

# FAMILY ET3500

CATALOGUE AND TECHNICAL DETAILED LISTS FOR AMPLIFIERS:  
E2000-E3500-E7000-E10000-E15000-E31000

CATALOGUE AND TECHNICAL DETAILED LISTS FOR TRANSMITTERS:  
ET2000-ET3500-ET7000-ET10000-ET15000-ET31000



The family ET3500 is arranged in several configurations from 2KW to 31KW in systems 1+0 e N+1X.

**ELENOS**®  
S.r.l.

broadcast @xperience

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



## WARNING

The use of this device  
is subject  
to National Regulations

Elenos Srl

## REVIEWS

31/05/2006	REVIEW 1:	Added outlines E2000 (pag. 22-23)
31/05/2007	REVIEW 2:	Modernized completely the handbook
02/10/2007	REVIEW 3:	Added designs of I block with quotas ET7000 Added designs of I block with quotas ET10000 Added designs of I block with quotas ET15000 Added designs of I block with quotas ET31000
19/10/2007	REVIEW 4:	Added heading to the entire manual
22/10/2007	REVIEW 5:	Added part scalability Updated graphics

**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 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 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*

# PRODUCTS

We design, realize, manufacture and market the following products :

Mos Fet transmitters up to 30KW

Tube Transmitters up to 30KW

Accessories: aerials, Stereo encoders, RDS, telemetry, Changeover units, audio processors, Sound treatment

Our equipment are 99/5EC European standard conform and respect the following Directives:

EN60215

EN301 489-11

EN 302 018-2



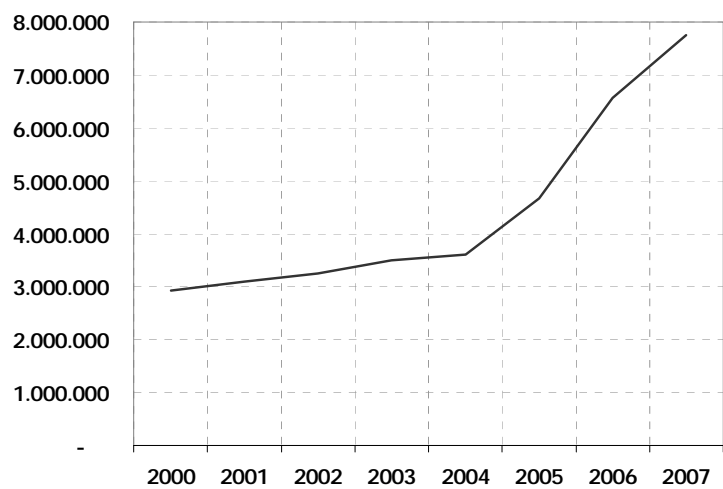
# ANNUAL TURNOVER

Among our customers we have the big Italian networks and an international distributor: Radio Maria (our best customer) which owns:

more than 1.000 radio stations in Italy: 82% of them use our equipment  
500 radio stations distributed in more than 40 countries, 90% of them use our products.

Mainly in:

USA, Bolivia, Colombia, Canada, Chile, Argentine, Brazil, Equator, Salvador, Guatemala, Mexico, Nicaragua, Panama, Peru, Philippines, Russia, Lithuania, Serbia, Croatia, Albania, Austria, Malta, Burkina Faso, Mali, Mozambique, Tanzania, Togo, Uganda, Zambia, France, Germany, Lebanon, Poland, Spain ,etc...



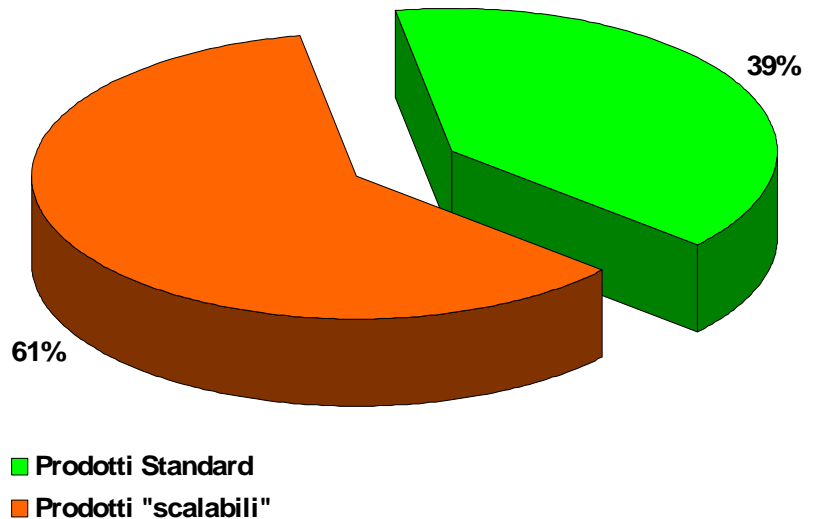
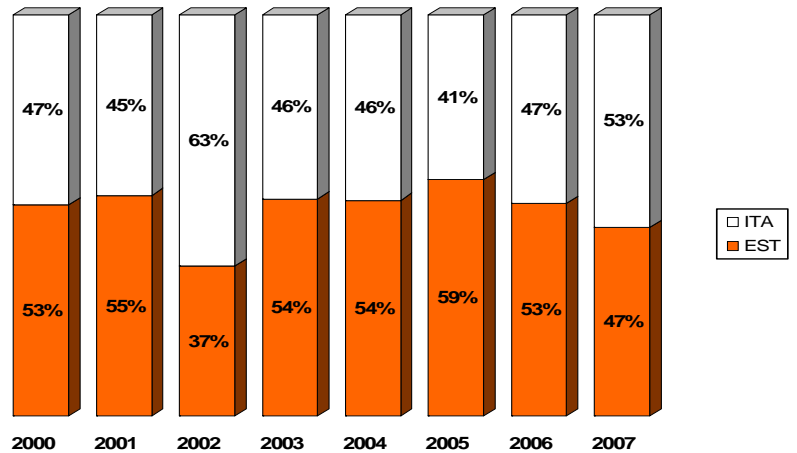


## LOCAL SALES AND EXPORT

We sell our equipment all over the world thank to the avant-garde technology and excellent ratio quality/price. Furthermore, our accurate selection on our dealers guarantees a good after-sales service.

Several patents cover our equipment, as:  
Polynomial Coupler;  
High-efficiency heat sink.

And many other that we use in cooperation with the University of Ferrara where our Research & development Manager teaches.



# DISTRIBUTORS ALL AROUND THE WORLD

Algeria	Angola	Argentina	Armenia
Arzerbaijan	Belize	Benin	Brazil
Bulgaria	Cabo Verde	Cameroon	Canada
Czech Republic	Chile	China	Colombia
Congo	Costa Rica	Cote d'Ivoire	Croatia
Cyprus	Estonia	Finland	France
Gabon	Gambia	Greece	Guatemala
Denmark	Dominican Republic	England	Honduras
Hong Kong	Hungary	Indonesia	Iran
Ireland	Israel	Jordan	Kazakhstan
Lebanon	Lithuania	Madagascar	Malaysia
Morocco	Mozambique	Netherlands	Nicaragua
Norway	Pakistan	Paraguay	Poland
Portugal	Romania	Russia	Rwanda
Senegal	Syria	Taiwan	Uganda



## **BROADCAST TRADE FAIRS ATTENDED:**

- IBC, Amsterdam – Holland
- Le Radio!, Paris – France
- NAB, Las Vegas – Nevada USA
- Broadcast Asia – Singapore
- BIRTV, Beijing – China
- IBTS, Milan – Italy
- ABERT, Brasilia – Brazil
- CAPER, Buenos Aires – Argentina
- TRBE, Moscow – Russia
- Teleradio Broadcast, Kiew - Ukraine
- IFEMA, Madrid – Spain
- AFRICAST, Abuja – Nigeria
- MEDiatech, Johannesburg – South Africa
- CONVENTION, Lisbon – Portugal
- Broadcast India, Mumbai – India

And many more exhibitions attended by our dealers...

## **COUNTRIES WHERE OUR EQUIPMENT ARE HOMOLOGATED**

- CE Europe
- FCC United States
- Argentina
- Brazil
- China
- Russia
- Bulgaria
- Hungary
- Romania
- Senegal
- Canada(homologation under process with Radio Canada)

## ELENOS' GOALS

Our aim is to create reliable transmitters for a better efficiency at reduced consumption and maintenance costs.

Our strategies to obtain this result are:

- An accurate selection on quality of components
  - Papst and Sanyo Blowers
  - Lithium batteries, 10 years warranty
  - -25 +105 °C (60.000 at 60°C) Capacitors
- "Conservative Strategy" for ex. 20 transistors instead of 16 for a 5KW amplifier, 12 instead of 10 for a 3KW amplifier.
- Reduce the temperature of the equipment thanks to patented Heat Sinks
- Maximize the protections
- Redundancy without "Single Point Failures", power supply in parallel with "Current Sharing"
- Derating, temperature, VSWR, over-voltage
- Low Maintenance costs, dimensions, weight and consumption
- Excellent after sales service

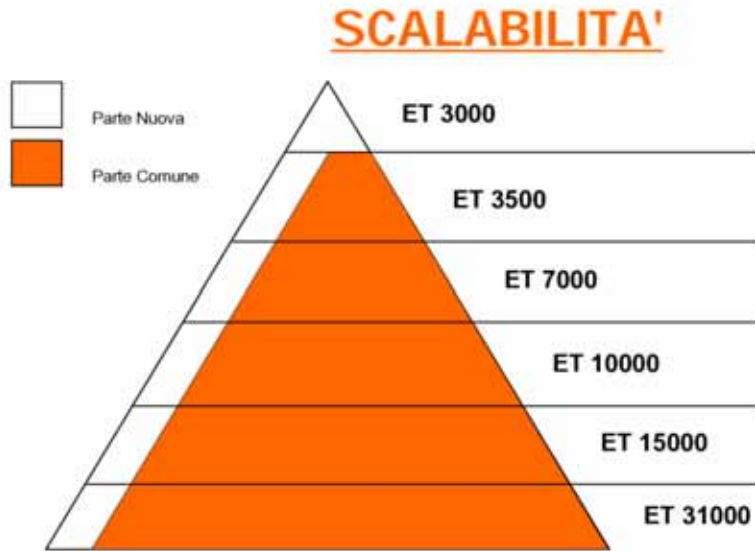
## SCALABILITY



## FAMIGLIA ET

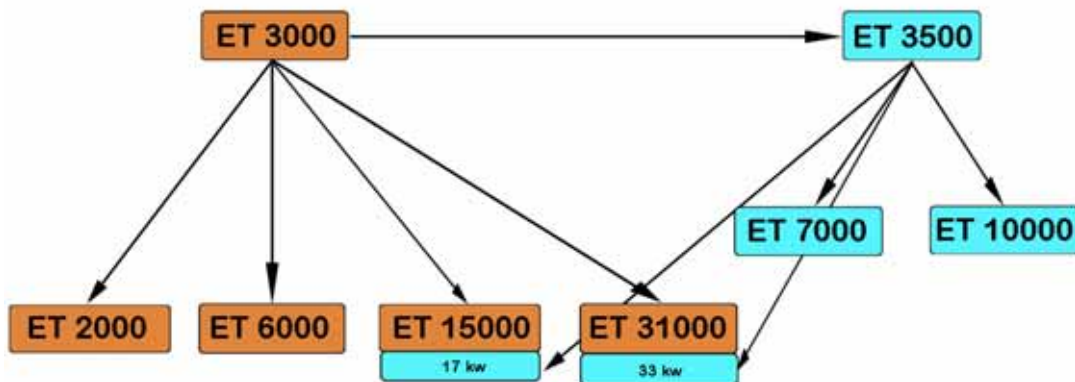
## SCALABILITY

“Capacity of a family of products immediately evolve its performance advantage of technical improvement of basic product”



## SCALABILITY ADVANTAGES

- Any technological improvement on the basic product is transferred directly on all apparatuses of the family
- Spreading knowledge and automatic maintenance
- Interchangeability and independence of individual modules



# ET3500 FAMILY FM ICEFET TRANSMITTER FROM 2Kw TO 60Kw

## **INTRODUCTION**

The ET3500 FM transmitters family is built up by combining the E3500 model in order to obtain higher power outputs: from 2Kw to 60Kw in 1+0 and N+1X configurations. All models are W.B. 87,5MHz – 108MHz and their frequency is changeable without adjustment.

The amplifiers are accessible from the front panel, the RF, control and power supply connections have been designed to ease the replacement of a module with no service interruption. Every base module is completely redundant itself.

The base module of this family is the E3500 amplifier with the ETG exciter, all the constituents of the family share the same characteristics concerning RF modules, power supplies, control logics, protection systems, derating, and so on. For this reason this document always refers to the characteristics of the E3500 amplifier and to the ETG exciter, same for all the other constituent of the family.

The main characteristics of the family:

- Tropicalization and completely stainless steel manufacture on all series
- Reduced dimensions and weight: it is the smallest and lightest transmitter of the world.
- Easy installation
- Convenient price
- Low cost for maintenance
- Reliability
- SMS alarms
- W.B.: ideal as a reserve (Dual Drive, Passive Reserve, Active Reserve, N+1)
- Working at full power with one RF module missing, and keeps in operation with even one RF Module functioning
- Working at full power with one power supply missing, and keeps in operation with even one power supply functioning.
- ICEFET technology
- Total redundancy on all models
- Remote diagnostic great ability
- Control and system logic through touch-screen graphic interface
- Connectivity
- Power supply
- Dual Exciter ETG100, ETG300, ETG500 and ETG1000
- Conservative use of mosfet
- No IPA (Intermediate Power Amplifier)
- IPF (Intelligent Proportional Foldback)
- IPC (Intelligent Power Control)
- Efficiency optimization on the whole band
- Fan speed proportional to temperature
- RF thermal derating
- Cooling system thermal derating
- PSU current derating



RF amplifiers' fault derating  
Alarm storage management

Continuous training: Elenos offers a continuous training to its distributors with the aim of qualifying their professionalism and allowing them to supply the better technical assistance on its products.

Sales service and technical assistance: ELENOS relies one of the greatest distribution channel of the world. Each distributor is selected mainly for his quality of the technical support he can provide to the customer.

The main characteristics of the equipment are described here below:

### ***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 facts, 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 MOSFETS***

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 coupler, 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 read 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 16000W

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 40,5° 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
RESETREQUIRED	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**

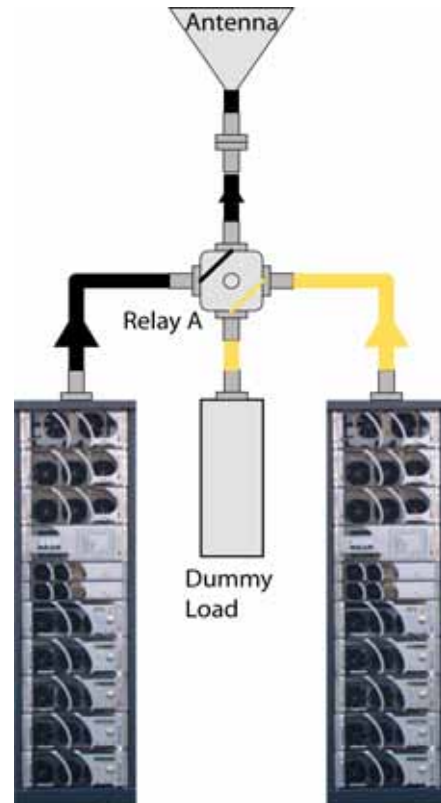
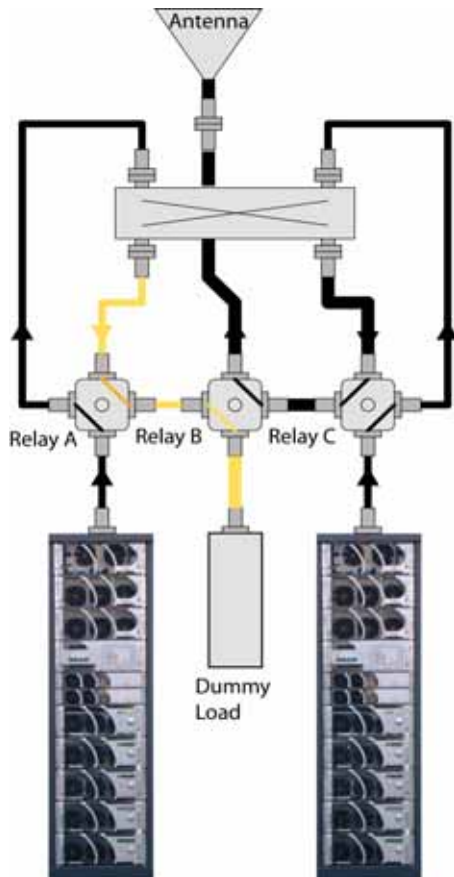
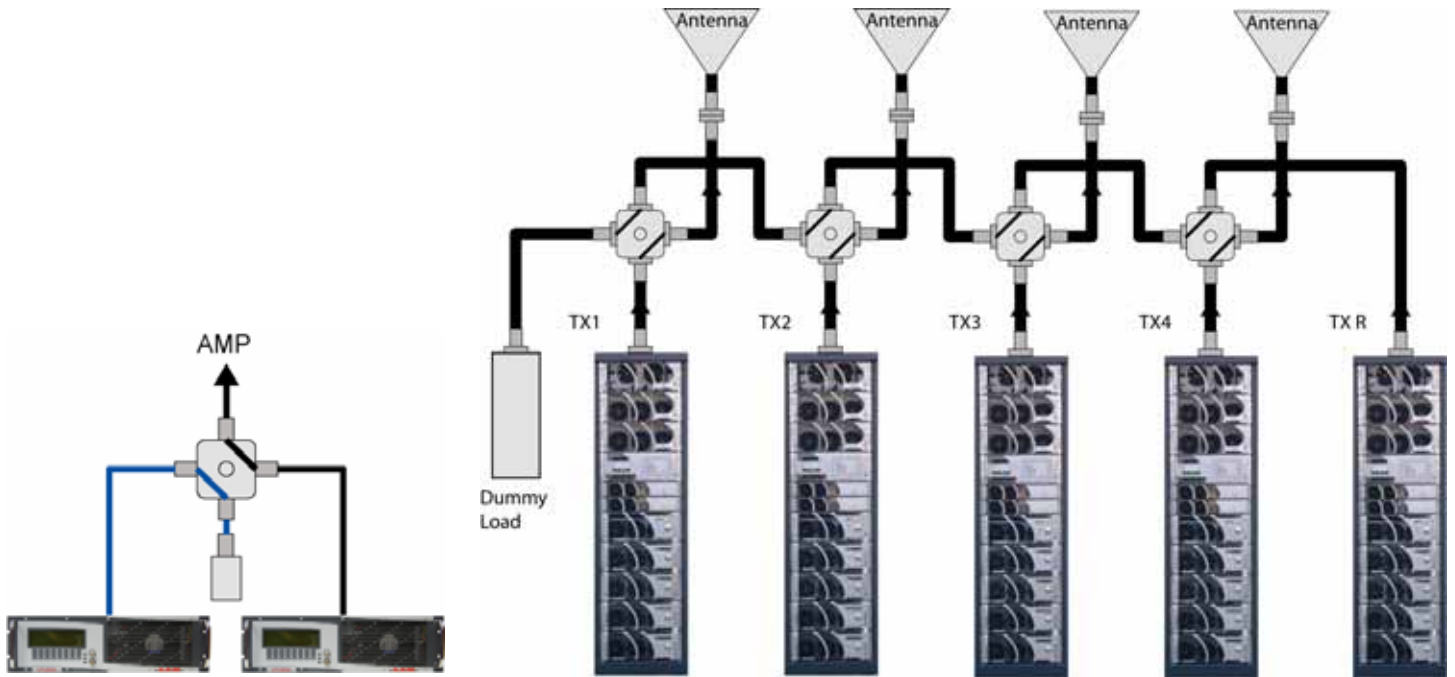
Alarm reset	Message, alarm reset under process, output flags decides the reset of all stored alarms and no more active.
Persistent data checksum error.	Message, the persistent data in eeprom have been lost and the equipment is configured with the default parameters.
Three block out.	Message, equipment 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  
Cooling system fault  
derating.  
On air  
Power up

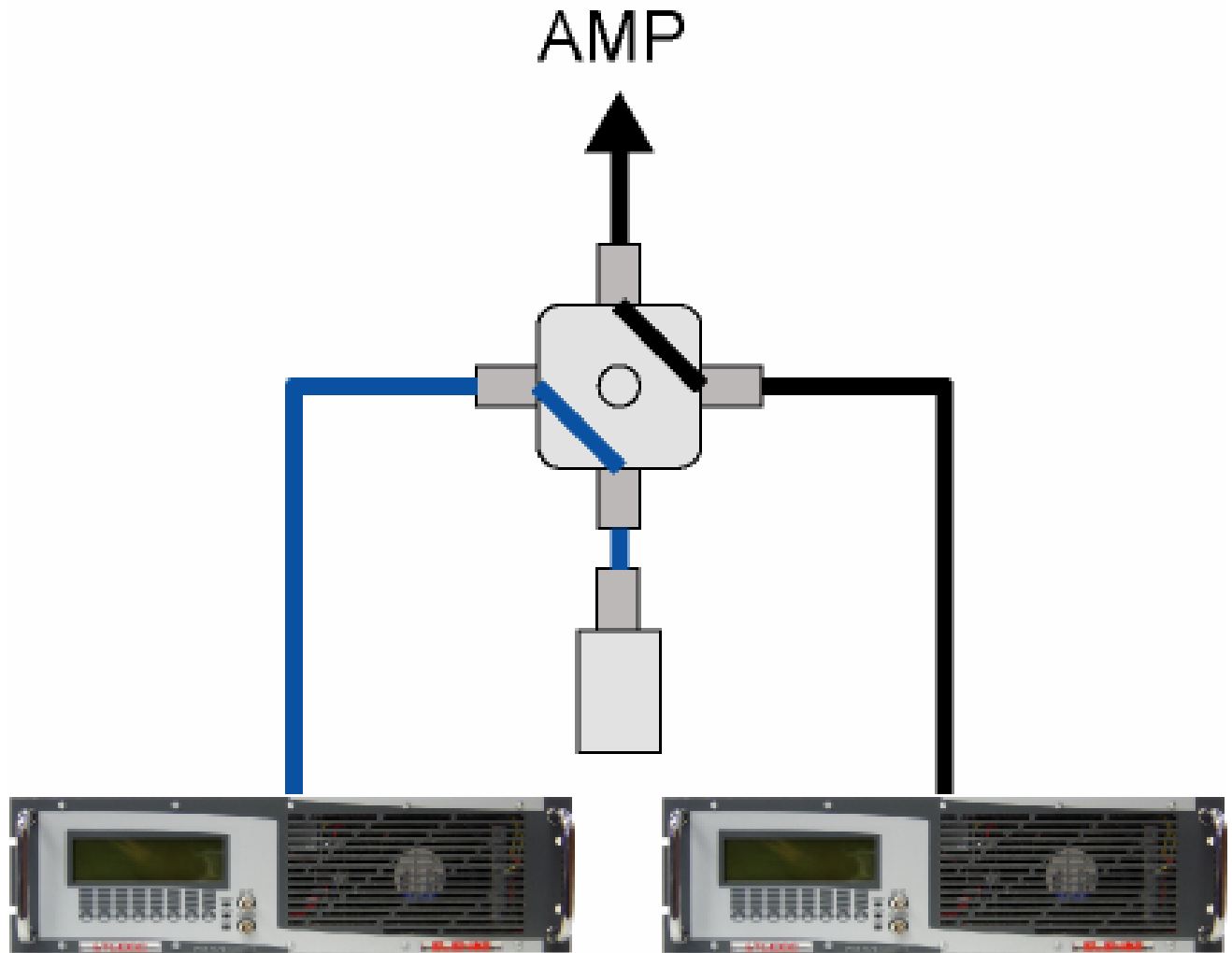
Input hardware and active interlock.  
Fast overheating of RF amplifier modules.

On air and properly functioning.  
Stores in the list that the equipment has re started-up

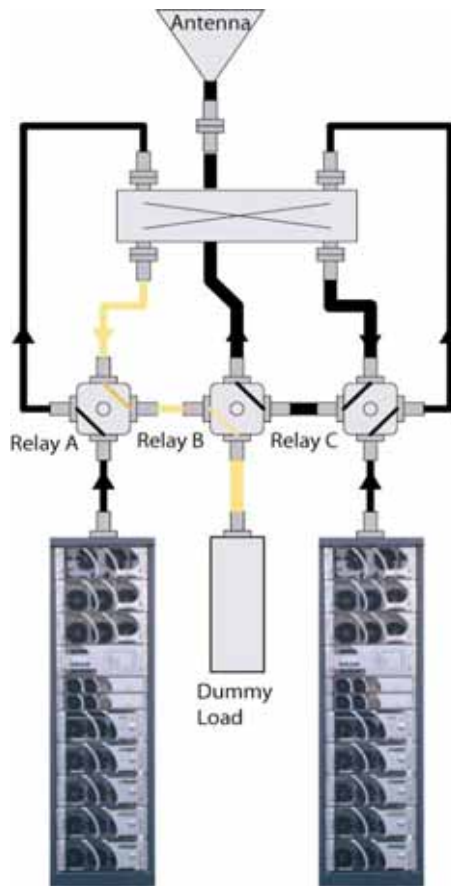
# SYSTEMS 1+1 - N+1X



# DOUBLE EXCITER SYSTEMS

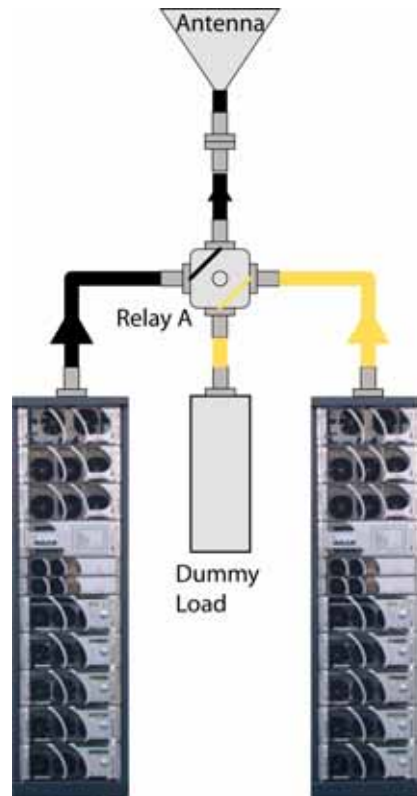


# 1 + 1 ACTIVE RESERVE SYSTEMS

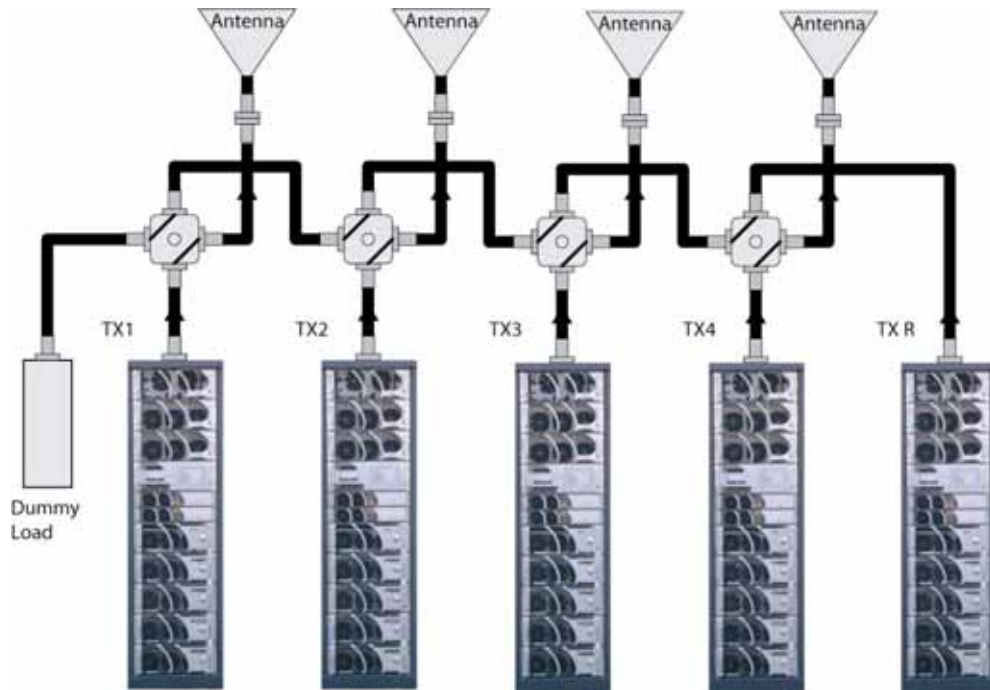




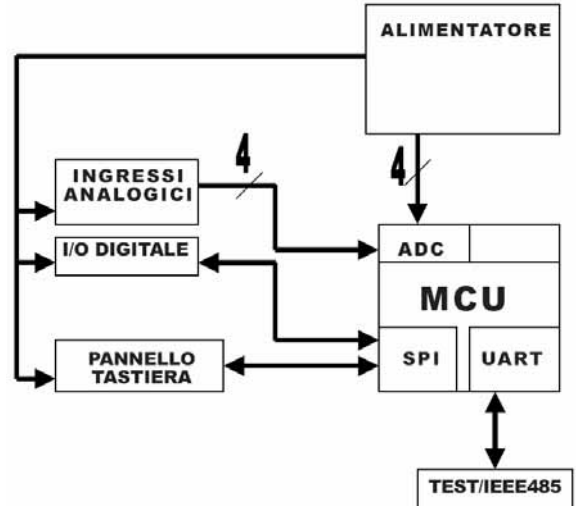
# 1 + 1 PASSIVE RESERVE SYSTEMS



# N+1X SYSTEMS



# ECHOS CHANGEOVER CONTROLLER



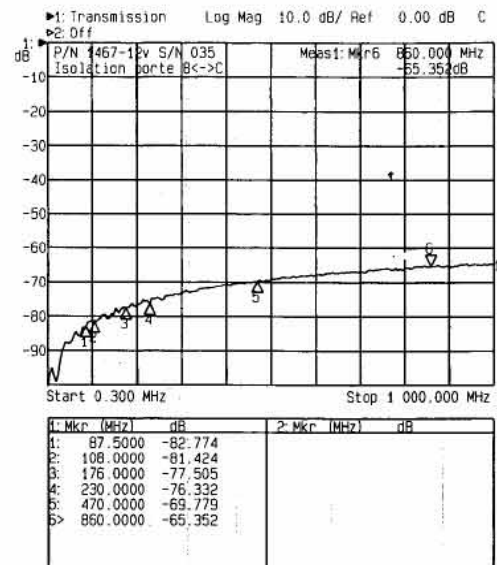
POWER SUPPLY	
Supply voltage:	230V monofase 50-60Hz
Consumption:	36 VA
Weight:	5 kg
DIGITAL I/O	
8 optoisolated inputs + 8 relais outputs	
Maximum output current:	1 A
Maximum optoisolated input voltage:	24 VDC
ANALOG INPUT	
4 system galvanically isolated inputs	
Maximum non linearity in the range:	0,3%
Separately adjustable gain for:	10 V f.s. 5 V f.s. 2,5 V f.s. 2V f.s.
A/D CONVERTER	
Reading resolution:	10 bit $\pm 2$ LSB
Maximum converter non linearity:	0,5 LSB

**Technical data sheet**

Part Number 1467

Commutating Iir

**DC ÷ 862 MHz Motorized Coaxial Switch 7/16**

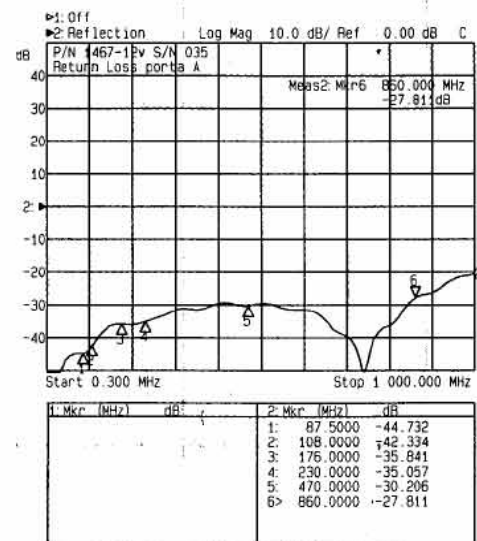


**Mechanical Characteristics**

Connections	DIN 7/16
Overall dimensions [WxDxH] [mm.]	117x117x146
Temperature range [C°]	-10 ÷ 50
Weight [kg.]	1.7

**Electrical Characteristics**

Frequency Range [MHz]	DC to 862 MHz
Insertion Loss [dB]	< 0.05
Input/Output Impedance [Ohm]	50
Operating Voltage [Vac]	220-240 / 50Hz
Control Voltage [Vdc]	5, 12 or 24
Switch-over Time [s]	< 3"



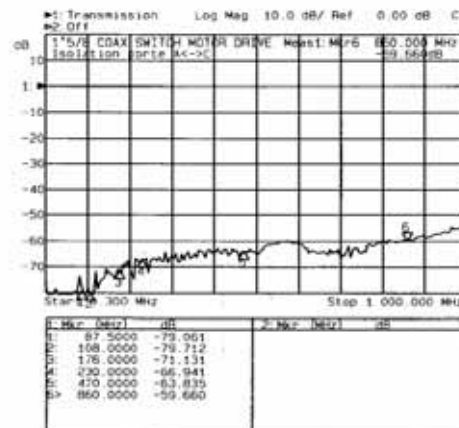
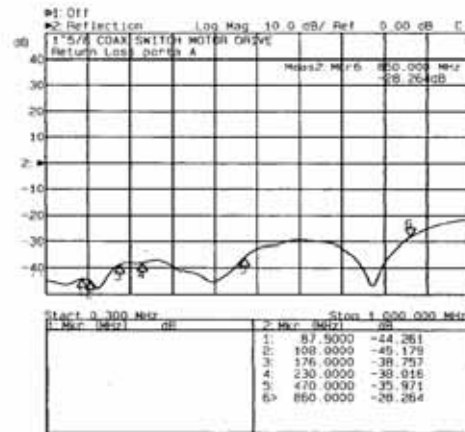
Frequency band	FM Radio	III	IV/V
Return loss [dB]	> 40	> 30	> 26
Insulation [dB]	> 80	> 75	> 65

## Technical data sheet

Part Number 1364

Commutating line

DC ÷ 862 MHz Motorized Coaxial Switch 1 5/8"



### Mechanical Characteristics

Connections	EIA 1 5/8"
Overall dimensions [WxDxH] [mm.]	205x205x295
Temperature range [C°]	-10 + 50
Weight [kg.]	6.5

### Electrical Characteristics

Frequency Range [MHz]	DC to 862 MHz
Insertion Loss [dB]	< 0.05
Input/Output Impedance [Ohm]	50
Operating Voltage [Vac]	220-240 / 50Hz
Control Voltage [Vdc]	5, 12 or 24
Switch-over Time [s]	< 3"

Frequency band	FM Radio	III	IV/V
Return loss [dB]	> 40	> 35	> 26
Insulation [dB]	> 80	> 65	> 60
Max. power [W]	10000	8000	4000

All data contained in this technical sheet are not binding and can be changed without notice

Data updating: 21/02/2006

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Via Fontanelle di Bardano, 20 - 05019 Orvieto (TR) - Italy

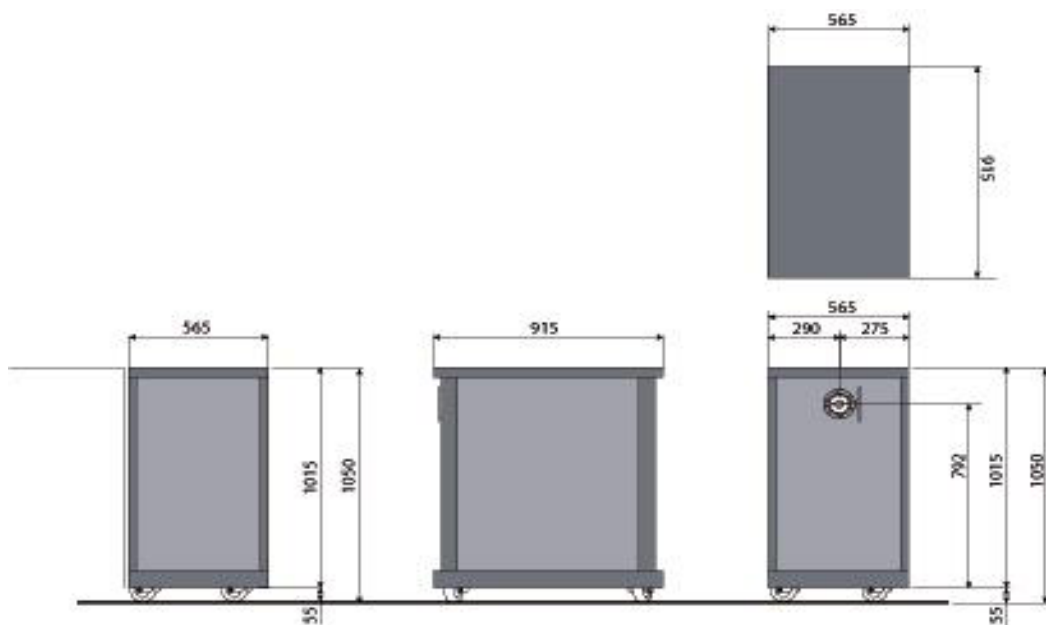
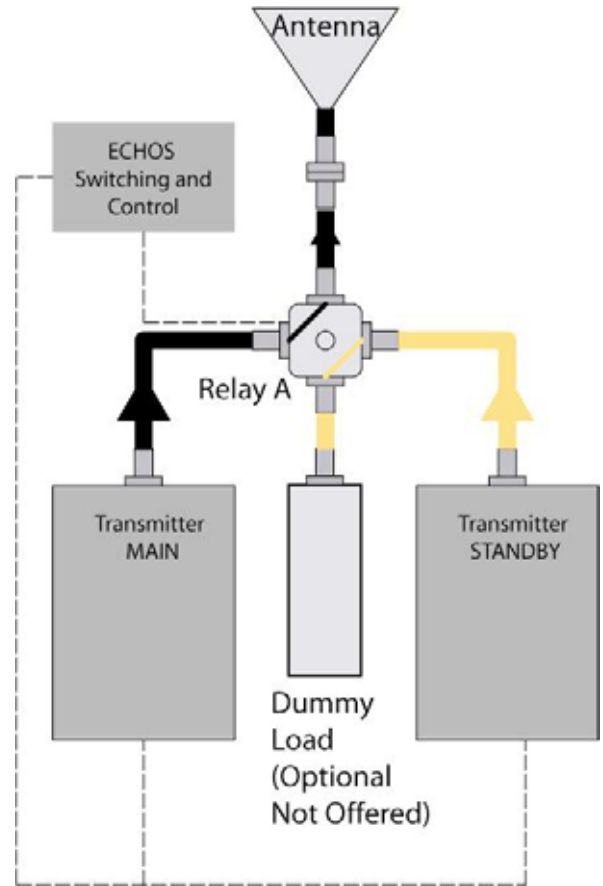
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# 500W+500W

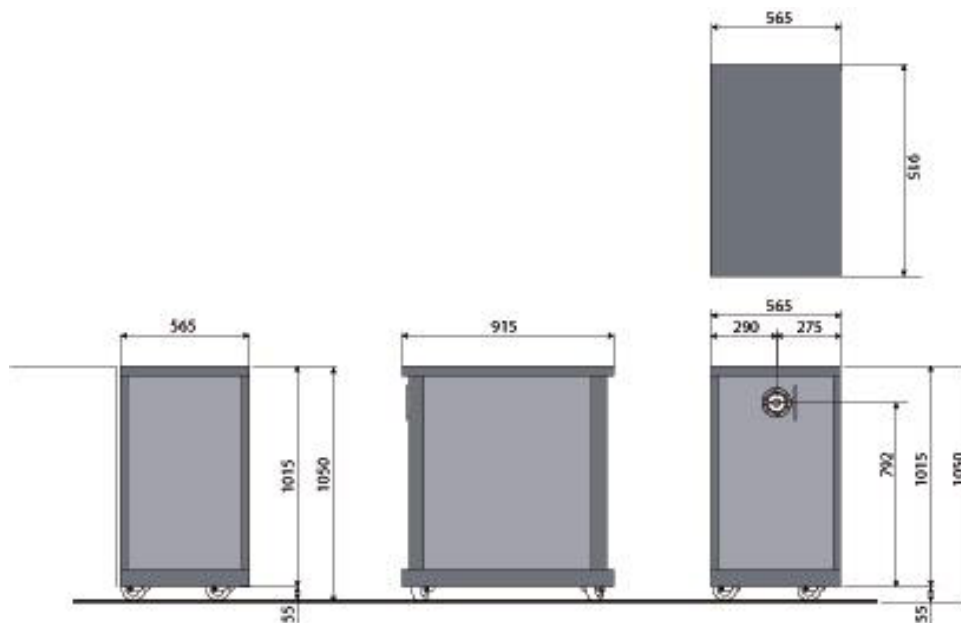
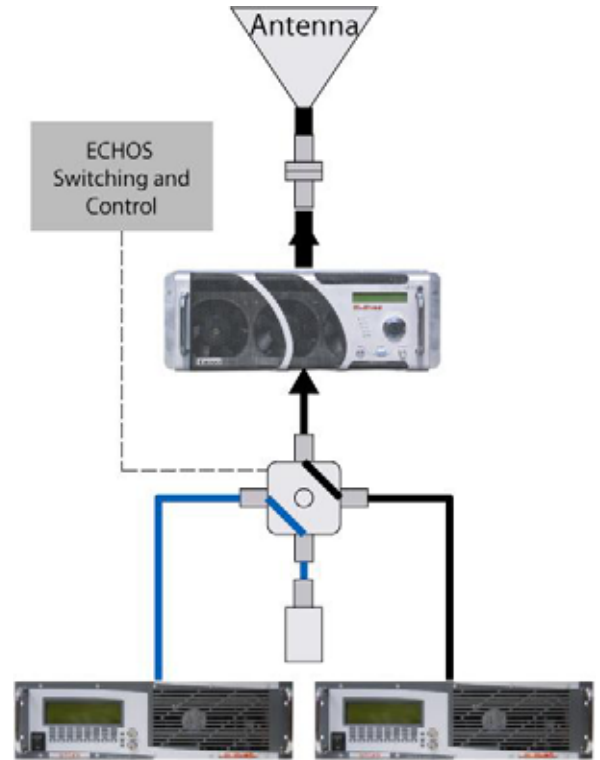
## 2XETG500 DR CHANGEOVER SYSTEM





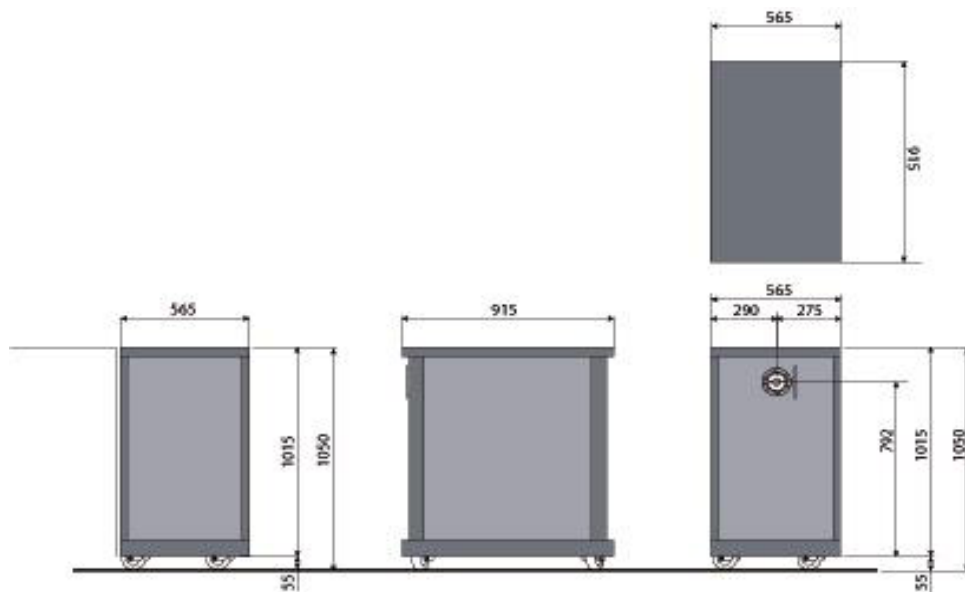
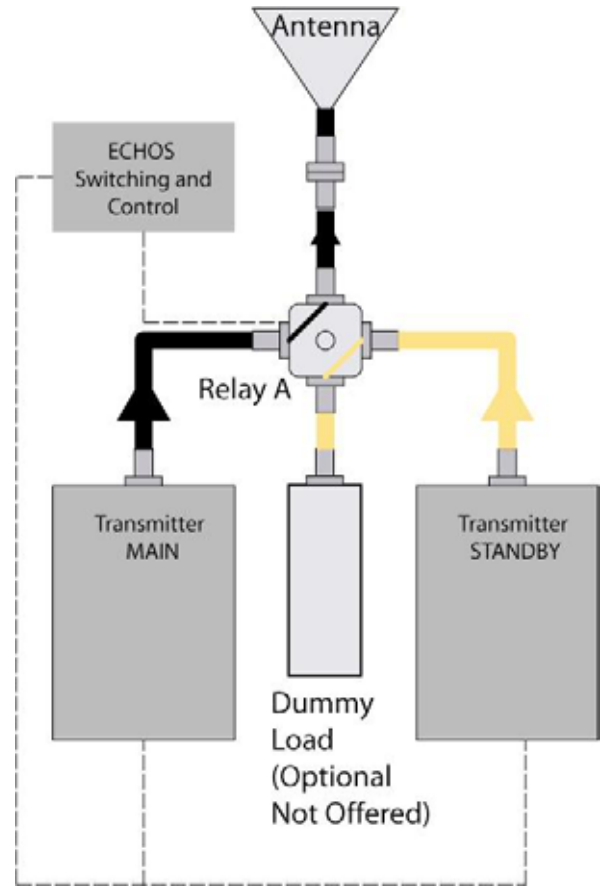
# 2000W DUAL EXCITER

## ET2000 DUAL DRIVE TRANSMITTER



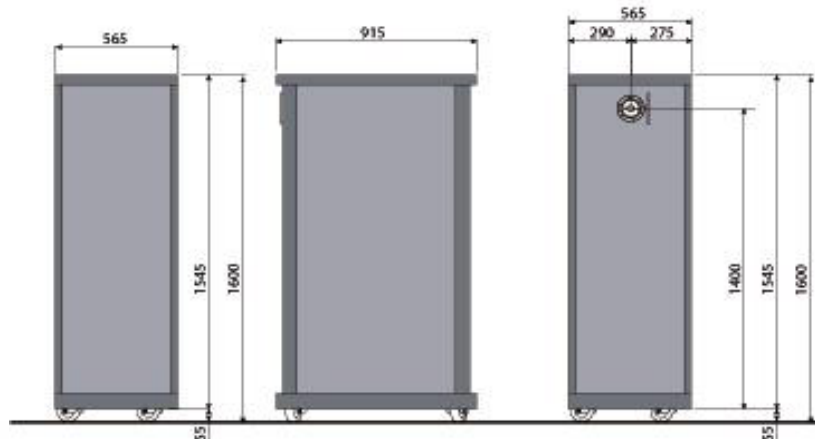
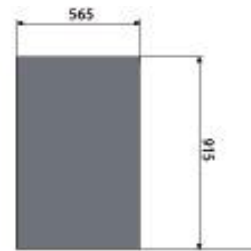
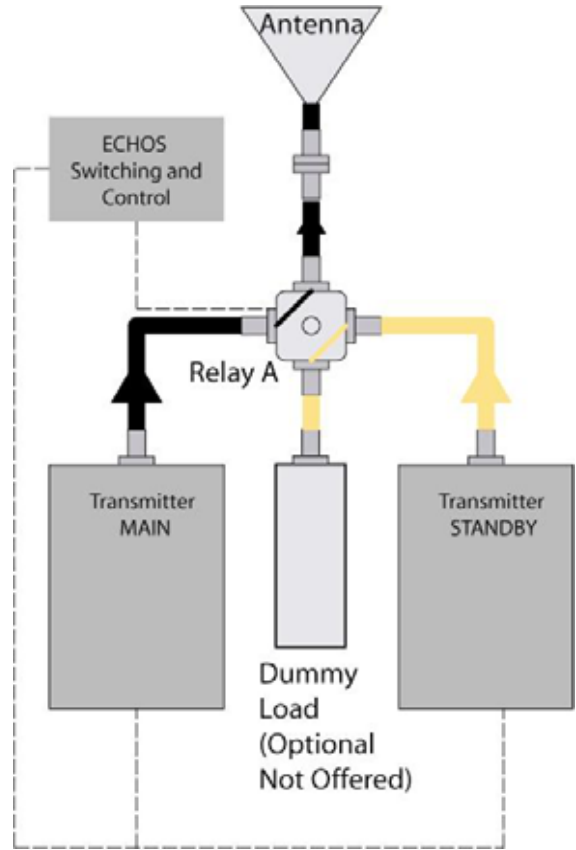
# 3500W+500W

## ET3500 TRANSMITTER + ETG500 DR AS RESERVE



# 5000W+2000W

## EK5000 TRANSMITTER + ET2000 DR AS RESERVE



# 4+1 10KW SYSTEM





# TELEMETRY



The telemetry can be connected to equipment of any other broadcast producer through analogue or digital inputs/outputs, or to the brand new generation of Elenos equipment via its RS 485 port.

It is provided with 8 digital inputs, 8 analog inputs, 8 outputs dry contacts relay outputs, GSM modem, battery, Battery charger, led bar visualizing the GSM signal level, RS232 and RS485 ports.

The user can see parameters and give commands to the equipment via connection between Modem and PC and via SMS.

Name, scale and alarm threshold of parameters are programmable through linear or logarithmic conversion, therefore any type of parameter can be seen in perfect scale: Voltage, Amperage, Power, Temperature etc.

All inputs are programmable to generate and send SMS alarms. For example, the user can program the telemetry to send an alarm when the transmitter power goes under a set threshold, when the site door is open or its temperature on site is too high and so on.

The outputs can be programmed at dry contacts normally open or closed, or at negative or positive impulse.

The connection to PC is made using Windows standard Hyperterminal, therefore it is not only intuitive and easy-to-use, but also there is no need of a specific software installation. It uses a ASCII protocol and it's easily adaptable to other producers' software.

Thank to the internal battery, it sends an SMS in case of mains interruption.

A led bar on the front panel indicates the signal level of the GSM modem thanks to which it is easy to adjust the antenna for a better reception.

# SOLAR PANNEL





# MINIBOX



# RADIO LINK RECEIVER – ELR SERIES



## MAIN FEATURES

- New functions and characteristics such as "Noise" and "Subcarrier" alarms.
- Microprocessor controlled.
- Large LCD graphics display show running parameters and settings.
- Direct, low noise, frequency Synthesizer with 10KHz steps.
- Frequency reference with high stability TCXO.
- Extremely simple frequency changing.
- Inputs, outputs and controls on front panel.
- Automatic switching between AC 110/220V and DC 12.5V supplies.
- High selectivity, double conversion.
- Very low noise, low distortion digital pulse demodulator (no calibration required).
- MPX processor with double low pass filter, amplitude and delay equalisation.
- 2 in-phase and 1 opposite-phase MPX outputs.
- 1 linear or de-emphasised Mono output with 15KHz low pass filter.
- Remote telecontrol output alarms on front panel.
- IF 10.7MHz monitor on front panel.

- Slides out for easy maintenance and repairs.

## **SOME OF THE AVAILABLE FUNCTIONS**

Main window from which you can access to measures and setup menu. The equipment's operation can be observed from this window i.e. the reception frequency, PLL and squelch status, frequency deviation and reception signal. Your logo or trademark can be put in the square at the top left.

Frequency setting window. Scroll the "UP" and "DOWN" buttons with increasing speed until you reach the desired frequency and memorise with the "STORE" button. An analogical indicator shows the VCO's working position.

The deviation value can be read as a composite of the MPX signal or as deviation due only to the pilot tone at 19KHz. In both cases the analogical indicator shows the peak number. Every time 75KHz are exceeded, the word "OverModulation" appears in the "Composite deviation" window. One new function of this type of equipment is its subcarrier alarm that indicates loss of 19KHz pilot tone and thus that there is no modulation (In MPX signals).

In this window's SETUP menu you can set, the signal level at 0.1 dB steps directly for all the outputs in dBu (0dBu=0.775V) for a 75KHz deviation.

The reception signal is measured on a log scale with a dynamic of 60dB.

Another window with the same scale allows to fix the threshold of the squelch in a precise way.

# RADIO LINK TRANSMITTER – ELT SERIES



## MAIN FEATURES

- User interface with graphic display (240X64 pixels) and simple and intuitive menus.
- Direct low noise Frequency Synthesizer with 10KHz steps.
- Frequency reference with high stability TCXO
- 6 watts RF output power.
- Completely wide band (no calibration necessary over the whole range).
- Automatic power control (APC) for a constantly stable power.
- Wide choice of measurements: Direct and reflected power; internal air and RF amplifier temperatures; composite and MPX-Subcarrier frequency deviation; RDS and SCA frequency deviation
- Protection of reflected power with gradual reduction of output power (and reset) without stopping apparatus.
- RDS and SCA audio inputs on the front panel. RF output on front or back panel.
- Recognition and automatic (or manual) addressing of MPX and Mono signals.
- All operating parameters adjustable without opening the apparatus.
- AC 110/220V and DC 12.5V supply with automatic switch-over.
- Alarm outlet for remote controls on the front panel (optional).

- Drawer type mechanism for taking out the frame and ease of maintenance and repairs.

## **SOME OF THE AVAILABLE FUNCTIONS**

The main window from which you can access the measures and setup menu. This window also gives the operational state of the apparatus, the transmission frequency and the state of the PLL, information on Audio input and measurement of the deviation and output power. The panel in the top left corner can be used for insertion of your own logo or trademark.

Frequency setting window. With the "Up" and "Down" keys you can move, with increasing speed, in steps of 10KHz to the desired frequency which is then memorised with the "Store" button. An analogue indicator bar showing the VCO working position with lighting up of the writing "Out of Range" if the frequency setting is wrong.

Special care has been given to all the variable measurements thanks to the use of a vhighly accurate 12-bit ADC. In particular, measurement of the deviation parameter, very important in a transmitter, can be done for the total deviation, the MPX pilot frequency tone and any SCA or RDS sub-carriers present. For all measurements there is an analogue bar or numeric indicator.

"SETUP" menu window from which it is possible to adjust the output power. The value set remains stable over the entire frequency range thanks to the APC system (automatic power control). In the presence of stationery waves the system reduces proportionately the output power without stopping the apparatus and resetting the full power when the anomaly stops.

Window from which the input Audio signal parameters can be set. It is possible to set input impedance, pre-emphasis and signal type (Mono or MPX). Selecting the "Auto" mode the type of signal used in the "Audio In" input is recognised and addressed automatically.

Input Audio level adjustment window. Sliding the "UP" and "DOWN" keys fixes the signal input level ("IN Lvl" bar) and the deviation obtained can be seen simultaneously. The transmitter is calibrated for 75KHz deviation with an Audio signal of 0 dBu.