

ELENOS®

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USE AND MAINTENANCE MANUAL

ET2000: ET1800/2, ET1500/2, ET1200/2, ET1000/2, ET800/2, ET500/2, ET400/2, ET300/2
E2000: E1800/2, E1500/2, E1200/2, E1000/2, E800/2, E500/2, E400/2, E300/2
ET2500: ET2000/2.5, ET1800/2, ET1500/2, ET1200/2, ET1000/2, ET800/2, ET500/2, ET400/2, ET300/2
E2500: E2000/2.5, E1800/2, E1500/2, E1200/2, E1000/2, E800/2, E500/2, E400/2, E300/2
ET3000: ET2500/3.5, ET2000/3.5, ET1800/3.5, ET1500/3.5, ET1200/3.5, ET1000/3.5, ET800/3.5, ET500/3.5, ET400/3.5, ET300/3.5
E3000: E2500/3.5, E2000/3.5, E1800/3.5, E1500/3.5, E1200/3.5, E1000/3.5, E800/3.5, E500/3.5, E400/3.5, E300/3.5
ET3500: ET3000/3.5, ET2500/3.5, ET2000/3.5, ET1800/3.5, ET1500/3.5, ET1200/3.5, ET1000/3.5, ET800/3.5, ET500/3.5, ET400/3.5, ET300/3.5
E3500: E3000/3.5, E2500/3.5, E2000/3.5, E1800/3.5, E1500/3.5, E1200/3.5, E1000/3.5, E800/3.5, E500/3.5, E400/3.5, E300/3.5



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AVISO IMPORTANTE

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

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WARNING

The use of this device
is subject
to National Regulations.

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REVIEWS

06/09/2007	REVIEW 1:	Modernized the handbook to 3500
22/01/2008	REVIEW 8:	Modernized to revision 8
13/08/2008	REVIEW 9:	Update diagram of: Mains wiring (230V 1Ph) Mains wiring (230V 3Ph DELTA) Mains wiring (400V 3Ph WYE) Added mounting instruction of voltage selector
06/05/2009	REVIEW 10:	Divided the manual, including user guide and technical manual

Dear User,

First of all 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 compatibility 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 stable performances over time, without the need of special maintenance, minimised to a functional fans-check.

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.

Customer Care

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GENERAL

Brief description of the unit

The model ET3500-3 is a power amplifier used for FM radio transmission in the 87.5MHz – 108MHz band. The unit is designed in order to assure continued broadcast service.

Its configuration has been specifically conceived to facilitate freight handling, installation and maintenance.

The unit consists of a main RF amplifier which has twelve (12) pull out modules of 250W each, combined in parallel to provide a 3.5KW RF output power.

Each RF module is built with a MOSFET of 300W power rating capability, which when set at 250W guarantees a higher level of reliability and an increased lifespan.

The main power supply is made up of three 2KW modules to facilitate access and replacement.

The operation's control of the unit, the protection's management, the interface for remote-control operation are all performed by a powerful microprocessor which optimizes the efficiency of the unit and guarantees assured operation under practically any operating and environmental conditions.

ICEFET TECHNOLOGY

This technology led to the lowest functioning temperature of MOSFETs. Together with the use of a high-efficiency heat sink (Elenos patent) a huge increase of reliability on MTBF is obtained.

TROPICALIZATION COMPLETELY STAINLESS STEEL MANUFACTURE

All mechanical parts are stainless steel, the electronic boards are treated with isolating varnish to protect against corrosion caused by salt deposit or humidity in general. Moreover, each electronic part that may be in contact with air flow has been protected with special protective screens.

TOTAL REDUNDANCY OF THE WHOLE SERIES

The ET3500 Family is conceived to be completely redundant.

The intrinsic redundancy of its equipment annuls each "SINGLE-POINT-FAILURES" thanks to a "SOFT FAILURE DESIGN" and to a sophisticated protection system allowing to stay «ON AIR» even in extreme working conditions.

If you analyze accurately the projects of many of the modern transmitters in the market, one realizes that they show "redundancy bottleneck" that is, parts of the transmitter that are not redundant, therefore more likely producing the interruption of the service if any of these parts goes faulty. Typical cases are fans, auxiliary power supplies, or medium stage amplifier or most frequently the control logic of the equipment.

In the ET3500 family each component is duplicated or multiplied to annul the redundancy bottleneck and prevent transmission interruption.

In the ELENOS ET3500 family the redundancy is on all series, there's no additional cost for the purchase of optional parts. This is an important detail when evaluating a purchase, in fact, on most transmitters in the market today redundancy is optional, to be paid separately. An example is the IPA or the power supply, usually declared redundant from the project but in the end an overprice is requested to be paid.

WIDE BAND

The transmitter maintains optimal performances of power and efficiency on the whole band, no need for tuning (important characteristic when we are dealing with a reserve transmitter in N+1 systems).

REDUCED WEIGHT AND DIMENSIONS

The complete transmitter is built in a 7U-rack dimensions (3.5KW) and 40U (15KW), with a base smallest than 0,31mq. (length 50cm x depth 63 cm).

REMOTE DIAGNOSTIC GREAT ABILITY

The Hostlink standard protocol used in the equipment grants a secure management of a high quantity of information for the remote diagnostic.

The telemetry based on Hyperterminal allows an easy remote access from any PC no necessity of dedicated software installation.

CONTROL AND SYSTEM LOGIC THROUGH TOUCH-SCREEN GRAPHIC

INTERFACE

The SCU System Control Logic or the TCU Transmitter Control Logic analyse the operating parameters according to which it takes clever decisions for a better functioning of the transmitter. In this way it controls the output power stability, launch the VSWR derating, temperature and so on, to ease troubleshooting and store faulty conditions' memory.

CONNECTIVITY:

the transmitter can be controlled through:

The local control logic (Color Touch Screen Display);

Local PC with Hyperterminal through the RS232 or RS485 ports;

Remote PC with Hyperterminal through a PSTN or GSM Modem;

Remote or local PC with SNMP;

Parallel interface;

For local or remote PCs a specific software is not necessary, because of the use of ANSI standard terminal (Hyperterminal) or Web Browser as Internet Explorer.

POWER SUPPLY

The power supply is the heart of any electronic device, for this reason, the redundant ones are standard built in each ELENOS amplifier.

The power supply is over-dimensioned, reliable, with PFC and voltage share, are at extended range. Thanks to them the equipment works on supplies between 110VAC and 380VAC, both singlephase and three-phase.

The power supply room of the E3500 contains 3 power supplies of 2KW 50V 40° each.

The complete power supply case, therefore, produces a total of 6Kw 50V 120A exceeding for 20% the necessary total power to work at full scale. Thanks to power supplies redundancy, the transmitter delivers 2KW still with one damaged power supply, or at 1KW with two damaged power supplies.

The PFC reduces the harmonic emissions in the mains, improves the overall efficiency and the power factor of the equipment, that results 0,98.

The outputs 50 VDC of the three power supplies are connected in parallel and use the voltage share technology.

This technology guarantees that all power supplies deliver the same voltage in a way that none of them is overcharged and that temperature of all is the minimum possible, furthermore it improves the balance of the absorption on the three phases minimizing the voltage on the neutral to a value very near to 0.

ETG100, ETG300, ETG500 and ETG1000 EXCITERS

The ETG101, ETG300, ETG500 and ETG1000 are FM exciters solid state with output power constantly variable from 0 to the nominal power, in the band 87,5 – 108 MHz tuneable at steps of 1KHz from the frontal panel through a LCD graphic interface, through which the user can analyse all operative parameters and program them through the ergonomic keyboard on the front panel.

The exciters of the ETG family are the state of art of FM broadcast, its warm and crystal sound - perceived from the first very listening – is confirmed by the measurements of the electric performances meaning the signal/noise ratio, distortion and the wide “Stereophonic Image”

DUAL EXCITER

In the ELENOS ET3500 family, all components and the softwares needed for the changeover between exciters are included in the combiner.

RF MODULE, CONSERVATIVE USE OF MOSFET

The MOSFET used is the BLF278, it delivers alone 400W power. Our conservative choice to use it at 280W was aimed to give more reliability in case of overcurrent, excessive SWR or temperature.

NO IPA (Intermediate Power Amplifier)

The high power MOSFET transmitters in the market today use on average a “Medium Stage Driver” commonly defined IPA and go from 300-1000W. This amplifier represents the critical element of the chain because not redundant: in case of fault the user has the complete loss of service.

Elenos transmitters don't use the IPA, so they annul every bottleneck in redundancy; this has been possible thanks to the wide choice of powers available in the ETG family from 101W to 1000W.

IPF (INTELLIGENT PROPORTIONAL FOLDBACK)

IPF is an intelligent system that varies the transmitter's output power according to the mismatch condition of the load and permits to the transmitter to work also on loads highly mismatched.

IPC-INTELLIGENT POWER CONTROL

IPC maintains the output power within the 2% of the target power, independently from mains variations, from temperature or load.

The management of "IPC" power is based on the control of the VDS voltage supplied by the power supplies and the BIAS voltage supplied by two analogue outputs, -10/10V of the logic.

The amplifier, under correct functioning, maintains the set power with a tolerance of 30 W (+/-%).

The control algorithm, in normal functioning, leads to a 30V value the VDS voltage and increases the BIAS voltage to join the targeted power set or saturation (10V). If there isn't enough BIAS voltage to raise the amplifier to the requested power, the VDS voltage should be raised. This optimizes the efficiency of the RF part: under high currents and reduced voltages MOSFETS work always at the maximum saturation level.

To reduce start-up time, if the power output moves away from the target power for more than 100 W, the increases of VBIAS and VDS are not unitary, but for the VBIAS increases or decreases of 400 mV are made (the single step corresponds to 40 mV), and for the VDS of 500mV (with the correspondent step at 12,5 mV).

The management activates itself only if the forward power is higher than 25W, measured on the directional couplet, otherwise it maintains the VDS at the minimum value and the BIA at -4V.

The increase of VBIAS and VDS occurs only if the voltage delivered by the power supplies doesn't overpass 42A each. This avoids a condition of instability in case of a damaged power supply.

EFFICIENCY OPTIMIZATION ON THE WHOLE BAND

The most important results obtained from the IPC functioning and the increase of the efficiency on the whole band and for all power levels set.

To keep high efficiency, means low temperature, decrease operation costs and improvement of reliability.

DERATING

DERATING is a mechanism of reduction of output power proportional to the entity of the fault occurred.

There are four main derating:

1. Thermic derating for RF amplifier when out of ventilation;
2. Thermic derating of PSU or RF amplifier;
3. Current PSU derating;
4. Derating for one or more of RF amplifier;

FAN SPEED PROPORTIONAL TO THE TEMPERATURE

In each 3.5KW amplifier module are 6 very-high-durability blowers, 100.000 MTBF hours. Their overdimensioning is such that the amplifier can work at full scale for an undetermined time even with 2 still blowers. Furthermore the intelligent control system of speed, contributes to their durability.

The functioning of the intelligent control of fans is the following: under the 45°C the fans work at 60%. From 45°C to 65°C the fan speed is proportional to temperature and varies from 60% to 100%. From 65°C to 70% the fan speed varies proportionally from 100% to 120%.

On start-up or on the activation of the "on air" condition, fans run for 1 minute at their nominal value (100%) or more if the temperature needs it, after this minute they reduce their speed at a fixed slope of 1% per second joining the "set point" connected to the equipment internal temperature.

RF THERMAL DERATING

The reaction of the IPC control logic in case of temperature increase up to derating is the following:

Overpassing the temperature of 70°C on the RF heatsink and of 72°C for the power supplies activates the thermal derating mode;

With active derating on, first, the target power is reduced to the 52% of the set power (2% more than -3dB), this to avoid that the transmitter generates an alarm of 3dB.

The reduction of 1°C of the temperature from 70°C for RF or 72°C for PSU, while derating, increases the temperature of 1/10 of 48% of the target power. The output power is reduced to the target value if the temperature is lower or equal to 60°C for the RF or of 62°C for PSU. This avoids also the thermal derating condition, restoring the normal functioning of the equipment.

If temperature continues to rise despite derating, the output power is reduced again even below a -3dB level, generating also the -3dB alarm.

If the derating is not able to stop the temperature raise, when the threshold of 80°C is overpassed for the RF or 77°C for PSU, turns off the power supplies, therefore the amplifier. The reset of the equipment occurs with a hysteresis of 5°C, so the functioning is reset respectively at 75°C for RF and 72°C for PSU. The transmitter shut-down is managed with three block-outs, that means that after three times it tries to contain the temperature through the derating, the total block of the equipment is determined.

Notice: When the power supplies stop, stop of blowers is consequently caused, therefore the equipment will work without forced air-cooling.

COOLING SYSTEM THERMAL DERATING

The ALC logic reduces the output power to max. 1600W in case of fast increase of temperature when fans get damaged.

Its functioning is the following:

If the output power red on the output directional coupler is higher than 1600W and the max absorbed current from the RF amplifier is higher than 5A, then the control is activated.

Derating starts therefore in the following cases:

- If the average temperature on frontal and rear blocks of the amplifiers is increasing
- If the average increase of module temperature is more than 2°C every 15 seconds
- If the difference of temperature between frontal and rear blocks is less than 3°C

At derating activation the equipment starts to work at 1600W

The reset of derating condition for damaged fans occurs if the temperature decreases every 15 seconds of 2°C and if the difference of temperature between frontal and rear blocks is more than 3°C.

PSU CURRENT DERATING

When the delivered currents from the single power supply increase, the ALC logic act as follows:

A maximum current of a single power supply over 40,5A determines the current derating condition.

The algorithm of ALC management under normal functioning conditions is replaced by another where the control of the VDS and VBIAS is determined by the set power and by the current delivered by the power supply – with major priority – that is maintained around 40A.

The current derating condition is annulled if the set power returns to the target value and the maximum current absorbed by the single power supply is equal or lower than 40A.

If the current delivered by one power supply is lower than 1/10 of the maximum current supplied by the other power supplies and if the total current delivered is higher than 10A, the power supplies generate a malfunctioning signal, in order to make a diagnosis of faulty power supply.

RF AMPLIFIERS FAULT DERATING

In case one or more broken RF amplifiers, this is what the ALC logic behaves:

the absorbed currents from the modules are detected by the SHUNT board. If the current value is lower than 1/10 of the maximum current delivered by the single RF amplifier, the power supplies have to give a VDS higher than 30V (minimum value), the total current is higher than $2,5 \times 12 > 30A$ (n. of RF modules) and the forward power is over 500W. Under these conditions the modules are considered faulty.

Controls on the total current, on the VDS state and on forward power mask the alarm in case of low current value, due to output powers too low and/or absence of driving.

A table shows the maximum power deliverable in a pre-defined and constant way according to the active modules.

If the maximum power deliverable is the set target power or higher, an alarm for RF modules malfunctioning is shown, but the equipment still works correctly.

If it is lower instead, the equipment will show an active derating and a malfunction of the amplifiers.

The reset of the derating condition of the modules occurs when the fault disappears, when the current of each module returns over 2,5 A and after a delay of 60 s.

To avoid the number of SMS sent in case of fault, the equipment does not send SMS during derating, in fact, the equipment sends SMS (if active) only for the -3dB signal, that means when the delivered power is lower than 50% of the set target power.

N° of active modules	Maximum deliverable power
0	< 500W
1	< 500W
2	< 500W
3	< 500W
4	< 500W
5	700W
6	1100W
7	1500W
8	1900W
9	2300W
10	2700W
11	3100W
12	3500W

PROTECTIONS

The E3500 has been built with a protection system that puts together hardware protections with the performances of software protections.

ALARM LIST MANAGEMENT

It lists the sequence of the last 19 alarms with date and time for each alarm.

Permanent stored data, with checksum,

HARDWARE PROTECTIONS

This system is composed by an ultra fast protection that turns off MOSFETS through the bias is the VSWR overpasses 10% of the maximum power. In fact, the equipment is able to bear shortcircuit events or open circuits on the RF output without damage.

Independent fuse protection on each 300W MOSFET amplifier module.

Electronic fast and fuse protection on power supply of the blowers.

SOFTWARE PROTECTIONS – ALARM MANAGEMENT

The protection system is made of the Alarm management module

Physic and logic digital inputs are used in order to verify the alarm condition. The state of each input is sampled, then the condition is elaborated in a logic way with a combinatory net so to determine which is active: the alarm or the message.

The minimum time is 100ms.

The turn-off modalities are mainly the following:

STOP3BLOCKOUT	Stops the equipment with Three Block Out
STOP	Stops the equipment without Three Block Out
STOPNOTFAULT	Stops the equipment without FAULT
RESETPREQUIRED	Requests a reset
REDPOWER	Reduced power functioning
FAULT_LED	Still Red Led
FAULT_B_LED	Red Led Flashing at 1,5 Hz
ON_AIR_B_LED	Green led on air Flashing at 1,5 Hz
INHIBIT	Amplifier inhibition alarm
HALF_POWER	-3dB functioning alarm
INTLOCK	Amplifier block alarm
NO_MAINS	No mains presence alarm
T_DERATING	Power reduction for temperature alarm
I_DERATING	Power reduction for power supply currents alarm
U_DERATING	Reduced power alarm for fast over-temperature on forced air- cooling
RF_MOD_DERATING	Reduced power alarm for fault on RF modules

This module is repeatedly executed at equal priority of the ALC management in order to constantly verify if alarm causes occurs, so that to intervene in time.

The implementation is based on a table which describes the arrest nets, therefore the code is the same for all alarm and in case of new stops it doesn't need changes.

ALARM LIST

Alarm reset	Message, alarm reset under process, output flags decides the reset of all stored alarms and no more active.
Persistent data checksum error.	Message, the persistent data in eeprom have been lost and the equipment is configured with the default parameters.
Three block out.	Message, equipment blocked for consecutive faults, requests the reset from the user to allow restart.
Standby / on air.	Message, identifies that the amplifier is in stand-by mode ready to start without alarms.
-3dB.	Message, the amplifier delivers a power output lower than 3dB in respect to the target set. Further to the 5 seconds of mains delay there is also a delay of 55 seconds before start up.
Max reflected power.	It indicates a too high level of reflected power. It turns the equipment off in three block out.
Minimum -12V.	Voltage level too low on -12V which prevents functioning of its protections. It turns the equipment off in three block out.
RF Modules fault	Anomaly on RF module, maximum deliverable power is reduced.
RF Modules derating	Output power reduced due to a broken RF module. If the set target power is lower than the one deliverable by the system with the remaining modules, this message does not appear.
RF thermal derating.	Thermic anomaly on RF modules, reducing the maximum power output.
RF over temperature error.	Maximum operating temperature overpassed and equipment turn off in three block out.

PSUs fault error.	Malfunctioning of one or more power supplies. The fault is determined by a too low absorption ($< 2A$) of one or more power supplies comparing to the total current delivered ($< 6A$).
PSU current derating.	Overload of one or more power supplies and reduces the power output to reduce absorption. Fault is determined by a too-high absorption ($> 40,5A$) of one or more power supply.
PSUs max current error.	Indicates a prolonged overload of one or more power supplies. The fault is determined by a too high absorption ($> 40,5A$) of one or more power supplies for 60 seconds.
PSUs thermal derating.	Indicates a power supply over-temperature: it reduces power.
PSUs over temperature.	Indicates a power supply over-temperature: it turns off the amplifier.
UNB OVERTEMPERATURE MSG	
PSU / SHUNT communication error.	Malfunction of internal 485 BUS for communications between CPU and PSU/SHUNT.
EXT DRV ENABLE A MSG	
EXT COMM TIMEOUT MSG	
External Interlock	Input hardware and active interlock.
Cooling system fault derating.	Fast overheating of RF amplifier modules.
On air	On air and properly functioning.
Power up	Stores in the list that the equipment has re started-up

MAIN CHARACTERISTICS

ET31000 FAMILY

GENERAL DATA

Operating band	87.5 - 108 MHz
Output Low-pass Filter	W.B. 87.5 MHz - 108 MHz
Corrosion	All mechanical parts are stainless steel
Internal bus RS232/RS485	Yes
Points of measure	RF Sample-MPX Monitor
Adjustments	From the frontal Panel trough LCD /from PC
Microprocessor controlled	Yes
Power supply redundancy	Yes
Blower redundancy	Yes
Final stage technology	MOSFET
Transistor type	BLF278 Philips
RF Modules maximum weight	35 Kg
Power supply units maximum weight	6 Kg

CONNETTORS

RF Input connector	N
Input connectors LEFT & RIGHT	XLR female
MPX Input connector	BNC female
SCA Connector	BNC female
Remote control connector	DB25
RS485 Connector	DB9

RF	
Overall output power stability	+/-0,1 dB
Output impedance	50 Ω
Harmonic suppression	> 70 dB
Spurious signal suppression	> 80 dB
Driving power	80 W
Input impedance	50 Ω
Gain	16 dB
Maximum reflected power accepted	300 W
Fast V.S.W.R. intervention threshold	300 W
Asynchronous residual AM (typical values)	0,1 %
Synchronous residual AM (typical values)	0,2 %

AUDIO

L/R Audio input level	+12/-12 dBm to produce 75KHz standard deviation
L/R level adjustment	Soft adjust 0,1dBm steps from front pannel
L/R Connector type	Balanced XLR
L/R Input Impedance	Selectable 10K- 600Ω
MPX audio input level	+12/-12 dBm to produce 75KHz standard deviation
MPX level adjustment	Soft adjust 0,1dBm steps from front pannel
MPX Connetor type	Unbalanced BNC
MPX Input impedance	5KΩ selectable
SCA/RDS level adjustment	Adjustable Trimmer
SCA/RDS Connector type	Unbalanced BNC
SCA/RDS Input Impedance	10KΩ
19KHz Output	Yes
STEREO/MPX easy changeover	Yes
AES/EBU Input option	Optional (External adapter)

PERFORMANCE EXCITER

Time of adjustment - frequency		< 1 minute
Time of adjustment - power		< 1 minute
MTBF		10 Years
Programmed Maintenance		5 Years
Intermodulation distortion	<0.05% Measured with two of tones 1KHz & 1.3KHz, ratio 1:1 at 100% modulation	
Frequency deviaton	+/- 75 KHz	0.1 dB steps adjustable
Frequency steps		10 KHz
THD+N		<0.03% @ 1KHz
Pre-emphasis		50/75 microseconds +/-0,1dB
FM S/N MPX FCC	82 dB 20Hz - 23KHz - 50uS - ref @ 53KHz - RMS	
FM S/N STEREO CCIR Weight		72 dB Weight-ref@53KHz-Qpk
FM S/N STEREO CCIR Unweight		72 dB Unweight-ref@53KHz-QPk
Mono frequency response		+/-0.15 dB 30Hz - 15KHz
MPX frequency response	+/-0.1 dB 30Hz - 100KHz, -45dB at 19 KHz	
Stereo frequency response		+/-0.15 dB 30Hz - 15KHz
SCA1,2,3 frequency response	+/-1 dB 20KHz - 100KHz, -45dB at 19KHz	
Type of modulation	F3 Direct FM modulation of the RF oscillator in fundamental frequency	
Stereo separation		> 60 dB @ 1KHz
Pilot tone frequency		19 KHz
Pilot tone deviation		7,5 KHz Adjustable
Pilot tone frequency stability		+/-1 Hz
Attenuation at 19KHz		> 45 dB
Frequency stability		1 ppmFrom 0 to +40°C
Time for starting up		30 secFrom OFF/ON
Time for starting up		1 secFrom interlock close

ENVIRONMENT

Temperature range (operating)		0 - +45 °C
Temperature range (non operating)		-20 - +70 °C
Humidity range (operating)		95% at 40 °C
Humidity range (non operating)		90% at 65 °C
Altitude range (operating)		>4600 meters
Altitude range (non operating)		>15000 meters

TELECONTROL & TELEMETRY

Remote control		Yes
Remote Control at clean contacts		Yes
SNMP option Y/N		Under development

REGULATIONS CONFORMITY

High frequency radiations from the enclosure		Below limit imposed by technical regulations.
Functioning type		h24 uninterrupted
Electromagnetic fields immunity		Higher than specified by laws on electromagnetic fields compatibility
CE Mark		Conform to 1999/5/CE European Directive

MANUFACTURING DATA

Year of the model		2004
Spares availability guaranteed for		2 years/see options attached

PRE- & POST- MAINTENANCE

Recurrence	4/8 years
Blower Replacement recurrence	4 years
Air blowers quantity and prices	4 x 52,31 (ampli) 1 x 30 (driver)
Lithium batteris replacement recurrence	10 years
Batteries	Yes, only for alarm list storage
Time to realize the preventive maintenance every 4 years	1 Hour
Time to realize the preventive maintenance very 8 years	2 Hours
Level and number of technician for maintenance	1 technician
Electrical safety	EN60215 (Standard CE)
Average repair time (change of an RF module or power supply)	2 Hours

SET

Power supply cable	Yes
Installation manual	Yes
User manual	Yes
Maintenance manual	Yes
Tests report	Yes

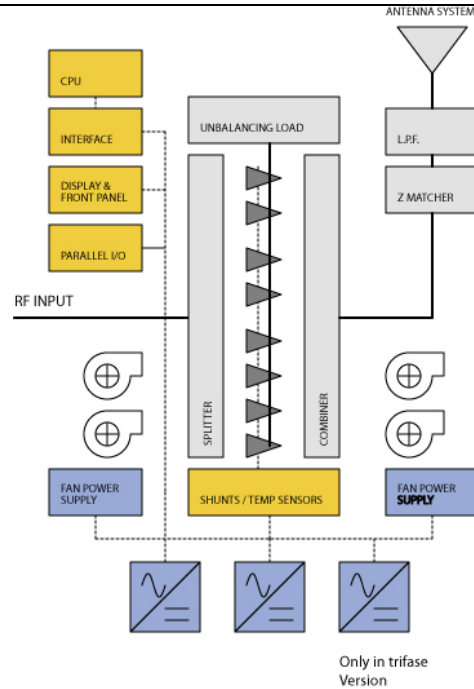
ET2000-3

ET2000 Member of ET31000 Family
2000W ICEFET SOLID STATE FM TRANSMITTERS



HIGHLIGHTS

- The compact, smallest and lightest 3KW of the world.
- ICEFET Technology
- Gsm alarms.
- Easy maintenance and Installation
- Low purchase and running costs.
- Reliability.
- Fully Broadband, ideal for reserve concepts (dual drive, passive reserve, active reserve, n+1).
- Operating with one or more broken modules.
- Operating with one or more broken power supplies.



ET2000 - composition:

- 8 Mosfet Philips BLF278
- 2 Redundant 2KW PFC switching Power Supply
- 5 Fans
- Output low pass filter
- Microprocessor controlled

MAIN CHARACTERISTICS ET2000-3

COMPOSED

Exciter	ETG101
Amplifiers	E2000
Mounted in 19" standard rack	No

GENERAL DATA

Output Nominal Power	2000 W adjustable
Output Low-pass Filter	W.B. 87.5 MHz - 108 MHz
Displayed Parameters	More than 50 parameters displayed on a LCD
Number of BLF278 MOSFETs	8
Number of power supplies	2
Dimensions: Rack units	4+3 U
Dimensions: Width	48,5 cm
Dimensions: Height	(17,6+13,5cm.) Tot. 31,1 cm
Dimensions: Depth	70 cm
Weight	(43+22Kg.) Tot.75 Kg

CONNETTORS

RF Output connector	7/8"
---------------------	------

RF

RF Efficiency	65% typ.
Output nominal power	2000 W Adjustable with continuity
Maximum peak power	2600 W
Power consumption	3050 W

POWER SUPPLY

Power supply	110/220/380 V. Threephase-singlephase 50-60Hz VAC
--------------	---

COOLING SYSTEM

Cooling flow (m3/h)	Variable from 400 to 800 m3/h
Air temperature increase between output /input	17 °C
Cooling system	Forced air-cooling

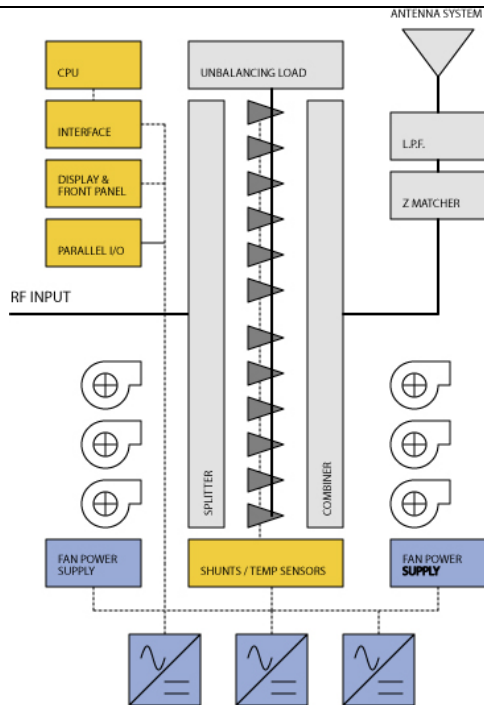
ET3500-3

ET3500 Member of ET31000 Family
3500W ICEFET SOLID STATE FM TRANSMITTERS



HIGHLIGHTS

- The compact, smallest and lightest 3.5KW of the world.
- ICEFET Technology
- Gsm alarms.
- Easy maintenance and Installation
- Low purchase and running costs.
- Reliability.
- Fully Broadband, ideal for reserve concepts (dual drive, passive reserve, active reserve, n+1).
- Operating with one or more broken modules.
- Operating with one or more broken power supplies.



ET3500 - composition:

- 12 Mosfet Philips BLF278
- 3 Redundant 2KW PFC switching Power Supply
- 6 Fans
- Output low pass filter
- Microprocessor controlled

MAIN CHARACTERISTICS ET3500-3

COMPOSED

Exciter	ETG101
Amplifiers	E3500
Number of E3500 Amplifiers	1
Mounted in 19" standard rack	No

GENERAL DATA

Output Nominal Power	3500 W adjustable
Output Low-pass Filter	W.B. 87.5 MHz - 108 MHz
Displayed Parameters	More than 50 parameters displayed on a LCD
Number of BLF278 MOSFETs	12
Number of power supplies	3
Dimensions: Rack units	4+3 U
Dimensions: Width	48,5 cm
Dimensions: Height	(17,6+13,5cm.) Tot. 31,1 cm
Dimensions: Depth	70 cm
Weight	(43+22Kg.) Tot.75 Kg

CONNETTORS

RF Output connector	7/8"
---------------------	------

RF

RF Efficiency	65% typ.
Output nominal power	3500 W Adjustable with continuity
Maximum peak power	3700 W
Power consumption	4600 W

POWER SUPPLY

Power supply	220/380 V. Threephase-singlephase 50-60Hz VAC
--------------	---

COOLING SYSTEM

Cooling flow (m3/h)	Variable from 400 to 800 m3/h
Air temperature increase between output /input	17 °C
Cooling system	Forced air-cooling through 6 axial fans

INSTALLATION

Transport

The transport of the must be made solely with its original wood packaging. Although the packaging is designed to avoid damage in case of the wrong manoeuvres, it is recommended to respect the verse "UP / DOWN" and not to give shocks to cash.

Unpacking

Manual unpacking

Are there 2 separate procedures: entirely by hand and with the help of half lift.
The cabinet must be prepared so that the lid opening is positioned upward. Leave the cash from the thickness of polystyrene to allow easy handling equipment. It is advisable to employ at least 4 people to extract cash by hand.

Unpacking with half lift

Using half of the lift, place the cash vertically so that the machinery inside is provided with its base supported at the bottom. After ensured the stability of cash, open the lid corresponding to the side of the front, making use of wheels placed at the base of the, extract cash by posing the greatest attention that has not been reversed during the operation. It recommended the use of an inclined plane for the transfer of the cash from inside the floor of the location.

Characteristics of location

The environment intended for installation on the amplifier must have the following characteristics:

Electrical system.

The electrical system must be designed to ensure the necessary power supply. It is recommended to provide for a transmitter ELENOS E3500 current availability of not less than 12 A for phase to 380 Vac, 32 A for phase to 220 Vac. All tenants should be Section appropriate and in accordance with the local technical standards. We recommend the use of protective devices by lightning discharges resulting from (transformer isolation and unloaders). It is recommended to prepare a discharge on the ground very efficient in order to enable the best possible effectiveness of protective devices by discharges from lightning. In all cases the electrical system must comply with the rules on the safety of operators.

Installation of air extraction.

During normal operation the transmitter enters into a quantity of heat that can reach 3.5 KW total, which is almost entirely removed from the airflow moved by the internal fans. Airflow exchanged is approximately 900 cubic metres per hour, so the location will be designed to ensure an injection of a corresponding flow of fresh air, and the extraction of a corresponding flow of air exhausted. It is recommended to use, for the disposal outwards, a pipe extraction diameter of the flange in the hood optional (about 14 cm) of lesser length possible (not exceeding 1.0 metres) And possibly devoid of curves. In cases where the pipe extraction were to be longer than 1.0 metres and / or present very pronounced curves, should be applied an additional extraction device with its own suction, capable of extracting the same amount of air in operating conditions laid down.

Air conditioning.

For a longer duration of the useful life you should give the location of an air conditioning system of internal temperature, whose optimal value will be between 10 ° C and 30 ° C. The power dissipated into the environment through of the housing is negligible in terms of adaptation excellent system antenna and optimization efficiency.

Procedures optimization of efficiency

Since the amplifier E3500 is able to operate on any frequency of 87.5 MHz banda - 108 MHz and at any level of output less than or equal to 3.5 KW, the efficiency of the stadium RF amplification could change depending on the Conditions of Employment.

The procedure for optimization of efficiency must necessarily be implemented following the methods described in order to obtain the minimization of the consumption of electricity, reducing the heat dispersed into the environment and ensuring the proper functioning of. A low value of efficiency, in fact, could create, under extreme conditions, a rise of temperature of the total corresponding to an excessive consumption of electricity.

Description of procedure

The procedure is performed automatically by of the CPU, and consists in seeking the condition of operation that allows you to obtain the desired output with the minimum voltage DRAIN possible, consistent with an RF power piloting not excessively high, which is to be set by the operator. In these conditions you get a high value efficiency of the stadium amplification RF power.

The steps that the operator must follow are as follows:

- a. put in place the amplifier E3500 pulling outwards the ignition knob on the front panel. Press the button at the wheel when the pointer in the display is to "ON AIR"
- b. Turn on the exciter to the desired frequency, setting his power to 0 W
- c. enter the menu "Power Setting" of E3500 and set the power ("Target") to the desired value (press "Enter" to edit the value of power, use the knob to adjust the value, press again "Enter" to save the 'Setting).
- d. bring the output of exciter to 90 W (remember to save the setting power in the exciter)
- e. wait about 30 seconds to allow the microprocessor to adjust the parameters of the operation for maximum efficiency

Now the machinery is ready to operate at desired power under optimal conditions.

MAINTENANCE

Speeches in case of failure

All interventions must be performed by trained and licensed. The failures, depending on the severity, may allow or not the continuity of service.

Failure does not mean that the interruption of service

The transmitter is constructed so as to enable the maintenance service in the event of partial failure. In particular, the failure of one or more modules RF amplifiers does not involve leaving office, because the transmitter can continue to provide power even in the presence of a single module in operation. Similarly, the failure of one or more of a power supply does not involve of the shutdown, although the lack of more than one power supply can have obvious repercussions in terms of reducing output.

Periodic controls

During normal operation is recommended conducting periodic inspections aimed at verifying the absence of operating conditions critical. It is recommended to adopt the following program:

Periodicity	Intervention
15 days	Clean filters (dusty) when provided in the apparatus
30 days	Clean filters (little dusty environment) when provided in the apparatus Check output direct and reflected Check operation telemetry Check proper functioning RF modules Check proper functioning power modules
6 months	Check proper functioning of fans Check temperatures functioning of apparatus Verification consumption of electricity power
12 months	Verify proper locking connector of antenna Check Status of connections power network Cleaning the fan blades Wash filters (dusty) when provided of the apparatus
24 months	Wash filters (little dusty environment) when provided of the apparatus Replacement filters (dusty) when provided of the apparatus

E3500

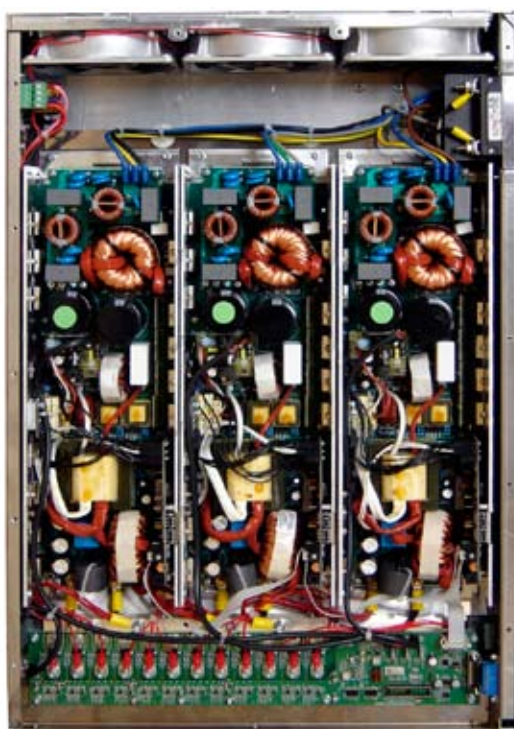
E3500

The ET3500-3 is made of twelve 250W amplifier modules, combined according to a patented design.

High efficiency, compactness and light weight are just some features of the unit.

The cooling is assured by six (6) high efficiency fans, controlled via software in an “adaptive” way. The level of efficiency required by the cooling system varies depending on the operating temperature scale which the unit is running on.

The unit is controlled either locally using the display and the adjustments control located on the front panel, or remotely through a serial connection.



USE MANUAL

CONDITIONS OF OPERATION:

The amplifier E3500 works with a pilot power of 90W, with this power is able to provide the optimum conditions and operational performance.

The photograph shows a complete transmitter in normal operating condition.



ETG150 PILOT

Direct Power: 90W circa.

Led ON AIR verde: acceso.

Led Failure red: Off.

Led Mains yellow: On.

E3500 AMPLIFIER:

Target power: 3500.

Output power 3025W.

FAULT red: Off

ON-AIR green: On

ST BY yellow: Off

LOCAL yellow: On or Off

MAINS green: On

LOCAL/REMOTE KEY: LOCAL o REMOTE

RF display: ON

LINKS

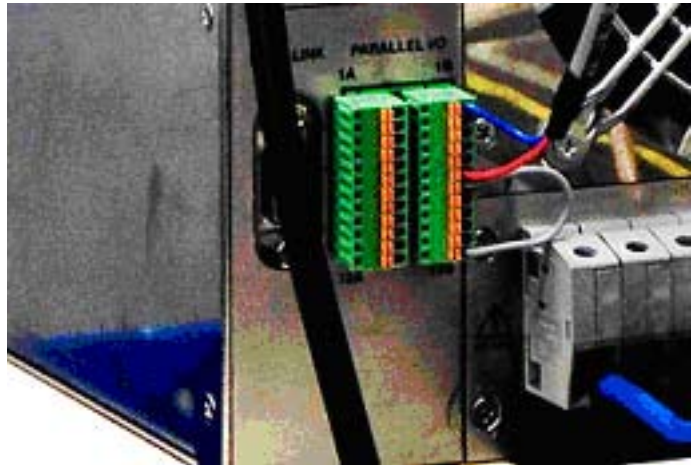
- 1) Power to exciter.
- 2) Power and cable mass to Amplifier E3500.
- 3) RF output of exciter and RF input of amplifier.
- 4) RF Output of amplifier E3500.
- 5) DB25 connector of ETG1000 with interlock input to Parallel I/O 1B connector of E3500



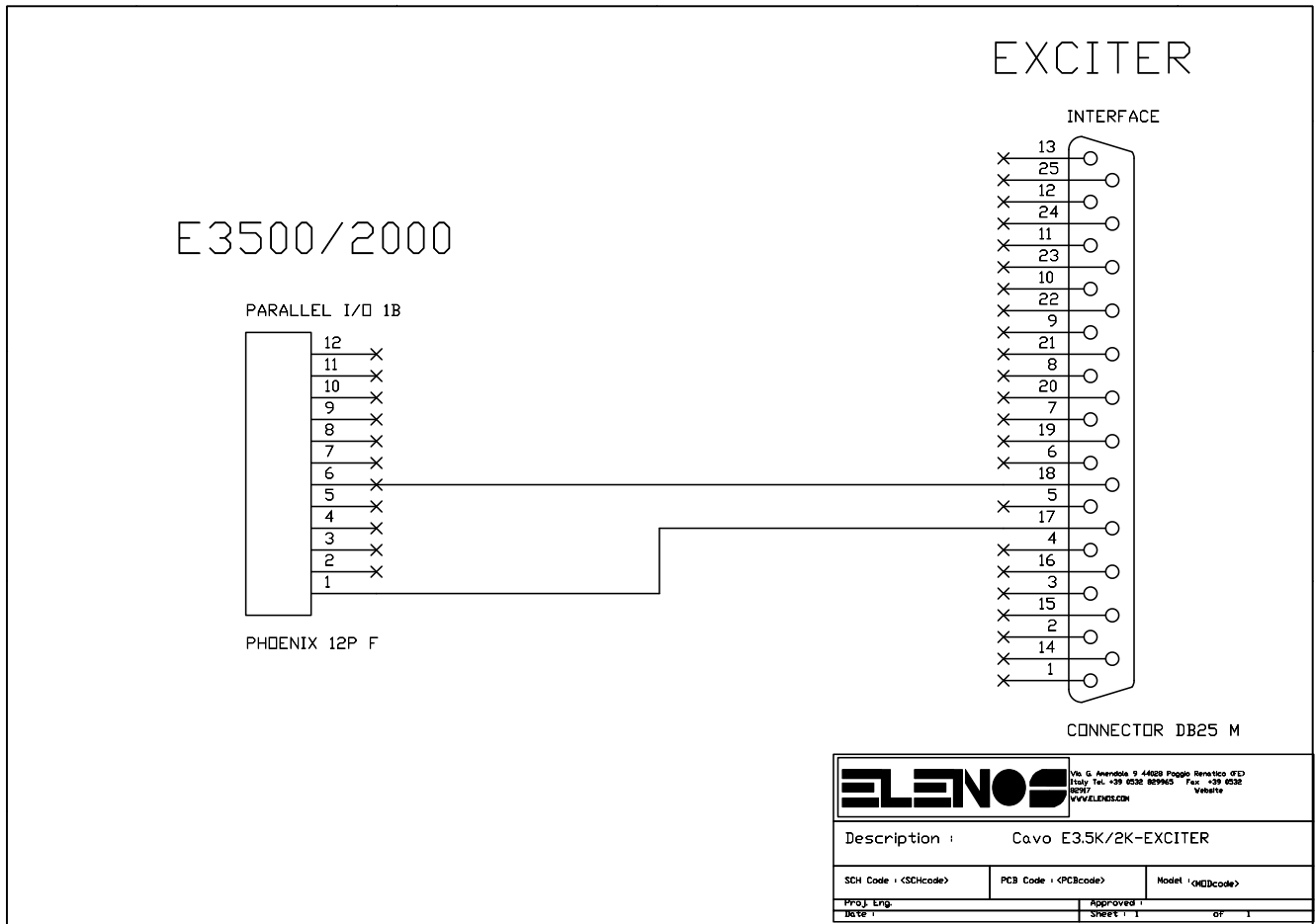
The wires Red and Blue are the exit interlock to the exciter. We need to put out the exciter when the E3500 is in STD-BY or stops in a state of alarm.
The gray wire is the closure dell'Interlock entrance to E3500.

INTERLOCK

To operate the E3500 must be enabled to provide power from contact external INTERLOCK. The contact INTERLOCK is located in the connector Tele-Remote control called "PARALEL I / O", to enable it must connect pin 7b (INTERLOCK) with pin 12b (COMMON).



ETG to E3500 cable



CONNECTORS DESCRIPTION



- local/remote control :
- Telemetry :
- Encoder :
- RF output signal sniffer :
- On/Off button :



- : Output Rf power
- : Terra
- : RF input
- : Triphase/monophase power
- : Interlock
- : Remote control

ET31000-3 SERIES Power setting

Step 1)

On delivery the transmitter is set to "LOCAL" and "STAND BY."

The LEDs are switched on "STDBY" and "MAINS."

With the key that came from a "REMOTE" to "LOCAL".



Step 2)

In "LOCAL" mode, turns on the LED. Press the encoder to enter the Menu "Power Setting"



Step 3)

Upon delivery the transmitter is set with the power minimum target.

Place the cursor on "STBY" and press the encoder move to "ON"



ET31000-3 SERIES Power setting

Step 4)

It turns off the led "STDBY" and the LED lights "ON AIR"

When does the command of "ON" the power output begins to grow slowly.



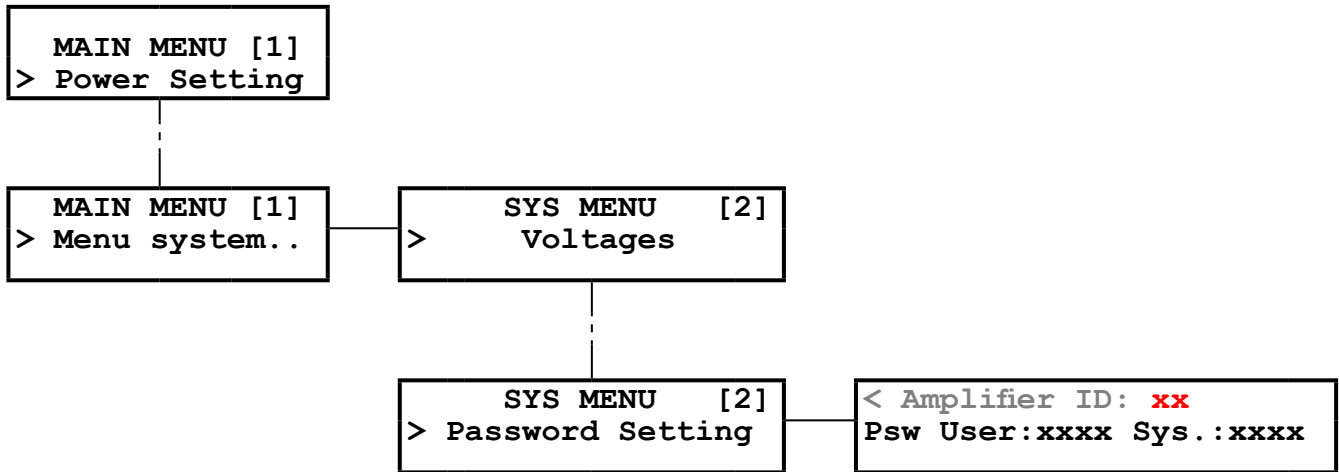
Step 5)

In a few seconds the output power reaches the target.



ET31000-3 series - Setting number of nodes

ID setting (Terminal Address).



The replacement of a unit should be set IDs communication (Terminal Address) putting on two lines display the value set in the previous year, the value is reported also on this equipment.

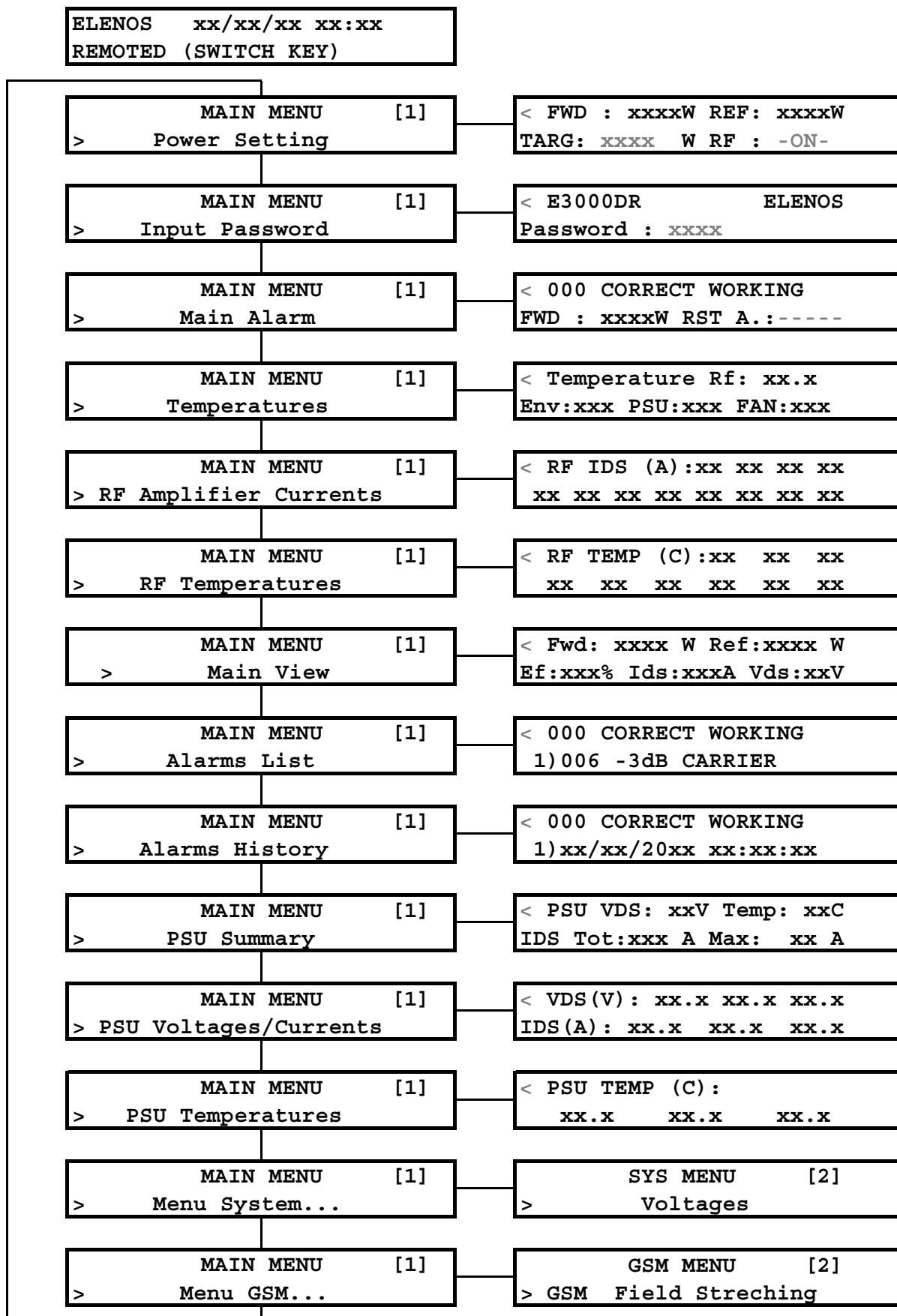
Is fundamental to set this to let you see the equipment Telemetry and the piloting and management in logical combination.

Power setting

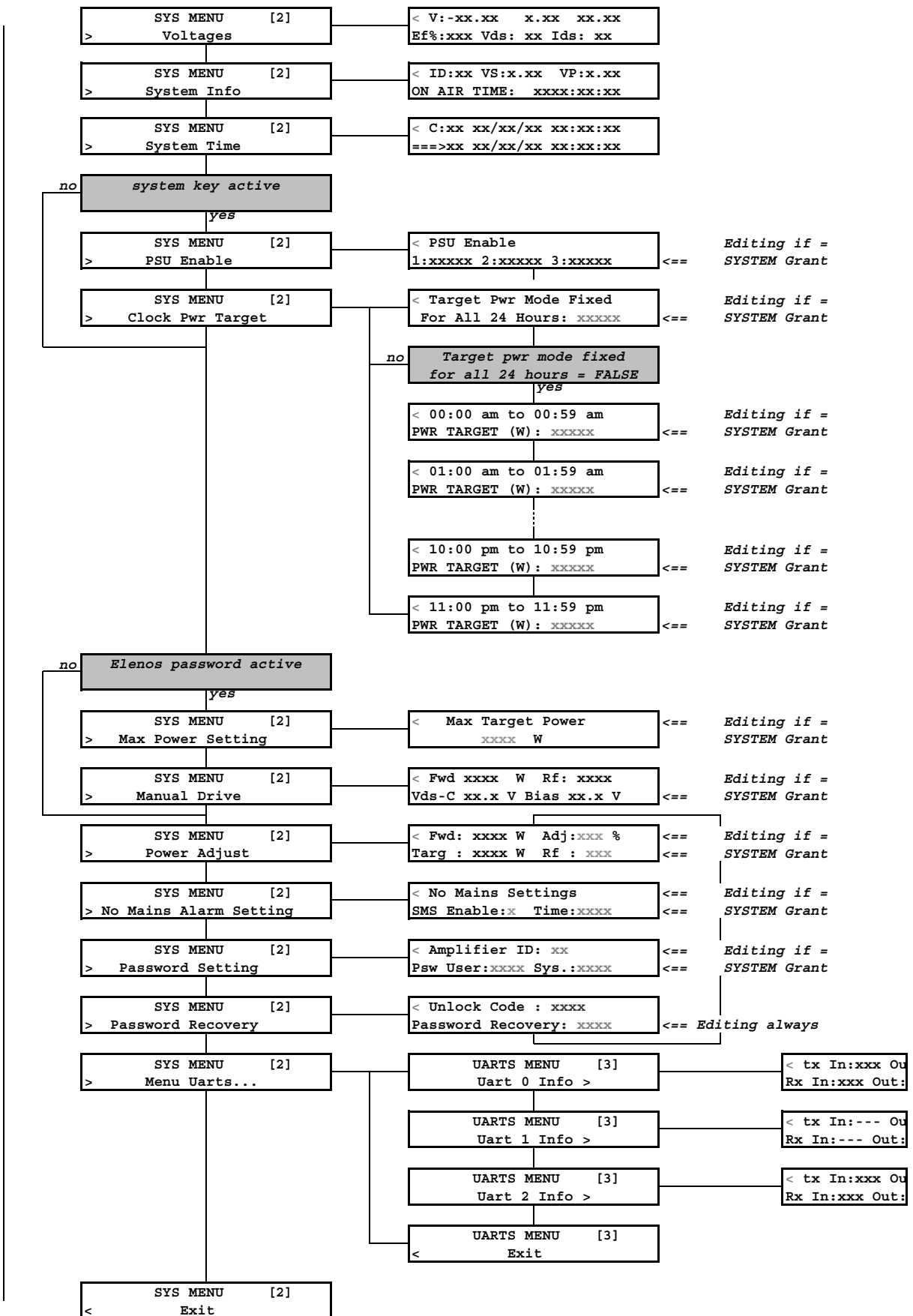
- 1) Push the encoder to entry Menu "Power Setting"
- 2) When you enter the setup menu power of the cursor is on the "<".
- 3) Stand with your cursor on Power Target "Targ." The cursor blinks full press the encoder to enter the mode of editing.
- 4) In mode edition the cursor appears as a line under the issue.
- 5) Turn the encoder for editing power.
- 6) To reach the desired target power.
- 7) Press the encoder to confirm the value of power.
- 8) Move the position cursor and position on the "<" character of ESC
- 9) End of procedure



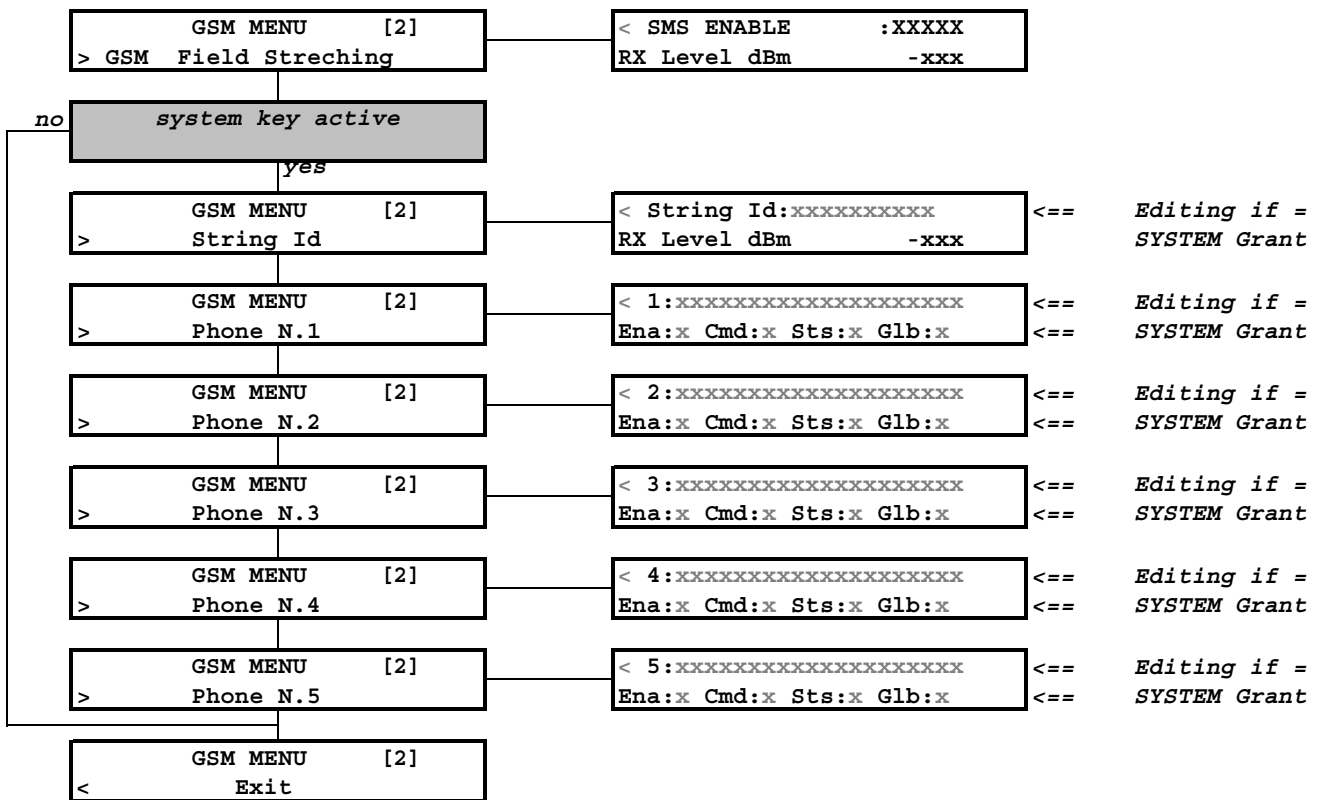
Menù 1 Main



Menù 2 Sys



Menù 3 GSM



Main Menu

It is made up of the following items:

- Power Setting
It allows you to set the RF power output and Stand By / On Air, and display the power and reflected.
- Input Password
Allows you to add your password to activate the mode parameters.
- Main Alarm
It allows you to view the alert / stop primary and reset the alarms.
- RF Amplifier Currents
This allows you to see patterns of amplifiers.
- RF Temperatures
This allows you to see temperatures in part RF.
- Main View
Display the directed and reflected power, the efficiency of the RF part, the current IDS and the voltage VDS.
- Alarms List
Show reports and alerts secondary.
- PSU Summary
Display the output voltage from the power supply, the maximum temperatures of these, the sum of paid and the current maximum output from the single power supply.
- PSU Voltages/Currents
Show individual tensions and individual pattern of power supplies.
- PSU Temperatures
Show individual temperatures of power supplies.
- Menu System...
Activate secondary menu system.
- Menu GSM...
Activate secondary menu for managing GSM/SMS.

Secondary Menu System

It is made up of the following items:

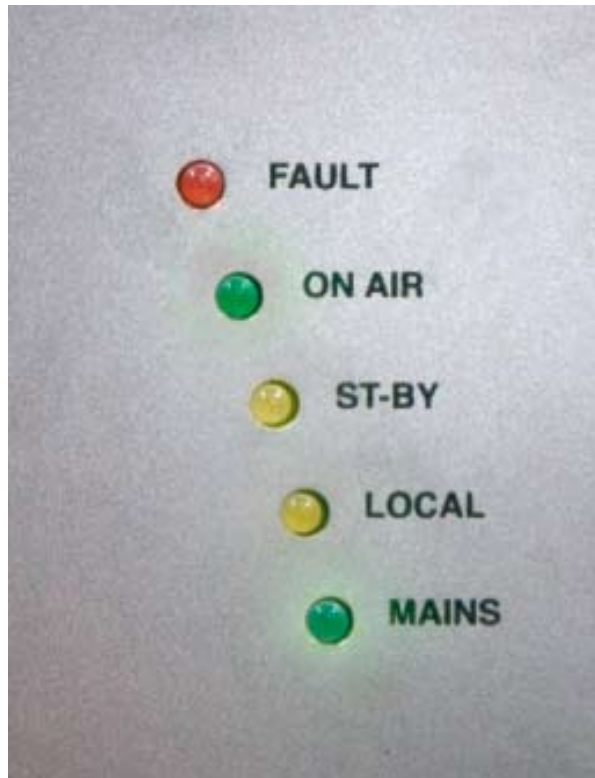
- Voltages
Show the values of feeds VDC, +13 V,-12V, the efficiency of the RF part, the voltage VDS and its power supply.
- System Info
See Id machine, the software version, the version of shared data and time of operation in power.
- System Time
It allows you to view and set the date and time.
- PSU Enable
It allows to exclude one or more power supplies
- Clock Pwr Target
It allows you to enable or exclude the operating mode with variable power over the 24 hours and masks subsequent targets power in 24 hours.
- Max Power Setting
It allows to define the maximum output for the approval of the machine, (Mask reserved solely for personal Elenos undergoing testing and approval).
- Manual Drive
Allows to force the voltage VDS and VBIAS piloting the equipment manually, (Mask reserved solely for personal Elenos being tested).
- Password Setting
Allows you to change passwords level "USER" and "SYSTEM".
- Password Recovery
Allows you to reset passwords "USER" and "SYSTEM" through a code variable to be requested to Elenos.

- Menu Uarts
Show a sub menu that shows the status of serial asynchronous communication.
- Exit
Allows you to return to the previous menu, in this case the principal.

Secondary menu GSM

Format the following items:

- GSM Field Strength
Enable generation of SMS and their reception, displays the level of field to allow GSM positioning unit.
- Sting Id
Allows you to customize the identification of the string, displays the level of field to allow GSM positioning unit.
- Phone N.1
Allows you to customize the identification of the string, displays the level of field to allow GSM positioning unit.
- Phone N.2
It allows to define the phone number n.2 and rights thereto (flags certification, receipt of the state, receive commands and echo the command performed).
- Phone N.3
It allows to define the phone number n.3 and rights thereto (flags certification, receipt of the state, receive commands and echo the command performed).
- Phone N.4
It allows to define the phone number n.4 and rights thereto (flags certification, receipt of the state, receive commands and echo the command performed).
- Phone N.5
It allows to define the phone number no.5 and rights thereto (flags certification, receipt of the state, receive commands and echo the command performed).
- Exit
Allows you to return to the previous menu, in this case the principal.

OPERATION OF LEDS

Led FAULT:	RED	Lights up when the machine does not provide power for 'intervention un'allarma. Flashes in the presence of a derating.
Led ON-AIR:	GREEN	Lights up when the machine delivers power.
Led ST_BY:	YELLOW	Illuminates when the machinery and Stand-By
Led LOCAL:	YELLOW	Illuminates when the transmitter is local.
Led MAINS:	GREEN	Illuminates in the presence of Mains, indicates that the transmitter is powered.

CONNECTOR FOR REMOTE TELEMETERING

In the rear panel of E3500 is the connector remote.



Digital inputs characteristics.

The circuit input is made as per schedule of principle below.

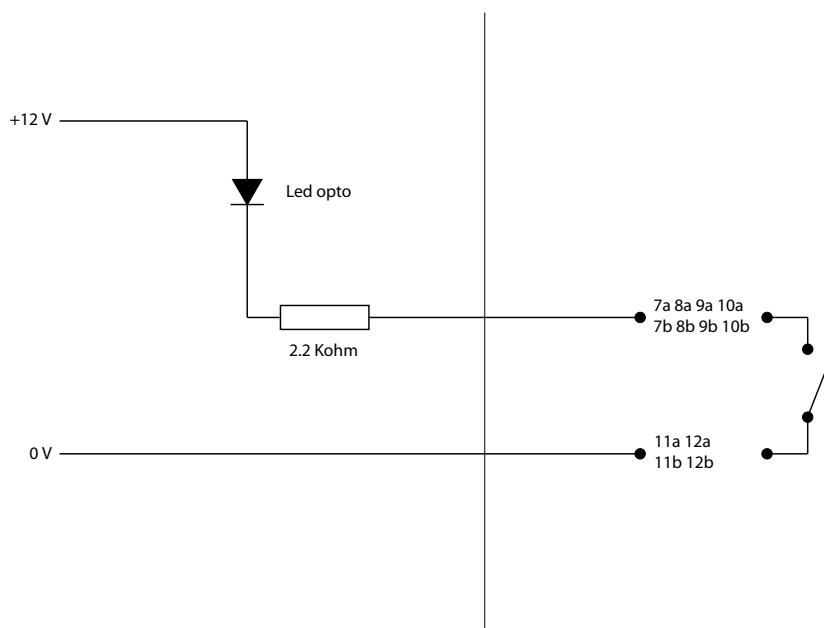
There are 4 inputs for each connector, a total of 8.

The current is below 6mA for each entry. As shown by the scheme in principle the closure of external contact feeds the diode led a fotoaccoppiatore through a resistance 2200Ohm limiting the current assets.

We must bear in mind that inputs are not floating among themselves, as reported to a single source. The 8 inputs are floating in relation to the apparatus and feeds the earth.

In fact, the power (+12 V, non-regulated voltage and current unsecured) supplied the equipment is free float (generated by DC / DC converter isolated, dedicated).

The current available is 70 mA total, however, sufficient to activate all inputs.



Pinout connector

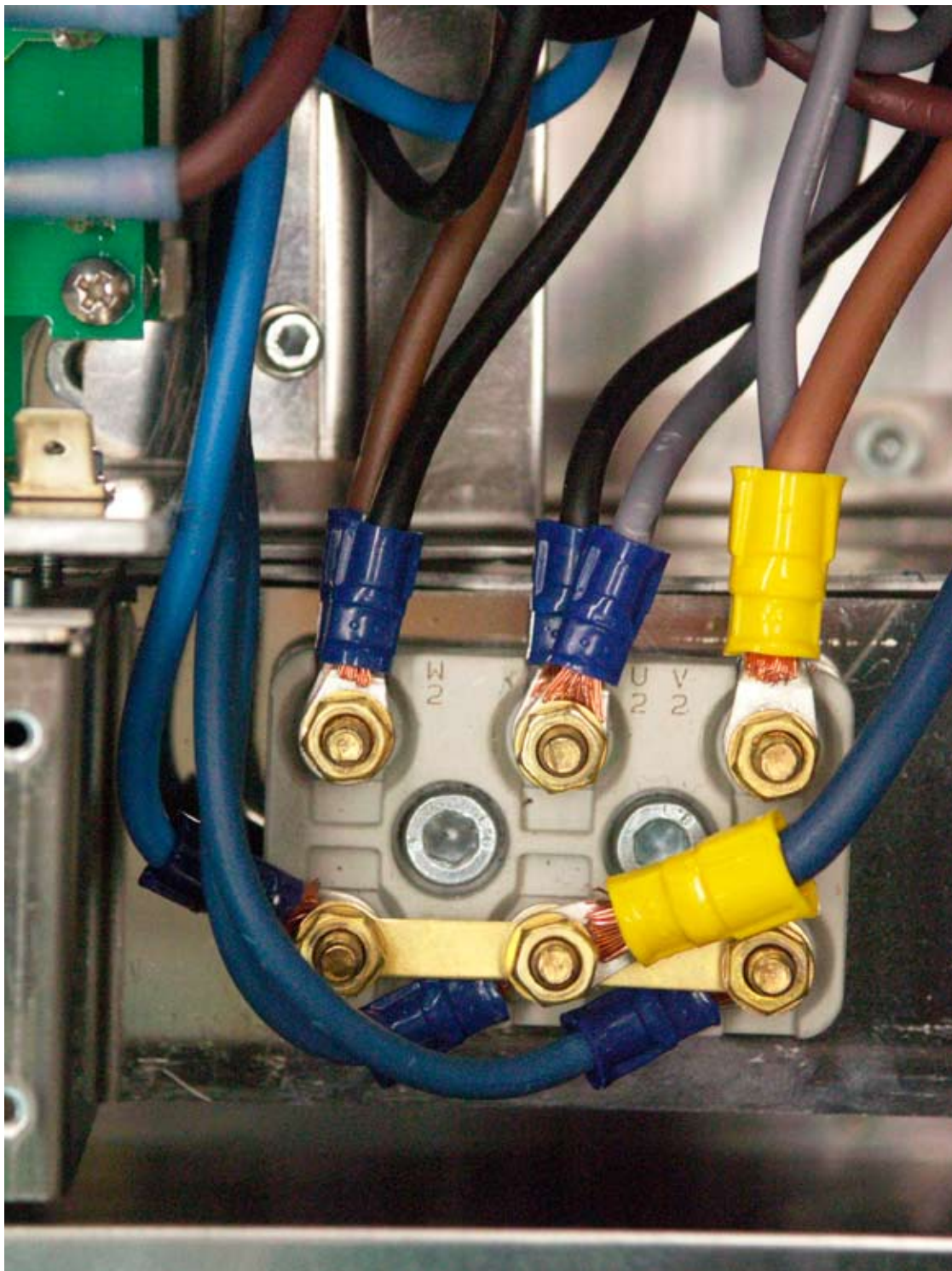
Pin	IN/OUT	FUNZIONE	DESCRIZIONE
1a	OUT1/2/3/4	Common	
2a	OUT1/2/3/4	Common	
3a	OUT1	FAULT (np)	Active when in three or block out a-3dB
4a	OUT2	READY (pp)	No in stop and in stand-by
5a	OUT3	REMOTE (pp)	State console of the machine depends on the key panel High wireless REMOTE
6a	OUT4	TX ON (pp)	Active in on-air Alto in TX ON
7a	IN1	Reserved POWER (pp)	Reserved (For internal testing and validation equipment)
8a	IN 2	TX ON (pp)	With a boost of more than 500 ms it on air machinery. (connect to pin 11b or 12b to give momentum through contact cleaned)
9a	IN3	TX OFF(pp)	With a boost of more than 500 ms puts stand-by machinery. More priority over the previous year. (connect to pin 11b or 12b to give momentum through contact cleaned)
10a	IN4	ALARM RESET(pp)	With a boost of more than 500 ms clears alarms stored and three block out. (connect to pin 11b or 12b to give momentum through contact cleaned)
11a	IN1/2/3/4	Common	
12a	IN1/2/3/4	Common	
1b	OUT/5/6/7/8	Common	
2b	OUT/5/6/7/8	Common	
3b	OUT5	TX OFF (np)	Active in stand-by Alto in TX OFF
4b	OUT 6		Not used
5b	OUT 7		Not used
6b	OUT 8	ETG ON AIR (pp)	Low in Stand-by, three alarm block out and interlock with active
7b	IN5		It generates an alarm that keeps stop the apparatus without requiring reset for the restart. The signal is managed at the level and is instantaneous. (must be connected to pin 12b)
8b	IN 6 --		Not used
9b	IN 7 --		Not used
10b	IN 8 --		Not used
11b	IN/5/6/7/8	VCC	
12b	IN/5/6/7/8	VCC	

pp polarity positive active high; np negative polarity active low;
nc contact normally closed; no contact normally open;

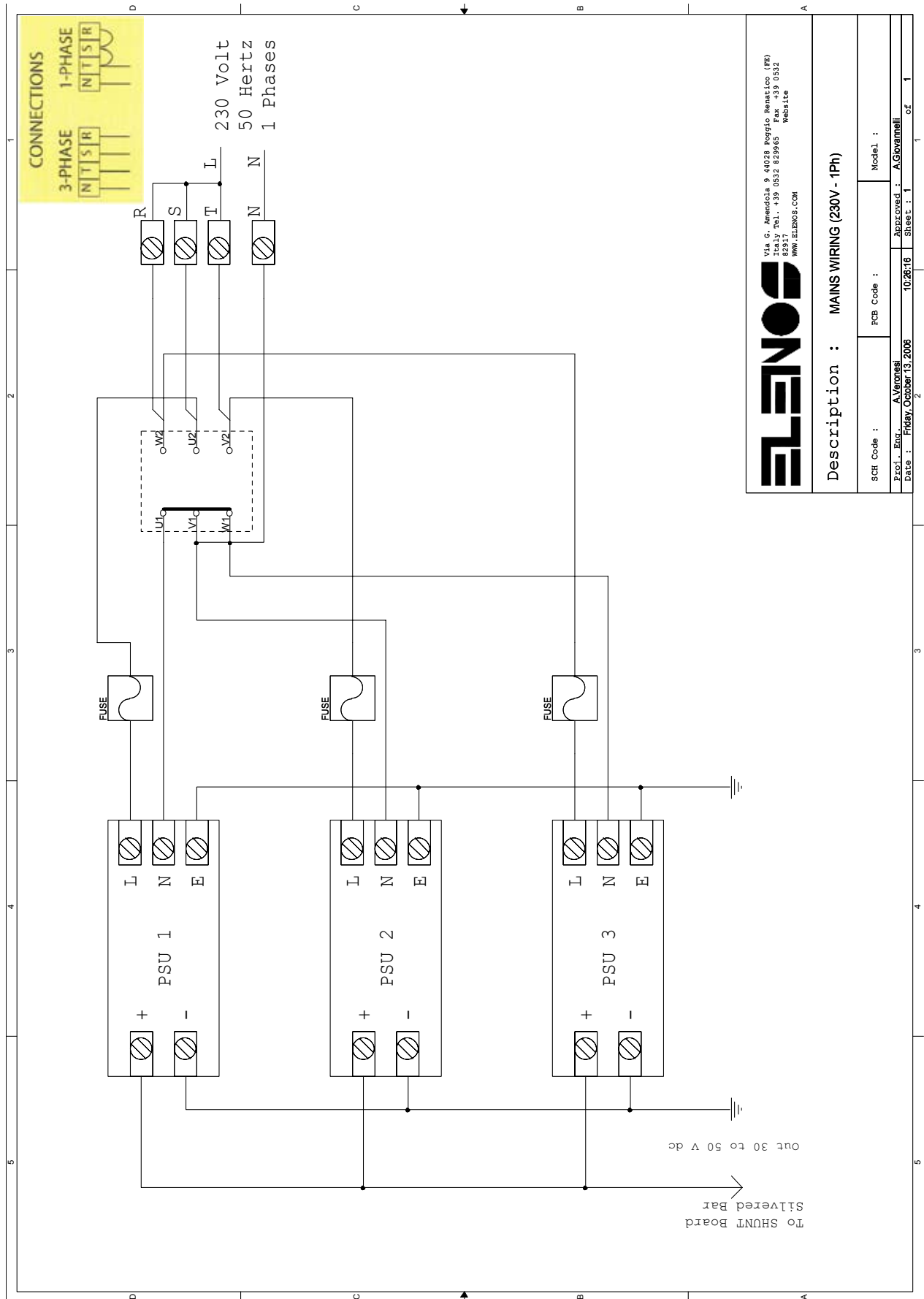
PROCEDURE FOR ASSEMBLY INSTRUCTIONS CHANGEVOLTAGE

To use the equipment E3500 E2000T with 3Ph voltage of 400V or 230V 3Ph (other than the standard Italian 230V - 1Ph - 50Hz) should prepare for the entry of food machine as described below:

POWER SUPPLY 230V – 1Ph



ELECTRICAL SCHEMATIC POWER SUPPLY 230V – 1Ph



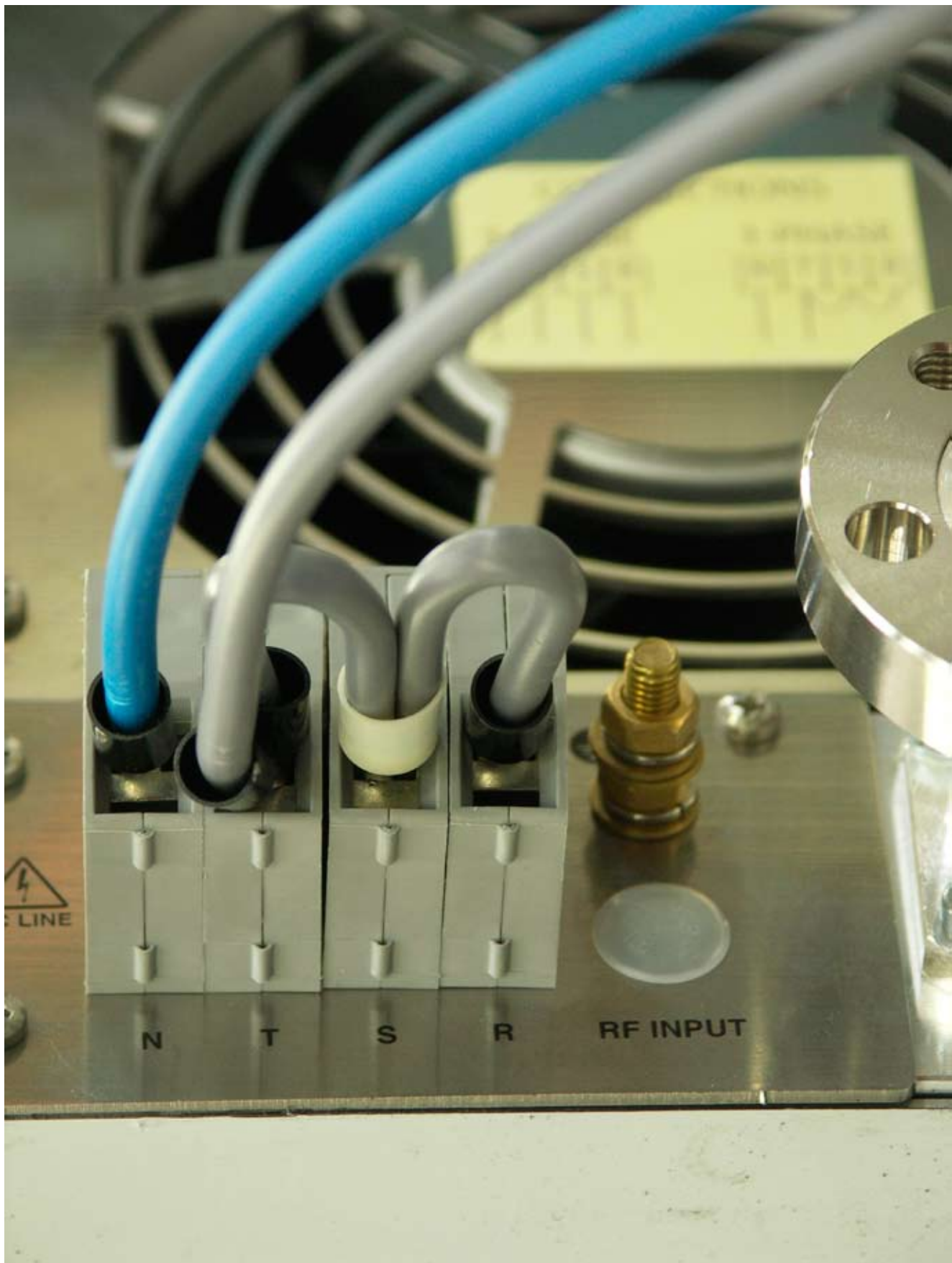
ELENOS

Via G. Amendola 9 44028 Foglio Benatico (FD)
 P.le. Libertà 10 43010 F. S. 0532
 83317 Tel. +39 0532 829965 WebSite
 WWW.ELENOS.COM

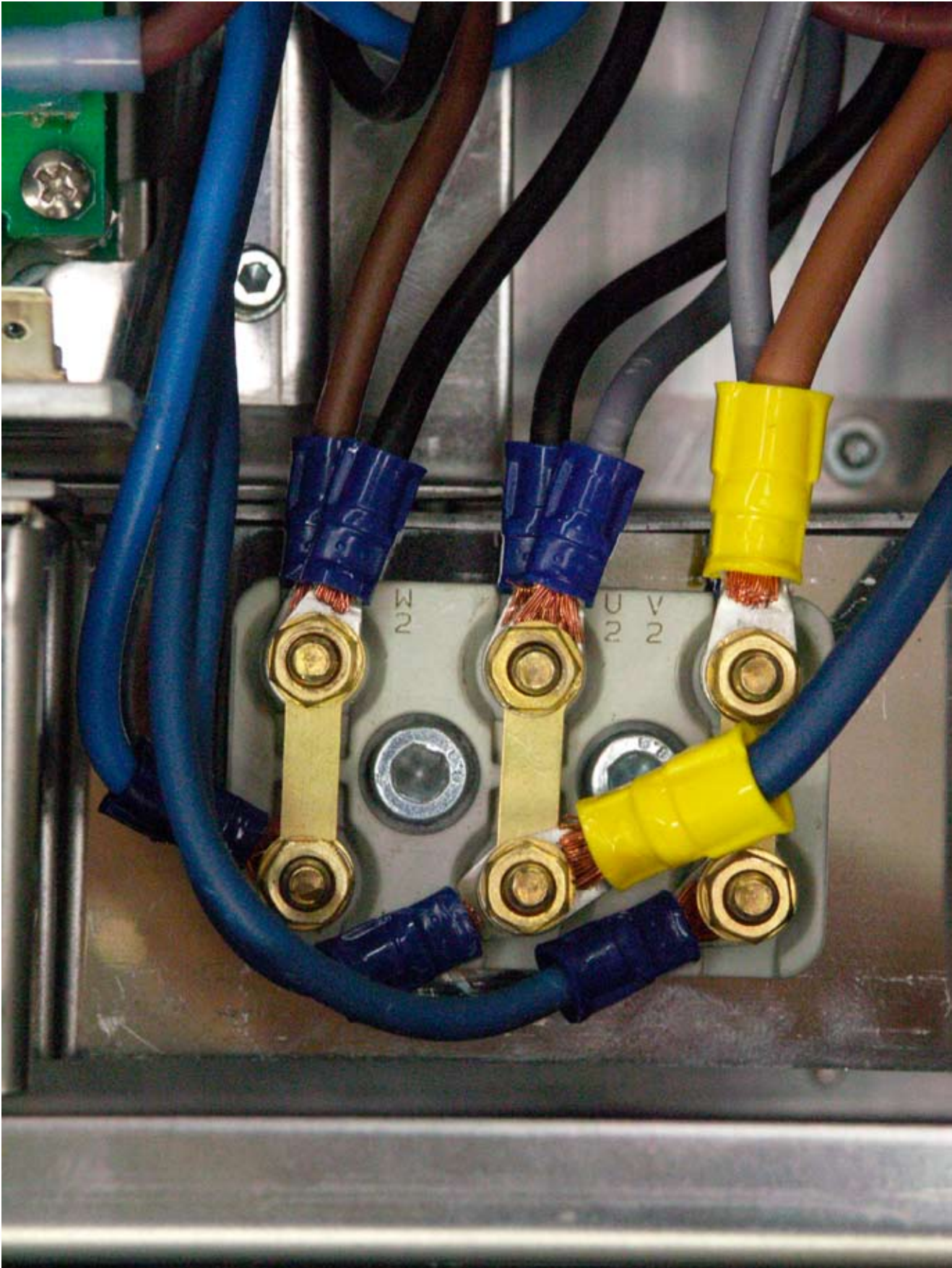
Description : MAINS WIRING (230V - 1Ph)

SCH Code :	PCB Code :	Model :
Proj. Eng. : A.Veronesi	Approved : A.Giovannelli	
Date : Friday, October 19, 2006	10/28/16	Sheet : 1 of 1

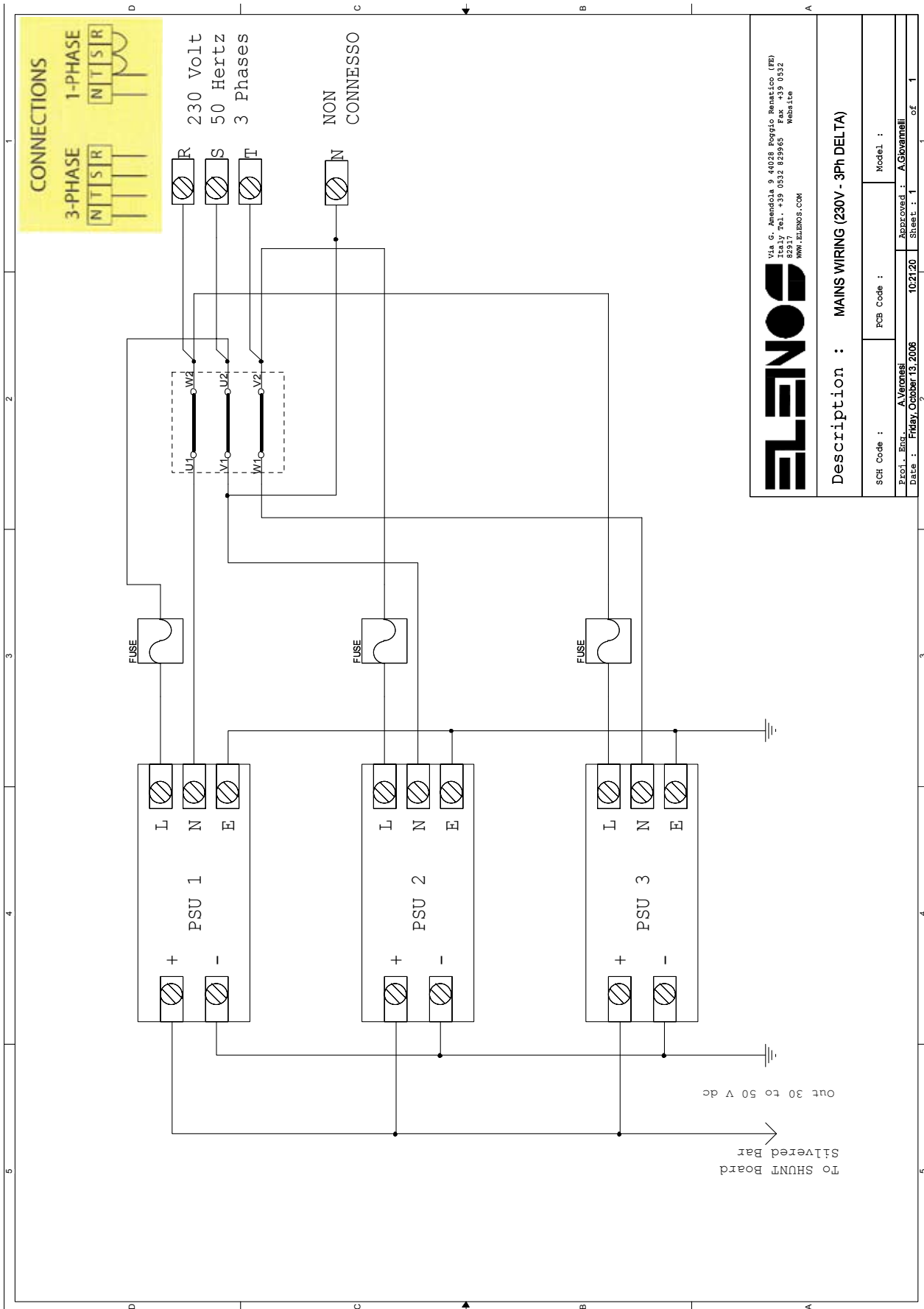
REAR PANEL POWER SUPPLY 230V – 1Ph



CONNECTION TO TRIANGLE POWER SUPPLY 230V – 3Ph



ELECTRICAL SCHEMATIC POWER SUPPLY 230V – 3Ph



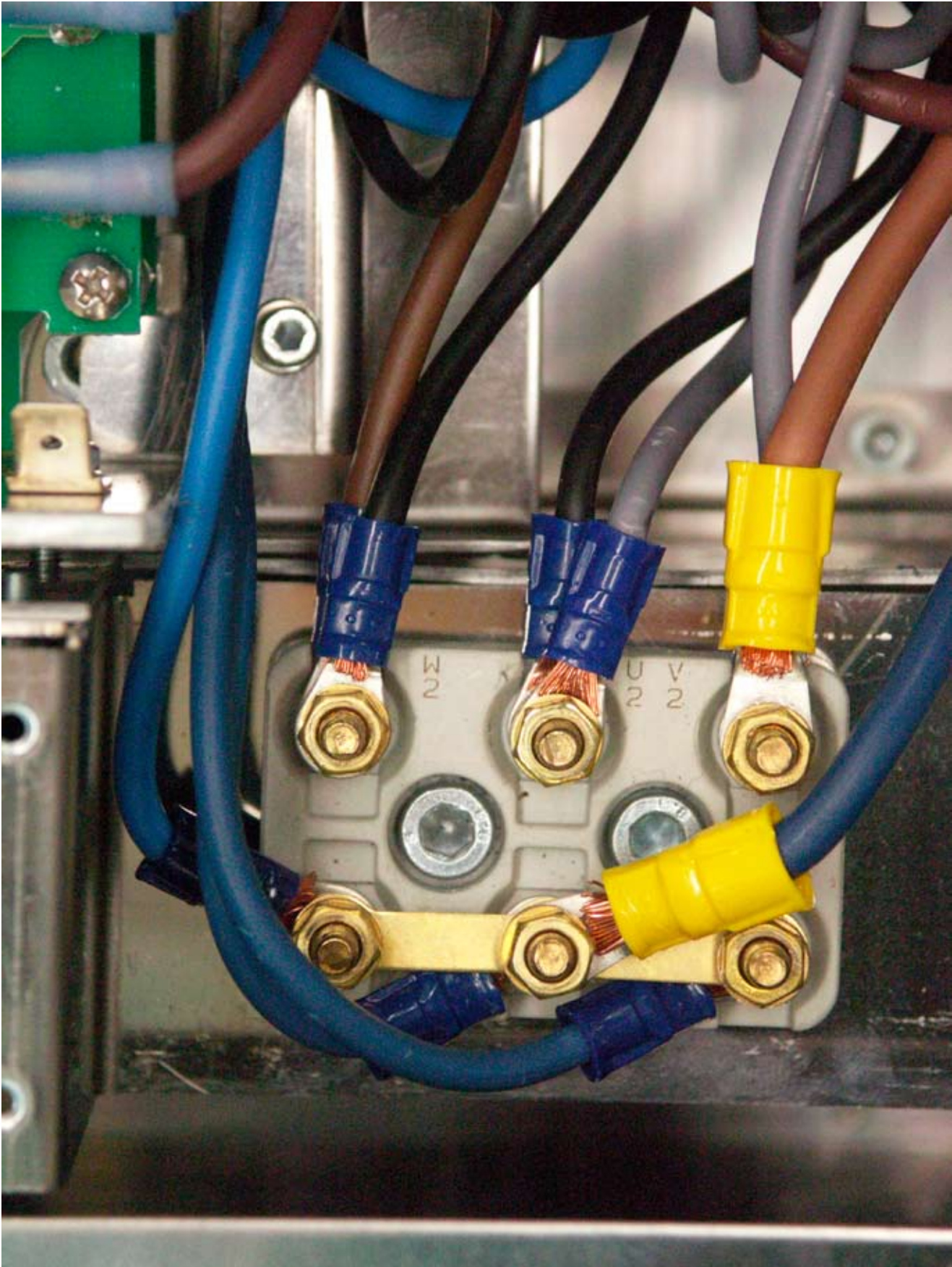
ELENOS

Via G. Amendola 9 40028 Bolognina, Benettonico (FB)
Italy Tel. +39 0532 829965 Fax +39 0532 82917
WWW.ELENOS.COM Website

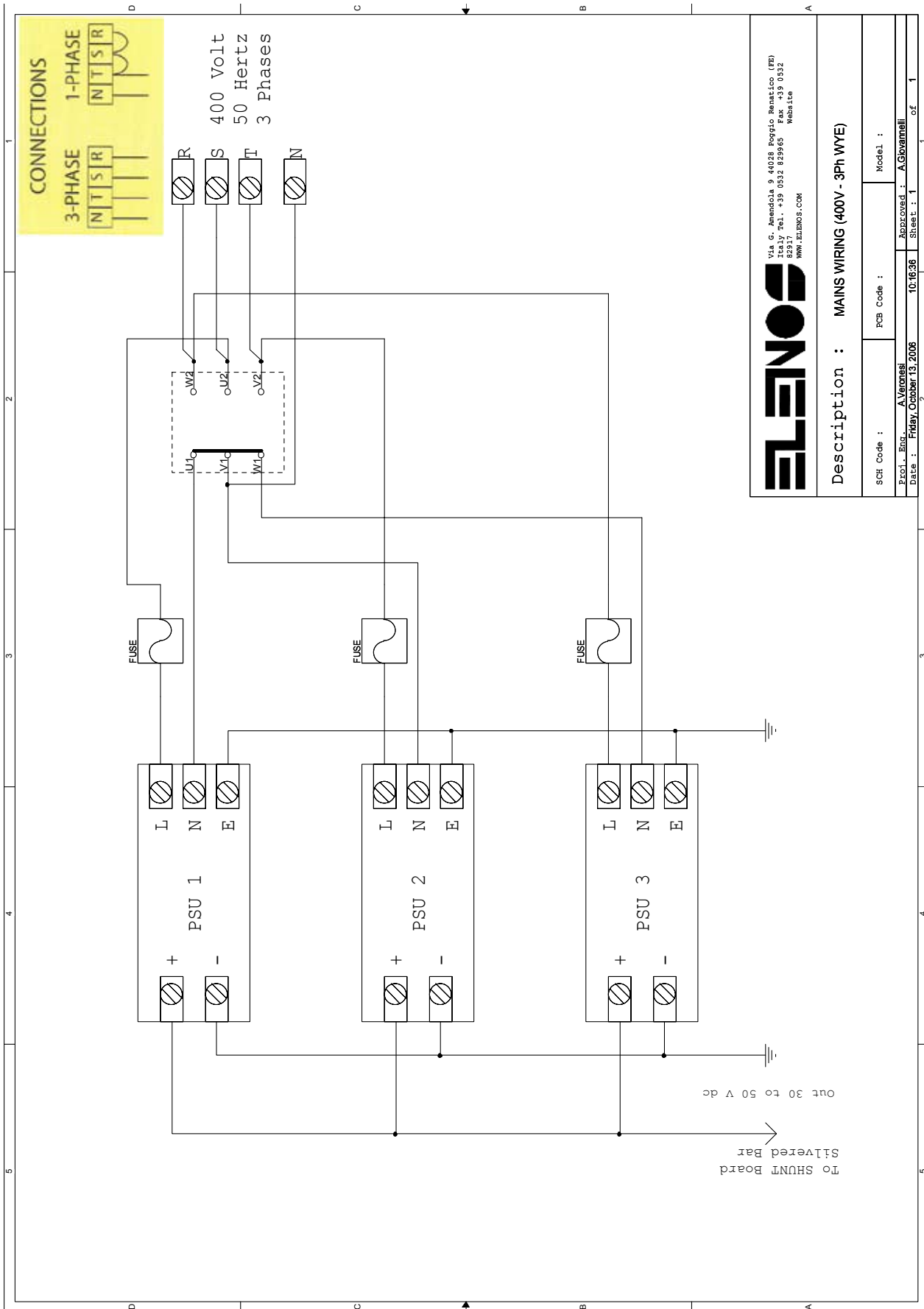
Description : MAINS WIRING (230V - 3Ph DELTA)

SCH Code :	PCB Code :	Model :
Proj. Eng. : A. Venturi	Approved : A. Giavattelli	
Date : Friday, October 15, 2008	10/21/20	Sheet : 1 of 1

CONNECTION TO STAR POWER SUPPLY 400V – 3Ph



ELECTRICAL SCHEMATIC POWER SUPPLY 400V – 3Ph



Via G. Amendola 9 40028 Bolognina, Benetton (FE)
Italy Tel. +39 0532 829965 Fax +39 0532 82917
WWW.ELENOS.COM Website

Description : MAINS WIRING (400V - 3Ph WYE)

SCH Code :	PCB Code :	Model :
Proj. Eng. : A. Venturi	Approved : A. Giavattelli	
Date : Friday, October 13, 2006	10:16:36	Sheet : 1 of 1

REAR PANEL POWER SUPPLY 400V – 3Ph

TESTING AND CALIBRATION

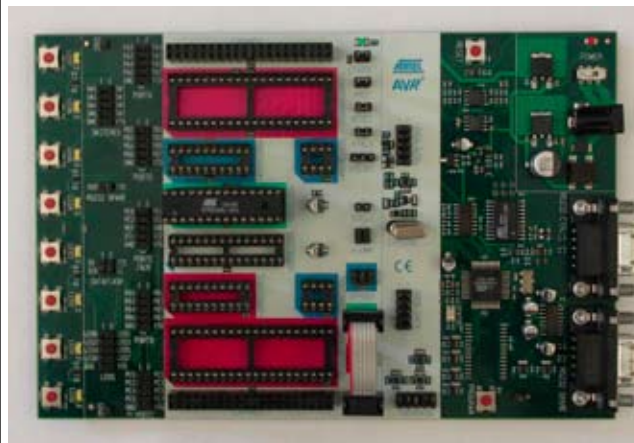
Testing procedure for E3500

The following procedure applies to the whole assembly completed only after having checked through careful visual inspection that there are no errors mounting mechanical (example loose bolts) or wiring, possible shorts and anything could undermine the proper functioning the machine. We must also verify that the feeders there is the maximum allowed space to allow a cooling optimal.

If needed them away with each other. With the machine still not connected to the electricity grid, remove the panels closing higher, lower and lateral (side houses where the card CPU)

1) Programming the microprocessor ATmega8 SHUNTS board

N.B. In this document refers, as device programming, card development Atmel AVR mod. STK500 represented here by side. The use of other devices programming is allowed.



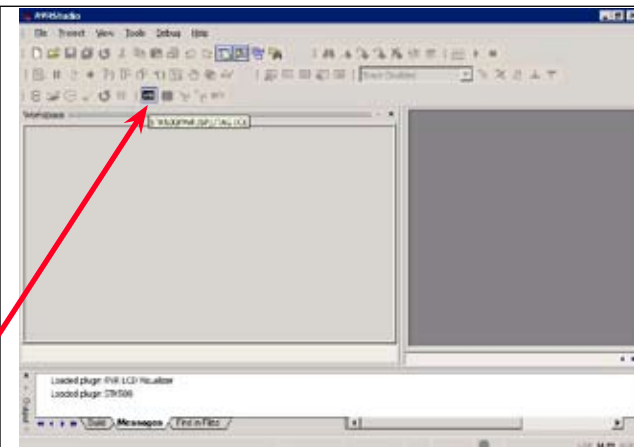
Before proceeding must have:

- 1) linked appropriately to P.C. STK500 the card, configured as provided by the manufacturer's manual depending on the device to be programmed
 - 2) installed its management software provided by AVR
- Is should also have obtained the files of the software to program

If present, remove the chip to SHUNTS board otherwise obtain one by another means and introduce it into the socket adapter STK500 for programming.

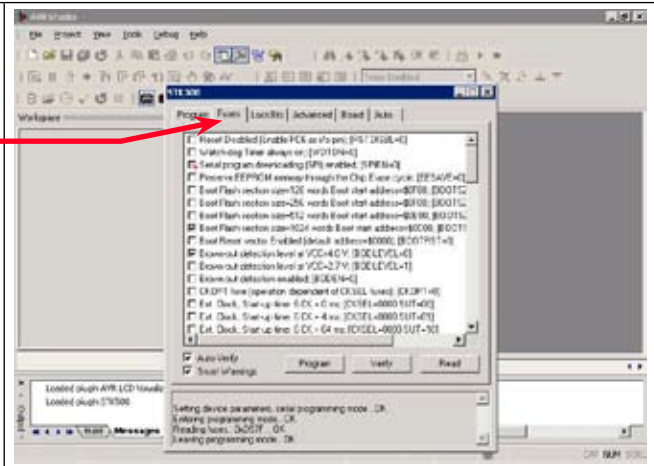
Turn on the board STK500

Start the program AVRStudio.exe and select the icon "AVR" as shown by side



Open the submenu “Fuses” and verify that the options selected to match those images guide. In particolare devono essere attive solo:

Boot Flash section size=1024 words Boot start address=\$0C00; [BO..
Brown-out detection level al VCC=4.0 V; [BODLEVEL=0]

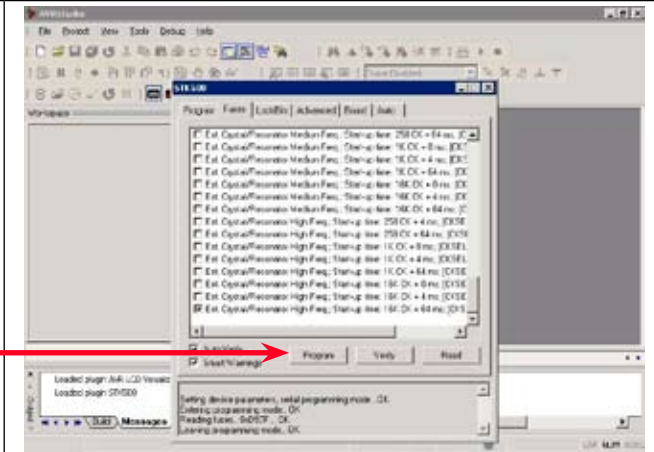


Ext. Crystal/Resonator High Freq.;Start-up time: 16K CK + 64 ms; [C..

They must also be active the general options:

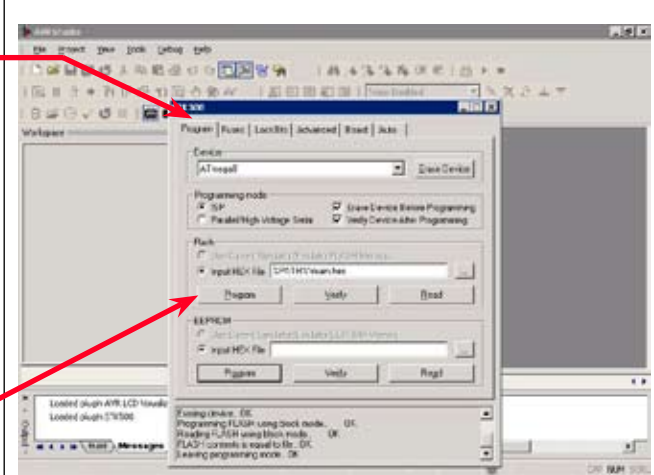
- Auto Verify
- Smart Warnings

After clicking on “Program” to save the chosen options



- 1) Open the submenu “Program”
- 2) In the “Device” select the device to be programmed (ATmega8)
- 3) Under the heading “Programming mode” select options as shown
- 4) In the “Flash” select “Input HEX File” then introduce path and file name to download in the memory device
- 5) Not consider the box “EEPROM”

After clicking on “Program” to start the planning and waiting for the completion




Verify that the comments that appear at the bottom of the window programming positively confirm the results of operations, after which you can turn off the STK500 board, remove the chip from the socket programming, insert in the SHUNTS board

2) Configuration of SWITCHES on the SHUNTS board

Arrange the SWITCHES present on the SHUNTS board, as specified in the following table

Number SWITCH	State
1	OFF
2	OFF
3	OFF
4	ON



3) Configuration JUMPERS on the CPU board

Arrange the JUMPERS on the CPU board as specified in the following table

Number JUMPER	Knight Position
JP 1	1-2
JP 2	OPEN
JP 3	OPEN
JP 4	1-2
JP 5	2-3
JP 6	CLOSE (only if the board is mounted on the machine)
JP 7	OPEN
JP 8	OPEN
JP 9	1-2
JP 10	2-3
JP 11	OPEN
JP 12	OPEN
JP 13	1-2
JP 14	2-3
JP 15	1-2
JP 16	2-3
JP 17	OPEN
JP 18	OPEN
JP 19	OPEN
JP 20	OPEN
JP 21	1-2
JP 22	2-3
JP 23	1-2
JP 24	2-3
JP 25	1-2
JP 26	OPEN
JP 27	OPEN
SW 1	outwards board

4) Configuration of SWITCHES on the power supplies

View of switching power supply

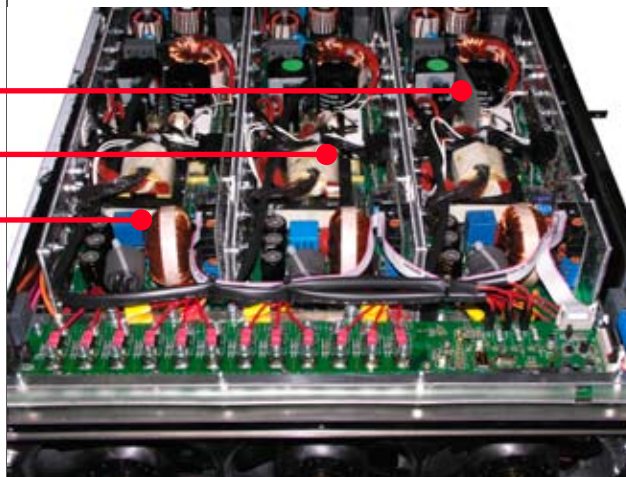


View of SWITCHES configuration



Arrange of power supplies on the machine

3
2
1



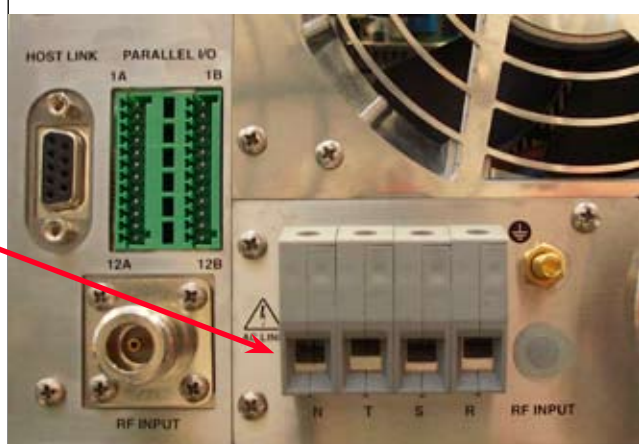
Arrange the SWITCHES present on power supplies as specified in the following tables

Number DX SWITCH	Power Supply 1	Power Supply 2	Power Supply 3
1	ON	OFF	ON
2	OFF	ON	ON
3	OFF	OFF	OFF
4	OFF	OFF	OFF

Number SX SWITCH	Power Supply 1	Power Supply 2	Power Supply 3
1	OFF	OFF	OFF
2	OFF	OFF	OFF
3	OFF	OFF	OFF
4	OFF	OFF	OFF

5) Connection to the electricity grid, the first ignition of the machine, programming CPU

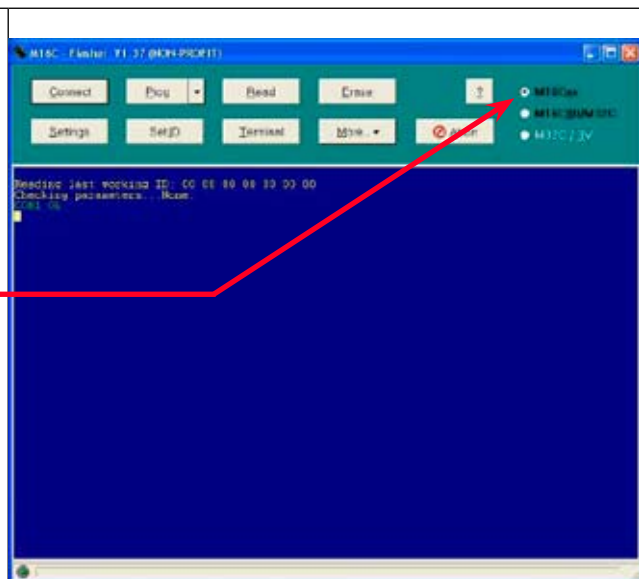
Make sure you have taken all precautions to work safely. With electrical panel disabled and / or switchgears open connect to terminal block on the back of the machine conductors liner respecting the planned configuration (single, triangle or Δ star Y)



Fuelling machine and connect the serial port communications (interface) to the PC which was previously installed software update (M16C - Flasher)

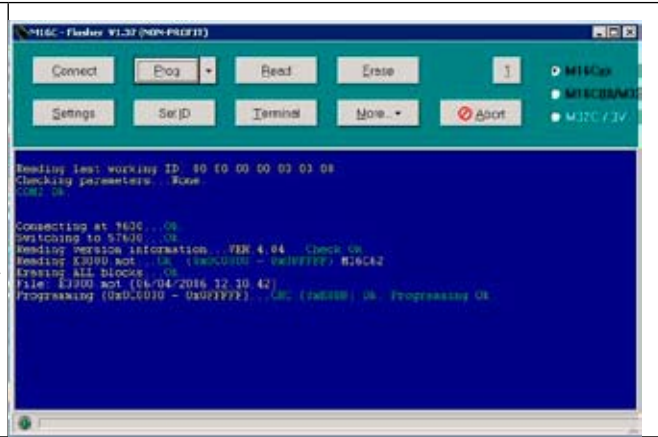


Start the program M16CFlasher.exe (M16C - Flasher) and select, if necessary, the option figure. The configuration of parameters connection must be already been made following the appropriate procedure



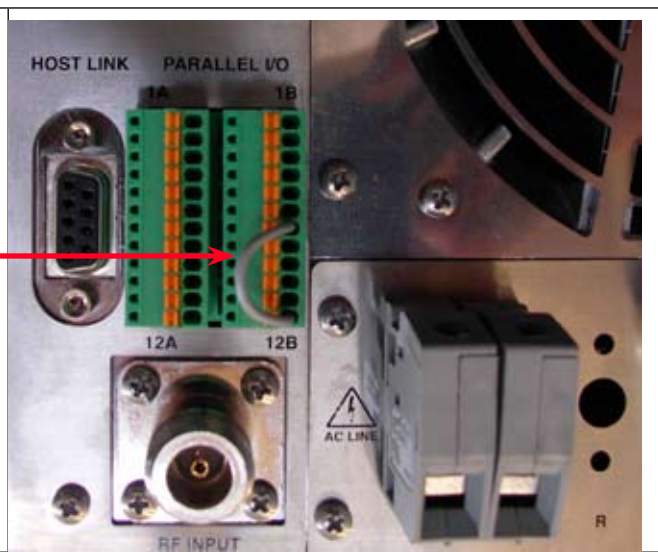
<p>Acting on programming switch located immediately behind the grid as shown by moving the lever in position "Program Mode" (downward). To help do this with a thin wire or metal disk with a pin</p>	
<p>Click the button "Prog" and make sure that the screen corresponds to that of the figure guide. If an error message must verify the connection machine-PC and verify the parameters of connection</p>	
<p>As soon as the link between machine and P.C. it was established should be inserted path and file name with which to program the flash memory of the microprocessor. Click on "Open" or press ENTER to start planning</p>	

Wait until the end of programming. After verifying that the operation is successful. In case of failure shut down the machine, close the program, wait a few seconds, repeat the above steps related to programming. In case of success turn off the machine, close the program, reposition the switch under the grid on "Run Mode"



6) Calibration tensions reference CPU board

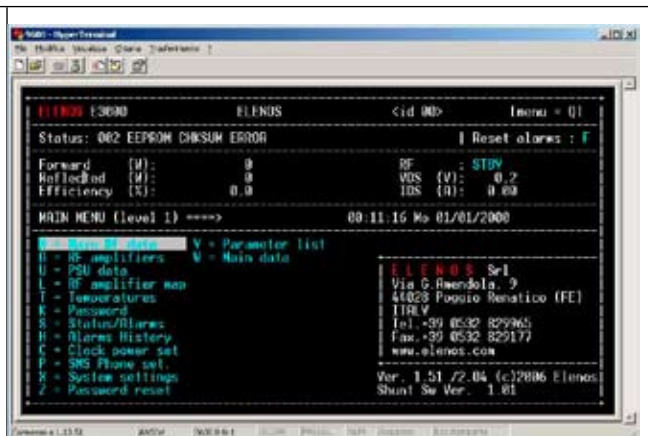
On the back of the machine prepare the bridge for service line INTERLOCK connecting with each other terminals 7B and 12B (connector PARALLEL I / O right).
On the front panel switch to place the key to "REMOTE"



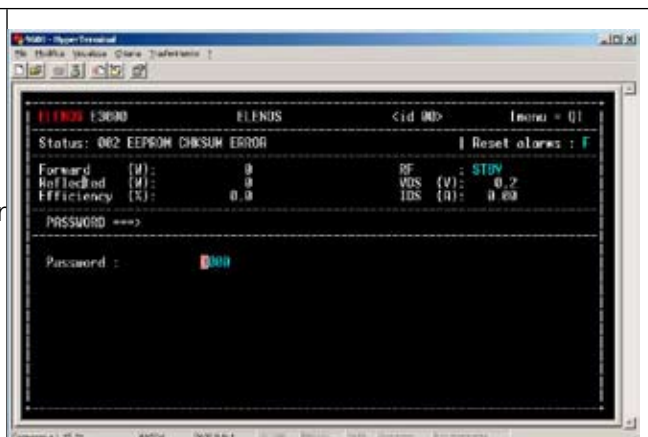
Turn the machine, make sure that appear on the LCD:
ELENOS DD / MM / YY HH: MM
REMOTED (SWITCH KEY)
Starting the session Hyper Terminal operations dedicated to testing the machine. If you are making for the first time and the session is not refer to the procedure for creation of the session testing requirements Hyper Terminal



Press on the keyboard, P.C. the button "1" (one). On the video must appear screen represented from the guide. If it does not ensure that the serial communication between the machine and the PC is correct (communication parameters). If the image has a background irregular or is not completely legible, press "Q" to get the refresh of the Main Menu



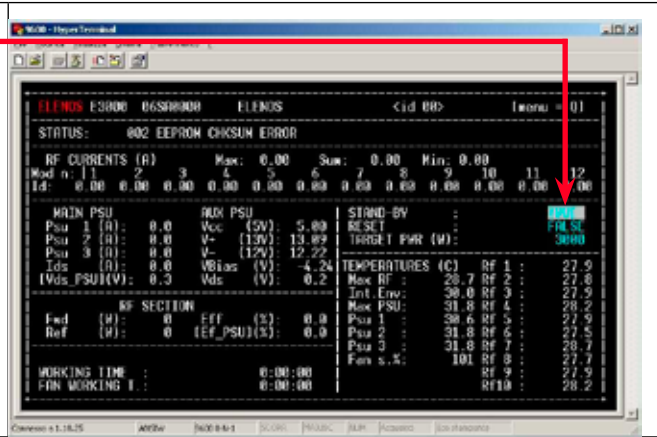
Press on the keyboard, P.C. the key "K" to enter the password, then press the button "ENTER" to select the first of four numeric fields. With the keys "Arrow-On" and "Arrow-Down" select the digit "3", press "ENTER" so that the total number is "3500". Return to Main Menu by pressing the button "Q"



This time, a greater number of options in the Main Menu compared with the first to introduce the password. Move with the keys "Arrow" bar evidenziatrice over the "W" directly or press the corresponding button

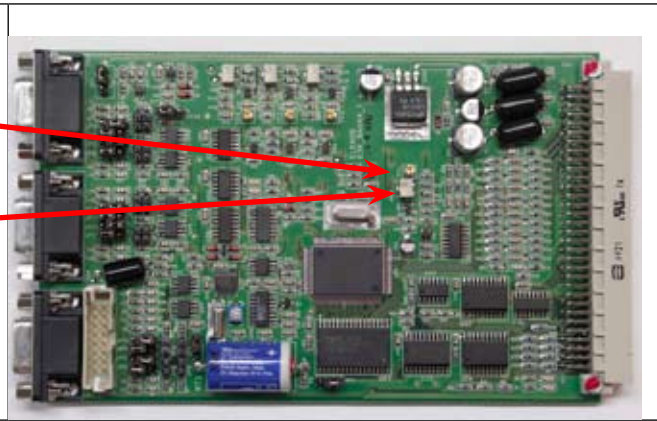


Machinery must be STAND-BY: Verify the tensions that must be present in this state and the various temperatures (all similar to that environment), press "Q" to return to the Main Menu and select with the bar or by pressing the option: "X - System settings"



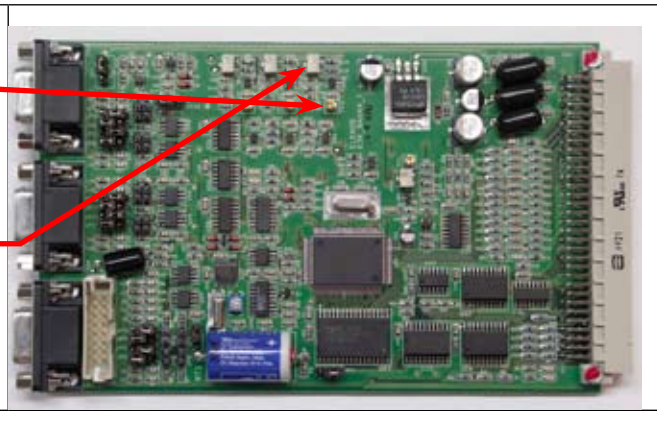
Connect a four-digit voltmeter with the tip negative frame of the machine and positive on Test Point number 1 (TP1)

Working trimmer RV1 to read up on the instrument a voltage of 4095 volts

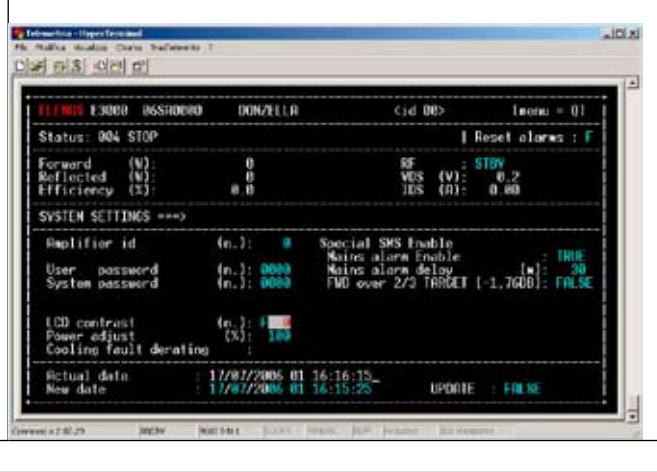


Bring with the positive tip on TP2

Acting on RV2 up to read on the instrument a voltage of 0780 volts



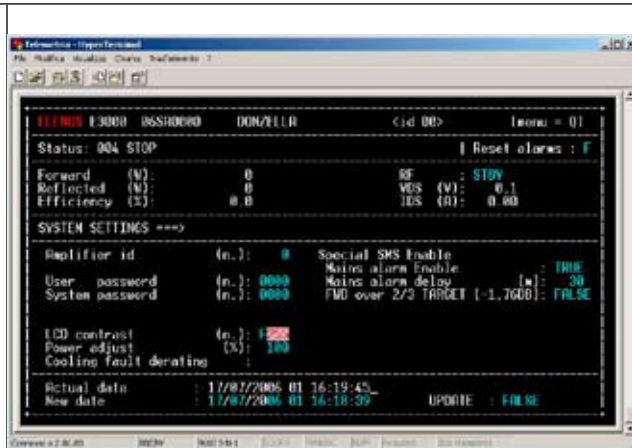
Select the field "LCD contrast" and lead to zero the numerical value



Acting on RV3 until the characters of LCD machine become completely blacks (stop with RV3 shortly after the threshold)



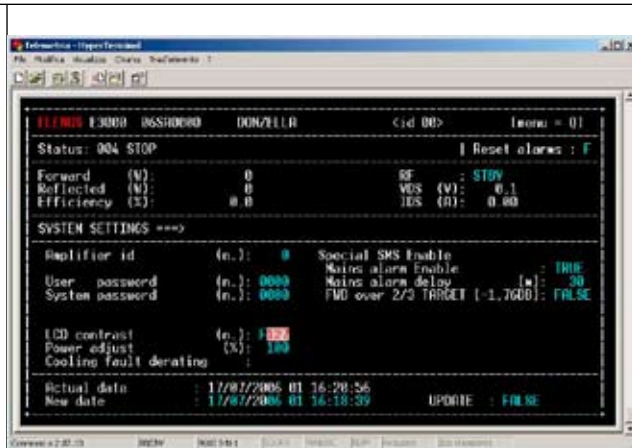
Bring the value of "LCD contrast" to 255



Acting on RV4 until the characters of LCD machine disappear completely (stop with RV4 shortly after the threshold)



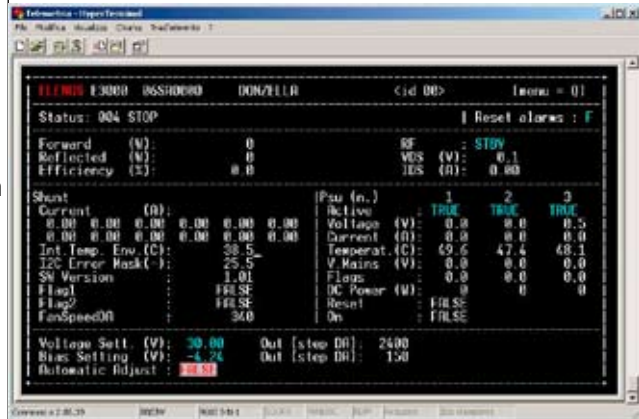
At the end of calibration card CPU lead the field "LCD contrast" to 127 then hit the "Q" to return to the Main Menu



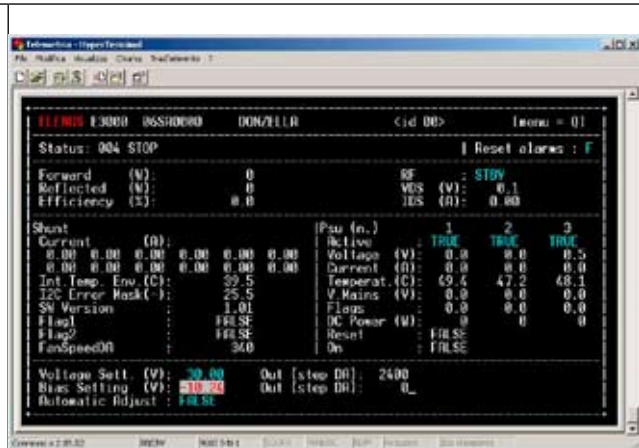
7) The calibration of polarisation voltage module MOSFET (Biasing)

Connect the output RF machine load testing, open the bridge on the back of the machine between the terminals 7B and 12B and connect these terminals to circuit INTERLOCK (circuit safety) load testing (Contact pure), connect I ' RF output RF dell'excitatore to the machine. NOT turn the exciter for the moment. The machine must continue to remain in the state of STAND-BY

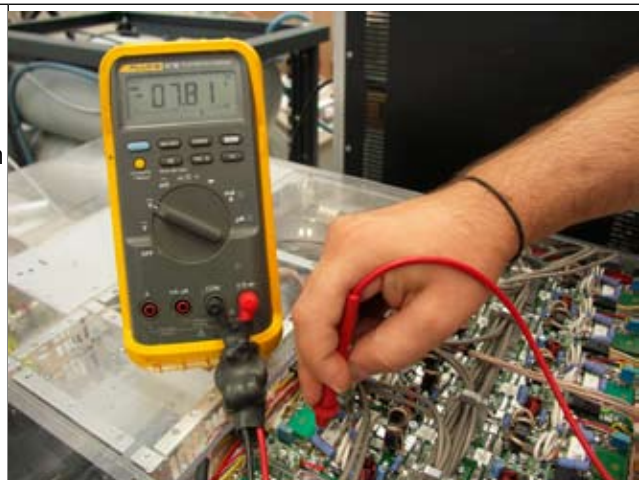
Choose the option "Shunt / PSU detail" to get the screen as in Figure guide. Prepare the machine operations manual selecting "FALSE" in the field on the "Automatic Adjust"



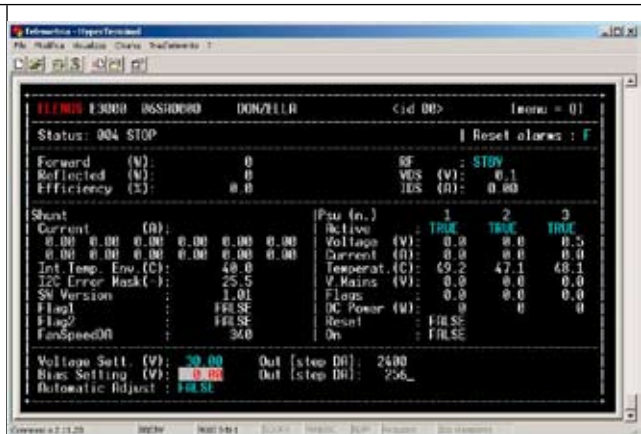
Place the selection bar on the ground "Bias Setting", activate the field and bring the value shown on -10.24



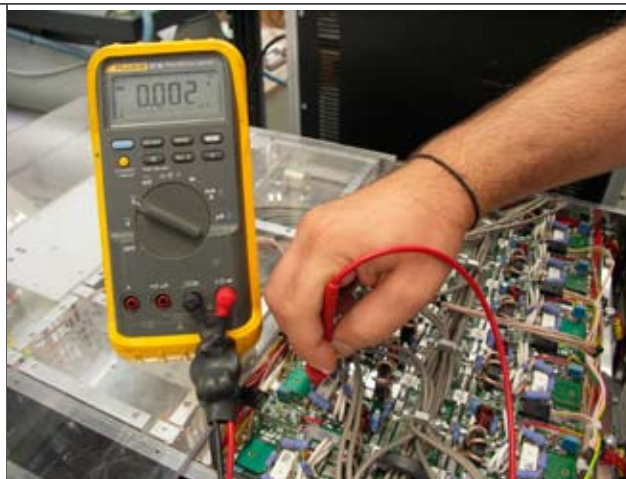
Connect the same voltmeter used previously with the tip negative frame of the machine and that the positive terminal of each MOSFET Gate and verify that the value of tension read is around -7.5 / -7.8 Volt



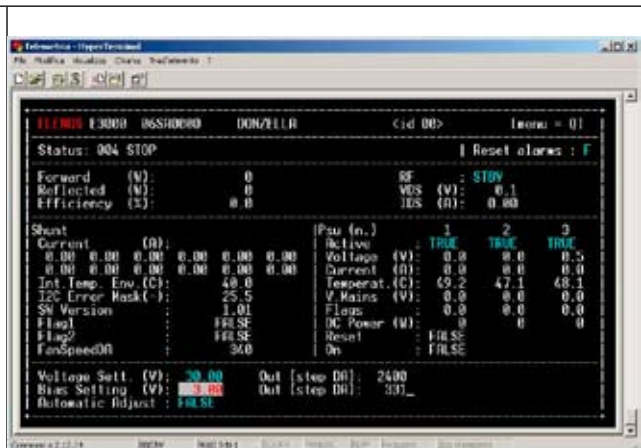
Also acting on the ground previous bring the value to 0.00



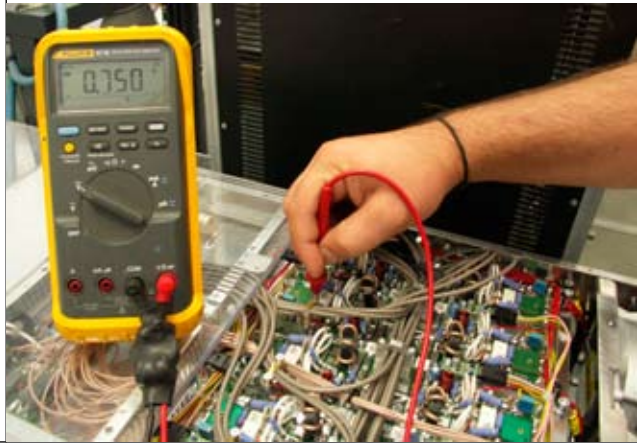
As always, check that the value of tension is 0 Volt (more or less some millivolt)



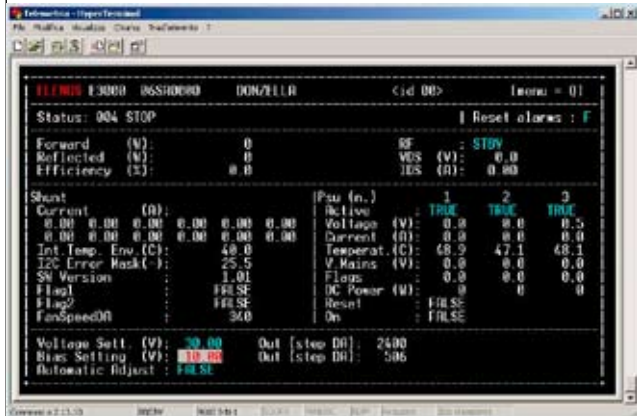
Still acting on the ground previous bring the value to 3.00



As always, check that the value of tension is close to 0.7 / 0.75 Volts



Further action on the same field to bring the value to 10.00

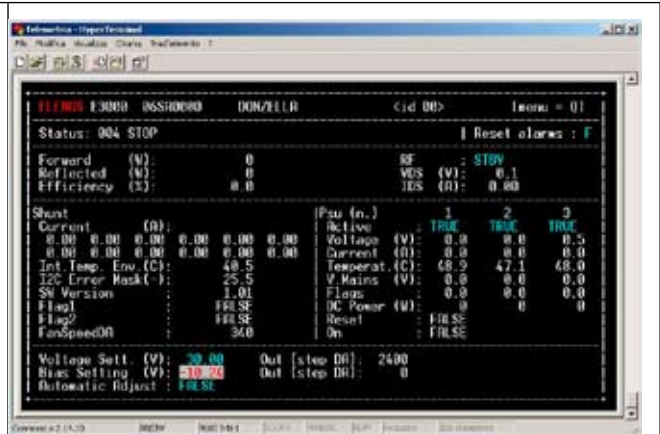


At this point we must calibrate the polarization trimmer (Bias) each module to read up on the instrument the value of tension corresponding to the letter imprinted on the MOSFET as follows:

Letter	Volt	Letter	Volt
J	2,2	M	2,4
K	2,3	N	2,5
L	2,35	O	2,6

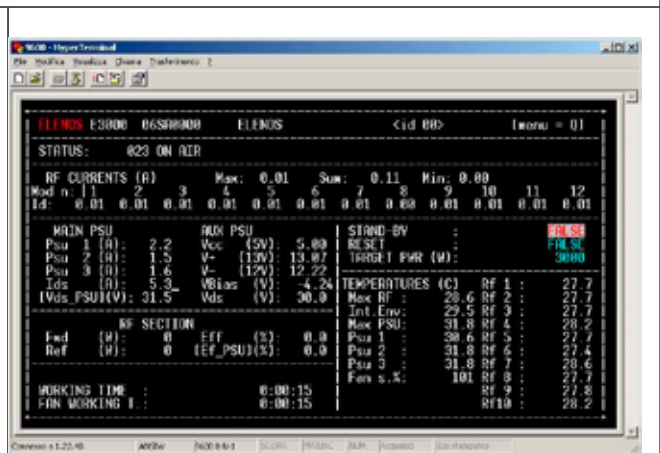


Bring back the value of tension to a minimum (-10.24) then press "Q" to return to the Main Menu and select with the bar evidenziatrice the "W" directly or press the corresponding button



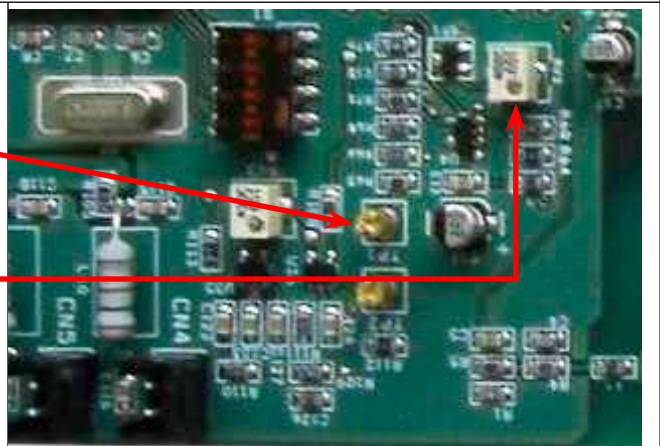
8) Calibration tensions reference SHUNTS board

Putting the machine in motion by removing the condition STAND-BY. To do this press "ENTER" to select the "TRUE", bring the condition to "false" through the "Arrow-Down." The fans of the machine will begin to turn. Verify that the fan speeds to fall to 60%, possibly wait before proceeding with the next step



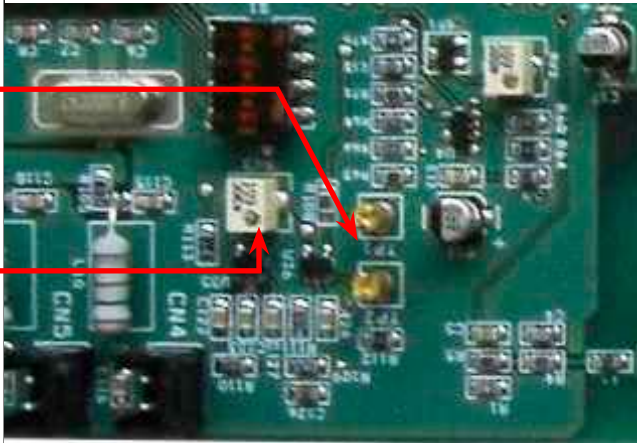
Connect the same voltmeter used previously with the tip negative frame of the machine and positive on Test Point number 1 (TP1)

Working trimmer RV2 up to read on the instrument a voltage of 4095 volts



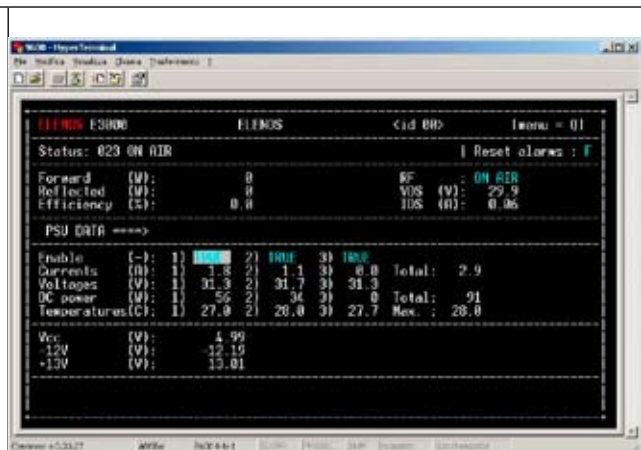
Portarsi with the positive tip on TP2

Acting on RV3 up to read on the instrument a voltage of 4.8 volts



9) Termination vain power supplies

Press the button "Q" to return to the Main Menu and then choose the option "U - PSU date."
Verify that all the tensions of ballasts are worth around 30 Volt



Return to Main Menu by pressing the button "Q", put the machine in STAND-BY selecting "TRUE" sull'apposita option. A car stops remove tension by opening the frame of food and / or switches. Cover feeders with transparent insulating sheet, apply stickers of danger, close the compartment with special panel removed the start of testing.

10) Testing of the machinery in power

If for closing the shaft feeders were due eliminate connections with other devices tested before proceeding to restore the conditions set out in paragraph 7); also provide protection transparent above modules (RF compartment).

Food only car leaving the exciter for the time off. Ricollegarsi the machine with Hyper Terminal pressing the button "1" (as seen above) and repeat the sequence for the introduction of passwords, then return to the Main Menu and put the car in running order again putting "FALSE" the field STAND - BY then re-set "Bias Setting" value -10.24 (Main Menu then option "Shunt / PSU detail").

At this point turn the exciter (making sure that we do not absolutely delivers power), to prepare for its frequency of work centre banda (98 MHz), increase the output value of up to 90 watts is monitoring the behaviour dell'E3500 the value Power reflected sull'eccitatore. If this power reflected should exceed 10 or 12 Watt, decrease the power all'E3500 up to bring this power reflected at about 8 or 9 Watt, the value of 90 watts will be reached later.

Start slowly increase the value "Bias Setting" controlling currents absorbed by all the modules and controlling the power output dall'E3500 on Wattmetro external connected to the load testing.

During this growth of power may be differences in the values of current absorbed by the modules up to 4 Amp. These discrepancies in the currents are acceptable as long as the "Bias Setting" remains below the 3.00 value. If increasing the value currents begin to equalizzarsi then you can continue to increase to 10.20, otherwise we must investigate the causes that produce excessive imbalance between the currents of the modules. If not done previously is now possible to achieve the 90 watts of power excitation.

When the "Bias Setting" has reached the value of 10.20 the power of the machine (on Wattmetro external) is not yet a 3.5 KW for which you should start to grow very slowly even the value "Voltage Setting" noting however that the Current now not differ among themselves for more than 1.5 Amp and still remain below the maximum value of 10.23 A.



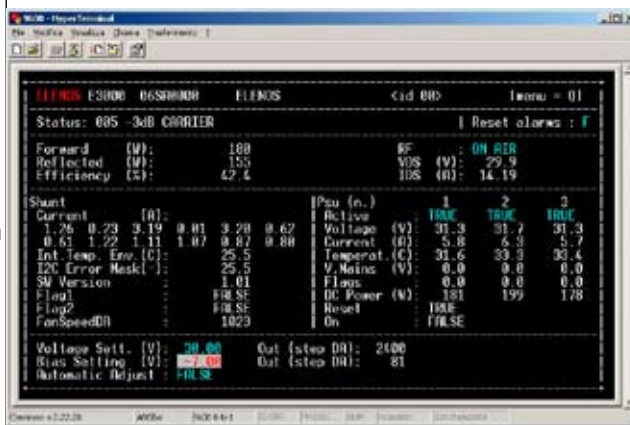
If you can not reach the 3.5 KW of power output while maintaining the current values within the limits necessary to suspend testing at this point investigating more thoroughly the causes (for example, the impedance mismatch between the modules) that hinder the achievement of Standard operating the machine.

If it was possible to achieve nominal power of 3.5 KW measured with the external Wattmetro then you can proceed to the calibration of power measured by the head of reading internal to the machine itself. The figure reported in the picture must correspond to that of a tool outside



Include "Voltage Sept." To a minimum (30.00), return to a minimum "Bias Setting" (-10.24), put the exciter in the state of "RF OFF" without changing the settings of power previously prepared. With the machine always in a position to march sure that this is NOT output power (the modules must absorb a current close to zero) and only now preparing the short antenna, calling the exciter in "RF ON" not looking after in this case of possible high value of power to it reflected, this because the following passage has a limited duration in time.

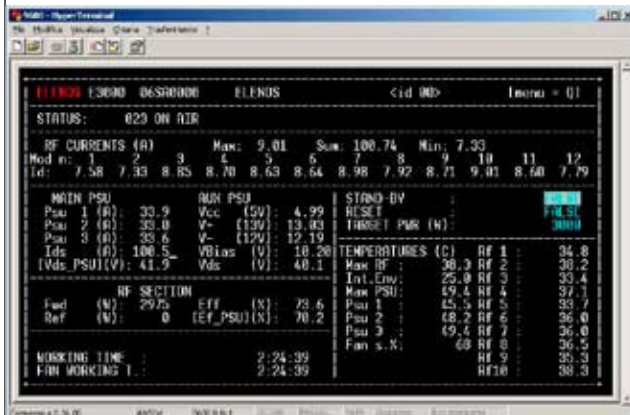
Increase very slowly yet the "Bias Setting", checking that the values of power (Forward) and reflected (Reflected) are equal or differ slightly, until you reach the value of 160 / 170 Watt. Stop as soon as they reached that value indifferently from "Forward" or "Reflected". Acting on adjusting head reading so as to match the two values. If it is "Forward" to be less than "Reflected" after uguagliato values go back again with "Bias Setting" to achieve 160 / 170 Watt and further verify that the two values are equal. If necessary repeat the calibration on the head reading



Turn off the exciter retaining the settings, put STAND BY machine, remove the short antenna finally lead again to "TRUE" the condition in the "Automatic Adjust"

11) Latest verification operations and calibration

Putting the machine back in running order and reactivate the exciter with the same terms as used previously. Return to Main Menu (key "Q") and select the "W". Check again that all current forms are to the full extent of 1.5 Amp difference from each other. Annotarsi possibly modules which do not meet the required conditions



Acting on exciter, repeat this last test for the following frequencies:

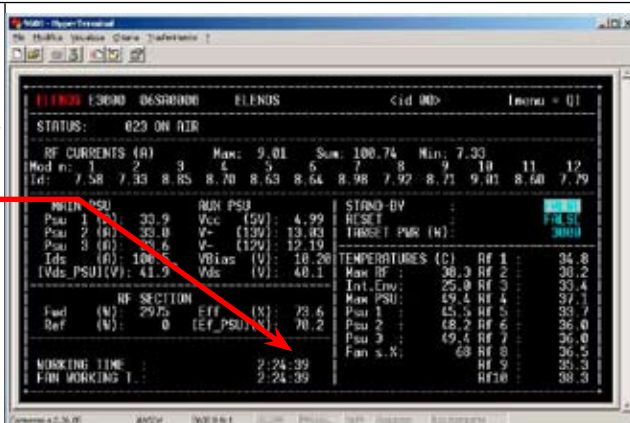
87.50 to 93.00 - 98.00 to 103.00 - 108.00 MHz


annotandosi always forms showing abnormalities absorption power supply.

At this point, the correction of anomalies described above can not follow a pattern unique but is an official from the experience of those who carry out testing of the machine. In principle, however, what action to play on the modules that are abnormal absorption (previously recorded) are on the condenser input on planar transformer, the resistor in parallel to the two terminal gate of MOSFET and possibly the coil to "U" parallel to the two terminals drain always MOSFET

Assuming that they managed to equalize the best currents of the modules must now verify that the performance of the machine is not lower than 70%.

Such action shall be taken for five frequencies soppraccitate.



<p>If the performance does not reach the standard value is needed on reels adapter impedance output generally tightening than two turns and enlarging the four turns.</p> <p>If the result still not getting you can slightly reduce the capacity removing shown in the figure where a small portion dell'armatura directly from the printed circuit board</p>	
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Repeat again tests to five frequencies indicated above ricontrollando currents of the modules and performance.

The actions described in the latter part does not necessarily have to be carried out in the order they were presented. It may happen that the adjustment dell'impedenza entry on the modules (capacitor, resistor, coil to "U") is not sufficient and that the current performance or continue to be out of specifications. For this reason you may need to intervene in advance on reels adapter impedance output and then return on individual modules. As already anticipated this depends on understanding and experience of the test.

At the end of operations should reseal the rooms splitter adapter input and output impedance and must repeat tests to five frequencies. If no abnormalities were found then you can close completely the machine repeating the tests at various frequencies and the frequency for which the machine is requested by the customer or ultimately the frequency of 103.00 MHz