHASIS ON/OFF
MONO:on   STEREO:on
```

It is here possible to vary the de-emphasis time-constant between 0, 25, 50 and 75µs. The de-emphasis function may be separately preset on the mono and the decoded stereo outputs, if present.

Field #28: Optional internal boards detection

```
      OPTIONS:
STEREO DECODER: NO
```

On this field it is shown the software detection of possible optional internal boards, avoiding to open or internally preset the equipment. Stereo decoder board is the main option in the receiver; other boards may be added in the future.

Field #33: Alarm setup and display

As in the transmitter here is possible to see and partially edit the various alarm conditions which may be associated to the general alarm signalling. The following table lists the possible alarms for the receiver:

```
       ALARM SETUP
TEMPERATURE:     ON
PLL UNLOCK:      ON
LOW RF INPUT:   ON/OFF
MISTUNING:      ON/OFF
NO MODULATION:  ON/OFF
OVERMODULATION: ON/OFF
HIGH TEMPERAT.:  55°C
LOW RF INPUT: -xxdBm
NO MOD. LEV.:-15.9dB
NO MOD. TIME:  90sec
UNLOCK TIME:   60sec
```

Field #34: I/O pin allocation and logic level setup

As described in the proper section, there are at least 4 I/O lines which may be associated to corresponding pins of the parallel remote I/O connector on the rear panel. This submenu permits to chose the corresponding function to associate to the pins with the following options:

Inputs:

```
PIN 6: AUDIO MUTING
       REMOTE LOCK
```

Outputs:

```
PIN 2: MODULATION OK
       REMOTE LOCKED


PIN 7: ALARM
       FIELD GOOD


PIN 3,8: FIELD GOOD
         ALARM
```

The factory default is the first line for each pin. All of these lines may be preset active high or low in the same menu.

As for the Transmitter, when "Remote Locked", the apparatus cannot be changed in its presets from front panel knob before exciting from this condition. The input pin #6 may be associated to a function which force this status ("Remote Locked"). In this case every temptative to change the setup will invoke menu field #21 to permit local control.

EXC18B
BROADCAST STL
TRANSMITTER
VHF/UHF/SHF
200 ÷ 960 & 1400 ÷ 2500 MHz

DIAGRAMS AND COMPONENT LAYOUT

Notes:

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EXC18B TRANSMITTER 200-960MHz - MECHANICAL ASSEMBLY VIEW
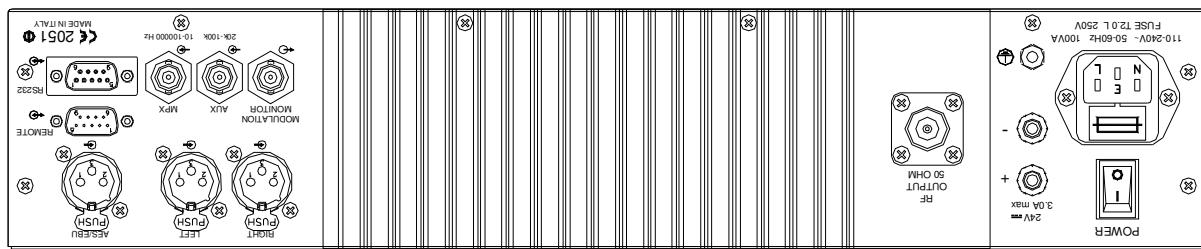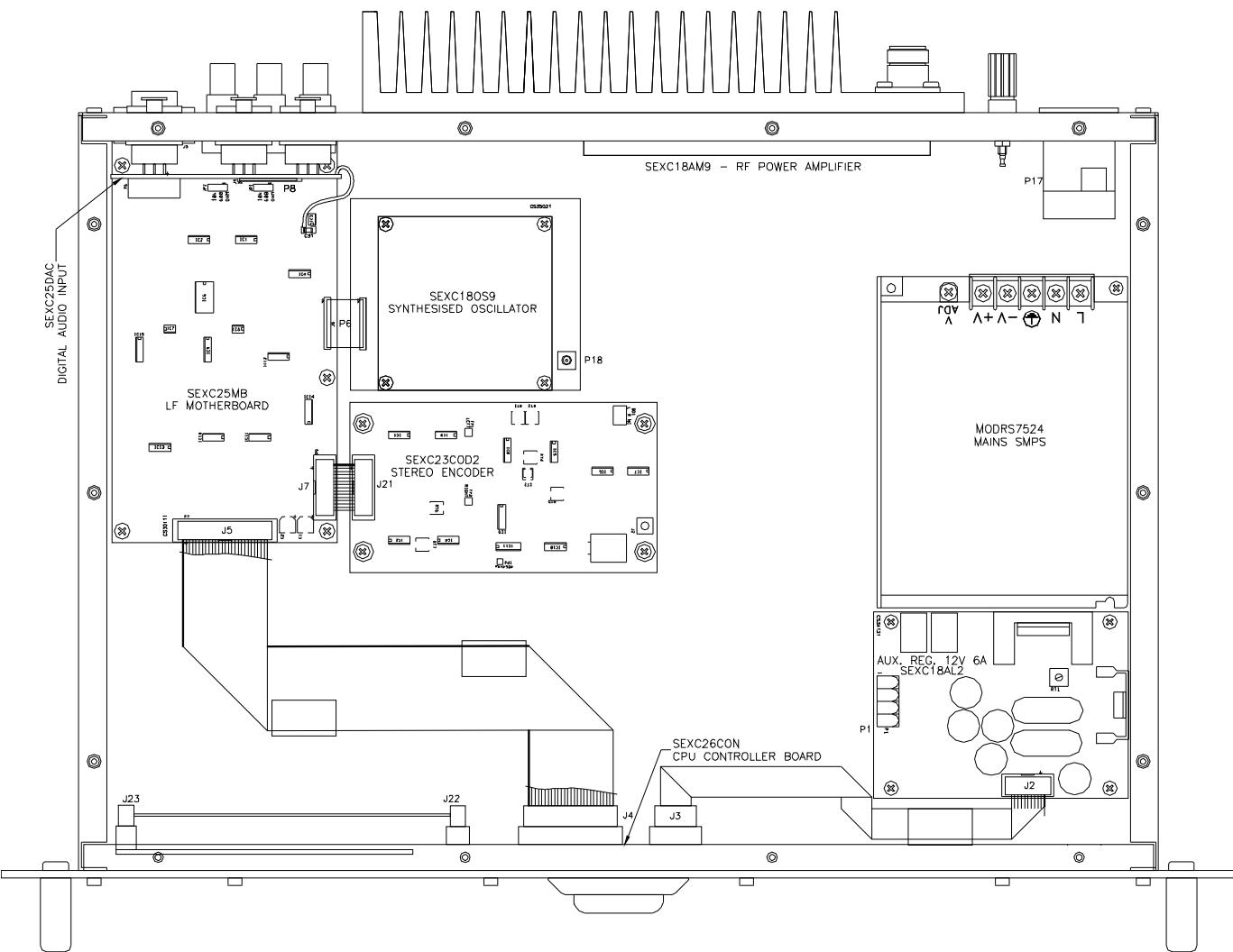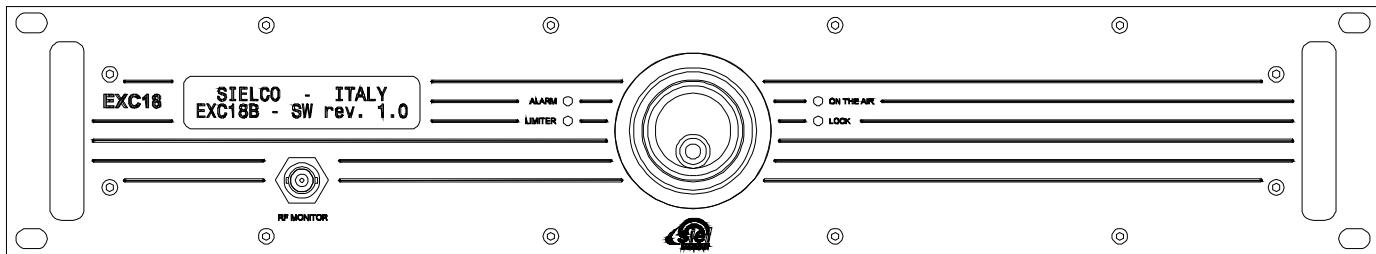
EXC18B TRANSMITTER 1300-2500MHz - MECHANICAL ASSEMBLY VIEW
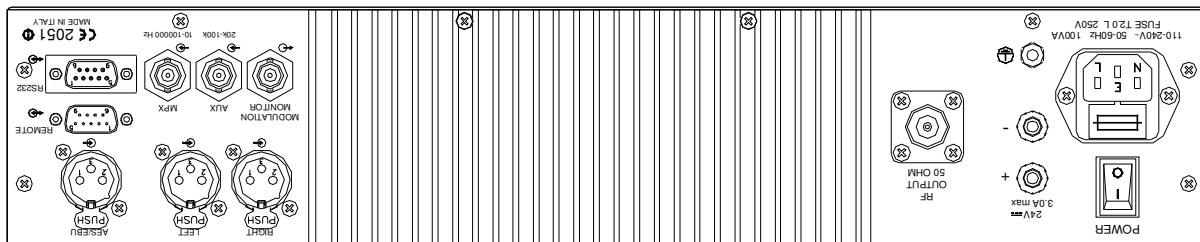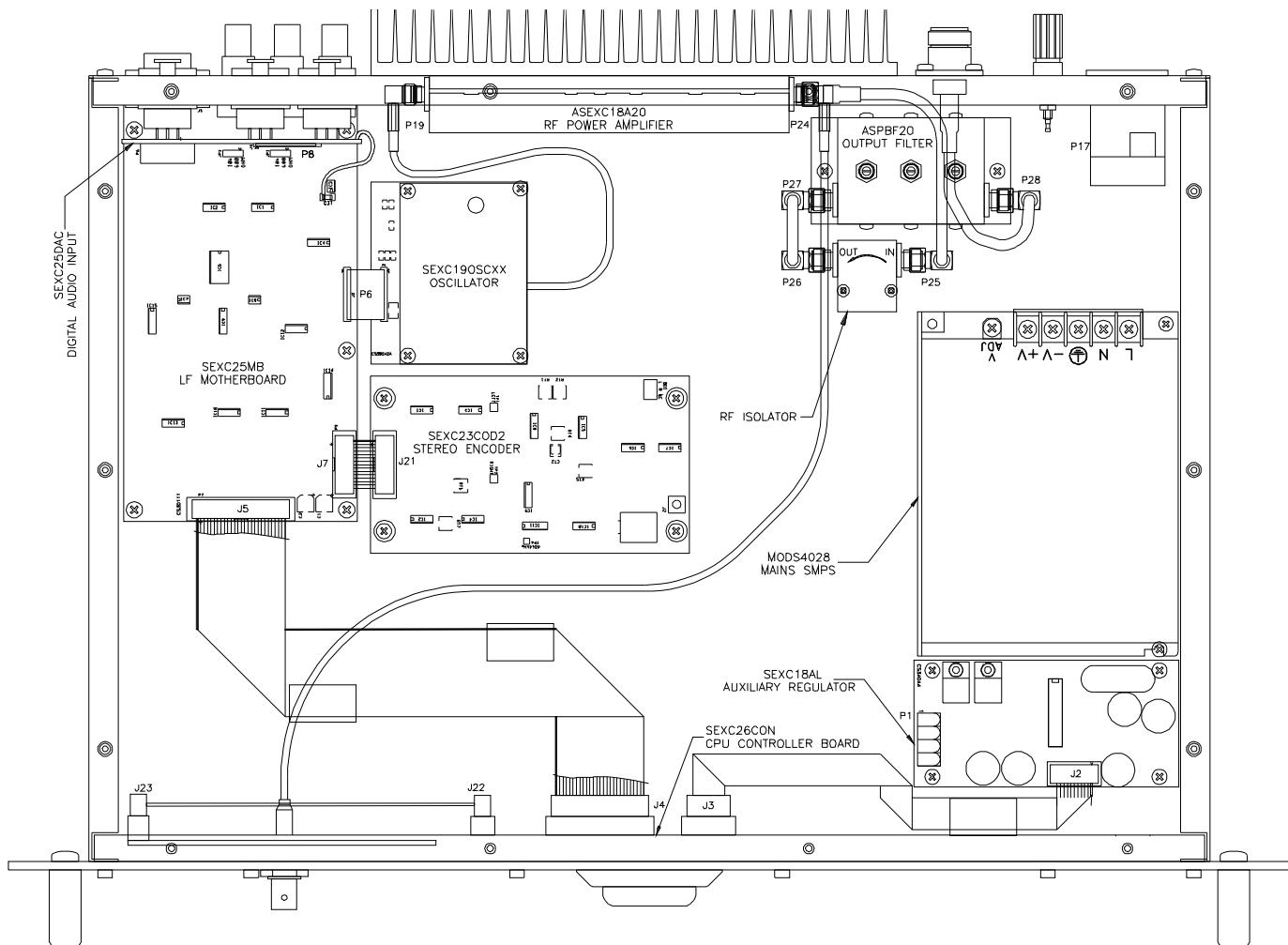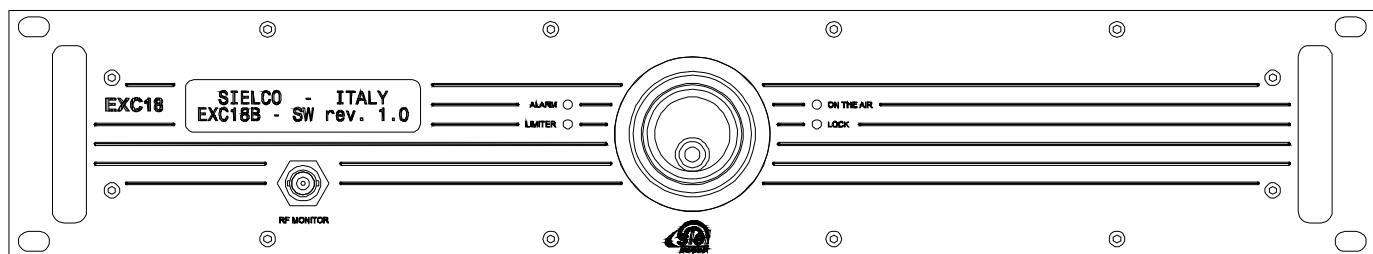
EXC18B TRANSMITTER 200-960MHz - E1298, Electrical wiring diagram

THE STEREO-ENCODER BOARD IS MOUNTED ONLY AS AN OPTION
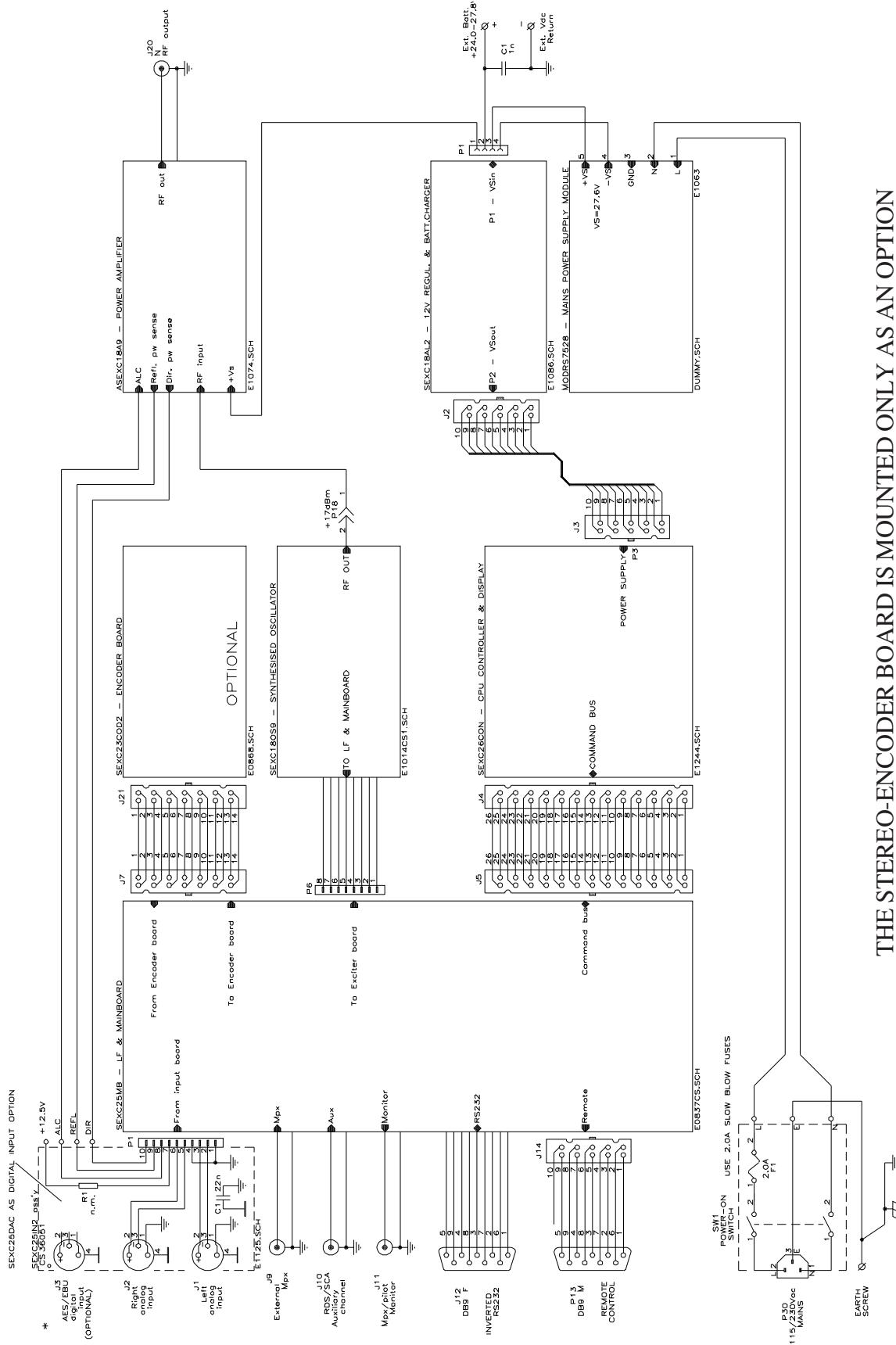
EXC18B TRANSMITTER 1300-2500MHz - E1243, Electrical wiring diagram
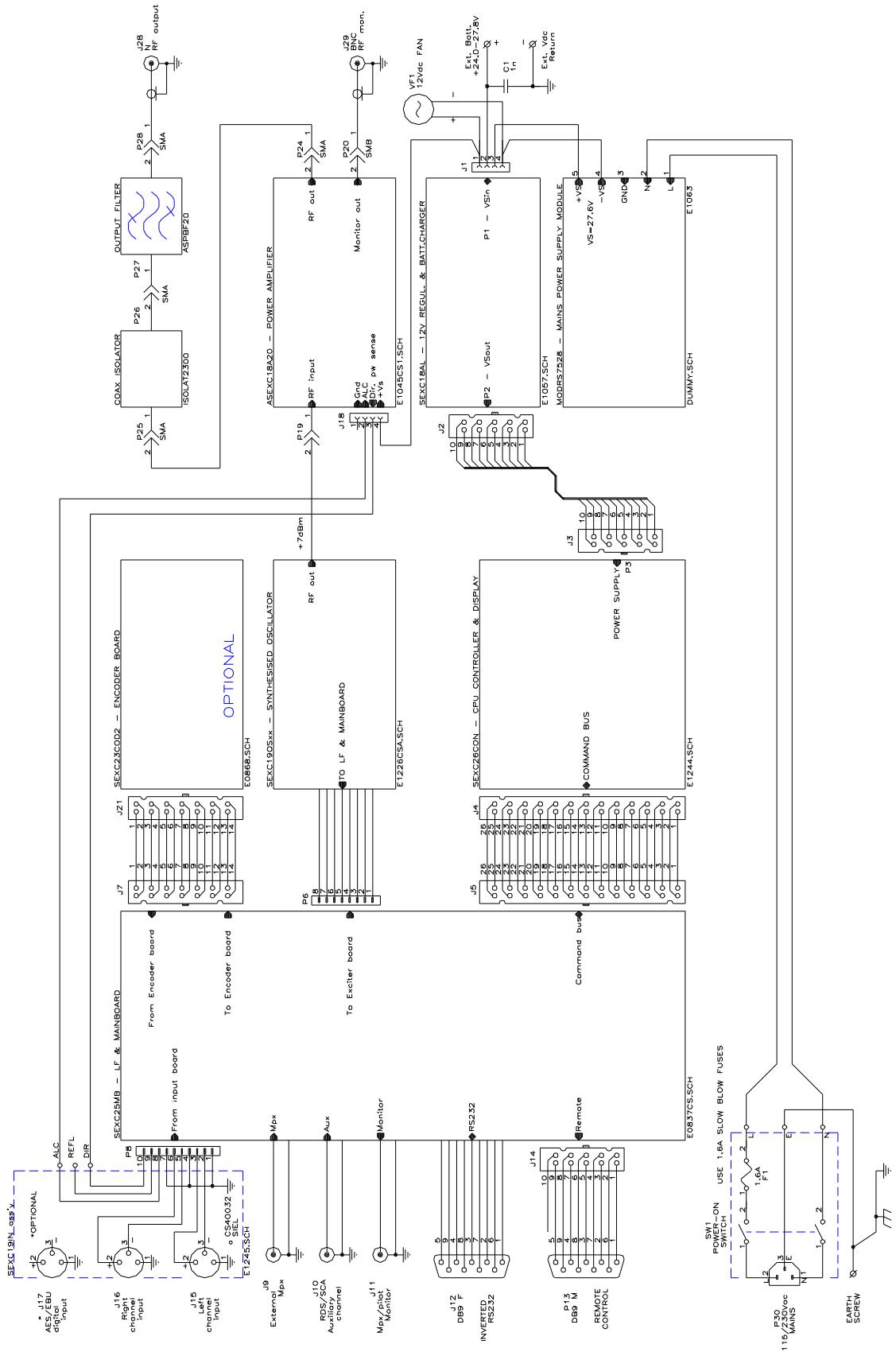
THE STEREO-ENCODER BOARD IS MOUNTED ONLY AS AN OPTION

SEXC26CON - E1244, CPU CONTROLLER & DISPLAY BOARD
Electrical diagram
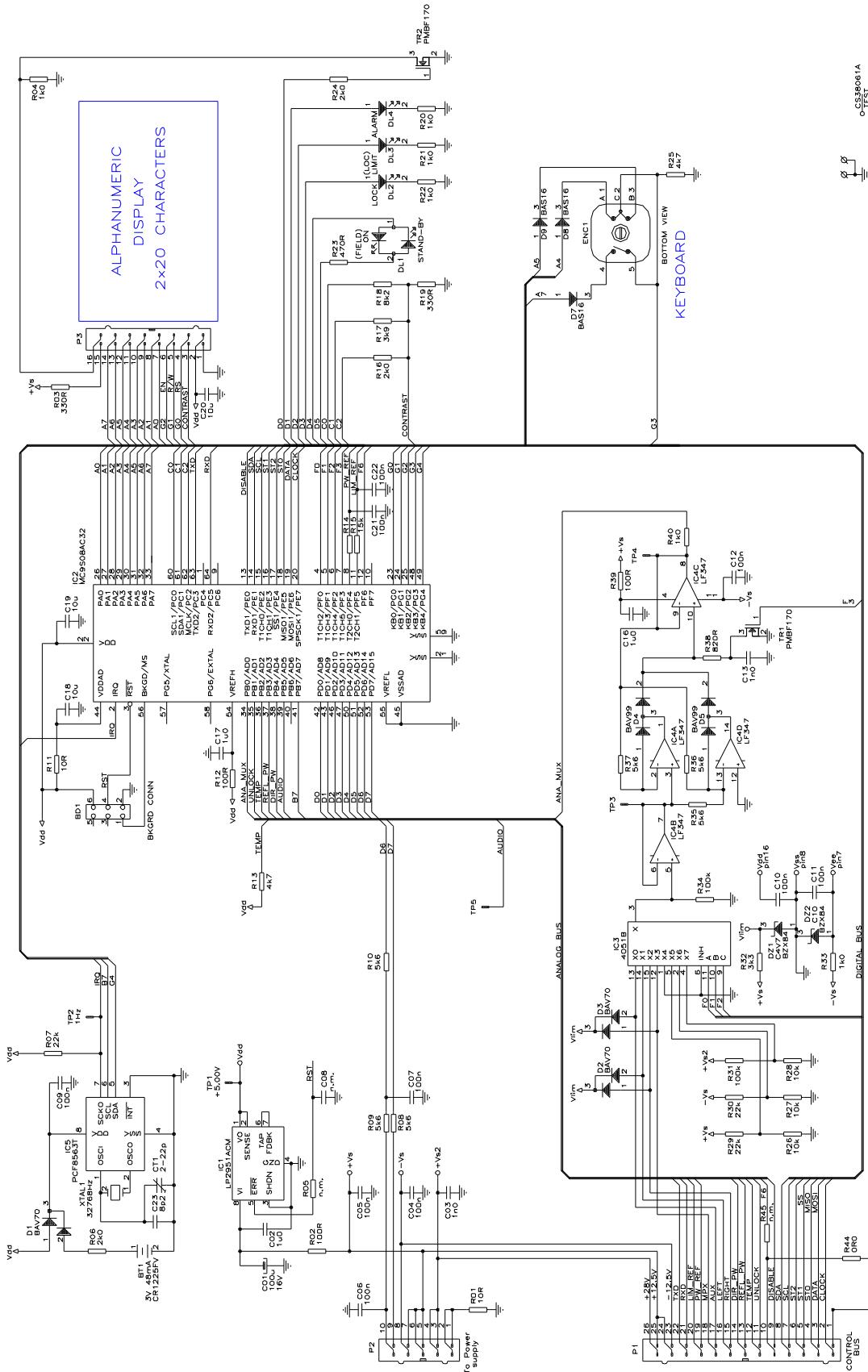
SEXC26CON - CPU CONTROLLER & DISPLAY BOARD - Component layout

COMPONENT SIDE
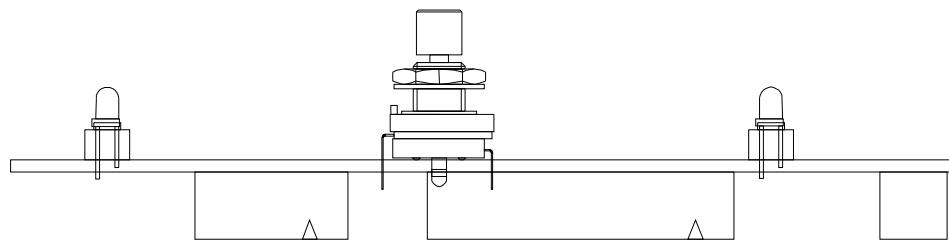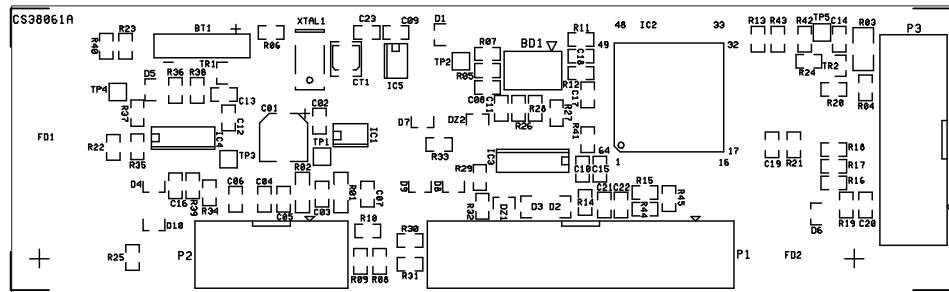
SOLDER SIDE
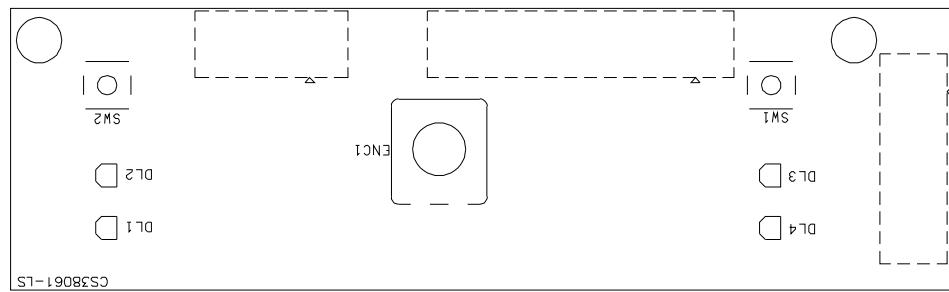
SEXC25MB - MAINBOARD / I/O & RF CONTROL SECTION
Electrical diagram - 1 of 2

COMPONENTS MAY VARY DUE TO PRODUCTION ADJUSTMENTS
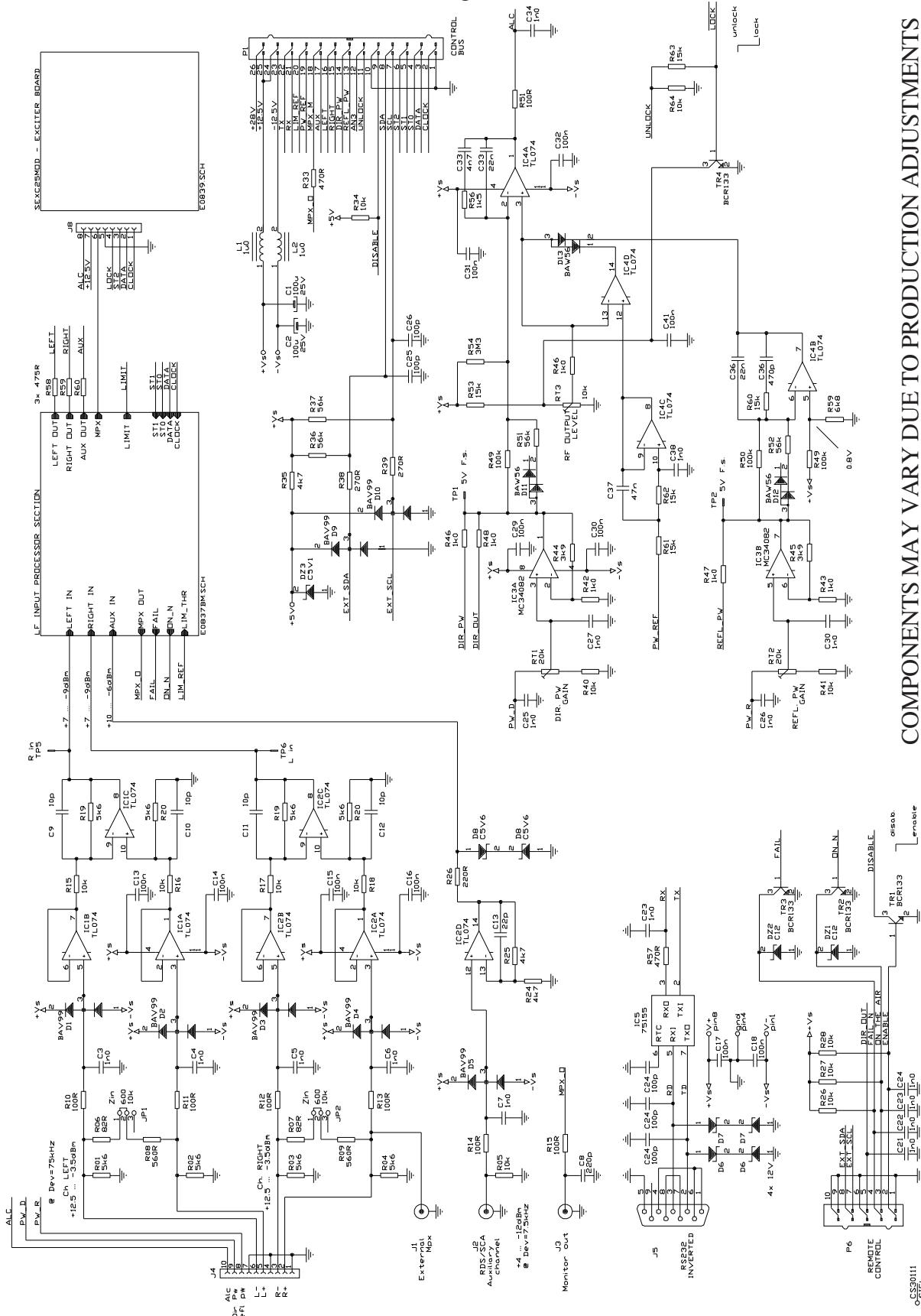
SEXC25MB - MAINBOARD / LF PROCESS SECTION
Electrical diagram - 2 of 2
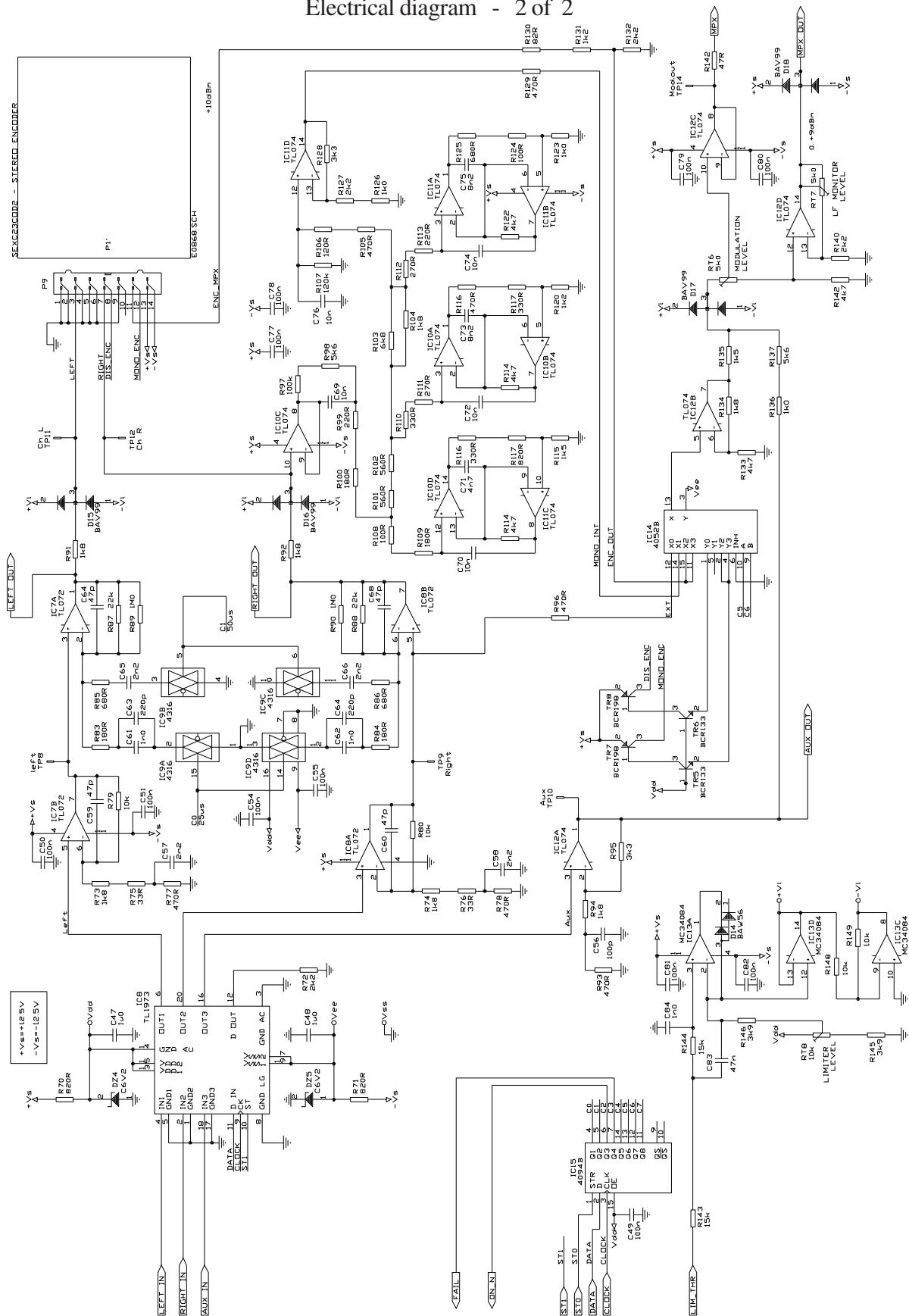
SEXC25MB - MAINBOARD - Component layout
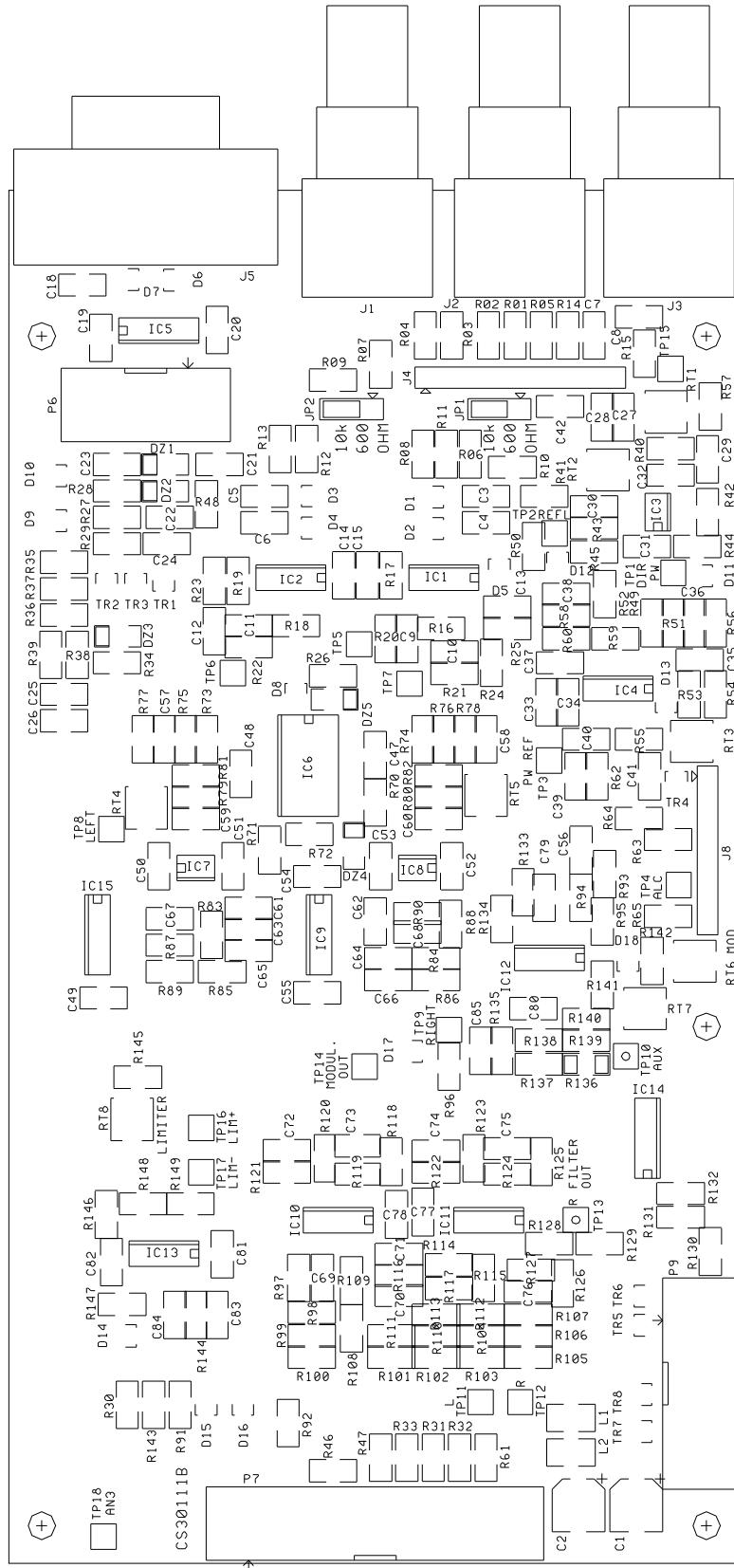
SEXC18OS9 - SYNTHESISED OSCILLATOR BOARD - E1014, Electrical diagram
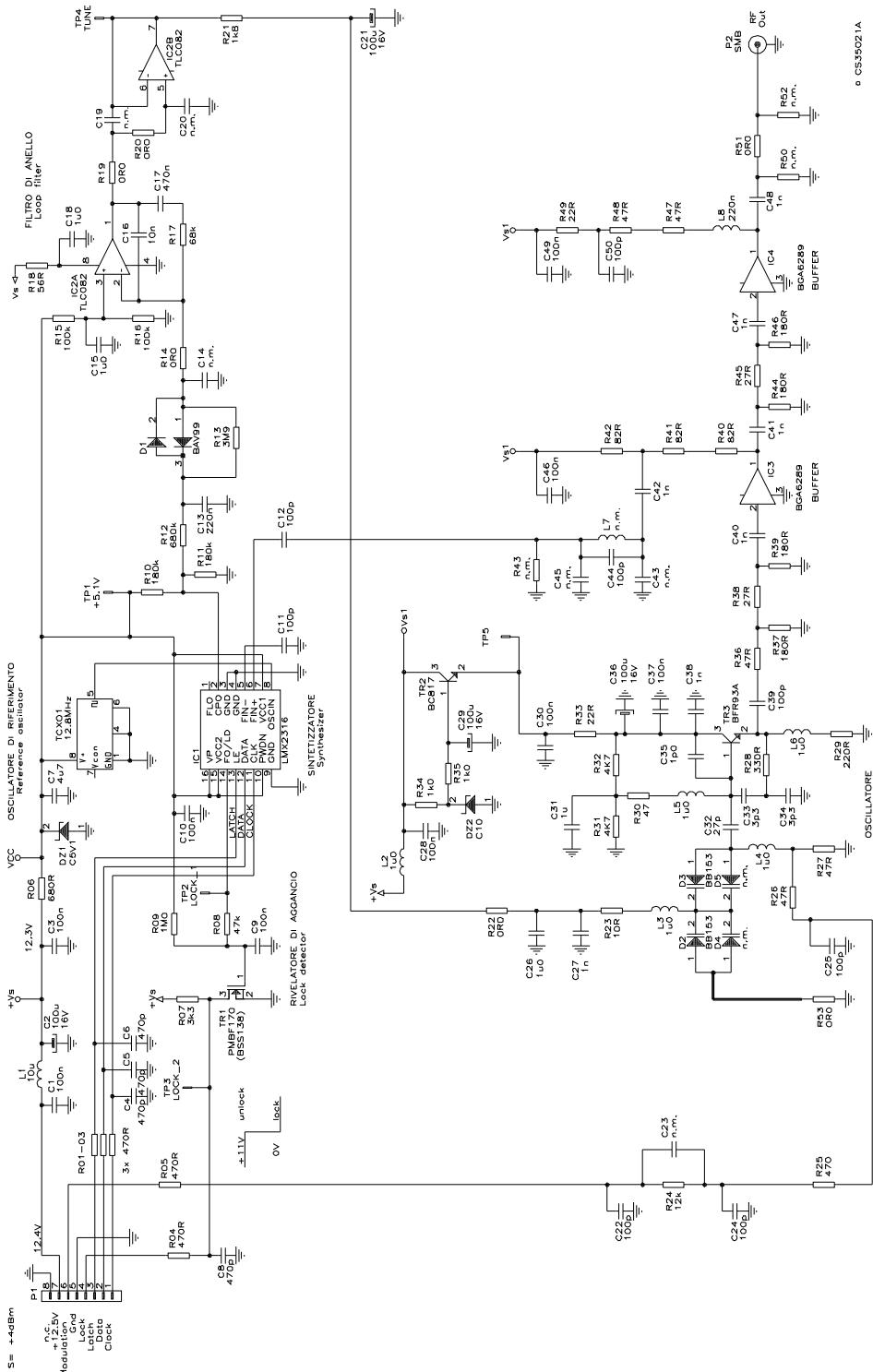
VALUES SHOWN ARE ONLY EXEMPLIFICATIVE AND VARY ACCORDING TO BAND AND PRODUCTION

SEXC18OS9 - SYNTHESISED OSCILLATOR BOARD - Component layout
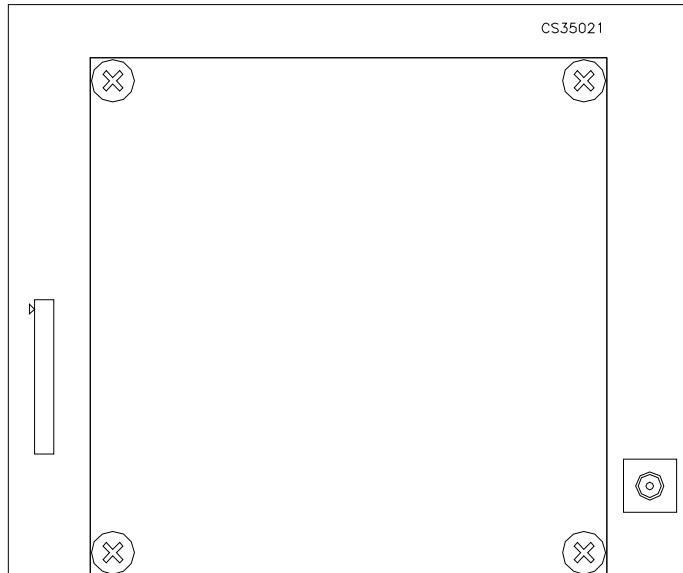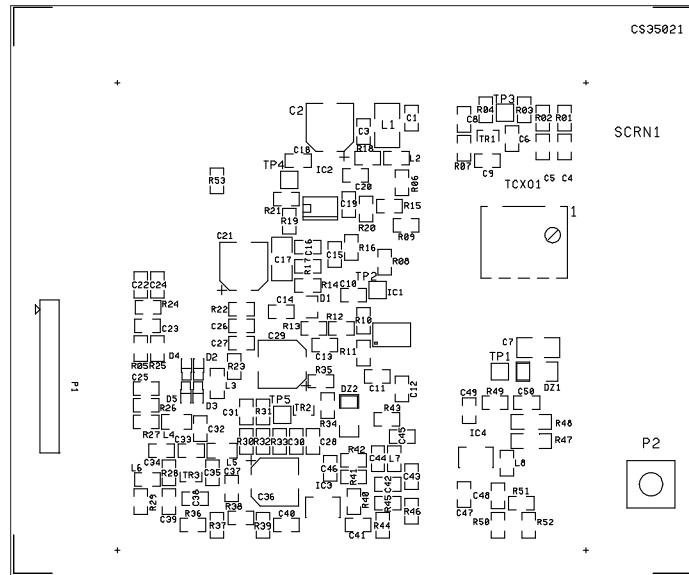
SEXC19OS13-26 - 1300-2600MHz SYNTHESISED OSCILLATOR MODULE

E1226, Electrical basic diagram
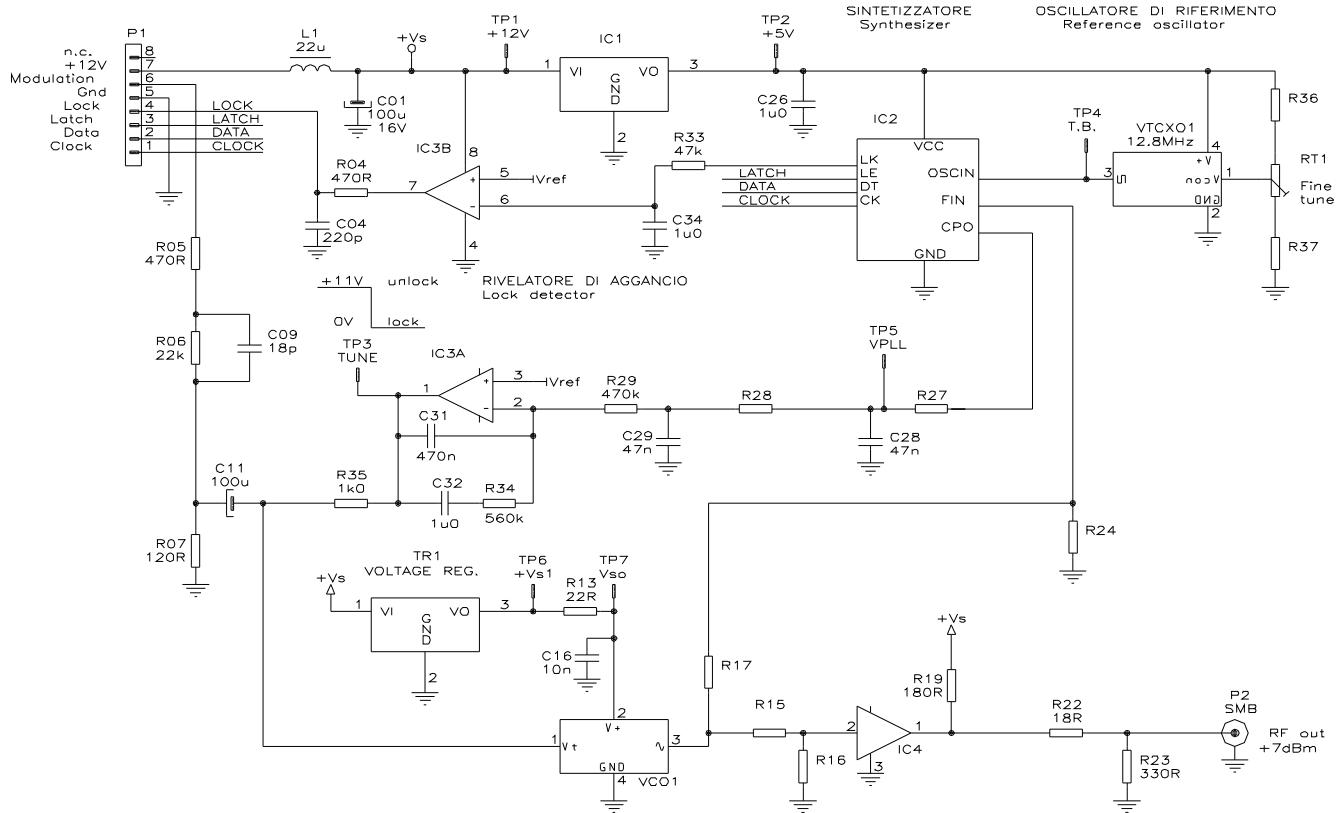
VALUE AND DIAGRAMS SHOWN ARE ONLY EXEMPLIFICATIVE AND DO NOT NECESSARILY
REFLECT REAL COMPONENTS

Module layout
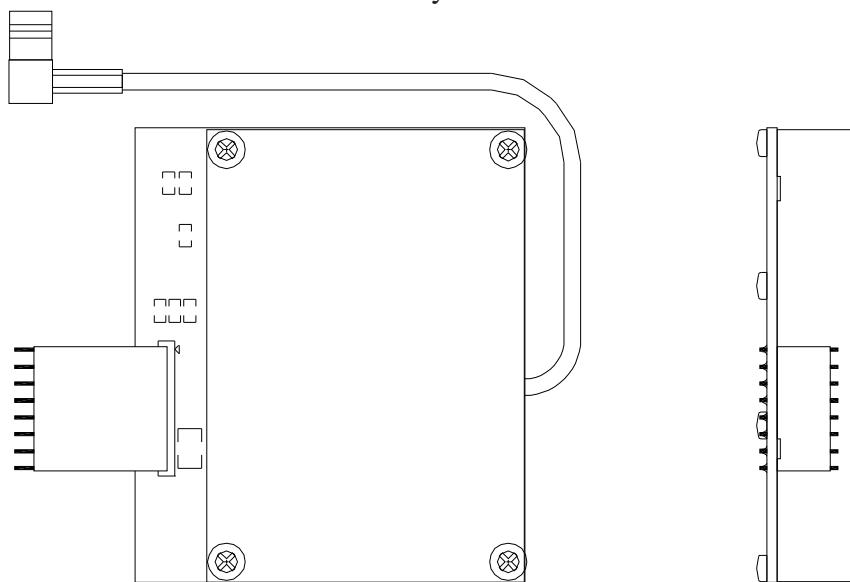
ASEXC18AM9 – 200-960Hz POWER AMPLIFIER
E1074, Electrical diagram & component layout

COMPONENTS SHOWN ARE ONLY EXEMPLIFICATIVE
AND VARY DEPENDING ON BAND AND PRODUCTION
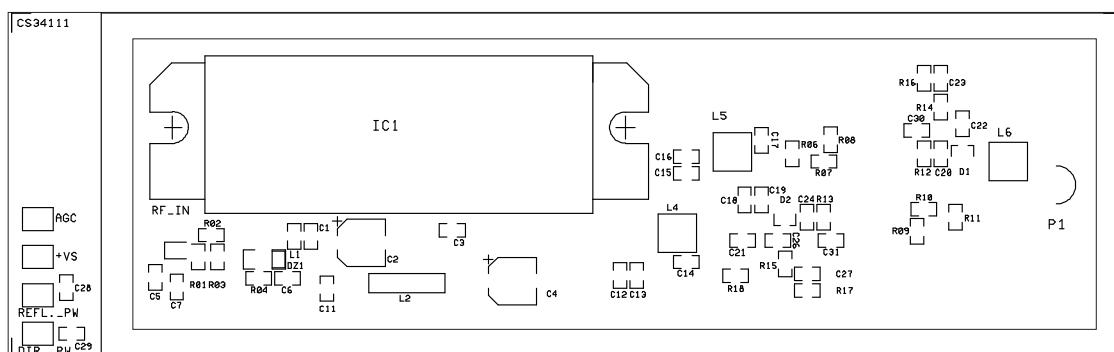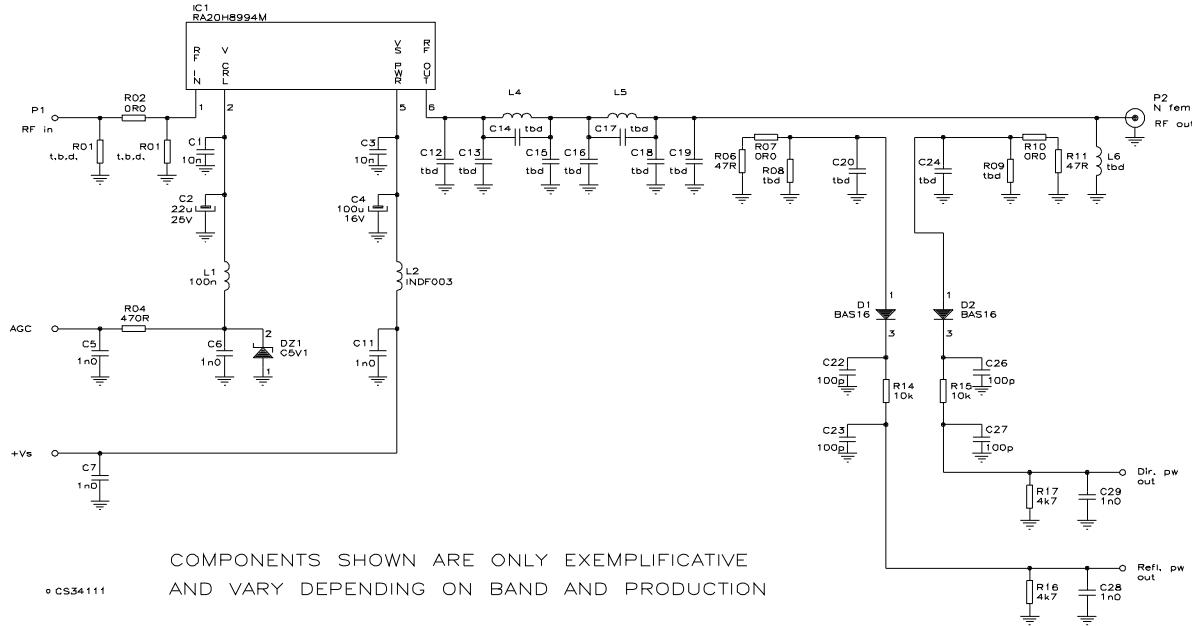
ASEXC18A20 - 2GHz RF POWER AMPLIFIER - Electrical diagram
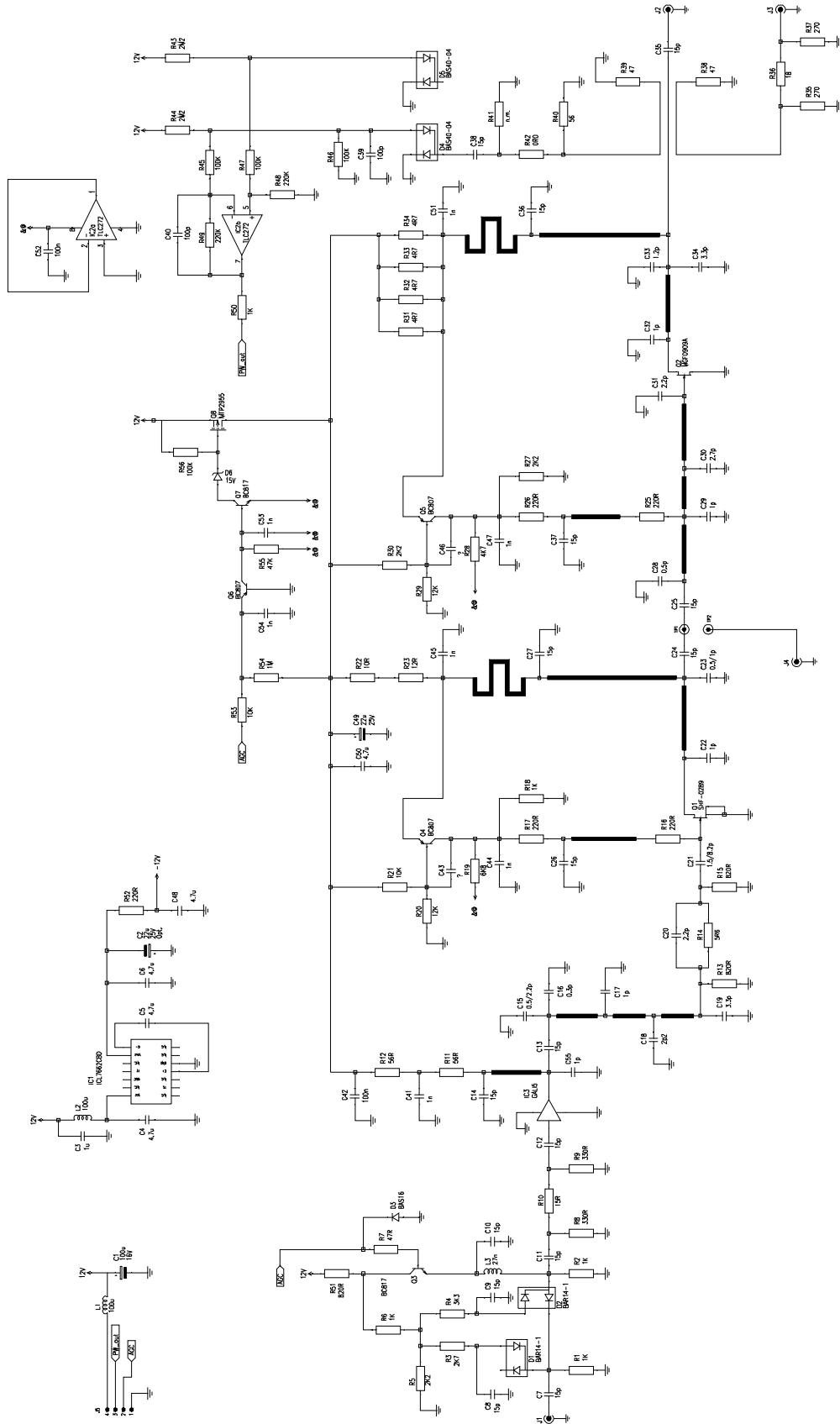
COMPONENTS MAY VARY DUE TO PRODUCTION ADJUSTMENTS

ASEXC18A20 - 2GHz RF POWER AMPLIFIER - component layout
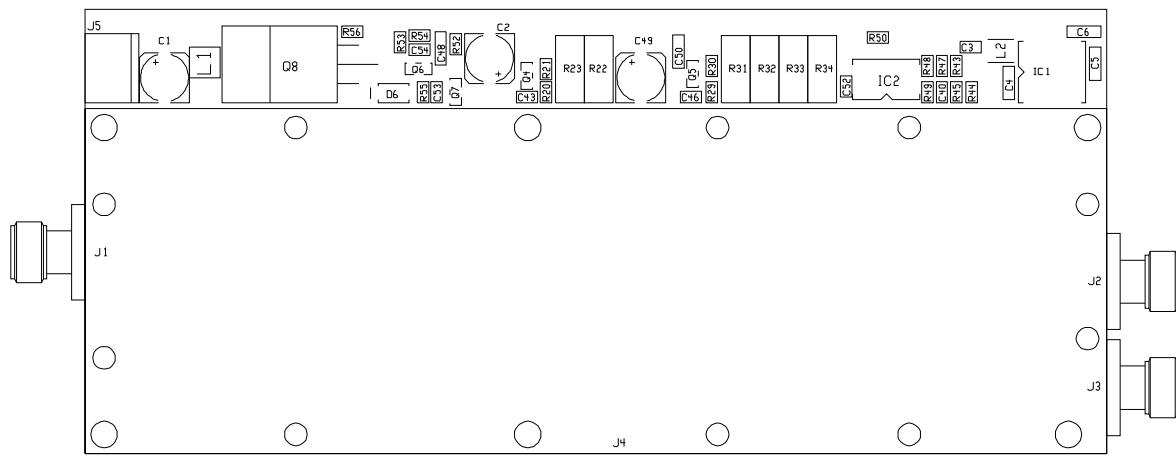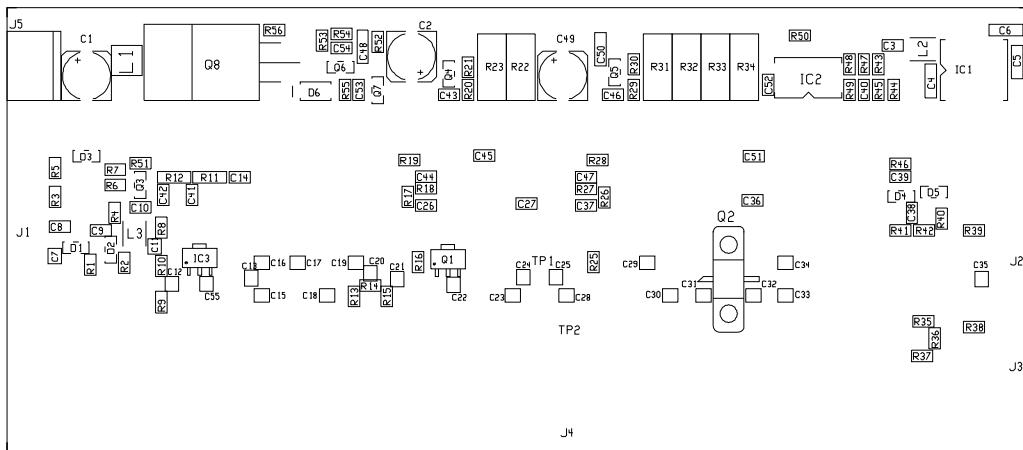
SEXC23COD2 - STEREO ENCODER BOARD - Electrical diagram
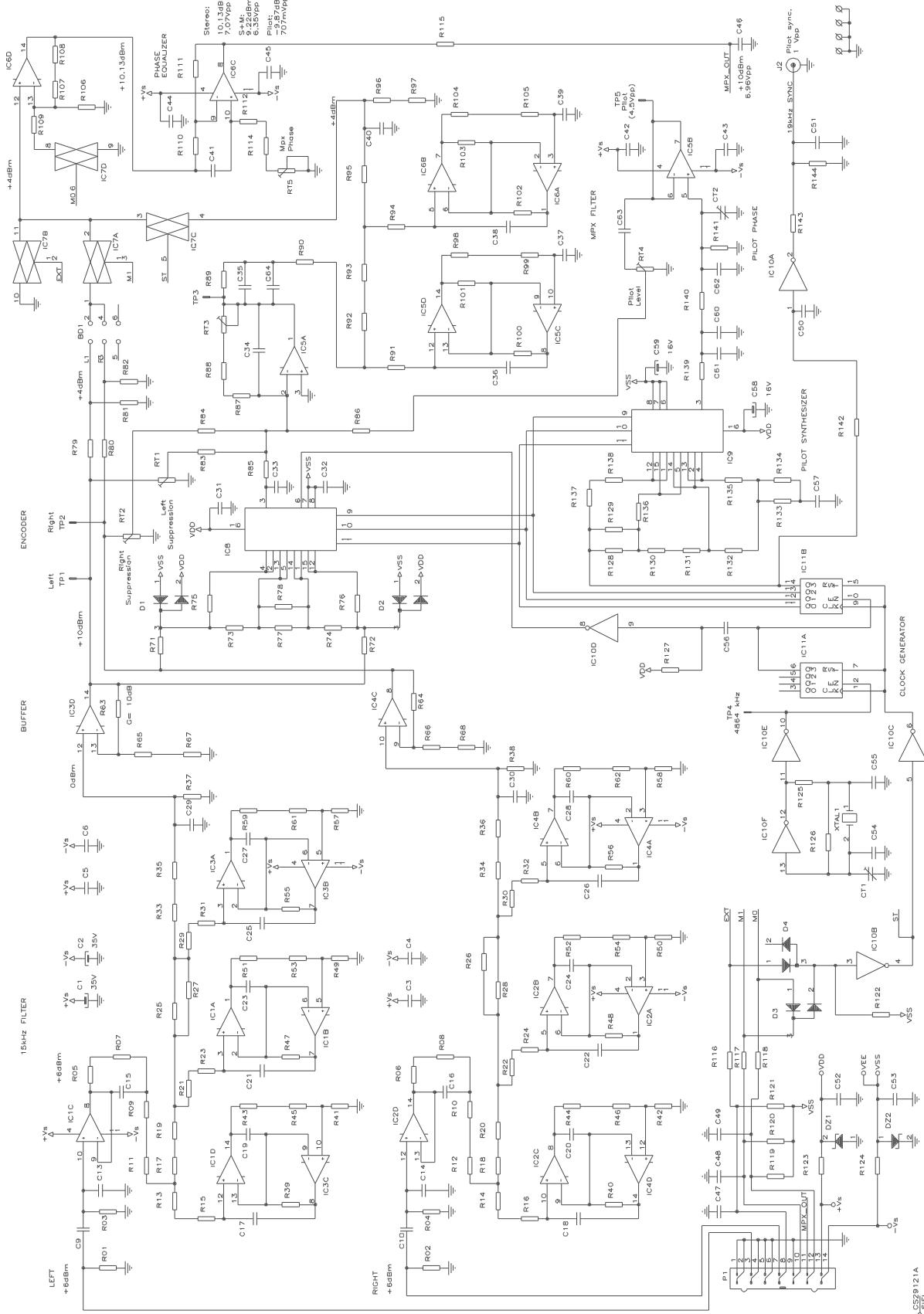
SEXC23COD2   -   STEREO ENCODER BOARD   -   Component layout
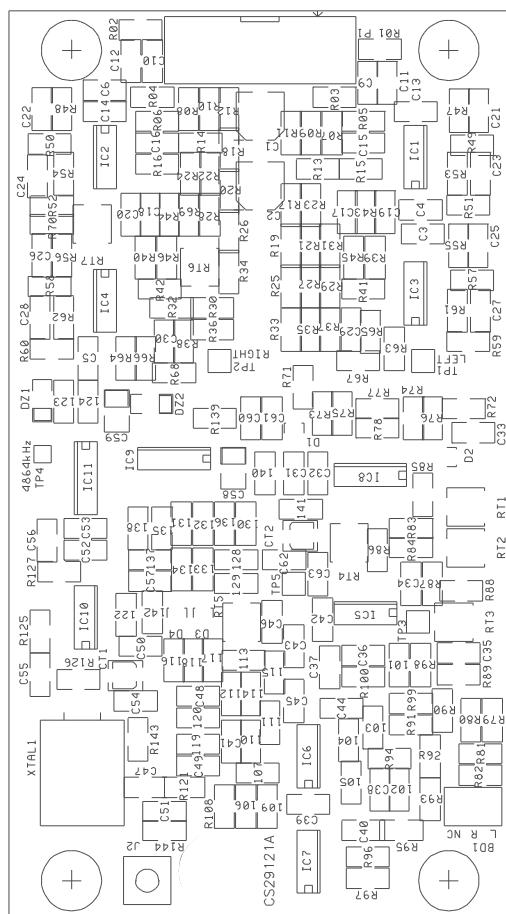
MODS4028 / MODRS7524 - Mains power supply modules
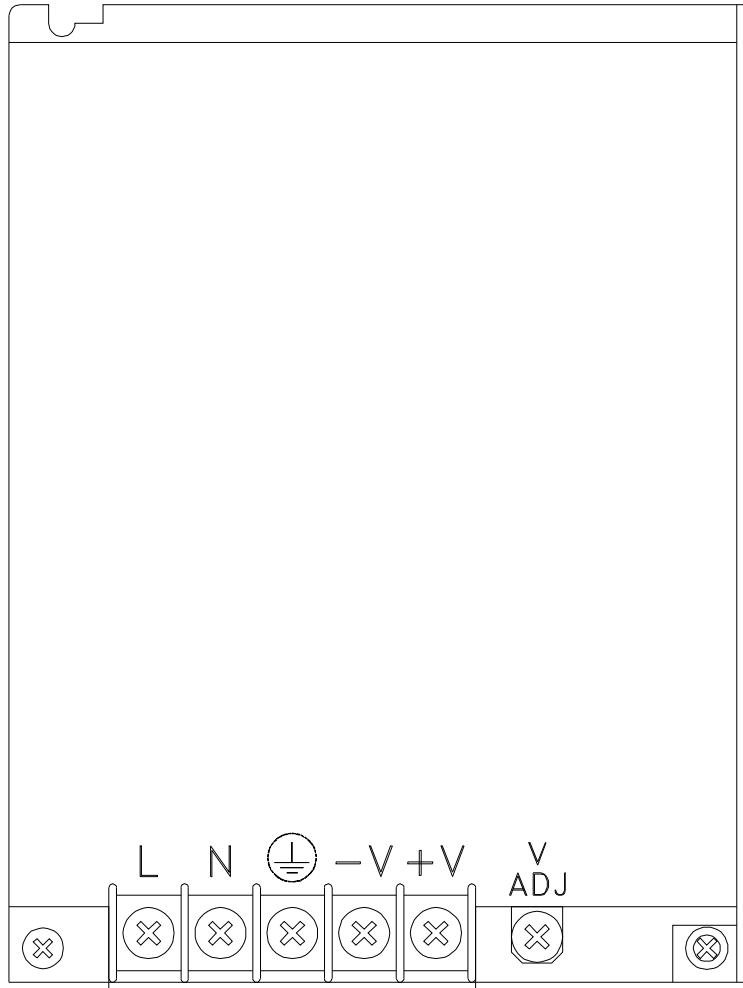
SPECIFICATIONS:

Input: 90-260Vac 47/60Hz
Output: 27.8Vdc / 1.6A (MODS4028)
             27.8Vdc / 3.0A (MODRS7524)

SEXC18AL - 12.5V REGULATOR & BATTERY CHARGER BOARD
E1057, Electrical diagram & component layout
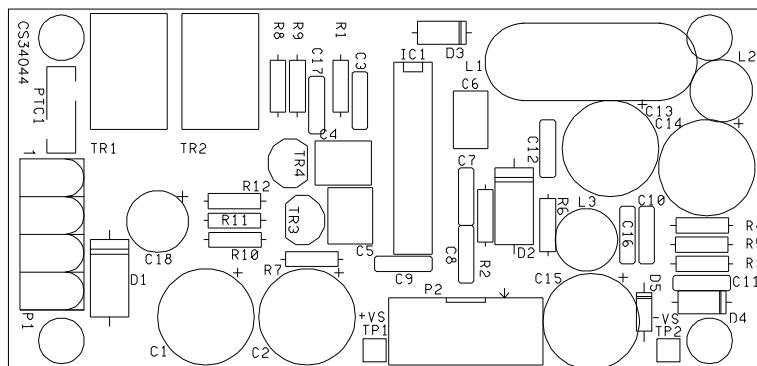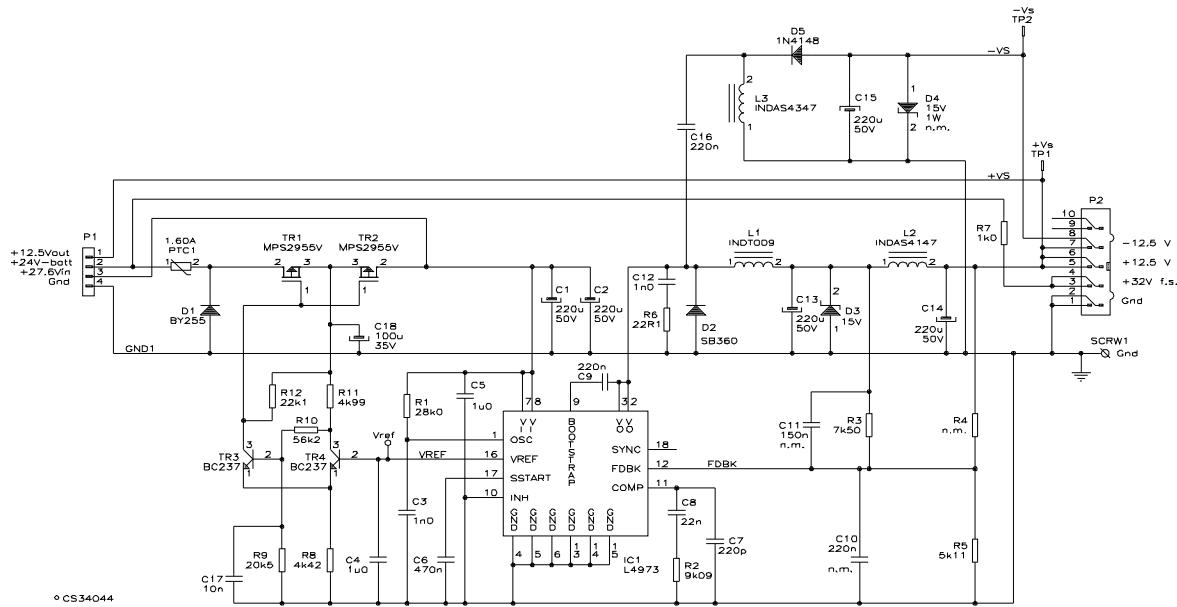
SEXC18AL2 - 12.5V REGULATOR & BATTERY CHARGER BOARD
E1086, Electrical diagram & component layout
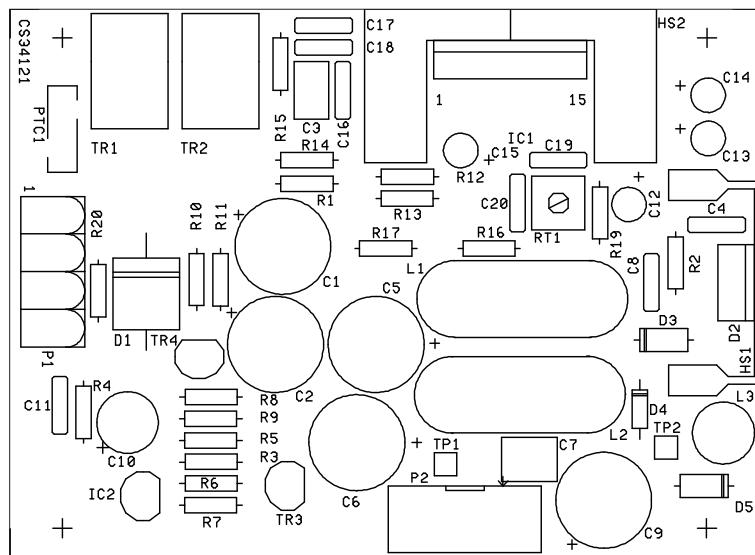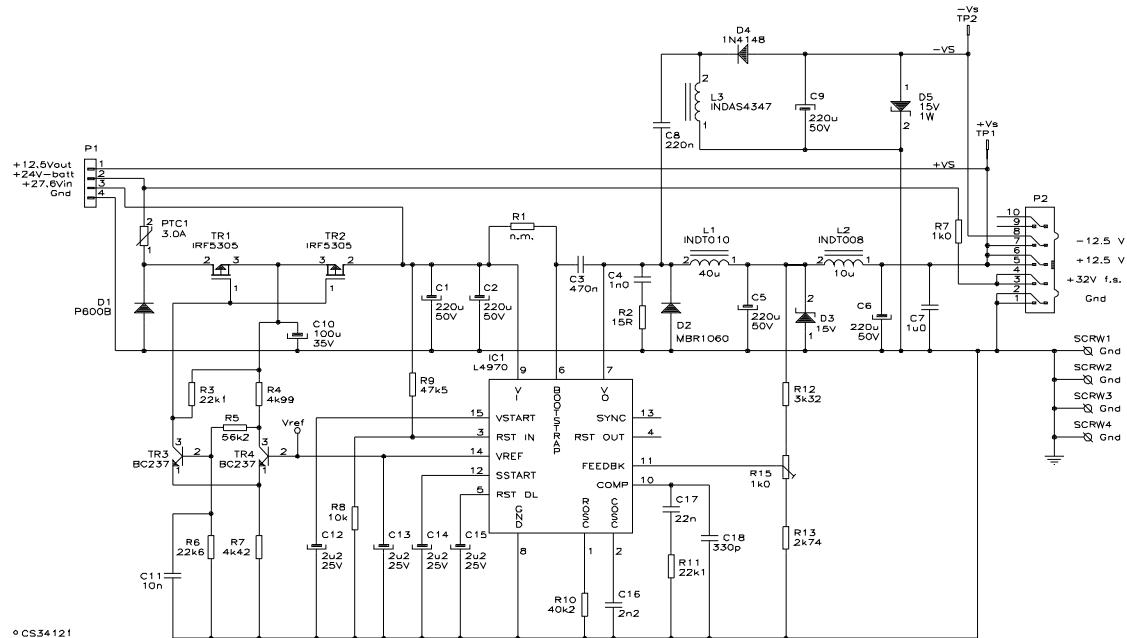
SEXC25DAC - DIGITAL AUDIO INTERFACE BOARD - E1124, Electrical block diagram
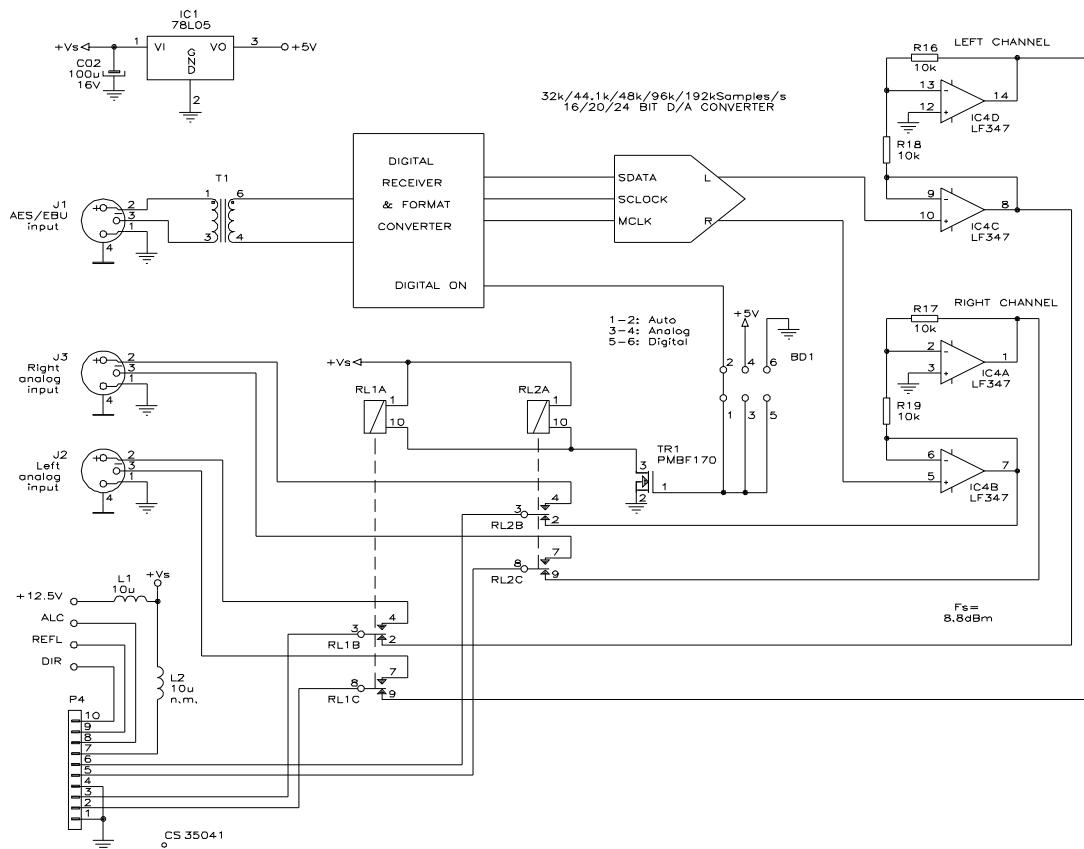
Module layout
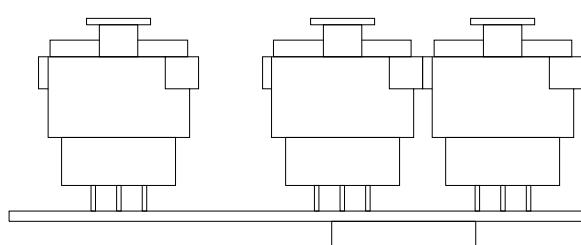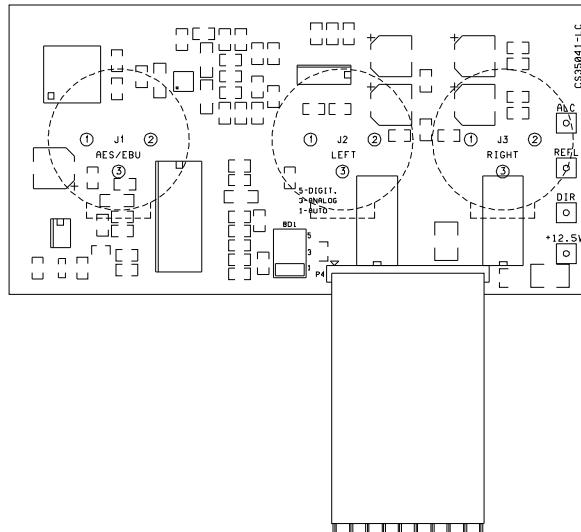
RTX18B
SHF BROADCAST STL RECEIVER
200 ÷ 960 & 1400 ÷ 2500 MHz

DIAGRAMS AND COMPONENT LAYOUT

Notes:

For all the modules which are also present on the transmitter, here not reported, please refer to the relevant section of the manual

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RTX18B RECEIVER 200-960MHz - MECHANICAL ASSEMBLY VIEW
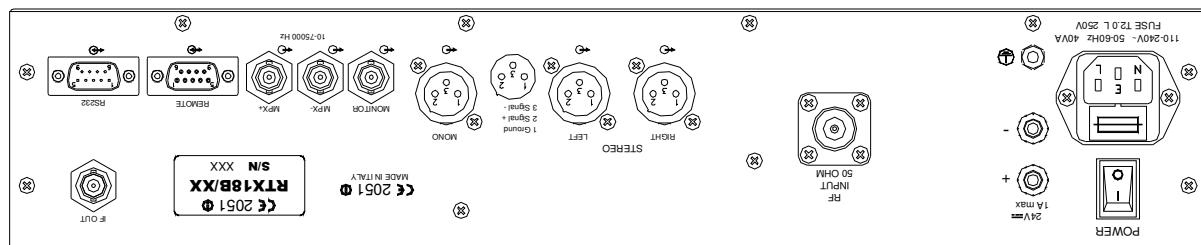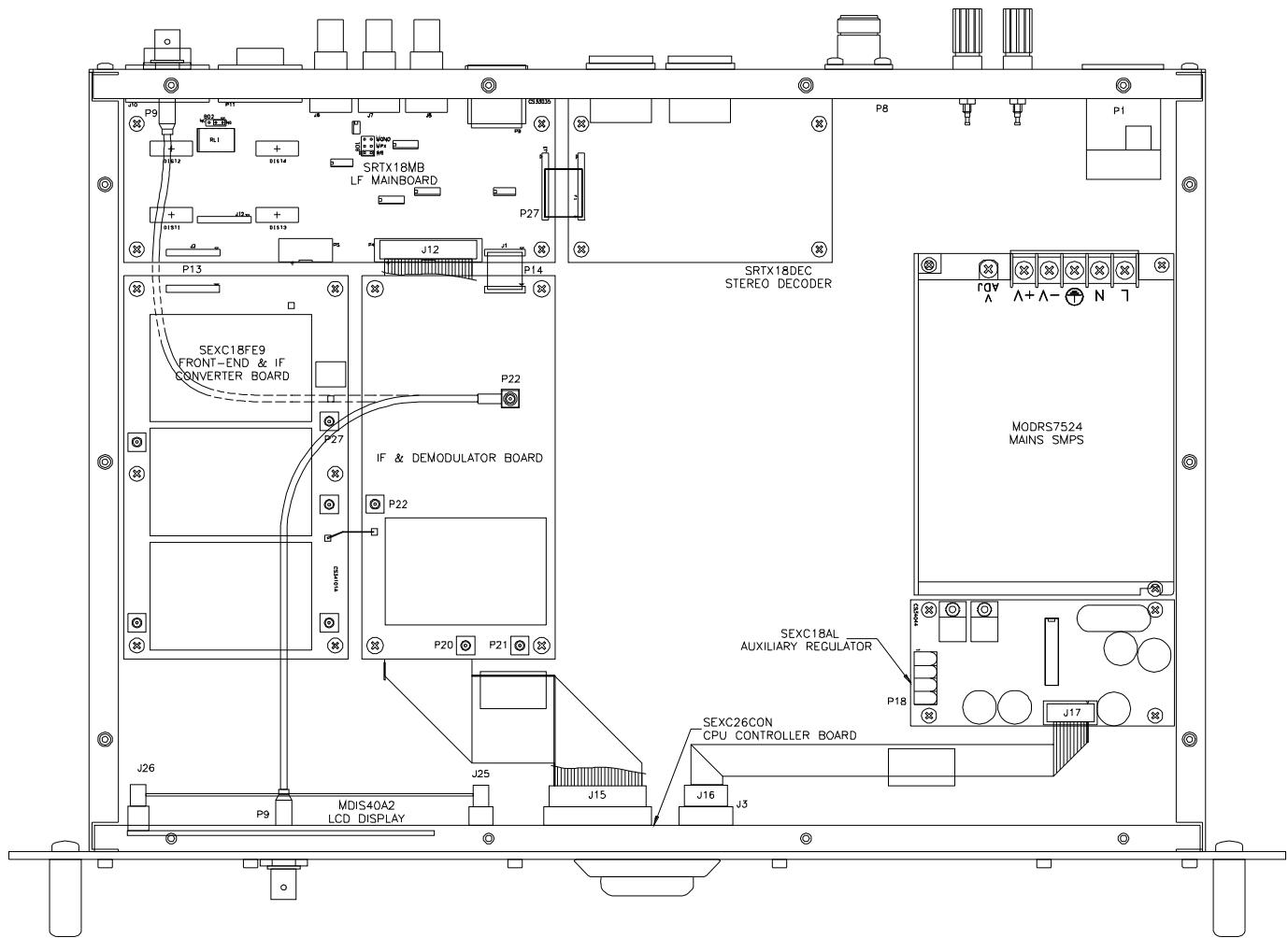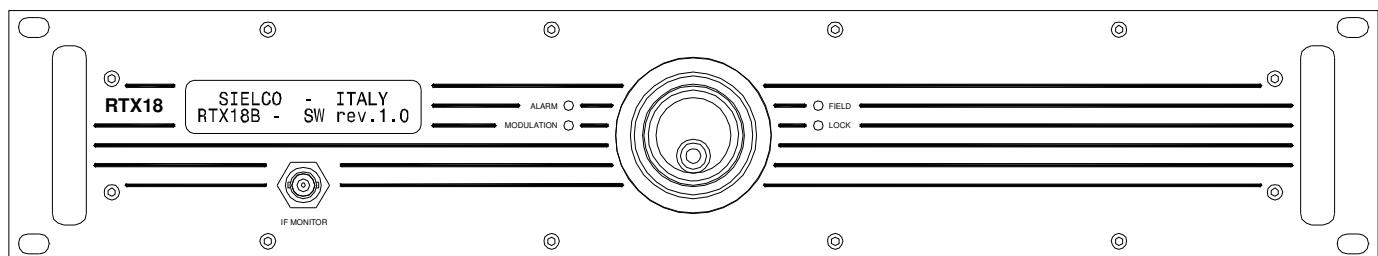
RTX18B RECEIVER 1300-2500MHz - MECHANICAL ASSEMBLY VIEW
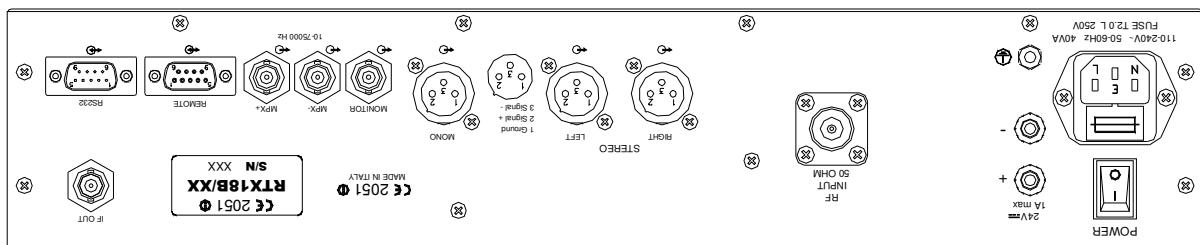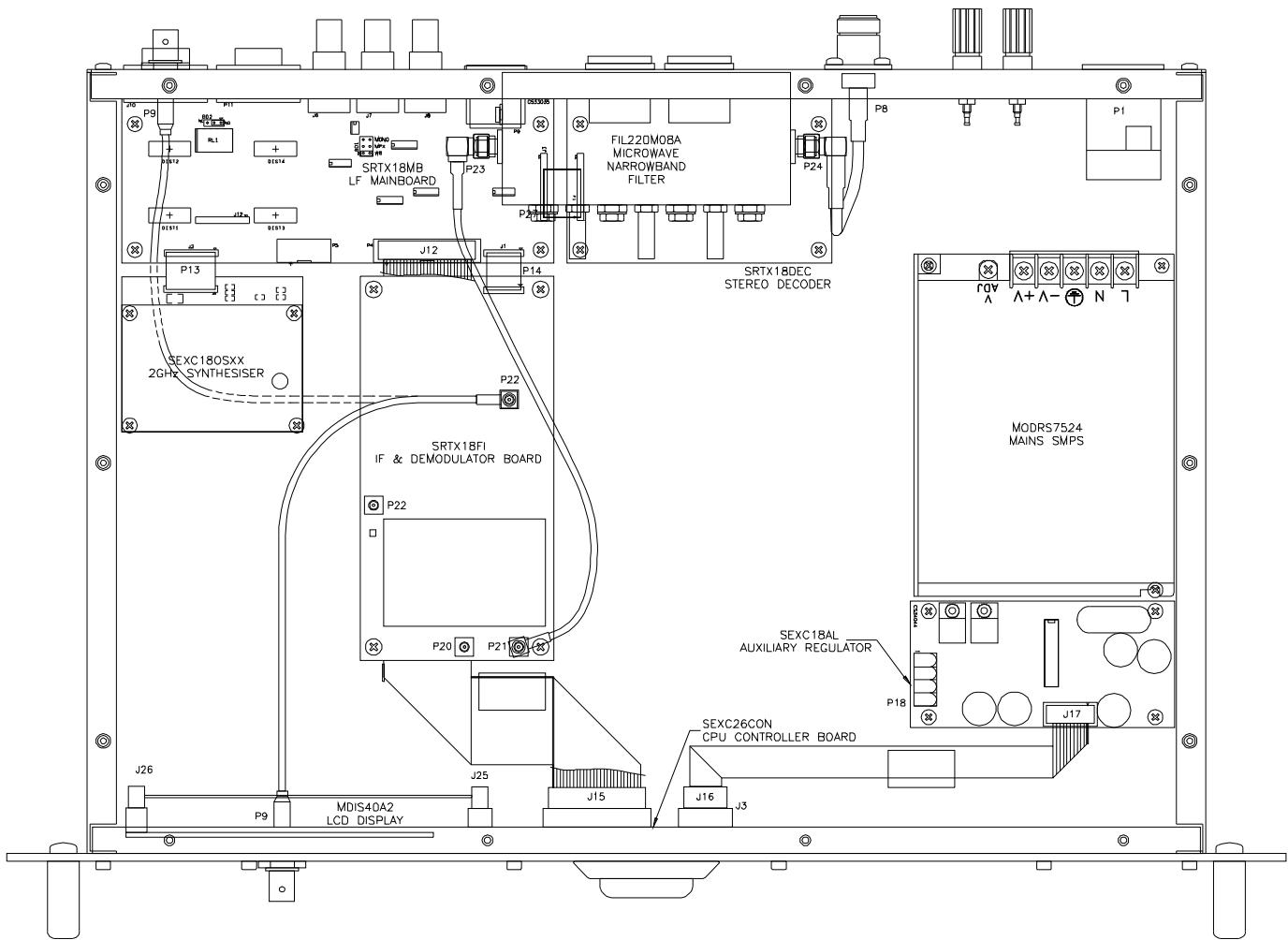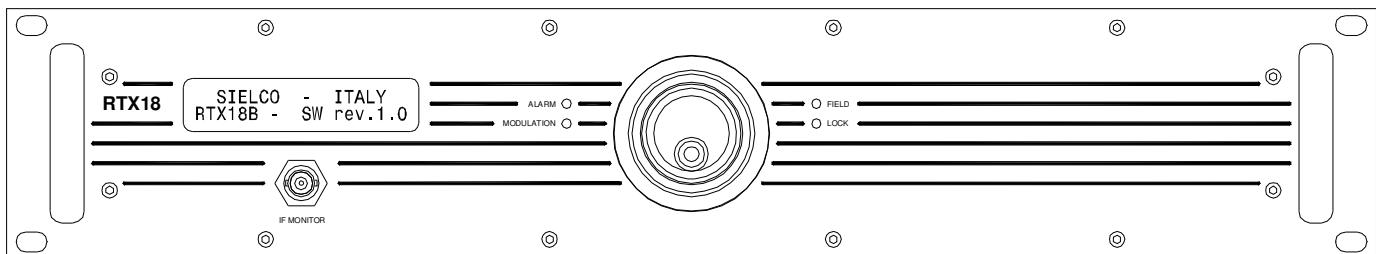
RTX18B RECEIVER, 100-960MHz - E1242, Electrical wiring diagram
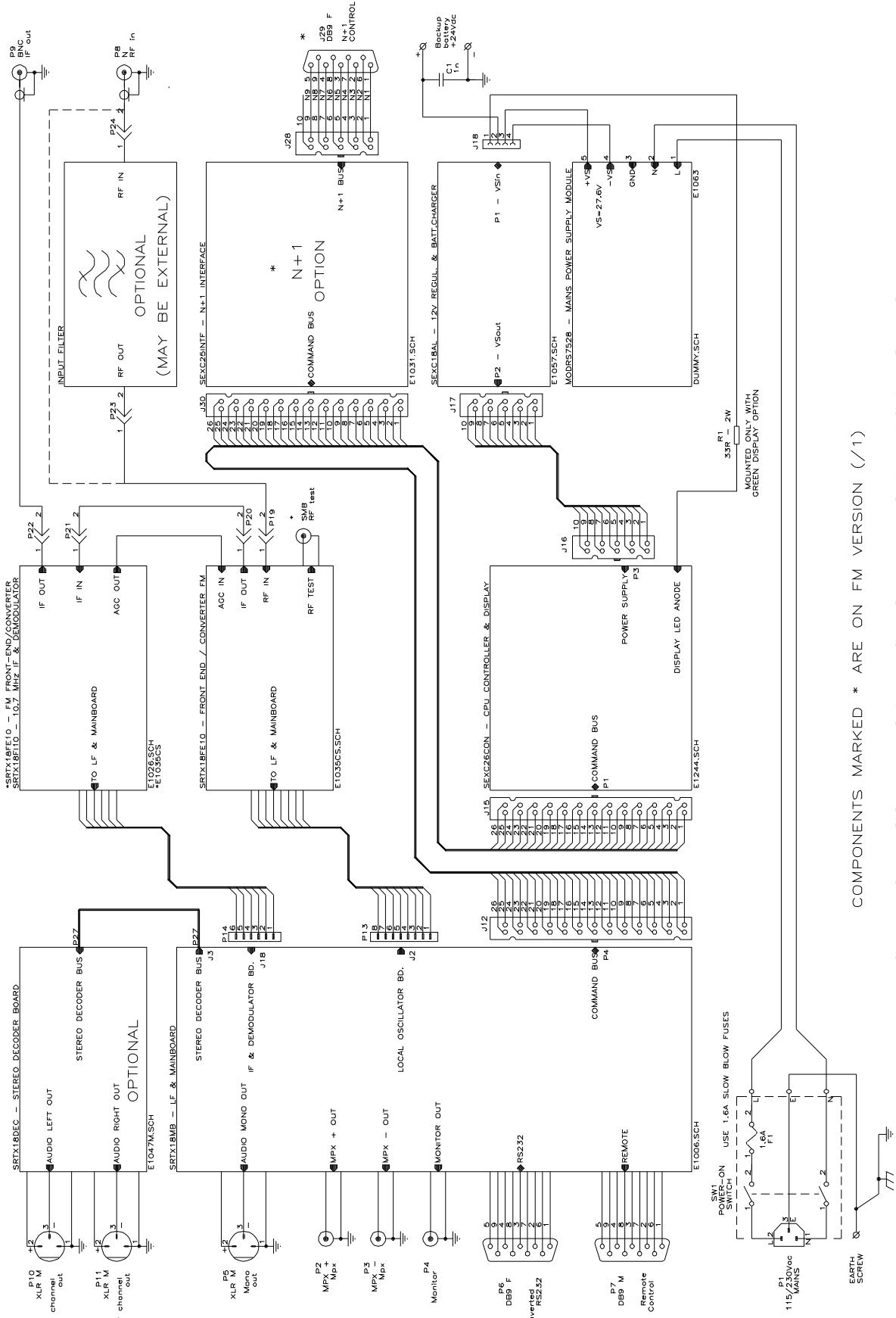
RTX18B RECEIVER, 1300-2500MHz - E1241, Electrical wiring diagram

THE STEREO-DECODER BOARD IS MOUNTED ONLY AS AN OPTION
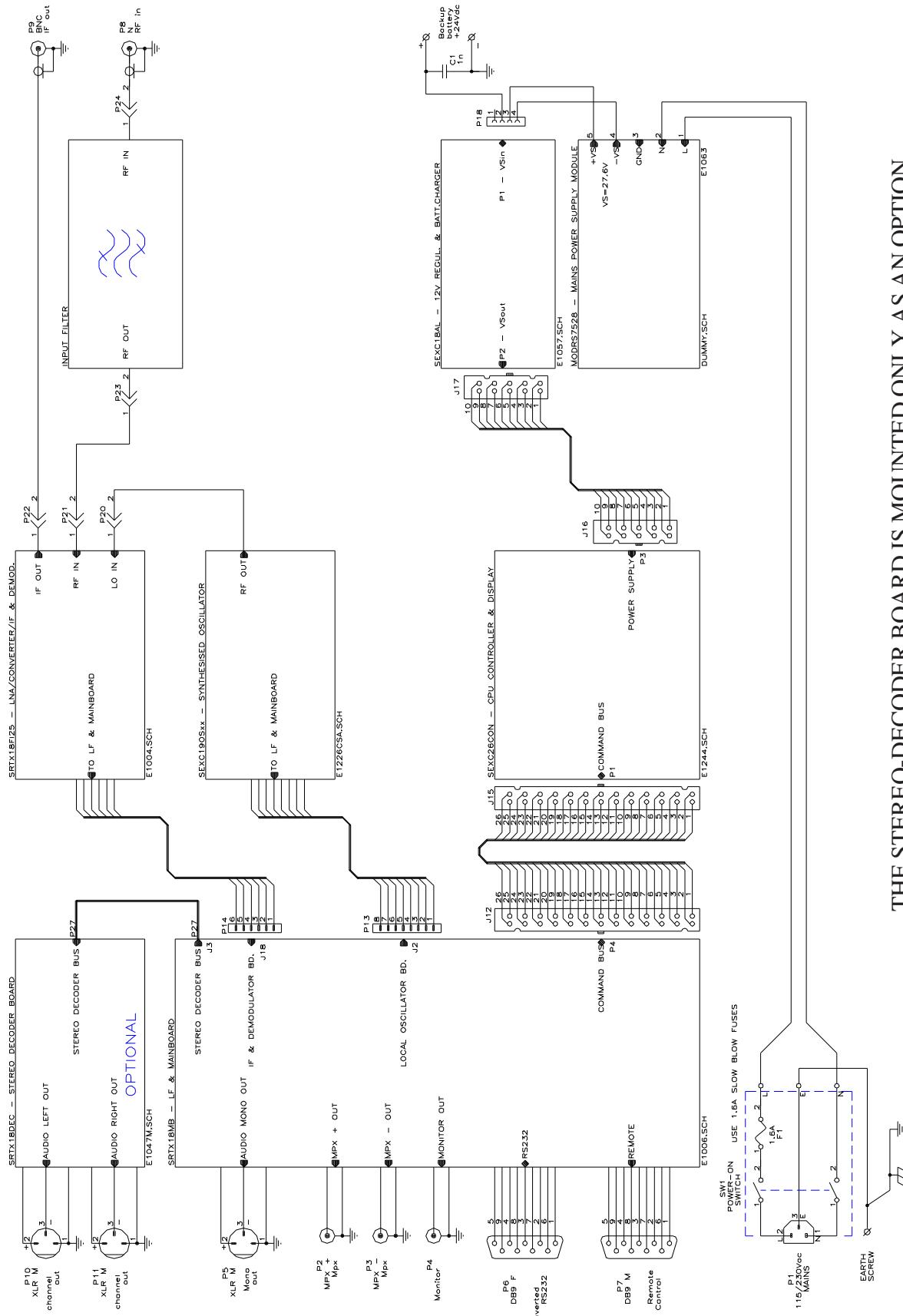
SRTX18FE9 - 200-900MHz FRONT-END / IF CONVERTER - E1073, Electrical diagram
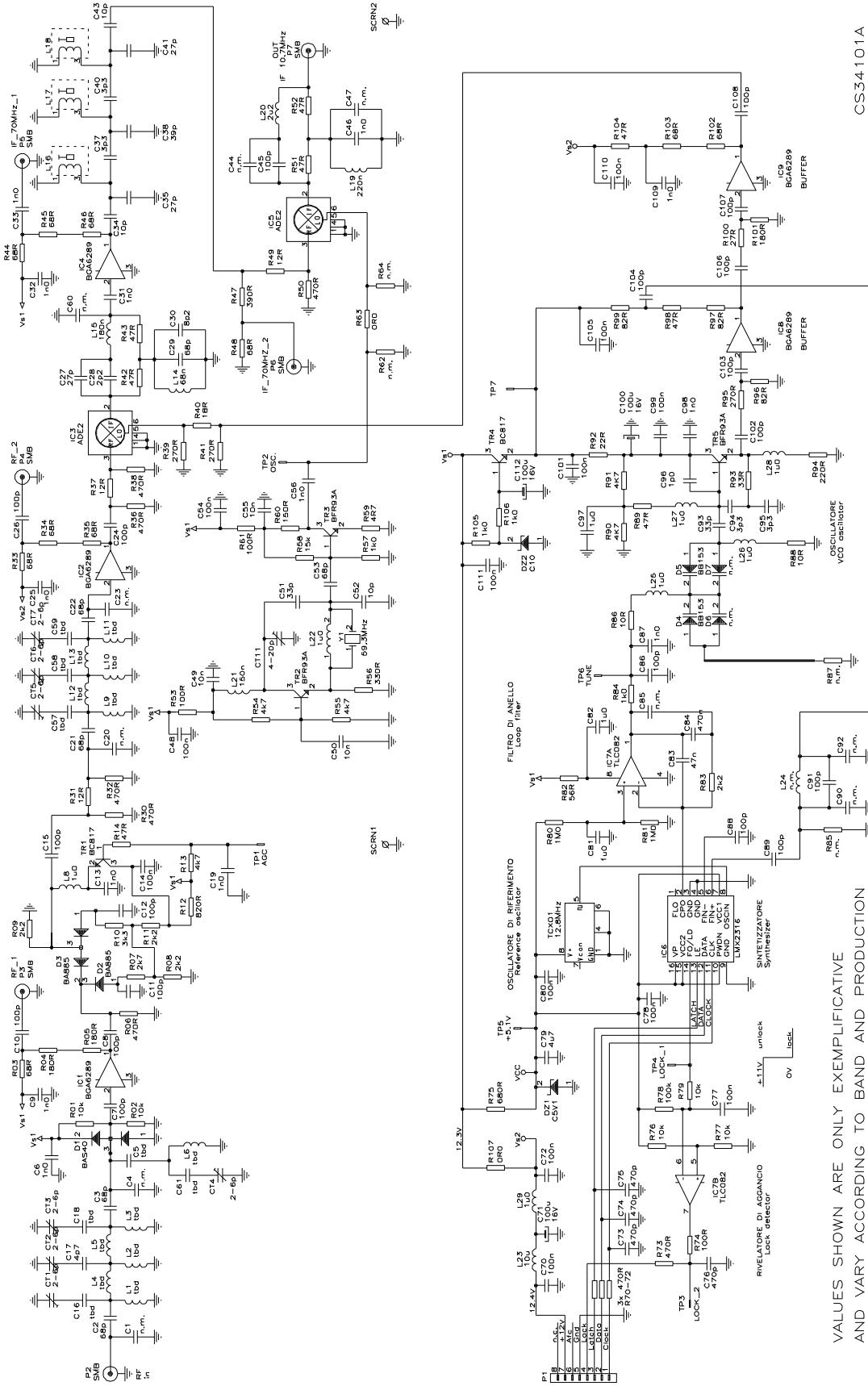
SRTX18FE9 - 200-900MHz FRONT-END / IF CONVERTER - Component layout
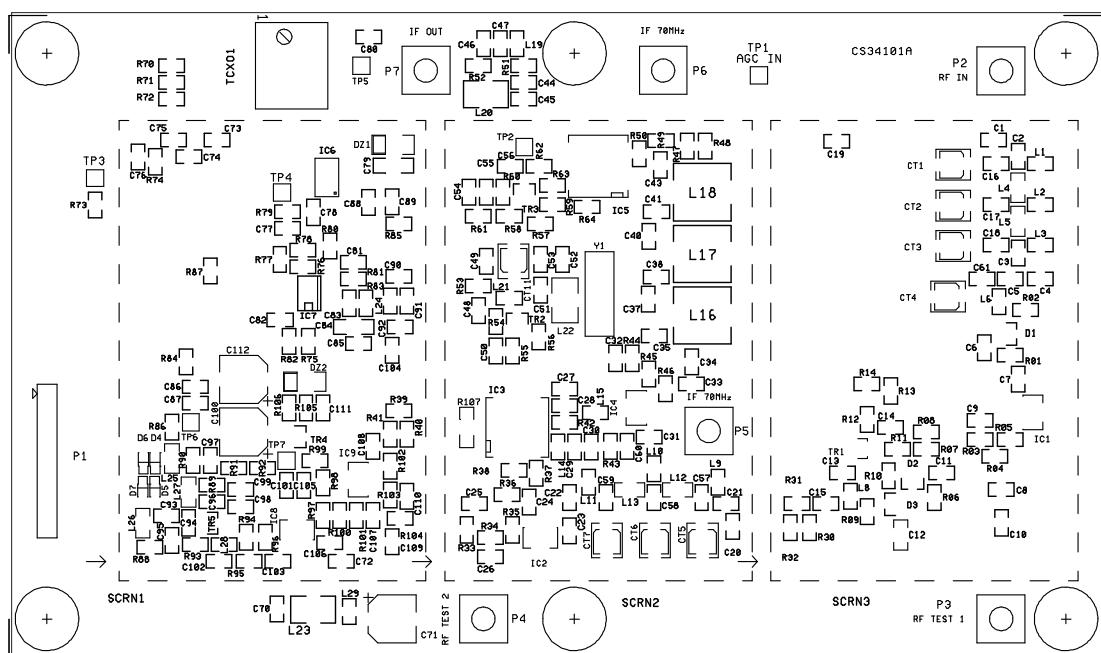
SRTX18FI25 - LNA / CONVERTER / IF / DEMODULATOR - E1004, Electrical diagram
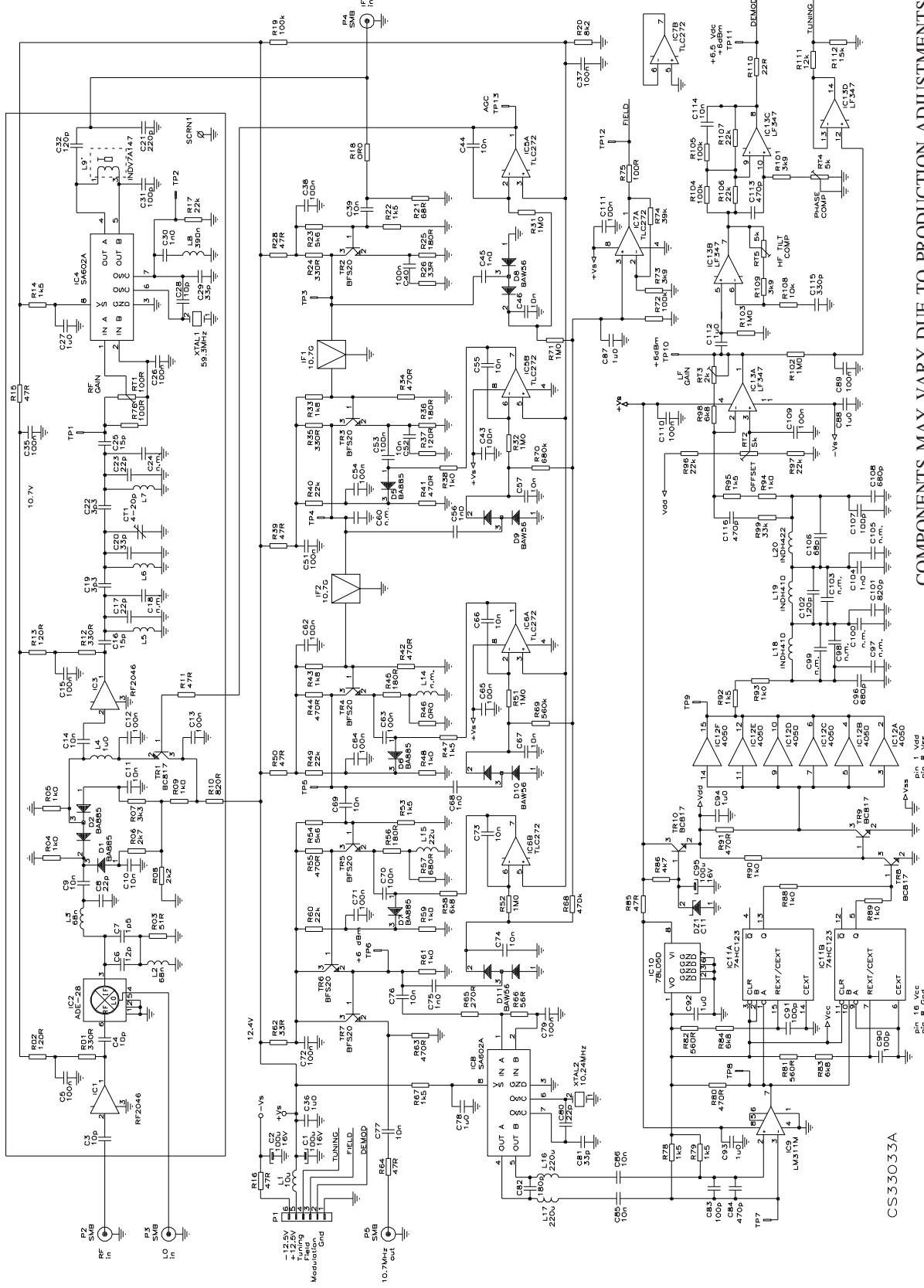
COMPONENTS MAY VARY DUE TO PRODUCTION ADJUSTMENTS

**SRTX18FI25** - LNA / CONVERTER / IF / DEMODULATOR - Component layout
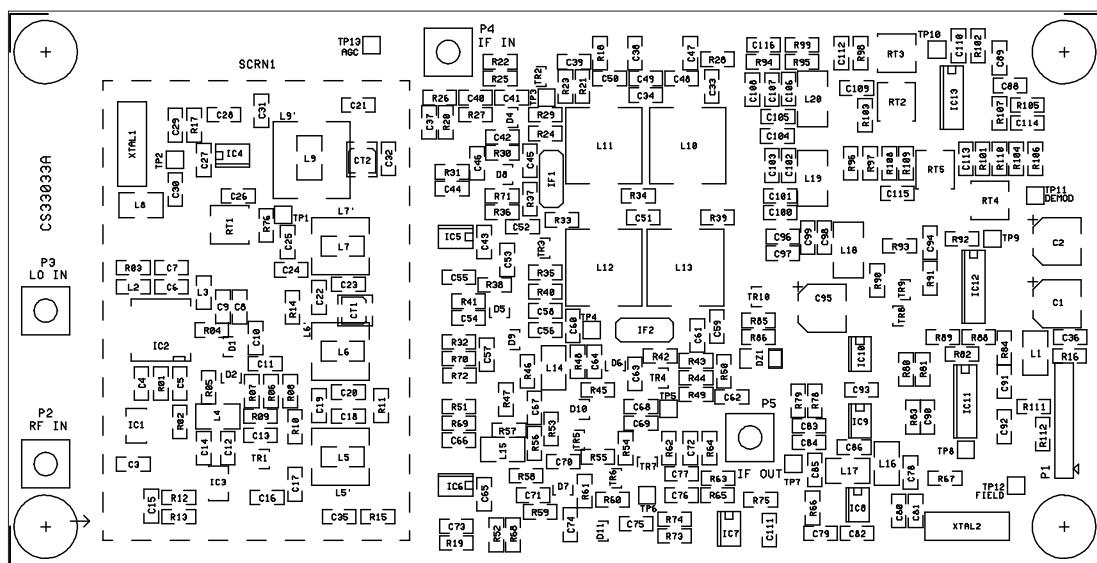
SRTX18MB - LF & I/O MAINBOARD - Electrical diagram

COMPONENTS MAY VARY DUE TO PRODUCTION ADJUSTMENTS

CS33035

SRTX18MB - LF & I/O MAINBOARD - Component layout

SRTX18DEC - STEREO DECODER BOARD - Block diagram

SRTX18DEC - STEREO DECODER BOARD - Component layout