MAINTENANCE SERVICE MANUAL FTC-1525A/1540A

YAESU MUSEN CO., LTD.
C.P.O. BOX 1500
TOKYO, JAPAN

YAESU ELECTRONICS CORP.
P.O. BOX 498
PARAMOUNT, CALIFORNIA, 90723

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INDEX

SECTION 4 – REPAIR PARTS

FOREWORD

The purpose of this manual is to provide information critical to the long-term operation and maintenance of the FTC-1525A and FTC-1540A VHF FM Mobile Transceivers. In the interest of clarity, descriptions have been kept brief and somewhat informal, while photographs and drawings are utilized liberally.

We believe the material presented herein to be correct and factual. However, should typographical or other errors be present, Yaesu assumes no liability for damage resulting from such errors. Your cooperation in pointing out any inconsistencies in the technical information would be appreciated.

The rugged, straightforward design of the FTC-1525A and FTC-1540A makes it unlikely that you will have frequent recourse to this manual. We hope and trust, however, that the material to follow will meet your service requirements.

Your attention to the note below is requested.

C.H. Margelli, K7JA
Public Relations Manager
Yaesu Musen Company, Ltd.
Tokyo

IMPORTANT NOTE

Any adjustments to the FTC-1525A or FTC-1540A which affect the transmitter characteristics or operating frequency must be performed only by an FCC licensed technician holding a Second Class (or higher) certificate.

YAESU
FTC-1525A/FTC-1540A
VHF LAND MOBILE TRANSCEIVERS

GENERAL DESCRIPTION

The FTC-1525A and FTC-1540A are compact, high performance VHF FM transceivers for land mobile applications. Fully solid state, these transceivers provide operation within a 1.5 MHz range anywhere in the 134–174 MHz land mobile band. The transmitter section of the FTC-1525A puts out 25 watts, while the FTC-1540A output is 40 watts. The receiver section provides high sensitivity, yet excellent rejection of intermodulation and cross modulation products.

Designed for use in a variety of land mobile applications, these transceivers are packaged in heavy gauge metal cases, thus minimizing the chance of damage from shock or vibration. The FTC-1525A and FTC-1540A are also fully protected against damage from reversed power supply polarity and high antenna SWR.

The FTC-1525A and FTC-1540A are supplied with all mounting hardware, cables, and connectors required for mobile installation.

PERFORMANCE SPECIFICATIONS

GENERAL

Frequency range:
7 desired spot frequencies within a 1.5 MHz spread within the range 134–174 MHz

Oscillation system:
Crystal control

External connections:
Push-to-talk microphone and mounting bracket furnished. External antenna jack and power supply connections in rear.

Weight:
2.8 kg.

Dimensions:
72 mm (H) x 180 mm (W) x 269 mm (D)

Power requirements:
DC 13.6 volts (negative ground)

Power consumption (at 13.6 V)
Standby: Less than 0.15 A
Receive: Less than 0.37 A
@ 1.5 W audio output
Transmit: 5.5 A (FTC-1525A)
7.5 A (FTC-1540A)

TRANSMITTER

Power output:
25 watts RF (FTC-1525A)
40 watts RF (FTC-1540A)

Frequency stability:
±0.0005% ** USA model

Modulation type:
16F3 (phase modulation)

Transmitter audio deviation:
±5 kHz

Audio response:
+1, –3 dB/octave pre-emphasis characteristic from 300 Hz to 2500 Hz.

FM noise:
–40 dB @ ±3 kHz deviation @ 1000 Hz modulation.

Spurious emissions:
At least 70 dB below carrier.

AF distortion:
10% or less @1 kHz, ± 3 kHz deviation.

Antenna impedance:
50 ohms

Microphone type:
Low impedance (600 ohm) dynamic

Crystal multiplication:
12 times

RECEIVER

Frequency stability:
±0.001%

Sensitivity:
Better than 0.3 μV for 20 dB noise quieting.

Adjacent channel selectivity:
Better than –70 dB.

Image rejection:
Better than –80 dB.

Intermodulation:
Better than –60 dB.

Squelch sensitivity:
0.2 μV.

AF output:
1.5 watts @ 10% THD (8 ohms)

Specifications subject to change without notice or obligation.

SEMICONDUCTORS

IC

AN214P	1
μPC577H	1
TA7061P	1

FET

3SK51	2
2SK19GR	1

Transistor

2SA496(O)	1
2SA697	1
2SC372Y	16
2SC710D	3
2SC735Y	2
2SC1047	2
2SC1923(O)	1
2SD235	1
2N6083 (FTC-1525A)	1
2N6084 (FTC-1540A)	1
MRF208	1
MRF237	1
MRF515	1

Germanium diode

1S188FM	10

Silicon diode

1S1555	3
15FD11	1
MC301	24
V06B	1

Varactor diode

1S1658	2

Zener diode

WZ090	5

Light emitting diode

LN222RP	1
LN322GP	2

TONE SQUELCH UNIT

IC

86022	1

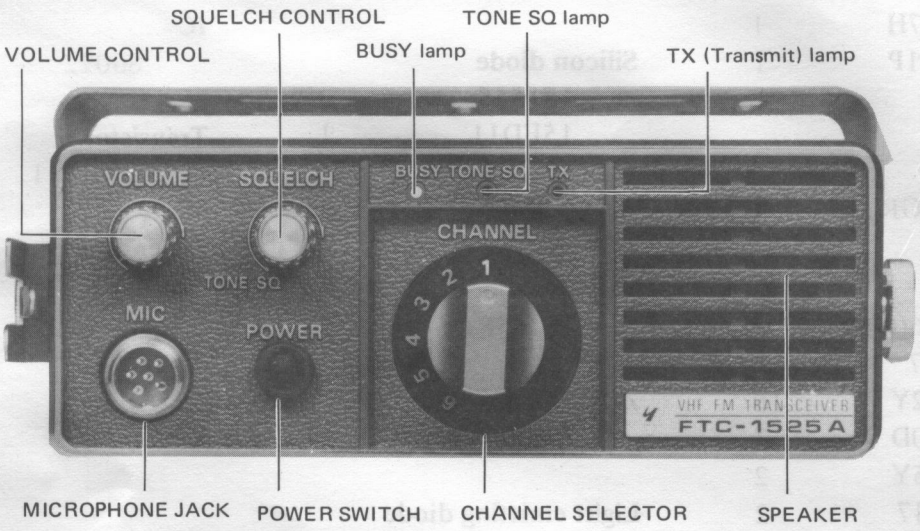
Transistor

2SC1311	2

Zener diode

RD8.2EB	1

FRONT PANEL CONTROLS AND SWITCHES



(1) MICROPHONE JACK

This six-pin jack accepts the microphone input, as well as push-to-talk (PTT) control.

(2) VOLUME

The volume control varies the receiver audio output level. Clockwise rotation increases the volume level.

(3) POWER

This is the main ON/OFF switch for the transceiver. When the switch is turned on, the channel selection dial will become illuminated.

(4) SQUELCH/TONE SQ.

The squelch control quiets the audio output of the transceiver until a signal is received. When rotated into the TONE SQ. position, an optional CTCSS subaudible tone encoder/decoder will be activated.

(5) CHANNEL

The 7-position channel selector switch selects the desired channel.

(6) BUSY

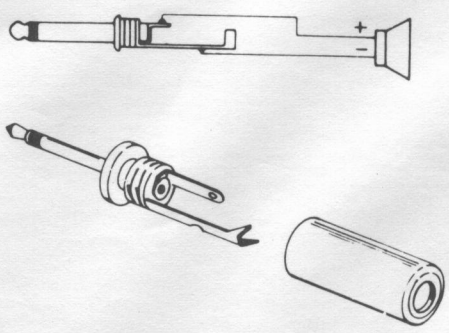
When a signal is being received, the BUSY lamp will light up. When the optional tone squelch is being used, the lamp will show the operator that the channel is occupied, even though no signal is being heard (if no subaudible tone is being received on the incoming signal).

(7) TONE SQ

When the optional tone squelch system is activated, this lamp will light up.

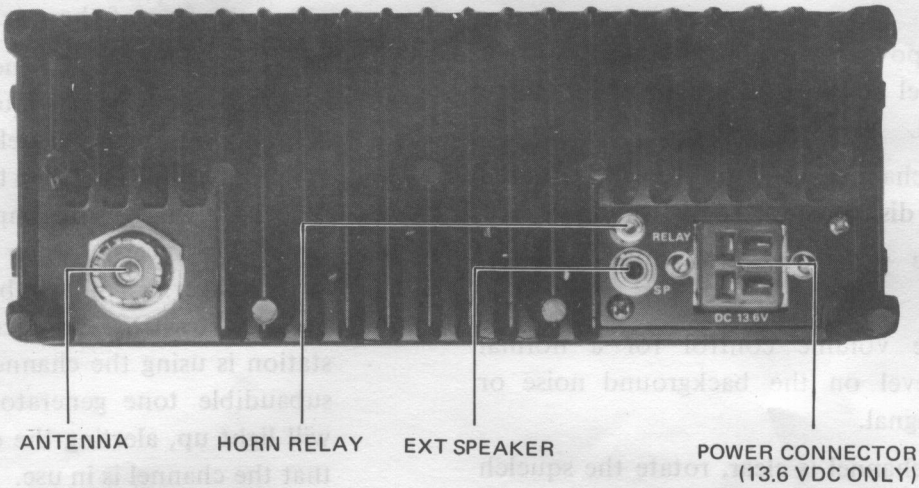
(8) TX

The transmit indicator will light up when you are transmitting.



Speaker Plug

REAR APRON CONNECTIONS



(1) ANT

This is a UHF type coaxial receptacle for making the connection to the antenna.

(2) HORN RELAY UNIT (OPTION) TERMINAL

This terminal is for connection to the FHR-1 option for Theft Guard use.

(3) EXT SP

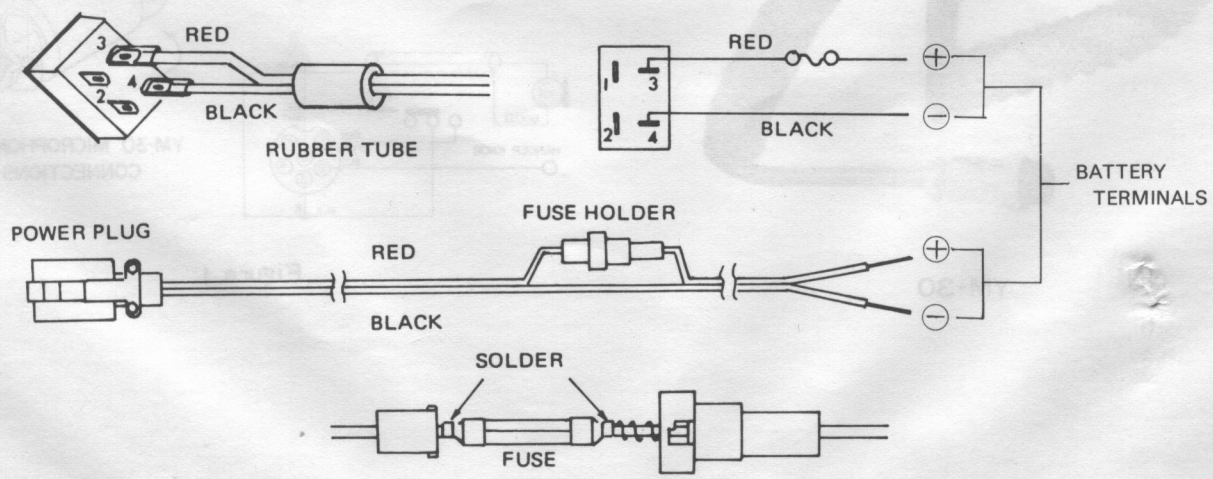
An external 8 ohm speaker may be connected at this point. Insertion of the plug into this jack automatically cuts off the internal speaker.

(4) POWER

This is a 4-pin connector for making power supply connections. Connect this jack, through the power cord, only to a 13.6 volt DC power source.

WARNING

DO NOT CONNECT AC POWER TO THE DC POWER RECEPTACLE. REPLACE FUSES ONLY WITH A 10 AMP FUSE (FTC-1540A: 15 AMP FUSE). FAILURE TO OBSERVE THESE WARNINGS WILL VOID THE WARRANTY.



OPERATION

Operation of the FTC-1525A or FTC-1540A is extremely straightforward. Before commencing operation, confirm that power supply connections have been correctly made, and that a 50 ohm antenna is connected to the antenna jack.

(1) Place the power switch in the ON position. The channel selector switch should become illuminated.

(2) Set the channel selector to the desired channel, as displayed in the dial window.

(3) Rotate the squelch control fully counter-clockwise.

(4) Adjust the volume control for a normal listening level on the background noise or incoming signal.

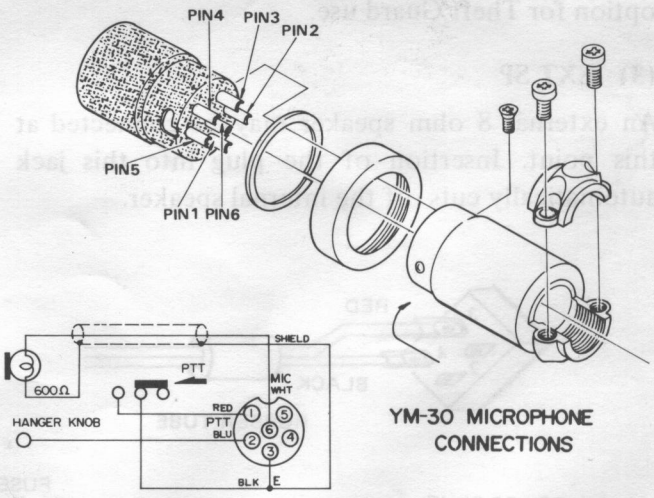
(5) When the channel is clear, rotate the squelch carefully in a clockwise direction, to the point where the background noise is just silenced. Do not go beyond the point where the noise just disappears, or the receiver will not respond to weak signals.

(6) After setting the receiver controls, and selecting the proper channel, close the microphone push-to-talk switch to activate the transmitter. Hold the microphone a short distance from your mouth, and speak in a normal voice across the face of the microphone.

(7) When the optional tone squelch unit is installed, and tone squelch operation is desired, rotate the squelch control to the TONE SQ position. When transmitting, a subaudible tone will be superimposed on the output signal. On receive, when the microphone is in its hanger, a similar subaudible tone will be required to trip the receiver squelch. If a station is using the channel, but is not using a subaudible tone generator, the BUSY lamp will light up, alerting the operator to the fact that the channel is in use.

MICROPHONE CONNECTIONS

YM-30



YM-30 MICROPHONE CONNECTIONS

Figure 1

INSTALLATION

The FTC-1525A/1540A are designed primarily for mobile installation, requiring only an antenna and 13.6 VDC power source for operation. The transceivers have been pretuned at the factory, and no adjustment is required for operation into a 50 ohm load.

For mobile installations, three basic factors must be considered. These are: the antenna system and feedline; the physical location of the transceiver; and the power connections. We will consider each of these individually in the following sections.

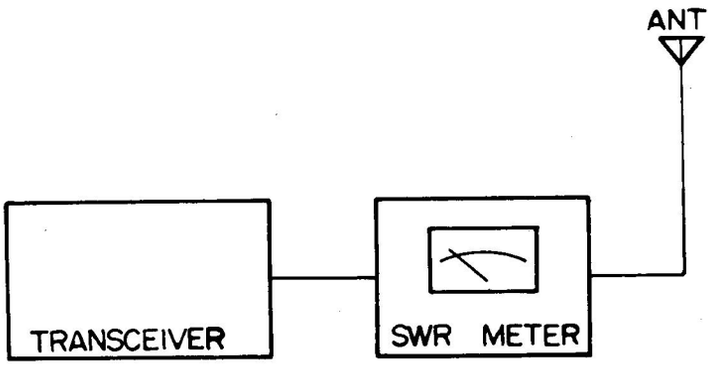
ANTENNA CONSIDERATIONS

The FTC-1525A/1540A are designed for operation into a 50 ohm antenna system. While variations of a few ohms from this figure are of no consequence whatsoever, the automatic final amplifier protection circuitry will reduce the power output if the impedance presented to the antenna jack is below 25 ohms or above 100 ohms.

Preferably, the antenna should be located away from the automobile engine, if possible, in order to avoid unnecessary noise pickup. A typical location would be in the center of the car roof or the center of the trunk lid. Where ground connections are made, they should be scraped clean of all paint and corrosion, so as to ensure adequate bonding. Lossy ground connections can have seriously detrimental effects on the antenna system impedance and radiation pattern.

To minimize losses in the antenna system, the shortest possible length of coaxial cable should be used. For mobile installations, type RG-58A/U is suitable because of its small size. For base stations, however, larger sizes are to be preferred. Base station systems requiring more than 25 feet of coaxial cable should utilize type RG8A/U, and extremely long runs of many hundreds of feet generally require the use of type RG-17A/U, aluminum-jacketed "foamflex" coax, or air-dielectric "heliax" coax.

The antenna should be tuned for the center of the 1.5 MHz working band of the transceiver. To check the SWR, install a 50 ohm SWR meter between the transceiver antenna jack and the antenna. Place the selector switch into the FORWARD position on the meter, and transmit briefly (make certain that the channel is clear). Rotate the FORWARD SET or SWR SET control for a full scale reading. Now switch to REFLECTED on the meter, and read the SWR. If it is below 1.5, you are in good shape. If not, check below or above the 1.5 MHz range of the transceiver. If the SWR is very high (more than 3 : 1), there may be trouble in the coaxial cable. Check the SWR with the meter installed **at the antenna**, or test the coax by replacement with cable known to be good.



1. SWITCH TO FORWARD
2. SET METER FOR FULL SCALE
3. SWITCH TO REFLECTED
4. READ SWR ON METER.

TYPICAL SWR TEST SETUP

Fig. 2

PHYSICAL LOCATION OF TRANSCEIVER

The FTC-1525A/1540A may be installed at any angle desired without loss of performance. Typical locations are atop the transmission tunnel, below or in the dash board, or overhead (in trucks, etc.).

When considering a possible location for the transceiver, several factors must be considered. First, there must be room for the transceiver cables, the microphone, and heat sink. We recommend that several inches of space be available around the heat sink to allow free air circulation. Also, we recommend that the transceiver not be located directly in the path of the output vent from the car heater.

Another consideration is the routing of cables to the desired installation location. If the power cable to the battery or the coaxial cable to the antenna must be extended greatly in order to meet aesthetic considerations, the increased losses may degrade performance. Fortunately, the common under-dash installation lends itself well to efficient performance, as the power cable can be fed through the fire wall.

One final consideration is safety. The transceiver and its microphone must never be installed in a position that may interfere with driver vision or operation of the vehicle. Be especially wary of stick shifts in compact cars, and allow plenty of room for unobstructed manipulation of the controls. The FTC-1525A/1540A are very compact units, so there is no reason ever to compromise safety during installation.

POWER CONNECTIONS

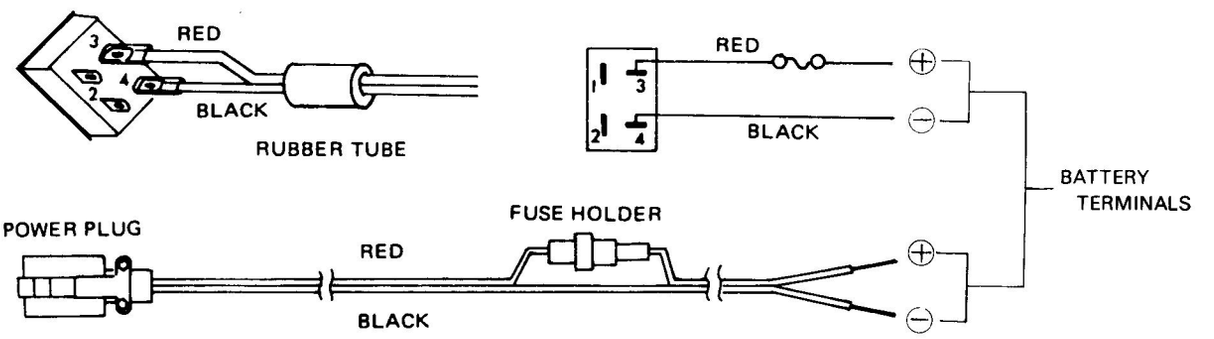
For mobile installation, direct connection to the battery is to be preferred. If power connections are made at the ignition switch, unnecessary noise pickup may occur. Also, if power is taken from the automobile lighting, cigarette lighter, or other circuits, the circuit line fuse will probably blow because of insuffucient capacity. A fuse (10 amp for FTC-1525A, 15 amp for FTC-1540A) is located in the DC power cord for the transceiver, protecting that circuit.

The power connection procedure is detailed below. Once the power connections are made, but before the power cord is connected to the transceiver, you should check the battery charging voltage with the engine running fast enough for the car ammeter to show a charge. If the voltage exceeds 15 volts, the car voltage regulator must be adjusted to limit the maximum voltage to less than 15 volts.

Also, when making power supply connections, you must be absolutely certain that the proper supply polarity is observed.

WARNING

NEVER APPLY AC POWER TO THE REAR PANEL POWER JACK OF THE TRANSCEIVER. NEVER CONNECT A DC POWER SOURCE OF GREATER THAN 15 VOLTS TO THE REAR PANEL POWER JACK. ALWAYS REPLACE FUSES WITH A FUSE OF THE PROPER RATING. FAILURE TO OBSERVE THESE SIMPLE PRECAUTIONS WILL VOID ALL WARRANTIES ON THIS EQUIPMENT.



INSTALLATION STEP-BY-STEP OUTLINE

1. Determine the optimum location for the transceiver, making certain that there is sufficient space for the transceiver, its cables and switches, and the microphone. Leave several inches of space around the heat sink, to permit free air flow.

2. A universal bracket is supplied with the transceiver. Use the universal bracket as a template for positioning the mounting holes. Use a 3/16" diameter bit for drilling these holes, allowing clearance for the transceiver and all accessories and cables. Secure the mounting bracket with the screws, washers, and nuts supplied, as shown in the drawing.

3. Ease the transceiver into the guide rail, and slide it into the desired position. Tighten the knobs on the outside of the universal bracket to secure the transceiver.

4. Confirm that the installation does not obstruct normal, safe operation of the vehicle.

5. Route the transceiver power cable through the fire wall to the battery. Avoid proximity to ignition cables if at all possible. Lay out the power cable so as not to have it interfere with the normal operation of the fan belt or other engine components.

6. Connect the RED battery lead to the POSITIVE (+) side of the battery. Connect the BLACK lead to the NEGATIVE (–) side of the battery.

7. If the optional FSP-1 external speaker is to be installed, it may be connected to the rear panel SP jack. The speaker can then be mounted wherever convenient for the operator. Insertion of the speaker plug into the rear apron automatically cuts off the internal speaker of the transceiver.

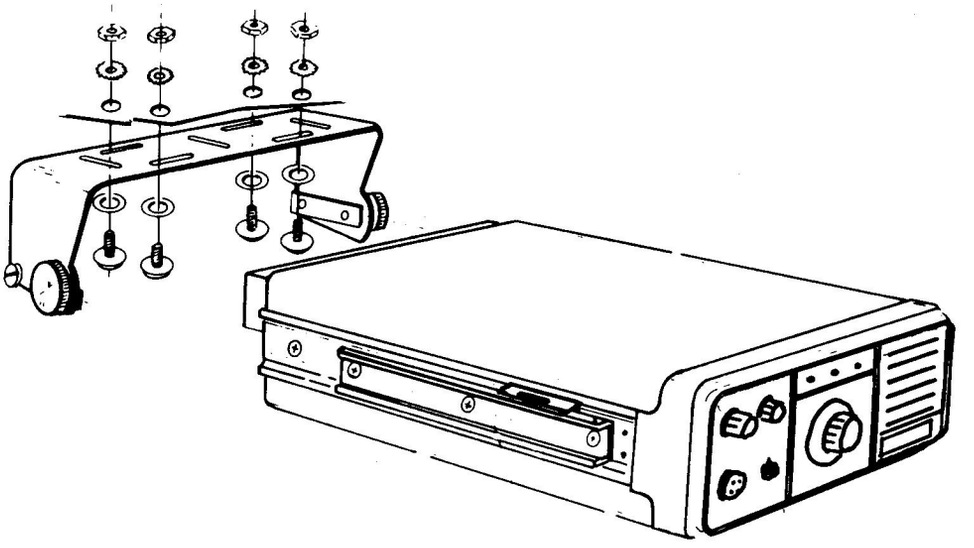


Fig. 3

BASE STATION INSTALLATION

For base station installations, the FP-6 AC power Supply option provides a convenient means of providing the required 13.6 VDC for the FTC-1525A/1540A transceivers.

Before commencing operation with the FP-6, be absolutely certain that the power transformer primary has been wired correctly for the local line voltage in your area. The FP-6 is marketed throughout the world, and a unit that you receive from a customer who recently has been abroad may be wired for 234 volts or similar. Operation of the FP-6 from an improper supply voltage will void all warranties on the set.

Connect the four pin plug to the transceiver POWER jack, and plug in the FP-6 AC cable to the wall outlet. Now turn the FP-6 switch ON, and then turn the transceiver power switch ON. The radio will now be ready for operation, if you have the antenna and microphone connected.

Power supply ON/OFF control can be exercised from the transceiver. Pins 1 and 2 of the four pin power plug (P_1) are connected to the transceiver power switch. So when the FP-6 power switch is on, one need only turn the transceiver power switch on and off to control the FP-6 at the same time.

The FP-6 contains a quality speaker for base station installation. Connect the miniature phone plug from the FP-6 to the SP jack on the rear apron of the transceiver.

CAUTION

When performing service on the FP-6 four pin power plug (P_1), be absolutely certain that you observe the proper connections to the plug. Pin 3 is 13.6 VDC out (+), pin 4 is ground, and pins 1 and 2 are used for the AC switching function. Improper connections will void the FP-6 warranty.

YM-30/FTC-1525A/FP6

TONE SQUELCH INSTALLATION

The FTS-1-1/PB CTCSS module option can easily be installed in a matter of minutes.

Installation Procedure:

(1) Inspect the frequency table accompanying this section, and select the resistor appropriate for the tone signal to be used. Install the selected R_{1002} onto the FTS-1-1/PB board, and be certain to use only a 1% tolerance metallic film resistor.

(2) If the tone frequency is above 125 Hz, install the jumper wires shown in Figure 4 (**JP1/2**).

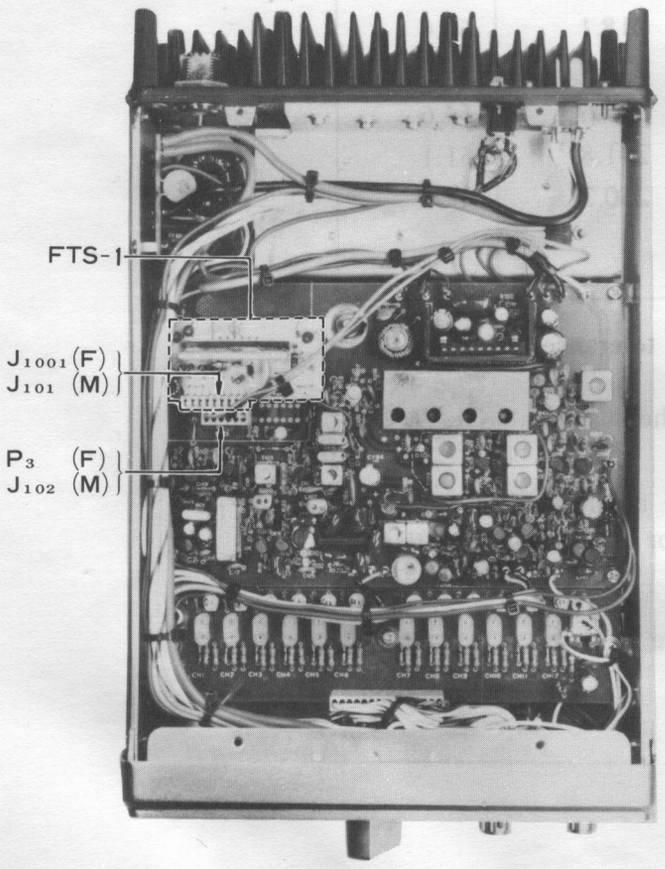
(3) Refer to Figure 5 , and unplug P_3 from its jack J_{102}. Install the FTS-1-1/PB onto J_{101}, and reinstall P_3 onto J_{102}. Installation is now complete.

TUNING RESISTORS (USA model)

CTCSS Frequency (Hz)	Tuning R (kOhms)	CTCSS Frequency (Hz)	Tuning R (kOhms)
67.0	180.441	136.5	173.892
71.9	156.684	141.3	162.278
74.4	146.331	146.2	151.582
77.0	136.616	151.4	141.349
79.7	127.517	156.7	131.949
81.0	123.456	162.2	123.152
82.5	119.008	167.9	114.932
85.4	111.062	169.0	113.441
88.5	103.418	173.8	107.261
90.0	100.000	179.9	100.111*
91.5	96.748	186.2	93.451
94.8	90.129	188.0	91.670
100.0	81.000	192.8	87.162
103.5	75.614	203.5	78.237
107.2	70.484	209.0	74.174
110.9	65.860	210.7	72.982
114.8	61.461	218.1	68.113
118.8	57.392	225.7	63.603
123.0	53.539	233.6	59.374
127.3	199.934	241.8	55.415
131.8	186.515	250.3	51.715

Table 1

NOTE:
Tuning resistors are metal film, 50 ppm/°C and ±0.1% tolerance. Stable trim pots of comparable quality may also be used in series with ±1.0% tolerance resistors.



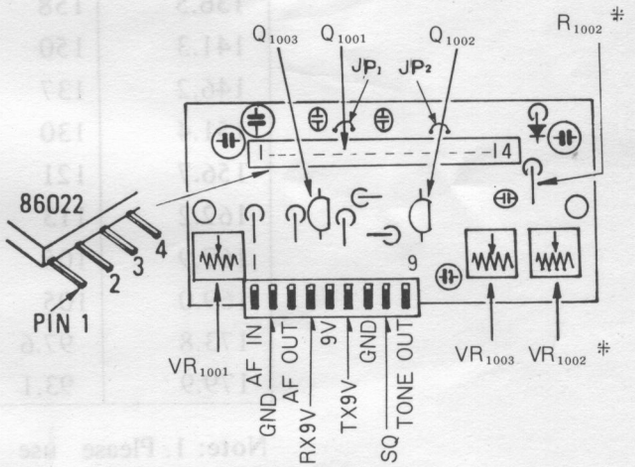


Figure 4.

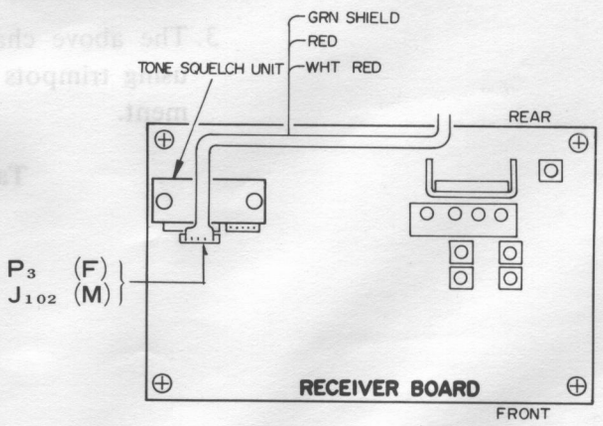


Figure 5.

THEFT GUARD INSTALLATION USING FHR-1

The Theft Guard feature of the FHR-1 Horn Relay box can be an effective deterrant to burglary. When the line from the FHR-1 box to the FTC-1525A/1540A is cut, the horn will begin blaring on and off, and further tampering with the car will probably be discouraged.

In order to make it difficult for a thief to disable the Theft Guard, we recommend that the FHR-1 be installed under the hood of the automobile in a fairly dry location. Alternatively, it may be installed in some inaccessible location under the dash. The only time that ON/OFF switching should be needed is in the event of an attempted burglary, as the current drain is negligible in the standby mode. To quiet the horn, turn the FHR-1 power switch to OFF.

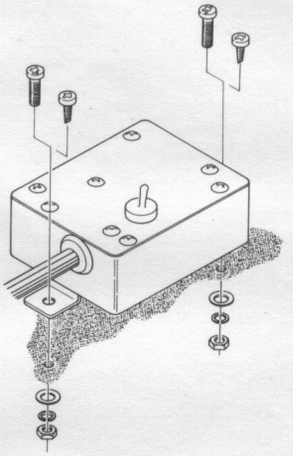


Figure 6.

Installation Procedure:

(1) Refer to Figure 6, and mount the FHR-1 box in the desired location. The unit is not waterproof, so a position not exposed to moisture is to be preferred.

(2) Refer to the interconnection diagram (Page 2 -5), and hook up the wires as shown. The two heavy red wires (bare ends, with no connector) should be wired in parallel with the main steering wheel horn switch of the car. The three leads from the molded connector are connected as follows: the white lead goes to the FTC-1525A/1540A HORN RELAY terminal (Figure 7); the red lead goes to an auxiliary post on the fuse block, if one is available (10 amp fuse is OK); the black lead goes to ground.

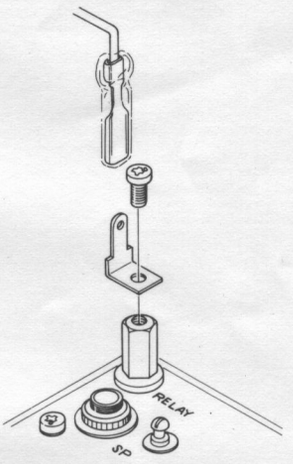


Figure 7.

(3) Inside the FHR-1 are two miniature potentiometers, shown in Figure 8. VR_{101} controls the ON time of the beeping horn; while VR_{102} controls the OFF time. Either control provides an adjustment range of 2 to 25 seconds in the on and off times.

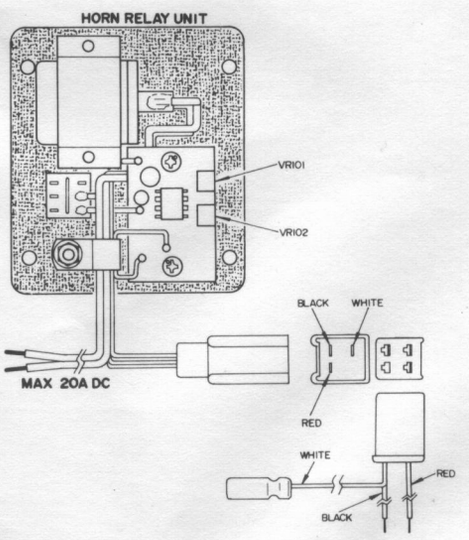
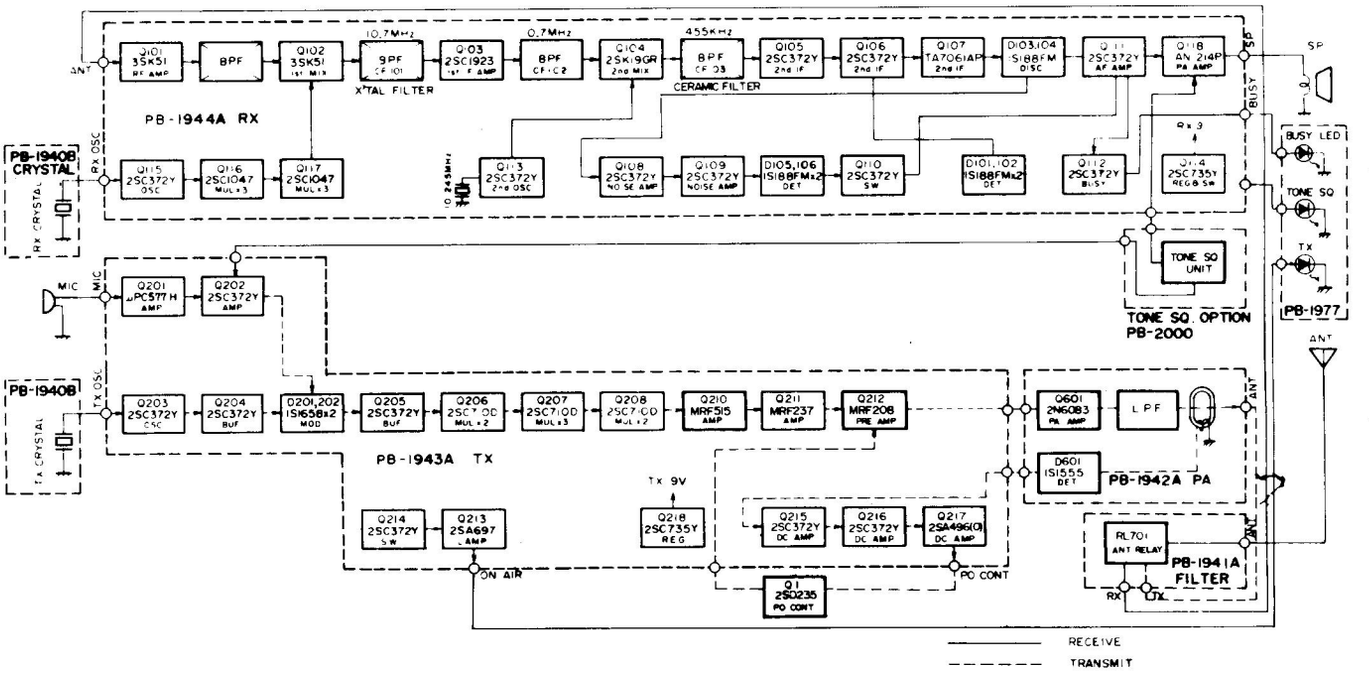


Figure 8.

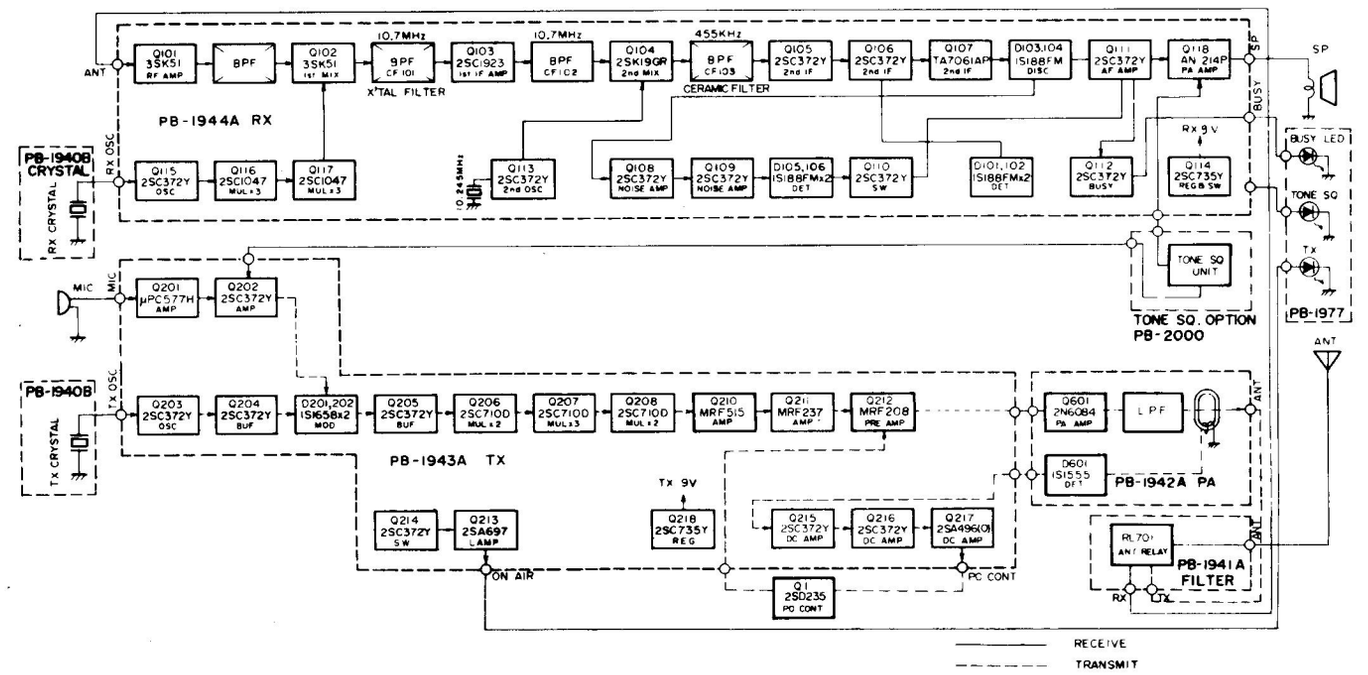
(4) The customer should be educated in the importance of being able to turn off the horn relay quickly, so as to minimize the disturbance to others. Also, discuss with the customer the importance of maintaining good connections to the HORN RELAY jack, etc., so as not to induce false triggering of the horn.

MEMO

BLOCK DIAGRAM



FTC-1525A BLOCK DIAGRAM



FTC-1540A BLOCK DIAGRAM

CIRCUIT DESCRIPTION

The block diagram, and circuit description to follow, will provide you with a better understanding of this transceiver. Please refer to the schematic diagram for specific circuit details.

PARTS DESIGNATIONS ON CIRCUIT BOARDS

The FTC-1525A/1540A transceivers utilize the "mother board" concept. Each circuit board has a code number assigned to it, and each part within the transceiver has a part number assigned to it (e.g. Q_{102}).

Part numbers 01–99 (e.g. R_{12}) are located on the main chassis. Other parts, located on the circuit boards, are assigned a three or four digit part number; the last two figures represent the part number for the particular board, while the first one or two digits are the code number for that board.

Thus, Q_{101} is transistor number 01, located on circuit board number 1, which is the RX Unit. Refer to the accompanying chart for a tabulation of the code numbers assigned to the FTC-1525A/1540A circuit boards.

Please note that the designation "Q" is applied to transistors as well as to integrated circuits. The "U" nomenclature for IC's is not used in Yaesu diagrams.

Code #	Unit	Board Designation
1	RX	PB-1944A
2	TX	PB-1943A
6	POWER AMPLIFIER	PB-1942A
7	FILTER BOARD	PB-1941A
8	CRYSTAL BOARD	PB-1940B
9	LED BOARD	PB-1977
10	TONE SQUELCH	PB-2000

RECEIVER

An incoming signal from the antenna is coupled through L_{101} to the RF amplifier, Q_{101} (3SK51), a dual-gate MOS FET with excellent rejection of cross modulation. The amplified signal is then passed through a four-stage helical resonator to the first mixer.

A crystal controlled signal is generated by Q_{115}, using up to twelve HC-25/U crystals operating in the fundamental mode. Individual trimmer capacitors for each crystal allow precise adjustment of the crystal frequency.

The output from Q_{115} is coupled through C_{158} to oscillator multipliers Q_{116} and Q_{117} (2SC1047), which multiply the oscillator signal by a factor of 9. The multiplier chain output, 10.7 MHz below the channel frequency, is link coupled from T_{110} and fed to gate 2 of the first mixer.

The local signal at gate 2 and the RF signal at gate 1 are mixed by the first mixer, Q_{102} (3SK51). The output of Q_{102} is tuned by T_{101} to the difference frequency of the input signals, resulting in a 10.7 MHz first IF. The IF signal is then passed through a selective filter, CF_{101}, and delivered to the IF amplifier.

The IF signal is amplified by first IF amplifier Q_{103} (2SC1923), and then fed through another selective filter, CF_{102}. The resulting signal has excellent image rejection characteristics, as well as high out-of-band attenuation. The IF signal is then delivered to the second mixer.

Crystal oscillator Q_{113} (2SC372Y) generates a second local signal of 10.245 MHz. Q_{113} oscillates in a series mode Colpitts circuit, and the output from the emitter of Q_{113} is delivered to the second mixer.

The 10.7 MHz IF signal and the 10.245 MHz local signal are mixed by Q_{104} (2SK19GR), resulting in a second IF signal of 455 kHz. The IF signal is passed through a selective filter, CF_{103}, and amplified by Q_{105} and Q_{106} (2SC372Y), and fed to amplifier limiter Q_{107} (TA7061AP). The limiting action of Q_{107} eliminates any amplitude variation in the IF signal, which is then delivered to the discriminator.

The discriminator is a ratio detector type demodulator. The output from the limiter is voltage coupled through T_{105} to T_{106}, then rectified by D_{103} and D_{104} (1S188FM). The discriminator produces an audio output in response to a corresponding frequency shift in the IF signal.

The audio signal from the detector is applied to the de-emphasis network, consisting of R_{129} and C_{137}. The de-emphasized audio is coupled through C_{145} to the base of Q_{111} (2SC372Y), where the audio signal is amplified for delivery to the final audio amplifier, Q_{118} (AN214), which delivers 1.5 watts of audio to the speaker.

When no carrier is present in the 455 kHz IF, the high frequency noise at the discriminator output is amplified by Q_{108} and Q_{109} (2SC372Y), then detected by D_{105} and D_{106} (1S188FM), producing a DC voltage. This voltage is applied to turn Q_{110} (2SC372Y) on. With the conduction of Q_{110}, the base of Q_{111} is grounded, squelching the audio amplifier. When a carrier is present in the 455 kHz IF, the noise is removed from the discriminator output, and the audio amplifier then recovers to normal operation. The opening of the squelch causes Q_{111} to conduct, causing Q_{112} (2SC372Y) to light up the BUSY lamp.

TRANSMITTER

The input signal from the microphone is amplified by Q_{201} (μPC577H), which contains a clipper/limiter (adjustable by VR_{201}). The output from Q_{201} is fed through a low pass filter to amplifier Q_{202} (2SC372Y), and then delivered to the modulator.

Crystal oscillator Q_{203} (2SC372Y) generates a fundamental signal, which is then fed through buffer Q_{204} (2SC372Y) to the phase modulator, consisting of D_{201}, D_{202} (1S1658), and associated circuitry. The signal from Q_{204} is varied in phase by the audio signal from Q_{202}, and the resulting modulated signal is amplified by Q_{205} (2SC372Y).

The frequency multiplier stages consist of Q_{206}, Q_{207}, and Q_{208} (2SC710D). The total multiplication factor is 12.

The signal frequency output from Q_{208} is amplified by Q_{210} (MRF515), Q_{211} (MRF237), and Q_{212} (MRF208), providing approximately 6 to 10 watts of drive to the final amplifier circuit, depending on the applied voltage and frequency. The drive level for the FTC-1540A is approximately 12 to 15 watts.

The output from Q_{212} is fed to the final amplifier stage, consisting of Q_{601} (2N6083), which provides a power output of approximately 25 watts to the antenna. The FTC-1540A power output is approximately 40 watts, using a 2N6084 as the final amplifier transistor.

A portion of the output signal is detected by VSWR detector D_{601} (1S1555), producing a DC voltage. When a high SWR exists on the feedline, this voltage is amplified by Q_{215}, Q_{216} (2SC372Y), and Q_{217} (2SA4960), providing a control voltage to PO controller Q_1 (2SD235), which will disable the transmitter when the SWR exceeds a preset value.

The output RF signal is filtered through four stages of filtering, prior to delivery to the antenna.

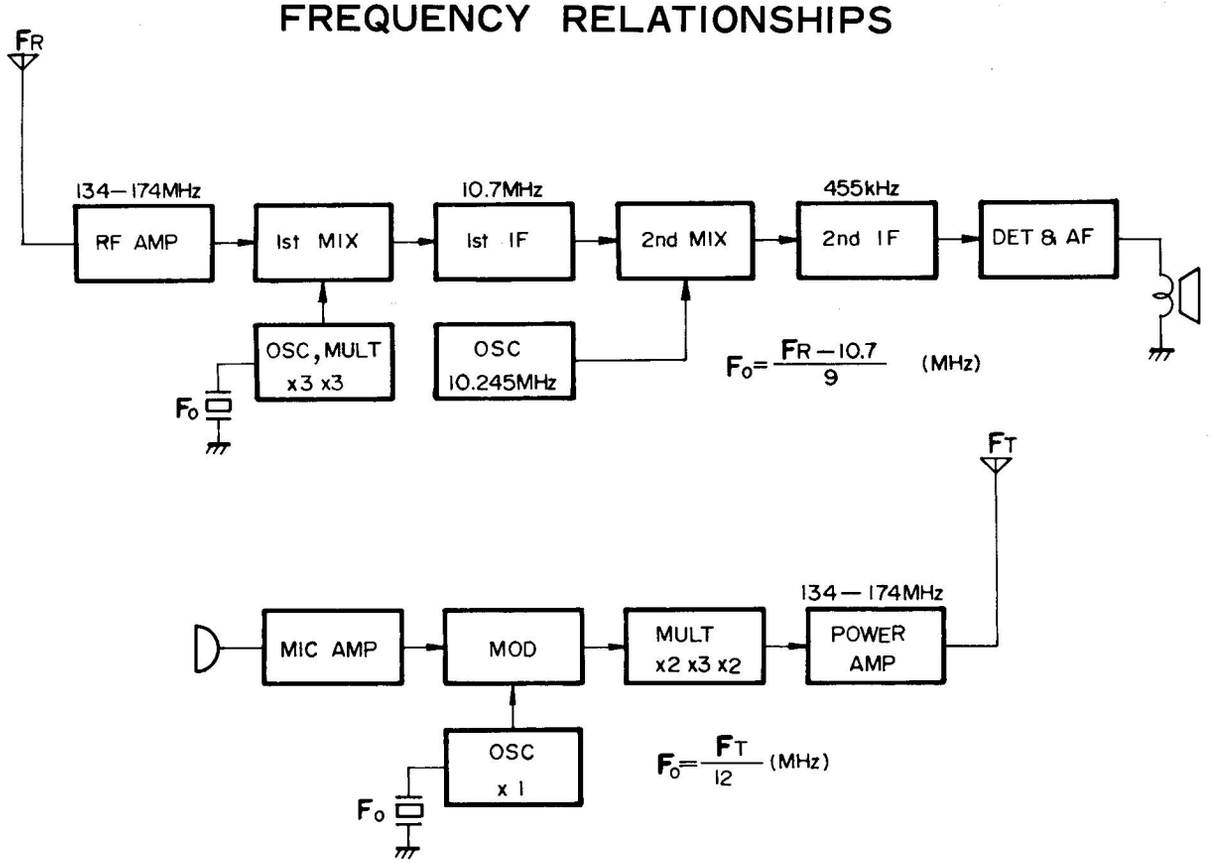
When the transmitter section is activated, Q_{214} (2SC372Y) acts as a switch to turn Q_{213} (2SA697) on, causing the ON AIR lamp to become illuminated during transmission.

Q_{218} (2SC735Y) stabilizes the supply voltage at 9 volts for the transistor circuits.

TONE SQUELCH UNIT (OPTION)

The tone squelch unit uses a hybrid IC, Q_{1001} (86022), to generate and decode the subaudible tone signal.

FREQUENCY RELATIONSHIPS



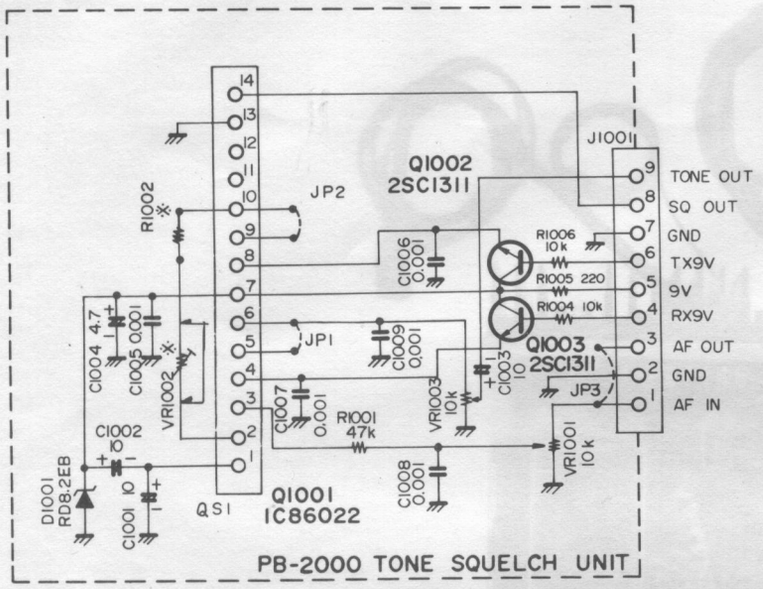
CRYSTAL DATA

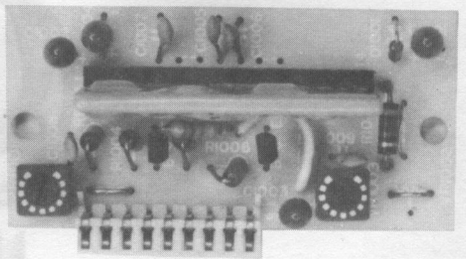
1. Type of holder:	HC-25/U	HC-42/U
2. Channel Frequency:	134MHz - 174MHz	
3. Oscillation frequency:	TX: CH/12 RX: (CH-10.7)/9	
4. Load Capacity:	TX: 50pF+60Hz=0 RX: 34.3pF−90Hz=0	
5. Drive Level:	TS-683/TSM 2mW	
6. Shunt Capacity:	TX: 12MHz - 4.3pF±0.5 13MHz - 4.5pF±0.5 14MHz - 4.8pF±0.5 RX: 15MHz - 4.5pF±0.5 16MHz - 5.0pF±0.5	
7. Frequency Tolerance:	±10ppm at 25°C	
8. Frequency Stability:	±10ppm−10°C to +50°C (HC-25/U)	±5ppm−30°C to +60°C (HC-42/U) **
9. Equivalent Resistance:	13 ohms max (series)	
10. Operation mode:	Fundamental	

** USA model uses only HC-42/U type.

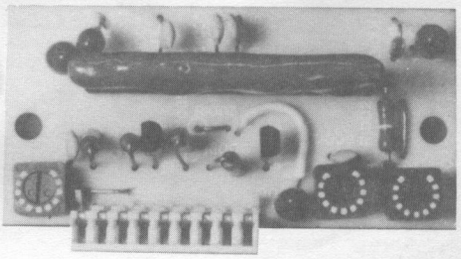
Table 3

TONE SQUELCH UNIT
FTS-1-1





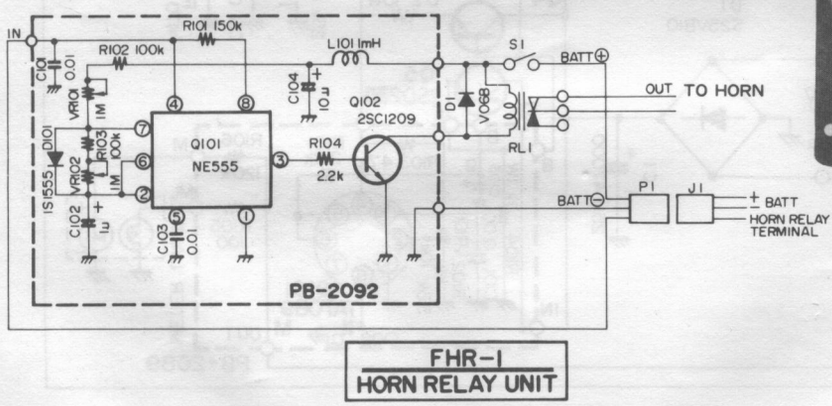
USA model

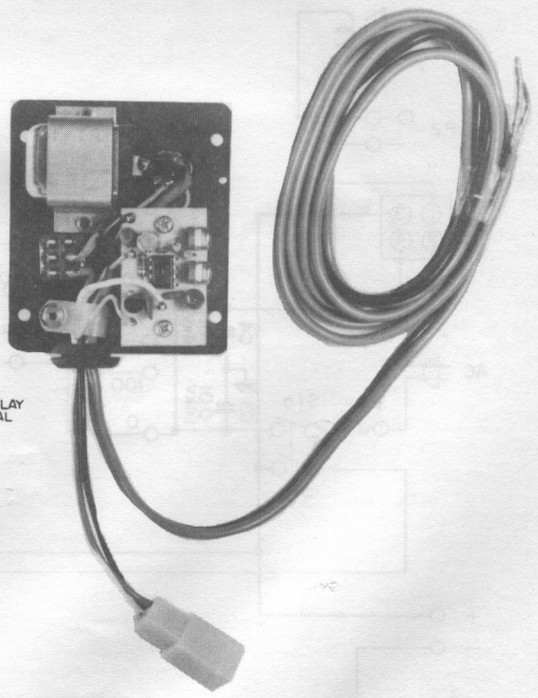


NOTE.
1. JUMPERS JP1 & JP2 ARE USED FOR FREQUENCIES ABOVE 125Hz.

※ COMPONENT VALUES SET FOR TONE FREQUENCY.

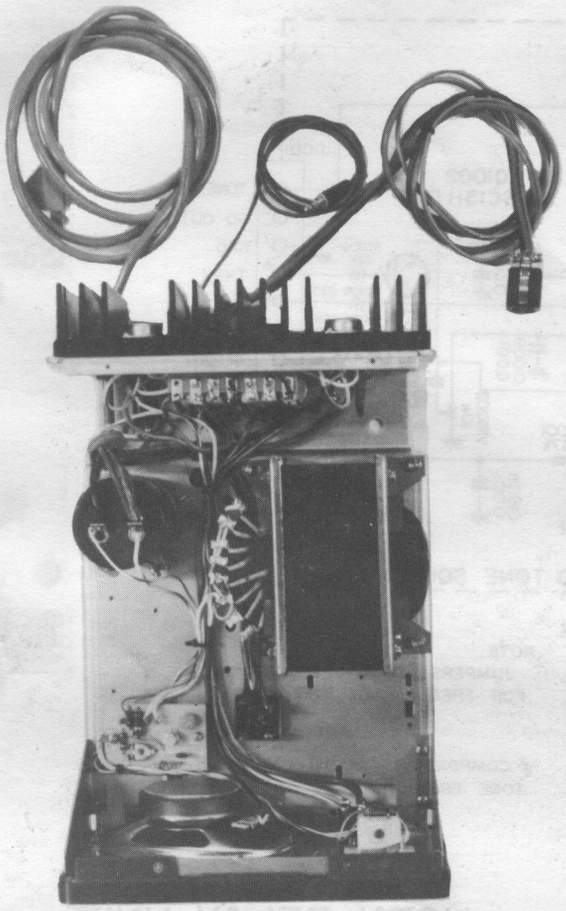
HORN RELAY UNIT
FHR-1



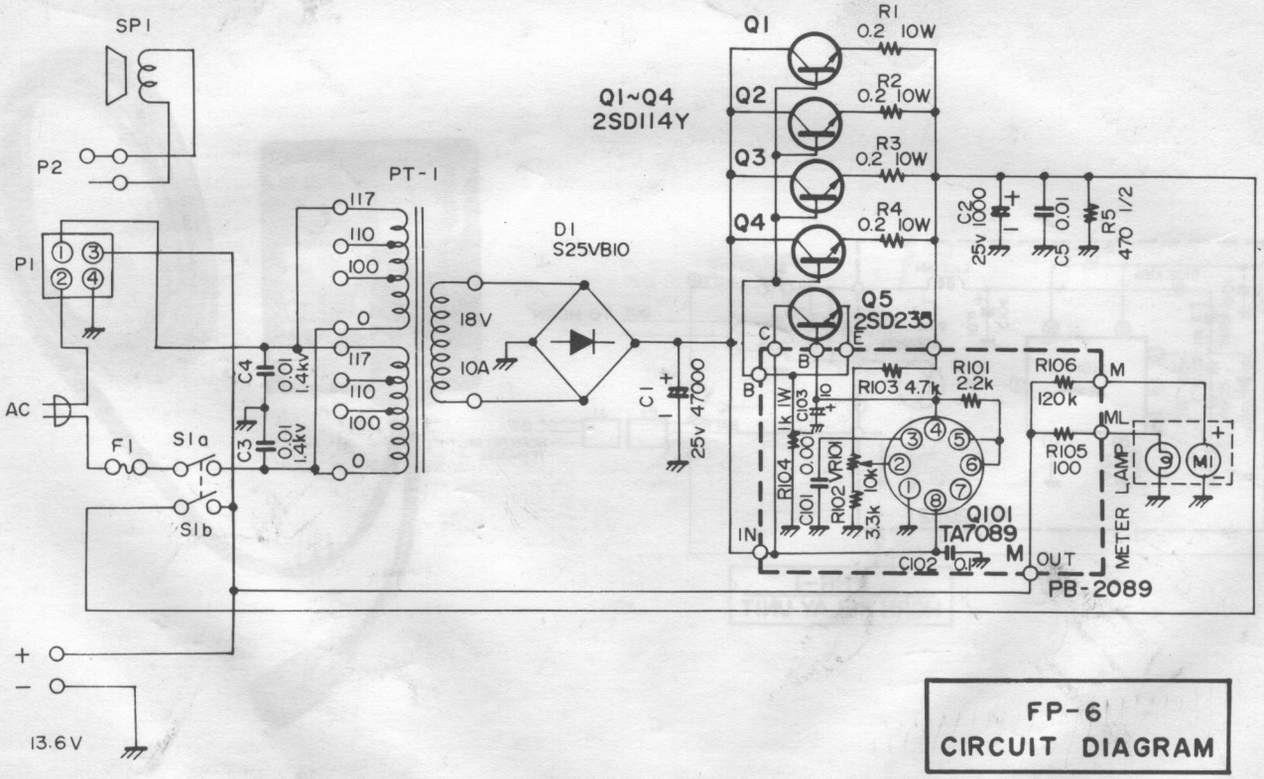


FHR-1
HORN RELAY UNIT

AC POWER SUPPLY

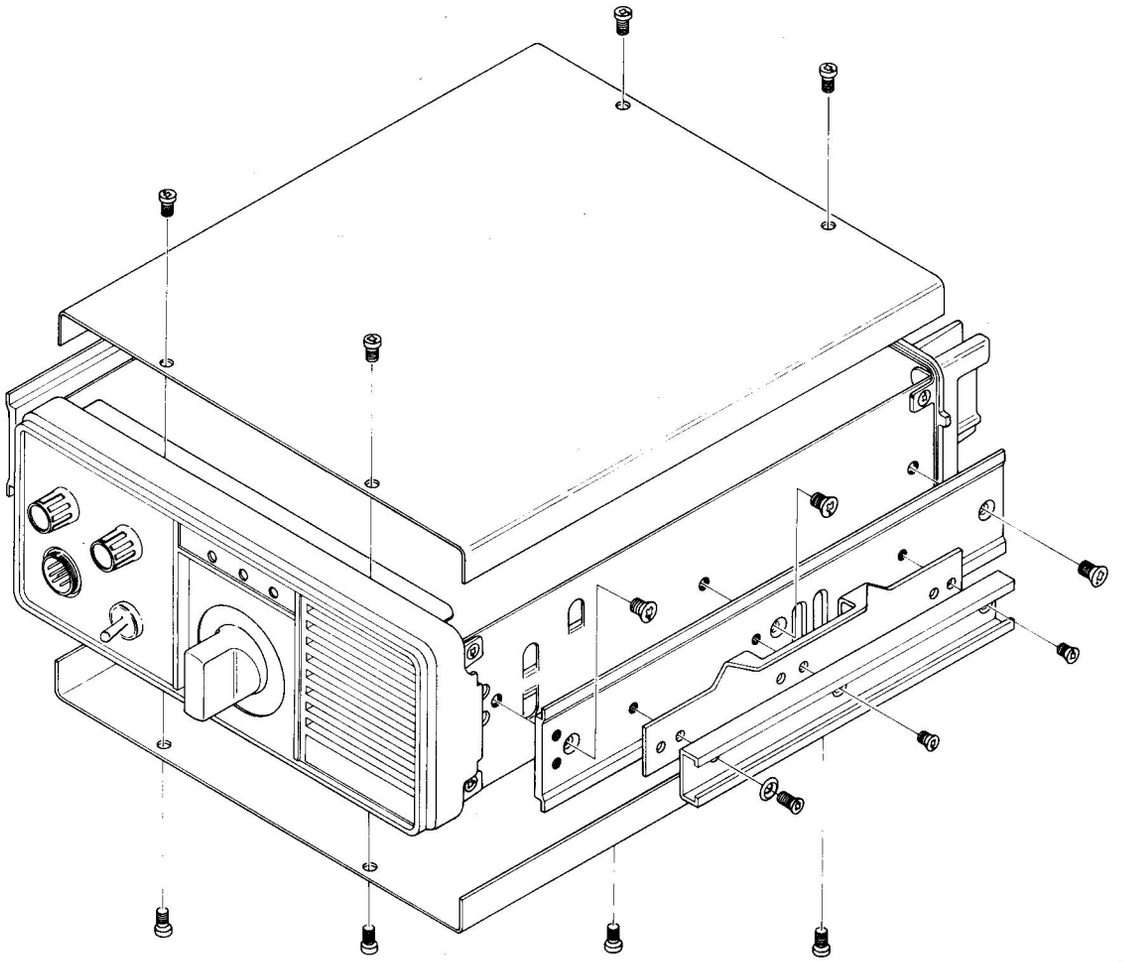


FP-6 TOP VIEW

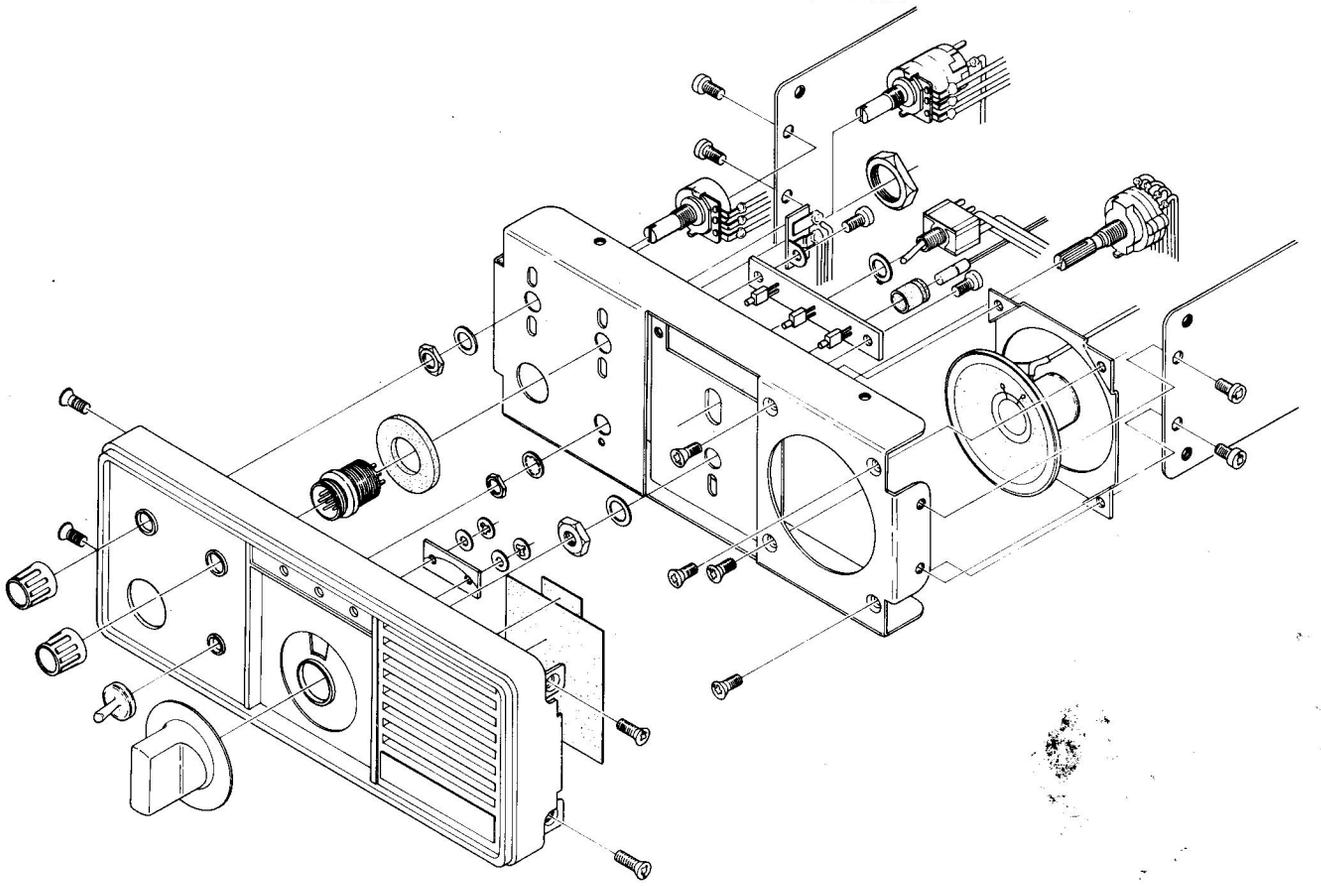


FP-6
CIRCUIT DIAGRAM

OUTER COVER REMOVAL

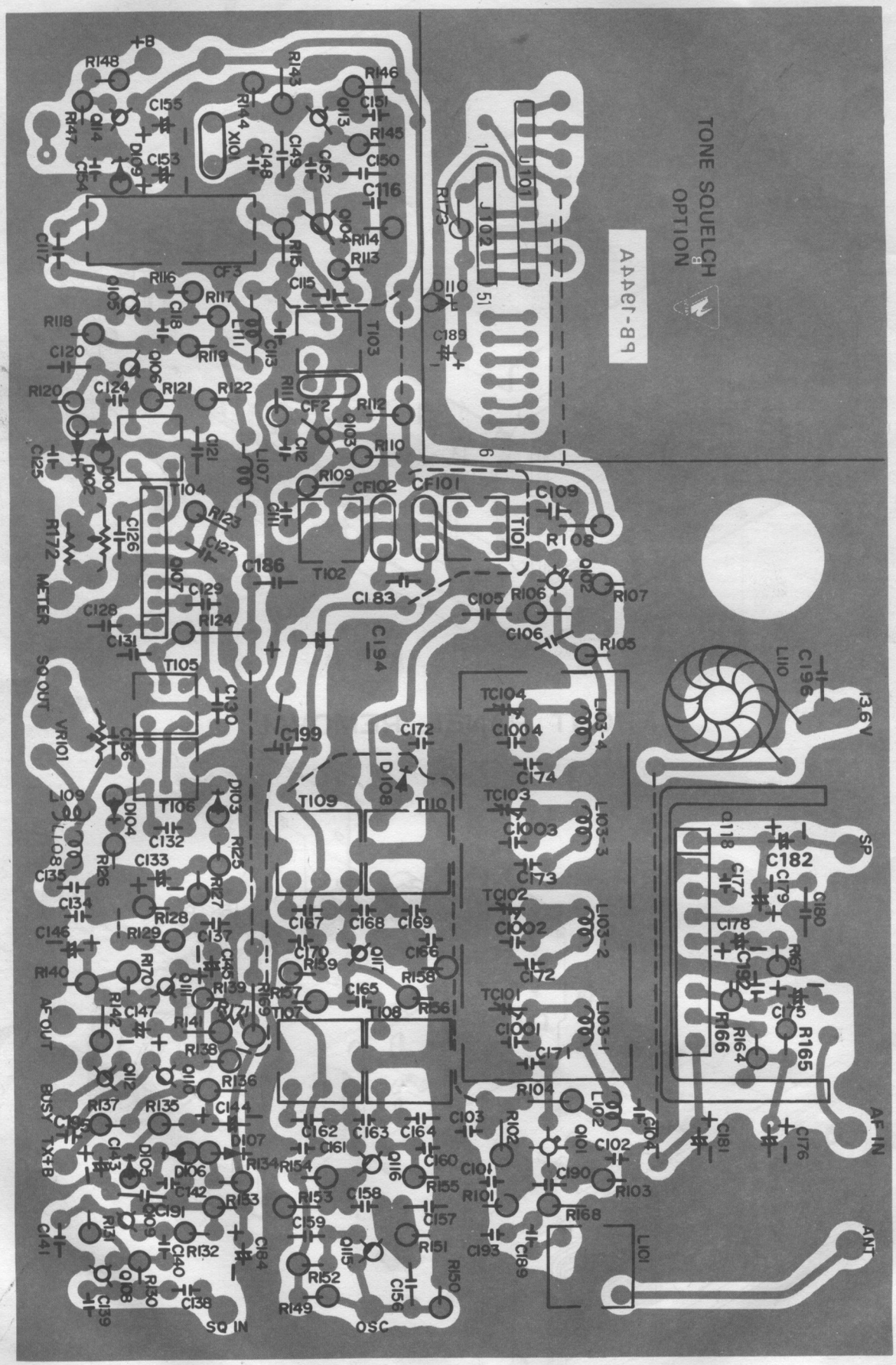


FRONT PANEL REMOVAL



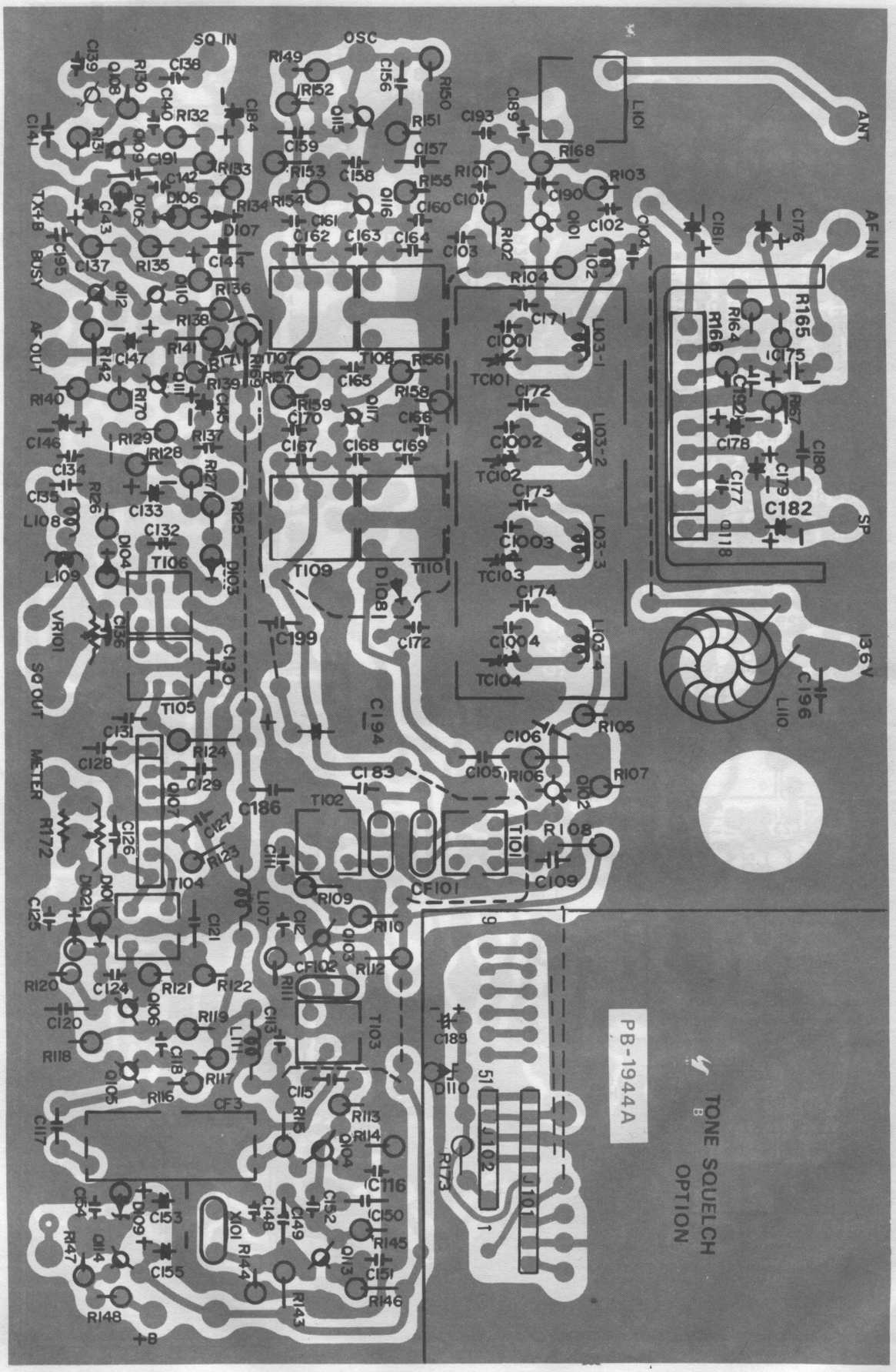
RX UNIT PARTS LAYOUT

(Viewed from component side)



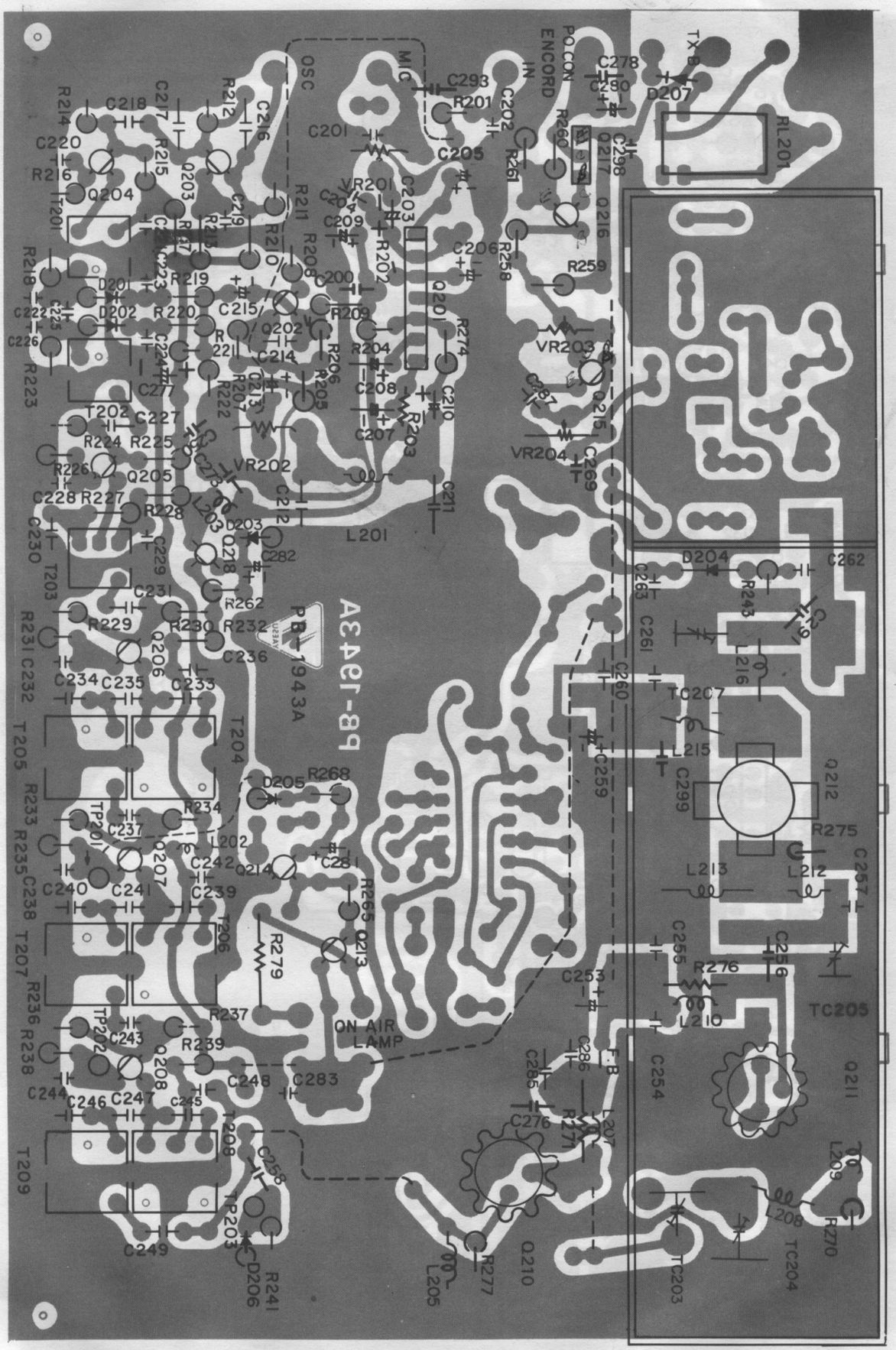
RX UNIT PARTS LAYOUT

(Viewed from solder side)



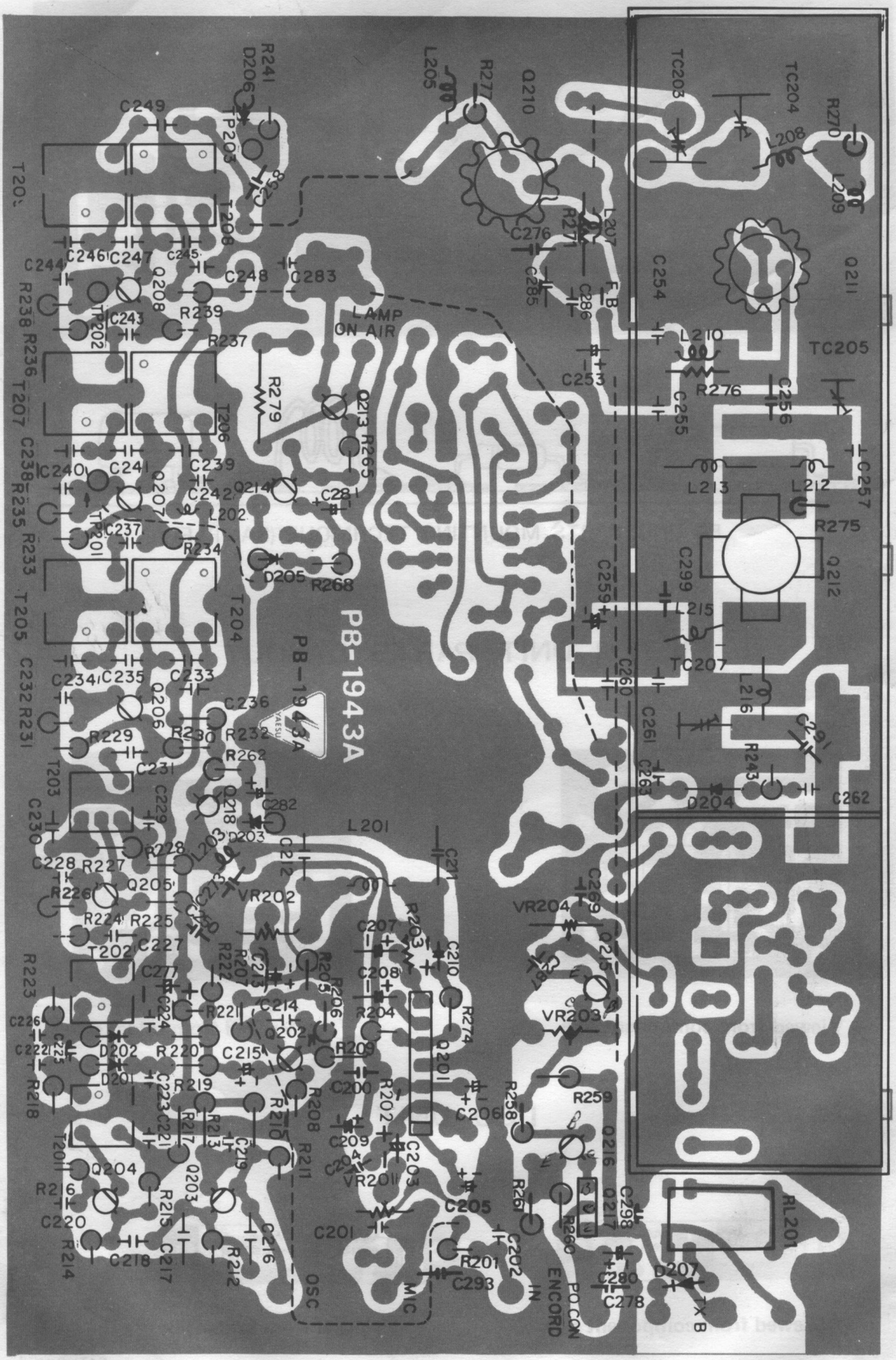
TX UNIT PARTS LAYOUT

(Viewed from component side)

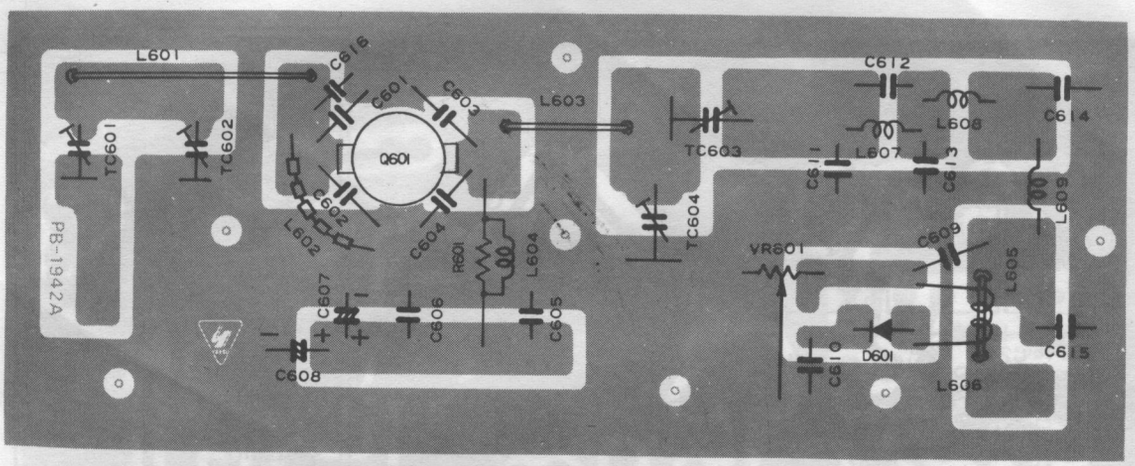


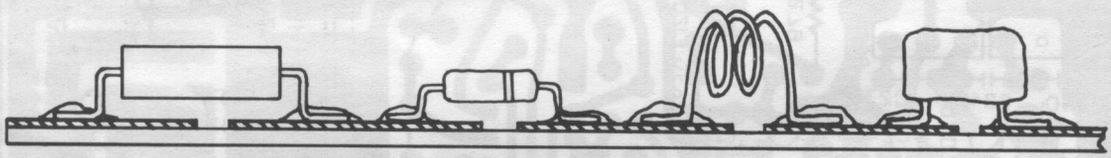
TX UNIT PARTS LAYOUT

(Viewed from solder side)



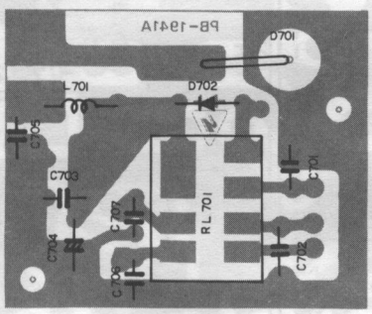
PA UNIT PARTS LAYOUT



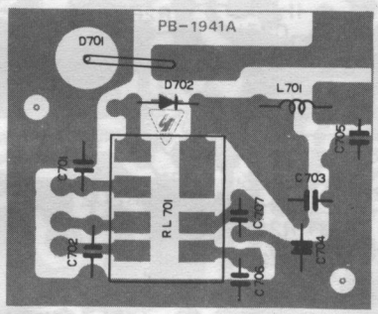


PA UNIT PARTS MOUNTING TECHNIQUE (SAMPLE)

FILTER UNIT PARTS LAYOUT

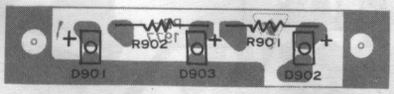


Viewed from component side

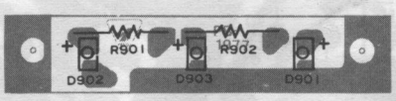


Viewed from solder side

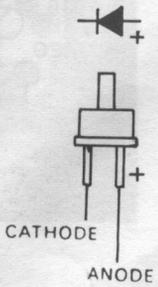
LED UNIT



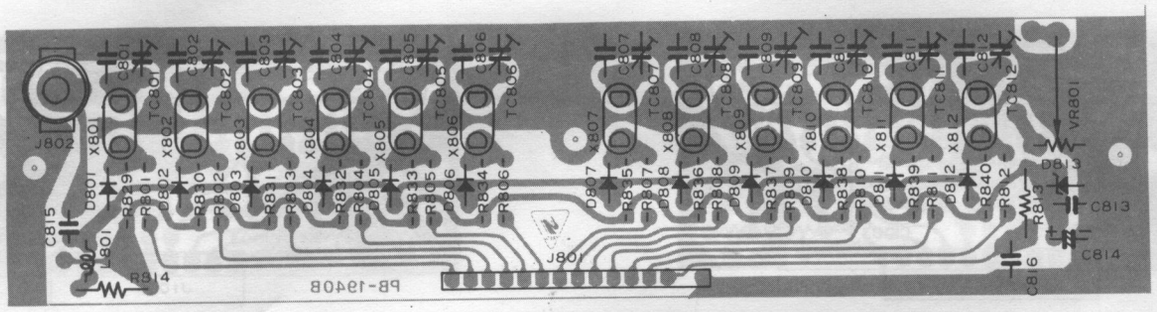
Viewed from component side



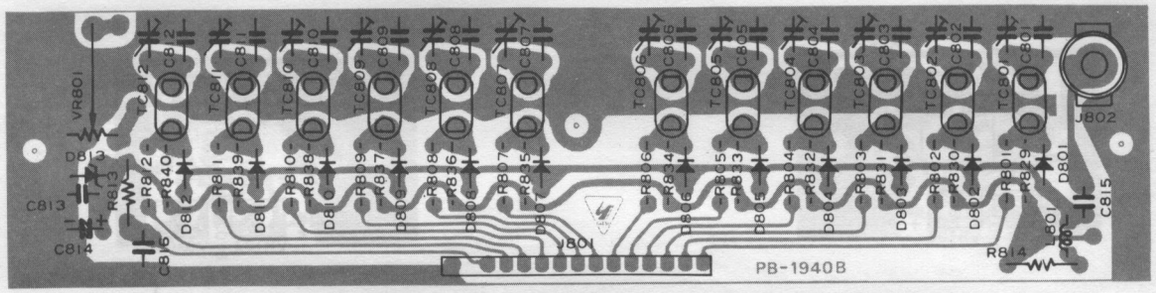
Viewed from solder side



RX CRYSTAL UNIT PARTS LAYOUT

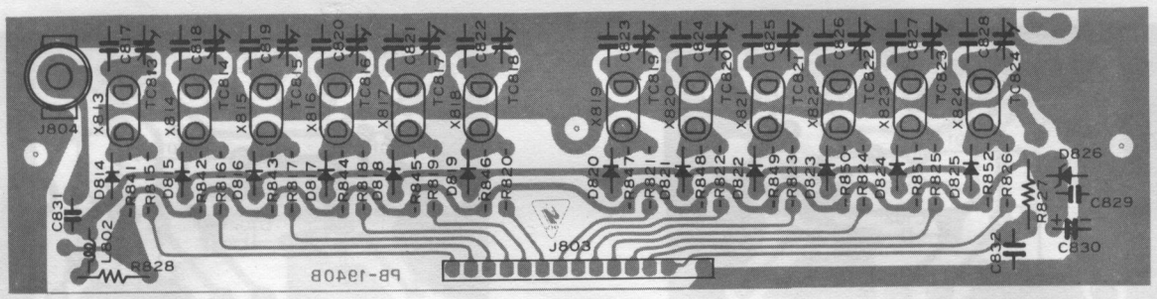


Viewed from component side

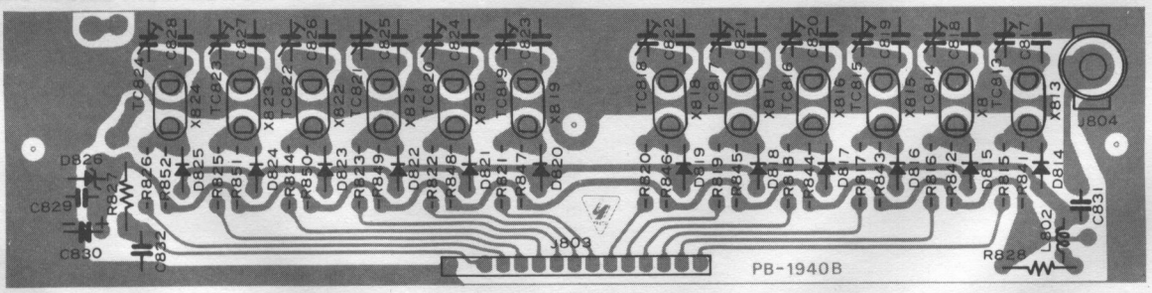


Viewed from solder side

TX CRYSTAL UNIT PARTS LAYOUT

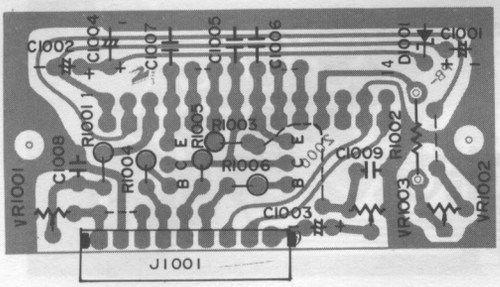


Viewed from component side

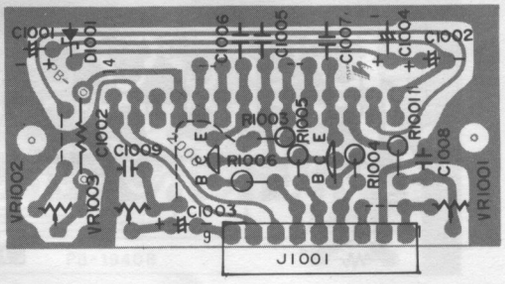


Viewed from solder side

TONE SQUELCH UNIT PARTS LAYOUT

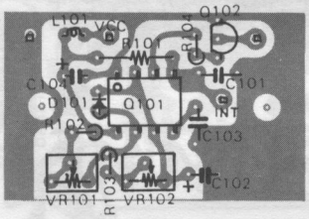


Viewed from component side

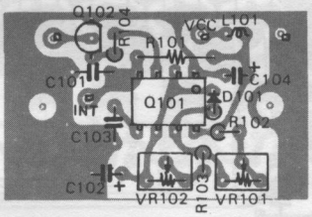


Viewed from solder side

FHR-1 HORN RELAY UNIT PARTS LAYOUT

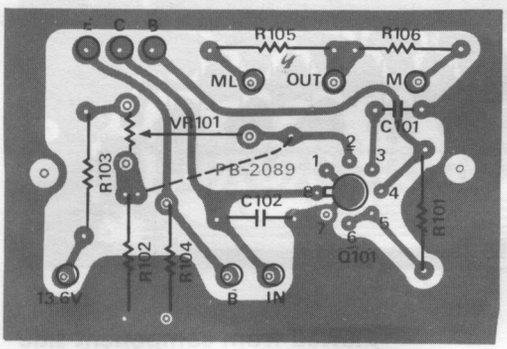


Viewed from solder side

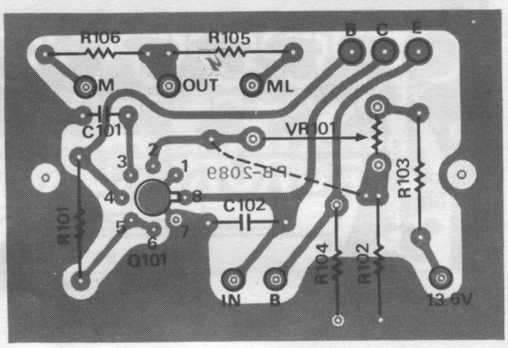


Viewed from component side

FP-6 REGULATOR BOARD PARTS LAYOUT

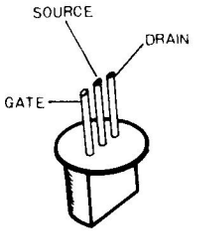


Viewed from component side

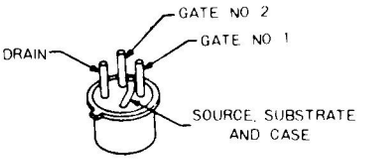


Viewed from solder side

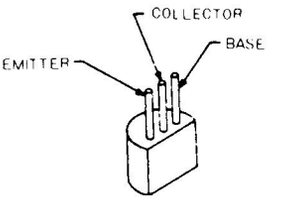
TRANSISTOR & IC CONNECTIONS



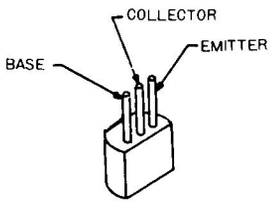
2SK 19GR



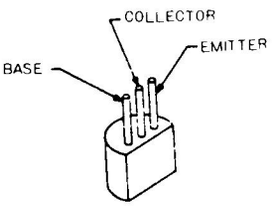
3SK51



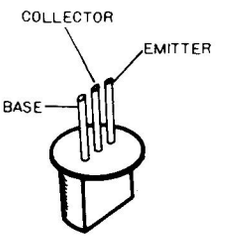
2SA697
2SC710D
2SC1209



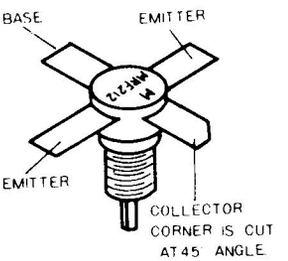
2SC1311



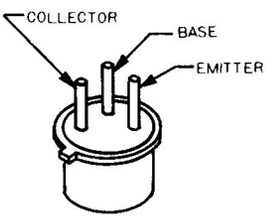
2SC1047
2SC1923



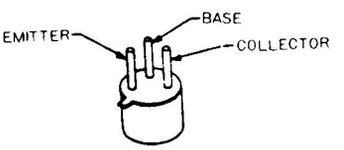
2SC372Y
2SC735Y



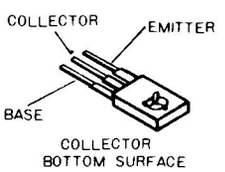
MRF208
2N6083
2N6084



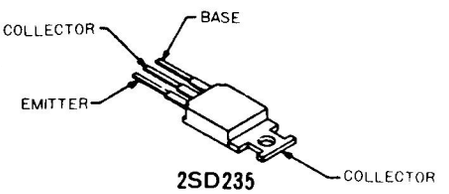
MRF237



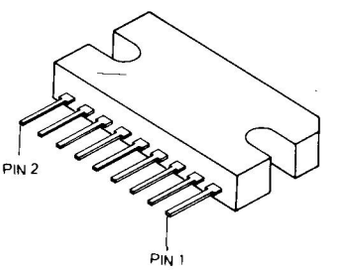
MRF515



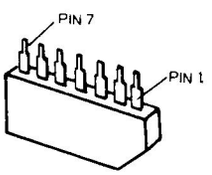
2SA496(O)



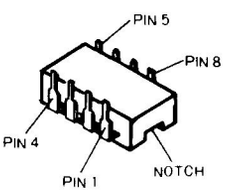
2SD235



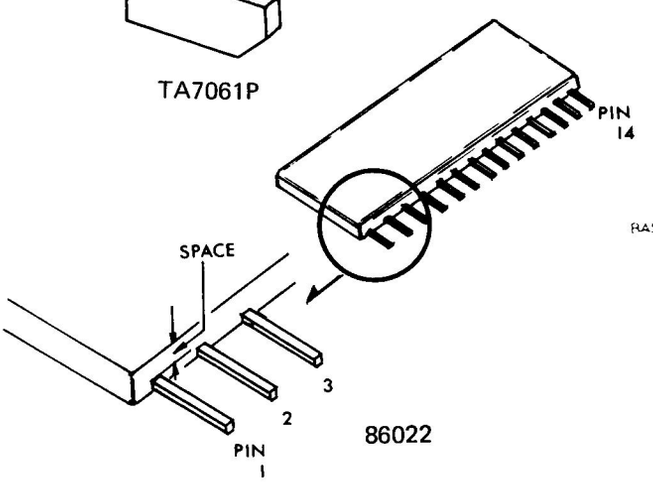
AN214P



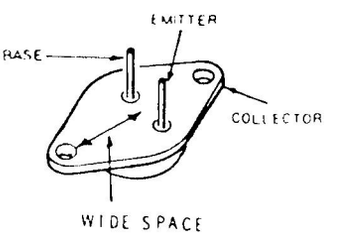
TA7061P



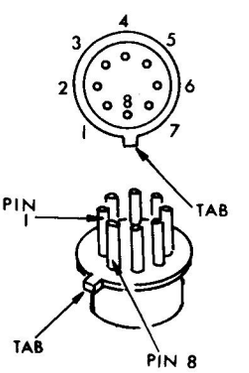
NE555



86022

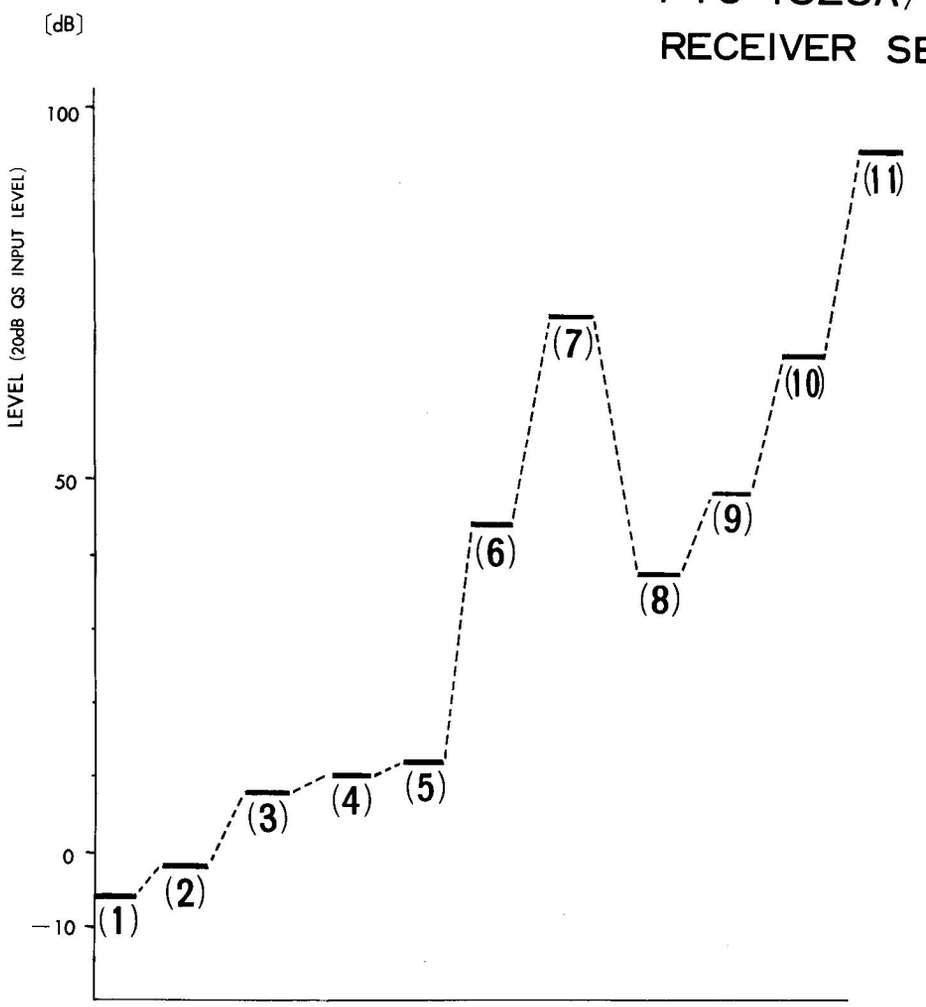


2SD114Y



TA7089M

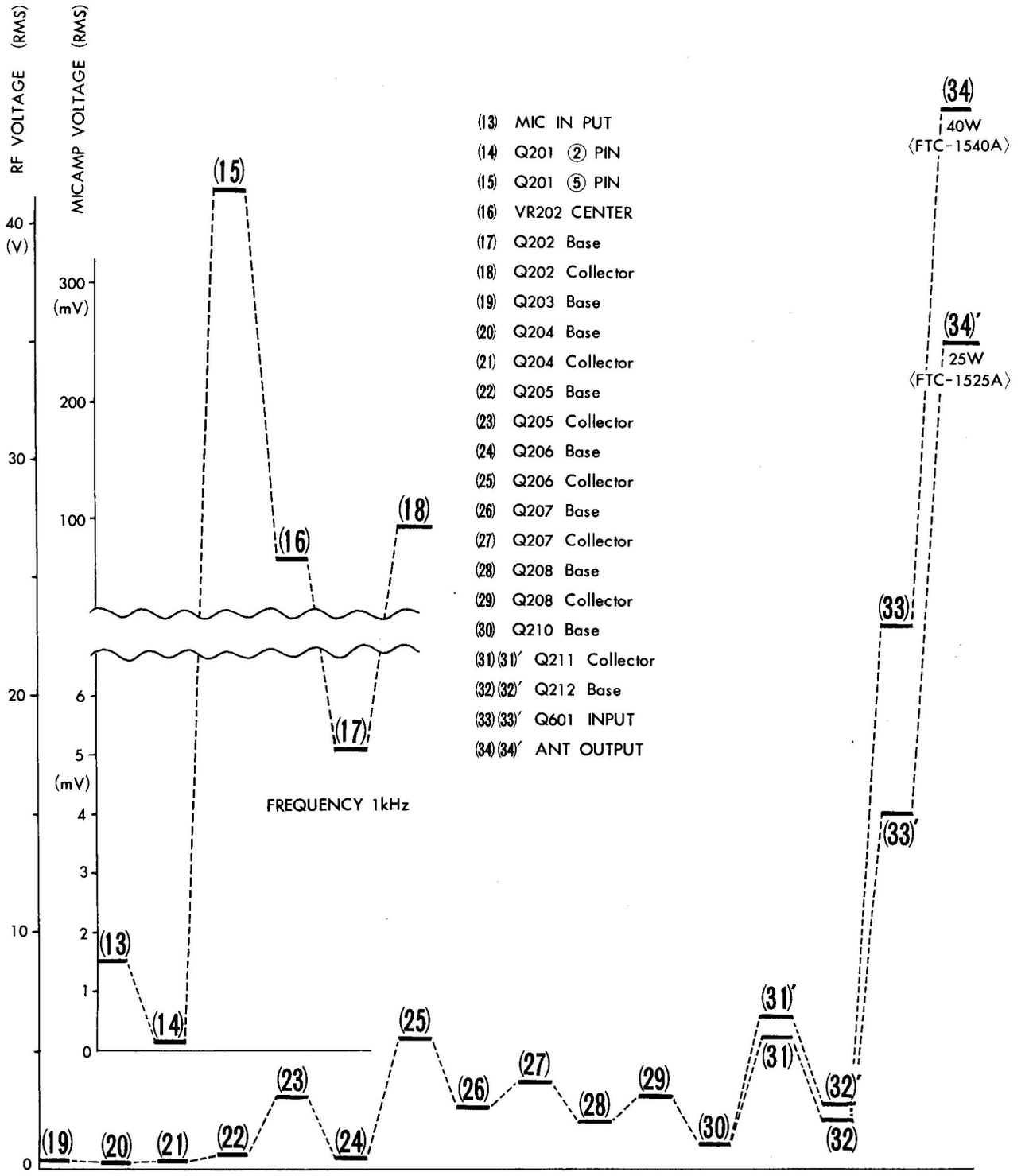
FTC-1525A/1540A
RECEIVER SECTION



(1) ANT INPUT
(2) Q101 Gate
(3) Q102 Gate
(4) CF101 INPUT
(5) Q103 Base
(6) Q103 Collector
(7) Q104 Gate
(8) Q104 Drain
(9) Q105 Base
(10) Q105 Collector
(11) Q106 Collector

(1)~(3) 134MHz~174MHz
(4)~(7) 10.7MHz
(8)~(11) 455kHz

FTC-1525A/1540A
TRANSMITTER SECTION



VOLTAGE CHART

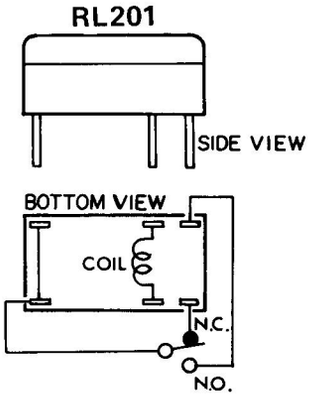
	B (G)	E (S)	C (D)			B	E	C	
Q_{601}	0 V	0 V	13.2 V	PTT:ON	Q_{202}	0.77 V	0.11 V	4.5 V	
Q_1	13.5	**13.0/7.0** (40W/25W)	13.5	PTT:ON	Q_{203}	1.4	0.8	7.5	
Q_{101}	$G_1$0 $G_2$4.0	0.3	8.0		Q_{204}	2.2	1.7	7.3	
Q_{102}	$G_1$0 $G_2$0.1	0.2	8.0		Q_{205}	1.7	1.2	7.0	
Q_{103}	1.7	1.1	6.0		Q_{206}	**0.9**	**1.0**	13.0	
Q_{104}	0	**2.2**	7.4		Q_{207}	0.7	2.2	13.4	
Q_{105}	0.6	0	1.8		Q_{208}	0.5	1.0	12.0	
Q_{106}	1.4	0.9	8.0		Q_{210}	**0**	**0**	**13.0**	
Q_{108}	0.6	0	1.2		Q_{211}	0	0	13.2	
Q_{109}	2.5	3.6	**4.2**		Q_{212}	0	0	**12.0/7.0**	**40W/25W**
Q_{110}	**0.3/0.6**	**0/0**	**2.0/0**	SQ: OFF/ON	Q_{215}	0.32/0.6	0	**9.0/0.4**	AFP: OFF/ON
Q_{111}	**2.0/0**	**1.3/0**	**4.7/7.5**	SQ: OFF/ON	Q_{216}	**3.0/2.0**	**2.2/1.5**	**12.0/12.5**	**40W/25W**
Q_{112}	**0/0**	**0/0.75**	**12.3/0.9**	**SQ: OFF/ON**	Q_{217}	12.0	12.7	12.7	
Q_{113}	1.0	0.8	8.0		Q_{218}	9.0	8.0	12.8	
Q_{114}	9.0	8.4	13.2		Q_{213}	11.2	12.5	12.5	
Q_{115}	1.8	1.4	8.2		Q_{220}	0	0	0	
Q_{116}	1.3	0.9	8.4		Q_{214}	0.5	0	0	
Q_{117}	0.6	0.5	8.2						

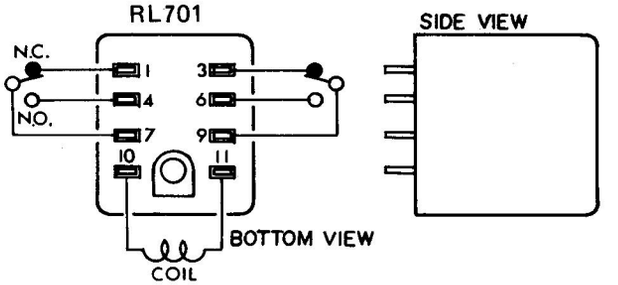
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Q_{107}	1.9	1.9	7.8	0	6.5	1.9	1.9							
Q_{118}	6.3	0	7.6	10.7	6.1	0	6.1	12.5	13.2					
Q_{201}	1.8	1.8	7.6	0	6.2	1.8	1.8							

Measured with VTVM. Q_{101}~Q_{117}·····Transmit 0V
Values are in VOLTS DC. Q_{201}~Q_{221}·····Receive 0V

RELAY CONNECTION INFORMATION

Should the need for replacement of relays become necessary, or if you are trying to verify proper relay operation, the diagrams below should help you.





SOLDERING AND DESOLDERING TECHNIQUE ON PRINTED CIRCUIT BOARDS

The FTC-1525A circuit boards are tough, but mishandling during soldering can cause circuit traces to "lift." While this does no permanent damage to the board, much servicing trouble can result, because of the tendency for this lifted trace to break. A few simple precautions will keep your circuit boards in A-1 condition.

1. Use only a 12 to 30 watt chisel-tip soldering iron. Yes, some "repairmen" have been known to use small blowtorches on cards.

2. Use only a soldering iron equipped with a three-wire cord, with the tip grounded. Also acceptable is a soldering iron isolated through a transformer. An old soldering iron or gun may have 117 volts on the tip, and will certainly cause more damage than it repairs!

3. USE ONLY 60/40 ROSIN CORE SOLDER. Acid core solder should be thrown away if you find it in your radio shop!

4. Use a solder sucker and solder tape to ensure a professional repair job.

5. If you **do** lift a trace, don't worry! Read on to find out how to repair traces like a pro.

NOTES ON USE OF CMOS COMPONENTS:

As CMOS devices are extremely sensitive to damage from static electricity, special precautions must be observed.

In storage, use only a non-inductive sponge.

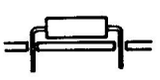
When installing a CMOS part in a socket, or on a circuit board, be certain that the power is off. In addition, the technician should rest his hand on the chassis as the component is inserted, so as to place his hand at the same level as the chassis (better to discharge small amounts of static electricity through your fingers than through a $5 IC !).

When soldering a CMOS part onto a circuit board, use a low wattage iron, and be sure to ground the tip with a clip lead, if the tip is not grounded through a three-wire power cord.

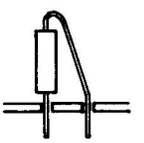
INSERTION OF PARTS ON CIRCUIT BOARDS

All of the below are acceptable ways of inserting components into circuit board mounting holes.

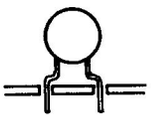
(a) Bend leads slightly



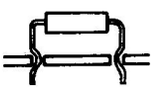
(b) Straight-in mounting



(c) Vertical mounting

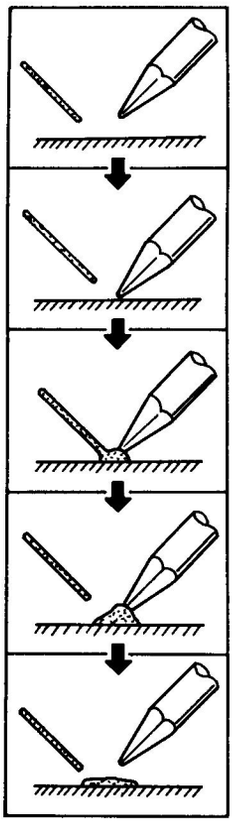


(d) Preformed disc ceramic capacitor



(e) Preformed resistor, diode, etc.

BASIC SOLDERING PRACTICE



(1) Prepare soldering iron and solder.

(2) Apply soldering iron to surface to be soldered.

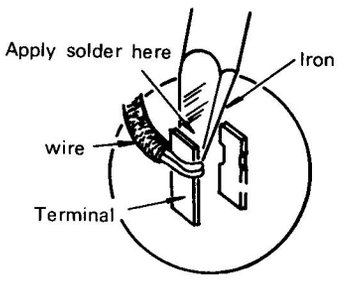
(3) Apply solder to heated surface.

(4) When enough solder is applied, remove solder. Continue to apply heat until solder flows cleanly.

(5) Remove iron from work. Do not apply more heat than necessary for good solder flow.

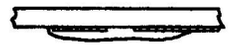
Soldering to terminal posts:

(Be certain to apply heat to both post and wire.)

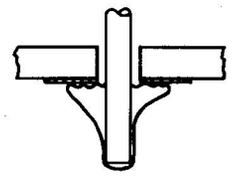


EXAMPLES OF POOR SOLDERING PRACTICE

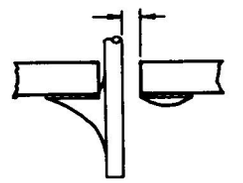
Solder bridge (caused by use of too much solder)



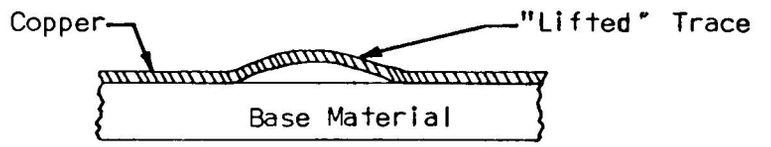
"Cold joint" (caused by insufficient heat to part of work, resulting in poor solder flow)

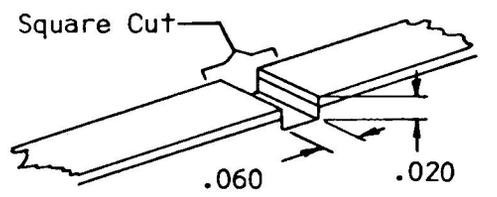


Unstable joint (caused by insufficient heat or solder)



If you have previously lifted a trace, make an etch cut on each side of the lifted trace, and install a wire bridge as shown in the drawing.





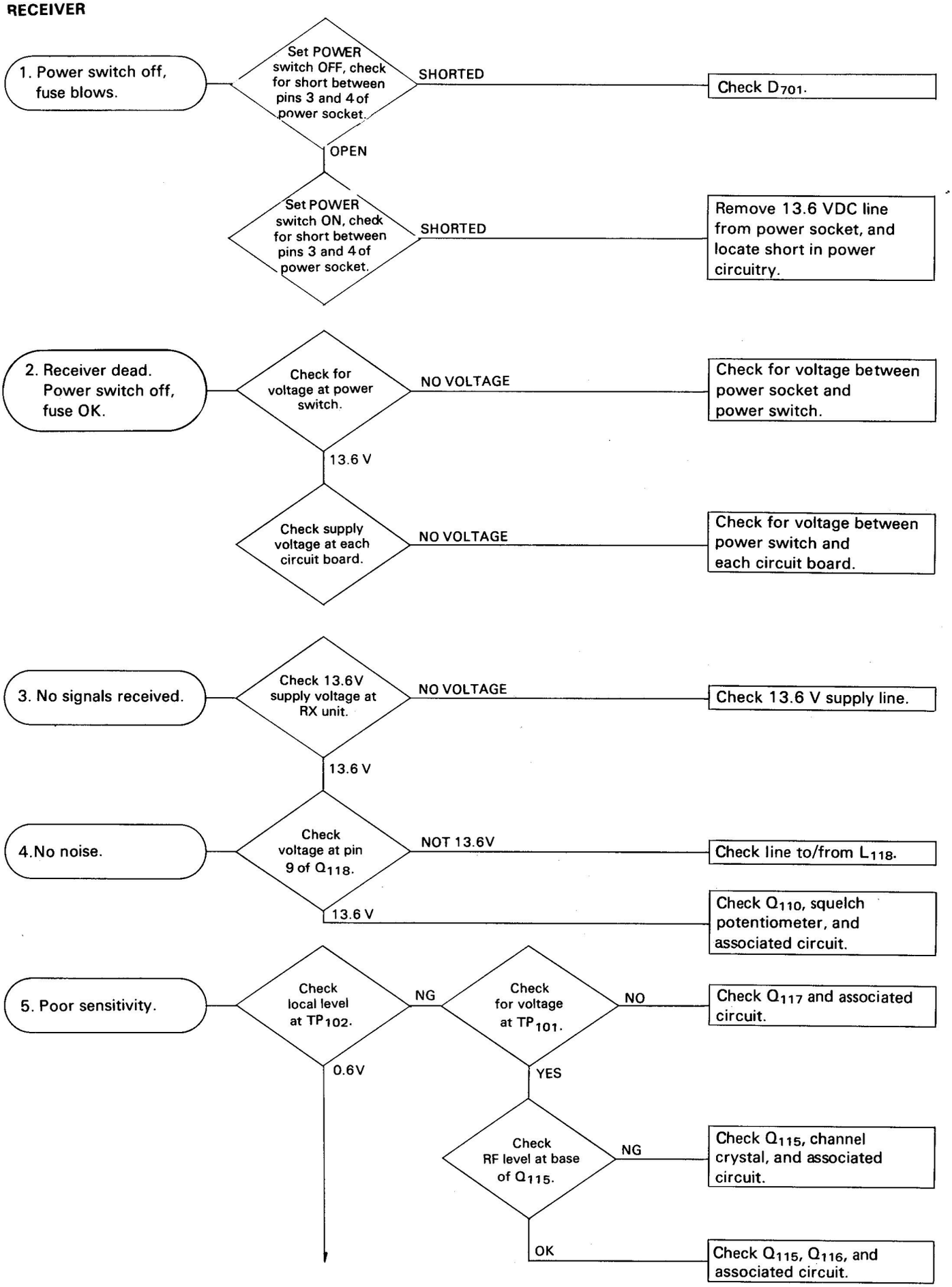
Coat Cut Area With Eastman 910

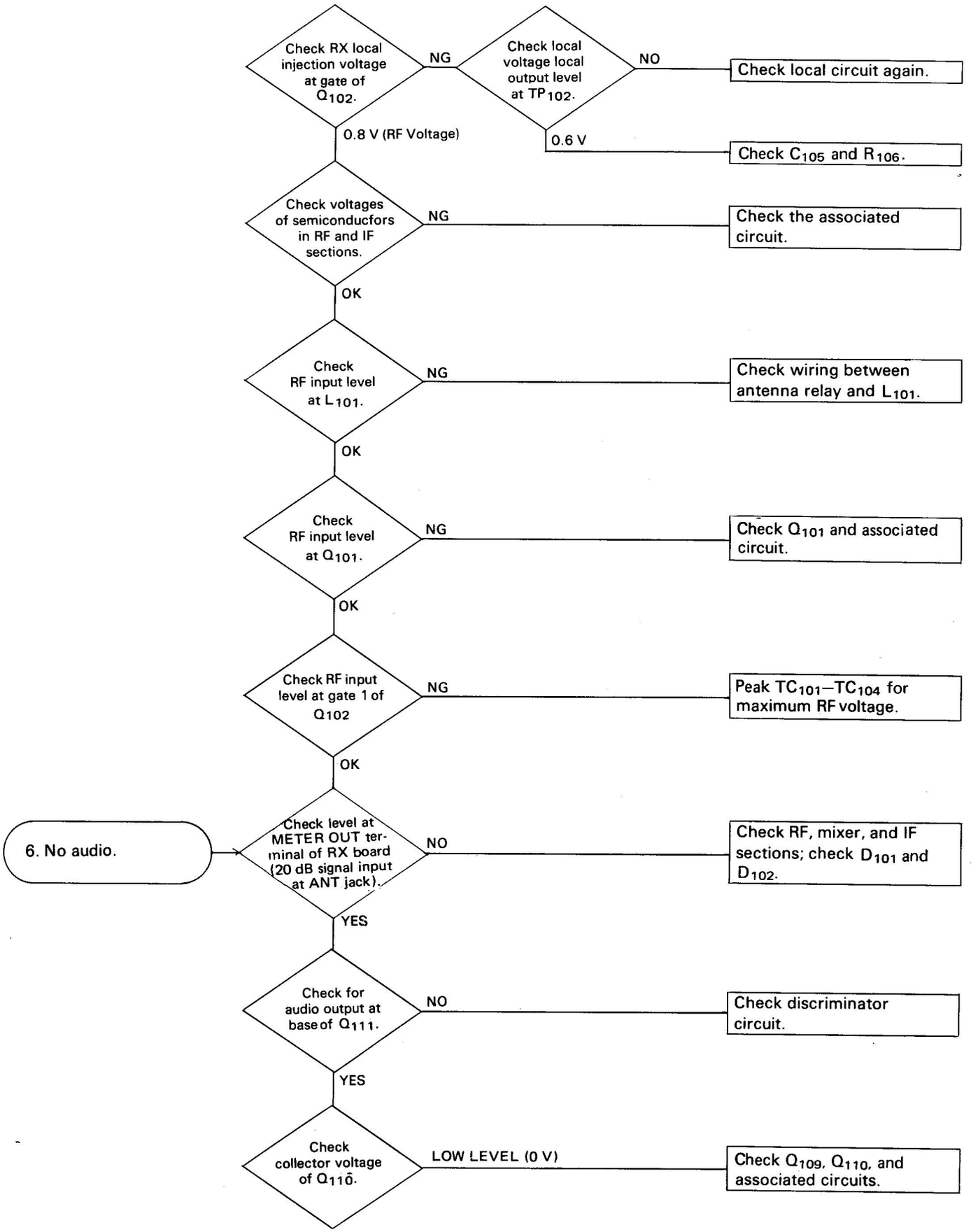
TYPICAL PART FAILURES, CAUSES, AND SYMPTOMS

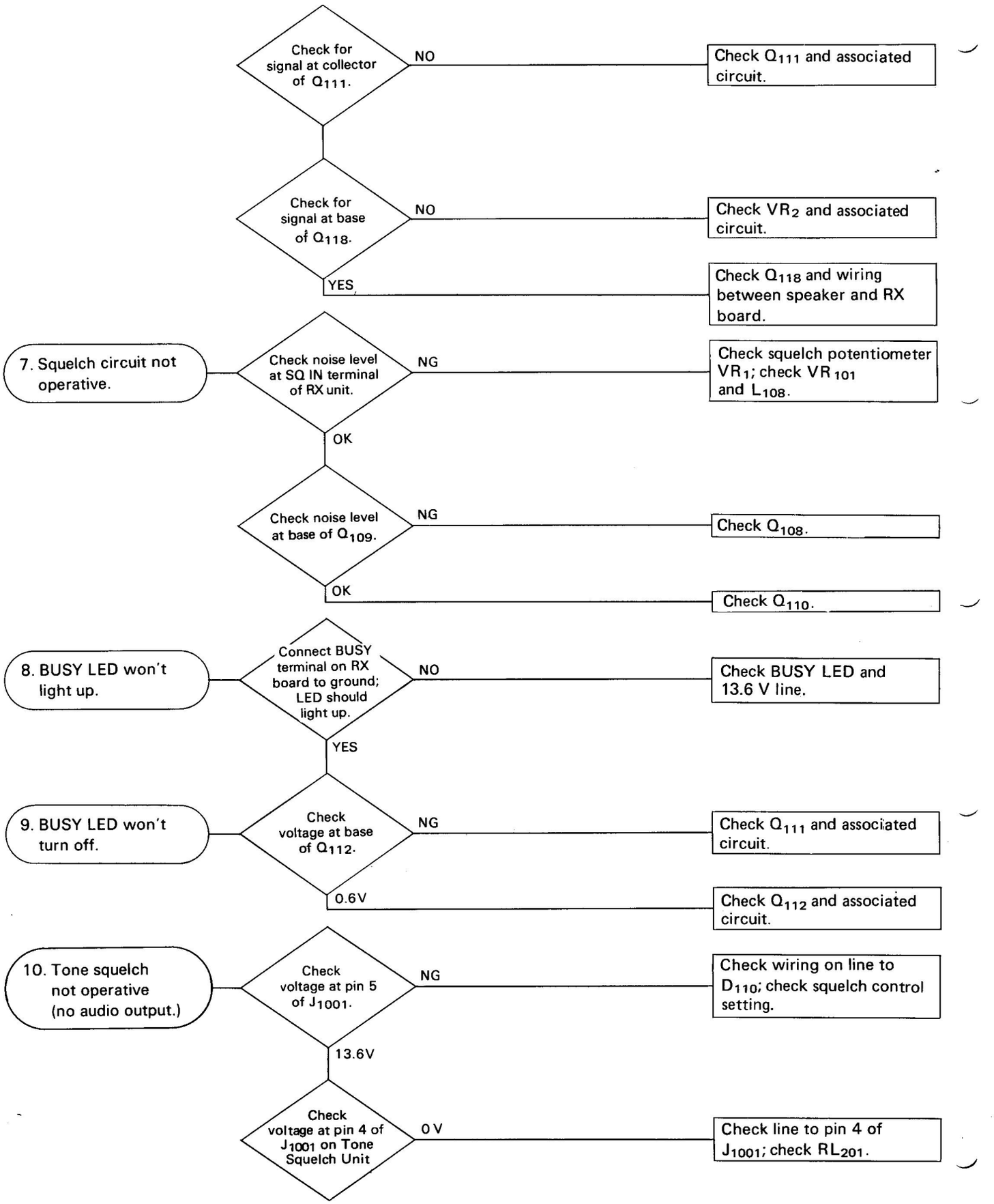
PARTS	CAUSE OF TROUBLE	SYMPTOMS
Semiconductors (IC, FET, TR)	High supply voltage Open circuit Excessive drive High temperature	Short or open circuit Output decreases to 1/2 at 80°C Internal noise Instability
MOS FET MOS IC	Static electricity	Total failure
Crystal Crystal filter	Shock High temperature	Crystal destroyed Frequency drift Filter bandpass change
Resistor	Excessive power Aging High temperature	Component burned Value changed Open circuit
Potentiometer	Excessive power Shock	Component burned Open circuit Noise Unsmooth rotation
Capacitor	Excess voltage High temperature Excess power	Shorted Leakage Open/decreased capacitance
Variable capacitor Trimmer capacitor	Ratings exceeded Dust between plates Shock, forced rotation	Shorted Leakage Unsmooth rotation
Coils	Ratings exceeded Variation	Open or short circuit Leakage or shorted turns Detuned
Switch	Ratings exceeded Aging	Poor contact Unsmooth operation Open circuit
Relay	Ratings exceeded Humidity	Poor contact Noise Coil open

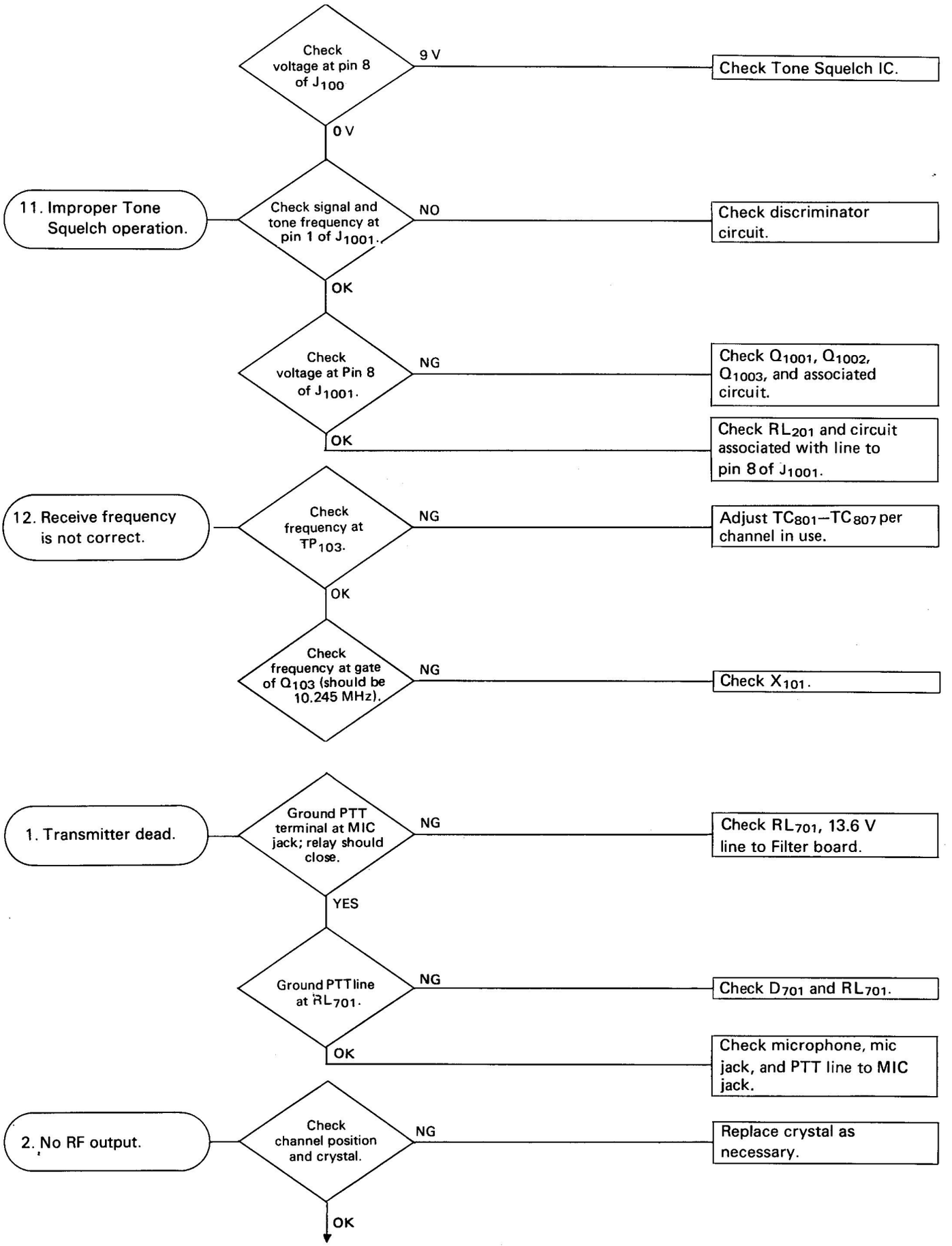
TROUBLESHOOTING

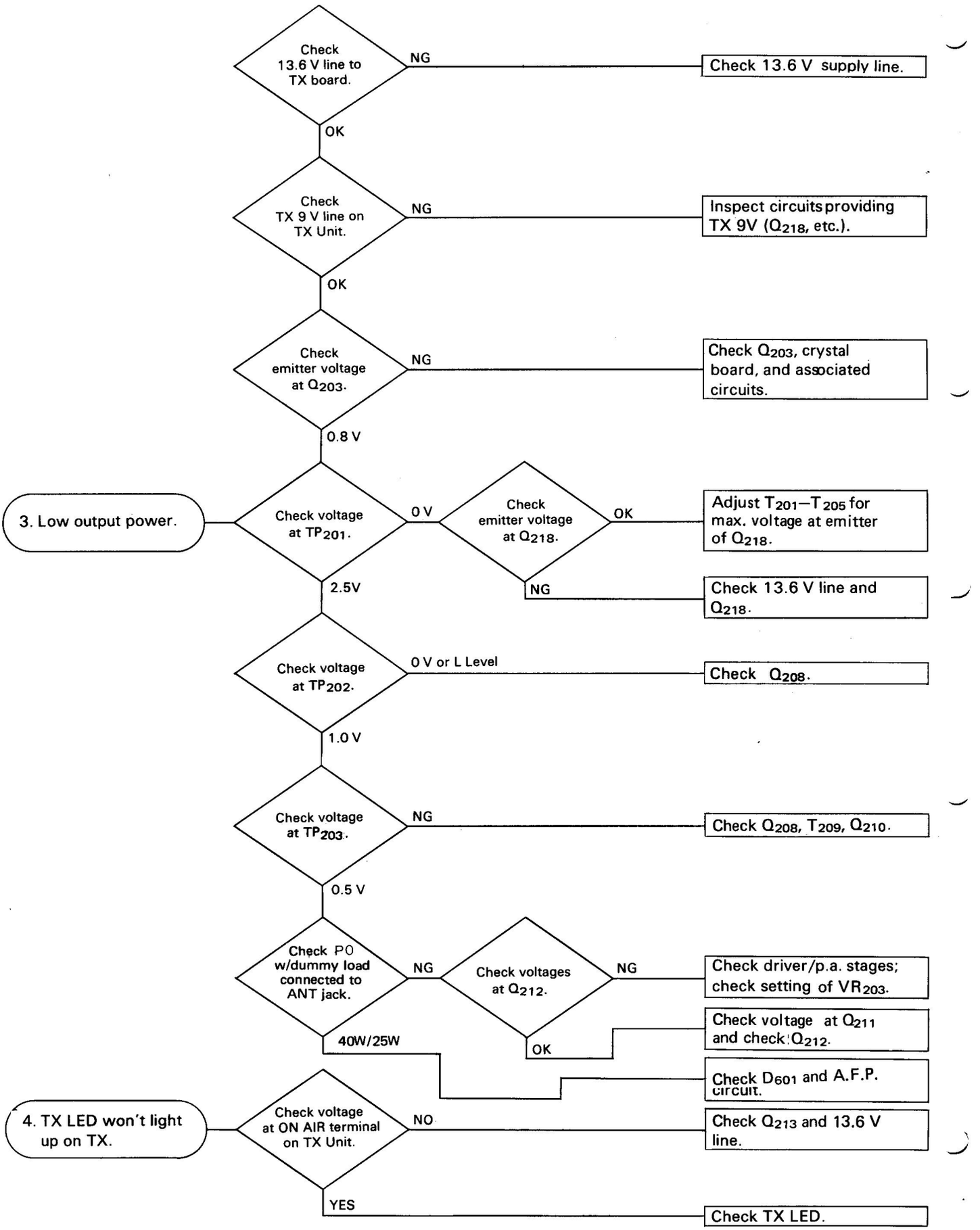
RECEIVER

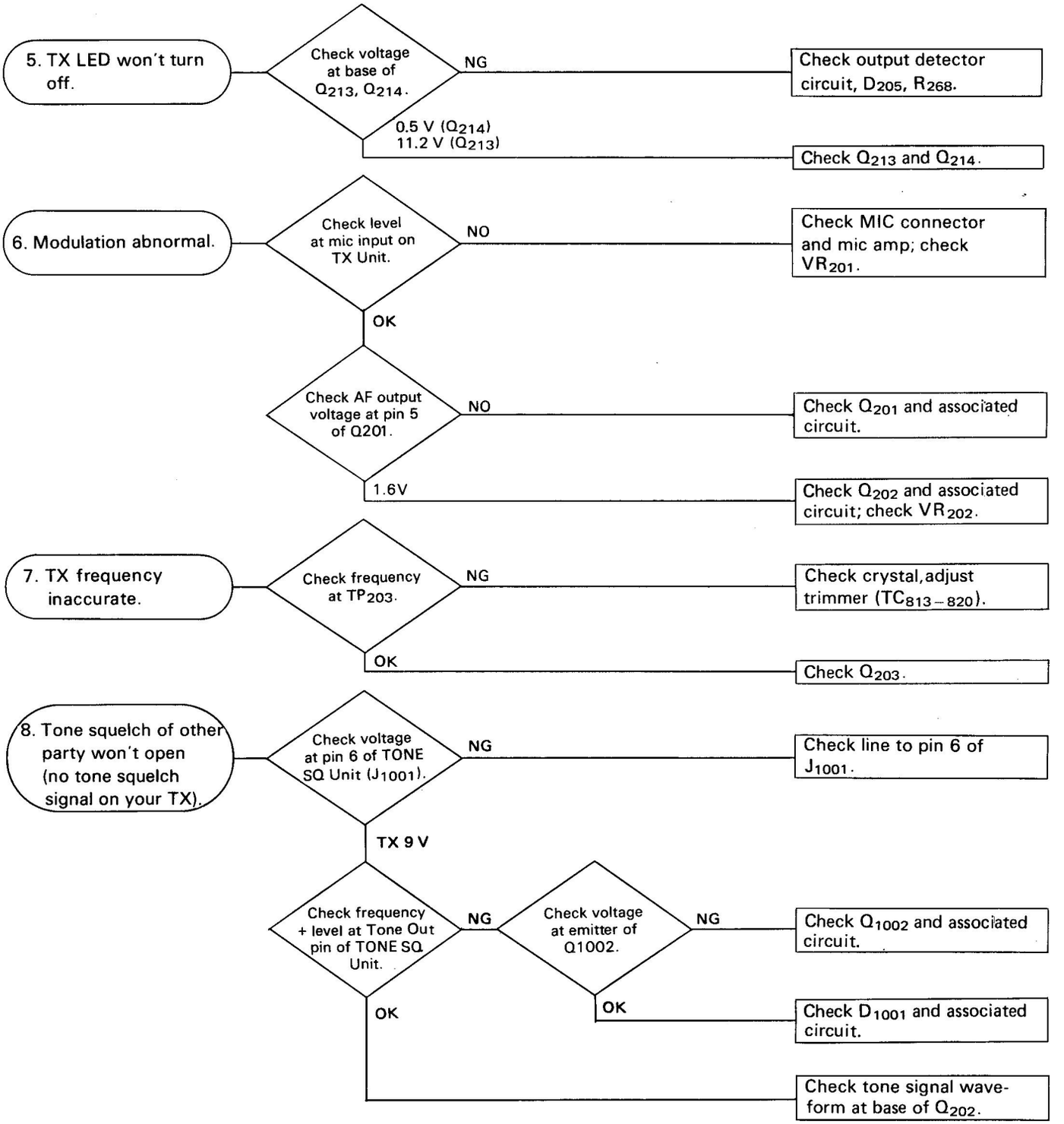



Check RX local injection voltage at gate of Q102.
NG
Check local voltage local output level at TP102.
NO
Check local circuit again.
0.8 V (RF Voltage)
0.6 V
Check C105 and R106.
Check voltages of semiconducfors in RF and IF sections.
NG
Check the associated circuit.
OK
Check RF input level at L101.
NG
Check wiring between antenna relay and L101.
OK
Check RF input level at Q101.
NG
Check Q101 and associated circuit.
OK
Check RF input level at gate 1 of Q102
NG
Peak TC101–TC104 for maximum RF voltage.
OK
6. No audio.
Check level at METER OUT terminal of RX board (20 dB signal input at ANT jack).
NO
Check RF, mixer, and IF sections; check D101 and D102.
YES
Check for audio output at base of Q111.
NO
Check discriminator circuit.
YES
Check collector voltage of Q110.
LOW LEVEL (0 V)
Check Q109, Q110, and associated circuits.


Check for signal at collector of Q_{111}.
NO
Check Q_{111} and associated circuit.
Check for signal at base of Q_{118}.
NO
Check VR_2 and associated circuit.
YES
Check Q_{118} and wiring between speaker and RX board.
7. Squelch circuit not operative.
Check noise level at SQ IN terminal of RX unit.
NG
Check squelch potentiometer VR_1; check VR_{101} and L_{108}.
OK
Check noise level at base of Q_{109}.
NG
Check Q_{108}.
OK
Check Q_{110}.
8. BUSY LED won't light up.
Connect BUSY terminal on RX board to ground; LED should light up.
NO
Check BUSY LED and 13.6 V line.
YES
9. BUSY LED won't turn off.
Check voltage at base of Q_{112}.
NG
Check Q_{111} and associated circuit.
0.6V
Check Q_{112} and associated circuit.
10. Tone squelch not operative (no audio output.)
Check voltage at pin 5 of J_{1001}.
NG
Check wiring on line to D_{110}; check squelch control setting.
13.6V
Check voltage at pin 4 of J_{1001} on Tone Squelch Unit
0 V
Check line to pin 4 of J_{1001}; check RL_{201}.


Check voltage at pin 8 of J_{100}
9 V
Check Tone Squelch IC.
0 V
11. Improper Tone Squelch operation.
Check signal and tone frequency at pin 1 of J_{1001}.
NO
Check discriminator circuit.
OK
Check voltage at Pin 8 of J_{1001}.
NG
Check Q_{1001}, Q_{1002}, Q_{1003}, and associated circuit.
OK
Check RL_{201} and circuit associated with line to pin 8 of J_{1001}.
12. Receive frequency is not correct.
Check frequency at TP_{103}.
NG
Adjust TC_{801}–TC_{807} per channel in use.
OK
Check frequency at gate of Q_{103} (should be 10.245 MHz).
NG
Check X_{101}.
1. Transmitter dead.
Ground PTT terminal at MIC jack; relay should close.
NG
Check RL_{701}, 13.6 V line to Filter board.
YES
Ground PTT line at RL_{701}.
NG
Check D_{701} and RL_{701}.
OK
Check microphone, mic jack, and PTT line to MIC jack.
2. No RF output.
Check channel position and crystal.
NG
Replace crystal as necessary.
OK


Check 13.6 V line to TX board.
NG
Check 13.6 V supply line.
OK
Check TX 9 V line on TX Unit.
NG
Inspect circuits providing TX 9V (Q_{218}, etc.).
OK
Check emitter voltage at Q_{203}.
NG
Check Q_{203}, crystal board, and associated circuits.
0.8 V
3. Low output power.
Check voltage at TP_{201}.
0 V
Check emitter voltage at Q_{218}.
OK
Adjust T_{201}–T_{205} for max. voltage at emitter of Q_{218}.
NG
Check 13.6 V line and Q_{218}.
2.5V
Check voltage at TP_{202}.
0 V or L Level
Check Q_{208}.
1.0 V
Check voltage at TP_{203}.
NG
Check Q_{208}, T_{209}, Q_{210}.
0.5 V
Check PO w/dummy load connected to ANT jack.
NG
Check voltages at Q_{212}.
NG
Check driver/p.a. stages; check setting of VR_{203}.
Check voltage at Q_{211} and check Q_{212}.
OK
40W/25W
Check D_{601} and A.F.P. circuit.
4. TX LED won't light up on TX.
Check voltage at ON AIR terminal on TX Unit.
NO
Check Q_{213} and 13.6 V line.
YES
Check TX LED.


5. TX LED won't turn off.
Check voltage at base of Q_{213}, Q_{214}.
NG
Check output detector circuit, D_{205}, R_{268}.
0.5 V (Q_{214})
11.2 V (Q_{213})
Check Q_{213} and Q_{214}.
6. Modulation abnormal.
Check level at mic input on TX Unit.
NO
Check MIC connector and mic amp; check VR_{201}.
OK
Check AF output voltage at pin 5 of Q201.
NO
Check Q_{201} and associated circuit.
1.6V
Check Q_{202} and associated circuit; check VR_{202}.
7. TX frequency inaccurate.
Check frequency at TP_{203}.
NG
Check crystal, adjust trimmer ($TC_{813-820}$).
OK
Check Q_{203}.
8. Tone squelch of other party won't open (no tone squelch signal on your TX).
Check voltage at pin 6 of TONE SQ Unit (J_{1001}).
NG
Check line to pin 6 of J_{1001}.
TX 9 V
Check frequency + level at Tone Out pin of TONE SQ Unit.
NG
Check voltage at emitter of Q1002.
NG
Check Q_{1002} and associated circuit.
OK
Check D_{1001} and associated circuit.
OK
Check tone signal waveform at base of Q_{202}.

MAINTENANCE AND SERVICING

REGULAR MAINTENANCE PLAN

Because of the rugged design and construction of the FTC-1525A/FTC-1540A, little maintenance should be required if the radio is not abused. As a Yaesu dealer, though, you are best in a position to determine the individual needs of your customers. Operation in extremely harsh environments may warrant more frequent checks of transceiver performance.

We recommend that your customers return their sets to your service facility once every two years for routine checks of the transmitter power output and the receiver sensitivity. In the meantime, keep in frequent touch with your customers regarding their expanding communications requirements. Not only will this give you the opportunity to introduce new Yaesu products, but your customers' particular service requirements will become evident.

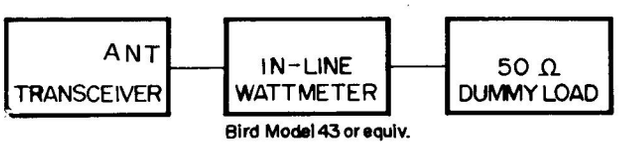
PERFORMANCE CHECKS

Make all performance checks at 13.6 volts DC under load.

Check the transmitter power output as follows:

a) Connect a suitable dummy load/wattmeter to the antenna jack.

b) Set the channel selector to any channel. Close the push-to-talk switch, and observe the power output. For the FTC-1525A, the output should be at least 25 watts, while the FTC-1540A should provide at least 40 watts output.



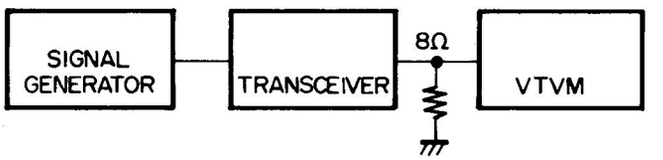
PO TEST SETUP

Check the receiver sensitivity as follows:

a) Connect an audio voltmeter to the SP jack, and set the squelch control fully counter-clockwise.

b) Connect the RF output of a precision VHF signal generator to the antenna jack, and note the audio voltmeter reading with no signal present. Adjust the volume control and voltmeter range, as necessary, to obtain roughly a full-scale reading.

c) Set the signal generator to the receiving frequency of the radio, and adjust the output amplitude of the signal generator until the voltmeter indicates a 20 dB decrease (1/10th voltage) of the reading in step b). The signal generator output voltage at this point is the 20 dB quieting sensitivity, and it should be approximately 0.3 μV.



RX SENSITIVITY TEST SETUP

If the above checks are both OK, then clean out the transceiver by applying moderate-force compressed air throughout the chassis area. This will remove any dust that may be present. If there is accumulated dirt inside the cabinet, a soft brush may be used to loosen it. Wipe the outer cabinet of the transceiver with a damp cloth, and use the compressed air to dislodge accumulated dust present in the corners of the radio.

PRELIMINARY ADJUSTMENTS

Internal adjustments should, under most circumstances, be limited to those described in the paragraphs below.

Remove the four screws from the top cover, then the four screws from the bottom cover, in order to provide full access to the transceiver circuitry.

1. Discriminator Crossover Adjustment

(a) Connect a 25-0-25 μA DC meter between the CM OUT terminal and ground on the receiver board.

(b) Connect an antenna to the ANT jack, and set up the transceiver for normal operation.

(c) Connect the output of a precision signal generator, through a 0.01 μF capacitor, to the base of Q_{106} on the receiver board. Monitor the signal generator output with a precision frequency counter, if possible.

(d) Adjust the signal generator for an output of 100 μV, at exactly 455.0 kHz.

(e) Using a non-metallic alignment tool, carefully adjust the cores in the primary and secondary of T_{105} and T_{106}, so as to obtain a ZERO indication on the meter.

2. Crystal Trimmer Adjustments

(a) Connect a 25-0-25 μA DC meter between the CM OUT terminal and ground on the receiver board.

(b) Set up the transceiver for normal operation.

(c) Connect the output of a precision VHF signal generator to the ANT receptacle.

(d) Set the CHANNEL selector to the desired channel, and adjust the signal generator to provide a signal exactly on the channel frequency. Monitor the signal generator frequency with a counter, if possible.

(e) Using a non-metallic alignment tool, adjust the appropriate trimmer capacitor on the RX crystal board, so as to obtain a ZERO indication on the meter.

(f) Repeat steps (d) and (e) for each channel.

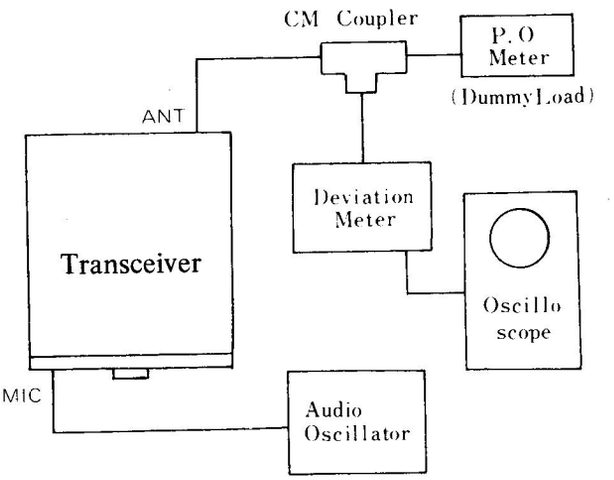
(g) Disconnect the signal generator from the ANT receptacle, and connect a 50 ohm dummy load in its place. Couple a frequency counter to the output of the transceiver; a 1 turn loop is usually sufficient to trigger the counter properly.

(h) Activate the transmitter on the desired channel, and adjust the appropriate trimmer capacitor on the TX crystal board for precisely the correct frequency of the channel being aligned.

(i) Repeat step (h) for each channel.

3. Deviation adjustment

(a) Connect a 50 ohm dummy load and FM deviation meter to the ANT receptacle, using a CM coupler. Connect an audio oscillator between pins 2 (signal) and 1 (ground) of the microphone receptacle.



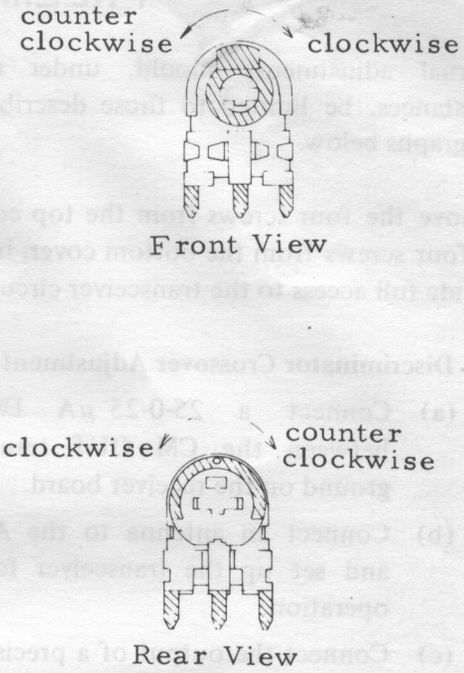
(b) Note that no microphone or other means of audio input should be connected to the microphone jack, other than the audio oscillator.

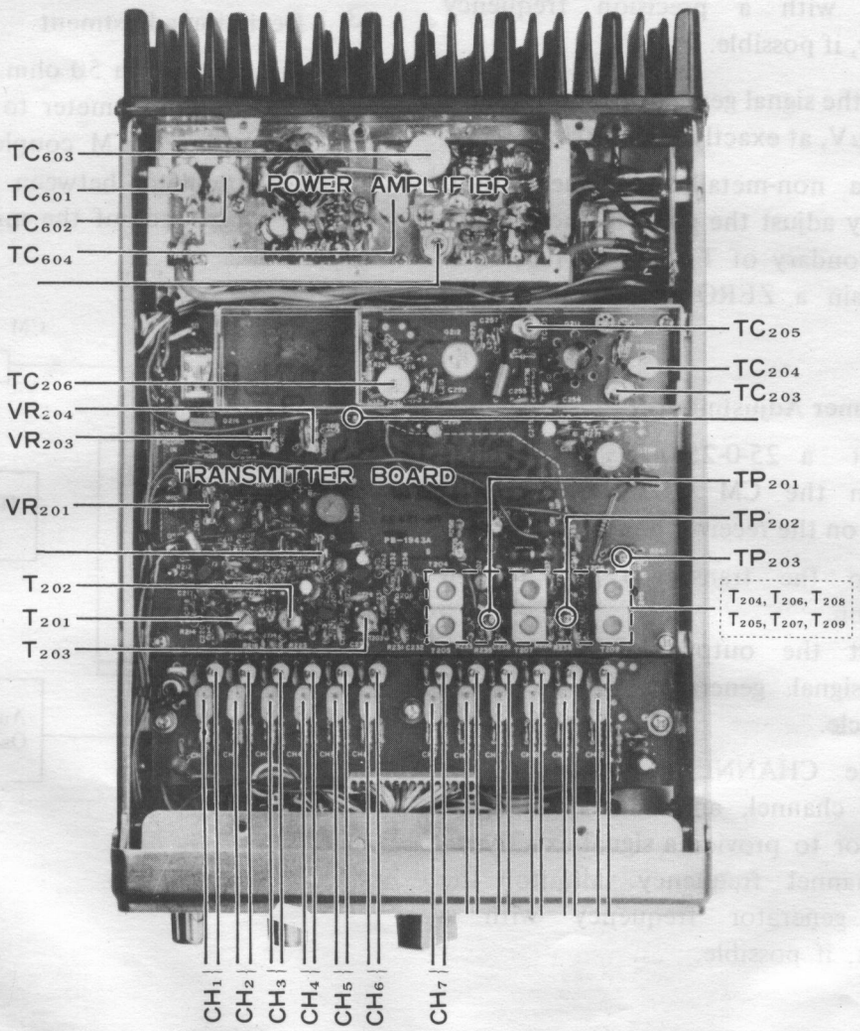
(c) Adjust the transceiver for normal operation.

(d) Set the audio oscillator for a level of 20 millivolts output at 1000 Hz.

(e) Adjust the deviation meter to display the transmitter deviation while transmitting. The transmitter may be keyed by grounding pin 3 of the microphone jack. Adjust the deviation control, VR_{202}, for a deviation of ±4.5 kHz.

(f) Set the audio oscillator output level to 2 mV, and adjust VR_{201} for a deviation of ± 3.0 kHz.





TRANSMITTER STRIP ALIGNMENT

Equipment Required:

1. VHF wattmeter, 30 watt slug (FTC-1540A: 50 watt slug).
2. 50 ohm dummy load, rated at 50 watts or better at 200 MHz.
3. Precision VHF signal generator.
4. Precision VHF frequency counter.
5. Microphone.
6. Power supply capable of 13.6 VDC at 6 amps (FTC-1540A:8 amps) continuous.
7. Vacuumtube voltmeter, 20K ohms/volt.
8. FM deviation meter.
9. Audio oscillator.
10. Oscilloscope.
11. Alignment tools.
12. Cables: (a) 1 length (3') PL-259 male to PL-259 male.
    (b) 1 length (3') BNC male to pick-up loop.

Setup:

1. Connect the transceiver to the wattmeter.
2. Connect the wattmeter to the dummy load and deviation meter.
3. Hook up microphone.
4. Connect the frequency counter to the pickup loop.

Alignment Procedure

1. Connect the VTVM to TP_{201}. Key the transmitter, and adjust IN ORDER the following transformers for maximum voltage on the meter: T_{201}, T_{202}, T_{203}, T_{204}, and T_{205}.
2. Connect the VTVM to TP_{202}. Key the transmitter, and adjust T_{206} and T_{207} for maximum voltage on the meter.
3. Connect the VTVM to TP_{203}. Key the transmitter, and adjust T_{208} and T_{209} for maximum voltage on the meter.
4. Key the transmitter, and use a non-metallic tuning wand to adjust the following trimmer capacitors IN ORDER for maximum power output: TC_{203}, TC_{204}, TC_{205}, TC_{206}, TC_{601}, TC_{602}, TC_{603}, and TC_{604}. Carefully observe the total current consumption.
5. Repeat the above procedure until no further improvement is obtained.
6. Adjust the trimmer capacitors for each transmitter channel, per the "Preliminary Adjustments" section.
7. Check the deviation, per the "Preliminary Adjustments" section.

AUTOMATIC FINAL PROTECTION ADJUSTMENT

(a) Connect a 50 ohm dummy load/RF wattmeter to the ANT receptacle.

(b) Adjust VR_{203} for a power output of 25 watts (FTC-1540A: 40 watts) or more.

(c) Set VR_{204} to the fully clockwise position. Connect a VTVM between the cathode of D_{601} (+) and ground. Key the transmitter, and adjust VR_{601} for a minimum VTVM reading (0.3 VDC nom.), while carefully observing the power output.

(d) Measure the total current of the DC power supply, which should be approximately 6 amps (FTC-1540A: 8 amps).

(e) Disconnect the dummy load from the ANT receptacle. With no antenna connected, key the transmitter. The DC current should read less than 4 amps, instead of the 6 amp (FTC-1540A: 8 amps) reading in step (d). Adjust VR_{204} to provide a current of less than 4 amps, if required. Reconnect the dummy load, and check the power output. If the output is not 25 watts (FTC-1540A:40 watts) or more, repeat step (c), and adjust VR_{203} to provide 25 watts (FTC-1540A:40 watts) output.

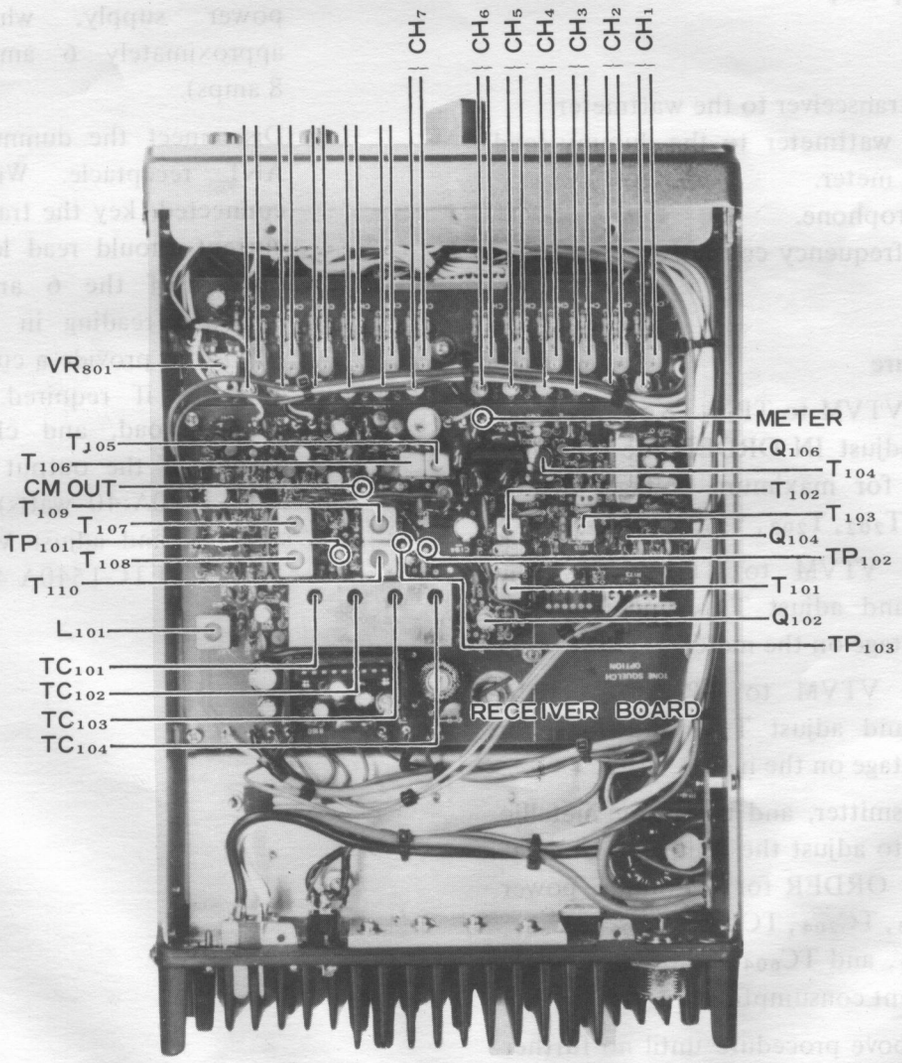
RECEIVER STRIP ALIGNMENT

Equipment needed:

1. Precision VHF signal generator.
2. Precision VHF frequency counter.
3. Audio voltmeter.
4. Vacuum-tube voltmeter, 20K ohms/volt.
5. Bench power supply.
6. Alignment tools.
7. Interconnection cables.

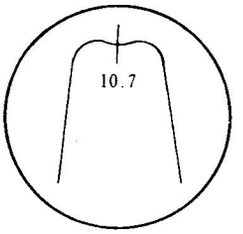
Alignment Procedure

1. Connect the DC voltmeter to TP_{101} (emitter of Q_{117}). Adjust T_{107} and T_{108} for maximum indication on the VTVM.
2. Connect the DC voltmeter to TP_{102} (cathode of D_{108}). Adjust T_{109} and T_{110} for maximum voltage on the VTVM.
3. Connect the frequency counter to the TP_{103} (anode of D_{108}). Check to see that the frequency is fc-10.7 MHz for each channel installed. If not, adjust the appropriate trimmer capacitor for a reading of exactly fc-10.7 MHz.
4. Connect the signal generator to the antenna jack, and adjust the frequency precisely to the channel frequency. Connect the DC voltmeter to TP_{103}. Adjust the discriminator transformer, T_{106}, for a reading of 0 volts on the VTVM.
5. Connect the signal generator to the antenna jack, and set its output to the channel frequency. Connect an audio voltmeter to the speaker terminals. Adjust TC_{101} –TC_{104} for maximum quieting on the receiver background noise. The specification is 20 dB quieting or better for a 0.3 μV signal.



RECEIVE CRYSTAL & TRIMMER

6. Connect the DC voltmeter to the METER TERMINAL. Connect the signal generator to the antenna jack, and set its output to the channel frequency, Adjust T_{104} for maximum indication on the VTVM with the generator signal applied.
7. Do not adjust T_{101}, T_{102}, or T_{103} if you do not have an IF oscilloscope. If you do, connect the sweep generator to gate 1 of Q_{102}, and connect the scope input to the source of Q_{104}. Set the frequency of the sweep generator to 10.7 MHz, and apply its output. Adjust T_{101}, T_{102}, and T_{103} until the pattern shown below is achieved.



	STEP	ADJUST	TEST POINT	READING	EQUIPMENT
	Local level	T_{107}, T_{108}	TP_{101}	Peak	DC voltmeter
	"	T_{109}, T_{110}	TP_{102}	"	"
RX	Local frequency check	TC_{801}–TC_{812}	TP_{103}	Within ±500 Hz of desired frequency	Frequency counter
	Sensitivity	L_{101}, TC_{101}–TC_{104}	Meter	Peak	DC voltmeter
	"	"	Speaker	20 dB Noise quieting	Signal generator Audio voltmeter
	Oscillator	T_{201} –T_{205}	TP_{201}	Peak	DC voltmeter
	Q_{207}	T_{206}, T_{207}	TP_{202}	"	"
	Q_{208}	T_{208}, T_{209}	TP_{203}	"	"
	Exciter power	T_{203}–T_{205}	TP_{204}	"	"
	Amplifier power	TC_{601}–TC_{604}	Wattmeter at antenna jack	Maximum power	Wattmeter
TX	AFP level	VR_{601}	D_{601} cathode	Minimum	DC voltmeter
	Power control	VR_{203}	Wattmeter at antenna jack	Maximum power	Wattmeter
	Oscillator frequency	TC_{813}–TC_{824}	Couple to co-ax lightly	Within ±500 Hz of desired frequency	Frequency counter
	Modulation	T_{201}, T_{202}	"	Waveform	Oscilloscope
	"	VR_{201}	—	Set at ±3 kHz deviation	"
	"	VR_{202}	—	Set at ±4.5 kHz deviation	"

Table 4
Summary of Alignment Procedure

CHANNEL CHANGES

1. Channel Modifications within Present 1.5 MHz Operating Range

Channel changes within the existing 1.5 MHz operating range of the transceiver are simple to perform.

a) Insert the desired crystals into the local crystal sockets (see Table 3 for crystal specifications). Crystal frequencies are determined according to the following formulas:

b) Connect a frequency counter to TP_{103}, and adjust the correct trimmer capacitor (TC_{801} through TC_{807}) for the correct frequency (RX channel frequency – 10.700 MHz).

c) Now use a 1 turn loop on the frequency counter probe, and couple it lightly to the coaxial cable. While transmitting, adjust the appropriate trimmer capacitor (TC_{813} through TC_{819}) for the correct transmit frequency (channel frequency).

d) If the modification is very close to the present band edge, and the set has not been in for alignment for some time, it's a good idea to verify that the receiver sensitivity and transmitter power output are satisfactory.

2. Channel Modifications to a New 1.5 MHz Range

If a new 1.5 MHz range is required (within the existing 134–148 MHz, 148–160 MHz, or 160–174 MHz bands), proceed as follows.

a) Insert the proper crystals into the sockets appropriate for the channels to be changed.

b) Set the receive crystals to the correct frequency, as outlined in 1-b above.

c) Perform an alignment of the receiver strip, as outlined briefly in Table 4 and detailed on page 3-26.

d) Set the transmit crystals precisely to the correct channel frequency.

e) Perform an alignment of the transmitter strip, as outlined briefly in Table 4 and detailed on page 3-25.

3. Channel Modifications Involving Major Frequency change

The FTC-1525A and FTC-1540A come equipped for operation on one of the following three bands: 134–148 MHz, 148–160 MHz, or 160–174 MHz. To make a channel change involving an entirely new operating range, proceed as follows.

a) Refer to Table 5, and change the 15 capacitors are listed by their Yaesu part number, and frequency range modification kits are available from Yaesu.

b) Now insert the desired crystals, and net them to the correct frequency using the trimmers.

c) Align the receiver and transmitter strips. Recheck the crystal frequencies, because your earlier readings, expecially of the transmitter frequency, might have been questionable (because of degraded performance in the new band).

BAND TABLE

BAND / COMPONENTS	134–148 MHz	148–160 MHz	160–174 MHz	153–165 MHz
C162 CH	27 pF	24 pF	20 pF	22 pF
164 CH	27	24	20	22
167 CH	8	7	6	7
169 CH	8	7	6	7
171 CH	15	15	10	12
172 CH	18	15	12	12
173 CH	18	15	12	12
174 CH	15	15	10	12
222 UJ	15	10	6	10
226 UJ	22	18	15	18
230 CH	47	39	33	36
233 CH	68	56	47	51
234 CH	68	56	47	51
239 CH	33	27	24	24
240 CH	33	27	24	24
245 CH	6	5	5	5
246 CH	6	5	5	5
L208	L0020441	L0020441	L0020194	L0020441
212	L0020194	L0020194	L0020433	L0020194
601	L0020350	L0020350	L0020431	L0020350

PARTS LIST AND ORDERING DATA

If you live in the United States, you may order parts from Yaesu Electronics Corporation. In other countries, you should order parts from the Yaesu agent for your country. In countries where Yaesu is not currently represented, you may order spare parts directly from Yaesu Musen Company, Ltd. in Tokyo.

When ordering, please specify the exact model number of the transceiver that the part is for. Many parts are standard, such as resistors and disc ceramic capacitors, but you should use particular care when ordering such items as electrolytics, tantalum capacitors, and the like.

The parts list to follow identifies the board that the parts belong to, as well as the circuit designation and part description. A "Part Number" is also specified, and this number will allow immediate identification by our parts department of the item you require. (**See note below.)

Shipment of parts from Yaesu USA is usually made by UPS, COD. Allow at least a week for the parts department to process your order. You will receive prompt notification that your order has been received, and if parts are back ordered, or if additional information is required, you will be so informed.

PARTS ORDER EXAMPLE

QUANTITY	TRANSCEIVER IDENTIFICATION	LOCATION	**PART NUMBER	CIRCUIT DESIGNATION
1	FTC-1525A	PB-1943A	G4800510C	Q_{101}(3SK51)

**Note: In earlier transceivers, no part numbering system was used in the manual. For this reason, the nomenclature "3SK51" will suffice for the part number. All transceivers have a part number for each component.

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YAESU MUSEN COMPANY, LTD. – C.P.O. BOX 1500, TOKYO, JAPAN
YAESU ELECTRONICS CORPORATION – P.O.Box 498, Paramount, CA 90723
YAESU ELECTRONICS CORPORATION – 9812 Princeton-Glendale Rd., Cincinnati, OH 45246

ORDER BLANK

QUANTITY	TRANSCEIVER IDENTIFICATION	LOCATION	PART NUMBER	CIRCUIT DESIGNATION

I authorize shipment via: ☐ Best Way ☐ Parcel Post ☐ UPS ☐ Other

Ship To: (Print or Type)
Name: _____
Address: _____
City: _____ State: _____ Zip: _____
Country: _____

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☐ UPS ☐ Other

Ship To:
(Print or Type)
Name: _____
Address: _____
City: _____ State: _____ Zip: _____
Country: _____

FTC-1525A/1540A

MAIN CHASSIS

Symbol No.	Parts No.	Description
		TRANSISTOR
Q1	G34023500	2SD235-O
		LAMP
PL1	Q1000017	BQ154-30423A 14V 40mA
		RESISTOR
R1	J10276471	Carbon composition ½W GK 470 Ω
		POTENTIOMETER
VR1 (with S3)	J60800040	VM11A 5M1222-5KB 5 kΩB
VR2	J60800041	VM10A 949A-10KA 10 kΩA
		SWITCH
S1	N2090001	8A2011 Power switch
S1▲	N2090019	8A3011 "
S2	N0050047	SRN-101CN Channel selector
	R7014230	Power switch rubber cap
		SPEAKER
SP1	M4090030	SS-57 1.5 W 8 Ω
		RECEPTACLE
J1▲	P0090012	FM146S 6P
J1	P0090011	FM144S 4P
J2	P1090028	MBR-06B TYPE M
J3	P0090060	QS-1B4MC 4P
J4	P1090005	SG-8050
P1 (with wire)	T9201190	5047-14 (#220119)
P2 (")	T9201200	5047-14 (#220120)
P3 (")	T9201390	5047-05 (#220139)
TB1	Q6000001	Terminal board 1L1P (1-0)

RX UNIT

Symbol No.	Parts No.	Description
PB-1944A	F0001944A	Printed circuit board
	C0019440	P.C. Board with components
		IC, FET & TRANSISTOR
Q107	G1090059	IC TA7061AP
Q118	G1090057	" AN214P
Q104	G3800190G	FET 2SK19GR
Q101, 102	G4800510C	" 3SK51-03
Q105, 106, 108 –113, 115	G3303720Y	Transistor 2SC372Y
Q114	G3307350Y	" 2SC735Y
Q116, 117	G3310473	Transistor 2SC1047C
Q103	G3319230O	" 2SC1923(O)
		DIODE
D101–106, 108	G2001880F	Germanium Diode 1S188FM
D107	G2015550	Silicon Diode 1S1555
D109, 110	G2090010	Zener Diode WZ090
		CRYSTAL
X101	H0100720	HC-18/U 10245 kHz
		FILTER
CF101	H1101960	10M2B2/FMT-15B
CF102	H3900130	SFE-10.7MS
CF103	H3900060	SFR-455(F)/LF-E12
CF101*	H1102000	FMT-8B (12.5 kHz model)
CF103*	H3900191	LF-E8 (")
		RESISTOR
R148, 159	J00245100	Carbon film 1/4W VJ 10 Ω
R103, 104, 107	J00245560	" " " " 56 Ω
R108, 158	J00245101	" " " " 100 Ω
R111, 167	J00245151	" " " " 150 Ω
R173	J00245181	" " " " 180 Ω
R122–124, 146, 152, 170, 171	J00245221	" " " " 220 Ω
R112, 155, 169	J00245331	" " " " 330 Ω
R120, 147	J00245471	" " " " 470 Ω
R140	J00245821	" " " " 820 Ω
R125, 126, 142, 145, 151	J00245102	" " " " 1 kΩ
R115, 135, 141	J00245152	" " " " 1.5 kΩ
R156	J00245222	" " " " 2.2 kΩ
R114, 117, 131, 133	J00245332	" " " " 3.3 kΩ
R109, 121, 127, 128, 144, 150, 153	J00245472	" " " " 4.7 kΩ
R118, 134	J00245562	" " " " 5.6 kΩ
R136	J00245103	" " " " 10 kΩ
R164	J00245123	" " " " 12 kΩ
R110, 149	J00245153	" " " " 15 kΩ
R101, 102, 119, 154, 157, 165	J00245223	" " " " 22 kΩ
R143, 172	J00245333	" " " " 33 kΩ
R166	J00245393	" " " " 39 kΩ
R105, 106, 139	J00245473	" " " " 47 kΩ
R137	J00245563	" " " " 56 kΩ
R129	J00245683	" " " " 68 kΩ
R113, 116, 130, 132, 138, 168	J00245104	" " " " 100 kΩ
R170*	J00245121	" " " " 120 Ω
		(12.5 kHz model)

FTC-1525A/1540A

		POTENTIOMETER	
VR101	J51723473	SR19R	47 kΩB
		CAPACITOR	
C168	K02173020	Ceramic 50WV CH	2 pF
C163, 183	K02173030	" " "	3 pF
C152, 1001–1004	K02173050	" " "	5 pF
C189	K02173080	" " "	8 pF
C193	K02173100	" " "	10 pF
C148, 165	K02173470	" " "	47 pF
C115,139,156–158, 191	K02173101	" " "	100 pF
C124	K02173121	" " "	120 pF
C149, 150	K02173151	" " "	150 pF
C104,105,111, 118,190,195, 197,199	K12171102	" " "	0.001 μF
C101–103,106, 109,116,117, 125,151,154, 159–161,166, 170,187,192, 196	K13170103	" "	0.01 μF
C113	K13179001	" (PH) "	0.01 μF
C112	K13179002	" (PH) "	0.022 μF
C186	K13170473	" "	0.047 μF
C134,138,140, 142,177	K50177103	Mylar "	0.01 μF
C135,136,141	K50177223	" "	0.022 μF
C120,121,126,–129,131,137	K50177473	" "	0.047 μF
C180	K50177224	" "	0.22 μF
C130	K51176331	Styrol "	330 pF
C132	K51176102	" "	0.001 μF
C145,147,175	K40170105	Electrolytic "	1 μF
C133	K40170335	" "	3.3 μF
C143, 144	K40170475	" "	4.7 μF
C153,155,198	K40120106	" 16WV	10 μF
C146,178,179	K40120226	" "	22 μF
C176	K40120336	" "	33 μF
C184, 194	K40120476	" "	47 μF
C182	K40100107	" 10WV	100 μF
C181	K40120227	" 16WV	220 μF
C162,164,167, 169,171–174	–	See frequency range conversion table.	
C183*	K02173180	Ceramic 50WV CH	18 pF
		* 12.5 kHz model	
		TRIMMER CAPACITOR	
TC101–104	K91000028	ECV-1ZW 10 x 53	10 pF
		INDUCTOR	
L101	L0020105	R12-4091	
L102	L1190008	FL4H2R2M	2.2 μH
L103	L0020302	Resonator Coil	
L107, 111	L1190001	EL0710 251K	250 μH
L108, 109	L1190017	FL5H102J	1 mH

L110	L2190001	Noise filter SN8S-500
	R0038280C	Resonator case
		TRANSFORMER
T101, 102	L0020186	
T103	L0020187	
T104	L0020188	
T105	L0020182	
T106	L0020183	
T107, 108	L0020110	
T109, 110	L0020111	
		FERRITE BEADS
FB101	L9190001	Ri 3 x 3 - 1
		HEAT SINK
	R0025590B	Heat sink
		CONNECTOR
J101	P0090090	3022-09A
J102	P0090042	5048-05A
P101	P0090045	SQ4052
	Q5000004	Terminal D
	Q5000026	" F
	Q5000011	Wrapping terminal

TX UNIT

Symbol No.	Parts No.	Description
PB-1943A	F0001943A	Printed circuit board
	C0019430	P.C. Board with components
		IC & TRANSISTOR
Q201	G1090072	Integrated circuit μPC577H
Q217	G3104960O	Transistor 2SA496O
Q213	G3106970D	" 2SA697D
Q202–205, 214–216	G3303720Y	" 2SC372Y
Q206–208	G3307100D	" 2SC710D
Q218	G3307350Y	" 2SC735Y
Q212	G3090011	" MRF208
Q211	G3090001	" MRF237
Q210	G3090013	" MRF515

FTC-1525A/1540A

		DIODE	
D204–206	G2001880F	Germanium diode	1S188FM
D207	G2015550	Silicon diode	1S1555
D203	G2090010	Zener diode	WZ090
D201, 202	G2016580	Varactor diode	1S1658
		RESISTOR	
R232	J00245100	Carbon film 1/4W VJ	10 Ω
R275	J00245220	" " " "	22 Ω
R238, 270	J00245470	" " " "	47 Ω
R277 (FTC-1525A)	J00245680	" " " "	68 Ω
R203,208,231, 235,239	J00245101	" " " "	100 Ω
R277 (FTC-1540A)	J00245151	" " " "	150 Ω
R213, 217	J00245221	" " " "	220 Ω
R216,226,228, 236,261,274	J00245471	" " " "	470 Ω
R202, 212	J00245561	" " " "	560 Ω
R204,233,243, 262	J00245102	" " " "	1 kΩ
R201, 229	J00245152	" " " "	1.5 kΩ
R260	J00245222	" " " "	2.2 kΩ
R209	J00245332	" " " "	3.3 kΩ
R207,211,214, 220,224,227, 258,268	J00245472	" " " "	4.7 kΩ
R237	J00245822	" " " "	8.2 kΩ
R215,218,241, 259	J00245103	" " " "	10 kΩ
R223,225,230, 234	J00245153	" " " "	15 kΩ
R205,210,265	J00245223	" " " "	22 kΩ
R221	J00245333	" " " "	33 kΩ
R206	J00245823	" " " "	82 kΩ
R222	J00245104	" " " "	100 kΩ
R263, 264	J10246569	"Composition ¼W GK	5.6 Ω
R278	J10276471	" " ½W "	470 Ω
R271	J10246221	" " ¼W "	220 Ω
R276	J10246681	" " " "	680 Ω
R279	J10276102	" " ½W "	1 kΩ
		POTENTIOMETER	
VR201, 202	J50702102	EVLS0AA00B13	1 kΩB
VR203, 204	J50702502	EVLS0AA00B53	5 kΩB
		CAPACITOR	
C262		Ceramic 50WV CH	0.5 pF
C247	K02173010	" " "	1 pF
C225, 241	K02173020	" " "	2 pF
C235	K02173030	" " "	3 pF
C258	K02173040	" " "	4 pF
C245, 246	K02173050	" " "	5 pF
C256	K02173080	Ceramic 50WV CH	8 pF
C257	K02173200	" " "	20 pF
C218	K02173330	" " "	33 pF
C249, 291	K02173470	" " "	47 pF
C243	K02173560	" " "	56 pF
C251	K02173680	" " "	68 pF
C237	K02173820	" " "	82 pF
C227, 276	K02173101	" " "	100 pF
C299	K00175271	" " SL	270 pF
C295	K00175471	" " "	470 pF
C201,202,204, 231,248,250, 254,261,263, 269,273,286, 287	K12171102	" "	0.001 μF
C223	K10179001	" (PH) "	0.001 μF
C200,255,260, 274,283,285	K12171472	" "	0.0047 μF
C219–221,228, 229,232,236, 238,242,244, 278,284,293, 298	K14170103	" "	0.01 μF
C217	K51176151	Styrol 50WV	150 pF
C216	K51176221	" "	220 pF
C224	K50177103	Mylar "	0.01 μF
C214	K50177223	" "	0.022 μF
C211, 212	K50177473	" "	0.047 μF
C203	K70167104	Tantalum 16WV	0.1 μF
C213	K70167105	" "	1 μF
C215	K70127475	" "	4.7 μF
C205,206,210	K70127106	" "	10 μF
C208	K70127226	" "	22 μF
C207, 209	K70127476	" "	47 μF
C280, 281	K40170105	Electrolytic 50WV R	1 μF
C253,259,277, 282	K40120106	" 16WV "	10 μF
C222,226,230, 233,234,239, 240,245,246	–	See frequency range conversion table.	
		TRIMMER CAPACITOR	
TC203	K91000012	ECV-1ZW 10 x 32	10 pF
TC204, 205	K91000013	" 20 x 32	20 pF
TC207	K91000048	222-808-32659	65 pF
		INDUCTOR	
L201	L1190041	Micro inductor	100 mH
L202, 203	L1190017	" "	1 mH
L205	L0020197		
L207	L0020190		
L209	L1020440		
L210	L0020432		
	L0020193		
L213	L0020068		
L215	L0020434		
L216	L0020194		
	L9190001	Ferrite beads Ri 3 x 3 - 1	
L208, 212	–	See frequency range conversion table.	

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					CAPACITOR
			C612	K30279063	Silvered mica 500WV 5 pF
		TRANSFORMER	C611, 615	K30279064	" " " 10 pF
T201–203	L0020612		C613, 614	K30279066	" " " 22 pF
T204, 205	L0020070		C601–604	K30279067	" " " 47 pF
T206–209	L0020111		C609	K00179001	Ceramic 50WV SL 0.5 pF
			C616	K02175680	" " CH 68 pF
			C606	K00175151	" " SL 150 pF
			C605, 610	K13170472	" " " 0.0047 μF
		PLUG	C607	K40170105	Electrolytic 50WV 1 μF
P201	P0090045	SQ4052	C608	K40120476	" 16WV 47 μF
			C617–619	K21170002	Feed through 0.001 μF
		RELAY			
RL201	M1190002	FBR211AD012M DC-12V			**TRIMMER CAPACITOR**
			TC601, 602	K91000047	TC-10 (91503) 40 pF
		Terminal D TP-D	TC604	K91000051	TC-10 (01001) 65 pF
		TP Terminal TP-A	TC603	K91000048	TC-14 (41121E1) 120 pF
	R0034320B	Exciter shield flame			
	R0048720	" " cover			
	R0034650	" " jumper			
					INDUCTOR
			L601	L0020350	
			L602	L1020351	
			L603	L0020352	
			L604	L0020353	
			L605	L0020354A	

POWER AMPLIFIER

Symbol No.	Parts No.	Description
PB-1942A	F0001942A	Printed circuit board
	C0019420	P.C. Board with components (FTC-1525A)
	C0019421	" " " (FTC-1540A)
		TRANSISTOR
Q601	G3090027	2N6083 (FTC-1525A)
	G3090012	2N6084 (FTC-1540A)
		DIODE
D601	G2015550	Silicon diode 1S1555
		RESISTOR
R601	J10246471	Carbon composition 1W GK 470 Ω
		POTENTIOMETER
VR601	J51721301	EVLS3AA00B32 300 ΩB

L606	L0020355A	
L607	L0020356A	
L608	L0020357A	
L609	L0020358A	
L601	–	See frequency range conversion table.
		FERRITE BEAD
FB601–606	L9190001	Ri. 3 x 3 - 1
	R0048730A	Booster shield flame
	R0048740A	" " cover
	R6025943B	Support D
	R5050650	Heat sink A

FILTER BOARD

Symbol No.	Parts No.	Description
PB-1941A	F0001941A	Printed circuit board
	C0019410	P.C. Board with components
		DIODE
D701	G2090072	15FD11 15 A
D702	G2090003	V06B

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		RELAY	
RL701	M1090002	MX2P DC12V	
		CAPACITOR	
C701, 702	K30279065	Dipped mica 500WV	15 pF
C706, 707	K13170103	Ceramic 50WV	0.01 μF
C703, 705	K13170473	" "	0.047 μF
C704	K40129001	Electrolytic 16WV	330 μF
		INDUCTOR	
L701	L2190002	SN Coil SN12-509	
		FERRITE BEAD	
FB701, 702	L9190001	Ri. 3 x 3 - 1	
	R6052655	Spacer ℓ = 5 mm	

RX CRYSTAL BOARD

Symbol No.	Parts No.	Description
	C0019400	RX CRYSTAL BOARD
		with components
PB-1940B	F0001940B	P. C. Board
		DIODE
D801–812	G2090044	Silicon MC301
D813	G2090010	Zener WZ090
		CRYSTAL
X801–812	—	HC-25/U See CRYSTAL DATA.
		RESISTOR
R814	J01245221	Carbon film 1/4W TJ 220 Ω
R813	J01245471	" " " " 470 Ω
R801–812	J01245332	" " " " 3.3 kΩ
R829–840	J01245334	" " " " 330 kΩ
		POTENTIOMETER
VR801	J51721103	EVL-S3AA 00B14 10 kΩB
		CAPACITOR
C801–812	K02173390	Ceramic 50WV CH 39 pF

C815	K12171102	Ceramic 50WV 0.001 μF
C813	K13170103	" " 0.01 μF
C816	K50177103	Mylar " 0.01 μF
C814	K40120336	Electrolytic 16WV R 33 μF
		TRIMMER CAPACITOR
TC801–812	K91000029	ECV-1ZW 20 x 53 20 pF
		INDUCTOR
L801	L1190017	Micro inductor 1 mH
		CRYSTAL SOCKET
XS801–812	P3090002	S2-101-P00
		CONNECTOR
J801	P0090036	5048-14A
J802	P1090016	SQ3056
	Q5000011	Wrapping terminal C
	R6052657	Spacer ℓ = 7 mm

TX CRYSTAL BOARD

Symbol No.	Parts No.	Description
	C0019401	TX CRYSTAL BOARD
		with components
PB-1940B	F0001940B	P. C. Board
		DIODE
D814–825	G2090044	Silicon MC301
D826	G2090010	Zener WZ090
		CRYSTAL
X813–824	—	HC-25/U See CRYSTAL DATA.
		RESISTOR
R828	J01245221	Carbon film 1/4W TJ 220 Ω
R827	J01245471	" " " " 470 Ω
R815–826	J01245332	" " " " 3.3 kΩ
R841–852	J01245334	" " " " 330 kΩ

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		CAPACITOR			IC & TRANSISTOR
C817–828	K06179024	Ceramic (PH) 50WV UJ 68 pF	Q1001	G1090178	IC 86022
C831	K12171102	" " 0.001 μF	Q1002, 1003	G3313110	Silicon transistor 2SC1311
C829	K13170103	" " 0.01 μF			
C832	K50177103	Mylar " 0.01 μF			
C830	K40120336	Electrolytic 16WV R 33 μF			DIODE
			D1001	G2090042	Zener diode RD8.2EB
		TRIMMER CAPACITOR			RESISTOR
TC813–824	K91000029	ECV-1ZW 20 x 53 20 pF	R1005	J00245221	Carbon film 1/4W VJ 220 Ω
				J00245472	" " " " 4.7 kΩ
			R1004, 1006	J00245103	" " " " 10 kΩ
			R1001	J00245473	" " " " 47 kΩ
		INDUCTOR	R1002	—	Metallic film 1/4W Tuning resistor
L802	L1190017	Micro inductor 1 mH			See Tone Frequency List.
					POTENTIOMETER
		CRYSTAL SOCKET	VR1001, 1003	J50707103	PN822H103H 1/2W 10 kΩB
XS813–824	P3090002	S2-101-P00	VR1002	—	" See Tone Frequency List.
					CAPACITOR
		CONNECTOR	C1004	K70167475	Tantalum 16WV 4.7 μF
J803	P0090036	5048-14A	C1001–1003	K70167106	" " 10 μF
J804	P1090016	SQ3056	C1005–1009	K10179001	Ceramic (PH) 50WV 0.001 μF

LED BOARD

Symbol No.	Parts No.	Description
PB-1977	F0001977A	Printed circuit board
	C0019770	PCB with components
		LED
PL901	G2090070	LN222RP
PL902, 903	G2090071	LN322GP
		RESISTOR
R901, 902	J10276391	Carbon composition 1/2W 390 Ω

TONE SQUELCH UNIT (OPTION)

Symbol No.	Parts No.	Description
	C0020000	P.C. Board with components
		(without Q1001, VR1002, R1002)
PB-2000	F0002000	Printed circuit board

ACCESSORIES

Symbol No.	Parts No.	Description
		MICROPHONE ASSEMBLY
	M3090019	Microphone assembly YM-30 with Microphone hanger, screws.
	P1090021	6P Microphone plug FM-146P
	M3090010	Microphone assembly YM-21 with Microphone hanger, screws.
	P1090020	4P Microphone plug FM-144P
		POWER CORD ASSEMBLY
	T9012810	T9012810 (FTC-1525A)
	T9012815	T9012815 (FTC-1540A)
	P1090049	Power plug QS-P4-FC
	Q2000001	Fuse holder SN1101
	Q0000007	Fuse 10A (FTC-1525A)
	Q0000008	" 15A (FTC-1540A)
	Q0000007	SPARE FUSE 10A (FTC-1525A)
	Q0000008	" 15A (FTC-1540A)
		MOUNTING KIT
		Mobil Hanger with Screw, Nut
		ALIGNMENT TOOL

AC POWER SUPPLY
FP-6

MAIN CHASSIS

Symbol No.	Parts No.	Description
		TRANSISTOR
Q1–4	G3401140Y	2SD114Y
Q5	G3402350D	2SD235D
		DIODE
D1	G2090121	S25VB10
		RESISTOR
R5	J10276471	Carbon composition ½W GK 470 Ω
R1–4	J30406029	Cement 10W 0.2 Ω
		SQ10L-R20
		CAPACITOR
C5	K13170103	Ceramic 50WV 0.01 μF
C3, 4	K12329001	" 1.4KV 0.01 μF
		ECK-DAL 103PE
C2	K41140108	Electrolytic 25WV 1000 μF
C1	K43140002	" " 47000 μF
		SWITCH
S1	N7090005	WD9223
		TERMINAL
	Q5000008	T203 (Red)
	Q5000009	T203 (Black)
		POWER TRANSFORMER
PT1	L3030071	
		SPEAKER
SP1	M4090033	SE-128A 8 Ω 3 W
		METER
M1	M0290014	
		PLUG
P1 (with wire)	T9202480A	QS1B4MC
P2	P0090034	P-2240
		FUSE HOLDER
FH1	P2000001	SN-1001 #2
		FUSE
F1	Q0000012	6A (100 V–117 V)
F1	Q0000004	3A (200 V–234 V)

		AC POWER CORD
	T9000482	3 wire, 3 prong plug (UL)
		UP365A04
	T9000684	3 wire, 2 prong EU plug
		EP011E03
	T9000680	3 wire, 3 prong Australian plug
		SP-400-004

REGULATOR BOARD

Symbol No.	Parts No.	Description
PB-2089	F0002089	Printed circuit board
	C0020890	P.C. Board with components
		IC
Q101	G1090036	TA7089M
		RESISTOR
R106	J10246124	Carbon composition ¼W GK 120 kΩ
R105	J10276101	" " ½W " 100 Ω
R101	J10276222	" " " " 2.2 kΩ
R102	J10276332	" " " " 3.3 kΩ
R103	J10276472	" " " " 4.7 kΩ
R104	J20306102	Metallic film 1W 1 kΩ
		POTENTIOMETER
VR101	J51721103	EVL-S3A 00B14 10 kΩB
		CAPACITOR
C101	K50177223	Mylar 50WV 0.022 μF
C102	K50177104	" " 0.1 μF
	Q5000011	Wrapping terminal C

HORN RELAY FHR-1

MAIN CHASSIS

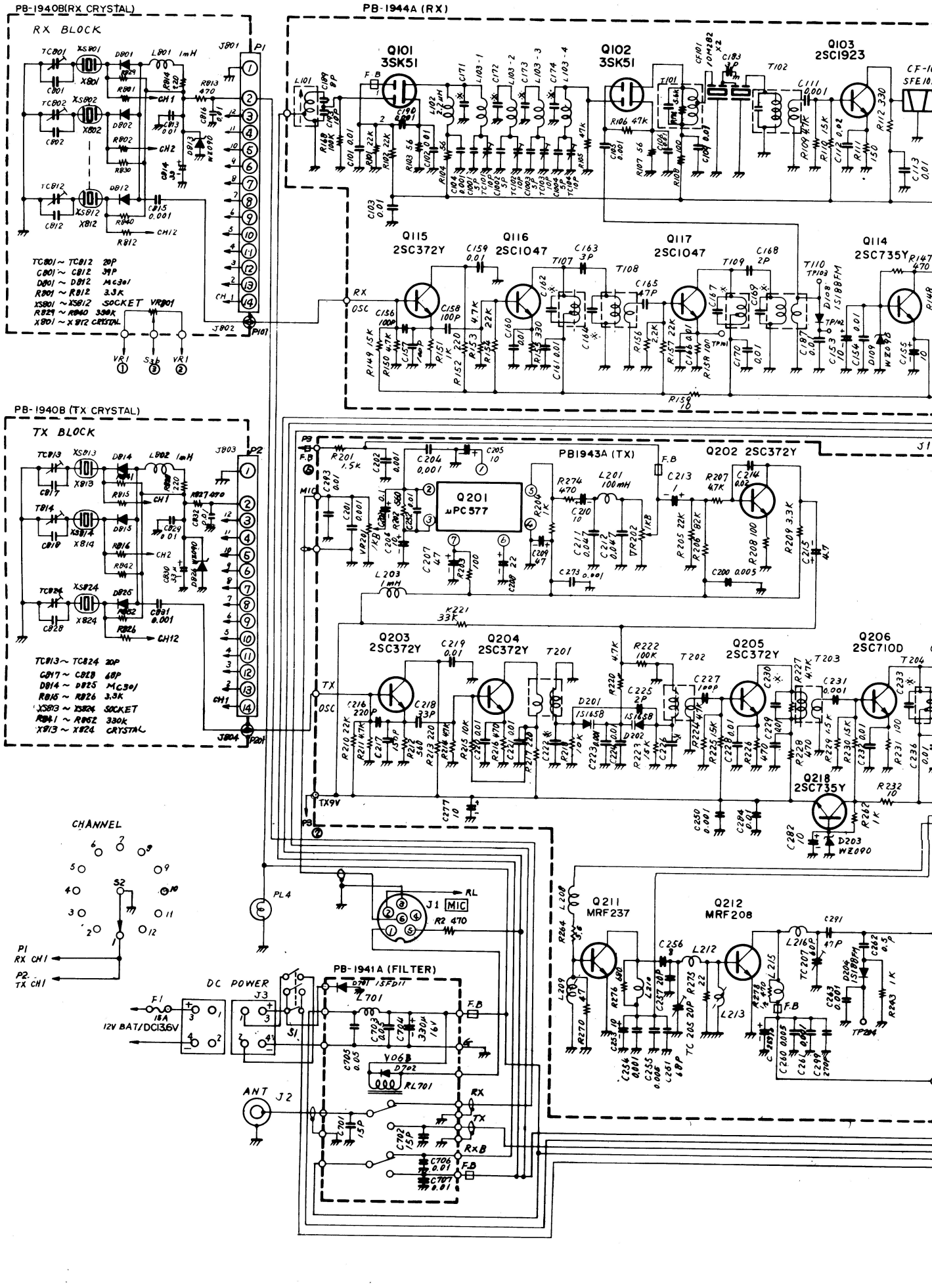
Symbol No.	Parts No.	Description
		DIODE
D1	G2090003	Si. V06B
		RELAY
RL1	M1090015	G2M-1121T
		SWITCH
S1	N2090001	8A2011
	R3014230	Switch rubber cap

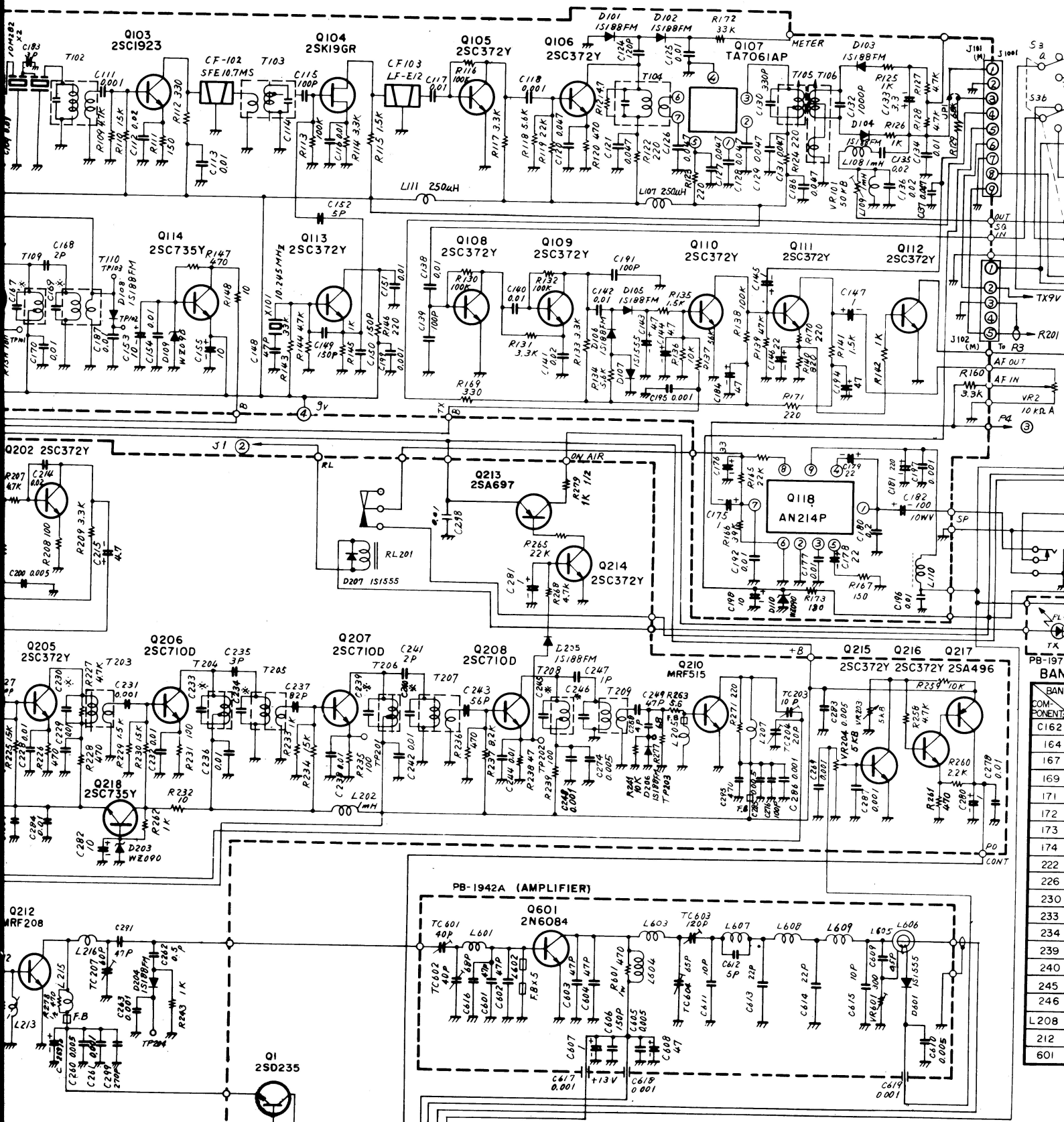
CONTROL BOARD

Symbol No.	Parts No.	Description
PB-2092	F0002092	Printed circuit board
	C0020920	P.C. Board with components
		IC & TRANSISTOR
Q101	G1090203	IC NE555
Q102	G3312090D	Transistor 2SC1209D
		DIODE
D101	G2015550	Silicon 1S1555
		RESISTOR
R104	J00245222	Carbon film ¼W VJ 2.2 kΩ
R102, 103	J00245104	〃 〃 〃 〃 100 kΩ
R101	J00245154	〃 〃 〃 〃 150 kΩ
		POTENTIOMETER
VR101, 102	J51732105	EVM-G1GA-01B16 1 MΩB
		CAPACITOR
C101, 103	K10177103	Ceramic 50WV 0.01 μF
C102	K70127336	Tantalum 16WV 33 μF
C104	K40149008	Electrolytic 25WV 10 μF
		MICRO INDUCTOR
L101	L1190017	FL-5H 102K 1 mH

ACCESSORIES

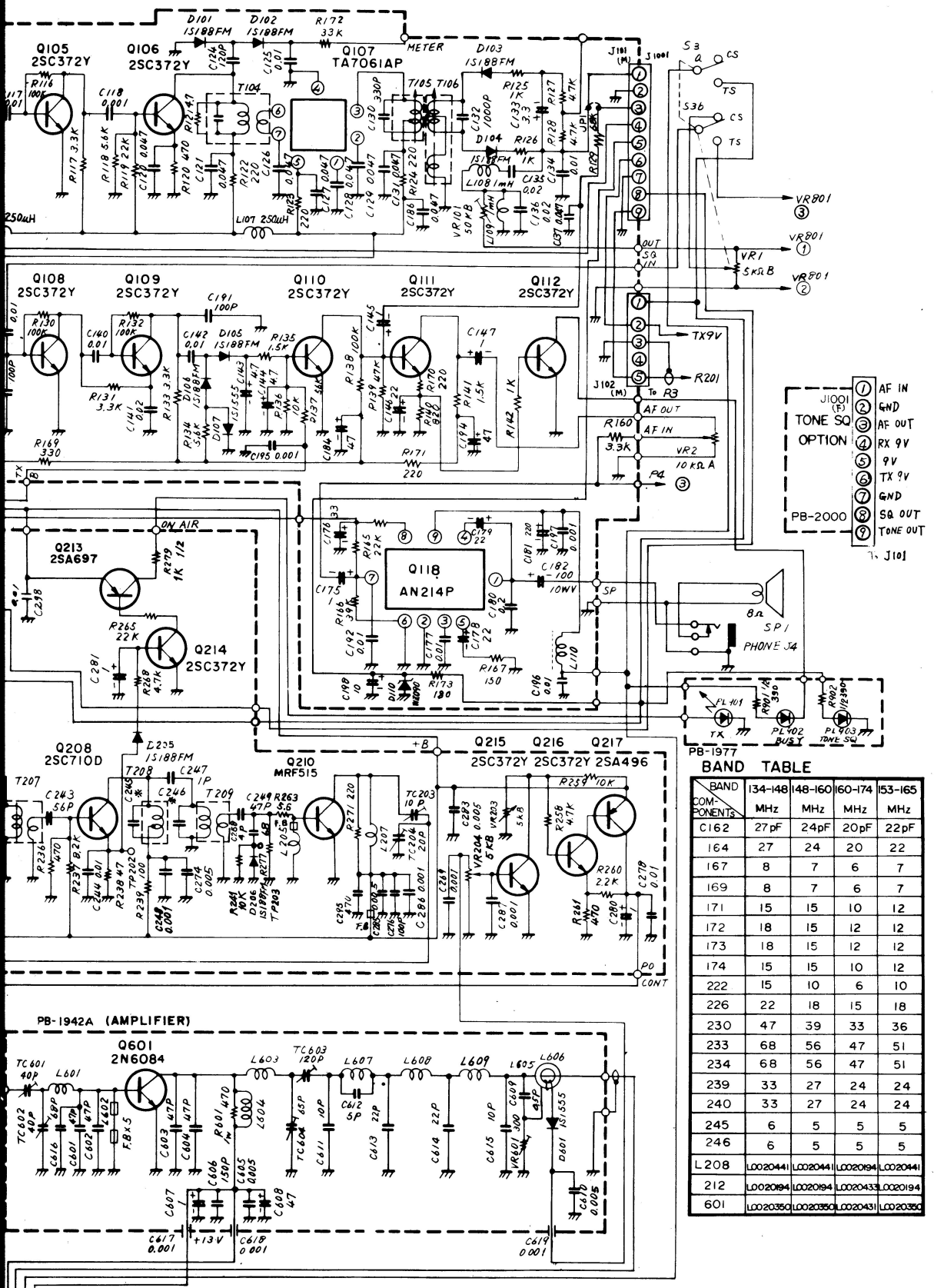
Symbol No.	Parts No.	Description
		Mount bracket with screws, washers & nuts
		Connection terminal


PB-1940B(RX CRYSTAL)
RX BLOCK
TCB01 ~ TCB12 20P
CB01 ~ CB12 39P
DB01 ~ DB12 MC301
RB01 ~ RB12 3.3K
XSB01 ~ XSB12 SOCKET
RB29 ~ RB40 330K
XB01 ~ XB12 CRYSTAL
PB-1944A (RX)
Q101 3SK51
Q102 3SK51
Q103 2SC1923
Q115 2SC372Y
Q116 2SC1047
Q117 2SC1047
Q114 2SC735Y
PB-1940B (TX CRYSTAL)
TX BLOCK
TCB13 ~ TCB24 20P
CB17 ~ CB28 68P
DB14 ~ DB25 MC301
RB15 ~ RB26 3.3K
XSB13 ~ XSB24 SOCKET
RB41 ~ RB52 330K
XB13 ~ XB24 CRYSTAL
PB1943A (TX)
Q201 μPC577
Q202 2SC372Y
Q203 2SC372Y
Q204 2SC372Y
Q205 2SC372Y
Q206 2SC710D
Q218 2SC735Y
D203 WZ090
CHANNEL
PB-1941A (FILTER)
DC POWER
12V BAT/DC13.6V
ANT J2
Q211 MRF237
Q212 MRF208
RX OSC
TX OSC
MIC
RL
PTT
RX
TX
RXB
F.B



NOTES
1. ALL RESISTERS IN Ω
UNLESS OTHERWISE N
2. ALL CAPACITORS IN
UNLESS OTHERWISE N
3. ※ COMPONENTS SEE B

FTC-1540A
CIRCUIT DIAGRAM

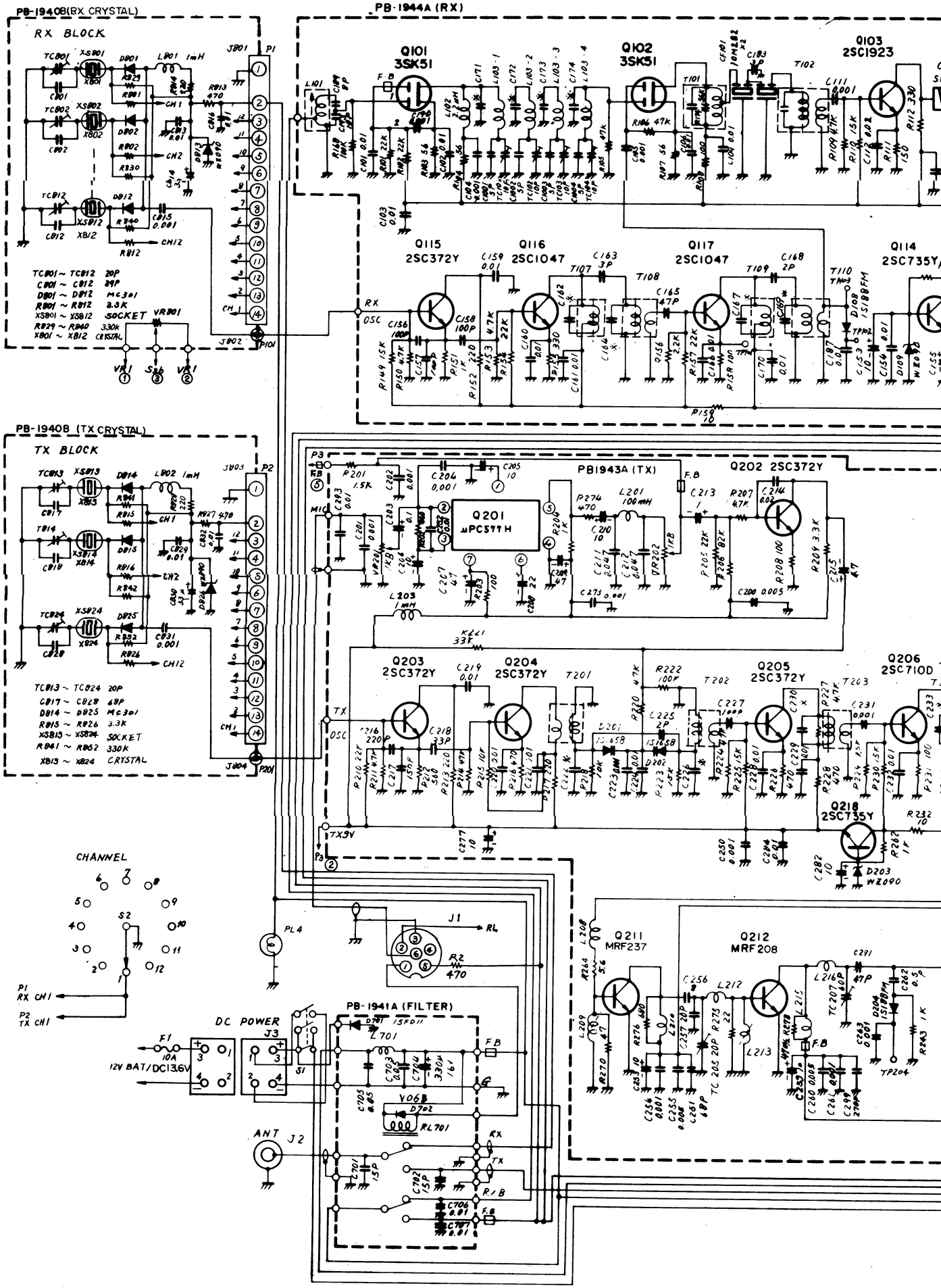


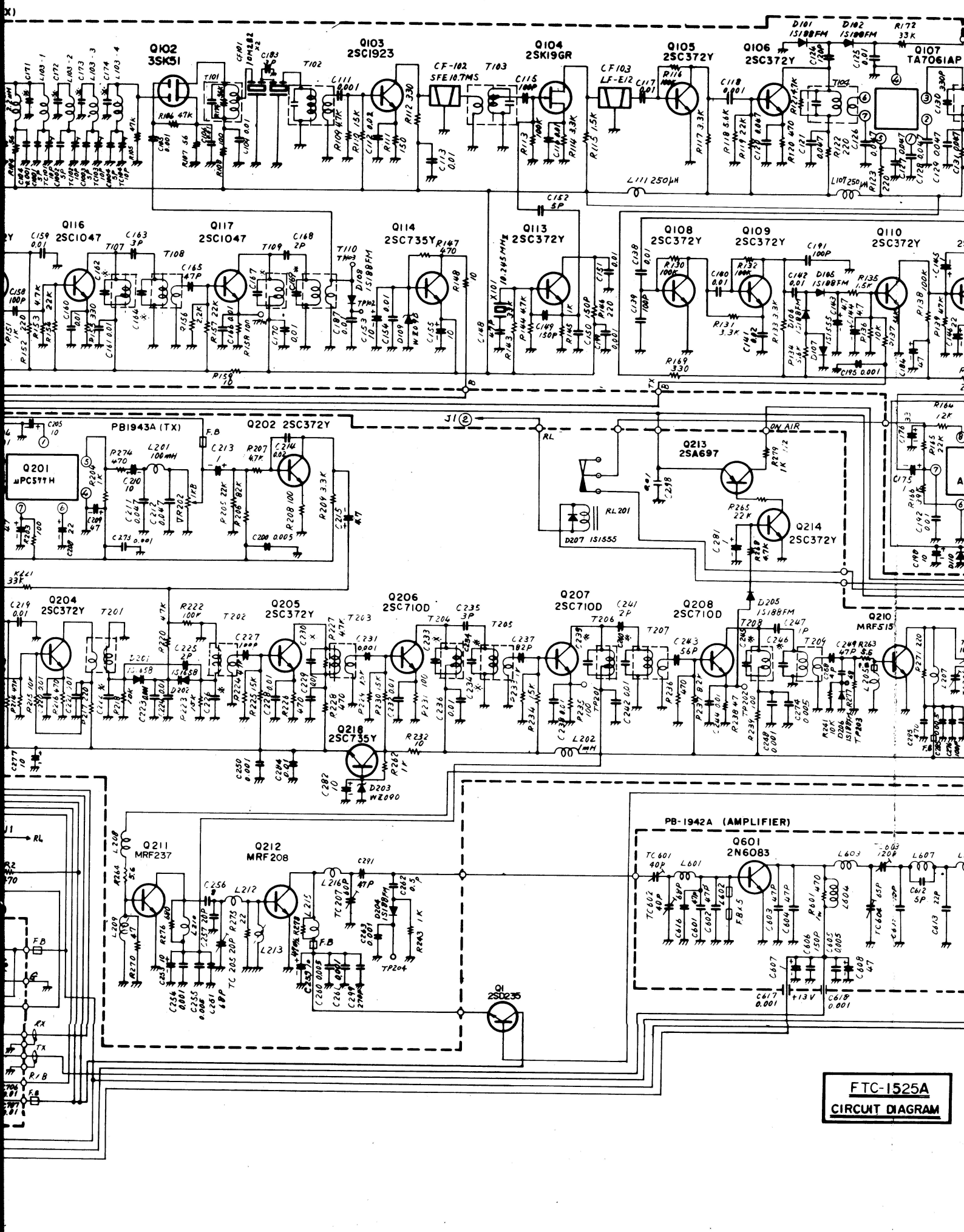
BAND TABLE

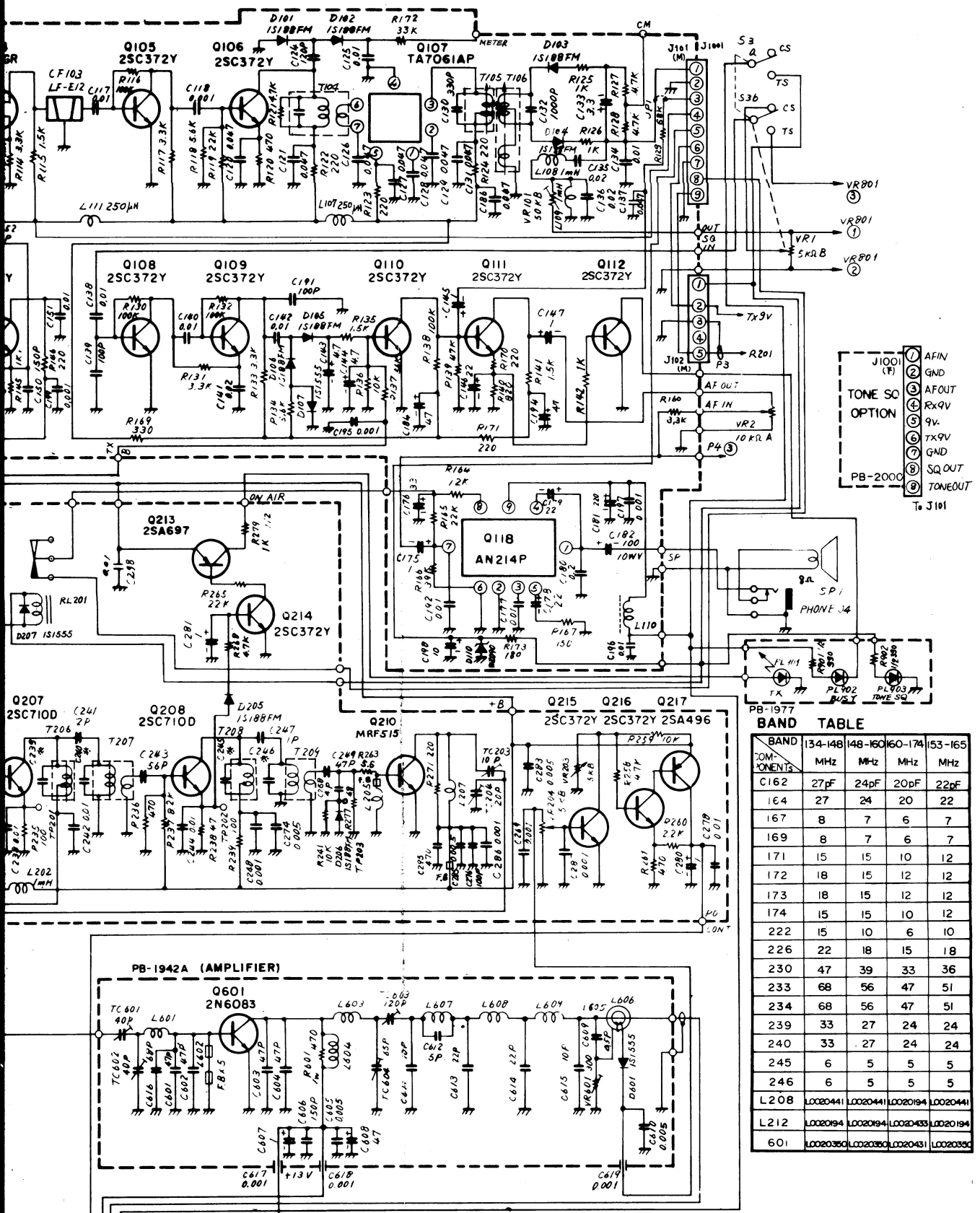
COMPONENTS \ BAND	134-148 MHz	148-160 MHz	160-174 MHz	153-165 MHz
C162	27pF	24pF	20pF	22pF
164	27	24	20	22
167	8	7	6	7
169	8	7	6	7
171	15	15	10	12
172	18	15	12	12
173	18	15	12	12
174	15	15	10	12
222	15	10	6	10
226	22	18	15	18
230	47	39	33	36
233	68	56	47	51
234	68	56	47	51
239	33	27	24	24
240	33	27	24	24
245	6	5	5	5
246	6	5	5	5
L208	L0020441	L0020441	L0020194	L0020441
212	L0020194	L0020194	L0020433	L0020194
601	L0020350	L0020350	L0020431	L0020350

NOTES
1. ALL RESISTERS IN Ω 1/4W ±10% UNLESS OTHERWISE NOTED
2. ALL CAPACITORS IN μF 16WV UNLESS OTHERWISE NOTED
3. ※ COMPONENTS SEE BAND TABLE

FTC-1540A
CIRCUIT DIAGRAM


PB-1940B(RX CRYSTAL)
RX BLOCK
TCB01 ~ TCB12 20P
CB01 ~ CB12 39P
DB01 ~ DB12 MC301
RB01 ~ RB12 3.3K
XSB01 ~ XSB12 SOCKET
RB29 ~ RB40 330K
XB01 ~ XB12 CRYSTAL
PB-1944A (RX)
Q101 3SK51
Q102 3SK51
Q103 2SC1923
Q115 2SC372Y
Q116 2SC1047
Q117 2SC1047
Q114 2SC735Y
PB-1940B (TX CRYSTAL)
TX BLOCK
TCB13 ~ TCB24 20P
CB17 ~ CB28 68P
DB14 ~ DB25 MC301
RB15 ~ RB26 3.3K
XSB13 ~ XSB24 SOCKET
RB41 ~ RB52 330K
XB13 ~ XB24 CRYSTAL
PB1943A (TX)
Q201 μPC577H
Q202 2SC372Y
Q203 2SC372Y
Q204 2SC372Y
Q205 2SC372Y
Q206 2SC710D
Q218 2SC735Y
CHANNEL
PB-1941A (FILTER)
DC POWER
12V BAT/DC13.6V
ANT J2
Q211 MRF237
Q212 MRF208
RX OSC
TX OSC
TX9V
RX
TX
R/B


Q102 3SK51
Q103 2SC1923
CF-102 SFE10.7MS
T103
Q104 2SK19GR
CF103 LF-E12
Q105 2SC372Y
Q106 2SC372Y
D101 1S188FM
D102 1S188FM
R172 33K
Q107 TA7061AP
L111 250μH
L107 250μH
Q116 2SC1047
Q117 2SC1047
Q114 2SC735Y
Q113 2SC372Y
Q108 2SC372Y
Q109 2SC372Y
Q110 2SC372Y
X101 10.245MHz
PB1943A (TX)
Q202 2SC372Y
Q201 μPC577H
L201 100mH
ON AIR
RL
Q213 2SA697
RL 201
D207 1S1555
Q214 2SC372Y
Q204 2SC372Y
Q205 2SC372Y
Q206 2SC710D
Q207 2SC710D
Q208 2SC710D
D205 1S188FM
Q210 MRF515
Q218 2SC735Y
D203 WZ090
PB-1942A (AMPLIFIER)
Q601 2N6083
Q211 MRF237
Q212 MRF208
TP204
Q1 2SD235
+13V
FTC-1525A
CIRCUIT DIAGRAM



BAND TABLE

COMPONENTS \ BAND	134-148 MHz	148-160 MHz	160-174 MHz	153-165 MHz
C162	27pF	24pF	20pF	22pF
164	27	24	20	22
167	8	7	6	7
169	8	7	6	7
171	15	15	10	12
172	18	15	12	12
173	18	15	12	12
174	15	15	10	12
222	15	10	6	10
226	22	18	15	18
230	47	39	33	36
233	68	56	47	51
234	68	56	47	51
239	33	27	24	24
240	33	27	24	24
245	6	5	5	5
246	6	5	5	5
L208	L0020441	L0020441	L0020194	L0020441
L212	L0020194	L0020194	L0020433	L0020194
601	L0020350	L0020350	L0020431	L0020350

NOTES
1 ALL RESISTERS IN Ω 1/4W ±10% UNLESS OTHERWISE NOTED
2 ALL CAPACITORS IN uF 16WV UNLESS OTHERWISE NOTED
3. ※ COMPONENTS SEE BAND TABLE

FTC-1525A
CIRCUIT DIAGRAM