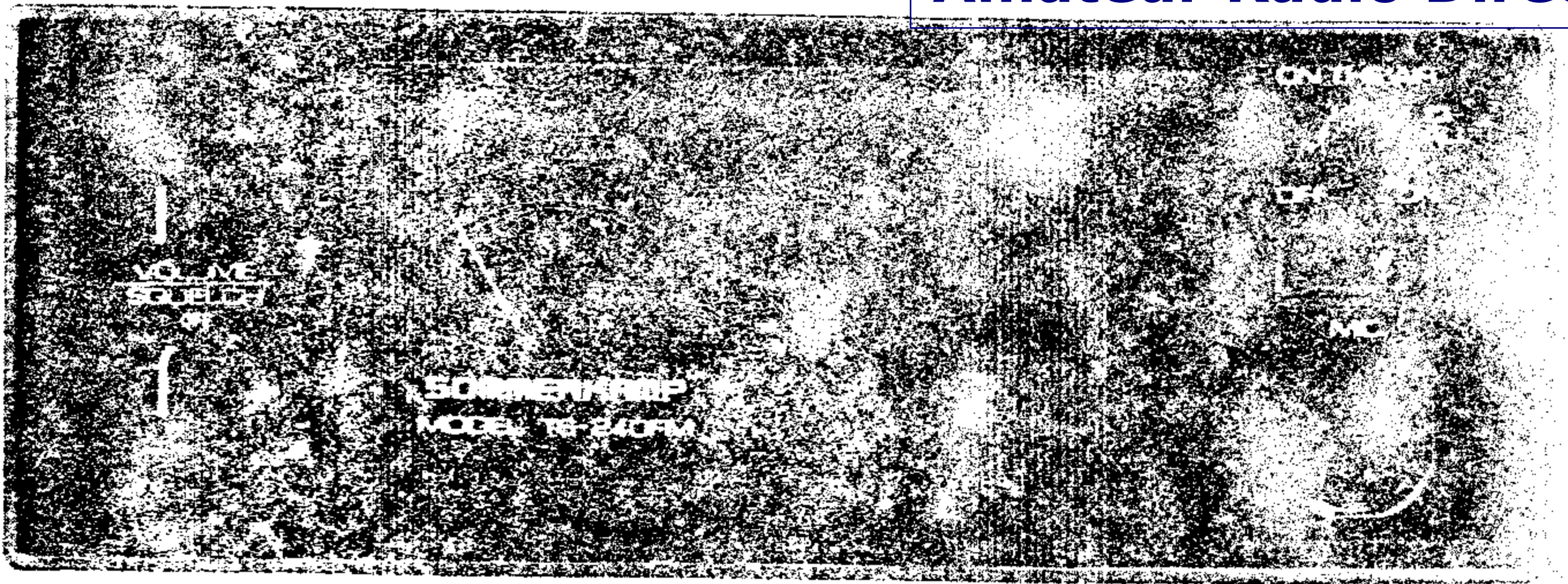


# SOMMERKAMP ELECTRONIC

**40 CHANNEL PLL  
10 WATTS FM-TRANSCEIVER  
WITH DIGITAL TUNING**

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**MODEL TS 240FM  
2m VHF MOBILE  
INSTRUCTION MANUAL**

## SPECIFICATIONS FOR TS 240 FM

### General

Frequency Coverage:	145.000 to 145.975 MHz in 25 KHz steps, ch. 40 to ch. 9. Receiver 600 KHz repeater offset.
Frequency control:	Digitally synthesized, low sideband noise PLL system.
Frequency stability:	$3 \times 10^{-6}$ at 25°C $8 \times 10^{-6}$ at -10 to +50°C
Semiconductor complements:	Transistors, FETs, ICs, LED displays, diodes.
Modulation Type:	
Supply Voltage:	10-16 VDC
Current drain:	Transmit: 2A at 14 Volts Receive: 300mA at 14V
Antenna Impedance:	50 Ohms unbalanced
Size:	58mm x 156mm x 216mm (excluding controls)
Weight:	1.9 kg
Transmitter:	
Frequency Control:	Phase Locked Loop synthesizer
Modulation:	FM
Audio Input:	600 Ohms
Microphone:	600 Ohms dynamic
Power Output:	min. 10 Watts at 12 Volts
Spurious and Harmonic Output:	less than -30dBm. (-70 dB below carrier)
Duty Cycle:	100% transmit at 16V/+60% C 50 Ohms resistive load
Receiver	
Frequency Scheme:	Dual conversion superheterodyne with 10.7MHz and 455 KHz IF
Sensitivity:	· 75µV for 12dB sinad. · 1µV squelch threshold
Spurious Response:	-70 dB
Selectivity:	15 KHz -3dB; 25 KHz -70dB
Audio Output Power:	2 Watts at 8 Ohm at less than 10% THD.

## GENERAL DESCRIPTION

The SOMMERKAMP TS 240 is a 10 Watts frequency synthesized solid state radio set designed for transmission and reception over the 145-146 MHz range. Frequency control employs state of the art digital circuitry combined with a precision phase-locked VCO to provide 40 transmit and receive channels in 25 KHz increments. The operation channel number is displayed by large, bright LED numerics. A unique feature of the TS 240 is its receive frequency flexibility wherein standard repeater splits of 600 KHz are accommodated automatically. Your SOMMERKAMP TS 240 Transceiver has been designed for continuous heavy duty mobile and base station application. It can be operated with a microphone and internal speaker or handset, speaker-microphone combination, telephone set incorporating automatic voice operated transmit/receive switching, external selective call with automatic answer-back PARROT 76 and many more.

## RECEIVER SECTION

The receiver section is designed to receive frequency or phase modulated signals in the 145-146 MHz (2m-amateur) band. The unique combination of low noise field effect transistors (FET's), double conversion, a combination of mechanical-ceramic and L/C-filters, integrated limiting amplifier and discriminator and a hi-fi quality speaker amplifier will provide exceptional reception quality in this fine piece of equipment.

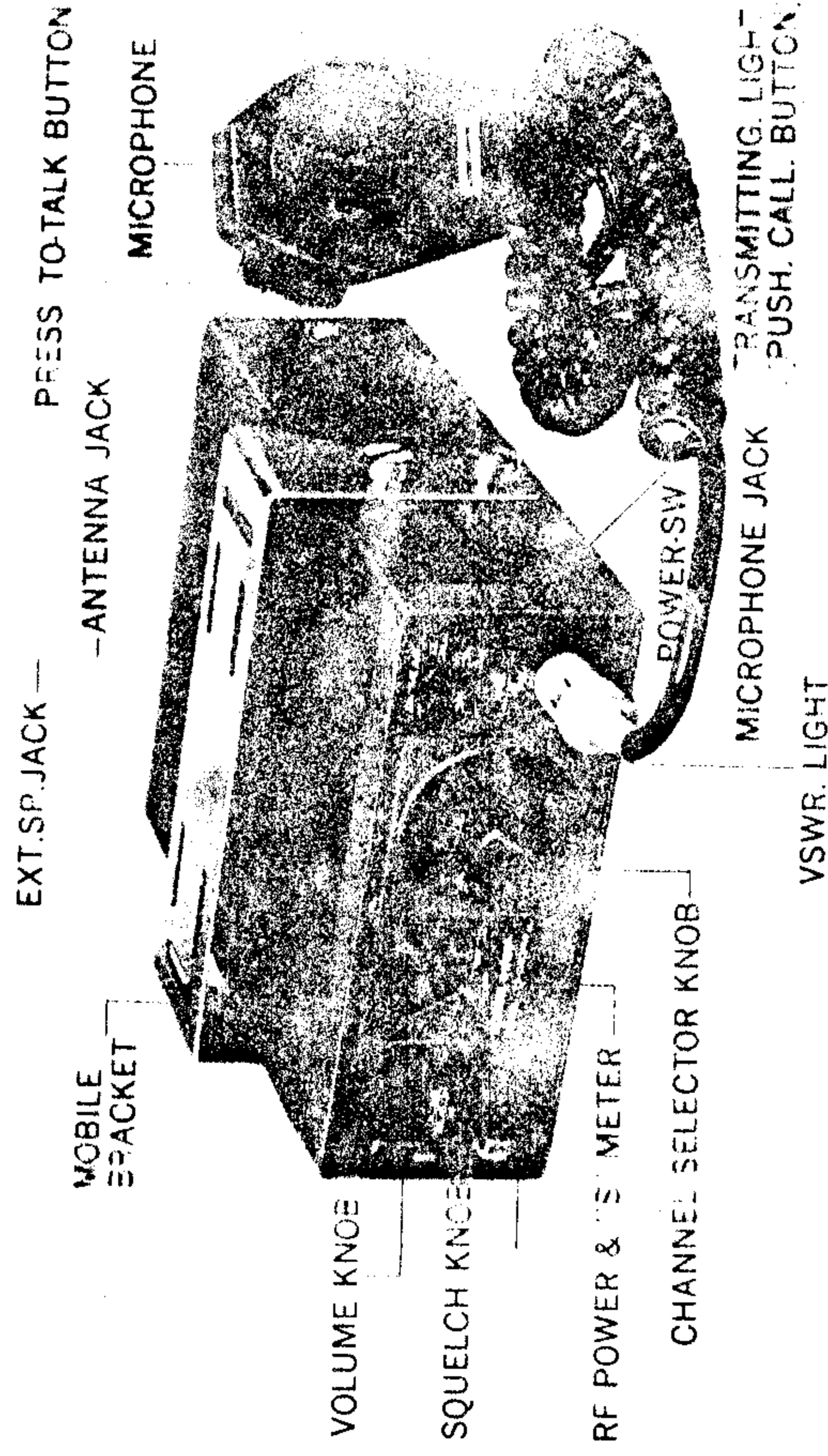
In addition, the above combination of the latest technology provides a sensitivity and unwanted signal rejection and noise suppression available previously only in space and military communication equipment.

The power supply of the receiver, RF-, IF- and second oscillator/mixer section is stabilized by an extremely sharp cut-off Zener diode in conjunction with a series regulator to obtain the high sensitivity and unwanted signal rejection. The high squelch sensitivity is achieved by using a separate noise amplifier detector and switching circuit with carefully balanced hysteresis. The transformerless hi-fi quality audio power amplifier will drive any load between 8 Ohms and indefinite such as internal speaker or external speaker/microphone or headset combination having the above impedances. The meter indicates the field strength during reception of a signal.

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## PACKING LIST

Besides this manual the carton should contain the following items:

1. Transceiver TS 240
1. Mounting bracket
4. Screws for mounting bracket
1. Microphone hanger
1. Microphone

## PLL SECTION

The PLL section consists of a C-MOS IC incorporating a reference crystal oscillator, 10 Bit divider chain and 8 Bit programmable binary counter and an edge-type phase detector, voltage controlled oscillator, limiting amplifier and balance mixer, down conversion oscillator and voltage regulators. In addition, the PLL unit contains the lock detector circuit, modulation amplifier and limiter.

## TRANSMITTER SECTION

The output signal of the PLL unit is amplified and multiplied to 134 MHz. This signal is mixed with 10.7 MHz and the resulting signal is amplified in the pre- and power amplifier of the transmitter section. The output of the final power amplifier is fed via a matching network, low pass filter and antenna switch to the antenna jack. Between the low pass filter and the antenna jack an SWR bridge detects the standing wave ratio on the antenna cable. If too high, it switches off the transmitter to protect the power amplifier.

## RECEIVE / TRANSMIT SWITCHING

The receive transmit switching is done by a single pole, single throw switch located in the microphone as well as a combination of NPN and PNP switching transistors which function also as voltage regulators.

## METER

The meter provides the following combined functions:  
in the receive mode it indicates the incoming signal strength, in the transmit mode it shows relative output power.

## INSTALLATION

### Unpacking:

Remove the transceiver carefully from the packing carton and examine it for external shipping damage. It is recommended to keep the shipping carton for future storage, moving or re-shipment. As the accessory hardware is packed with the transceiver, check if all parts are accounted for.

### Location:

The placement of the transceiver in the vehicle is not critical and should be governed

by convenience and accessibility. Since the unit is very compact, there should not be any difficulties in finding a suitable location for it. Any place where it can be easily mounted with metal screws, bolts or pop-rivets will do.

For base-station operation, the mounting bracket will place the controls at a comfortable level and the built-in speaker into an efficient position.

## POWER REQUIREMENTS

Voltage in excess of 16.0 Volts will cause heavy damage to the TS 240. Check the supply voltage before connecting the power cord.

The TS 240 FM is supplied ready for operation from any regulated 13.8 Volts DC, 2.0 Amps. negative ground source. Any vehicle system, 12.0 Volts, negative ground is usually more than adequate. Note however, that problems such as low battery, worn generator/alternator, poor voltage regulator etc. will impair the mobile operation of the TS 240 FM as well as the vehicle itself.

It is recommended that the DC power cable supplied with the set be wired directly to the vehicle battery terminals. Be certain to observe the correct polarity. RED wire is POSITIVE (+) whereas the BLACK wire is NEGATIVE (-). Do not attempt to install the TS 240 FM in a vehicle employing POSITIVE GROUND ignition system. Where a temporary mobile installation is made by connecting the power cable for instance to the cigar lighter, only less than full performance of the TS 240 FM can be expected.

In selecting a base station power supply it is imperative that the unit be sufficiently regulated so that its no-load voltage never exceeds 16.0 Volts and its voltage at a 2.0 Amps load would not drop below 10.0 Volts. The output hum and ripple should be less than 100 millivolts.

## ANTENNA

The most important single item that will influence the performance of any communication system is the antenna. For that reason, a good, high-quality antenna of 50 ohms impedance is recommended. When adjusting your antenna, whether mobile or fixed, by all means follow the manufacturer's instructions. There are some pitfalls to be aware of. For example, do not attempt to adjust an antenna for lowest VSWR when using a VSWR meter not engineered for VHF applications. Such readings will invariably be substantial at 144 MHz. Rather, use an in line meter similar to the

Bird Model 23 with VHF cartridge. Further, when adjusting a mobile antenna, do so with the motor running preferably above normal idling speed. This will insure proper voltage level to the transceiver.

Do not become alarmed if your transceiver fails to transmit at times during the antenna tune up procedure. Remember, your transceiver has a built-in Automatic Protection Circuit (APC) that will disable the transmitter if excessive VSWR, or an open or shorted coaxial line or connector, or other antenna deficiency is present. The RF coaxial connector on the rear chassis mates with a standard PL-259 connector.

## MICROPHONE:

A high quality dynamic microphone is supplied with the transceiver. Merely plug it into the proper receptacle on the front panel. Should you want to use a different microphone, make certain it is of low impedance type (600 ohms). Particular care should be exercised in wiring as the internal electronic switching system is dependant upon it. See the schematic for the proper hook up. Under no circumstances use a "gain pre-amp" type microphone. The audio system in your transceiver is more than adequate and additional pre-amplification is unnecessary. To use this class of microphone is to invite distortion and unsatisfactory operation of the transceiver.

## OPERATING INSTRUCTIONS

After completing the installation as described above switch the transceiver ON by moving the power switch to position ON. The receiving meter and the channel numbers will light up. Turn the squelch control to minimum. Turn the volume control to maximum until you hear a hissing sound from the speaker. Switch the channel selector to channel 1. Press the transmit button of the microphone and check that the meter needle is near the red mark during transmitting. Release the PTT button and switch to channel 2. Repeat this procedure until all 40 channels are checked out. Then switch to a channel where there is a transmitting station, wait until this station stops to transmit and turn the squelch control slowly to maximum until the background noise just disappears. When the station starts to transmit again you will hear the station, but you will not hear the background noise during its non-transmitting periods.

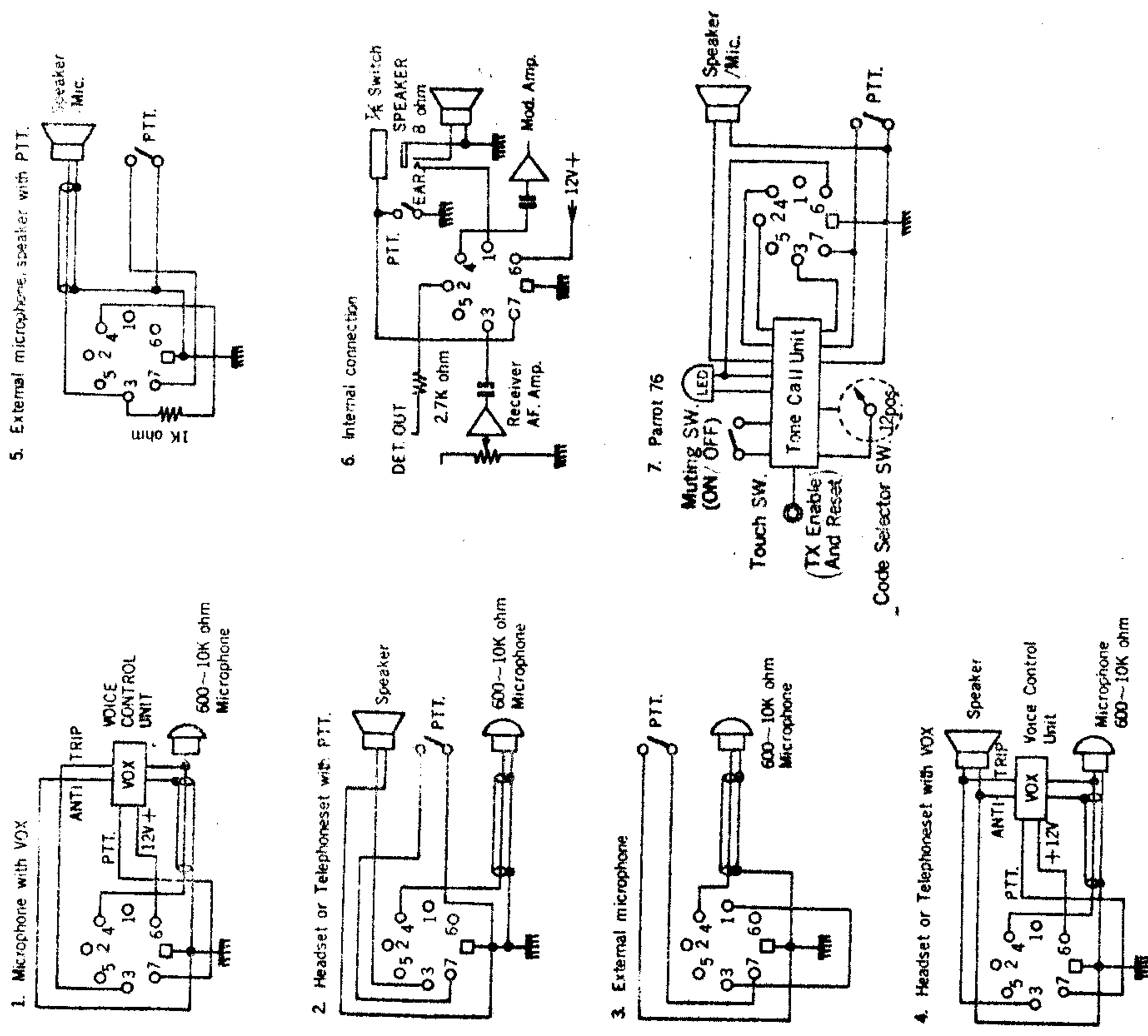
To send out a call just push the CALL-button. This will transmit automatically a 1750 Hz signal to open repeaters etc. In case the antenna is mis-matched the automatic protection circuit operating the protection lamp will light up. This can be re-set by switching off the transceiver with the POWER switch.

## ACCESSORY JACK

The 7-pin DIN standard accessory jack has the following connections:

1. Internal speaker (Z 8 ohm)
2. Audio detector output
3. Audio output (Z 8 ohm- 10 K ohm)
4. Microphone input (Z 600-10 K ohm)
- Case=ground
5. Internal speaker with PTT.
6. +12 Volt
7. transmit/receive switching

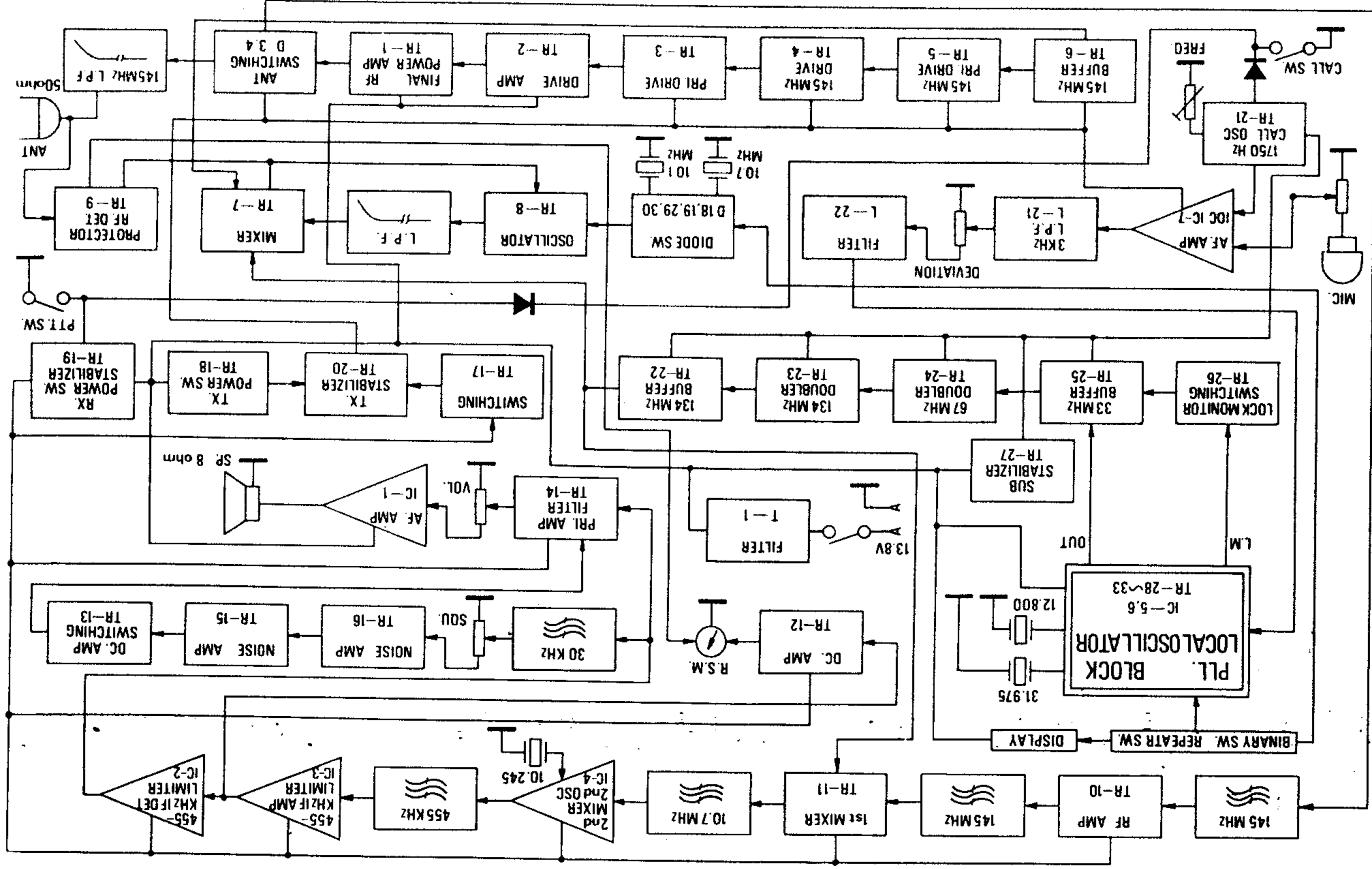
Always operate the transceiver with the shortening plug inserted in the accessory jack, or with the following external connections:



**LIST OF CHANNEL FREQUENCIES**

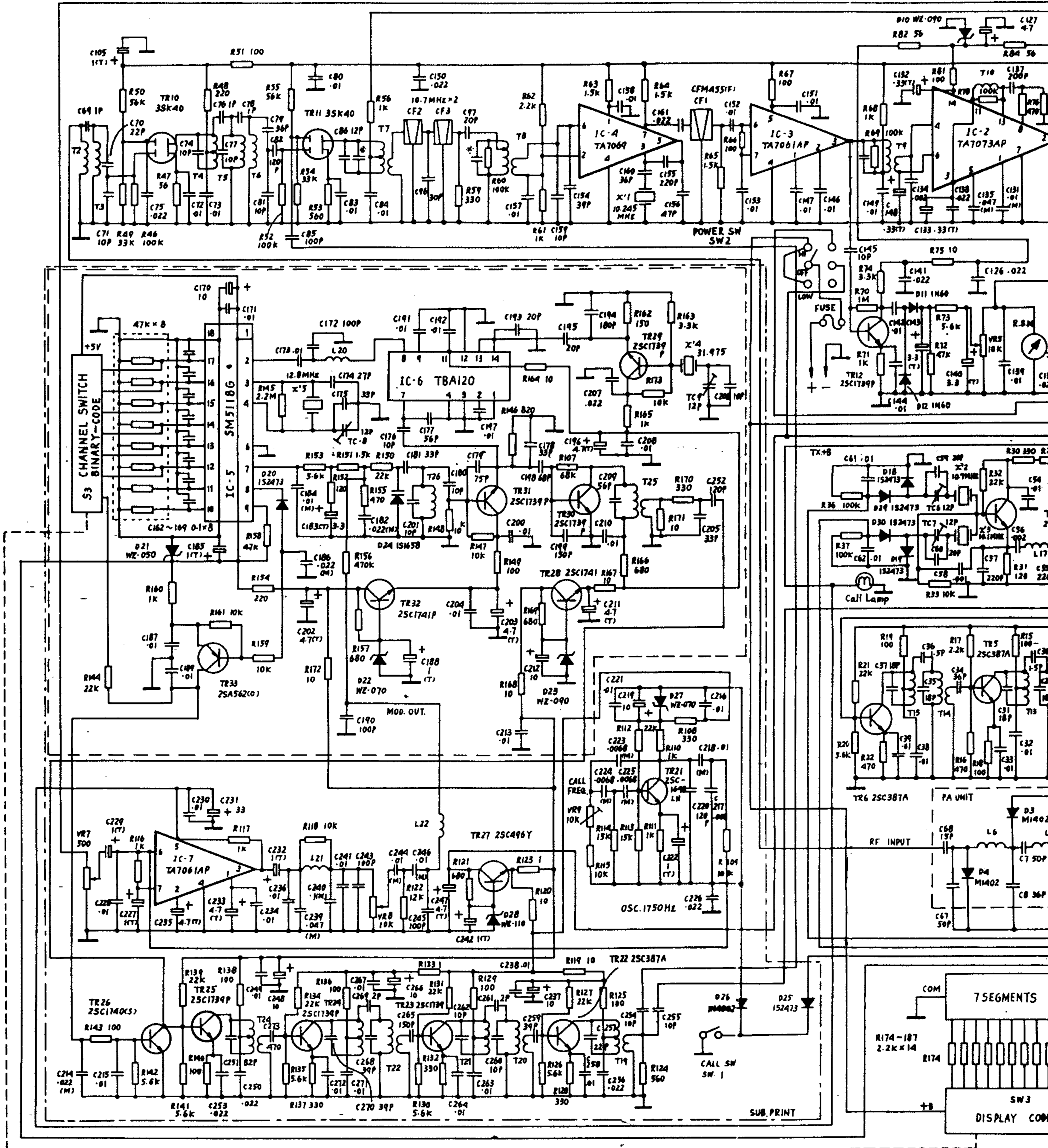
CH. NO.	TX	RX
1	145.025	145.625
2	050	650
3	075	675
4	100	700
5	125	725
6	150	750
7	175	775
8	200	800
9	225	825
10	250	250
11	275	275
12	300	300
13	325	325
14	350	350
15	375	375
16	400	400
17	425	425
18	450	450
19	475	475
20	500	500
21	525	525
22	550	550
23	575	575
24	600	600
25	625	625
26	650	650
27	675	675
28	700	700
29	725	725
30	750	750
31	775	775
32	800	800
33	825	825
34	850	850
35	875	875
36	900	900
37	925	925
38	950	950
39	975	975
40	145.000	145.600

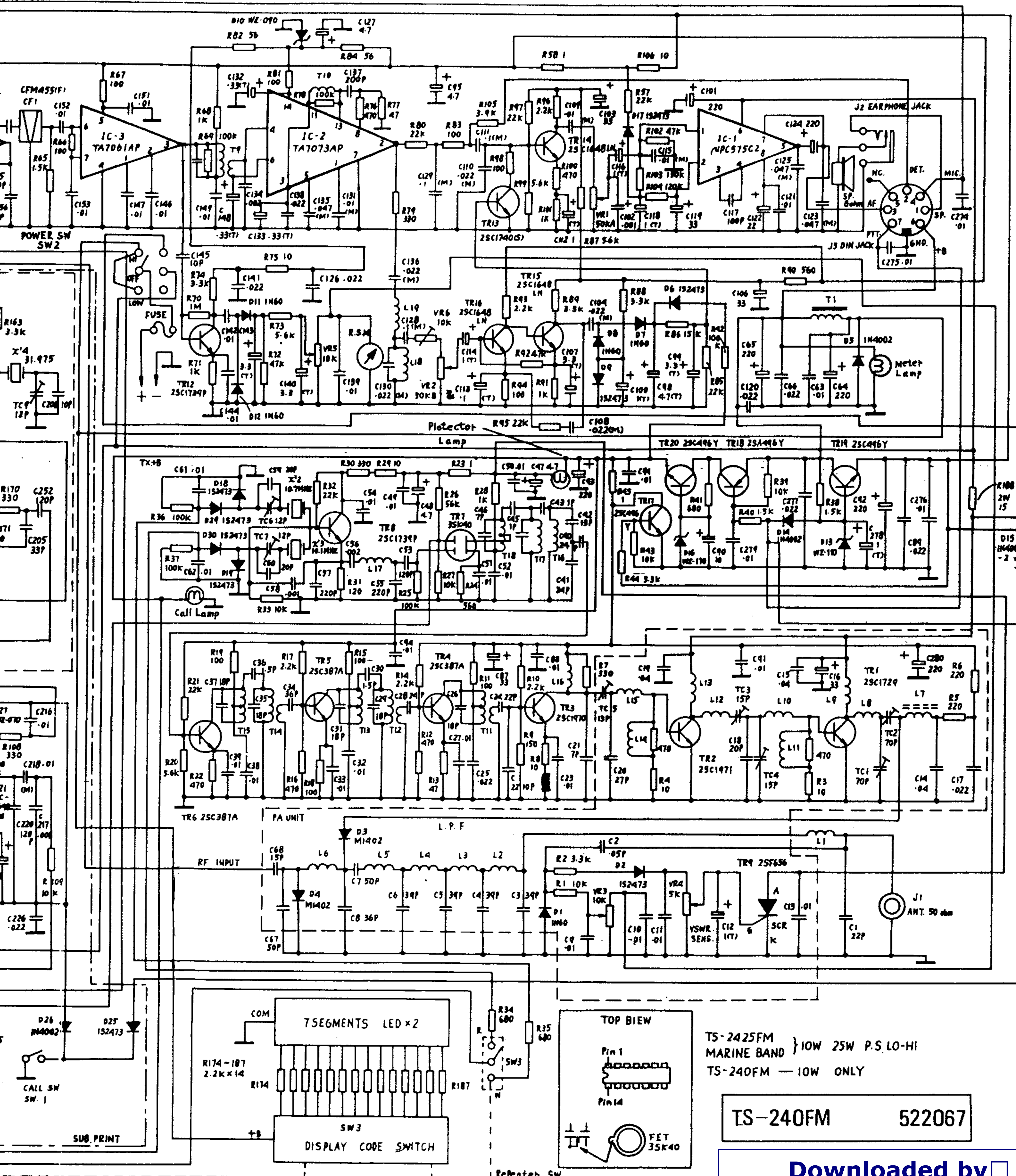
**BLOCK DIAGRAM**



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# MAIN CHASSIS PRINTED CIRCUIT BOARD PARTS LAYOUT





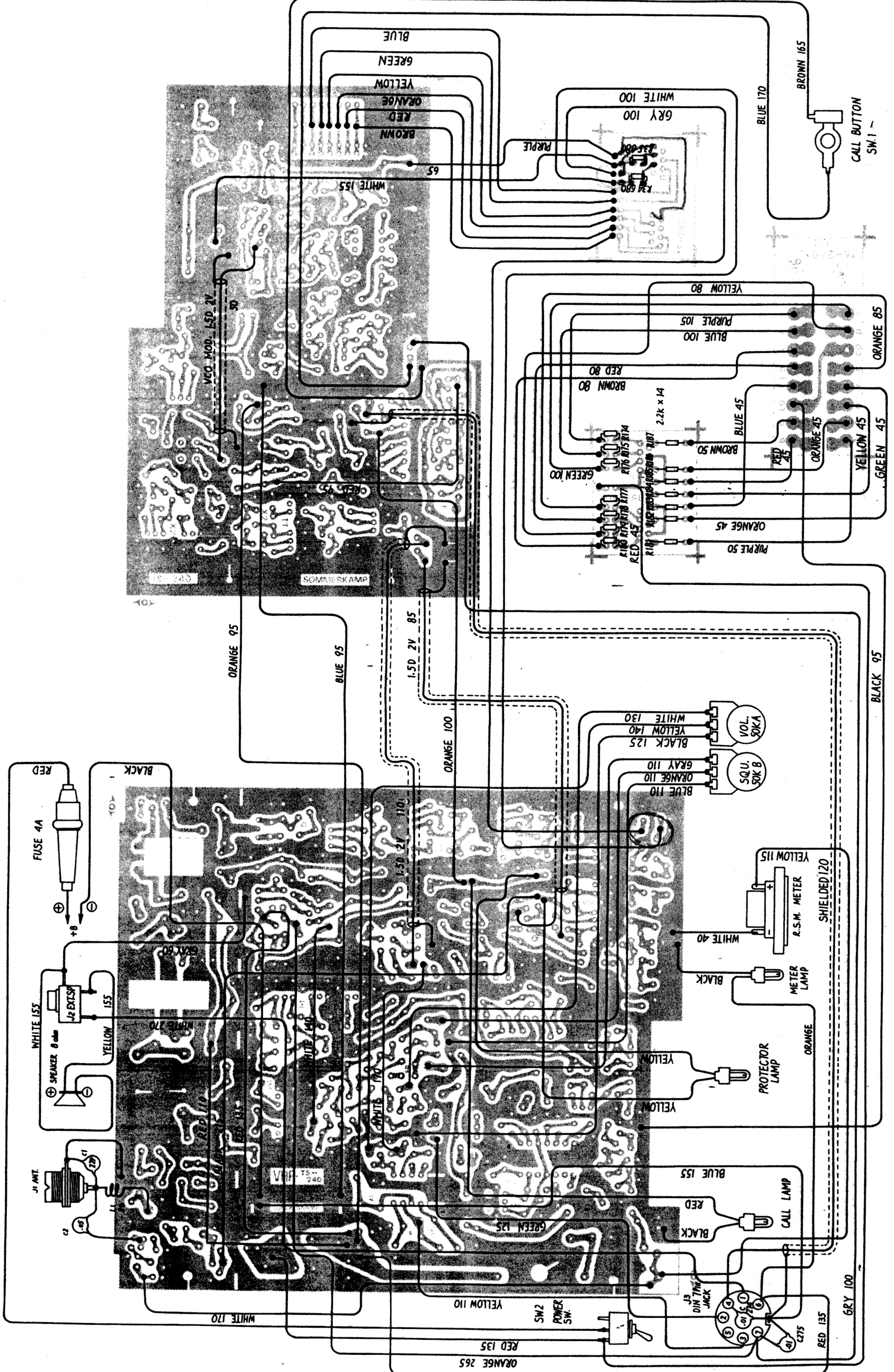
TS-2425FM } 10W 25W P.S. LO-HI  
 MARINE BAND  
 TS-240FM — 10W ONLY

TS-240FM 522067

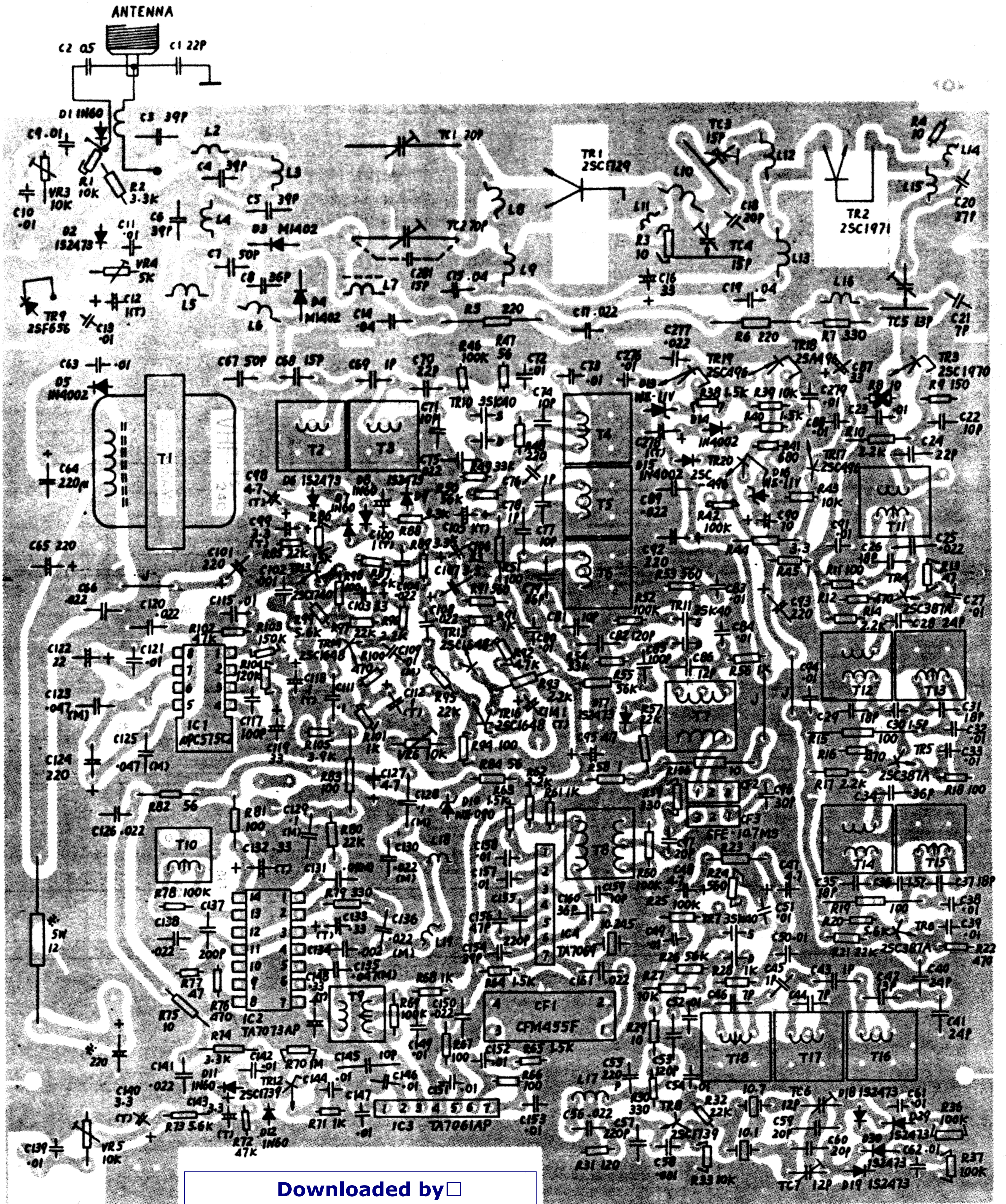
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INTERCONNECTION WIRING DIAGRAM



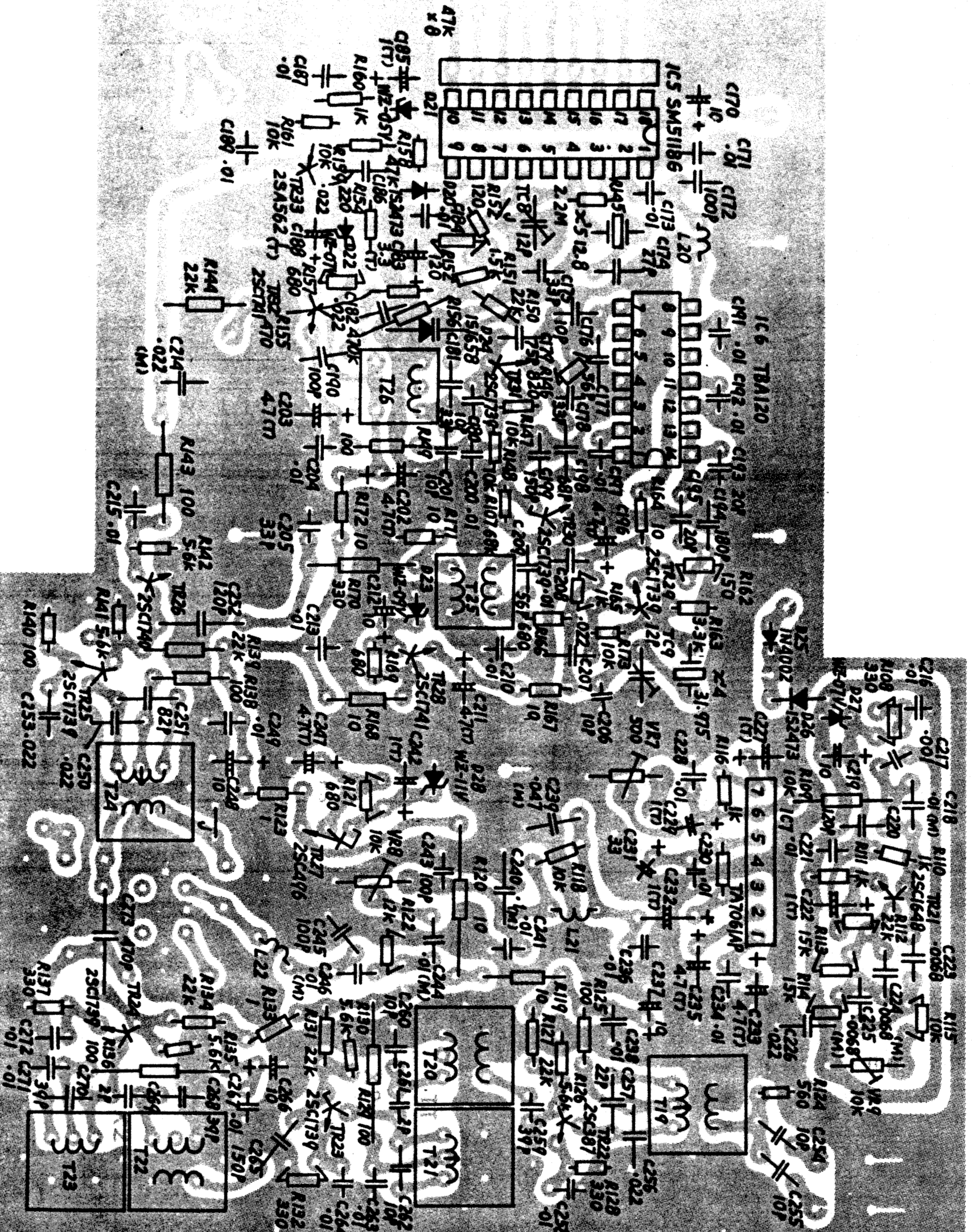
# CIRCUIT DIAGRAM



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# PLL ASSEMBLY PARTS LAYOUT

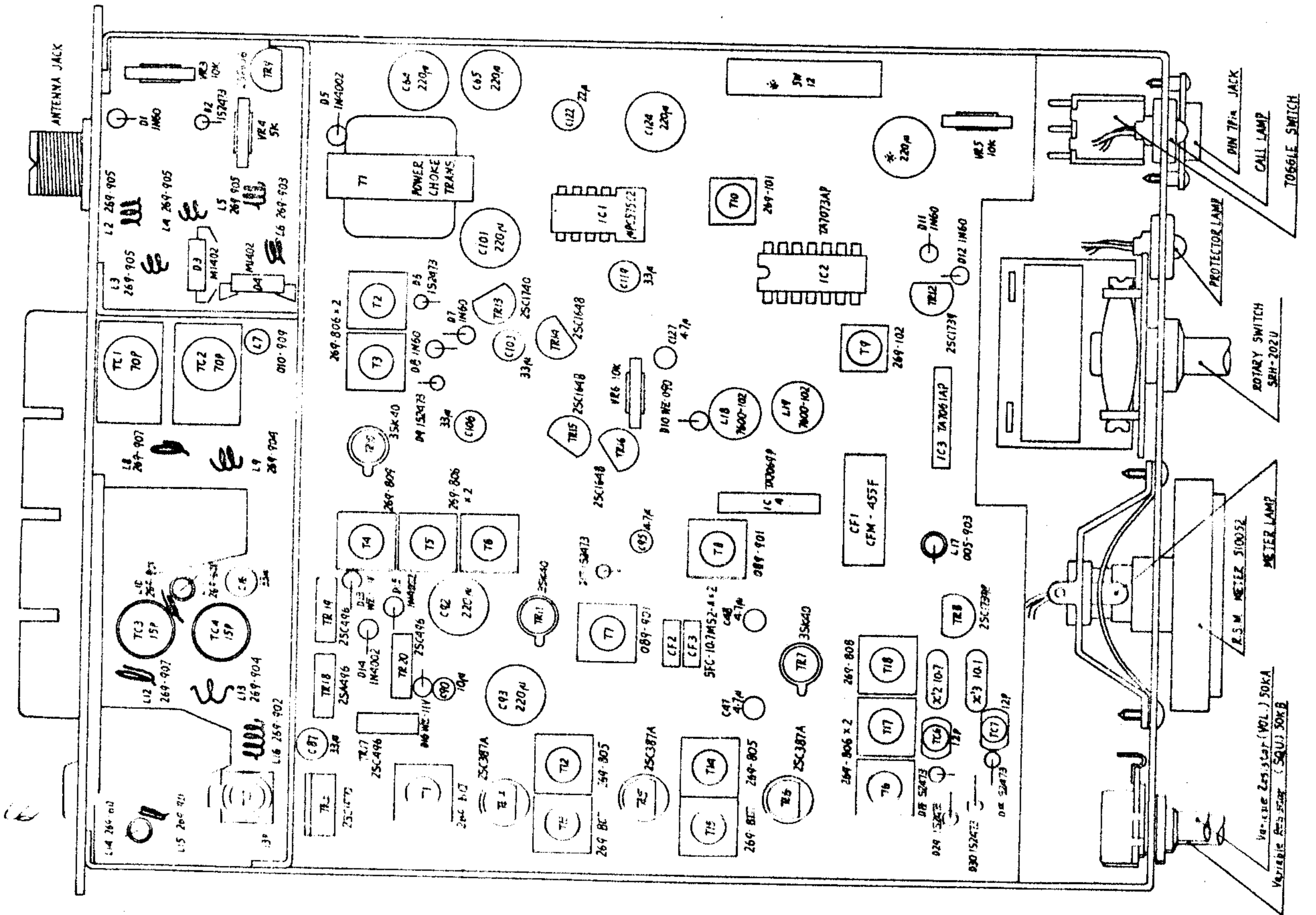
- C162 — .01
- C163 — .01
- C164 — .01
- C165 — .01
- C166 — .01
- C167 — .01
- C168 — .01
- C169 — .01



12-240

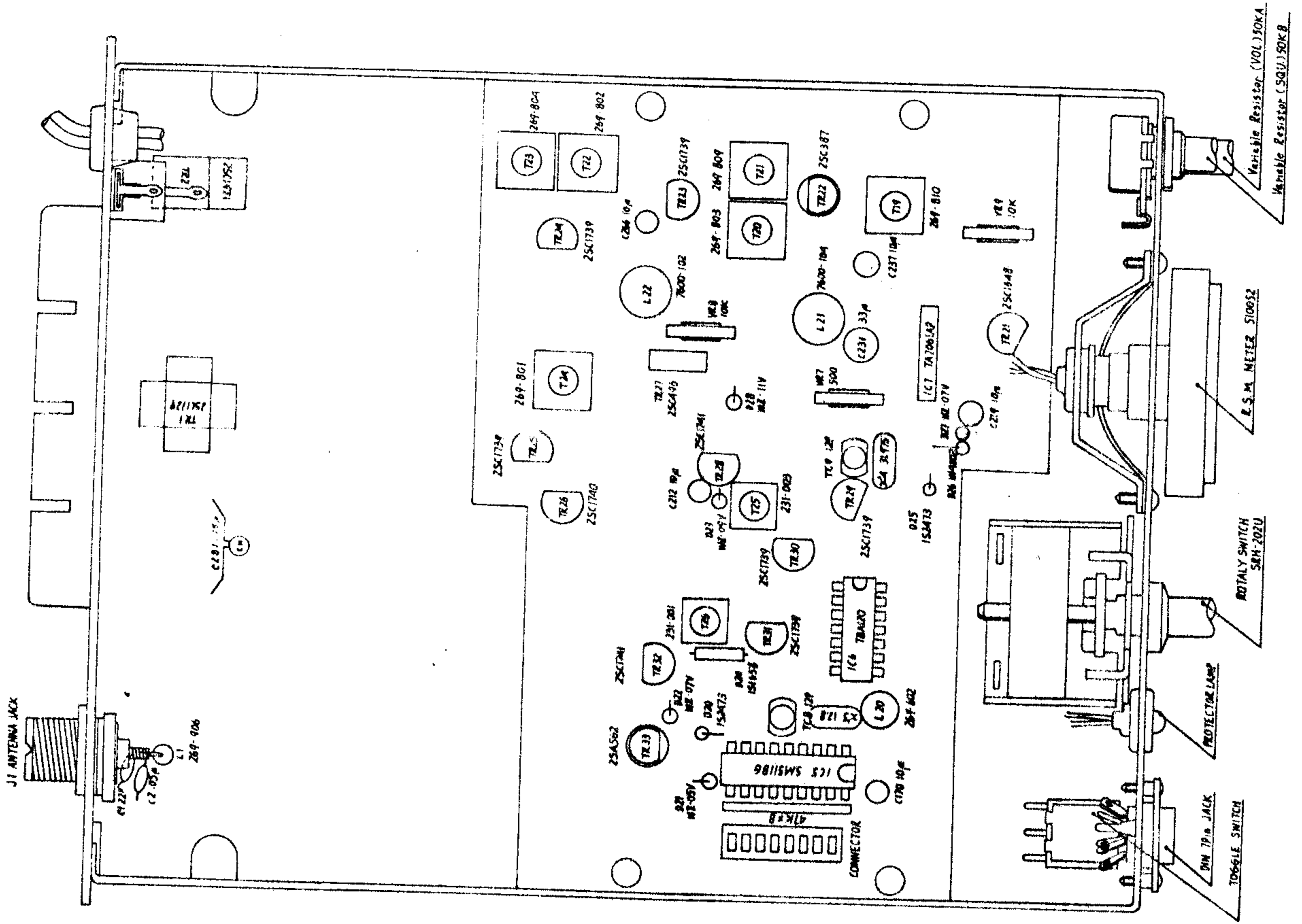
12-240

**MAIN CHASSIS PRINTED CIRCUIT BOARD  
COMPLETE PARTS LAYOUT**



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**PLL ASSEMBLY  
COMPLETE PARTS LAYOUT**



## PARTS LIST FOR TS-240FM

DESIGNATION	PARTS NAME	PARTS NO.
MP-443	Front Frame	524405
MP-444	Front Plate (R)	524423-R
MP-445	Front Plate (L)	524423-L
MP-446	Brand Plate	524424
MP-447	Back Plate	524425
MP-448	Chassis Frame	522060
MP-107	Mounting Bracket	484085
MP-105	Cabinet Cover (Upper)	483016
MP-449	Cabinet Cover (Lower)	523061
MP-450	Back Pannel	524429
MP-211	Meter Lamp Reflection Plate	484063
MP-353	Heatsink A	494251
MP-354	Heatsink B	494252
MP-451	Heatsink(for 2SC1729, 2SC1971)C	524432
MP-110	Mounting Bracket for Meter	484064
MP-406	Mounting Bracket for Speaker	504335
MP-111	Call Switch Contact	484086
MP-112	Call Switch Spring	484087
MP-117	Knob for Channel Selector	484116
MP-17	Knob for Vol./Squ. Control	474011
MP-19	Call Button	484057
MP-109	Supporter for MIC. Consent	484084
MP-118	Nut for Channel Selector	484073
MP-120	Screw for Mounting Bracket	484098
MP-500	PLL Unit Cover (Upper) A	524376
MP-501	PLL Unit Cover (Lower) B	524386
MP-452	Power Unit Cover C	524430
MP-453	Power Unit Cover D	524430
MP-454	Power Unit Cover E	524431
TC-1.2	Trimmer Final Tune. 70PF	AV-70C
TC-3.4	Trimmer Drive Tune. 15PF	CV03A150
TC-5	Trimmer Pri Drive Tune. 13PF	CV7-13
TC-6~9	Trimmer Crystal FREQ. 12PF	CV05-C120

## PARTS LIST FOR TS-240FM

DESIGNATION	PARTS NAME	PARTS NO.
TR1	TRANSISTOR	2SC1729
TR2	TRANSISTOR	2SC1971
TR3	TRANSISTOR	2SC1970
TR4.5.6.22	TRANSISTOR	2SC387-A
TR17.19.20.27	TRANSISTOR	2SC496-Y
TR18	TRANSISTOR	2SA496-Y
TR33	TRANSISTOR	2SA562-O
TR8.12.23.24.	TRANSISTOR	2SC1739-P
25.29.30.31	TRANSISTOR	
TR28.32	TRANSISTOR	2SC1741-P
TR13.26	TRANSISTOR	2SC1740-S
TR14.15.16.21	TRANSISTOR	2SC1648LN
TR7.10.11	FET	3SK40
TR9	SCR	2SF656
IC5	Integrated Circuit	SM5118G
IC6	Integrated Circuit	TBA120
IC1	Integrated Circuit	UPC575C2
IC2	Integrated Circuit	TA7073AP
IC4	Integrated Circuit	TA7069P
IC3.7	Integrated Circuit	TA7061AP
CF1	Ceramic Filter	CFM-455F
CF2.3	Ceramic Filter	SFC-10.7MS2-A
D2.6.9.17.~20	Silicon Diode	IS2473
25.26.29.30		
D5.14.15	Silicon Diode	IN4002
D1.7.8.11.12	Germanium Diode	IN60
D13.16.28	Zener Diode	WZ-110
D10.23	Zener Diode	WZ-090
D22.27	Zener Diode	WZ-070
D21	Zener Diode	WZ-050
D24	Varicap Diode	IS-1658
D3.4	RF. SW. Diode	MI-402