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ELC40
40W EXCITER

TECHNICAL MANUAL
Edition: April 1996
Cod: MAN0066

SOMMARIO

CABLAGGI

ATTACHMENTS:

SYSTEM CHARACTERISTICS

RF SECTION

FREQUENCY RANGE	**FM 87.5÷108 MHz band**. Frequency carrier presettable only from 87.6 to 107.9MHz on the front panel in 100KHz increments, with an internal fine frequency adjustments. Other bands from 50MHz up to 108MHz and 10KHz steps available.
MAX. POWER OUTPUT	2 to 40W with 2W step, presettable on the front panel.(max. power continuosly variable)
TYPE	Solid state, direct FM frequency synthesized, crystal referenced, thermal compensated.
RF POWER	output connector: type N female, 50 impedance : 50 power stability : better than 1dB
FREQUENCY STABILITY	Better than 5 ppm, 0 °C to 40 °C
MODULATION TYPE	F3, direct FM at the carrier frequency.
ASYNCHRONOUS (no AM S/N RATIO	60dB below reference carrier with 100% AM modulation, 50 s de-emphasis FM modulation present).
SYNCHRONOUS AM S/N RATIO	60dB below reference carrier with 100% AM modulation (FM modulation ±75KHz).
HARM. or SUB-HARM. EMISSION	70 dBc or more below carrier level
SPURIOUS ANTENNA EMISSION	<-85dBc.
CARRIER SPURIOUS TX EMISSION (no antenna output measured)	<-70dB (in accordance with Decr. 311 art. 16)
TX SPURIOUS EMISSION (no antenna output measured)	<-90dB (in accordance with Decr. 311 art. 16)

MODULATION SECTION

MOD. CAPABILITY	

Option MX One Composite program (balanced or unbalanced input) and 3 subcarrier channels (SCA) up to 100KHz.

Option MF One Mono (balanced or un-balanced input), one Composite program and 3 subcarrier channels (SCA) up to 200KHz.

Option ST One Mono or Stereo (L and R channel, balanced or unbalanced input) or Composite program and 3 subcarrier channels (SCA) up to 200KHz.

MOD. INPUTS

SCA 10k impedance, freqency range 20KHz÷200KHz.
All levels are factory set for +6dBm and adjustable in the 0÷12dBm range.
Input connector: BNC.

Ext. MPX 10K impedance, frequency range 20Hz÷100KHz.
The level is factory set for +6dBm and is adjustable in the 0 to +12dBm range.
Input connector: BNC.

Left /Right Channel Input impedance selectable 600 or 10K , frequency range 20÷15000Hz. Input level is factory set for +6dBm (different levels on request) and is adjustable in the 0÷+12dBm range.
Input connector: balance Canon XLR, unbalanced BNC.

COMPOSITE
FM S/N RATIO
(referred to ±75KHz dev and with 50 S de.emph)

Mono 80 dB, 85dB typical (with a 30÷20000Hz filter bandwith).
Int. Stereo 80dB (L-R, decoded and with a 30Hz÷20000 filter bandwith).
Ext. Stereo (MPX) 80dB (L-R, decoded and with a 30÷20000Hz filter bandwith).

TOTAL HARM. DISTORTION
F=±75KHz and with 50 s de.emph.)

Mono <0.03% - 0.02% typical
Int. Stereo (L/R Ch) <0.04% - 0.02% typical (L-R, decoded and with a 30Hz÷20000 filter bandwith).
Ext. Stereo (MPX) <0.04% - 0.02% typical (L-R, decoded and with a 30Hz÷20000 filter bandwith).

STEREO SEPARATION

Baseb. monitor out Greater than 65dB 100Hz to 15KHz
Greater than 60dB 40Hz to 15KHz.

TX Greater than 50dB 40Hz to 15KHz

COMPOSITE
AMPLITUDE RESPONSE

Mono ±0.15 dB - typ. 0.12dB [30Hz÷15KHz]
<-45dB at 19KHz (typ. 55dB).

Int. Stereo (L/R Ch) ±0.15 dB - typ. 0.12dB [30Hz÷15KHz]
<-45dB at 19KHz (typ. 55dB).

Ext. Stereo (MPX) <±0.1 dB [30Hz÷15KHz].

SCA 1, 2, 3 <±1 dB [20KHz÷200KHz].

COMPOSITE
PHASE RESPONSE ±0.5 from linear phase [30Hz÷53KHz]

PRE-EMPHASIS VALUE 75 s for FCC or 50 s for CCIR (factory set).

PRE-EMPHASIS ERROR <±0.1dB.

FACILITIES

MULTIMETER 4 function diagnostic aid: peak and semipeak modulation, forward and reflected power

MONITORING

Leds
-12 +5 +12 +24 Vdc.
Transmitter PLL lock.
Pre-emphasys presence. **(option MF or ST)**
Internal coder "ON" **(option ST).**
Overmodulation. **(option MF or ST)**

BNC connector
Carrier enable input, active grounded.
19KHz output, to syncronize external devices (i.e. RDS). **(option ST)**
Sync. input for an external 2.5KHz clock TTL compatible, to synchronize PLL oscillator (for FM syncro).

SETTING
Output frequency 87.6÷107.9MHz, step 100KHz.
(Other frequency range and 10KHz step on request.)
Max. Forward power continuosly variable.
Forward power 2÷36W 2W step
Refelected power continuosly variable 1÷10W.
Baseband VCO input -6 ÷ +5dBr 1dB step

GENERAL CHARACTERISTICS

ENVIRONMENTAL CONDITIONS

Temperature
Operating: 0 °C ÷ +40 °C
Non-operating: -20 °C ÷ +50 °C

Humidity
Operating: up to 95% relative humidity (non-condensing) at +40 °C
Non-operating: up to 90% relative humidity at +65 °C

Altitude
Operating: up to 4600 meters
Non-operating: up to 15000 meters

POWER REQUIREMENTS

Voltage 100/120/220/240 Vac -% to +% 50-66Hz

Power 160VA maximum

WEIGHT

Net approximately 16 kg.

Shipping approximately 18 kg.

DIMENSION

Cabinet size 48.26 cm wide x 13.33 cm high x 48.26 cm deep.

Boxed 60 cm wide x 21 cm high x 59 cm deep

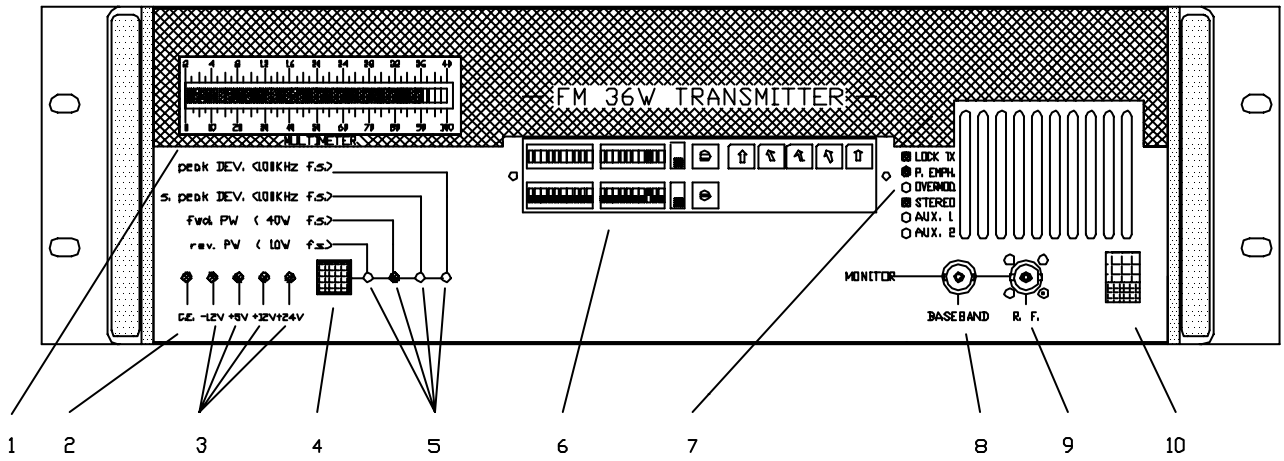
REQUIREMENTS

ELCA HPT SISTEM meet or exceed all CCR, ETSI and FCC requirements and particularly:

IT. D.M. n 311 dated 09/03/94	Italian requirements to ratify Radio broadcasting transmitters (frequency or amplitude modulated) and TV transmitters.
ETS - 300 -384	Radio broadcasting system; VHF, frequency modulated, sound broadcasting transmitter
CCIR - 450	Transmission standards for FM sound broadcasting at VHF
CCIR - 412	Planning standards for FM sound broadcasting at VHF
CCIR - 559	Objective measurement for radio frequency protection ratios in LF, MF and FH broadcasting
CCIR - 468	Measurement of audio frequency noise voltage levels in sound broadcasting.

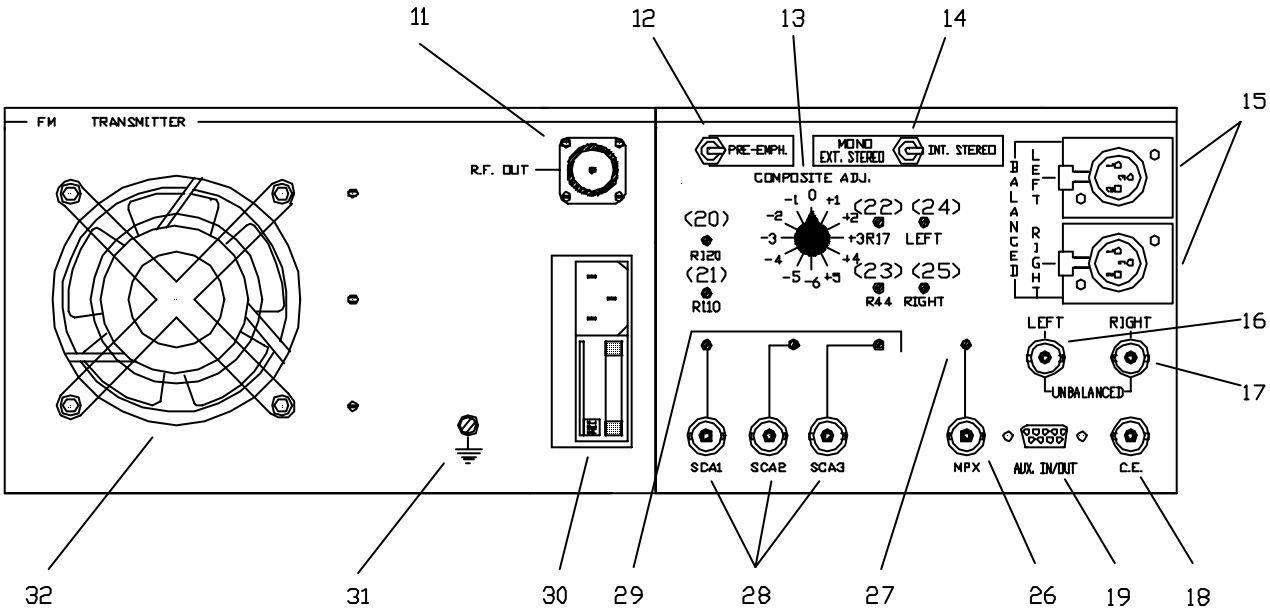
CONTROLS and INDICATORS

FRONT PANEL



1	**FUNCTION METER**	Multimeter measuring the functions (5) Upper scale: Reflected (10Wf.s.) and Forward Power (40W f.s.) Lower scale: Semi-peak and Peak deviation (100KHz f.s.)
2	**CARRIER ENABLE**	Led "ON": carrier presence (R.F. Power) Connecting to ground the corresponding BNC connector on the rear panel (14) the Radio-Frequency Power is immediately switched-off, as the PLL remains locked.
3	**POWER SUPPLY**	Leds "ON": internal power supply voltages presence (-12, +5, +12, +24Vdc)
4	**FUNCTION SELECTOR**	Push it to select the measurement required (5).
5	**FUNCTION LEDS**	Leds "ON": they correspond to the measurement selected by pushing the function selector (4) and displayied by the Function Meter (1).
6	**[SETTINGS]**	Power and Frequency settings.
7	**FUNCTIONS LEDS**	LOCK TX : lighted when TX is locked P.ENPH : lighted when Pre-emphasys is inserted (option MF and ST) OVERMOD : lighted when the Audio input level exceeds the threshold (option MF and ST) STEREO : lighted when internal Stereogenerator is inserted (option ST)
8	**BASEBAND MONITOR**	BNC connector: composite signal control 30Hz÷200KHz.
9	**R.F. MONITOR**	BNC connector: R.F. output for testing, -40dBc.
10	**A.C. POWER SWITCH**	

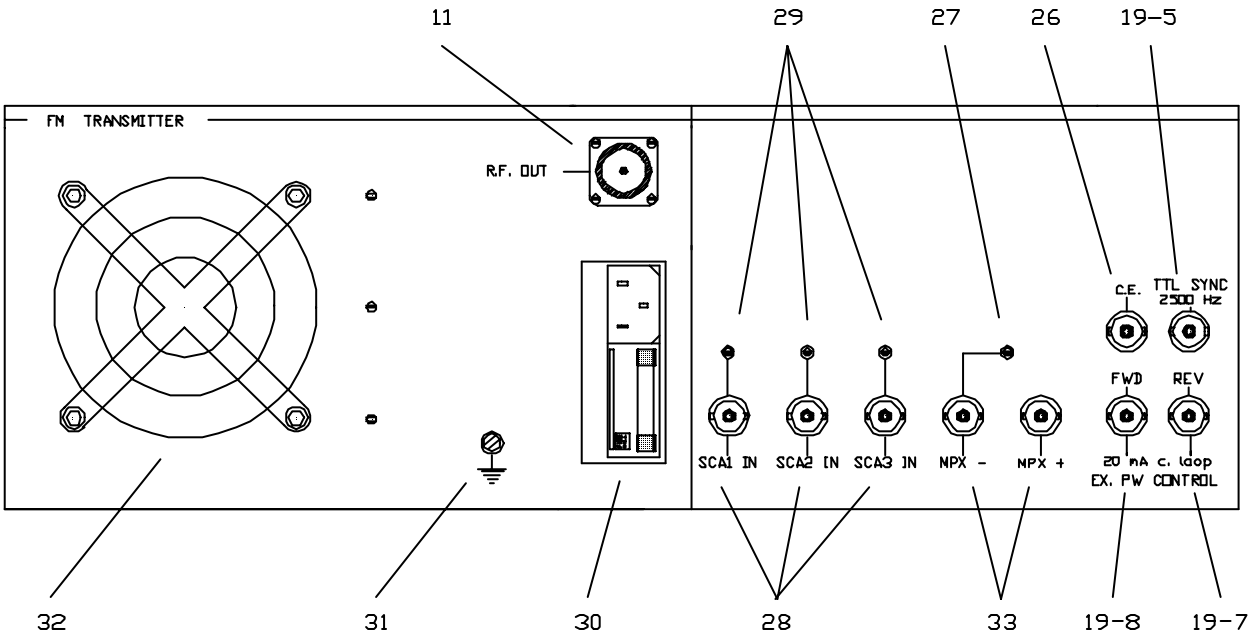
REAR PANEL (OPTION MF-LM-ST))



11	**R. F. OUTPUT**	Tipe "N" connector, 50 .
12	**PRE-EMPHASIS**	switch, for pre-emphasis insertion, L/R Channel (option MF and ST) .
13	**COMPOSITE ADJ.**	multiswitch to adjust composite level, 1dB step (-6÷+5dB) (option MF and ST).
14	**EXT/INT CODER**	switch to select int. stereo operation or ext. mono /MPX operation (option ST)
15	**L/R BALANCED**	CANON XLR connector: pin 1= ground. pin 2= +Signal. pin 3= -Signal (option MF and ST).
16	**LEFT UNBALANCED**	BNC connector for unbalanced Left Channel input (option MF and ST).
17	**RIGHT UNBALANCED**	BNC connector for unbalanced Right Channel input (option MF and ST).
18	**CARRIER ENABLE**	BNC connector carrier enable command: when connected to ground, the corresponding led (2) on the front panel and the R.F. power output are switched-off.
19	**IN/OUT** (DB9 connector)	pin 1 = 19KHz output for RDS sync. (TTL output) (option ST) pin 5 = external clock input for synchronisation, 2500Hz TTL pin 7 = external reflected power control (20mA control loop) pin 8 = external forward power control (20mA control loop) pin 6-9 = ground pin 2-3-4= not used
20	**R120**	ADJ multiturn trimmer to adjust the threeshold of overmodulation led (i.e. 75KHz) (option MF and ST).
21	**R110**	ADJ multiturn trimmer to adjust deviation meter (option MF and ST).

22	**R17**	ADJ multiturn trimmer to adjust Left ch. pre-emphasis (option MF and ST).
23	**R44**	ADJ multiturn trimmer to adjust Right ch. pre-emphasis (option MF and ST).
24	**LEFT ADJ.**	ADJ multiturn trimmer to adjust Left channel level (option MF and ST).
25	**RIGHT ADJ.**	ADJ multiturn trimmer to adjust Right channel level (option MF and ST).
26	**MPX**	BNC connectors, MPX (or Mono) input (option MF and ST).
27	**MPX ADJ.**	Multiturn trimmer for MPX input level adjustment. The level is factory set at +6dBm to obtain ±75KHz dev.
28	**SCA1, SCA2, SCA3**	BNC connectors, SCA1, SCA2, SCA3 inputs (20KHz÷200KHz flat)
29	**SCA ADJ.**	Multiturn trimmers for SCA1, SCA2, SCA3 input level adjustment. They are factory set at +6dBm to obtain ±7.5KHz dev.
30	**A.C. LINE**	ac Plug and Fuse Block & Voltage Change Plug (see Preface Chapter)
31	**EARTH**	Earth connection.
32	**FAN**	Fan, 110Vac.
33	**MPX**	BNC connectors, Balanced and unbalanced MPX inputs (option MX)

REAR PANEL (OPTION MX)



11	**R. F. OUTPUT**	Tipe "N" connector, 50 .
18	**CARRIER ENABLE**	BNC connector carrier enable command: when connected to ground, the corresponding led (2) on the front panel and the R.F. power output are switched-off.
19-5		BNC connector: external clock input for synchronisation, 2500Hz TTL
19-7		BNC connector: external reflected power control (20mA control loop)
19-8		BNC connector: external forward power control (20mA control loop)
27	**MPX ADJ.**	Multiturn trimmer for MPX input level adjustment. The level is factory set at +6dBm to obtain ±75KHz dev.
28	**SCA1, SCA2, SCA3**	BNC connectors, SCA1, SCA2, SCA3 inputs (20KHz÷200KHz flat)
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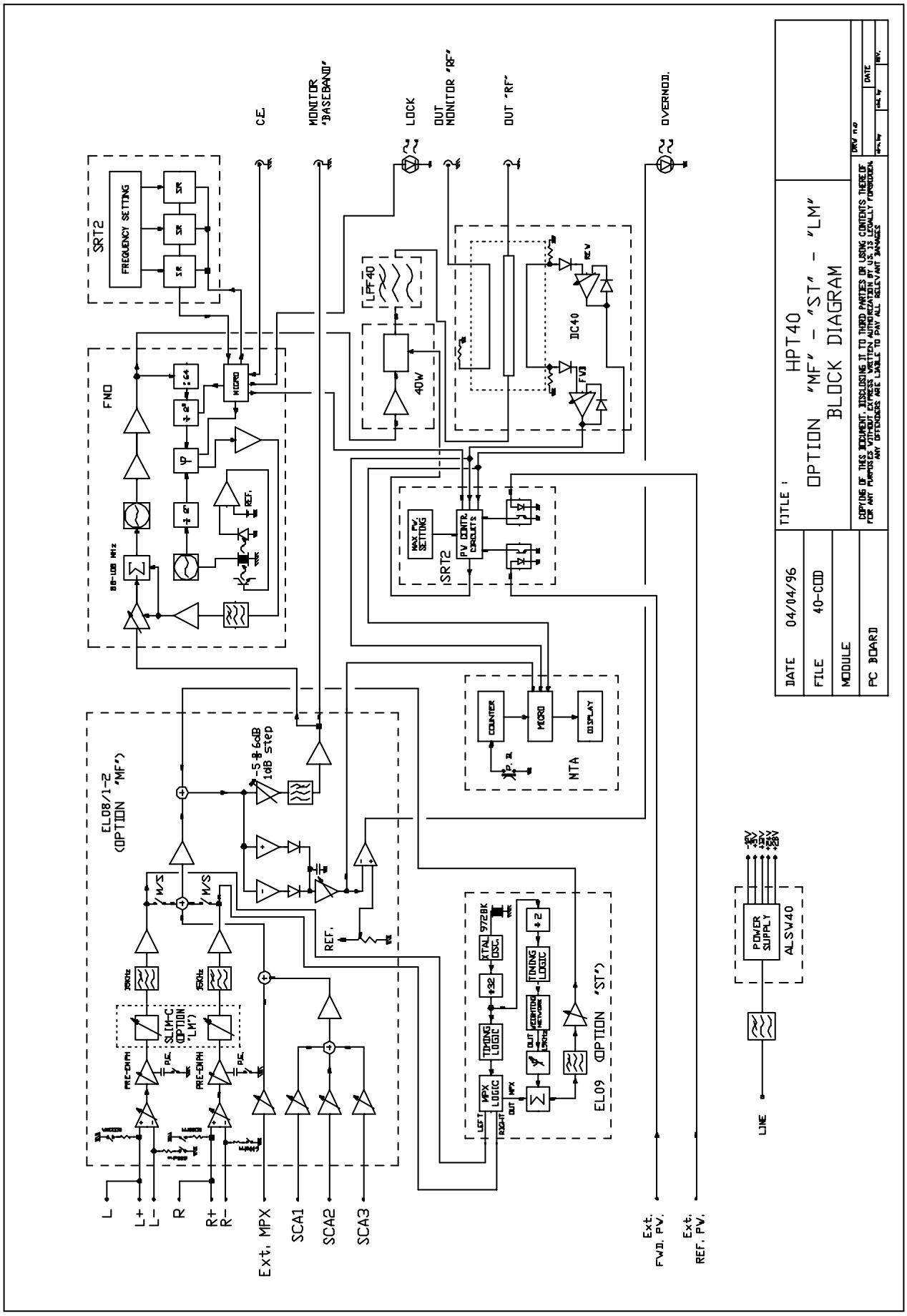
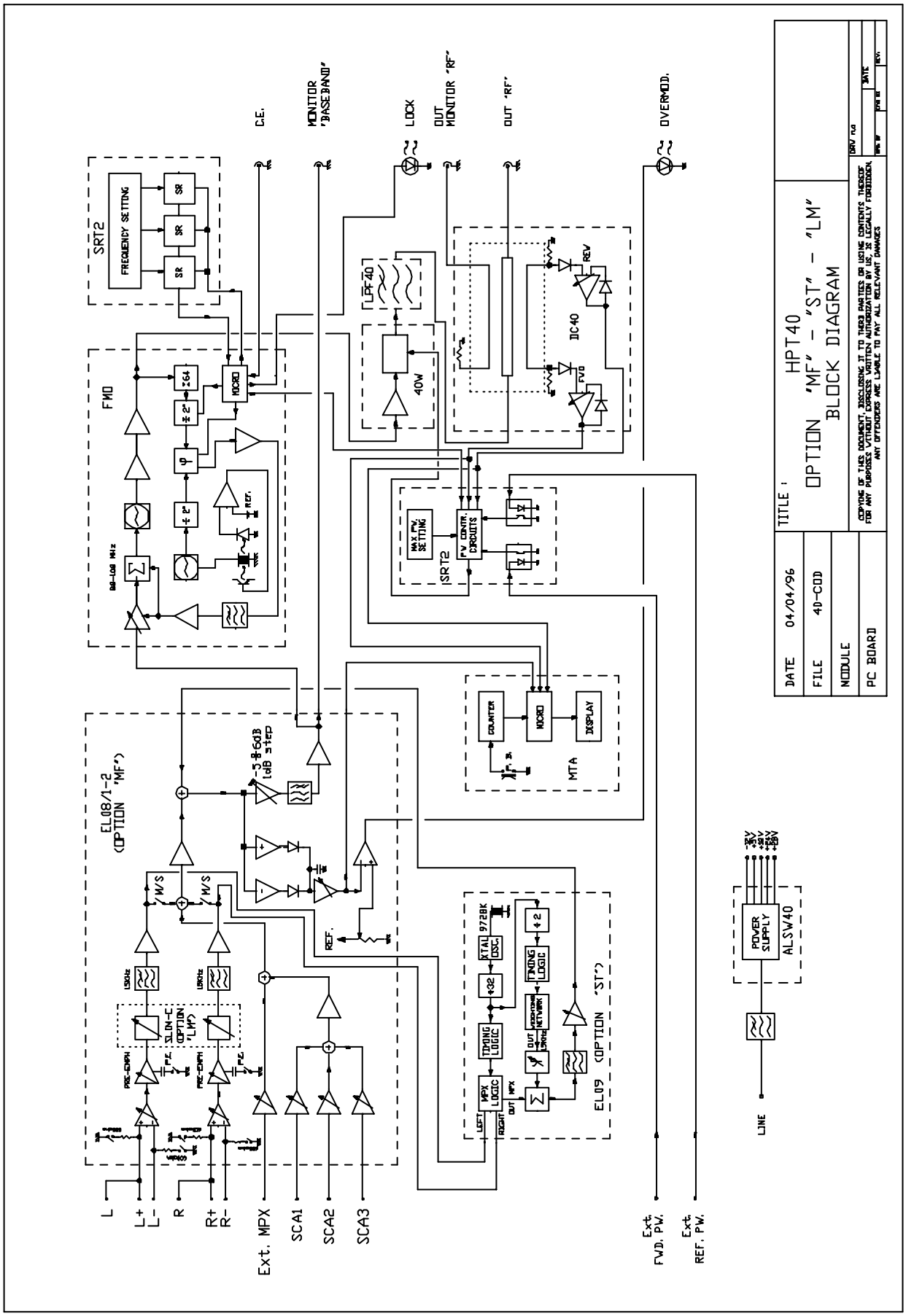

HPT40
OPTION "MF" - "ST" - "LM"
BLOCK DIAGRAM
DATE 04/04/96
FILE 40-COD
MODULE
PC BOARD
SRT2
FREQUENCY SETTING
FMD
EL08/1-2
(OPTION "MF")
EL09 (OPTION "ST")
NTA
SLIM-C
(OPTION "LM")
POWER SUPPLY
ALSW40
40W
IDC40
C.E.
MONITOR "BASEBAND"
LOCK
OUT MONITOR "RF"
OUT "RF"
OVERMOD.
L
L+
L-
R
R+
R-
Ext. MPX
SCA1
SCA2
SCA3
Ext. FWD. PV.
Ext. REF. PV.
LINE


SRT2
FREQUENCY SETTING
SR
SR
SR
FMD
MONO
÷64
÷2
÷2
REF.
C.E.
MONITOR "BASEBAND"
LOCK
OUT MONITOR "RF"
OUT "RF"
OVERMOD.
LPF40
40W
IIC40
REV
FWD
SRT2
MAX PW. SETTING
PW COUNTR. CIRCUITS
EL08/1-2 (OPTION "MF")
-5.8608 1dB step
REF.
SLIN-C (OPTION "LM")
PRE-EMPH
L
L+
L-
R
R+
R-
Ext. MPX
SCA1
SCA2
SCA3
EL09 (OPTION "ST")
XTAL 9728K OSC.
÷32
TIMING LOGIC
÷2
TIMING LOGIC
MPX LOGIC
LEFT
RIGHT
OUT MPX
MTA
COUNTER
MONO
DISPLAY
Ext. FWD. PW.
Ext. REF. PW.
POWER SUPPLY
ALSW40
LINE
TITLE :
OPTION "MF" - "ST" - "LM"
BLOCK DIAGRAM
DATE 04/04/96
FILE 40-COD
MODULE
PC BOARD

ELC SYSTEM

BEFORE SUPPLYING POWER,VERIFY THAT THE VOLTAGE OF THE AC POWER TO BE USED IS THE SAME AS THE SPECIFIED VOLTAGE

The power voltage for use is set at shipping, according to the specification when the order was received. If power voltage was not specified in the order, it is standard the 230Vac mode.

To change the standard specification to another, for example 110Vac, first remove the fuse in the AC line connector on the rear panel by sliding the plastic cover to the left side of the AC line connector and pulling the lever toward you.Then remove the voltage indicating panel from the fuse box and re-insert the voltage indicating panel so that 110V is displayed on the voltage indicating window on the lower of the fuse.

Finally insert the fuse in the box, slide the plastic cover to the right and connect the power cable to the AC line connector. Now you are ready to turn the power switch at the lower of the front panel ON.
When power is supplied, a self diagnostic test is running. The test sequence light the bar-leds on the Vu-meter and the control leds.

The internal dc voltages (-12, +5, +12, +24) are displayed by means of four leds.
The device has a thermal compensated cristal, so warm it up for about 10 minutes to obtain the specified performance.

ELC SYSTEM

USER INSTRUCTIONS

The EXCITER can supply a Maximum RF Power of the 36W, in the frequency range 87.5 108MHz

Before supplying power and connect it to Transmission Antenna or Power Amplifier, is necessary to execute this procedure:

A) Verify that the voltage of the ac power to be used is the same as the specified voltage. If is necessary to change the standard specification to another, for example 110Vac, first remove the fuse in the Power Entry Module Filter with IEC Plug, Voltage Selector and Fuse Block on the rear panel by sliding the plastic cover to the left side of the AC line connector and pulling the lever toward you.Then remove the voltage indicating panel from the fuse box and re-insert the voltage indicating panel so that 110V is displayed on the voltage indicating window on the lower of the fuse. Finally insert the fuse in the box, slide the plastic cover to the right and connect the power cable to the AC line connector.

B) Connect a dummy load capable of handling at least 50W, to the N connector labeled "RF OUT." An in-line wattmeter is also recommended

C) Remove the digiswitch cover on the front panel by removing the two screws holding it on.Set the transmission frequency by use of the rotary-switches provided. The transmission frequency may be set in 10KHz increments.The switch increments from left to right are 100MHz, 10MHz, 1MHz, 100KHz, and 10KHz. A red LED indicator is also provided to indicate when the VCO is locked.

D) On the front panel, in the frequency select window , there are two banks of 10 switches and, by the label"MAX. SET OUTPUT POWER", there are two banks of 10 LED indicators. **The switches are used to set the maximum power, that the Transmitter shall not exceed.**The first bank of 10 switches represents the power from 2 to 20 watts, while the second bank represents the power from 22 to 40 watts.**THERE SHOULD NEVER MORE THAN "ONE"SWITCH ON AT ANY TIME**. In the case where the operator selects more than one switch the unit will not execute the sum of the power, however an incorrect reading will be displayed on the indicator

E) Located to the left of the Power control switch banks are two singol switches located one above the other.The top switch selects the Internal or External control of Direct Power Output while the lower switch selects Internal or External control of Reflected Power Output. **Place both switches in the "down" position which selects Internal power control**

F) To the left of the left control switches are two small Trimmers. Rotate both controls full clockwise

G) Connect the equipment to the AC line and turn ON the power. Set the multimeter to the Direct Power Reading by pressing the square button until the red LED indicates the desired parameter has been selected.

H) Wait for a few seconds and observe that the red lock indicator light (TX PLL LOCK), indicating that the VCO is locked in to the frequency selected on the front panel. The direct power reading will come up slowly (5 seconds)

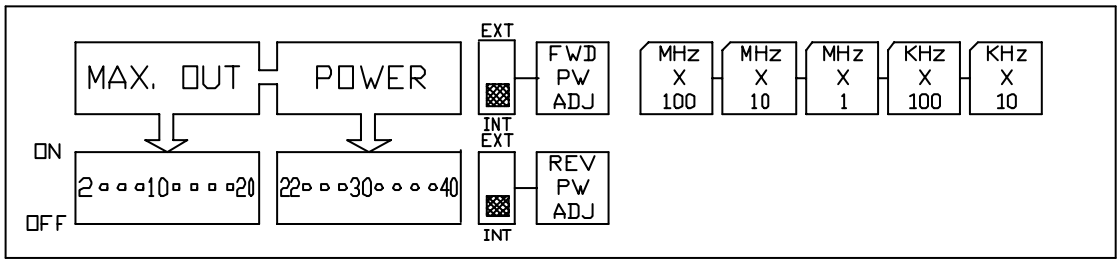
i) Adjust the top trimmer until the power does not go above the maximum desired power. Turning the trimmer counterclockwise will reduce the power.

L) Turn the reflected power control trimmer fully counterclockwise. The power output should decrease. Remove the antenna cable (VSWR=) and adjust the trimmer so that the direct power output is approx. 4 watts. This adjustement sets the automatic fold-back control so that the HIGH VSWR conditions cause the transmitter to automatically go to a safe operating level

M) Reconnect the dummy load and the RF power should automatically come back up the desired level and to remain in ALC. This indicates that the transmitter now sees the correct load.

N) Remove power from the unit and connect the unit to the transmission antenna

40W SETTING



HPT40 MODULES DESCRIPTION

POWER SUPPLY (ALSW40 module)

This module supplies -12.5V, +5V, +12.5V, +24V, +28V DC Voltages
The input is composed of 3 x Rectifier Bridges (RD1, RD2, RD3). RD1 bridge, powered by an 8V rms secondary of the toroidal transformer, supplies DC voltage of +5V through the 7805 regulator, RD2 bridge, powered by a 16Vrms secondary, supplies, through the L200 regulator, DC voltage of +12V and supplies the switching circuit, that, supplies, through the 7912 regulator, DC voltage of -12V.
RD3 bridge, powered by an 28Vrms secondary of the toroidal transformer, supplies, through an appropiate regulation circuit, DC voltage of +28V-5A, to 40W RF module. From this voltage, the U5 regulator supplies DC Voltage of +24V.

LOW FREQUENCY CIRCUIT (BFI board) M version

The purpose of this module is to apply sound signals (mono, stereo, SCA) to the modulator. The input circuit for mono or stereo signals (with frequencies lower than 53kHz) is unbalanced with an input impedance of 0.6 or 10Kohm which may be selected by means of jumpers. The three unbalanced inputs for SCA signals accept input frequencies up to 200kHz.
After the first two stages, which allow regulation of the total gain, there is the pre-emphasis circuit by means of which variable time constants can be obtained between 40 and 80 microseconds (factory set at 50µS for CCIR, at 75µS for FCC)
The base band signal obtained in this way directly modulates the VCO, with a level of +6dB for maximum Deviation. On the module there is also a circuit to measure the level of the sound signal, whose output goes to the MTA board, for reading on the multimeter located on the front panel.

LOW FREQUENCY CIRCUIT (EL08/1-2 boards) MF and ST versions

The "low frequency input filter" module is composed of two overlaying boards housed in the rear of the rack in direct contact with the input connectors;
It has the task of controlling the various input signals (MPX, Left, Right, SCA 1,2,3), filtering them, and sending them either to the modulator or to the stereocoder; in addition, there is also a low-pass filter for the internal or external multiplex signal. There is provision to set the various levels of both the single signals and the composite signal; it is possible to insert pre-emphasis and adjust the level of the overmodulation indicator.
Input levels are normally calibrated for 0dBm, 6dBm, or 12dBm, while output which is present also as a VDU on the front panel is set at a fixed level of 6 dBm (1550mVrms).
On the right- or left-hand channel there are two elliptical filters to ensure excellent suppression of the low frequency signal spectrum for frequencies greater than 15kHz; at 19kHz attenuation typically exceeds 50dB, while ripple in the band is around 0.1dB.

The analog signals are switched by means of very low distortion and noise analog switches.
The precision modulation intensity detector is peak-to-peak and gives error-free response up to and over 100kHz.

STEREO LIMITER CIRCUIT (SLIM board) MF/LM and S/LM versions

The SLIM board, located between EL081 and EL082 boards, is composed of a LIM circuit and it intends to limit the frequency deviation at +/-75KHz; such circuit is inserted between the left and right audio inputs and the relevant 15KHz low pass filters. This circuit delivers three properly switched signals to an amplifier; this switching function is in relation with the audio level of the audio signal applied to the left and right channels. The intervention threeshold is adjusted by the R1 trimmer, which automatically sets the positive and negative values.
If the audio input signal is lower than the threeshold set, the audio input signal is delivered directly to the audio output without any level and phase variation.
If the audio input signal exceeds positively or negatively the threesholds set, a negative and positive voltage exactly equal to the threeshold value is then delivered to the audio output.
The following low pass filter located at the EL081 board, eliminates the harmonics and eventual switching glitches caused by the audio signal clip.
The group delay of the low pass filter may originate small oscillations on the clip, but the level of these oscillations doesn't increase the deviation more than 1dB, even if the audio input level will double.

STEREO GENERATOR CIRCUIT (EL09 module) S version

The audio signals coming from the input boards containing the 15KHz audio filters enter the MPX module (EL09 board) at J1 and J2 respectively. They are then taken to the level of 2Vrms by U12 and U13 then enter the analog switches that work at a frequency of 608KHz.
This commutation frequency is a multiple of the pilot tone frequency (19KHz) and it is derived from a crystal oscillator (U3) operating at 9728KHz and from two shift-registers (U5). This makes it possible to have the commutation spurious emissions of the multiplex signal at a much greater frequency than the maximum frequency of the stereophonic signal and so they can easily be eliminated with a Bessel filter of the fifth order on the input boards. Since this Bessel filter's cut-off frequency is over 300KHz, its response in amplitude and phase within the 53 KHz is excellent and therefore does not prejudice separation of the left and right channels of the stereophonic signal.
The R8 trimmer is used to balance the two commutation signals and should be adjusted to have maximum suppression of the 38KHz.
The R12 trimmer polarizes the analog switches and adjusts itself for minimum distortion of the decoded signal.
The 19KHz subcarrier is also generated by the 9728KHz crystal; after the integrated circuit U3 has been divided by U3 with its eight "shifted" outputs, it makes it possible to build the pilot tone frequency by approximation by means of a weighted sum. The amplitude of the 19 KHz pilot tone is adj by R59, while R57 adj its phase.

The multiplex signal is summed with the pilot tone frequency with a suitable weight through the operational amplifiers U15 and U16; these have a continuous coupling and their offset is zeroed by R36; the R70 trimmer adj the level of the output signal, normally adj at +6dBm, same value of the EL09 audio inputs

VCO CIRCUIT (FMO module)

This module includes a section enclosed in an aluminium screened box containing a very-low-noise FET oscillator and relative amplifier, a modulation circuit whose great linearity throughout the FM band is ensured by an original compensating circuit, and a VCO input for the frequency control loop.
Outside this aluminium screened box there is the section for digital frequency synthesising, obtained by means of a microprocessor that acquires the frequency set on the front panel by means of dip-switches and it programs a series of dividers with the purpose of lowering the frequency of the VCO to the comparison level, which may be obtained by the crystal thermostatic oscillator located inside the module, or by using an outside sample source with a frequency of 2500Hz.

MULTIMETER CIRCUIT (MTA board)

The MTA board displays on the front panel the working condition of the most important transmitter parameters
The power supply voltages (-12, +5, +12, +24Vdc) are displayed from 4 leds located on the left side of front panel
The analog voltages showing the Direct Power, Reflected Power, peak and semi-peak modulation, are displaying from "BAR-GRAF" with a resolution of the 40 leds that make sure a reading accuracy to agree with measurement trasductor. The selected function is displayed from respective led.
The Deviation Measurement (full-scale is100KHz) is derived from peak to peak detector circuit with response very accuracy also for MPX signals. Moreover is displaying the semi-peak modulation with the aid of a microprocessor that read the maximum deviation peak every 300msec. This function is useful in order to verify the frequency deviation value with "musical" signal. Infact the choice of use of the "BAR-GRAF" is necessary in order to have a good response with "music" signal.
The led C.E. (carrier enable) shows the enable of the RF POWER MODULE, (with VCO module always frequency locked), in case the transmitter is used in a Active Reserve System

RF AMPLIFIER AND POWER CONTROL SECTION (40W, LPF40, DC40 AND SRT modules)

RF AMPLIFIER SECTION (40W, LPF40 and DC40 modules)

This includes the RF Amplifier, the Low Pass Filter and the Directional Coupler modules. The first represents a power amplifier with gain higher than 36 dB and bandwidth 87.5-108 MHz; the typical input exciting power is 10dBm (+/-3dBm). All the stages are in AB Class to ensure an adequate stability even with very low output powers. The trimmer R10 fixes the polarization of the second stage, whereas the R17

fixes that of the last one. The amplifier which supplies more than 60W output power on the whole range, is followed by a Low Pass Filter of 9th order which ensures, with a ripple in lower band of 0.1dB, a rejection of the harmonics better than 70 dB; its typical insertion loss is lower than 0.3 dB within the 87.5-108Mhz, and exceeds 42dB at 176Mhz. After the Low Pass Filter, before the output antenna connector, we find the Directional Coupler module (strip-line configuration) which, besides showing the direct and reflected power, controls the figures and grants a protection of the Power Transistor in case of wrong functionning of the output load. This circuit is completed shield, ensuring a typical decoupling between direct and reflected power higher than 20dB and therefore a reading precision better than 5%. The detected voltages, proportional to the two RF powers, go on two operational amplifiers which amplify their value, taking into consideration the thermic drift of the detector diodes. The Directional Coupler Insertion Loss is lower than 0.2dB.

POWER CONTROLLER CIRCUIT (SRT board)

This board, fixed on the internal side of the front panel, has two functions: the acquisition (by means of 5 decimal dip-switches) of the frequency, to be sent to the microprocess located on the FMO module by means of a shift-register PISO, and the control of the directed and reflected powers. This control is effected by pre-setting 20 dip-switches of the total desired power (2 40W) and, inside it, of the directed and reflected power, by means of a trimmer.

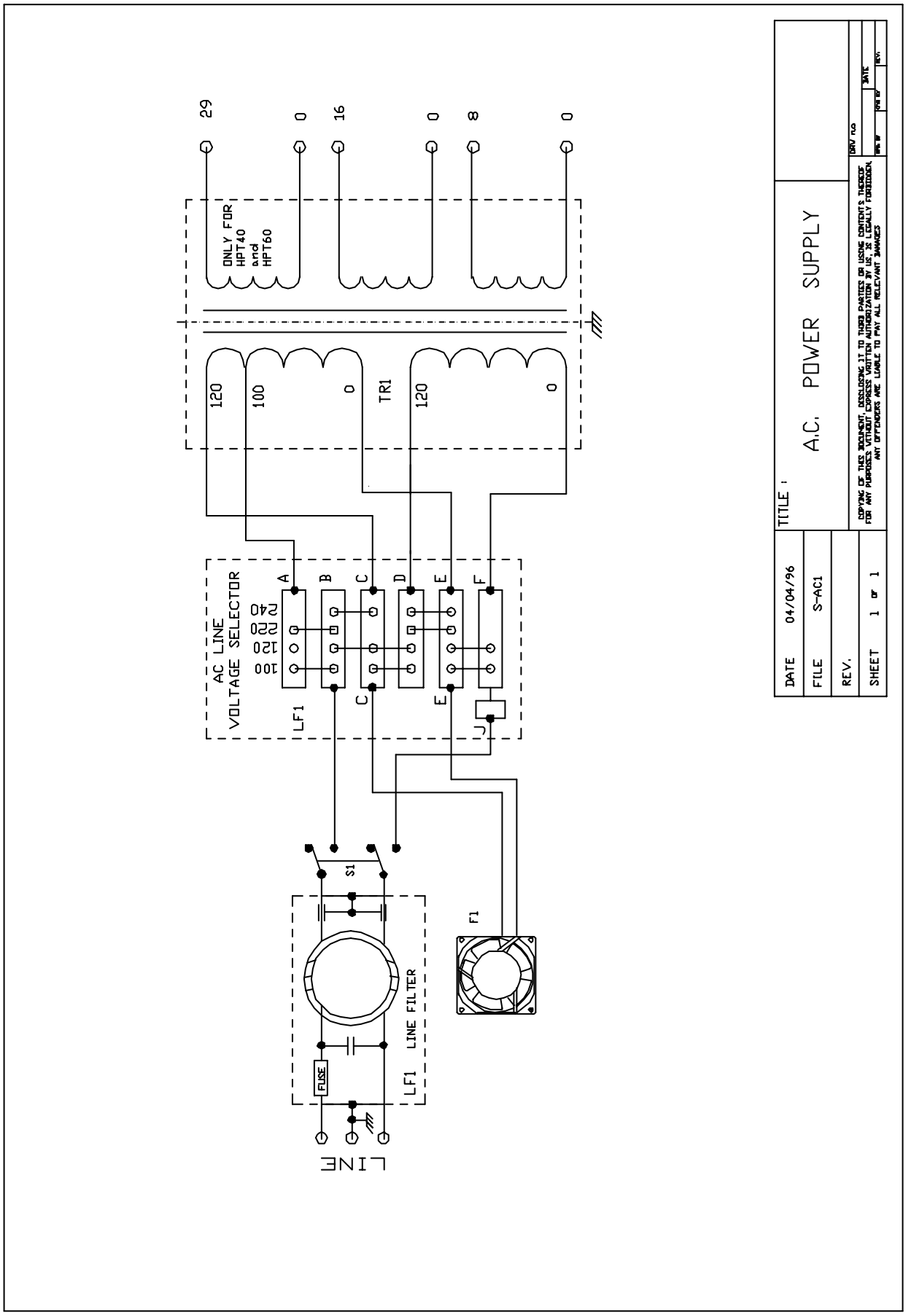
By means of two optoinsulated inputs, it is possible to control the power of an external amplifier driven by this unit, provided it is supplied with the suitable directional coupler.

ELC SYSTEM

CABLE

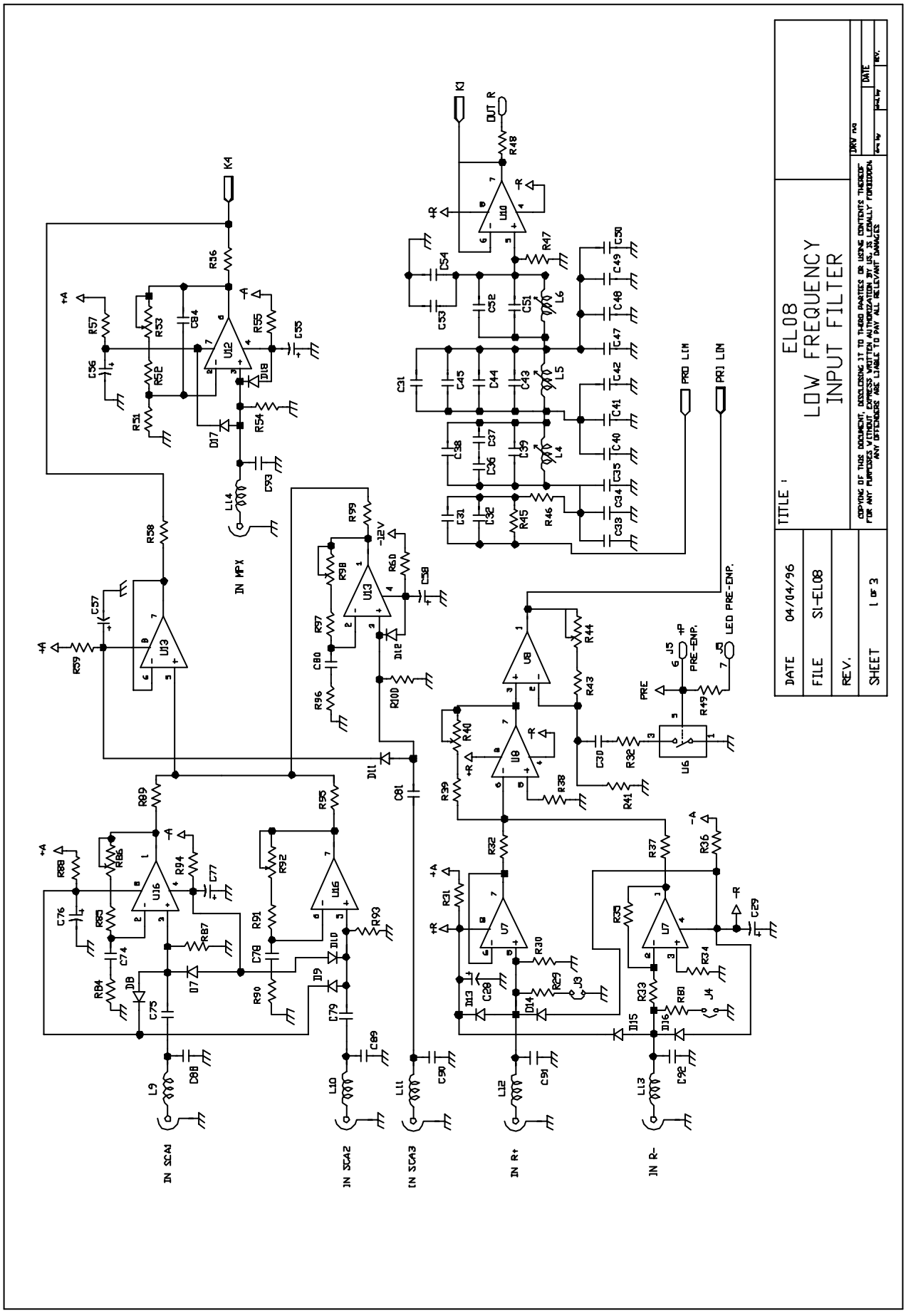
COLOUR	*FUNCTION*	*EQUIPMENT*
RED	+12Vdc	All the equipments.
GREY	+5Vdc	All the equipments.
DARKBLUE	+24Vdc	All the equipments.
WHITE	-12Vdc	All the equipments.
GREEN	R.F. field measure	RXG, RXFM, RX2G,HPT-FMR, HPT-STL
BROWN	Carrier Detect output	RXG, RXFM, RX2G, HPT-FMR, HPT-STL
BLUE	D.T.-T: Data Tranfer Tx frequency settting	Exciter, transmitter and transposer.
CYAN	Carrier Detect led	Receiver and transposer.
YELLOW	Tx locked led	Exciter, transmitter and transposer.
PINK	AB-FIN: power enable	Exciter, transmitter and transposer.
ORANGE	Carrier Enable	Exciter, transmitter and transposer.
BLACK	ground	All the equipments..
PINK-BLACK	Over-Modulation led	/Cod option for exciter and transmitter.
DARKBLUE-BLACK	Rx locked led	Receiver and trasposer.
YELLOW-BLACK	CK-T: clock for Tx frequency setting board	Exciter, transmitter and transposer.
CYAN-BLACK	D.T.-R: Data Transfer Rx frequency setting	Transposer.
GREY-BLACK	PE-R: Parallel Enable for Rx frequency setting board	Transposer.
RED-BLACK	IN-PR: Tx reflected power measure	Transmitter/P, exciter and transposer.
BLUE-WHITE	EX-PD: External Forward Power measure	Transmitter/P, exciter and transposer.
GREEN-WHITE	IN-PD: Tx forward power measure	Transmitter/P, exciter and e transposer.
YELLOW-WHITE	CK-R: clock for Rx frequency setting board	Receiver and transposer.
GREY-WHITE	IN-V: Tx amplifier module driving voltage	Transmitter/P, exciter and transposer.
ORANGE-WHITE	Pre-enphasis inserted.	/Cod option for exciter and trasmitter.
RED-DARKBLUE	Deviation meter	
WHITE-DARKBLUE	Power enabling for A2G, AXG1, FX6 and YU6 modules	TXG, TX6 and TX2G.

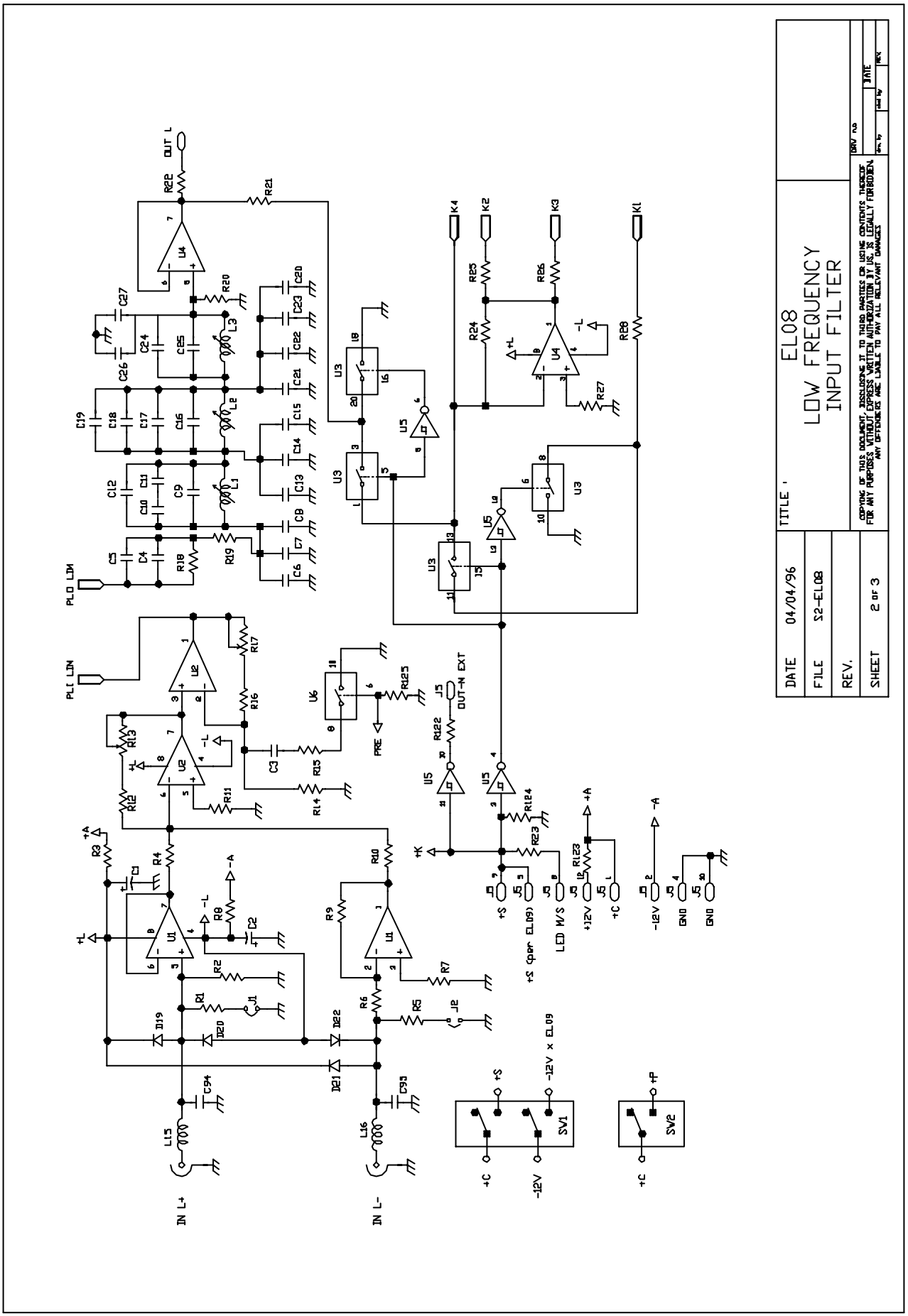
YELLOW-RED	VCO voltage measure	
ORANGE-RED	Internal Stereo-generator inserted	/Cod option for exciter and trasmitter.
CYAN-RED	TXG amplifier module driving voltage	TXG with power adjusting on the rear panel.
BLUE-RED	TXG amplifier module driving voltage	TXG with power adjusting on the rear panel.
PINK-CYAN	EX-PR: external reflected power measure	Trasmitter/P, exciter and transposer.
GREEN-BROWN	PE-T: Parallel Enable for Tx frequency setting board	Exciter, tranmitter and transposer.
CYAN-WHITE	Reset for microprocessor	All the equipments


A.C. POWER SUPPLY
TITLE :
DATE 04/04/96
FILE S-AC1
REV.
SHEET 1 OF 1
DRW No
DATE
REV.
DRN BY
CHK BY
APP BY
COPYING OF THIS DOCUMENT, DISCLOSING IT TO THIRD PARTIES OR USING CONTENTS THEREOF FOR ANY PURPOSES WITHOUT EXPRESS WRITTEN AUTHORIZATION BY US, IS LEGALLY FORBIDDEN. ANY OFFENDERS ARE LIABLE TO PAY ALL RELEVANT DAMAGES
29
0
16
0
8
0
ONLY FOR HPT40 and HPT60
120
100
0
TR1
120
0
AC LINE VOLTAGE SELECTOR
100
120
220
240
A
B
C
D
E
F
LF1
C
E
J
S1
F1
LINE FILTER
LF1
FUSE
LINE

A.C. PLUG-IN PART LIST

LF1	POWER ENTRY MODULE WITH FILTER	CORCOM
S1	BIPOLAR LINE SWITCH WITH LAMP	
TR1	TOROIDAL TRANSFORMER	150VA
F1	ASSIAL FAN	110V A.C.
F2	6X32 FUSE	


EL08
LOW FREQUENCY
INPUT FILTER
TITLE :
DATE 04/04/96
FILE SI-EL08
REV.
SHEET 1 OF 3
IN MPX
IN SCA1
IN SCA2
IN SCA3
IN R+
IN R-
OUT R
PRE-EMP.
LED PRE-EMP.
PRJ LIN
PRJ LIN


EL08
LOW FREQUENCY
INPUT FILTER
TITLE :
DATE 04/04/96
FILE S2-EL08
REV.
SHEET 2 OF 3
DRW No
DATE
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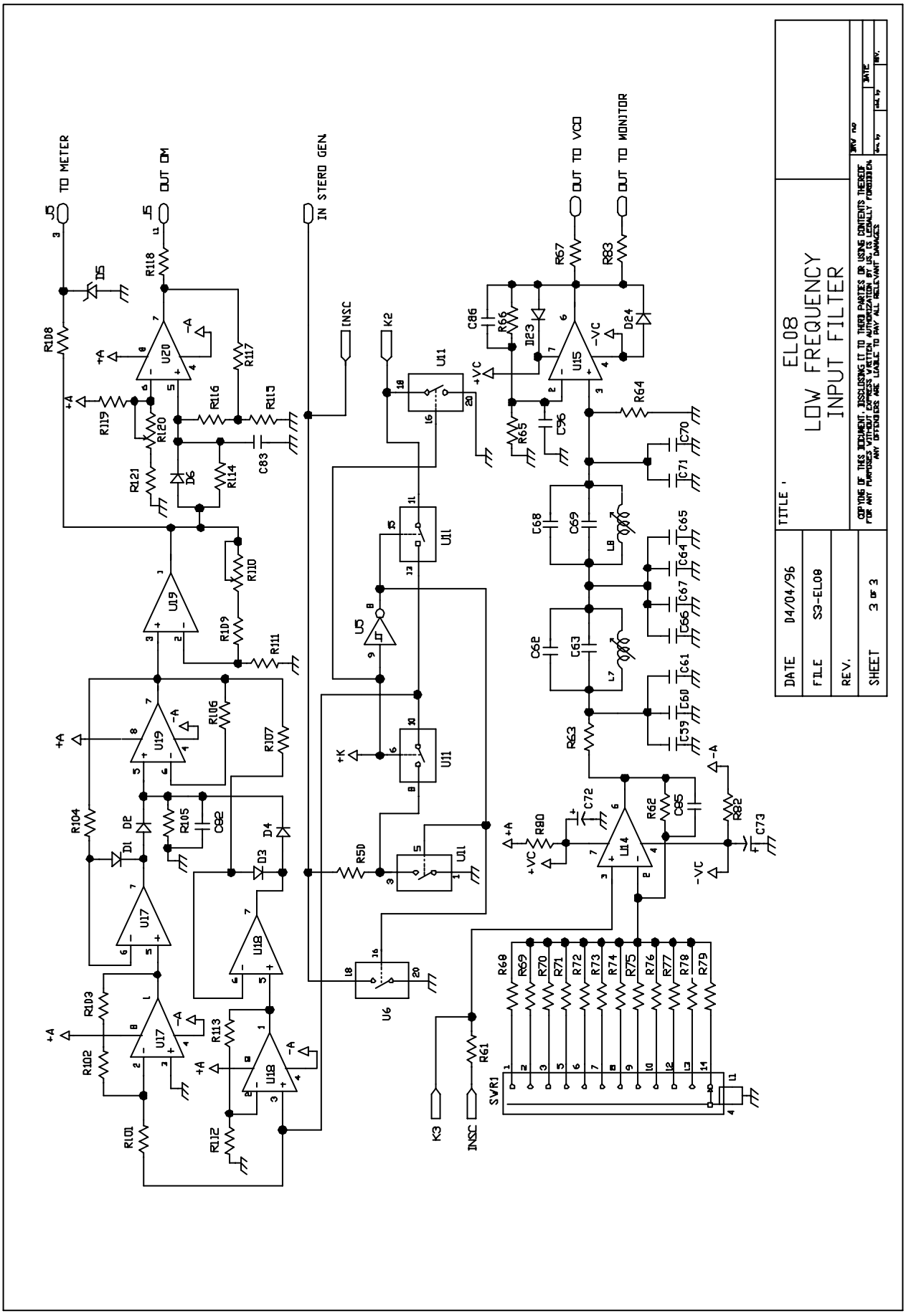
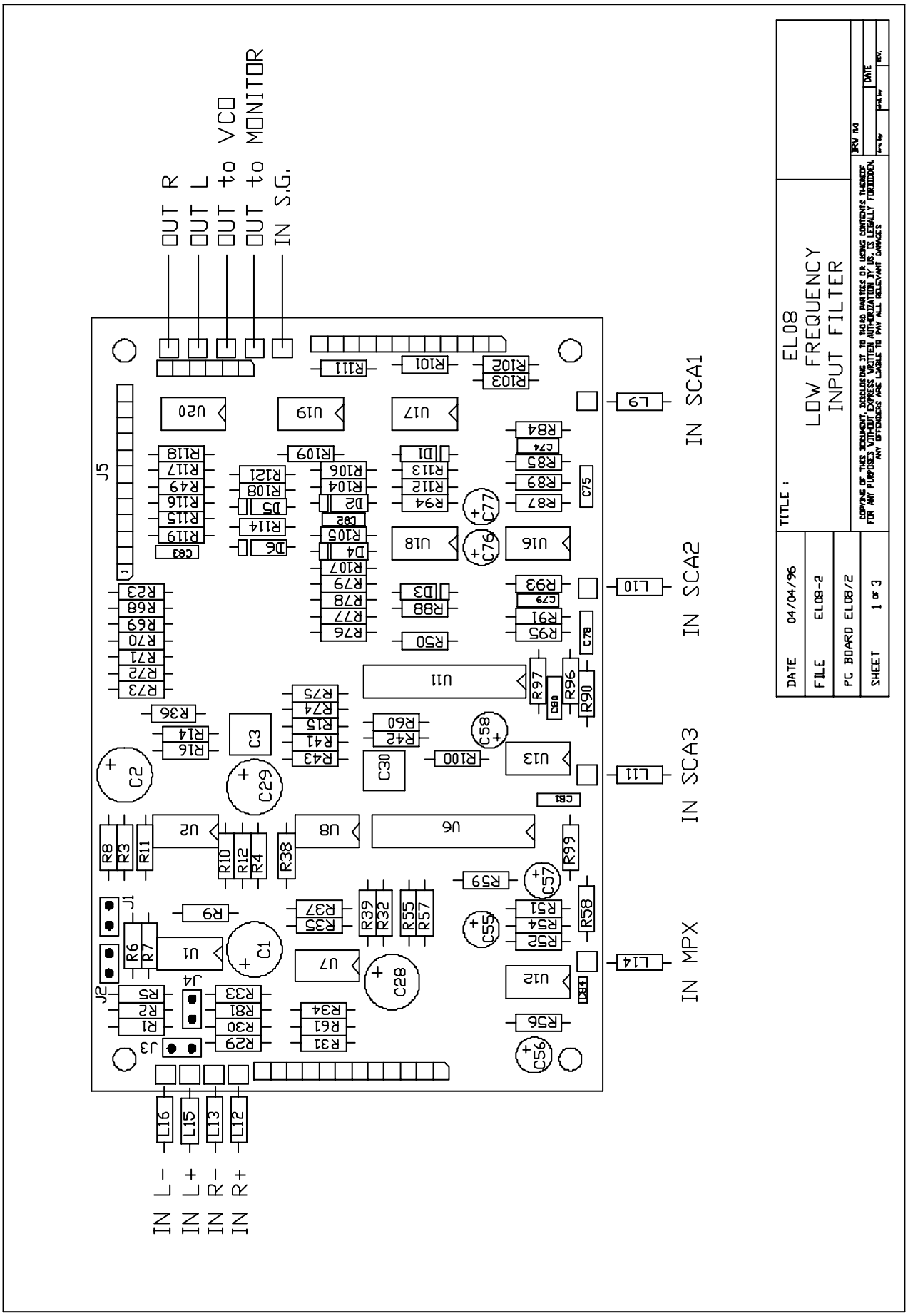
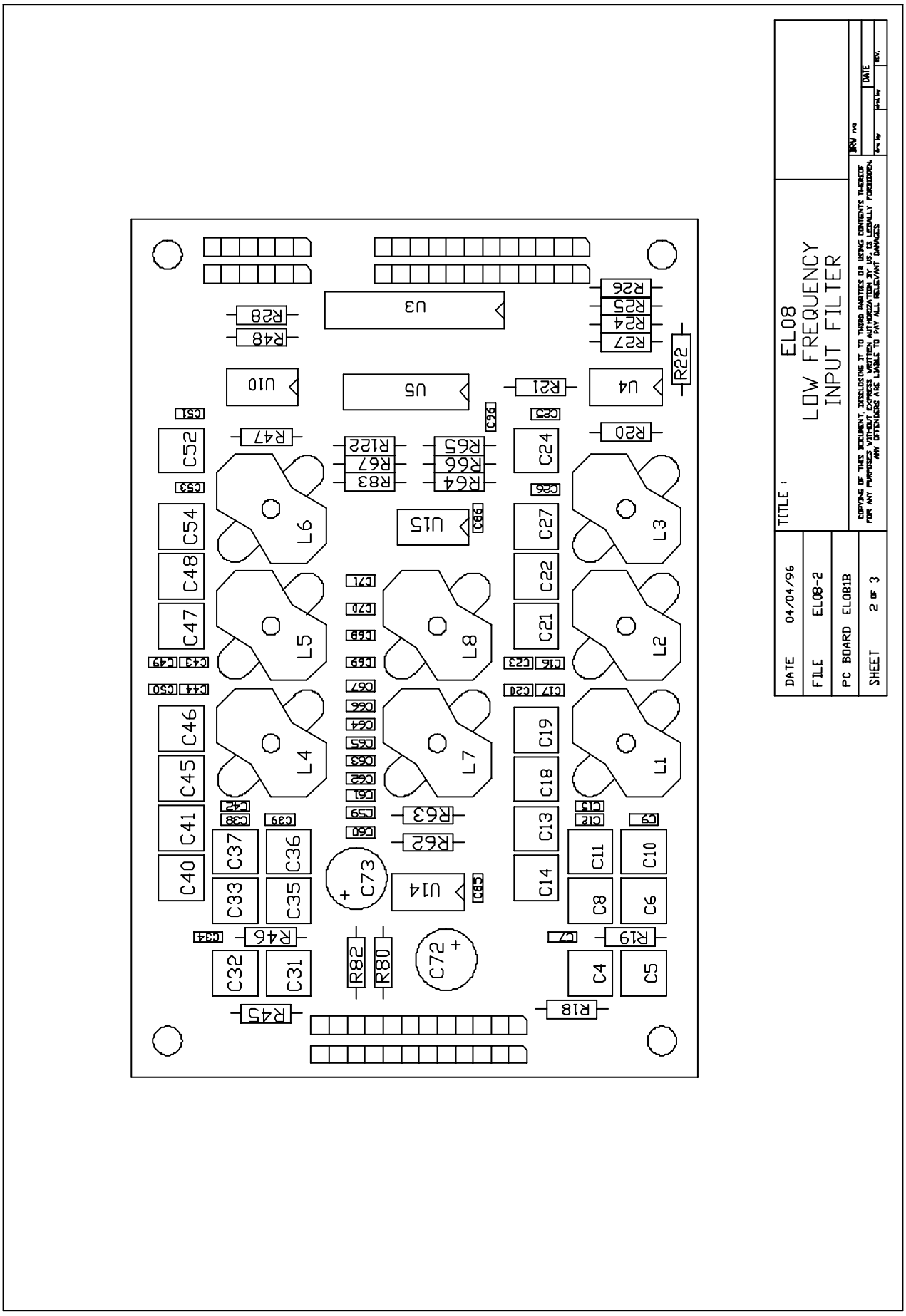
OUT L
PLI LDM
PLI LIN
IN L+
IN L-
OUT-M EXT
PRE
LED M/S
+S (per EL09)
+12V
+C
-12V
GND
GND
-12V x EL09
SV1
SV2


TO METER
OUT DM
IN STEREO GEN.
OUT TO VCO
OUT TO MONITOR
INSC
K2
K3
+A
-A
+VC
-VC
+K
SVR1
TITLE :
EL08
LOW FREQUENCY
INPUT FILTER
DATE 04/04/96
FILE S3-EL08
REV.
SHEET 3 OF 3


OUT R
OUT L
OUT to VCO
OUT to MONITOR
IN S.G.
IN L-
IN L+
IN R-
IN R+
IN MPX
IN SCA3
IN SCA2
IN SCA1
EL08
LOW FREQUENCY
INPUT FILTER
TITLE :
DATE 04/04/96
FILE EL08-2
PC BOARD EL08/2
SHEET 1 OF 3
DATE
REV.


EL08
LOW FREQUENCY
INPUT FILTER
TITLE :
DATE 04/04/96
FILE EL08-2
PC BOARD EL0818
SHEET 2 OF 3
DRV no
DATE
REV.
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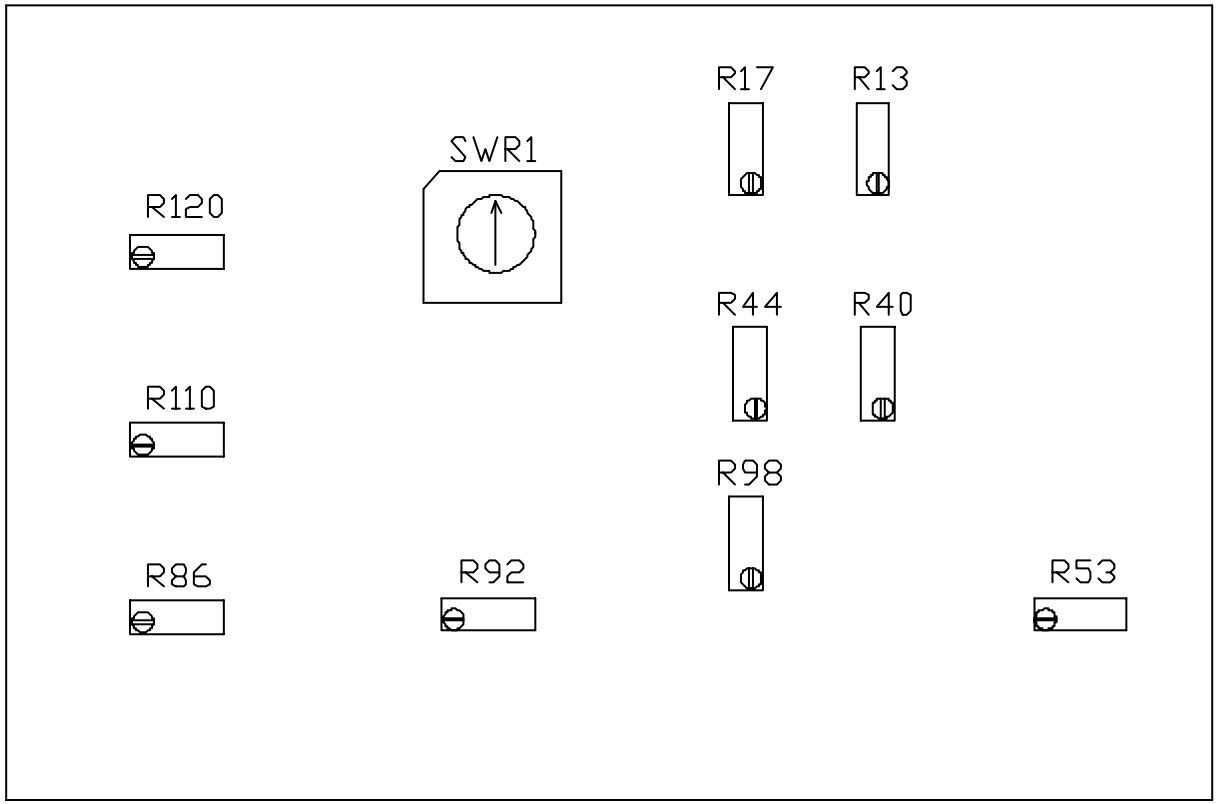
U3
U5
U4
U10
U15
U14
L1
L2
L3
L4
L5
L6
L7
L8
C73
C72
R22
R82
R80



DATE	04/04/96
FILE	EL08-3
PC BOARD	EL08/2
SHEET	3 OF 3

TITLE :

EL08
LOW FREQUENCY
INPUT FILTER

IRV n.a

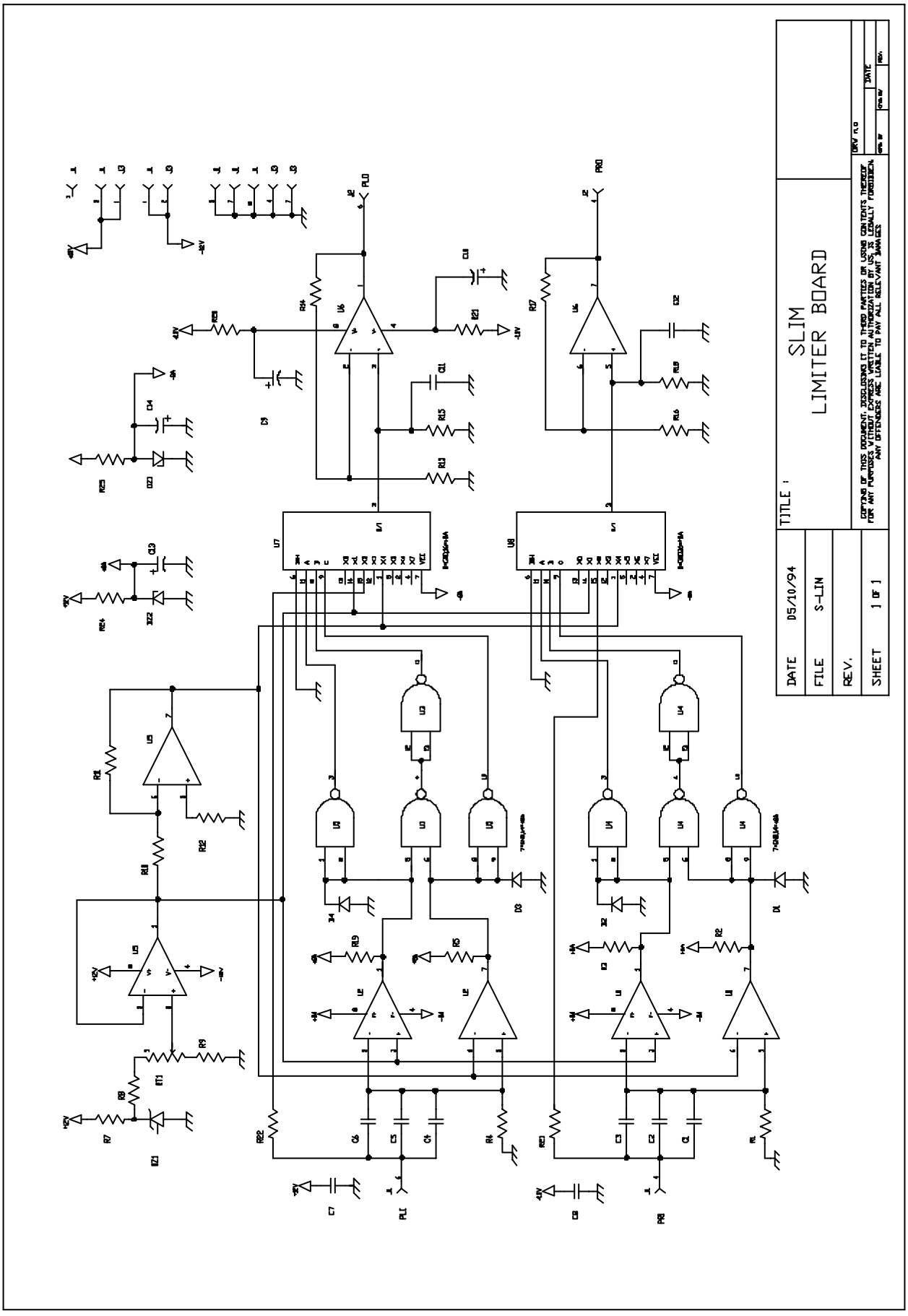
	DATE
drw by	chkd by	REV.

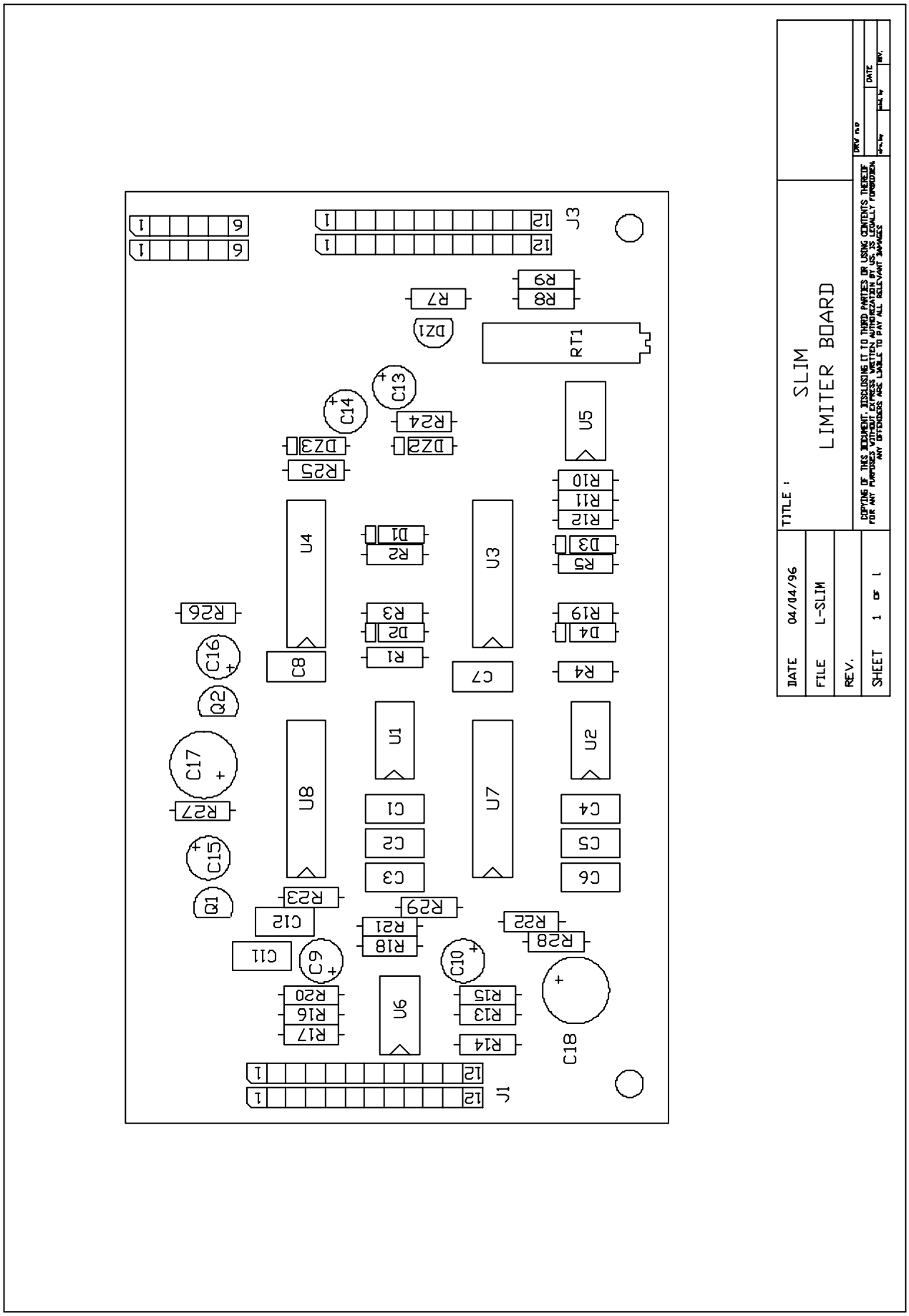
EL08/1-2 BOARD PART LIST

R1	RESISTOR 1% 0,25W	680
R2	RESISTOR 1% 0,25W	10K
R3	RESISTOR 1% 0,25W	270
R4	RESISTOR 1% 0,25W	2.2K
R5	RESISTOR 1% 0,25W	680
R6	RESISTOR 1% 0,25W	10K
R7	RESISTOR 1% 0,25W	10K
R8	RESISTOR 1% 0,25W	270
R9	RESISTOR 1% 0,25W	10K
R10	RESISTOR 1% 0,25W	2.2K
R11	RESISTOR 1% 0,25W	1K
R12	RESISTOR 1% 0,25W	1.2K
R13	TRIMMER 10T	10K
R14	RESISTOR 1% 0,25W	6.8K
R15	RESISTOR 1% 0,25W	10
R16	RESISTOR 1% 0,25W	1K
R17	TRIMMER 10T	1K
R18	RESISTOR 1% 0,25W	1K
R19	RESISTOR 1% 0,25W	1.2K
R20	RESISTOR 1% 0,25W	2.2K
R21	RESISTOR 1% 0,25W	1.2K
R22	RESISTOR 1% 0,25W	47
R23	RESISTOR 1% 0,25W	820
R24	RESISTOR 1% 0,25W	1.2K
R25	RESISTOR 1% 0,25W	10K
R26	RESISTOR 1% 0,25W	1.2K
R27	RESISTOR 1% 0,25W	10K
R28	RESISTOR 1% 0,25W	1.2K
R29	RESISTOR 1% 0,25W	680
R30	RESISTOR 1% 0,25W	10K
R31	RESISTOR 1% 0,25W	270
R32	RESISTOR 1% 0,25W	2.2K
R33	RESISTOR 1% 0,25W	10K
R34	RESISTOR 1% 0,25W	10K
R35	RESISTOR 1% 0,25W	10K
R36	RESISTOR 1% 0,25W	270
R37	RESISTOR 1% 0,25W	2.2K
R38	RESISTOR 1% 0,25W	1K
R39	RESISTOR 1% 0,25W	1.2K
R40	TRIMMER 1OT	10K
R41	RESISTOR 1% 0,25W	6.8K
R42	RESISTOR 1% 0,25W	10
R43	RESISTOR 1% 0,25W	1K
R44	TRIMMER 10T	1K
R45	RESISTOR 1% 0,25W	1K
R46	RESISTOR 1% 0,25W	1.2K
R47	RESISTOR 1% 0,25W	2.2K
R48	RESISTOR 1% 0,25W	47
R49	RESISTOR 1% 0,25W	820
R50	RESISTOR 1% 0,25W	10K
R51	RESISTOR 1% 0,25W	3.3K
R52	RESISTOR 1% 0,25W	22
R53	TRIMMER 10T	10K
R54	RESISTOR 1% 0,25W	10K
R55	RESISTOR 1% 0,25W	270
R56	RESISTOR 1% 0,25W	2.2K
R57	RESISTOR 1% 0,25W	
R58	RESISTOR 1% 0,25W	8.2K
R59	RESISTOR 1% 0,25W	270
R60	RESISTOR 1% 0,25W	10K
R61	RESISTOR 1% 0,25W	1.2K
R62	RESISTOR 1% 0,25W	1K
R63	RESISTOR 1% 0,25W	1.5K
R64	RESISTOR 1% 0,25W	1.5K
R65	RESISTOR 1% 0,25W	10K
R66	RESISTOR 1% 0,25W	10K
R67	RESISTOR 1% 0,25W	330
R68		
R69	RESISTOR 1% 0,25W	8.2K
R70	RESISTOR 1% 0,25W	3.9K
R71	RESISTOR 1% 0,25W	2.4K
R72	RESISTOR 1% 0,25W	1.7K
R73	RESISTOR 1% 0,25W	1.3K
R74	RESISTOR 1% 0,25W	1K
R75	RESISTOR 1% 0,25W	820
R76	RESISTOR 1% 0,25W	680
R77	RESISTOR 1% 0,25W	470
R78	RESISTOR 1% 0,25W	390
R79	RESISTOR 1% 0,25W	3.32K
R80	RESISTOR 1% 0,25W	10K
R81	RESISTOR 1% 0,25W	680
R82	RESISTOR 1% 0,25W	10K
R83	RESISTOR 1% 0,25W	47
R84	RESISTOR 1% 0,25W	8.2K
R85	RESISTOR 1% 0,25W	330
R86	TRIMMER 10T	50K
R87	RESISTOR 1% 0,25W	10K
R88	RESISTOR 1% 0,25W	270
R89	RESISTOR 1% 0,25W	10K
R90	RESISTOR 1% 0,25W	8.2K
R91	RESISTOR 1% 0,25W	330
R92	TRIMMER 10T	50K
R93	RESISTOR 1% 0,25W	10K
R94	RESISTOR 1% 0,25W	270
R95	RESISTOR 1% 0,25W	10K
R96	RESISTOR 1% 0,25W	8.2K
R97	RESISTOR 1% 0,25W	330
R98	TRIMMER 10T	50K
R99	RESISTOR 1% 0,25W	10K
R100	RESISTOR 1% 0,25W	10K
R101	RESISTOR 1% 0,25W	10K
R102	RESISTOR 1% 0,25W	10K

R103	RESISTOR 1% 0,25W	10K
R104	RESISTOR 1% 0,25W	5.6K
R105	RESISTOR 1% 0,25W	2.7M
R106	RESISTOR 1% 0,25W	3.9K
R107	RESISTOR 1% 0,25W	5.6K
R108	RESISTOR 1% 0,25W	1K
R109	RESISTOR 1% 0,25W	3.9K
R110	TRIMMER 10T	20K
R111	RESISTOR 1% 0,25W	10K
R112	RESISTOR 1% 0,25W	10K
R113	RESISTOR 1% 0,25W	10K
R114		
R115	RESISTOR 1% 0,25W	47K
R116	RESISTOR 1% 0,25W	2.7M
R117	RESISTOR 1% 0,25W	1M
R118	RESISTOR 1% 0,25W	1K
R119	RESISTOR 1% 0,25W	10K
R120	TRIMMER 10T	10K
R121	RESISTOR 1% 0,25W	1K
R122	RESISTOR 1% 0,25W	
C1	ELECTROLYTIC CAPACITOR	220 F
C2	ELECTROLYTIC CAPACITOR	220 F
C3	POLICARB. CAPACITOR	47nF
C4	POLICARB. CAPACITOR	6.8nF
C5	POLICARB. CAPACITOR	
C6	POLICARB. CAPACITOR	1.8nF
C7	CERAMIC CAPACITOR	100pF
C8	CERAMIC CAPACITOR	2.7nF
C9	CERAMIC CAPACITOR	8.2pF
C10	POLICARB. CAPACITOR	1.5nF
C11	POLICARB. CAPACITOR	1.5nF
C12	CERAMIC CAPACITOR	120pF
C13	POLICARB. CAPACITOR	3.3nF
C14	POLICARB. CAPACITOR	2.7nF
C15	CERAMIC CAPACITOR	100pF
C16	CERAMIC CAPACITOR	100pF
C17	CERAMIC CAPACITOR	120pF
C18	POLICARB. CAPACITOR	2.2nF
C19	POLICARB. CAPACITOR	2.2nF
C20	CERAMIC CAPACITOR	100pF
C21	POLICARB. CAPACITOR	2.2nF
C22	POLICARB. CAPACITOR	2.7nF
C23	CERAMIC CAPACITOR	120pF
C24	POLICARB. CAPACITOR	3.3nF
C25	CERAMIC CAPACITOR	20pF
C26	CERAMIC CAPACITOR	100pF
C27	POLICARB. CAPACITOR	2.7nF
C28	ELECTROLYTIC CAPACITOR	220 F
C29	ELECTROLYTIC CAPACITOR	220 F
C30	POLICARB. CAPACITOR	47nF
C31	POLICARB. CAPACITOR	3.9nF
C32	POLICARB. CAPACITOR	1.5nF
C33	POLICARB. CAPACITOR	1.8nF
C34	CERAMIC CAPACITOR	100pF
C35	POLICARB. CAPACITOR	2.7nF
C36	POLICARB. CAPACITOR	1.5nF
C37	POLICARB. CAPACITOR	1.5nF
C38	CERAMIC CAPACITOR	120pF
C39	CERAMIC CAPACITOR	8.2pF
C40	POLICARB. CAPACITOR	3.3nF
C41	POLICARB. CAPACITOR	2.7nF
C42	CERAMIC CAPACITOR	100pF
C43	CERAMIC CAPACITOR	100pF
C44	CERAMIC CAPACITOR	120pF
C45	POLICARB. CAPACITOR	2.2nF
C46	POLICARB. CAPACITOR	2.2nF
C47	POLICARB. CAPACITOR	2.2nF
C48	POLICARB. CAPACITOR	2.7nF
C49	CERAMIC CAPACITOR	120pF
C50	CERAMIC CAPACITOR	100pF
C51	CERAMIC CAPACITOR	20pF
C52	POLICARB. CAPACITOR	3.3nF
C53	CERAMIC CAPACITOR	100pF
C54	POLICARB. CAPACITOR	2.7nF
C55	ELECTROLYTIC CAPACITOR	47 F
C56	ELECTROLYTIC CAPACITOR	47 F
C57	ELECTROLYTIC CAPACITOR	47 F
C58	ELECTROLYTIC CAPACITOR	
C59	CERAMIC CAPACITOR	100pF
C60	CERAMIC CAPACITOR	100pF
C61	CERAMIC CAPACITOR	2.2pF
C62	CERAMIC CAPACITOR	18pF
C63	CERAMIC CAPACITOR	
C64	CERAMIC CAPACITOR	12pF
C65	CERAMIC CAPACITOR	100pF
C66	CERAMIC CAPACITOR	150pF
C67	CERAMIC CAPACITOR	150pF
C68	CERAMIC CAPACITOR	15pF
C69	CERAMIC CAPACITOR	
C70	CERAMIC CAPACITOR	47pF
C71	CERAMIC CAPACITOR	100pF
C72	ELECTROLYTIC CAPACITOR	
C73	ELECTROLYTIC CAPACITOR	
C74	POLICARB. CAPACITOR	2.2nF
C75	POLICARB. CAPACITOR	2.2nF
C76	ELECTROLYTIC CAPACITOR	
C77	ELECTROLYTIC CAPACITOR	
C78	POLICARB. CAPACITOR	2.2nF
C79	POLICARB. CAPACITOR	2.2nF
C80	POLICARB. CAPACITOR	2.2nF
C81	POLICARB. CAPACITOR	2.2nF
C82	POLICARB. CAPACITOR	47nF
C83	ELECTROLITIC CAPACITOR	1 F
C84	CERAMIC CAPACITOR	10pF
C85	CERAMIC CAPACITOR	82pF
C86	CERAMIC CAPACITOR	pF
C87	CERAMIC CAPACITOR	100pF
C88	CERAMIC CAPACITOR (placed near the SCA1-IN)	100pF
C89	CERAMIC CAPACITOR (placed near the SCA2-IN)	100pF
C90	CERAMIC CAPACITOR	100pF

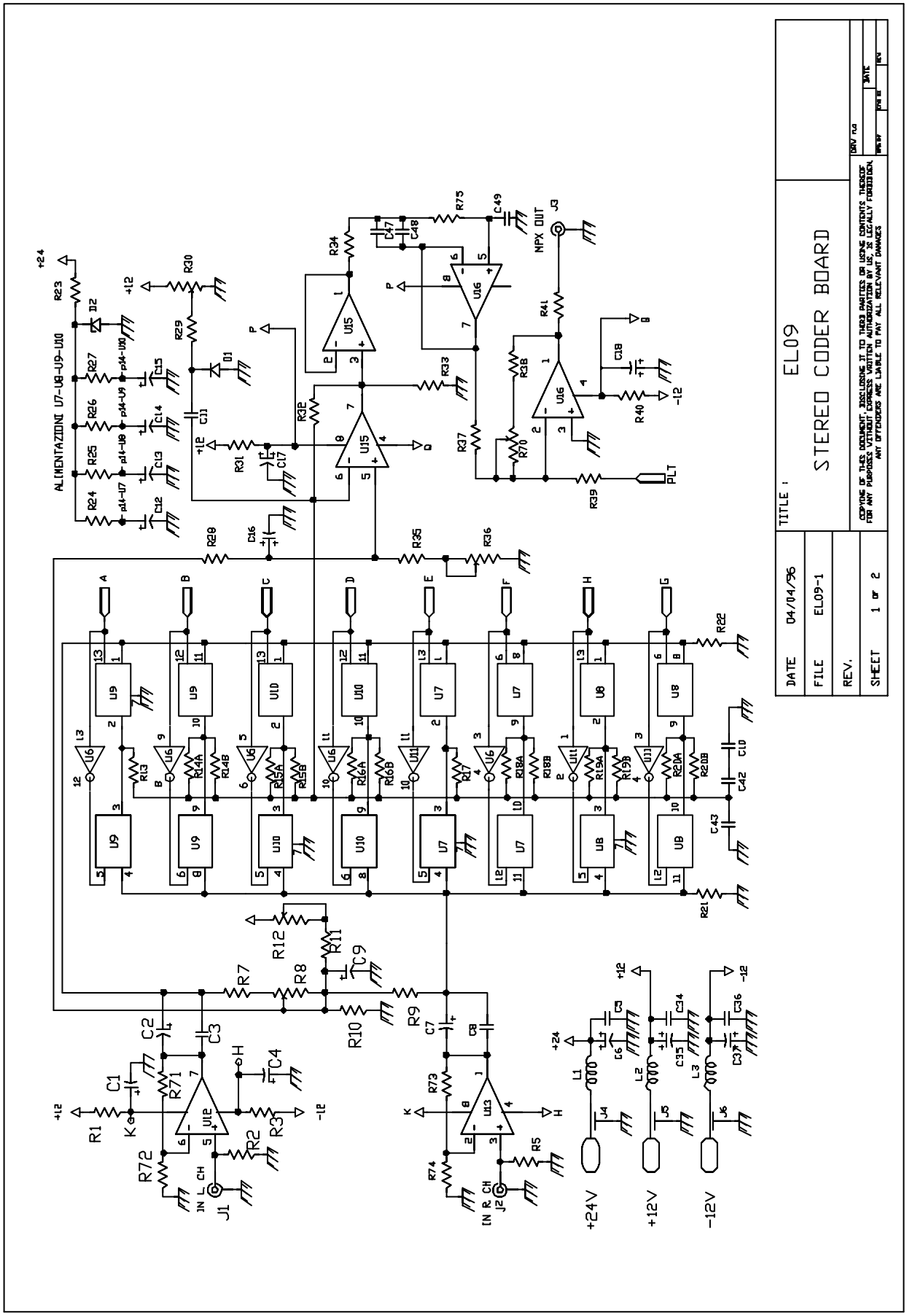
	(placed near the SCA3-IN)	
C91	CERAMIC CAPACITOR	100pF
	(placed near the IN-R+)	
C92	CERAMIC CAPACITOR	100pF
	(placed near the IN-R-)	
C93	CERAMIC CAPACITOR	100pF
	(placed near the MPX-IN)	
C94	CERAMIC CAPACITOR	100pF
	(placed near the IN-L+)	
C95	CERAMIC CAPACITOR	100pF
	(placed near the IN-L-)	
D1	DIODE	BAR10
D2	DIODE	1N4148
D3	DIODE	BAR10
D4	DIODE	1N4148
D5	DIODE	LED
D5	ZENER DIODE	5.6V
D6	DIODE	1N4148
D7	DIODE (under U16)	BAV21
D8	DIODE (under U16)	BAV21
D9	DIODE (under U16)	BAV21
D10	DIODE (under U16)	BAV21
D11	DIODE (under U13)	BAV21
D12	DIODE (under U13)	BAV21
D13	DIODE (under U7)	BAV21
D14	DIODE (under U7)	BAV21
D15	DIODE (under U7)	BAV21
D16	DIODE (under U7)	BAV21
D17	DIODE (under U12)	BAV21
D18	DIODE (under U12)	BAV21
D19	DIODE (under U1)	BAV21
D20	DIODE (under U1)	BAV21
D21	DIODE (under U1)	BAV21
D22	DIODE (under U1)	BAV21
D23	DIODE (under U15)	BAV21
D24	DIODE (under U15)	BAV21
L1	INDUCTOR	RM6-G
L2	INDUCTOR	RM6-W
L3	INDUCTOR	RM6-R
L4	INDUCTOR	RM6-G
L5	INDUCTOR	RM6-W
L6	INDUCTOR	RM6-R
L7	INDUCTOR	RM6-G2
L8	INDUCTOR	RM6-P
L9	INDUCTOR	1 H
L10	INDUCTOR	1 H
L11	INDUCTOR	1 H
L12	INDUCTOR	1 H
L13	INDUCTOR	1 H
L14	INDUCTOR	1 H
L15	INDUCTOR	1 H
L16	INDUCTOR	1 H
U1	INTEGRATED CIRCUIT	LF353
U2	INTEGRATED CIRCUIT	LF353
U3	INTEGRATED CIRCUIT	PMI2404
U4	INTEGRATED CIRCUIT	TL082
U5	INTEGRATED CIRCUIT	74C14
U6	INTEGRATED CIRCUIT	PMI2404
U7	INTEGRATED CIRCUIT	LF353
U8	INTEGRATED CIRCUIT	LF353
U9	INTEGRATED CIRCUIT	
U10	INTEGRATED CIRCUIT	LF353
U11	INTEGRATED CIRCUIT	PMI2404
U12	INTEGRATED CIRCUIT	AC797
U13	INTEGRATED CIRCUIT	LF353
U14	INTEGRATED CIRCUIT	AD797
U15	INTEGRATED CIRCUIT	AD797
U16	INTEGRATED CIRCUIT	LF353
U17	INTEGRATED CIRCUIT	LF353
U18	INTEGRATED CIRCUIT	LF353
U19	INTEGRATED CIRCUIT	LF353
U20	INTEGRATED CIRCUIT	LF353
J1	JUMPER	
J2	JUMPER	
J3	JUMPER	
J4	JUMPER	

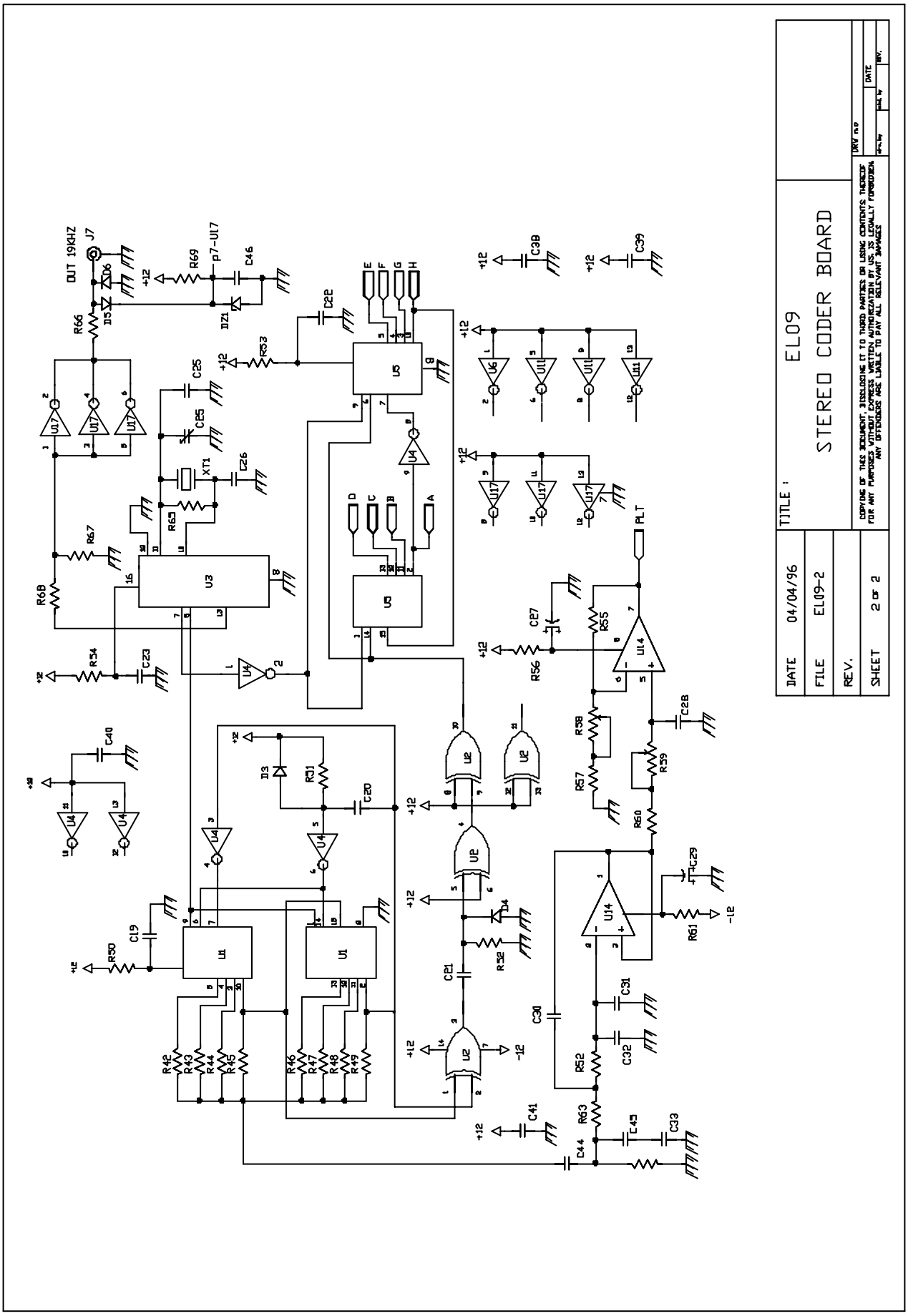

SLIM
LIMITER BOARD
TITLE :
DATE 05/10/94
FILE S-LIN
REV.
SHEET 1 OF 1

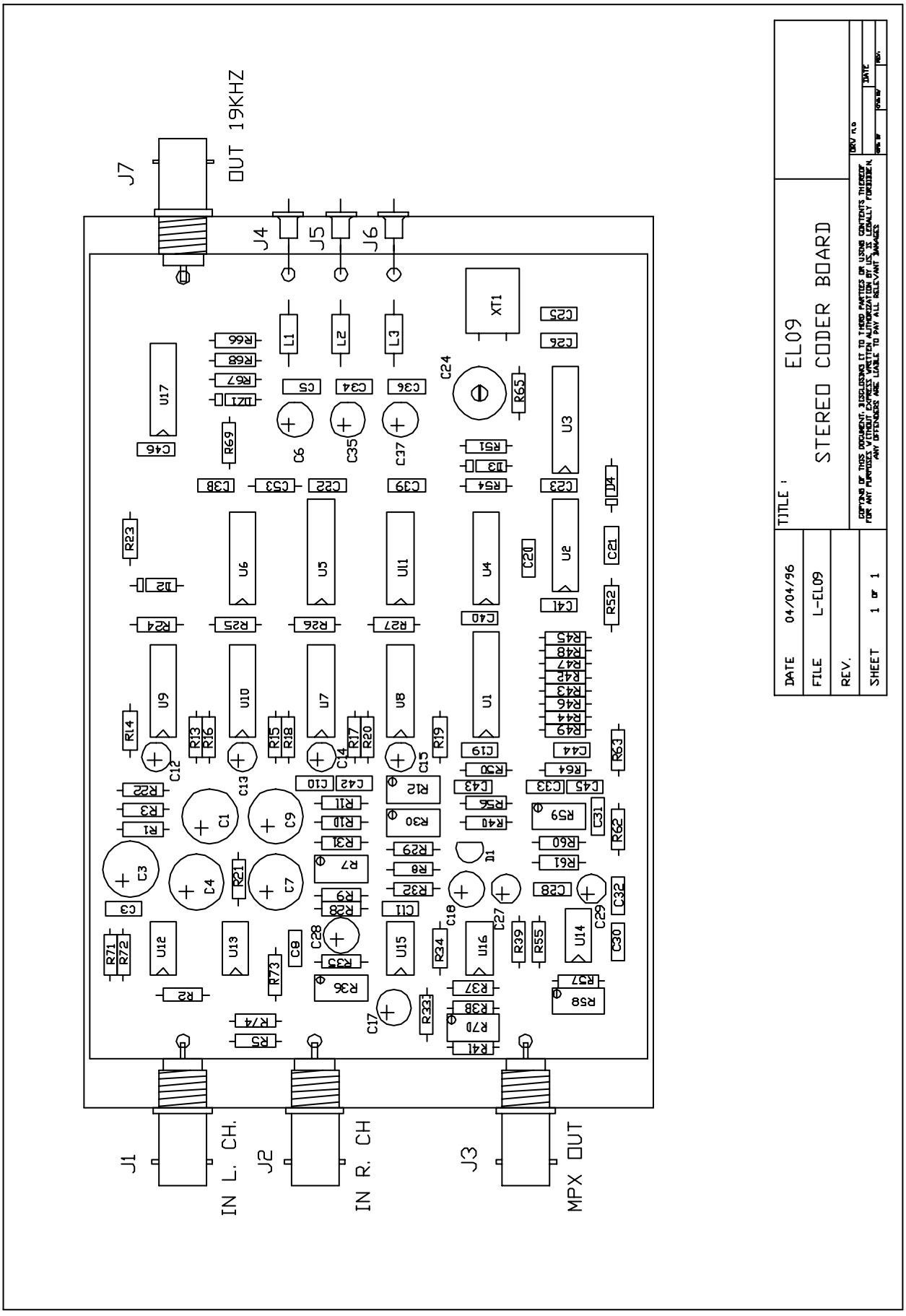

J3
J1
RT1
U1
U2
U3
U4
U5
U6
U7
U8
C18
SLIM
LIMITER BOARD
TITLE :
DATE 04/04/96
FILE L-SLIM
REV.
SHEET 1 OF 1

SLIM BOARD PART LIST

R1	RESISTOR 1% 0.25W	330K
R2	RESISTOR 1% 0.25W	1K
R3	RESISTOR 1% 0.25W	1K
R4	RESISTOR 1% 0.25W	330K
R5	RESISTOR 1% 0.25W	1K
R6	RESISTOR 1% 0.25W	180
R7	RESISTOR 1% 0.25W	3.3K
R8	RESISTOR 1% 0.25W	182
R9	RESISTOR 1% 0.25W	1.8K
R10	RESISTOR 1% 0.25W	10K
R11	RESISTOR 1% 0.25W	10K
R12	RESISTOR 1% 0.25W	4.7K
R13		
R14	RESISTOR 1% 0.25W	10K
R15	RESISTOR 1% 0.25W	10K
R16		
R17	RESISTOR 1% 0.25W	10K
R18	RESISTOR 1% 0.25W	10K
R19	RESISTOR 1% 0.25W	1K
R20	RESISTOR 1% 0.25W	100
R21	RESISTOR 1% 0.25W	1K
R22	RESISTOR 1% 0.25W	182
R23	RESISTOR 1% 0.25W	182
R24	RESISTOR 1% 0.25W	330
R25	RESISTOR 1% 0.25W	330
R26	RESISTOR 1% 0.25W	6.8K
R27	RESISTOR 1% 0.25W	6.8K
R28	RESISTOR 1% 0.25W	270
R29	RESISTOR 1% 0.25W	270
RT1	TRIMMER 10T	10K
C1	CERAMIC CAPACITOR	2.2 F
C2	CERAMIC CAPACITOR	2.2 F
C3	CERAMIC CAPACITOR	2.2 F
C4	CERAMIC CAPACITOR	2.2 F
C5	CERAMIC CAPACITOR	2.2 F
C6	CERAMIC CAPACITOR	2.2 F
C7	CERAMIC CAPACITOR	100nF
C8	CERAMIC CAPACITOR	100nF
C9	ELECTROLYTIC CAPACITOR	10 F
C10	ELECTROLYTIC CAPACITOR	10 F
C11	POLICARB. CAPACITOR	100nF
C12	POLICARB. CAPACITOR	100nF
C13	ELECTROLYTIC CAPACITOR	10 F
C14	ELECTROLYTIC CAPACITOR	10 F
C15	ELECTROLYTIC CAPACITOR	47 F
C16	ELECTROLYTIC CAPACITOR	47 F
C17	ELECTROLYTIC CAPACITOR	220 F
C18	ELECTROLYTIC CAPACITOR	220 F
U1	INTEGRATED CIRCUIT	LM393
U2	INTEGRATED CIRCUIT	LM393
U3	INTEGRATED CIRCUIT	4011
U4	INTEGRATED CIRCUIT	4011
U5	INTEGRATED CIRCUIT	LM358
U6	INTEGRATED CIRCUIT	LF353
U7	INTEGRATED CIRCUIT	4051
U8	INTEGRATED CIRCUIT	4051
D1	DIODE	1N4148
D2	DIODE	1N4148
D3	DIODE	1N4148
D4	DIODE	1N4148
DZ1	ZENER DIODE	LM336/5V
DZ2	ZENER DIODE	7.5V
DZ3	ZENER DIODE	7.5V
J1	STRIP CONNECTOR 6p	
J2	STRIP CONNECTOR 12p	
J3	STRIP CONNECTOR 12p	


TITLE :
EL09
STEREO CODER BOARD
DATE 04/04/96
FILE EL09-1
REV.
SHEET 1 OF 2
NPX OUT
ALIMENTAZIONE U7-U8-U9-U10
+24V
+12V
-12V
IN L CH
IN R CH

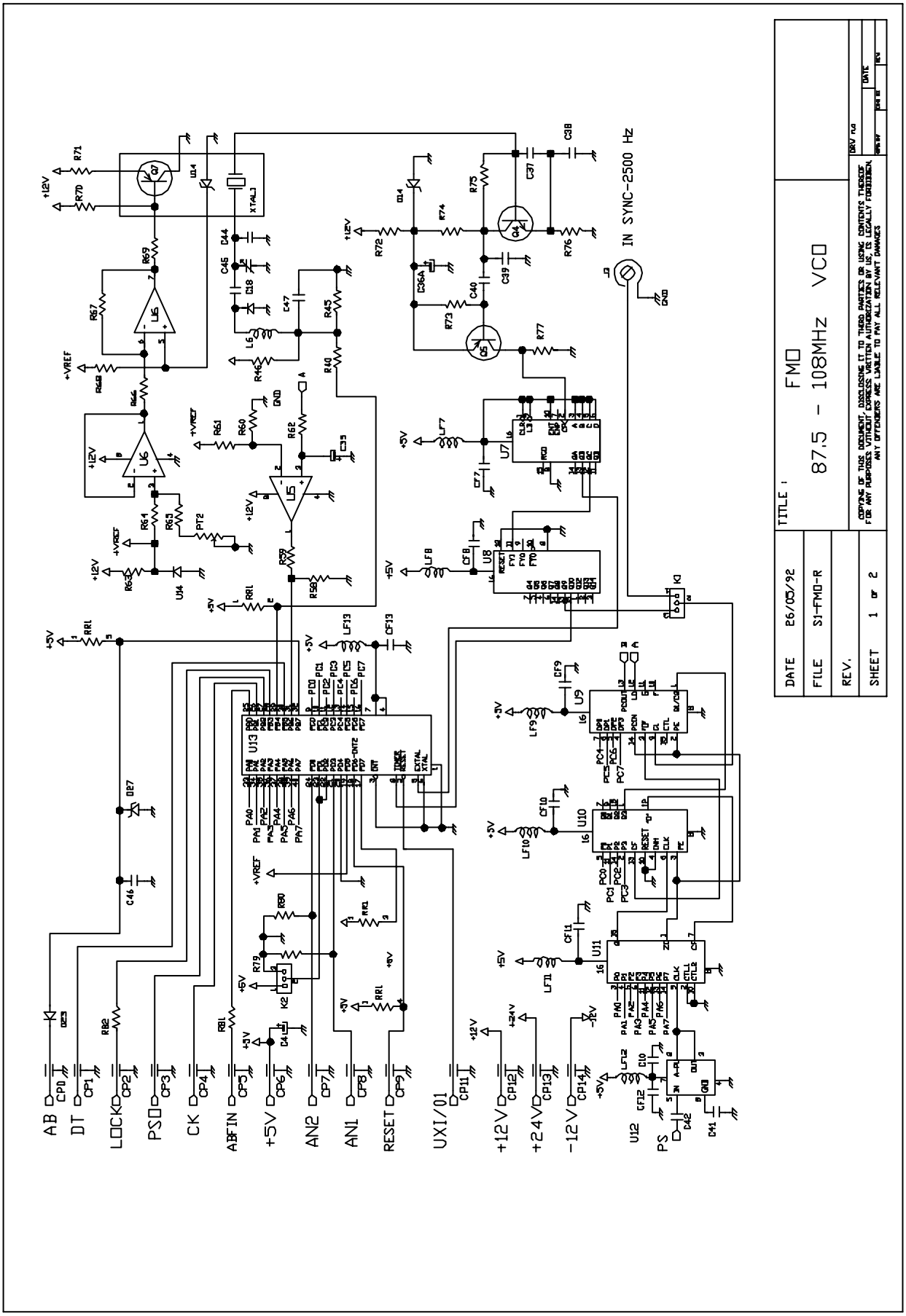

EL09
STEREO CODER BOARD
TITLE :
DATE 04/04/96
FILE EL09-2
REV.
SHEET 2 OF 2
DRV n.o
DATE
OUT 19KHZ
J7
D6
D21
R66
R69
p7-U17
C46
C22
R53
C25
C24
XT1
C26
R65
R67
R68
U3
R54
C23
U5
U4
U2
U1
U14
R55
R56
C27
R58
R57
R59
R60
R61
C28
C29
C30
C31
C32
R52
R63
C41
C44
C45
C33
C19
R50
C20
R51
D3
C21
R32
D4
R42
R43
R44
R45
R46
R47
R48
R49
C40
C39
C38
U6
U11
U17
E
F
G
H
A
B
C
D
+12
-12

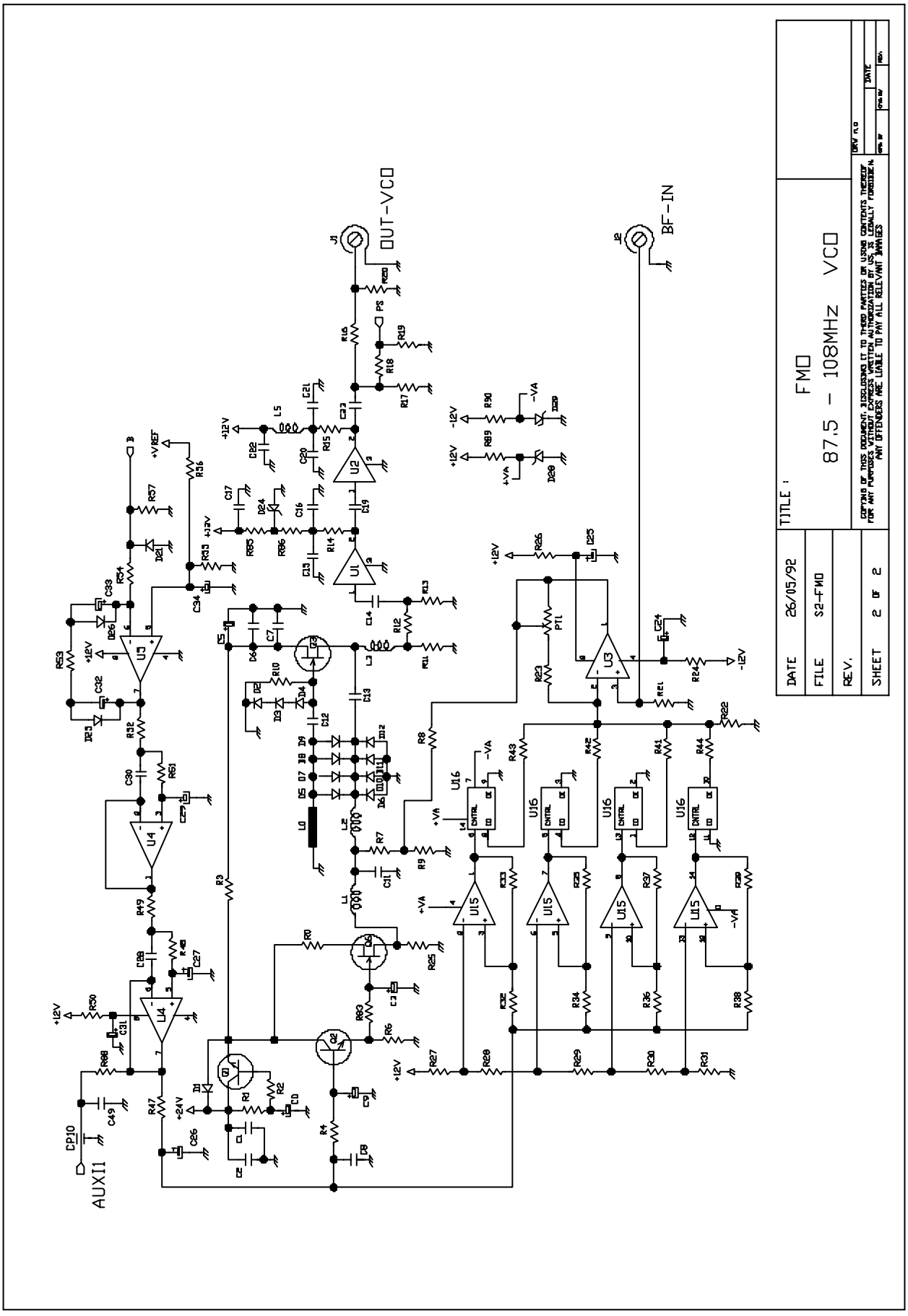

J7
OUT 19KHZ
J4
J5
J6
J1
IN L. CH.
J2
IN R. CH
J3
MPX OUT
XT1
TITLE :
EL09
STEREO CODER BOARD
DATE 04/04/96
FILE L-EL09
REV.
SHEET 1 OF 1

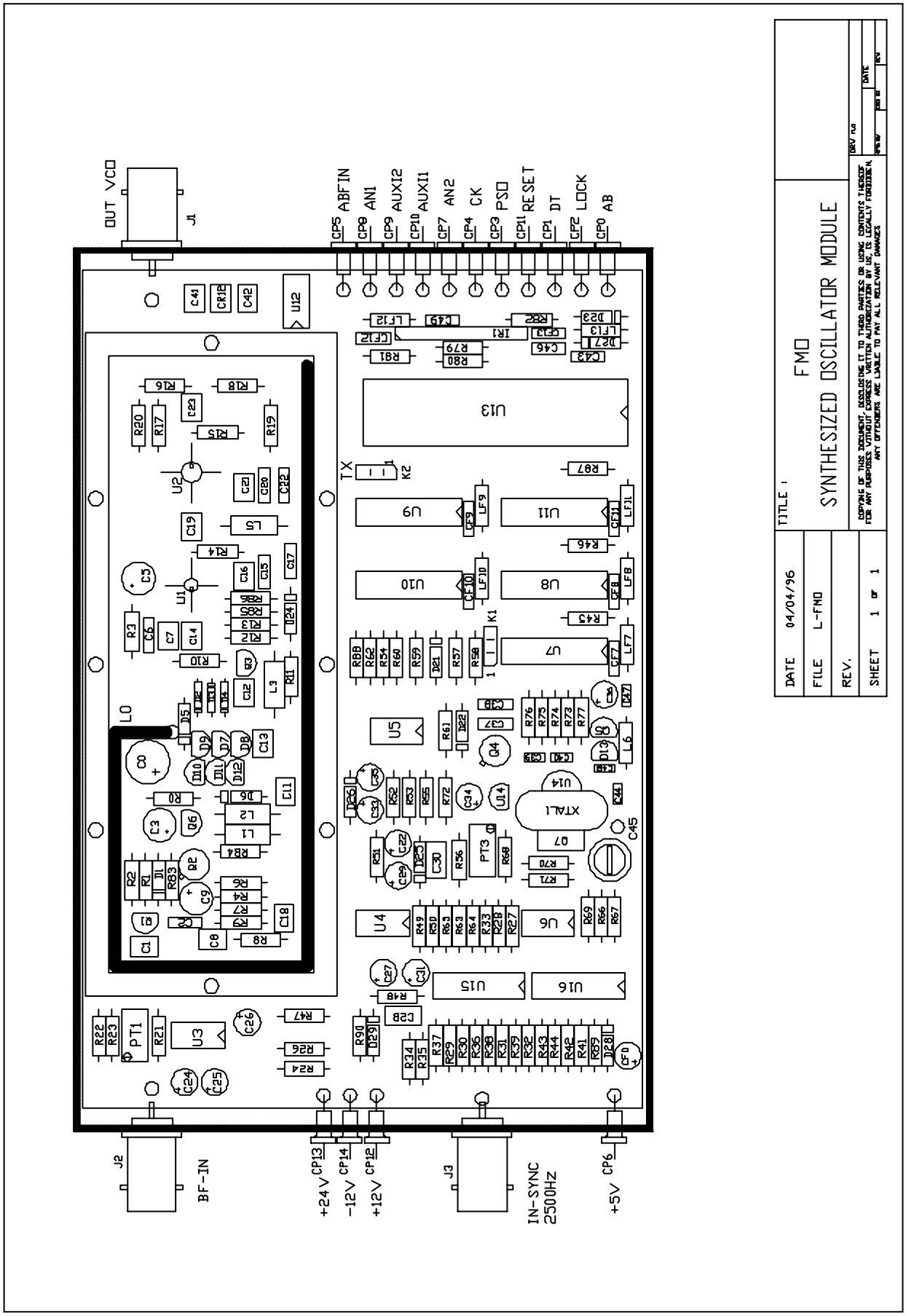
ELO9 BOARD PART LIST

R1	RESISTOR 1% 0.25W	180
R2	RESISTOR 1% 0.25W	4.7K
R3	RESISTOR 1% 0.25W	180
R4	RESISTOR 1% 0.25W	180
R5	RESISTOR 1% 0.25W	4.7K
R6	RESISTOR 1% 0.25W	180
R7	RESISTOR 1% 0.25W	2.2K
R8	TRIMMER 10T	1K
R9	RESISTOR 1% 0.25W	2.7K
R10	RESISTOR 1% 0.25W	10K
R11	RESISTOR 1% 0.25W	180
R12	TRIMMER 10T	50K
R13	RESISTOR 1% 0.25W	33.1K
R14A	RESISTOR 1% 0.25W	11.8K
R14B	RESISTOR 1% 0.25W	1M
R15A	RESISTOR 1% 0.25W	8.2K
R15B	RESISTOR 1% 0.25W	150K
R16A	RESISTOR 1% 0.25W	6.8K
R16B	RESISTOR 1% 0.25W	180K
R17	RESISTOR 1% 0.25W	33.1K
R18A	RESISTOR 1% 0.25W	11.8K
R18B	RESISTOR 1% 0.25W	1M
R19A	RESISTOR 1% 0.25W	6.8K
R19B	RESISTOR 1% 0.25W	180K
R20A	RESISTOR 1% 0.25W	8.2K
R20B	RESISTOR 1% 0.25W	150K
R21	RESISTOR 1% 0.25W	1M
R22	RESISTOR 1% 0.25W	1M
R23	RESISTOR 1% 0.25W	470
R24	RESISTOR 1% 0.25W	180
R25	RESISTOR 1% 0.25W	180
R26	RESISTOR 1% 0.25W	180
R27	RESISTOR 1% 0.25W	180
R28	RESISTOR 1% 0.25W	47K
R29	RESISTOR 1% 0.25W	82K
R30	TRIMMER 10T	10K
R31	RESISTOR 1% 0.25W	180
R32	RESISTOR 1% 0.25W	1K2
R33	RESISTOR 1% 0.25W	15K
R34	RESISTOR 1% 0.25W	6.8K
R35	RESISTOR 1% 0.25W	15K
R36	TRIMMER 10T	10K
R37	RESISTOR 1% 0.25W	10K
R38	RESISTOR 1% 0.25W	1K
R39	RESISTOR 1% 0.25W	150K
R40	RESISTOR 1% 0.25W	560
R41	RESISTOR 1% 0.25W	47
R42	RESISTOR 1% 0.25W	331K
R43	RESISTOR 1% 0.25W	115K
R44	RESISTOR 1% 0.25W	75K
R45	RESISTOR 1% 0.25W	66K
R46	RESISTOR 1% 0.25W	66K
R47	RESISTOR 1% 0.25W	75K
R58	RESISTOR 1% 0.25W	115K
R49	RESISTOR 1% 0.25W	331K
R50	RESISTOR 1% 0.25W	100
R51	RESISTOR 1% 0.25W	10K
R52	RESISTOR 1% 0.25W	33K
R53	RESISTOR 1% 0.25W	100
R54	RESISTOR 1% 0.25W	100
R55	RESISTOR 1% 0.25W	10K
R56	RESISTOR 1% 0.25W	180
R57	RESISTOR 1% 0.25W	2.2K
R58	TRIMMER 10T	20K
R59	TRIMMER 10T	2.2K
R60	RESISTOR 1% 0.25W	560
R61	RESISTOR 1% 0.25W	180
R62	RESISTOR 1% 0.25W	3.9K
R63	RESISTOR 1% 0.25W	3.9K
R64	RESISTOR 1% 0.25W	5.6K
R65	RESISTOR 1% 0.25W	2.2M
R66	RESISTOR 1% 0.25W	47
R67	RESISTOR 1% 0.25W	10K
R68	RESISTOR 1% 0.25W	10K
R79	RESISTOR 1% 0.25W	330
R70	TRIMMER 10T	10K
R71	RESISTOR 1% 0.25W	3.3K
R72	RESISTOR 1% 0.25W	12K
R73	RESISTOR 1% 0.25W	3.3K
R74	RESISTOR 1% 0.25W	12K
R75	RESISTOR 1% 0.25W	1.3K
C1	ELECTROLYTIC CAPACITOR	220 F
C2	ELECTROLYTIC CAPACITOR	220 F
C3	CERAMIC CAPACITOR	120pF
C4	ELECTROLYTIC CAPACITOR	220 F
C5	CERAMIC CAPACITOR	100nF
C6	ELECTROLYTIC CAPACITOR	10 F
C7	ELECTROLYTIC CAPACITOR	220 F
C8	CERAMIC CAPACITOR	120pF
C9	ELECTROLYTIC CAPACITOR	220 F
C10	ELECTROLYTIC CAPACITOR	220 F
C11	CERAMIC CAPACITOR	100nF
C12	ELECTROLYTIC CAPACITOR	47 F
C13	ELECTROLYTIC CAPACITOR	47 F
C14	ELECTROLYTIC CAPACITOR	47 F
C15	ELECTROLYTIC CAPACITOR	47 F
C16	ELECTROLYTIC CAPACITOR	47 F
C17	ELECTROLYTIC CAPACITOR	47 F
C18	ELECTROLYTIC CAPACITOR	47 F
C19	CERAMIC CAPACITOR	100n
C20	CERAMIC CAPACITOR	33pF
C21	CERAMIC CAPACITOR	33pF

C22	CERAMIC CAPACITOR	100nF
C23	CERAMIC CAPACITOR	100nF
C24	VARIABLE CAPACITOR	25pF
C25	CERAMIC CAPACITOR	22pF
C26	CERAMIC CAPACITOR	100pF
C27	ELECTROLYTIC CAPACITOR	10 F
C28	POLICARB. CAPACITOR	1.8nF
C29	ELECTROLYTIC CAPACITOR	10 F
C30	POLICARB. CAPACITOR	1.2nF
C31	CERAMIC CAPACITOR	150pF
C32	CERAMIC CAPACITOR	150pF
C33	POLICARB. CAPACITOR	1nF
C34	CERAMIC CAPACITOR	100nF
C35	ELECTROLYTIC CAPACITOR	10 F
C36	CERAMIC CAPACITOR	100nF
C37	ELECTROLYTIC CAPACITOR	10 F
C38	CERAMIC CAPACITOR	100nF
C39	CERAMIC CAPACITOR	100nF
C40	CERAMIC CAPACITOR	100nF
C41	CERAMIC CAPACITOR	100nF
C42	POLICARB. CAPACITOR	3.3nF
C43	POLICARB. CAPACITOR	2.7nF
C44	CERAMIC CAPACITOR	100nF
C45	POLICARB. CAPACITOR	1nF
C46	CERAMIC CAPACITOR	100n
C47	CERAMIC CAPACITOR	120p
C48	CERAMIC CAPACITOR	150p
C49	CERAMIC CAPACITOR	100p
U1	INTEGRATED CIRCUIT	4015
U2	INTEGRATED CIRCUIT	4070
U3	INTEGRATED CIRCUIT	4060
U4	INTEGRATED CIRCUIT	4070
U5	INTEGRATED CIRCUIT	4015
U6	INTEGRATED CIRCUIT	4069
U7	INTEGRATED CIRCUIT	4016
U8	INTEGRATED CIRCUIT	4016
U9	INTEGRATED CIRCUIT	4016
U10	INTEGRATED CIRCUIT	4016
U11	INTEGRATED CIRCUIT	4069
U12	INTEGRATED CIRCUIT	NE5532
U13	INTEGRATED CIRCUIT	NE5532
U14	INTEGRATED CIRCUIT	LF353
U15	INTEGRATED CIRCUIT	LF353
U16	INTEGRATED CIRCUIT	LF353
U17	INTEGRATED CIRCUIT	74C14
D1	VARICAP	MV115
D2	ZENER DIODE	15V
D3	DIODE	1N4148
D4	DIODE	1N4148
D5	DIODE (under U17)	BAV21
D6	DIODE (under U17)	BAV21
DZ1	ZENER DIODE	5.1V
L1	INDUCTOR	2.2 H
L2	INDUCTOR	2.2 H
L3	INDUCTOR	2.2 H
XT1	CRYSTAL QUARTZ KWG	9,728KHz
J1	BNC CONNECTOR	
J2	BNC CONNECTOR	
J3	BNC CONNECTOR	
J4	FT CAPACITOR	1000pF
J5	FT CAPACITOR	1000pF
J6	FT CAPACITOR	1000pF
J7	BNC CONNECTOR	


FMD
87.5 - 108MHz VCO
IN SYNC-2500 Hz
DATE 26/05/92
FILE S1-FMD-R
REV.
SHEET 1 OF 2
AB
DT
LOCK
PS
CK
ABFIN
+5V
AN2
AN1
RESET
UXI/01
+12V
+24V
-12V
PS


FM
87.5 - 108MHz VCO
DATE 26/05/92
FILE S2-FMD
REV.
SHEET 2 OF 2
OUT-VCO
BF-IN
AUX11


FMD
SYNTHESIZED OSCILLATOR MODULE
DATE 04/04/96
FILE L-FMD
REV.
SHEET 1 OF 1
OUT VCO
J1
ABFIN
AN1
AUX12
AUX11
AN2
CK
PSD
RESET
DT
LOCK
AB
TX
LO
XTAL1
J2
BF-IN
+24V
-12V
+12V
J3
IN-SYNC
2500Hz
+5V

FMO MODULE PART LIST

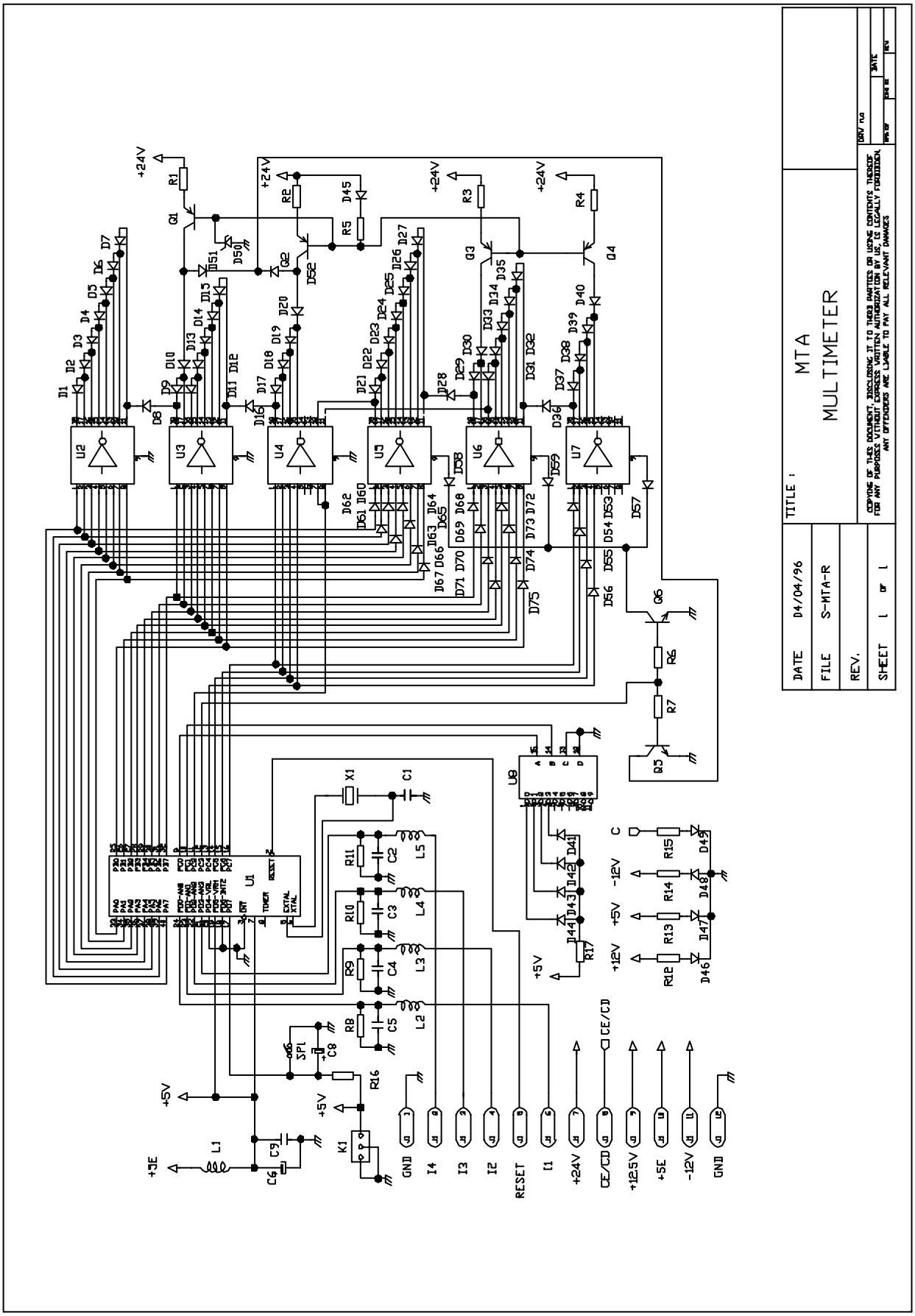
R0	RESISTOR 1% 0.25W	330
R1	RESISTOR 1% 0.25W	5.6K
R2	RESISTOR 1% 0.25W	180
R3	RESISTOR 1% 0.25W	1K
R4	RESISTOR 1% 0.25W	330
R5	RESISTOR 1% 0.25W	390
R6	RESISTOR 1% 0.25W	2.7K
R7	RESISTOR 1% 0.25W	10K
R8	RESISTOR 1% 0.25W	1.5K
R9	RESISTOR 1% 0.25W	470
R10	RESISTOR 1% 0.25W	100K
R11	RESISTOR 1% 0.25W	270
R12	RESISTOR 1% 0.25W	120
R13	RESISTOR 1% 0.25W	270
R14	RESISTOR 1% 0.25W	100
R15	RESISTOR 1% 0.25W	100
	INDUCTOR (for RX/FM	
	and option /N	6.8 H
R16	RESISTOR 1% 0.25W	15
	RESISTOR 1% 0.25W	
	(for RX/FM/option N)	0
R17	RESISTOR 1% 0.25W	1.2K
	Not inserted for RX/FM/option N	
R18	RESISTOR 1% 0.25W	470
R19	RESISTOR 1% 0.25W	180
R20	RESISTOR 1% 0.25W	330
	Not inserted for RX/FM/option N	
R21	RESISTOR 1% 0.25W	10K
R22	RESISTOR 1% 0.25W	4.7K
R23	RESISTOR 1% 0.25W	8.2K
R24	RESISTOR 1% 0.25W	470
R25	RESISTOR 1% 0.25W	330
R25	RESISTOR 1% 0.25W	470
R27	RESISTOR 1% 0.25W	6.8K
R28	RESISTOR 1% 0.25W	2.7K
R29	RESISTOR 1% 0.25W	820
R30	RESISTOR 1% 0.25W	470
R31	RESISTOR 1% 0.25W	2.7K
R32	RESISTOR 1% 0.25W	10K
R33	RESISTOR 1% 0.25W	1.8M
R34	RESISTOR 1% 0.25W	10K
R35	RESISTOR 1% 0.25W	1.8M
R36	RESISTOR 1% 0.25W	10K
R37	RESISTOR 1% 0.25W	1.8M
R38	RESISTOR 1% 0.25W	10K
R39	RESISTOR 1% 0.25W	1.8M
R40		===
R41	RESISTOR 1% 0.25W	47K
R42	RESISTOR 1% 0.25W	39K
R43	RESISTOR 1% 0.25W	33K
R44	RESISTOR 1% 0.25W	82K

R45		===
R46		===
R47	RESISTOR 1% 0.25W	330
R48	RESISTOR 1% 0.25W	18K
R49	RESISTOR 1% 0.25W	18K
R50	RESISTOR 1% 0.25W	820
R51	RESISTOR 1% 0.25W	18K
R52	RESISTOR 1% 0.25W	18K
R53	RESISTOR 1% 0.25W	68K
R54	RESISTOR 1% 0.25W	220K
R55	RESISTOR 1% 0.25W	220K
R56	RESISTOR 1% 0.25W	18K
R57	RESISTOR 1% 0.25W	330K
R58	RESISTOR 1% 0.25W	10K
R59	RESISTOR 1% 0.25W	18K
R60	RESISTOR 1% 0.25W	10K
R61	RESISTOR 1% 0.25W	10K
R62	RESISTOR 1% 0.25W	330K
R63	RESISTOR 1% 0.25W	1K
R64	RESISTOR 1% 0.25W	10K
R65	RESISTOR 1% 0.25W	8.2K
R66	RESISTOR 1% 0.25W	4.7K
R67	RESISTOR 5% 0.25W	1M
R68	RESISTOR 1% 0.25W	3.3K
R69	RESISTOR 1% 0.25W	10K
R70	RESISTOR 1% 0.25W	4.7K
R71	RESISTOR 1% 0.25W	15
R72	RESISTOR 1% 0.25W	180
R73	RESISTOR 1% 0.25W	10K
R74	RESISTOR 1% 0.25W	330
R75	RESISTOR 1% 0.25W	56K
R76	RESISTOR 1% 0.25W	150
R77	RESISTOR 1% 0.25W	150
R78	RESISTOR 1% 0.25W	====
R78	RESISTOR 1% 0.25W	10K
R80	RESISTOR 1% 0.25W	10K
R81	RESISTOR 1% 0.25W	1K
R82	RESISTOR 1% 0.25W	1K
R83	RESISTOR 1% 0.25W	470
IR1	INTEGRATED RESISTOR	10K
PT1	TRIMMER 20T	20K
PT2	TRIMMER 20T	10K
C0	ELECTROLYTIC CAPACITOR	220 F
C1	CERAMIC CHIP CAPACITOR	1nF
C2	CERAMIC CAPACITOR	100nF
C3	ELECTOLYTIC CAPACITOR	10 F
C4	ELECTOLYTIC CAPACITOR	47 F
C5	ELECTROLYTIC CAPACITOR	47 F
C6	CERAMIC CAPACITOR	100nF
C7	CERAMIC CHIP CAPACITOR	1nF
C8	CERAMIC CHIP CAPACITOR	1nF

C9	ELECTROLYTIC CAPACITOR	22 F
C10	=========	====
C11	CERAMIC CHIP CAPACITOR	1nF
C12	CERAMIC CAPACITOR	33pF
C13	CERAMIC CAPACITOR	68pF
C14	CERAMIC CHIP CAPACITOR	1nF
C15	CERAMIC CAPACITOR	100nF
C16	CERAMIC CHIP CAPACITOR	1nF
C17	CERAMIC CHIP CAPACITOR	1nF
C18	==========	===
C19	CERAMIC CHIP CAPACITOR	1nF
C20	CERAMIC CAPACITOR	100nF
C21	CERAMIC CHIP CAPACITOR	1nF
C22	CERAMIC CAPACITOR	100nF
C23	CERAMIC CHIP CAPACITOR	1nF
C24	ELECTROLYTIC CAPACITOR	22 F
C25	ELECTROLYTIC CAPACITOR	22 F
C26	ELECTROLYTIC CAPACITOR	47 F
C27	ELECTROLYTIC CAPACITOR	0.47 F
C28	CERAMIC CAPACITOR	1 F
C29	ELECTROLYTIC CAPACITOR	0.47 F
C30	CERAMIC CAPACITOR	1 F
C31	ELECTROLYTIC CAPACITOR	47 F
C32	ELECTROLYTIC CAPACITOR	47 F
C33	ELECTROLYTIC CAPACITOR	47 F
C34	ELECTROLYTIC CAPACITOR	22 F
C35	ELECTROLYTIC CAPACITOR	22 F
C36	ELECTROLYTIC CAPACITOR	22 F
C37	CERAMIC CAPACITOR	150pF
C38	CERAMIC CAPACITOR	150pF
C39	CERAMIC CAPACITOR	27pF
C40	CERAMIC CAPACITOR	47pF
C41	CERAMIC CHIP CAPACITOR	1nF
C42	CERAMIC CHIP CAPACITOR	1nF
C42	==========	===
C44	CERAMIC CAPACITOR	33pF
C45	VARIABILE CAPACITOR	14pF
C46	CERAMIC CAPACITOR	1 F
C47	=========	===
CF7	CERAMIC CAPACITOR	100nF
CF8	CERAMIC CAPACITOR	100nF
CF9	CERAMIC CAPACITOR	100nF
CF10	CERAMIC CAPACITOR	100nF
CF11	CERAMIC CAPACITOR	100nF
CF12	CERAMIC CAPACITOR	100nF
CF13	CERAMIC CAPACITOR	100nF
L1	INDUCTOR	40T Coil
L2	INDUCTOR	40T Coil
L3	INDUCTOR	40T Coil
L4	INDUCTOR	6.8 H
L5	INDUCTOR	6.8 H
	RESISTOR 1% 0.25W	
	(for RX/FM/option N)	100
LF7	INDUCTOR	8.2 H
LF8	INDUCTOR	8.2 H
LF9	INDUCTOR	8.2 H
LF10	INDUCTOR	8.2 H
LF11	INDUCTOR	8.2 H
LF12	INDUCTOR	8.2 H
LF13	INDUCTOR	8.2 H
D1	DIODE	1N4001
D2	DIODE	1SS
D3	DIODE	1SS
D4	DIODE	1SS
D5	DIODE	BB505
D6	DIODE	BB505
D7	DIODE	MV209
D8	DIODE	MV209
D9	DIODE	MV209
D10	DIODE	MV209
D11	DIODE	MV209
D12	DIODE	MV209
D13	DIODE	1N4148
D14	ZENER DIODE	10V
D15	DIODE	1N4148
D16	ZENER DIODE	9.1V
D17	DIODE	1N4148
D18	DIODE	1N4148
D19	ZENER DIODE	5V
D20	ZENER DIODE	6.8V
D21	ZENER DIODE	6.8v
D22	REFERENCE I.C.	LM336/5V
Q1	TRANSISTOR	BC183
Q2	TRANSISTOR	BCY59
Q3	FET	BF247
Q4	TRANSISTOR	2N2369
Q5	TRANSISTOR	BC557
Q6	FET	BF247
Q7	DARLINGTON	TIP127
U1	MODULE	MAR6
U2	MODULE	MAV11
U3	INTEGRATED CIRCUIT	TL082
U4	INTEGRATED CIRCUIT	TL082
U5	INTEGRATED CIRCUIT	TL082
U6	INTEGRATED CIRCUIT	LM358
U7	INTEGRATED CIRCUIT	74HC160
U8	INTEGRATED CIRCUIT	4060
U9	INTEGRATED CIRCUIT	4568
U10	INTEGRATED CIRCUIT	4526
U121	INTEGRATED CIRCUIT	4569
U12	INTEGRATED CIRCUIT	MC12023
U13	SINGLE-CHIP P	MC68705R5S
U14	INTEGRATED CIRCUIT	LM335
U15	INTEGRATED CIRCUIT	LM324
U16	INTEGRATED CIRCUIT	CD4066
CP1	FT CAPACITOR	1000pF
CP2	FT CAPACITOR	1000pF
CP3	FT CAPACITOR	1000pF
CP4	FT CAPACITOR	1000pF
CP5	FT CAPACITOR	1000pF
CP6	FT CAPACITOR	1000pF
CP7	FT CAPACITOR	1000pF

CP8	FT CAPACITOR	1000pF
CP9	FT CAPACITOR	1000pF
CP10	FT CAPACITOR	1000pF
CP11	FT CAPACITOR	1000pF
CP12	FT CAPACITOR	1000pF
CP13	FT CAPACITOR	1000pF
CP14	FT CAPACITOR	1000pF

J1	BNC CONNECTOR	
J2	BNC CONNECTOR	
J3	BNC CONNECTOR	
XTAL1	XTAL	12.800MHz
K1	JUMPER	
K2	JUMPER	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MTA
MULTIMETER
DATE 04/04/96
FILE S-MTA-R
REV.
SHEET 1 OF 1
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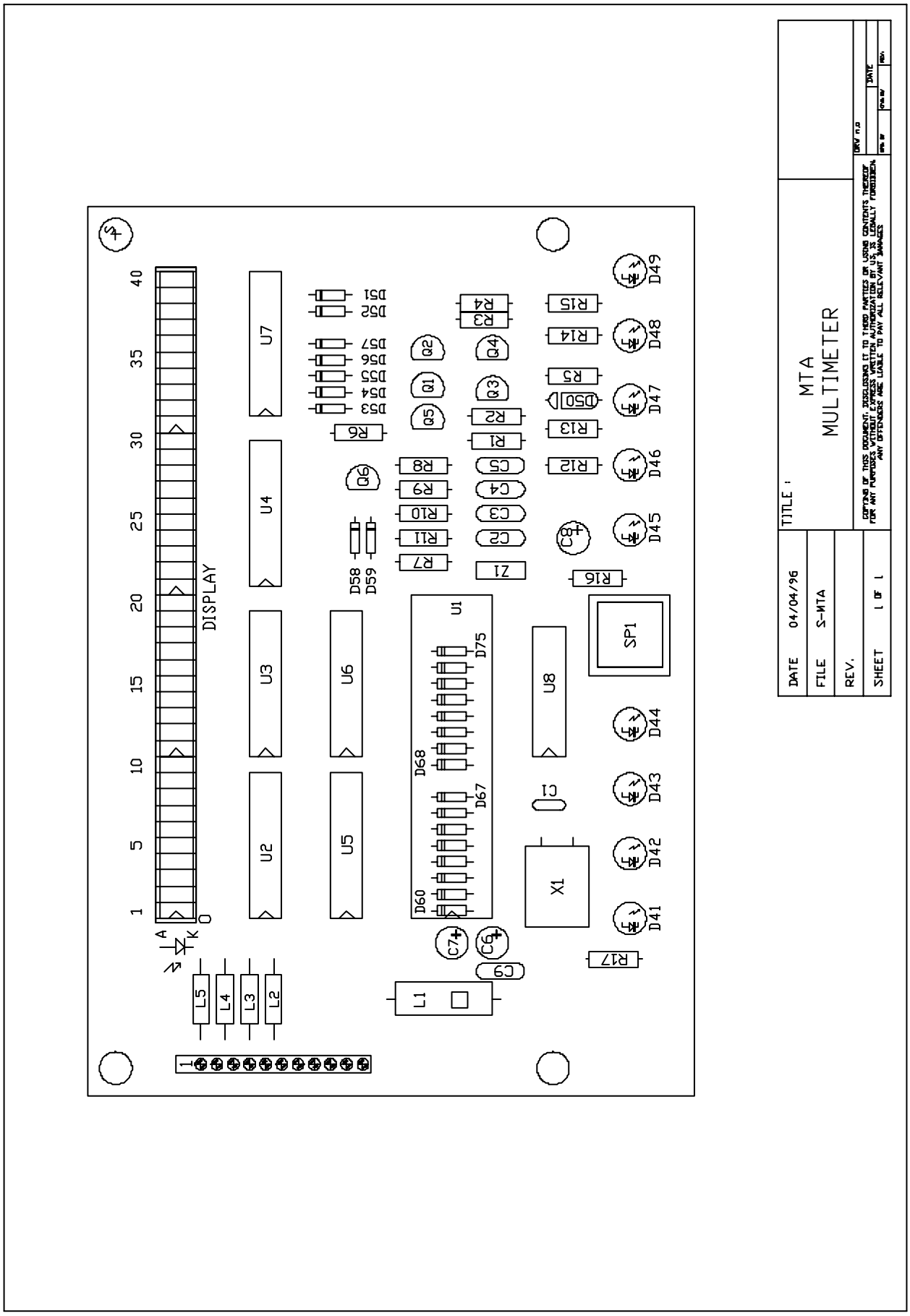
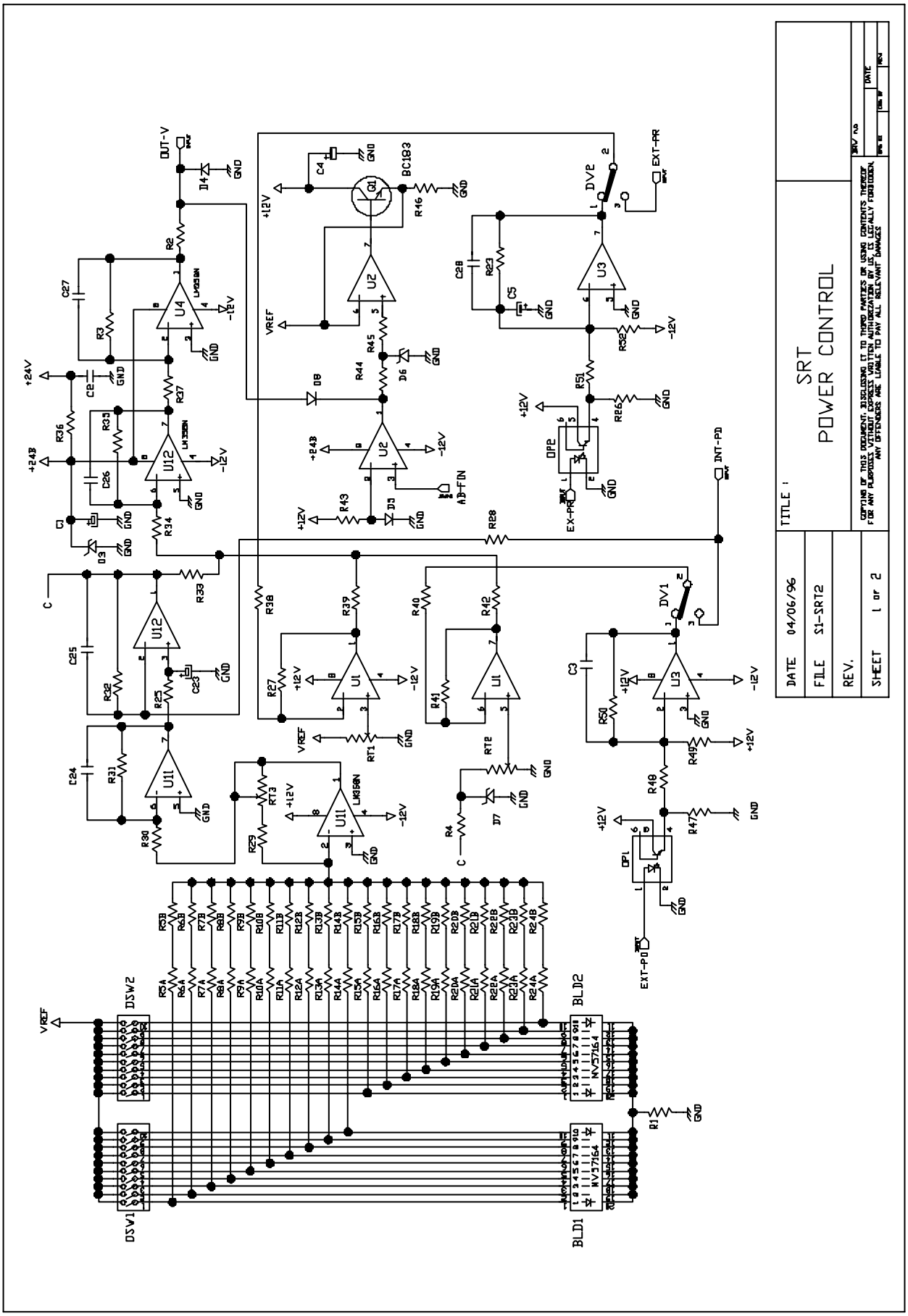
+24V
+5V
+3E
GND
I4
I3
I2
RESET
I1
CE/CD
+12.5V
-12V
U1
U2
U3
U4
U5
U6
U7
U8
Q1
Q2
Q3
Q4
Q5
Q6
X1
K1
SPI

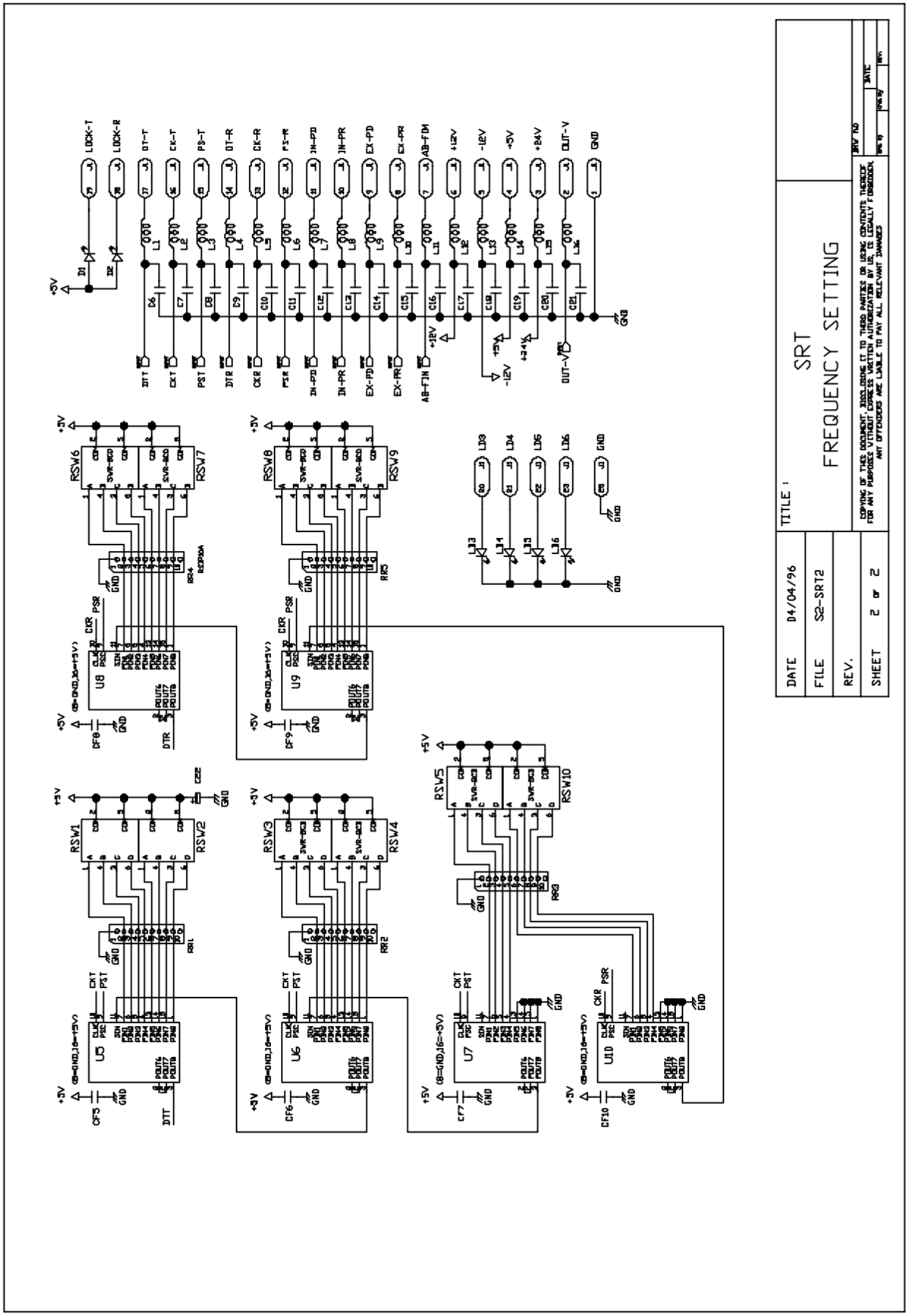

MTA
MULTIMETER
TITLE :
DATE 04/04/96
FILE S-MTA
REV.
SHEET 1 OF 1
DISPLAY
U1
U2
U3
U4
U5
U6
U7
U8
SP1
X1
L1
L2
L3
L4
L5
C1
C2
C3
C4
C5
C6
C7
C8
C9
Z1
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
Q1
Q2
Q3
Q4
Q5
Q6
D41
D42
D43
D44
D45
D46
D47
D48
D49
D50
D51
D52
D53
D54
D55
D56
D57
D58
D59
D60
D67
D68
D75

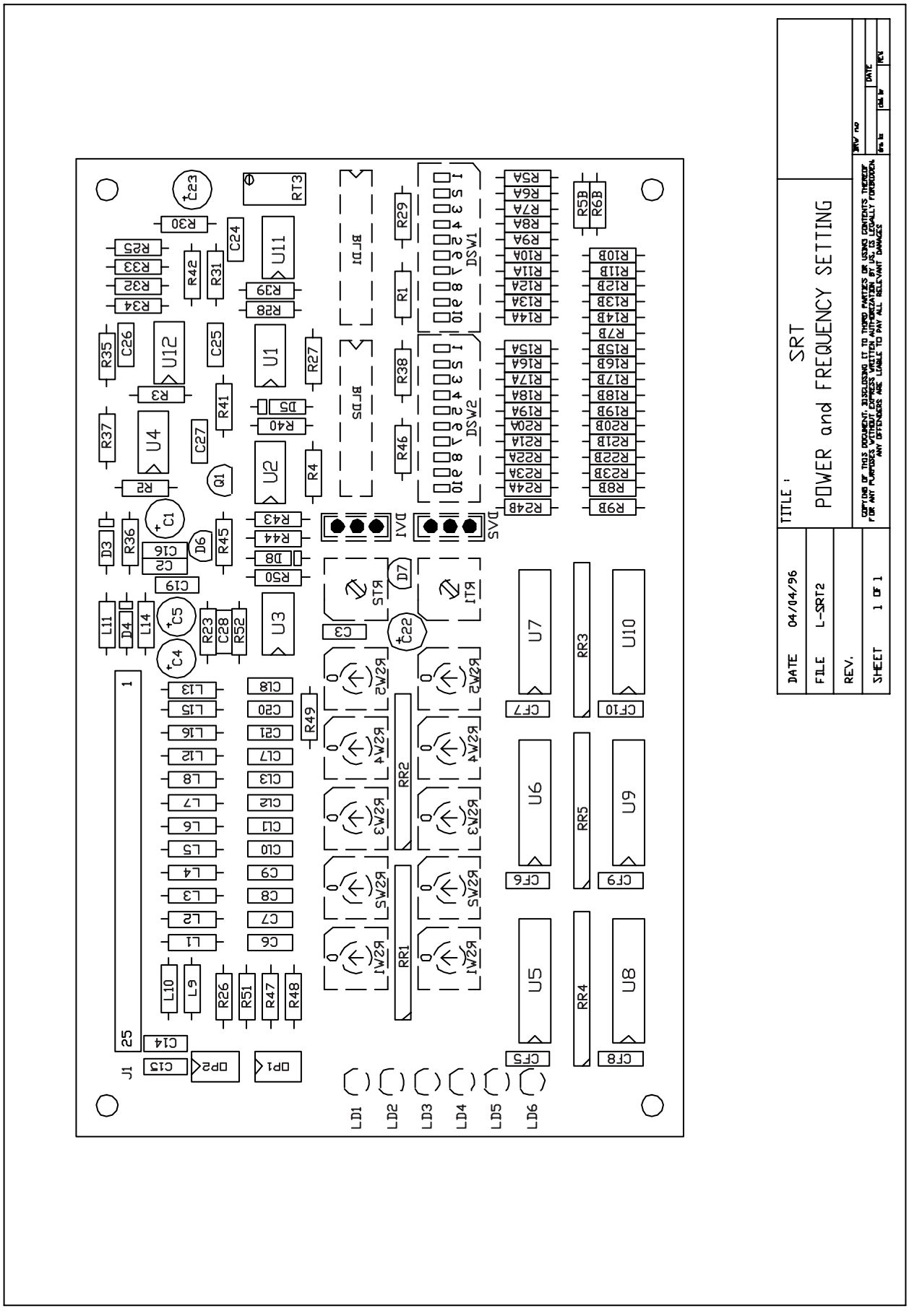
MTA BOARD PART LIST

R1	RESISTOR 1% 0.25W	560
R2	RESISTOR 1% 0.25W	560
R3	RESISTOR 1% 0.25W	560
R4	RESISTOR 1% 0.25W	560
R5	RESISTOR 1% 0.25W	390
R6	RESISTOR 1% 0.25W	8.2K
R7	RESISTOR 1% 0.25W	8.2
R8	RESISTOR 1% 0.25W	10K
R9	RESISTOR 1% 0.25W	10K
R10	RESISTOR 1% 0.25W	10K
R11	RESISTOR 1% 0.25W	10K
R12	RESISTOR 1% 0.25W	1.5K
R13	RESISTOR 1% 0.25W	330
R14	RESISTOR 1% 0.25W	1.5
R15	RESISTOR 1% 0.25W	330
R16	RESISTOR 1% 0.25W	33K
R17	RESISTOR 1% 0.25W	330
C1	CERAMIC CAPACITOR	33pF
C2	ELECTROLYTIC CAP.	10 F-35V
C3	ELECTROLYTIC CAP.	10 F-35V
C4	ELECTROLYTIC CAP.	10 F-35V
C5	ELECTROLYTIC CAP.	10 F-35V
C6	ELECTROLYTIC CAP.	4.7 F-35V
C7	ELECTROLYTIC CAP.	4.7 F-35V
C8	ELECTROLYTIC CAP.	4.7 F-35V
C9	CERAMIC CAPACITOR	0,1 F
D1 D10	BAR-LED	MV57164
D11 D20	BAR-LED	MV57164
D21 D30	BAR-LED	MV57164
D31 D40	BAR-LED	MV57164
D41	LED DIODE	
D42	LED DIODE	
D43	LED DIODE	
D44	LED DIODE	
D45	LED DIODE	
D46	LED DIODE	
D47	LED DIODE	
D48	LED DIODE	
D49	LED DIODE	
D50	ZENER DIODE 1W	20V
D51	DIODE	1N4148
D52	DIODE	1N4148
D53	DIODE	1N4148
D54	DIODE	1N4148

D55	DIODE	1N4148
D56	DIODE	1N4148
D57	DIODE	1N4148
D58	DIODE	1N4148
D59	DIODE	1N4148
D60	DIODE	1N4148
D61	DIODE	1N4148
D62	DIODE	1N4148
D63	DIODE	1N4148
D64	DIODE	1N4148
D65	DIODE	1N4148
D66	DIODE	1N4148
D67	DIODE	1N4148
D68	DIODE	1N4148
D69	DIODE	1N4148
D70	DIODE	1N4148
D71	DIODE	1N4148
D72	DIODE	1N4148
D73	DIODE	1N4148
D74	DIODE	1N4148
D75	DIODE	1N4148
Q1	TRANSISTOR	BC557
Q2	TRANSISTOR	BC557
Q3	TRANSISTOR	BC557
Q4	TRANSISTOR	BC557
Q5	TRANSISTOR	BC183
Q6	TRANSISTOR	BC183
U1	SINGLE-CHIP P 68705	
U2	INTEGRATED CIRCUIT	ULN2803
U3	INTEGRATED CIRCUIT	ULN2803
U4	INTEGRATED CIRCUIT	ULN2803
U5	INTEGRATED CIRCUIT	ULN2803
U6	INTEGRATED CIRCUIT	ULN2803
U7	INTEGRATED CIRCUIT	ULN2803
U	INTEGRATED CIRCUIT	74C42
L1	INDUCTOR 8	.2 H
L2	INDUCTOR 8	.2 H
L3	INDUCTOR 8	.2 H
L4	INDUCTOR 8	.2 H
L5	INDUCTOR 8	.2 H
X1	CRYSTAL QUARTZ	4194KHz
Z1	JUMPER	
J1	12 PIN SHF CONNECTOR	
SP1	PUSH BUTTON	


SRT
POWER CONTROL
TITLE :
DATE 04/06/96
FILE S1-SRT2
REV.
SHEET 1 or 2
OUT-V
EXT-PR
INT-PD
EXT-PD
VREF
DSW2
DSW1
BLD2
BLD1
BC183
LM358N
NV5764


SRT
FREQUENCY SETTING
TITLE :
DATE 04/04/96
FILE S2-SRT2
REV.
SHEET 2 OF 2
LOCK-T
LOCK-R
DT-T
CK-T
PS-T
DT-R
CK-R
PS-R
IN-PD
IN-PR
EX-PD
EX-PR
AB-FM
+12V
-12V
+5V
+24V
OUT-V
GND
RSW1
RSW2
RSW3
RSW4
RSW5
RSW6
RSW7
RSW8
RSW9
RSW10
U5
U6
U7
U8
U9
U10
RR1
RR2
RR3
RR4
RR5


TITLE :
SRT
POWER and FREQUENCY SETTING
DATE 04/04/96
FILE L-SRT2
REV.
SHEET 1 OF 1
DRW no
DATE
REV
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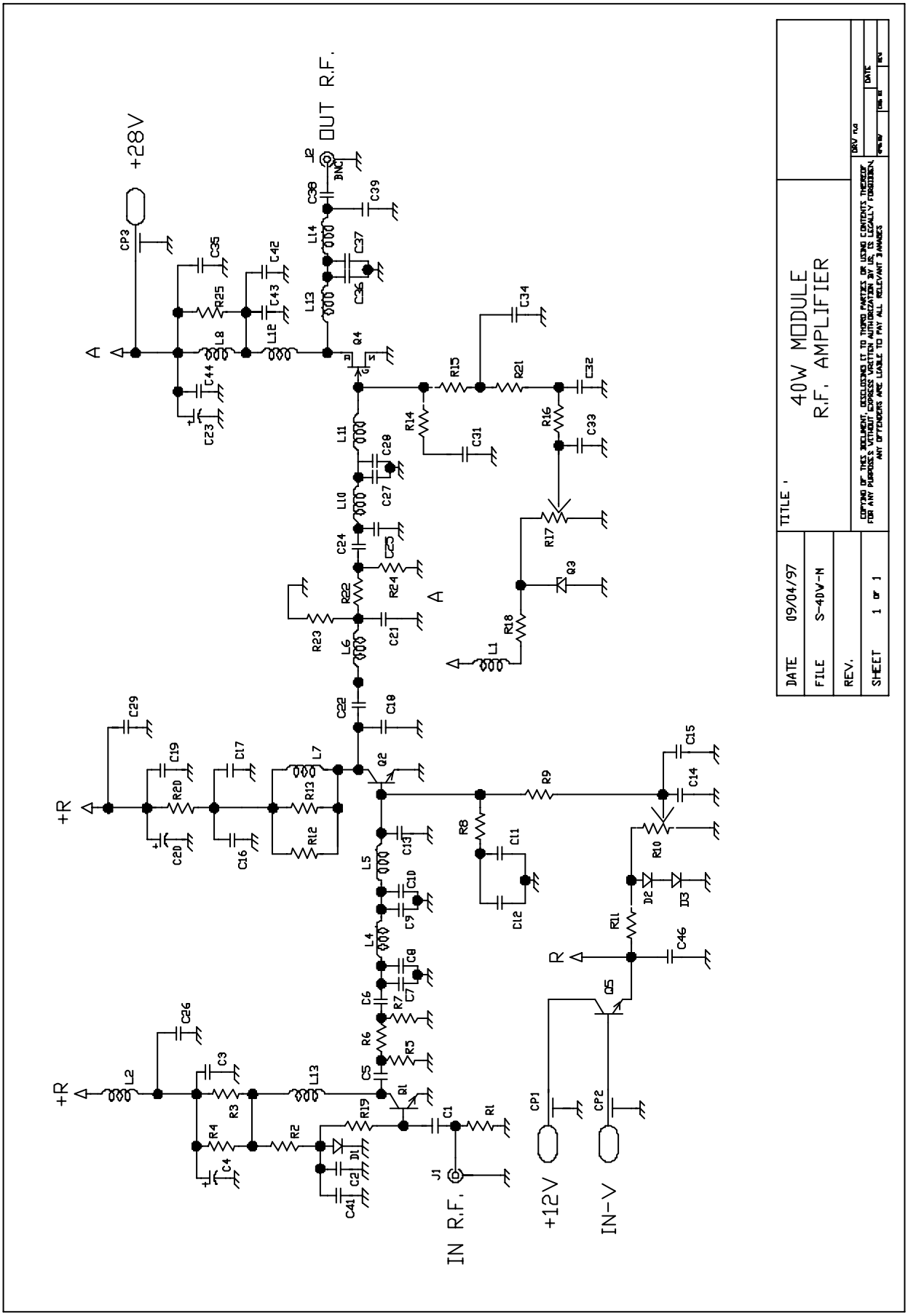
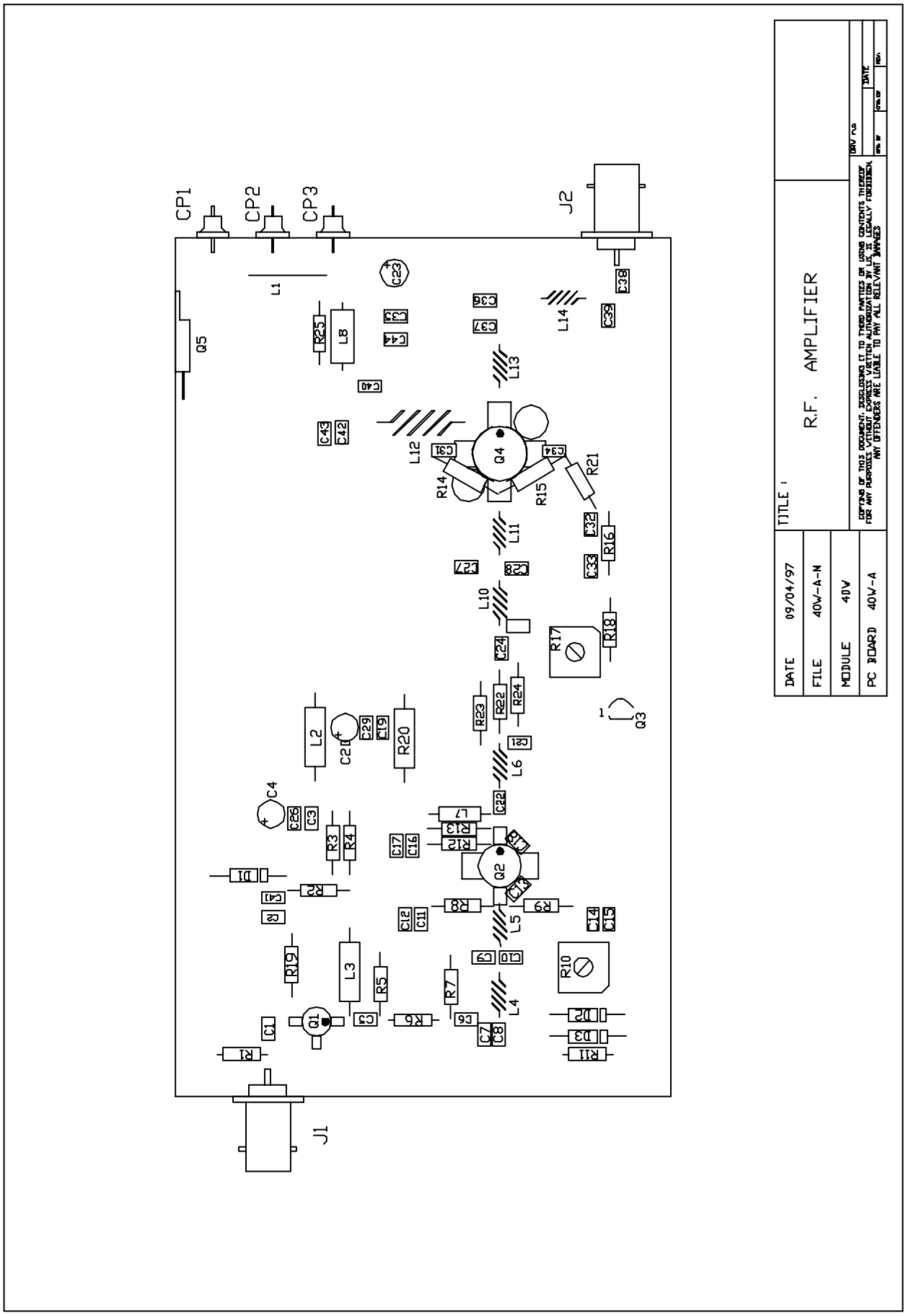
SRT BOARD PART LIST

R1	RESISTOR 1% 0.25W	330
R2	RESISTOR 1% 0.25W	100
R3	RESISTOR 1% 0.25W	56K
R4	RESISTOR 1% 0.25W	820
R5A	RESISTOR 1% 0.25W	32.4K
R5B	RESISTOR 1% 0.25W	34K
R6A	RESISTOR 1% 0.25W	24.3K
R6B	RESISTOR 1% 0.25W	18.2K
R7A	RESISTOR 1% 0.25W	34K
R7B	RESISTOR 1% 0.25W	331
R8A	RESISTOR 1% 0.25W	28K
R8B	RESISTOR 1% 0.25W	1K
R9A	RESISTOR 1% 0.25W	24.3
R9B	RESISTOR 1% 0.25W	1,21K
R10A	RESISTOR 1% 0.25W	22.1K
R10B	RESISTOR 1% 0.25W	845
R11A	RESISTOR 1% 0.25W	21.5K
R11B	RESISTOR 1% 0.25W	165
R12A	RESISTOR 1% 0.25W	19.1K
R12B	RESISTOR 1% 0.25W	464
R13A	RESISTOR 1% 0.25W	18.2K
R13B	RESISTOR 1% 0.25W	68.1
R14A	RESISTOR 1% 0.25W	16.5K
R14B	RESISTOR 1% 0.25W	845
R15A	RESISTOR 1% 0.25W	16.5K
R15B	RESISTOR 1% 0.25W	68.1
R16A	RESISTOR 1% 0.25W	15K
R16B	RESISTOR 1% 0.25W	698
R17A	RESISTOR 1% 0.25W	15K
R17B	RESISTOR 1% 0.25W	150
R18A	RESISTOR 1% 0.25W	14.3K
R18B	RESISTOR 1% 0.25W	274
R19A	RESISTOR 1% 0.25W	13.8K
R19B	RESISTOR 1% 0.25W	221
R20A	RESISTOR 1% 0.25W	12.4K
R20B	RESISTOR 1% 0.25W	1.13K
R21A	RESISTOR 1% 0.25W	12.4K
R21B	RESISTOR 1% 0.25W	681
R22A	RESISTOR 1% 0.25W	11.8K
R22B	RESISTOR 1% 0.25W	845
R23A	RESISTOR 1% 0.25W	12.1K
R23B	RESISTOR 1% 0.25W	221
24A	RESISTOR 1% 0.25W	11.8K
R24B	RESISTOR 1% 0.25W	221
R25	RESISTOR 1% 0.25W	150K
R25	RESISTOR 1% 0.25W	1.5K
R27	RESISTOR 1% 0.25W	470K
R28	RESISTOR 1% 0.25W	10K
R29	RESISTOR 1% 0.25W	6.8K
R30	RESISTOR 1% 0.25W	10K
R31	RESISTOR 1% 0.25W	10K
R32	RESISTOR 1% 0.25W	470
R33		
R34	RESISTOR 1% 0.25W	33K
R35	RESISTOR 1% 0.25W	47K
R36	RESISTOR 1% 0.25W	820
R37	RESISTOR 1% 0.25W	47K
R38	RESISTOR 1% 0.25W	10K
R39	RESISTOR 1% 0.25W	33K
R40	RESISTOR 1% 0.25W	10K
R41		
R42	RESISTOR 1% 0.25W	33K
R43	RESISTOR 1% 0.25W	4.7K
R44	RESISTOR 1% 0.25W	820
R45	RESISTOR 1% 0.25W	820
R46	RESISTOR 1% 0.25W	5.6K
R47	RESISTOR 1% 0.25W	1.5K
R48	RESISTOR 1% 0.25W	15K
R49	RESISTOR 1% 0.25W	12K
R50	RESISTOR 1% 0.25W	56K
R51	RESISTOR 1% 0.25W	15K
R52	RESISTOR 1% 0.25W	12K
RR1	INTEGRATED RESISTOR	10K
RR2i	INTEGRATED RESISTOR	10K
RR3i	INTEGRATED RESISTOR	10K
RR4i	INTEGRATED RESISTOR	10K
RR5i	INTEGRATED RESISTOR	10K
RT1	TRIMMER 1T	10K
RT2	TRIMMER 1T	10K
RT3	TRIMMER 20T	10K
C1	ELECTROLYTIC CAPACITOR	47 F
C2	CERAMIC CAPACITOR	100nF
C3	CERAMIC CAPACITOR	100nF
C4	ELECTROLYTIC CAPACITOR	47 F
C5		
C6	CERAMIC CAPACITOR	1nF
C7	CERAMIC CAPACITOR	1nF
C8	CERAMIC CAPACITOR	1nF
C9	CERAMIC CAPACITOR	1nF
C10	CERAMIC CAPACITOR	1nF
C11	CERAMIC CAPACITOR	1nF
C12	CERAMIC CAPACITOR	1nF
C13	CERAMIC CAPACITOR	1nF
C14	CERAMIC CAPACITOR	1nF
C15	CERAMIC CAPACITOR	1nF
C16	CERAMIC CAPACITOR	1nF
C17	CERAMIC CAPACITOR	1nF
C18	CERAMIC CAPACITOR	1nF
C19	CERAMIC CAPACITOR	1nF
C20	CERAMIC CAPACITOR	1nF
C21	CERAMIC CAPACITOR	1nF
C22	ELECTROLYTIC CAPACITOR	47 F

C23	ELECTROLYTIC CAPACITOR	10 F
C24	CERAMIC CAPACITOR	100nF
C25	CERAMIC CAPACITOR	1 F
C26	CERAMIC CAPACITOR	220nF
C27	CERAMIC CAPACITOR	100nF
C28	CERAMIC CAPACITOR	100nF
L1	INDUCTOR	8.2 H
L2	INDUCTOR	8.2 H
L3	INDUCTOR	8.2 H
L4	INDUCTOR	8.2 H
L5	INDUCTOR	8.2 H
L6	INDUCTOR	8.2 H
L7	INDUCTOR	8.2 H
L8	INDUCTOR	8.2 H
L9	INDUCTOR	8.2 H
L10	INDUCTOR	8.2 H
L11	INDUCTOR	8.2 H
L12	INDUCTOR	8.2 H
L13	INDUCTOR	8.2 H
L14	INDUCTOR	8.2 H
L15	INDUCTORI	8.2 H
L16	INDUCTOR	8.2 H
D1	DIODE	LED
D2	DIODE	LED
D3	DIODE	Zener 15V
D4	DIODE	1N4148
D5	DIODE	1N4148
D6	REFERENCE I.C.	LM336/5V
D7	REFERENCE I.C.	LM336/5V
Q1	TRANSISTOR	BC183
U5	INTEGRATED CIRCUIT	CD4014
U6	INTEGRATED CIRCUIT	CD4014
U7	INTEGRATED CIRCUIT	CD4014
U8	INTEGRATED CIRCUIT	CD4014
U9	INTEGRATED CIRCUIT	CD4014
U10	INTEGRATED CIRCUIT	CD4014
U11	INTEGRATED CIRCUIT	LM358
U12	INTEGRATED CIRCUIT	LM358
U13	INTEGRATED CIRCUIT	LM358
U14	INTEGRATED CIRCUIT	LM358
U15	INTEGRATED CIRCUIT	LM358
U16	INTEGRATED CIRCUIT	LM358
CP6	CERAMIC CAPACITOR	100nF
CP7	CERAMIC CAPACITOR	100nF
CP8	CERAMIC CAPACITOR	100nF
CP9	CERAMIC CAPACITOR	100nF
CP10	CERAMIC CAPACITOR	100nF
J1	CONNECTOR	SHF 20p
BLD1	BAR LED	MV57164
BLD2	BAR LED	MV57164
DV1	DIP SWITCH	10P
DV2	DIP SWITCH	10P
DSW1	JUMPER	
DSW2	JUMPER	
RSW1	ROTARY SWITCH	
RSW2	ROTARY SWITCH	
RSW3	ROTARY SWITCH	
RSW4	ROTARY SWITCH	
RSW5	ROTARY SWITCH	
RSW6	ROTARY SWITCH	
RSW7	ROTARY SWITCH	
RSW8	ROTARY SWITCH	
RSW9	ROTARY SWITCH	
RSW10	ROTARY SWITCH	


+28V
OUT R.F.
IN R.F.
+12V
IN-V
+R
R
A
TITLE :
40W MODULE
R.F. AMPLIFIER
DATE 09/04/97
FILE S-40V-N
REV.
SHEET 1 OF 1


CP1
CP2
CP3
J2
J1
Q5
L1
L8
L13
L14
L12
Q4
R14
R15
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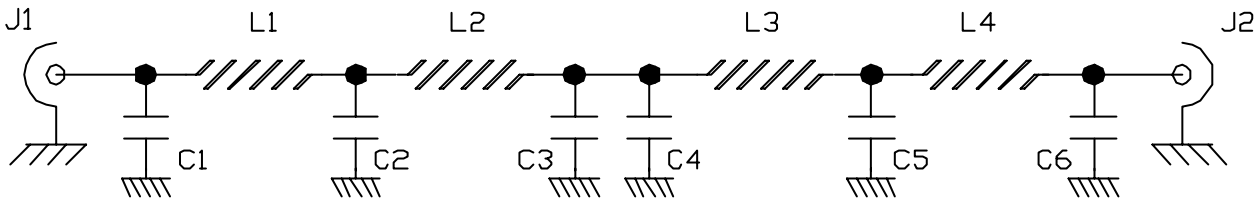
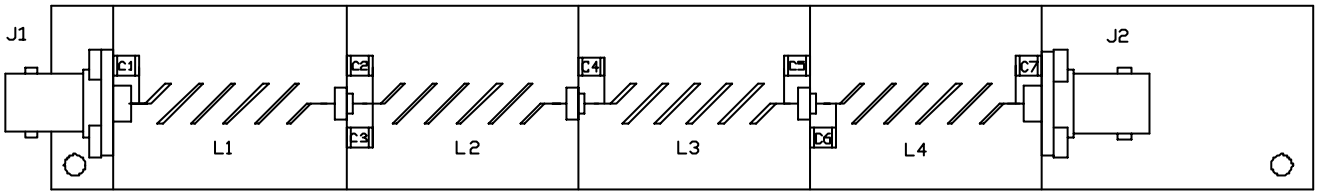
L11
L10
R17
R18
Q3
L2
R20
L6
C4
L7
Q2
L5
L3
R5
R7
L4
R10
Q1
R19
TITLE :
R.F. AMPLIFIER
DATE 09/04/97
FILE 40W-A-N
MODULE 40W
PC BOARD 40W-A

40W MODULE PART LIST

R1	RESISTOR 1% 1/4W	56
R2	RESISTOR 1% 1/4W	5.6K
R3	RESISTOR 1% 1/4W	180
R4	RESISTOR 1% 1/4W	180
R5	CHIP RESISTOR	470
R6	CHIP RESISTOR	10
R7	CHIPRESISTOR	470
R8	RESISTOR 1% 1/4W	10
R9	RESISTOR 1% 1/4W	10
R10	TRIMMER 1T	500
R11	RESISTOR 1% 1/4W	680
R12	RESISTOR 1% 1/4W	220
R13	RESISTOR 1% 1/4W	220
R14	RESISTOR 5% 2W	10
R15	RESISTOR 5% 2W	10
R16	RESISTOR 1% 1/4W	5.6K
R17	TRIMMER 1T	10K
R18	RESISTOR 1% 1/4W	6.8K
R19	RESISTOR 1% 1/4W	270
R20	RESISTOR 20% 2W	1
R21	RESISTOR 1% 1/4W	5.6K
R22	CARBON RESISTOR 5% 2W	10
R23	CARBON RESISTOR 5% 2W	270
R24	CARBON RESISTOR 5% 2W	270
R25	CARBON RESISTOR 5% 2W	10
C1	CERAMIC CAPACITOR	1nF
C2	CERAMIC CAPACITOR	1nF
C3	CERAMIC CAPACITOR	1nF
C4	ELECTROLYTIC CAPACITOR	47 F/35V
C5	CERAMIC CAPACITOR	1nF
C6	CERAMIC CAPACITOR	1nF
C7	CERAMIC CAPACITOR	4.7pF
C8	CERAMIC CAPACITOR	47pF
C9	CERAMIC CAPACITOR	56pF
C10	CERAMIC CAPACITOR	100pF
C11	CERAMIC CAPACITOR	1nF
C12	CERAMIC CAPACITOR	100nF
C13	CERAMIC CAPACITOR	82pF
C14	CERAMIC CAPACITOR	1nF
C15	CERAMIC CAPACITOR	100nF
C16	CERAMIC CAPACITOR	1nF
C17	CERAMIC CAPACITOR	100nF
C18	CERAMIC CAPACITOR	22pF
C19	CERAMIC CAPACITOR	1nF
C20	ELECTOLYTIC CAPACITOR	47 F/35V
C21	CERAMIC CAPACITOR	39pF
C22	CERAMIC CAPACITOR	1nF
C23	ELECTOLYTIC CAPACITOR	47 F/35V
C24	CERAMIC CAPACITOR	1nF
C25	CERAMIC CAPACITOR	68pF
C26	CERAMIC CAPACITOR	1nF
C27	CERAMIC CAPACITOR	100pF
C28	CERAMIC CAPACITOR	100pF
C29	CERAMIC CAPACITOR	100nF
C30	CERAMIC CAPACITOR	1nF
C31	CERAMIC CAPACITOR	1nF
C32	CERAMIC CAPACITOR	100nF
C33	CERAMIC CAPACITOR	1nF
C34	CERAMIC CAPACITOR	100nF
C35	CERAMIC CAPACITOR	1nF
C36	CERAMIC CAPACITOR	100pF
C37	CERAMIC CAPACITOR	100pF
C38	CERAMIC CAPACITOR	1nF
C39	CERAMIC CAPACITOR	68pF
C40	CERAMIC CAPACITOR	1nF
C41	CERAMIC CAPACITOR	100nF
C42	CERAMIC CAPACITOR	1nF
C43	CERAMIC CAPACITOR	100nF
C44	CERAMIC CAPACITOR	100nF
CP1	FT CAPACITOR	1nF
CP2	FT CAPACITOR	1nF
CP3	FT CAPACITOR	1nF
L1	SHORT-CIRCUIT	
L2	INDUCTOR	2.2 H
L3	INDUCTOR	2.2 H
L4	COIL	EL401
L5	COIL	EL402
L6	COIL	EL403
L7	INDUCTOR	1.5 H
L8	INDUCTOR	VK200
L9	COIL	EL404
L10	COIL	EL405
L11	COIL	EL406
L12	COIL	EL407
L13	COIL	EL408
L14	COIL	EL409
D1	DIODE	1N4148
D2	DIODE	1N4148
D3	DIODE	1N4148
Q1	TRANSISTOR	BFR96
Q2	TRANSISTOR	BFQ68
Q3	REFERENCE I.C.	LM336/5V
Q4	TRANSISTOR	DU2860U
Q5	DARLINGTON	TIP122
J1	BNC CONNECTOR	
J2	BNC CONNECTOR	



DATE	08-12-93	TITLE : FPB40 LOW-PASS FILTER	
FILE	S-FPB40		
REV.			
SHEET	1 OF 1	COPYING OF THIS DOCUMENT, DISCLOSING IT TO THIRD PARTIES OR USING CONTENTS THEREOF FOR ANY PURPOSES WITHOUT EXPRESS WRITTEN AUTHORIZATION BY US, IS LEGALLY FORBIDDEN. ANY OFFENDERS ARE LIABLE TO PAY ALL RELEVANT DAMAGES	DRV n.d DATE REV



DATE	10/4/96
FILE	FPB40-2
REV.	
SHEET	1 OF 1

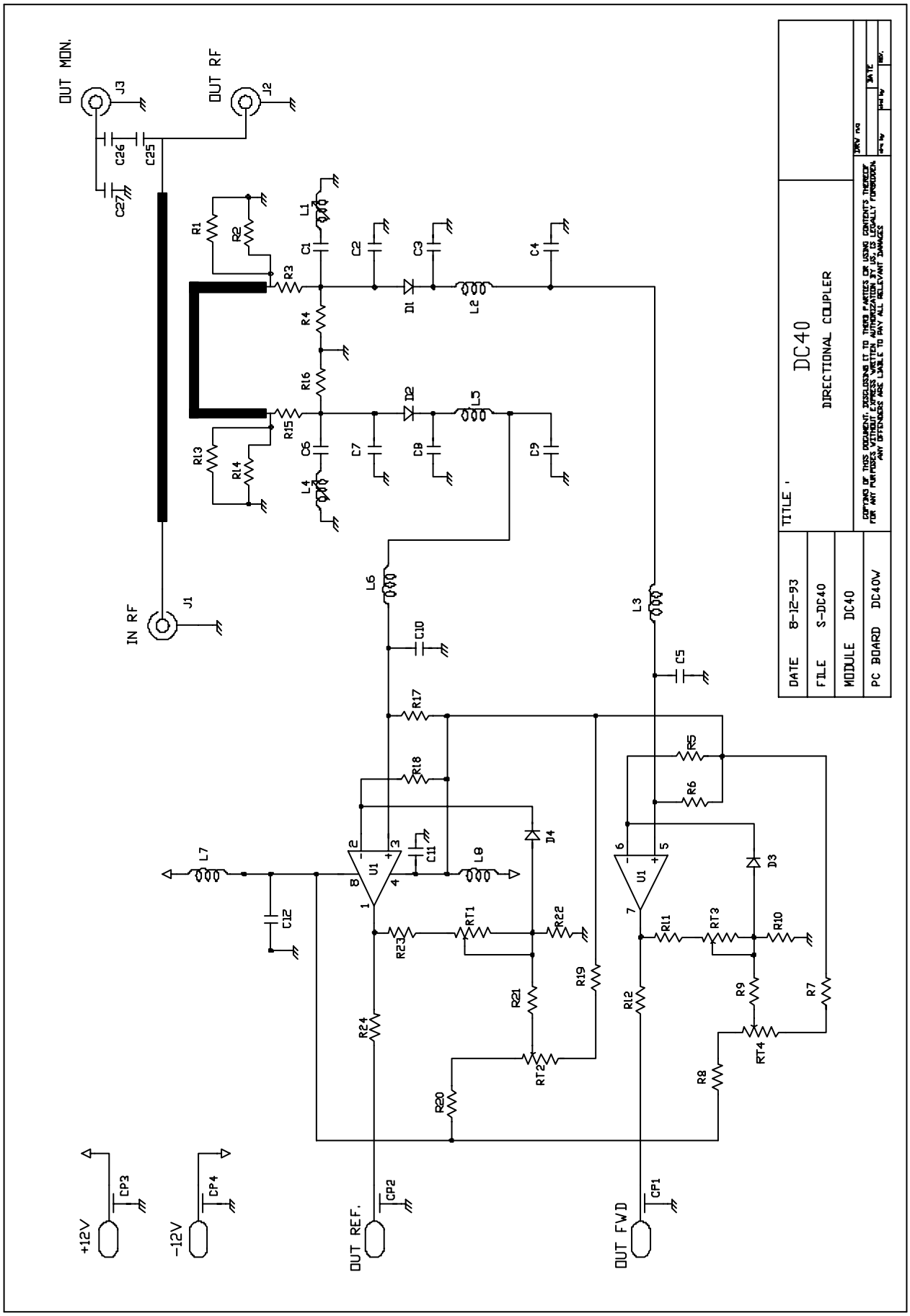
TITLE :

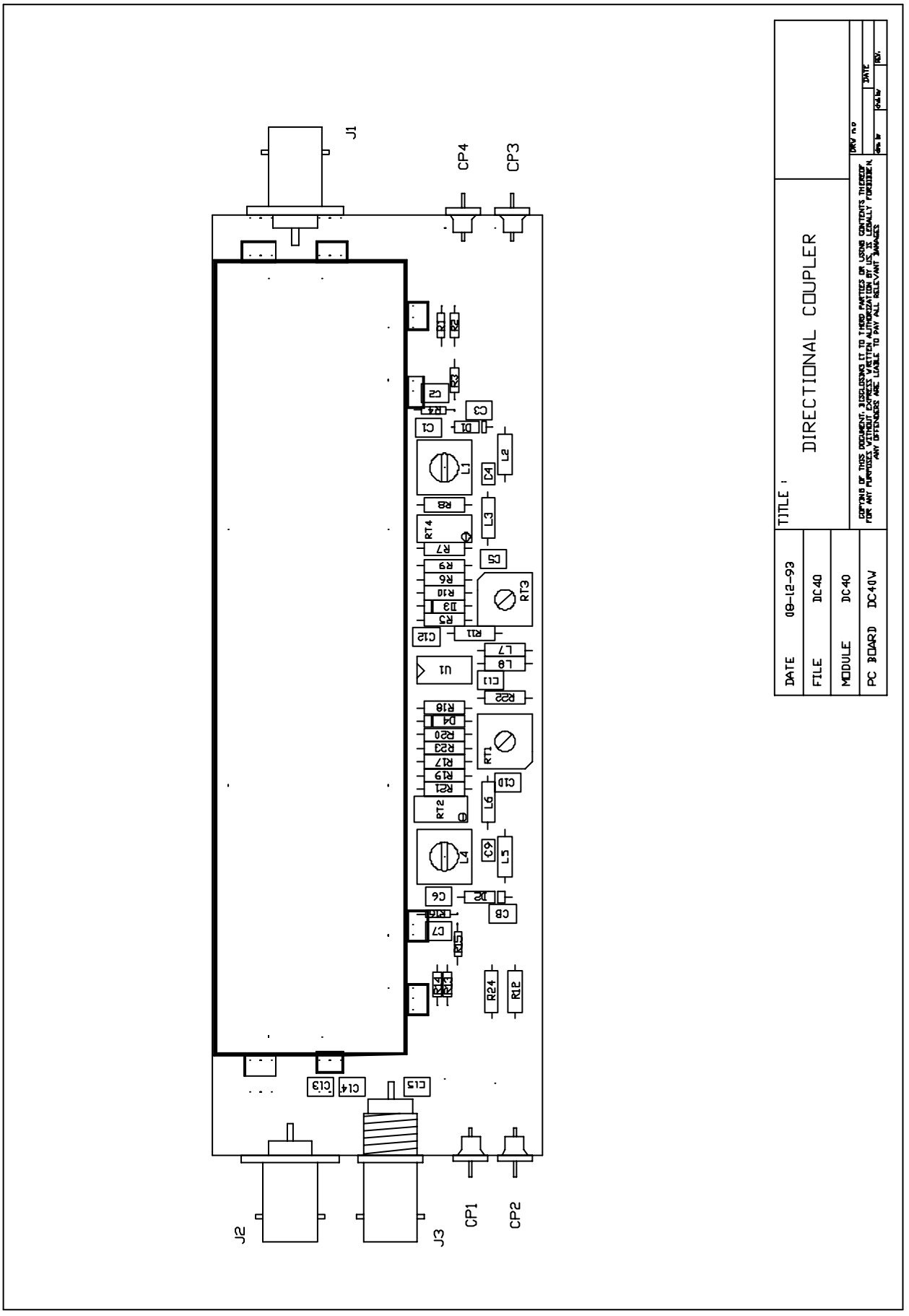
LPF40
LOW-PASS FILTER

APP'V'D			
		DATE	
DRN. BY	CHK'D BY	REV.	

FPB40 MODULE PART LIST

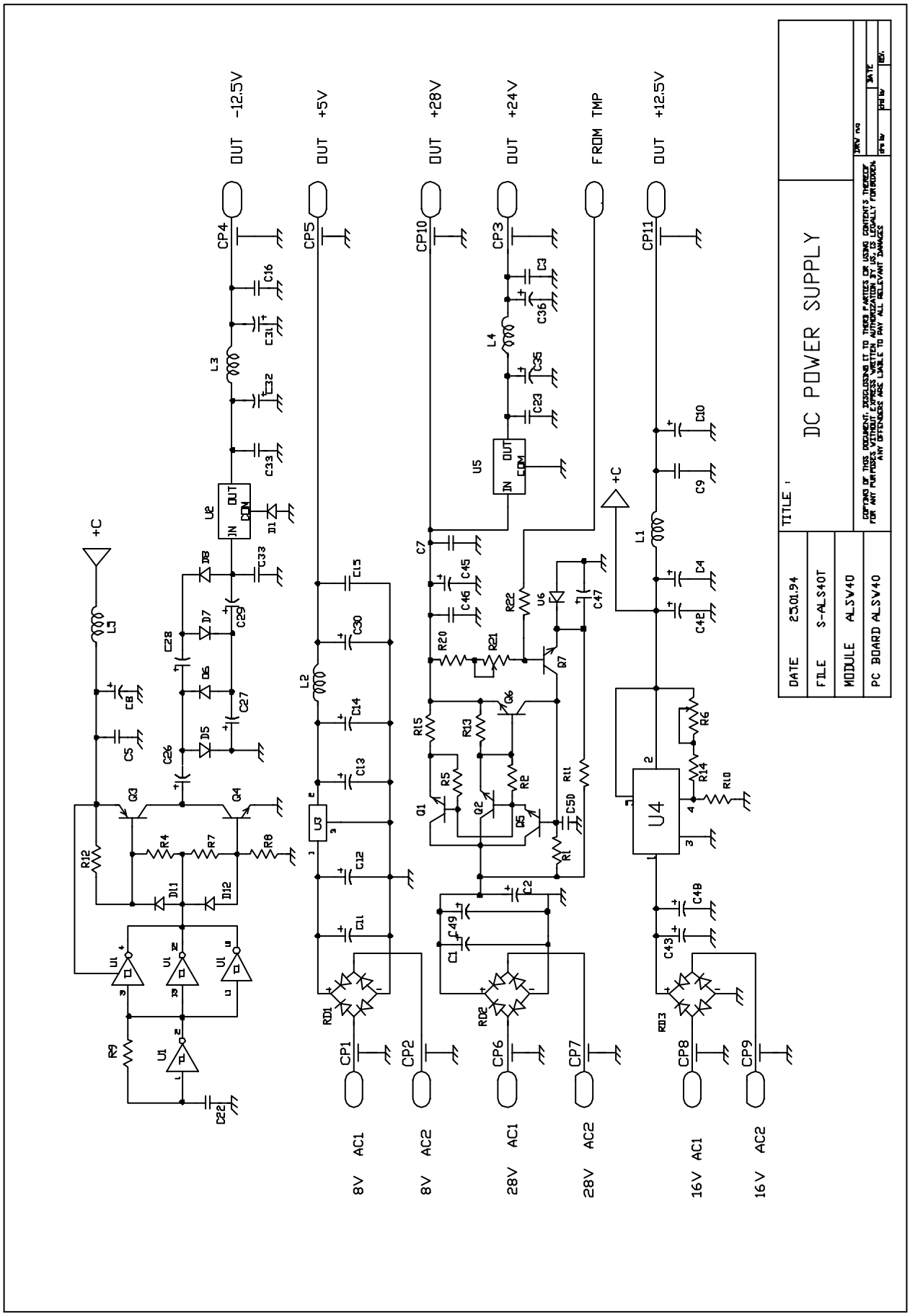
C1	HP CERAMIC CAPACITOR	22pF
C2	HP CERAMIC CAPACITOR	47pF
C3	HP CERAMIC CAPACITOR	47pF
C4	HP CERAMIC CAPACITOR	33pF
C5	HP CERAMIC CAPACITOR	47pF
C6	HP CERAMIC CAPACITOR	22pF
L1	COIL	
L2	COIL	
L3	COIL	
L4	COIL	
J1	BNC CONNECTOR	
J2	BNC CONNECTOR	

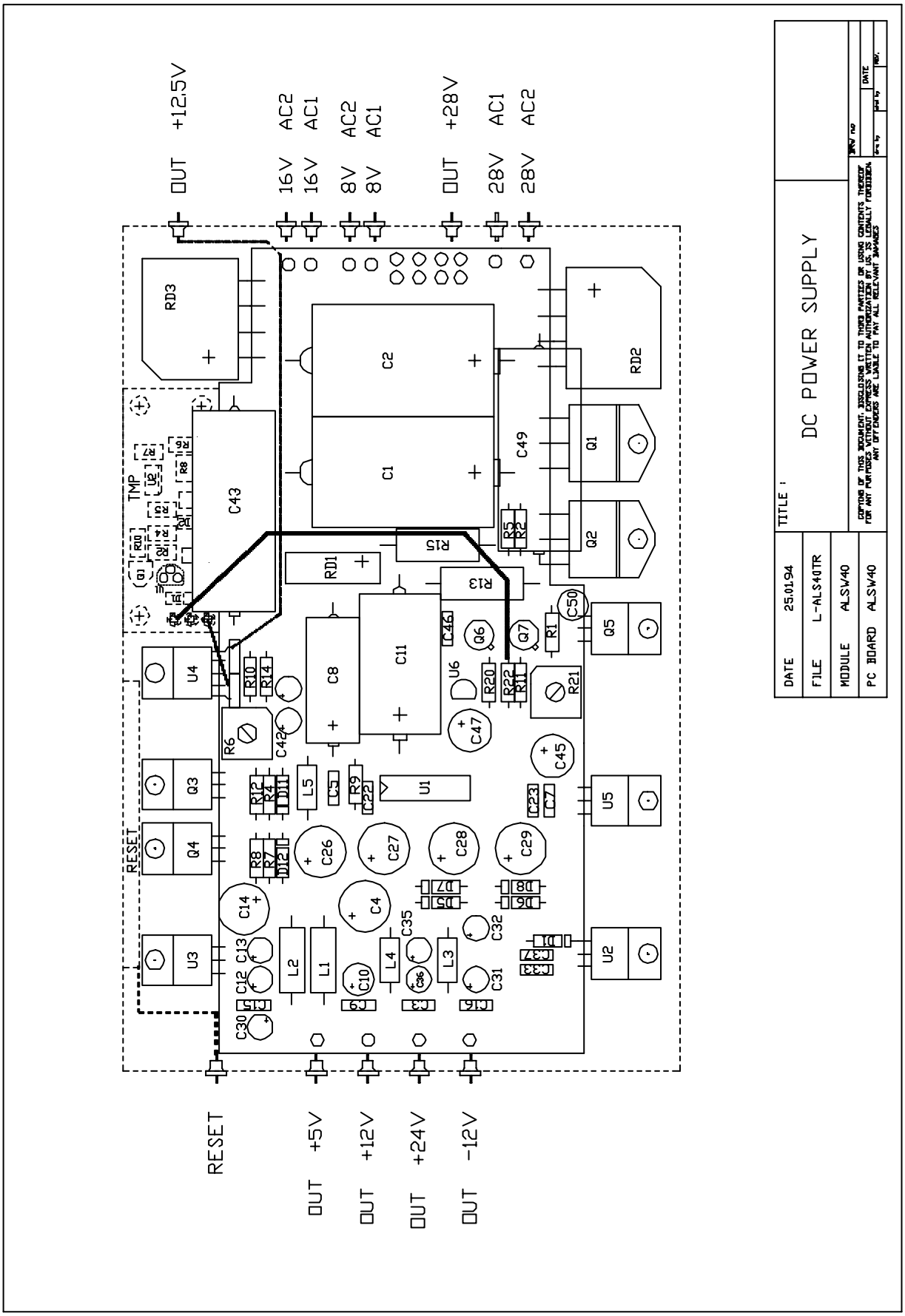

OUT MON.
OUT RF
IN RF
J1
J2
J3
C25
C26
C27
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
RT1
RT2
RT3
RT4
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
L1
L2
L3
L4
L5
L6
L7
L8
D1
D2
D3
D4
U1
+12V
-12V
OUT REF.
OUT FWD
CP1
CP2
CP3
CP4
TITLE :
DC40
DIRECTIONAL COUPLER
DATE 8-12-93
FILE S-DC40
MODULE DC40
PC BOARD DC40W


J1
CP4
CP3
J2
J3
CP1
CP2
DIRECTIONAL COUPLER
DATE 09-12-99
FILE DC40
MODULE DC40
PC BOARD DC40W

CD40 MODULE PART LIST

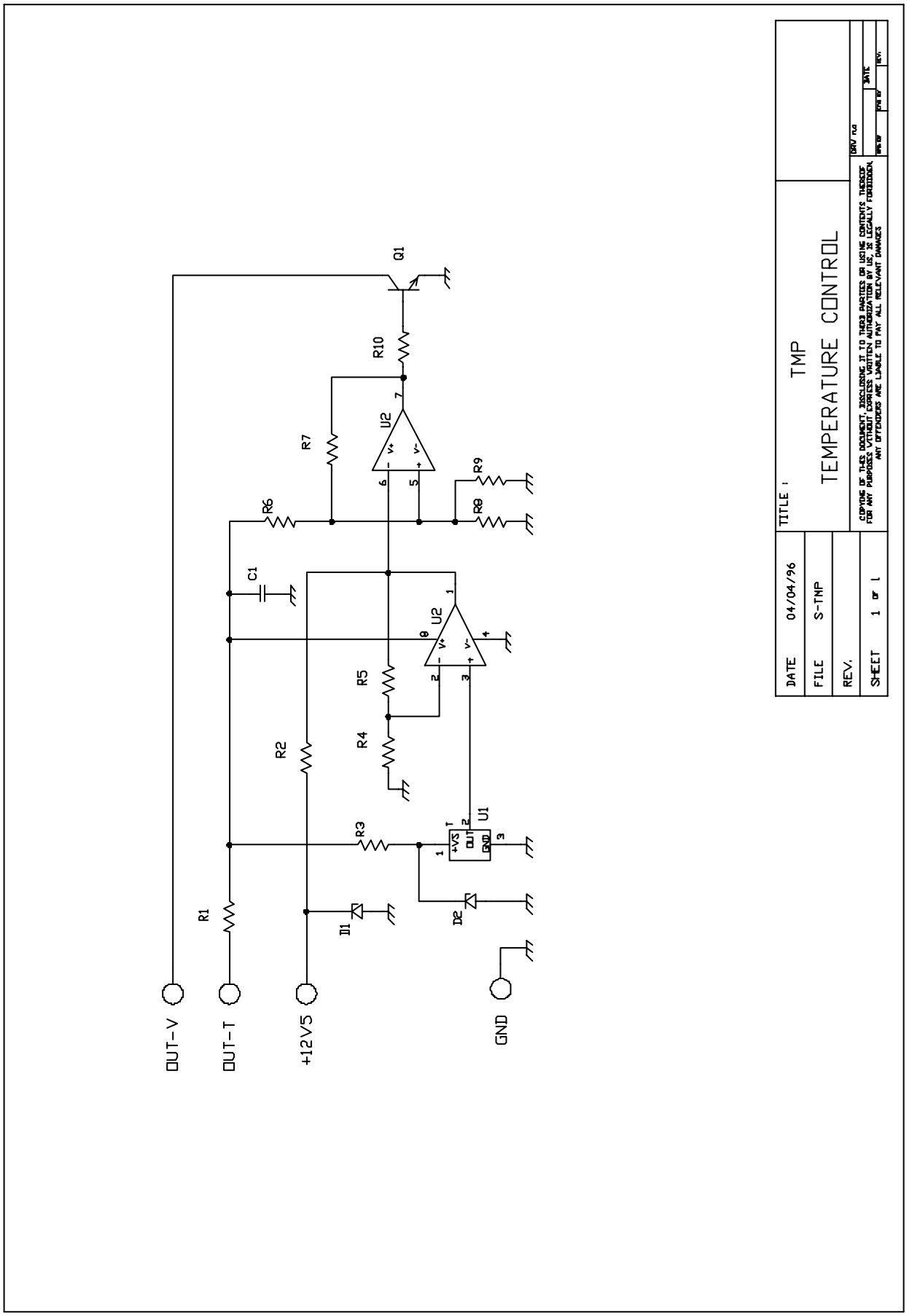
R1	RESISTOR 5% 1W	56
R2	RESISTOR 1% 1/4W	
R3	RESISTOR 5% 1/8W	150
R4	RESISTOR 5% 1/8W	680
R5	RESISTOR 1% 1/4W	220K
R6	RESISTOR 1% 1/4W	220K
R7	RESISTOR 1% 1/4W	1K
R8	RESISTOR 1% 1/4W	1K
R9	RESISTOR 1% 1/4W	10K
R10	RESISTOR 1% 1/4W	270
R11	RESISTOR 1% 1/4W	270
R12	RESISTOR 1% 1/4W	270
R13	RESISTOR 5% 1W	56
R14	RESISTOR 5% 1/8W	
R15	RESISTOR 5% 1/8W	150
R16	RESISTOR 5% 1/8W	680
R17	RESISTOR 1% 1/4W	220K
R18	RESISTOR 1% 1/4W	220K
R19	RESISTOR 1% 1/4W	1K
R20	RESISTOR 1% 1/4W	1K
R21	RESISTOR 1% 1/4W	10K
R22	RESISTOR 1% 1/4W	270K
R23	RESISTOR 1% 1/4W	270K
R24	RESISTOR 1% 1/4W	10K
RT1	TRIMMER 1T	2.2K
RT2	TRIMMER 10T	2.2K
RT3	TRIMMER 1T	2.2K
RT4	TRIMMER 10T	2.2K
C1	CERAMIC CAPACITOR	1nF
C2	CERAMIC CAPACITOR	1nF
C3	CERAMIC CAPACITOR	15pF
C4	CERAMIC CAPACITOR	1.5nF
C5	CERAMIC CAPACITOR	1nF
C6	CERAMIC CAPACITOR	1nF
C7	CERAMIC CAPACITOR	1nF
C8	CERAMIC CAPACITOR	15pF
C9	CERAMIC CAPACITOR	1.5nF
C10	CERAMIC CAPACITOR	1nF
C11	CERAMIC CAPACITOR	1nF
C12	CERAMIC CAPACITOR	1nF
C13	CERAMIC CAPACITOR	0.3pF
C14	CERAMIC CAPACITOR	0.3pF
C15	CERAMIC CAPACITOR	1nF
CP1	FT CAPACITOR	1nF
CP2	FT CAPACITOR	1nF
CP3	FT CAPACITOR	1nF
CP4	FT CAPACITOR	1nF
L1	INDUCTOR	6T
L2	INDUCTOR	2.2 H
L3	INDUCTOR	2.2 H
L4	INDUCTOR	6T
L5	INDUCTOR	2.2 H
L6	INDUCTOR	2.2 H
L7	INDUCTOR	2.2 H
L8	INDUCTOR	2.2 H
D1	DIODE	1SS
D2	DIODE	1SS
D3	DIODE	1SS
D4	DIODE	1SS
U1	INTEGRATED CIRCUIT	LM358
J1	BNC CONNECTOR	
J2	BNC CONNECTOR	
J3	BNC CONNECTOR	

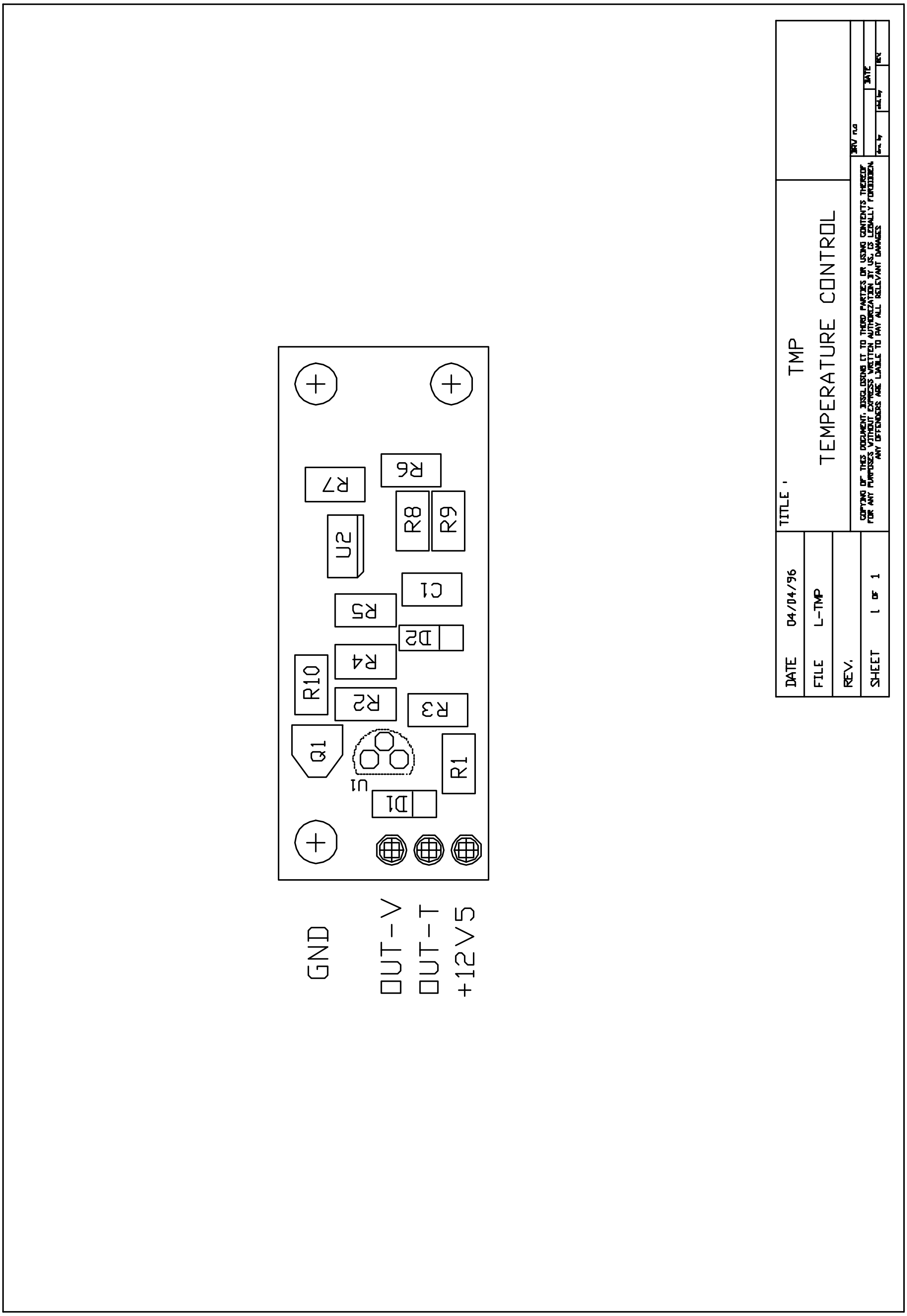

DC POWER SUPPLY
TITLE :
DATE 23.01.94
FILE S-ALS40T
MODULE ALSV40
PC BOARD ALSV40
OUT -12.5V
OUT +5V
OUT +28V
OUT +24V
FROM TMP
OUT +12.5V
8V AC1
8V AC2
28V AC1
28V AC2
16V AC1
16V AC2


OUT +12.5V
16V AC2
16V AC1
8V AC2
8V AC1
OUT +28V
28V AC1
28V AC2
RESET
OUT +5V
OUT +12V
OUT +24V
OUT -12V
DC POWER SUPPLY
TITLE :
DATE 25.01.94
FILE L-ALS40TR
MODULE ALSV40
PC BOARD ALSV40

ALSW1 MODULE PART LIST

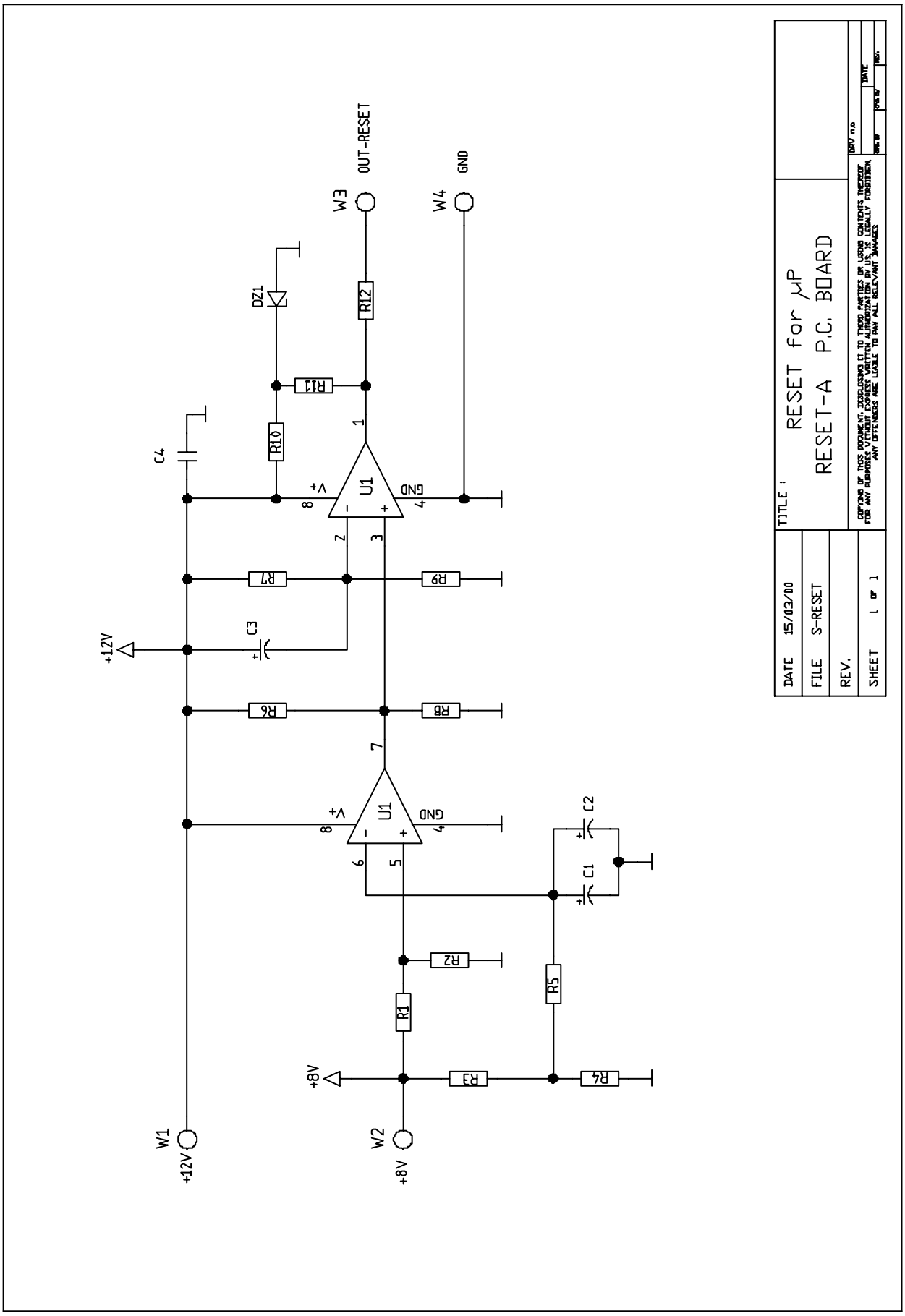
R1	RESISTOR 1% 1/4W	12K
R2	RESISTOR 1% 1/8W	270
R4	RESISTOR 1% 1/4W	10K
R5	RESISTOR 1% 1/4W	270
R6	TRIMMER 1T	1K
R7	RESISTOR 1% 1/4W	10K
R8	RESISTOR 1% 1/4W	6.8K
R9	RESISTOR 1% 1/4W	6.8K
R10	RESISTOR 1% 1/4W	1.2K
R11	RESISTOR 1% 1/4W	8.2K
R12	RESISTOR 1% 1/4W	2.7K
R13	RESISTOR 5% 5W	
	(for HPT40)	0.33
	(for HPT60)	0.22
R14	RESISTOR 1% 1/4W	3.9K
R15	RESISTOR 5% 5W	
	(for HPT40)	0.33
	(for HPT60)	0.22
R20	RESISTOR 1% 1/4W	3.3K
R21	TRIMMER 1T	2K
R22	RESISTOR 1% 1/4W	1K
C1	ELECTROLYTIC CAPACITOR	2200 F/63V
C2	ELECTROLYTIC CAPACITOR	2200 F/63V
C3	CERAMIC CAPACITOR	100nF
C4	ELECTROLYTIC CAPACITOR	220 F/25V
C5	CERAMIC CAPACITOR	100nF
C7	CERAMIC CAPACITOR	100nF
C8	ELECTROLYTIC CAPACITOR	1000 F/25V
C9	CERAMIC CAPACITOR	100nF
C10	ELECTROLYTIC CAPACITOR	4.7 F/25V
C11	ELECTROLYTIC CAPACITOR	2200 F/25V
C12	ELECTROLYTIC CAPACITOR	0.68 F/25V
C13	ELECTROLYTIC CAPACITOR	0.68 F/25V
C14	ELECTROLYTIC CAPACITOR	220 F/25V
C15	CERAMIC CAPACITOR	100nF
C16	CERAMIC CAPACITOR	100nF
C22	POLYESTER CAPACITOR	6.8nF
C23	CERAMIC CAPACITOR	100nF
C24	ELECTR. CAPACITOR EKR	220 F/25V
C26	ELECTR. CAPACITOR EKR	220 F/25V
C27	ELECTR. CAPACITOR EKR	220 F/25V
C28	ELECTR. CAPACITOR EKR	220 F/25V
C29	ELECTR. CAPACITOR EKR	220 F/25V
C30	ELECTR. CAPACITOR	4.7 F/25V
C31	ELECTROLYTIC CAPACITOR	4.7 F/25V
C32	ELECTROLYTIC CAPACITOR	4.7 F/25V
C33	CERAMIC CAPACITOR	100nF
C35	ELECTROLYTIC CAPACITOR	4.7 F/35V
C36	ELECTROLYTIC CAPACITOR	4.7 F/35V
C37	CERAMIC CAPACITOR	100nF
C42	ELECTROLYTIC CAPACITOR	4.7 F/25V
C43	ELECTROLYTIC CAP.	4700 F/40V
C45	ELECTROLYTIC CAPACITOR	4.7 F/35V
C46	CERAMIC CAPACITOR	100nF
C47	ELECTROLYTIC CAPACITOR	220 F/35V
C48	ELECTROLYTIC CAPACITOR	4.7 F/35V
C49	ELECTROLYTIC CAP.	
	(only for HPT60)	2200 F/63V
C50	ELECTROLYTIC CAPACITOR	10 F/35V
CP1	FT CAPACITOR	1000pF
CP2	F T CAPACITOR	1000pF
CP3	F T CAPACITOR	1000pF
CP4	F T CAPACITOR	1000pF
CP5	F T CAPACITOR	1000pF
CP6	F T CAPACITOR	1000pF
CP7	F T CAPACITOR	1000pF
CP8	F T CAPACITOR	1000pF
CP9	F T CAPACITOR	1000pF
CP10	FT CAPACITOR	1000pF
CP11	FT CAPACITOR	1000pF
L1	INDUCTOR	VK200
L2	INDUCTOR	VK200
L3	INDUCTOR	22 H
L4	INDUCTOR	VK200
L5	INDUCTOR	22 H
D1	DIODE	1N4148
D5	DIODE	1N5818
D6	DIODE	1N5818
D7	DIODE	1N5818
D8	DIODE	1N5818
D11	DIODE	BAR10
D12	DIODE	BAR10
RD1	RECTIFIER BRIDGE	KBL04
RD2	RECTIFIER BRIDGE	KBPC10
RD3	RECTIFIER BRIDGE	KBL04
U1	INTEGRATED CIRCUIT	74HC14
U2	VOLTAGE REGULATOR	7912
U3	VOLTAGE REGULATOR	7805
U4	VOLTAGE REGULATOR	L200
U5	VOLTAGE REGULATOR	7024
U6	REFERENCE I.C.	LM336-5V
Q1	DARLINGTON	TIP35
Q2	DARLINGTON	TIP35
Q3	DARLINGTON	TIP127
Q4	DARLINGTON	TIP122
Q5	DARLINGTON	TIP122
Q6	TRANSISTOR	BVY59
Q7	TRANSISTOR	BCY59

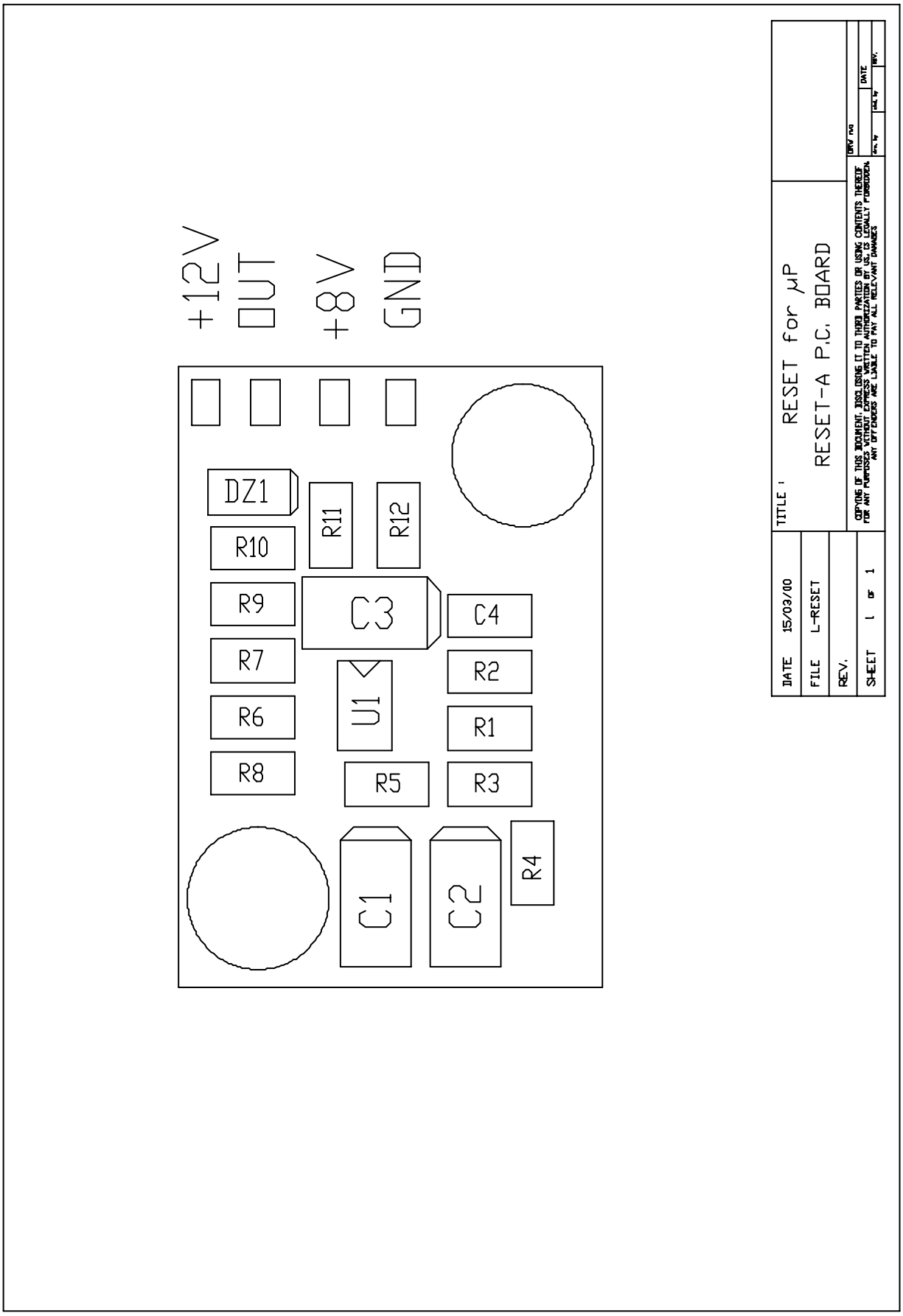

OUT-V
OUT-T
+12V5
GND
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
C1
D1
D2
Q1
U1
U2
+VS
OUT
GND
TITLE :
TMP
TEMPERATURE CONTROL
DATE 04/04/96
FILE S-TMP
REV.
SHEET 1 OF 1


TITLE :
TMP
TEMPERATURE CONTROL
DATE 04/04/96
FILE L-TMP
REV.
SHEET 1 OF 1
R6
R7
R8
R9
U2
C1
R5
D2
R4
R10
R2
R3
Q1
R1
U1
D1
GND
OUT-V
OUT-T
+12V5

TMP BOARD PART LIST

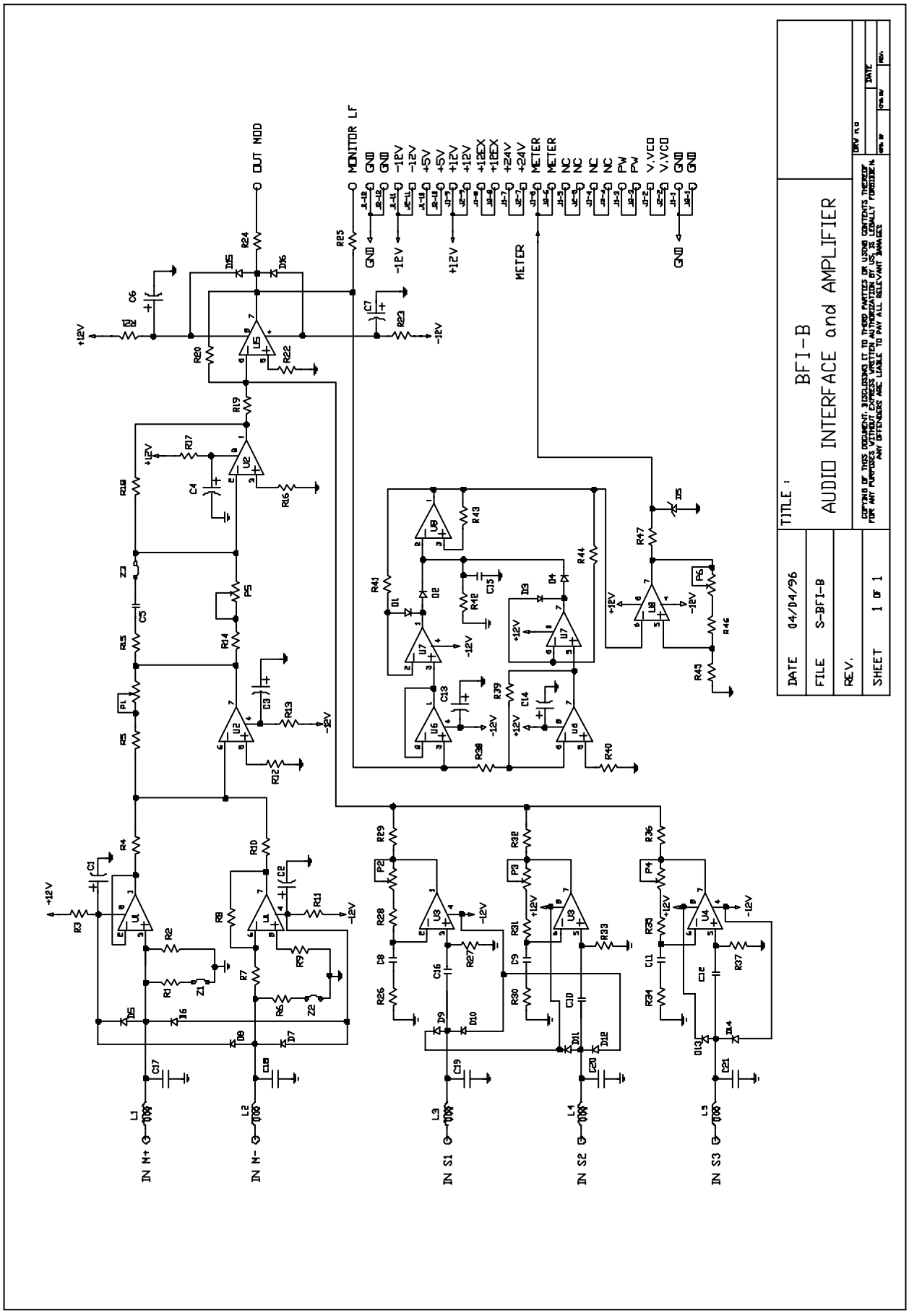
R1	SMD RESISTOR 1/8W 1%	100
R2	SMD RESISTOR 1/8W 1%	560
R3	SMD RESISTOR 1/8W 1%	1K
R4	SMD RESISTOR 1/8W 1%	10K
R5	SMD RESISTOR 1/8W 1%	15K
R6	SMD RESISTOR 1/8W 1%	8.2K
R7	SMD RESISTOR 1/8W 1%	82K
R8	SMD RESISTOR 1/8W 1%	22K
R9	SMD RESISTOR 1W 5%	3.3K
R10	SMD RESISTOR 1W 5%	10K
C1	CERAMIC SMD CAPACITOR	100nF
D1	SMD ZENER DIODE	5.1V
Q1	SMD TRANSISTOR	BCW33
U1	SMD TEMP. SENSOR	TMP37GT9
U1	SMD I.C.	LM358D

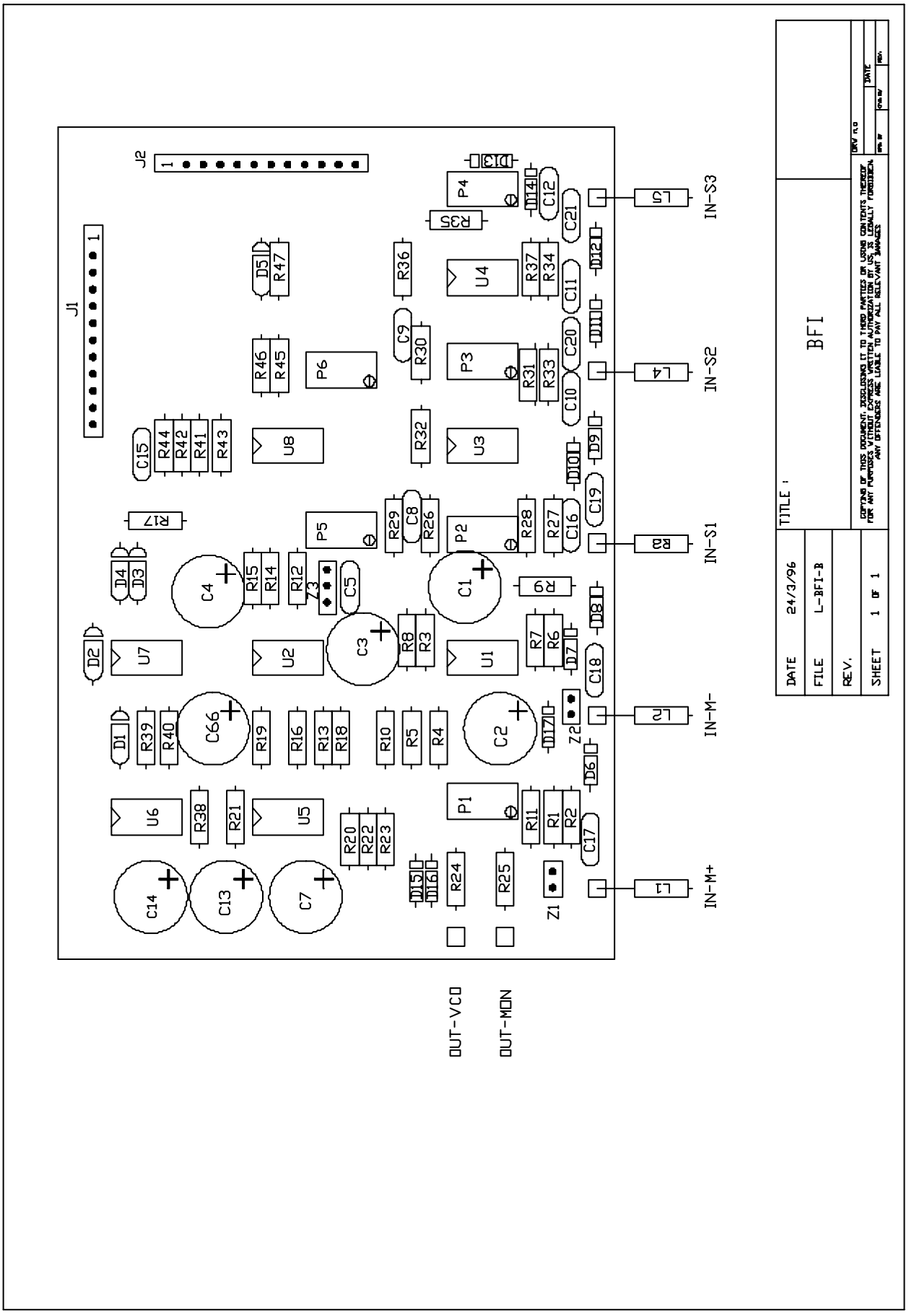

RESET for µP
RESET-A P.C. BOARD
DATE 15/03/00
FILE S-RESET
REV.
SHEET 1 OF 1
W1 +12V
W2 +8V
W3 OUT-RESET
W4 GND
U1
C1
C2
C3
C4
DZ1
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
+12V
+8V


+12V
OUT
+8V
GND
DZ1
R10
R11
R12
R9
C3
C4
R7
R2
U1
R6
R1
R8
R5
R3
C1
C2
R4
TITLE :
RESET for µP
RESET-A P.C. BOARD
DATE 15/03/00
FILE L-RESET
REV.
SHEET 1 OF 1
DRW NO
DATE
REV.

RESET BOARD PART LIST

R1	SMD RESISTOR 1/8W 1%	2.2k
R2	SMD RESISTOR 1/8W 1%	8.2k
R3	SMD RESISTOR 1/8W 1%	3.9k
R4	SMD RESISTOR 1/8W 1%	8.2k
R5	SMD RESISTOR 1/8W 1%	180k
R6	SMD RESISTOR 1/8W 1%	8.2k
R7	SMD RESISTOR 1/8W 1%	100k
R8	SMD RESISTOR 1/8W 1%	8.2k
R9	SMD RESISTOR 1W 5%	56k
R10	SMD RESISTOR 1W 5%	1k
R11	SMD RESISTOR 1/8W 1%	2.2k
R12	SMD RESISTOR 1/8W 1%	330
C1	TANTALUM SMD CAPACITOR	10 F/16V
C2	TANTALUM SMD CAPACITOR	10 F/16V
C3	TANTALUM SMD CAPACITOR	10 F/16V
C4	CERAMIC SMD CAPACITOR	100nF
DZ1	SMD ZENER DIODE	5.1V
U1	SMD INTEGRATED CIRCUIT	


BFI-B
AUDIO INTERFACE and AMPLIFIER
DATE 04/04/96
FILE S-BFI-B
REV.
SHEET 1 OF 1
OUT MOD
MONITOR LF
GND
-12V
+12V
+5V
+12EX
+24V
METER
NC
PW
V.VCO
IN N+
IN N-
IN S1
IN S2
IN S3


BFI
DATE 24/3/96
FILE L-BFI-B
REV.
SHEET 1 OF 1
IN-M+
IN-M-
IN-S1
IN-S2
IN-S3
OUT-VCO
OUT-MON

BFI BOARD PART LIST

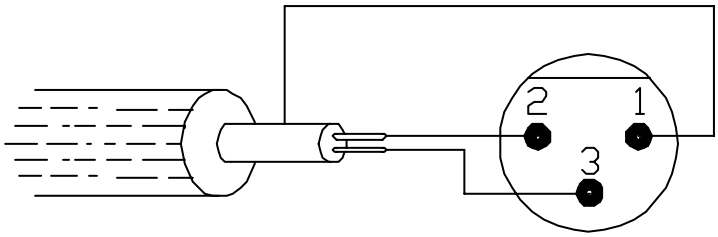
R1	RESISTOR 1% 0.25W	680
R2	RESISTOR 1% 0.25W	10K
R3	RESISTOR 1% 0.25W	820
R4	RESISTOR 1% 0.25W	10K
R5	RESISTOR 1% 0.25W	4.7K
R6	RESISTOR 1% 0.25W	680
R7	RESISTOR 1% 0.25W	10K
R8	RESISTOR 1% 0.25W	10K
R9	RESISTOR 1% 0.25W	4.7K
R10	RESISTOR 1% 0.25W	10K
R11	RESISTOR 1% 0.25W	820
R12	RESISTOR 1% 0.25W	470
R13	RESISTOR 1% 0.25W	820
R14	RESISTOR 1% 0.25W	8.2K
R15	RESISTOR 1% 0.25W	560
R16	RESISTOR 1% 0.25W	470
R17	RESISTOR 1% 0.25W	820
R18	RESISTOR 1% 0.25W	18K
R19	RESISTOR 1% 0.25W	10K
R20	RESISTOR 1% 0.25W	5.6K
R21	RESISTOR 1% 0.25W	820
R22	RESISTOR 1% 0.25W	470
R23	RESISTOR 1% 0.25W	820
R24	RESISTOR 1% 0.25W	47
R25	RESISTOR 1% 0.25W	680
R26	RESISTOR 1% 0.25W	10K
R27	RESISTOR 1% 0.25W	10K
R28	RESISTOR 1% 0.25W	10K
R29	RESISTOR 1% 0.25W	120K
R30	RESISTOR 1% 0.25W	10K
R31	RESISTOR 1% 0.25W	10K
R32	RESISTOR 1% 0.25W	120K
R33	RESISTOR 1% 0.25W	10K
R34	RESISTOR 1% 0.25W	10K
R35	RESISTOR 1% 0.25W	10K
R36	RESISTOR 1% 0.25W	120K
R37	RESISTOR 1% 0.25W	10K
R38	RESISTOR 1% 0.25W	10K
R39	RESISTOR 1% 0.25W	10K
R40	RESISTOR 1% 0.25W	470
R41	RESISTOR 1% 0.25W	5.6K
R42	RESISTOR 1% 0.25W	5.6M
R43	RESISTOR 1% 0.25W	3.9K
R44	RESISTOR 1% 0.25W	5.6K
R45	RESISTOR 1% 0.25W	10K
R46	RESISTOR 1% 0.25W	3.9K
R47	RESISTOR 1% 0.25W	1K
P1	TRIMMER 10T	20K
P2	TRIMMER 10T	20K
P3	TRIMMER 10T	20K
P4	TRIMMER 10T	20K
P5	TRIMMER 10T	10K
P6	TRIMMER 10T	20K
C1	ELECTROLYTIC CAPACITOR	220 F-25V
C2	ELECTROLYTIC CAPACITOR	220 F-25V
C3	ELECTROLYTIC CAPACITOR	220 F-25V
C4	ELECTROLYTIC CAPACITOR	220 F-25V
C5	POLICARB. CAPACITOR	4.7nF
C6	ELECTROLYTIC CAPACITOR	220 F-25V
C7	ELECTROLYTIC CAPACITOR	220 F-25V
C8	POLICARB. CAPACITOR	2.2nF
C9	POLICARB. CAPACITOR	2.2nF
C10	POLICARB. CAPACITOR	2.2nF
C11	POLICARB. CAPACITOR	2.2nF
C12	POLICARB. CAPACITOR	2.2nF
C13	ELECTROLYTIC CAPACITOR	220 F-25V
C14	ELECTROLYTIC CAPACITOR	220 F-25V
C15	POLICARB. CAPACITOR	22nF
C16	POLICARB. CAPACITOR	2n2F
C17	CERAMIC CAPACITOR	100pF
C18	CERAMIC CAPACITOR	100pF
C19	CERAMIC CAPACITOR	1nF
C20	CERAMIC CAPACITOR	1nF
C21	CERAMIC CAPACITOR	1nF
C66	ELECTROLYTIC CAPACITOR	220 F-25V
D1	DIODE	BAT82
D2	DIODE	IN4148
D3	DIODE	BAT82
D4	DIODE	IN4148
D6	DIODE	BAV21
D7	DIODE	BAV21
D8	DIODE	BAV21
D9	DIODE	BAV21
D10	DIODE	BAV21
D11	DIODE	BAV21
D12	DIODE	BAV21
D13	DIODE	BAV21
D14	DIODE	BAV21
D15	DIODE	BAV21
D16	DIODE	BAV21
D17	DIODE	BAV21
L1	INDUCTOR	0.1 H
L2	INDUCTOR	0.1 H
L3	INDUCTOR	8.2 H
L4	INDUCTOR	8.2 H
L5	INDUCTOR	8.2 H
U1	INTEGRATED CIRCUIT	TL072
U2	INTEGRATED CIRCUIT	TL072
U3	INTEGRATED CIRCUIT	TL072
U4	INTEGRATED CIRCUIT	TL072
U5	INTEGRATED CIRCUIT	TL072
U6	INTEGRATED CIRCUIT	TL082

U7	INTEGRATED CIRCUIT	TL082
U8	INTEGRATED CIRCUIT	TL072
Z1	JUMPER	
Z2	JUMPER	
Z3	JUMPER	
J1	SHF 12 PIN CONNECTOR	

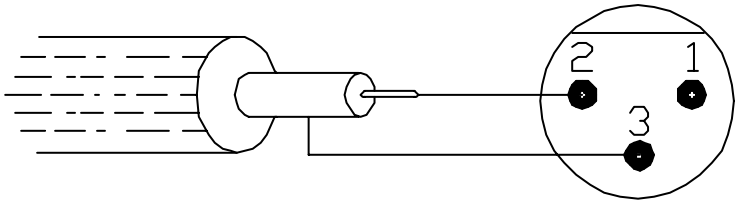
Wiring diagram for “XLR” CANNON connectors, either for NALANCED or UNBALANCED configuration.

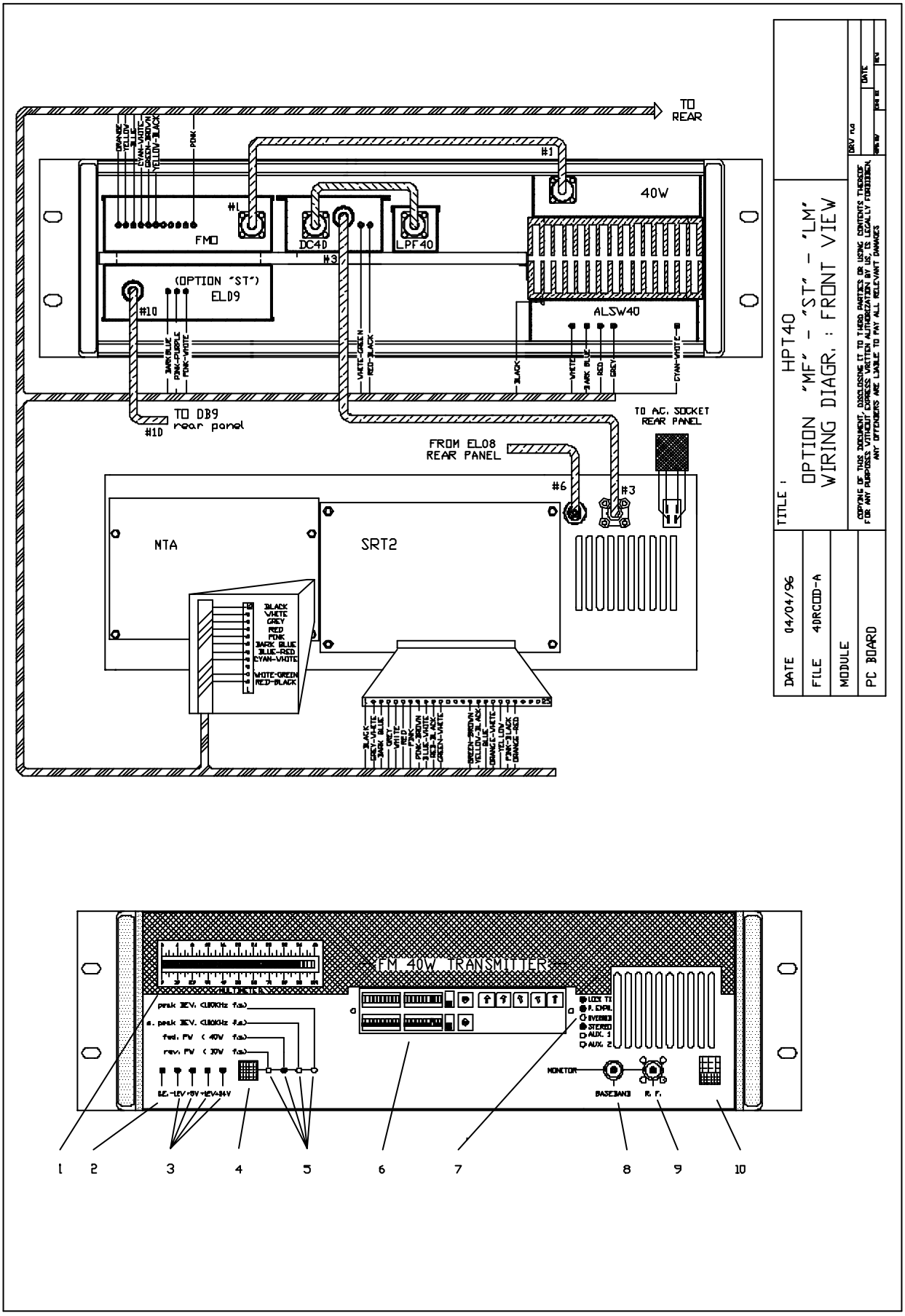
PIN 1	GND
PIN 2	+
PIN 3	-

BALANCED LINE

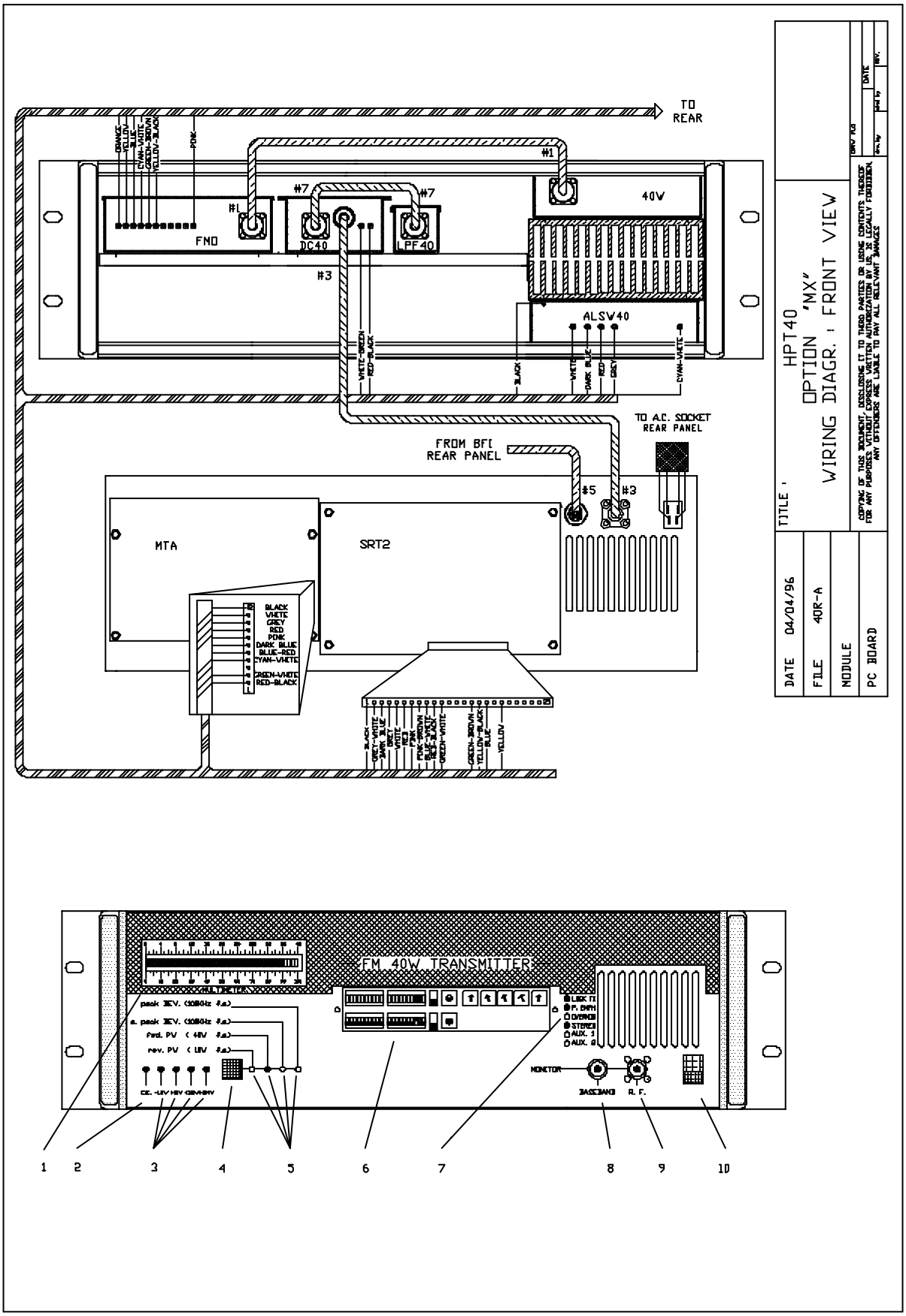


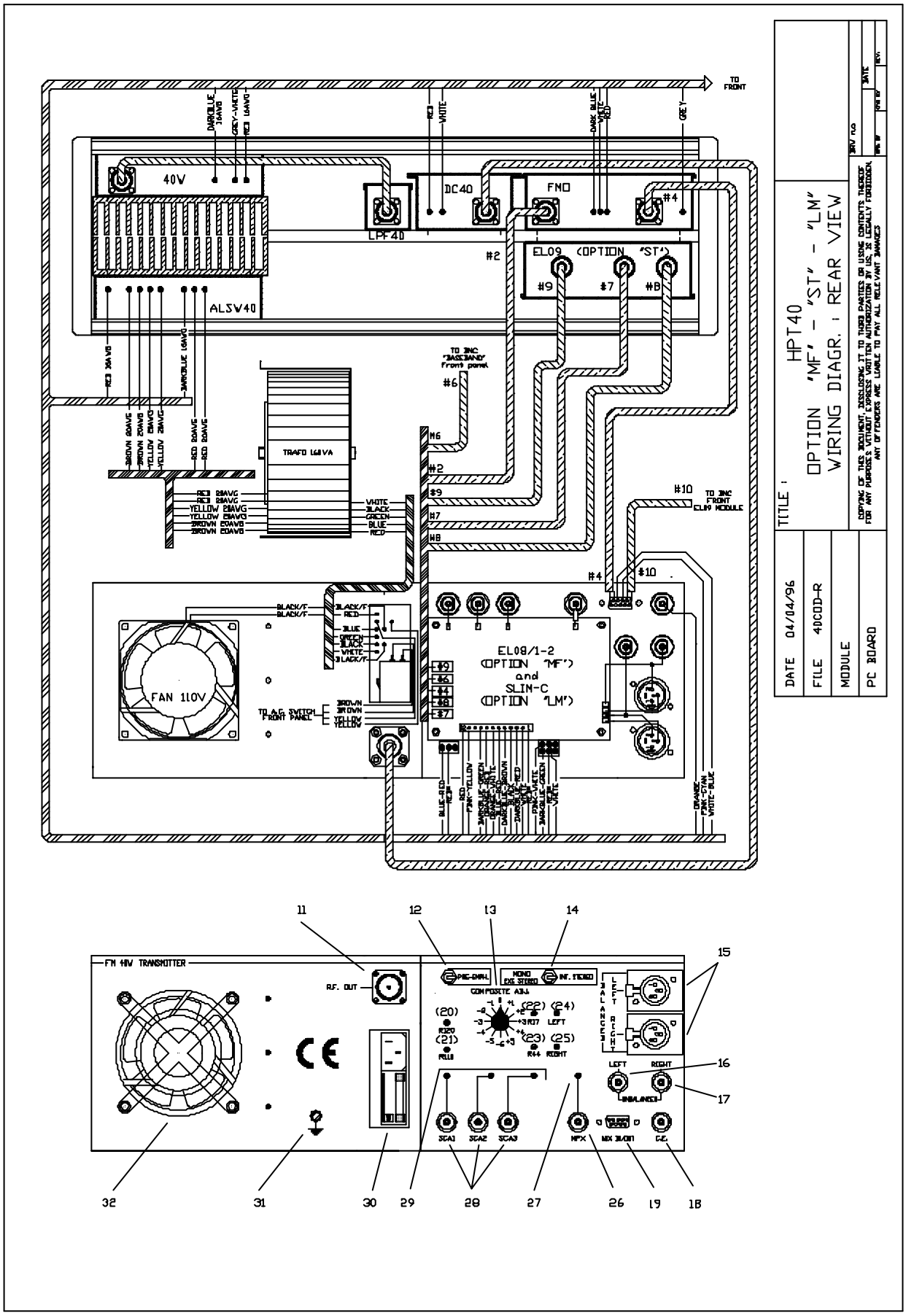
UNBALANCED LINE

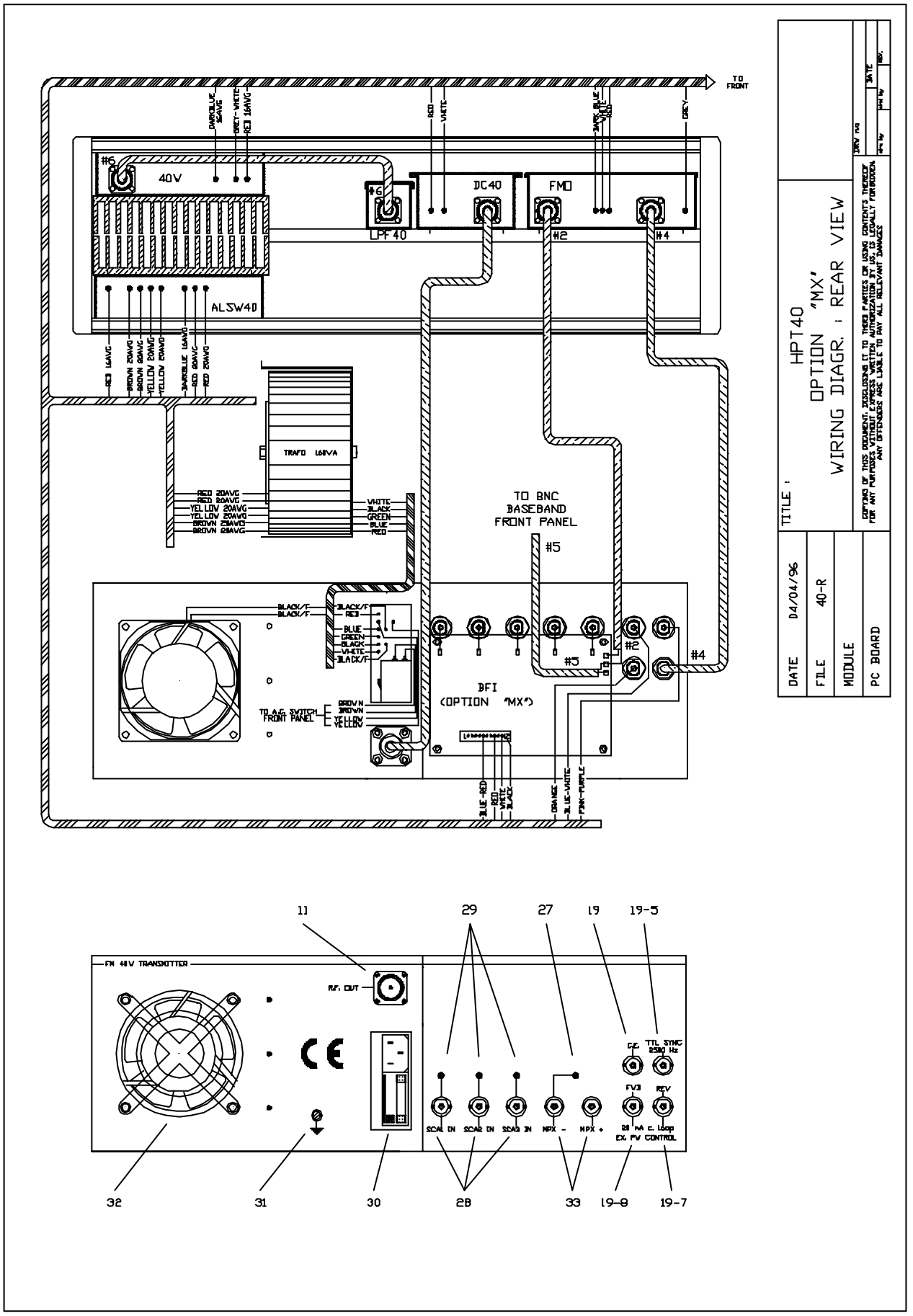



TO REAR
FM0
DC40
LPF40
40W
(OPTION "ST")
EL09
ALSW40
TO DB9
rear panel
#10
#1D
TO AC. SOCKET
REAR PANEL
FROM EL08
REAR PANEL
#6
#3
MTA
SRT2
TITLE :
HPT40
OPTION "MF" - "ST" - "LM"
WIRING DIAGR. : FRONT VIEW
DATE 04/04/96
FILE 40RCOD-A
MODULE
PC BOARD

FM 40W TRANSMITTER
1
2
3
4
5
6
7
8
9
10


TO REAR
FMO
DC40
LPF40
40W
ALSW40
#1
#3
#5
#7
FROM BFI REAR PANEL
TO A.C. SOCKET REAR PANEL
MTA
SRT2
TITLE : HPT40 OPTION 'MX' WIRING DIAGR. : FRONT VIEW
DATE 04/04/96
FILE 40R-A
MODULE
PC BOARD
FM 40W TRANSMITTER
MULTIMETER
MONITOR
BASEBAND
R. F.
1
2
3
4
5
6
7
8
9
10


TITLE :
OPTION 'MF' - "ST" - "LM"
WIRING DIAGR. : REAR VIEW
HPT40
DATE 04/04/96
FILE 40COD-R
MODULE
PC BOARD
40V
DC40
FMD
LPF40
ALSW40
EL09 (OPTION "ST")
TRAFO 160VA
FAN 110V
EL08/1-2
(OPTION "MF")
and
SLIN-C
(OPTION "LM")
TO FRONT
TO INC. "BASSBAND" Front panel
TO INC FRONT EL09 MODULE
TO A.F. SWITCH FRONT PANEL
FM 40W TRANSMITTER
R.F. OUT
MONO
STEREO
COMPOSITE A.F.
LEFT
RIGHT
BALANCED
SCA1
SCA2
SCA3
MPX
MIX IN/OUT
C.E.


TO FRONT
#6
40V
#6
DC40
FM□
LPF40
#2
#4
ALSW40
TRAFO 160VA
TO BNC BASEBAND FRONT PANEL
#5
BFI (OPTION "MX")
#2
#5
#4
TRIAC SWITCH FRONT PANEL
HPT40
OPTION "MX"
WIRING DIAGR. : REAR VIEW
TITLE :
DATE 04/04/96
FILE 40-R
MODULE
PC BOARD
DRW no
DATE
REV.
drw by
chk by
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11
29
27
19
19-5
FM 40W TRANSMITTER
RF. OUT
TTL SYNC 2580 Hz
FWD
REV
SCA1 IN
SCA2 IN
SCA3 IN
MPX -
MPX +
4-20 mA C. Loop EXT. PW CONTROL
32
31
30
28
33
19-8
19-7

PROCEDURES OF THE HPT40 ADJUSTMENTS

TEST EQUIPMENT DETAILS

TYPE	*PERFORMANCE*	*MODEL*	*MANUFACTURER*
Signal Generator	**100 KHz - 1000 MHz**	**SMX**	**Rohde & Schwarz**
Oscilloscope	**DC - 60 MHz**	**PM 3050**	**Philips**
Spectrum analyzer	**50 Hz - 2.9 GHz**	**HP - 8560A**	**Hewlett Packard**
Modulation Analyzer	**50 KHz - 5.2 GHz**	**FMB**	**Rohde & Schwarz**
Digital Multimeter	**5 ½ digit**	**UDL44**	**Rohde & Schwarz**
Attenuator	**40 dB - 100 Watt**	**16-3763**	**Delta Ohom**
Thruline Wattmeter	**50 - 125 MHz 5 Watt**	**43**	**Bird**
RF Power Meter	**10 MHz - 18 GHz**	**6950**	**Marconi Instruments**

1 PRELIMINARY CHECK

1.1 These technical procedures must to go with the fill of the ADJUSTMENT FORM

1.2 Please see the details written on the INPUT and QUALIFICATION FORMS

1.3 Make sure the voltage-switchover (located inside the AC socket on the rear panel) is set properly and that the fuse housed in the same socket is of the right value according to the AC voltage used (see the "PREFACE" chapter in this manual) and power up the equipment

2 ALSW40 POWER SUPPLY

2.1 Adj. R6 trimmer of ALSW40 to bring the voltage on the passing capacitor CP11 (Red wire) to the value of 12.5VDC
2.2 Adj. R21 trimmer of ALSW40 to bring the voltage on the passing capacitor CP10 to the value of 28VDC

2.3 Check the DC voltages on the grey, bleu and white wires, in order to have +5V, +24V, -12V

2.4 To stress by plastic screwdriver the soldering of ALSW40 board, and verify the correct fixing of the power transistor screws

2.5 To write these values on the ADJUSTMENT FORM

3 EL08 board - LIM C

3.1 Verify the requested Input Impedance (600 or 10Kohm) and consequently insert the J1, J2, J3 and J4 jumpers in correct position. Test the switches of the PRE-EMPHASIS and of the EXT-INT STEREO. Switch off the internal stereo coder and the Pre-emphasis, verify the position of the 1dB step Attenuator, located on the rear panel, normally adj. @ 0dB.

3.2 Insert an audio signal, from FMB Modulation Analyzer and with the same level highlight on the INPUT FORM, into LEFT input and to verify with AC multimeter the correct value, and balance, if necessary, the voltage drop due to Output Impedance of the Audio Generator. Connect the BASEBAND output to Oscilloscope and check the distortion @ 1KHz Audio Input Signal, and, if necessary, adj. R13 trimmer to have minimum distortion

3.2.1 Set the Audio Signal Generator @ 19KHz and adj. L2 coil to minimum distortion

3.2.2 Set the Audio Signal Generator @ 21.5KHz and adj. L3 coil to minimum distortion

3.2.3 Set the Audio Signal Generator @ 1KHz, make a reference to 0dBr, and adj. L1 coil in order to have the same value @ 15KHz

3.2.4 Verify the ripple in 1KHz-15kHz band, no more than +/-0.15dB, refereed to 1KHz

3.2.5 Set the Audio Signal Generator @ 15KHz and 20dB minus of the Nominal Audio Input (-14dBm is corresponding to 6dBm Nominal Audio Input), and adj. R13 & R17 for choice pre-emphasis value (50 or 75 S)

3.2.6 Turn the pre-emphasis OFF and set the Audio Signal Generator @ 1KHz and Nominal Audio Input, and adj. R13 trimmer in order to have 1550 V rms to BASEBAND output

3.3 Repeat the procedures 3.2 for RIGHT channel, replacing these values

R14 with R40	L1 with L4
R17 with R44	L2 with L5
	L3 with L6

3.4 Set the Audio Signal Generator @ 1KHz and Nominal Audio Input into MPX audio input, and adj. R53 trimmer in order to have 1.550Vrms to BASEBAND output

3.5 Set the Audio Signal Generator @ 57KHz and Nominal Audio Input into SCA 1, 2, 3 audio inputs, and adj. R85, R92 and R98 trimmers in order to have 155mV rms to BASEBAND output (typical value)

3.6 Set the Audio Signal Generator @ 1KHz and Nominal Audio Input into MPX audio input, and adj. R110 trimmer in order to have 75KHz Deviation to BAR-GRAF multimeter

3.7 Set the Audio Signal Generator @ 1KHz and Nominal Audio Input into MPX audio input, and adj. R120 trimmer in order to have lighted the over-modulation led

3.8 Check by BASEBAND Output if the 1dB step Attenuator is working

3.9 With Deviation Limiter option, set the Audio Signal Generator @ 1KHz and Nominal Audio Input into LEFT audio input, and adj. RT1 trimmer of the LIM board in order to see the CLIPPER function on the Oscilloscope connected to BASEBAND Output

3.10 Stress by plastic screwdriver the soldering of EL08/1-2 and LIM C boards

4 STEREO CODER EL09

4.1 Insert an audio signal, from FMB Modulation Analyser set @ 1KHz and Nominal Audio Input into LEFT audio input, turn on the stereo coder by switch, connect the BASEBAND output to Oscilloscope and check the presence of MPX signal, adj. the C24 capacitor in order to synchronise the 19KHz sub-carrier with 1KHz envelope

4.2 Adj. R57 trimmer to get 2.8Vrms @ 19KHz on pin nr 7 of U14

4.3 Disconnect the audio input signal, connect the BASEBAND output to Oscilloscope and check the sub-carrier, adj. R36 trimmer for no offset

4.4 Adj. R12 trimmer to get 6V dc on R110

4.5 Disconnect the audio input signal, connect the BASEBAND output to FMB and check the 19KHz sub-carrier distortion value, better than 0.5%

4.6 Set the Audio Signal Generator @ 1KHz and Nominal Audio Input into LEFT+ audio input, and connect same signal into RIGHT-- and Oscilloscope External Trigger, connect the Oscilloscope CH1 input to BASEBAND output and check the presence of the double envelope, with superimposed the 19KHz pilot tone; optimisme the cross-talk of the two envelopes and to make coincide Left cross-talk with Right cross-talk by R59 pilot tone phase trimmer

4.7 Set the Audio Signal Generator @ 1KHz and Nominal Audio Input into LEFT audio input, and connect BASEBAND output to STEREO DECODER; check the Left&Right separation. For improve the separation adj R30 trimmer in order to get 70dB or better. If necessary, add a suitable capacitor (typ 330 pF-1800 pF), in parallel to C43 capacitor, by the C10 & C42 free holes (components not mounted)

4.8 Repeat the 4.7 procedure for RIGHT audio input, and act on the R59 and R30 trimmers in order to have better Separation in the 87.5-108MHz band and both audio channels

4.9 Check the Vpp of the MPX signal, with nominal audio input, and act on the R70 trimmer to have 1.1Vpp value; therefore turn off the nominal audio input and to measure the subcarrier value, acting on the R36 trimmer to have 110mVpp value

4.10 Set the Audio Signal Generator @ 1KHz and Nominal Audio Input into LEFT audio input, and check the distortion of the decoded MPX, and optimize the distortion by R12 trimmer (typ. <0.02%)

4.11 Set the Audio Signal Generator @ 15KHz and Nominal Audio Input into LEFT+ audio input, and connect same signal into RIGHT--; in this way you transmit the stereo information only, and this condition represents the very worst event for engaged base band and out band spurious emission.
Connect the Spectrum Analyzer to BASEBAND output, through Oscilloscope Probe, set @ x1
Adj the pilot subcarrier at - 21dBr, and check in 0-53 KHz band the presence of two lines with -7dBr @ 23KHz and 53KHz
Check the 38KHz suppression (typ 65dBr), the line at 15KHz (typ. 50dBr), and if necessary adj. very fine the audio input level (left or right) and/or the L1 or L4 coil composing the 15KHz Low Pass Filter.
Moreover to check the response of the out band spurious in the 53-200KHz band (<65dBr) and in the 200-1000KHz band (<70dBr)

4.12 Stress by plastic screwdriver the soldering of the board

5 VCO module FMO

5.1 Disconnect the audio input cable from input BNC connector (BF-IN), adj the voltage value in order to have 3.16Vdc on the 1 pin of the U6 (corresponding to crystal temperature =50°C)

5.2 After setting the rotary switches @ 100MHz, connect the OUT-VCO connector to S.ANALYZER, in order to check the spurious emission, with CENTER FREQUENCY=100MHz, SPAN=100MHz, REF LEVEL=20dBm. Turn off and turn on the exciter and to check at the S.A. the 100 MHz signal =10-12dBm

5.3 Connect the OUT-VCO connector to MODULATION ANALYZER, in order to check residual noise value lower than 9Hz (CCIR filter inserted)

5.4 Turn C36 capacitor to have the precision frequency 100MHz +/-100Hz

5.5 Reconnect the audio input cable from input BNC connector (BF-IN), turn off the Pre-emphasis by switch, turn off the stereo coder by switch, set the Audio Signal Generator @ 1KHz and Nominal Audio Input into LEFT audio input, adj the deviation at 75KHz by RT1 trimmer. Change the transmitter frequency in the range 87.5-108MHz and verify the range (included +/-1dB). If necessary adj RT1 trimmer

5.6 Stress by plastic screwdriver the soldering and mechanical parts of the board

6 RF AMPLIFIER MODULE AND ACCESSORIES (DC40, 40W and SRT boards)

6.1 Disconnect the RF input cable from the 40W module, set in ON position the dip-switches nr 10 and 20 of the MAX SET OUTPUT POWER SWITCHES, located on the EL10 Front Panel board

6.2 Turn anti-clockwise the two trimmers RT1 and RT3 of the Directional Coupler; cancel the output offset on CP1 and CP2, by acting on RT2 and RT4

6.3 Act on the R10 trimmer (40W module) to have 0.35V drop in parallel to 1 ohm R8 resistor, corresponding Idriver =350mA

6.4 Act on the R17 trimmer (40W module) to have 0.33V drop in parallel to 0.33 ohm R13 resistor, corresponding Ifinal =1A

6.5 Connect a 50W Dummy Load, a 40dB attenuator, a reflected PWR Wattmeter, a Bolometer, in serie to RF Output of Transmitter; set the RF Signal Generator @ 98MHz and 12dBm output, connect the RF signal generator to RF-IN of the 40W module; turn clockwise RT1 and RT2 trimmer (SRT board), to have 40W output power

6.6 Set the RF Signal Generator @ 88MHz and 108MHz, to have 40W output power; if necessary, modify L13 coil dimension or adj the bias of the driver transistor and final transitor

6.7 Set the RF Signal Generator @ 100MHz and turn anti-clockwise RT2 trimmer of the SRT board to decrease the output power till to reach 20W or similar on the panel Wattmeter; the Bolometer will read a value lower than 40W; now adj L4 coil (DC40 module) to have same Bolometer reading in the range 88-98-108MHz; now set the RF Signal Generator @ 98MHz and act on the trimmer RT2 (DC40 module) to have 20W or similar on the Bolometer reading

6.8 Set in OFF position the dip-switches nr 20 of the MAX SET OUTPUT POWER SWITCHES, located on the SRT Front Panel board (so is set 20W O.P.); turn the Directed Power Trimmer to the full

scale (clockwise); the Bolometer will read a PWR value higher than 20W; now adj RT3 trimmer to have 20W on the Bolometer reading

6.9 Set different MAXIMUM OUTPUT POWERS by selected the MAX SET OUTPUT POWER SWITCHES, and verify the correct reading

6.10 Turn the RT1 trimmer (SRT board) of the reflected power completely anti-clockwise; disconnect the Dummy Load, and reading the PWR of the reflected PWR Wattmeter, turn the RT1 trimmer (SRT board) of the reflected power to have 4W reading on the exciter leds-bar; set the RF Signal Generator @ 88-98-108MHz and modify L13 coil dimension (DC40) to have a constant value on the reflected PWR Wattmeter; set the RF Signal Generator @ 98MHz and adj RT2 trimmer (DC40 module) to have 4 W reading on the exciter leds-bar

6.11 Stress by plastic screwdriver the soldering and mechanical parts of the board, and fill in the ADJUSTMENT FORM

7 BFI board

7.1 Verify the requested Input Impedance (600 or 10Kohm) and consequently insert the Z1 and Z2 jumpers in correct position, for MPX input

7.2 Insert Z3 Pre-emphasis Jumper in ON position; set the Audio Signal Generator @ 15KHz and minus -20dBm, into MPX input; connect the Output Monitor to MODULATION ANALYZER, adj P5 trimmer to have a value difference of the 13.67dB from Pre-emphasis ON and OFF (16.84dB for FCC)

7.3 Disconnect the Pre-emphasis, set the Audio Signal Generator @ 1KHz and Nominal Audio Input into MPX+ audio input; adj P1 trimmer, located next to MPX+ audio input connector, to read 1550mV rms on the Modulation Analyzer. Same procedure and final result for MPX- audio input

7.4 Set the Audio Signal Generator @ 57KHz and Nominal Audio Input into SCA1 audio input; adj P2 trimmer, located next to SCA1 audio input connector, to read a correct ratio with previous MPX output on the Modulation Analyzer

7.5 Repeat the procedures 7.4 for SCA2 audio input, adj P3 trimmer

7.6 Repeat the procedures 7.4 for SCA3 audio input, adj P4 trimmer

7.7 Set the Audio Signal Generator @ 1KHz and Nominal Audio Input into MPX+ audio input; adj P6 trimmer (BFI board) to read 75KHz deviation on the exciter leds-bar

PROCEDURES OF THE ELC40 TEST

TEST EQUIPMENT DETAILS

TYPE	*PERFORMANCE*	*MODEL*	*MANUFACTURER*
Spectrum Analyzer	**9 Khz - 26.5 Ghz**	**HP-8563E**	**Hewlett Packard**
Signal Generator	**100 Khz - 1000 Mhz**	**SMG**	**Rohde & Schwarz**
Audio Analyzer	**10 hz - 100 Khz**	**UPA**	**Rohde & schwarz**
Multifunction Synthesizer	**DC - 600 Khz**	**HP - 8904-A**	**Hewlett Packard**
Oscilloscope	**DC - 60 Mhz**	**PM-3050**	**Philips**
Digital Multimeter	**6 ½ digit**	**8840-A**	**Fluke**
Modulation Analyzer	**55 Khz - 1360 Mhz**	**FAM**	**Rohde & Schwarz**
Stereo monitor decoder	**20 hz - 15 Khz**	**FMS - 2**	**Belar**
Stereo Coder	**40 hz - 15 Khz**	**MSC2**	**Rohde & Schwarz**
Stereo Decoder	**40 hz - 15 khz**	**MSDC2**	**Rohde & Schwarz**
Thruline Wattmeter	**50 - 200 Mhz**	**Model 4412**	**Bird**
Coaxial Resistor	**50 ohm - 500 Watt**	**Model 8201**	**Bird**

1 PRELIMINARY COMMENT

1.1 This technical procedures must to go with the fill of the TEST FORM

1.2 The TEST of the HPT40 exciter must to be realized by different engineering (no ADJUSTEMENT technician) and different Test Equipment

1.3 Before realise the TEST verify the ADJUSTEMENT, INPUT and QUALIFICATION FORMS, in order to note the possible previous faults indicated from previous technicals, or customer request

2 ALSW40 POWER SUPPLY

2.1 Connect a 50W Dummy Load in serie to RF Output of Transmitter; and TURN ON the exciter set @ 100MHz, maximum RF POWER

2.2 Check the DC voltages, on the output wires, with following tollerance:

VOLTAGE (V)	+ max (V)	- max (V)	ripple (mV)	colour
-12	1	1	< 5	white
+5	0.2	0.2	< 5	grey
+12.5	0.5	0.5	< 8	red
+24	1	1	< 5	bleu
+28	0.1	0.5	< 60	red-big

2.3 Stress by plastic screwdriver the soldering of ALSW40 board, and verify the correct fixing of the power transistor screws

3 EL08 board - LIM C

3.1 Set the UPA Modulation Analyzer @ Nominal Audio Input into LEFT input and verify with AC multimeter the correct value, and to balance, if necessary, the voltage drop due to Output Impedance of the Audio Generator, take off the Pre-emphasis and to switch off the internal stereo coder, verify the position of the 1dB step Attenuator, located on the rear panel, normally adj. @ 0dB

3.2 Set the UPA Mod. Analyzer @ 1KHz and verify from BASEBAND output the level =+6dBm 01dB

3.3 Verify the ripple in 1KHz-15KHz band, lower than 0.15dB, referred to 1KHz

3.4 Verify the out band attenuation >45dB in the range 19KHz-53KHz

3.5 Set the Audio Signal Generator @ 15KHz and 20dB minus of the Nominal Audio Input (-14dBm is corresponding to 6dBm Nominal Audio Input), and verify the correct Pre-emphasis Response (13.67dB for 50uS and 16.84dB for 75uS)

3.6 Repeat the procedures 3.2, 3.3, 3.4, 3.5 for RIGHT audio input

3.7 Switch off the Pre-emphasis

3.8 Check the requested Input Impedance

3.9 Check the light up of the OVERMODULATION LED, with 0.5dB of the Audio Input Variation

3.10 Set the Audio Signal Generator @ Nominal Audio Input into MPX audio input, and verify the correct value =1550mVrms 0.1dB to BASEBAND output

3.11 Set the Audio Signal Generator @ 57KHz and Nominal Audio Input into SCA 1, 2, 3 audio inputs, and verify the value =155mVrms to BASEBAND output (typical value)

4 EL09 STEREO CODER TEST

4.1 Switch ON the internal stereo coder, and verify on the BASEBAND output the 19KHz sub-carrier level (-14 17dBm). Typically is -14dBm or 155mVrms

4.2 Verify the 19KHz sub-carrier distortion, better than 0.5% (value proportional to 38KHz suppression)

4.3 Set the Audio Signal Generator @ 1KHz and Nominal Audio Input into LEFT audio input, and check the Stereo Separation on the BELAR Stereo monitor

4.4 Repeat the procedure 4.3 for RIGHT audio channel

4.5 Extend the previous measure in the audio range 40Hz, 300Hz, 1KHz, 5KHz, 15KHz for LEFT and RIGHT audio channel, with Pre-emphasis (Exciter) and De-emphasis (BELAR Stereo monitor) OFF

4.6 Repeat the previous procedure with the MSDC2 Rohde Schwarz Stereo Decoder, and verify the results better than 60dB; if necessary adj the Stereo Decoder Equipment with the same phase, through the HP multifunction Synthesizer; if necessary, adj the 19KHz pilot phase (EL09 module)

4.7 Set the UPA Audio Analyzer @ 1KHz and Nominal Audio Input into LEFT audio input, and connect the BELAR Decoder to BASEBAND output; take the Belar Decoded and De-emphasis Output into UPA Audio Analyzer, and check the distortion better than 0.03%

4.8 Connect RF EXCITER PROBE at FAM RF INPUT, take FAM REAR MPX OUTPUT and connect it at BELAR Decoder; in this condition repeat the procedures 4.3, 4.4, 4.5 and verify the stereo-separation better than 48dB (this value is the limit for this test equipment)

4.9 Hold the test equipment how previous procedure, connect the Belar Decoded and De-emphasis Output into UPA Audio Analyzer, check the S/N with 300Hz audio signal and nominal audio input, make a reference at 0dBr, deconnect the audio input and read the result on the UPA equipment better than 80dB

4.10 Repeat the 4.9 procedure, taking the BASEBAND monitor instead of FAM REAR MPX OUTPUT, and read the result better than 85dB

4.11 Stress by plastic screwdriver the soldering of EL09 board

5 FMO module (VCO Oscillator)

5.1 Check that the voltage on the pin nr 1 of the U6 is 3.16V 0.01V; touch with finger the crystal case in order to verify the tolerant temperature (50°C); infact any problem in this circuit bring the temperature at two possible values, ambient temperature or 70°C

5.2 Set the front panel rotary-switches @ customer frequency or 100MHz, connect RF probe to FAM, and check the frequency precision (100Hz tolerance)

5.3 In this condition, check the Residual Noise value in the range indicate from the TEST FORM, value lower than 5Hz in the range 30Hz-20KHz; check the S/N weighted (CCIR option), value better than 77dB, refered at 75KHz and De-emphasis off

5.4 Connect the VCO output to Spectrum Analyzer, and check the amplitude, included in the range 10 13dBm

5.5 Set the front panel rotary-switches @ 88 MHz, check that the voltage on the pin nr 1 of the U4 is higher than 3V

5.6 Set the front panel rotary-switches @ 108MHz, check that the voltage on the pin nr 1 of the U4 is higher than 10V

5.7 Set the front panel rotary-switches @ frequencies displayed on the TEST FORM, with set the following parameters: MONO mode, 1KHz Audio Signal and nominal audio input; check that the frequency deviation is 75KHz 1dB

5.8 In the previous condition, check that the DISTORTION is better than 0.03%

5.9 Stress by plastic screwdriver the soldering of the VCO module; check also the microphonique quality

6 OUTPUT POWER

6.1 Set the front panel rotary-switches @ 87.5MHz, set in ON position the dip-switches nr 10 and 20 of the MAX SET OUTPUT POWER SWITCHES, located on the SRT Front Panel board; the RF Output Power will reading higher than 38W (with the Direct PWR trimmer to the full scale, clockwise); check now on the S.Analyzer that the second Harmonic is better than 70dBc (attention to saturation of the S. Analyzer RF input)

6.2 Set now in OFF position the dip-switch nr 20 of the MAX SET OUTPUT POWER SWITCHES (so is set 20W O.P.); the Output Power will reading 20 W 1W

6.3 Disconnect the Dummy Load, and read than the Reflected Power is 4W 1W. Check on the Spectrum Analyzer the Spurios presence (due to Final Stage instability)

6.4 Repeat the procedures nr 6.1, 6.2 and 6.3 for 98MHz Output Frequency

6.5 Repeat the procedures nr 6.1, 6.2 and 6.3 for 108MHz Output Frequency

6.6 Check the RF coaxial cables and respective RF connectors, and stress by plastic screwdriver the solderings

7 AUDIO FREQUENCY (BFI board)

7.1 Read the Customer request, regarding the MPX Input Impedance (600 or 10Kohm) and consequently insert the Z1 and Z2 jumpers in correct position

7.2 Insert Z3 Pre-emphasis Jumper in ON position; set the Audio Signal Generator @ 15KHz and minus -20dBm, into MPX+ input; connect the Output Monitor to MODULATION ANALYZER and check that the value difference is 13.67dB from Pre-emphasis ON and OFF (16.84dB for FCC)

7.3 Disconnect the Pre-emphasis, set the Audio Signal Generator @ 1KHz and Nominal Audio Input into MPX+ audio input; check that the Output monitor is 1550mVrms

7.4 Set the Audio Signal Generator @ 57KHz and Nominal Audio Input into SCA1 audio input; check that there is a correct ratio between MPX and SCA

7.5 Repeat the procedures 7.4 for SCA2 audio input

7.6 Repeat the procedures 7.4 for SCA3 audio input

7.7 Set the Audio Signal Generator @ 1KHz and Nominal Audio Input into MPX+ audio input; check that the exciter leds-bar are reading 75KHz deviation