REALISTIC®

Service Manual

21-1563

TRC-480

40-CHANNEL AM/SSB MOBILE TRANSCEIVER

Catalog Number: 21-1563

CUSTOM MANUFACTURED FOR RADIO SHACK TC A DIVISION OF TANDY CORPORATION

CONTENTS

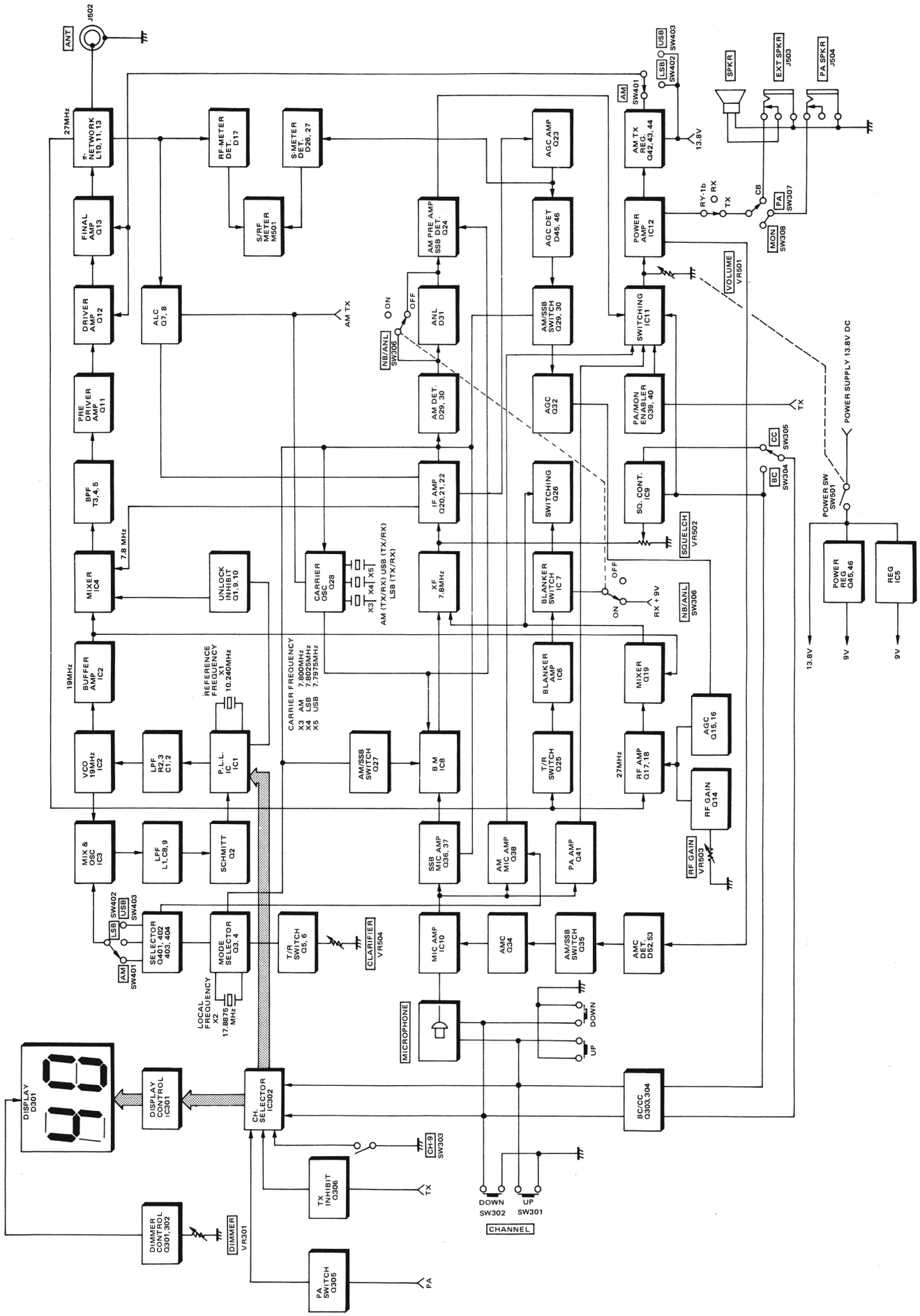
SPECIFICATIONS

DESCRIPTION		CONDITION		NOMINAL	LIMIT
TRANSMITTER					
Frequency Tolerance	**AM**	at 25°C		±0.0005%	±0.005%
	SSB	at 25°C		±0.0005%	±0.005%
RF Output	**AM**	13.8 V DC, No Modulation		4 W max.	3.6 ~ 4.4 W
	SSB	13.8 V DC		12 W PEP max.	10 ~ 13.2 W
Modulation Distortion		80% MOD at 1 kHz		3%	8%
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)		−55 dB	−40 dB
Current Drain		No Modulation (AM)		2100 mA	2500 mA
		(SSB)		800 mA	1200 mA
		80% MOD (AM) at 1 kHz		2500 mA	3000 mA
		10 W PEP Two-Tone (SSB)		2100 mA	3000 mA
Modulation Frequency Response		1 kHz 0 dB			
		Lower 450 Hz		AM SSB −6 dB	AM SSB −6 ± 3 dB
		Upper 2.5 kHz		AM SSB −6 dB	AM SSB −6 ± 3 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, 1000 Hz Single-Tone (SSB)		2 dB	3 dB
Intermodulation Distortion		500 and 2400 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 at 1 kHz		1.0 mV	2.0 mV
		SSB 4 W PEP		1.0 mV	2.0 mV
AMC Range		AM 50~100% MOD at 1 kHz		60 dB	40 dB
		SSB 10 ~ 13.2 W PEP		60 dB	40 dB
RECEIVER					
Max. Sensitivity		AM		0.2 μV	0.5 μV
		SSB		0.2 μV	0.5 μV
Sensitivity		for 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 1 V	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	4000 Hz	3000 ~ 5000 Hz
		Lower Frequency	AM	450 Hz	300 ~ 650 Hz
			SSB	450 Hz	300 ~ 650 Hz
Cross Modulation, RS Standard		AM		60 dB	50 dB
Adjacent Channel Selectivity		10 kHz	AM	70 dB	60 dB
			SSB	70 dB	60 dB
Maximum Audio Output Power		AM		5 W	4 W
		SSB		5 W	4 W
Audio Output Power		10% THD	SSB	4.5 W	3.5 W
			AM	4.5 W	3.5 W
THD AM		500 mW Output 1 mV			
		Input 30% (MOD) at 1 kHz		3%	6%
		80% (MOD) at 1 kHz		5%	10%
THD SSB		1 mV Input 1 kHz			
		Single Tone		3%	6%

DESCRIPTION	CONDITION	NOMINAL	LIMIT
RF Gain Control Range at Max. Sensitivity	AM	40 dB	30 ~ 50 dB
	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	350 ~ 2800 μV
	SSB	1000 μV	350 ~ 2800 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	60 dB
fo + (2 x 7.8 MHz)	SSB	80 dB	60 dB
1/2 IF Rejection Ratio	AM	60 dB	50 dB
fo + 7.8 MHz/2	SSB	60 dB	50 dB
IF Rejection Ratio 7.8 MHz	AM	80 dB	60 dB
	SSB	80 dB	60 dB
Oscillator Drop-out Voltage	AM	9 V	10 V
	SSB	9 V	10 V
Current Drain at No Signal	AM	400 mA	600 mA
	SSB	400 mA	600 mA
Current Drain at Maximum	AM	1200 mA	1500 mA
	SSB	1200 mA	1500 mA
Clarifier Range	AM	±1.2 kHz	±0.6 ~ ±1.8 kHz
	SSB	±1.2 kHz	±0.6 ~ ±1.8 kHz
Spurious Rejection Ratio			
Within Band	AM	65 dB	60 dB
	SSB	65 dB	60 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 at Maximum	Input 15 mV	5.0 W	4.0 W
Output Power	10% Distortion	4.5 W	4.0 W
Audio Fidelity	at 6 dB Down		
	Lower Frequency	350 Hz	250 Hz
	Upper Frequency	2900 Hz	3500 Hz
Current Drain	No Signal	400 mA	600 mA
	Max. Output Power	1500 mA	2000 mA
GENERAL			
Frequency Coverage	29.965 to 27.405 MHz		
Channel	40 Channels		
Frequency Control	Crystal Control (PLL System)		
Frequency Tolerance	Less than ±0.005%		
Operating Temperature	−30°C to +60°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	210 (W) x 62 (H) x 258 (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 provides a brief technical description of unique or special circuits which you might otherwise find a little hard to understand, may not notice or be able to troubleshoot.

PLL CIRCUITRY

The TRC-480 uses Digital Phase Locked Loop circuitry to synthesize each of the channel frequencies. The PLL circuitry consists of IC-1 (Programmable Counter, Reference Frequency Divider and Phase Detector), IC-2 (Voltage Controlled Osc.), IC-3 (Mixer, Osc.), Reference Frequency Osc. (10.24 MHz), Low Pass Filters and related circuits.

Refer to the Block Diagram as you read the following description. A 10.24 MHz Crystal is used as a reference frequency. The crystal is connected between Pins 4 and 5 of the PLL IC, IC-1.

Pressing channel selector switch (UP/DOWN) provides IC-302 (Channel Scanning System) with an enable level at Pins 13 and 14 respectively. Then IC-302 prepares binary coded information to be transfered to IC-1. The information determines "N", the divisor which produces the required output frequency for each channel (precisely spaced 10 kHz apart).

Three different frequency signals which correspond with each mode are generated at IC-3. Those are: 17.885 MHz in AM Mode, 17.8875 MHz in USB Mode, and 17.8825 MHz in LSB Mode. The signals are mixed by IC-3 Mixer with the IC-2 VCO frequency (See Table on page 18). The resulting down-mix produces signals of 1.28 through 1.72 MHz, which pass through LPF, and an amplifier, and then are applied to Pin 2 of PLL IC, IC-1. These frequencies are divided by "N" (128 through 172) internally at IC-1; the resulting output will always be 10 kHz.

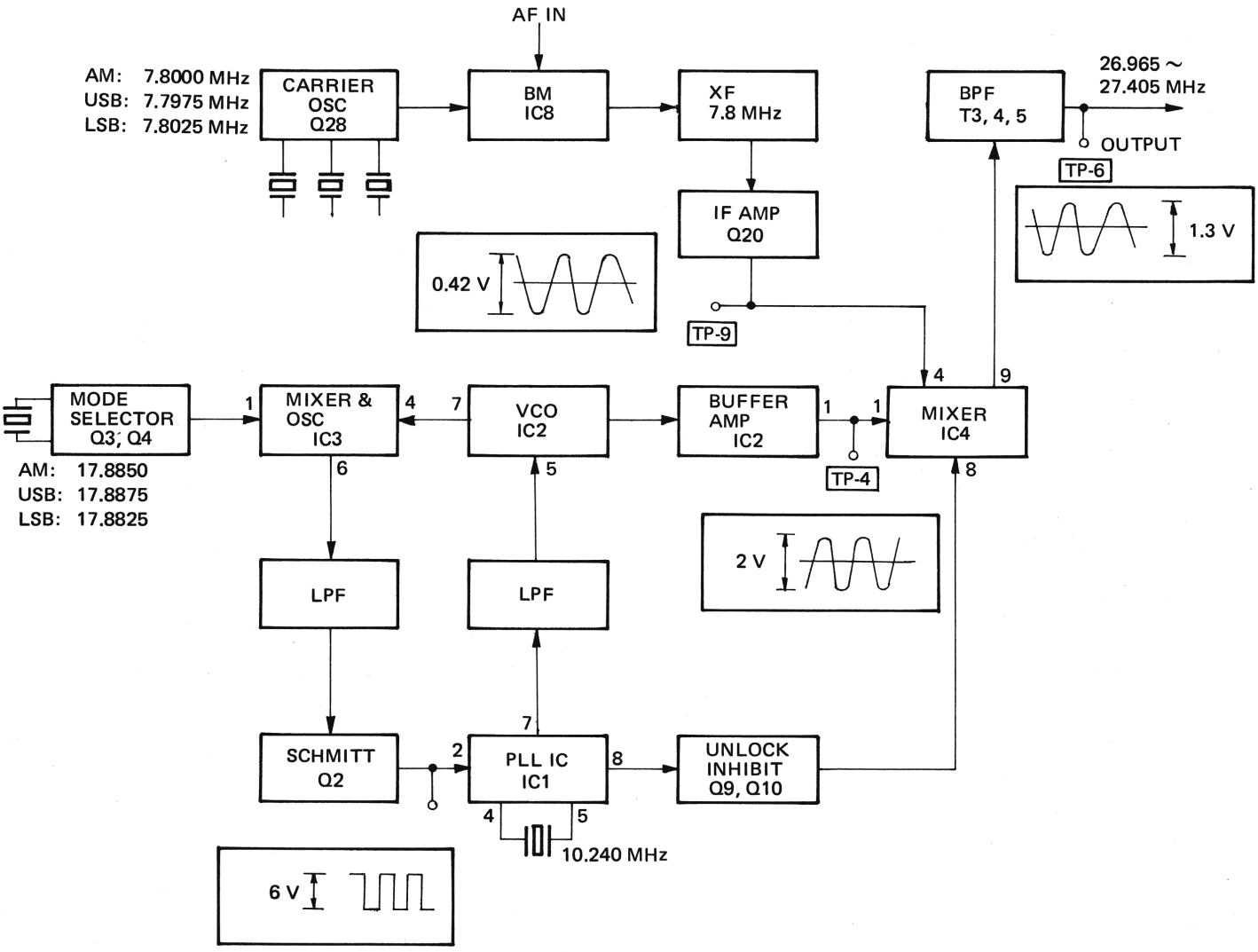
Also, the Reference Oscillator, 10.24 MHz, is divided by 1024 (again, internally by IC-1) resulting in another 10 kHz frequency.

These two 10 kHz signals are fed to the Phase Detector. 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 of IC-1 and passes through the LPF where the error voltage is integrated, and harmonics and noise are filtered out. The resulting DC voltage is applied to the Varicap Diode (part of VCO) whose capacity varies with applied DC voltage. Thus the output frequency of VCO is corrected. With proper circuit design and precise adjustments, the VCO frequency is accurate and precise. When the system is "locked", the Phase Detector senses no phase differences between the two 10 kHz signals and the VCO generates a frequency which is as accurate and stable as the reference crystal oscillator.

For AM Mode, a 7.8000 MHz signal, produced by Crystal X3 is used for the carrier. This signal is fed to Crystal Filter XF-1 through IC-8, and is mixed with the VCO Signals (19.165 to 19.605 MHz) in IC-4 to produce the desired frequency signal (26.965 to 27.405 MHz).

For USB Mode, a 7.7975 MHz signal, produced by Crystal X5 is used for the carrier. This signal is fed to the Balanced-Modulator IC-8 where it is combined with the audio signal. The resulting signal from the Balanced Modulator contains two signals. Only the upper sideband is needed for USB Mode. Crystal Filter XF-1 eliminates the unnecessary lower sideband, and only the upper sideband (USB) appears at its output. In IC-4, the USB Signal is mixed with the VCO Signals (19.1675 to 19.6075 MHz) to produce the desired frequency signal (26.965 to 27.405 MHz).

For LSB Mode, the circuit function is the same as for USB Mode, except Crystal X4 (7.8025 MHz) provides the carrier frequency and the VCO Signals are 19.1625 to 19.6025 MHz.



CHANNEL CONTROL SYSTEM

1. UP/DOWN Operation

   IC-302 produces a BCD code to determine divisor "N" for PLL. OSCillator (in IC-302) produces a control signal, which is waveformed by Clock Generator. When UP (or DOWN) button is pressed, pin 14 (or 13) level goes low. The C-MOS Inverter applies resulting high level to the Control Circuit. The output from the Control Circuit is fed to UP/Down Counter, which in turn is processed to the Code Converter ROM, where it is encoded to BCD.

2. Search Operation

   IC-302 has logic control in the Control Circuit which controls upwards counting when both pins 13 and 14 go low. Pressing Busy (or Clear) Search button will turn "on" Q303 and Q304, thus pins 13 and 14 go low. Pin 16 of IC-302 is a "pause" control pin; if the level of this pin becomes low, upwards counting (caused by the low level at pins 13 and 14) will stop.

   Pin 2 of IC-9 is low when squelch is "open", while pin 4 of IC-9 is low when squelch is "closed". In Busy Search mode, low level from pin 2 of IC-9 is added to pin 16 of IC-302 via Clear SEARCH switch, and Searching stops where there is a signal. In Clear Search mode, low level from pin 4 of IC-9 is added to pin 16 via pin 3 of J303 and Clear SEARCH switch.

3. Channel Control Inhibit during Transmit

   During transmitting, Q306 turns on and pin 15 of IC-302 becomes low, signalling the Control Circuit to shut off.

4. Channel 9 Priority

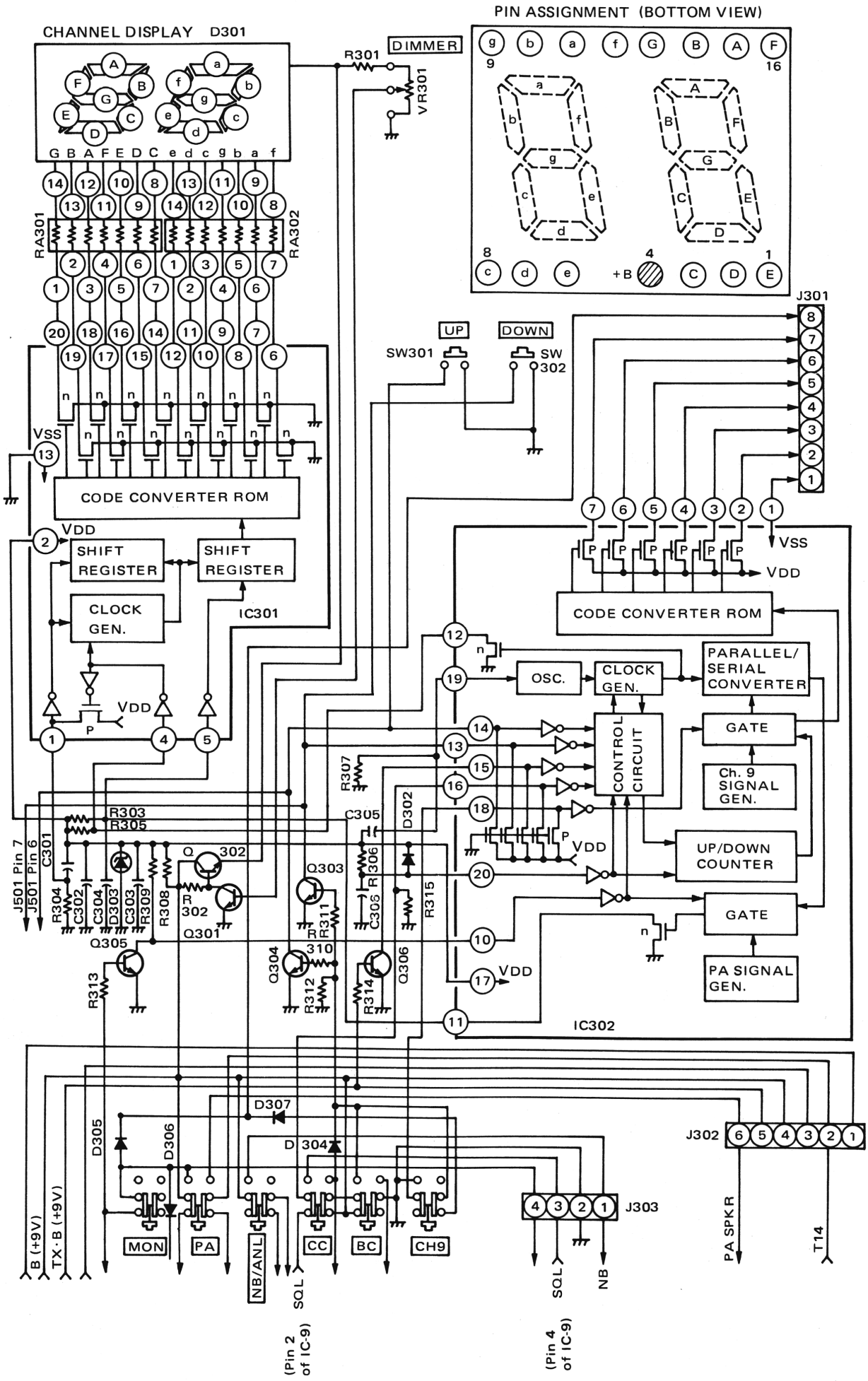
   When Channel 9 button is pressed, pin 18 goes low and signals the Control Circuit and Gate to apply only Channel 9 code to Code Converter ROM.

5. PA Mode

   When PA button is pressed, Q305 turns on and pin 10 level becomes low. This signals the Control Circuit and the Gate to operate in PA mode. When MONitor button is also pressed, Q305 turns off and CB incoming calls can be monitored.

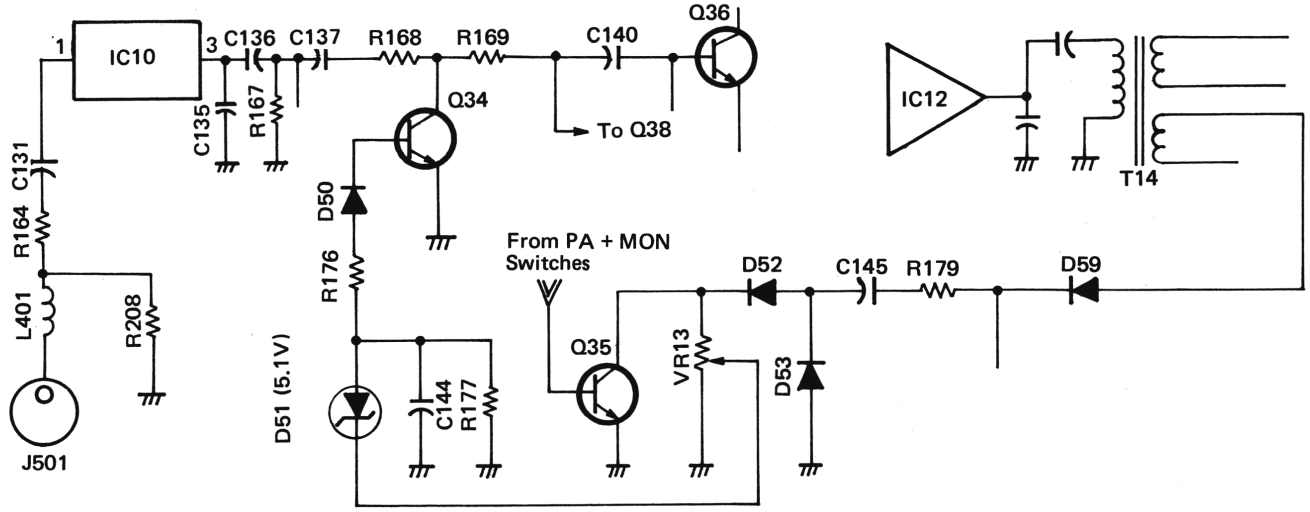
6. Channel Number Display

   The Shift Register in IC-301 converts serial data output from pin 11 of IC-302 to parallel, and the Code Converter ROM will drive the Channel Display LED's to light the correct number(s) or "PA" display.


CHANNEL DISPLAY D301
PIN ASSIGNMENT (BOTTOM VIEW)
DIMMER
R301
VR301
RA301
RA302
J301
UP
DOWN
SW301
SW 302
VSS
VDD
CODE CONVERTER ROM
SHIFT REGISTER
SHIFT REGISTER
CLOCK GEN.
IC301
OSC.
CLOCK GEN.
PARALLEL/ SERIAL CONVERTER
CONTROL CIRCUIT
GATE
Ch. 9 SIGNAL GEN.
UP/DOWN COUNTER
GATE
PA SIGNAL GEN.
IC302
J501 Pin 7
J501 Pin 6
C301
R303
R305
R304
C302
C304
D303
C303
R309
R308
Q 302
R 302
Q301
Q305
R313
Q303
R311
C305
D302
R306
C306
R315
Q304
R310
R312
Q306
R314
R307
D307
D304
D305
D306
J302
J303
B (+9V)
TX·B (+9V)
MON
PA
NB/ANL
CC
BC
CH9
SQL
(Pin 2 of IC-9)
SQL
NB
(Pin 4 of IC-9)
PA SPKR
T14

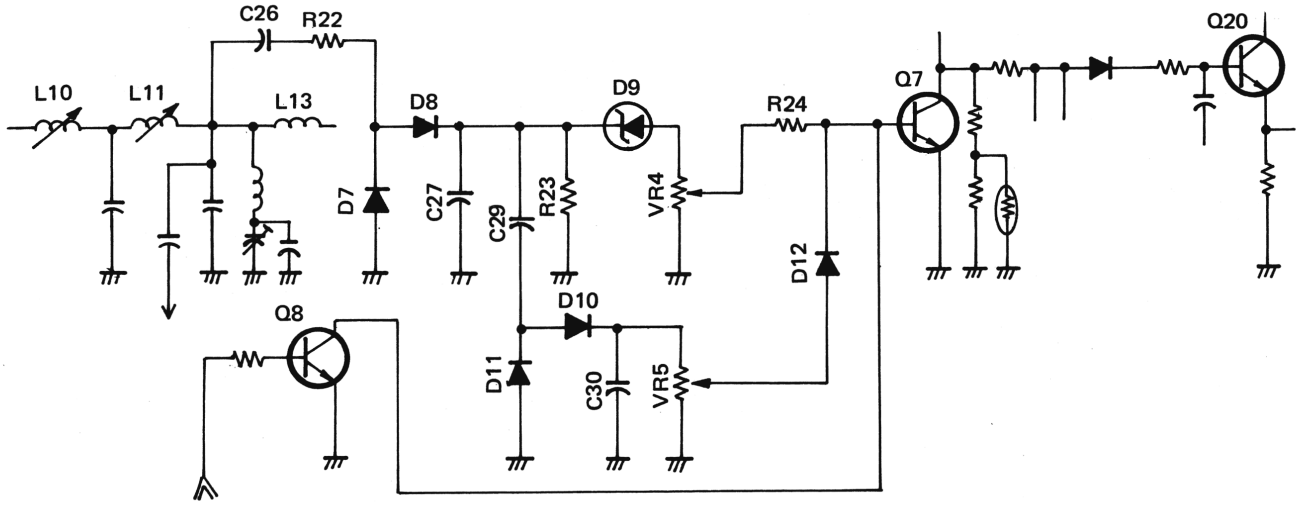
AUTOMATIC MODULATION CONTROL CIRCUIT

The Automatic Modulation Control (AMC) Circuit consists of Q34 and D50 – 53.
Mic input signal is fed to pin 4 of Microphone Jack J501 and through R164 and C131 to pin 1 of IC-10. The amplified mic signal (from pin 3 of IC-10) is applied to the base of Q38 and is amplified once again. This signal is conveyed to IC-12 the Audio Frequency Power Amplifier through IC-11. IC-12 drives T14, whose secondary couples a portion of the signal through D59 and R179 to AMC detector diodes D52 and D53. D51 (5.1 V Zener) is connected to the output of D52/D53 through VR13 ; when the detected DC voltage from D52/D53 exceeds 5.1 V, D51 conducts and applies DC voltage to the base of Q34 through R176 and D50, decreasing the potential at the collector of Q34. VR13 is adjusted for less than 100% modulation level. Q35 disables the AMC when PA button is pressed in.



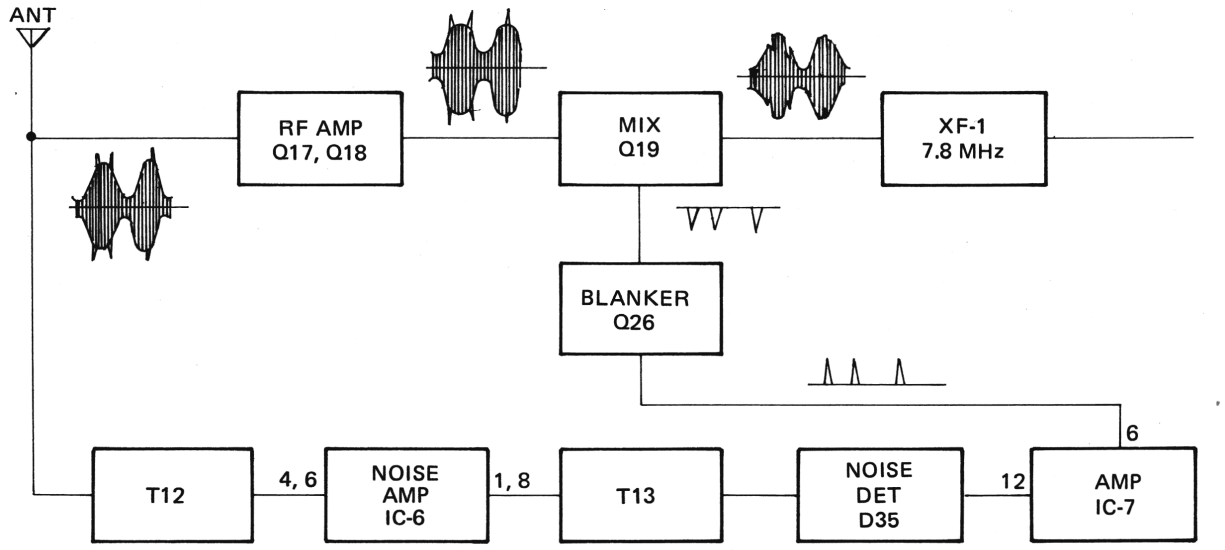
AUTOMATIC LIMITER CONTROL

The Automatic Limiter Control (ALC) circuit consists of D7, D8, D9 (5.1 V Zener), D10 – 12, Q7 and Q8. A portion of the transmitter's RF modulated signal is detected by D7 and D8 (for single – tone modulation). If the detected DC voltage exceeds 5.1 V, a positive voltage is applied to the base of Q7. This decreases the potential at the collector of Q7. Thus the base of Q20 is less-biased than before. In this way the desired RF output level is determined.
VR4 is adjusted to set maximum RF power level to less than 12 W PEP. (Single tone)
RF signals modulated by two or more different tones are detected by D7, D8, D10 and D11. The detected DC voltage is applied to the base of Q7 and the potential at the base of Q20 is controlled in the same way. VR5 is adjusted to set maximum RF power level to less than 12 W PEP. (Two tone)
In AM Transmit mode, Q8 turns on and disables ALC.



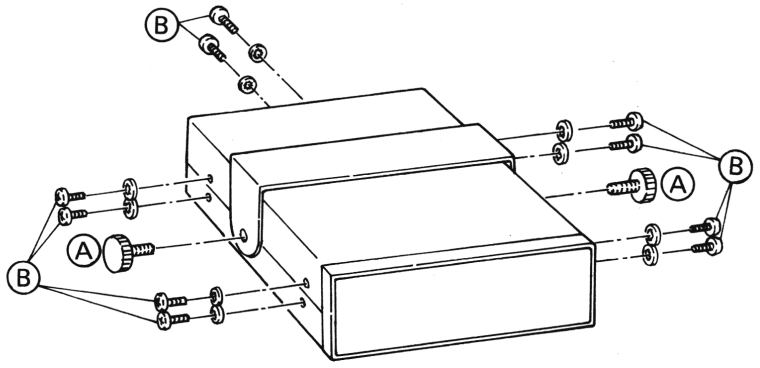
NOISE BLANKER

Noise pulses are amplified by IC-6 and detected by D35. Detected pulses are then amplified by IC-7. IC-7 applies a positive pulse to the base of Q26, thus decreasing its collector impedance to shunt Q19 gate impedance during the duration of the noise pulses. The most objectional noise pulse frequencies are distributed around 40 MHz, thus T12 and T13 are tuned to this frequency.



DISASSEMBLY

1: Remove two bracket screws (A) and bracket.
2: Remove 10 cabinet mounting screws (B).
3: Remove cabinet top and bottom.



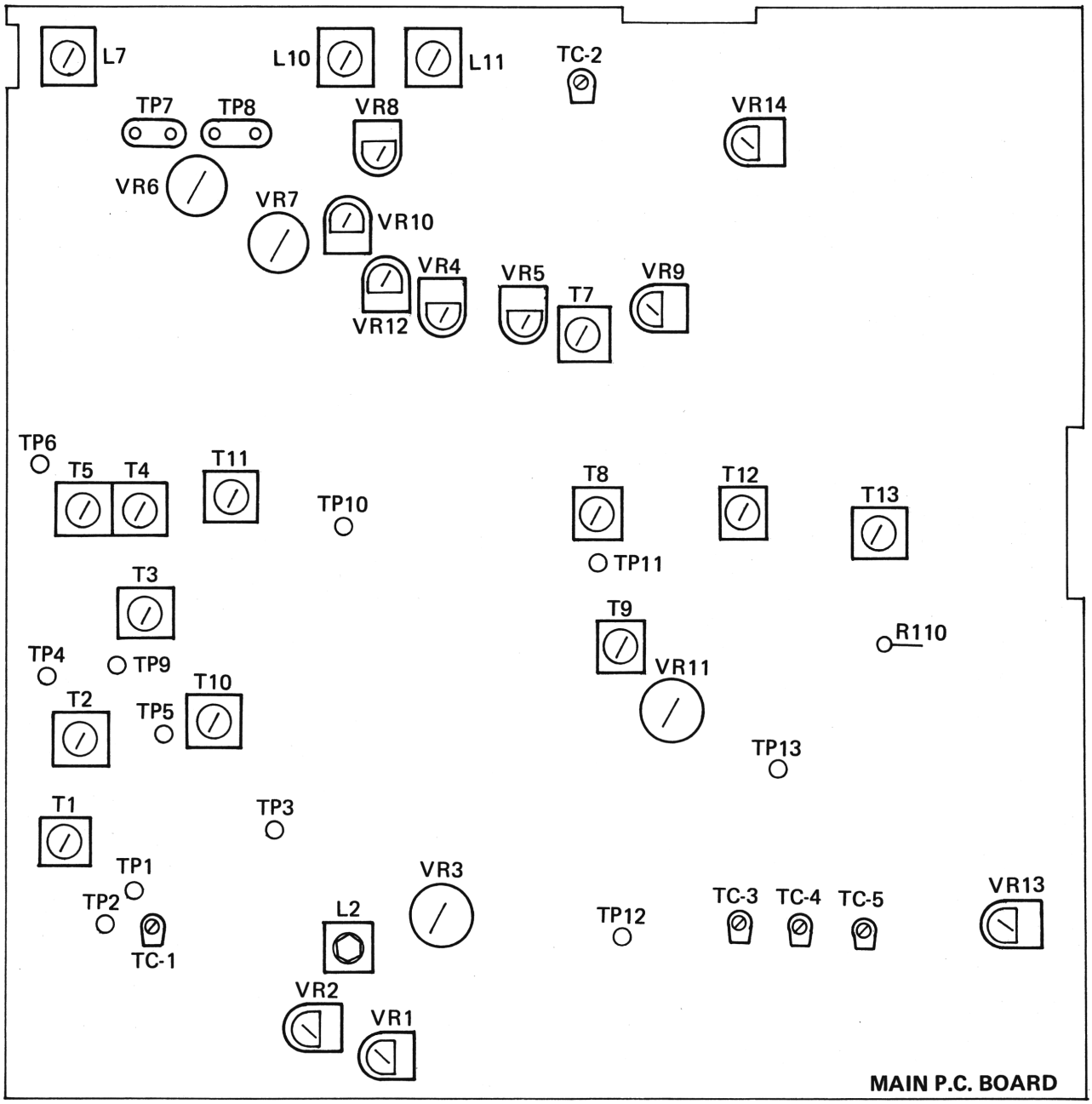
ALIGNMENT PREPARATION

Test instruments required

1. Oscilloscope
2. AC VTVM
3. DC VTVM
4. Frequency Counter
5. 8Ω Dummy Load
6. RF Signal Generator
7. Power Meter (50Ω)
8. 50Ω Dummy Load
9. AF Signal Generator (2)
10. 54 MHz Monitor Receiver (or Spectrum Analyzer)
11. DC Current Meter
12. Pulse Generator

NOTE: Use non-metallic tuning tools. Allow instruments and unit 15 minutes to warm-up prior to alignment. Maintain Generator output level at minimum necessary to obtain usable output readings (this will avoid distortion, saturation and clipping).

ALIGNMENT POSITIONS AND POINTS



PLL SECTION ALIGNMENT CHART

Step	Control Setting	Test Instrument	Test Instrument Connection	Remarks
1	Power Switch : ON	Frequency Counter	Refer to Figure 1 (TP-1/TP-5)	Adjust TC-1 for 10.240 MHz
2	Power Switch : ON CLARIFIER : Center Mode : USB	Frequency Counter	Refer to Figure 1 (TP-3/TP-5)	Adjust L2 for 17.8875 MHz
3	Power Switch : ON CLARIFIER : Center Mode : LSB	Frequency Counter	Refer to Figure 1 (TP-3/TP-5)	Adjust VR2 for 17.8825 MHz
4	Power Switch : ON CLARIFIER : Center Mode : AM	Frequency Counter	Refer to Figure 1 (TP-3/TP-5)	Adjust VR1 for 17.885 MHz
5	Power Switch : ON CLARIFIER : Center Mode : AM CH : 1 and 40	DC VTVM	Refer to Figure 2 (TP-2/TP-5)	Adjust T1 for 2 V readings at CH1, 3.5 – 4 V readings at CH40.
6	Power Switch : ON CLARIFIER : Center Mode : USB CH : 18	Frequency Counter	Refer to Figure 1 (TP-4/TP-5)	Adjust L2 for 19.3775 MHz
7	Power Switch : ON CLARIFIER : Center Mode : LSB CH : 18	Frequency Counter	Refer to Figure 1 (TP-4/TP-5)	Adjust VR2 for 19.3725 MHz
8	Power Switch : ON CLARIFIER : Center Mode : AM CH : 18	Frequency Counter	Refer to Figure 1 (TP-4/TP-5)	Adjust VR1 for 19.3750 MHz
9	Same as Step 8	RF VTVM	Refer to Figure 2 (TP-4/TP-5)	Adjust T2 for max.

NOTE: You can check each channel frequency (CH-1 through CH-40) at TP-2 after Step 8. The frequency should be as shown on Table on page 18.

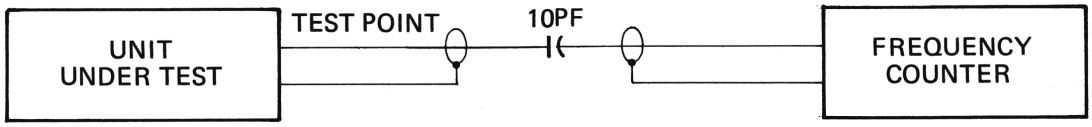


Figure 1

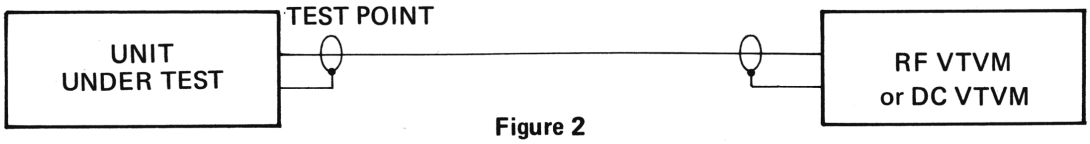
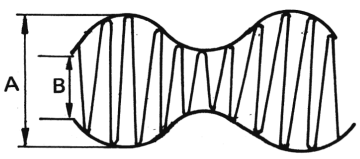


Figure 2

TRANSMITTER SECTION ALIGNMENT CHART

NOTE: Alignment of Transmitter Section must not be done until PLL section alignment is completed.

Step	Control Setting	Test Instrument Connection and Setting	Adjust	Remarks
1	POWER Switch : ON Mode : AM	Connect Frequency Counter to TP-12. (Figure 1)	TC-3	Frequency Adjustment Adjust TC-3 for 7.800 MHz
2	POWER Switch : ON Mode : USB	Same as Step 1	TC-5	Frequency Adjustment Adjust TC-5 for 7.7975 MHz
3	POWER Switch : ON Mode : LSB	Same as Step 1	TC-5	Frequency Adjustment Adjust TC-4 for 7.8025 MHz
4	POWER Switch : ON CH : 18 Mode : LSB or USB TX : ON	Connect DC Current Meter to TP-7. Connect RF-Power Meter and 50Ω Dummy Load to ANT Jack J502. (Figure 3)	VR-6	Current Adjustment Adjust VR-6 for approx. 20 mA
5	Same as Step 4	Connect DC Current Meter to TP-8. Connect RF-Power Meter and 50Ω Dummy Load to ANT Jack J502. (Figure 3)	VR-7	Current Adjustment Adjust VR-7 for approx. 40 mA
6	POWER Switch : ON CH : 18 Mode : AM TX : ON	Connect RF VTVM to TP-6. Connect RF-Power Meter and 50Ω Dummy Load to ANT Jack J502. (Figure 4)	T3 T4 T5	Alignment of Power Stage Adjust T3, T4 and T5 for max. on RF VTVM.
7	POWER Switch : ON CH : 18 Mode : AM TX : ON	Connect RF-Power Meter and 50Ω Dummy Load to ANT Jack J502 (Figure 5)	L7 L10 L11	Alignment of Power Stage Adjust L7, L10 and L11 for max. output
8	Same as Step 7	Same as Step 7	VR-14	Power Output Adjustment Adjust VR-14 for 4 W output
9	Same as Step 7	Connect Frequency Counter and 50Ω Dummy Load to ANT Jack J502 (Figure 5)	VR-3	Frequency Adjustment Adjust VR-3 for 27.175 MHz
10	POWER Switch : ON CH : 18 Mode : USB or LSB TX : ON	Connect RF Power Meter, 50Ω Dummy Load and Monitor Scope to ANT Jack J502. (Figure 6)	VR-11	Adjustment of Balanced Modulator Adjust VR-11 for min. output
11	POWER Switch : ON CH : 18 Mode : AM TX : ON	Connect RF Power Meter, Dummy Load and Monitor Scope to ANT Jack J502. Connect AF Generator (1 kHz) to Pin 4 of MIC Jack J501. (Figure 6) Adjust AF Generator so that the waveform on Monitor Scope shows 50% modulation. Calculation of Modulation Degree. Mod. $\frac{A-B}{A+B} \times 100$ Mod. (%) : Modulation Degree		

12	Same as Step 11	Same instrument connection as Step 11. Increase AF Generator output +30 dB from 50% modulation output level.	VR-13	Adjustment of AMC Adjust VR-13 for 90 – 100% Mod. (but not so that over Mod. occurs).
13	POWER Switch : ON CH : 18 Mode : USB or LSB TX : ON	Same instrument connection as Step 12. Set AF Generator output to 10 mV.	VR-4	Adjustment of ALC (single tone) Adjust VR-4 for 10 – 12 W output.
14	Same as Step 13	Connect 50Ω Dummy Load and RF-Power Meter to ANT Jack J502. Connect two AF Generators to Pin 4 of Mic Jack J501. Set one AF Generator to 500 Hz and the other to 2400 Hz, output to 10 mV. (Figure 6)	VR-5	Adjustment of ALC (two tone) Adjust VR5 for 10 – 12 W output.
15	Same as Step 7	Same as Step 7	VR-8	Adjustment of Power Indicator Adjust VR-8 so that the unit's Meter reads at 4.
16	POWER Switch : ON CH : 18 Mode : AM TX : ON	Connect 50Ω Dummy Load, RF Power Meter and 54 MHz Monitor Receiver (or Spectrum Analyzer, if available) to ANT Jack J502. (Figure 7)	TC-2	Alignment of 2nd harmonic/ spurious radiation. Adjust TC-2 for minimum reading on the scope.

NOTE: You can check each channel frequency (CH-1 through CH-40) at J502 after Step 9. The frequency should be as shown on Table on page 18.

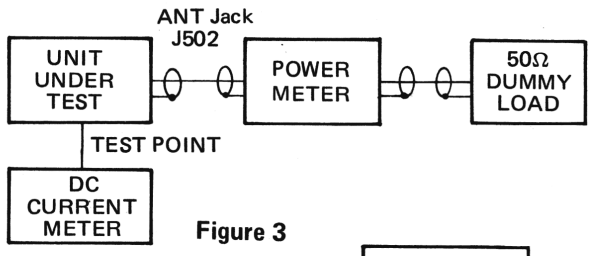


Figure 3

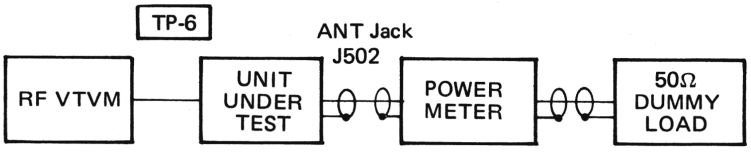


Figure 4

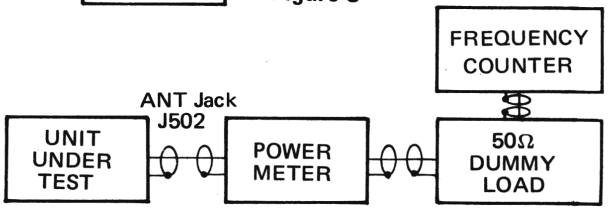


Figure 5

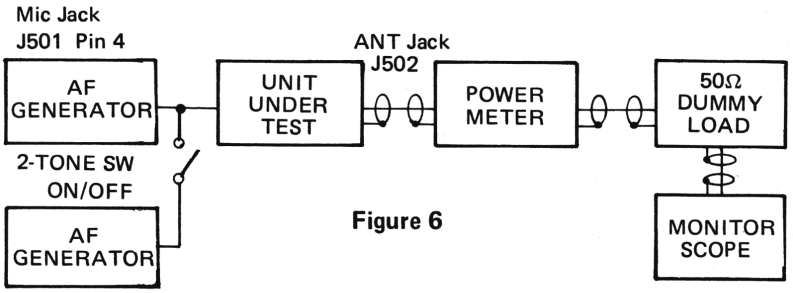


Figure 6

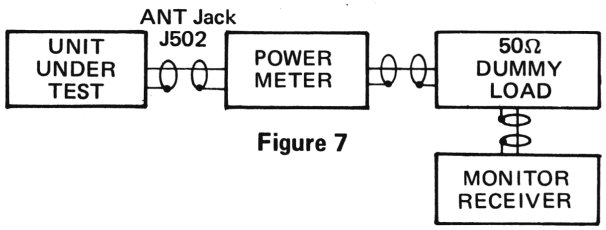


Figure 7

RECEIVER SECTION ALIGNMENT CHART

NOTE: Alignment of Receiver Section must not be done until PLL Section and Transmitter Section alignment is completed.

Step	Control Setting	Test Instrument	Signal Generator Setting	Adjust	Remarks
1	POWER Switch : ON RF GAIN : Max. SQUELCH : Min. VOLUME : Max. CH : 18 Mode : AM	Connect Oscilloscope and AC VTVM to EXT SPKR Jack J503 across 8 ohm Dummy Load. Connect RF Signal Generator to ANT Jack J502. (Figure 8)	Freq. 27.175 MHz (Channel 18) at 1 kHz 30% Modulation. Set output level to minimum necessary	T7 T8 T9 T10 T11	Alignment of RF Adjust T7, T8, T9, T10 and T11 for Max. S/N on Oscilloscope and AC VTVM.
2	Same as Step 1	Same as Step 1	Set output level to 100μV	VR-10	Adjustment of S-Indicator Adjust VR-10 so that the unit's S-Meter reads 9.
3	POWER Switch : ON RF GAIN : Max. SQUELCH : Max. VOLUME : Max. CH : 18 Mode : AM	Same as Step 1	Set output Level to 1 mV	VR-12	Adjustment of SQUELCH Adjust VR-12 to the point where waveform just appears.
4	POWER Switch : ON RF GAIN : Max. SQUELCH : Min. VOLUME : Set AF output level for approx. 0.775 V (0 dB) with 100 μV RF input, with VR-9 set to full counter clockwise position CH : 18 Mode : AM	Same as Step 1	Set SG output to 100μV before adjustment	VR-9	Adjustment of AGC Increase RF input level to 100 mV, adjust VR-9 for AF output of 0.775 V (0 dB).

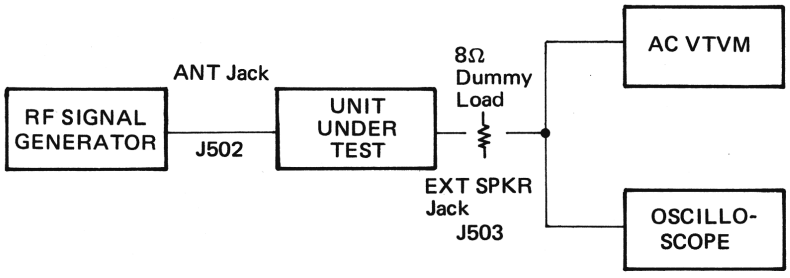


Figure 8

NOISE BLANKER ALIGNMENT CHART

Without Pulse Generator

Control Setting	Test Instrument Connection and Setting	Adjust	Remarks
POWER Switch : ON	Connect RF Signal Generator to ANT Jack J502. Set Freq. to 40 MHz, and output to 10 μV. Connect DC VTVM to the both ends of R110 (Figure 9).	T12 T13	Adjust T12 and T13 for max. reading on DC VTVM.

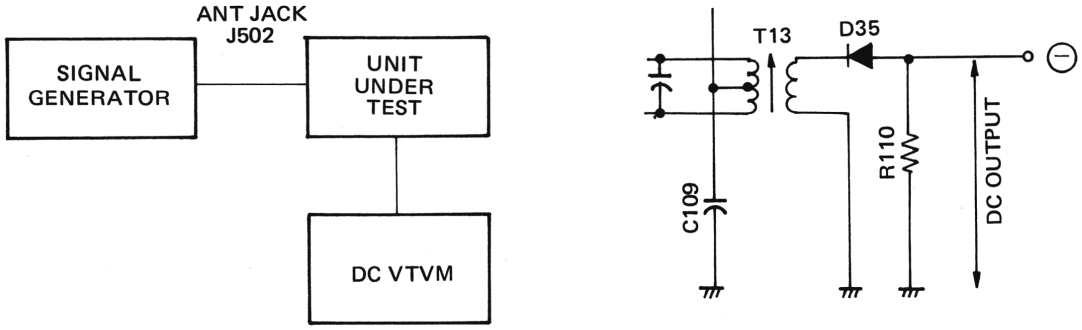


Figure 9

Using Pulse Generator

Control Setting	Test Instrument Connection and Setting	Adjust	Remarks
POWER Switch : ON SQUELCH: Min. VOLUME : Max. CH : 18 (27.175 MHz)	Connect Signal Generator and Pulse Generator to ANT Jack J502. Set SG Freq. to 27.175 MHz, and output to 1 μV. Set PG pulse width to 1 μ Sec, cycle to 10 m Sec, and output to 1 V P-P. Connect Oscilloscope to EXT SPKR Jack J503, across 8 ohm Dummy Load. (Figure 10)	T12 (or T13)	Adjust T12 (or T13) for max. S/N ratio on oscilloscope.

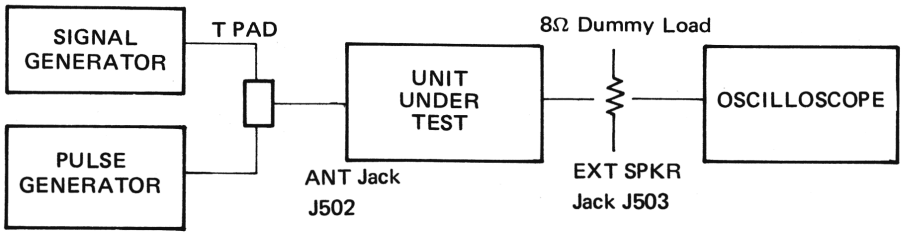
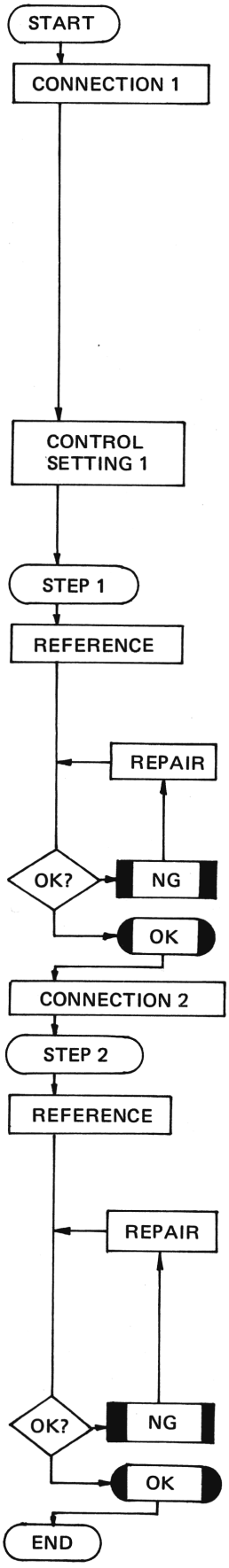


Figure 10

VCO OUTPUT FREQUENCY, IC1 INPUT FREQUENCY AND CODE TABLE

CH	Frequency (MHz)	VCO Frequency (MHz)			fin (MHz)	N	INPUT CODE PIN No. (IC-1)					
		TX (AM) RX (AM) ±1.2 kHz	TX (LSB) RX (LSB) ±1.2 kHz	TX (USB) RX (USB) ±1.2 kHz			10	11	12	13	14	15
1	26.965	19.165	19.1625	19.1675	1.28	128	0	0	0	0	0	0
2	26.975	19.175	19.1725	19.1775	1.29	129	0	0	0	0	0	1
3	26.985	19.185	19.1825	19.1875	1.30	130	0	0	0	0	1	0
4	27.005	19.205	19.2025	19.2075	1.32	132	0	0	0	1	0	0
5	27.015	19.215	19.2125	19.2175	1.33	133	0	0	0	1	0	1
6	27.025	19.225	19.2225	19.2275	1.34	134	0	0	0	1	1	0
7	27.035	19.235	19.2325	19.2375	1.35	135	0	0	0	1	1	1
8	27.055	19.255	19.2525	19.2575	1.37	137	0	0	1	0	0	1
9	27.065	19.265	19.2625	19.2675	1.38	138	0	0	1	0	1	0
10	27.075	19.275	19.2725	19.2775	1.39	139	0	0	1	0	1	1
11	27.085	19.285	19.2825	19.2875	1.40	140	0	0	1	1	0	0
12	27.105	19.305	19.3025	19.3075	1.42	142	0	0	1	1	1	0
13	27.115	19.315	19.3125	19.3175	1.43	143	0	0	1	1	1	1
14	27.125	19.325	19.3225	19.3275	1.44	144	0	1	0	0	0	0
15	27.135	19.335	19.3325	19.3375	1.45	145	0	1	0	0	0	1
16	27.155	19.355	19.3525	19.3575	1.47	147	0	1	0	0	1	1
17	27.165	19.365	19.3625	19.3675	1.48	148	0	1	0	1	0	0
18	27.175	19.375	19.3725	19.3775	1.49	149	0	1	0	1	0	1
19	27.185	19.385	19.3825	19.3875	1.50	150	0	1	0	1	1	0
20	27.205	19.405	19.4025	19.4075	1.52	152	0	1	1	0	0	0
21	27.215	19.415	19.4125	19.4175	1.53	153	0	1	1	0	0	1
22	27.225	19.425	19.4225	19.4275	1.54	154	0	1	1	0	1	0
23	27.255	19.455	19.4525	19.4575	1.57	157	0	1	1	1	0	1
24	27.235	19.435	19.4325	19.4375	1.55	155	0	1	1	0	1	1
25	27.245	19.445	19.4425	19.4475	1.56	156	0	1	1	1	0	0
26	27.265	19.465	19.4625	19.4675	1.58	158	0	1	1	1	1	0
27	27.275	19.475	19.4725	19.4775	1.59	159	0	1	1	1	1	1
28	27.285	19.485	19.4825	19.4875	1.60	160	1	0	0	0	0	0
29	27.295	19.495	19.4925	19.4975	1.61	161	1	0	0	0	0	1
30	27.305	19.505	19.5025	19.5075	1.62	162	1	0	0	0	1	0
31	27.315	19.515	19.5125	19.5175	1.63	163	1	0	0	0	1	1
32	27.325	19.525	19.5225	19.5275	1.64	164	1	0	0	1	0	0
33	27.335	19.535	19.5325	19.5375	1.65	165	1	0	0	1	0	1
34	27.345	19.545	19.5425	19.5475	1.66	166	1	0	0	1	1	0
35	27.355	19.555	19.5525	19.5575	1.67	167	1	0	0	1	1	1
36	27.365	19.565	19.5625	19.5675	1.68	168	1	0	1	0	0	0
37	27.375	19.575	19.5725	19.5775	1.69	169	1	0	1	0	0	1
38	27.385	19.585	19.5825	19.5875	1.70	170	1	0	1	0	1	0
39	27.395	19.595	19.5925	19.5975	1.71	171	1	0	1	0	1	1
40	27.405	19.605	19.6025	19.6075	1.72	172	1	0	1	1	0	0

PLL OPERATION CHECK (TRANSMIT MODE)



Connect the Frequency counter to TP-3, and 50Ω Dummy Load to ANT Jack J502. Refer to Figure 11.

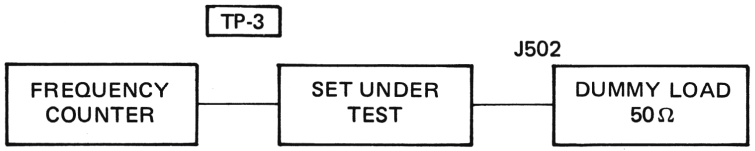


Figure 11

POWER Switch : ON (Turn clockwise)
CB Switch : ON (PA Switch : Press out)
Channel : CH-19
Push-to-talk switch : PUSH

Check frequency in each mode : AM, USB, and LSB.

Frequencies are : 17.8850 MHz ± 100 Hz in AM, 17.8875 MHz ± 100 Hz in USB, and 17.8825 MHz ± 100 Hz in LSB.

Readjust VR-1 and/or VR-2 and/or L2. Check D1, D2, Q3, Q4 and/or associated circuit components.

Wrong frequencies appear or no signal appears.

Frequencies are OK.

Connect the Frequency counter to TP-4.

Check frequency in each mode : AM, USB, and LSB.

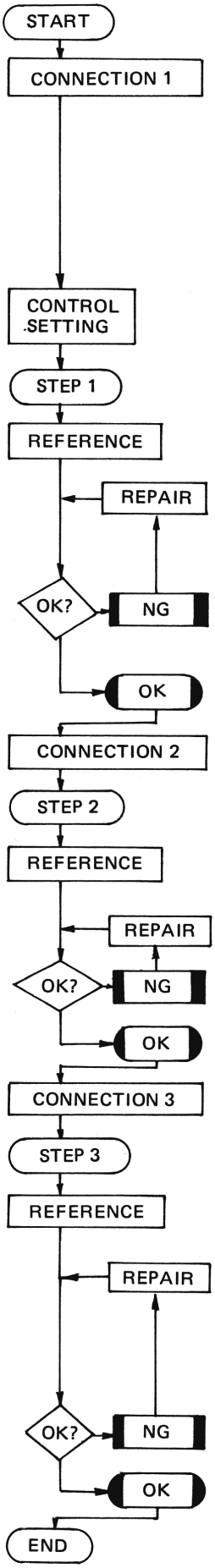
Frequencies are : 19.385 MHz ± 100 Hz in AM, 19.3875 MHz ± 100 Hz in USB, and 19.3825 MHz ± 100 Hz in LSB.

Check IC-1, IC-2 and/or associated circuit components.
Check the Channel Scanning System (IC-302) and/or associated circuit components.

Wrong frequencies appear or no signal appears.

Frequencies are OK.

PLL OPERATION CHECK (RECEIVE MODE)



Connect the Frequency counter to TP-1. Refer to Figure 12.

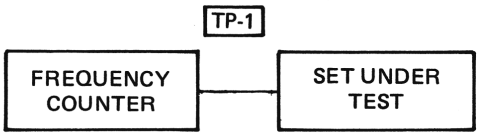


Figure 12

POWER Switch : ON (Turn clockwise)
Channel : CH-19 CLARIFIER : Center

Check frequency

Frequency is 10.240 MHz ± 100 Hz.

Adjust TC-1 until the frequency is 10.240 MHz ± 100 Hz. Check IC-1 and/or associated circuit components.

Frequency is not 10.240 MHz ± 100 Hz or no signal appears.

Frequency is OK.

Connect the Frequency counter to TP-3.

Check frequency in each mode : AM, USB and LSB.

Frequencies are : 17.8850 MHz ± 1.2 kHz in AM, 17.8875 MHz ± 1.2 kHz in USB, and 17.8825 MHz ± 1.2 kHz in LSB.

Check IC-3 and/or associated circuit components.

Wrong frequencies appear or no signal appears.

Frequencies are OK.

Connect the Frequency counter to TP-4.

Check frequency in each mode : AM, USB, and LSB.

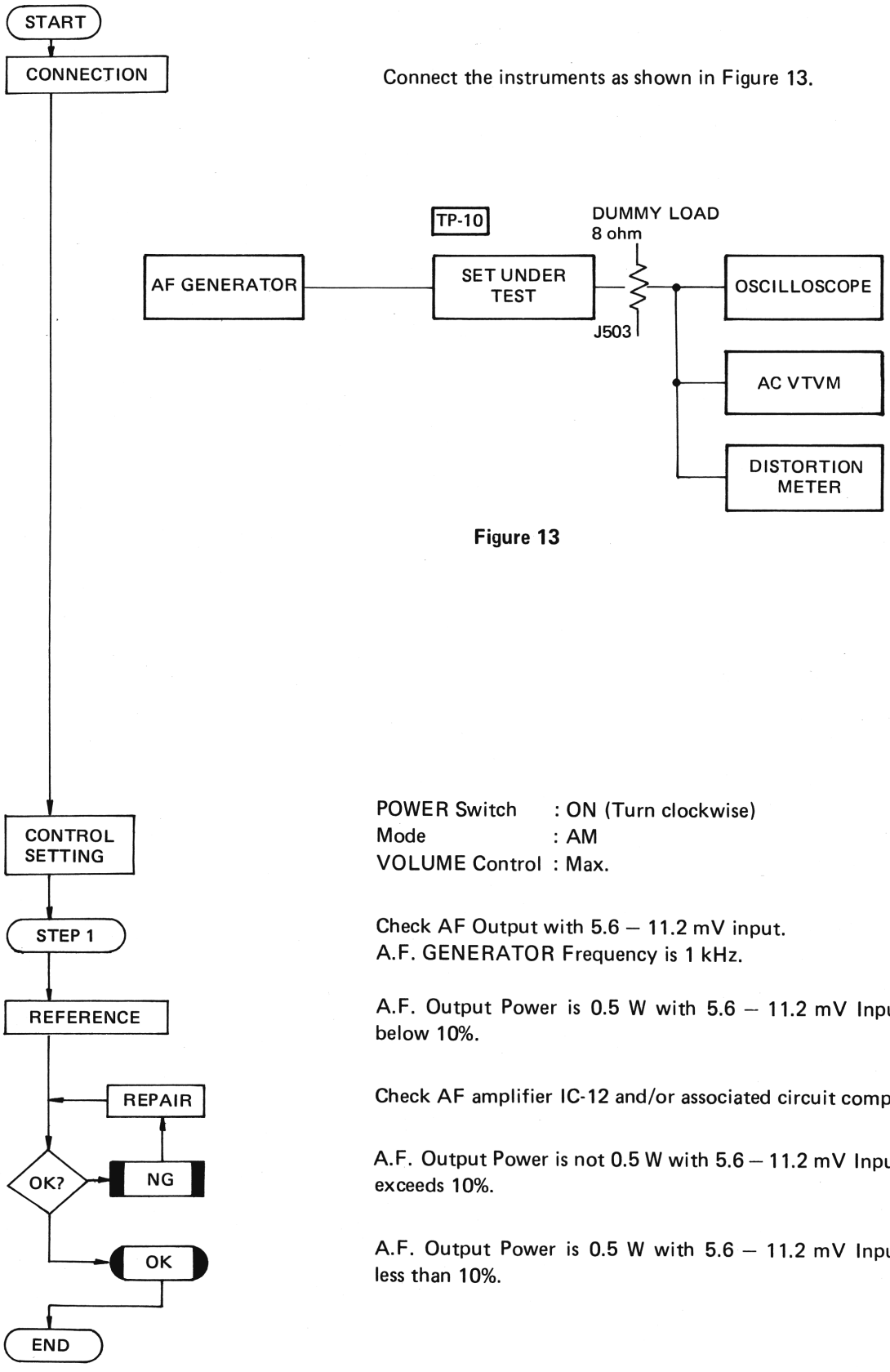
Frequencies are : 19.385 MHz ± 1.2 kHz in AM, 19.3875 MHz ± 1.2 kHz in USB, and 19.3825 MHz ± 1.2 kHz in LSB.

Check IC-1, IC-2 and/or associated circuit components. Check Input code of IC-1 (Pin 10-15). See page 18.
Check the Channel Scanning System and/or associated circuit components.

Wrong frequencies appear or no signal appears.

Frequencies are OK.

AF OPERATION CHECK



Connect the instruments as shown in Figure 13.

Figure 13

POWER Switch : ON (Turn clockwise)
Mode : AM
VOLUME Control : Max.

Check AF Output with 5.6 – 11.2 mV input.
A.F. GENERATOR Frequency is 1 kHz.

A.F. Output Power is 0.5 W with 5.6 – 11.2 mV Input. And Distortion is below 10%.

Check AF amplifier IC-12 and/or associated circuit components.

A.F. Output Power is not 0.5 W with 5.6 – 11.2 mV Input. And/or Distortion exceeds 10%.

A.F. Output Power is 0.5 W with 5.6 – 11.2 mV Input. And Distortion is less than 10%.

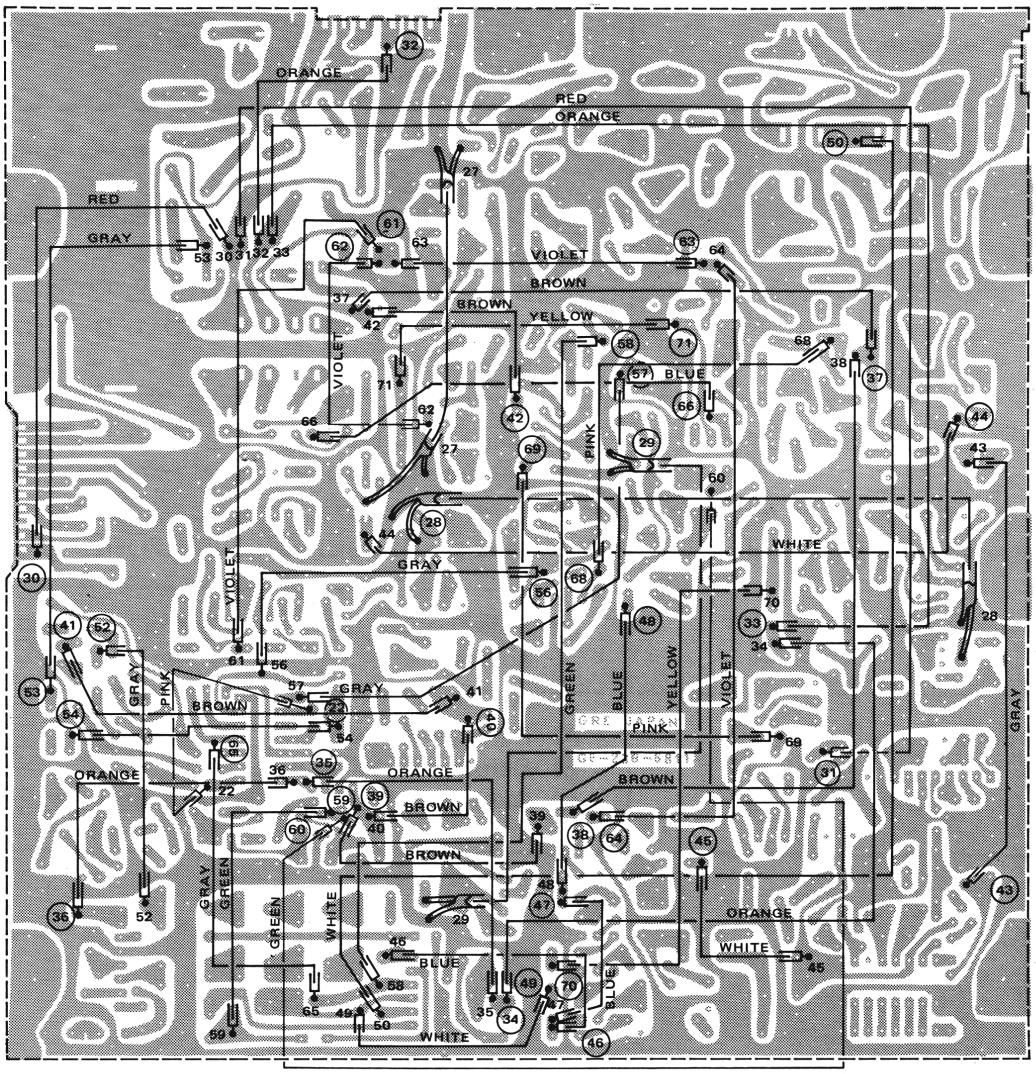
TROUBLESHOOTING GUIDE

Symptom	Possible Cause
1) Power failed, with Fuse not blown.	A) Faulty DC power cable. B) Defective power switch SW501, Q45, Q46, D60 and/or associated circuit components.
2) Power failed and Fuse is blown.	A) Reverse polarity. B) D61 is broken and/or any short circuit to the GND.
3) Does not receive both AM and SSB.	A) Defective PLL circuit. Proceed to PLL OPERATION CHECK (RECEIVE MODE). B) Defective RF Stage amplifier Q17, Q18, Mixer Q19 and/or associated circuit components. C) Defective Q24 and/or associated circuit components.
4) No sound TX SSB : OK	A) Defective AM amplifier. Proceed to AF OPERATION CHECK.
5) No sound TX AM/SSB : OK	A) Defective speaker or EXT SPKR jack. B) Faulty Squelch control circuit. C) Defective Relay RY-1.
6) Does not transmit both AM and SSB.	A) Defective PLL circuit. Proceed to PLL OPERATION CHECK (TRANSMIT MODE). B) Defective Q11, Q12, Q13 and/or associated circuit components. C) Defective IC-8.
7) Does not transmit on AM, TX SSB : OK	A) Defective Q42, Q43, Q44 and/or associated circuit components. B) AM/SSB switch Q27 is defective.
8) Does not transmit on SSB, no modulation on AM.	A) Defective IC-10.
9) Does not transmit on SSB, TX AM : OK	A) Defective Q36, Q37, D47 (LSB), D48 (USB) and/or associated circuit components. B) Defective AM/SSB switch Q27 (E-C : short)
10) No modulation on AM, TX SSB : OK	A) Defective IC-11. B) Defective Q38, Q401, Q402 and/or associated circuit components.
11) RX AGC does not function.	A) Defective Q23, Q29, Q30, Q32, D45, D46 and/or associated circuit components.
12) Low sensitivity TX : OK	A) Defective AGC circuit (refer to 11). B) Defective Q20, Q21, Q22, Q23 and/or associated circuit components.

Symptom	Possible Cause
13) AMC does not function.	A) Defective Q34, Q35, D51, D52, D53 and/or associated circuit components.
14) NB/ANL does not function.	A) Defective Q25, Q26, IC-6, IC-7 and/or associated circuit components. B) Defective D31 and/or associated circuit components. C) Defective NB/ANL switch.
15) ALC does not function.	A) Defective D7, D8, D9, D10, D11, D12, Q7, Q8 and/or associated circuit components.
16) SQUELCH does not function.	A) Defective VR502. B) Defective IC-9 and/or associated circuit components.
17) RF GAIN control does not function.	A) Defective Q14 and/or associated circuit components.
18) Clarifier does not function.	A) Defective Q5, Q6, D1, D2 and/or associated circuit components.
19) PA does not function. CB : OK	A) Defective PA switch. B) Defective PA SPKR jack. C) Defective Q41, IC-11 and/or associated circuit components.

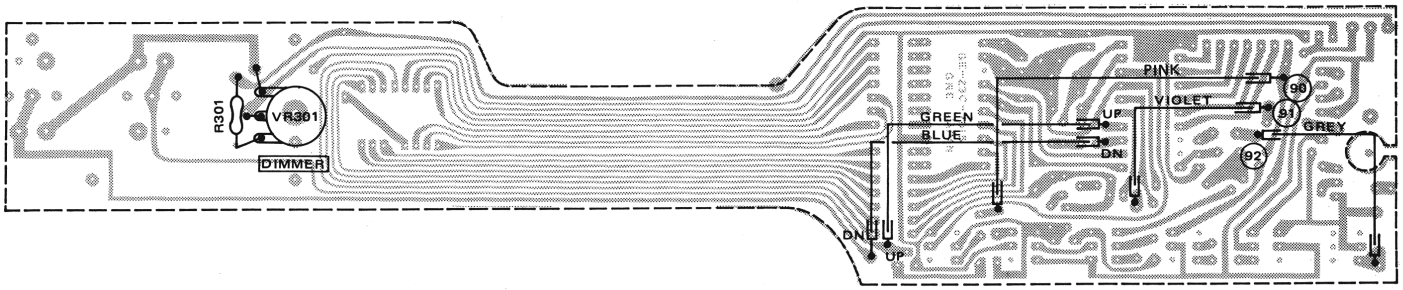
WIRING DIAGRAM

Main P.C.B.

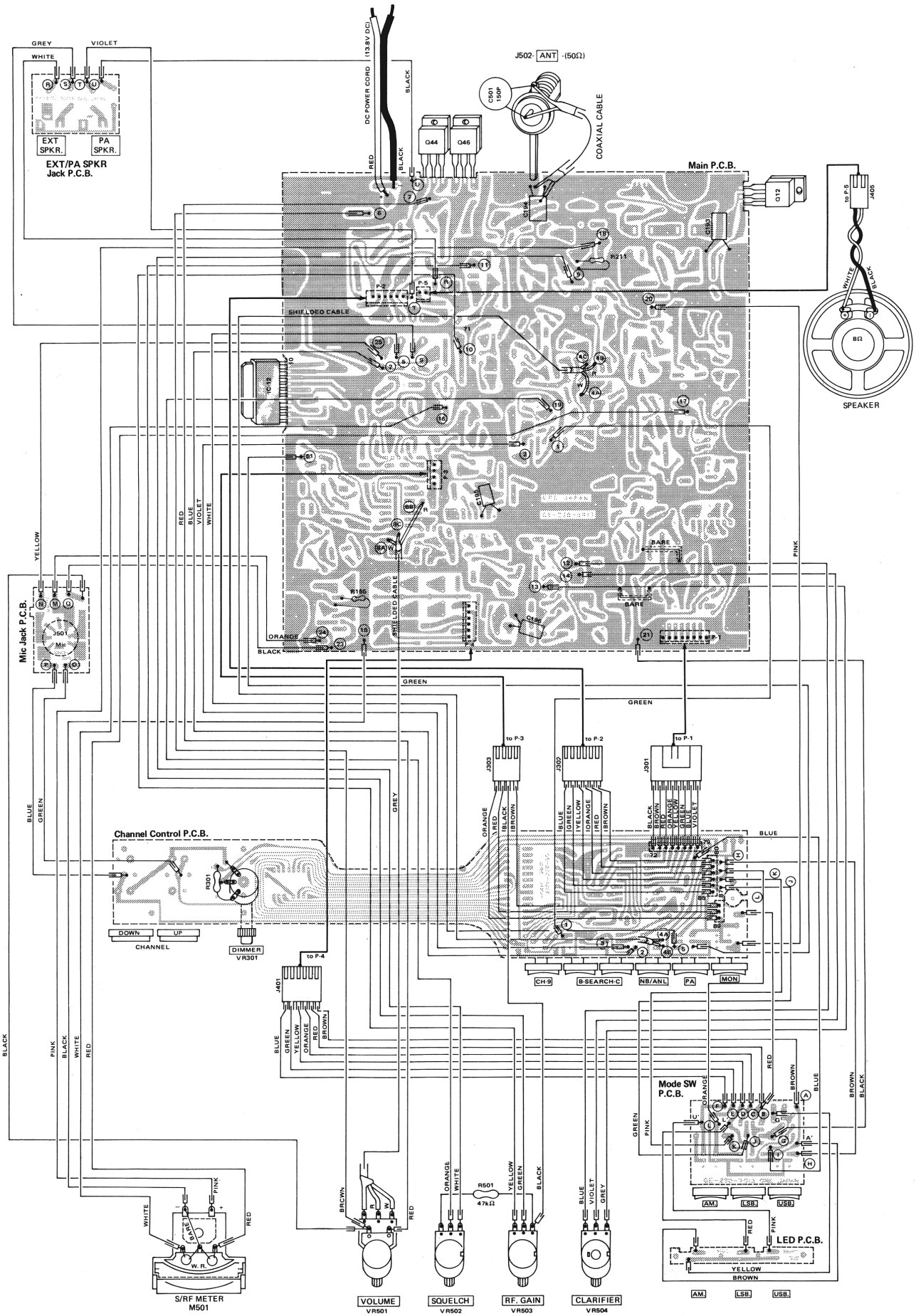


(27) – 27
(28) – 28
(29) – 29
} COAXIAL CABLE

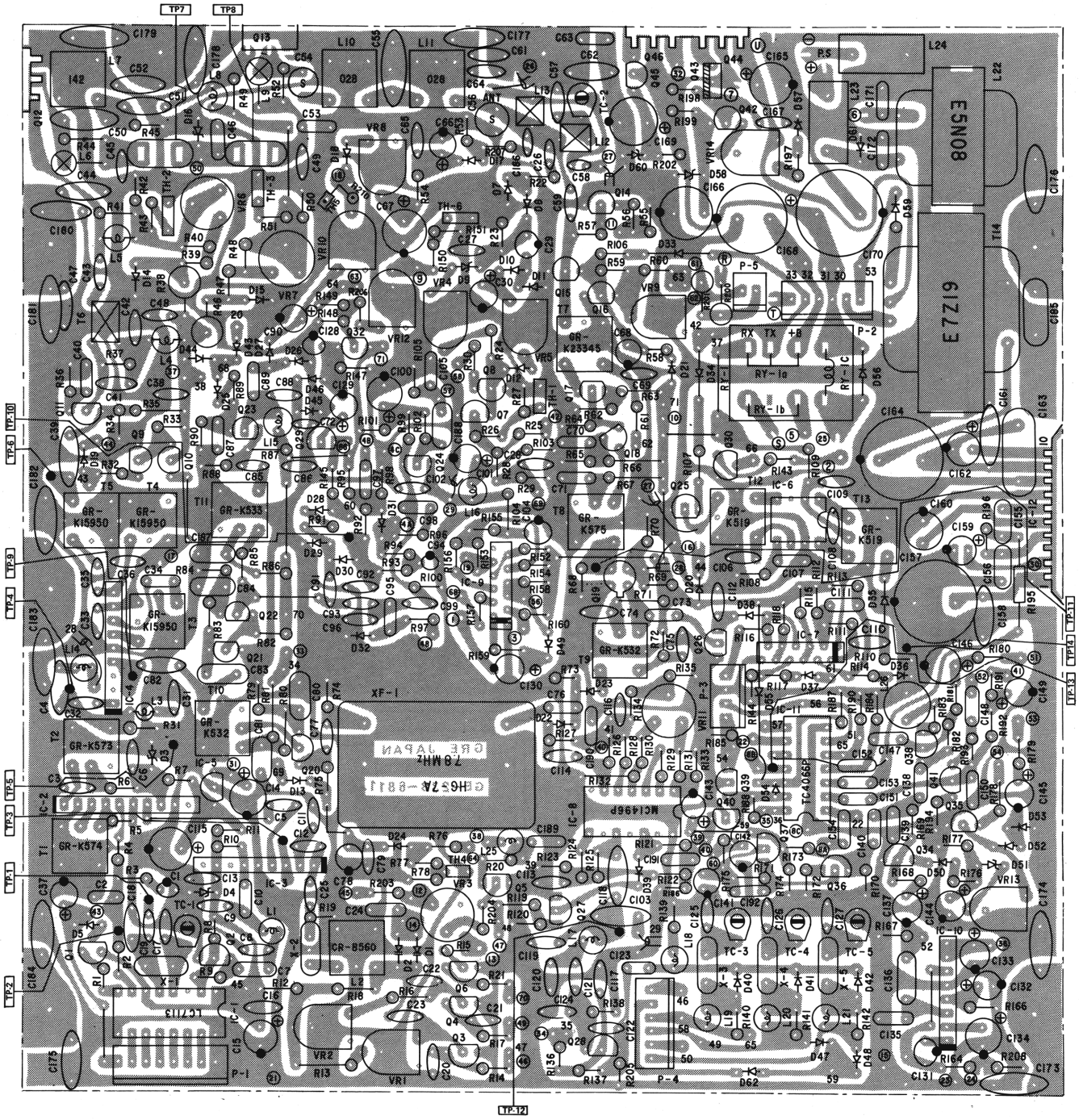
Channel Control P.C.B.



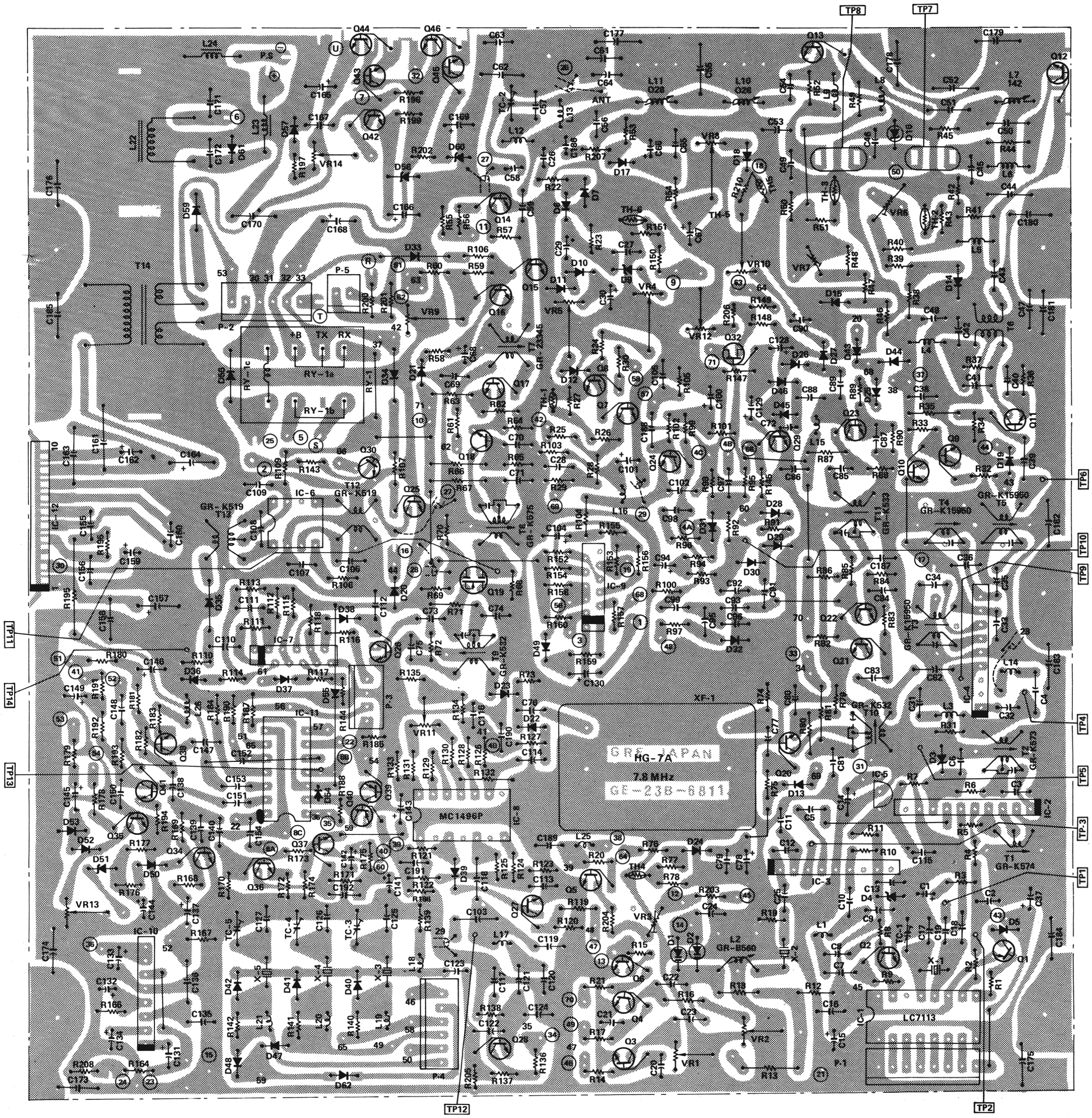
Master Interconnection



MAIN P.C. BOARD PARTS LOCATION (TOP VIEW)

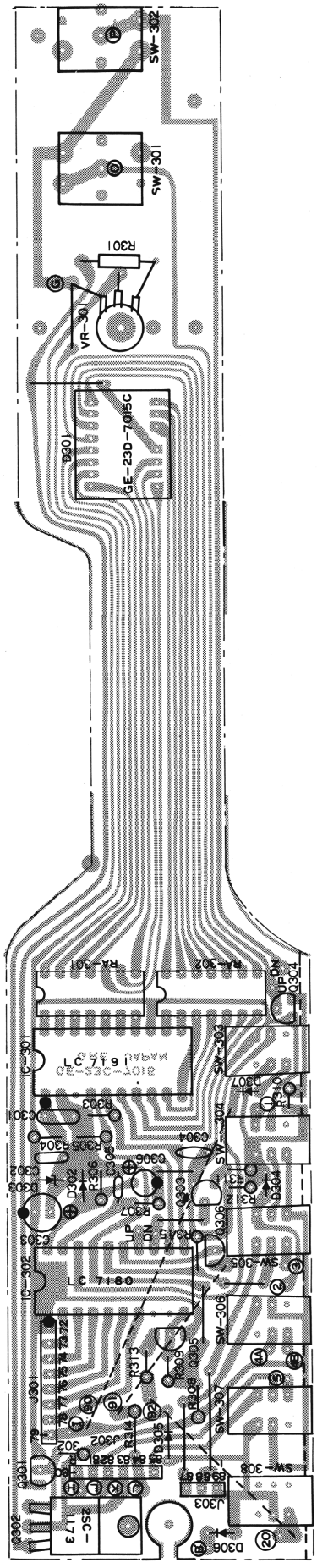


MAIN P.C. BOARD PARTS LOCATION (BOTTOM VIEW)

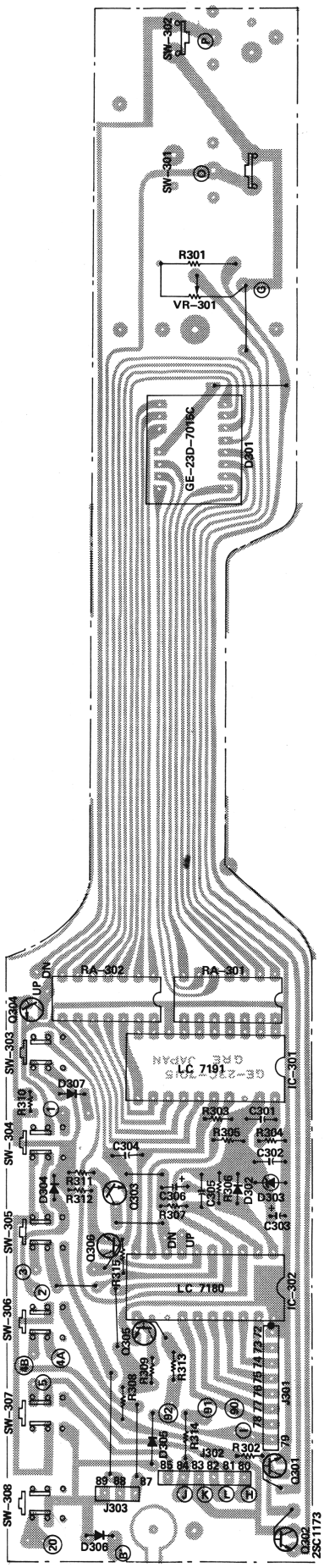


CHANNEL CONTROL P.C. BOARD PARTS LOCATION

(TOP VIEW)

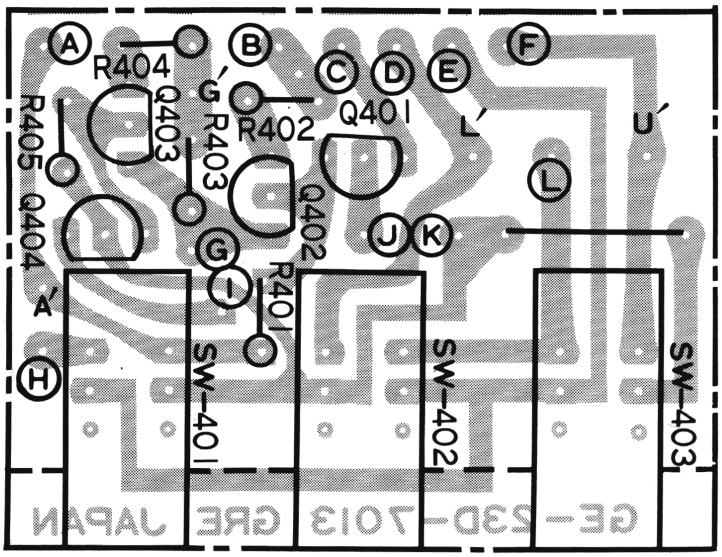


(BOTTOM VIEW)

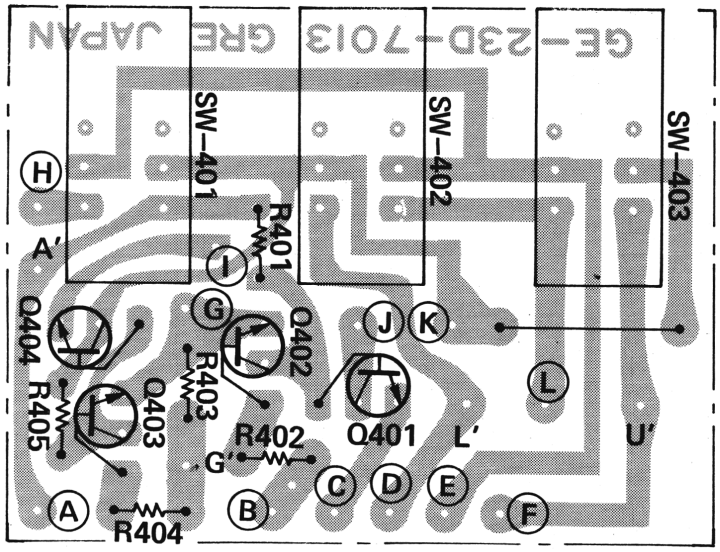


MODE SWITCH P.C. BOARD PARTS LOCATION

(TOP VIEW)

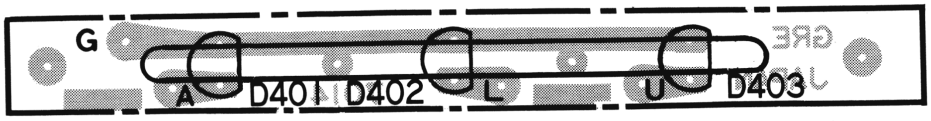


(BOTTOM VIEW)



LED P.C. BOARD PARTS LOCATION

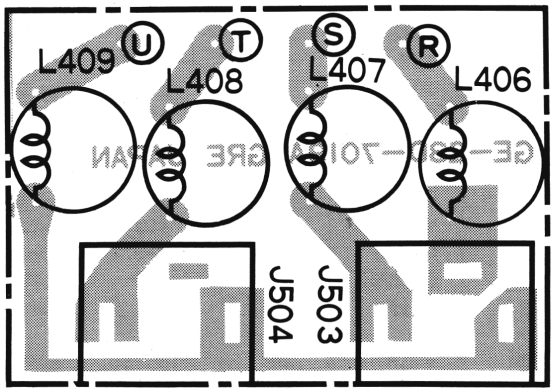
(TOP VIEW)



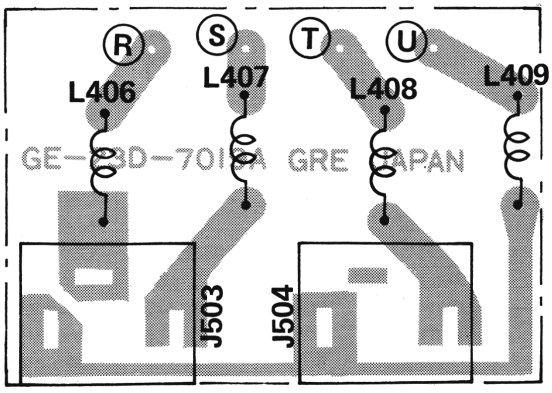
(BOTTOM VIEW)

PA/EXT SPKR JACK P.C. BOARD PARTS LOCATION

(TOP VIEW)

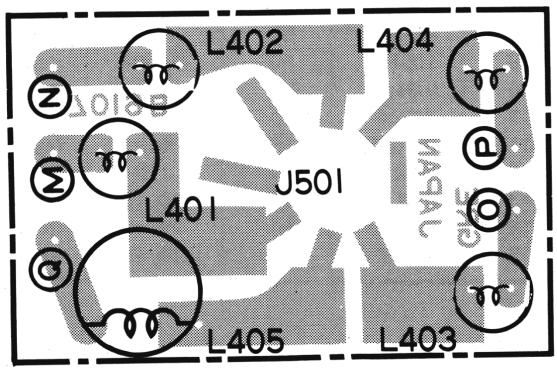


(BOTTOM VIEW)

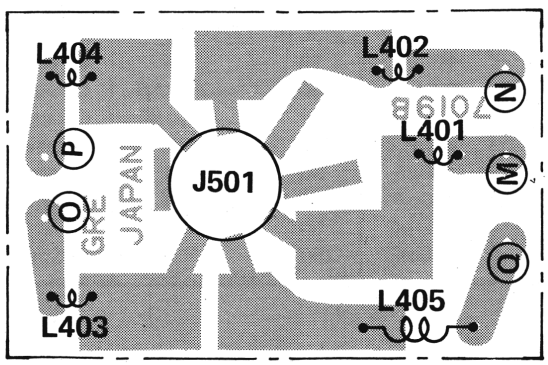


MIC JACK P.C. BOARD PARTS LOCATION

(TOP VIEW)



(BOTTOM VIEW)



ELECTRICAL PARTS LIST

CAPACITORS

NOTE: Temperature characteristic
(C) NP0
(R) N220
(TH) N470
(U) N750

Ref. No.	Value	Voltage (V)	Tolerance (%)	Material
C1	6.8μF	10	±20	Tantalum
C2	0.01μF	50	±10	Mylar
C3	0.01μF	50	−20, +80	Ceramic
C4	150pF	50	±10	Ceramic (C)
C5	33pF	50	±10	Ceramic (C)
C6	0.01μF	50	−20, +80	Ceramic
C7	0.01μF	50	±10	Mylar
C8	220pF	50	±10	Ceramic
C9	56pF	50	±10	Ceramic (C)
C10	0.01μF	50	±10	Mylar
C11	18pF	50	±10	Ceramic (C)
C12	27pF	50	±10	Ceramic (C)
C13	0.01μF	50	−20, +80	Ceramic
C14	33μF	16	−10, +50	Electrolytic
C15	33μF	16	−10, +50	Electrolytic
C16	0.01μF	50	−20, +80	Ceramic
C17	10pF	50	±0.5pF	Ceramic (R)
C18	150pF	50	±10	Ceramic (R)
C19	5pF	50	±0.25pF	Ceramic (C)
C20	0.01μF	50	−20, +80	Ceramic
C21	0.01μF	50	−20, +80	Ceramic
C22	10pF	50	±0.5pF	Ceramic (TH)
C23	4pF	50	±0.25pF	Ceramic (TH)
C24	0.01μF	50	±10	Mylar
C25	10pF	50	±0.5pF	Ceramic (U)
C26	4pF	50	±0.25pF	Ceramic (C)
C27	0.001μF	50	−20, +80	Ceramic
C28	0.01μF	50	−20, +80	Ceramic
C29	4.7μF	16	±20	Tantalum
C30	1μF	50	−10, +75	Electrolytic
C31	27pF	50	±10	Ceramic (C)
C32	15pF	50	±10	Ceramic (C)
C33	0.01μF	50	−20, +80	Ceramic
C34	0.01μF	50	±10	Mylar
C35	3pF	50	±0.25pF	Ceramic (C)
C36	0.01μF	50	−20, +80	Ceramic
C37	1μF	50	−10, +75	Electrolytic
C38	0.01μF	50	−20, +80	Ceramic
C39	220pF	50	±10	Ceramic (C)
C40	0.001μF	50	±10	Mylar
C41	68pF	50	±10	Ceramic (C)
C42	0.01μF	50	−20, +80	Ceramic
C43	0.01μF	50	−20, +80	Ceramic
C44	100pF	50	±10	Ceramic (C)
C45	0.01μF	50	−10, +80	Ceramic
C46	0.022μF	50	±10	Mylar
C47	100pF	50	±10	Ceramic (C)
C48	0.01μF	50	−20, +80	Ceramic
C49	0.01μF	50	−20, +80	Ceramic
C50	68pF	50	±10	Ceramic (C)
C51	180pF	50	±10	Ceramic (C)
C52	100pF	50	±10	Ceramic (C)
C53	0.01μF	50	±10	Mylar
C54	330pF	250	±5	Polystyrene
C55	470pF	500	±10	Ceramic
C56	150pF	250	±5	Polystyrene
C57	47pF	50	±10	Ceramic (C)
C58	5pF	50	±0.25pF	Ceramic (C)
C59	10pF	50	±0.5pF	Ceramic (C)
C60	Not used			
C61	100pF	50	±10	Ceramic (C)
C62	220pF	50	±10	Ceramic (C)
C63	0.01μF	50	±10	Mylar
C64	0.01μF	50	−20, +80	Ceramic
C65	0.01μF	50	−20, +80	Ceramic
C66	10μF	16	−10, +50	Electrolytic
C67	47μF	16	−10, +50	Electrolytic
C68	10μF	16	−10, +50	Electrolytic
C69	0.01μF	50	−20, +80	Ceramic
C70	0.022μF	50	±10	Mylar
C71	0.01μF	50	±10	Mylar
C72	5pF	50	±0.25pF	Ceramic (C)
C73	0.01μF	50	±10	Mylar
C74	0.01μF	50	−20, +80	Ceramic
C75	0.01μF	50	−20, +80	Ceramic
C76	0.01μF	50	±10	Mylar
C77	220pF	50	±10	Ceramic
C78	10μF	16	−10, +50	Electrolytic
C79	0.01μF	50	−20, +80	Ceramic
C80	0.039μF	50	±10	Mylar
C81	0.039μF	50	±10	Mylar
C82	68pF	50	±10	Ceramic (C)
C83	0.039μF	50	±10	Mylar
C84	0.039μF	50	±10	Mylar
C85	8pF	50	±0.5pF	Ceramic (C)
C86	0.01μF	50	−20, +80	Ceramic
C87	0.022μF	50	±10	Mylar
C88	47pF	50	±10	Ceramic (C)
C89	0.022μF	50	±10	Mylar
C90	1μF	50	−10, +75	Electrolytic
C91	22pF	50	±10	Ceramic (C)
C92	330pF	50	±10	Ceramic
C93	10pF	50	±0.5pF	Ceramic (C)
C94	0.1μF	35	±20	Tantalum
C95	0.01μF	50	±10	Mylar
C96	47pF	50	±10	Ceramic (C)
C97	0.01μF	50	±10	Mylar
C98	0.022μF	50	±10	Mylar
C99	22pF	50	±10	Ceramic (C)
C100	47μF	10	−10, +50	Electrolytic
C101	10μF	16	−10, +50	Electrolytic
C102	150pF	50	±10	Ceramic
C103	150pF	50	±10	Ceramic
C104	4.7μF	16	±20	Tantalum
C105	0.0056μF	50	±10	Mylar
C106	0.01μF	50	−20, +80	Ceramic
C107	0.01μF	50	±10	Mylar
C108	10pF	50	±0.5pF	Ceramic (C)
C109	0.01μF	50	−20, +80	Ceramic
C110	220pF	50	±10	Ceramic
C111	0.01μF	50	±10	Mylar
C112	100pF	50	±10	Ceramic
C113	0.01μF	50	−20, +80	Ceramic
C114	0.01μF	50	−20, +80	Ceramic
C115	100μF	10	−10, +50	Electrolytic

Ref. No.	Value	Voltage (V)	Tolerance (%)	Material
C116	0.01μF	50	−20, +80	Ceramic
C117	0.01μF	50	−20, +80	Ceramic
C118	100pF	50	±10	Ceramic (C)
C119	82pF	50	±10	Ceramic (C)
C120	82pF	50	±10	Ceramic (C)
C121	56pF	50	±10	Ceramic (C)
C122	20pF	50	±10	Ceramic (C)
C123	0.001μF	50	±10	Mylar
C124	39pF	50	±10	Ceramic (R)
C125	12pF	50	±10	Ceramic (C)
C126	12pF	50	±10	Ceramic (C)
C127	12pF	50	±10	Ceramic (C)
C128	2.2μF	16	±20	Tantalum
C129	10μF	16	−10, +50	Electrolytic
C130	10μF	16	−10, +50	Electrolytic
C131	22μF	6.3	±20	Tantalum
C132	10μF	16	−10, +50	Electrolytic
C133	10μF	16	−10, +50	Electrolytic
C134	33μF	16	−10, +50	Electrolytic
C135	0.01μF	50	±10	Mylar
C136	0.047μF	50	±10	Mylar
C137	1μF	50	−10, +75	Electrolytic
C138	0.0033μF	50	±10	Mylar
C139	0.0056μF	50	±10	Mylar
C140	0.01μF	50	±10	Mylar
C141	10μF	16	−10, +50	Electrolytic
C142	10μF	16	−10, +50	Electrolytic
C143	1μF	50	−10, +75	Electrolytic
C144	1μF	50	−10, +75	Electrolytic
C145	1μF	50	−10, +75	Electrolytic
C146	47μF	16	−10, +50	Electrolytic
C147	0.022μF	50	±10	Mylar
C148	0.056μF	50	±10	Mylar
C149	10μF	16	−10, +50	Electrolytic
C150	0.047μF	50	±10	Mylar
C151	0.01μF	50	±10	Mylar
C152	0.01μF	50	±10	Mylar
C153	0.033μF	50	±10	Mylar
C154	0.015μF	50	±10	Mylar
C155	0.047μF	50	±10	Mylar
C156	0.01μF	50	±10	Mylar
C157	1000μF	16	−10, +50	Electrolytic
C158	100pF	50	±10	Ceramic (C)
C159	4.7μF	35	−10, +75	Electrolytic
C160	100μF	10	−10, +50	Electrolytic
C161	220pF	50	±10	Ceramic (C)
C162	47μF	10	−10, +50	Electrolytic
C163	0.22μF	50	±10	Mylar
C164	1000μF	16	−10, +50	Electrolytic
C165	470μF	16	−10, +50	Electrolytic
C166	220μF	10	−10, +50	Electrolytic
C167	0.01μF	50	−20, +80	Ceramic
C168	470μF	16	−10, +50	Electrolytic
C169	220μF	16	−10, +50	Electrolytic
C170	1000μF	16	−10, +50	Electrolytic
C171	0.022μF	50	±10	Mylar
C172	0.022μF	50	±10	Mylar
C173	0.1μF	25	−20, +80	Ceramic
C174	0.22μF	50	±10	Mylar
C175	0.1μF	25	−20, +80	Ceramic
C176	0.22μF	50	±10	Mylar
C177	0.1μF	25	−20, +80	Ceramic
C178	0.1μF	25	−20, +80	Ceramic
C179	0.1μF	25	−20, +80	Ceramic
C180	0.1μF	25	−20, +80	Ceramic
C181	0.1μF	25	−20, +80	Ceramic
C182	0.1μF	25	−20, +80	Ceramic
C183	0.1μF	25	−20, +80	Ceramic
C184	0.1μF	25	−20, +80	Ceramic
C185	0.1μF	50	±10	Mylar
C186	4pF	50	±0.25pF	Ceramic (C)
C187	0.039μF	50	±10	Mylar
C188	0.1μF	50	±10	Mylar
C189	0.022μF	50	±10	Mylar
C190	0.022μF	50	±10	Mylar
C191	0.022μF	50	±10	Mylar
C192	0.01μF	50	±10	Mylar
C193	0.01μF	50	±10	Mylar
C194	0.01μF	50	±10	Mylar
C195	0.01μF	50	±10	Mylar
C196	0.01μF	50	±10	Mylar
C301	0.068μF	50	±10	Mylar
C302	0.022μF	50	±10	Mylar
C303	33μF	16	−10, +50	Electrolytic
C304	33pF	50	±10	Ceramic (C)
C305	0.0068μF	50	±10	Mylar
C306	1μF	50	−10, +75	Electrolytic
C501	150pF	50	±10	Ceramic (C)

COILS & TRANSFORMERS

Ref. No.	Description	RS Part No.	MFR's Part No.
L1	Inductor (100μH)	CB-2427	LF1-101K
L2	OSC Coil	CA-4999	GR-B560
L3	Inductor (0.68μH)	CB-2190	FL-3H-R68M
L4	Inductor (270μH)	CB-2429	LF1-271K
L5	Inductor (180μH)	CB-2428	LF1-181K
L6	Choke Coil	CB-2195	4LNC-027
L7	Choke Coil	CA-3931	10PND-142
L8	Inductor (180μH)	CB-2428	LF1-181K
L9	Choke Coil	CB-2195	4LNC-027
L10, 11	Choke Coil	CA-7968	10PNP-028
L12, 13	Choke Coil	CA-3488	4LNC-092
L14	Inductor (3.3μH)	C-0984	LF1-3R3
L15	Inductor (470μH)	C-0835	LF1-471K
L16	Inductor (100μH)	CB-2427	LF1-101K
L17	Inductor (10μH)	CB-2196	LF1-100K
L18 – 21	Inductor (470μH)	C-0835	LF1-471K
L22	Choke Transformer	CB-2364	E5N08
L23, 24	Choke Coil	CB-2170	6LNC-053
L25	Inductor (470μH)	C-0835	LF1-471K
L26	Inductor (33mH)		8GCS-0041
T1	VCO (19MHz)	CA-5001	GR-K574
T2	VCO (19MHz)	CA-5000	GR-K573
T3, 4, 5	BPF (27MHz)	CA-3885	GR-K15950
T6	TX (27MHz)	TA-0715	TR-2
T7	RF (27MHz)	CA-3811	GR-K23345
T8	RF (27MHz)	CA-4998	GR-K575
T9, 10	IF (7.8MHz)	CA-3809	GR-K532
T11	IF (7.8MHz)	CA-3810	GR-K533
T12, 13	NB	CA-3738	GR-K519
T14	Modulation	TD-0184	E7Z19
L401 – 404	Inductor (10μH)	CB-2196	LF1-100K
L405 – 409	Choke Coil	CA-3182	3B-037

CRYSTALS & CRYSTAL FILTERS

Ref. No.	Description	RS Part No.	MFR's Part No.
X1	Crystal	MX-2382	10.240MHz
X2	Crystal	MX-2383	17.8875MHz
X3	Crystal	MX-2384	7.800MHz
X4	Crystal	MX-2385	7.8025MHz
X5	Crystal	MX-2386	7.7975MHz
XF1	Filter (7.8MHz)	C-0964	HG-7A

DIODES

Ref. No.	Description	RS Part No.	Type No.
D1, 2	Vari-cap	DX-1196	1S2789W
D3, 4	Zener (6.2V)	DX-1194	05Z6.2L
D5	Silicon	DX-0270	1S1555
D6	Not used		
D7, 8	Silicon	DX-0270	1S1555
D9	Zener (5.1V)	DX-1193	05Z5.1L
D10 – 12	Germanium	DX-0161	1N60
D13	Silicon	DX-0270	1S1555
D14, 15	Silicon	DX-1131	S5277B
D16	Zener (33V)	DX-1195	1Z33-A
D17 – 21	Silicon	DX-0270	1S1555
D22 – 24	Germanium	DX-0161	1N60
D25	Silicon	DX-0270	1S1555
D26, 27	Germanium	DX-0161	1N60
D28	Silicon	DX-0270	1S1555
D29 – 31	Germanium	DX-0161	1N60
D32 – 34	Silicon	DX-0270	1S1555
D35, 36	Germanium	DX-0161	1N60
D37	Silicon	DX-0270	1S1555
D38	Germanium	DX-0161	1N60
D39 – 44	Silicon	DX-0270	1S1555
D45, 46	Germanium	DX-0161	1N60
D47, 48	Silicon	DX-0270	1S1555
D49, 50	Silicon	DX-0270	1S1555
D51	Zener (5.1V)	DX-1193	05Z5.1L
D52, 53	Germanium	DX-0161	1N60
D54, 55	Silicon	DX-0270	1S1555
D56	Silicon	DX-1131	S5277B
D57	Silicon	DX-0270	1S1555
D58	Zener (4V)	DX-1228	HZ4C2
D59	Silicon	DX-1229	3BZ61
D60	Zener (10V)	DX-1034	05Z10L
D61	Silicon	DX-1131	S5277B
D62	Silicon	DX-0270	1S1555
D301	LED	L-0880	SG-2-N52-02
D302	Silicon	DX-0270	1S1555
D303	Zener (6.2V)	DX-1194	05Z6.2L
D304 – 307	Silicon	DX-0270	1S1555
D401 – 403	LED	L-0983	TLR-124

INTEGRATED CIRCUITS

Ref. No.	Type No.	Substitute Type No.
IC1	LC7113	
IC2	KH3207	
IC3, 4	TA7310P	
IC5	TA78L009P	
IC6	SN76600P	
IC7	TA78 or TA58	
IC8	MC1496P	LM1496N
IC9	TA78 or TA58	
IC10	μPC1170H	
IC11	TC4066P or BP	MC14066
IC12	TA7222P or AP	
IC301	LC7191	
IC302	LC7180	

METER

Ref. No.	Description	RS Part No.	MFR's Part No.
M501	S/RF Meter	M-0415	36E080

RELAY

Ref. No.	Description	RS Part No.	MFR's Part No.
RY1	Relay (TX-RX Switching)	R-8088	MX-2P-0

THERMISTORS

Ref. No.	Description	RS Part No.	MFR's Part No.
TH1	Thermistor	T-1207	M-100
TH2, 3	Thermistor	T-1138	M-60
TH4	Thermistor	T-1012	M-10K
TH5	Thermistor	T-1210	M-2K
TH6	Thermistor	T-1012	M-10K

RESISTORS

NOTE: Unless otherwise specified all resistors are carbon film, wattage 1/4W, tolerance ±5%.

Ref. No.	Value	RS Part No.	Wattage (W)	Tolerance (%)	Material
R1	100kΩ	NEE-0371			
R2	10kΩ	NEE-0281			
R3	470Ω	NEE-0169			
R4	39kΩ	NEE-0330			
R5	3.3kΩ	NEE-0230			
R6	220Ω	NEE-0149			
R7	150Ω	NEE-0142			
R8	1kΩ	NEE-0196			
R9	82kΩ	NEE-0360			
R10	1kΩ	NEE-0196			
R11	56Ω	NEE-0107			
R12	4.7kΩ	NEE-0247			
R13	5.6kΩ	NEE-0257			
R14	10kΩ	NEE-0281			
R15	10kΩ	NEE-0281			
R16	2.2kΩ	NEE-0216			
R17	10kΩ	NEE-0281			
R18	100kΩ	NEE-0371			
R19	18kΩ	NEE-0303			
R20	10kΩ	NEE-0281			
R21	10kΩ	NEE-0281			
R22	1.2kΩ	NEE-0199			
R23	33kΩ	NEE-0324			
R24	33kΩ	NEE-0324			
R25	5.6kΩ	NEE-0257			
R26	1.2kΩ	NEE-0199			
R27	2.7kΩ	NEE-0224			
R28	2.2kΩ	NEE-0216			
R29	12kΩ	NEE-0288			
R30	10kΩ	NEE-0281			
R31	220Ω	NEE-0149			
R32	33kΩ	NEE-0324			
R33	4.7kΩ	NEE-0247			
R34	470Ω	NEE-0169			
R35	2.7kΩ	NEE-0224			
R36	10Ω	NEE-0063			
R37	2.2kΩ	NEE-0216			
R38	82Ω	NEH-0122	2	±5	Metal
R39	2.2Ω	NEE-0032			
R40	4.7Ω	NEE-0047			
R41	82Ω	NEE-0122			
R42	39Ω	NEE-0092			
R43	10Ω	NEE-0063			
R44	220Ω	NEE-0149			
R45	1kΩ	NEE-0196			
R46	82Ω	NEH-0122	2	±5	Metal
R47	1Ω	NEE-0022			
R48	2.2Ω	NEE-0032			
R49	39Ω	NEE-0092			
R50	39Ω	NEE-0092			
R51	10Ω	NEE-0063			
R52	1kΩ	NEE-0196			
R53	2.2kΩ	NEE-0216			
R54	560Ω	NEE-0176			
R55	3.3Ω	NEE-0230			
R56	10kΩ	NEE-0281			

Ref. No.	Value	RS Part No.	Watt-age (W)	Toler-ance (%)	Material
R57	47Ω	NEE-0099			
R58	10kΩ	NEE-0281			
R59	39kΩ	NEE-0330			
R60	12kΩ	NEE-0288			
R61	4.7kΩ	NEE-0247			
R62	56Ω	NEE-0107			
R63	820Ω	NEE-0187			
R64	1kΩ	NEE-0196			
R65	5.6kΩ	NEE-0257			
R66	4.7kΩ	NEE-0247			
R67	100Ω	NEE-0132			
R68	47kΩ	NEE-0340			
R69	220kΩ	NEE-0396			
R70	18kΩ	NEE-0303			
R71	220Ω	NEE-0149			
R72	220Ω	NEE-0149			
R73	220Ω	NEE-0149			
R74	330Ω	NEE-0159			
R75	330Ω	NEE-0159			
R76	15kΩ	NEE-0297			
R77	22kΩ	NEE-0311			
R78	10kΩ	NEE-0281			
R79	56Ω	NEE-0107			
R80	4.7kΩ	NEE-0247			
R81	100Ω	NEE-0132			
R82	3.3kΩ	NEE-0230			
R83	47kΩ	NEE-0340			
R84	150Ω	NEE-0142			
R85	100Ω	NEE-0132			
R86	220Ω	NEE-0149			
R87	27kΩ	NEE-0316			
R88	10kΩ	NEE-0281			
R89	820Ω	NEE-0187			
R90	470Ω	NEE-0169			
R91	5.6kΩ	NEE-0257			
R92	100kΩ	NEE-0371			
R93	820kΩ	NEE-0440			
R94	220kΩ	NEE-0396			
R95	680kΩ	NEE-0433			
R96	39kΩ	NEE-0330			
R97	33kΩ	NEE-0324			
R98	56kΩ	NEE-0345			
R99	68kΩ	NEE-0354			
R100	10kΩ	NEE-0281			
R101	1kΩ	NEE-0196			
R102	10kΩ	NEE-0281			
R103	1kΩ	NEE-0196			
R104	2.2kΩ	NEE-0216			
R105	68kΩ	NEE-0354			
R106	2.7kΩ	NEE-0224			
R107	2.7kΩ	NEE-0224			
R108	2.2kΩ	NEE-0216			
R109	56Ω	NEE-0107			
R110	330kΩ	NEE-0410			
R111	1.5MΩ	NEE-0450			
R112	10kΩ	NEE-0281			
R113	180kΩ	NEE-0387			
R114	6.8kΩ	NEE-0262			
R115	68kΩ	NEE-0354			
R116	2.2kΩ	NEE-0216			
R117	22kΩ	NEE-0311			

Ref. No.	Value	RS Part No.	Watt-age (W)	Toler-ance (%)	Material
R118	10kΩ	NEE-0281			
R119	22kΩ	NEE-0311			
R120	10kΩ	NEE-0281			
R121	1kΩ	NEE-0196			
R122	1.2kΩ	NEE-0199			
R123	3.3kΩ	NEE-0230			
R124	56Ω	NEE-0107			
R125	56Ω	NEE-0107			
R126	680Ω	NEE-0183			
R127	1kΩ	NEE-0196			
R128	8.2kΩ	NEE-0271			
R129	1kΩ	NEE-0196			
R130	560Ω	NEE-0176			
R131	560Ω	NEE-0176			
R132	1kΩ	NEE-0196			
R133	1kΩ	NEE-0196			
R134	470Ω	NEE-0169			
R135	470Ω	NEE-0169			
R136	2.2kΩ	NEE-0216			
R137	39kΩ	NEE-0330			
R138	2.2kΩ	NEE-0216			
R139	1kΩ	NEE-0196			
R140	47kΩ	NEE-0340			
R141	47kΩ	NEE-0340			
R142	47kΩ	NEE-0340			
R143	10kΩ	NEE-0281			
R144	390kΩ	NEE-0414			
R145	4.7kΩ	NEE-0247			
R146	Not used				
R147	220kΩ	NEE-0396			
R148	47kΩ	NEE-0340			
R149	4.7kΩ	NEE-0247			
R150	12kΩ	NEE-0288			
R151	6.8kΩ	NEE-0262			
R152	2.7kΩ	NEE-0224			
R153	1.5MΩ	NEE-0450			
R154	6.8kΩ	NEE-0262			
R155	2.2kΩ	NEE-0216			
R156	15kΩ	NEE-0297			
R157	10kΩ	NEE-0281			
R158	3.3kΩ	NEE-0230			
R159	33kΩ	NEE-0324			
R160	10kΩ	NEE-0281			
R161	Not used				
R162	Not used				
R163	Not used				
R164	10kΩ	NEE-0281			
R165	2.2kΩ	NEE-0216			
R166	100kΩ	NEE-0371			
R167	4.7kΩ	NEE-0247			
R168	4.7kΩ	NEE-0247			
R169	4.7kΩ	NEE-0247			
R170	270kΩ	NEE-0402			
R171	10kΩ	NEE-0281			
R172	390Ω	NEE-0162			
R173	1MΩ	NEE-0445			
R174	1kΩ	NEE-0196			
R175	100Ω	NEE-0132			
R176	680Ω	NEE-0183			
R177	56kΩ	NEE-0345			
R178	4.7kΩ	NEE-0247			
R179	680Ω	NEE-0183			

Ref. No.	Value	RS Part No.	Watt-age (W)	Toler-ance (%)	Material
R180	120Ω	NEE-0136			
R181	330Ω	NEE-0159			
R182	1MΩ	NEE-0445			
R183	22Ω	NEE-0078			
R184	10kΩ	NEE-0281			
R185	10kΩ	NEE-0281			
R186	10kΩ	NEE-0281			
R187	220kΩ	NEE-0396			
R188	10kΩ	NEE-0281			
R189	Not used				
R190	10kΩ	NEE-0281			
R191	220Ω	NEE-0149			
R192	4.7kΩ	NEE-0247			
R193	1MΩ	NEE-0445			
R194	220Ω	NEE-0149			
R195	2.2kΩ	NEE-0216			
R196	2.2kΩ	NEE-0216			
R197	560Ω	NEE-0176			
R198	330Ω	NEE-0159			
R199	820Ω	NEE-0187			
R200	2.2Ω	NEG-0032	1	±5	Metal
R201	22Ω	NEG-0078	1	±5	Metal
R202	220Ω	NEE-0149			
R203	15kΩ	NEE-0297			
R204	5.6kΩ	NEE-0257			
R205	27kΩ	NEE-0316			
R206	4.7kΩ	NEE-0247			
R207	560Ω	NEE-0176			
R208	1kΩ	NEE-0196			
R209	Not used				
R210	3.3kΩ	NEE-0230			
R211	4.7kΩ	NEE-0247			
R301	8.2kΩ	NEE-0271			
R302	1k Ω	NEE-0196			
R303	10kΩ	NEE-0281			
R304	68kΩ	NEE-0354			
R305	10kΩ	NEE-0281			
R306	100kΩ	NEE-0371			
R307	470kΩ	NEE-0423			
R308	220Ω	NEE-0149			
R309	33kΩ	NEE-0324			
R310	10kΩ	NEE-0281			
R311	10kΩ	NEE-0281			
R312	10kΩ	NEE-0281			
R313	10kΩ	NEE-0281			
R314	10kΩ	NEE-0281			
R315	47kΩ	NEE-0340			
R401	10kΩ	NEE-0281			
R402	10kΩ	NEE-0281			
R403	1kΩ	NEE-0196			
R404	10kΩ	NEE-0281			
R405	330Ω	NEE-0159			
R501	47kΩ	NEE-0340			

RESISTOR ARRAYS

Ref. No.	Description	RS Part No.	MFR's Part No.
RA301	560Ω x 7	RX-0109	EXB-RB7-561M
RA302	560Ω x 7	RX-0109	EXB-RB7-561M

SWITCHES

Ref. No.	Description	RS Part No.	MFR's Part No.
SW301	UP	S-9101	AKC8S
SW302	DOWN	S-9101	AKC8S
	Function SW Ass'y	S-7408	6B-005D-C2060
SW303	CH9		
SW304	BC		
SW305	CC		
SW306	NB/ANL		
SW307	PA		
SW308	MON		
	Mode SW Ass'y	S-7409	3BB-0001-DF2060
SW401	AM		
SW402	LSB		
SW403	USB		

TRANSISTORS

Ref. No.	Type No.	Substitute Type No.
Q1	2SA1015 (Y)	2SA495 (Y)
Q2	2SC1815 (GR)	2SC373
Q3, 4	2SC1923 (O)	2SC784 (O)
Q5 – 9	2SC1815 (GR)	2SC373
Q10	2SC735 (O) or (Y)	
Q11	2SC2086	
Q12	2SC2393	
Q13	2SC2394	
Q14, 15	2SC1923 (O)	2SC784 (O)
Q16	2SC1815 (GR)	2SC373
Q17	2SC1923 (O)	2SC784 (O)
Q18	2SC1815 (GR)	2SC373
Q19	3SK59 (GR)	
Q20 – 23	2SC1815 (Y)	2SC372 (Y)
Q24	2SC732 (GR)	
Q25, 26	2SC1923 (O)	2SC784 (O)
Q27	2SC1815 (GR)	2SC373
Q28	2SC1815 (Y)	2SC372 (Y)
Q29, 30	2SC1815 (GR)	2SC373
Q31	Not used	
Q32	2SK19 (GR)	
Q33	Not used	
Q34 – 38	2SC1815 (GR)	2SC373
Q39, 40	2SA1015 (Y)	2SA495 (Y)
Q41, 42	2SC1815 (GR)	2SC373
Q43	2SC509 (O) or (Y)	
Q44	2SD525 (O) or (Y)	
Q45	2SC1815 (GR)	2SC373
Q46	2SD234 (O) or (Y)	
Q301	2SC1815 (GR)	2SC373
Q302	2SC1173 (O)	
Q303 – 306	2SC1815 (GR)	2SC373
Q401 – 404	2SC1815 (GR)	2SC373

VARIABLE RESISTORS

Ref. No.	Description	RS Part No.	MFR's Part No.
VR1	Semi-fixed 20kΩB	P-6530	EVN-K4AA-00-B24
VR2	Semi-fixed 10kΩB	P-6531	EVN-K4AA-00-B14
VR3	Semi-fixed 10kΩB	P-6446	SR-19 10k
VR4	Semi-fixed 5kΩB	P-6456	EVN-K4AA-00-B53
VR5	Semi-fixed 50kΩB	P-6457	EVN-K4AA-00-B54
VR6, 7	Semi-fixed 50ΩB	P-0836	TM10K (PV)-B50
VR8	Semi-fixed 20kΩB	P-6530	EVN-K4AA-00-B24
VR9	Semi-fixed 50kΩB	P-6457	EVN-K4AA-00-B54
VR10	Semi-fixed 5kΩB	P-6456	EVN-K4AA-00-B53
VR11	Semi-fixed 100ΩB	P-1351	SR-19R 100Ω
VR12, 13	Semi-fixed 20kΩB	P-6530	EVN-K4AA-00-B24
VR14	Semi-fixed 500ΩB	P-6455	EVN-K4AA-00-B52
VR301	DIMMER Control 5kΩB	S-9102	V12M4-1 N20FHB 5kΩ
VR501/ SW501	VOLUME Control 10kΩA with Power Switch	P-6538	VN21A024-5N1111-10kA
VR502	SQUELCH Control 50kΩC	P-6539	VN20A550-50kC
VR503	RF GAIN Control 50kΩB	P-6540	VN20A550-50kB
VR504	CLARIFIER Control 10kΩB	P-6541	VN20E505-10kB

VARIABLE CAPACITORS

Ref. No.	Description	RS Part No.	MFR's Part No.
TC1	Trimmer (20pF)	C-0965	ECV-1ZW-20X53N
TC2	Trimmer (25pF)	C-0966	ECV-1ZW-25X53N
TC3 – 5	Trimmer (20pF)	C-0965	ECV-1ZW-20X53N

MISCELLANEOUS			
Ref. No.	**Description**	**RS Part No.**	**MFR's Part No.**
P1	Connector (male : 8P)	J-6675	IL-8P-S3EN2
P2	Connector (male : 6P)	J-6676	IL-6P-S3EN2
P3	Connector (male : 4P)	J-6677	IL-4P-S3EN2
P4	Connector (male : 6P)	J-6676	IL-6P-S3EN2
P5	Connector (male : 2P)	J-6678	IL-2P-S3EN2
J301	8P Wire Connector Ass'y	J-6671	GE-23D-7473
J302	6P Wire Connector Ass'y	J-6674	GE-23D-7474
J303	4P Wire Connector Ass'y	J-6672	GE-23D-7475
J401	6P Wire Connector Ass'y	J-6674	GE-23D-7476
J405	2P Wire Connector Ass'y	J-6670	GE-23D-7477
J501	Mic Jack	J-6682	CS2270-01-101
J502	ANT Jack	J-6487	N-Y-R
J503, 504	EXT/PA SPKR Jack	J-0840	S-G8022
TP1 – 6	Test Pin		CHP-02A
TP7, 8	Crystal Socket for Test Point		S2-101P-01
TP9 – 14	Test Pin		CHP-02A

MECHANICAL PARTS LIST

Ref. No.	Description	RS Part No.	MFR's Part No.
(1)	Front Panel	Z-4591	GE-23B-7011
(2)	Control Knobs (VOL, SQ, RF GAIN, CLARI)	K-3327	GE-23D-7036
(3)	DIMMER Control Knob	K-3418	GE-23D-7037
(4)	Mode/Function SW Buttons (AM, LSB, USB, CH9, BC, CC, NB/ANL, PA, MON)	S-7410	GE-23D-7038
(5)	Channel Selection SW Button (UP)	K-3419	GE-23D-7039
(6)	Channel Selection SW Button (DOWN)	K-3420	GE-23D-7122
(7)	VOLUME Control with Power SW	P-6538	VN21A024-5N1111-10kA
(8)	SQUELCH Control	P-6539	VN20A550-50kC
(9)	RF GAIN Control	P-6540	VN20A550-50kB
(10)	CLARIFIER Control	P-6541	VN20E505-10kB
(11)	Bracket for Controls	RT-2023	GE-23D-7040
(12)	Bracket for CH Control P.C. Board		GE-23D-7451
(13)	Meter (Signal strength/RF power)	M-0415	36E080
(14)	CH Control P.C. Board Ass'y	X-8045	GE-23E-7467
(15)	Mode SW P.C. Board Ass'y	X-8046	GE-23E-7468
(16)	LED P.C. Board Ass'y	X-8047	GE-23E-7469
(17)	Main Chassis		GE-23A-7030
(18)	Main P.C. Board Ass'y	X-8044	GE-23E-7466

Ref. No.	Description	RF Part No.	MFR's Part No.
(19)	Mic Jack P.C. Board Ass'y	X-8049	GE-23E-7470
(20)	PA/EXT SPKR Jack P.C. Board Ass'y	X-8048	GE-23E-7471
(21)	Mic Jack	J-6682	CS2270-01-101
(22)	ANT Jack	J-6487	N-Y-R
(23)	Speaker	S-4709	PD-960ST
(24)	Top Cover	Z-4592	GE-23B-7031
(25)	Bottom Cover	Z-4593	GE-23B-7032
(26)	Speaker Holder	HB-7385	GE-21D-6295
	DC Power Cord Ass'y		GE-23E-7482
	DC Power Cord		GE-23D-7246
	Fuse		4A
	Fuse Label		4A
	Cord Strain Relief		3P-4
	Protection Cloth for Speaker		GE-23D-7452
	Protection Cloth for Cover (top/bottom)		GE-23D-7453
	Protection Fiber for CH Control P.C. Board		GE-23D-7450
	Protection Tape for CH Control P.C. Board		GE-23D-7590
	Model Label		GE-23D-7051
	Screws		
(27)	Round-Head Self Tapping Screws		3 x 6 mm
(28)	Binding-Head Self Tapping Screws		2.6 x 7 mm
(29)	Binding-Head Screws		3 x 6 mm
(30)	Binding-Head Screws		3.x 8 mm
(31)	Binding-Head Screws (black)		3 x 6 mm
(32)	Pan-Head Screws (nylon)		3 x 6 mm
(33)	Flat-Head Screws		2.6 x 6 mm
(34)	Flat-Head Screws		3 x 6 mm
(35)	Internal Star Lock Washers		16 ϕ
(36)	Internal Star Lock Washers		3 ϕ
(37)	Hex Nuts		3 ϕ
(38)	Binding-Head Self Tapping Screws (black)		3.5 x 10 mm
	Post Pin (Assembled in Main P.C.B.)		MX-1.14T18

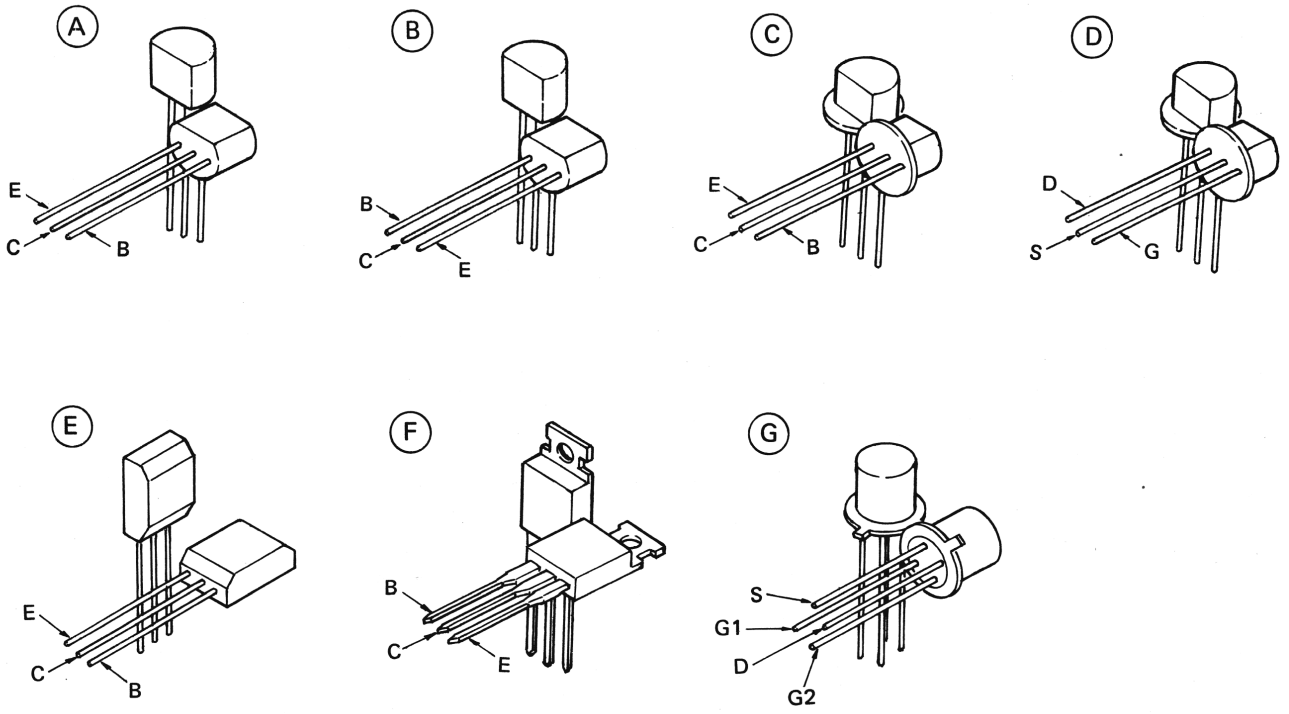
ACCESSORY LIST

Ref. No.	Description	RS Part No.	MFR's Part No.
	Microphone with UP/DowN Key	M-2299	M195D50G0310
	Mic Hanger with Mounting Screws	M-3119	UZ-0060
(39)	Car Mounting Bracket	MB-0189	GE-21D-6153
(40)	Car Mounting Bracket Screws		GE-23D-7587
(41)	Protection Fiber for Car Mounting Bracket		GE-23D-7673

SEMICONDUCTOR LEAD IDENTIFICATION

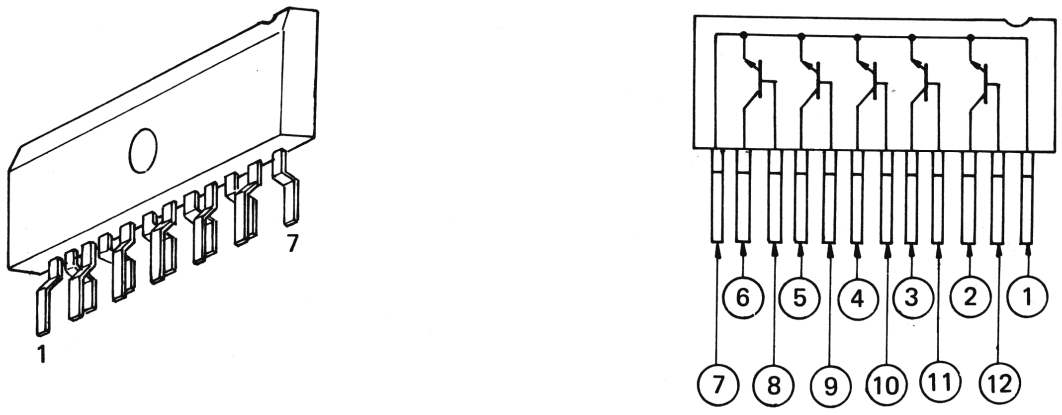
(1) TRANSISTOR

(A) ; 2SA1015(Y), 2SC1923(O), 2SC1815(Y), 2SC1815(GR)
(B) ; 2SC2086
(C) ; 2SC735(O) or (Y), 2SC732(GR)
(D) ; 2SK19(GR)
(E) ; 2SC509(O) or (Y)
(F) ; 2SD525(O) or (Y), 2SC1173(O), 2SC2393, 2SC2394, 2SD234(O) or (Y)
(G) ; 3SK59(GR)



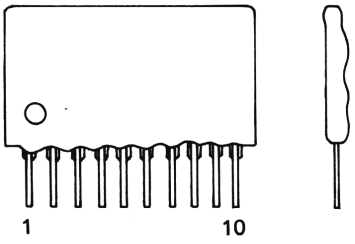
(2) IC/TRANSISTOR ARRAY

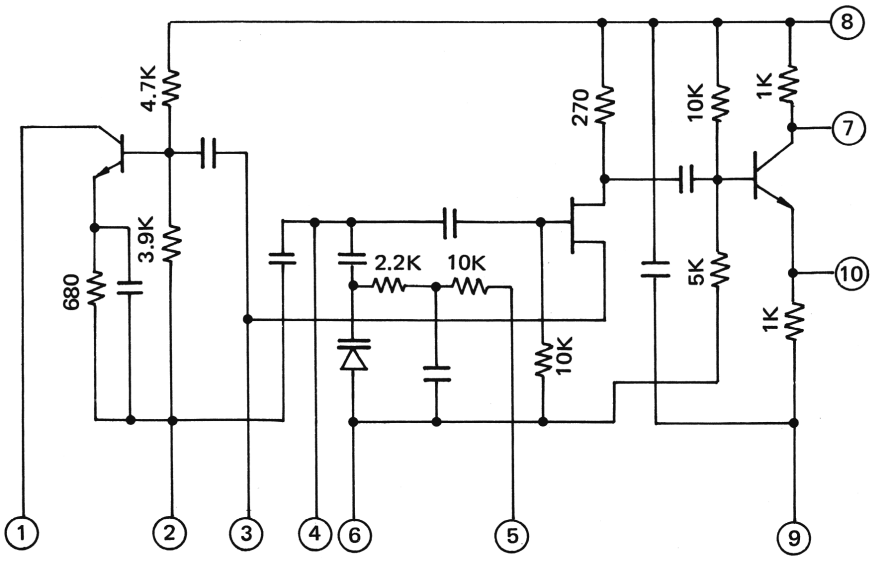
TA58/TA78



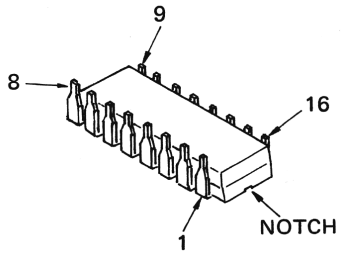
IC LEAD IDENTIFICATION AND EQUIVALENT CIRCUIT

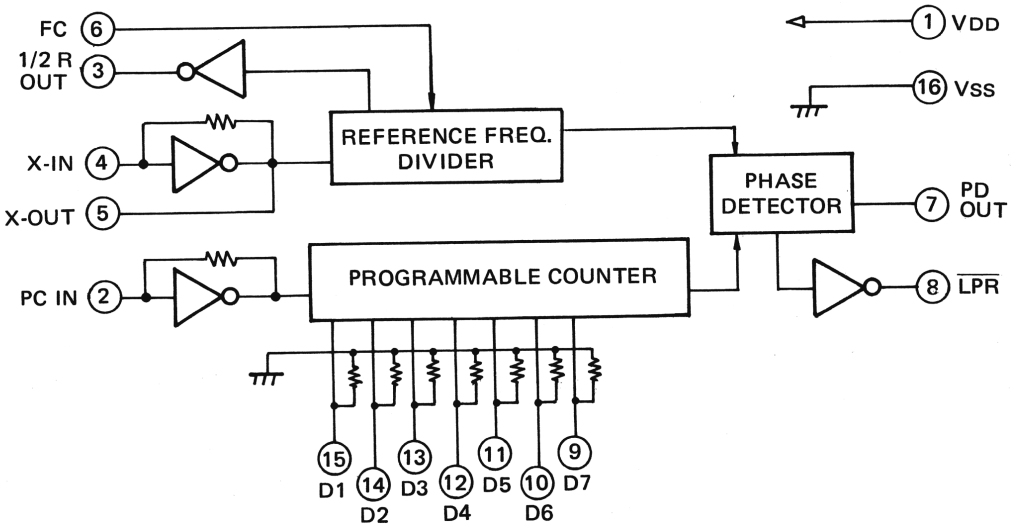
1. KH3207



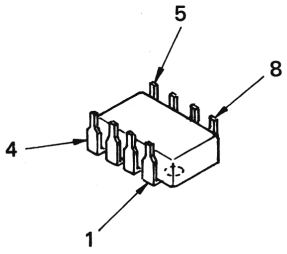


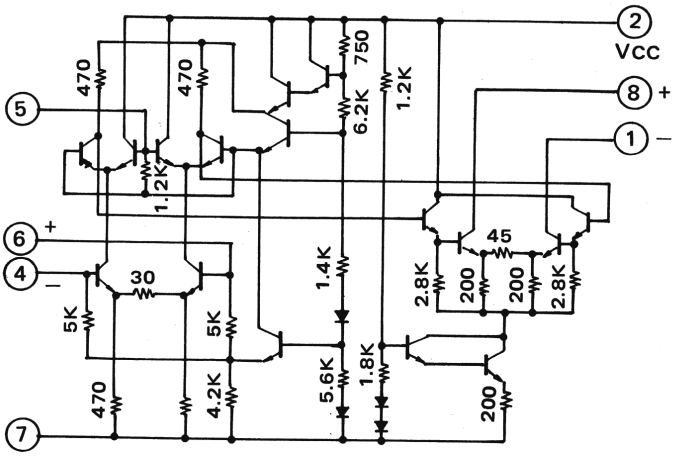
2. LC7113



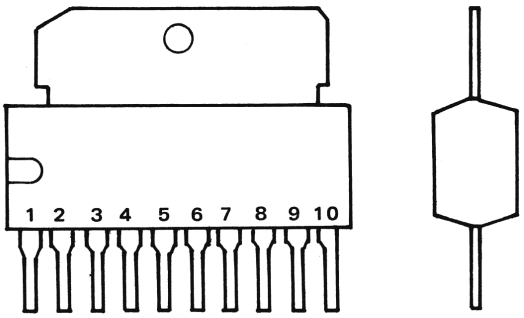


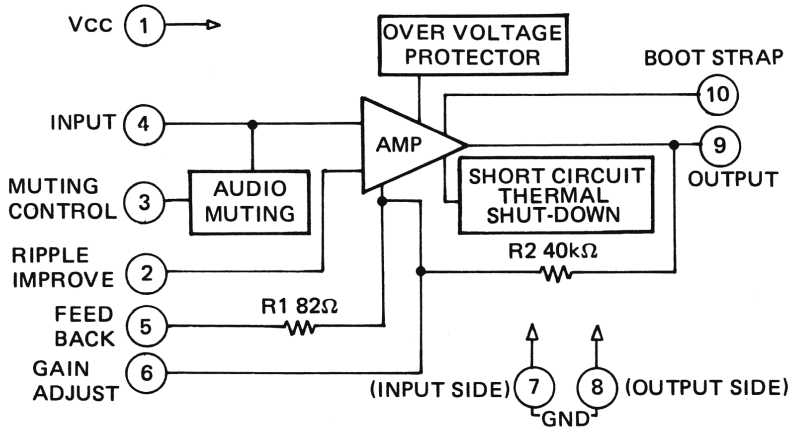
3. SN76600P



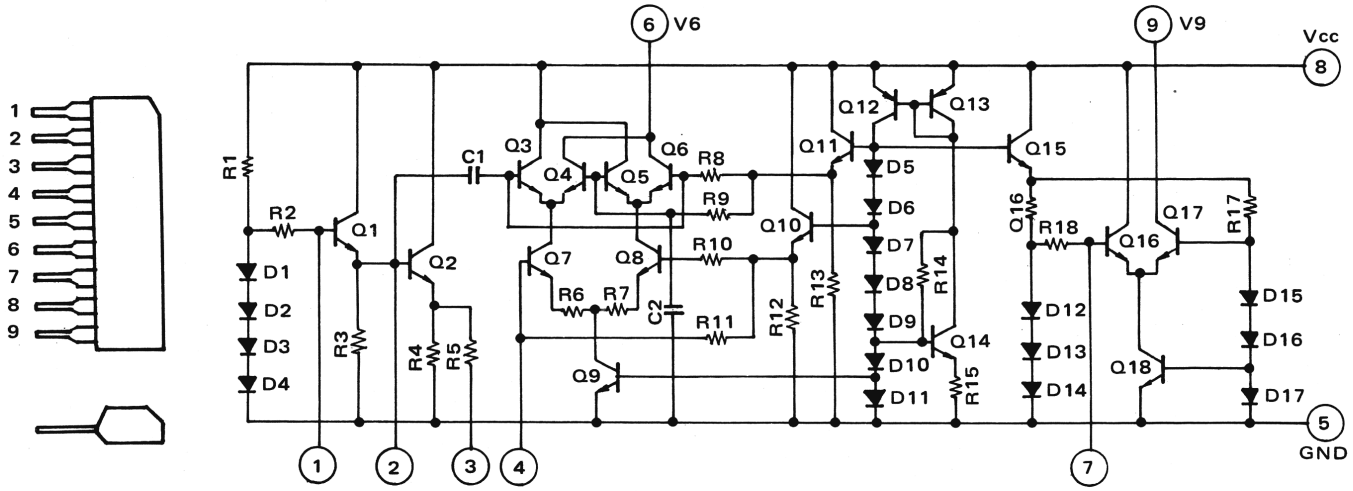


7. TA7222P

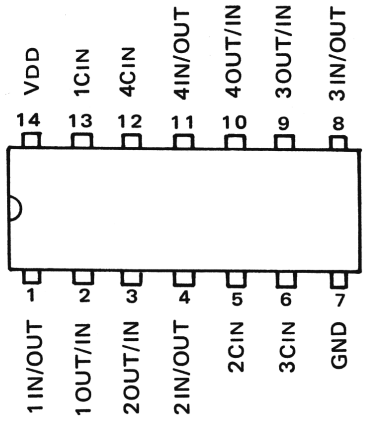




8. TA7310P

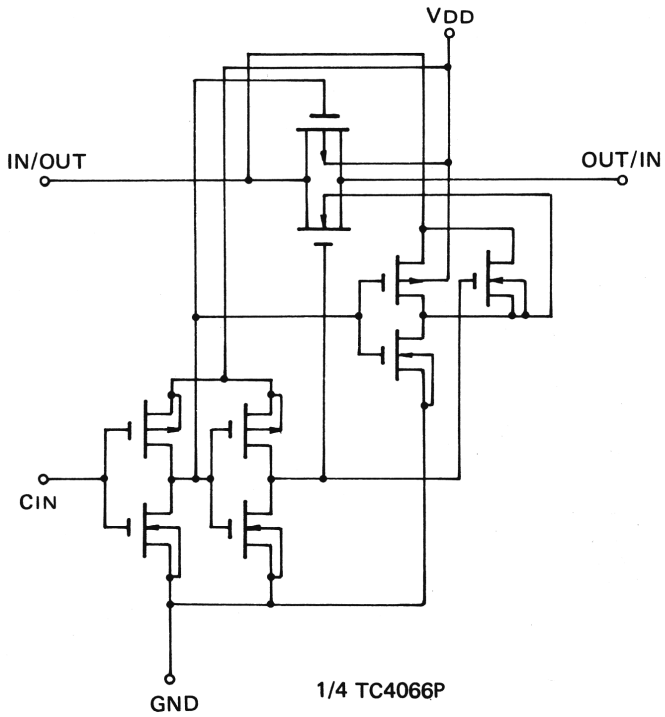


9. TC4066P

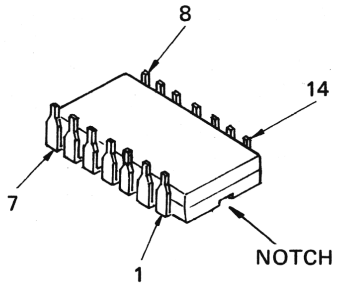


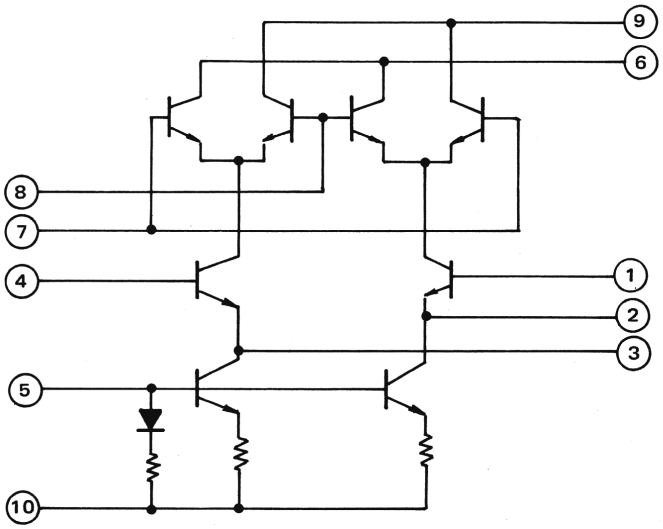
TRUTH TABLE

CIN	IN	OUT
H	VDD ~ GND	VIN
L	VDD ~ GND	High Impedance

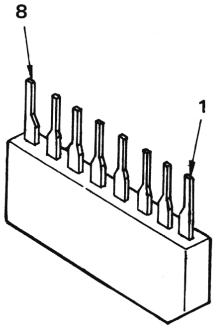


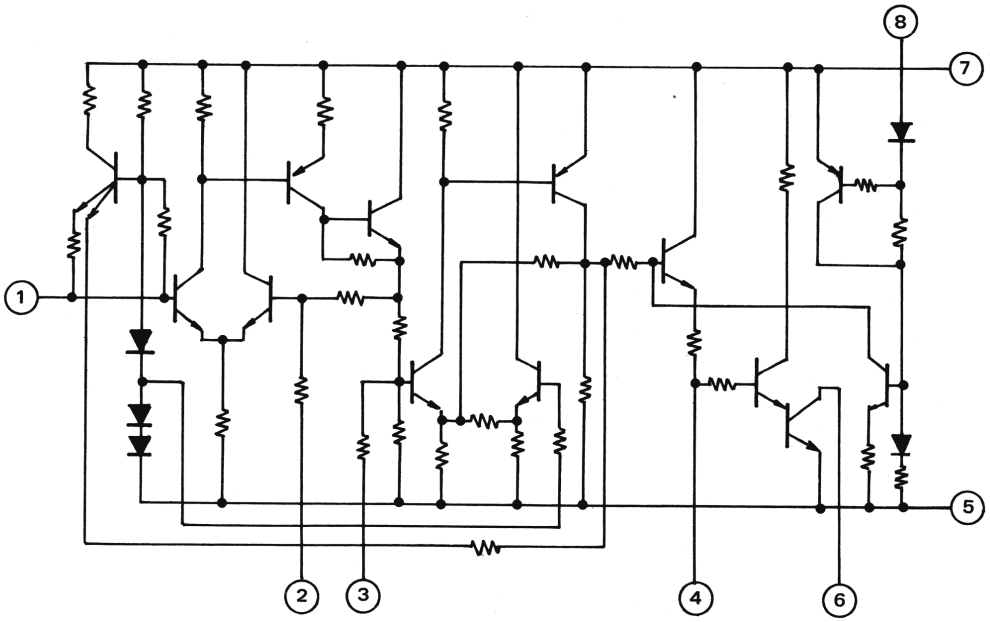
4. MC1496P



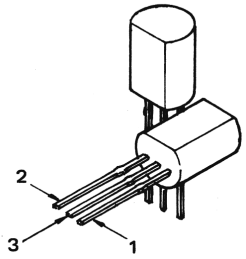


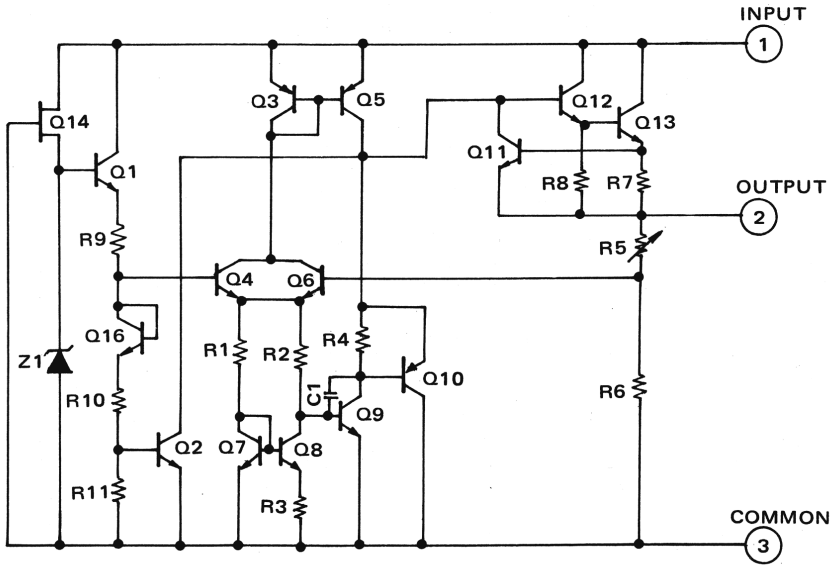
5. μPC1170H



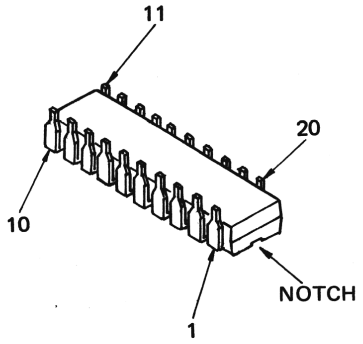


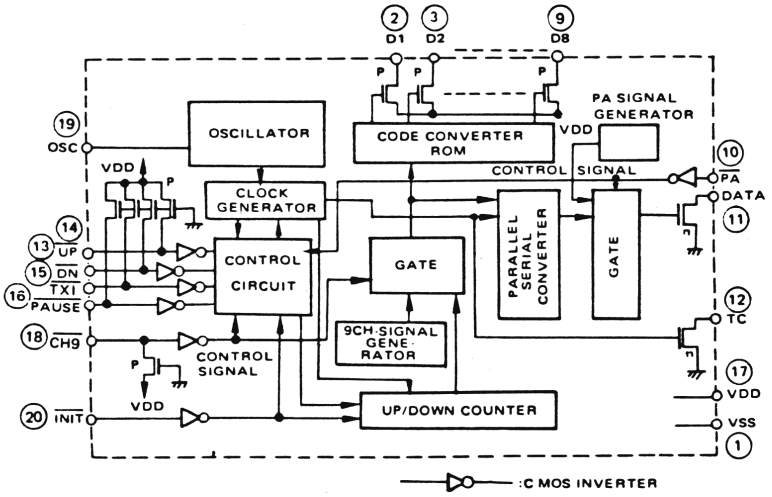
6. TA78L009P



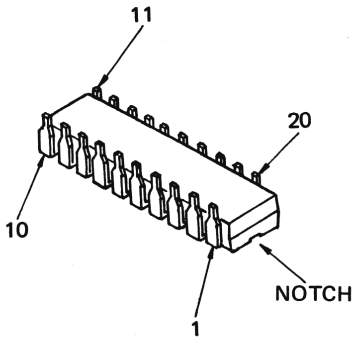


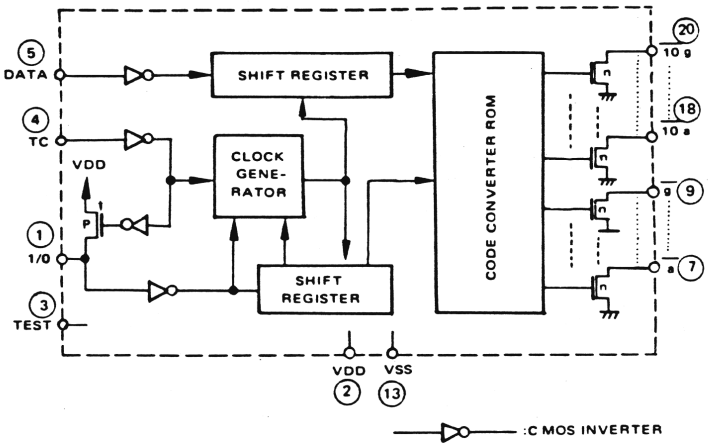
10. LC7180





11. LC7191





SEMICONDUCTOR VOLTAGE READINGS

REF. NO.		RECEIVING POWER SUPPLY 13.8 V DC (V DC)			TRANSMITTING POWER SUPPLY 13.8 V DC NO MODULATION (V DC)		
		AM	LSB	USB	AM	LSB	USB
Q1	B	6	6	6	6	6	6
	C	0	0	0	0	0	0
	E	6	6	6	6	6	6
Q2	B	0.6	0.6	0.6	0.6	0.6	0.6
	C	2.4	2.4	2.4	2.4	2.4	2.4
	E	0	0	0	0	0	0
Q3	B	0.75	0	0	0.75	0	0
	C	0	3.7	6	0	3.7	6
	E	0	0	0	0	0	0
Q4	B	0	0.75	0	0	0.75	0
	C	4.7	0	6	4.7	0	6
	E	0	0	0	0	0	0
Q5	B	0	0	0	0.68	0.68	0.68
	C	3.4	3.4	3.4	0	0	0
	E	0	0	0	0	0	0
Q6	B	0.68	0.68	0.68	0	0	0
	C	0	0	0	2.4	2.4	2.4
	E	0	0	0	0	0	0
Q7	B	0	0	0	0	0	0
	C	0	0	0	1.5	1.5	1.5
	E	0	0	0	0	0	0
Q8	B	0	0	0	0.7	0	0
	C	0	0	0	0	0	0
	E	0	0	0	0	0	0
Q9	B	0	0	0	0	0	0
	C	0	0	0	8	8	8
	E	0	0	0	0	0	0
Q10	B	0	0	0	8	8	8
	C	0	0	0	8.6	8.6	8.6
	E	0	0	0	7.2	7.2	7.2
Q11	B	0	0	0	1.2	1.2	1.2
	C	0	0	0	8.4	8.4	8.4
	E	0	0	0	0.54	0.5	0.5
Q12	B	0	0	0	0.58	0.64	0.64
	C	13.8	13.8	13.8	6	13.8	13.8
	E	0	0	0	0	0	0
Q13	B	0	0	0	0.58	0.64	0.64
	C	13.8	13.8	13.8	6	13.8	13.8
	E	0	0	0	0	0	0
Q14	B	RF MAX 0 RF MIN 0.74	RF MAX 0 RF MIN 0.74	RF MAX 0 RF MIN 0.74	0	0	0
	C	RF MAX 0 RF MIN 0	RF MAX 0 RF MIN 0	RF MAX 0 RF MIN 0	0	0	0
	E	RF MAX 0 RF MIN 0	RF MAX 0 RF MIN 0	RF MAX 0 RF MIN 0	0	0	0

REF. NO.		RECEIVING			TRANSMITTING		
		POWER SUPPLY 13.8 V DC (V DC)			POWER SUPPLY 13.8 V DC NO MODULATION (V DC)		
		AM	LSB	USB	AM	LSB	USB
Q15	B	RF IN:0V 0 RF IN: 50mV 0.55	RF IN:0V 0 RF IN: 50mV 0.55	RF IN:0V 0 RF IN: 50mV 0.55	0.78	0.78	0.78
	C	0 0	0 0	0 0	0	0	0
	E	0 0	0 0	0 0	0	0	0
Q16	B	RF IN:0V 0.62 RF IN: 50mV 0.62	RF IN:0V 0.62 RF IN: 50mV 0.62	RF IN:0V 0.62 RF IN: 50mV 0.62	0.2	0.2	0.2
	C	0.1 0.55	0.1 0.55	0.1 0.55	0.79	0.79	0.79
	E	0 0	0 0	0 0	0	0	0
Q17	B	RF IN:0V 1.3 RF IN: 50mV 1.02	RF IN:0V 1.3 RF IN: 50mV 1.02	RF IN:0V 1.3 RF IN: 50mV 1.02	0	0	0
	C	5.2 5.2	5.2 5.2	5.2 5.2	0	0	0
	E	0.6 0.46	0.6 0.46	0.6 0.46	0	0	0
Q18	B	RF IN:0V 5.8 RF IN: 50mV 5.8	RF IN:0V 5.8 RF IN: 50mV 5.8	RF IN:0V 5.8 RF IN: 50mV 5.8	0	0	0
	C	8 8	8 8	8 8	0	0	0
	E	5.2 5.2	5.2 5.2	5.2 5.2	0	0	0
Q19	G_1	0	0	0	0	0	0
	G_2	0.58	0.58	0.58	0	0	0
	S	0	0	0	0	0	0
	D	7.6	7.6	7.6	0	0	0
Q20	B	RF IN:0V 0.76 RF IN: 50mV 0.62	RF IN:0V 0.76 RF IN: 50mV 0.62	RF IN:0V 0.76 RF IN: 50mV 0.62	0.76	0.76	0.76
	C	8.4 8.4	8.4 8.4	8.4 8.4	8.4	8.4	8.4
	E	0.18 0.1	0.18 0.1	0.18 0.1	0.12	0.12	0.12
Q21	B	0.66	0.66	0.66	0	0	0
	C	2	2	2	0	0	0
	E	0	0	0	0	0	0
Q22	B	2	2	2	0	0	0
	C	6	6	6	0	0	0
	E	1.25	1.25	1.25	0	0	0
Q23	B	2.2	2.2	2.2	0	0	0
	C	8.6	8.6	8.6	0	0	0
	E	1.5	1.5	1.5	2.6	2.6	2.6
Q24	B	2.1	2.1	2.1	0	0	0
	C	3	3	3	0	0	0
	E	0.3	0.3	0.3	0	0	0
Q25	B	0	0	0	0.72	0.72	0.72
	C	0	0	0	0	0	0
	E	0	0	0	0	0	0
Q26	B	0	0	0	0	0	0
	C	0	0	0	0	0	0
	E	0	0	0	0	0	0
Q27	B	0	0	0	0.72	0	0
	C	0	0	0	0.1	7.4	7.4
	E	0	0	0	0	0	0
Q28	B	3.6	3.6	3.6	3.6	3.6	3.6
	C	5.1	5.1	5.1	5.1	5.1	5.1
	E	3.4	3.4	3.4	3.4	3.4	3.4

REF. NO.		RECEIVING POWER SUPPLY 13.8 V DC (V DC)			TRANSMITTING POWER SUPPLY 13.8 V DC NO MODULATION (V DC)		
		AM	LSB	USB	AM	LSB	USB
Q29	B	0	0.72	0.72	0	0	0
	C	0	0	0	0	0	0
	E	0	0	0	0	0	0
Q30	B	C.C. Push in 0	C.C. Push in 0.7	C.C. Push in 0.7	—	—	—
	C	0	0	0	—	—	—
	E	0	0	0	—	—	—
Q31	B C E	Not used					
Q32	G	RF IN:0V 0 / RF IN: 50mV -0.75	RF IN:0V 0 / RF IN: 50mV -0.75	RF IN:0V 0 / RF IN: 50mV -0.75	0	0	0
	S	2.4 / 1.35	2.4 / 1.35	2.4 / 1.35	0	0	0
	D	8.7 / 8.7	8.7 / 8.7	8.7 / 8.7	0	0	0
Q33	B C E	Not used					
Q34	B	0	0	0	0	0	0
	C	0	0	0	0	0	0
	E	0	0	0	0	0	0
Q35	B	0	0	0	0	0	0
	C	CB 0 / PA/MON 0	CB 0 / PA/MON 0	CB 0 / PA/MON 0	CB 0 / PA/MON 0	CB 0 / PA/MON 0	CB 0 / PA/MON 0
	E	0	0	0	0	0	0
Q36	B	0	0.6	0.6	0	0.6	0.6
	C	0	4.4	4.4	0	4.4	4.4
	E	0	0.1	0.1	0	0.1	0.1
Q37	B	0	4.4	4.4	0	4.4	4.4
	C	0	6.6	6.6	0	6.6	6.6
	E	0	3.8	3.8	0	3.8	3.8
Q38	B	0	0	0	0.63	0	0
	C	0	0	0	4.5	0	0
	E	0	0	0	0	0	0
Q39	B	0	0	0	0	0	0
	C	CB 0 / PA/MON 8.6	CB 0 / PA/MON 8.6	CB 0 / PA/MON 8.6	CB 0 / PA/MON 8.6	CB 0 / PA/MON 8.6	CB 0 / PA/MON 8.6
	E	0.6 / 0.6	0.6 / 0.6	0.6 / 0.6	0.64 / 8.6	0.64 / 8.6	0.64 / 8.6
Q40	B	0	0	0	8.6	8.6	8.6
	C	0	0	0	0	0	0
	E	0.6	0.6	0.6	0.64	0.64	0.64
Q41	B	0	0	0	0.7	0.7	0.7
	C	0	0	0	PA 4.8	PA 4.8	PA 4.8
	E	0	0	0	0.2	0.2	0.2
Q42	B	5.3	5.3	5.3	5.3	5.3	5.3
	C	7.4	7.4	7.4	7.6	7.4	7.4
	E	4.6	4.6	4.6	4.6	4.6	4.6

REF. NO.		RECEIVING POWER SUPPLY 13.8 V DC (V DC)			TRANSMITTING POWER SUPPLY 13.8 V DC NO MODULATION (V DC)		
		AM	LSB	USB	AM	LSB	USB
Q43	B	7.4	7.4	7.4	7.6	7.4	7.4
	C	13.8	13.8	13.8	13.8	13.8	13.8
	E	6.8	6.8	6.8	7.0	6.8	6.8
Q44	B	6.8	6.8	6.8	7.0	6.8	6.8
	C	13.8	13.8	13.8	13.8	13.8	13.8
	E	6.3	6.3	6.3	6.3	6.3	6.3
Q45	B	10.6	10.6	10.6	10.6	10.6	10.6
	C	13.8	13.8	13.8	13.8	13.8	13.8
	E	10	10	10	10	10	10
Q46	B	10.6	10.6	10.6	10.6	10.6	10.6
	C	13.8	13.8	13.8	13.8	13.8	13.8
	E	9.3	9.3	9.3	9.3	9.3	9.3
Q301	B	DIM:Min. 0 DIM:Max. 0.6	DIM:Min. 0 DIM:Max. 0.6	DIM:Min 0 DIM:Max. 0.6	DIM:Min. 0 DIM:Max. 0.6	DIM:Min. 0 DIM:Max. 0.6	DIM:Min. 0 DIM:Max. 0.6
	C	9.2 2	9.2 2	9.2 2	9.2 2	9.2 2	9.2 2
	E	0 0	0 0	0 0	0 0	0 0	0 0
Q302	B	DIM:Min. 9.2 DIM:Max. 2	DIM:Min. 9.2 DIM:Max. 2	DIM:Min. 9.2 DIM:Max. 2	DIM:Min. 9.2 DIM:Max. 2	DIM:Min. 9.2 DIM:Max. 2	DIM:Min. 9.2 DIM:Max. 2
	C	9.3 9.3	9.3 9.3	9.3 9.3	9.3 9.3	9.3 9.3	9.3 9.3
	E	8.6 1.7	8.6 1.7	8.6 1.7	8.6 1.7	8.6 1.7	8.6 1.7
Q303	B	0.6	B.C. : Push-in	0	B.C. : Push-out		
	C	0		6			
	E	0		0			
Q304	B	0.6	C.C. : Push-in	0	C.C. : Push-out		
	C	0		6			
	E	0		0			
Q305	B	0.6	PA : Push-in	0	PA : Push-out		
	C	0		6			
	E	0		0			
Q306	B	0	0	0	0.6	0.6	0.6
	C	6	6	6	0	0	0
	E	0	0	0	0	0	0
Q401	B	0.6	0	0	8.5	0	0
	C	0	0	0	9.3	9.3	9.3
	E	0	0	0	8	0	0
Q402	B	0	0.6	0.6	0	0.6	0.6
	C	0	0	0	8.5	0	0
	E	0	0	0	0	0	0
Q403	B	0.6	Mode : AM or LSB or USB				
	C	0					
	E	0					
Q404	B	0					
	C	9.3					
	E	0					

REF. NO.		RECEIVING POWER SUPPLY 13.8 V DC (V DC)			TRANSMITTING POWER SUPPLY 13.8 V DC NO MODULATION (V DC)		
		AM	LSB	USB	AM	LSB	USB
IC1	1	6	6	6	6	6	6
	2	2.3	2.3	2.3	2.3	2.3	2.3
	3	–	–	–	–	–	–
	4	–	–	–	–	–	–
	5	2.8	2.8	2.8	2.8	2.8	2.8
	6	6	6	6	6	6	6
	7	2.1	2.1	2.1	2.1	2.1	2.1
	8	6	6	6	6	6	6
	9	0	0	0	0	0	0
DATA	10	6 or 0	6 or 0	6 or 0	6 or 0	6 or 0	6 or 0
	11						
	12						
	13						
	14						
	15						
	16	0	0	0	0	0	0
IC2	1	5.3	5.3	5.3	5.3	5.3	5.3
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	2.1	2.1	2.1	2.1	2.1	2.1
	6	0	0	0	0	0	0
	7	4.8	4.8	4.8	4.8	4.8	4.8
	8	6	6	6	6	6	6
	9	0	0	0	0	0	0
	10	1.7	1.7	1.7	1.7	1.7	1.7
IC3	1	1.25	1.25	1.25	1.25	1.25	1.25
	2	6	6	6	6	6	6
	3	2	2	2	2	2	2
	4	3.2	3.3	3.3	3.3	3.3	3.3
	5	0	0	0	0	0	0
	6	2.5	2.5	2.5	2.5	2.5	2.5
	7	2.4	2.4	2.4	2.4	2.4	2.4
	8	2.3	2.3	2.3	2.3	2.3	2.3
	9	2.4	2.4	2.4	2.4	2.4	2.4
IC4	1	0	0	0	7.2	7.2	7.2
	2	0	0	0	7.2	7.2	7.2
	3	0	0	0	2.1	2.1	2.1
	4	0	0	0	7.2	7.2	7.2
	5	0	0	0	0	0	0
	6	0	0	0	2.6	2.6	2.6
	7	0	0	0	1.5	1.5	1.5
	8	0	0	0	2.3	2.3	2.3
	9	0	0	0	2.6	2.6	2.6

REF. NO.		RECEIVING			TRANSMITTING		
		POWER SUPPLY 13.8 V DC (V DC)			POWER SUPPLY 13.8 V DC NO MODULATION (V DC)		
		AM	LSB	USB	AM	LSB	USB
IC5	1	13.8	13.8	13.8	13.8	13.8	13.8
	2	9	9	9	9	9	9
	3	0	0	0	0	0	0
IC6	1	8.1	8.1	8.1	8.1	8.1	8.1
	2	8.1	8.1	8.1	8.1	8.1	8.1
	3	0	0	0	0	0	0
	4	2.4	2.4	2.4	2.4	2.4	2.4
	5	2.4	2.4	2.4	2.4	2.4	2.4
	6	2.4	2.4	2.4	2.4	2.4	2.4
	7	0	0	0	0	0	0
	8	8.1	8.1	8.1	8.1	8.1	8.1
IC7	1	0 / 0	0 / 0	0 / 0	0	0	0
	2	5 / 5	5 / 5	5 / 5	0	0	0
	3	0.7 / 0.6	0.7 / 0.6	0.7 / 0.6	0	0	0
	4	0 / 0	0 / 0	0 / 0	0	0	0
	5	0 / 0	0 / 0	0 / 0	0	0	0
	6	0 / 0	0 / 0	0 / 0	0	0	0
	7	0 / 0	0 / 0	0 / 0	0	0	0
	8	0 / 0	0 / 0	0 / 0	0	0	0
	9	0.65 / 0.65	0.65 / 0.65	0.65 / 0.65	0	0	0
	10	0.7 / 0.6	0.7 / 0.6	0.7 / 0.6	0	0	0
	11	0.4 / 0.4	0.4 / 0.4	0.4 / 0.4	0	0	0
	12	0.56 / 0.56	0.56 / 0.56	0.56 / 0.56	0	0	0
IC8	1	0	0	0	1.7	2.1	2.1
	2	0	0	0	0	1.4	1.4
	3	0	0	0	1.0	1.4	1.4
	4	0	0	0	1.7	2.05	2.05
	5	0	0	0	1.2	1.4	1.4
	6	0	0	0	2.1	7.7	7.7
	7	0	0	0	0	0	0
	8	0	0	0	1.75	6.3	6.3
	9	0	0	0	0	0	0
	10	0	0	0	1.7	6.3	6.3
	11	0	0	0	0	0	0
	12	0	0	0	0.9	7.7	7.7
	13	0	0	0	0	0	0
	14	0	0	0	0	0	0

NB/ANL : ON / NB/ANL : OFF

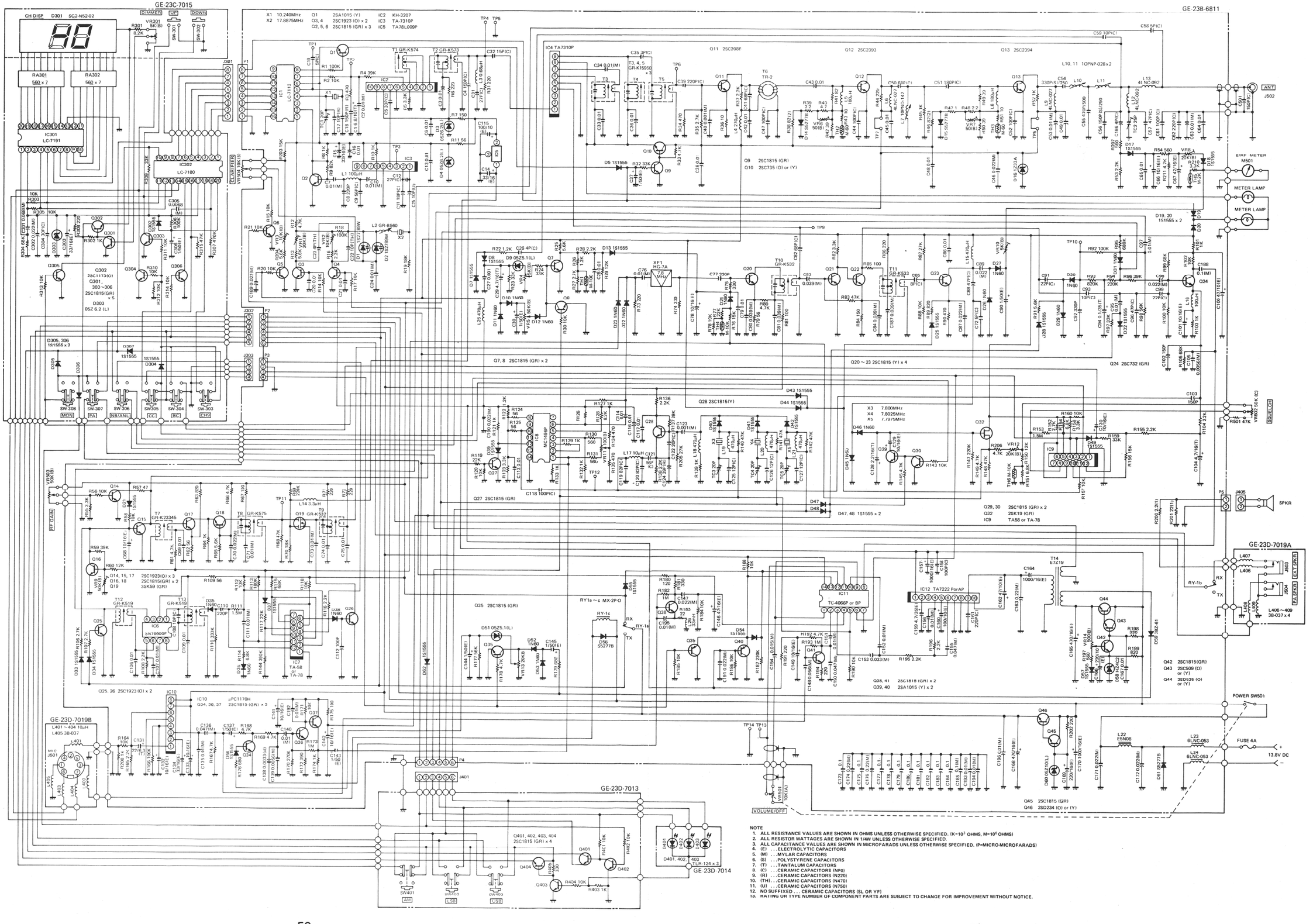
REF. NO.		RECEIVING POWER SUPPLY 13.8 V DC (V DC)			TRANSMITTING POWER SUPPLY 13.8 V DC NO MODULATION (V DC)		
		AM	LSB	USB	AM	LSB	USB
IC9	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	SQ : ON 5.6 / SQ : OFF 0	SQ : ON 5.6 / SQ : OFF 0	SQ : ON 5.6 / SQ : OFF 0	0	0	0
	6	SQ : ON 0 / SQ : OFF 0.7	SQ : ON 0 / SQ : OFF 0.7	SQ : ON 0 / SQ : OFF 0.7	0	0	0
	7	SQ : ON 0 / SQ : OFF 0	SQ : ON 0 / SQ : OFF 0	SQ : ON 0 / SQ : OFF 0	0	0	0
	8	0.65	0.65	0.65	0	0	0
	9	0	0	0	0	0	0
	10	0.67	0.67	0.67	0	0	0
	11	0	0	0	0	0	0
	12	0	0	0	0	0	0
IC10	1	1.8	1.8	1.8	1.8	1.8	1.8
	2	2.0	2.0	2.0	2.0	2.0	2.0
	3	1.35	1.35	1.35	1.35	1.35	1.35
	4	0	0	0	0	0	0
	5	0	0	0	0	0	0
	6	0	0	0	0	0	0
	7	8.6	8.6	8.6	8.6	8.6	8.6
	8	8.6	8.6	8.6	8.6	8.6	8.6
IC11	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	0	0	0	8.3	8.3	8.3
	6	8.7	8.7	8.7	0	0	0
	7	0	0	0	0	0	0
	8	0	0	0	0	0	0
	9	0	0	0	0	0	0
	10	0	0	0	0	0	0
	11	0	0	0	0	0	0
	12	9	9	9	PA : ON 0 / PA : OFF 9	PA : ON 0 / PA : OFF 9	PA : ON 0 / PA : OFF 9
	13	0.6	0.6	0.6	0.6	0.6	0.6
	14	9.3	9.3	9.3	9.3	9.3	9.3
IC12	1	13.8	13.8	13.8	13.8	13.8	13.8
	2	2.8	2.8	2.8	2.8	2.8	2.8
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	1.9	1.9	1.9	1.9	1.9	1.9
	6	1.9	1.9	1.9	1.9	1.9	1.9
	7	0	0	0	0	0	0
	8	0	0	0	0	0	0
	9	6.8	6.8	6.8	6.8	6.8	6.8
	10	13	13	13	13	13	13

REF. NO.		RECEIVING POWER SUPPLY 13.8 V DC (V DC)			TRANSMITTING POWER SUPPLY 13.8 V DC NO MODULATION (V DC)		
		AM	LSB	USB	AM	LSB	USB
IC301	1	6	6	6	6	6	6
	2	6	6	6	6	6	6
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	0	0	0	0	0	0
	6	7.1	7.1	7.1	7.1	7.1	7.1
	7	7.1	7.1	7.1	7.1	7.1	7.1
	8	0	0	0	0	0	0
	9	7.1	7.1	7.1	7.1	7.1	7.1
	10	0	0	0	0	0	0
	11	7.1	7.1	7.1	7.1	7.1	7.1
	12	7.1	7.1	7.1	7.1	7.1	7.1
	13	0	0	0	0	0	0
	14	7.1	7.1	7.1	7.1	7.1	7.1
	15	7.1	7.1	7.1	7.1	7.1	7.1
	16	7.1	7.1	7.1	7.1	7.1	7.1
	17	7.1	7.1	7.1	7.1	7.1	7.1
	18	7.1	7.1	7.1	7.1	7.1	7.1
	19	7.1	7.1	7.1	7.1	7.1	7.1
	20	7.1	7.1	7.1	7.1	7.1	7.1
IC302	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	0	0	0	0	0	0
	6	0	0	0	0	0	0
	7	0	0	0	0	0	0
	8	0	0	0	0	0	0
	9	0	0	0	0	0	0
	10	6	6	6	6	6	6
	11	0	0	0	0	0	0
	12	0	0	0	0	0	0
	13	6	6	6	6	6	6
	14	6	6	6	6	6	6
	15	6	6	6	0	0	0
	16	0	0	0	0	0	0
	17	6	6	6	6	6	6
	18	6	6	6	6	6	6
	19	4.5	4.5	4.5	4.5	4.5	4.5
	20	5.7	5.7	5.7	5.7	5.7	5.7

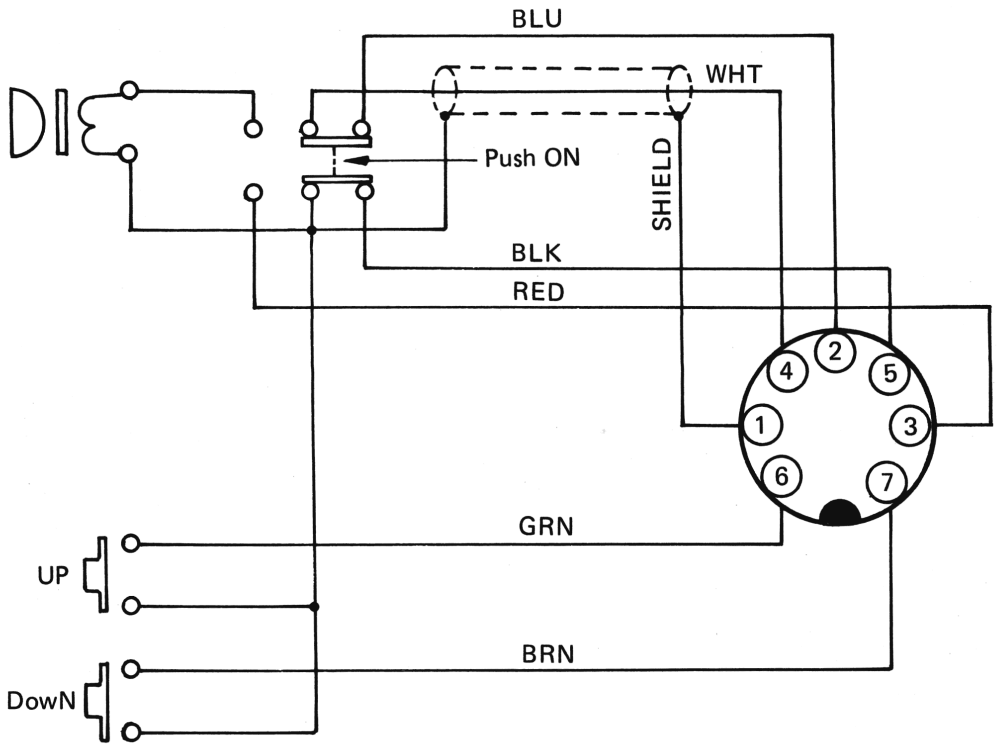
CH1 DIM : Max.

CH1

SCHEMATIC DIAGRAM

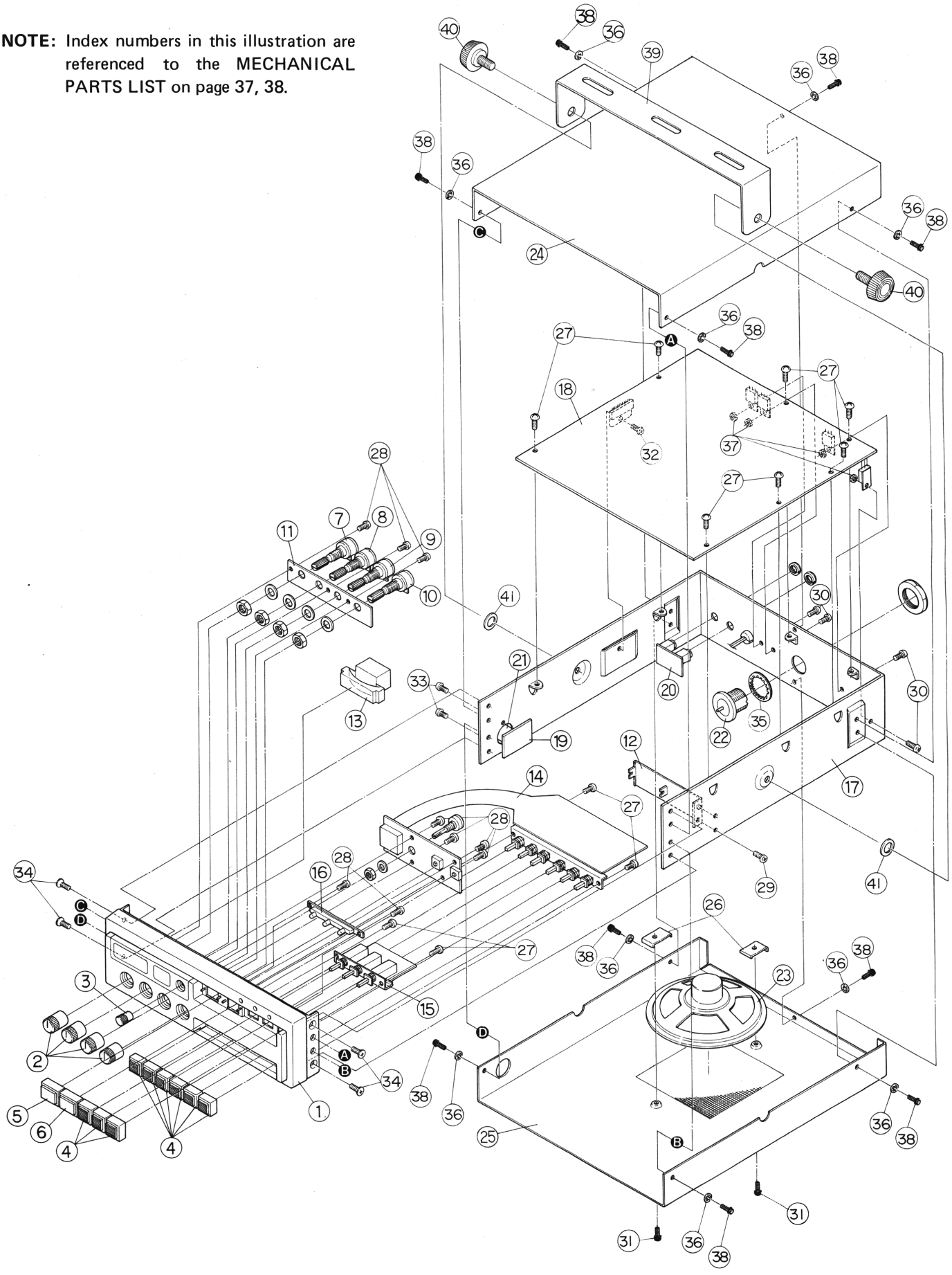


SCHEMATIC DIAGRAM OF MICROPHONE



EXPLODED VIEW

NOTE: Index numbers in this illustration are referenced to the MECHANICAL PARTS LIST on page 37, 38.



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