ELENOS

BROADCAST EQUIPMENT COMPANY

USER AND MAINTENANCE MANUAL

ETG30

TECHNICAL ANNEX

ELENOS

Dear User,

Firstly, thank you for choosing an **ELENOS** product.

ELENOS products are solid state or thermionic tube transmitters that develop power from a minimum of 20W to a maximum of 30KW.

Great care has been taken during the design of the protection circuitry to ensure compatability with products from other manufacturers. However the best performance is achieved when the equipment is used with other products manufactured by **ELENOS**.

The unit has been designed to guarantee consistent performance over time, without the need for special maintenance. The need for this is minimised by regular functional checks of those components which are ventilated.

Operation of the unit is very easy and intuitive. Even so it is recommended that this manual and other relevant documentation is read carefully before any operation is attempted.

Customer Care

CONTENTS

Page numbers marked with an asterisk (*) are in A3 format

Engineering Department PHONE: +39 0532 829 965 - FAX: +39 0532 829 177
E-Mail: support@elenos.com

1.1.
Front view

1.1.1.
Front Panel description

1) Power on switch
2) Switches for programming operation
3) Led: "ON AIR" lit, indicates the PLL has reached the desired frequency
   "FAULT" lit, indicates the output power is below the preset threshold
   "MAINS" lit, indicates the unit is switched on
4) The "RF monitor" connector provides an RF monitor signal
5) The "MPX OUT" connector provides an audio signal
6) Display

N.B.
Do not obstruct the ventilation grills

1.2.
Rear view
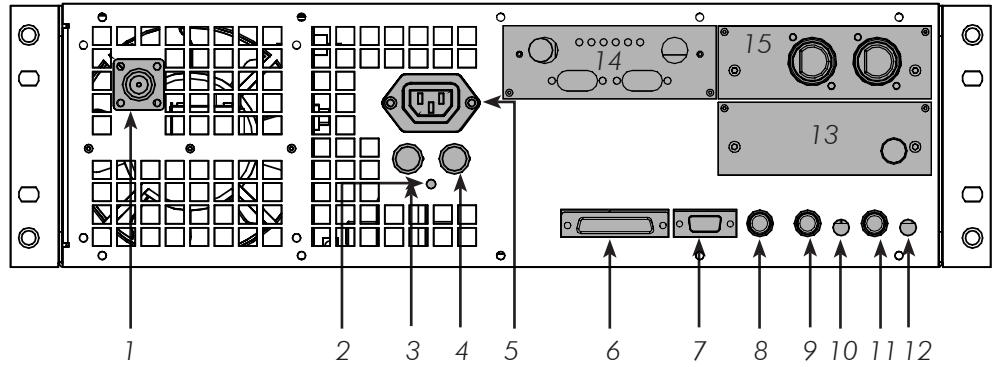
1.2.1.
Rear Panel description

1) "RF OUT" connector
2) Earthing terminal
3-4) Power supply fuse (10A)
5) Line supply socket
6) Analog signal interface
7) Telemetry interface
8) "MPX" input connector
9) "SCA2" input connector
10) Trimmer for calibrating the "SCA2" input
11) "SCA1" input connector
12) Trimmer for calibrating the "SCA1" input
13) Slot for inserting the RDS board
14) Slot for inserting the stereo inputs board
15) Slot for inserting the stereo encoder board

N.B.
Do not obstruct the ventilation grills

2.
Installation

Remove the unit from its packaging and before attempting any operation, check that the unit has not been damaged during transport and that all the switches and connectors located on the front and rear panels are serviceable.

☞ Install the unit so that it is accessible from all sides
☞ Ensure that the location of the unit allows for connection to an efficient earthing point
☞ Ensure that the antenna system is suitable
☞ Check that any amplifier to be eventually connected downstream is connected to the antenna system
☞ Connect the appropriate inputs of the exciter according to the type of operation required:
　　☞ the monophonic signal to the XLR connector on the mono board
　　☞ the stereo signal (low frequency) to the left and right XLR connectors on the stereo input board
　　☞ the stereo signal (wide-band) to the MPX connector on the MPX and SCA inputs board
　　☞ the RDS signal to one of the two SCA connectors on the MPX and SCA inputs board
　　☞ If the RDS board is fitted, the wide-band stereo signal goes directly to the MPX inputs on the RDS board, so the MPX+RDS output will be connected to the MPX input on the MPX and SCA inputs board.
☞ Connect the electricity supply cable
☞ Connect the RF output to the input of any amplifier to be used, or to the antenna system
☞ Switch on the amplifier (if present)
☞ In order to verify that the equipment is functioning correctly, check the values displayed by the exciter and amplifier displays and instrumentation

3.1.
User interface

The user interface is designed to accept upto 14 analog signals in the range 0 to 2V. For example, it is possible to read a remote temperature, remote voltages and currents of other equipment and direct and reflected power of other equipment.
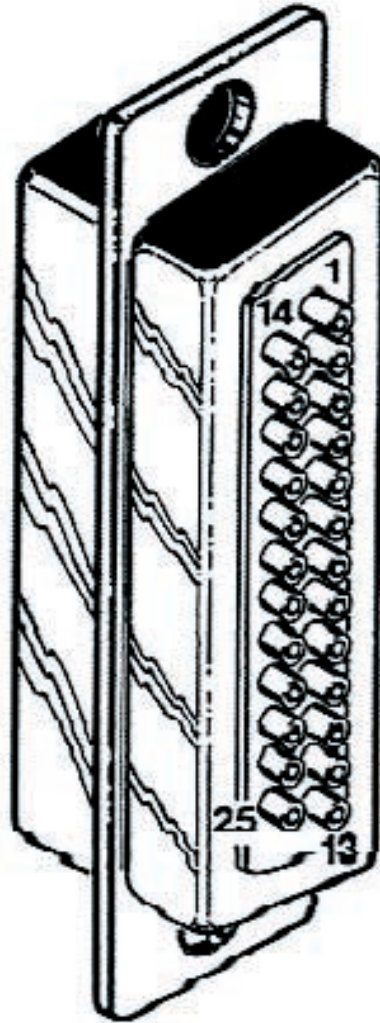
1	IN1 = SB_ON
2	IN2 = SB_OFF
3	GND
4	GND
5	OUT1 = VDS 5V.F.S.
6	OUT2 = IDRAIN 5V.F.S.
7	NC
8	IN5 = LOCK REM.
9	IN6 = +5V. REM.
10	IN7 = RPW REM.
11	IN8 = CUR REM.
12	IN9 = IPW REM.
13	IN10 = V. REF. REM.
14	GND
15	GND
16	NC
17	GND
18	IN11 = STAND-BY
19	IN12 = REF. PWR 1V.F.S.
20	IN13 = DIR PWR 3.6V.F.S.
21	IN14 = TMP REM.
22	IN15 = VPW REM.
23	IN16 = FPW REM.
24	IN17 = -12V. REM.
25	IN18 = +12V. REM.

Pins with an "IN" prefix are inputs
Pins with an "NC" prefix are not connected
Pins with a "GND" prefix are earths

To enable external RF OFF function (stand by) after having switched on the device, during countdown, press P2 and P7 at the same time, enter the password (2222, press P2 four times) enable "EXT RF OFF" and save the new configuration.

3.2.
Telemetry
Connection
and operation

The ETG101's (ETG151's) telemetry feature allows an IBM compatible PC to be connected directly to the unit, or via a GSM modem. The main operational parameters can be displayed and modified via telemetry using the Hyper Terminal software supplied with any version of Microsoft Windows (c).

Connect the unit to a GSM modem, or directly to a PC, using the cable supplied (see diagram below).

PROPRIETÀ

HYPER TERMINAL

BIT x SEC = 9600
BIT DATI = 8
PARITÀ = NESSUNA
BIT STOP = 1
CONTROLLO
DI FLUSSO = NESSUNO

ETG30 ------------->Modem

1 TX		DCD 1
2 TX		RxD 2
3 RX		TxD 3
4 RX		DTR 4
5 GND		GND 5
6 GND		DSR 6
7 GND		RTS 7
8 GND		CTS 8
9 GND		RI 9
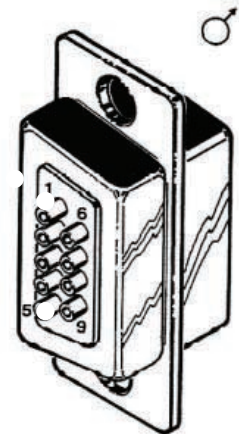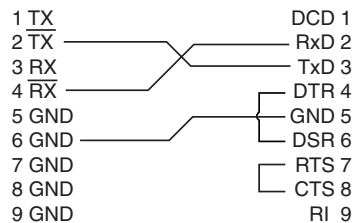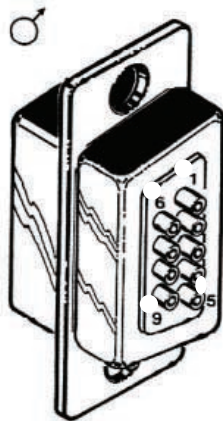
DB9 Male - DB9 Male

ETG30 -------------> PC

1 TX		DCD 1
2 TX		RxD 2
3 RX		TxD 3
4 RX		DTR 4
5 GND		GND 5
6 GND		DSR 6
7 GND		RTS 7
8 GND		CTS 8
9 GND		RI 9
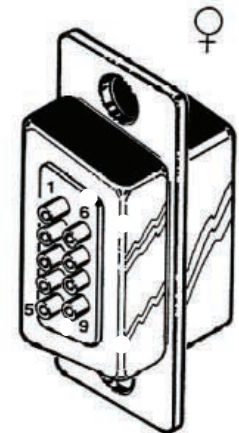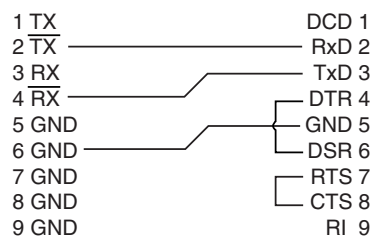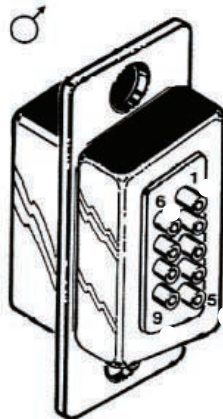
DB9 Male - DB9 Female

Run the Hyper Terminal software supplied with Microsoft Windows.
Enable the connection (to connect via modem, refer to the configuration in the GSM modem manual).
Telemetry will now be available on the PC, but to transfer data, the code $1111 must be entered; only then may the unit's parameters be displayed and modified.

3.2.
Telemetry
Connection
and operation

Main Screen

```
┌──────────────────────────────────────────────────────────────┐
│  ELENOS  s.r.l. -   ETG030 ON BOARD MONITOR    -    V1.30 del 01/082002 │
├──────────────────────────────────────────────────────────────┤
│ Frequency:  096.82   MHz  *      [ LOCK]    [SWR]   [TEMP]   [PW-ON ]   [PREE]   [STEREO] │
│                                                              │
│   FPWR  ████████████████████████████████████████          │
│         0w        5w       10w      15w      20w      25w      30w │
│                                                              │
│   RPWR                                                       │
│         0w        5w       10w      15w      20w      25w      30w │
│                                                              │
│   MPX   ████████████████████████████████████                │
│        -21dB   -18dB   -15dB   -12dB    -9dB    -6dB    -3dB    0dB    +3dB │
│                                                              │
│                                                              │
│   [M] Main/Principale │ [H] Help/Aiuto │        │        │  │
└──────────────────────────────────────────────────────────────┘
```
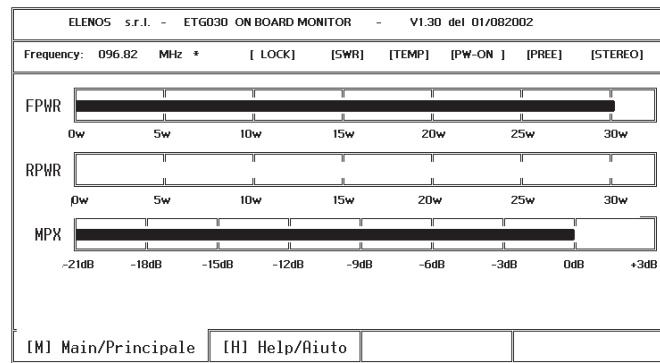
In the main menu you can read the following parameters:

"   Transmission frequency
"   PLL locked
"   Protection against reflected power
"   Protection against excess of temperature
"   Power ON/OFF
"   Preenphasys ON/OFF
"   Stereo ON

Three bars indicate the value of: forward power, reflected power, MPX

It is possible to modify the following parameters:

FREQUENCY: press <T> to edit, than press <]> to increase or <[> to decrease the frequency (step = 10 KHz); in the box dedicated to the value o frequency, you have to read the new value during the setting; press <S> to save the new frequency

OUTPUT POWER: press <P> to edit, than press <]> to increase or <[> to decrease the power (the whole scale is divided in 255 steps, so that to each step corresponds a power of about Pmax/255); press <S> to save the new value of power

POWER ON/OFF: press <P> to edit, than press <X> to take OFF the power, and again <P> and <X> to take ON the power

A page of HELP is available: press <H> to read this page and <M> to came back to main page

Digit the I234 code to stop the connection (pay attention: the first character is the "I" letter and not the "1" number !!)

```
┌──────────────────────────────────────────────────────────────┐
│  ELENOS s.r.l. -ETG030 ON BOARD MONITOR   -   V1.30 del 01/08/2002 │
├──────────────────────────────────────────────────────────────┤
│ Page/Pagine:     [ H - Help/Aiuto ]        [ M - Main/Principale ] │
│ Power/Potenza: <P>, <]> Up/Su, <[> Down/Giù. <S> = Save/Salva (EEPROM) │
│ Power Toggle On-Off-On/Cambio Potenza On-Off-On: <P>,<X>     (EEPROM) │
│ Frequency/za   <T>, <]> Up/Su, <[> Down/Giù. <S> = Save/Salva (EEPROM) │
│ End & Quit / Fine ed Uscita : I.2.3.4                        │
│ PASSWORD: ETG Key-code / Codice Tasti ETG   [A] [B] [C] [D] [E] [F] [G] [H] │
│                                                              │
│                                                              │
│                                                              │
│  [M] Main/Principale │ [H] Help/Aiuto │        │        │   │
└──────────────────────────────────────────────────────────────┘
```
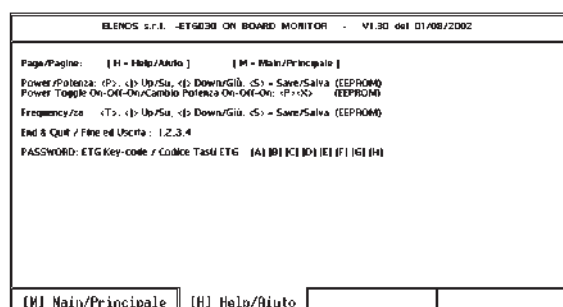
3.3.
Powering up
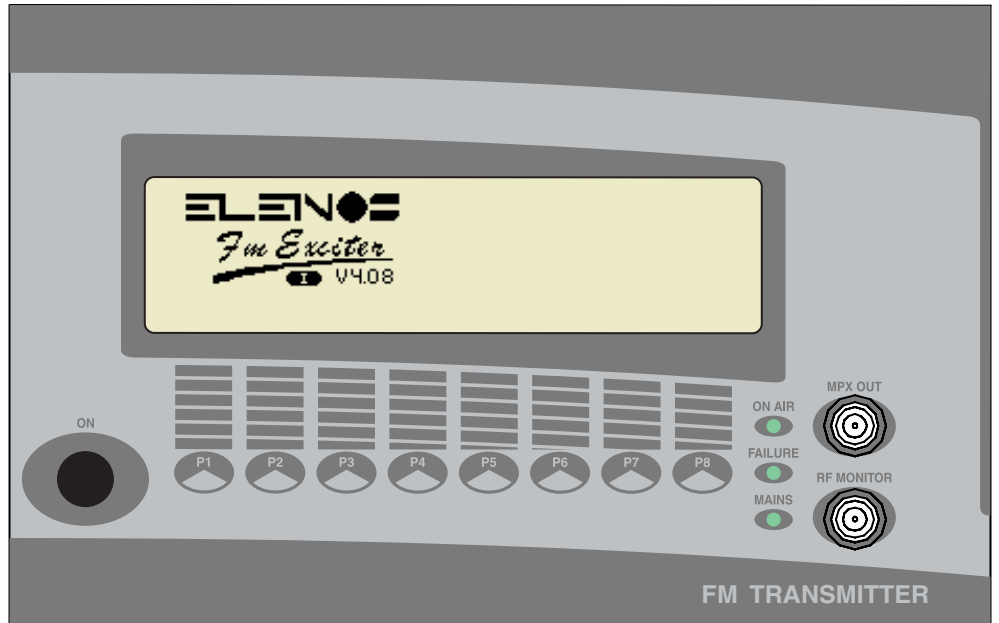
➟ The start up screen appears showing the state of the audio BUS.
➟ The microprocessor runs a system check to verify which optional boards have been fitted.
➟ The countdown starts (duration 8 seconds) after which the exciter will develop power.

Pressing keys during the countdown:
☞ Pressing any key will prevent power from being developed
☞ Pressing F1+F8 will terminate the countdown

On termination of the countdown, the main menu will appear (with the ELENOS logo or that of the customer)
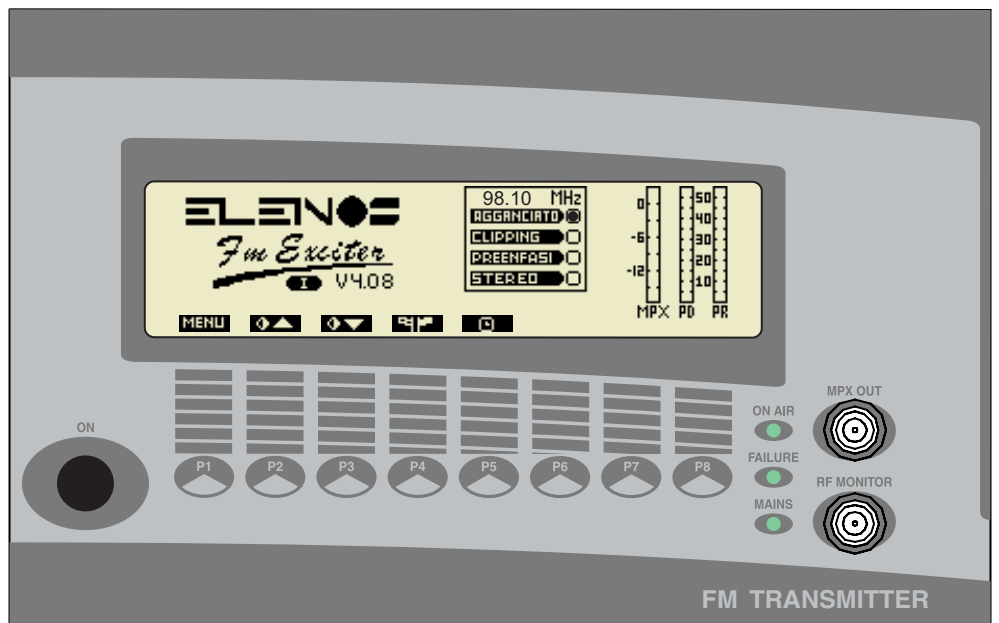
3.4.1.
Main Menu
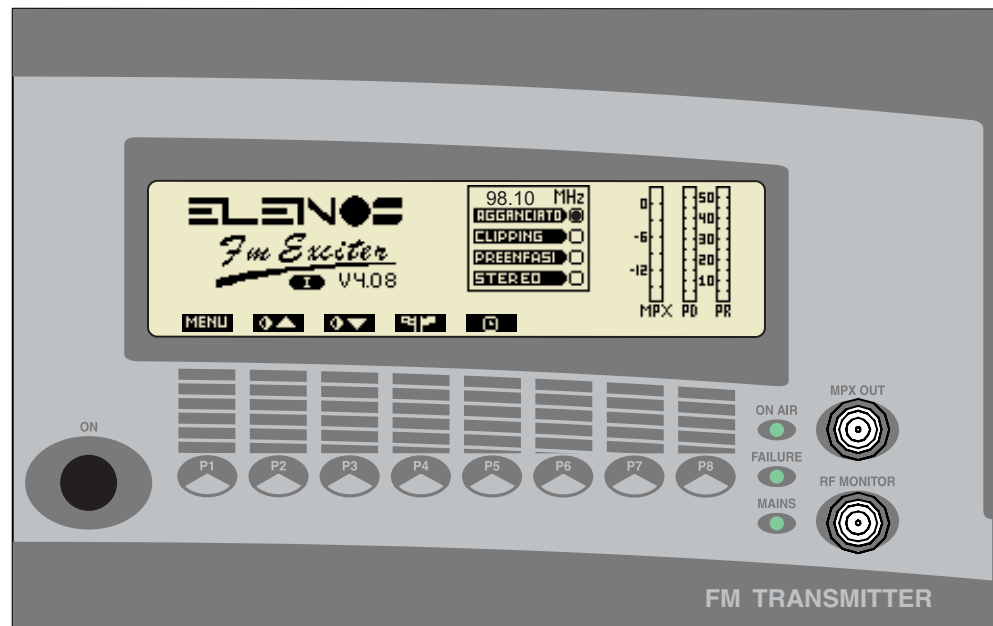
☞ Press key P1 to access the menu functions
☞ Press key P2 to increase the contrast of the display
☞ Press key P3 to reduce the contrast of the display
☞ Press key P4 repetitively to select the desired language
   The language of the display will change each time the key is pressed
   The language selected will be indicated by a letter under the ELENOS logo.
☞ Press key P5 to display the time for which the unit has been operated.

   The main menu displays respectively: MPX level, direct power, reflected power, opera-
ting frequency, PLL lock, clipper operation, insertion of pre-emphasis and insertion of the
stereo encoder.
   The logo displayed by the unit can be personalised on the request of the user. The
default logo is that of ELENOS with which is also displayed the version of software instal-
led (e.g. V4.08) and the language selected (e.g. UK)

3.4.2.
Functions Menu
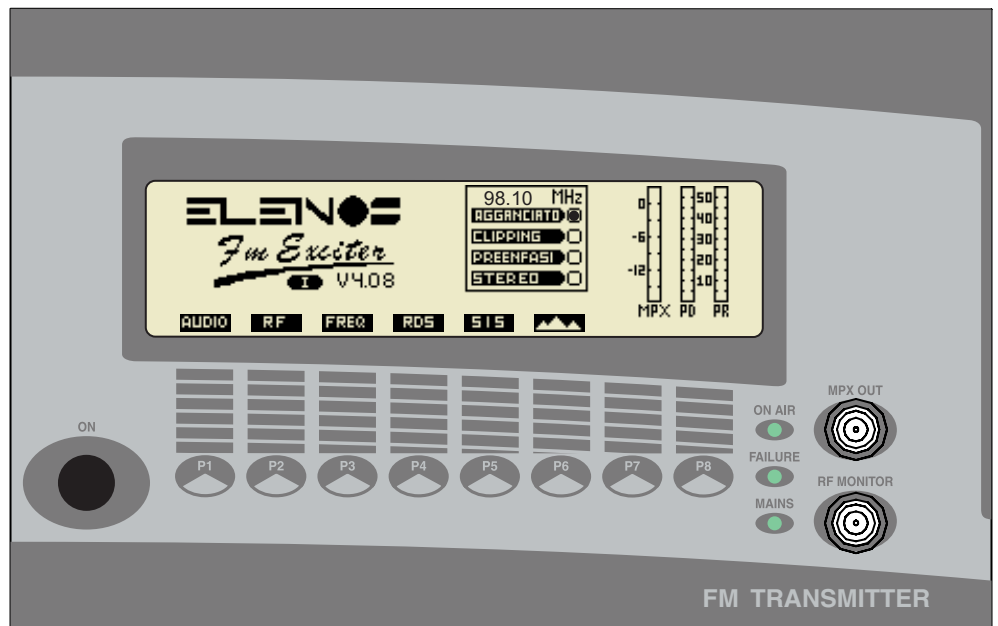
☞ Press key P1 to access the audio menu
☞ Press key P2 to access the RF menu
☞ Press key P3 to access the frequency programming menu
☞ Press key P4 to access the RDS menu if the optional RDS board is fitted
☞ Press key P5 to access the user setup menu
☞ Press key P6 to access the deviation and statistics menu

The following parameters are displayed in the Functions menu: MPX level, direct power, reflected power, operating frequency, PLL lock, clipper operation, insertion of pre-emphasis and activation of the stereo encoder.

Once the functions menu has been entered, if no key is pressed, the main menu will automatically appear after 10 seconds.

3.4.3.
Audio Menu

Adjustment of the input signal level
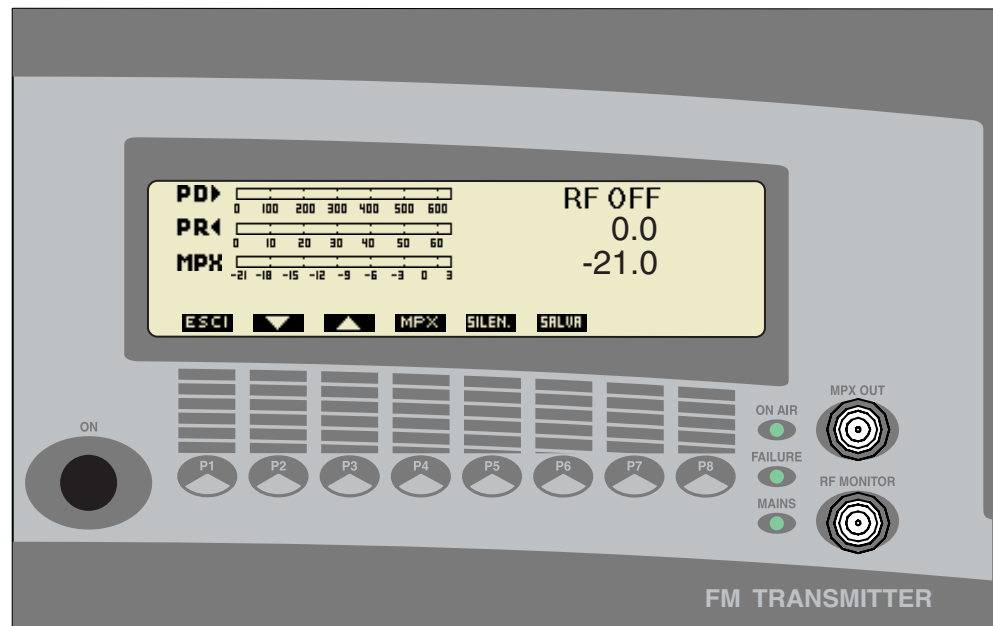
☞ Press key P1 to return to the functions menu
☞ Press key P4 to set the input signal level (default 0dBm)
☞ Press key P2 to reduce the input signal level
☞ Press key P3 to increase the input signal level
☞ Press key P6 to save the adjustment made
☞ Press key P5 to disable or re-enable the audio signal

The audio menu displays the following parameters: direct power, reflected power and MPX signal level in both "analog" and numerical form. In the diagram direct power is disabled (RF OFF), the reflected power is 0W and the MPX signal level is -21dBm.

If the stereo encoder is present, the indication of direct and reflected power is replaced by the level of the signals on the left and right channels.

3.4.4.
RF Menu

Adjustment of output power
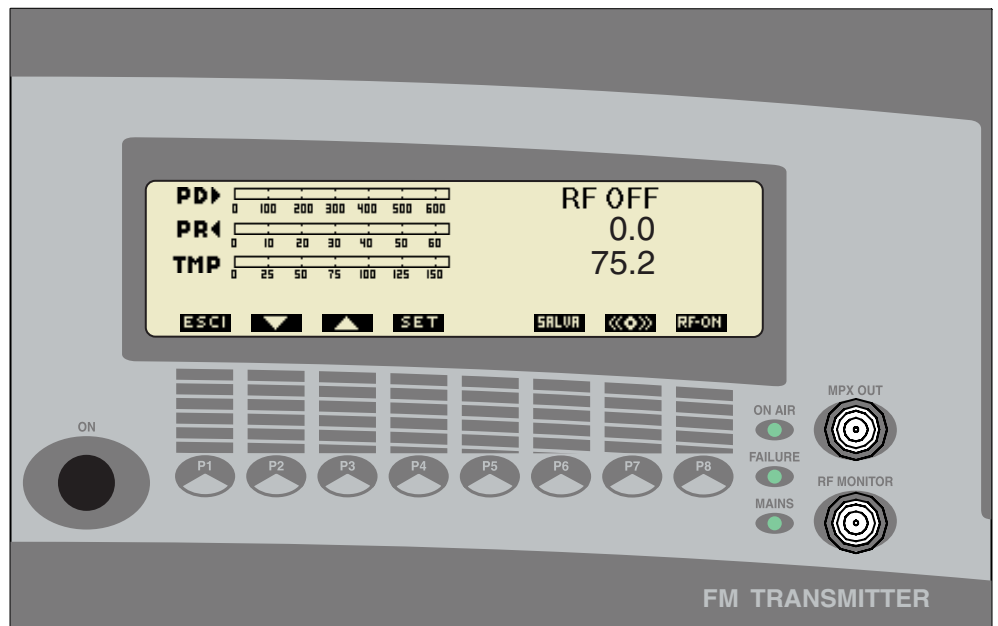
☞ Press key P1 to return to the functions menu

☞ Press key P4 to set the output power level from 0W to a maximum value of 500W

☞ Press key P2 to reduce the output power

☞ Press key P3 to increase the output power

☞ Press key P6 to save the adjustment made

☞ Press key P7 to activate or disactivate the output stage of the amplifier. For example, in the diagram, output power is disabled.

    In the RF menu, the following parameters are displayed: direct power, reflected power and temperature in both "analog" and numerical form.

3.4.5.
Frequency Menu

Adjustment of output frequency
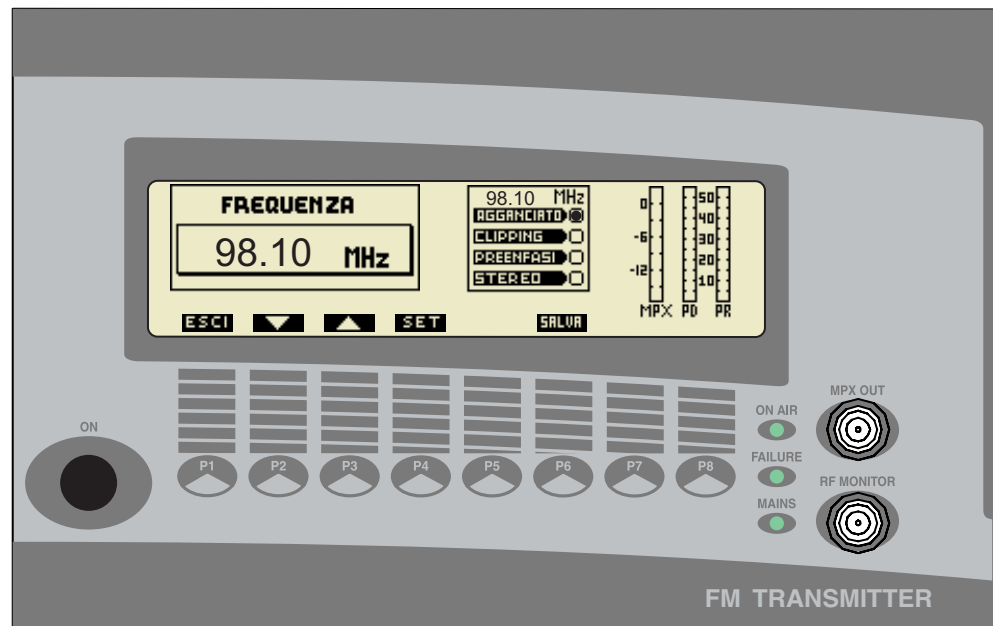
☞ Press key P1 to return to the functions menu
☞ Press key P4 to set the operating frequency
☞ Press key P2 to reduce the operating frequency
☞ Press key P3 to increase the operating frequency
☞ Press key P6 to save the adjustment made

The frequency menu displays the following parameters: MPX level, direct power, reflected power, operating frequency (highlighted), PLL lock, clipper operation, insertion of pre-emphasis and activation of the stereo encoder.

3.4.6.
User setup menu
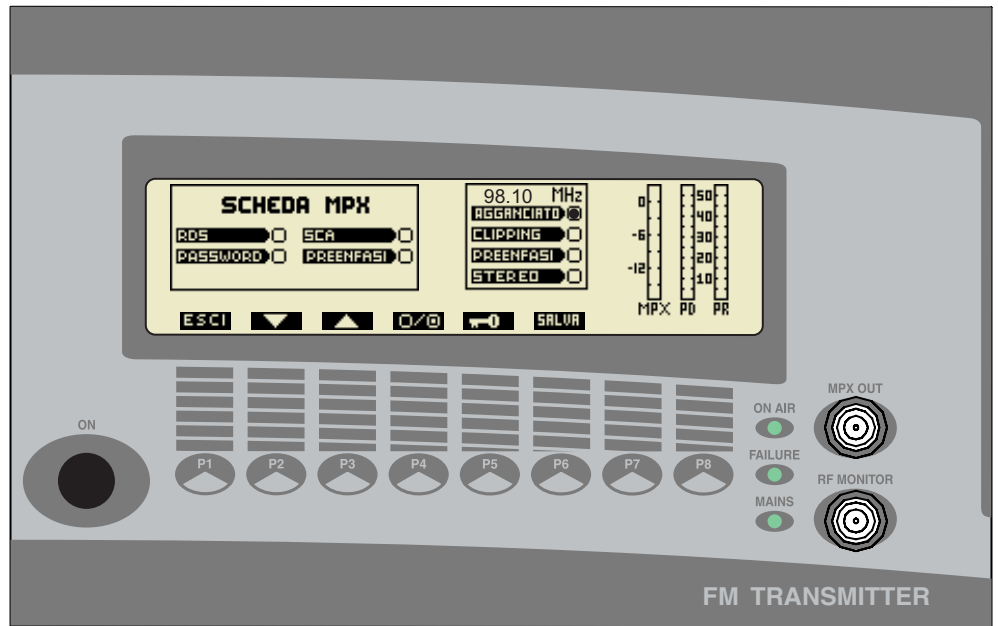
☞ Press key P1 to return to the functions menu
☞ Press key P2 to scroll the menu options from top to bottom
☞ Press key P3 to scroll the menu options from bottom to top
☞ Press key P4 to enable (circle filled) or disable (circle empty) the selected function
☞ Press key P6 to save the change
☞ Press key P5 to program a four figure password

The password restricts access to the audio, frequency, power and user setup menus by unauthorised personnel.
The following parameters are displayed in the user setup menu: MPX level, direct power, reflected power, operating frequency, PLL lock, clipper operation, insertion of pre-emphasis and activation of the stereo encoder.

3.4.7.
Timer Display
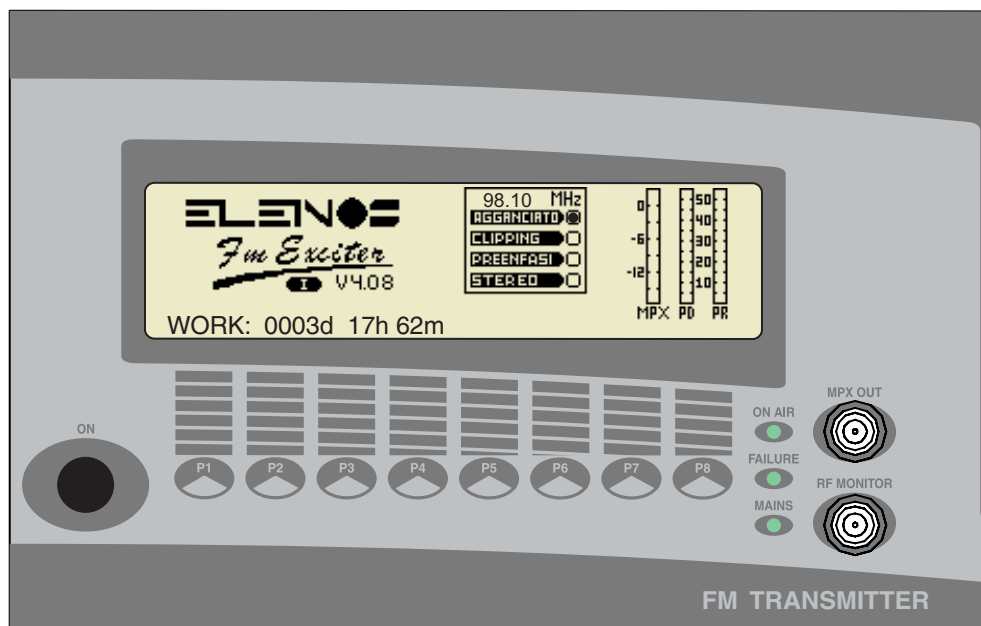
From the main menu, key P5 accesses the timer display which indicates the operating time of the unit in days (d), hours (h) and minutes (m).

3.4.8.
RDS menu
(Optional)

Adjustment of RDS settings (optional)
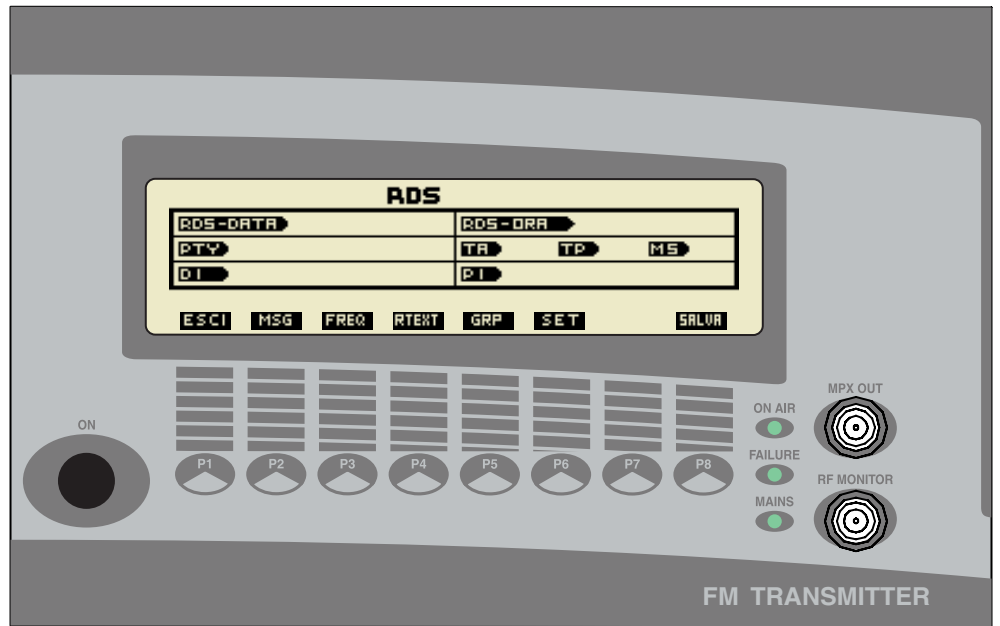
In function menu press P4 to enter RDS menu

☞ Press P1 to return to function menu
☞ Press P2 to enable RDS messaging settings
☞ Press P3 to enable alternative frequencies settings
☞ Press P4 to enable radio text settings
☞ Press P5 to enable groups settings
☞ Press P6 to set RDS Date and Time, PTY, DI, TA, TP, MS and PI
☞ Press P8 to save settings

3.4.8.
RDS Menu
(Optional)

From the RDS menu (page 21)
☞ Press key P6 to program RDS Date and Time, PTY, DI, TA, TP, MS and PI
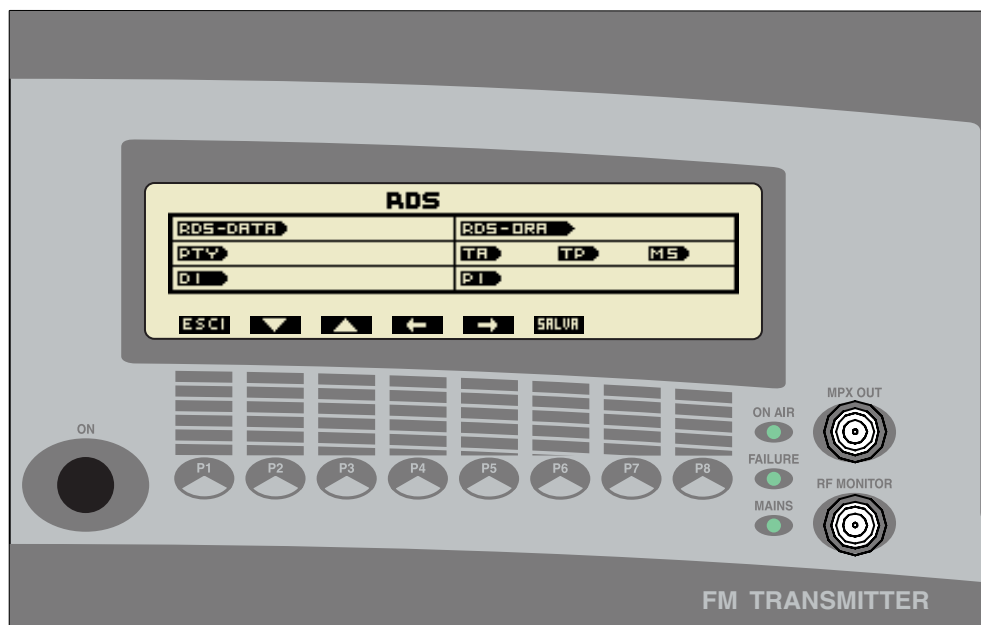
☞ Press key P1 to return to the main RDS menu
☞ Press keys P4 and P5 to select the data to modify
☞ Press keys P2 and P3 to select options for the selected data
☞ Press key P6 to save the changes made

Engineering Department PHONE: +39 0532 829 965 - FAX: +39 0532 829 177
E-Mail: support@elenos.com

3.4.8.
RDS Menu
(Optional)

From the RDS menu (page 21)
☞ Press key P4 to set the RDS TEXT message
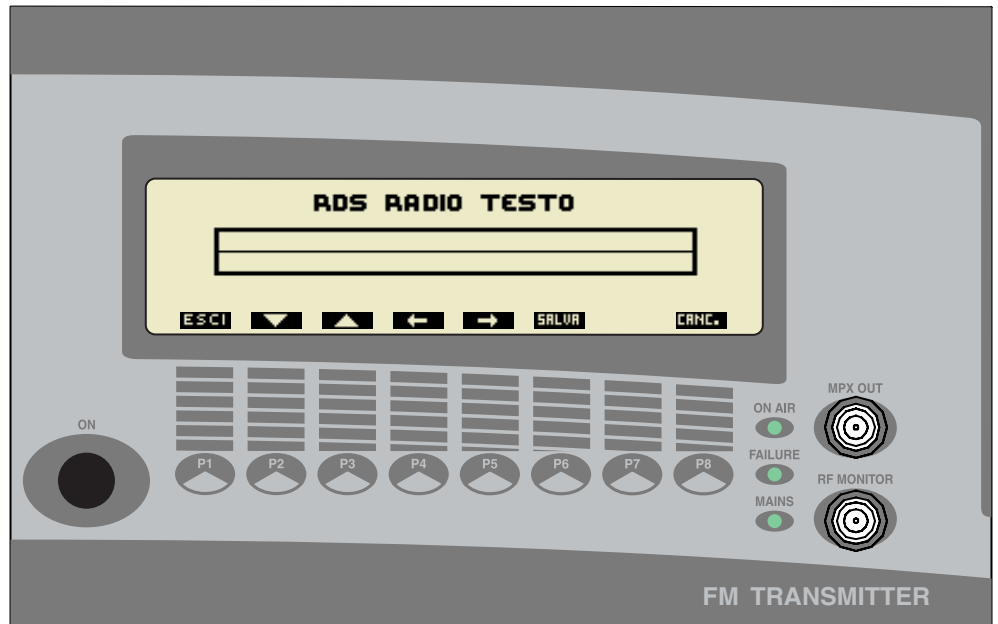
☞ Press key P1 to return to the main RDS menu
☞ Press keys P4 and P5 move the cursor
☞ Press keys P2 and P3 to select the letter to insert
☞ Press key P6 to save the changes made to the message
  N.B. If unsaved, the previous message will remain unchanged
☞ Press key P8 to delete the whole message

3.4.8.
RDS menu
(Optional)

From the RDS menu (page 21)
☞ Press key P2 to display the RDS messages
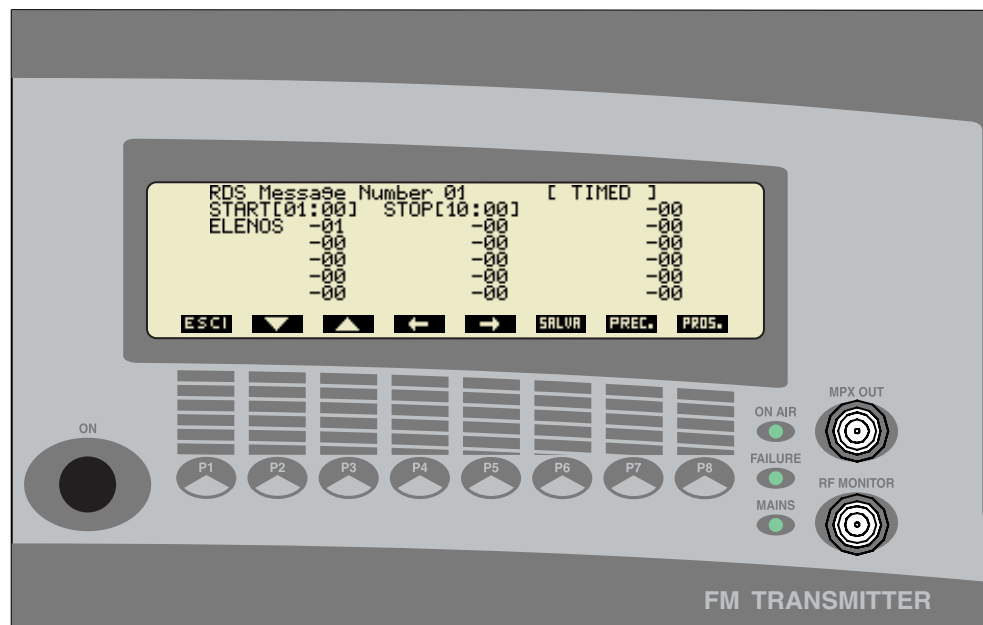
✔ Status display (Disable, Timed, Scroll)
✔ Display of START and END display time
✔ 16 fields comprising 8 characters each and display times in seconds

From the RDS menu (page 21)
☞ Press key P3 to set alternative frequencies
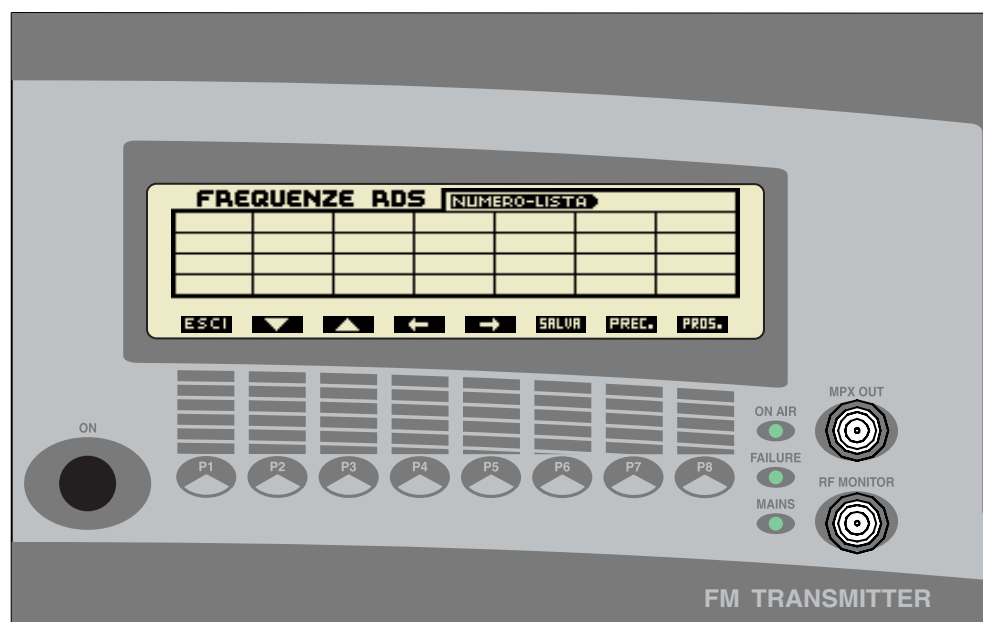
This window shows one of the sixteen lists of RDS frequencies.
The following is displayed in this window:
✔ Display of the list number
✔ Display of the type of list (A or B)
✔ Display of the list header (only for list type "B")
✔ 28 fields that can be filled with 24 frequencies of type "A" or 12 of type "B"

3.4.9.
Deviation and
Statistics Menu

From the functions menu (page 15)
☞ Press key P6 to display Deviation and Statistics
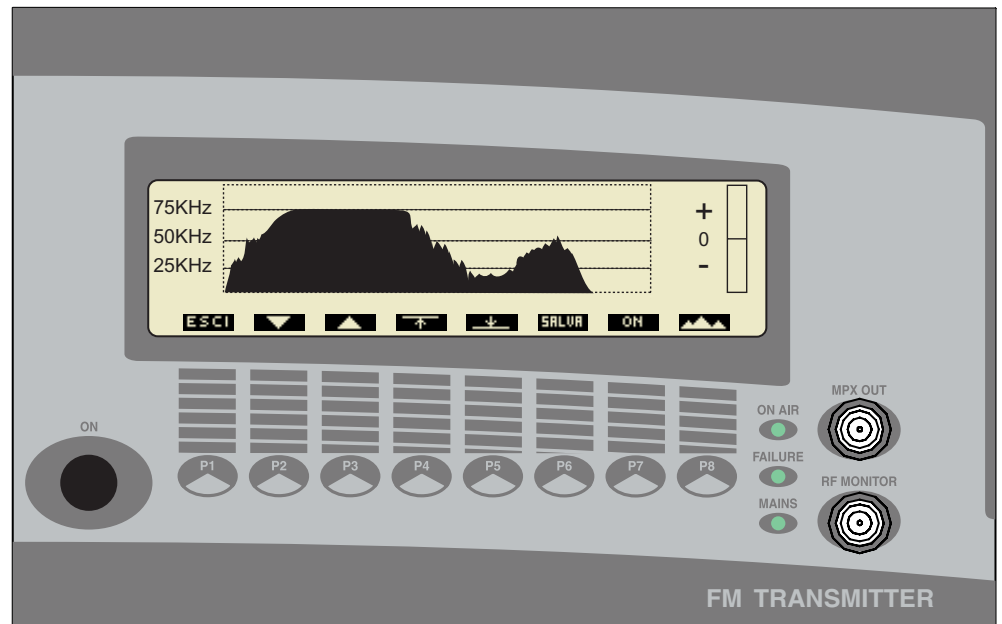
☞ Press key P1 to return to the main menu
☞ Press key P7 to enable or disable audio ALC (Automatic Level Control)
☞ Press key P4 * to set the upper threshold for ALC
☞ Press key P2 to reduce the value of the upper threshold
☞ Press key P3 to increase the value of the upper threshold
☞ Press key P6 to save the changes made
☞ Press key P5 * to set the lower threshold for ALC
☞ Press key P2 to reduce the value of the lower threshold
☞ Press key P3 to increase the value of the lower threshold
☞ Press key P6 to save the changes made

(*) Pressing keys P4 or P5 will cycle through the options to modify the threshold measured in KHz, in dB, and the response time of the Clipper in seconds.

N.B.
The status of the ALC is diplayed by the right hand bar

☞ Press key P8 to access the statistics menu (see next page)

This window shows the absolute value of modulation (MPX) in time.
The graphics allow the modulation to be displayed over a period of several minutes of transmission.
To facilitate reading, the display is calibrated at values of 25, 50 and 75KHz.

3.4.9.
Deviation and
Statistics Menu

From the deviation menu (page 25)
☞ Press key P8 to display Statistics
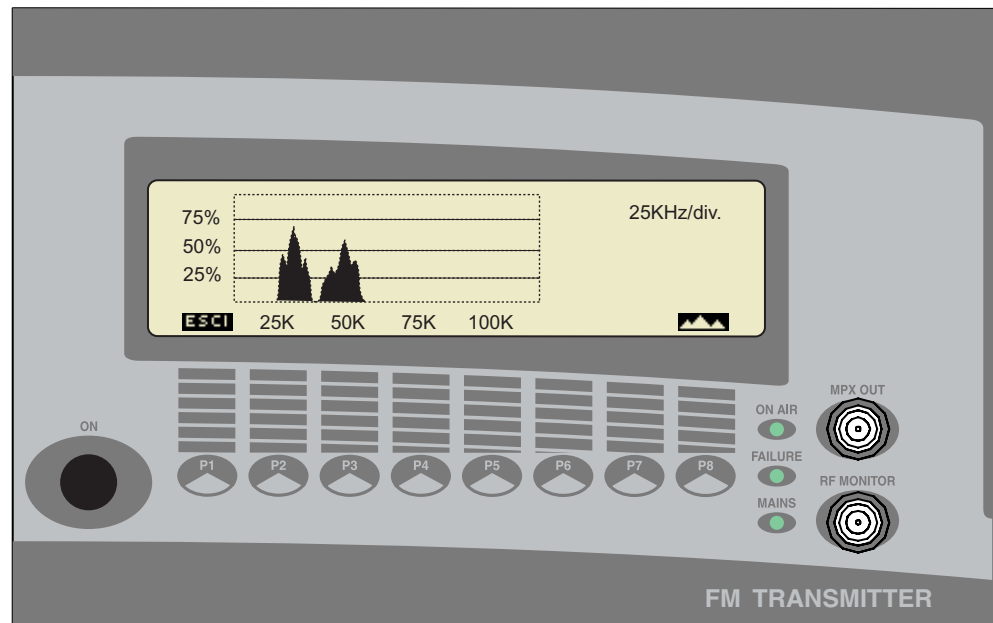
☞ Press key P1 to return to the main menu
☞ Press key P8 to return to the deviation menu (previous page)

    This window displays the percentage modulation (MPX).
The graphics allow evaluation of how much deviation is present and the percentage exceeding 75KHz of deviation.
- Y AXIS: The grid highlights the values 0%, 25%, 75%, 100%
- X AXIS: The grid highlights deviation values 0, 25, 50, 75, 100KHz

3.4.10.
RDS Encoder
Programming

Each encoder is supplied with a 3.5" disk containing programming software for an IBM compatibile PC.

Once installed, the software is already operational - just connect the PC to the encoder and switch it on to start programming it.

At start up a screen will appear asking whether COM1 or COM2 is used for the serial connection. A second screen will then appear, "Baud Rate Selection", which asks for the speed of the serial connection in baud. Select 2400 as the default.

ATTENTION:

In the event that the correct serial port or baud rate has not been selected, the following message will appear:

This window will appear whenever an error is detected.

ATTENTION:

Whenever this programme is in use, ensure that you exit any ETG500 window that corresponds to RDS programming.

3.4.10.
RDS Encoder
Programming

Once the port and baud rate have been set, the PC will begin to upload enco-
der data to determine the data with which it has been programmed. When successfully
completed, a screen will appear with three main sections: "PS Messages","Alternative
Frequencies" and "Program Identification".
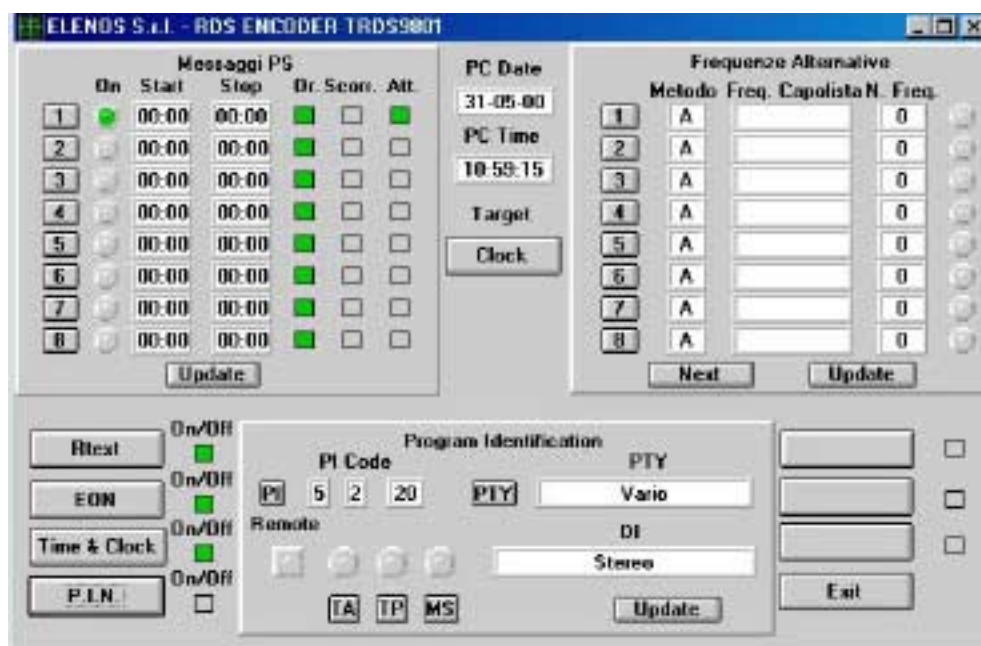
3.4.10.
RDS Encoder
Programming

PS Messages:

The "PS Messages" section shows 8 zones, each of which comprises the following fields:

✔ 1-8 keys to select the window for modifying the contents of the corresponding PS message.
✔ START text box corresponding to the time of start of transmission of the PS message. This field can only be modified if the OR key is lit.
✔ STOP text box corresponding to the time of the end of transmission of the PS message. This field can only be modified if the OR key is lit.
✔ ATT (active) key enabling the PS message to be transmitted on-air; if green, the message is on-air.
✔ OR (time) key enabling the on-air message to be timed; if OR and ATT are both green, the PS message will go on-air between the times specified by the START and STOP fields.
✔ SC (scroll) key enabling the transmission of the PS message in scrolling mode (one letter to the right every second).
✔ ON indicator (green) confirming that the corresponding message is on-air.

Active messages (ATT lit green) which are not timed (OR grey) will be transmitted consecutively during intervals when timed messages are inactive. To ensure that the video programming is in step with the encoder, press the "Update" key.

Procedure for programming message 1

☞ Press OR (time) so that it is lit green (time setting enabled)
☞ Click the mouse on the START window
☞ Delete the previous time (CANC key)
☞ Enter the start time (using the same format:"XX:XX")
☞ Click the mouse on the STOP window
☞ Delete the previous time (CANC key)
☞ Write the end time of the message
☞ Press key 1 (the message programming window will appear)

3.4.10.
RDS Encoder
Programming

Programming PS Messages

Having pressed one of the keys 1-8, corresponding to the number of the PS message to program, a window will appear with 16 fields for the words which make up the message, and the corresponding times for which the words will be displayed.

The times, in seconds, can be programmed from a minimum of 1 second to a maximum of 60 seconds and represent the time for which the word will be displayed before being replaced by the next word. However, if the message is programmed to scroll (the SC key is lit green in the previous window), the times displayed have no relevance.

N.B.
The fields which are left blank are not transmitted even if a display time of more than one second has been set.

Procedure for programming a message
1. Double click on the text box where a word is to be entered, and then enter the word
2. Adjust the display time of the word using the UP and DOWN arrows underneath the text box
3. Repeat steps 1 and 2 for all the other words to be programmed
4. Press the UPDATE key to save the message and exit from the window

Alternatively, press the EXIT key to exit from the window without saving the message

From the main window:

5. Press the ATT key (activate the message)
6. Press the UPDATE key to update (the green ON indicator will light to show the message is active)
7. It is now possible to insert other messages (upto 8) following the same procedure
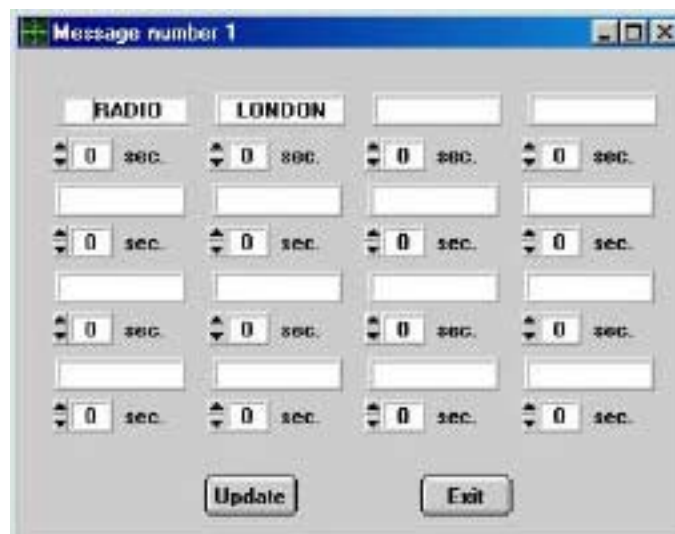
3.4.10.
RDS Encoder
Programming

Alternative frequencies

The Alternative frequencies section allows 16 lists of different frequencies to be programmed, each in mode A or B. 8 lists are displayed at a time and with each one, the mode (A or B) with which it was programmed, the header frequency (this field is filled only if mode B has been used) and the number of frequencies in the list. To access a list just click the corresponding key with the mouse; a display will appear showing the mode and the list of possible frequencies on the left, and the frequencies in the list on the right. Double-click on a frequency contained in the left-hand list and it will be added, if not already present, to the list on the right. With mode A, it is possible to create a list with a maximum of 25 frequencies compared with 12 in mode B.
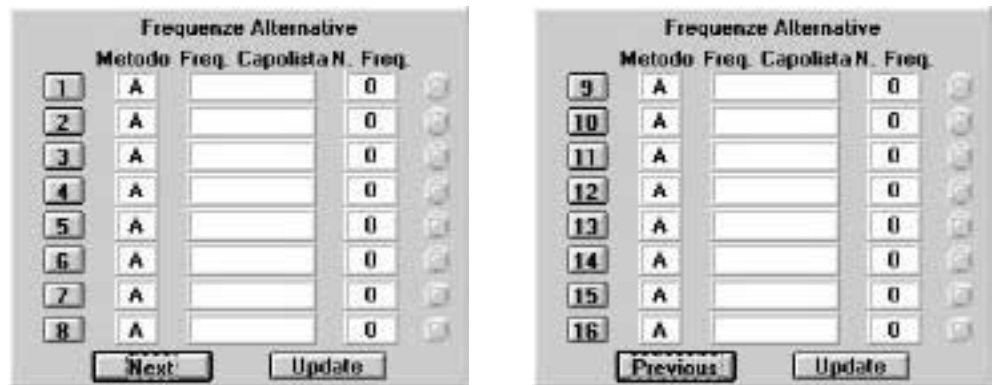
Method A/B

The EBU standard allows for the possibility of transmitting the set of frequencies to a network of transmitters in two modes, A and B.
- Method A allows transmission of one or more lists of frequencies, each upto a maximum of 25.
- Method B allows transmission of as many lists as there are transmitters in the network
Each list is headed with the frequency of the transmitter to which it corresponds and contains all the frequencies of adjacent transmitters.

Each receiver is designed to store a certain number of alternative frequencies which will be searched automatically for a new frequency when the current signal is too weak to receive. The search is as fast as the list of alternative frequencies is short. When the number of transmitters exceeds 12, it is advisable to use method B in which the receiver stores only the list corresponding to the header frequency to which it is tuned, so facilitating a faster change of frequency.

3.4.10.
RDS Encoder
Programming

Programming alternative frequencies

To correctly program alternative frequencies, follow the instructions in sequence:

1. From the main menu, click on the key corresponding to the list to program.
2. Select method A or B.
3. Scroll the list of frequencies and double-click the mouse on the desired frequency. The data will be inserted in the selected list of frequencies (right-hand list). With method B selected, the first selected frequency is the header frequency and appears in the relevant window. To delete any stored frequency, double-click on it with the mouse.
4. To save the selection, click on USCITA.
5. In the main menu a green indicator will appear to the left of the list being modified or programmed to show that data is being changed. Click the UPDATE key to store the new data in the RDS board.

At this point, further alternative frequencies may be programmed.

Esempi

Metodo A   Metodo B

Program identification

In this section parameters specific to the broadcaster are programmed; Program Identification, Program Type, Decoder Identification, Traffic Announcement, Traffic Program and Music/Speech.

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E-Mail: support@elenos.com

3.4.10.
RDS Encoder
Programming

Program identification PI

PI is an identification code comprising 3 fields: COUNTRY + DIFFUSIONE + CODE.

COUNTRY is a numerical value from 0 to 15 (0,F in hexadecimal) which identifies the country of the broadcaster (Italy - code 5).

DIFFUSIONE is a numerical value from 0 to 15 (0,F in hexadecimal) which identifies the area of coverage of the broadcast signal (local, regional, national, international).

CODE is a numerical value from 0 to 255 (00,FF in hexadecimal) which identifies the broadcaster; the code is assigned by an authorised organisation.
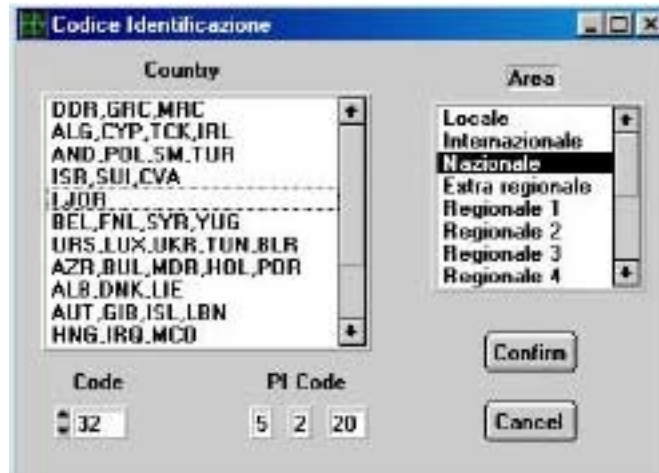
1. To program PI just click on the corresponding key with the mouse.
2. Double-clicking on the item will automatically enable the relevant codes.
3. Press the CONFIRM key to confirm the choice.
4. To exit without saving, press CANCEL

Program Type and Decoder Identification DI

PTY is a code with 32 values (from 0 to 31) which identifies the type of transmission being broadcast.

DI identifies 16 different operational modes that the broadcaster can use.

- Click the PTY key with the mouse to start programming
- To store the selection, press UPDATE.
- To exit without saving, press EXIT.
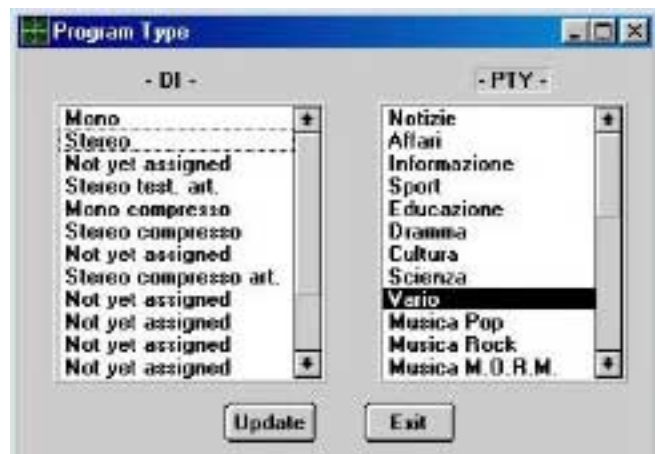
3.4.10.
RDS Encoder
Programming

TA-TP-MS

At any time during the day, the broadcaster can interrupt the programme being transmitted with traffic news; for this reason the standard provides for a number of flags which indicate to the receiver that this information is being transmitted so that automatic tuning and/or volume adjustment can be made. These flags are named TA, TP and MS.

✔   The TP flag identifies the broadcaster which is making traffic announcements
✔   The TA defines the time intervals between traffic announcements.
✔   The MS flag indicates whether the transmission is of Music or Speech (Voice)

These flags can be set by clicking the mouse on the relevant keys or via a remote keyboard connected to the appropriate board connector. If the remote keyboard is connected, the "Remote" key will be lit green and setup via a PC will be inhibited.

If the colour of the TA, TP and MS keys do not agree with the encoder leds immediately above, this means that the flags set on the screen do not match those of the encoder. To update them press the Update key.
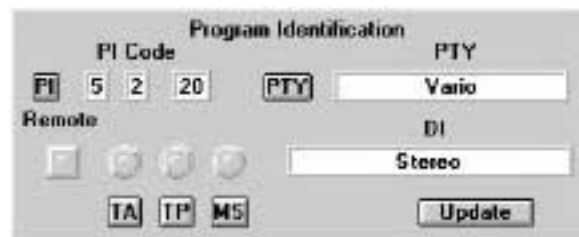
Radio Text

Radio Text is a message with a maximum length of 64 characters used to check the quality of the signal within the coverage area. The message is transmitted indefinitely

To program the message, click the mouse on the RTEXT key.
To activate the message, click the mouse on the adjacent ON/OFF key.

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3.4.10.
RDS Encoder
Programming

EON Message

The EON message is used when a broadcaster has an agreement with another broadcaster (that we shall call "Friend") to permit automatic tuning of receivers to Radio Friend, in areas where the signal quality of the broadcaster is poor or absent, or when Radio Friend is broadcasting information of interest to the listener.

RDS allows programming of data upto a maximum of 8 partner broadcasters. Each broadcast network is a broadcaster in its own right and must therefore have unique identification of its data and allow all common services of interest identifiable between the two broadcasters.

Programming access to all this data is enabled by clicking the EON key located on the left side of the main panel; this displays the list of 8 networks that can be programmed.

Having chosen a network, a screen is displayed which shows all the parameters to be programmed: PI-PS-TA-TP-PTY-AF-PIN

✔ PI is the identification code of radio Friend.
✔ PS is the 8 character message which is displayed on receivers tuned to the radio Friend frequencies.
✔ TP indicates that the Friend broadcaster is enabled to transmit traffic news.
✔ TA indicates that the Friend broadcaster is transmitting traffic announcements.
✔ PTY indicates the type of programme.
✔ AF indicates the list of alternative frequencies on which radio Friend can be received.

3.4.10.
RDS Encoder
Programming

The method of programming is similar to that of the main broadcaster (see previous pages). For each network it is possible to program a maximum of 7 frequencies with method A and 4 frequencies with method B.

To enable transmission of the programmed data for each network, just press the "Message Active" key; if it is coloured green, this means that the data is valid and may be transmitted.

ATTENTION: data relating to active networks (those for which the "Message Active" is green) are transmitted even if the ON/OFF key on the main panel is set (green).
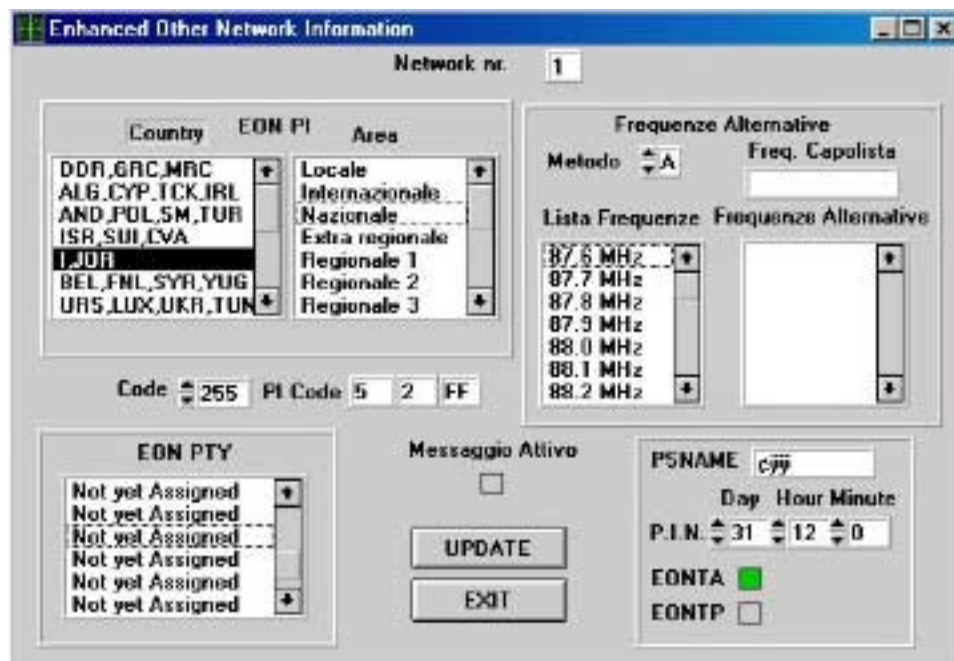
Time & Clock Data

The RDS encoder has an on-board clock-calendar which provides an autonomous timing function. The clock-calendar can be read and updated so that listener's receivers can be synchronised. When this message is transmitted, the encoder sends a data packet containing the date and time referred to the Greenwich meridian on every change of minute. The time difference is expressed in half-hour steps.

To synchronise the clock-calendar to the actual date and time:

1. Press the CLOCK key or the TIME&C key

3.4.10.
RDS Encoder
Programming

2. Double-click on the TARGET TIME box and enter the time local to where the broadcaster is transmitting.
3. Double click on the TARGET DATE box and enter the date.
4. Select the location with respect to Greenwich (the RDS system is able to update the time according to the country in which it is transmitting).
5. Press the UPDATE key to transfer the data to the encoder.

If the EXIT key is pressed, the clock-calendar will not be changed.
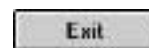
Once the programming is complete, the PC can be diconnected and used for other purposes. Clicking the mouse on the EXIT key will terminate programming of the encoder.

3.4.10.
RDS Encoder
Programming

Technical data

RDS SIGNAL	as per CENELEC EN50067 ....
ENCODING	2 level differential ....
MODULATION	DSB suppressed carrier ....
FREQUENCY	57 KHz..
BAND	+/- 2.4 KHz ....
INPUT MPX..........................	0/+12 dBm into 600 Ohms ....
OUTPUT	MPX+RDS ....
MPX OUTPUT LEVEL..............	Inp. MPX...
RDS OUTPUT LEVEL	20 - 150 mV RMS ....
OUTPUT IMPEDANCE...........	100 Ohms...
PS MESSAGES	8 with 16 words of 8 characters.................................
ALTERNATIVE .... FREQUENCY LISTS	16 with maximum 250 frequencies each ....
MESSAGE............................. PROGRAMMING	With IBM compatibile PC ....
CONNECTION	RS232-C Standard ....
COMMUNICATION.............	Full Duplex...
SPEED	2400 baud ....
CONNECTORS	9 Pin Cannon Female ....
....	9 Pin Cannon Male ....
....	BNC...
MESSAGE MANAGEMENT	Microcontroller...
DATA BACKUP	10 years ....
OPERATING TEMPERATURE...	0 - 55 °C...
POWER SUPPLY	+12Vdc 100mA, +5Vdc 800mA ....

3.5.
Checking performance

This procedure for checking performance should be carried out if there is any doubt over the integrity of the unit or possible damage sustained during transport. It should be performed by expert personnel capable of operating radiofrequency measurement equipment.

The unit is calibrated using an FMAB modulation analyser (R&S) and so the performance checking equipment must be high precision, analogue instrumentation.

Power developed

Connect a high quality wattmeter (e.g. Bird mod. 43) to the unit, via a double, male N-type connector. The wattmeter output is connected to a high quality dummy load (SWR less than 1.05) capable of dissipating at least 500W continuously via a 50 Ohm coaxial cable of appropriate cross section (e.g. RG213). Adjust the maximum range of the wattmeter to correspond to the power generated (e.g. for a Bird mod. 43 wattmeter, use a 500W probe adjusted to measure direct power). Power up the unit and check that the power shown on the display corresponds to the power displayed by the wattmeter. There is a tolerance of upto 25W difference between the two.

It is of the utmost importance to use a wattmeter that is performing to its high precision specification.

The measurement will be invalid if the wattmeter is connected to the unit via a coaxial cable without the double connector as specified.

Programmed frequency

Connect the unit to a dummy load with a -30dB output capable of dissipating at least 500W of continuous power, via a 50 Ohm coaxial cable of appropriate section (e.g. RG213). Connect the output of the dummy load, attenuted by another 20dB, to a frequency meter which is known to be performing to its high-precision specification. Power up the unit and check that the frequency shown on the display corresponds to the frequency displayed by the frequency meter. There is a tolerance of upto 100Hz difference between the two readings.

Deviation

Connect the unit to a dummy load with a -30dB output capable of dissipating at least 500W of continuous power, with a coaxial cable of appropriate section (e.g. RG213). Connect the output of the dummy load, attenuated by another 20dB to a modulation analyser which is known to be performing to its high-precision specification. Connect the MPX input to a 1KHz sinusoidal signal from a low-frequency signal generator, with the amplitude adjusted for a level of 0dBm. Power up the unit and check that the deviation displayed by the unit and by the modulation analyser fall within the range 75KHz -0.2dB and 75 KHz.

4.1.
Introduction

This technical manual contains information regarding the operation, use and maintenance of the ETG30 exciter.

The ETG30 operates in the frequency band from 87.5MHz to 108MHz in steps of 10KHz and is capable of developing a maximum, continuous power of 30W).

All the operating controls of the unit are directly accessible from the front panel whilst all the connectors are available on the rear panel.

The connectors for measurement of signals are however located on the front panel.

The exciter can be used for monophonic, stereo and composite multiplex transmissions.

4.2.
Using the block diagram

The block diagram describing the ETG30 exciter is on the following page.

The principle of communication between the various boards is clear from their interconnection; each connection is identified by a progressive number within a circle. In the pages following the block diagram where individual boards are decribed, the cable loom numbers are identified in order to simplify maintenance and eventual repair.
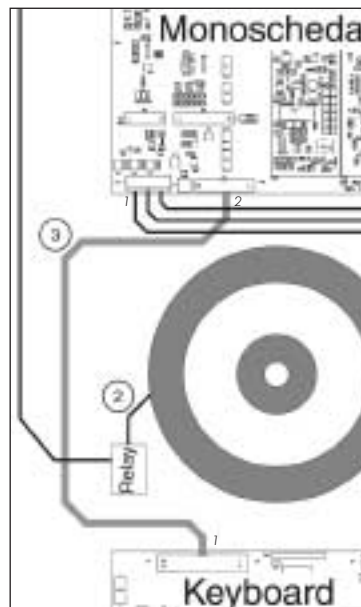
In this case, for example, the board is connected to the keyboard via flat 3, and the transformer is connected to the relay via cable 2 etc.

In the board descriptions following the block diagram, the following information appears:

Connections:
- 1 (JD1) via cable flat 3 to 1 (J1) of the monoboard

The first number is a reference whilst the number in brackets represents the name of the connector of the board in question.

For more detail, see the layouts of the schematics.
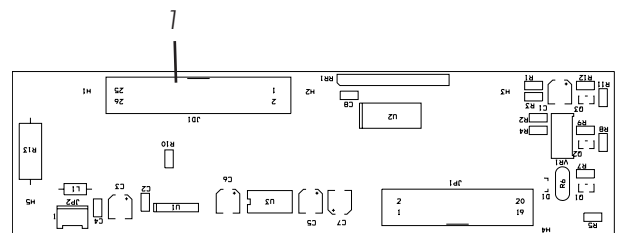
Pag 1 file A3

4.4.
Power supply section

The ETG30 uses a switch-mode converter.

The ETG30 exciter features a line filter fitted to the alternating supply to provide maximum suppression of conducted interference.

The use of discrete component technology enables easy replacement in the event of failure.

4.4.1.
Service power supply

The service (or auxiliary) power supply furnishes 5 separate supplies which supply the various boards which go to make up the unit.

The table below summarises the supply voltages for each section of the unit and the corresponding protection.

The service (or auxiliary) power supply is a linear type in order to reduce to a minimum any disturbances that could interfere with the boards.
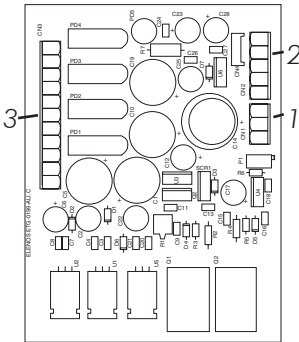
Supply Voltage	Boards supplied	Protection
+12V	Mother board (CPU, PLL, BUS)	Current protection
-12V	Mother board (CPU, PLL, BUS)	Current protection
+5V	Mother board (CPU, PLL, BUS)	Current and voltage protection
+12V$_{RF}$	RF driver stage	Current protection
+18V$_{RF}$	RF driver stage	Current protection

Connections:
- 1 (CN1) via cable 13 to 2 to the "DRIVER" board
- 2 (CN2) via cable 4 to 1 (J1) of the mother board
- 3 (CN3) via cable 7 to the transformer

4.5.
Radiofrequency section

This comprises a low power output stage (driver) connected to the final power stage.

The power output from the module supplies the input of the low-pass filter.

The measurement probe which is located on the final part of the low-pass filter, reads the values of direct and reflected power for the CPU.

4.5.1.
Driver

The driver comprises an input stage of about 10mW and supplies a maximum output power of 15W.

It is built using a mix of technologies and subdivided into three main amplifying stages.

The first stage is a "MMIC" type "ERA5".

The second stage is a MOS BLF404.

The third stage is a MOS BLF245.

The output of the driver is connected to the input of the RF module.
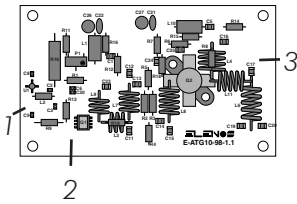
Connections:
- 1 via coaxial cable 10 to 3 (J8 RF OUT) of the mother board
- 2 via cable 13 to 1 (CN1) of the power supply
- 3 via coaxial cable 14 to 2 of the Low Pass Filter
- 4 via cable 6 to 1 (J1) of the mother board

4.5.3.
Low-pass filter

RF Out

This is a ninth order "CHEBYCHEV" filter, with teflon support. It guarantees the suppression of harmonic components with the limits set by International standards.
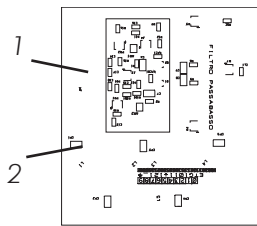
Connections:
- 1 (JP1) via flat cable 11 to 5 (CN1) of the mother board
- 2 via coaxial cable 14 to 3 of the Driver

"RF Out" indicates the RF power output connector which is located on the rear panel

4.5.4.1.
Directional coupler
Output power
measurement

The directional coupler is located on the final output stage of the low-pass filter. It is designed using SMD technology and is shielded to prevent RF intereference. It generates a voltage proportional to the direct and reflected power.

Connections:
- 1 (JP1) via flat cable 11 to 5 (CN1) of the mother board
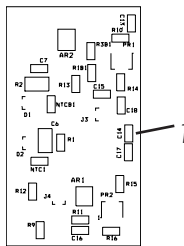
N.B.
The directional coupler is mounted on the same circuit board.

4.5.4.2.
Directional coupler
AGC protection

A control circuit regulates the output power and maintains it to within +0.1dB across the whole operating band, progressively reducing it down to 50W in the event of excessive SWR. This enables the exciter to continue to work with infinite SWR at any phase angle.

4.6.
Logic
(Mother board)
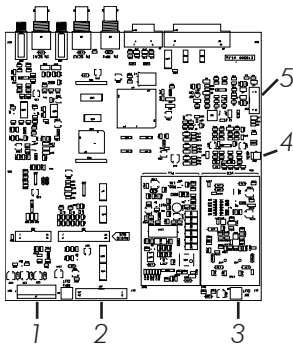
This board is constructed using only SMD technology and comprises the following stages:
- CPU
- AGC
- VCO/PLL
- MPX

Connections:
- 1 (J1) via cable 4 to 2 (CN2) of the power supply
- 1 (J1) via cable 6 to 4 of the Driver
- 2 (JD1) via cable flat 3 to 1 (JD1) of the Keyboard
- 3 (SC1) via coaxial cable 10 to 1 of the Driver
- 4 (CN2) via cable 12 to the temperature sensor
- 5 (CN1) via cable flat 11 to 1 of the directional coupler

4.6.1.
CPU

The CPU controls the display, the keyboard, ALC and the VCO/PLL. It comprises an 80C552 microprocessor which operates at a clock rate of 16MHz.

It features a 256 Kbit RAM and a 2Mbit ROM.

It receives input signals from the directional coupler and supplies processed signals to the ALC.

It also controls all the audio functions.

4.6.2.
ALC

This receives signals from the CPU and supplies 2 output voltages:
1) Controls the MOS gates
2) Controls the output voltage of the power supply.

It features SWR protection which limits the output power in the event of an SWR in excess of the programmed threshold.

4.6.3.
VCO/PLL

The PLL board generates the frequency-modulated RF signal using phase-lock synthesis.

The oscillator, controlled by the VCO voltage and mounted next to the PLL board, uses very low-noise components and also separation stages to obtain very low phase noise.

The reference frequency is generated by a temperature-compensated oscillator with a maximum drift of 1ppm.

4.6.4.
MPX

Accepts the wide-band MPX input signal, i.e. it supplies the transmitter with a stereo signal derived from an external stereo encoder. It features 2 SCA inputs, one of which can be used as an RDS data input.

The two unbalanced inputs for SCA signals accept input frequencies upto 200 KHz. The MPX also supplies the microcontroller with an appropriately processed MPX signal so that the level can be displayed as a bar graph and in dBV values. The inputs are protected against over-voltage.
The inputs are unbalanced on BNC connectors (impedance 10KOhm).

4.7.
Keyboard
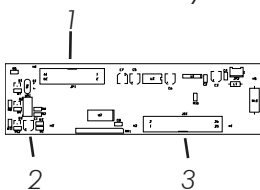
This is interfaced to the CPU and supplies signals to the display as well as power for illumination.

A trimmer allows adjustment of the contrast.

8 soft keys perform functions shown on the display.

Connections:
- 1 (JP1) via flat cable 3 to 2 (JD1) of the mother board
- 2 via cable 8 to the display
- 3 (JD1) via flat cable 9 to the display

4.8.
Optional boards

The optional boards offer extra facilities required by customers and are simply fitted by inserting them into the relevant slots, described on page 7 of this manual, with the unit switched off.

4.8.1.
Stereo Input Board

This board comprises two modules:
- Inputs
- Clipper

Inserted into the slot indicated on page 7, it has the function of processing the audio signal for stereophonic transmission. The board also supplies the processed stereo signal to the microcontroller which displays stereo levels using a bar graph and values expressed in dBu. The input connectors are balanced, XLR type (see the connection diagram below).

Adjustments:
☞ selection (jumper) of the value of pre-emphasis (50/75 usec)
☞ ON/OFF (jumper) of pre-emaphasis
☞ ON/OFF (software) of pre-emphasis, of the clipper and of the filter
☞ adjustment (software) of the level in steps of 0.5dB on each channel
☞ selection (jumper) of the input impedance value (600Ohm/10KOhm)

Linea bilanciata
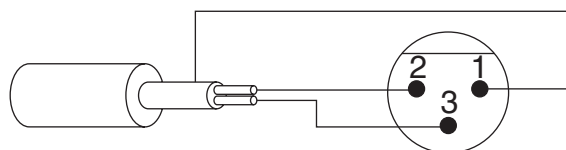
Piedino 1: massa
Piedino 2: positivo
Piedino 3: invertente

Linea sbilanciata
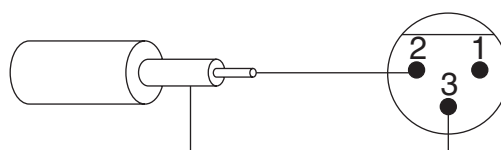
4.8.2.
Stereo Encoder Board

This board digitally generates the 19 KHz pilot carrier and the suppressed carrier. It fits in the slot indicated on page 7.
It features a BNC connector for supplying the signal to other transmitters.

Adjustments:
- ☞ adjustment (trimmer) of the pilot tone (8-12%)
- ☞ adjustment (trimmer) of the MPX signal clipper threshold before being added to the pilot carrier
- ☞ ON/OFF (jumper) of the clipper
- ☞ adjustment (trimmer) of the MPX level on the output of the board
- ☞ adjustment (trimmer) of the phase of the pilot tone with respect to the suppressed carrier
- ☞ adjustment (2 trimmers) of the equaliser of the sum of the signals (L+R) to obtain maximum separation
- ☞ adjustment (trimmer) of the suppressed carrier level (greater than 90 dB)
- ☞ ON/OFF (sofware) of the clipper
- ☞ ON/OFF (software) of the pilot carrier
- ☞ selection (software) stereo/mono

Technical data

PRE-EMPHASIS	50/75 us +/-0.1dB
FREQUENCY RESPONSE	+/-0.15dB (30Hz - 15KHz)
STEREO SEPARATION	typically 65dB @ 1KHz
PILOT TONE	Frequency: 19KHz +/- 1Hz deviation 7.5KHz adjustable
AUDIO INPUT MODULE L/R	Input impedance: 10KOhm - 600Ohm (selectable) balanced input Frequency response: 20Hz - 15KHz Adjustment: -12 - +12dB in steps of 0.1dB Connector: XLR female
ATTENUATION AT 19KHz	45dB

4.8.3.
RDS Board

Introduction

For several years now, within the field of radio broadcasting, the importance of transmitting data packets of various types, over and above the radio signal, has been recognised as crucial to improving the quality and reliability of the services offered, let alone implementing new ones.

This need was acknowledged at international level and a study group was given a mandate to identify the various needs and define a transmission standard which is suitable for the sector.

The group created the RADIO DATA SYSTEM (RDS) which is now the most diffuse system of data transmission in the radiophonic sector.

The optional RDS board fits in the slot indicated on page 7 of this technical manual.

The ETG101's (ETG151's) optional RDS board allows a data channel to be transmitted alongside the radiophonic signal (mono or stereo), in conformity with the "Specification of the radio data system (RDS)" document, published by the European Committe for Electrotechnical Standardization (CENELEC) Ref. NO. EN50067:1990.

RDS system

The RADIO-DATA-SYSTEM (RDS) has been specified for the transmission of information within mono/stereophonic programmes in the VHF/MF (87.5-108MHz) band, thus satisfying the requirements for transmission of additional data in radiophonic programmes.

> Compatibility with actual mono/stereophonic programmes
> Absence of intereference between adjacent channels
> Compatibility with other existing systems of identification

4.8.3.
RDS board

The system, selected by an international working group of specialists, allows data transmission at a speed of 1187.5 bit/sec with phase modulation at two levels, 57KHz carrier and band +/- 2KHz. The transmitted binary signal undergoes differential enco-ding.

The transmission protocol comprises packets of 104 bit (87.6ms) length, named GROUPS, each comprising 4 BLOCKS of 26 bits each. Each BLOCK is made up of 16 bits of information and 10 protection bits, designed specifically to allow words to be cor-rected upto a maximum of 5 bit in error. 16 distinct GROUPS are provided, some of which have not yet been defined. Each group starts with an identification code (PI) which has the double scope of synchronising the receiver and identifying the broadcaster that is transmitting the signal. The PI comprises a 4 bit code to identify the country (Italy is code 5), a 4 bit code to define the coverage of the transmitted signal (International, National, Sub-National,Regional or Local) and an 8 bit code for the number of reference of the program.

The Zero GROUP is used for sending the PS message (shown on the display of RDS compatible receivers) and for tuning frequencies. Each Zero group contains 2 cha-racters of the message, two tuning frequencies, a code which defines the type of transmis-sion (mono, stereo, compressed, etc.), a bit to define whether music or speech is being transmitted and a code for signalling the transmission of traffic news.

Two formats are provided for the transmission of alternative frequencies:
A) Each station transmits a unique list of frequencies, preceded by the number of frequen-cies that it contains (max 24);
B) Each station transmits a unique list of frequencies for each transmitter that it possesses. The list begins with the header frequency, followed by the frequencies (max 12) used by adjacent transmitters in the coverage area. This method is more efficient when the list of frequencies is long because it presents the self-tuning system with fewer frequencies to choose from and thus speed up the process of searching for new frequencies. If the number of frequencies is low, mode A is advised as it requires less data to be transmit-ted.

RDS system

The RDS encoder comprises a single Euro card offe-ring the following features:

✔ Connector 41612 which accepts the power supply volta-ges +5V and +12V
✔ BNC for the input of the mono or stereo signal
✔ BNC for the ouptput of the MPX signal and/or MPX+RDS
✔ Cannon connector 9 PIN for serial connection to a PC
✔ Cannon connector 9 PIN for connection of a remote key-board
✔ A panel-mounted trimmer for adjusting the RDS signal level
✔ Led indicator, for lock and carrier generation RDS (LOCK)
✔ Led indicator, for synchronisation with stereo carrier (STEREO)
✔ Led indicator for remote control active (REM)
✔ Led indicator for TP set (TP)
✔ Led indicator for TA set (TA)
✔ Led indicator for MS set (MS

4.8.3.
RDS board

The board is equipped with DB25-type female to DB9-type male cable, which can be replaced by a DB9 female to DB9 male cable (see diagram below), plus a 3.5" floppy with software for correctly programming the RDS.

N.B.
The software supplied is Microsoft Windows (c) compatible.

```
1 DCD ─────────────── DCD 1
2 RxD ─────────────── RxD 2
3 TxD ─────────────── TxD 3
4 DTR                 DTR 4
5 GND ─────────────── GND 5
6 DSR                 DSR 6
7 RTS                 RTS 7
8 CTS                 CTS 8
9 RI                  RI  9
```

DB25 Female - DB9 Male

```
1                     DCD 1
2 TxD ───────╲   ╱─── RxD 2
3 RxD ────────╳────── TxD 3
4 RTS          ╲      DTR 4
5 CTS ──────────╲──── GND 5
6 DSR                 DSR 6
7 SG ────────────────RTS 7
8 DCD                 CTS 8
9                     RI 9
...
...
19
20 DTR
21
...
...
25
```

DB9 Female - DB9 Male

The board features a microcontroller which controls the RDS message generation.

The services supported by the encoder are programmed via a PC connected to the serial interface, running an easy-to-use program. Once programmed, the RDS messages are saved, even in the absence of primary power.

The board is equipped with a timer-calendar which updates the date and time even when no external power is present.

The RDS carrier is generated internally by a quartz oscillator, but when a 19KHz carrier is applied to the MPX1 IN input, whose amplitude, stability and frequency conform with the specification, the encoder locks to the external frequency and generates the 57 KHz synchronised to it (STEREO led lit). Thanks to the microcontroller, the encoder can modify the transmitted message in real time which makes the system extremely flexible and adaptable to the various customer requirements.

The software supplied allows programming of a set of 8 distinct PS Messages each comprising 16 words of 8 characters and a maximum of 16 lists of alternative frequencies. These limits are not binding but have been advised by a sample of users.

4.8.3.
RDS board

The set of messages can be put on-air automatically at any hour of the day. Programming of the messages is very quick and easy; an entire message can be programmed in one minute. No special knowledge is necessary on the part of the user.
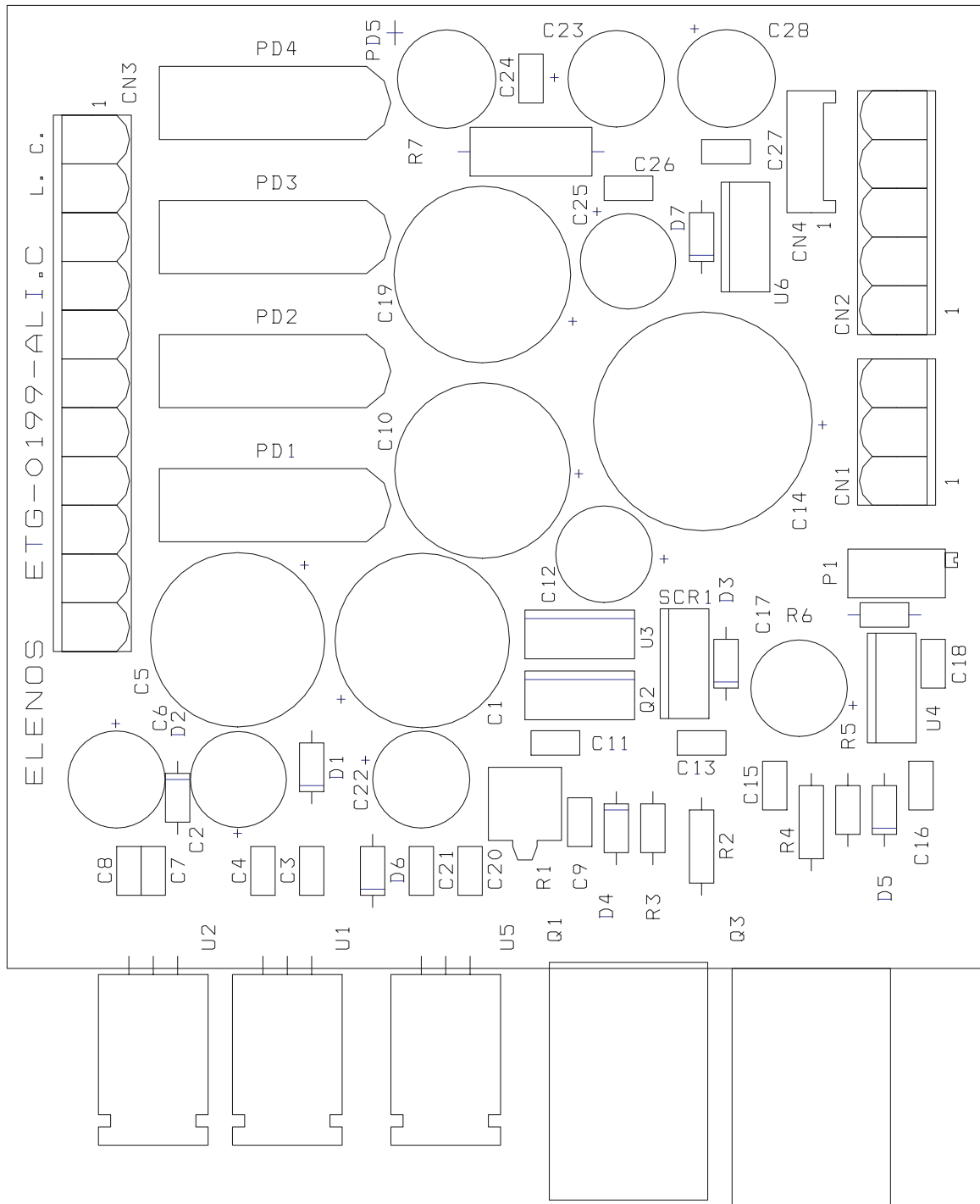
Via G.Amendola 9 44028 Poggio Renatico (FE) Italy
Tel +39 0532 829965   Fax +39 0532 829177
Website WWW.ELENOS.COM

Title:	POWER SUPPLY		
Board Code: ETG-0199-ALI.C		Model: ETG30	Rev 1
Proj. Engr. : A.Tomassini		Approved : A.Giovannelli	
Date: Wednesday, November 15, 2000		Sheet 1 of 1	

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Parts list

Ref.	Description
CN1	WIELAND 3 M V
CN2	WIELAND 5 M V
CN3	HEADER 11
CN4	AMP MODUII 4 M V
C_v	100nF
C1	CEV 4700uF 35V
C5	CEV 4700uF 35V
C10	CEV 4700uF 35V
C19	CEV 4700uF 35V
C2	CEV 100uF 63V
C6	CEV 100uF 63V
C12	CEV 100uF 63V
C17	CEV 100uF 63V
C22	CEV 100uF 63V
C28	CEV 100uF 63V
C3	CMY 0.1uF 63V
C4	CMY 0.1uF 63V
C7	CMY 0.1uF 63V
C8	CMY 0.1uF 63V
C9	CMY 0.1uF 63V
C11	CMY 0.1uF 63V
C13	CMY 0.1uF 63V
C15	CMY 0.1uF 63V
C16	CMY 0.1uF 63V
C18	CMY 0.1uF 63V
C20	CMY 0.1uF 63V
C21	CMY 0.1uF 63V
C23	CMY 0.1uF 63V
C26	CMY 0.1uF 63V
C27	CMY 0.1uF 63V
C14	CEV 4700uF 63V
C24	CEV 100uF 50V
C25	CEV 100uF 50V
D1	DIODE 1N4007
D2	DIODE 1N4007
D4	DIODE 1N4007
D5	DIODE 1N4007
D6	DIODE 1N4007
D7	DIODE 1N4007
D3	BZX85C5V6
HOL1	CONNECTOR SCREW
HOL2	CONNECTOR SCREW
HOL3	CONNECTOR SCREW
HOL4	CONNECTOR SCREW
PD1	BRIDGE KBU8K
PD2	BRIDGE KBU8K
PD4	BRIDGE KBU8K
PD5	BRIDGE KBU8K
PD3	BRIDGE 2CRA0002 (35A)
P1	RES. 67X 10K
Q_v	BC337
Q1	TIP34C
Q3	TIP34C
Q2	BD140
R_v	22K 1/4W 5%

Parts list

Ref.	Description
R1	RES. 0.22R 5W 5%
R2	RES. 18R 0.5W 5%
R4	RES. 18R 0.5W 5%
R3	RES. 22R 0.25W 5%
R5	RES. 1K 0.25W 5%
R6	RES. 12K 0.25W 5%
R7	33 Ohm,1W
SCR1	TIC216M
U1	LM7812CT
U2	LM7912CT
U3	LM7805CT
U4	LM317
U5	UA7812
U6	UA7818
DS2	Dissipatore a U codice SAM 9ETG0072
DS1	Dissipatore codice SAM 9MOD2553T_1

Serigrafia monoscheda   *Pag 5 file A3*

Pag 6 file A3
Schema VCO

Pag 7 file A3

schema PLL

Pag 8 file A3
Schema MPX

Pag 9 file A3
Schema AGC

Pag 10 file A3
Schema CPU

Parts list

Ref.		Description
CN1	HEADER 10	Connett. per flat cable 2X5
CN2	AMP MODU II	Connett. AMP MODU 2pin p 2,54
CX1	47uF	Cond. elettrolitico Case D
C25	47uF	Cond. elettrolitico Case D
C30	47uF	Cond. elettrolitico Case D
C33	47uF	Cond. elettrolitico Case D
CX10	22uF 25V	
C1	1nF	Cond. ceramico SMT 0805
C10	1nF	Cond. ceramico SMT 0805
C11	1nF	Cond. ceramico SMT 0805
C14	1nF	Cond. ceramico SMT 0805
C18	1nF	Cond. ceramico SMT 0805
C21	1nF	Cond. ceramico SMT 0805
C22	1nF	Cond. ceramico SMT 0805
C41	1nF	Cond. ceramico SMT 0805
C139	1nF	Cond. ceramico SMT 0805
C147	1nF	Cond. ceramico SMT 0805
C149	1nF	Cond. ceramico SMT 0805
C185	1nF	Cond. ceramico SMT 0805
C2	47uF	Cond. tantalio Case 3528
C3	4.7nF	Cond. ceramico SMT 0805
C5	4.7nF	Cond. ceramico SMT 0805
C6	4.7nF	Cond. ceramico SMT 0805
C9	4.7nF	Cond. ceramico SMT 0805
C12	4.7nF	Cond. ceramico SMT 0805
C13	4.7nF	Cond. ceramico SMT 0805
C19	4.7nF	Cond. ceramico SMT 0805
C23	4.7nF	Cond. ceramico SMT 0805
C24	4.7nF	Cond. ceramico SMT 0805
C26	4.7nF	Cond. ceramico SMT 0805
C27	4.7nF	Cond. ceramico SMT 0805
C28	4.7nF	Cond. ceramico SMT 0805
C29	4.7nF	Cond. ceramico SMT 0805
C31	4.7nF	Cond. ceramico SMT 0805
C32	4.7nF	Cond. ceramico SMT 0805
C34	4.7nF	Cond. ceramico SMT 0805
C35	4.7nF	Cond. ceramico SMT 0805
C40	4.7nF	Cond. ceramico SMT 0805
C157	4.7nF	Cond. ceramico SMT 0805
C158	4.7nF	Cond. ceramico SMT 0805
C137	10nF	Cond. ceramico SMT 0805
C4	10nF	Cond. ceramico SMT 0805
C7	100nF	Cond. ceramico SMT 0805
C15	100nF	Cond. ceramico SMT 0805
C17	100nF	Cond. ceramico SMT 0805
C20	100nF	Cond. ceramico SMT 0805
C42	100nF	Cond. ceramico SMT 0805
C43	100nF	Cond. ceramico SMT 0805
C44	100nF	Cond. ceramico SMT 0805
C45	100nF	Cond. ceramico SMT 0805
C47	100nF	Cond. ceramico SMT 0805
C49	100nF	Cond. ceramico SMT 0805
C50	100nF	Cond. ceramico SMT 0805
C51	100nF	Cond. ceramico SMT 0805
C52	100nF	Cond. ceramico SMT 0805

Parts list	Ref.	Description	
	C54	100nF	Cond. ceramico SMT 0805
	C56	100nF	Cond. ceramico SMT 0805
	C59	100nF	Cond. ceramico SMT 0805
	C60	100nF	Cond. ceramico SMT 0805
	C61	100nF	Cond. ceramico SMT 0805
	C62	100nF	Cond. ceramico SMT 0805
	C64	100nF	Cond. ceramico SMT 0805
	C68	100nF	Cond. ceramico SMT 0805
	C69	100nF	Cond. ceramico SMT 0805
	C73	100nF	Cond. ceramico SMT 0805
	C74	100nF	Cond. ceramico SMT 0805
	C75	100nF	Cond. ceramico SMT 0805
	C76	100nF	Cond. ceramico SMT 0805
	C77	100nF	Cond. ceramico SMT 0805
	C78	100nF	Cond. ceramico SMT 0805
	C79	100nF	Cond. ceramico SMT 0805
	C80	100nF	Cond. ceramico SMT 0805
	C83	100nF	Cond. ceramico SMT 0805
	C84	100nF	Cond. ceramico SMT 0805
	C85	100nF	Cond. ceramico SMT 0805
	C91	100nF	Cond. ceramico SMT 0805
	C92	100nF	Cond. ceramico SMT 0805
	C95	100nF	Cond. ceramico SMT 0805
	C96	100nF	Cond. ceramico SMT 0805
	C97	100nF	Cond. ceramico SMT 0805
	C98	100nF	Cond. ceramico SMT 0805
	C99	100nF	Cond. ceramico SMT 0805
	C104	100nF	Cond. ceramico SMT 0805
	C105	100nF	Cond. ceramico SMT 0805
	C106	100nF	Cond. ceramico SMT 0805
	C108	100nF	Cond. ceramico SMT 0805
	C109	100nF	Cond. ceramico SMT 0805
	C113	100nF	Cond. ceramico SMT 0805
	C116	100nF	Cond. ceramico SMT 0805
	C121	100nF	Cond. ceramico SMT 0805
	C122	100nF	Cond. ceramico SMT 0805
	C124	100nF	Cond. ceramico SMT 0805
	C125	100nF	Cond. ceramico SMT 0805
	C127	100nF	Cond. ceramico SMT 0805
	C128	100nF	Cond. ceramico SMT 0805
	C135	100nF	Cond. ceramico SMT 0805
	C138	100nF	Cond. ceramico SMT 0805
	C140	100nF	Cond. ceramico SMT 0805
	C151	100nF	Cond. ceramico SMT 0805
	C153	100nF	Cond. ceramico SMT 0805
	C155	100nF	Cond. ceramico SMT 0805
	C8	1uF	Cond. poliestere SMT
	C16	100nF	
	C36	10uF	Cond. elettrolitico SMT Case C
	C38	10uF	Cond. elettrolitico SMT Case C
	C144	10uF	Cond. elettrolitico SMT Case C
	C39	10uF	Cond. elettrolitico Case C
	C37	10uF	Cond. elettrolitico Case C
	C46	4n7	Cond. ceramico SMT 0805
	C48	4n7	Cond. ceramico SMT 0805

Parts list

Ref.	Description				
C58	4n7	Cond. ceramico SMT 0805			
C63	4n7	Cond. ceramico SMT 0805			
C67	4n7	Cond. ceramico SMT 0805			
C72	4n7	Cond. ceramico SMT 0805			
C53	22pF	Cond. ceramico SMT 0805			
C57	22pF	Cond. ceramico SMT 0805			
C55	10uF	Cond elettrolitico SMT Case C			
C86	10uF	Cond elettrolitico SMT Case C			
C87	10uF	Cond elettrolitico SMT Case C			
C88	10uF	Cond elettrolitico SMT Case C			
C89	10uF	Cond elettrolitico SMT Case C			
C65	68pF	Cond. ceramico SMT 0805			
C66	68pF	Cond. ceramico SMT 0805			
C70	68pF	Cond. ceramico SMT 0805			
C71	68pF	Cond. ceramico SMT 0805			
C81	470nF	Cond elettrolitico SMT Case B			
C82	10uF/25V	Cond elettrolitico SMT Case C			
C90	10uF/25V	Cond elettrolitico SMT Case C			
C93	4.7uF	Cond. elettrolitico SMT Case B			
C94	100pF	Cond. ceramico SMT 0805			
C100	100pF	Cond. ceramico SMT 0805			
C107	100pF	Cond. ceramico SMT 0805			
C101	10pF	Cond. ceramico SMT 0805			
C102	10pF	Cond. ceramico SMT 0805			
C114	10pF	Cond. ceramico SMT 0805			
C112	2.2nF	Cond. poliestere SMT			
C103	2.2nF	Cond. poliestere SMT			
C110	10nF	Cond. poliestere SMT			
C111	47uF	Cond. tantalio SMT Case 3528			
C115	220nF	Cond. poliestere SMT			
C117	10uF				
C119	4,7uF	Cond. tantalio SMT Case 3528			
C126	4,7uF	Cond. tantalio SMT Case 3528			
C120	10uF	Cond. tantalio SMT Case 3528			
C123	10uF NP	Cond. elettrolitico SMT Case C			
C129	220uF	Cond. tantalio SMT Case 7343			
C130	330uF	Cond. tantalio SMT Case 7343			
C136	22uF	Cond. elettrolitico SMT Case C			
C141	1500uF	Cond elettolitico Vert. 6,3V			
C142	68uF	Cond. tantalio SMT Case 7343			
C143	47nF	Cond. ceramico SMT 0805			
C145	220pF	Cond. ceramico SMT 0805			
C146	100nF	Cond. ceramico SMT 0805			
C148	470uF	Cond. elettrolitico passo 5,08			
C150	1uF	Cond. elettrolitico SMT Case C			
C152	220nF	Cond. ceramico SMT 0805			
C154	27pF	Cond. ceramico SMT 0805			
C156	47uF	Cond. elettrolitico SMT Case D			
C159	4.7pF	Cond. ceramico SMT 0805			
C160	33uF	Cond. elettrolitico SMT Case C			
C161 X7R472KL2AT	4.7nF	Cond.	ceramico	SMT	ATC 0805
C162 X7R472KL2AT	4.7nF	Cond.	ceramico	SMT	ATC 0805
C163	4.7nF	Cond.	ceramico	SMT	ATC 0805

Parts list	Ref.	Description					
	X7R472KL2AT						
	C164	4.7nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C165	4.7nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C167	4.7nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C168	4.7nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C173	4.7nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C175	4.7nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C176	4.7nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C183	4.7nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C184	4.7nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C166	4.7uF	Cond. tantalio SMT Case 3528 16V				
	C182	33uF	Cond. elettrolitico SMT Case D 25V				
	C170	33uF	Cond. elettrolitico SMT Case D 25V				
	C171	1nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C172	1nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C174	1nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C180	1nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C181	1nF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C177	470pF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C178	15pF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	C179	220pF	Cond.	ceramico	SMT	ATC	0805
	X7R472KL2AT						
	DL1	LED	Led 3mm				
	DZ1	5.1V	Diodo SMT MiniMelf				
	DZ20	10V 1/4W					
	D1	LM336-2.5V	Riferim. di tensione SMT SOIC8				
	D2	1N4148	Diodo SMT MiniMelf				
	D3	1N4148	Diodo SMT MiniMelf				
	D4	1N4148	Diodo SMT MiniMelf				
	D6	1N4148	Diodo SMT MiniMelf				
	D7	1N4148	Diodo SMT MiniMelf				
	D8	1N4148	Diodo SMT MiniMelf				
	D5	4.7V	Diodo SMT MiniMelf				
	D9	LM336/SO	Riferim. di tensione SMT SOIC8				
	D10	1N4148	Diodo SMT Case MiniMelf				
	D11	1N4148	Diodo SMT Case MiniMelf				
	D12	1N4148	Diodo SMT Case MiniMelf				
	D13	1N4148	Diodo SMT Case MiniMelf				
	D14	1N4148	Diodo SMT Case MiniMelf				

Parts list	Ref.	Description	
	D15	1N4148	Diodo SMT Case MiniMelf
	D16	1N4148	Diodo SMT Case MiniMelf
	D17	1N4148	Diodo SMT Case MiniMelf
	D23	1N4148	Diodo SMT Case MiniMelf
	D24	1N4148	Diodo SMT Case MiniMelf
	D25	1N4148	Diodo SMT Case MiniMelf
	D26	1N4148	Diodo SMT Case MiniMelf
	D27	1N4148	Diodo SMT Case MiniMelf
	D29	1N4148	Diodo SMT Case MiniMelf
	D18	1N4002	Diodo SMT Case Melf
	D19	1N4002	Diodo SMT Case Melf
	D20	1N4148	Diodo SMT Case MiniMelf
	D22	1N4148	Diodo SMT Case MiniMelf
	D21	1N4148	Diodo SMT Case MiniMelf
	D30	BAT42	Diodo Schottky assiale passo 10mm
	D28	BAT42	Diodo Schottky assiale passo 10mm
	D31	3V (NON MONTARE)	Diodo Zener MiniMelf
	D32	US1A o 1N4148	Diodo SMD Case DO214
	D33	BB515	Diodo Varicap SMT SOD323
	D34	BB515	Diodo Varicap SMT SOD323
	D35	BB515	Diodo Varicap SMT SOD323
	D36	BB515	Diodo Varicap SMT SOD323
	D37	BB515	Diodo Varicap SMT SOD323
	D38	BB515	Diodo Varicap SMT SOD323
	D39	BB515	Diodo Varicap SMT SOD323
	D40	BB515	Diodo Varicap SMT SOD323
	D41	BB515	Diodo Varicap SMT SOD323
	D42	BB515	Diodo Varicap SMT SOD323
	D43	BB515	Diodo Varicap SMT SOD323
	D44	BB515	Diodo Varicap SMT SOD323
	ISO1	NEC 2501	Fotoaccoppiatore NEC Dip8
	JB1	CON26	Connettore DIN 41651 femm. vert. 2X13 pin
	JB2	CON16	Connett. DIN 41651 femm. vert. 2X10 pin
	JD1	CON26	Connettore per flat cable 2X13 pin
	JP1		Jumper 3 pin
	JP4		Jumper 3 pin
	JP3	JUMPER	Jumper
	JP2	JUMPER	Jumper
	JP5	ampmod2	
	J1	CON8	Connettore passo 3,96mm
	J2	DSUB9R	Connett. a vaschetta 9 poli femm. 90°
	J3	BNC	BNC da pannello isolato
	J4	BNC	BNC da pannello isolato
	J5	BNC	BNC da pannello isolato
	J6	SMB CS M VERT	Connett. SMB vert.
	J8	SMB CS M VERT	Connett. SMB vert.
	J9	DSUB25R	Connett. a vaschetta 25 poli femm. 90°
	L1	2.2uH	Induttanza SMT 1212
	L2	2.2uH	Induttanza SMT 1212
	L3	2.2uH	Induttanza SMT 1212
	L4	2.2uH	Induttanza SMT 1212
	L5	2.2uH	Induttanza passo 10mm
	L6	2.2uH	Induttanza passo 10mm
	L7	2.2uH	Induttanza passo 10mm
	L9	10uH-1A	Induttanza assiale passo 10mm

Parts list

Ref.		Description
L8	10uH-1A	Induttanza assiale passo 10mm
L10	1mH	Induttanza assiale passo 10mm
L11	1mH	Induttanza assiale passo 10mm
L12	1mH	Induttanza assiale passo 10mm
L13	2.2uH	Induttanza assiale passo 10mm
L14	2.2uH	Induttanza assiale passo 10mm
L15	2.2uH	Induttanza assiale passo 10mm
L16	2.2uH	Induttanza assiale passo 10mm
L22	2.2uH	Induttanza assiale passo 10mm
L18	2.2uH	Induttanza assiale passo 7,5mm
L17	2.2uH	Induttanza assiale passo 7,5mm
L19	2.2uH	Induttanza assiale passo 7,5mm
L20	2.2uH	Induttanza assiale passo 7,5mm
L21	2.2uH	Induttanza assiale passo 7,5mm
QX1	BC817	Transistor SMT SOT23
Q1	BC817	Transistor SMT SOT23
Q3	BC817	Transistor SMT SOT23
Q4	BC817	Transistor SMT SOT23
Q6	BC817	Transistor SMT SOT23
Q2	FMMT619	Transistor SMT SOT23
Q7	SMBT2222A	Transistor SMT SOT23
Q5	SMBT2222A	Transistor SMT SOT23
Q8	BC850	Transistor SMT SOT23
Q9	BF998	Fet SMT SOT143
Q10	BF998	Fet SMT SOT143
RR2	10K	Rete resistiva 9+1
RR1	10K	Rete resistiva 9+1
RR3	47K	Rete resistiva 8 R singole SMT SOIC16
RR4	47K	Rete resistiva 8 R singole SMT SOIC16
RW1	0 ohm	Ponticello di corto circuito
RX1	4K7	Resistenza SMT 0805 5%
RX2	4K7	Resistenza SMT 0805 5%
RX3	4K7	Resistenza SMT 0805 5%
RX7	4K7	Resistenza SMT 0805 5%
R18	4K7	Resistenza SMT 0805 5%
R27	4K7	Resistenza SMT 0805 5%
R136	4K7	Resistenza SMT 0805 5%
R140	4K7	Resistenza SMT 0805 5%
R150	4K7	Resistenza SMT 0805 5%
R161	4K7	Resistenza SMT 0805 5%
RX4	2.2M	Resistenza SMT 0805 5%
R2	10K	Resistenza SMT 0805 5%
R4	10K	Resistenza SMT 0805 5%
RX5	10K	Resistenza SMT 0805 5%
RX8	10K	Resistenza SMT 0805 5%
R8	10K	Resistenza SMT 0805 5%
R13	10K	Resistenza SMT 0805 5%
R15	10K	Resistenza SMT 0805 5%
R20	10K	Resistenza SMT 0805 5%
R21	10K	Resistenza SMT 0805 5%
R24	10K	Resistenza SMT 0805 5%
R25	10K	Resistenza SMT 0805 5%
R37	10K	Resistenza SMT 0805 5%
R39	10K	Resistenza SMT 0805 5%
R40	10K	Resistenza SMT 0805 5%

Parts list

Ref.	Description	
R43	10K	Resistenza SMT 0805 5%
R44	10K	Resistenza SMT 0805 5%
R46	10K	Resistenza SMT 0805 5%
R47	10K	Resistenza SMT 0805 5%
R49	10K	Resistenza SMT 0805 5%
R50	10K	Resistenza SMT 0805 5%
R51	10K	Resistenza SMT 0805 5%
R53	10K	Resistenza SMT 0805 5%
R54	10K	Resistenza SMT 0805 5%
R56	10K	Resistenza SMT 0805 5%
R57	10K	Resistenza SMT 0805 5%
R59	10K	Resistenza SMT 0805 5%
R61	10K	Resistenza SMT 0805 5%
R63	10K	Resistenza SMT 0805 5%
R67	10K	Resistenza SMT 0805 5%
R68	10K	Resistenza SMT 0805 5%
R72	10K	Resistenza SMT 0805 5%
R84	10K	Resistenza SMT 0805 5%
R104	10K	Resistenza SMT 0805 5%
R105	10K	Resistenza SMT 0805 5%
R108	10K	Resistenza SMT 0805 5%
R110	10K	Resistenza SMT 0805 5%
R131	10K	Resistenza SMT 0805 5%
R137	10K	Resistenza SMT 0805 5%
R146	10K	Resistenza SMT 0805 5%
R162	10K	Resistenza SMT 0805 5%
R174	10K	Resistenza SMT 0805 5%
RX6	0	Resistenza SMT 0805 5%
RX10	10	
RX20	ponte 0 ohm	Resistenza SMT 0805 5%
R1	470	Resistenza SMT 0805 5%
R9	470	Resistenza SMT 0805 5%
R35	470	Resistenza SMT 0805 5%
R55	470	Resistenza SMT 0805 5%
R58	470	Resistenza SMT 0805 5%
R64	470	Resistenza SMT 0805 5%
R133	470	Resistenza SMT 0805 5%
R143	470	Resistenza SMT 0805 5%
R148	470	Resistenza SMT 0805 5%
R155	470	Resistenza SMT 0805 5%
R156	470	Resistenza SMT 0805 5%
R157	470	Resistenza SMT 0805 5%
R172	470	Resistenza SMT 0805 5%
R182	470	Resistenza SMT 0805 5%
R183	470	Resistenza SMT 0805 5%
R3	22	Resistenza SMT 0805 5%
R10	22	Resistenza SMT 0805 5%
R14	22	Resistenza SMT 0805 5%
R22	22	Resistenza SMT 0805 5%
R29	22	Resistenza SMT 0805 5%
R32	22	Resistenza SMT 0805 5%
R41	22	Resistenza SMT 0805 5%
R109	22	Resistenza SMT 0805 5%
R5	470K	Resistenza SMT 0805 5%
R17	470K	Resistenza SMT 0805 5%

Parts list

Ref.		Description
R152	5K6	Resistenza SMT 0805 5%
R6	5K6	Resistenza SMT 0805 5%
R7	10	Resistenza SMT 0805 5%
R12	10	Resistenza SMT 0805 5%
R121	10	Resistenza SMT 0805 5%
R129	10	Resistenza SMT 0805 5%
R177	10	Resistenza SMT 0805 5%
R11	220K	Resistenza SMT 0805 5%
R16	8K2	Resistenza SMT 0805 5%
R19	1M	Resistenza SMT 0805 5%
R36	1M	Resistenza SMT 0805 5%
R124	1M	Resistenza SMT 0805 5%
R141	1M	Resistenza SMT 0805 5%
R23	10K	
R188	10K	
R191	10K	
R192	10K	
R26	1K	Resistenza SMT 0805 5%
R28	1K	Resistenza SMT 0805 5%
R30	1K	Resistenza SMT 0805 5%
R33	1K	Resistenza SMT 0805 5%
R34	1K	Resistenza SMT 0805 5%
R42	1K	Resistenza SMT 0805 5%
R60	1K	Resistenza SMT 0805 5%
R70	1K	Resistenza SMT 0805 5%
R76	1K	Resistenza SMT 0805 5%
R147	1K	Resistenza SMT 0805 5%
R158	1K	Resistenza SMT 0805 5%
R160	1K	Resistenza SMT 0805 5%
R31	2K2	Resistenza SMT 0805 5%
R38	2K2	Resistenza SMT 0805 5%
R86	2K2	Resistenza SMT 0805 5%
R100	2K2	Resistenza SMT 0805 5%
R164	2K2	Resistenza SMT 0805 5%
R48	18K	Resistenza SMT 0805 5%
R45	18K	Resistenza SMT 0805 5%
R52	27K	Resistenza SMT 0805 5%
R142	27K	Resistenza SMT 0805 5%
R165	27K	Resistenza SMT 0805 5%
R62	100	Resistenza SMT 0805 5%
R138	100	Resistenza SMT 0805 5%
R163	100	Resistenza SMT 0805 5%
R66	100K	Resistenza SMT 0805 5%
R65	100K	Resistenza SMT 0805 5%
R69	4K99 1%	Resistenza SMT 0805 1%
R71	4K99 1%	Resistenza SMT 0805 1%
R74	4K99 1%	Resistenza SMT 0805 1%
R75	4K99 1%	Resistenza SMT 0805 1%
R79	4K99 1%	Resistenza SMT 0805 1%
R81	4K99 1%	Resistenza SMT 0805 1%
R83	4K99 1%	Resistenza SMT 0805 1%
R89	4K99 1%	Resistenza SMT 0805 1%
R91	4K99 1%	Resistenza SMT 0805 1%
R92	4K99 1%	Resistenza SMT 0805 1%
R93	4K99 1%	Resistenza SMT 0805 1%

Parts list

Ref.	Description	
R96	4K99 1%	Resistenza SMT 0805 1%
R102	4K99 1%	Resistenza SMT 0805 1%
R106	4K99 1%	Resistenza SMT 0805 1%
R107	4K99 1%	Resistenza SMT 0805 1%
R117	4K99 1%	Resistenza SMT 0805 1%
R118	4K99 1%	Resistenza SMT 0805 1%
R120	4K99 1%	Resistenza SMT 0805 1%
R122	4K99 1%	Resistenza SMT 0805 1%
R123	4K99 1%	Resistenza SMT 0805 1%
R127	4K99 1%	Resistenza SMT 0805 1%
R73	100 1%	Resistenza SMT 0805 1%
R77	100 1%	Resistenza SMT 0805 1%
R103	100 1%	Resistenza SMT 0805 1%
R115	100 1%	Resistenza SMT 0805 1%
R119	100 1%	Resistenza SMT 0805 1%
R126	100 1%	Resistenza SMT 0805 1%
R78	1K 1%	Resistenza SMT 0805 1%
R80	1K 1%	Resistenza SMT 0805 1%
R82	1K 1%	Resistenza SMT 0805 1%
R95	1K 1%	Resistenza SMT 0805 1%
R98	1K 1%	Resistenza SMT 0805 1%
R99	1K 1%	Resistenza SMT 0805 1%
R112	1K 1%	Resistenza SMT 0805 1%
R85	47K	Resistenza SMT 0805 5%
R113	47K	Resistenza SMT 0805 5%
R149	47K	Resistenza SMT 0805 5%
R101	220	Resistenza SMT 0805 5%
R87	220	Resistenza SMT 0805 5%
R88	4K42 1%	Resistenza SMT 0805 1%
R90	47	Resistenza SMT 0805 5%
R97	47	Resistenza SMT 0805 5%
R128	47	Resistenza SMT 0805 5%
R94	100R	Resistenza SMT 0805 5%
R111	100R	Resistenza SMT 0805 5%
R116	100R	Resistenza SMT 0805 5%
R114	5M6	Resistenza SMT 0805 5%
R125	22K	Resistenza SMT 0805 5%
R130	2K7	Resistenza SMT 0805 5%
R135	2K7	Resistenza SMT 0805 5%
R151	2K7	Resistenza SMT 0805 5%
R180	120	Resistenza SMT 0805 5%
R132	120	Resistenza SMT 0805 5%
R134	27	Resistenza SMT 0805 5%
R139	56	Resistenza SMT 0805 5%
R170	56	Resistenza SMT 0805 5%
R176	56	Resistenza SMT 0805 5%
R179	56	Resistenza SMT 0805 5%
R184	56	Resistenza SMT 0805 5%
R144	390	Resistenza SMT 0805 5%
R145	1K5	Resistenza SMT 0805 5%
R153	6K	Resistenza SMT 0805 5%
R159	15K	Resistenza SMT 0805 5%
R154	15K	Resistenza SMT 0805 5%
R166	12K	Resistenza SMT 0805 5%
R167	12K	Resistenza SMT 0805 5%

Parts list	Ref.	Description	
	R178	270	Resistenza assiale 1/4W 10%
	R168	270	Resistenza assiale 1/4W 10%
	R169	620	Resistenza SMT 0805 5%
	R171	820	Resistenza SMT 0805 5%
	R173	330K	Resistenza SMT 0805 5%
	R175	15	Resistenza SMT 0805 5%
	R181	20K	Resistenza SMT 0805 5%
	R185	100K	
	R186	1K	
	R187	1K	
	R190	1K	
	R189	1K	
	SC1	SCREW	Vite fissaggio N3X5mm
	SC2	SCREW	Vite fissaggio N3X5mm
	SC3	SCREW	Vite fissaggio N3X5mm
	SC4	SCREW	Vite fissaggio N3X5mm
	SC5	SCREW	Vite fissaggio N3X5mm
	SC6	SCREW	Vite fissaggio N3X5mm
	SC7	SCREW	Vite fissaggio N3X5mm
	SH1	VCO SHIELD	Scatolino VCO e PLL
	SH2	PLL SHIELD	Scatolino VCO e PLL
	TL1	75 ohm	Cavo coassiale Belden
	TP1	INP	Test point
	TP2	OUT	Test point
	TP3	SCA	Test point
	TP4	LEV CC	Test point
	TP5	Vpll TEST POINT	Test point
	U2	LM324	IC SMT SOIC14
	U1	LM324	IC SMT SOIC14
	U3	LMC7101/SOT23	Op-Amp SMT SOT23-5
	U8	LMC7101/SOT23	Op-Amp SMT SOT23-5
	U14	LMC7101/SOT23	Op-Amp SMT SOT23-5
	U21	LMC7101/SOT23	Op-Amp SMT SOT23-5
	U4	PCF80C552	IC PLCC28 Con zoccolo
	U5	74HC138	IC SMT SOIC16
	U6	74HC00	IC SMT SOIC14
	U10	74HC574	IC SMT SOIC20 Wide
	U7	74HC574	IC SMT SOIC20 Wide
	U9	7421	IC SMT SOIC14
	U11	TL7705	IC SMT SOIC8
	U12	74HC08	
	U13	74HC157AS	IC SMT SOIC16
	U15	74HC573	IC SMT SOIC20 Wide
	U16	74HC245	IC SMT SOIC20 Wide
	U20	74HC245	IC SMT SOIC20 Wide
	U19	MAX485	IC SMT SOIC8
	U17	MAX485	IC SMT SOIC8
	U18	AT27C020/LCC	IC PLCC32 Con zoccolo
	U22	62256	IC SMT SOIC28 Wide
	U23	ST24C02	IC SMT SOIC8
	U24	MC74HC595	IC SMT SOIC16
	U25	CS3310	IC SMT SOIC16
	U27	MC33078	IC SMT SOIC8
	U26	MC33078	IC SMT SOIC8
	U28	SSM2404	IC SMT SOIC20 Wide

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	Website WWW.ELENOS.COM		

Title:	KEYBOARD		
Board Code: KEYB.ETG500V1.0A	Model: ETG30		Rev 1
Proj. Engr. : A.Tomassini	Approved : A.Giovannelli		
Date: Wednesday, November 15, 2000	Sheet 1 of 1		

Pag 11 file A3
Schema Keyboard

Parts list

Ref.	Description
C3	10uF/25V
C1	10uF/25V
C2	100nF
C4	100nF
C8	100nF
C5	10u
C6	10u
C7	10u
D1	BAT64
H1	CON1
H2	CON1
H3	CON1
H4	CON1
H5	CON1
JD1	CON26
JP1	DISPLAY
JP2	CONN 2
LD1	LED
LD2	LED
LD3	LED
L1	2,2uH
SW1	SWITCH
P1	SWITCH
P2	SWITCH
P3	SWITCH
P4	SWITCH
P5	SWITCH
P6	SWITCH
P7	SWITCH
P8	SWITCH
Q1	BC817
Q2	BC817
Q3	BC817
RR1	10K
R7	10K
R9	10K
R10	10K
R12	10K
R1	4K7
R2	N.M.
R3	2K2
R4	1K
VR1	1K
R5	330
R8	330
R11	330
R6	VARISTOR
R13	3,3 2W
U1	14042
U2	74HC245
U3	LTC1054CN8

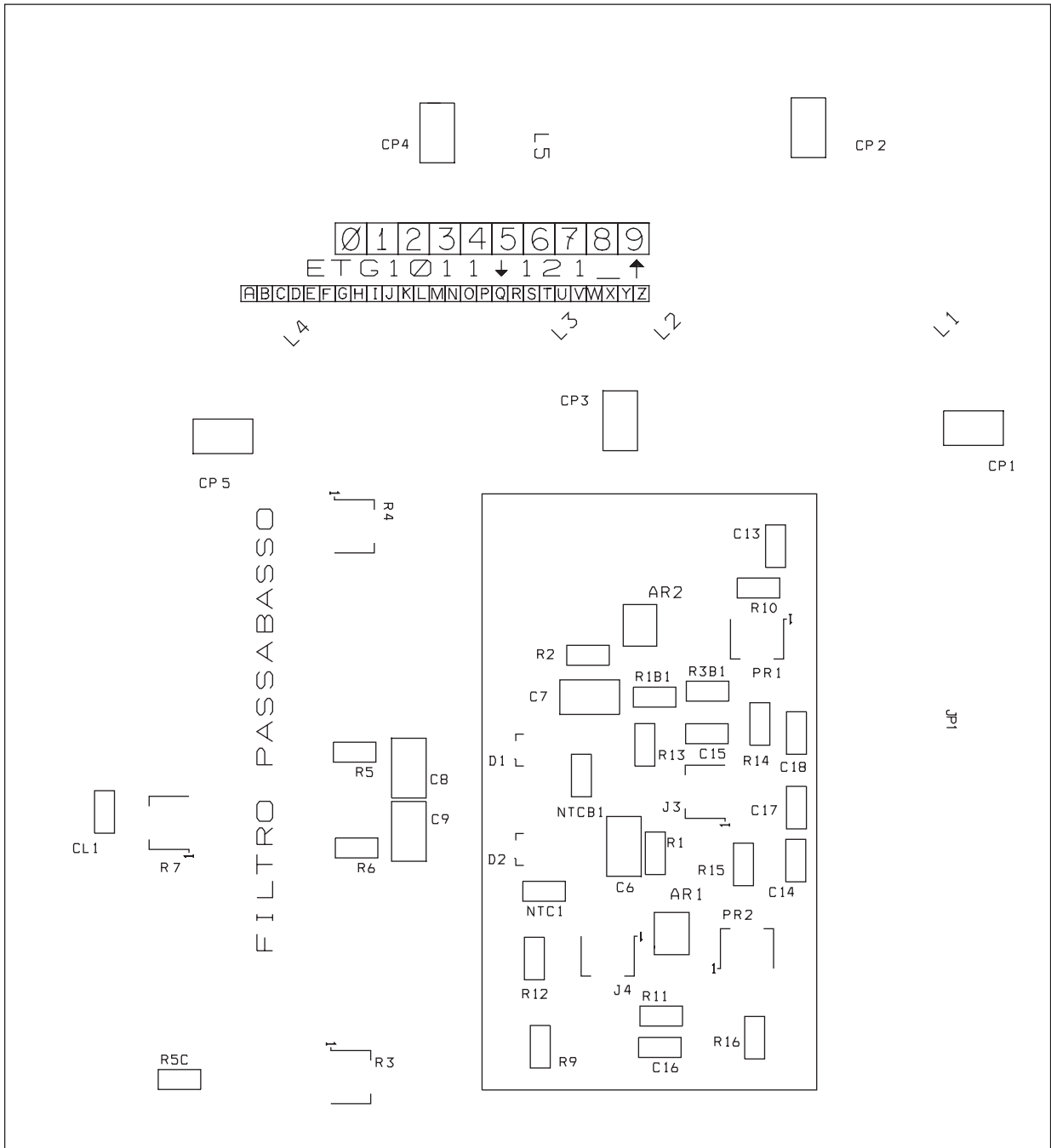|		
ELENOS	Via G.Amendola 9 44028 Poggio Renatico (FE) Italy Tel +39 0532 829965 Fax +39 0532 829177 Website WWW.ELENOS.COM	
Title:	DRIVER	
Board Code: E-ATG-98-1.1	Model: ETG30	Rev 1.1
Proj. Engr. : A.Tomassini	Approved : A.Giovannelli	
Date: Wednesday, November 15, 2000	Sheet 1 of 1	

VCC +12V

C22 47n

C26 10uF +

R10 100

C3 4n7

C2 4n7

L2 2u2

R18 10K

R1 33K

C6 4n7

C30 4n7

R13 47

R16 47

L1 VK200

R11 12K

C1 1n

R12 10

C23 300pF

L9 2u2

R19 1000

L3 5sp1mmD6L8

L7 4sp1mmD6L6

C13 10n

INGRESSO max. +7dBm

J1

C8 10n

U1

ERA 5

1

4

C9 10n

R9 2.7

Q1 BLF404

C11 68pF

C12 39pF

D2 1N4148

C4 10nF

D1 1N4148

To mainboard

R7 47K

C25 4.7n

R6 6K8

C24 4.7n

R18 12

R8 680

L8 3sp1mmD6L9

C33 10pF

C15 43pF

R15 47

L10 VK200

C5 1n

R14 2.2

C16 300pF

L4 5sp1mmD6L10

Q2 BLF245

L11 2sp1mmD5L8

C17 120pF

C32 75pF

C21 47n

C27 10uF +

+VCC
18V< +VCC <28V

L6 3sp1mmD6L6

C19 75pF

C20 10n

J2

USCITA

Title:	DRIVER			
Board Code: E-ATG10-98-1.1		Model: ETG30		Rev 1.1
Proj. Engr. : A.Tomassini		Approved : A.Giovannelli		
Date: Wednesday, November 15, 2000		Sheet	1 of	1

Parts list

Ref.	Description
C1	1n
C5	1n
C2	4n7
C3	4n7
C6	4n7
C30	4n7
C8	10n
C9	10n
C13	10n
C20	10n
C11	68pF
C12	39pF
C14	10nF
C15	43pF
C16	300pF
C23	300pF
C17	120pF
C32	75pF
C19	75pF
C22	47n
C21	47n
C24	4.7n
C25	4.7n
C27	10uF
C26	10uF
C33	10pF
D1	1N4148
D2	1N4148
J1	INGRESSO max. +7dBm
J2	USCITA
L1	VK200
L10	VK200
L2	2u2
L9	2u2
L3	5sp1mmD6L8
L4	5sp1mmD6L10
L6	3sp1mmD6L6
L7	4sp1mmD6L6
L8	3sp1mmD6L9
L11	2sp1mmD6L8
P1	10K
Q1	BLF404
Q2	BLF245
R1	33K
R6	6K8
R7	47K
R8	680
R9	2.7
R10	100
R11	12K
R12	10
R13	47
R15	47
R16	47
R14	2.2

Parts list

Ref.	Description
R18	12
R19	1000
U1	ERA 5

FILTRO PASSABASSO

| Ø | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

E T G 1 Ø 1 1 ↓ 1 2 1 _ ↑

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
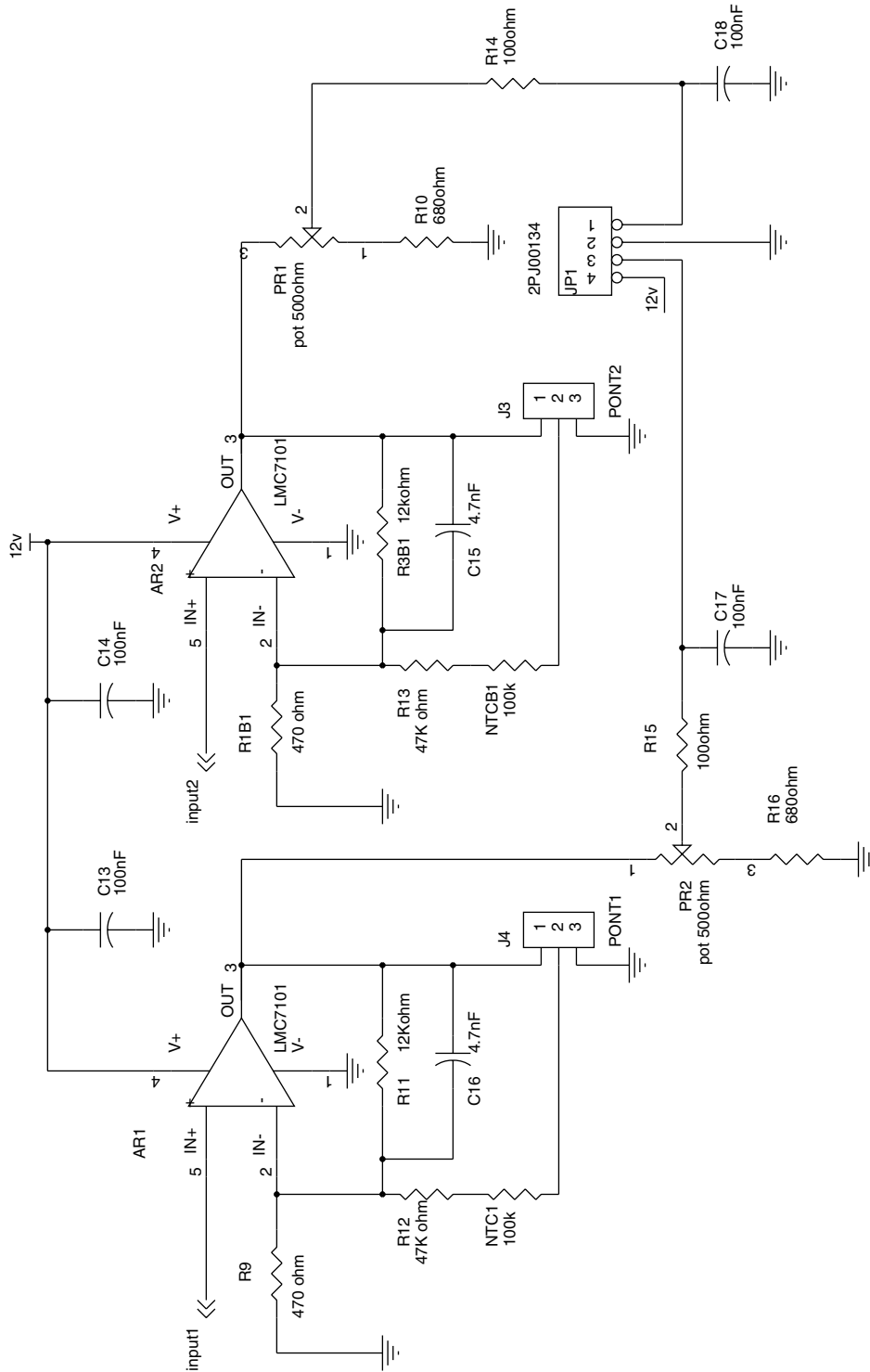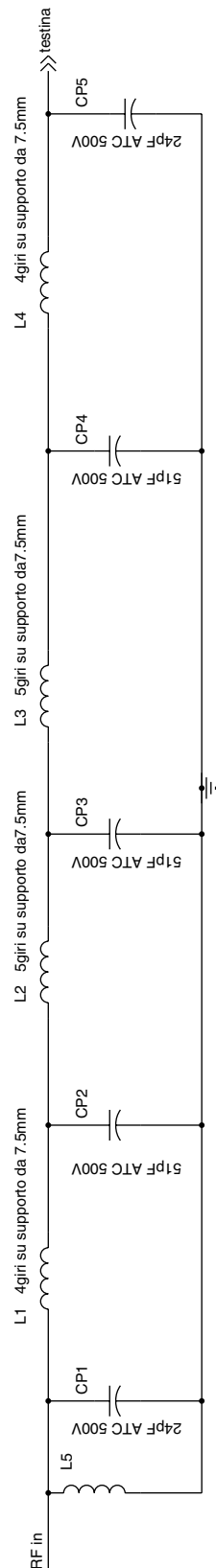
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Website WWW.ELENOS.COM

Title:	LPF AND POWER PROBE		
Board Code: ETG1011A121_0	Model: ETG30		Rev 1
Proj. Engr. : A.Tomassini	Approved : A.Giovannelli		
Date: Wednesday, November 15, 2000	Sheet	1 of 1	

input1

R1

12kohm 0805

C6

4.7nF ATC 1206

D2
hsms2850

C9

R6
330ohm 0805

47pF ATC 1206

POT 500ohm SMD

3

2

R3

1

input2

R2

12kohm 0805

C7

4.7nF ATC 1206

D1
hsms2850

C8

R5
330ohm 0805

47pF ATC 1206

POT 500ohm SMD
R4

1

2

3

testina

RF out

R7

34ohm 0805

RF Test

220pF
CL1

R5C

100ohm 0805

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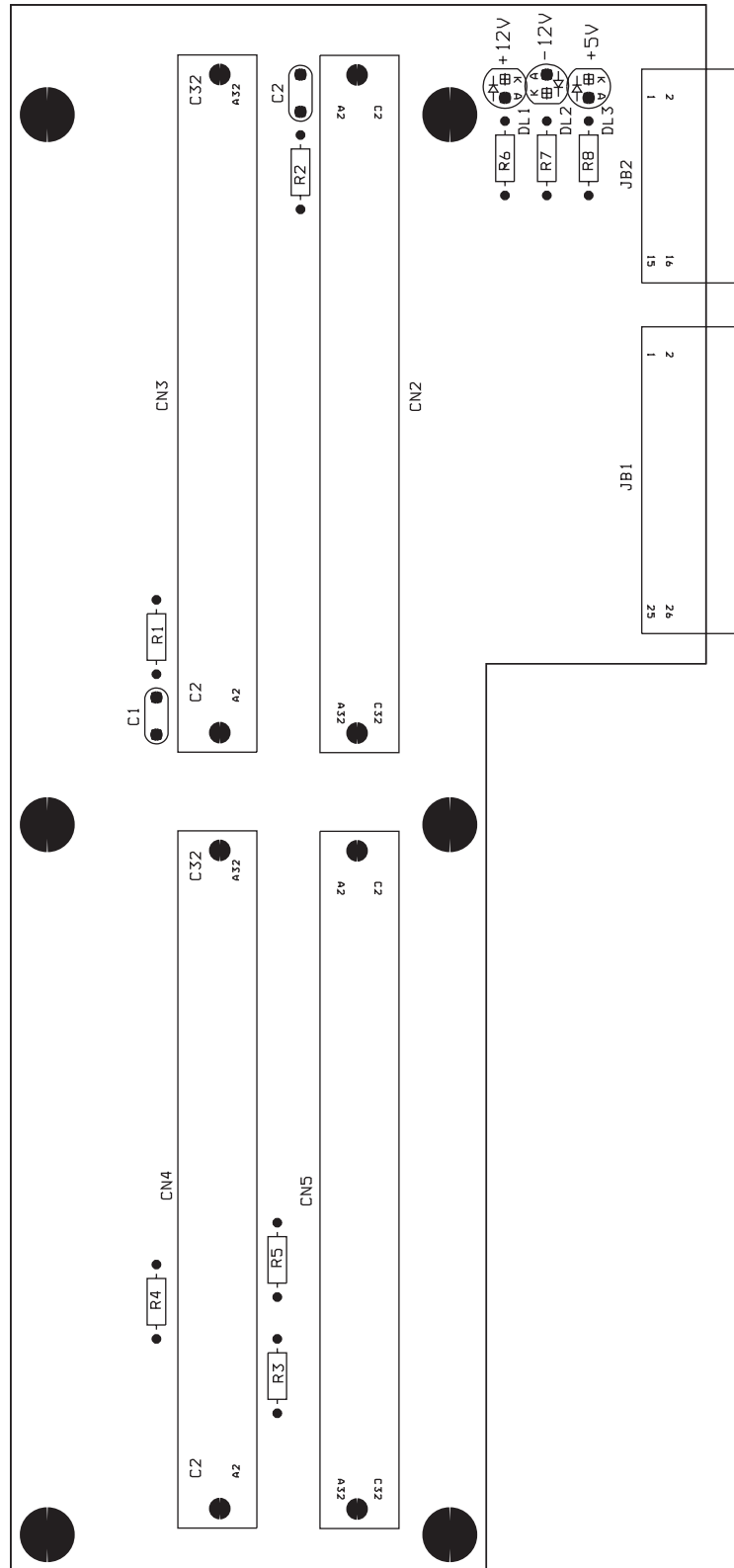| Title:	POWER PROBES		
Board Code:	2PCB0266B	Model: ETG30	Rev 1
Proj. Engr. : A.Tomassini		Approved : A.Giovannelli	
Date: Wednesday, November 15, 2000		Sheet 1 of 3	

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Title:	POWER PROBE AMPLIFIER		
Board Code: 2PCB0266B	Model: ETG30		Rev 1
Proj. Engr. : A.Tomassini	Approved : A.Giovannelli		
Date: Wednesday, November 15, 2000	Sheet 2 of 3		

ELENOS

testina

CP5

2 4pF ATC 500V

L4   4giri su supporto da 7.5mm

CP4

51pF ATC 500V

L3   5giri su supporto da7.5mm

CP3

51pF ATC 500V

L2   5giri su supporto da7.5mm

CP2

51pF ATC 500V

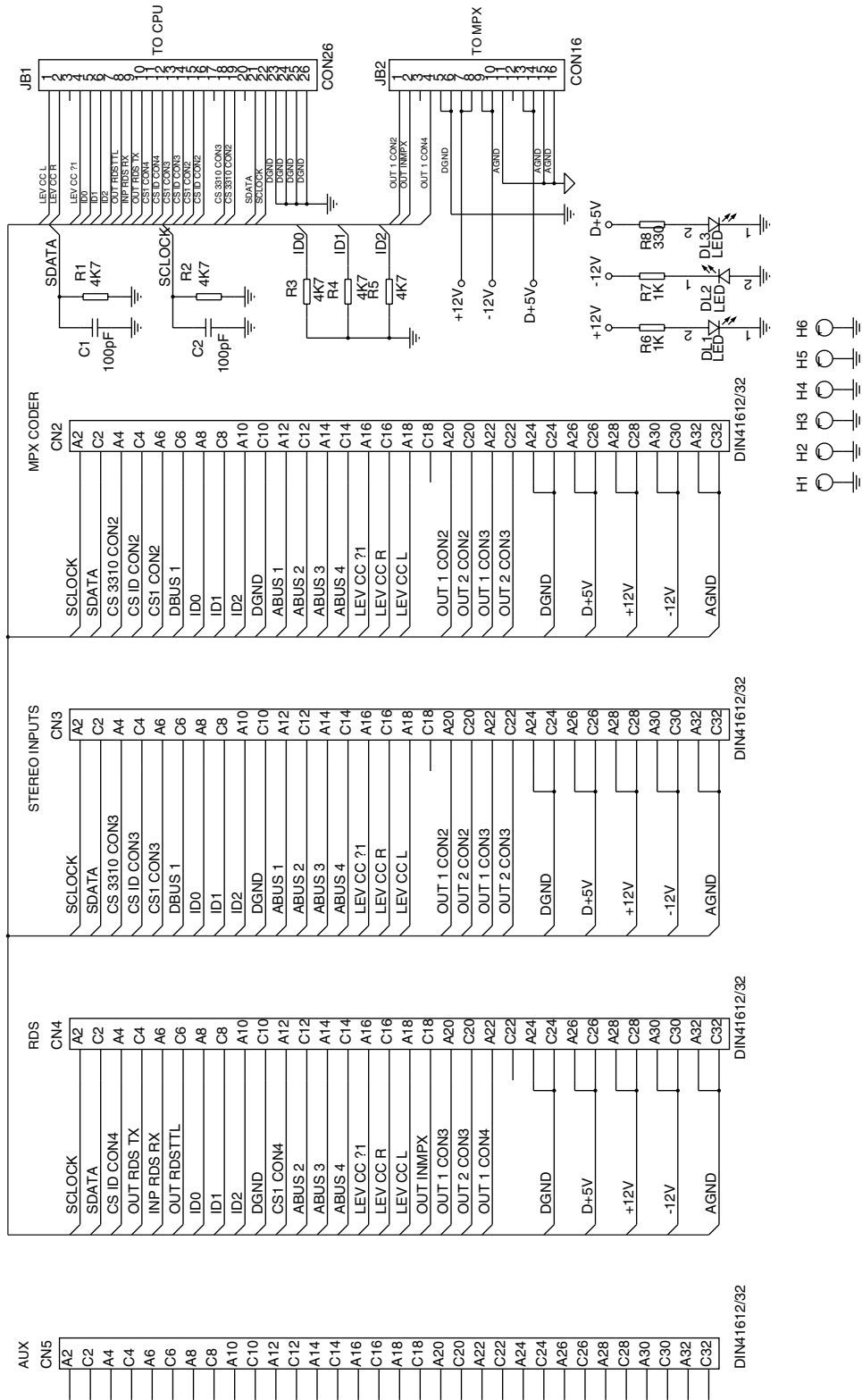L1   4giri su supporto da 7.5mm

CP1

2 4pF ATC 500V

L5

RF in

ELENOS

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Website WWW.ELENOS.COM

Title:	LPF		
Board Code: 2PCB0266B		Model: ETG30	Rev 1
Proj. Engr. : A.Tomassini		Approved : A.Giovannelli	
Date: Wednesday, November 15, 2000		Sheet 3 of 3	

Parts list

Ref.	Description
AR1	LMC7101
AR2	LMC7101
CP1	18pF ATC 500V
CP9	18pF ATC 500V
CP10	18pF ATC 500V
CP11	18pF ATC 500V
CP12	18pF ATC 500V
CP2	7.5pF ATC 500V
CP8	7.5pF ATC 500V
CP13	7.5pF ATC 500V
CP3	27pF ATC 500V
CP4	27pF ATC 500V
CP5	3pF ATC 500V
CP7	22pF ATC 500V
CP6	22pF ATC 500V
C7	4.7nF ATC 1206
C6	4.7nF ATC 1206
C8	47pF ATC 1206
C9	47pF ATC 1206
C13	100nF 0805
C14	100nF 0805
C17	100nf 0805
C18	100nF 0805
C15	4.7nF 0805
C16	4.7nF 0805
D2	hsms2850
D1	hsms2850
JP1	2PJ00134
J4	CON3
J3	CON3
L1	vedi note
L2	vedi note
L3	vedi note
L4	vedi note
L5	vedi note
NTC1	100k c620
NTCB1	100k c620
PR1	pot 500ohm SMD
PR2	pot 500ohm SMD
R3	POT 500ohm SMD
R4	POT 500ohm SMD
R1	12kohm 0805
R2	12kohm 0805
R11	12Kohm 0805
R6	330ohm 0805
R5	330ohm 0805
R5C	100ohm 0805
R14	100ohm 0805
R15	100ohm 0805
R7	34ohm 0805
R9	470 ohm 0805
R1B1	470 ohm 0805
R10	680ohm 0805
R16	680ohm 0805
R12	47Kohm 0805

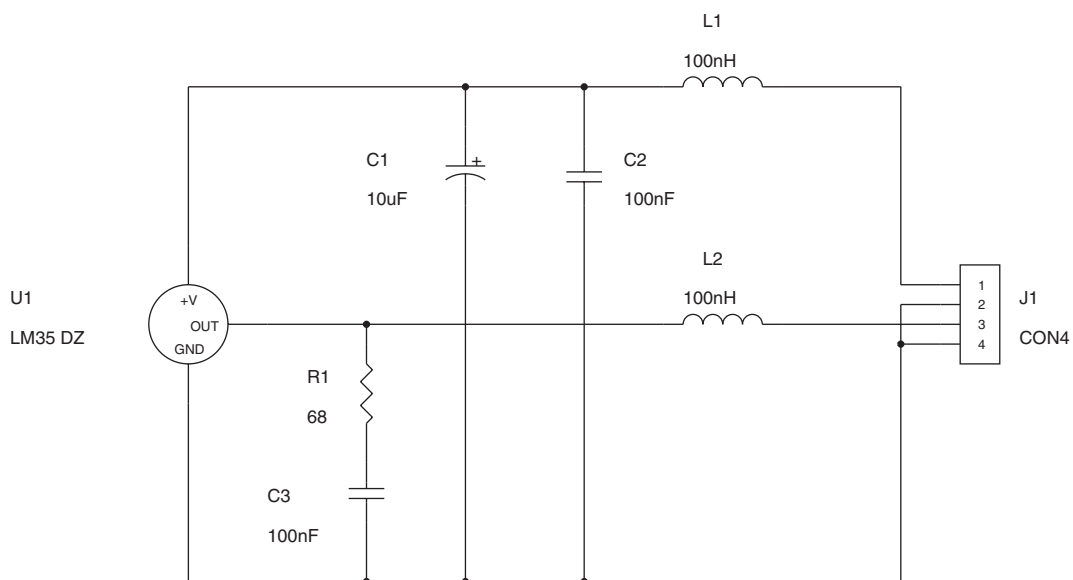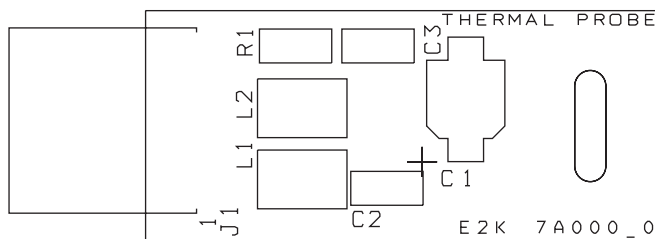| Title:	BUS			
Board Code:	ETG500BU	Model:	ETG30	Rev 1.1
Proj. Engr. : A.Tomassini		Approved : A.Giovannelli		
Date: Wednesday, November 15, 2000		Sheet	1 of 1	

Via G.Amendola 9 44028 Poggio Renatico (FE) Italy
Tel +39 0532 829965   Fax +39 0532 829177
Website WWW.ELENOS.COM

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Via G.Amendola 9 44028 Poggio Renatico (FE) Italy
Tel +39 0532 829965   Fax +39 0532 829177
Website WWW.ELENOS.COM

Title:	BUS		
Board Code: ETG500BU		Model: ETG30	Rev 1.1
Proj. Engr. : A.Tomassini		Approved : A.Giovannelli	
Date: Wednesday, November 15, 2000		Sheet 1 of 1	

Parts list

Ref.	Description
CN2	DIN41612/32
CN3	DIN41612/32
CN4	DIN41612/32
CN5	DIN41612/32
C2	100pF
C1	100pF
DL1	LED
DL2	LED
DL3	LED
H1	CON1
H2	CON1
H3	CON1
H4	CON1
H5	CON1
H6	CON1
JB1	CON26
JB2	CON16
R1	4K7
R2	4K7
R3	4K7
R4	4K7
R5	4K7
R6	1K
R7	1K
R8	330

THERMAL PROBE

E2K 7A000_0

U1
LM35 DZ

+V
OUT
GND

C1
10uF

C2
100nF

L1
100nH

L2
100nH

R1
68

C3
100nF

J1
CON4
1
2
3
4

Via G.Amendola 9 44028 Poggio Renatico (FE) Italy
Tel +39 0532 829965   Fax +39 0532 829177
Website WWW.ELENOS.COM

Title:	THERMAL PROBE		
Board Code: E2K 7A000_0		Model: ETG30	Rev 0
Proj. Engr. : A.Tomassini		Approved : A.Giovannelli	
Date: Wednesday, November 15, 2000		Sheet 1 of 1	

Parts list

Ref.	Description
C1	10uF
C3	100nF
C2	100nF
J1	CON4
L2	100nH
L1	100nH
R1	68
U1	LM35 DZ

TROUBLESHOOTING GUIDE

Problem	Cause	Solution
✔ The unit will not power up	✔ Power cable missing or faulty ✔ Power supply fuses (rear panel) blown ✔ Auxiliary power supply faulty ("MAIN" front panel led not lit)	✔ Connect or replace power cable and try again ✔ Replace the fuses and try again ✔ Contact the manufacturer
✔ The unit does not reach required power level	✔ Unit in Stand-By ✔ Antenna or amplifier not connected ✔ PLL unlocked ("ON Air" front panel indicator not lit) ✔ Power supply or RF module faulty	✔ Access the RF menu and enable "RF On" ✔ Connect the antenna or amplifier (check the integrity of the connection) ✔ Contact the manufacturer ✔ Contact the manufacturer
✔ The unit transmits on the wrong frequency	✔ PLL board faulty	✔ Contact the manufacturer
✔ Absence of modulation on the output and on the display	✔ Missing or faulty audio cable ✔ MPX board faulty ✔ Modulation switched off	✔ Connect or replace the audio cable ✔ Contact the manufacturer ✔ Enable modulation from the audio menu
✔ Absence of modulation on the output but not on the display	✔ MPX board faulty	✔ Contact the manufacturer
✔ Modulation does not reach the required value	✔ Low audio input level ✔ MPX board faulty ✔ ALC threshold programming error	✔ Increase the audio input level ✔ Contact the manufacturer ✔ Set the correct threshold
✔ Absence of stereo modulation	✔ Stereo carrier disabled ✔ Missing or damaged audio cable ✔ Stereo board faulty ✔ Missing stereo board and/or stereo encoder	✔ Enable stereo carrier from the user setup menu ✔ Connect or replace the audio cable ✔ Contact the manufacturer ✔ Insert stereo board and/or stereo encoder
✔ Absence of RDS transmission	✔ RDS switched off ✔ RDS message programming error ✔ RDS board missing	✔ Switch on RDS from the user setup menu ✔ Reprogram RDS board ✔ Insert RDS board

Engineering Department PHONE: +39 0532 829 965 - FAX: +39 0532 829 177
E-Mail: support@elenos.com

Parameter	Values
FREQUENCY BAND	87.5 - 108.0 MHz in steps of 10KHz
OUTPUT POWER	0 - 30Watt continuously adjustable
OUTPUT POWER STABILITY	between +/- 0.1 dB
FINAL STAGE TECHNOLOGY	MOSFET
OUTPUT IMPEDANCE	50 Ohm
OUTPUT CONNECTOR	Standard type "N" Female
HARMONIC SUPPRESSION	> 70 dB
SPURIOUS SIGNAL SUPPRESSION	> 80 dB
FREQUENCY STABILITY	Better than 1ppm: (0 - +40°C) in the first year
TYPE OF MODULATION	F3 Direct FM Modulation on RF oscillator at fundamental frequency
RESIDUAL AM	Asynchronous: 0.1% Synchronous: 0.2% (typical values)

Low frequency section

Parameter	Values
V.S.W.R. PROTECTION	Progressively reduced to a safety level (50W)
AUTOMATIC GAIN CONTROL	Stabilises the output power to the level programmed
INTERMODULATION DISTORTION	<0.05% measured with composite tones 1KHz and 1.3KHz, 1:1 ratio at 100% modulation
FREQUENCY DEVIATION	+/- 75KHz adjustable in steps of 0.1dB
THD+N	<0.03% @ 1 KHz
FM S/N RATIO with weighted CCIR filter	-72dB ref. at +/-75KHz dev.
PRE-EMPHASIS	50/75 us +/-0.1dB
FREQUENCY RESPONSE	Mono: +/-0.15dB (30Hz - 15KHz) MPX: +/-0.1dB (30Hz - 100KHz) -45dB at 19KHz Stereo: +/-0.15dB (30Hz - 15KHz) SCA1,2,3: +/-1dB (20KHz - 100KHz) -45dB at 19KHz
STEREO SEPARATION	65dB @ 1KHz typical value
PILOT TONE	Frequency: 19KHz +/- 1Hz deviation 7.5KHz adjustable
INPUT MODULE AUDIO L/R	Input Impedance: 10KOhm - 600Ohm (selectable) balanced i/p Frequency response: 20Hz - 15KHz Adjustment: -12 - +12dB in steps of 0.1dB Connector: XLR female
ATTENUATION AT 19KHz	45dB
MPX INPUT MODULE	Impedance 10KOhm unbalanced i/p Frequency response: 30Hz - 100KHz Adjustment: -12 - +12dB in steps of 0.1dB Connector: BNC female
SCA INPUT	Impedance 10KOhm unbalanced i/p Frequency response: 20KHz - 100KHz Connector: BNC female

General characteristics

Parameter	Value	
AMBIENT CONDITIONS	Temperature: (operating): 0- +45°C (non operating): -20 - +50°C	Humidity (operating): 95% at 40°C (non operating): 90% at 65°C
	Altitude: (operating): >4600 metres (non operating): >15000 metres	

Parameter	Value
WEIGHT	10Kg
DIMENSIONS	50x14x50 cm
POWER SUPPLY	110-240V
POWER CONSUMPTION	80W typical at maximum power output
COOLING	Forced ventilation

Limitations on cable lengths

RS232	connection cable less than 1m.
MPX	connection cable less than 1m.
SCA1	connection cable less than 1m.
SCA2	connection cable less than 1m.
Power supply cable	length less than 3 m.

BROADCAST EQUIPMENT COMPANY

Via G. Amendola 9 - 44028 Poggio Renatico (FE) - Italy
Tel. +39 0532 829 965 - Fax +39 0532 829 177
E-Mail: info@elenos.com
Internet address: www.elenos.com

Engineering Department PHONE: +39 0532 829 965 - FAX: +39 0532 829 177
E-Mail: support@elenos.com