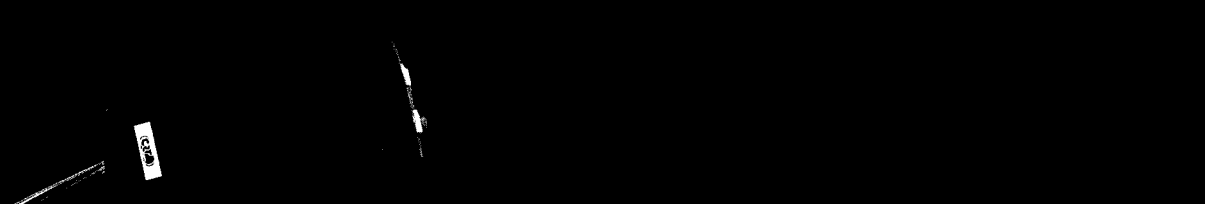
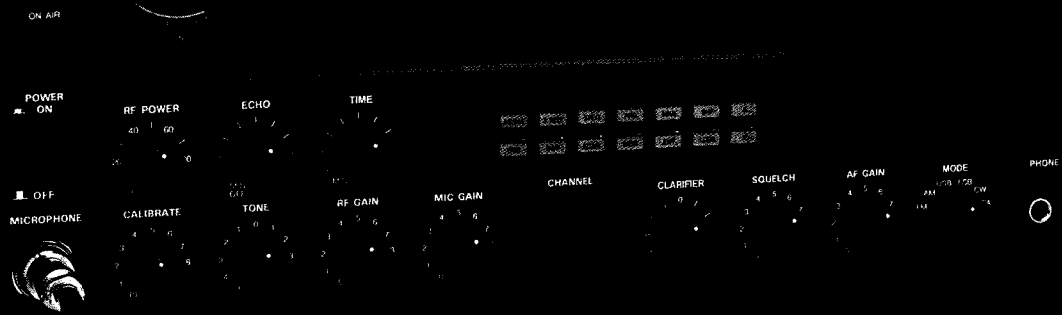




# SUPERSTAR®



## HERCULE TURBO



# HERCULE TURBO

# CRT HERCULE TURBO

## GÉNÉRALITÉS :

Fréquences couvertes	:	28 0000 à 29 6999 Mhz	EXPORT 26 à 32 MHz
Fonction Split	:	Semi duplex activé	
Pas d'incrémentation	:	100 Hz, 1 KHz, 10 KHz, 100 KHz, 1 Mhz	
Classes d'émission	:	USB, LSB (J3E) CW (A1A) AM (A3E) FM (F3E)	
Fréquence control	:	PLL synthétisé	
Fréquence tolérance	:	0,005 %	
Fréquence stabilité	:	0,001 %	
Température de fonctionnement	:	0°C à 40°C	
Antenne impédance	:	50 Ohms	
Haut parleur impédance	:	8 Ohms, 2 Watts	
Micro impédance	:	400 Ohms, pastille dynamique	
Affichage	:	Digital LCD	
Alimentation	:	220 V AC	

## ÉMETTEUR :

Puissance de sortie antenne	:	AM/FM : 50 W - USB/LSB/CW : 100 W
Fréquences parasites	:	- 50 Db
Suppression de la porteuse	:	- 50 Db
Connecteur antenne	:	UHF 50 (SO239)
Modes de transmission	:	USB, LSB, CW, AM, FM

## RÉCEPTEUR :

Réception pour 10 Db de signal/bruit AM	:	0,5 Microvolts USB/LSB/CW : 0,3 Microvolts FM : 1 Microvolt
Rejection image	:	65 Db
AGC Figure	:	SSB/CW/AM : 80 Db pour 50 Microvolts pour 10 Db change en BF sortie
Puissance BF à 10 % de distorsion	:	2,5 Watts
Principe de réception	:	Double changement de fréquence (10 695 Mhz et 455 KHz)

AGRÈMENT PTT : 910021 AMA 1



DISTRIBUTEUR AGRÉÉ :

**SERVICE MANUAL**

**CRT HERCULE  
TURBO**

# CRT HERCULE TURBO

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# CRT HERCULE TURBO

## SPECIFICATIONS

### GENERAL

<b>Model</b>	<b>HERCULE TURBO</b>
Frequency	28.000 -- 29.699MHz
Emission Steps	AM, FM, CW, USB, LSB
Frequency Control	Phase - Locked - Loop Synthesizer
Frequency Tolerance	0.005%
Frequency Stability	0.005%
Temperature Ranger	- 30°C to + 55°C
Antenna Impedance	50 Ohms
Meter Function	RF Output, RX Receive Signal Strength Modulation, SWR Calibration, SWR
Input Voltage	AC 110V,60Hz (AC 220V,50Hz)

### TRANSMITTER

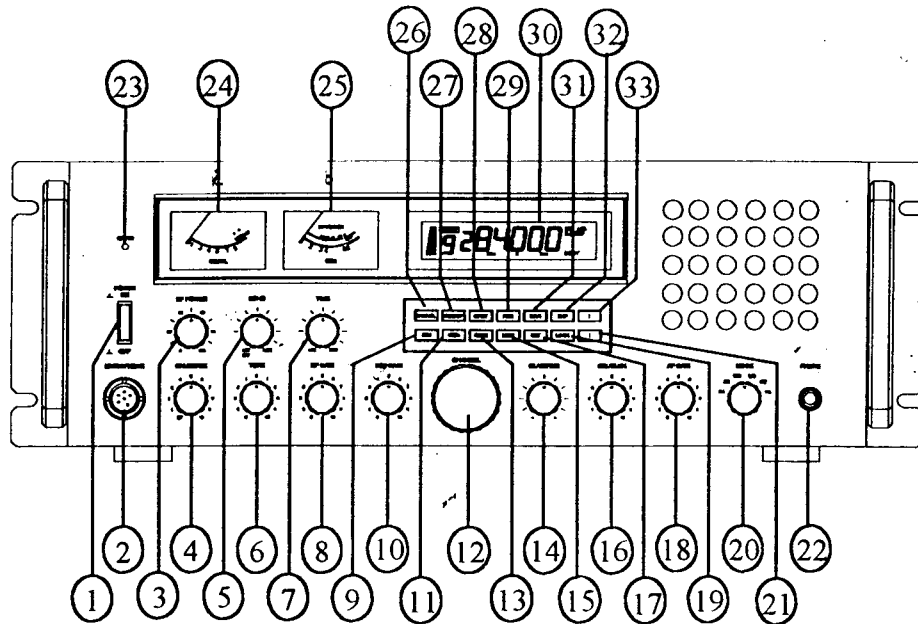
RF Power Output	100W : USB, LSB 50W : AM/FM/CW
RF Transmit Modes	AM, FM, CW, USB, LSB
Antenna Connector	UHF Type, 50 Ohms
Modulation	16F3
Spurious Emissions	-60dB
Carrier Suppression	-60dB

### RECEIVER

Sensitivity for 10dB S/N	AM 1.0uV
Sensitivity for 10dB S/N	USB/LSB/CW 0.2uV
Sensitivity for 20dB S/N	FM 1.0uV
Image Rejection Ratio	-65dB
AGC Figure of Merit	SSB/CW/AM : 80dB for 50mV for 10dB Change in Audio Output
Audio Output Power @ 10% THD	2.5W

# SATURN TURBO

## SECTION 1 OPERATION



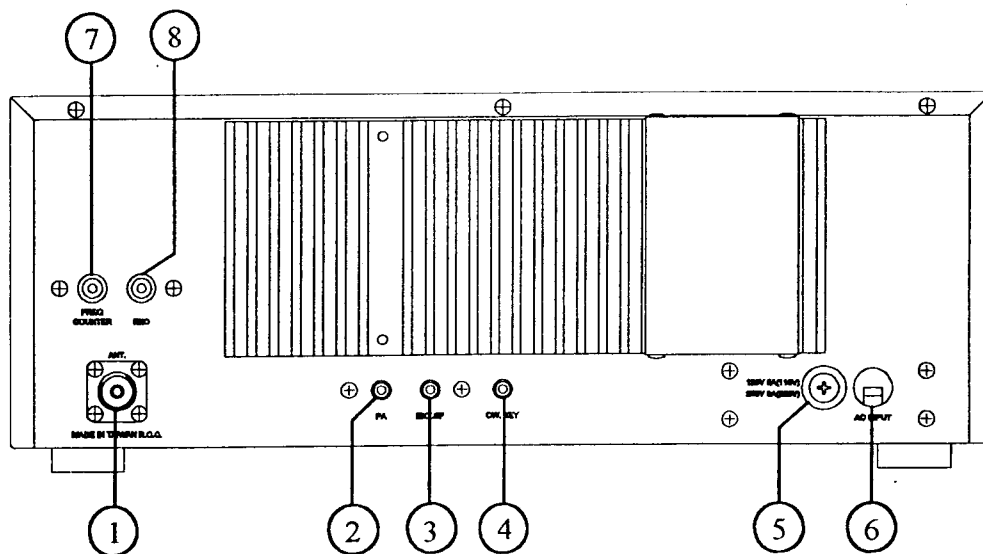
### 1.0 INTRODUCTION

This section explains the basic operating procedures for the **HERCULE TURBO** Citizen's Band 11 meter mobile transceiver.

### 1.1 CONTROL & CONNECTIONS

1. **POWER ON/OFF CONTROL** : Push on to apply power to the unit.
2. **MICROPHONE JACK** : Used to connect microphone for voice source.
3. **RF POWER CONTROL** : This control that to adjust the RF power output level you want in AM or FM transmission.
4. **CALIBRATE CONTROL** : This control allows the user to calibrate the SWR meter.
5. **ECHO** : This control is used to ECHO effect.
6. **TONE** : This changes tonal sound quality when receiving. Clockwise rotation will emphasize the high tone.
7. **TIME** : Set this control to your desired echo delay.
8. **RF GAIN CONTROL** : This control is used to reduce the gain of the RF amplifier under strong signal conditions.
9. **DIM SWITCH** : This switch adjust the display backlighting in four different steps to best match environment.
10. **MIC GAIN CONTROL** : This control adjusts the microphone gain in the transmit mode. This feature is designed for use in a high-ambient noise environment or to maximize talk power.
11. **SWR SWITCH** : This switch is used to check SWR.
12. **CHANNEL SELECTOR** : This control is used to select a desired channel or frequency.

13. **SCAN SWITCH** : This switch is used to scan frequencies in each band segment. The operation section of this manual provides detailed information on using this scan control.
14. **CLARIFIER CONTROL** : Allows variation of the receiver operating frequency above and below the assigned frequency. Although this control is intended primarily to tune in SSB signal, it may be used to optimize AM/FM signals as described in the operating procedure paragraphs.
15. **MEMORY SWITCH** : This is used program memory channels.
16. **SQUELCH CONTROL** : This control is used to control or eliminate receiver background noise in the absence of incoming signal. For maximum receiver sensitivity, it is desired that the control be adjusted only to the point where the receiver background noise is eliminated. Turn fully counterclockwise, then slowly clockwise until the receiver noise disappears. Any signal to be received must now be slightly stronger than the average received noise. Further clockwise rotation will increase the threshold level which a signal must overcome in order to be heard. Only strong signal will be heard at a maximum clockwise setting.
17. **ENTER SWITCH** : This is used program frequencies in memory.
18. **AF GAIN** : Permits you to adjust the listening level when receiving.
19. **LOCK SWITCH** : This switch is used to lock a selected frequency.
20. **MODE CONTROL** : This control allows you to select one of six following operating modes : CW/FM/AM/LSB/USB/PA.
21. **▲ UP SWITCH** : This switch is used to move frequency upward to select a desired frequency.
22. **PHONE JACK** : Used to connect earphone to listening.
23. **POWER LED** : The RED LED indicate the unit is power on.
24. **SIGNAL METER** : The left hand meter provide indication of the signal strength of a received signal in S units during reception.
25. **RF/SWR METER** : Used for two purpose, to indicate relative transmitter power when transmitting and to indicate antenna SWR.
26. **NB/ANL SWITCH** : The noise blacker is very effective in eliminating repetitive impulse noise such as ignition interference. In the ANL position the automatic noise limite in the audio circuits is activate.
27. **ROGER BEEP SWITCH** : When this switch is placed in the ROGER BEEP position, you radio automatically transmit the audio sign at the end of you transmission. The listener can note easily your transmission is over through the sign.
28. **SPLIT SWITCH** : This switch enables you to split and operating frèquency for FM repeater operation.
29. **PROGRAM SWITCH** : This switch is used to program operating or scanning frequency into memory.
30. **FREQUENCY COUNTER** : The frequency counter indicates the frequency of the selected channel you wish to operate on.
31. **MANUAL SWITCH** : This is used to return to the manual mode.
32. **SHIFT SWITCH** : This is used to select 100 Hz, 1KHz, 10KHz, 100KHz or 1MHz frequency steps.
33. **▼ UP SWITCH** : This switch is used to move frequency down ward to select a desired frequency.



## 1.2 REAR PANEL CONNECTOR

1. **ANTENNA** : This jack accepts 50 ohm coaxial cable with a PL-259 type plug.
2. **PA SP** : Used to connect a PA speaker (8 ohm 4w) for PA operation. Before operating PA you must first connect a PA speaker to this jack.
3. **EXTERNAL SPEAKER** : This jack accepts 4 to 8 ohm, 5 watt external speaker. When the external speaker is connected to this jack, the built-in speaker will be disabled.
4. **CW KEY** : This is used for Morse Code operation. To operate this mode, connect a CW key to this jack and place the mode switch in the CW position.
5. **FUSE** : Accommodates a fuse for AC input circuit protection. Use 125V 7A or 250V 4A fuse for replacement.
6. **AC POWER CORD** : Connects to AC power outlet for AC mains supply.
7. **FREQUENCY COUNTER JACK** : The RCA-type jack is used to connect an optional frequency counter so that you can watch channel frequency digitally. The frequency counter readout will be possible on transmit only.

8. **RECORDING OUTPUT JACK** : The RCA-type jack provides output for connection to a tape recorder to permit recording of receiver signals or your modulating voice.

## 1.3 MICROPHONE

The receiver and transmitter are controlled by the push-to-talk switch on the microphone. Press the switch and the transmitter is activated, release switch to receive. When transmitting, hold the microphone two inches from the mouth and speak clearly in a normal "voice". The radios come complete with low-impedance dynamic microphone.

## 1.4 OPERATION

### A. PROCEDURE TO RECEIVE

1. Be sure that power source, microphone and antenna are connected to the proper connectors before going to the next step.
2. Turn unit on by running **VOL** knob clockwise on transceiver.
3. Set the **VOL** for a comfortable listening level.
4. Set the **MODE** switch to the desired mode.
5. Listen to the background noise from the speaker. Turn the **SQ** knob slowly clockwise until the noise just disappears. Level



the control at this setting. This **SQ** is now properly adjusted. The receiver will remain quiet until a signal is actually received. Do not advance the control too far, or some of weaker signals will not be heard.

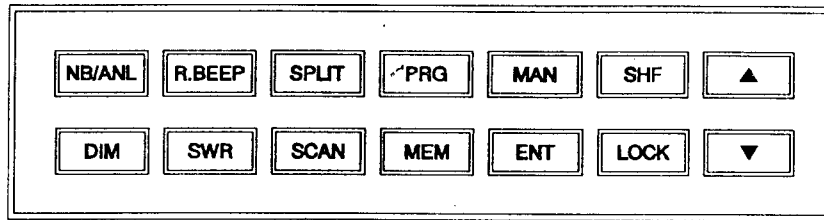
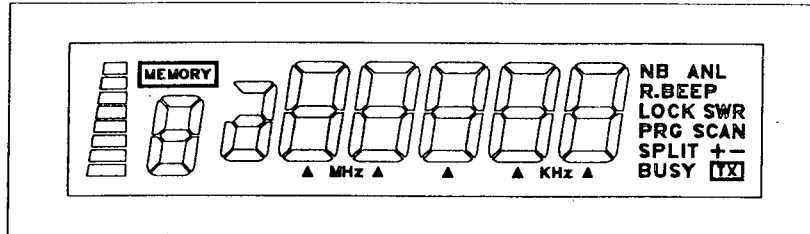
6. Set the **CHANNEL** select or switch to the desired channel or frequency.
7. Set the **RF** gain control fully clockwise for maximum **RF** gain.
8. Adjust **CLARIFIER** control to clarify the **SSB/CW** signals or to optimize **AM / FM** signals.

#### **B. PROCEDURE TO TRANSMIT**

1. Select the desired channel of transmission
2. Set the **MIC GAIN** control fully clockwise.
3. If the channel is clear, depress the push-to talk switch on the microphone and speak in a normal voice.

# CRT HERCULE TURBO

## SECTION 2 PROGRAMMING



### 2.0 INTRODUCTION

This section explains the basic programming procedures for the **HERCULE TURBO** amateur 10 meter mobile transceiver.

### 2.1 FREQUENCY SELECTION

Frequency selection in the radio can be accomplished using three of the following methods :

1. The first method of frequency selection is through the use of the **SHF** key and the **UP** and **DOWN** arrows. To accomplish this, press the **SHF** button until the cursor arrow is position under the digit of the frequency that is to be changed. Then use the **UP** arrow to increase the number. If a decrease in frequency is desired, press the **DOWN** arrow. Perform the steps described above for each digit of the frequency until the desired frequency is displayed in the **LCD** display windows.
2. The second method of frequency selection is accomplished using the **SHF** button and

the channel select knob located above the front panel. Use the **SHF** button in the manner described above to select the digit to be changed. Then proceed to rotate the channel select knob clockwise to increase the frequency. Rotate the channel select knob counterclockwise to decrease the frequency.

3. The third method of selecting the operating frequency of the radio is through the use of the **SHF** button and the channel **UP** and **DOWN** button located on the microphone. Frequency selection by this method is accomplished in the same manner as with the **UP** and **DOWN** arrows on the key pad. The only difference is that the channel **UP** and **DOWN** buttons on the microphone are used.

While in receive mode, once a signal has been detected on a particular frequency, It may be necessary to slightly change the frequency to provide the best audio through the speaker. This can be accomplished by rotating the clarifier control to

vary the frequency by  $\pm 0.5\text{KHz}$ . After this fine tuning has been accomplished, press the **LOCK** button to lock in the frequency at the point of best reception.

## 2.2 FREQUENCY SCANNING

Frequency scanning can be achieved using one of two methods: the first method involves the scanning of pre-programmed memory channels; the second method will permit the user to scan all frequency between a pre-set upper and lower scan limit. Both methods frequency scanning follow.

### 2.2.1 All Frequency Scanning

To allow all frequency scanning, one must first program the upper and lower scanning limits. The scan limits are simply the highest and lowest frequencies that will be scanned. To program these limits, perform the following steps;

1. Press the **PRG** (program) key.
2. Press the **SCAN** key ("**PRG SCAN +**" should appear in the lower right corner of the display window.)
3. Using the **SHF** key and **UP** and **DOWN** arrows, select the upper scan limit, then press **ENT**.
4. Press the **SCAN** key again. ("**SCAN -**" should appear in the display window.)
5. Using the **SHF** key and the **UP** and **DOWN** arrows, select the lower scan limit, then press **ENT**.

The upper and lower scan limits have now been programmed. To activate the scan feature, return the radio to manual operation and press the **SCAN** button. If the display shows "**SCAN +**", the radio will scan from the lower limit to the upper limit. If "**SCAN -**" is display, the unit will scan from the upper limit to the lower limit. To change from **SCAN +** to **SCAN -** or vice versa, press **SCAN**.

**NOTE :** When programmed, the upper and lower scan limits will also act the upper and lower operating limits of the radio. The radio cannot now be programmed to operate above or below the scan limits.

### 2.2.2 Memory Scanning

The **SATURN TURBO** has 10 non-volatile (i.e, memory resident) memory locations which can be programmed with any available frequency within the operating band of the radio. The scan function of the unit can be programmed to scan these memory channels. The radio will then scan only those memory channels which have been programmed.

The first step in utilizing the memory scan function is to program the desired frequency into the radio memory. This can be accomplished by performing the following steps.

1. With the radio operating in the manual mode press the **PRG** (program) key
2. Press the **MEM** key. "**PRG**" should be display in the lower right-hand corner of the **LCD** display window. In the upper left portion of the display. "**MEMORY**" should be displayed. Directly below **MEMORY**, a number between 0 and 9 will be displayed. This number represents the memory location currently being displayed. Pressing the **MEM** key will increase the memory counter to the next memory location and contents of that memory location will be displayed.
3. Using the **SHF** key and the **UP** and **DOWN** arrows, enter the frequency to be stored in the memory location displayed. After the desired frequency has been entered, press **ENT**.
4. Repeat steps 2 and 3 for all of the memory locations to be programmed.
5. After all desired memory locations have been programmed with frequencies, return

the unit to the manual mode of operation by pressing the **MAN** key.

6. To initiate memory scanning, press **MEM** and then press **SCAN**. As previously discussed, the display will show "**SCAN +**" or "**SCAN -**" to indicate whether the radio is scanning from the lowest the highest memory location or vice versa.
7. To return the radio to normal (non-scanning) operation, press the **MAN** key.

## 2.3 OFFSET FREQ. OPERATION

The **SATURN TURBO** has an offset or split frequency feature that will permit the radio to be operated in a half-duplex mode. This will allow the user to talk on FM repeaters operating in the 10 meter band. This split frequency function offsets the transmitter frequency either above or below the receive frequency by a user programmable amount. In the following example, programming of a 100KHz offset will be described. Before attempting to program the offset frequency, ensure that the radio is operating in the manual mode by pressing the **MAN** key.

1. Press the **PRG** key.
2. Press the **SPLIT** key. The **LCD** display window will display "**00000**" with "**PRG**" and "**SPLIT**" being displayed in the lower left-hand corner.
3. Using the **SHF** key and the **UP** and **DOWN** arrows as described earlier, program the display to read "**01000**".
4. Press **ENT**. A 100KHz offset has now been programmed into the radio.
5. Return the radio to manual operation by pressing the **MAN** key.
6. Using the **SHF** key and the **UP** and **DOWN** arrows as described previously,

set the radio for the desired receive frequency.

7. Press **SPLIT**. In the lower right corner of the display, either "**SPLIT +**" or "**SPLIT -**" will be displayed. If **SPLIT +** is displayed, the transmitter will be offset 100KHz above the receive frequency when keyed. If **SPLIT -** is displayed, the transmitter will be offset 100KHz below the receive frequency.

**NOTE** : When the transmitter is keyed, the frequency display will change to show the frequency being transmitted.

8. To return the radio simplex operation (i.e. same transmit and receive frequency), press the **MAN** key.

# CRT HERCULE TURBO

## SECTION 3 ALIGNMENT

### 4.0 TEST EQUIPMENT

1. RF Power Meter (100MHz, 250W )
2. Multimeter.
3. Deviation Meter.
4. Audio Signal Generator.
5. RF Signal Generator (100MHz).
6. Frequency Counter (100MHz).
7. Distortion Meter.
8. Oscilloscope (50MHz).
9. Spectrum Analyzer.

### 4.1 PLL SYNTHESIZER / OSCILLATOR FREQUENCY ALIGNMENT

ITEM	CONNECTS & SETTING	ADJUST	MEASUREMENT
VCO & OSC	Disconnect the "short PCB" from test point TP1,2 and TP3. Set radio to 28.000MHz, AM mode CLARIFIER Setting in 12 O'clock Connect Frequency Counter to L61	VC1	10.240MHz $\pm$ 10Hz
	Connect Oscilloscope to L61	L4	Maximum Output
	Connect Frequency Counter to pin3 of IC14	VC2	10.240MHz $\pm$ 10Hz
	Connect Volt Meter to R203,202	L21	2.0VDC
	Connect Frequency Counter to C169	L21	Lock on 11.10MHz
	Connect Frequency Counter to L26	L23	Lock on 1.135MHz
	Connect Frequency Counter to C188	L24,25	Lock on 11.375MHz
	Connect volt meter to JP13 and ground	L17	2.2VDC $\pm$ 0.1
	Connect Frequency Counter to J86	L17	Lock on 17.305MHz
	Connect Oscilloscope to L62	L19	Maximum Output
Connect Frequency Counter to L62, Then Key Transmitter	VR21	TX & RX same Frequency	
AM OSC	Set radio to 28.000MHz, AM mode Connect freq counter to D45 cathode	L27	10.695MHz $\pm$ 10Hz

ITEM	CONNECTS & SETTING	ADJUST	MEASUREMENT
USB OSC	Set radio to 28.000MHz, USB mode Connect freq counter to D45 cathode and short Q30 (collector, emitter).	L29	10.6925MHz $\pm$ 10Hz
LSB OSC	Set radio to 28.000MHz, LSB mode Connect freq counter to D45 cathode and short Q30 (collector, emitter).	L28	10.6975MHz $\pm$ 10Hz

#### 4.2 RECEIVER ALIGNMENT

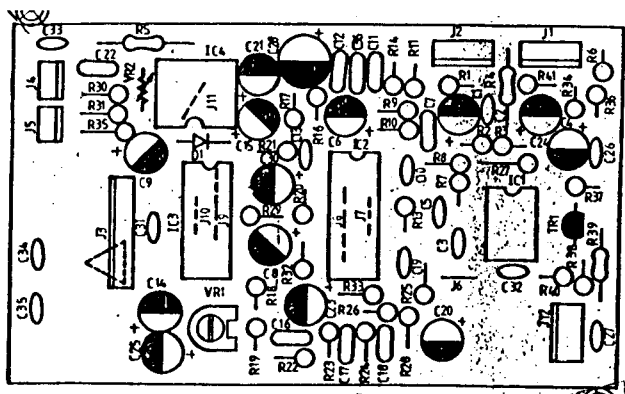
ITEM	CONNECTS & SETTING	ADJUST	MEASUREMENT
AM SENSITIVITY	Set radio to 28.000MHz, AM mode CLARIFIER Setting in 12 O'clock RF Gain fully clockwise, SQ at minimum, VOL control at 2 O'clock. Connect RF SG to ANT jack and setting 28.000MHz, MOD 30%, 1.0uV Connect distortion meter to EXT SP jack	L8,9,11,12 13,14,3,4, 5,6	Audio output >2V S/N 10dB
AM AF OUTPUT	Set radio to 28.000MHz, AM mode VOL control at fully clockwise. RF SG setting 28.000MHz, MOD 30%, 1mV	L5,6	Audio output >5V Bast at distortion.
FM DISTORTION	Set radio to 28.000MHz, FM mode VOL control at fully clockwise. RF SG setting 28.000MHz, MOD 3KHz, 1mV	L7	Audio output >5V Bast at distortion.
USB SENSITIVITY	Set radio to 28.000MHz, USB mode VOL control at fully clockwise. RF SG setting 28.001MHz, MOD off, 0.5uV	L15,16	Audio output >3V S/N 10dB.
LSB SENSITIVITY	Set radio to 28.100MHz, LSB mode VOL control at fully clockwise. RF SG setting 28.099MHz, MOD off, 0.5uV	L15,16	Audio output >3V S/N 10dB.
NB ADJUST	Set radio to 28.000MHz, AM mode RF SG setting 28.010MHz, MOD 30%, 1mV, NB/ANL switch on. Connect volt meter to D2 cathode.	L1,2	DC voltage to MAX (About >2.5V)
AM SQUELCH	Set radio to 28.000MHz, AM mode SQ control at fully clockwise. RF SG setting 28.000MHz, MOD 30%, 1mV	VR4 Slowly	Adjust very slowly until squelch just open.

ITEM	CONNECTS & SETTING	ADJUST	MEASUREMENT
SSB SQUELCH	Set radio to 28.000MHz, USB mode SQ control at fully clockwise. RF SG setting 28.001MHz, MOD off, 1mV	VR3 Slowly	Adjust very slowly until squelch just open.
AM S/RF METER	Set radio to 28.000MHz, AM mode Meter switch at S/RF position. RF SG setting 28.000MHz, MOD 30%, 100uV	VR1	Meter needle to S9 on the S scale.
SSB S/RF METER	Set radio to 28.000MHz, USB mode S/RF switch at S/RF position. RF SG setting 28.001MHz, MOD off, 100uV	VR2	Meter needle to S9 on the S scale.

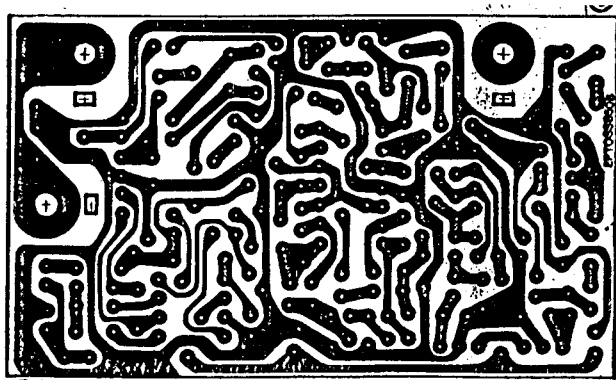
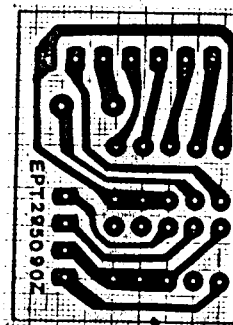
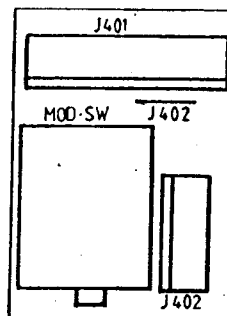
#### 4.3 TRANSMITTER ALIGNMENT

ITEM	CONNECTS & SETTING	ADJUST	MEASUREMENT
SSB TX POWER	Set radio to 28.000MHz, AM mode MIC, RF POWER Gain fully clockwise, Connect "short PCB" to TP1,2 and 3 Connect RF power meter to ANT jack Audio signal 30mV, 1KHz to MIC. Adjust VR12 fully clockwise. Connect Volt Meter to TP1.	VR13	DC6V
	Set radio to USB mode	L43,46,47, 48	Maximum output
	Set radio to 29.699MHz, USB mode	L19,43 L34	Maximum output Same as 28MHz power
	Set radio to 28.000MHz, USB mode	VR12	70 ~ 130W
	RF POWER Gain Counterclockwise	VR16	10 ~ 20W
AM TX POWER	Set radio to 28.000MHz, AM mode RF Gain fully clockwise, No MOD	VR13	45 ~ 50W
	RF POWER Gain Counterclockwise	VR15	5 ~ 10W
AM MODULATION	Set radio to 28.000MHz, AM mode Audio signal 30mV, 1KHz to MIC.	VR14 VR11	70 ~ 90% Maximum output
TX S/RF METER	Set radio to 28.000MHz, AM mode MIC Gain at minimum position.	VR8	Meter needle to the same scale of the power meter readed.

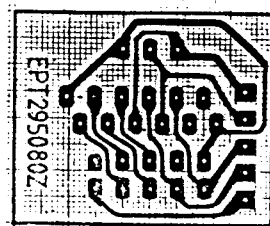
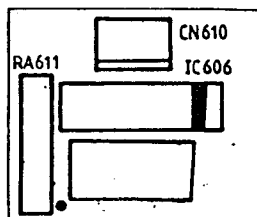
# ECHO PCB LAYOUT



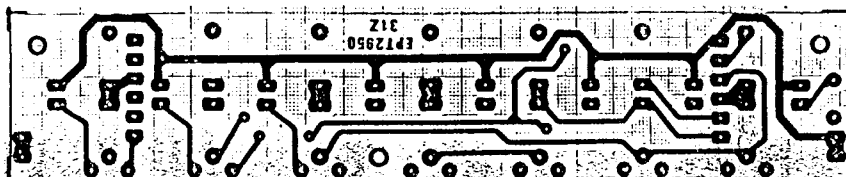
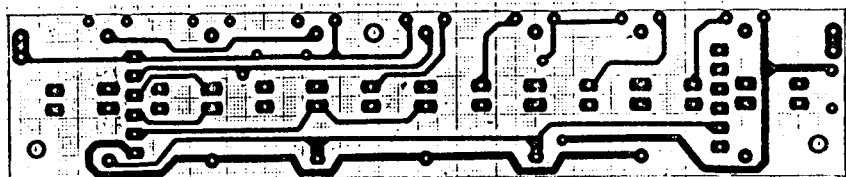
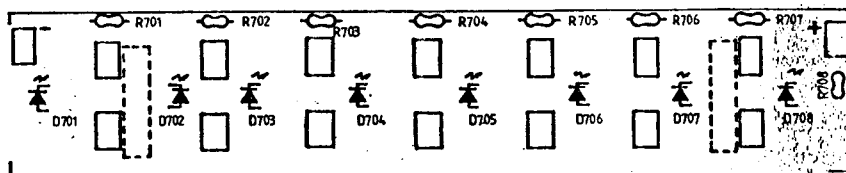
# BAND PCB LAYOUT



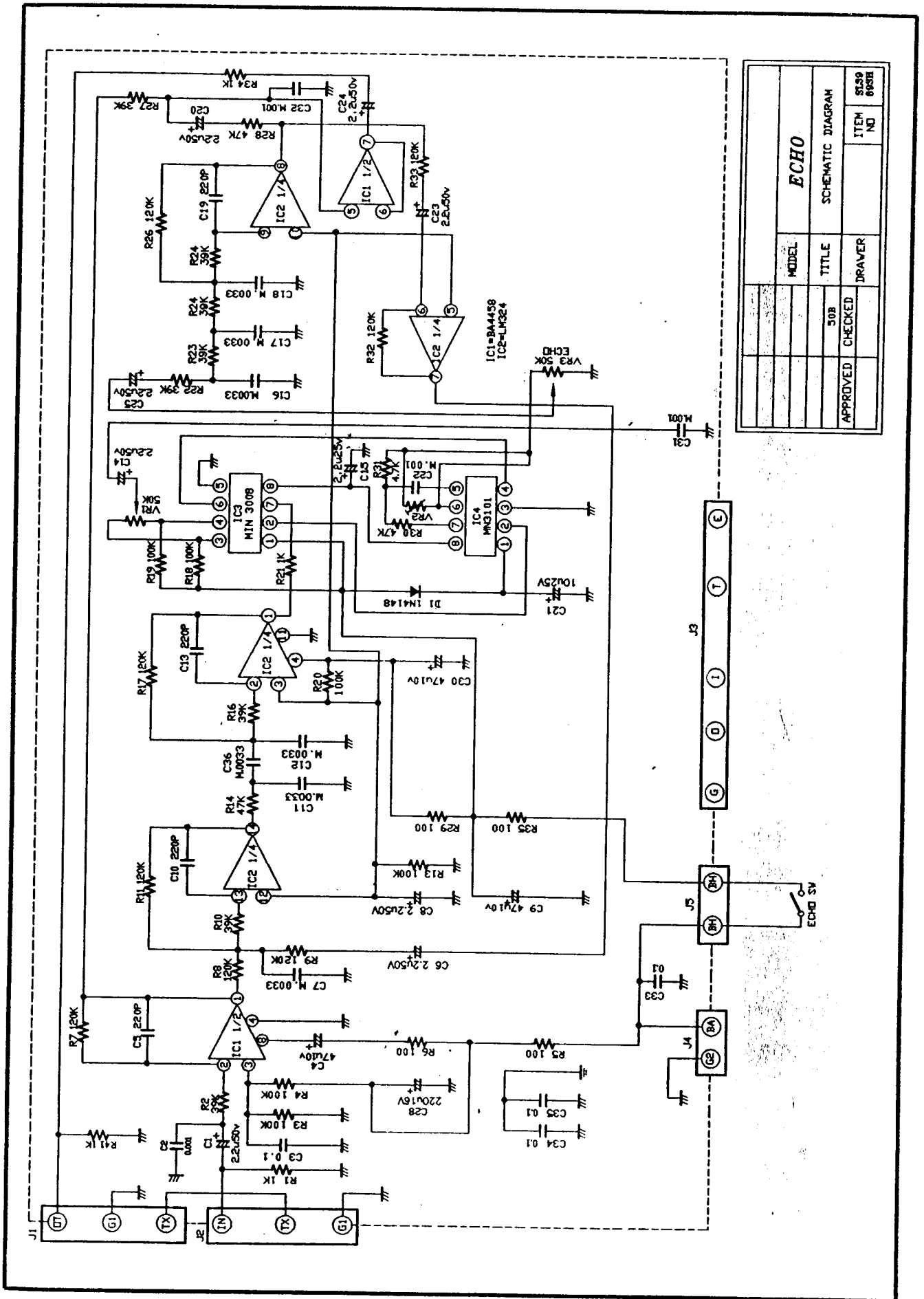
# MIC PCB LAYOUT



# KEY BOARD LAYOUT

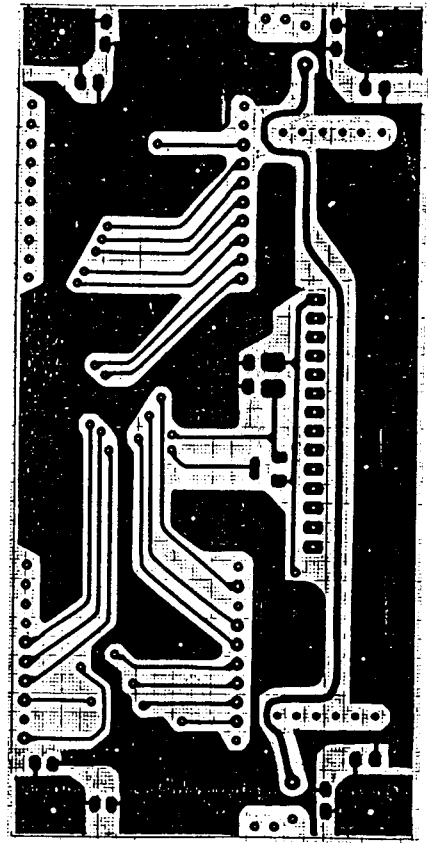
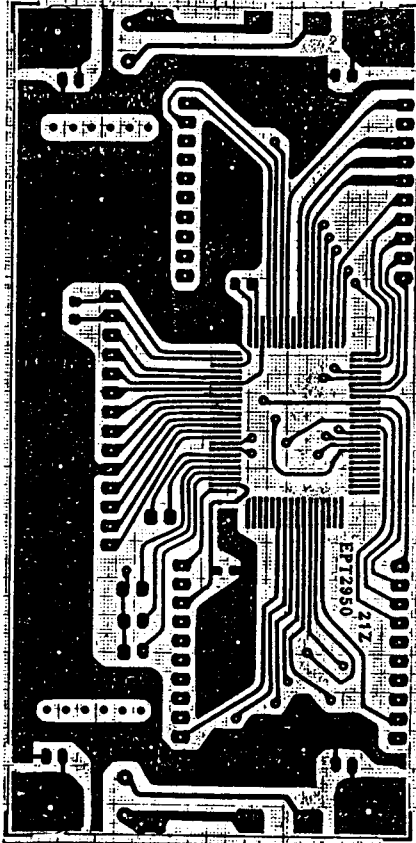
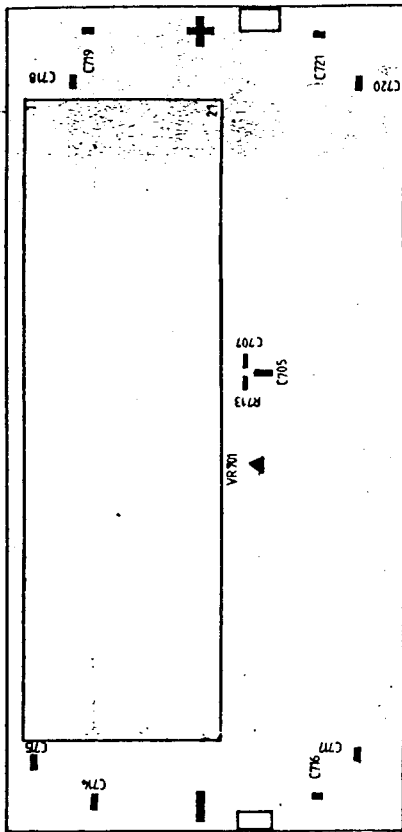




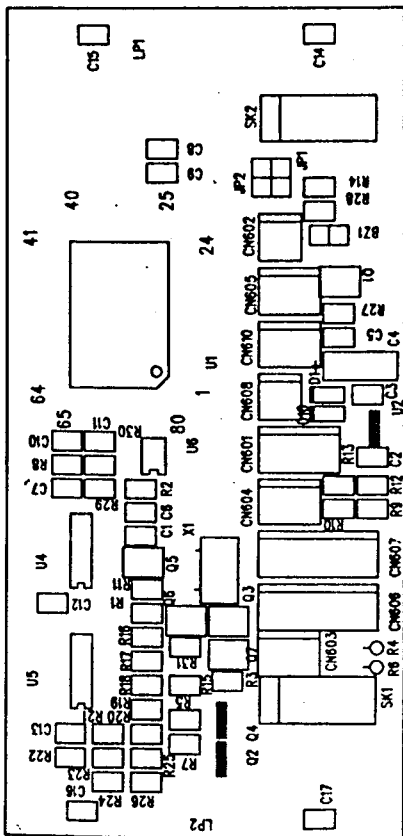


MODEL		TITLE		ECHO	
				SCHEMATIC DIAGRAM	
APPROVED		50B		DRAWER	
CHECKED		50B		TITLE	
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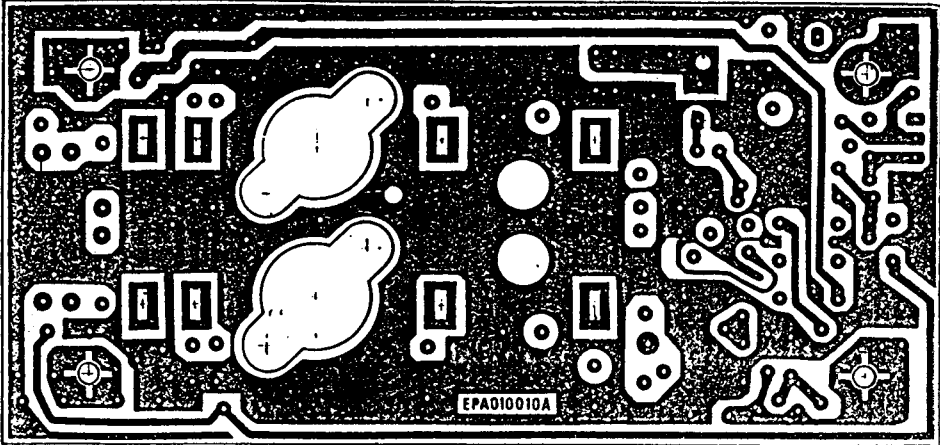
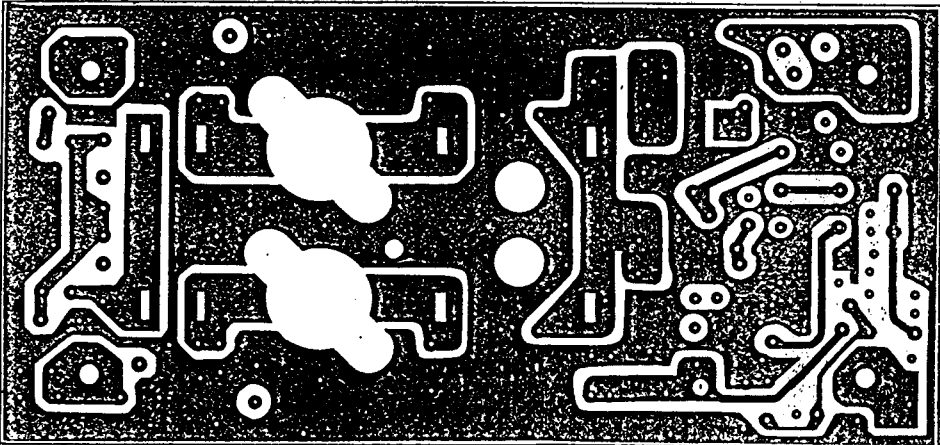
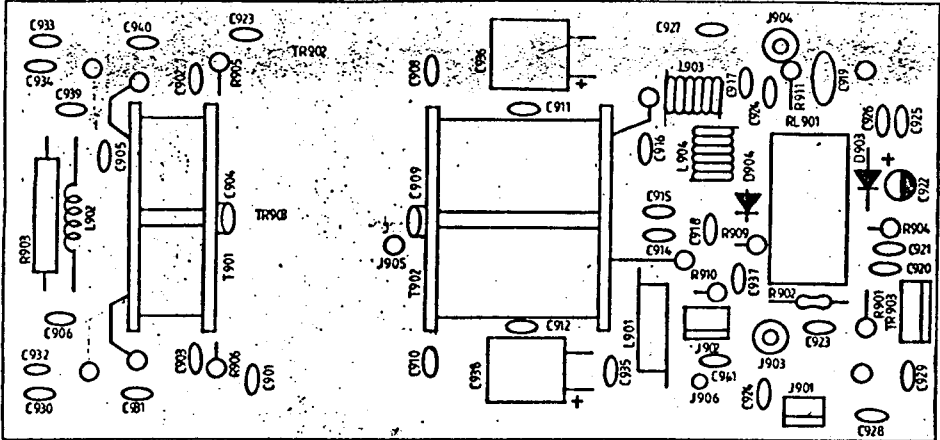
# LCD PCB LAYOUT



# CPU PCB LAYOUT

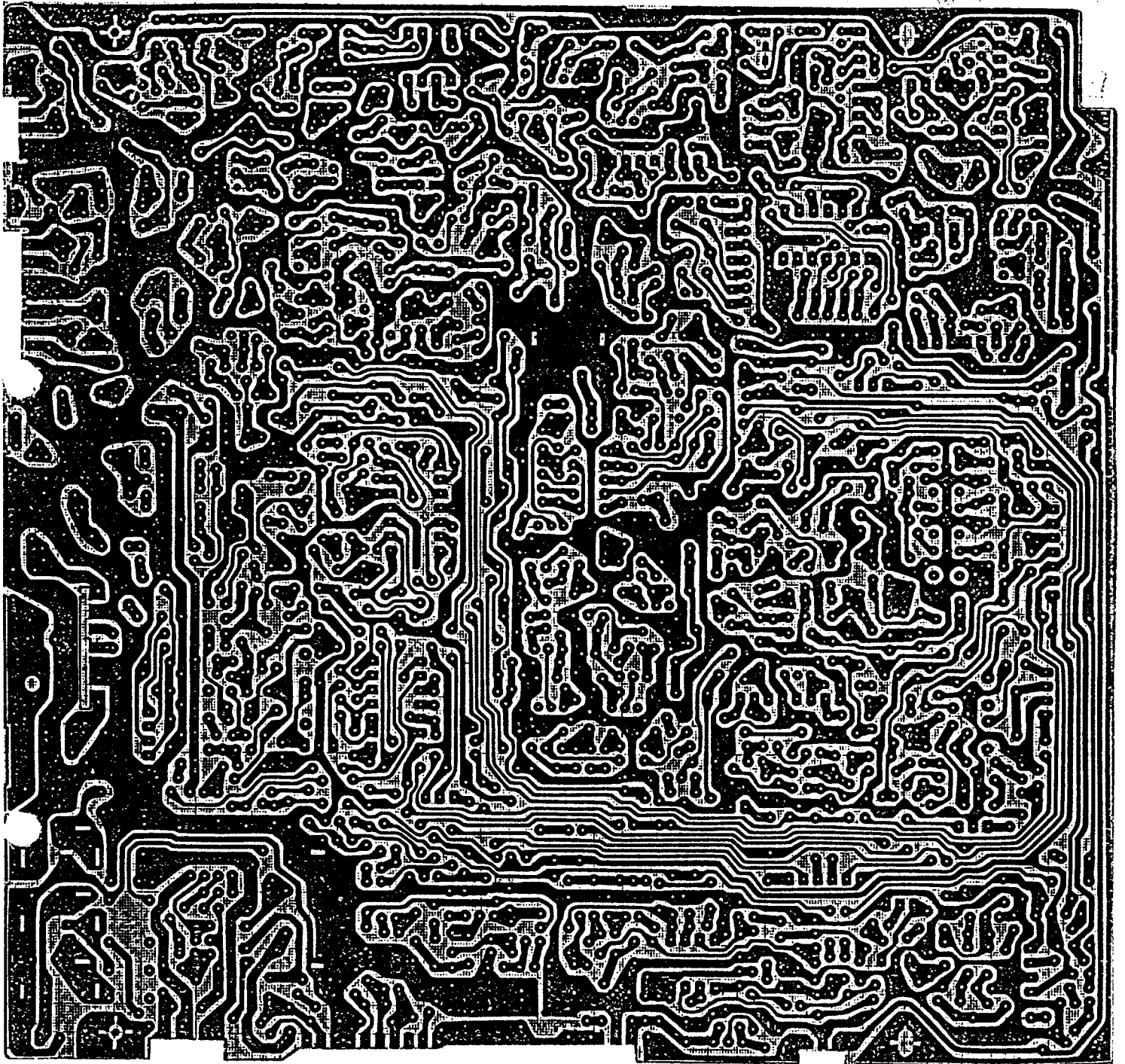


# POWER BOOSTER PCB LAYOUT

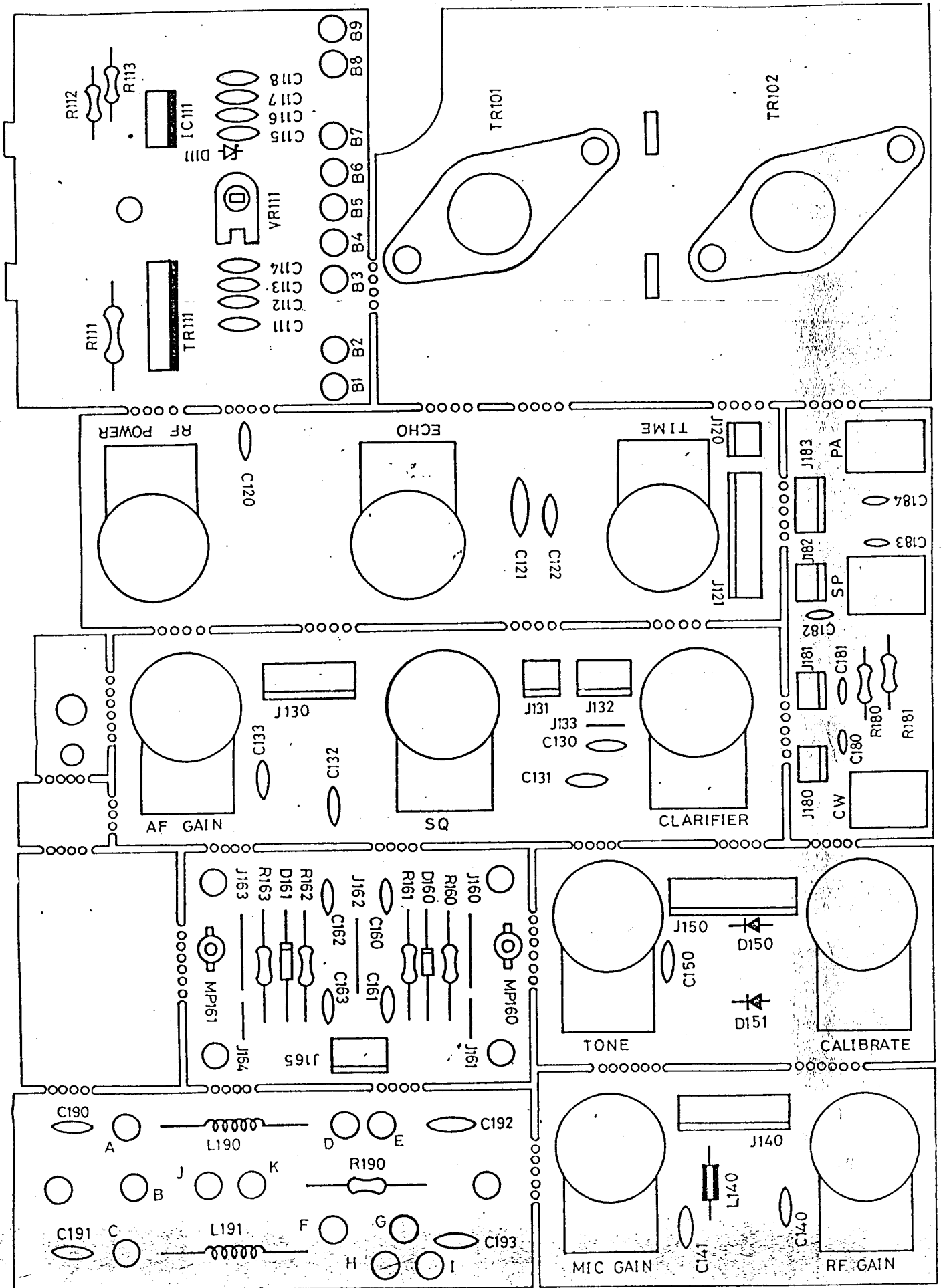




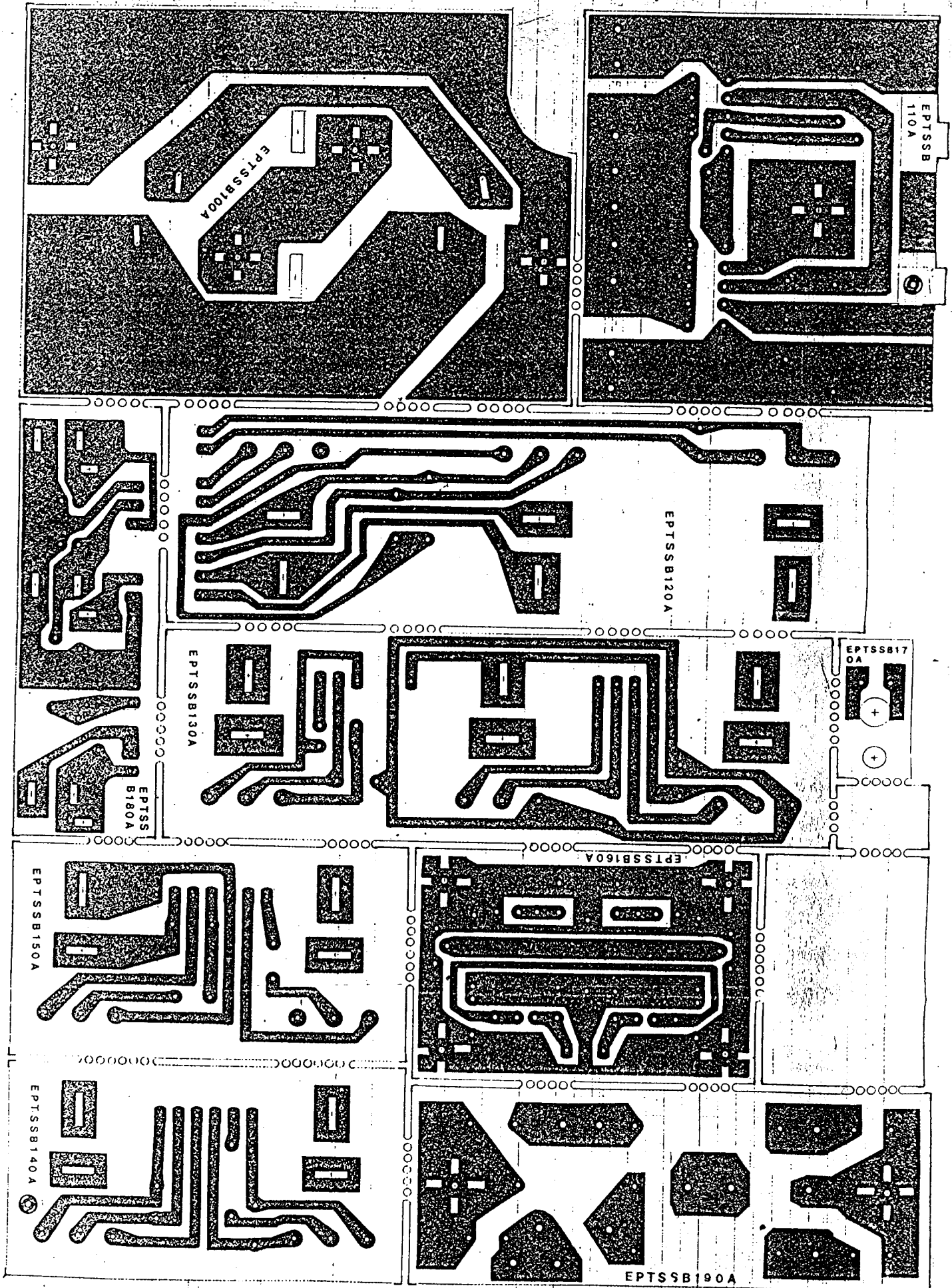
MAIN PCB LAYOUT



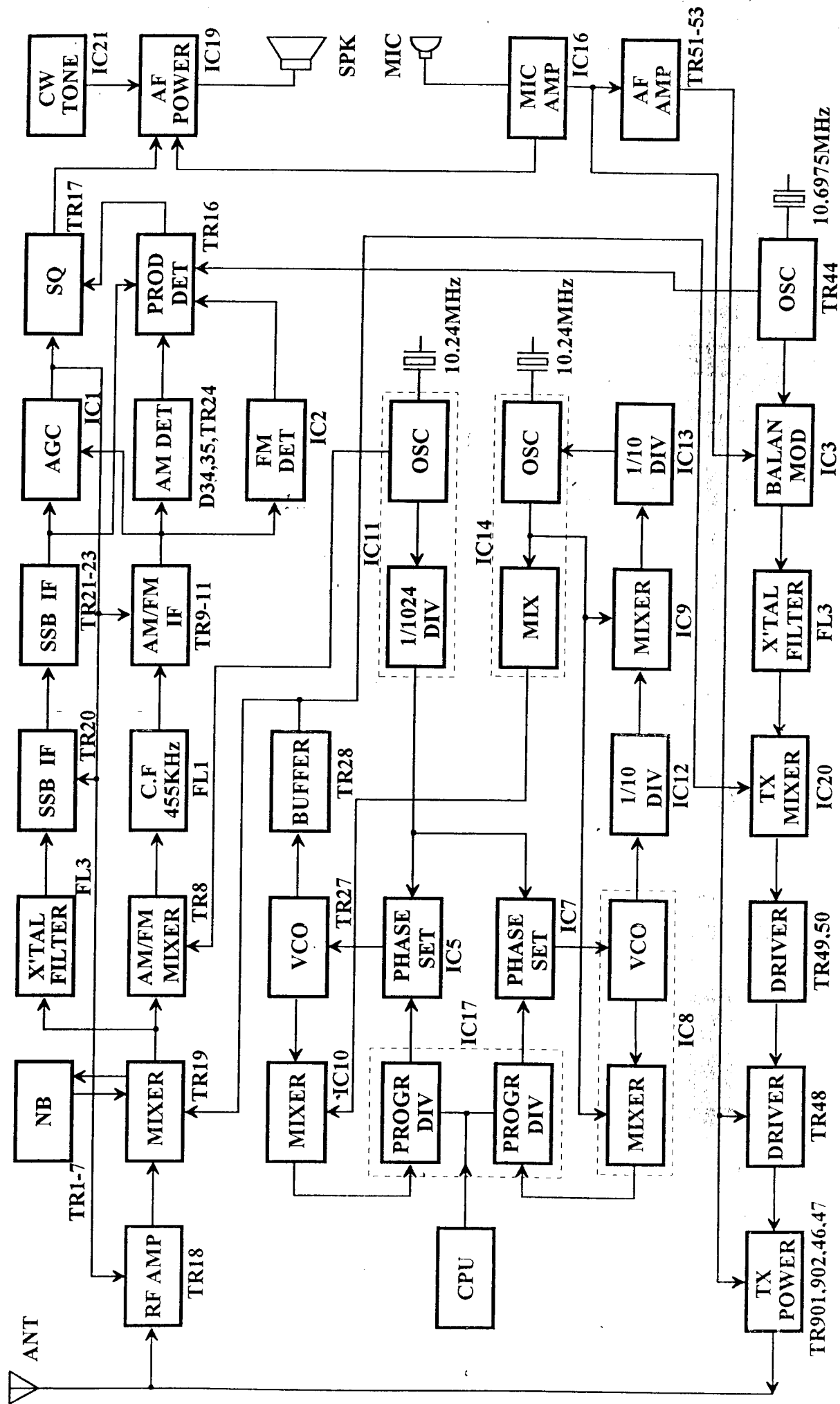
# POWER & FUNCTION PCB LAYOUT



# POWER & FUNCTION PCB LAYOUT



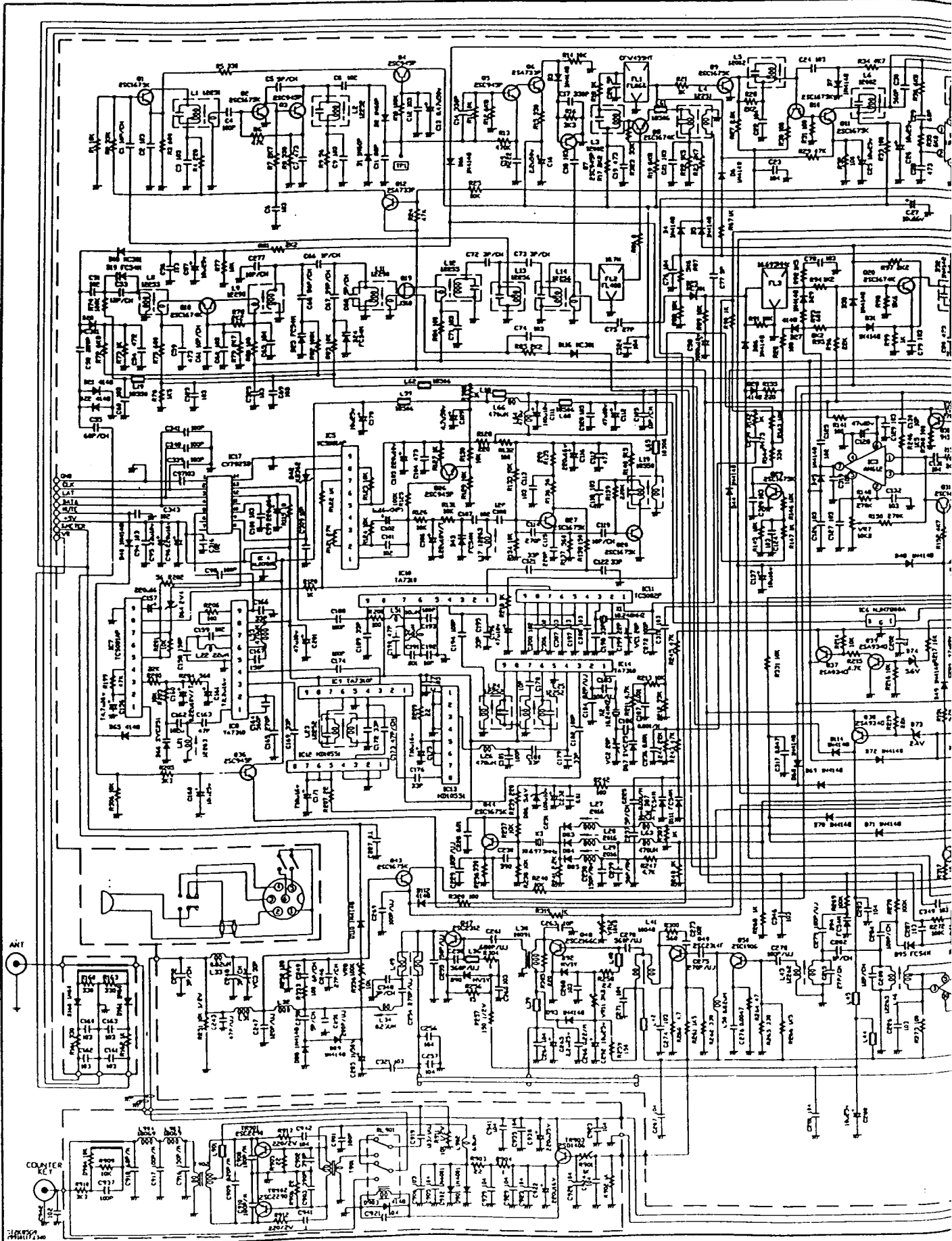
# BLOCK DIAGRAM







## SCHEMA ELECTRONIQUE





# CUCULE TURBO

1C

1D

