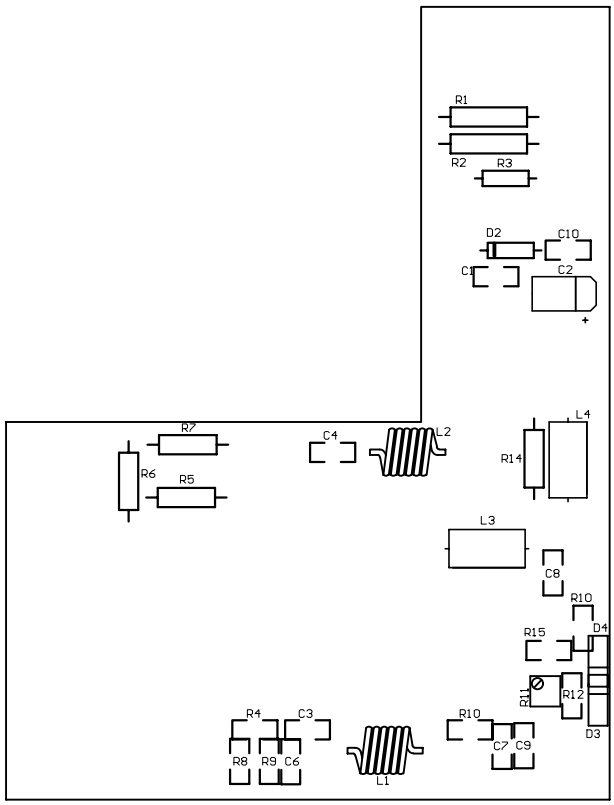
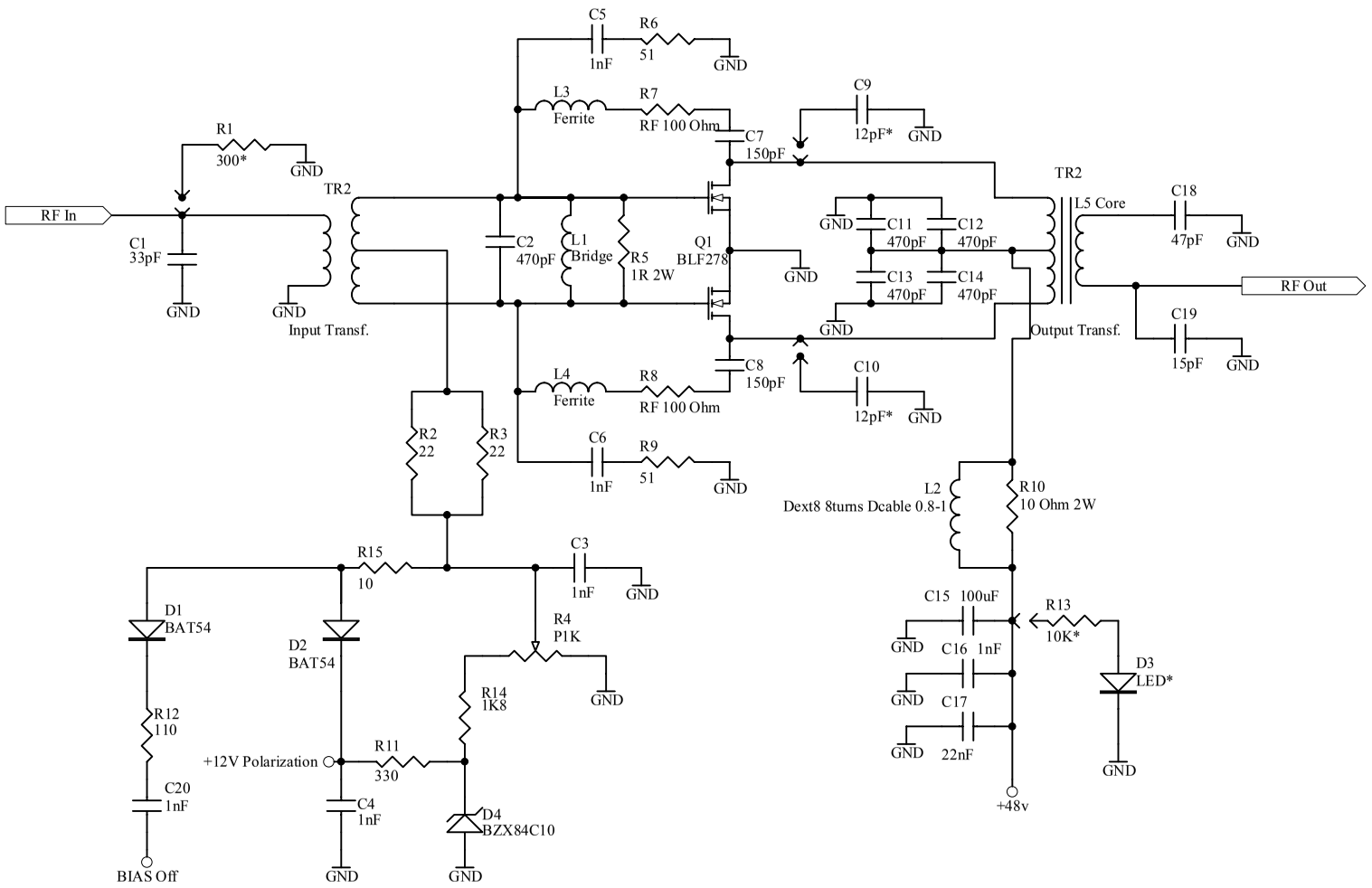


	Date	Name	Signature:	Sistemas Electrónicos S.A.
Drawn	06/06/02	OMB Eng. Dpt.		
Checked				
Standards				

Scale:	Title: Driver FM v1.2 7W FM Driver	Drawing nr: 05.01.01.000
		Replace:
		Replaced with:

FM 300W Power Amplifier

DESCRIPTION	REFERENCE	QUANTITY
Cap. 33pF SMD 1206 100V	C1	1
Cap. 470pF SMD 1210 5% 200V NPO	C2, C11-C14	5
Cap. 1nF SMD 1206 100V	C3-C6, C16,C20	6
Cap. 150pF 100V Ceramic	C7,C8	2
Cap. 100uF SMD ≥50V Electrolytic	C15	1
Cap. 22nF SMD 1206 200V Ceramic X7R	C17	1
Cap. 47pF SMD 1210 5% 500V C17	C18	1
Cap. 15pF SMD 1210 5% 500V C17	C19	1
Diode BAT54 SMD SOT-23	D1,D2	2
Zener diode 10V SMD 0.35W	D4	1
Thread ∅0.8mm Cu-Ag 30mm. approx.	Material for L1 and TR2 fixing	
Thread ∅1mm Cu enamelled 250mm. approx.	Material for L2	
Thread ∅1.5mm Cu-Ag 50mm. approx.	Material for L5 and TR1 fixing	
Axial ferrite	L3,l4	2
Output transformer core	L5	1
22Ω SMD 1206 1/4W	r2,r3	2
Potentiometer 1turn 1K 3/8"	R4	1
Metal 1 Ω / 2W L=12mm ∅=3.9mm Non-inductive	R5	1
Res. 10Ω SMD 1206 1/4W	R6-R9	4
Res. 10Ω Coal 2W L=16mm ∅=5.5mm Non-inductive	R10	1
Res. 330Ω SMD 1206	R11	1
Res. 110Ω SMD 1206	R12	1
Res. 1K8Ω SMD 1206	R14	1
Res. 10Ω SMD 0805	R15	1
Output Transformer	TR1	1
Input Transformer	TR2	1
Connection terminals tab 2.8x0.5	CON1,CON2	2
Female-female hex. separator 10mm Brass-Nickel	CON3	1
MOSFET, N 108MHz 300W SALD BLF278	Q1	1



*Elements with * are optional*

	Date	Name	Signature:
Drawn	04/05/04	M. Tsvelev	
Checked			
Standards			

Sistemas Electrónicos S.A.

Scale :

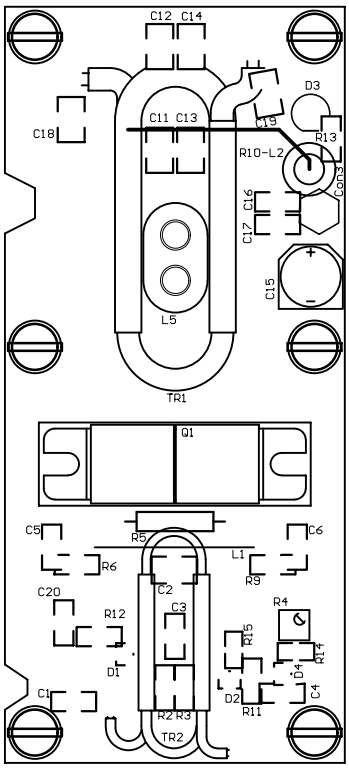
Title: MODPOT v1.3

300W R.F. Power Amplifier

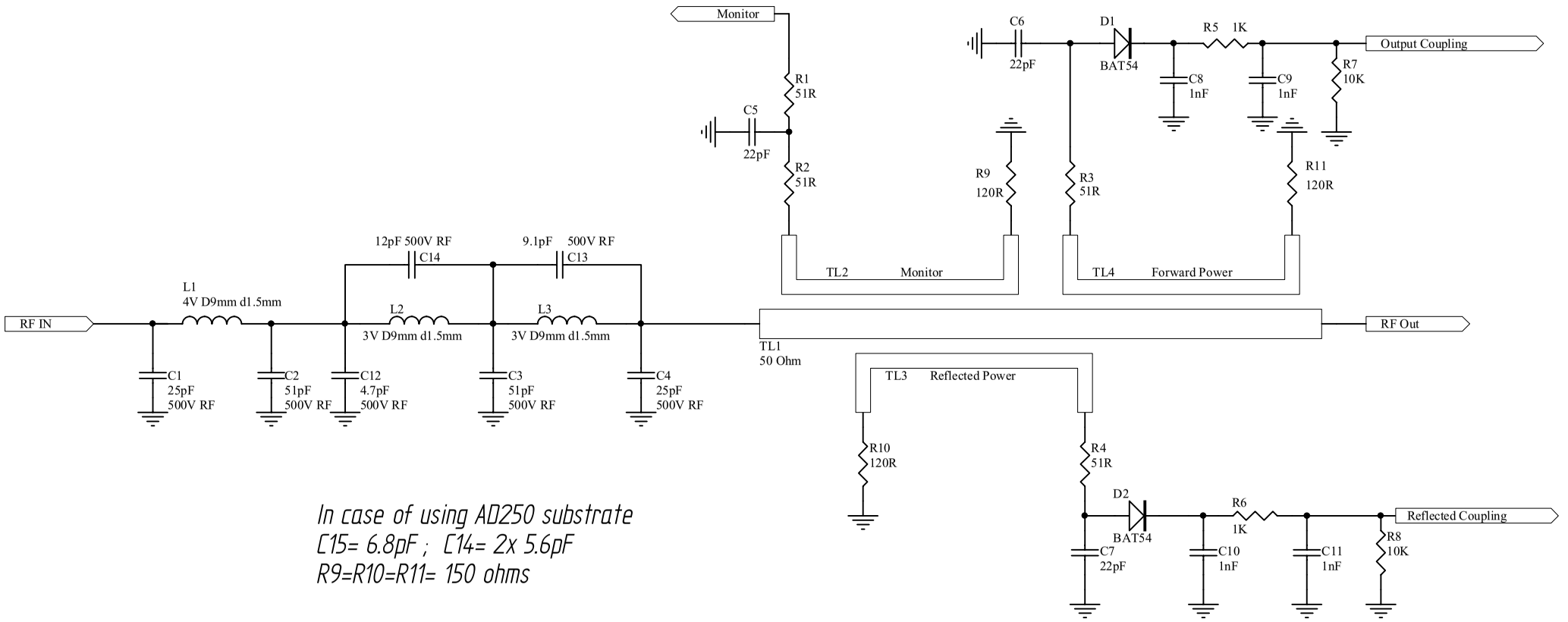
Drawing nr: 04.04.01.003

Replace:

Replaced with:



	Date	Name	Signature:	
Drawn	04/05/04	M. Tsvelev		Sistemas Electrónicos S.A.
Checked				
Standards				
Scale:	Title: MODPOT v1.3 300W R.F. Power Amplifier			Drawing nr:
				Replace:
				Replaced with:



In case of using AD250 substrate
C15= 6.8pF ; C14= 2x 5.6pF
R9=R10=R11= 150 ohms

	Date	Name	Signature:
Drawn	06/06/02	OMB Eng. Dpt.	
Checked			
Standards			

Sistemas Electrónicos S.A.

Scale :

Title: EM 250 COMPACT DIG
300W FM FIlter

Drawing nr: 05.04.02.000

Replace:

Replaced with:

2.6 Control unit and display board.

This circuit board is basically simple.It contains the Microcontroller,the keyboard and few other circuits which we will briefly discuss.Control and Display Units are shown in Figure 2-7 below. The Microcontroller has 3 digital 8-bit ports and an analog one. This latter is the interface with the analog signals that must be measured in the transmitter. A fast peak rectifier built around IC4 drives one of these analog lines. All audio or baseband modulation plus some steady state signals are multiplexed to its input by IC3, so requiring only one peak rectifier and increasing the number of the analog channels. One analog channel reads the internal temperature through the optional TR3 sensor.

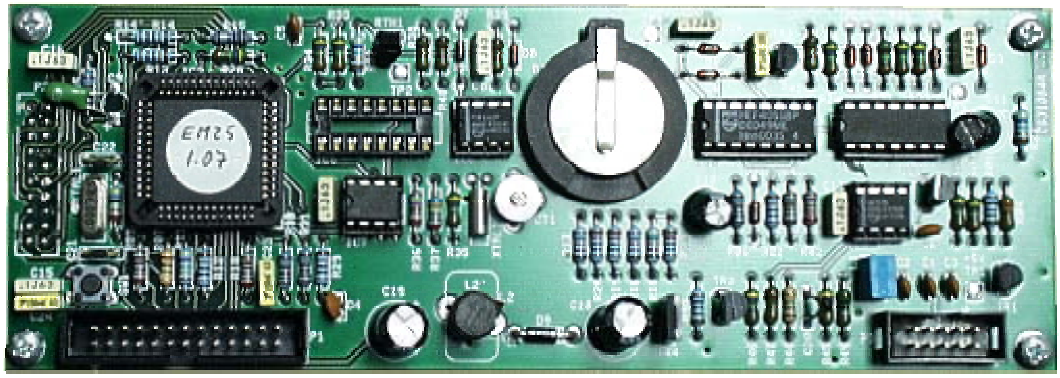


Fig. 2-7: DETAILED VIEW OF CONTROL UNIT.

The simple specialized IC6 performs clock and date functions as a stand-alone unit, backed-up by a NiMnh battery which keeps circuit active for a long time when the power is removed.

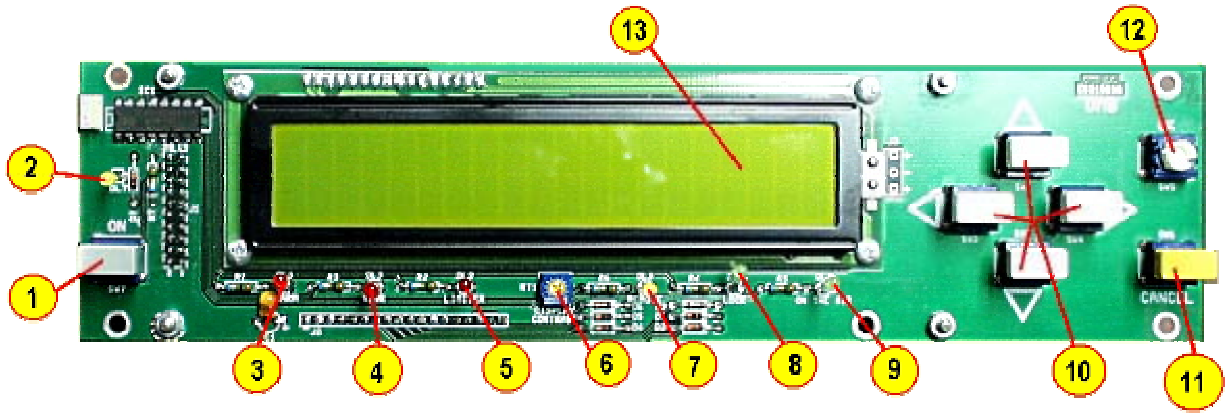


Fig. 2-8: DETAILED VIEW OF DISPLAY and EXTERNAL CONTROL BOARD.

Elements numbered in Figure 2-8 are the following:

1 - MAIN/STANDBY push button switch.

2 - STANDBY indicator LED.

3 - ALARM indicator LED.

4 - VSWR indicator LED.

5 - LIMITER indicator LED.

6 - DISPLAY CONTRAST adjustment potentiometer.

7 - REMOTE operation indicator LED.

8 - LOCK indicator LED.

9 - ON THE AIR indicator LED.

10 - External control keyboard.

11 - CANCEL key, to suppress any order or command.

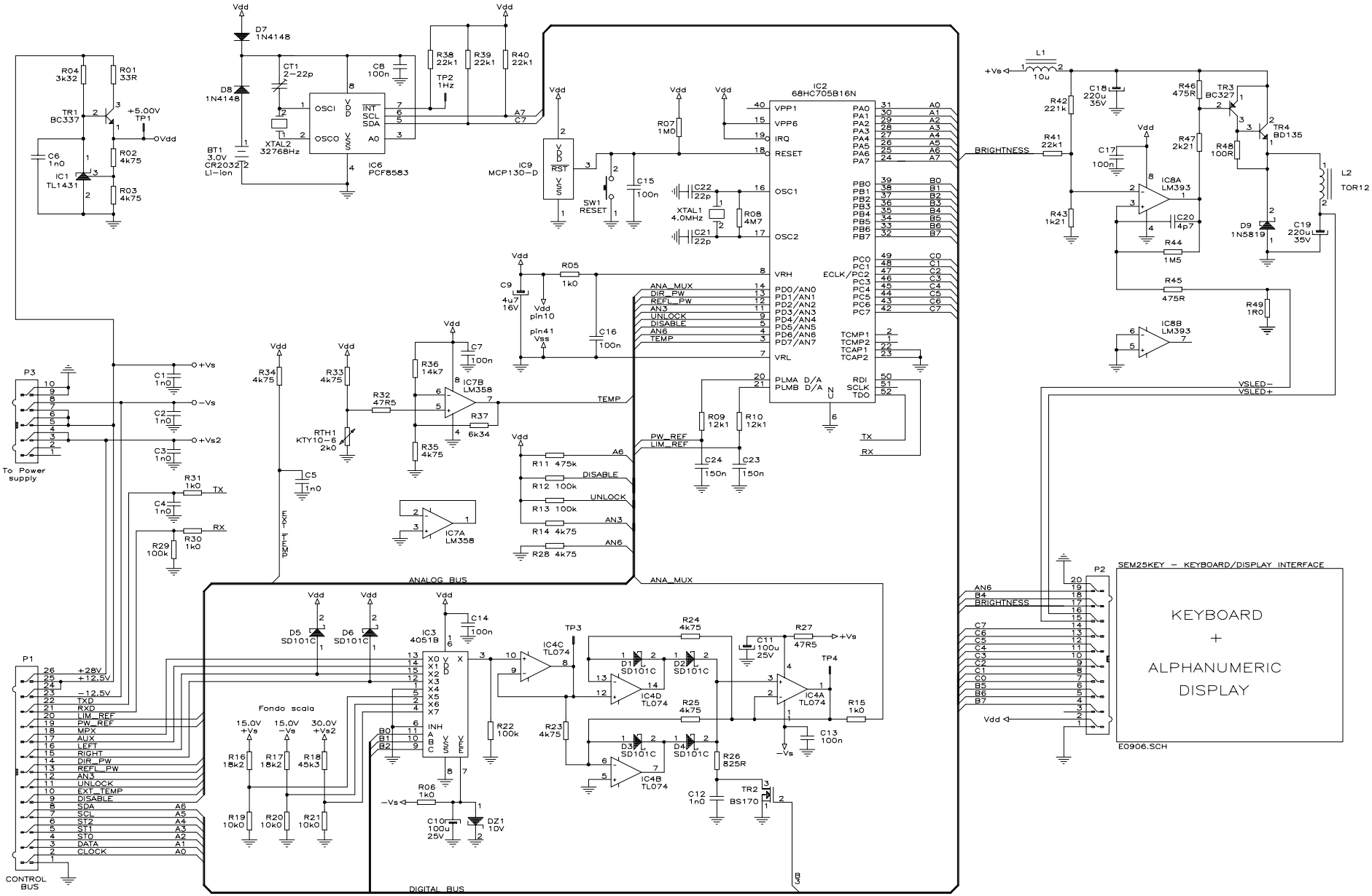
12 - OK data entering key, to confirm any order or command.

13 - Two-row, backlighted alphanumeric LCD display.

The keyboard switch set is sequentially interrogated one hundred times in a second to determine if a key was pushed. IC5,a serial to parallel converter, drives the front-panel LEDs and the display backlighting with TR2.

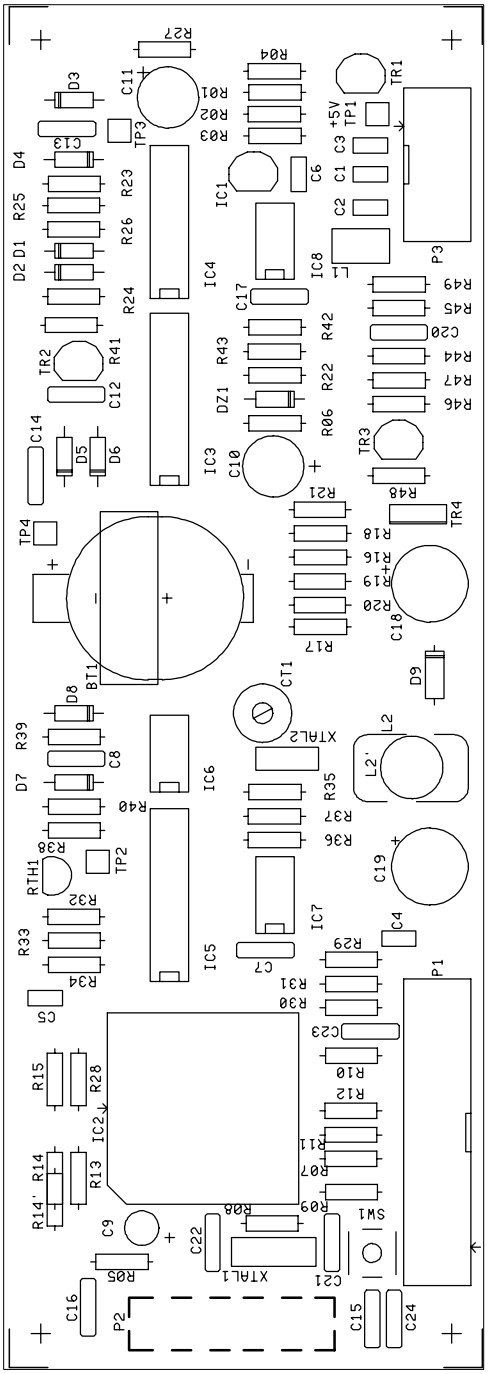
The alphanumeric display is a separate module, connected to the board by a small flat-ribbon cable, as shown in Figure 2-8. 11 digital lines from the Microcontroller drive this module. The internal board potentiometer RT1 regulates the LCD contrast and may be used to change it for different situations. A separate power supply current for the backlight LEDs is provided by R41 and R42: these resistors become quite hot when the display is full on and their heat someway influence the internal temperature read by TR3.

No other regulation is provided on the board.The precision of the measurements is guaranteed by design by the precision of the components and the reference voltage source IC1.

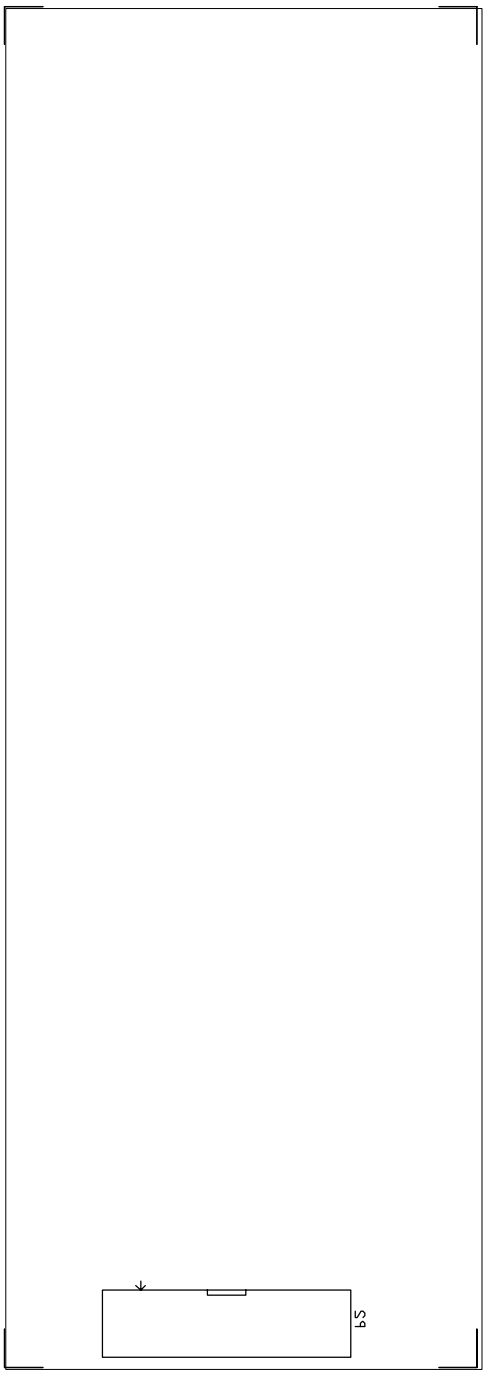


	Date	Name	Signature:	Sistemas Electrónicos S.A.
Drawn	18/04/03	OMB Eng. Dpt.		
Checked				
Standards				
Scale :	Title: EM 250 COMPACT DIG Control unit			Drawing nr: Replace: Replaced with:

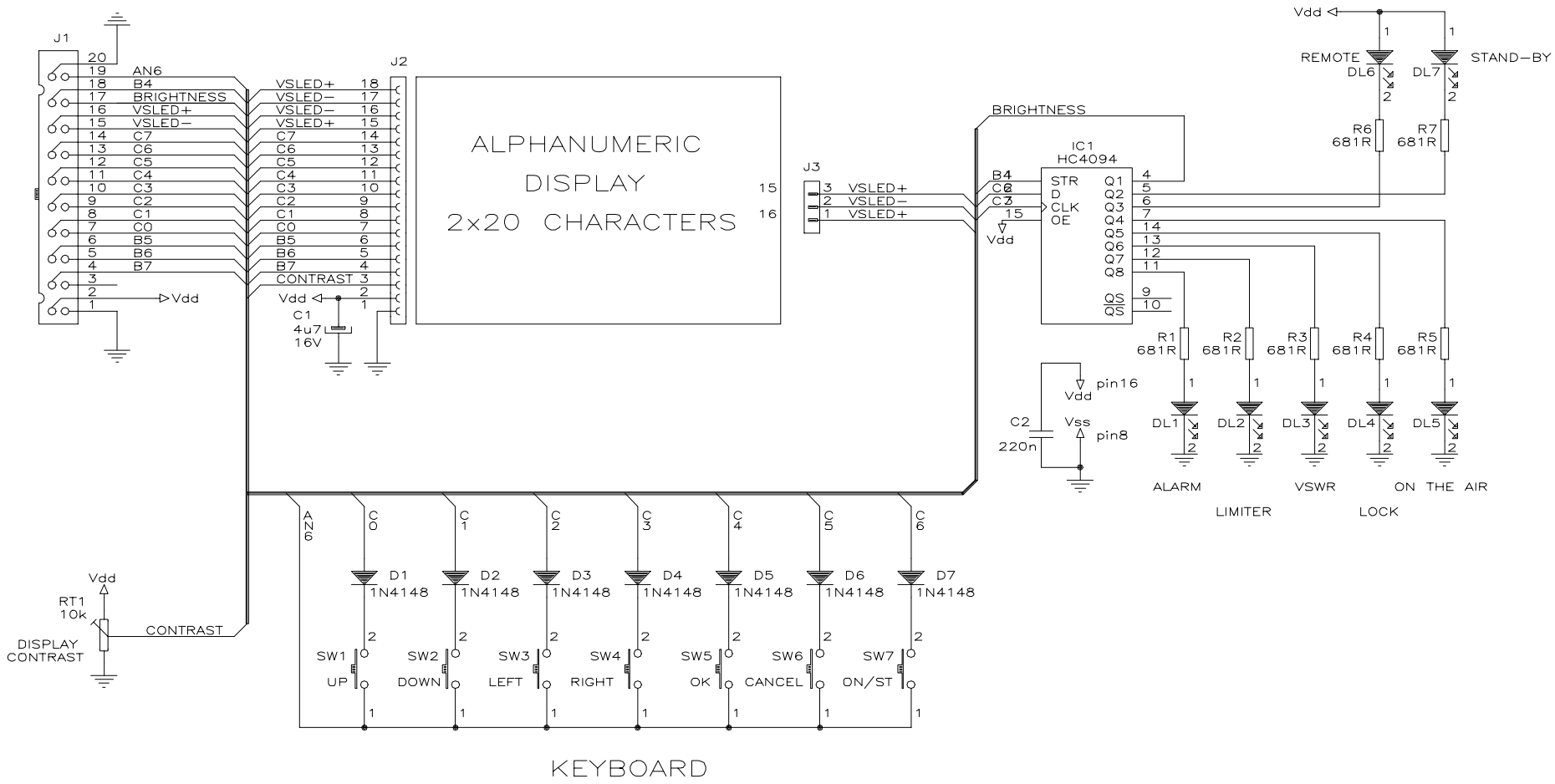
Component side



Solder side



	Date	Name	Signature:	
Drawn	18/04/03	OMB Eng. Dpt.		Sistemas Electrónicos S.A.
Checked				
Standards				
Scale:	Title: EM 250 COMPACT DIG Control unit			Drawing nr:
				Replace:
				Replaced with:



	Date	Name	Signature:
Drawn	16/07/02	OMB Eng. Dpt.	
Checked			
Standards			

Sistemas Electrónicos S.A.

Scale :

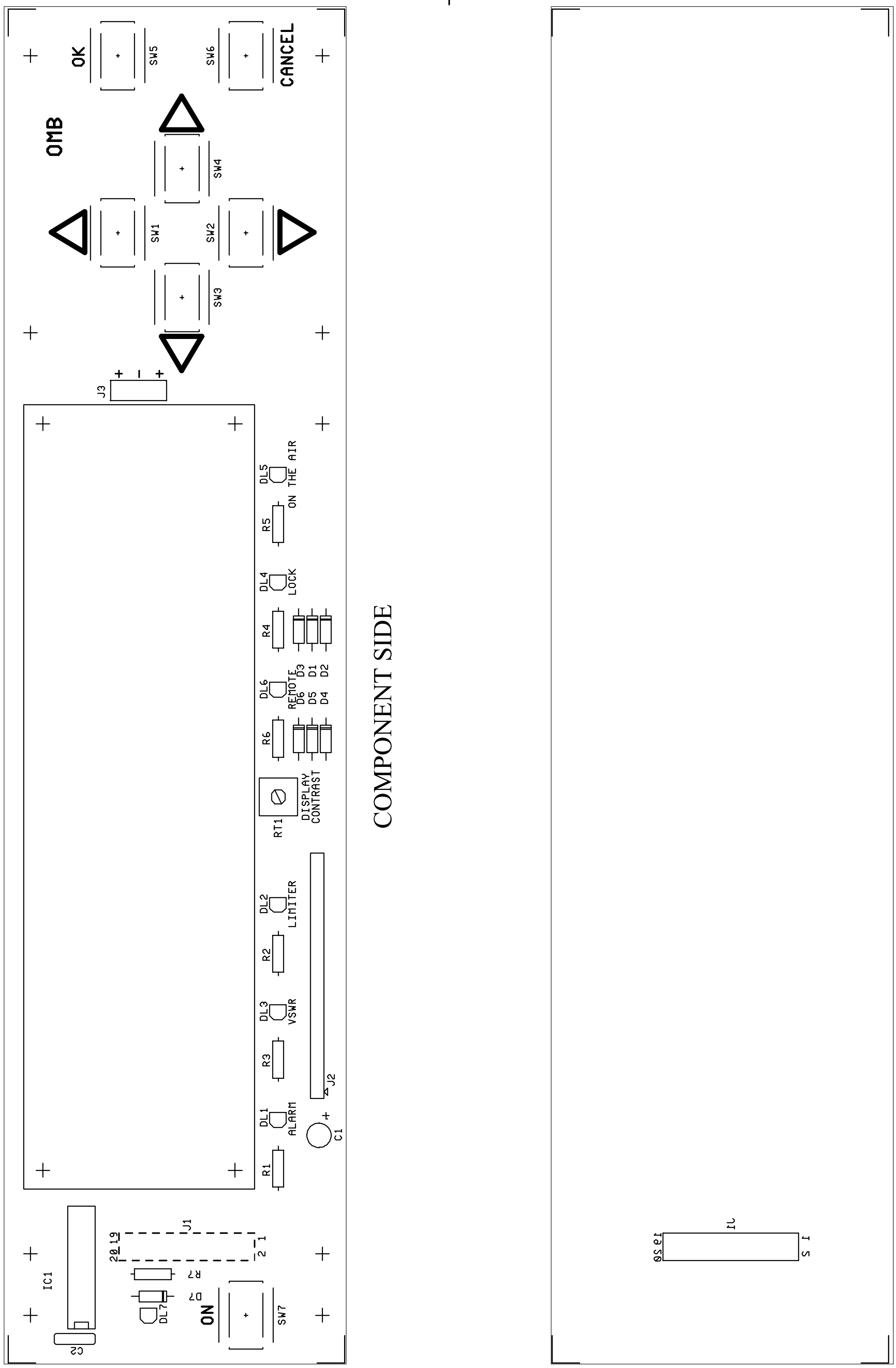
Title: EM 250 COMPACT DIG

Keyboard/display interface

Drawing nr:

Replace:

Replaced with:



	Date	Name	Signature:
Drawn	16/07/02	OMB Eng. Dpt.	
Checked			
Standards			

Sistemas Electrónicos S.A.

Scale:	Title: EM 250 COMPACT DIG Keyboard / display interface	Drawing nr:
		Replace:
		Replaced with:

2.7 Power supply units.

2.7.1 MAIN UNIT.

The main power supply regulator is a sturdy SP-500/48 unit having a high-efficiency, direct mains switching-mode type. The power supply accepts mains input varying in the range of 90~260V_{AC}, generating an unregulated DC voltage which is used by the regulator as input voltage. This unit is intended to be replaced as a whole unit in event of damage, and not to be repaired in the field. This power supply delivers +48V_{DC} to the load, at a nominal power rate of 500W.

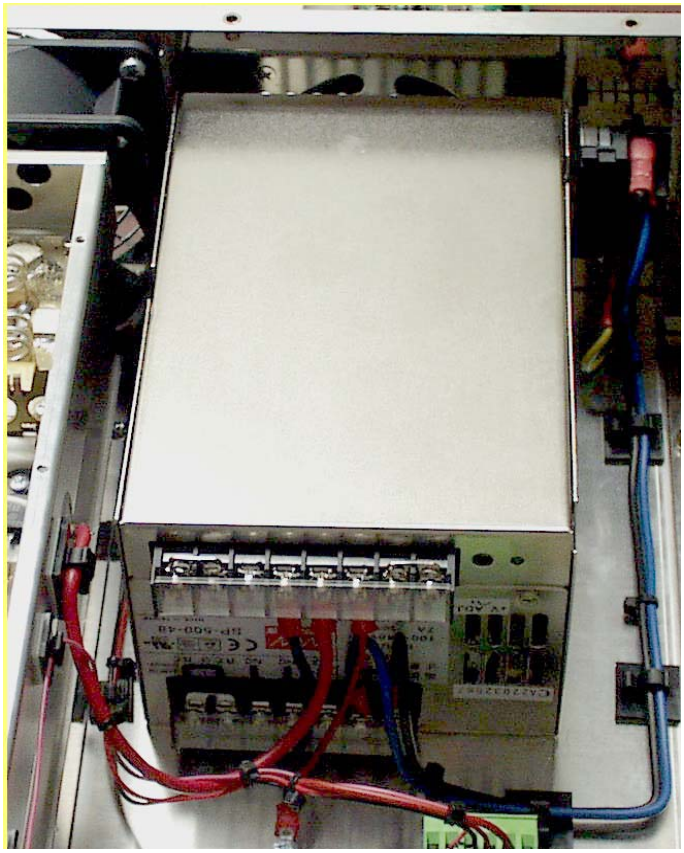


Fig. 2-9: MAIN +48V_{DC} POWER SUPPLY.

WARNING

IN THIS UNIT, MAINS VOLTAGE AND OTHER DANGEROUS VOLTAGES ARE PRESENT. DO NOT MAKE ANY INTERVENTION ON THE BOARD WHEN IT IS CONNECTED TO MAINS. SERVICE IS LIMITED TO LABORATORIES ONLY.

2.7.2 AUXILIARY UNIT.

This unit delivers ± 12V to feed Control and Display units, and to develop the fast bias cutoff of -12V in order to protect the Power Amplifier components from an irreversible damage in event of a sudden increase of VSWR or other failure that may appear during Equipment's normal operation.

A detailed view of this unit is given in Figure 2-10. Note that this unit is fitted with a protection fuse (F) to protect it in case of any overload. Always replace this fuse with the same type and rating, in order to keep active this protection.

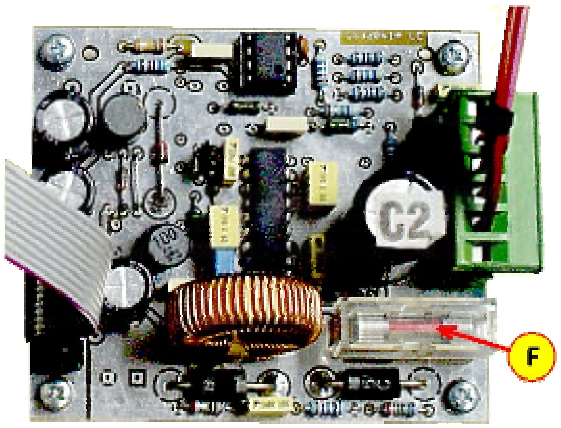
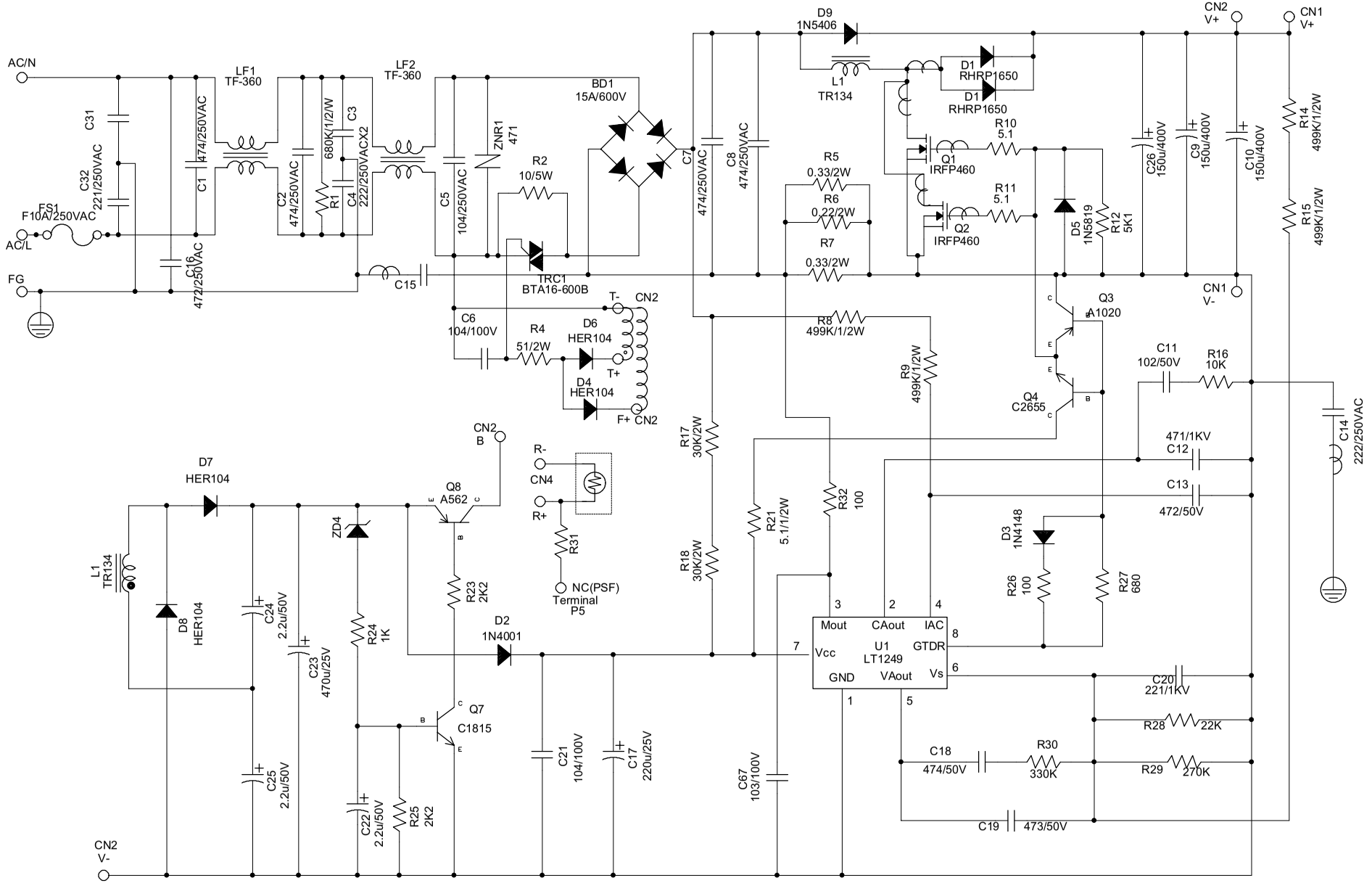


Fig. 2-10: VIEW OF AUXILIARY POWER SUPPLY.



SP-500A DIFFERENT COMPONENT:

MODEL / PART NO.	12V	13.5V	15V	24V	27V	48V	54AD
R31	X	X	X	X	X	X	1K
ZD4	8.9V	8.9V	8.9V	8.9V	8.9V	8.9V	9.1V/1W

	Date	Name	Signature:
Drawn	18/07/00		
Checked			
Standards			

Sistemas Electrónicos S.A.

Scale :

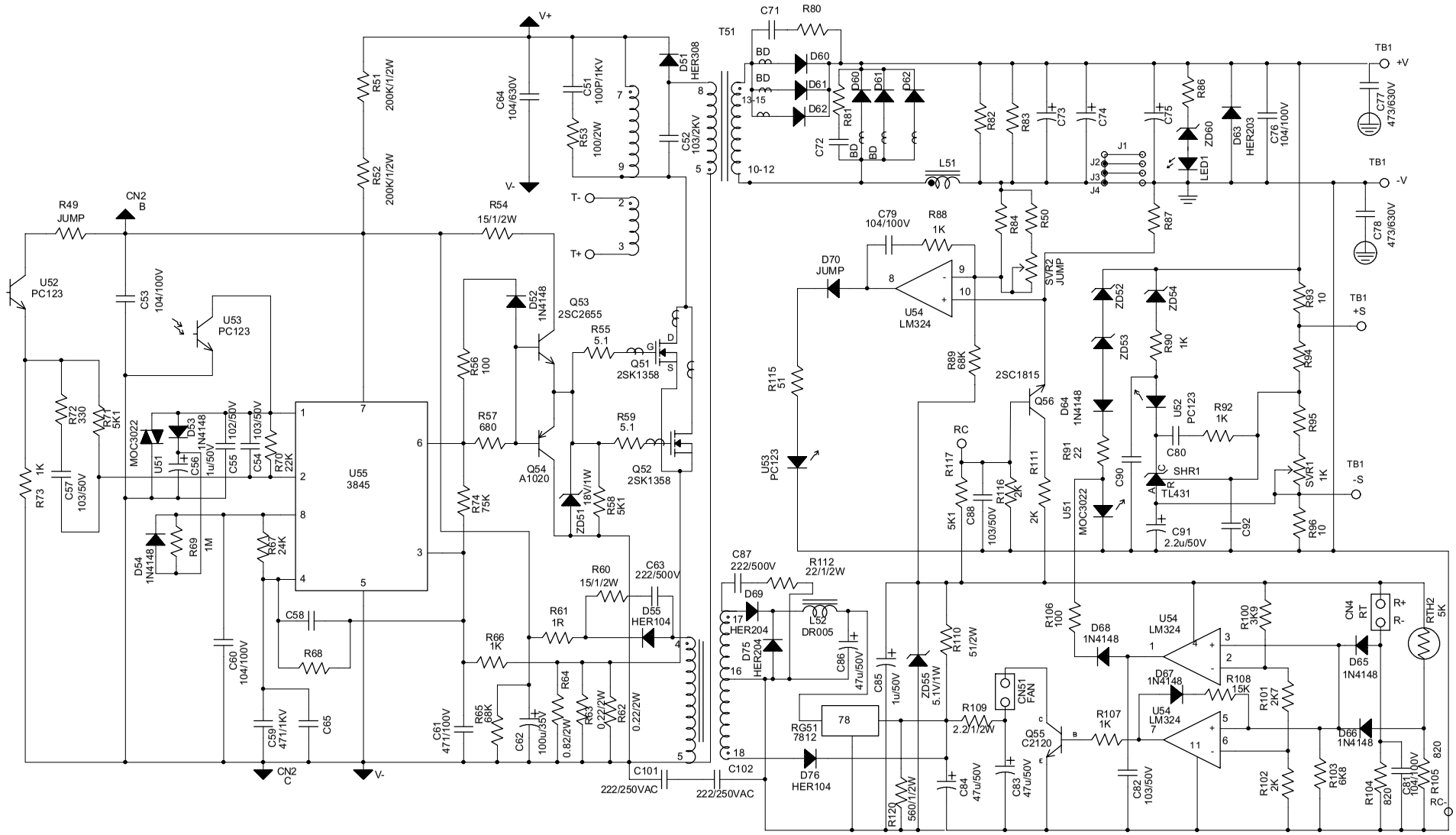
Title: EM 250 COMPACT DIG

Switching Power Supply SP-500/48A

Drawing nr:

Replace:

Replaced with:



SP-500B DIFFERENT COMPONENT:

PART NO. / MODEL	C71,72	R80,81	D60,61 62	L51	R82,83	C73,74 75	R86	R94	R95	C80	R87	T51	1.40 10mm	ZD52	ZD53	ZD54	ZD60	R84	R50	C92
12V	222 /500V	10/1W	C25P06Q	TR127	220 /2W	1000u /35V	1K	6K8	1K5	1u/50V	910	TF407	J1,J2 J3,J4	12.9V	JUMP	JUMP	5.4V	1K8	10K	X
13.5V	222 /500V	10/1W	C25P06Q	TR127	220 /2W	1000u /35V	1K	10K	1K8	1u/50V	1K2	TF400	J1,J2 J3,J4	16.1V	JUMP	JUMP	5.4V	1K8	6K8	X
15V	222 /500V	15/1W	D9202	TR129	270 /2W	1000u /35V	1K	10K	1K5	1u/50V	1K2	TF401	J1,J2 J3,J4	18V/1W	JUMP	JUMP	5.4V	1K5	8K2	X
24V	471 /1KV	22/1W		TR130	680 /2W	1000u /35V	2K2	20K	2K	1u/50V	910	TF402	J1,J2 J3	15V/1W	12.9V	12V/1W	10.6V	1K2	10K	X
27V	331 /1KV	27/1W		TR131	1K /2W	470u /50V	2K2	24K	2K	224 /100V	820	TF403	J1,J2 J3	18V/1W	15V/1W	18V/1W	10.6V	1K1	6K8	X
48V	221 /1KV	39/1W	D9202	TR132	3K3 /2W	220u /63V	6K8 /1/2W	36K	1K5	224 /100V	910	TF404	J2,J3	33V/1W	27V/1W	33V/1W	16.1V	1K	6K8	221/1KV

	Date	Name	Signature:
Drawn	20/04/01		
Checked			
Standards			

Sistemas Electrónicos S.A.

Scale :

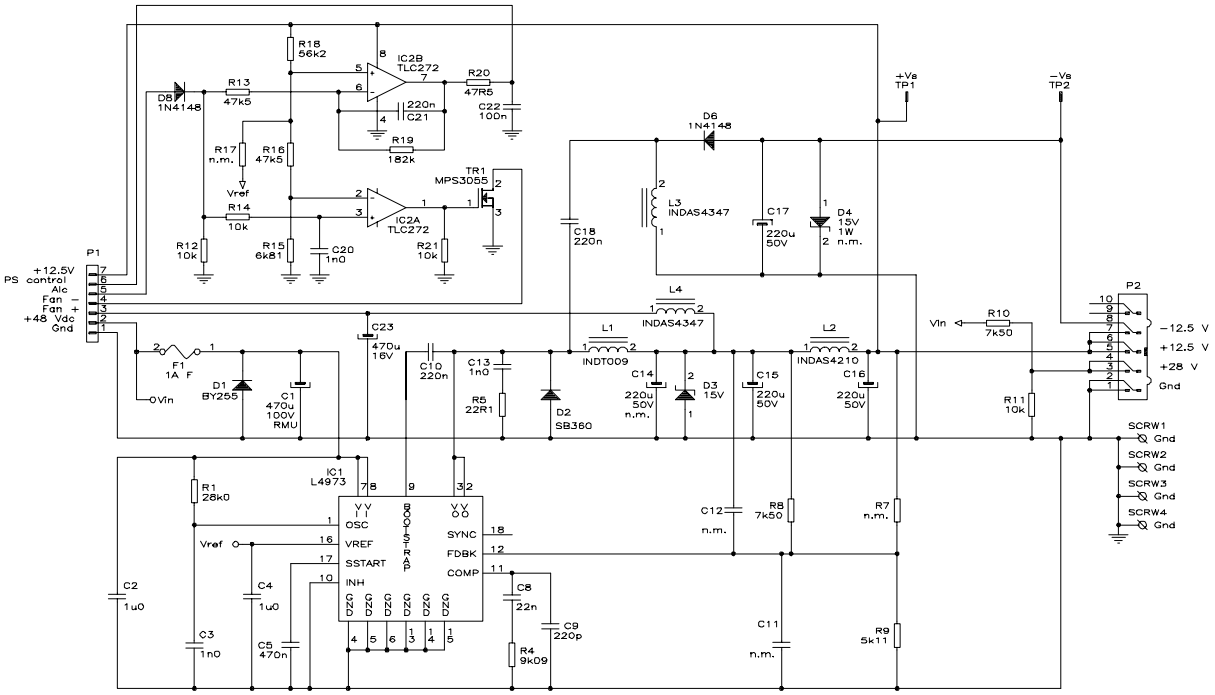
Title: EM 250 COMPACT DIG

Switching Power Supply SP-500/48B

Drawing nr:

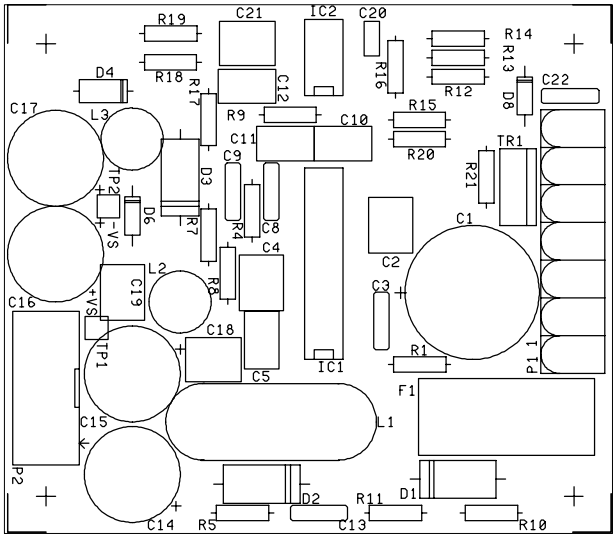
Replace:

Replaced with:



	Date	Name	Signature:	
Drawn	23/04/03	OMB Eng. Dpt.		Sistemas Electrónicos S.A.
Checked				
Standards				

Scale:	Title: EM 250 COMPACT DIG Aux. Power Supply	Drawing nr:
		Replace:
		Replaced with:



	Date	Name	Signature:
Drawn	23/04/03	OMB Eng. Dpt.	
Checked			
Standards			

Sistemas Electrónicos S.A.

Scale:

Title: EM 250 COMPACT DIG

Aux. Power Supply

Drawing nr:

Replace:

Replaced with:

Section 3

INSTALLATION AND MAINTENANCE

CONTENTS :

3.1 Introduction 54
3.2 System connection 54
3.3 Audio Base Band connections and settings . . . 56
3.4 Operation 59
3.5 Service and maintenance 62

3.1 Introduction.

Install the transmitter in a dry, ventilated and possibly dust-free environment, so that it will operate in the +10 ~ +35°C temperature range.

Connect the Transmitter to the load and audio source using suitable cables and connectors, which should be periodically inspected. The EM-250 COMPACT DIG has many features of a HI-FI Transmitter and should be installed and audio-wired with the same care, avoiding earth loops as much as possible. When these conditions are met,the transmitter performs superbly.

This Transmitter is adequately shielded and can be installed close to the program Studios without fear that it will affect the audio equipment. This arrangement has the advantage that the audio level, deviation and power parameters can be continually monitored. EM-250 COMPACT DIG can also be installed away from the studio and connected with several meters of LF coaxial cables with no adverse effect on modulation quality. A remote installation usually requires a STL (Studio -to -Transmitter Link).

As the final modulation performance is dependent on the whole system arrangement, carefully consider the whole system planning.

3.2 System connection.

1.- Connect the N-type output connector, marked "RF OUT " to the antenna or RF Power Amplifier with low-loss 50Ω coaxial cable, tested to 500W of peak-power rating in the frequency range used. Andrew LDF4 or 1/2" Heliax line can be used in some short hops.

2.- Connect the audio inputs as required for operation and detailed in the following chapters for various situations. If needed, connect the serial and / or parallel remote control I/O ports as required,or jump this step to a subsequent moment.

3.- Switch off the mains rear switch and connect the transmitter to mains and ground system.

4.- Before turning on Transmitter in the system, pre-set if possible frequency and power separately on a dummy load, to avoid system problems at the first turn-on of the equipment. If this cannot be done, check that the transmitter's maximum output power (250~300W) does not harm any external supplementary amplifier stage (if any).

5.- Turn on the rear panel mains switch, then push-on the front panel on/stand-by switch to operate the transmitter and check that:

- All LEDs and the display briefly lights on and off for the initial check.
- The yellow <STAND-BY> LED turns off.
- The green <LOCK> LED must light up after a very short time, when frequency is locked at PLL.

Once locked, the RF power will rapidly increase to the pre-set level in a mild increasing mode. Once preset power is reached, the <ON THE AIR> LED will light completely, if the power is set >5W (at least 5.1W). Till that moment it will turn off and on, signalling the RF power is present but not correct.

Equipment is now functioning in the pre-set mode, delivers power and can be accessed to be programmed or simply to monitor its functions with the front panel display.

The first request it will do will be entering the password for the required level of authorization/security.The equipment is factory pre-set with the first 2 passwords levels disabled: this will allow to set most of the operating parameters, including power, frequency, input levels, clock and date. Some more critical parameters it will require the upper 3rd level: be sure to know it if you need this access.

NOTE: EM-250 COMPACT DIG WILL ALWAYS TURN ON IN THE SAME STATE AS IT WAS IN THE LAST TIME IT WAS TURNED OFF FROM MAINS,I.E.POWER,FREQUENCY AND EVEN ON OR STAND-BY CONDITION. AS SOON YOU TURN ON THE REAR PANEL MAINS SWITCH BE PROMPT TO THAT, EVEN WHEN JUST FACTORY DELIVERED.

6.- The first task to manage when turning on the equipment as factory delivered is to set up the passwords. At least the 3rd (the highest) level must be immediately changed: because, if any unauthorized people change it or you lose it, there is no way to change it for security reasons and the equipment may become unmanageable.Gaining again access to the equipment will require factory reprogramming or changing of the internal Microcontroller unit. For this reason be sure to write down and keep it immediately in a secure place: there is no way to read it after you have programmed down and confirmed.

For practically any parameters that may require some setting in the field, the 2nd level password is enough and may be used for any standard service requirement . The main purpose of the existence of the 3rd level is a security assurance for the user if he loses control on the lower password levels.

7.- If not already done,adjust frequency and RF power as required and check reflected power on the transmitter's display.

To this aim search for RF power menu and read the corresponding value of direct and reflected output power.

For proper operation, the reflected power reading should typically be less than 10%of the direct power value, (< 25W max). Any higher reading may indicate that the antenna is not properly connected or the subsequent amplifier input needs to be tuned.

8.- Check and/or set clock and data and all transmission parameters as required, i.e.channel sensitivity and deviation, mono/stereo, preemphasis etc. Refer to the appropriate section of the Manual.

3.3 Audio Base Band connections and settings.

3.3.1 Baseband Connection and Wiring and Impedance Selection.

EM-250 COMPACT DIG supports balanced or unbalanced signals with selectable input impedance.

The audio inputs are basically balanced and have selectable 600/10kΩ resistive impedance, factory pre-set at 10kΩ.They can be connected to the balanced output of a professional mixer console or to the unbalanced one of a cheaper unit without appreciable degradation.

Audio mono or stereo channels inputs are XLR female connectors.They should be connected to the output of the mixer console, or of any audio processor that drives it, by a balanced coaxial cable connected to pin 3(+) and pin 2(-). The cable shield, connected to the ground of the driving equipment,has to be connected to pin 1.

In case of unbalanced drive, input pin 2 shall be short-circuited with ground and shield on pin 1, while the signal shall be available on pin 3. Higher impedance selection, in this case, will be 5kΩ instead of 10kΩ.

With balanced driving signals,the connecting cables to the audio source may be well more than 100m long.

Mpx or an externally processed signal, usually an unbalanced signal, can be fed to the female BNC connector, marked <**MPX**>, which is internally parallel-wired with the <**RIGHT**> channel connector:for this reason it is not possible to connect signals to these two connectors at the same time. Higher impedance position is 5kΩ in this case too.

Connect this input with a 50Ω (RG58) cable for a short distance; if the distance exceeds several tens of meters, use 75Ω (RG59) or 92Ω (RG62) coaxial cables.

The auxiliary-channel connector is also of the grounded BNC female type. Use 50Ω (RG58) or 75Ω (RG59) cables to connect to the driver. The same applies to the monitor "MODULATION" output, If needed.

3.3.2 Pre-emphasis setting.

Non-precoded low frequency mono and stereo channel signals have to be adequately pre-emphasized. Standard preemphasis time constant is 50 and 75μs, the former being usually factory pre-set for Europe countries.

Check whether this is correct for your country (it is usually correct for any European country and part of the Pacific areas). It is not correct for USA and Center and South America standards,which require 75μs.

If above correction is needed, simply set it on the <**MODE**> frame of the transmitter menu, which also includes mono/stereo operation and frequency. See appropriate section further on in this Manual.

3.3.3 Audio Baseband Input Level Range, Setting and Requirements.

In the following paragraph we will refer to 0dBm as the audio signal which produce 1mW on 600Ω, i.e. a 775mV$_{RMS}$ / 2200mVpp sinusoidal. Irrespective of the impedance, we will continue to assume 0dBm as an audio signal whose peak is +(or -)1100 mV.

In the same way, when talking of the modulation, we will assume as 0dB the signal which produces 100% maximum allowed modulation, i.e. 75kHz deviation.

There is no absolute worldwide standard regarding audio peak level as modulation signal for a transmitter,nor for the mean deviation. Many Broadcasters use 0 or +6dBm as LF peak level for 100%modulation, USA often uses +4 or +10dBm.

Many European countries specify +6dBm for 40kHz deviation (which is assumed to be a "mean" modulation). This allows for 5.5dB headroom to max. 75kHz deviation, i.e.+11.5dBm for 100%modulation.

A higher level minimize system and ambient noise. A level too high may over-stress the input circuitry of the transmitter, reducing the dynamic distortion-free range over the nominal level (headroom). It may also be costly to produce with high quality.

For this reason OMB recommends,whenever possible,to adopt +6 ~ +11.5dBm as nominal peak level for audio modulation purposes.

EM-250 COMPACT DIG transmitters allows an input audio level on the main channel/s ranging -3.5 ~ +12.5dBm to be set for 100% modulation, with almost no difference in modulation performances, if high quality signal is provided. Even at the higher level,at least +6dB headroom is additionally allowed: i.e.up to 150kHz deviation, with no distortion.

Obviously this deviation is not currently allowed by the broadcast standards and the limiter threshold must be set at its maximum to permit undistorted performance.

The auxiliary channel 's level ranges -12 ~ +4dBm to produce 10% modulation,i.e.7.5kHz deviation. Consequently typical input levels for an SCA-type signal (10%max. admissible deviation) are 0.2 ~ 1.0V$_{RMS}$ // 696 ~ 2200mVpp, when the input is set between -11.5 and +2.5dB. All the same, an RDS-type signal could be accommodated in the 0.052 ~ 0.33V$_{RMS}$ //150 ~ 930mVpp level range, to produce the standard peak deviation of 2kHz, as above.

Regulating the nominal input level for 0dB modulation on the transmitter is an easy task. From the proper menu screen it may be seen varying the modulation in real-time with the level adjustment,in 0,5dB steps. The modulation is reported as deviation in kHz and in dB, referred to 75kHz.

In this screen, the reported deviation includes any other auxiliary signal as pilot tone, when in stereo, and RDS or SCA signals applied at the same time. To measure only the audio channel signal, go to the Left / Right level menu screen. The auxiliary channel level is slightly less immediate to set, being measured in dB only. Remember that 0dB corresponds to 7.5kHz deviation, i.e. 10%max allowed total modulation. The typical level for RDS so being 11.5 for 2kHz deviation. This menu screen accounts only for deviation due to auxiliary signal. To see the added effect on the total deviation, go to the MPX menu.

The exciter's internal limiter is of the peak-clipping type; this means that as soon at it cuts in, modulation distortion increases sharply. For this reason, the modulation signal should be kept under control to prevent intervention of the limiter.

The cut-in limiter threshold, when enabled, is factory pre-set to +2.5dB (100kHz peak value). It may be set from 0dB (75kHz) up to +7.1dB (170kHz). This threshold value is mostly specified in the various national standards, and tolerance to short over-modulating peaks varies from country to country. Some countries do not permit the user to disable the limiter or change the level. Note that the limiter action begins slightly after the pre-set level, with no action at all till that. The difference between the threshold level and hard clipping is some 0.5dB.

In any case,the modulation peak value that is internationally admitted for FM is 75kHz for peaks that are not extremely short. For this reason,the limiter's cut-in threshold should never be too high.

It is highly recommended to use an external multi-band limiter to optimize modulation, with higher tolerance for any audio-signal peaks. Such devices momentarily reduce the amplifier circuits' gain if the threshold is exceeded and prevent severe, significant distortion.

Any external compressor, limiter, audio or modulation meter must be frequency-compensated with the same time constant of the pre-emphasis to modulate or monitor deviation properly.

Therefore, the audio level shall be constantly and correctly monitored and adjusted, to prevents as much as possible, the internal limiter from cutting in. On the other hand, the audio level should be as high as possible, to achieve the best signal/noise ratio on reception.

The tendency to over-process audio signals is common in many local broadcasting stations:some sort of processing is advisable and we recommend using a top grade multiband compressor, but not to compress the signal too much as this impairs the original dynamics.

The audio response of the EM-250 COMPACT DIG transmitter is extremely flat, without perceivable loss on low and high audio frequency: for this reason large frequency alterations of the audio signal supplied by using a so-called "frequency equalizer," are not advisable. An increase of the low and high frequency contents of the audio signal by more than a few dB can cause general degradation of modulation dynamics and improper functioning of the limiter.

3.3.4 RS232 Serial Port.

The RS232 port manages only Tx, Rx and Return data signals, with no handshake. Being the two former signals wired inverted to the port, it need a simple straight wired serial cable with appropriate connectors:usually a female DB-9 or DB-25 female to the PC port and a male DB-9 connector at the transmitter end. Appropriate software is needed for communication. OMB can provide this software and also Telemetry Equipment at request. Do not connect the cable with neither transmitter or PC energized.

3.3.5 Parallel REMOTE Port.

Remember that this port accommodates some lines for simple direct control /monitor on a DB-9 male connector. See next table for details.

PIN	FUNCTION
1	GND
2	ON THE AIR. A +12V /10kΩ signals that the transmitter is delivering substantial RF power.
3	FWD PWR. A signal proportional to transmitted power is present, with a pseudo square law. Range is 0-5V_{DC} /10KΩ impedance.On EM-250 COMPACT DIG 5V stands for 250W.
4	-
5	GND
6	RF ENABLE. A shorted circuit to ground disables RF. Signal level +10V_{DC}/1mA max.
7	FAILURE. Logic low signal means alarm. Correct functioning is signalled by +12V /10KΩ Maximum current sinking capability <10mA.
8	GND
9	-

3.4 Operation.

3.4.1 Monaural Broadcasting,from a Monophonic Audio Source through Main Monaural Channel.

1.- Connect the "right "(or mono) input connector to the corresponding audio source as described in the "system connection" section. No connection to the "left" channel input is needed. The signal runs through the channel processor and is 15kHz filtered and pre-emphasized.

2.- Select the <**MODE**> command menu screen (see relevant section on the manual) and select <**MONO**> operating mode. Confirm or change also 50 or 75μs preemphasis as required.

3.4.2 Monaural Broadcasting, from a Stereophonic Audio Source through the Optional Internal Stereo Encoder.

1.- Connect both the <**LEFT**>and <**RIGHT**> input connector to the corresponding audio source as required for stereo transmission as described above. The audio signals will run through the channel processors and will be 15kHz filtered and pre-emphasized. The internal stereo-encoder will blend the stereo input source to transmit in monaural mode. In this case the transmitter is already preset for stereo operation if needed, simply reversing transmission mode to <**STEREO**>.

2.- Select the <**MODE**> command menu screen and select <**MONO L+R**> operating mode.Confirm or change also 50 or 75μs preemphasis as required.

3.4.3 Mono or Stereo Broadcasting from a STL Receiver or an External Encoder.

1.- In this case, the signal is already multiplexed and pre-emphasized. Use the <MPX> BNC input connector. The signal skips the coding and filtering stage and therefore is not pre-emphasized.

2.- Select the <MODE> command menu screen and select <EXT MPX> operating mode. While it is anyway advisable to select the proper preemphasis time-constant as required for your country, in this position this selection is not influent.

3.4.4 Stereo Broadcasting from a Stereophonic Audio Source through the Optional Internal Stereo Encoder.

1.- Connect the XLR-type modulation input connectors, marked <LEFT> (channel) and <RIGHT> (channel), to the output of the two channels from the mixer console or stereo source. They will be internally 15kHz filtered and pre-emphasized.

2.- Select the <MODE> command menu screen and select <STEREO> operating mode. Confirm or change 50 or 75μs preemphasis as required.

3.4.5 Operation with a RDS or SCA Encoder.

1.- Connect the BNC-type <AUX> connector to the output of the RDS or SCA Encoder. If the internal optional stereo coder is used, connect the <LF MONITOR> BNC output to the pilot tone synchronization input of the RDS coder, if present.

2.- Select the <AUX> command menu screen and push <OK> to vary the channel sensitivity.

Adjust both transmitter sensitivity and/or the level of the external generator for the deviation required, as explained in the previous Manual sections. Consider that 0dB modulation reading (not the input level) in this field means 10% total modulation or 7.5kHz deviation, i.e.the standard setting for a SCA auxiliary channel. In the case of RDS,a reading of -11.5dB or 2kHz is the correct value of modulation.

3.- Total modulation and deviation may be read in the <MPX> display screen, with the addition of any other composite signal simultaneously present. If only the final modulation due to the auxiliary signal requires to be measured, momentarily disconnect every other baseband signals present on the inputs and change mode to <MONO> or <MPX EXT> mode, for the measuring operation only. This is not required when you display only the auxiliary signal.

4.- If you have changed transmission mode selection or removed any input signal for check purpose, reverse to the original setting and reconnect any previously disconnected signal.

3.4.6 Modulation Adjustment with Broadcast Signal.

Check the overall modulation level for adequacy,as follows:

1.- Select the display menu screen <MPX>: The total modulation will be displayed, both in dB and as deviation in kHz. An analog moving bar and a digital peak reading are shown at the same time.

2.- Send a sufficiently constant-level music signal to modulator input, and check that the measure hovers around 0dBm and moves into the upper range during signal peak only and by no more than 1 or 2 dB. For any other reading, adjust the mixer console's "MASTER" or output attenuator until the above conditions are obtained. The red <LIMITER> alarm LED should never or rarely light up, as this would indicate distortion.

If the limiter is set just above 75kHz, the red LED will light up above 0dB and the modulation measured will never show a much greater value. Factory pre-set is 100kHz (+2.5dB).

3.4.7 Check of Pilot Tone on Stereophonic Broadcast.

In case of internal stereo coder, no allowance is externally provided to change the pilot tone level, which is usually internally pre-set for 9~10%of modulation, i.e. -21 ~ -20dB or 7 ~ 7.5kHz deviation.

In case it is externally provided by a separate stereo coder, it must be measured in absence of audio modulationand any other auxiliary signal as below described:

1.- Disconnect any signal from the external stereo-encoder input and any RDS or SCA signal.
2.- Select the display menu screen <MPX> and check the pilot tone, which must be now the only signal present. The standard level is that previously stated,i.e.: 9~10% or -21 ~ -20dB,and may be adjusted accordingly on the external stereo encoder to suit the request.

3.- Connect again any previously disconnected signals as done.

3.5 Service and maintenance.

Since the EM-250 COMPACT DIG is cooled by forced air, it is subject to clogging by dust. It is very important to keep clean and dust-free both heat sink fins and cooling fan, to assure a good cooling of RF Power Module.

Install the equipment on a stable stand/rack, in such a way to permit good air circulation and hot air exhaust. If needed, cabinet may be externally cleaned with a soft brush and a wet cloth, with the Equipment turned off.

Other than this, because of the high-quality materials used in their manufacture, if it is installed as it has been explained before it will not require special maintenance for quite some time. Only periodical cooling fan and heat sink inspection, and fan replacement after 2 years of continuous service, even if it's yet in good conditions.

Minimum maintenance inspection is set monthly, containing the following aspects:

- Throughly clean Equipment externally. Clean Equipment's room and Transmitter's environment. Check that internal humidity and room's temperature not to exceed the allowable limits.

- Check by visual inspection the operational conditions of Antennas system and external environmental conditions of Station site and building.

- Take all possible readings from LCD Display and log it in the Station's log book. If any trouble is detected, it must be solved before leaving the site.

- Each six months, or when an anomaly is externally detected, perform a througly check of Antenna system and transmission line, including VSWR check, frequency response curve, Return losses, etc. Log all checks in Station's log book.

After a few years of continuous service, it is recommended that the equipment be overhauled in the factory or in a OMB specialized laboratory.

It is especially important that the Main Power Supply be overhauled when the Transmitter have been working at high temperatures, over 30 ~ 35°C.

WARNING

Never change the internal calibrations to avoid altering Transmitter Specifications.

Section 4

SETTINGS

CONTENTS :

4.1 Introduction 64
4.2 Passwords 64
4.3 Description of menus and commands 65

4.1 Introduction.

EM-250 COMPACT DIG allows an exhaustive control of all transmission parameters and a complete programmability and monitoring through the various software controls via the front panel keyboard and display.The same functions are remotely addressable with proper software, which is not included as a standard option other than some simple demo programs.

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

4.2 Passwords.

The passwords organization is set in 3 security levels, each with its own password. A higher level permits to change the lower levels authorizations and passwords.

The password is composed by 4 alphanumeric characters, including extended capital and lowercase ones and several special symbols. We suggest using a wide range of characters as the security level raises, to increase the possible combinations. No password is ever shown: it is always masked by dummy characters as "...." or "****".

Nevertheless it may be always changed with the higher level authorization. Here is the purpose of each level:

LEVEL 1: Lower security level. It is needed to access to most of the monitoring and control menu screens, not permitting to alter or programming any operating parameter. It is set to "off" state as default, allowing anybody to navigate freely through exciter's monitoring menu information. OMB suggests leaving it in this state if a high "privacy" level is not required.

If set to "on", it will show the default menu screen #00, requiring password for any other information or pre-set.

Failure to insert a correct password of any level will impede any other access to the commands for the time-out length (usually 3 minutes). No change to the operational mode is done in case of incorrect password input. No information is available on the display regarding the transmitter functioning.

LEVEL 2: Service level.This password is needed for any functioning set-up as frequency and power,sensitivities, clock and date etc. Its use is reserved only to service technicians who need wide access to the transmitter presets and functions.

Although the default factory state is "off", OMB suggests changing the default state and password immediately at the first power on, to prevent to unauthorized people to tamper with transmitter commands, if the default word is known or the status is set to "off".

LEVEL 3: Highest security level. It is always "on" by default and reset anyway to "on" after the display time-out, for security purposes. Its knowledge is deserved only to **very few** people and must be immediately registered after setup and kept in a secure place: **there is no way to read it** after you have setup and confirmed on the exciter.

This password must be **immediately** changed at the first pre-set of the equipment: if any unauthorized people tampers with it or you lose it, there is no way to change it if you do not know the correct word for security reasons and the apparatus may become unmanageable.

WARNING

Gaining again access to the equipment will require Factory reprogramming or changing the internal Control Unit .

For practically any parameters that may require some setting in the field, the 2nd level password is enough and may be used for any standard service requirement. The main purpose of the existence of the 3rd level is a security assurance for the user if he loses control on the lower password levels.

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

4.2.1 Factory Default Passwords.

These are the factory default passwords:

Level 1: P001

Level 2: P002

Level 3: ABCD

For what previously said, be sure to change at least the 3rd and possibly the 2nd level as soon as you receive and turn on the equipment.

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

4.3 Description of menus and commands.

The hierarchical tree of the menu is depicted in the following Figure 4-1, with a small number near the left side of each field for easy reference. In the following pages we will examine each menu field and option.

All of the first column fields require the first level password authorization to be navigated. In a similar way, practically all the second column fields require the second level authorization, as some in the third column. The third level is required only by some functions in this last column. Navigation through the menu screens is quite straightforward and natural, with the direction keyboard. "Up" and "Down" keys vertically scrolling the screens, while the "Left" and "Right" keys horizontally scrolls the menu.

Moving to the right may be impeded by the password permission,while returning to left is always possible.

The <OK> key changes from scrolling to programming mode, if allowed in the field. Another push on the <OK > key will confirm the input data. When in program mode, the up and down keys will change the character, while the left and right keys will move the cursor on the field.

Pushing on the <CANCEL> key will abort the input while repeated escape commands will reset the menu screen to the default one (# 00).

A local input time-out will automatically cancel the command mode resetting input data if this is not confirmed in 60 seconds after the last variation.

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

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

4.3.1 Start menu.

The start menu screen is the unnumbered one on the top of the menu tree.It is shown only when the equipment is turned on from mains or software reset. It will show the software version and the initialization step, when all the LEDs and the display will be turned on and off for testing purpose. Any subsequent key input will turn this menu field on the next, requesting a password code.

4.3.2 Menu #11: Initial Password.

ENTER PASSWORD
CODE

This screen requests to input a valid password code. When the input is confirmed by the <OK> key, the word will be compared with the memorized passwords and, if recognized,the corresponding security level will be allowed. If the password is incorrect or the input is terminated by a <CANCEL>, the password will be signalized as invalid and the security level allowed will be as actually in memory,i.e.0 (no permission at all),1 or 2.

If the security level is already pre-set to "off" for the 1st level and "on" for the 2nd one, as usual, there is no need to input any password to freely navigate in the menu tree without altering any parameter.

When the password is recognized as valid and the corresponding level is displayed, press on <CANCEL>key will turn on the default menu field #00.

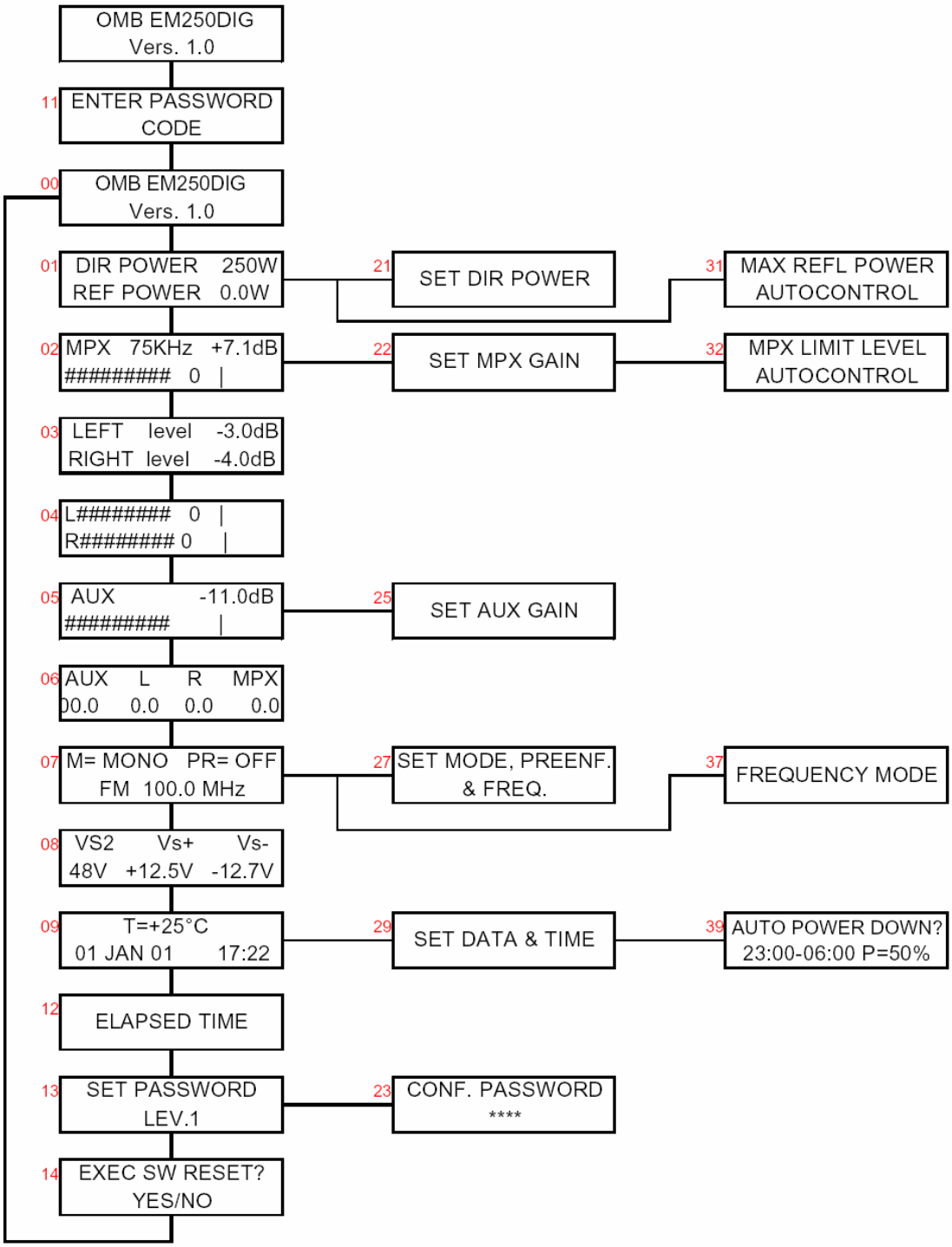
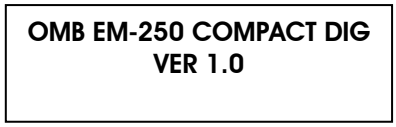


Fig. 4-1: SEQUENCE OF MENUS DISPLAYED BY SCREEN. HYERARCHICAL TREE.

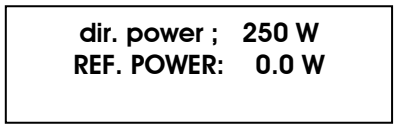
4.3.3 Menu #00: Default Message.



This screen shows the default message and the software release.It is the field that will be initially set, or to which it will return back after repeated CANCEL commands.

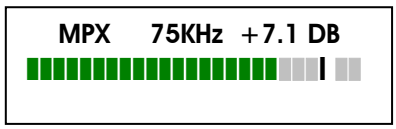
If authorized by the 3rd level permission, going in the command mode (inputting <**OK**>) will permit to edit the first row of this field with a custom message e.g.your organization name.

4.3.4 Menu #01: Direct and Reflected Power.



This screen shows the direct and reflected power actually delivered.Going in the command mode, with the 2nd level password authorization, will permit to set a new direct RF output power. See menu #21.

4.3.5 Menu #02: Multiplex Signal Level (Output Modulation).

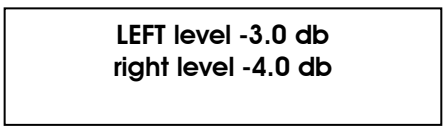


This screen shows the actual peak modulation in dB referred to 75kHz and as deviation in kHz. A pseudo-analog moving bar contemporary fast changes with the modulation, leaving a peak mark at its end for 1 or 2 seconds. A vertical bar (|)on this line marks the 0dB position.

Command mode, with the 2nd level password authorization, permits to set LF input channel sensitivity, or modulation depth. See Menu #22.

Right key,with the 3rd level password authorization, permits to access to limiter setup and threshold. See Menu #32.

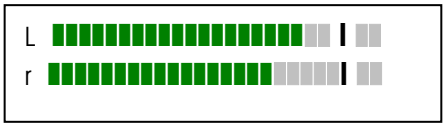
4.3.6 Menu #03: Left and Right Signal Level in dB.



This screen shows the actual left and right peak modulation in dB referred to 75kHz. The reading is adequately accurate with real audio signals. Some steady state test tone especially at very low audio

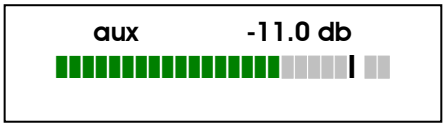
frequency may beat with the discrete A/D conversion sometimes producing some reading uncertainty. In this case the MPX level reading will anyway produce correct overall modulation measure.

4.3.7 Menu #04: Left and Right Signal Levels Seen as Analog Moving Bar.



This screen shows the actual left and right peak modulation as two moving bars. A vertical line marks 0dB position and the same considerations as the previous menu are still valid.

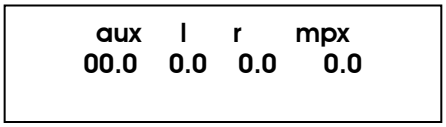
4.3.8 Menu #05: Auxiliary Signal Modulation Level (SCA,RDS).



This screen shows the actual modulation due to an auxiliary (SCA,RDS) signal in dB referred to 7.5kHz or 10% of max peak modulation. Usual level for SCA signal is 0dB (7.5kHz) while a standard RDS modulation is set at -11.5dB (2kHz).

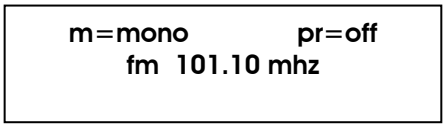
Command mode,with the 2nd level password authorization, permits to set auxiliary input channel sensitivity. See menu #25.

4.3.9 Menu #06: Aux, Left, Right and MPX level in dB.



This screen simultaneously summarizes the actual modulation in dB due to auxiliary, left, right and multiplex signal as seen in their own menu screens.

4.3.10 Menu #07: Transmission Modes and Frequency.

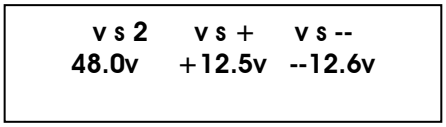


This screen shows the transmission mode,i.e."MONO R", "STEREO", "MONO L+R", "EXT MPX". It also displays the preemphasis constant time and the transmission frequency.

Entering in command mode, with the 2nd level password authorization, permits to set every of this transmission parameters. See menu #27.

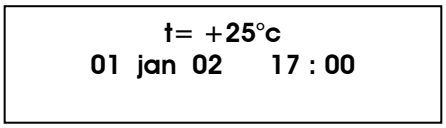
Only 3rd level authorization permits,pressing "Right" key, to change the frequency variation between 10 and 100kHz /step. See menu #37.

4.3.11 Menu #08: Internal Voltages.



This screen shows the internal regulated voltages.In the EM-250 COMPACT DIG they are +48 ±0.8V,+12.5 ±0.3V, -13.0 ±1.0V. A marked difference from these values, especially regarding VS2, may indicate misfunctioning or very low mains voltage.

4.3.12 Menu #09: Temperature, Data and Clock.



This screen shows the internal temperature, the actual data and clock. To set data and clock it is required to go in command mode, with the 2nd level password authorization. See Menu #29.

The temperature sensor is optional and,when present,in the case of EM-250 COMPACT DIG reads the internal temperature slightly behind the front panel. It is usual it reads some 20°C higher than external ambient temperature at full output power: i.e. some +65°C assuming an external temperature of +45°C (the maximum allowed).

4.3.13 Menu #12: Elapsed Time.

This screen shows the elapsed time whether the exciter is on the air or in stand-by with the mains applied. There is no way to change the reading.

4.3.14 Menu #13: Password Management.

This screen shows the password status and permits to change the code and/or the status in command mode, when in possession of the necessary level authorization. No code is ever shown and no access is permitted to a level higher than the current authorization.

If the code or the status is changed, it is always required to confirm the correct password for that level. If the password is unknown, lost or tamperers changed it, it is possible to change status and code

when in possession of the higher password. In this case the lower level password code must be changed and confirmed: no possibility still being to know what was the old password.

In case a lower password permission is actually set in regard to the needed action, it is possible to input the higher level password either performing a software reset, if permitted, or turning off and on the mains voltage through the rear mains switch or an external switch.

The 3rd level authorization, when set, will stay valid only till a display time-out is performed,i.e.usually 3 minutes after the last command.Simply navigating through the menu or performing some action will prolong the time-out.

If the password status is set to on for the level 1,a hung-up may follow after the time-out. This may be intentional to prevent unauthorized people from browsing the exciter parameters. Exciter performance will be unaffected by this condition. Any attempt to access the exciter will cause the password request:if an invalid password in entered,it needs to wait for the time-out to permit a new attempt or to remove the mains power to the equipment,causing a hardware reset. Even in this case, the first request will be a valid password input.

4.3.15 Menu #14: Software Reset.

exec. sw reset ?
yes/no

This screen permits to execute a software reset if in possession at least of level 1 password authorization. The main purpose of this reset is permitting to input a new password level; its action is similar to turning off and on the mains to the equipment. A software reset will lead to a small interruption of the RF output power which will be re-established in few seconds, while lock on frequency will not be lost.No transmission or sensitivity parameter is lost in consequence of software or hardware reset.

4.3.16 Menu #21: Output Power Set.

set dir power

This screen derives from #01, in command mode. The direct power value blinks and acting on up and down keys the numeric value varies. The output power will vary in real time.Confirming the final value with an "OK" will write the new setting in the non-volatile memory of the equipment. Escaping (<CANCEL>) will abort the change.

A local time-out will automatically escape the input if not confirmed in 30 seconds from the last change performed.

4.3.17 Menu #22: Multiplex, Left and Right Input Level Set.

This screen in command mode, with the 2nd level password authorization, permits to set LF input channels sensitivity, i.e.multiplex, left and right channel. Take present that multiplex and left signals share the same channel and the sensitivity is set to the same value for both left (or multiplex)and right channel,with a differential error <0.2dB at any level. Allowed range is -3.5 ~ +12.5dBm.

The first line of the display shows the actual modulation,while the bottom line shows the input level for 100% modulation.Increasing the input level will accordingly decrease the modulation.

4.3.18 Menu #23: Password Confirmation.

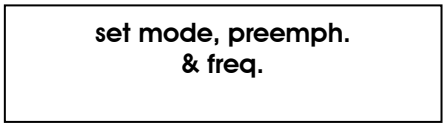
This screen is displayed when password code or mode is changed on menu #13. It requires inputting the same password code as in the current level which is to be changed.Failure to do so will show the message:**ERROR PASSWORD**.

This display stops input mode for 5 seconds and than permits to exit (and possibly to try again) with the <**CANCEL**> key.

4.3.19 Menu #25: Auxiliary Channel Input Level Set.

This screen in command mode, with the 2nd level password authorization, permits to set the auxiliary channels input sensitivity. Allowed range is -12 ~ +4dBm to produce 10%modulation, i.e. 7.5kHz deviation or 0dB in the upper line of the display.

4.3.20 Menu #27: Operation Mode, Preemphasis and Frequency Set.



In this screen it is possible to set the transmission "modes" (MONO R, STEREO, MONO L+R, EXT MPX), the preemphasis time constant (0,25,50 and 75μs) and the frequency in step of 10 or 100kHz as preset on the menu #37. To access to this last menu, the 3rd authorization level is required, from the main frequency menu # 07.

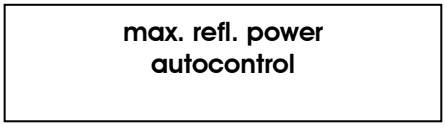
Left and right keys change the input fields whilst the up and down keys change the various options or increase/decrease the frequency.

4.3.21 Menu #29: Data and Time Set.

This screen is the command mode display of menu #09, with the 2nd level password authorization and permits to set correct data and time.

As in the last menu,the left and right keys change the input fields while the up and down keys increase/decrease the date and time.

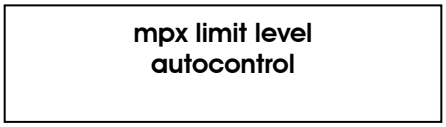
4.3.22 Menu #31: Maximum Reflected Power Set.



This screen permits to set the maximum reflected power level. Default value is 15.0W and in any case this power is hardware limited to 25W for security reason.

Auto Control on the lower line is not operative and could be absent in other software releases.

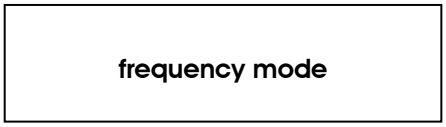
4.3.23 Menu #32: Limiter Set.



This screen, with the 3rd level authorization, permits to set the limiter action. The right/left keys toggles limiter on and off. The up/down keys vary the threshold level.

Auto Control on the lower line is not operative in some software releases. When it is, it will dynamically reduce the input sensitivity to allow distorsionless limiting if pre-set to ON. Even in this case it will be wise not to exceed the limiter threshold to avoid "pumping" effect on the modulation.

4.3.24 Menu #37: Frequency Change Mode.



This screen, with the 3rd level authorization, permits to set the frequency step variation between 100 and 10kHz.

4.3.25 Menu #39: Power-Down Setup.

auto power down ? **23:00 - 06:00 p=50%**

This screen, with the 2nd level authorization, allows to preset the "power-down" mode. If this mode is on, the output power will be automatically decreased to the pre-set percentage in the time period set on the bottom line.

The scaled power is approximate and must be tested and/or adjusted before final setup, if critical.

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