REALISTIC®

# Service Manual

21-1561

84-9448-12

## TRC-448

# 40-CHANNEL MOBILE TRANSCEIVER

Catalog Number: 21-1561




CUSTOM MANUFACTURED FOR RADIO SHACK A DIVISION OF TANDY CORPORATION

# CONTENTS

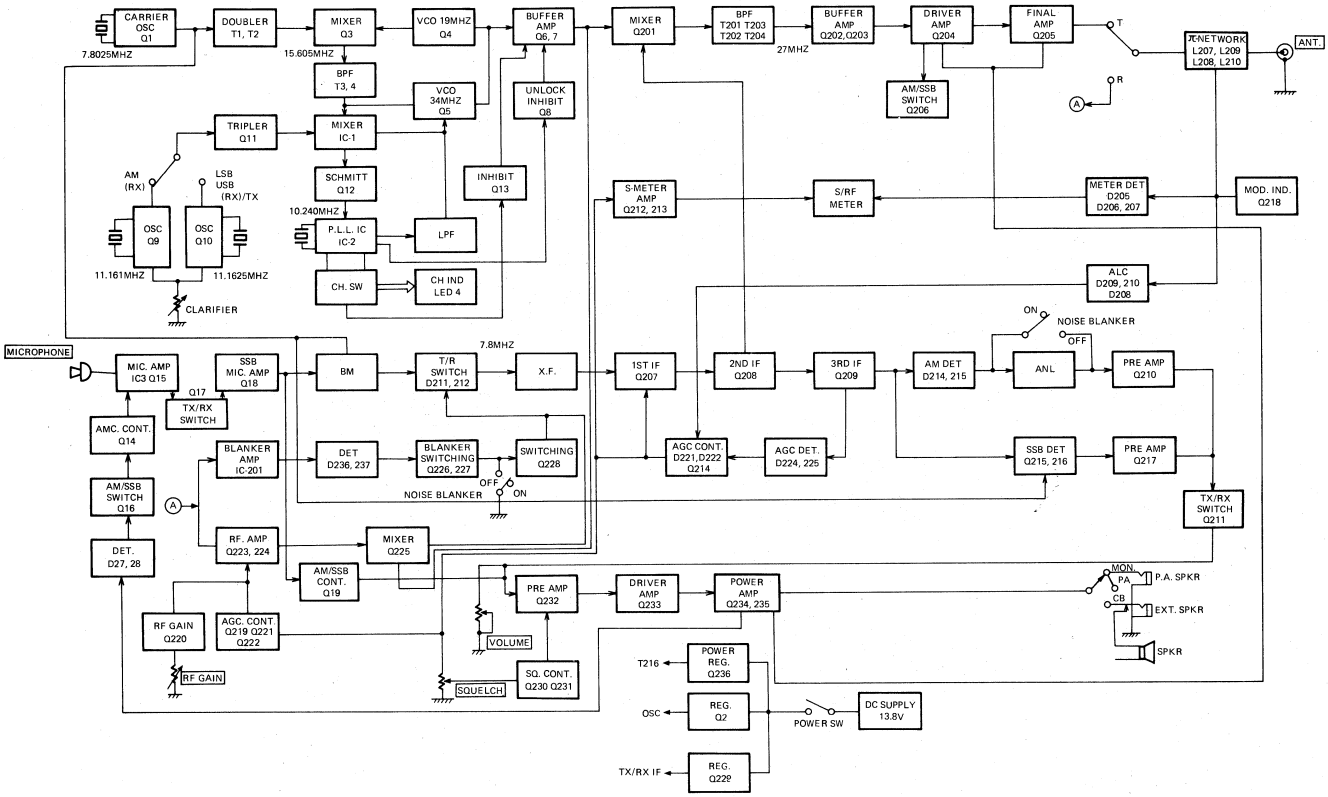
# SPECIFICATIONS

| DESCRIPTION | CONDITION | NOMINAL | LIMIT |
|---|---|---|---|
| **TRANSMITTER** | | | |
| **Frequency Tolerance** AM | | ±0.0003% | ±0.005% |
| SSB | | ±0.0003% | ±0.005% |
| **RF Output** AM | 13.8 V DC | 3.8 W (4 watts max.) | 3.5 ~ 4.0 W |
| SSB | 13.8 V DC | 12 W PEP | 10 ~ 12 W |
| **Modulation Distortion** | 80% MOD 1 kHz | 3% | 10% |
| **Spurious Harmonic Emission** AM | | −65 dB | −60 dB |
| SSB | | −65 dB | −60 dB |
| **Carrier Suppression** SSB | | −50 dB | −40 dB |
| **Unwanted Sideband Suppression** | 2.5 kHz (SSB) | −50 dB | −40 dB |
| **Current Drain** | No Modulation (AM) | 1500 mA | 2000 mA |
| | (SSB) | 1000 mA | 1500 mA |
| | 80% MOD (AM) | 2000 mA | 2600 mA |
| | 10 W PEP Two-Tone (SSB) | 2500 mA | 3000 mA |
| **Modulation Frequency Response** | 1 kHz 0 dB | | |
| | Lower 450 Hz | AM SSB −6 dB | AM −10 dB SSB −14 dB |
| | Upper 2.5 kHz | AM SSB −6 dB | AM SSB −10 dB |
| **Carrier Power Uniformity** | Ch-to-Ch with No MOD | AM 0.3 W | 0.5 W |
| **MIC Input Level Uniformity** | Ch-to-Ch for 4 W Output, 1000Hz Single-Tone | SSB 2 dB | 3 dB |
| **Intermodulation Distortion** | 500 and 2500 Hz Two-Tone | 30 dB | 25 dB |
| **MIC Input Level Uniformity** | LSB/USB 4 W Output 1.5 kHz Single Tone | 1 dB | 3 dB |
| **Microphone Sensitivity** | AM 50% MOD | 0.7 mV | 1.5 mV |
| | SSB 4 W PEP | 0.7 mV | 1.5 mV |
| **AMC Range** | AM 50 ~ 100% MOD | 50 dB | 30 dB |
| | SSB 10 ~ 12 W PEP | 20 dB | 10 dB |
| **RECEIVER** | | | |
| **Max. Sensitivity** | AM | 0.5 μV | 1 μV |
| | SSB | 0.25 μV | 0.5μV |
| **Sensitivity** | 10 dB S/N AM | 0.5 μV | 1 μV |
| | SSB | 0.25 μV | 0.5 μV |
| **AGC Figure of Merit** | 50 mV 10 dB AM | 90 dB | 80 dB |
| | SSB | 90 dB | 80 dB |
| **Overload AGC Characteristics** | 10 mV to 100 mV AM | ±2 dB | ±5 dB |
| | SSB | ±2 dB | ±5 dB |
| **Overall Audio Fidelity** | at 6 dB Down | | |
| | Upper Frequency AM | 2100 Hz | 1750 ~ 2500 Hz |
| | SSB | 3500 Hz | 1750 ~ 2500 Hz |
| | Lower Frequency AM | 300 Hz | 150 ~ 500 Hz |
| | SSB | 300 Hz | 150 ~ 500 Hz |
| **Cross Modulation RS Standard** | AM | 60 dB | 50 dB |
| **Adjacent Channel Selectivity** | 10 kHz AM | 80 dB | 60 dB |
| | SSB | 90 dB | 60 dB |
| **Maximum Audio Output Power** | AM | 5 W | 4 W |
| | SSB | 5 W | 4 W |
| **Audio Output Power** | 10% THD SSB | 3.5 W | 3 W |
| | AM | 3.5 W | 3 W |
| **THD AM** | 500 mW Output 1 mV | | |
| | Input 30% (MOD) | 3% | 6% |
| | 80% (MOD) | 5% | 12% |
| **THD SSB** | 1 mV Input 1 kHz | | |
| | Single Tone | 3% | 6% |

| DESCRIPTION | CONDITION | NOMINAL | LIMIT |
|---|---|---|---|
| RF Gain Control Range at Max. | AM | 40 dB | 30 ~ 50 dB |
| Sensitivity Level | SSB | 40 dB | 30 ~ 50 dB |
| S/N Ratio | AM Input 1 mV | 40 dB | 35 dB |
| | SSB | 40 dB | 35 dB |
| Squelch Sensitivity at Threshold | AM | 0.5 μV | 1 μV |
| | SSB | 0.5 μV | 1 μV |
| Squelch Sensitivity at Tight | AM | 1000 μV | 500 ~ 2000 μV |
| | SSB | 1000 μV | 500 ~ 2000 μV |
| Skirt Rejection (±20 kHz) | AM | 80 dB | 70 dB |
| S Meter Sensitivity at "S-9" | AM | 100 μV | 50 ~ 200 μV |
| (No Modulation AM) | SSB | 100 μV | 50 ~ 200 μV |
| Image Rejection Ratio | AM | 80 dB | 65 dB |
| fo + (2 x 7.8 MHz) | SSB | 80 dB | 65 dB |
| 1/2 IF Rejection Ratio | AM | 90 dB | 80 dB |
| fo + 7.8 MHz/2 | SSB | 90 dB | 80 dB |
| IF Rejection Ratio 7.8 MHz | AM | 90 dB | 75 dB |
| | SSB | 90 dB | 75 dB |
| Oscillator Drop-out Voltage | AM | 7 V | 10 V |
| | SSB | 7 V | 10 V |
| Current Drain at No Signal | AM | 550 mA | 1000 mA |
| | SSB | 550 mA | 1000 mA |
| Current Drain at Maximum | AM | 1000 mA | 1500 mA |
| | SSB | 1000 mA | 1500 mA |
| Clarifier Range | AM | ±1 kHz | ±0.6 ~ ±2.5 kHz |
| | SSB | ±1 kHz | ±0.6 ~ ±2.5 kHz |
| Spurious Rejection Ratio | | | |
| Within Band | AM | 65 dB | 56 dB |
| | SSB | 65 dB | 56 dB |
| Outside of Band | AM | 60 dB | 50 dB |
| | SSB | 60 dB | 50 dB |
| **PUBLIC ADDRESS** | | | |
| Microphone Sensitivity | 3 W Output 1 kHz | 1 mV | 2 mV |
| Output Power | 10% Distortion | 3.5 W | 3 W |
| Current Drain | No Signal | 500 mA | 1000 mA |
| | Max. Output Power | 1000 mA | 1500 mA |
| **GENERAL** | | | |
| Frequency Range | 29.965 to 27.405 MHz | | |
| Channel | 40 Channels | | |
| Frequency Control | Crystal Control (PLL System) | | |
| Operating Temperature | −10°C to 50°C | | |
| Humidity | 10 to 95% | | |
| Microphone | Dynamic Type with PTT Switch | | |
| Operating Voltage | 13.8 V DC Nominal (12.0 ~ 15.0 Volt DC) | | |
| Power Consumption | Pos./Neg. Ground 40 Watts | | |
| Meter | TX Power and Signal Strength | | |
| Size | 205(W) x 60(H) x 260(D) mm (8-1/4" x 2-1/2" x 10-1/2") | | |

**NOTE:** *Nominal Specs represent the design specs: all units should be able to approximate these — some will exceed and some may drop slightly below these specs. Limit Specs represent the absolute worst condition which still might be considered acceptable; in no case should a unit perform to less than within any Limit Spec.*

# BLOCK DIAGRAM



# PRINCIPLES OF OPERATION

This section of the Service Manual will give you a brief technical description of unique or special circuits which you might otherwise not understand, notice or be able to troubleshoot.

## PLL CIRCUIT

The TRC-448 uses a Digital Phase Lock Loop circuit to synthesize each of the channel frequencies. The PLL Circuit consists of a reference crystal oscillator (10.24 MHz), reference divider, programable divider, crystal oscillator, Phase Detector, Low Pass Filter (LPF) and a Voltage Controlled Oscillator (VCO, which uses a varicap diode as the frequency control source).

Refer to the AM and USB Block Diagram as you go through the following description. A 10.24 MHz Crystal is used as a reference frequency. The crystal is connected between Pin 4 and 5 of the PLL IC IC-2.

Crystal oscillator Q10 produces a 33.4875/3 MHz frequency signal. This signal is processed through Q11 tripler and mixed by IC-1 mixer with the Q5 VCO frequency (34.7675 to 35.2075 MHz). The resulting down-mix produces signals of 1.28 through 1.72 MHz, which pass through LPF, and Q12 amplifier and then applied to Pin 3 of PLL IC IC-2. These frequencies are divided by "N" (128 through 172) as determined by the Channel Selector switch. Thus the output is 10 kHz (divided internally by IC-2).

Also, the reference oscillator frequency, 10.24 MHz, is divided by 1024 (again, internally by IC-2) resulting in another 10 kHz frequency.

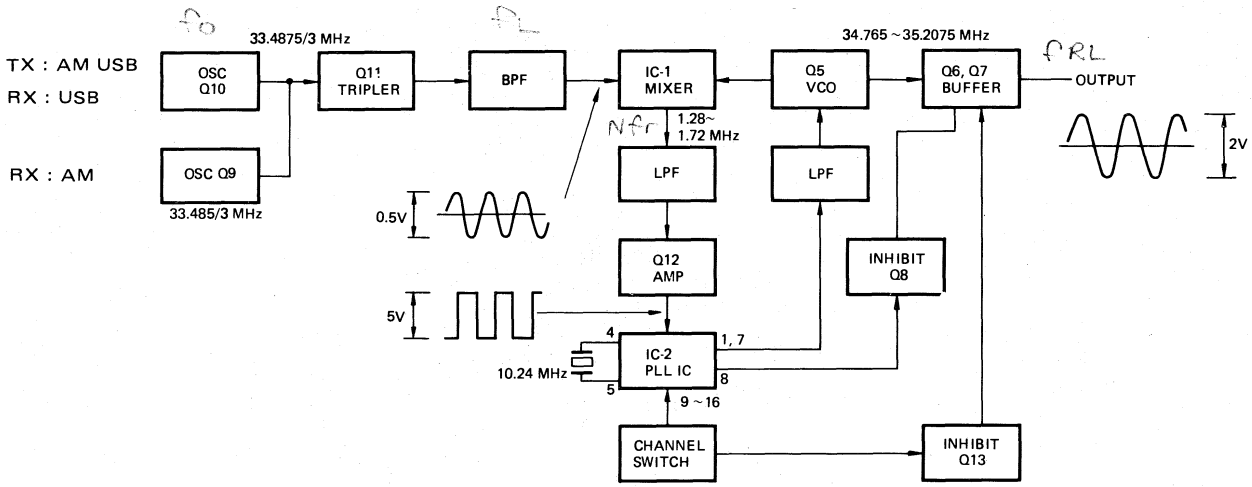
These two 10 kHz signals are fed to the Phase Detector and AFC. An error voltage is generated by the Phase Detector which is in proportion to the phase difference between these two 10 kHz signals. This error voltage appears at Pin 7. The AFC circuit brings the VCO to within the lock range of the Phase Detector. The AFC output is a tri-state output that is open when the circuit is in phase lock, provides positive going pulses when the VCO frequency is lower than the reference frequency and provides negative going pulses when the VCO frequency is higher than the reference frequency. This error voltage appears at Pin 1. The error voltage which appears at Pin 7 and 1 are the result of the phase difference, plus effects of harmonics and extraneous noise. These error voltages pass through the LPF, where the error voltage is integrated and harmonics and noises are filtered out. The resulting DC voltage is applied to the VCO (a varicap diode) whose capacity varies with applied DC voltage. With proper circuit design and precise adjustments, the VCO frequency is accurate and precise. When the Phase Detector senses no frequency or phase difference between the two 10 kHz signals, the system is "locked" and the VCO generates a frequency which is as accurate and stable as the reference crystal oscillator.

The Channel Selector switch provides a Binary Code output which is connected to Pins 9 through 16. The resulting code determines "N", the divisor which produces the required output frequency for each channel (precisely spaced 10 kHz apart).

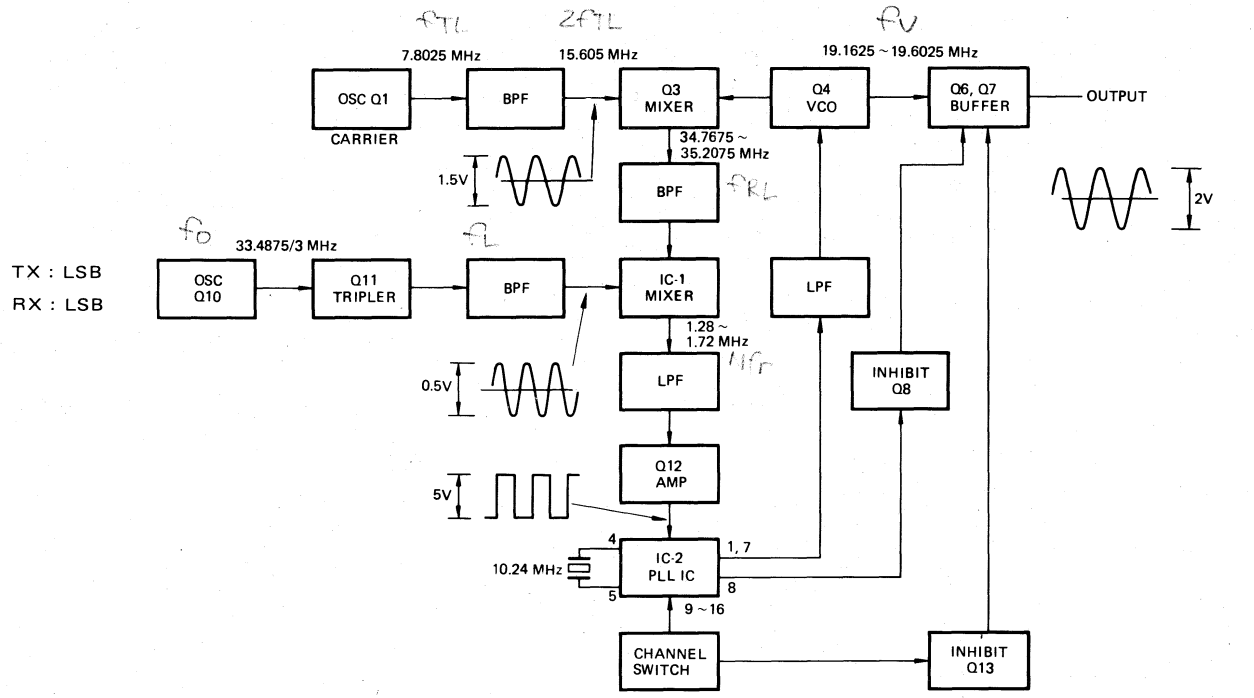
For AM Receive Mode, crystal oscillator Q9 generates a frequency of 33.485/3 MHz. This signal is also processed through Q11 tripler and mixed in IC-1 mixer with the Q5 VCO frequency (34.765 to 35.205 MHz). The resulting down-mix produces 1.28 through 1.72 MHz frequencies which are supplied to Pin 3 of IC-2. Thus, the circuit functions in the same way, except for the method of deriving the required 1.28 through 1.72 MHz stepped frequencies.

For LSB, crystal oscillator Q10 generates a frequency of 33.4875/3 MHz. This signal is processed through Q11 tripler. Carrier oscillator Q1 produces a 7.8025 MHz signal. This signal is processed through T1 and T2 Band Pass Filter, tuned to the 2nd harmonic (15.605 MHz) and mixed in Q3 mixer with the Q4 VCO frequency (19.1625 to 19.6025 MHz). The resulting up-mix produces 34.7675 through 35.2075 MHz which pass through BPF and mixed in IC-1 mixer with the 33.4875 MHz. The resulting down-mix produces the 1.28 through 1.72 MHz frequencies which are supplied to Pin 3 of IC-2. Thus, the circuit functions in the same way, except for the method of deriving the required 1.28 through 1.72 MHz stepped frequencies.

At Pin 8 of IC-2 a Transmit Inhibit signal is available. It provides a high output (supply voltage to IC-2) when the synthesizer attains a lock condition, or a low (0 volt) when not in lock. When the output is either high or low, no phase error pulses are outputted that require detection. This circuit is used to inhibit transmitter operation if the programmed frequency cannot be properly acquired. The lock detector output will go low if a frequency error exists for more than 0.5 milliseconds. This signal is applied to the base of Q8, turning it on or off. Thus the Transmitter can not operate in an unlocked condition of the PLL.
The channel selector switch also has an inhibit function, when the selector switch is set in between two channel positions, Q13 is turned on to kill Q6.




**AM and USB**
**(Receive and Transmit)**

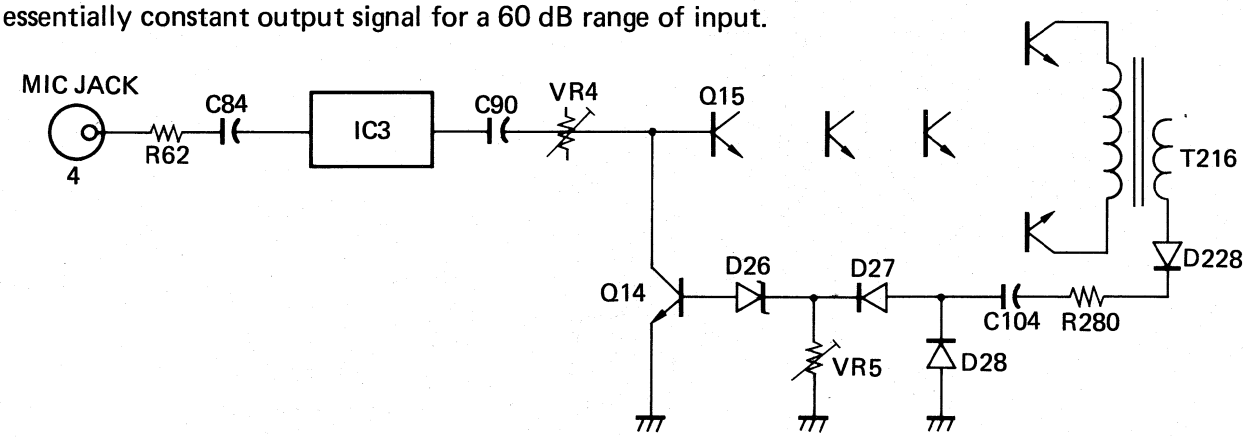



**LSB**
**(Receive and Transmit)**

## AUTOMATIC MODULATION CONTROL CIRCUIT

The Automatic Modulation Control (AMC) circuit consists of Q14, D26, D27 and D24. The Mic input signal is fed to pin 4 of the microphone jack and then through R62, C84 to the input terminal (pin 5) of IC-3 where it is amplified and delivered through C90 and VR4 for further amplification by Q15, Q232, Q233, Q234 and Q235. The Audio amplifier/Modulation amplifier drives T216, whose secondary incorporates C104, through D228 and R280, which couples a portion of the signal to AMC detector diodes D27 and D28. D26 (an 8-volt zener) is connected to the output of D27/28; when the detected DC voltage from D27/28 exceeds 8 volts, D26 conducts. This applies a DC voltage to the base of Q14, thus decreasing its collector impedance. Notice that the combination of Q14 and VR4 automatically sets the desired audio signal level processed by the audio amplifier circuitry. VR5 is adjusted to set a modulation level of less than 100%.

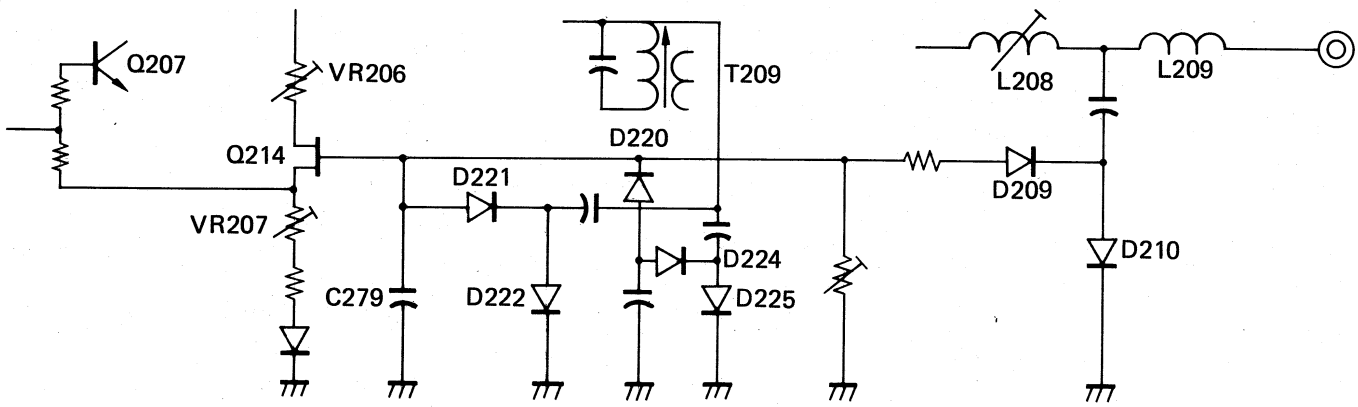
VR4 is adjusted to set a modulation level in the SSB mode. IC-3 is a silicon integrated circuit which functions as a audio amplifier with built-in automatic voice-operated gain adjustment. It is designed to provide an essentially constant output signal for a 60 dB range of input.




## AUTOMATIC LIMITER CONTROL (TRANSMITTER)/AUTOMATIC GAIN CONTROL (RECEIVER)

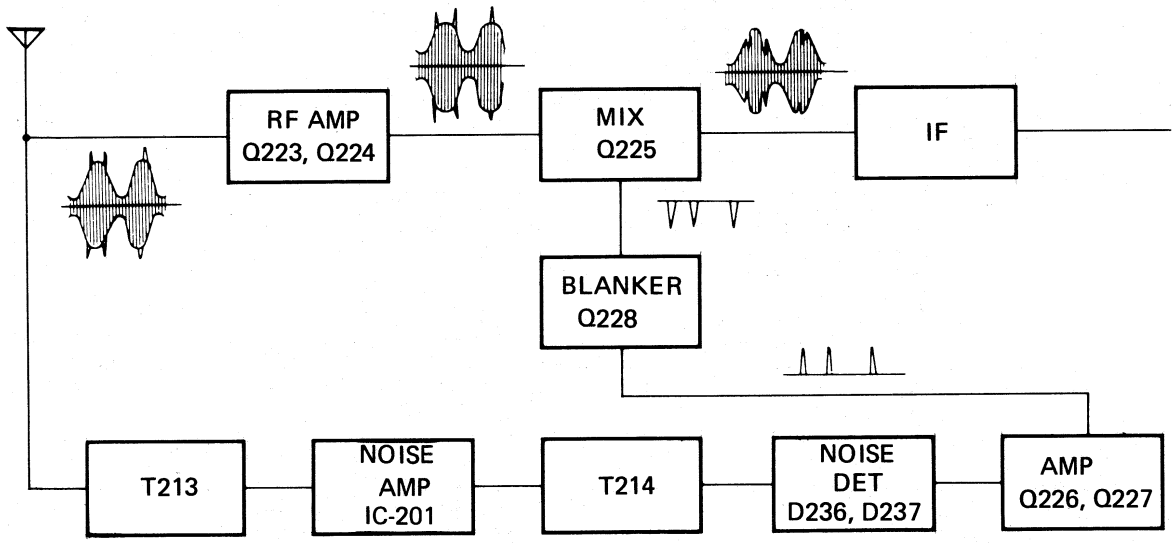
The Automatic Limiter Control (ALC) circuit consists of D209, D210 and Q214. The RF output signal is detected by D209 and D210. This applies a negative DC voltage to the gate of Q214, thus decreasing its source voltage. This source voltage controls Q207's (7.8 MHz amplifier) base bias voltage, thus decreasing its base voltage. This automatically sets the desired RF output level processed by the RF amplifier circuitry. VR207 is adjusted to set a RF power level of less than 12 watts PEP.

Q214 is also used as an automatic gain control (AGC). AGC circuit consists of Q214, D221 and D222. The amplified IF signal is detected by D221, D222, D224, and D225. This voltage is used for fast-attack AGC. D221, D222 and C279 are used for slow-release AGC. Thus, the circuit functions in the same way, except for the delivering of source voltage. VR206 is adjusted to set a "0" reading on the S-meter.



### NOISE BLANKER

Noise pulses are amplified by IC-201 and detected by D236 and D237. The detected pulses are then amplified by Q226 and Q227. This applies a positive pulse to the base of Q228, thus decreasing its collector impedance to shunt the Q225 gate impedance during the duration of the noise pulses. The most objectionable noise pulse frequencies are distributed around 40 MHz, thus T213 and T214 are tuned to this frequency.




# DISASSEMBLY

Refer to Figure 1.

Step 1: Remove two bracket screws Ⓐ and the Bracket.

Step 2: Remove 4 cabinet mounting screws Ⓑ (two from each side).

Step 3: Remove Cabinet Top and Bottom.

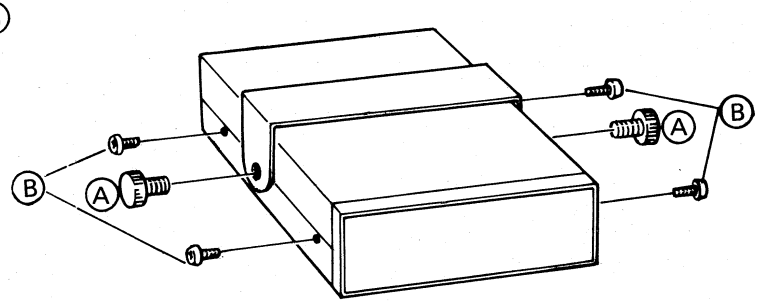


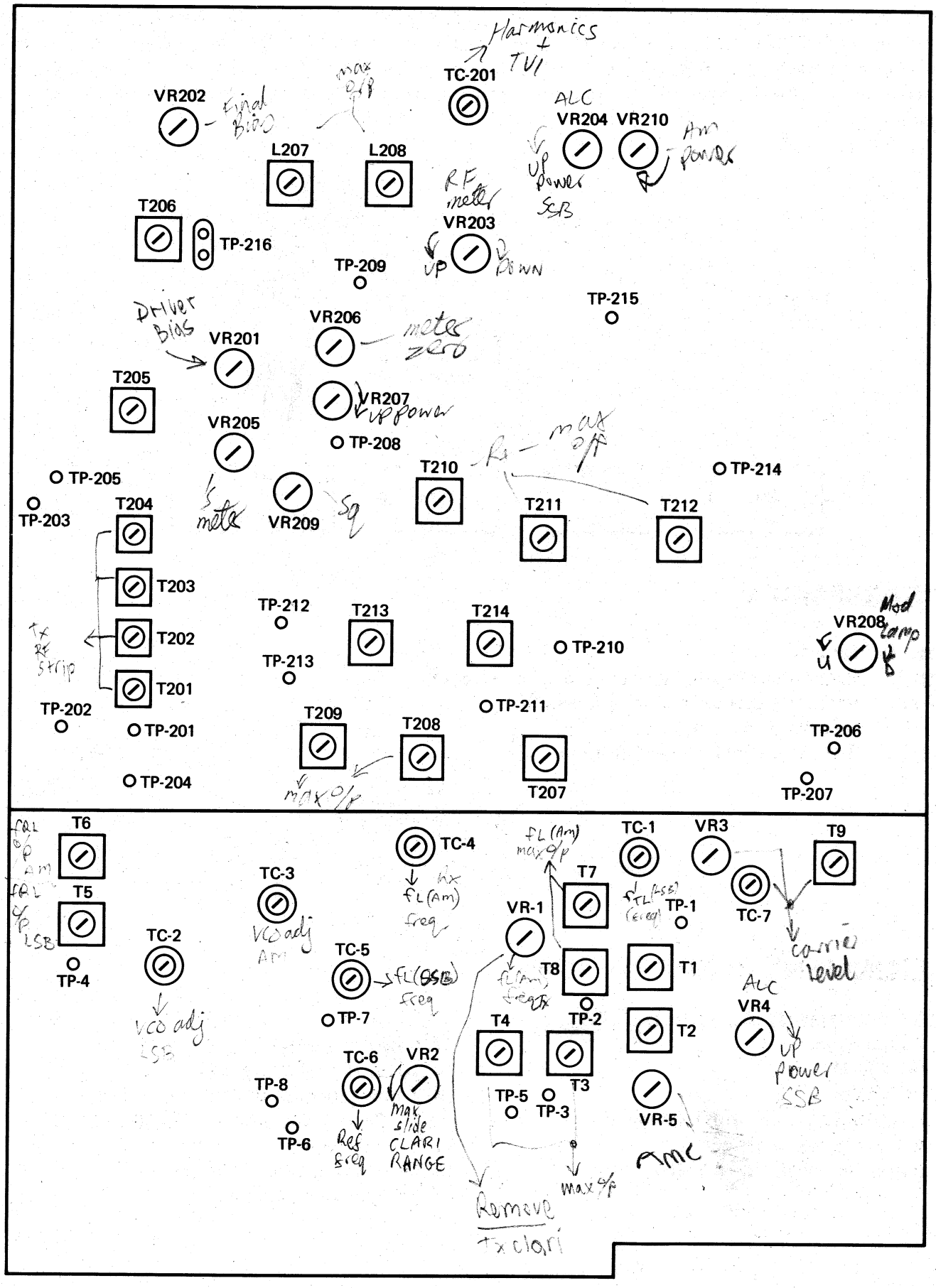

**FIGURE 1**

# ALIGNMENT PREPARATION

TEST EQUIPMENT REQUIRED

1. Oscilloscope
2. AC VTVM
3. DC VTVM
4. Frequency Counter with level meter
5. AUDIO Signal Generator
6. Sweep Generator (0 ~ 50 MHz)
7. Power meter (50 Ω)
8. 50 Ω, 10 W dummy load
9. 2-tone generator (500 Hz ~ 2.5 kHz)
10. RF Signal Generator (0 ~ 30 MHz)
11. Pulse Generator
12. Monitor Receiver (54 MHz) (or Spectrum Analyzer)

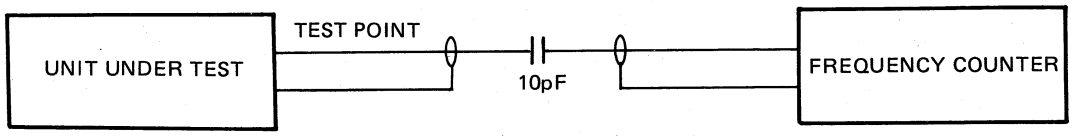
# ALIGNMENT POSITIONS AND POINTS



# PLL SECTION ALIGNMENT CHART

| Step | Control Setting | Test Equipment | Test Point or Connection | Adjust |
|---|---|---|---|---|
| 1 | MODE – RX<br>CH-19<br>CLARIFIER – Center | DC VTVM | Both ends of VR-304 CLARIFIER Control | VR-2 for 4V DC |
| 2 | MODE – RX<br>CH-19 | Freq. Counter with with level meter<br>See NOTE 1 below | TP-8 | TC-6 for 10.24 MHz ±10Hz |
| 3 | MODE – RX (AM) | Freq. Counter with level meter | TP-5 | TC-4 for 33.485 MHz<br>T7, 8 for max. output |
| 4 | MODE – RX (LSB or USB) | Freq. Counter with level meter | TP-5 | TC-5 for 33.4875 MHz |
| 5 | MODE – RX (LSB) | Freq. Counter with level metre | TP-1 | Check the frequency : 7.8025 MHz |
| 6 | MODE – RX (LSB) | Freq. Counter with level meter | TP-2 | TC-1 for 7.8025 MHz ±10 Hz<br>T1, T2 for max. output |
| 7 | MODE – RX (USB)<br>CH-1 | DC VTVM<br>See NOTE 2 below | TP-7 | TC-3 for 2.5 V DC ±0.1 V |
| 8 | MODE – RX (LSB)<br>CH-19 | Freq. Counter with Level Meter | TP-3 | T3, T4 34.9875 MHz for max. output |
| 9 | MODE – RX (LSB)<br>CH-1 | DC VTVM<br>See NOTE 2 below | TP-7 | TC-2 for 2.5 V DC |
| 10 | MODE – RX (AM)<br>CH-19 | Freq. Counter with level meter | TP-4 | T6 for max. output at 34.985 MHz |
| 11 | MODE – RX (LSB)<br>CH-19 | Freq. Counter with level meter | TP-4 | T5 for max. output at 19.3825 MHz |
| 12 | MODE – TX (AM or USB) | Freq. Counter | TP-5 | VR-1 for 33.4875 MHz |

**NOTE 1 :** *Steps 2 through 12, connect Frequency Counter through a 10 pF Capacitor to the test point noted.*




**NOTE 2 :** *Steps 7 and 9, DC output should change from 2.5 ± 0.1 volts on CH-1 to approx. 3.5 volts on CH-40.*

**NOTE 3 :** *You can check the input frequency to IC-2 at TP-6, use TP-7 for ground.*

# VCO OUTPUT FREQUENCY, IC-2 INPUT FREQUENCY AND CODE TABLE

| CH | Frequency (MHz) | VCO RX (AM) ±1.5 kHz | VCO TX (LSB) RX (LSB) ± 1.5 kHz | VCO TX (AM USB) RX (USB) ± 1.5 kHz | fin (MHz) | N | INPUT CODE PIN NO. 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 26.965 | 34.765 | 19.1625 | 34.7675 | 1.28 | 128 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 26.975 | 34.775 | 19.1725 | 34.7775 | 1.29 | 129 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 3 | 26.985 | 34.785 | 19.1825 | 34.7875 | 1.30 | 130 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 4 | 27.005 | 34.805 | 19.2025 | 34.8075 | 1.32 | 132 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 5 | 27.015 | 34.815 | 19.2125 | 34.8175 | 1.33 | 133 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 6 | 27.025 | 34.825 | 19.2225 | 34.8275 | 1.34 | 134 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 7 | 27.035 | 34.835 | 19.2325 | 34.8375 | 1.35 | 135 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 8 | 27.055 | 34.855 | 19.2525 | 34.8575 | 1.37 | 137 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 9 | 27.065 | 34.865 | 19.2625 | 34.8675 | 1.38 | 138 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 10 | 27.075 | 34.875 | 19.2725 | 34.8775 | 1.39 | 139 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 11 | 27.085 | 34.885 | 19.2825 | 34.8875 | 1.40 | 140 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 12 | 27.105 | 34.905 | 19.3025 | 34.9075 | 1.42 | 142 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 13 | 27.115 | 34.915 | 19.3125 | 34.9175 | 1.43 | 143 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 14 | 27.125 | 34.925 | 19.3225 | 34.9275 | 1.44 | 144 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 15 | 27.135 | 34.935 | 19.3325 | 34.9375 | 1.45 | 145 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 16 | 27.155 | 34.955 | 19.3525 | 34.9575 | 1.47 | 147 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 17 | 27.165 | 34.965 | 19.3625 | 34.9675 | 1.48 | 148 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 18 | 27.175 | 34.975 | 19.3725 | 34.9775 | 1.49 | 149 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 19 | 27.185 | 34.985 | 19.3825 | 34.9875 | 1.50 | 150 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| 20 | 27.205 | 35.005 | 19.4025 | 35.0075 | 1.52 | 152 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 21 | 27.215 | 35.015 | 19.4135 | 35.0175 | 1.53 | 153 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| 22 | 27.225 | 35.025 | 19.4225 | 35.0275 | 1.54 | 154 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| 23 | 27.255 | 35.055 | 19.4525 | 35.0575 | 1.57 | 157 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| 24 | 27.235 | 35.035 | 19.4325 | 35.0375 | 1.55 | 155 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| 25 | 27.245 | 35.045 | 19.4425 | 35.0475 | 1.56 | 156 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 26 | 27.265 | 35.065 | 19.4625 | 35.0675 | 1.58 | 158 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |
| 27 | 27.275 | 35.075 | 19.4725 | 35.0775 | 1.59 | 159 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| 28 | 27.285 | 35.085 | 19.4825 | 35.0875 | 1.60 | 160 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 29 | 27.295 | 35.095 | 19.4925 | 35.0975 | 1.61 | 161 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 30 | 27.305 | 35.105 | 19.5025 | 35.1075 | 1.62 | 162 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 31 | 27.315 | 35.115 | 19.5125 | 35.1175 | 1.63 | 163 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 |
| 32 | 27.325 | 35.125 | 19.5225 | 35.1275 | 1.64 | 164 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 33 | 27.335 | 35.135 | 19.5325 | 35.1375 | 1.65 | 165 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 34 | 27.345 | 35.145 | 19.5425 | 35.1475 | 1.66 | 166 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| 35 | 27.355 | 35.155 | 19.5525 | 35.1575 | 1.67 | 167 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 |
| 36 | 27.365 | 35.165 | 19.5625 | 19.1675 | 1.68 | 168 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 37 | 27.375 | 35.175 | 19.5725 | 35.1775 | 1.69 | 169 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| 38 | 27.385 | 35.185 | 19.5825 | 35.1875 | 1.70 | 170 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 39 | 27.395 | 35.195 | 19.5925 | 35.1975 | 1.71 | 171 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| 40 | 27.405 | 35.205 | 19.6025 | 35.2075 | 1.72 | 172 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |

# TRANSMITTER SECTION ALIGNMENT CHART

| STEP | CONTROL SETTING | TEST EQUIPMENT | TEST EQUIPMENT SETTING | ADJUST | REFER TO |
|---|---|---|---|---|---|
| 1<br>BPF | MODE – AM<br>CH-19 | Sweep Generator | Freq. : 27 MHz | T201 – 204 for max. output best wave form | Fig. 2 |
| 2 | MODE – AM<br>CH-19 | RF Power Meter<br>50Ω dummy load<br>DC current meter | Connect in series at TP-216 | VR202 for 15 mA on the DC current meter | |
| 3<br>AM<br>POWER | MODE – AM<br>CH-19 | RF-Power Meter<br>50Ω dummy load | | T205 – 208, L207, 208 for max. output | Fig. 3 |
| 4<br>AM<br>POWER | MODE – AM<br>CH-19 | RF Power Meter<br>50Ω dummy load | | VR-210 for 3.8 W output | Fig. 3 |
| 5<br>BM | MODE – LSB or USB<br>CH-19 | RF Power Meter<br>50Ω dummy load<br>AF Generator<br>Monitor Scope | AF Generator<br>Freq. : 1 kHz<br>Set the AF Generator output to get approx. 10 W. | VR-3, TC-7, T9 for min. carrier | Fig. 4 |
| 6<br>SSB<br>MOD | MODE – LSB or USB<br>CH-19 | RF Power Meter<br>50Ω dummy load<br>AF Genarators<br>Monitor Scope | 2 AF Generators<br>Freq. :<br>500/2400 Hz<br>Output :<br>approx. 30 mV | Set VR-204 to 0 ohm. (fully counterclockwise)<br>VR-4 for 11 W PEP output | Fig. 5 |
| 7<br>AM<br>AMC | MODE – AM<br>CH-19 | RF Power Meter<br>50Ω dummy load<br>AF Generator<br>Monitor Scope | AF Generator<br>Freq. : 1 kHz<br>Set the output to 50% Mod.<br>+ 16 dB | VR-5 for clean wave form with no over modulation ( should be 85~90% mod). | Fig. 3 |
| 8<br>ALC | MODE – LSB, USB or AM<br>RECEIVE | DC VTVM | Connect DC VTVM to TP-208 (use TP-209 for ground connection) | VR-207 for 1.2~1.8V | |
| 9<br>ALC | MODE – LSB or USB<br>CH-19 | RF Power Meter<br>50Ω dummy load<br>AF Generator<br>Monitor Scope | AF Generator<br>Freq. : 1 kHz<br>Output: 15 mV<br>+ 6 db | VR-204 for 11 W PEP | Fig. 5 |
| 10<br>TWO<br>TONE | MODE – LSB or USB<br>CH-19 | RF Power Meter<br>50Ω dummy load<br>AF Generators<br>Monitor Scope | 2 AF Generators<br>Freq. :<br>500/2400 Hz<br>Output:<br>Approx. 30 mV | VR-201 for clean wave form | Fig. 5 |

**NOTE :** *You can check 7.8025 MHz in AM transmit mode at TP-204.*

| STEP | CONTROL SETTING | TEST EQUIPMENT | TEST EQUIPMENT SETTING | ADJUST | REFER TO |
|---|---|---|---|---|---|
| 11 RF METER | MODE – AM CH-19 | RF Power Meter 50Ω dummy load | | VR-203 for same reading on built-in meter as power meter indication | Fig. 3 |
| 12 MOD IND | MODE – AM CH-19 | RF Power Meter 50Ω dummy load AF Generator Monitor Scope | AF Generator Freq. : 1 kHz Set the AF Generator output to get 30% mod. | VR-208 for modulation lamp just comes on | Fig. 3 |
| 13 HAR-MONICS | MODE – AM CH-19 | RF Power Meter 50Ω dummy load 54 MHz Monitor Receiver (or Spectrum Analyzer if available) | | TC-201 for min. reading on the receiver | Fig. 3 |

# RECEIVER SECTION ALIGNMENT CHART

| STEP | CONTROL SETTING | TEST EQUIPMENT | TEST EQUIPMENT SETTING | ADJUST | REFER TO |
|---|---|---|---|---|---|
| 1 | SQ Minimum MODE – LSB or USB | Sweep Generator Oscilloscope | Frequency: 7.8 MHz | T209 for max. output and best wave form | Fig. 2 |
| 2 RF | SQ Minimum MODE – AM CH-19 | RF Signal Generator Oscilloscope AC VTVM 8 Ω load | Frequency : 27.185 MHz MOD 30% at 1 kHz | T210, T211, T212 for max. output | Fig. 6 |
| 3 S-Meter | MODE – AM RF GAIN Maximum | RF Signal Generator | No signal | VR-206 for zero on the S-meter | Fig. 6 |
| 4 S-Meter | MODE – AM RF GAIN Maximum | RF Signal Generator | Output : 100 μV | VR-205 for S9 on the S-meter | Fig. 6 |
| 5 SQ | SQ Maximum MODE – AM | RF Signal Generator Oscilloscope AC VTVM 8 Ω Load | Channel 19 Output : 1 mV MOD. : 30% at 1 kHz | VR-209 to the point where wave form just shows | Fig. 6 |

# ALIGNMENT CONNECTIONS

## BAND PASS FILTER ALIGNMENT

Connect the instruments as shown in Figure 2.

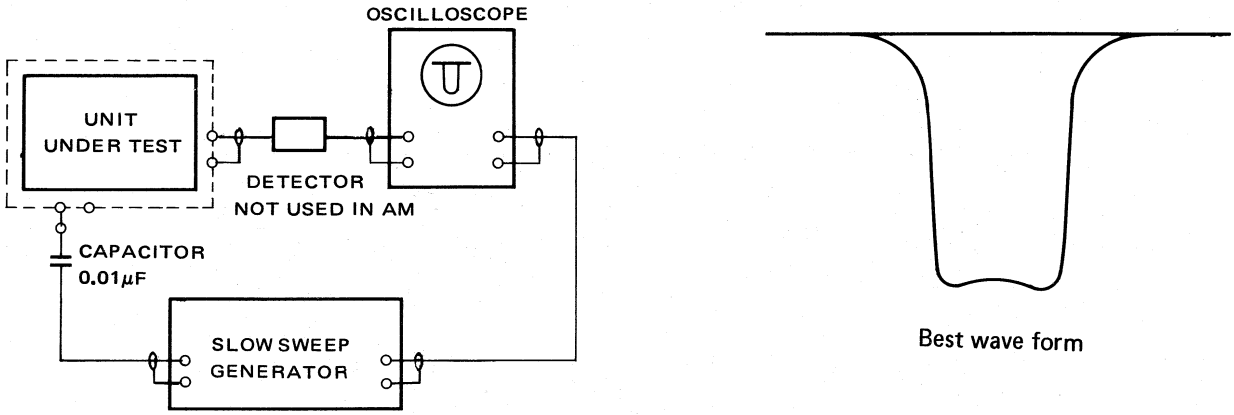



FIGURE 2

| Mode Switch | Input Test Point | | Output Test Point | | Sweep Generator |
|---|---|---|---|---|---|
| | hot | ground | hot | ground | |
| AM | TP-201 | TP-202 | TP-205 | TP-203 | 27 MHz |
| USB or LSB | TP-206 or TP-214 | TP-207 or TP-215 | TP-212 | TP-213 | 7.8 MHz |

## TRANSMITTING SECTION ALIGNMENT

Connect the instruments as shown in Figure 3.

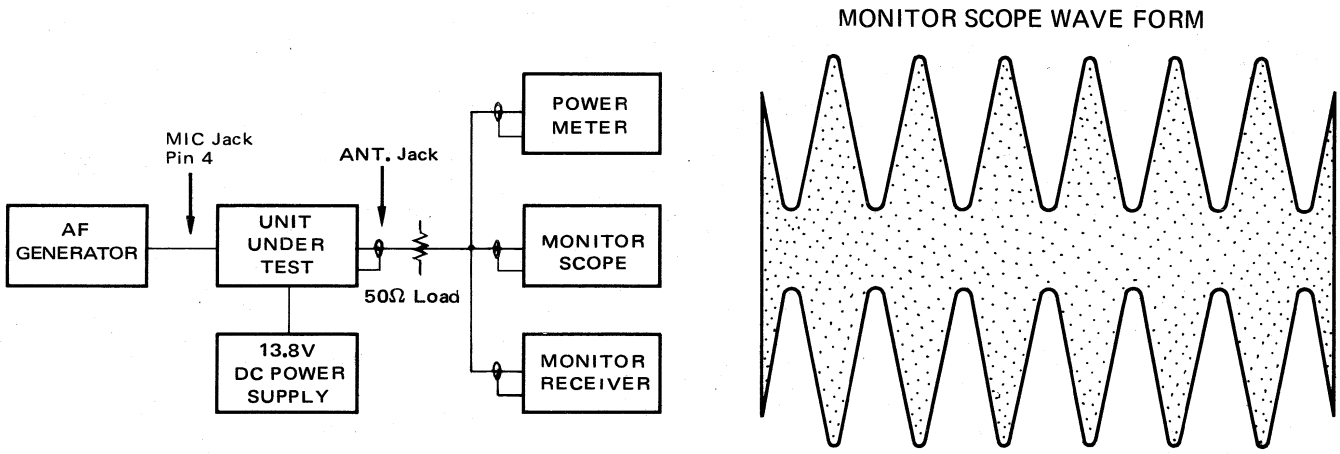



FIGURE 3

## BALANCED MODULATOR ALIGNMENT

Connect the instruments as shown in Figure 4.

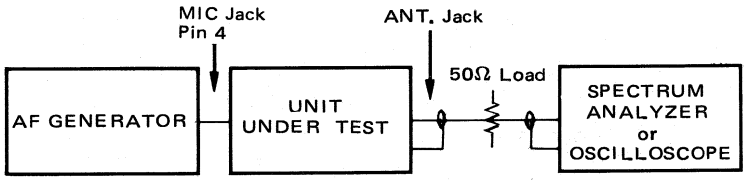



FIGURE 4

| Step | Control Setting | Adjust | Remarks |
|---|---|---|---|
| 1 | SSB TX | AF Generator | To get 10W output power<br>Note the carrier level at 10W output power |
| 2 | SSB TX | VR-3<br>T-9 | Remove AF Generator<br>Minimum carrier level |
| 3 | SSB TX | TC-7 | Minimum carrier level |
| 4 | SSB TX | | Repeat steps 2 and 3 |

## TRANSMITTING SECTION ALIGNMENT (SSB)

Connect the instrument as shown is Figure 5.

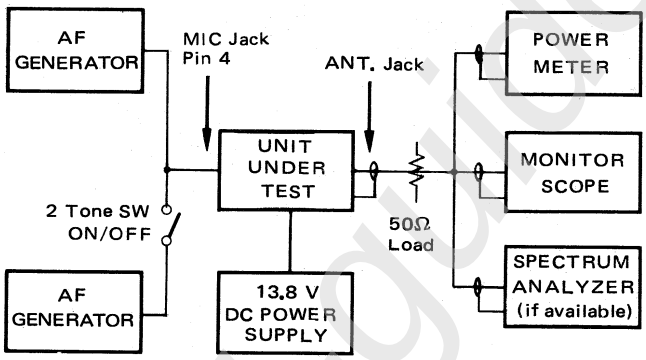



FIGURE 5

*AF input frequency
2500 Hz

*AF Two-tone input frequency
Select frequencies not related harmonically.
The test tones of 500 Hz and 2400 Hz are suggested.

*Idling current of Final Transistor : Approx. 50 mA

## RECEIVER SECTION ALIGNMENT

Connect the instruments as shown in Figure 6.

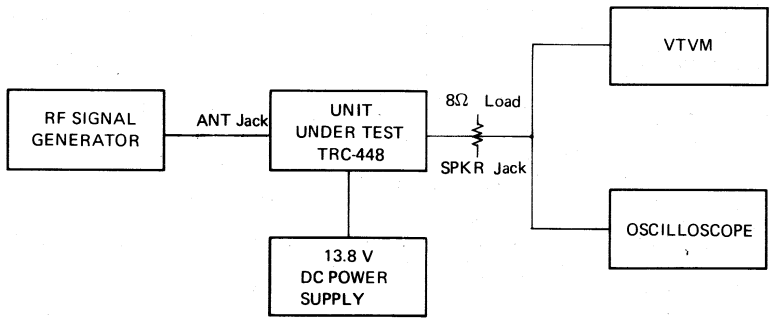
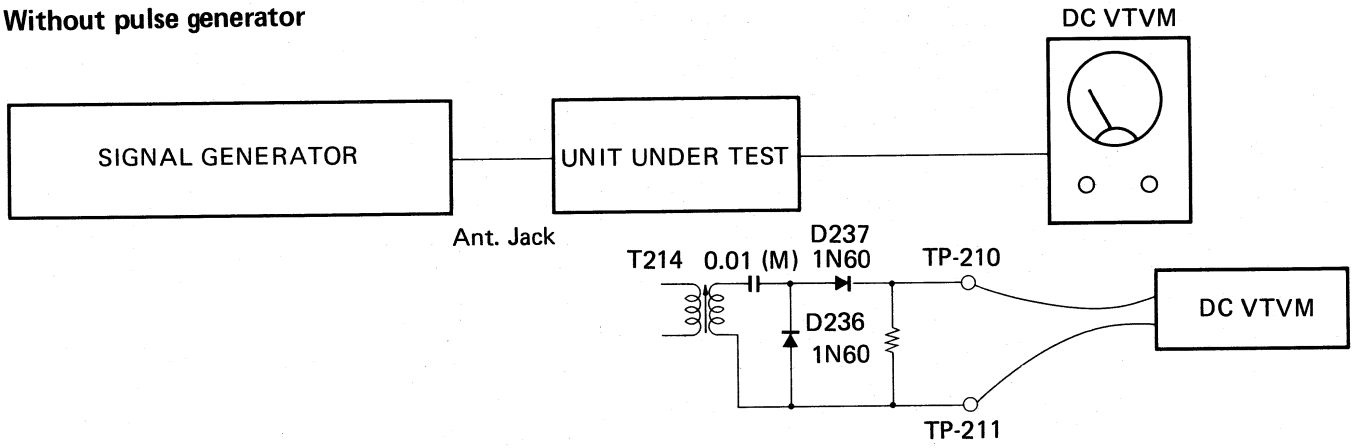



FIGURE 6

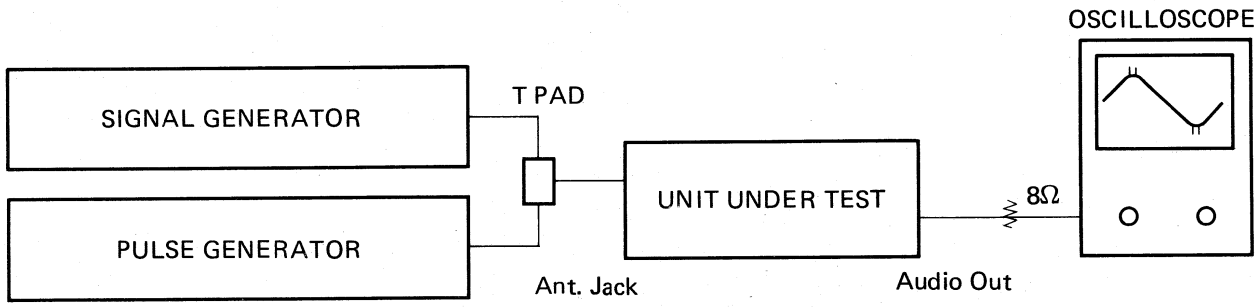
# NOISE BLANKER ALIGNMENT CHART

**Without pulse generator**



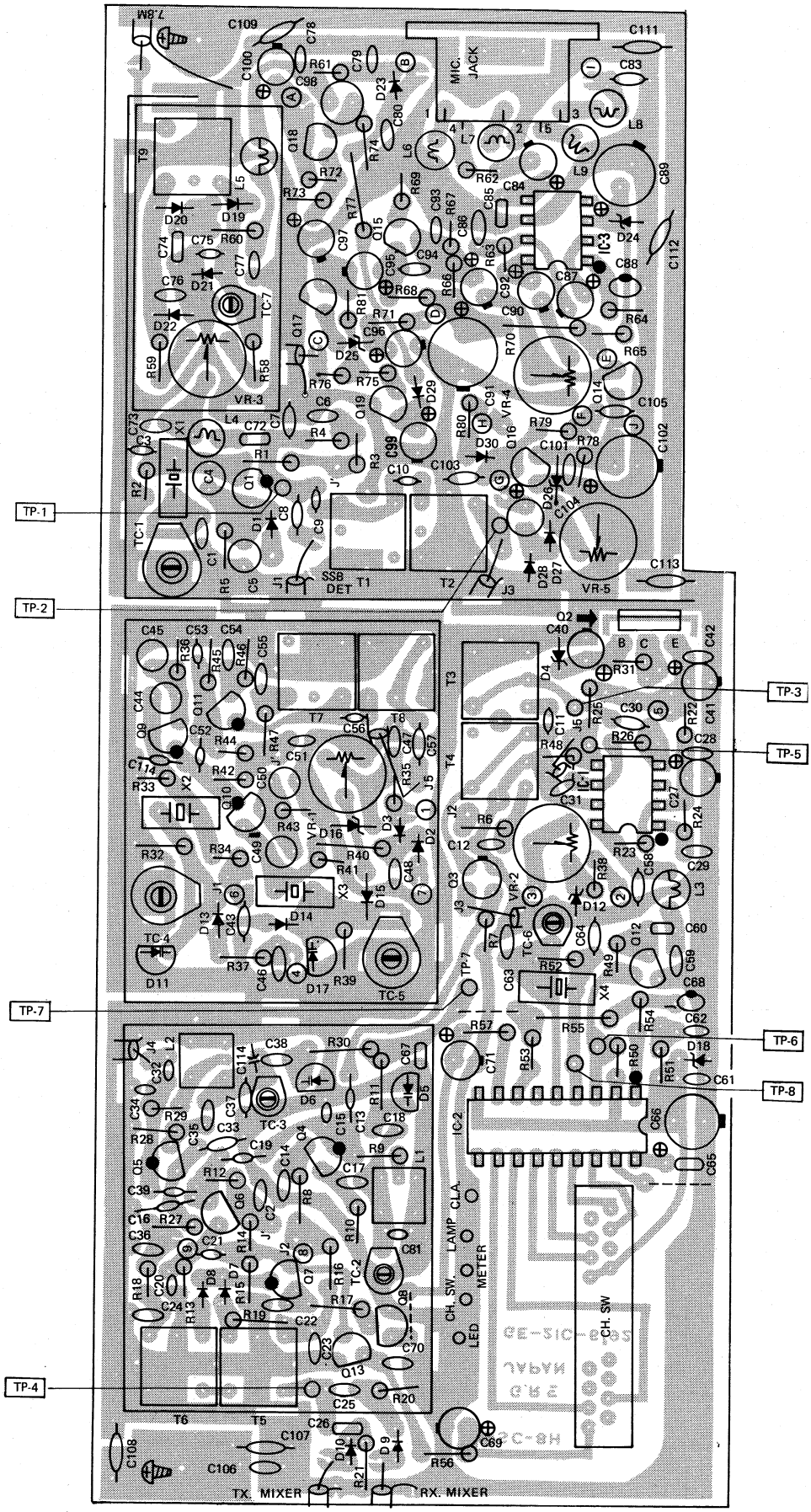

| Control Setting | Test Equipment | Adjust | Procedure |
|---|---|---|---|
| Channel -19 | Signal Generator 40MHz (Output : 10 μV) | T213 T214 | Tune T213 and T214 for maximum reading on the DC VTVM |
| | Connect Oscilloscope | | |

**With pulse generator**

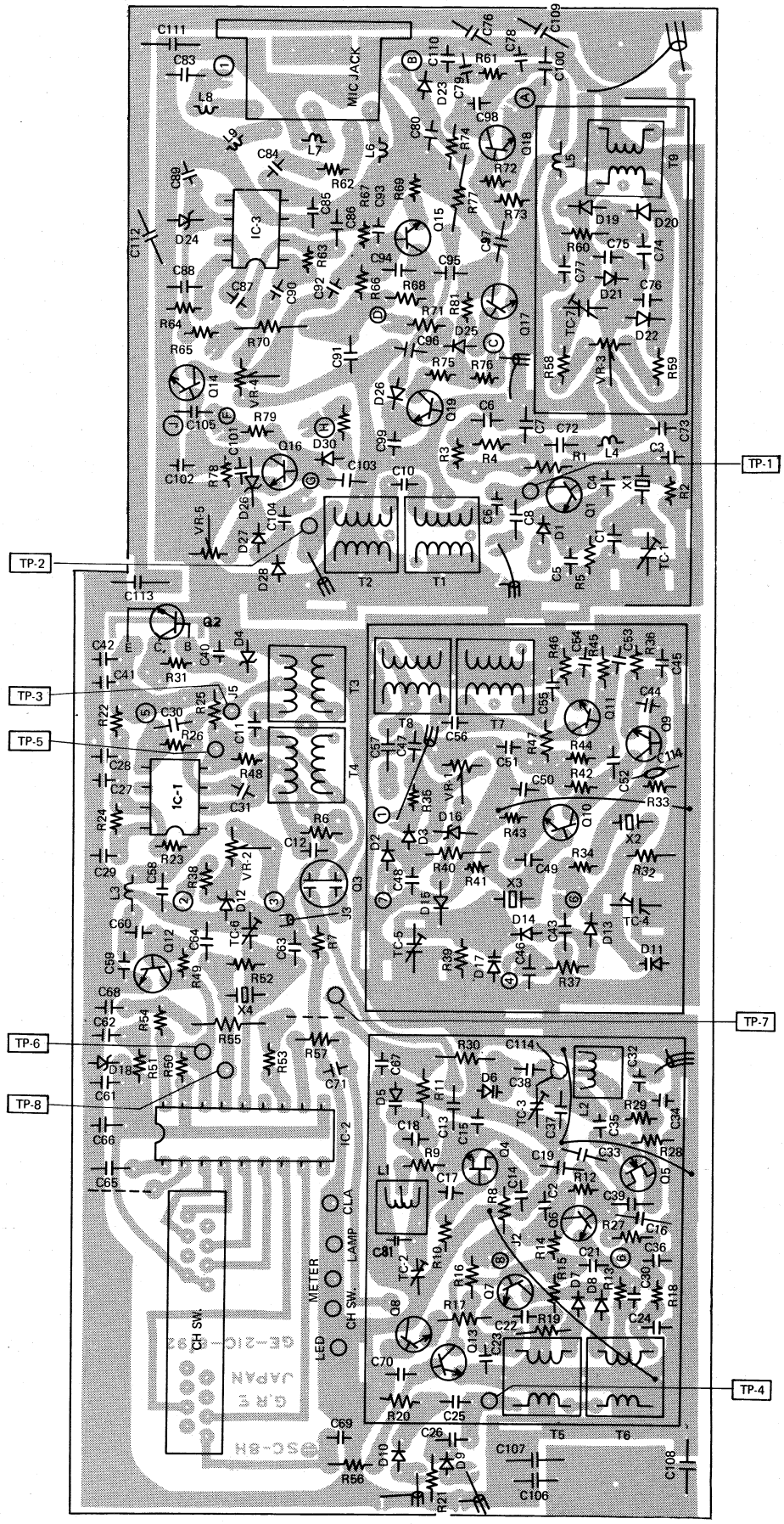



| Control Setting | Test Equipment | Adjust | Procedure |
|---|---|---|---|
| CH : 19 (27.185 MHz) | Signal Generator (Output : 1 μV) | T214 | Tune T214 for Max. S/N ratio on the oscilloscope |
| | Pulse Generator (Pulse width : 1 μSec.) (Cycle : 10 mSec.) (Output : 1V P.P.) | | |
| | Connect Oscilloscope | | |

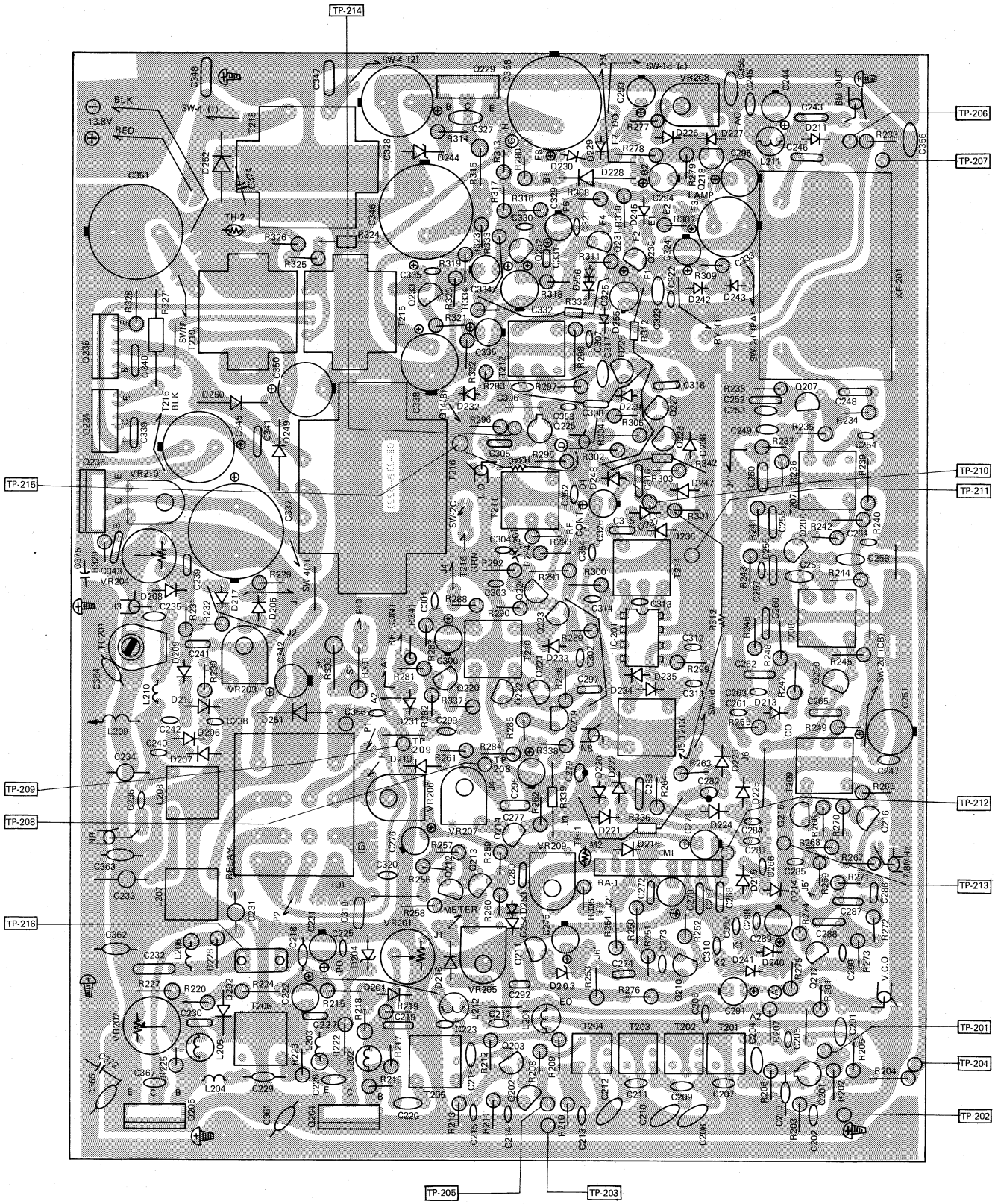
# PLL P.C.BOARD (TOP VIEW)



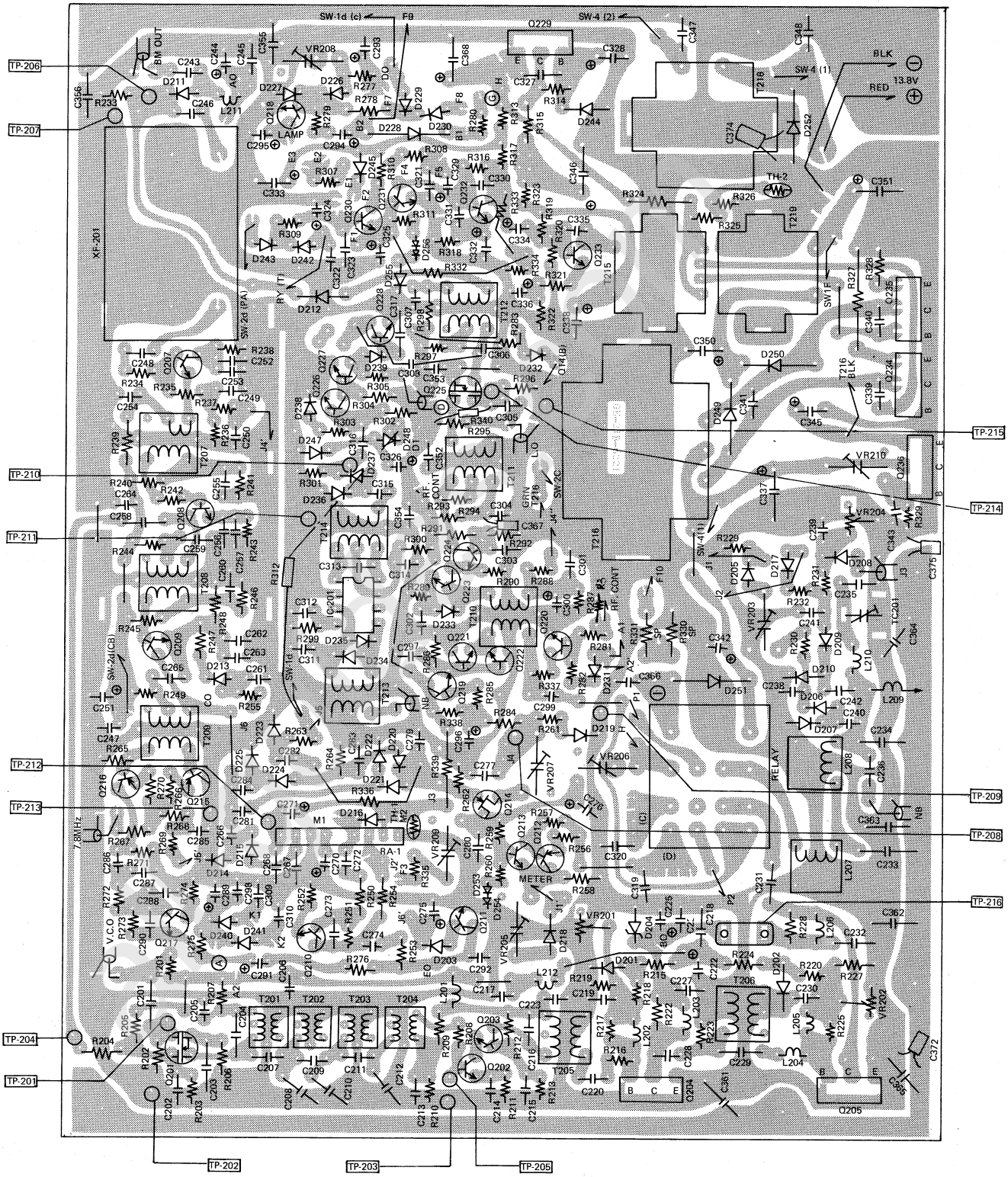
# PLL P.C.BOARD (BOTTOM VIEW)



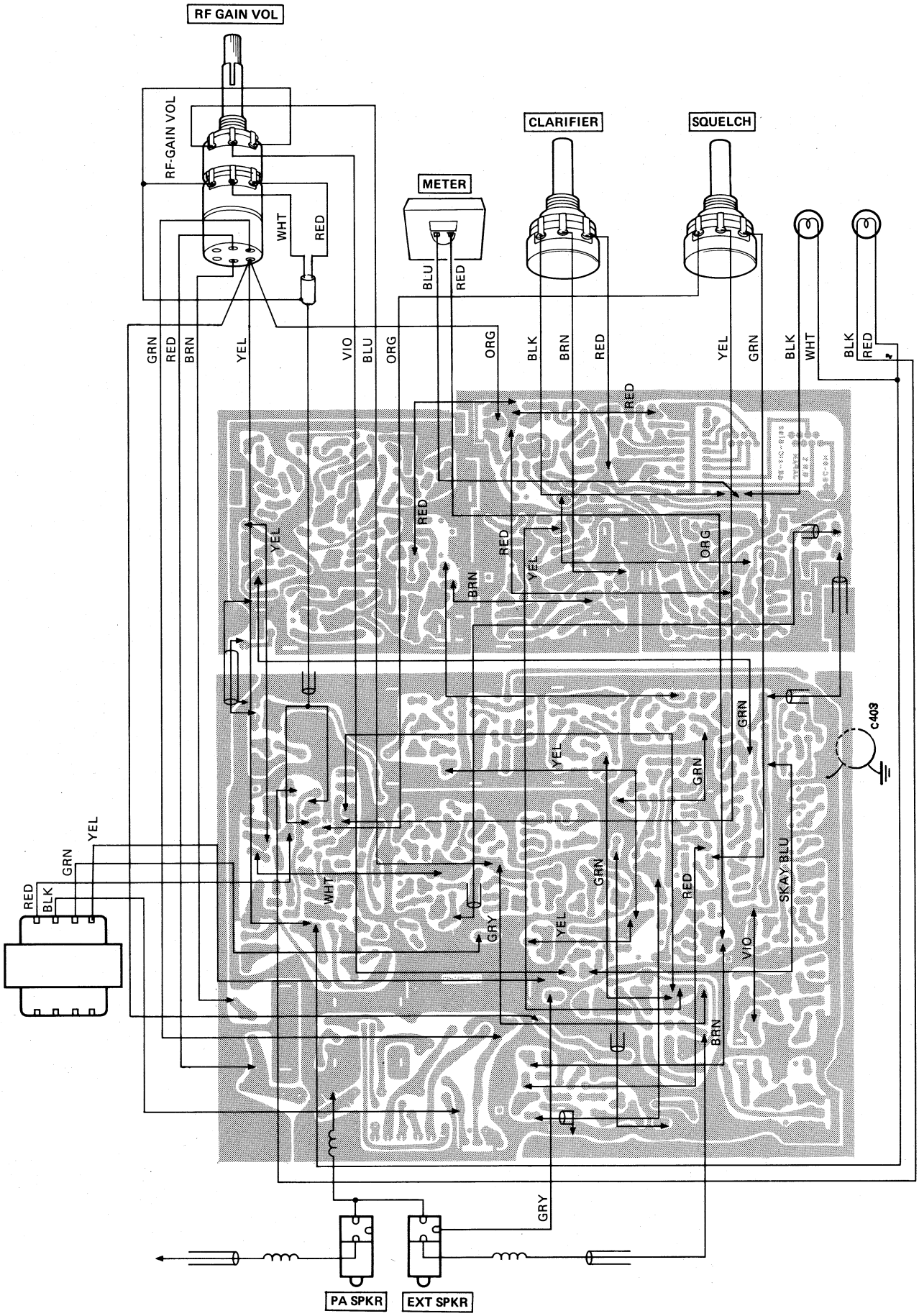
# MAIN P.C.BOARD (TOP VIEW)



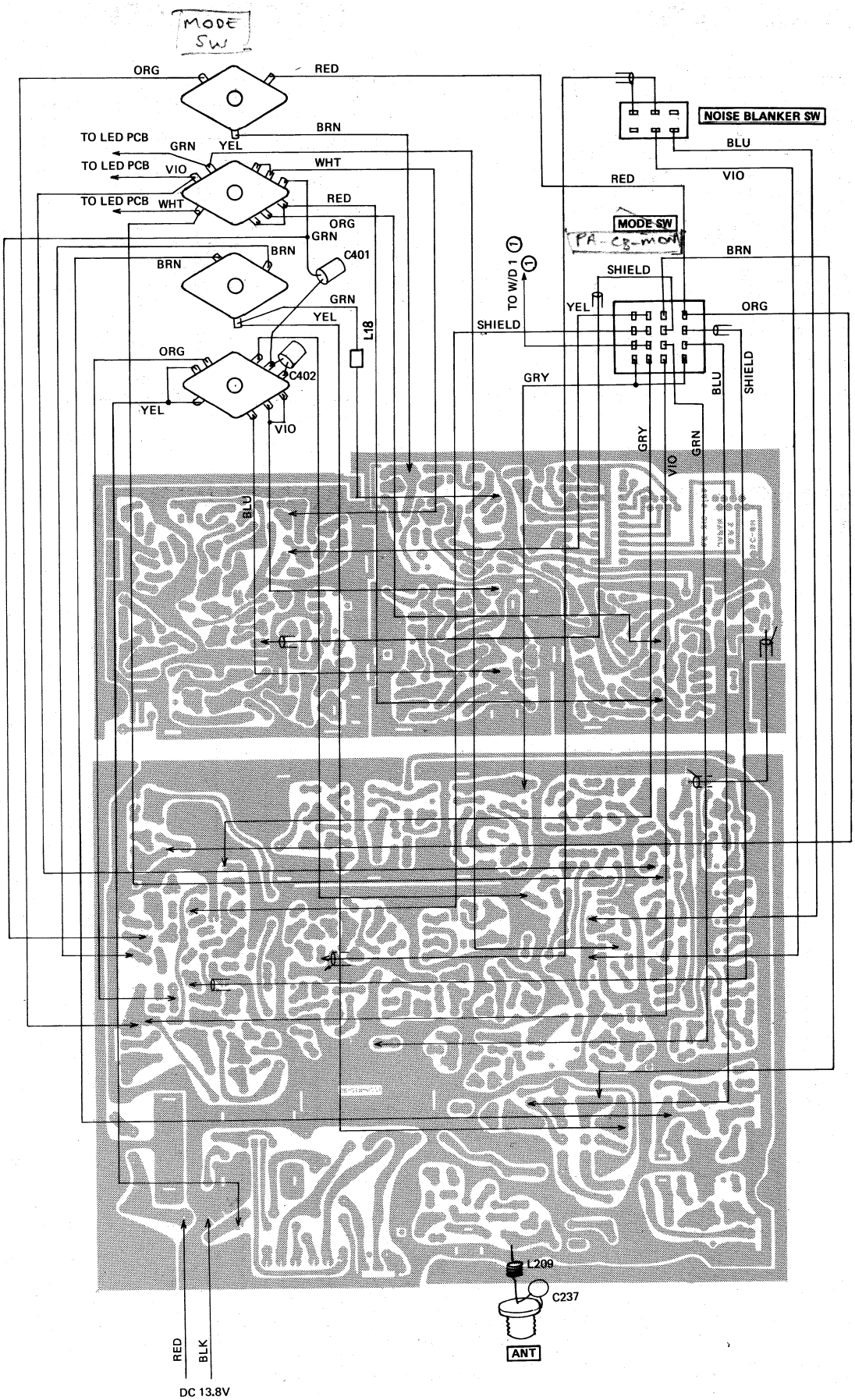
# MAIN P.C.BOARD (BOTTOM VIEW)



# WIRING DIAGRAM (1)

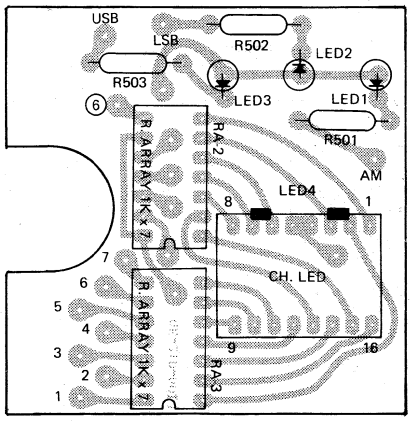


# WIRING DIAGRAM (2)

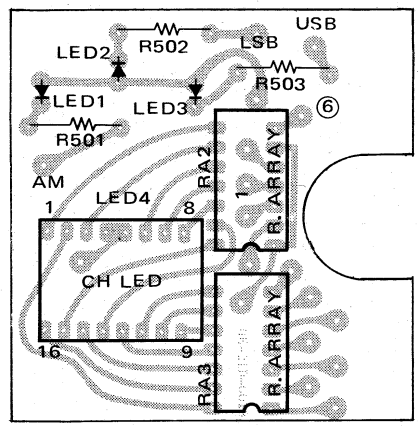


# LED P.C.BOARD

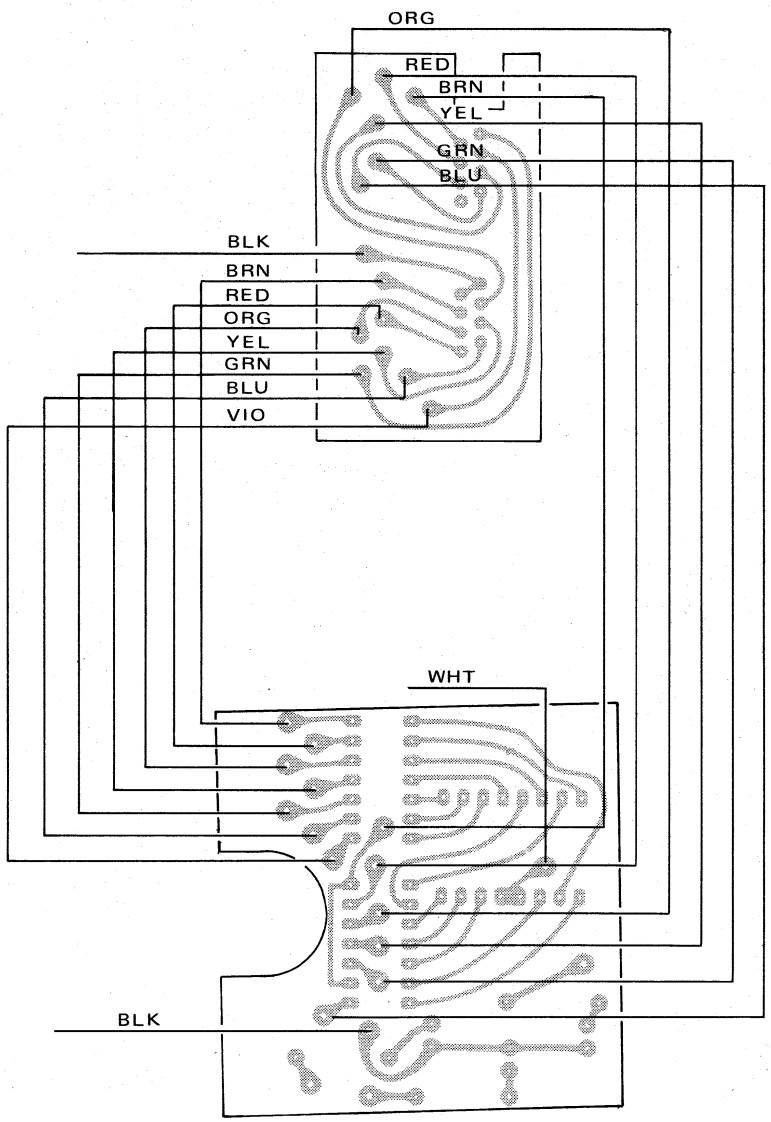
## (TOP VIEW)




## (BOTTOM VIEW)




# LED P.C.BOARD/ CHANNEL SWITCH P.C.BOARD WIRING DIAGRAM



# TROUBLE SHOOTING

Before starting trouble shooting, first check the PLL section with the channel selector set at CH-19.

| STEP | CONTROL SETTING | TEST POINT | TEST EQUIPMENT | OUTPUT | REMARKS |
|---|---|---|---|---|---|
| 1 | RX (AM) | TP-4 | Freq. Counter | 34.985 MHz | VCO freq. |
| 2 | RX (LSB) or TX (LSB) | TP-4 | Freq. Counter | 19.3825 MHz | VCO freq. |

If above 2 steps are OK, the PLL section is OK.

## PLL SECTION

| Symptom | Possible Cause |
|---|---|
| 1) Wrong frequency in step 1 above | Defective Q5, D6, L2, Q9, X2, Q11, IC-1 and/or associated circuit components |
| 2) Wrong frequency in step 2 above | Defective Q4, D5, L1, Q1, T1, T2, Q10, X3, Q11 and/or associated circuit components |
| 3) Wrong frequency in both steps 1 and 2 above | Defective IC-2, X4, Q3, Q4, Q6, Q7, Q8, Q13 and/or channel selector switch |

## OTHER SECTIONS

| Symptom | Possible Cause |
|---|---|
| 1) Meter lamp does not light and/or set fails to operate when power is on | A) Faulty DC power cord<br>B) Defective Q229 and/or associated circuit components<br>C) Defective power cord<br>D) Defective meter lamp<br>E) Fuse blown |
| 2) Fuse blows | A) Collector of the Q204, Q205, Q234 and/or Q235 are shorted to chassis.<br>B) Reverse polarity<br>C) Defective Q204, Q205, Q234, Q235 and/or D204<br>D) Defective Q299 and/or D244 |
| 3) Does not receive AM<br>RX SSB : OK<br>TX AM SSB : OK | A) Defective D214, D215 and/or associated circuit components<br>B) Defective Q210 and/or associated circuit componets<br>C) Defective Q211, D255 and/or associated circuit components |

| Symptom | Possible Cause |
|---|---|
| 4) Does not receive SSB<br>RX AM : OK<br>TX AM SSB : OK | A) Defective Q215, Q216 and/or associated circuit components<br>B) Defective Q217 and/or associated circuit components |
| 5) Does not receive or transmit SSB<br>RX AM : OK<br>TX AM : OK | A) Defective Q1 and/or associated circuit components |
| 6) Does not receive AM/SSB or transmit SSB<br>TX AM : OK | A) Defective XF201, Q207, Q208, T207, T208 and/or associated circuit components |
| 7) Does not receive both AM and SSB | A) Defective Q223, Q224, Q235 and/or associated circuit components |
| 8) No sound<br>TX AM SSB : OK | A) Defective speaker or defective EXT. SPKR jack<br>B) Faulty Squelch control circuit<br>C) Defective Relay |
| 9) Does not transmit AM and SSB | A) Defective Q201, Q202, Q203, Q204, Q205 and/or associated circuit components<br>B) Defective Relay, D251 and/or Microphone PTT switch<br>C) Defective MODE Switch |
| 10) Does not transmit AM<br>TX SSB : OK | A) Defective Q236, D228, MODE switch and/or associated circuit components |
| 11) Does not transmit SSB<br>TX AM : OK<br>RX AM SSB : OK | A) Defective IC-3, Q15, Q17, Q18 and/or associated circuit components<br>B) Defective D19, D20, D21, D22, T9, D211 and/or associated circuit components<br>C) Defective D249, D250 and/or associated circuit components |
| 12) SQUELCH Control does not function | A) Defective VR-209 and/or VR-303<br>B) Defective VR-206<br>C) Defective Q230, Q231 and/or associated circuit components |
| 13) Receiver oscillates on AM<br>RX SSB : OK | A) Defective D1<br>B) Defective MODE switch |
| 14) Low sensitivity<br>TX SSB : OK | A) Faulty AGC circuit Q219, Q220, Q221 and/or associated circuit components<br>B) Defective Q228 and/or associated circuit components<br>C) Defective Q223, Q224, Q225 and/or associated circuit components |
| 15) No modulation on AM<br>TX SSB : OK<br>RX AM : OK | A) Defective IC-3, Q15, Q17, Q18 and/or associated circuit components<br>B) Defective T216 |

| Symptom | Possible Cause |
|---|---|
| 16) Modulation indicator does not flash on AM.<br>MOD : OK | A) Defective Q218, D226, D227 and/or associated circuit components<br>B) Defective modulation indicator lamp |
| 17) Meter lamp does not turn on in RX. | A) Defective D229 |
| 18) Meter lamp does not turn on in MON/PA | A) Defective D230 |
| 19) RX AGC and SSB TX ALC does not work | A) Defective Q214 and/or associated circuit components |
| 20) Noise blanker and ANL does not work. | A) Defective IC-201, Q226, Q228,D236. D237, D238, D239 and/or associated circuit components<br>B) Defective D216 and/or associated circuit components<br>C) Defective NB switch |
| 21) PA does not work.<br>CB : OK | A) Defective PA–CB switch<br>B) Defective PA jack |
| 22) RF control does not work. | A) Defective Q220, D253 and/or associated circuit components |
| 23) CLARIFIER does not work. | A) Defective D12,D13, D14 and/or associated circuit components<br>B) Defective VR-304 and/or VR-2 |

# REVISION

# FOR

# AUSTRALIAN MODEL OF TRC-448

# Catalog Number: 21-9448

When servicing Australian model of TRC-448 (Catalog Number 21-9448), refer to the Service Manual for TRC-448 (Catalog Number 21-1561) as well as the following revision:

Page 4

## SPECIFICATION

### GENERAL

Frequency Range: 26.965 to 27.405 should be **27.015 to 27.225 MHz.**

Channel: 40 channels should be **18** channels.

Page 6

## PRINCIPLES OF OPERATION

### PLL CIRCUIT

3rd paragraph

2nd line: Q5 VCO frequency (34.7675 to 35.2075 MHz) should read **34.8175 to 35.0275 MHz.**

3rd line: down-mix produces signals of 1.28 through 1.72 MHz should read **1.33 through 1.54 MHz.**

4th line: "N" (128 through 172) should read N (133 through 154).

7th paragraph

2nd line: Q5 VCO frequency (34.765 to 35.205) should read **34.815 to 35.025.**

3rd line: down-mix produces 1.28 through 1.72 should read **1.33 through 1.54 MHz.**

4th and 5th line: deriving the required 1.28 through 1.72 MHz should read **1.33 through 1.54 MHz.**

8th paragraph

3rd and 4th line: Q4 VCO frequency (19.1625 to 19.6025 MHz) should read **19.2125 to 19.4225 MHz.**

4th line: up-mix produces 34.7675 through 35.2075 MHz should read **34.8175 through 35.0275 MHz.**

6th line: The 1.28 through 1.72 MHz should read **1.33 through 1.54 MHz.**

7th line: deriving the required 1.28 through 1.72 MHz should read **1.33 through 1.54 MHz.**

Page 7

## PLL CIRCUIT BLOCK DIAGRAM

### AM and USB

Q5 VCO frequency 34.765 ~ 35.2075 should be **34.815 ~35.025 MHz.**
IC-1 MIXER output frequency 1.28 ~ 1.72 should be **1.33 ~ 1.54 MHz.**

### LSB

Q4 VCO frequency 19.1625 ~ 19.6025 should be **19.2125 ~ 19.4225 MHz.**
Q3 MIXER output frequency 34.7675 ~ 35.2075 should be **34.8175 ~ 35.0275 MHz.**
IC-1 MIXER output frequency 1.28 ~ 1.72 MHz should be **1.33** ~ 1.54 MHz.

Page 11

## PLL SECTION ALIGNMENT CHART

Control Setting: CH-19 should be **CH-9.**
Step 7 Adjust T3-3 for **2.7V DC ± 0.1V.**
Step 8 Adjust T3, T4 **34.9175 MHz.**
Step 9 Adjust TC-2 for **2.7 V DC.**
Step 10 Adjust T6 for max. output at **34.915 MHz.**
Step 11 Adjust T5 for max. output at **19.3125 MHz.**

NOTE 2 should read as follow; Step 7 and 9, DC output should change from 2.7±0.1 volts on CH-1 to approx. 3.2 volts on CH-18.

Page 12

## VCO OUTPUT FREQUENCY, IC-2 INPUT FREQUENCY AND CODE TABLE

Refer to the following table.

| CH | FREQUENCY (MHz) | VCO (MHz) | | | fin (MHz) | N | INPUT CODE PIN No. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | RX (AM) | TX (LSB) RX (LSB) | TX (AM USB) RX (USB) | | | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 1 | 27.015 | 34.815 | 19.2125 | 34.8175 | 1.33 | 133 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 2 | 27.025 | 34.825 | 19.2225 | 34.8275 | 1.34 | 134 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 3 | 27.035 | 34.835 | 19.2325 | 34.8375 | 1.35 | 135 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 4 | 27.055 | 34.855 | 19.2525 | 34.8575 | 1.37 | 137 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 5 | 27.065 | 34.865 | 19.2625 | 34.8675 | 1.38 | 138 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 6 | 27.085 | 34.885 | 19.2825 | 34.8875 | 1.40 | 140 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 7 | 27.095 | 34.895 | 19.2925 | 34.8975 | 1.41 | 141 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 8 | 27.105 | 34.905 | 19.3025 | 34.9075 | 1.42 | 142 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 9 | 27.115 | 34.915 | 19.3125 | 34.9175 | 1.43 | 143 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 10 | 27.125 | 34.925 | 19.3225 | 34.9275 | 1.44 | 144 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 11 | 27.135 | 34.935 | 19.3325 | 34.9375 | 1.45 | 145 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 12 | 27.155 | 34.955 | 19.3525 | 34.9575 | 1.47 | 147 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 13 | 27.165 | 34.965 | 19.3625 | 34.9675 | 1.48 | 148 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 14 | 27.175 | 34.975 | 19.3725 | 34.9775 | 1.49 | 149 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 15 | 27.185 | 34.985 | 19.3825 | 34.9875 | 1.50 | 150 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| 16 | 27.195 | 34.995 | 19.3925 | 34.9975 | 1.51 | 151 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |
| 17 | 27.205 | 35.005 | 19.4025 | 35.0075 | 1.52 | 152 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 18 | 27.225 | 35.025 | 19.4225 | 35.0275 | 1.54 | 154 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |

Page 13, 14

**TRANSMITTER SECTION ALIGNMENT CHART & RECEIVER SECTION ALIGNMENT CHART**

Control Setting: CH19 should be **CH9.**

Page 17

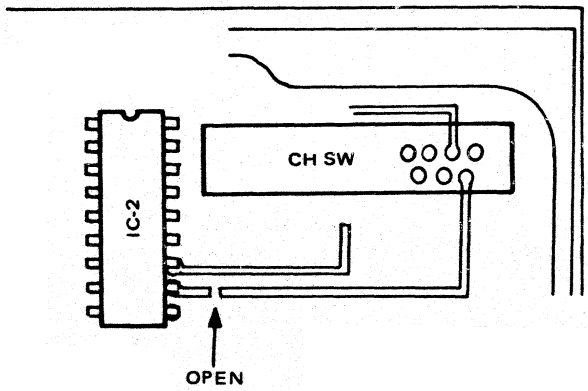
**NOISE BLANKER ALIGNMENT CHART**

Control Setting: CH19 should be **CH9 27.115 MHz.**

Page 22

**WIRING DIAGRAM**

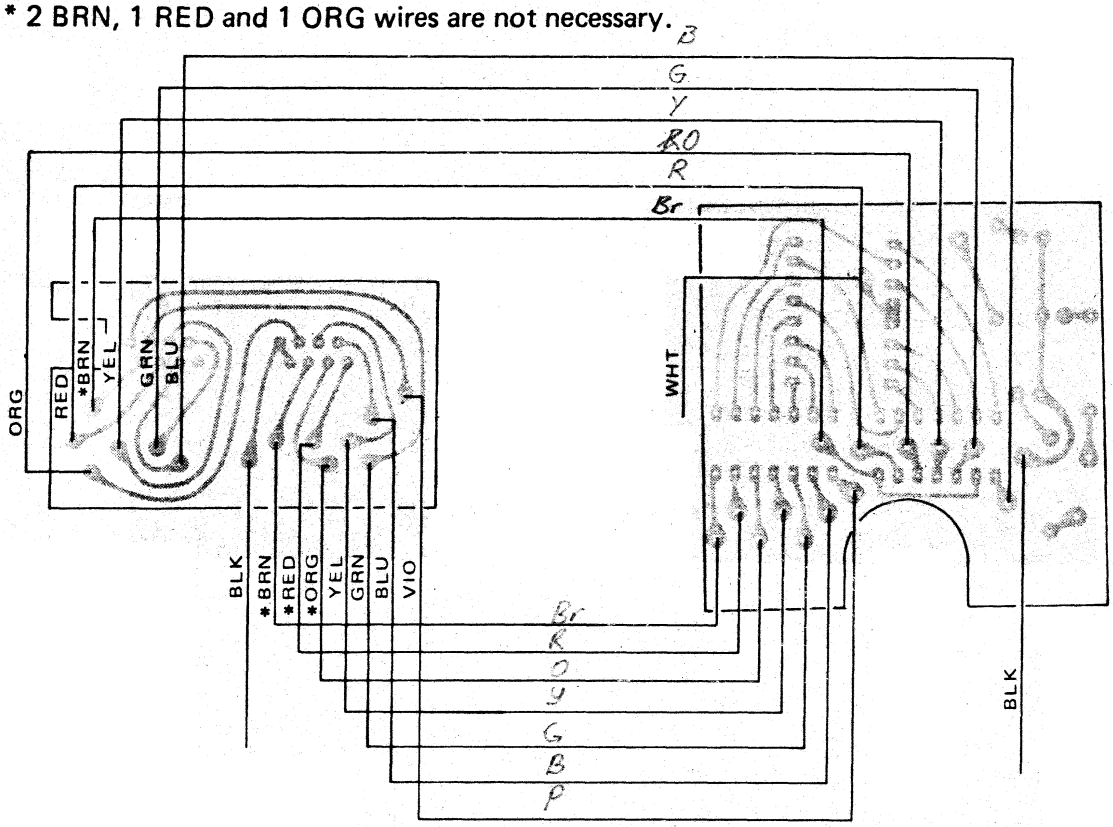
Cat a PLL P.C. Board pattern open at pin 11 of IC-2.




Page 24

**LED P.C. BOARD/CHANNEL SWITCH P.C. BOARD WIRING**

* 2 BRN, 1 RED and 1 ORG wires are not necessary.



Page 25

## TROUBLE SHOOTING

Read first line as follow: Before starting trouble shooting first check the PLL section with the channel selector set at **CH-15.**

Page 50

## CHASSIS ASSEMBLY PARTS LIST

(7) Channel SW. MFR's Part Number should be **SRH202J.**

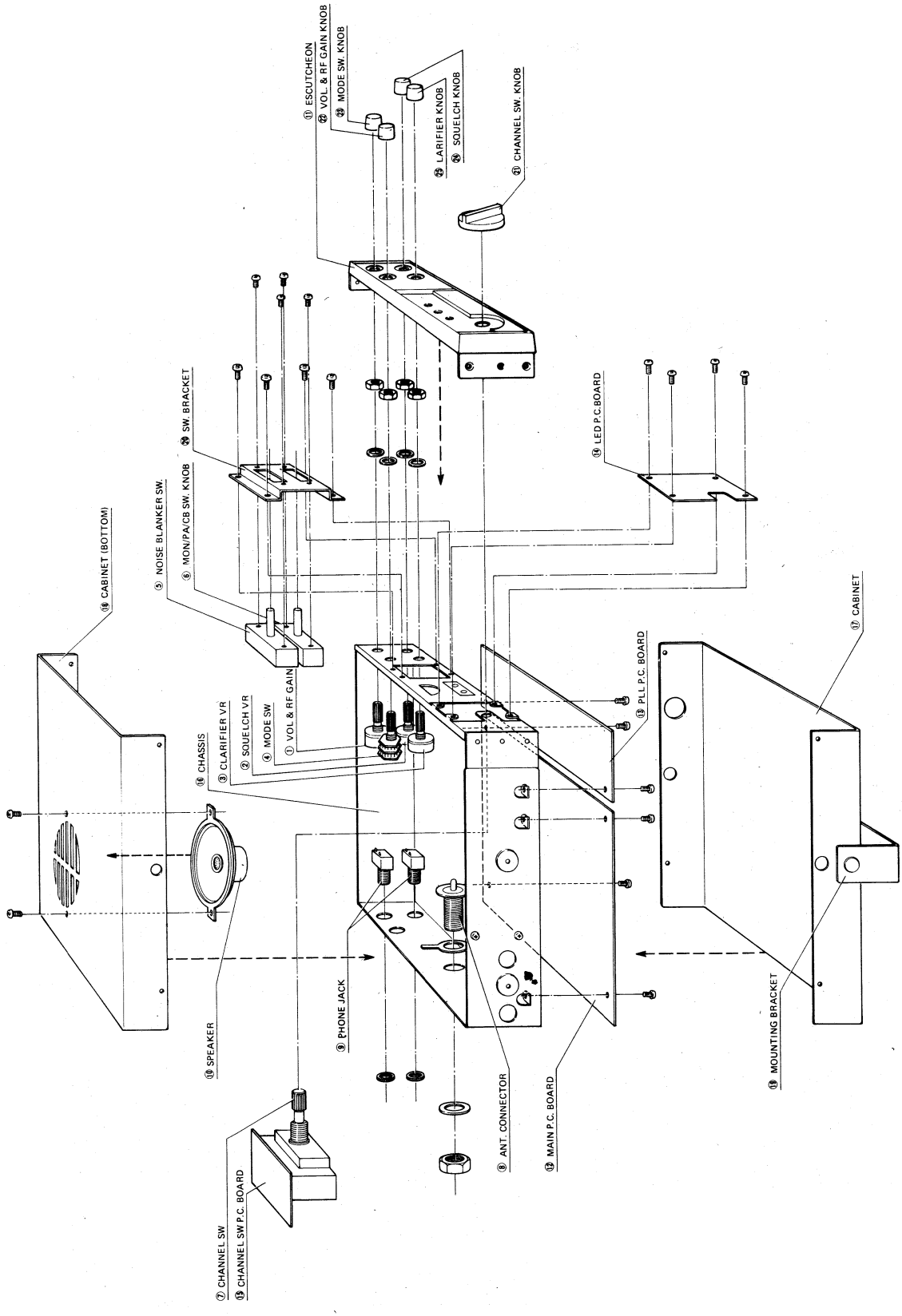


TANDY CORPORATION

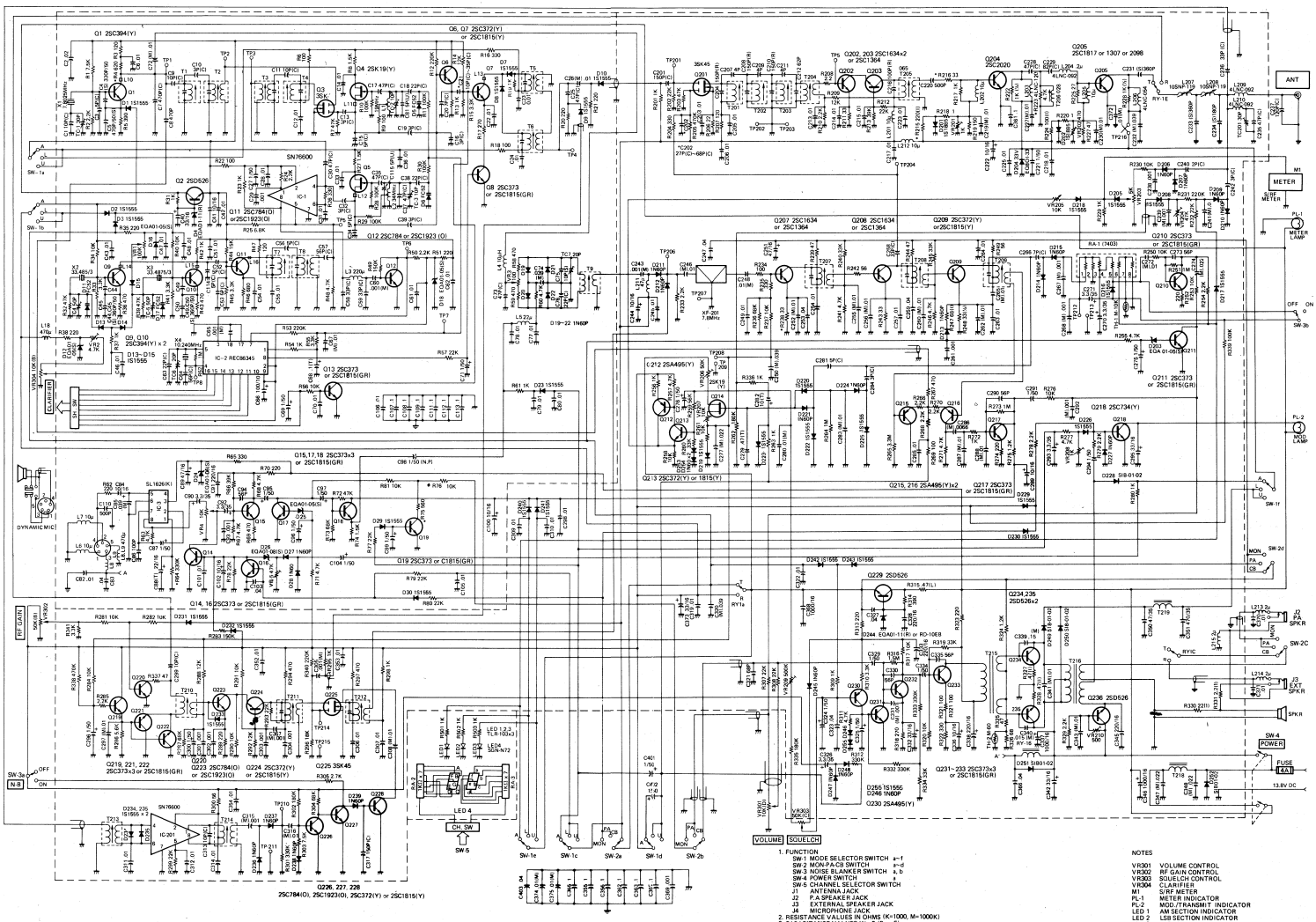
280-316 VICTORIA ROAD
RYDALMERE. N.S.W., 2116
AUSTRALIA

Printed in Japan

# EXPLODED VIEW



# SCHEMATIC DIAGRAM




1. FUNCTION
   SW-1 MODE SELECTOR SWITCH a~f
   SW-2 MON-PA-CB SWITCH a~d
   SW-3 NOISE BLANKER SWITCH a, b
   SW-4 POWER SWITCH a
   SW-5 CHANNEL SELECTOR SWITCH
   J1 ANTENNA JACK
   J2 P.A SPEAKER JACK
   J3 EXTERNAL SPEAKER JACK
   J4 MICROPHONE JACK
2. RESISTANCE VALUES IN OHMS (K=1000, M=1000K)
3. CAPACITANCE VALUES IN $\mu$F (P=$\mu$F)
4. RATING OR TYPE NUMBER OF COMPONENT PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE
5. * : NOT ALWAYS USED

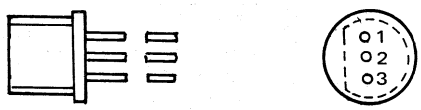
NOTES

| | |
|---|---|
| VR301 | VOLUME CONTROL |
| VR302 | RF GAIN CONTROL |
| VR303 | SQUELCH CONTROL |
| VR304 | CLARIFIER |
| M1 | S/RF METER |
| PL-1 | METER INDICATOR |
| PL-2 | MOD./TRANSMIT INDICATOR |
| LED 1 | AM SECTION INDICATOR |
| LED 2 | LSB SECTION INDICATOR |
| LED 3 | USB SECTION INDICATOR |
| LED 4 | CHANNEL INDICATOR |

# SEMICONDUCTORS LEAD IDENTIFICATION

(A) : 2SA495(O), 2SC372(O), 2SC373, 2SC387(A), 2SC394(Y), 2SC784
(B) : 2SK19(Y)
(C) : 2SD526, 2SC2020, 2SC2098
(D) : 2SC1634, 2SC1364, 2SC1815, 2SC1923
(E) : 3SK45, 3SK35

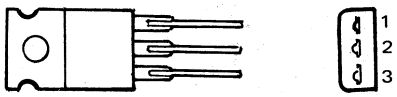
(A) (B)




(A)
1. Base
2. Collector
3. Emitter

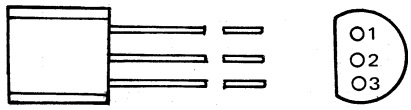
(B)
1. Gate
2. Source
3. Drain

(C)



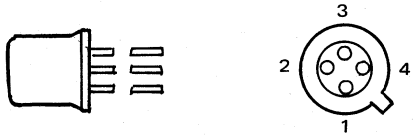

(C)
1. Emitter
2. Collector (Heat Sink)
3. Base

(D)




(D)
1. Base
2. Collector
3. Emitter

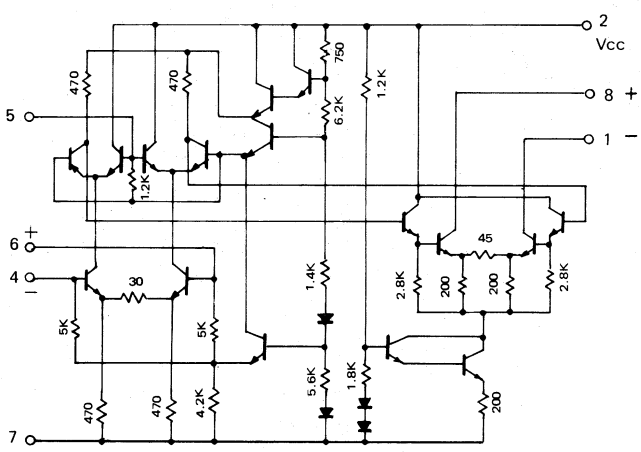
(E)



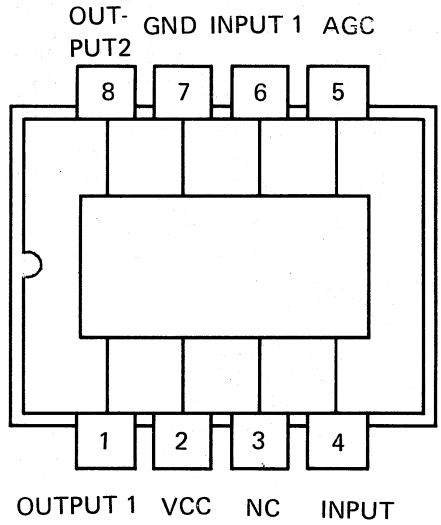

(E)
1. Drain
2. Gate 2
3. Gate 1
4. Source (Case)

# IC PIN CONFIGURATIONS

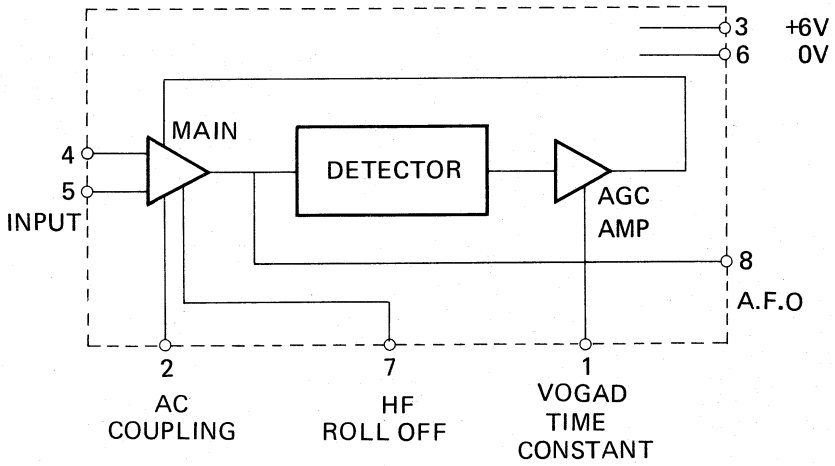
SN76600 SCHEMATIC DIAGRAM



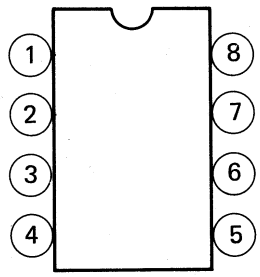

SN76600 LEAD IDENTIFICATION



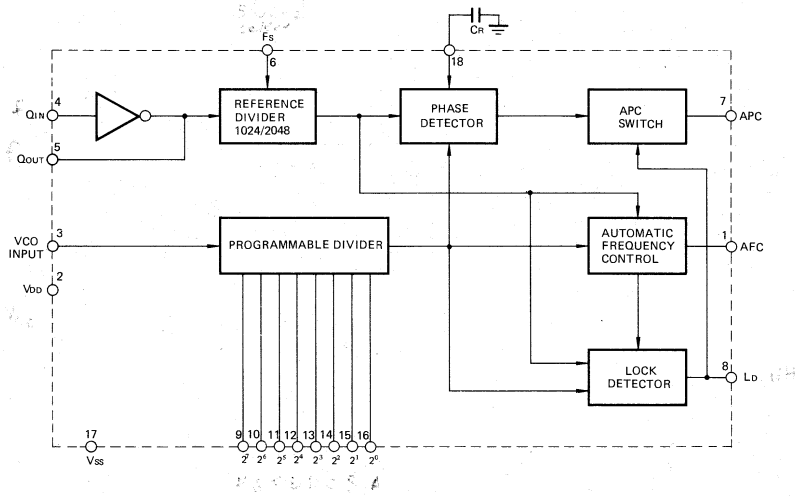
## SL1626C SCHEMATIC DIAGRAM



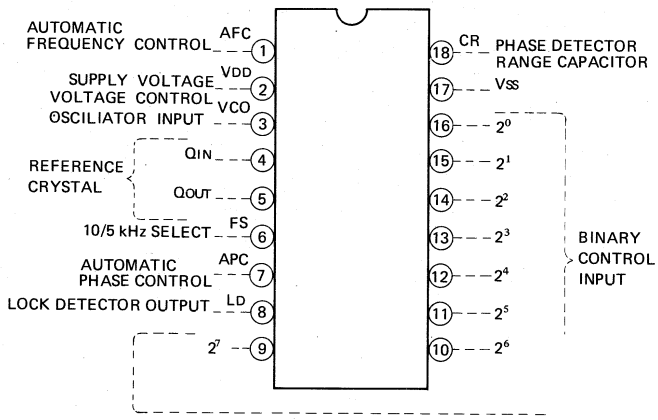

## SL1626C LEAD IDENTIFICATION




## REC86345 SCHEMATIC DIAGRAM




## REC86345 LEAD IDENTIFICATION



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