

SF 150

ELENOS

BROADCAST EQUIPMENT COMPANY

The manufacturer reserves the right to change at any time this handbook without the condition to advise that the version has been updated.

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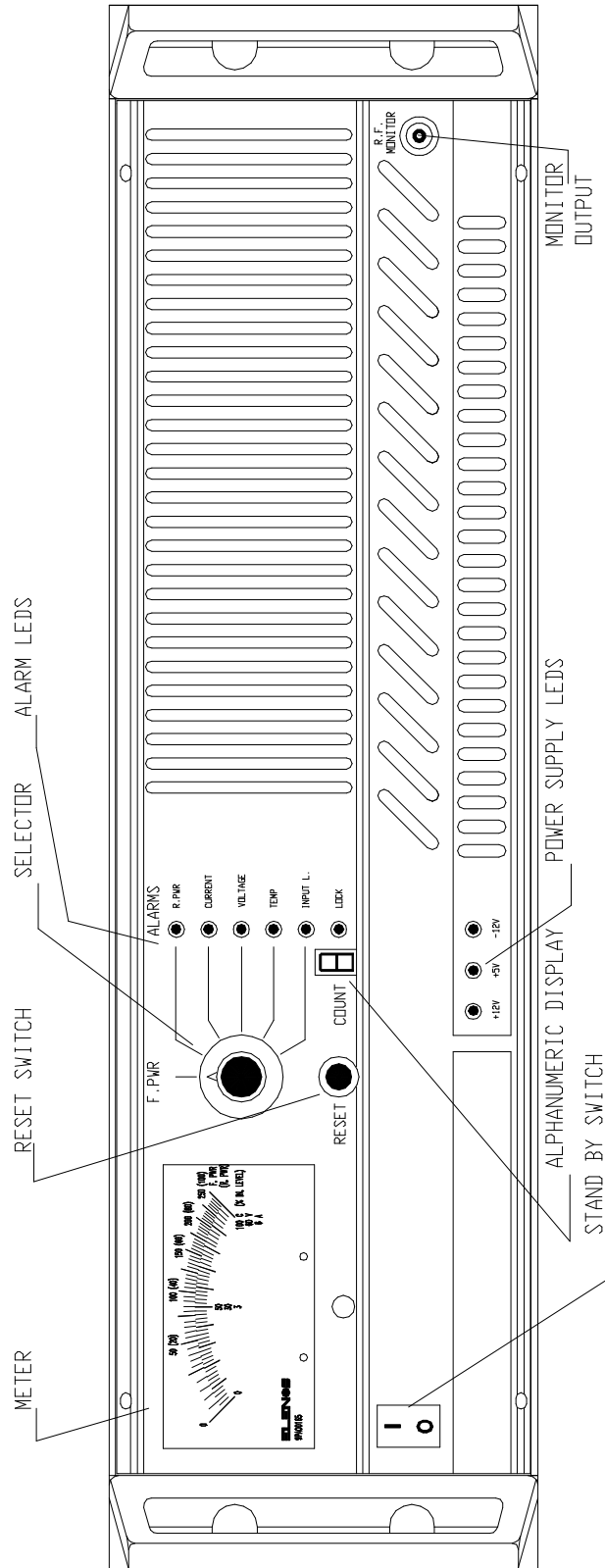
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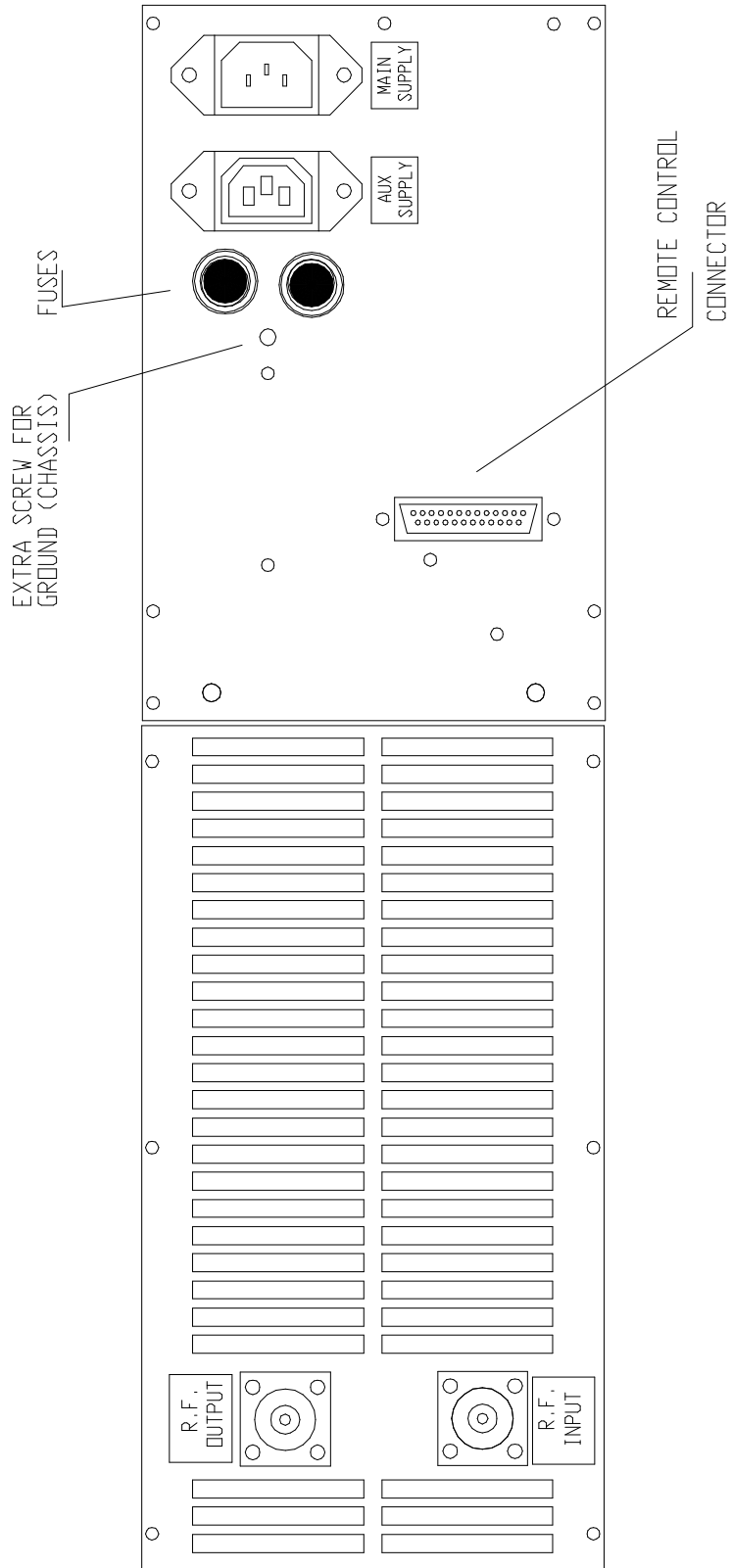
GENERAL DESCRIPTION

The SF150 model is a solid state amplifier without variable tuning circuits for the 87.5 to 108 MHz frequency band, intended as a supplementary power stage for FM modulators. The unit is designed to operate as a final stage powering a radiating system, or as an intermediate stage in a chain of amplifiers, thus loaded by the input stage of a following amplifier. In both cases an exciter modulator is necessary.

FRONT VIEW



REAR VIEW



TECHNICAL FEATURES

Max. power output: 150W

Max. power for 150W output: from 2W to 6W

Mosfet efficiency at 150W output: from 52% to 68%

Mosfet voltage: from 25V to 50V d.c.

Mosfet rest current: from 3mA to 12mA

Mosfet current at 150W: from 4.6A to 5

Input SWR: <1.65W

Differential of the heat-sink temperature at 150W out: 40 °C

Mono supply voltage: 208/220/240 V with mains voltage changeover to 110V

Mains frequency: from 47Hz to 70Hz

Power supply for 150W output: 510VA maximum

Spurious emission at the antenna connector: - 72dBc

Ambient temperature: from -5 to +45°C

Relative ambient humidity: up 95% (45°C) NOT CONDENSED

Protection of output reflected power: 40W max.

Protection of Mosfet current: 6A max.

Protection of input power: 20W max.

Thermal protection: 85 °C max.

PRECAUTIONS

Do not handle the unit in any way unless all its protection panels are completely closed and it is connected to a good earth which can ground parasitic currents circulating in the chassis.

Of the Do not operate the unit unless all its panels are completely closed.

Do not open the unit for internal inspection of any sort unless the line supply cable is disconnected from the supply and all other connections to other equipment are also disconnected.

Any operations which need to be carried out with panels open should be left exclusively to qualified personnel and those aware of all the risks associated with operating high voltage equipment generating significant RF power levels.

Some components used in the construction of the unit contain TOXIC SUBSTANCES. If, on a visual inspection, any components reveal themselves to be damaged, fractured or incomplete, proceed with extreme caution to avoid contact with the hands or any other part of the body. The principal components of the unit operating at radio frequency contain the highly dangerous substance, Beryllium Oxide.

WARNING! BERYLLIUM OXIDE IS LETHAL

Only qualified, competent personnel are capable of handling the equipment and its electronic components without risk. Owners equipment are obliged to conform with these recommendations.

MANUFACTURER'S RECOMMENDATIONS

The installation of any electronic apparatus exposes personnel to risk; ELENOS explicitly requests that no work is carried out unless at least two people are present. This is in view of the fact that over and above the electrical connections that are necessary, the sheer physical weight of the unit will not allow a single person to install the unit with complete safety. Do not commence any operation before reading all safety and operational instructions. ELENOS advises the following safeguards: hang a poster in the equipment room with clear instructions for first aid in the event of personal injury; provide local first aid equipment and facilities and display telephone numbers and means of contacting local public or private emergency services which can easily be referred to by all personnel.

TECHNICAL DESCRIPTION

The SF150 is a solid state amplifier using MOSFET power devices as the active radio frequency element. The equipment comprises one RF amplifier module (card EF150FM1) which is matched for input/output impedance of 50Ω and a low-pass filter (card LPF501FM) which is also an output power measurement circuit. The equipment features a sophisticated array of supervisory circuits which monitor the operation of the RF circuits so as to maximise operational life and minimise down-time and operator intervention. The RF module power supply circuit (card E20147) employs phase-angle switching rectification. The line transformer is of toroidal construction with an electrostatic screen separating the primary and secondary windings. The rectifier's filter is inductive and capacitive. Control of the stabilised voltage is by a microcontroller which controls the output voltage as a function of the RF power being developed. The microcontroller on the power supply card monitors the safety of the RF power modules; in the event of parameters going outside their limits, it will reduce the voltage supplied to the modules and thus the total RF power. The power supply is protected against accidental short circuits and, importantly, features a rapid power shut-down system (reaction time about $200\mu\text{s}$) which can save the delicate MOSFET devices from damage which they would otherwise incur even after short periods of overload. The master card (card E30501) controls the power-up sequence and any reset required after a fault has triggered a protection mechanism of any sort. The program of the microcontroller may be partially customised at the customer's request to adapt it to local operating requirements. This card is in continual digital communication with the power supply card and the front panel card (card E30502). It collates information received from the power supply and the operator and can supply current or past data to the operator via codes displayed on the front panel. It also routes commands to the power supply received from the front panel or from the remote connector situated on the remote interface card (card E40101).

USER INTERFACE

All the controls and indications of the status of the unit needed by the operator are situated on the front panel. The unit does not have a power on/off switch but rather a STAND BY switch. This switch is situated on the lower left of the panel; in position 1 the equipment is operative, in position 0 operation is suspended, i.e. power is no longer supplied to the RF amplifier stages and the auxiliary line output for an external modulator is disabled. In the front panel also features a meter which can display alternatively: power output (F. PWR), reflected power (R. PWR), current drawn by the RF amplifier stages (CURRENT), amplifier stage supply voltage (VOLTAGE) and input power from the exciter (INPUT L.). Other indicators with the same names display the normal or abnormal, current or past operating status of the apparatus. The LOCK indicator lights when a temporary or permanent shut-down of the unit has occurred as a result of either operator intervention or a fault. An alphanumeric display (COUNT) is situated on the front panel together with a selector. The selector selects the parameter to be shown on the meter and also influences the alphanumeric display. When the unit has been functioning normally, the alphanumeric display shows a 0 (except in the case of F. PWR and VOLTAGE). Otherwise the number of faults pertaining to the parameter selected is displayed. If, in the past, an anomaly occurred, the corresponding indicator remains permanently lit. These indicators can light intermittently during Automatic Power Control intervention. If an operational parameter being monitored, has exceeded the alarm threshold, the RF modules' power supply will reduce the supply voltage and therefore the power dissipated, in an attempt to avoid a complete shut-down with the consequential loss of service, on the basis that: better less power output than no power output. When the selector is in the F. PWR position, the function is special: the alphanumeric display will show S if the unit is in stand-by and P if it is operational. When VOLTAGE is selected, the alphanumeric display will show a sequence of 2 consecutive characters, an error code useful as a diagnostic (see table of error codes) or a confirmation of normal operation. Not all faults generating error codes are permanent, the temporary removal of electrical power from the apparatus leaves two possibilities: remove the cause of the shut-down or repair the equipment. Clearly, faults due to failure of the microcontrollers cannot be ruled out and these will preclude any diagnostic assistance. Shut-downs (LOCK indicator lit) are of two types: permanent, without any attempt to reset, and temporary shut-down with successive attempts at automatic rest. The period between resets have been programmed according to the type of fault. The equipment will attempt resets for 24 hours without operator intervention, unless the fault is considered non-resettable. The RESET button can be used by the operator when the equipment has shutdown due to a fault which is no longer believed to be a cause of malfunction. This will clear the memory of previous faults but has no effect if the fault has been identified as fatal. Three indicator lights for other internal voltages are situated in the lower central part of the

panel; these should be lit whenever the unit is powered from the line supply. The R.F. MONITOR socket provides a sample of the power output of the unit, attenuated by 40-50 dB, for connection to a spectrum analyser and can be used to check correct operation of the apparatus and any anomalies present in the radio spectrum.

REMOTE INTERFACE

At the rear of the unit, a CANNON DB25F connector is situated, labelled REMOTE. This connector allows remote devices to control various operational parameters of the unit and to activate various operations even via automatic controllers such as timers, interlocks and other similar electronic or electromechanical devices.

Pin description:

Pin #1 (remote STAND BY 1). Can be used in conjunction with pin #14 to reset after an enforced shut-down. The unit will leave the STAND BY state when pin #1 and pin #14 are connected for a short period.

Pin #2 (remote STAND BY 2). Can be used in conjunction with pin #14 to enforce a shut-down. The unit will enter STAND BY mode when pin #2 and pin #14 are connected together for a short period.

Pin #3, pin #4, pin #5, pin #15, pin #16, pin #17, (GND.) are connected to the units chassis and may be used as analog signal returns when connecting to external equipment.

Pin #6 RESERVED

Pin #7 (S.C.L.). One of two serial communication lines; IIC BUS, clock signal

Pin #8 (LOCK). If low (0V), the unit has shut-down, if high (10 Volts), the unit is operational.

Pin #9 (5 Volts). Internal 5V supply indicator.

Pin #10 (R. PWR). Reflected power signal normalised at 2 Volts f.s.d. on the front panel meter.

Pin #11 (CURRENT). Signal representing current drawn by the RF stages, normalised at 2 Volts f.s.d. on the front panel meter.

Pin #12 (INPUT L.). Signal representing RF exciter input voltage, normalised at 2 Volts f.s.d. on the front panel meter.

Pin #13 (V. REF.). Voltage normalised for the front panel meter (2 Volts).

Pin #14 (STAND BY COMMON) see pin #1 and pin #2.

Pin #18 (STAND BY SWITCH). When connected to GND via an external switch, the unit is forced in stand by mode.

Pin #19 (S.D.A.) One of two serial communication lines; IIC BUS, data signal.

Pin #20 RESERVED

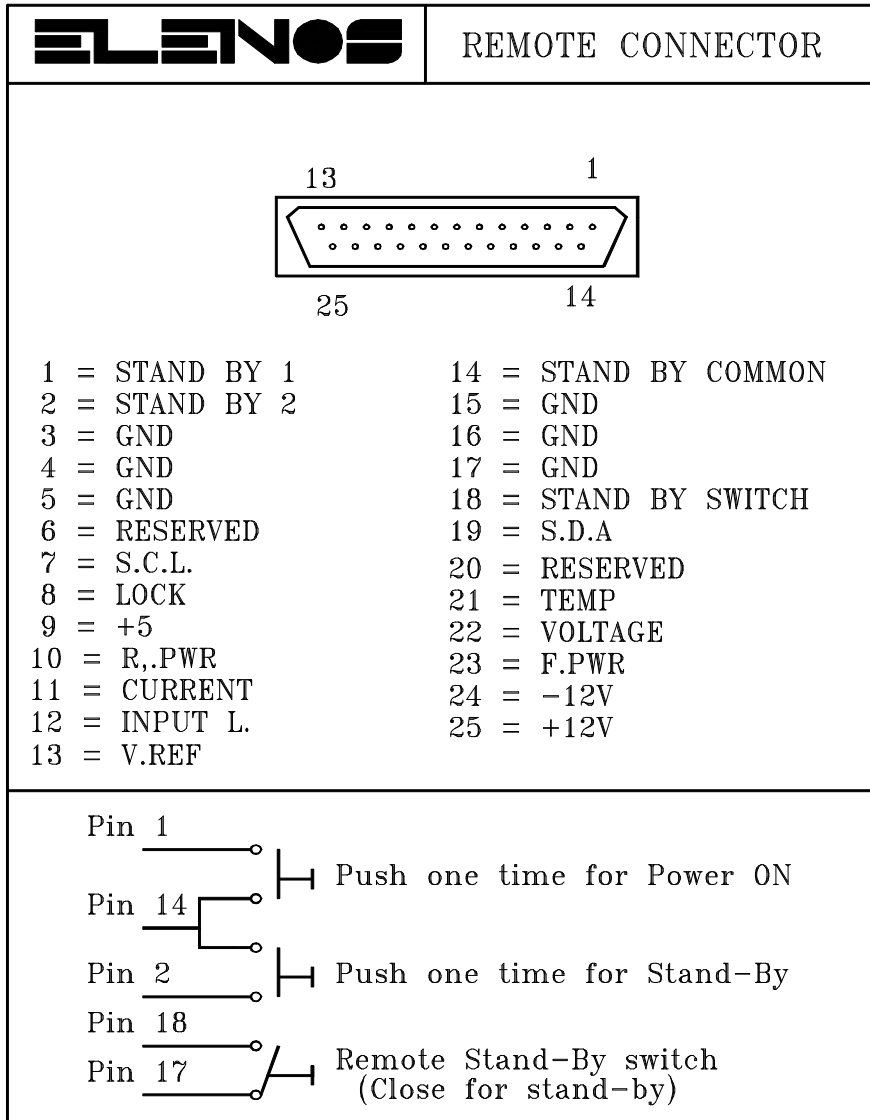
Pin #21 (TEMP.). Signal representing heatsink temperature, normalised at 2 Volts f.s.d. on front panel meter.

Pin #22 (VOLTAGE). Signal representing RF module power supply voltage, normalised at 2 Volts f.s.d. on front panel meter.

Pin #23 (F. PWR.). Signal representing the units RF power output, normalised at 2 Volts f.s.d. on front panel meter.

Pin #24 (-12V). Internal -12V voltage indicator.

Pin #25 (+12V). Internal +12V voltage indicator.



INSTALLATION

The following is an important pre-requisite to operation: the installation site must conform to necessary safety standards for equipment and personnel. In particular, the power supply should feature a cut-out facility in the event of over-current; safety breakers for protecting personnel and earth connections for all equipment. The installation site should have outlets for the discharge of hot air produced by the equipment and a supply of fresh air. The equipment must operate within an ambient temperature range of -5 to 45°C and at relative humidities of less than 95% (non-condensing). The SF150 is not a transmitter but an amplifier which requires at least a modulator, if not additional power stages. This poses the problem of integrating a system with other technical specifications which must comply with the transmission regulations of the country of installation. It is therefore necessary to consult this technical manual and especially the chapter regarding problems of transmitter systems which are assembled from diverse components. Two configurations of the SF150 are envisaged:

- 1) as the final amplifier driving the radiating system.
- 2) as an intermediate amplifier driving the input stages of another amplifier.

In both cases, the equipment will leave ELENOS laboratories without any special setup. Before installation, all packing pieces used during transit should be removed from the equipment. Then a visual inspection should be made of the equipment to ensure that no damage has been incurred during transport. In the case of any evident damage, contact ELENOS, for return under warranty. All the technical manuals supplied with each unit which make up the system being installed should be read to ensure that the conditions of guarantee are complied with and, most importantly, that any danger to personnel is avoided. Check that the line voltage stated on the test documents corresponds with that of the local supply, if not, connect an appropriate means of conversion. Situate the SF150 and its modulator in their final position. The modulator must be of a quality commensurate with the service required (mono/stereo) and of variable power output from the lowest power possible upto at least 17W. The connections between the SF150 and its modulator must be as follows: the modulator must receive its line supply from the AUX SUPPLY socket on the rear of the SF150. In turn the SF150 receives its line supply from a successive amplifier, if present, or direct from the electricity supply (see the technical manuals of other stages connected to the SF150 for more information). The radio frequency connections start at the modulator, the output of which should be connected to the R.F. INPUT socket of the SF150. The R.F. OUTPUT connector of the SF150 should be connected to the antenna or successive amplifying stages. The modulator features a regulator to adjust the RF power output, this should be set so that, at switch-on, output power is at a minimum (see the modulator technical manual for more information regarding adjustment and connection to other equipment). On the rear of the unit, a supplementary earth connection can be made via the exposed

captive screw. This allows a low-resistance path to earth for atmospheric electrostatic discharges and may also be used for special connection configurations. When all the equipment is connected and all panels are closed, the units can be switched on in the following sequence: first the final stage the whole transmitter system, then the intermediate stages and finally the modulator. If the system is configured with the SF150 as the final stage, the modulator should be adjusted to regulate the output power of the SF150 amplifier to comply with the terms of the homologation licence for the site in question. It will clearly be necessary to test not only the correct operation of the system but also compliance of parameters with transmission regulations. If the SF150 is instead an intermediate stage of a more complex transmitter, the calibration instructions regarding the final stage should be referred to, ensuring that the SF150 is not exposed to risk of damage by other devices in the system. The SF150 amplifier has no adjustment for tuning or other parameters; from a functional point of view it is passive. Its characteristics are determined by equipment up- and down-stream of it. The operator using the SF150 is therefore only concerned with ensuring that the limits of safe operation are not exceeded indefinitely: the modulator must not exceed the tolerated level of excitation power, including situations in which ambient factors downgrade performance; for successive stages the operator must perform the calibration of input stages to ensure safe levels of reflected power displayed by the SF150's meter. For safety limits on all operational parameters, see the table of typical and maximum specifications. The SF150 features internal circuits which automatically reduce the output power if other parameters go outside the limits of safety. The operator responsible for calibration may exceed some of the limits temporarily, but must not leave the site with the unit indicating Automatic Power Control (flashing lights on the front panel). In this case the stability of the RF output power is not guaranteed (see the chapters entitled TECHNICAL DESCRIPTION and USER INTERFACE of the SF150 manual). Consult the table of typical operating parameters and their safety limits for the SF150 and other connected equipment to ensure that the installation operations are complete.

FRONT PANEL DIAGNOSTICS

A) Diagnostic with selector in VOLTAGE position

When the selector is in the VOLTAGE position, it is possible to obtain useful diagnostic data from the COUNT alphanumeric display. This display shows a 2 character code which identifies the functional status of the unit. Anomalies can be permanent or temporary. The error code disappears if the amplifier returns to normal working. The code will remain displayed permanently if the fault remains indefinitely. Each message has a technical and logical significance and timing which is described below:

A0: Appears when there are communication difficulties between cards E30501 and E20147.4. The status of other indicators is irrelevant and the equipment will not function. Check the integrity of connections between the two electronic cards and the efficiency of the screen which protects against RF interference. A permanent fault on one of the automatic control cards is also possible.

A1: This code appears when the supply current drawn by the RF modules is excessive. In this case the (CURRENT) and (VOLTAGE) indicator will also be lit. For each occurrence of this alarm condition, the amplifier will shut down for 7 seconds and will then attempt an automatic reset. If 9 of these events occur consecutively, the unit will shut down for 9 seconds, clear the event counter (CURRENT) and again attempt an automatic reset. If, instead, this message appears only once, the fault is not permanent and is considered as an isolated incident and consequently ignored by the protection logic. Check the power transistors of the series regulator and for short circuits caused by foreign bodies.

If this message has appeared just once it is not a permanent fault but a single event which is then ignored by the protection logic. Check the integrity of the EF150FM1 module; if a module is not functioning, it is possible that excess current will be drawn. Check the output and low-pass filter connections.

A2: This code appears when there is a short circuit between input and output of the series regulator on the E20147.4 power supply card. The RF module power supply is not functioning correctly. For each intervention of this type, the amplifier will shut down for 7 seconds before trying again. If 2 of these events occur consecutively, the amplifier will shut down for 9 seconds, clear the event counter (CURRENT) and again attempt an automatic reset. The LOCK and VOLTAGE indicator will also appear on the front panel. If, instead, this message appears only once, the fault is not permanent and is considered as an isolated incident and consequently ignored by the protection logic. Check the power transistors of the series regulator and for short circuits caused by foreign bodies.

- A3:** This code appears when current consumption becomes excessive but there is no input voltage on the power supply card E20147.4. For each occurrence of this type, the amplifier will shut down for 7 seconds before trying again. If 2 of these events occur consecutively, the amplifier will shut down for 9 seconds clear the event counter (CURRENT) and again attempt an automatic reset. The LOCK and VOLTAGE indicator will also appear on the front panel.. If, instead, this message appears only once, the fault is not permanent and is considered as an isolated incident and consequently ignored by the protection logic. Check for short circuits between the power supply card input and the chassis. Quite common in this instance is the breakdown of the thermal insulator of one of the series regulator power transistors.
- A4:** This code appears when current consumption is high but there is no power output. For each occurrence of this type, the amplifier will shut down for 7 seconds before trying again. If 2 of these events occur consecutively, the amplifier will shut down for 9 seconds clear the event counter (CURRENT) and again attempt an automatic reset. The LOCK and CURRENT indicator will also appear on the front panel. If, instead, this message appears only once, the fault is not permanent and is considered as an isolated incident and consequently ignored by the protection logic. Check that the RF power modules are functioning.
- A5:** This code appears when there are problems with the RF output of the amplifier, in particular when there are sporadic variations in output power. In this case the R. PWR indicator will be illuminated. For each occurrence of this alarm condition, the amplifier will shut down for 7 seconds and will then attempt an automatic reset. If 9 of these events occur consecutively, the unit will shut down for 9 seconds clear the event counter (CURRENT) and again attempt an automatic reset. There are many causes of this alarm condition which can be complex: check that there is no RF self-oscillation; check for instability of excitation due to poor connections or modulator faults. If the modulator is a frequency conversion type, intervention of the squelch function of the radio link receiver can cause problems.
- A6:** This code appears when there are problems with the RF output of the amplifier, in particular when there is a sporadic or persistent mismatch with the radiating system or successive amplifying stage. In this case the R. PWR indicator will be illuminated. For each occurrence of this alarm condition, the amplifier will shut down for 7 seconds and will then attempt an automatic reset. If 2 of these events occur consecutively, the unit will shut down for 9 seconds, clear the event counter (R. PWR) and again attempt an automatic reset. Check if the amplifier's RF load is abnormal and for any intermittent faults. When the amplifier is driving a thermionic tube stage, this alarm condition can arise during the tuning phase of the input or when the tube is either very new or near the end of its life.

A7: This code appears when there are thermal problems with the amplifier, in particular excessive heating of the heatsink on which the RF modules and power supply are mounted. In this case the TEMP indicator will illuminate. For each occurrence of this alarm condition, the amplifier will shut down for 7 seconds and will then attempt an automatic reset. If 9 of these events occur consecutively, the unit will shut down for 9 seconds then, clear the event counter (TEMP) and again attempt an automatic reset. If, instead, this message appears only once, the fault is not permanent and is considered as an isolated incident and consequently ignored by the protection logic. Check if the ambient temperature is occasionally exceeding specified values. Check if the flow of cooling air is working effectively. Check that the amplifier's internal cooling fan is functioning normally. Check the output of the amplifier; if the RF load is abnormal, overheating can occur.

A8: Message reserved.

A9: This does not indicate an anomaly. This code appears when the amplifier is in STAND BY mode as a result of operator intervention or control by other equipment. The LOCK indicator will also be lit.

AA: This does not indicate an anomaly. This code confirms that the equipment is fully functional, regardless of status of other front panel indicators. The code remains displayed even when the unit is in Automatic Power Control mode.

AB: This code appears when an RF input signal is present but the amplifier is disabled. Check that the modulator is connected to the AUX SUPPLY connector situated at the rear of the unit.

AC: This code appears when no voltage is present at the input of the power supply card. For each occurrence of this type, the amplifier will shut down for 7 seconds before trying again. If 2 of these events occur consecutively, the amplifier will shut down for 9 seconds then, clear the event counter and again attempt an automatic reset. The LOCK indicator will also appear on the front panel. Check the input circuits of the power supply card; the most likely cause is a short circuit.

AD: This code indicates that the 'syncro' circuit of the power supply card is not synchronising with line frequency; the unit is faulty. In this case the LOCK indicator will also be lit. Check the relevant parts of the E20147.4 card.

AE: Message reserved

AF: Message reserved

Note: During the initial phase of powering the unit, it is normal for all indicators to briefly light. If, when this sequence has finished, the segments of the alphanumeric display light in a rotating sequence, the unit is faulty. The problem should be sought in the digital connections between all the microcontroller cards.

B) Diagnostic with the rotary selector in the PWR position.

When the rotary selector is in the F PWR position, the fault count is not displayed and excess power protection is not expected. The following status codes appear on the alphanumeric display:

S: indicates that the amplifier is in STAND BY mode as a result of operator intervention or control by external equipment.

P: Indicates that the unit is ready to generate RF power.

L: Indicates faulty connection or operating sequence. Confirmed by the Ab message.

TROUBLESHOOTING

(1) The equipment cannot develop nominal output power.

Check the front panel for an intermittent indicator light, this signifies that the equipment is operating automatically at reduced power level due to the corresponding parameter having exceeded its safe operating level. The only solution is to remove the electrical or ambient cause of the malfunction. Check that the output connections are correct - this is one of the most frequent causes of problems. Low output power can manifest even if the reading of the power output indicator is correct. The power supply regulates the voltage supplied to the RF modules as a function of the internal output power measurement; if the power does not rise, it is because the voltage is not increasing and it will be impossible to achieve maximum performance. In this case it will be necessary to either recalibrate the measurement of RF output power or to repair the circuits in question (consult ELENOS for necessary assistance). The reduced power output can be caused by a fault in one of the RF amplifier modules, or, less frequently, in other parts.

(2) The unit does not develop power and immediately enters R. PWR protection or, at random, CURRENT protection, as soon as the input is excited.

Check the RF output connections; it is likely that one or more of the radiating system connections is defective or operating inefficiently. A second important cause of this malfunction is the quality of the RF load which is connected to the output of the unit. If a narrow-band filter is connected, it is possible that some instability can arise leading to oscillations in some of the internal RF modules. If the filter is well connected and of high quality, this phenomenon is rare, nevertheless sporadic anomalies can occur. The solution in this case is to experiment: modify the length of the RF cables which connect the unit to the output filter and recalibrate the narrow-band output filter, attempting to better match the load which the filter presents to the amplifier. The loss of performance in the previous cases is the price that is paid for the wide-band characteristics of the tuning circuits. Check the behaviour of the modulator when RF power is developed; if the excitation of the SF150 is intermittent, the transmission spectrum becomes that of a pulse transmitter, not an FM transmitter. In this case it is likely that protection against a load mismatch, due to an excessively wide spectrum, is active and the only remedy is to eliminate the defect of the preceding modulator.

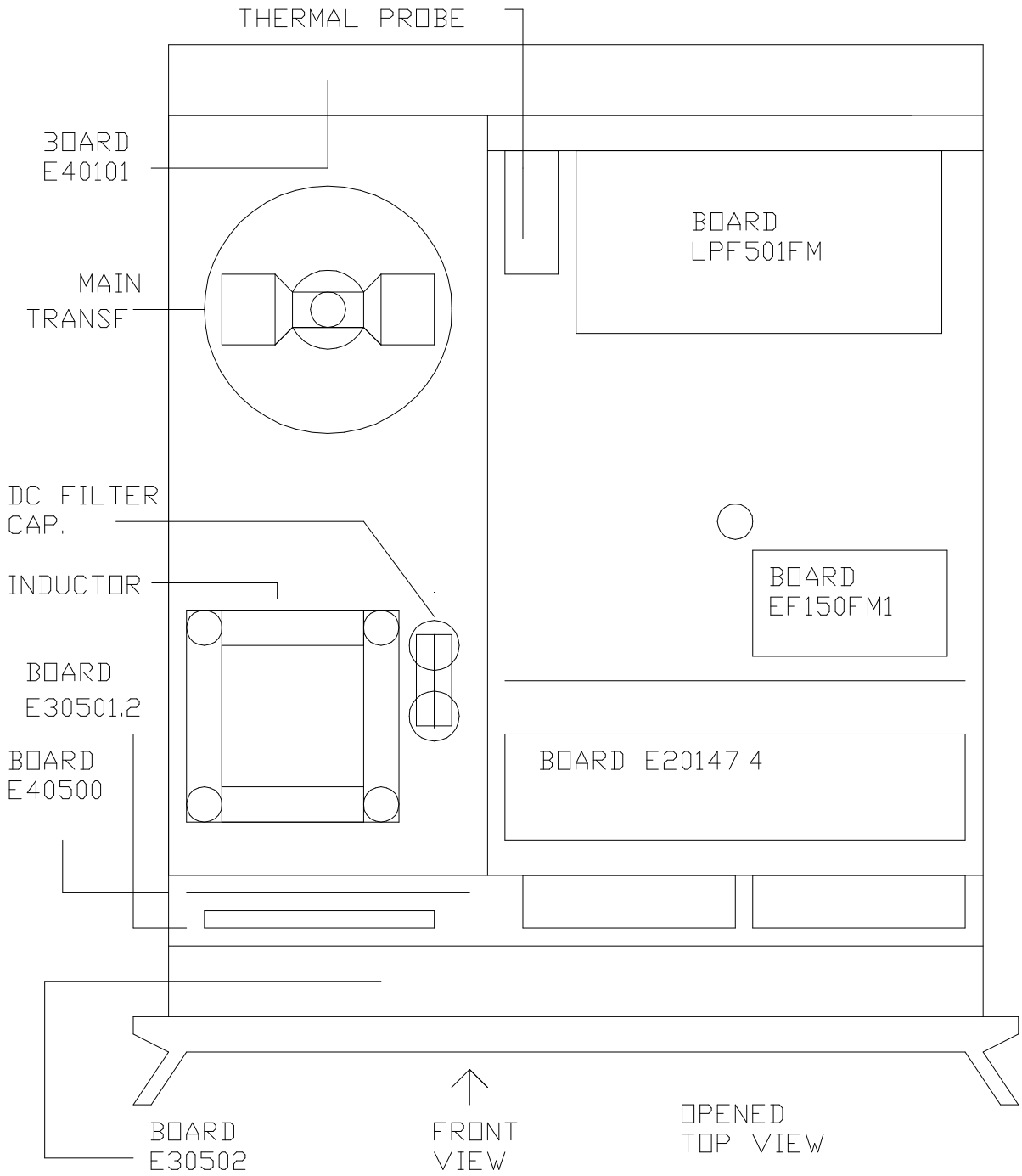
(3) Output power is unstable

Check the front panel for flashing indicators; the instability is due to reduced operating power by the internal protection circuits which avoid indefinite power reduction but do not guarantee stability. Remove the cause of the Automatic Power Control intervention by checking ambiental factors or connections to other equipment as indicated, guided by the parameter indicated on the front panel. Furthermore check that the instability is not being generated by the modulator but being reflected by the SF150. Even successive stages can cause power instability; this can occur if the load presented to the unit is unstable or there is a high content of harmonic or spurious radio frequencies. Check the harmonic and out-of-band content of the RF present between the SF150 and successive equipment.

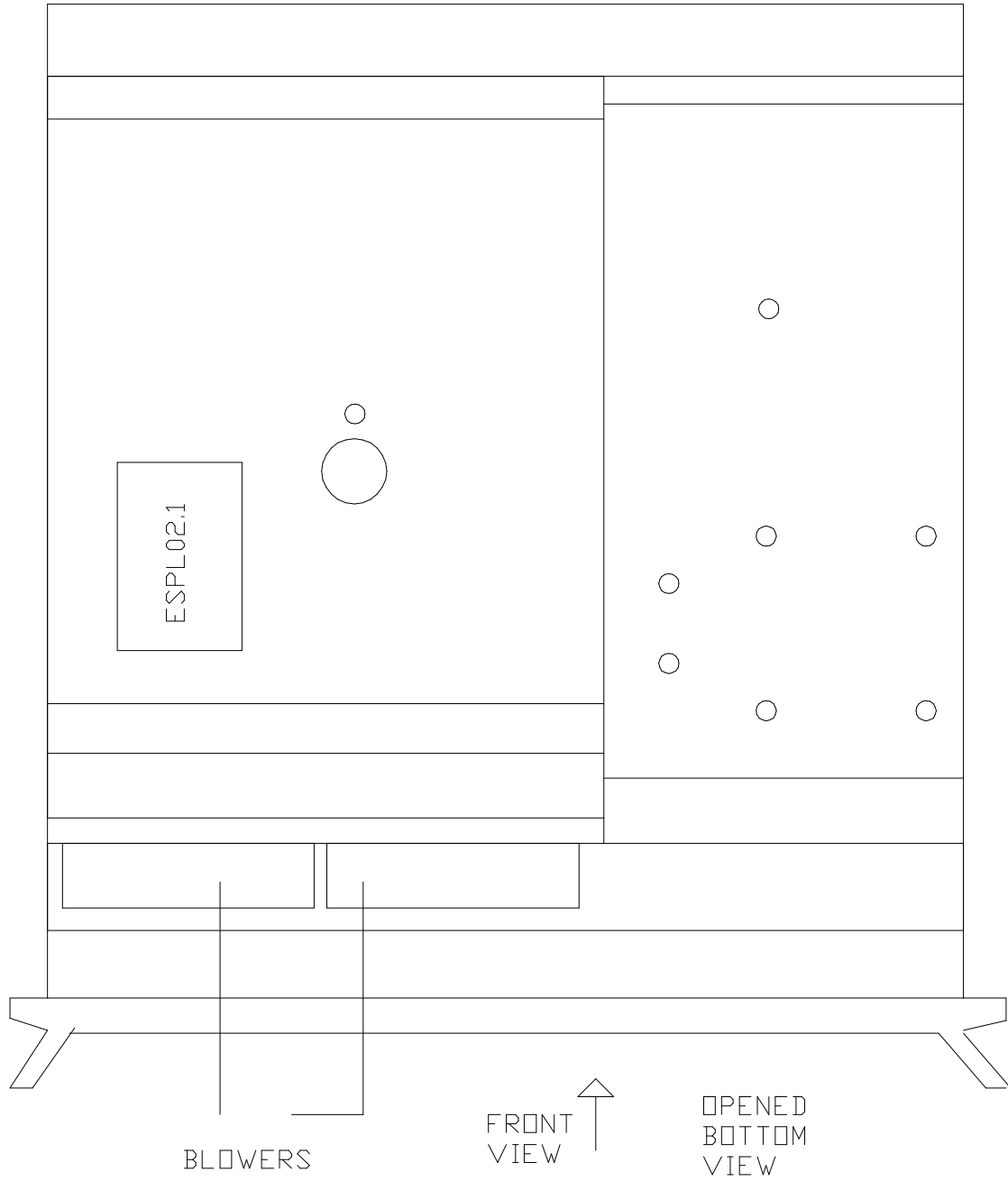
(4) The SF150 unit sporadically interrupts operation (even at reduced power) indicating R. PWR and CURRENT faults on the front panel.

Check that the connectors of the radiating system and the successive stage are not defective or damaged. Check that the modulator is not generating instability with sudden power fluctuations or even large swings of carrier frequency. Check that the modulation frequency deviation is not excessive or that the frequency synthesizer is not losing control. Check the bandwidth of any selective filter attached to the output of the unit; if the frequency deviation is greater than the calibration, the transmitter cannot function properly. Check that the receiver of the radio link does not destabilise the modulator during squelch intervention. Check that overvoltage of the line supply is not destabilising the modulator frequency control. Many difficult problems can be resolved with low-cost solutions: connection of an input filter to the SF150 with the same transfer function as the output filter; supply of the modulator and SF150 via mains-borne interference filters; supply of equipment via stabilisers with reserves of power capacity.

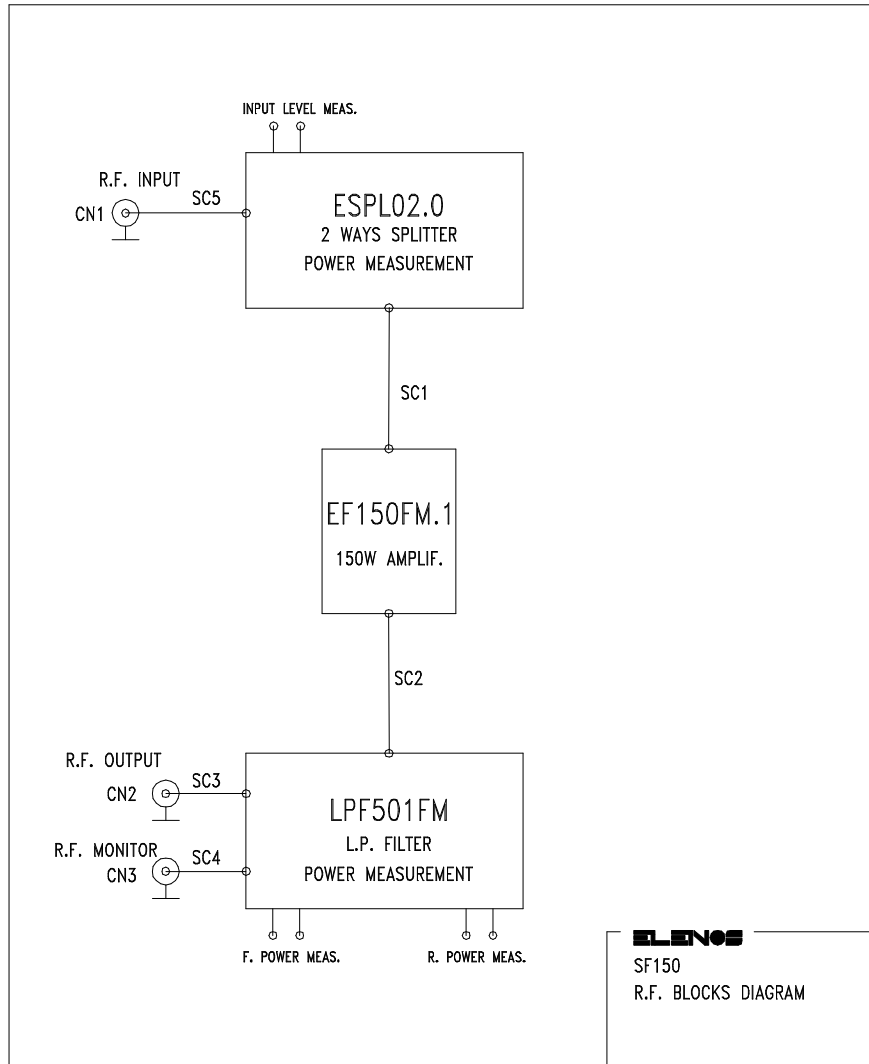
TOP VIEW



BOTTOM VIEW



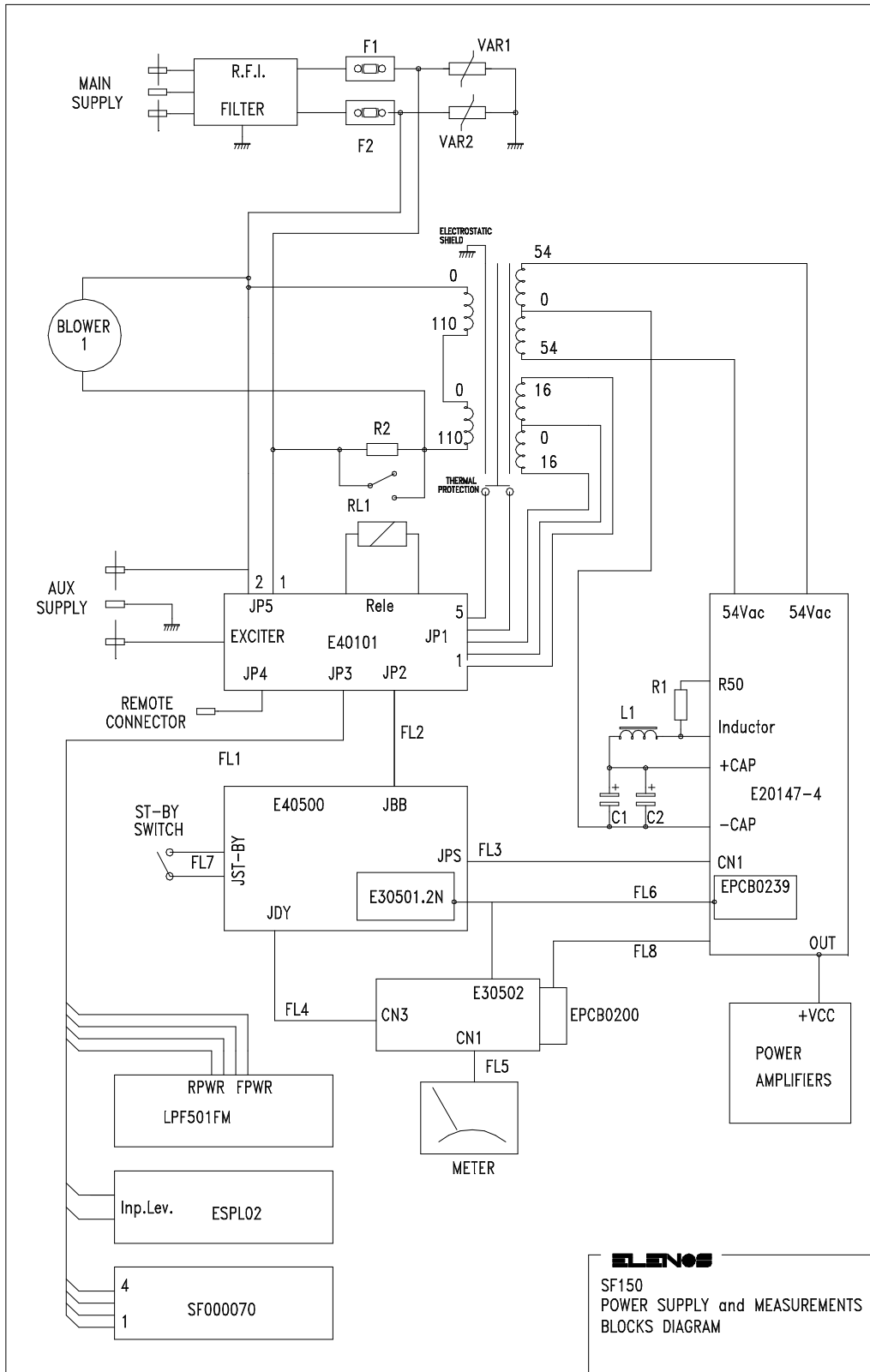
R.F. BLOCK DIAGRAM



Part List of R.F. Block Diagram

Rif.	Description	Value	Remarks
ESPL06.0	Splitter input and power measurement board		
EF150FM.1	Power amplifier board		
LPF501FM	Low pass filter board		
SC1	Coax. Cable type RG178 50 ohm		
SC2	Coax. cable type RG316 50 ohm		
SC3	Coax. cable type RG303 50 ohm		
SC4	Coax. cable type RG178 50 ohm		
SC5	Coax. cable type RG316 50 ohm		
CN1, CN2	Coaxial connector type N female		
CN3	Coaxial connector type BNC male		

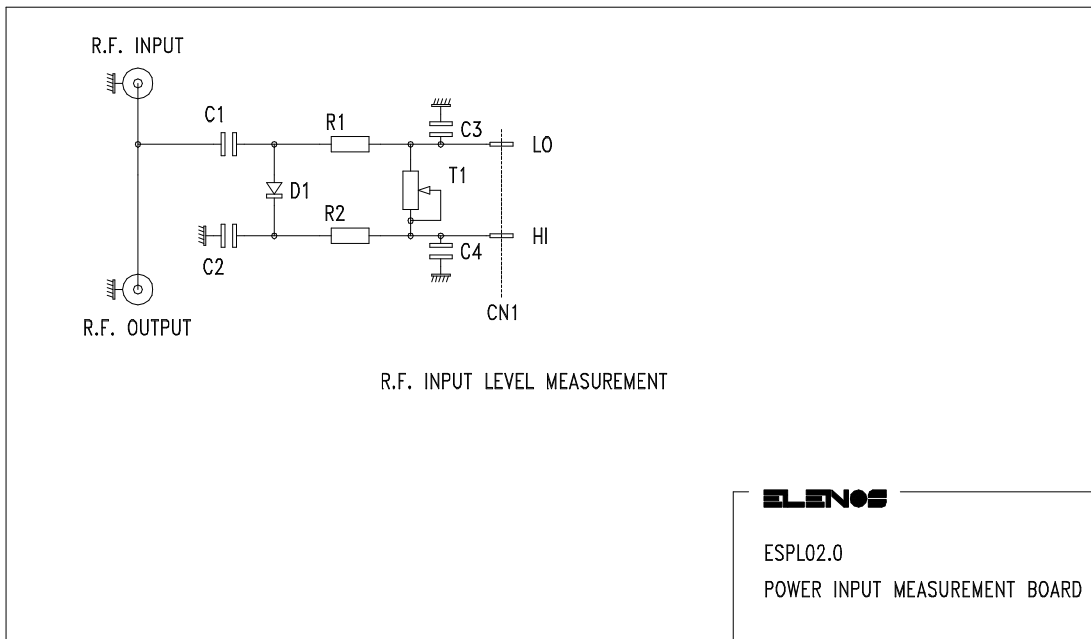
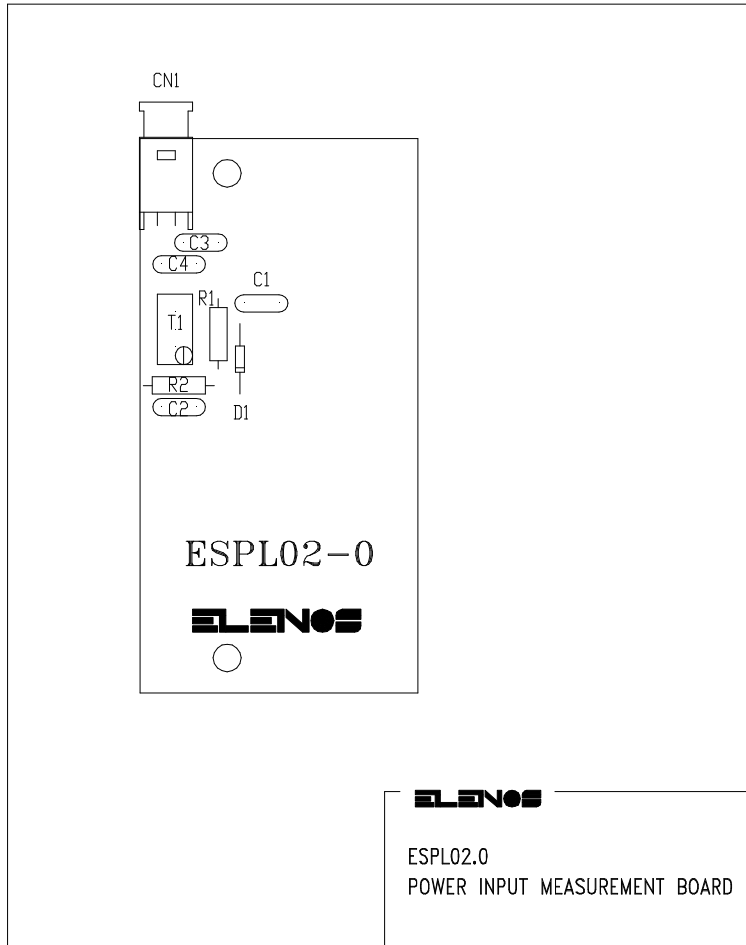
POWER SUPPLY and MEASUREMENT BLOCK DIAGRAM



PART LIST OF POWER SUPPLY AND MEASUREMENT
BLOCK DIAGRAM

Rif.	Description	Value	Remarks	Elenos Code
BLOWER 1	Blower 120x120 30W			
C1,C2	Electrolytic capacitor	4700 μ F	63V	
E20147-4	Power supply board			
E30501-2N	Protection board			
E30502	Front panel board			
E40101	Back board			
E40500	Connection board			
LPF501FM	Low pass filter			
ESPL02.1	2 ways splitter			
EPCB0200	Clock buffer Board			
EPCB0239	Watch-Dog Board			
F1, F2	Fuse holder with 10A fuse			
FL1	Flat Cable 10 pin			CSF- F006
FL2	Flat Cable 40 pin			CSF- F007
FL3	Flat Cable 20 pin			CSF- F008
FL4	Flat Cable 20 pin			CSF- F004
FL5	Flat Cable 2 pin			CSF- F016
FL6	Flat Cable 2 pin			CSF- 0024
FL7	Flat Cable 4 pin			CSF- F005
FL8	Cable type RG178	35 cm		
L1	Inductor	750 μ H	11 A	
Meter	Meter 100 μ A f.s. M3D			
R1	Wire wound resistor	50 Ω	5%	
R2	Resistor	10 Ω	25W 5%	
RL1	Relay FINDER type 65.31	12 V DC		
R.F.I. filter	Arcotronics FAMDB3600ZE			
ST-BY SWITCH	2-way 2-position switch	250V 6A		
SF000070	Thermal Probe Board			
Transformer	Toroidal transformer with electrostatic shield	480 VA		
VAR1, VAR2	MOV type S20K-275			

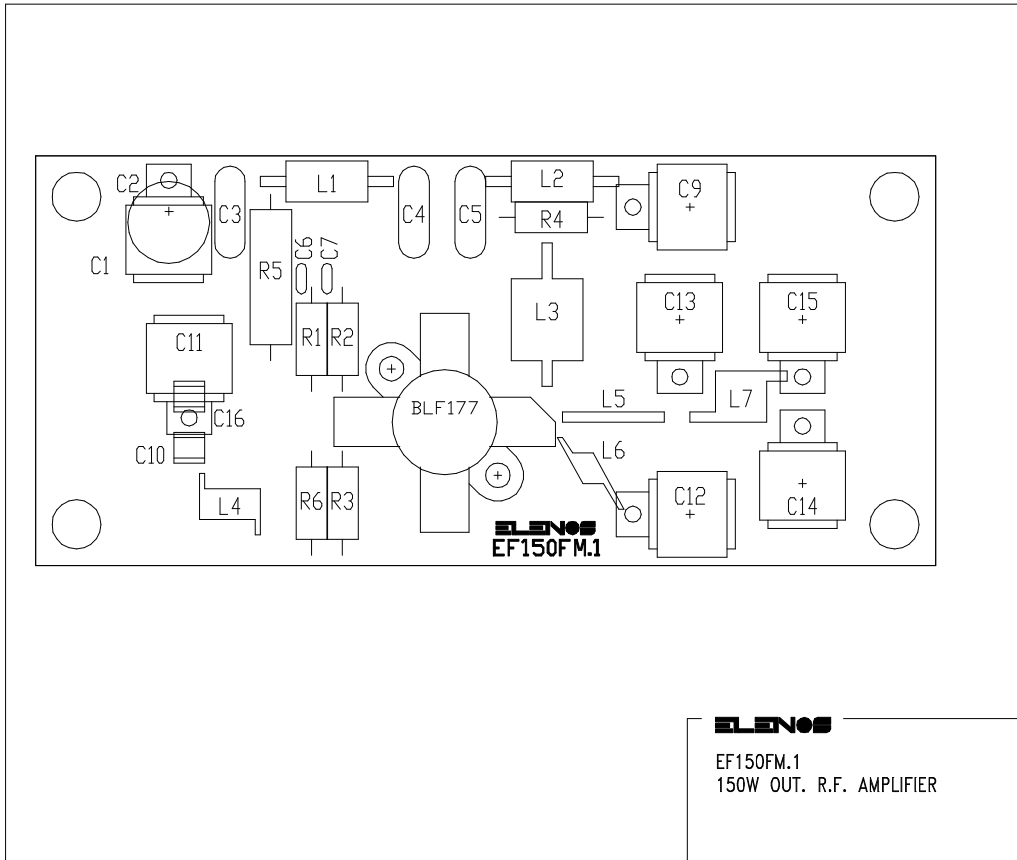
ESPL02 (Power measurement Board)



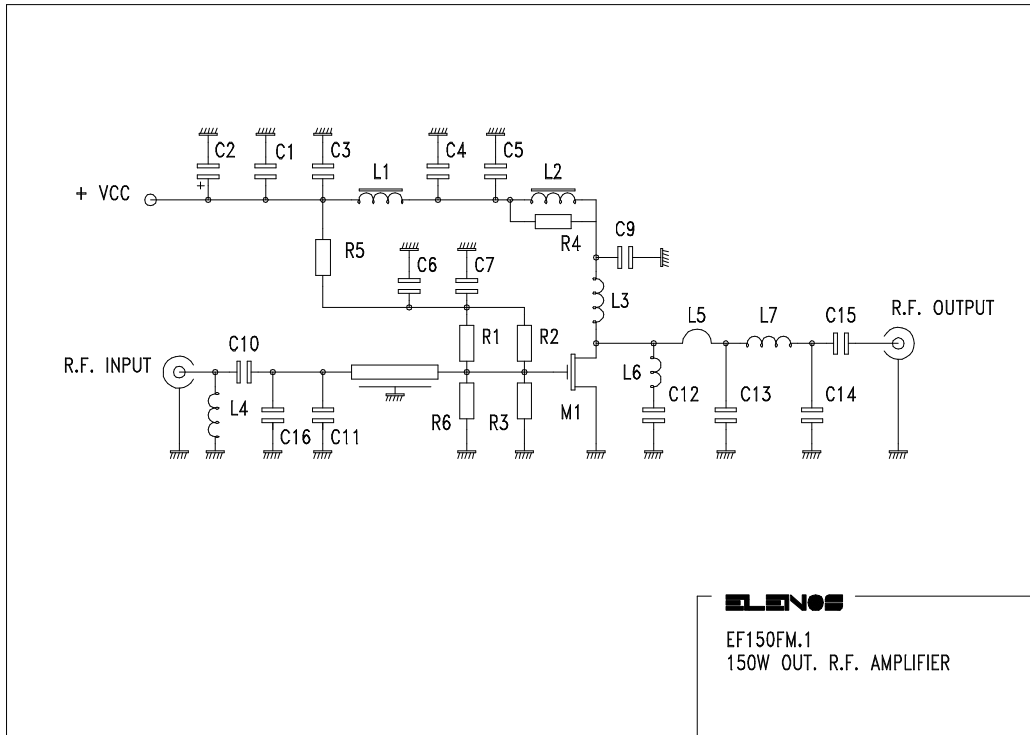
Part List of ESPL02.0 Board

Rif.	Description	Value	Remarks
PCB	Print Board code 2PCB0210		
R1, R2	Resistor	34 K Ω	1%
R3	Resistor	100 Ω	2W
T1	Trimmer type 67W	50 K Ω	
C1, C2	Ceramic Capacitor	10 pF	50 V
C3, C4	Ceramic Capacitor	4n7	50 V
D1	Diode Germanium	AA118	
CN1	Connector AMP MODU II 2 pin angled		

EF150FM.1 (Power Amplifier)



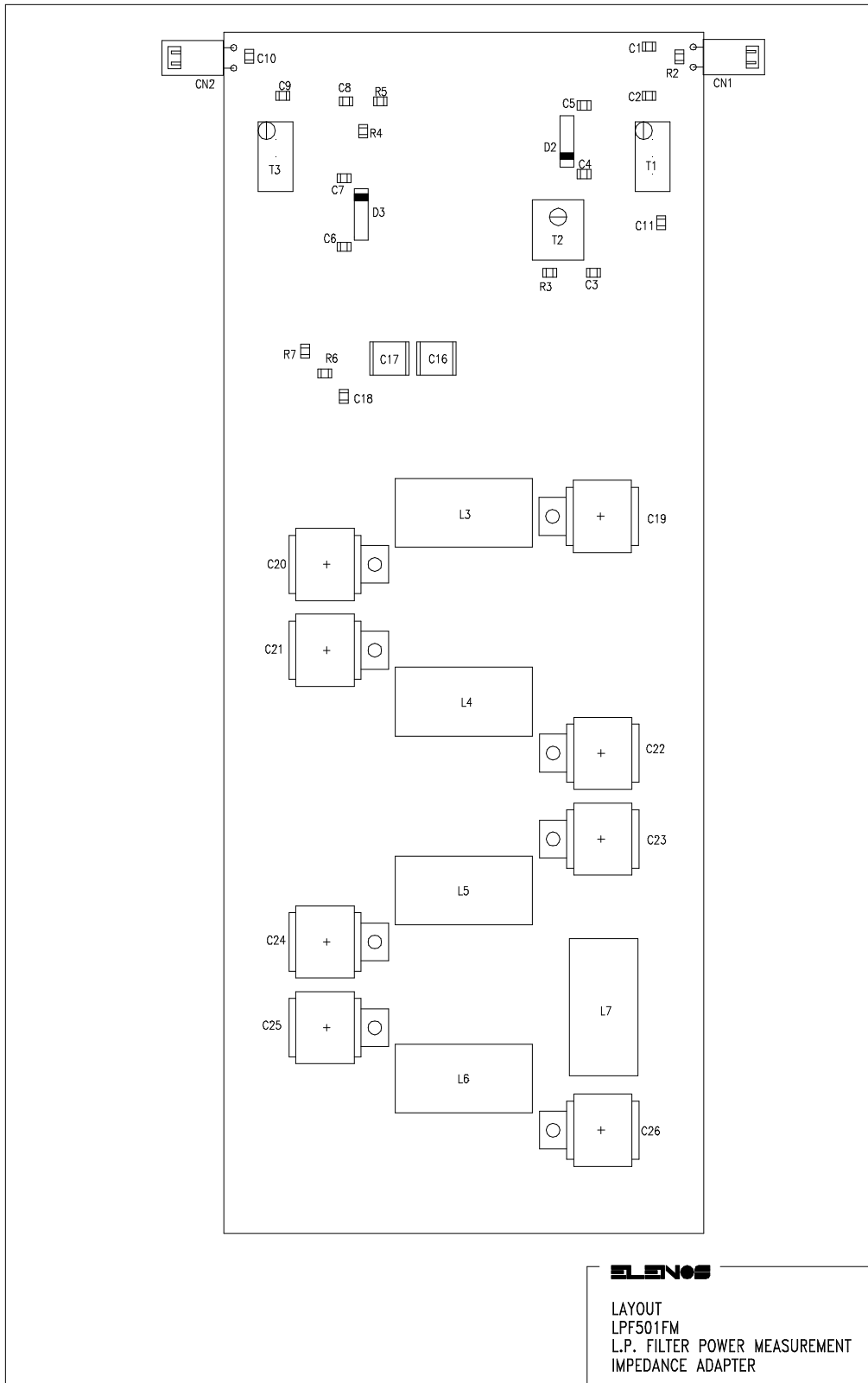
ELENOS
EF150FM.1
150W OUT. R.F. AMPLIFIER

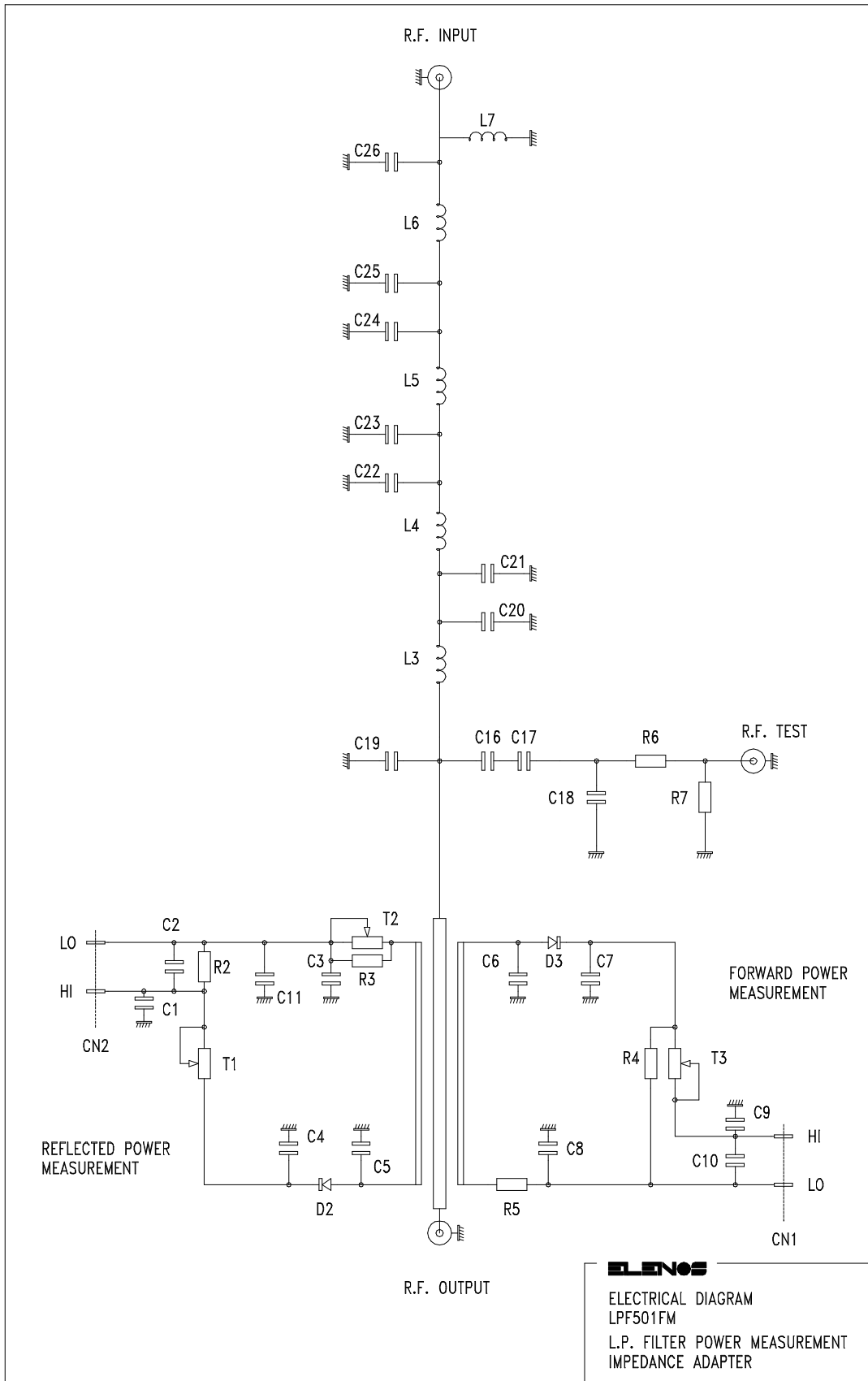


PART LIST BOARD EF150FM1

Rif.	Description	Value	Remarks	Elenos Code
PCB				2PCB0190
R1, R2	Resistor	100 Ω	0.5 W 5%	
R3	Resistor	820 Ω	0.25 W 5%	
R4	Resistor	10 Ω	2 W 5%	
R5	Resistor	15 K Ω	0.25 W 5%	
R6	Resistor	2k7	0.25 W 5%	
C1	Mica Capacitor	1000 pF	500 V	
C2	Electrolytic. Vert. Capacitor	47 μ F	63 V	
C3	Ceramic Capacitor	4n7	2 KV	
C4	Mylar Capacitor	220 nF	100 V	
C5	Ceramic Capacitor	4n7	2 KV	
C6, C7	Ceramic Capacitor SMD	4n7	50 V	
C9	Mica Capacitor	1000 pF	500 V	
C10	Ceramic Capacitor NPO	82 pF	100 V	
C11, C12	Mica Capacitor	330 pF	500 V	
C13	Mica Capacitor	220 pF	500 V	
C14	Mica Capacitor	47 pF	500 V	
C15	Mica Capacitor	1000 pF	500 V	
C16	Ceramic Capacitor NPO	82 pF	100 V	
L1, L2	Inductor type VK200	200 μ H		
L3	Coil #8 turns D=8.0 W=1.0			2L000110
L4	Coil #3 turns D=5.0 W=1.0			2L000100
L5	Coil #0.5 turns D=8.5 W=1.0			2L000140
L6	Coil #2 turns D=5.0 W=1.0			2L000130
L7	Coil #3 turns D=6.5 W=1.0			2L000120
M1	Mosfet type BLF177			

LPF501FM (Low Pass Filter)





PART LIST BOARD LPF501FM

Rif.	Description	Value	Remarks	Elenos Code
PCB	Board LPF501FM			2PCB0225
R2, R6	CHIP Resistor S.1206	220 Ω		
R3	CHIP Resistor S.1206	270 Ω		
R4	CHIP Resistor S.1206	3.3 K Ω		
R5	CHIP Resistor S.1206	100 Ω		
R7	CHIP Resistor S.1206	47 Ω		
T1	Trimmer type 67W Beckman/Bourns	100 K Ω		
T2	Trimmer type 72P Beckman/Bourns	500 Ω		
T3	Trimmer type 67W Beckman/Bourns	50 K Ω		
C1, C2, C3, C4, C7, C8, C9, C10, C11	Ceramic Capacitor	4n7	100V	
C5, C6	Ceramic Capacitor	47 pF	100V	
C16, C17	Ceramic Capacitor	1.5 pF	500V	
C18	Ceramic Capacitor	22 pF	100V	
C19, C20, C21, C22, C23, C24, C25, C26	Mica Capacitor	27 pF	500V	2CMI0027
L3, L6	Coil #4 turns D=8.5 W=1.5			2L000220
L4, L5	Coil #5 turns D=8.5 W=1.5			2L000230
L7	Coil #20 turns D=8.5 W=1.5			2L000250
D2, D3	Diode type 1N82AG			
CN1, CN2	Connector AMP MODU II 2 pin angled			