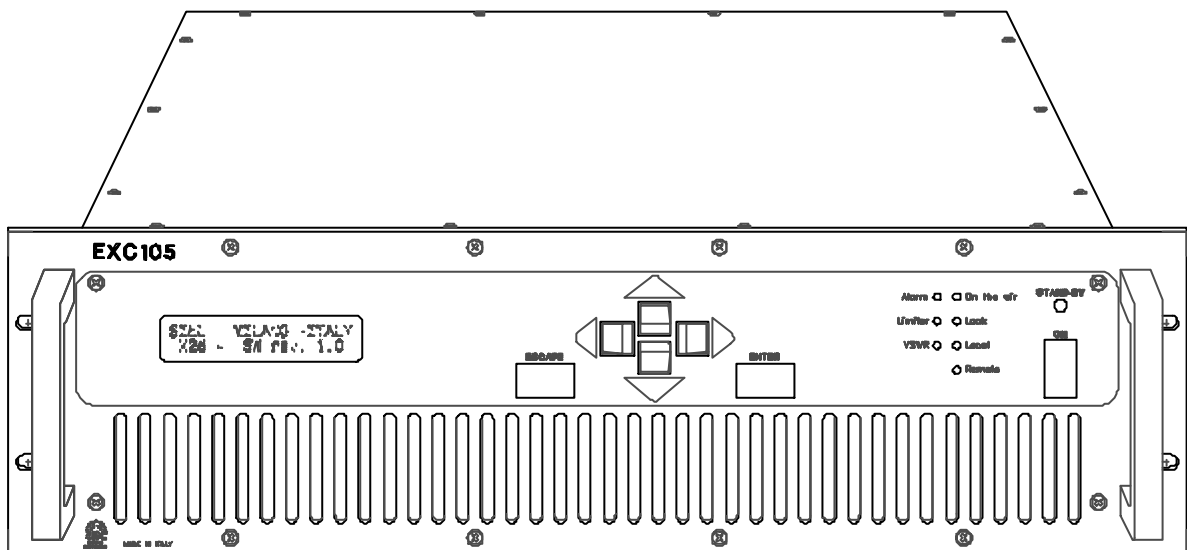


EXC105

87.5 ÷ 108 MHz FM 100W TRANSMITTER

EXCERPT FROM USER AND MAINTENANCE MANUAL





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EXC 105

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INTRODUCTION

The EXC105 series transmitters are the result of experience gained by SIEL during years of producing FM broadcast equipment, transmitters, stl and stereo encoders.

These transmitters 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 went 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, SIEL strongly recommend to rely on qualified personnel to install and verify the equipment which makes up the radio station, i.e. the transmitter, the possible stl and power amplifier, the corresponding antennas, cables and connectors. This will assure to achieve the best performance and stability in time.

To this aim, SIEL 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.

The transmitters 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  EMI/EMC AND SAFETY REQUIREMENTS, ETSI EN300384, ETS300447 AND EN60215 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 EXC105 is a 100W rated, direct-synthesis, FM-modulated transmitter. Being digitally controlled, it is extensively on field programmable by front panel or remotely in every respect: frequency, power, channel sensitivity, preemphasis, functioning mode (mono, stereo, external mpx), clock and date and many other parameters without adjusting or substituting any part. A powerful 3-levels password management permits a very high degree of security and privacy as may be required in different situations. The apparatus requires little or no maintenance and its simple modular layout facilitates stage testing and servicing.

As imposed by various national standards, these transmitters incorporate sophisticated low-pass audio filters on mono and stereo channels, and a sharp acting modulation limiter, which is usually set at a peak deviation slightly higher than 75 kHz. Its intervention may nevertheless be avoided, if required, pre-setting its threshold at a deviation higher than 150 kHz.

Output frequency is phase-locked to a temperature-compensated crystal oscillator, which ensures superior precision and stability. A very low noise, low distortion VCO produces a harmonic-free, spurious-free signal. A lock control circuit inhibits the presence of power on the output until the apparatus is on the right frequency, when turning on.

To lower the noise threshold further, the low-frequency inputs are fitted with balanced input circuitry. The input level is precisely adjustable over a broad range, by means of a 0.5dB stepwise variable attenuators. The transmitter has an auxiliary input, specifically designed for RDS and SCA encoders. A modulation output permits to control other transmitters or STL's with the same internally processed high-quality mpx signal.

The alphanumeric display permits easy and accurate metering, adjustment and continuous monitoring of modulation levels, power, operation and internal parameters. All these information may be 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 (RF power, On the air state, Disable line) are available on a parallel I/O socket for easy interfacing with others analog controllers or supervisory systems.

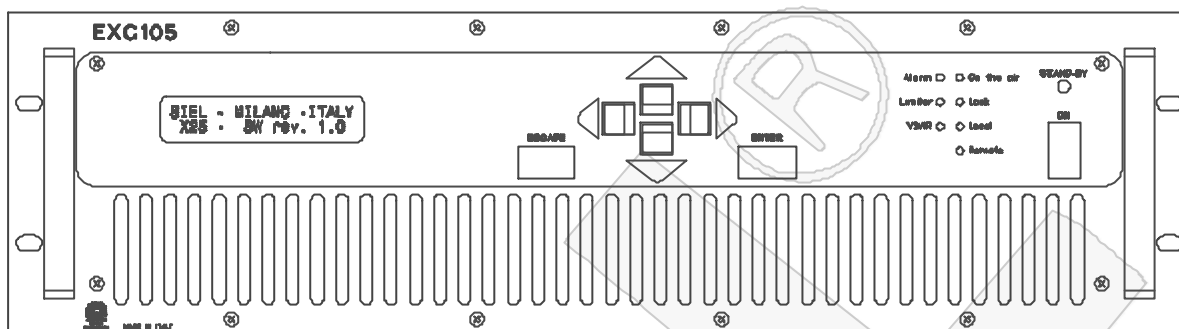
A top-quality stereo encoder may be factory installed as option and even retrofitted in the field in a second time, requiring minimum technical skill. The powerful internal software and monitoring functions recognise its presence and enable its functions.

The RF power amplifier employs a broadband design and has plenty of reserve: the output power is feedback controlled for increased stability till higher than nominal level. High reflected power is limited to prevent output stage degradation; direct power is accordingly continuously reduced so as not to exceed the reflected power safety level. A sturdy telecom-grade high efficiency switch-mode power supply permits operation in a very wide and noisy mains environment.

The temperature alarm circuitry reduce the output power in case of high internal or ambient temperature, trying to continue to stay on the air in spite of the adverse conditions.

TECHNICAL FEATURES

FRONT PANEL COMMANDS AND SIGNALLING



The EXC105 front panel is clean and easy to control. The wide alphanumeric display and the control keyboard permit a simple self-explanatory menu-driven navigation through the various options.

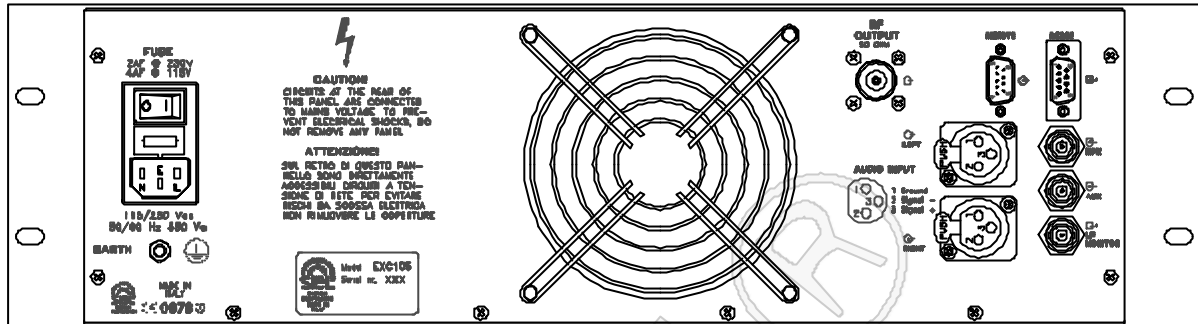
Great care was taken in the design of the software to allow natural feeling with the controls to permit operation and programming in every respect of the apparatus without needing to extensively read the user-manual.

The password management, hides some functions and prevents tampering with the most critical options and data to unauthorised people.

The on/stand-by key do not power off the apparatus, which is still locked on frequency and ready to transmit as soon the key is pushed or a remote command is sent.

Some leds signal at a glance proper functioning and warning states.

REAR PANEL CONNECTORS



All transmitter inputs and outputs are allocated on the rear panel. They are:

- The audio channels input sockets on balanced female XLR-type connectors
- The wide-band external processed / stereo or composite signal input on a grounded unbalanced BNC connector
- The frequency limited (20k÷ 100kHz) auxiliary channel input on a grounded, unbalanced BNC connector
- The If modulation output for monitoring, RDS external synchronisation or re-broadcasting purpose, BNC-type
- The inverted wired RS232 DB9 female remote serial control port
- The parallel control port, DB9 male type
- The RF antenna connector, N-type

Note that:

- The hot centre-pin on the "EXTERNAL" BNC input is physically in parallel with the signal + input (pin 3) on the mono/right channel XLR socket. For this reason both connectors cannot be used at the same time.

On the left side of the panel it is located the mains supply IEC320-type outlet and an earth screw for system earthing in addition to the ground pin on mains socket. On the same socket it is located the mains switch and the fuses.

Please note that the transmitter is usually factory pre-set for 220-240 Vac nominal mains voltage. If requested, 110-120 Vac range must be internally set on the mains transformer.

TECHNICAL SPECIFICATIONS

- Frequency range: 87.5÷108 MHz
- Modulation: FM, 75 kHz peak dev.
180kF3E mono
256kF3E stereo
- Synthesis step: 10/100 kHz
- Frequency error: <200 Hz
- Frequency drift: <250 Hz over temperature
<100 Hz/year
- RF output power: 10 ÷ 100W
- Max allowable reflected power: 10W
- RF harmonic products: <-67 dBc, -72 dBc typ.
- RF spurious products: <-85 dBc, -95 dBc typ.
- RF output impedance: 50 ohm on N connector
- Audio/mpx input level: -3.5 ÷ +12.5 dBm
@ ±75 kHz deviation
- Audio/mpx input impedance: 10 k ohm / 600 ohm
bal/unbalanced, select.
- Common mode input rejection:
>50 dB >60 typ. (20 ÷ 15000 Hz)
- Audio input connectors: female XLR type
- Aux channel input level:
-12.5 ÷ +3.5 dBm @ ±7.5 kHz dev.
-24 ÷ -8 dBm @ ±2 kHz dev.
- Aux channel input impedance: 10 k ohm
- Linear and aux input connectors: BNC
- Mpx output level: 0 ÷ +10 dBm @ ±75 kHz dev.
- Preemphasis time constant: 0 / 50 / 75 µs ±2%
- S/N ratio, mono:
≥76 dB 86 typ.(30÷20000Hz)
≥75 dB 81 typ.(CCIR)
- S/N ratio, stereo: ≥72 dB 77 typ. (30÷20000Hz)
≥68 dB 72 typ. CCIR
- Modulation distortion:
<0.05% 0.02% typ. @ 75 kHz dev.
<0.2% ≤0.05% typ. @ 150 kHz dev.
(limiter threshold > 150 kHz)
- Stereo crosstalk:
<-50 dB with external encoder
<-60 dB (100 ÷ 5000 Hz)
<-50 dB (30 ÷ 15000 Hz)
with internal encoder
- Audio channel freq. response:
30 Hz ÷ 15 kHz ±0.1dB
- Out of band filter reject.: >50 dB @ F≥19 kHz
- Deviation limiter: adjust. between 0 and > +7 dB
- Composite input freq. response:
10 Hz ÷ 100 kHz ±0.1dB
- Aux input frequency response:
10 ÷ 100 kHz ±0.2 dB
- I/O lines: RF disable, Direct pw, On the air, Alarm
RS232 for monitoring and control
- Mains supply requirements:
115 / 230 Vac ±15% 50/60 Hz
320 VA / 220W @ 100 Wout
- Operating temperature range: 0 ÷ 35 °C recomb.
-10 ÷ 45 °C max
- Dimensions without handles: 19" 3 un. std. rack
483 x 132.5 x 360mm

CHECK, PROTECTION AND CONTROL SYSTEMS

- Block against emission on spurious frequencies
- Reflected power
- Modulation limiter
- High internal or external temperature
- Real-time clock and date, with battery back-up

COMMANDS AND PROGRAMMING

The transmitter permits exhaustive control of all transmission parameters and complete programmability and monitoring facilities through the various software controls via the front panel keyboard and display. The same functions are remotely addressable with proper software, which is not included as a standard option other than some simple demo programs.

For a description of remote capability see the proper section on the manual. In this section we will examine the front panel menu-driven operational capability.

PASSWORD ORGANISATION

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. It is set to "off" state as default, permitting to anybody to navigate freely through transmitter's monitoring menu information. SIEL suggests leaving it in this state if a high privacy level is not needed. If set to "on" it will show the default menu field #00 (c.r. 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 transmitter functioning.

Level 2: Service level. This password is needed for any functioning set-up as frequency and power, sensitivities, clock and date etc. Its use is reserved to service technicians who need wide access to the transmitter 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 transmitter 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 reset anyway 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 loses control on the lower password levels.

Only very few critical parameters, like limiter permission or control require this password, as in some countries this functions are not allowed to be freely chosen.

FACTORY DEFAULT PASSWORDS

These are the factory default password:

Level 1: **XXXX**

Level 2: **YYYY**

Level 3: **ZZZZ**

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.

For security purpose the 3rd level password may be factory changed from the default value before the transmitter is shipped, in consequence of a specific final customer request.

MENU AND COMMANDS DESCRIPTION

The hierarchical tree of the menu is depicted in the following table, 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.

All of the first column fields require the first level password authorisation to be navigated. Similarly practically all the second column fields require the second level authorisation, as some in the third column. The third level is required only by some functions in this last column.

Navigation through the menu fields is quite straightforward and natural, with the direction key. "Up" and "down" key vertically scroll the fields, while the "left" and "right" key horizontally scroll the menu. Moving to the right may be impeded by the password permission, while returning to left is always possible.

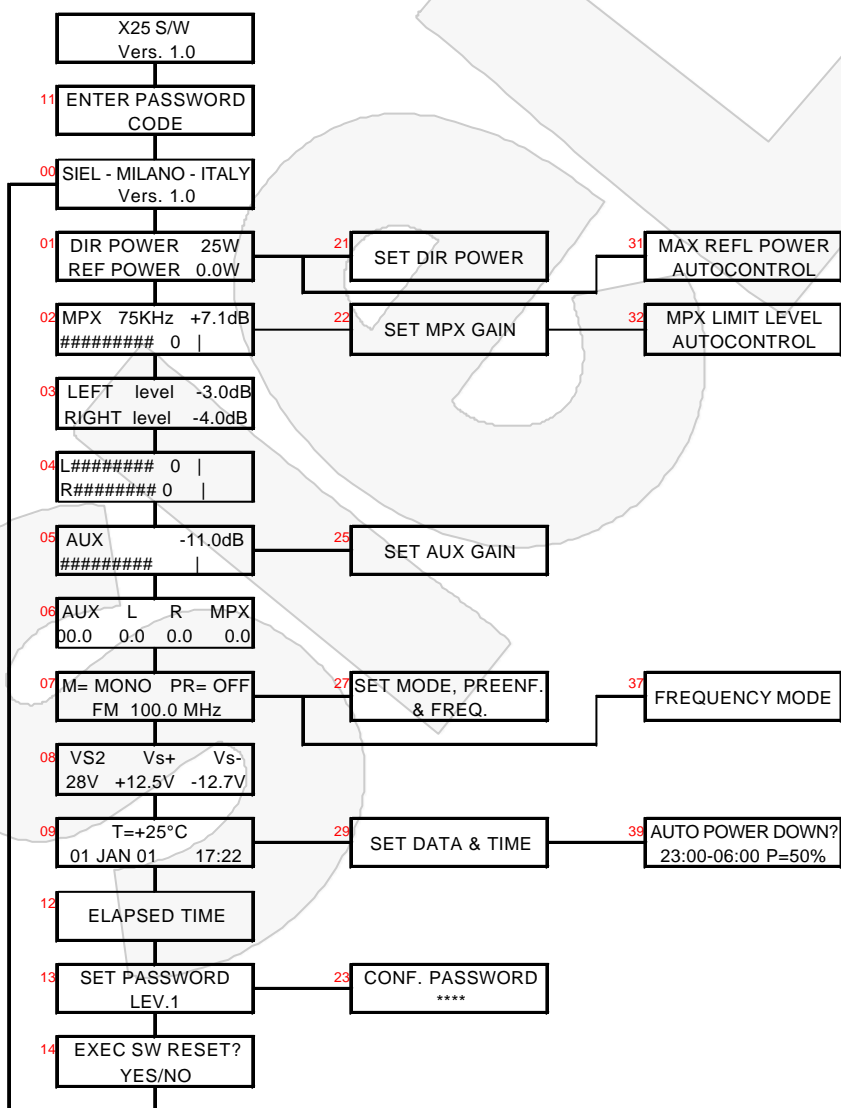
The "enter" key changes from scrolling to programming mode, if allowed in the field. Another push

on the "enter" key will confirm the input data. When in program mode, the up and down keys will change the character, while the left and right key will move the cursor on the field. Pushing on the "escape" key will abort the input while repeated escape commands will reset the menu field to the default one (#00).

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.

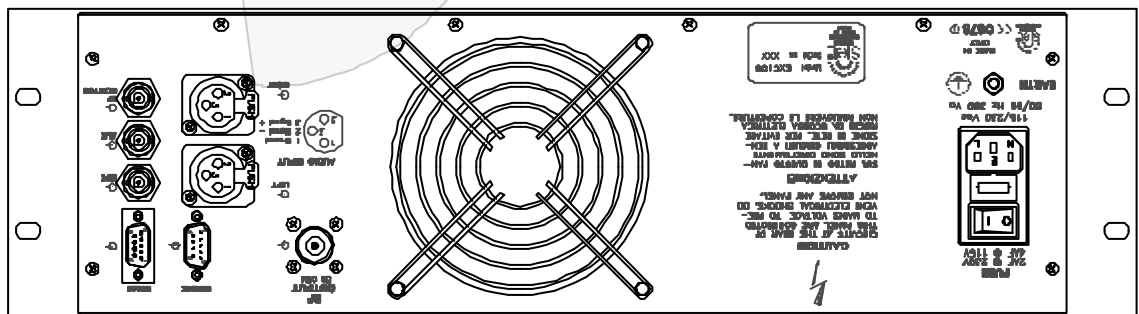
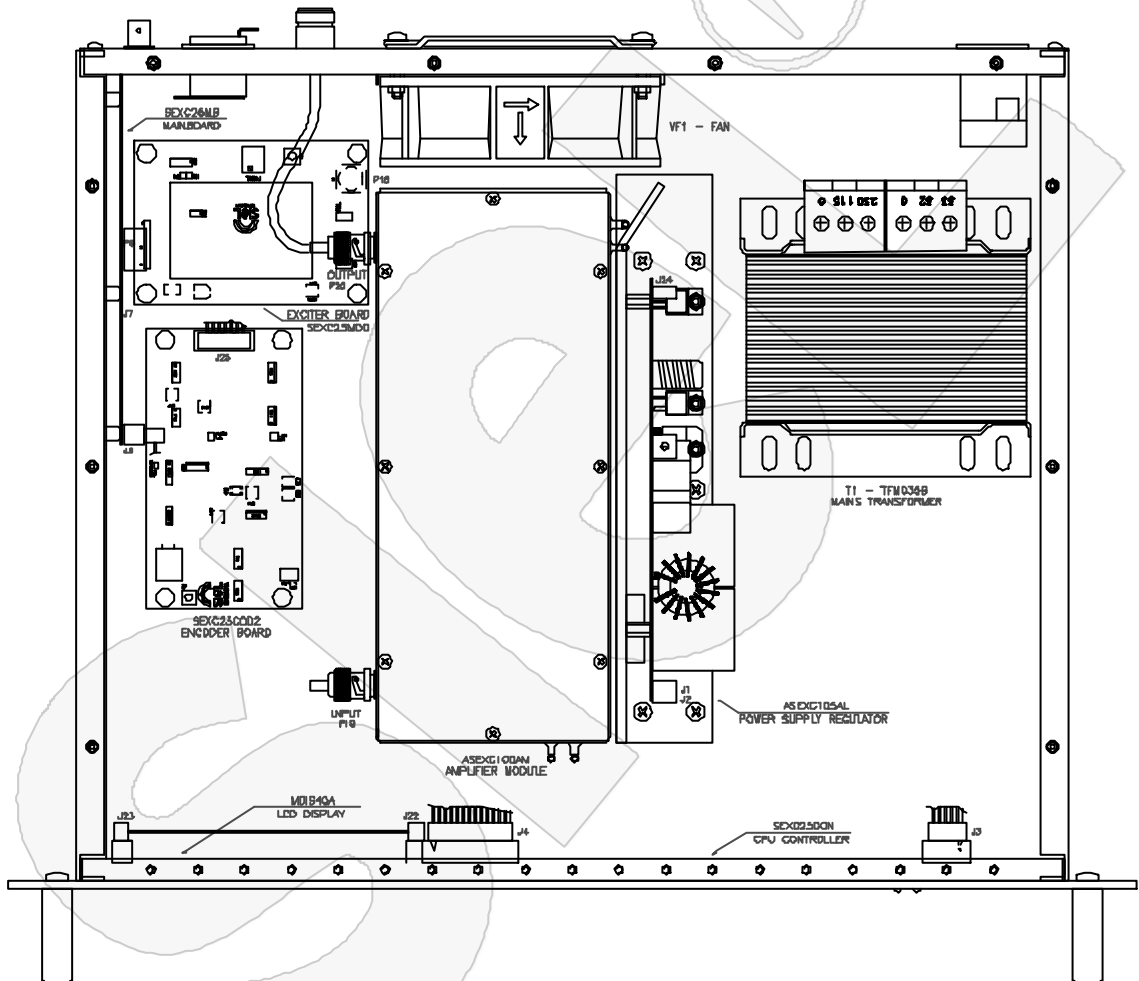
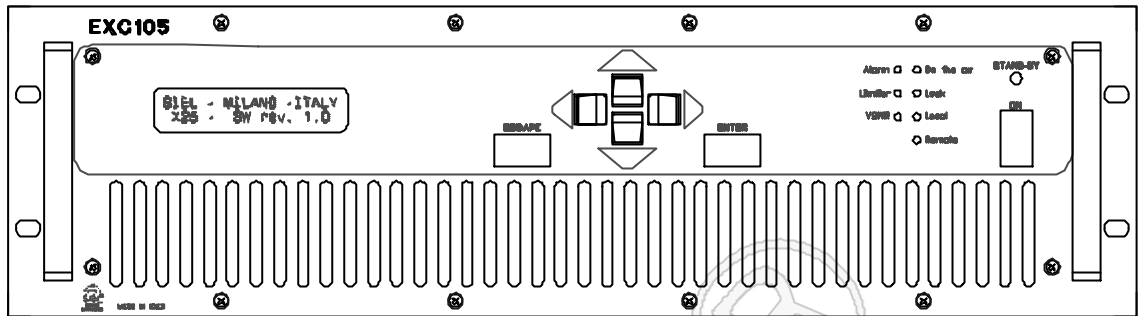
Few minutes of experiments will enable most users to gain confidence with control keys and menu and to be able to access all main features of the transmitter, without any previous training.

Anyway it is impossible to discover hidden functions without the proper password permission.



Hierarchical menu tree

EXC105 TRANSMITTER - TOP, FRONT & REAR ASSEMBLY VIEW



EXC105 TRANSMITTER - TOP, FRONT & REAR ASSEMBLY VIEW

