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**Sharp CB-4370 Service Manual**

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# SHARP

OUTSTANDING RECEPTION THE WORLD OVER

# SERVICE MANUAL

CB-4370



SYNTHESIZED 40 CHANNEL  
CITIZENS BAND TRANSCEIVER

## MODEL CB-4370

**"WARNING"**  
It is unlawful for the user to make any replacement or substitution of parts, adjustments or to service the transmitter by any one other than a person holding a commercial 1st or 2nd class radio operator's license. Any change in the circuitry that would change or violate the technical regulations or type acceptance is prohibited.

### SPECIFICATIONS

#### Transmitter section

RF power output ..... 4W (maximum)  
 Frequency range ..... 27MHz Citizens Band  
 Channels ..... 40 chs. P.L.L. (Phase Locked Loop) circuit Synthesizer  
 Type of crystal ..... HC-18U  
     Tolerance  
     10.240MHz . . . . . ± 0.003%  
 Transmitter modulation... 100% (maximum)  
 Modulation limiter..... Yields high average modulation at average voice levels  
 Antenna matching ..... Nominal 50 ohms  
 Carrier deviation ..... Not greater than ± 800Hz nominal on (exceeds F.C.C., D.O.C., etc. requirements)  
 Harmonic suppression ..... Exceeds 60dB

#### Receiver section

Audio power output ..... 3.5 Watts maximum power output  
 Sensitivity ..... 0.5µV/m for 10dB S + N/N ratio at 30% at 1000Hz modulation  
 Channels ..... 40 chs. P.L.L. (Phase Locked Loop) circuit Synthesizer  
 Type of crystal ..... HC-18U  
     11.150MHz . . . . . ± 0.003%  
 Selectivity ..... 6dB down at ± 3kHz;  
     60dB down at ± 10kHz.  
 Intermediate frequency.... 1st-IF: 10.695MHz,  
     2nd-IF: 455kHz

Circuit type..... Dual conversion superheterodyne: Phase Locked Loop (P.L.L.) frequency synthesizer provides 40 transmit and receive channels. Delta tuning of ±1.0kHz on each channels plus ceramic filter.  
 Auxiliary circuits ..... Automatic noise limiter (ANL), Variable squelch, Public Address System (P.A.)

#### General

Power source ..... DC 12.0V Nominal negative or positive ground  
 Antenna ..... 50 ohm external antenna for car or base operation  
 Speaker ..... 3-1/8" P.D.S. 8-ohm Imp.  
 Microphone ..... Press-to-talk dynamic microphone (500 ohm)  
 Accessories..... Microphone hanger  
     Mobile mounting bracket  
     Mounting screws  
     Microphone with plug and cord.  
     Power supply cord with fuse holder and socket.  
     Spare fuse (2.3A)  
 Dimensions ..... 2-17/32" (H) x 6-11/16" (W) x 7-9/16" (D)  
 Weight ..... 3.8 lbs. without microphone  
 Cabinet..... Metal body with plastic front

## SHARP ELECTRONICS CORPORATION

#### Executive Office:

10 Keystone Place, Paramus, New Jersey 07652 (201) 265-5600

#### Regional Offices & Distribution Centers:

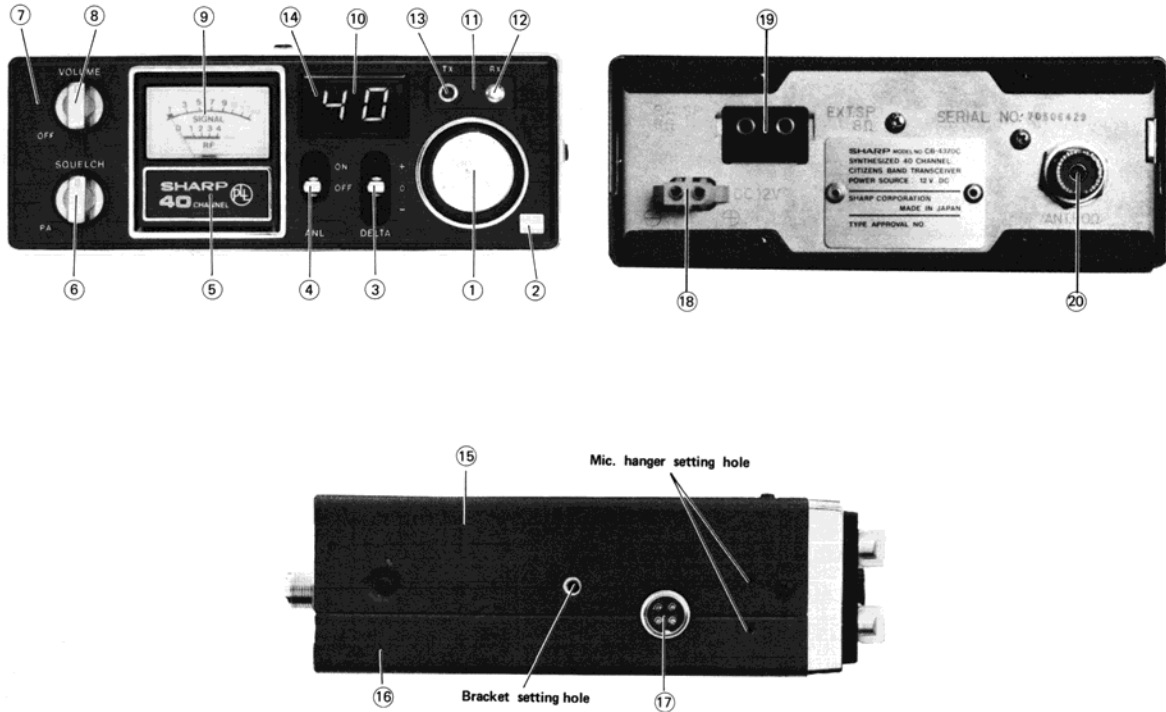
10 Keystone Place Paramus, New Jersey 07652 (201) 265-5600  
 21580 Wilmington Ave., Long Beach, Calif. 90810 (213) 830-4470

U.S. Subsidiary of Sharp Corporation, Osaka, Japan

#### Parts Centers:

P.O. Box 664 Paramus, New Jersey 07652 (201) 265-5600  
 P.O. Box 20394 Long Beach, Calif. 90801 (213) 830-4470

## PARTS LAYOUT



- ① Channel Selector Knob (JKNBN0299AFSA)
- ② Emblem "SHARP" (HINDM1080AFSB)
- ③ Delta Tuning Switch Knob (JKNBM0219AFSA)
- ④ A.N.L. Switch Knob (JKNBM0219AFSA)
- ⑤ Decoration Plate, 40 CHANNEL (HBDGS3050AFSA)
- ⑥ Squelch Control with P.A. Switch (JKNBN0300AFSA)
- ⑦ Front Panel (HPNLC1225AFSA)
- ⑧ Volume Control with Power Switch (JKNBN0300AFSA)
- ⑨ Signal/RF Power Meter (RMTRE0063AFZZ)
- ⑩ Window, Channel Indicator (GMADT0051AFSA)
- ⑪ Decoration Plate, TX/RX (HDEC B0065AFSA)
- ⑫ Indication Plate, Green, RX (HINDP0116AFSA)
- ⑬ Indication Plate, Red, TX (HINDP0116AFSB)
- ⑭ Film, Channel Indicator, Red (PFILW0004AFZZ)
- ⑮ Cabinet, Top (GCABA3447AFSA)
- ⑯ Cabinet, Bottom (GCABB3447AFSA)
- ⑰ Microphone Socket, SO101 (QSOCZ2468AFZZ)
- ⑱ Power Supply Plug (QSOCZ2454AFZZ)
- ⑲ Jacks, External Speaker and P.A. Speaker (QJAKB0050AFZZ)
- ⑳ External Antenna Socket, SO401 (QSOCZ2470AFZZ)

**Figure 1 PARTS LAYOUT**



## GENERAL DESCRIPTION (Refer to Figure 2)

### RECEIVER SECTION

An input signal sent from the antenna is applied to the 1st-mixer (transistor Q2) via the RF amplifier (transistor Q1). Meanwhile, an oscillator signal delivered from the P.L.L. synthesizer is applied to the base of the transistor Q2 (1st-mixer) via the buffer circuit (transistor Q202). In this stage the above-mentioned input signal is converted to 1st-IF signal of 10.695 MHz.

This 1st-IF (10.695MHz) signal is supplied to the base of the transistor Q3 (2nd-mixer) through the transformers T3 and T4. Also to this transistor Q3 is supplied an oscillator signal (11.150MHz) from the transistor Q6, in which the signal is converted to 2nd-IF signal of 455kHz. The 2nd-IF (455kHz) signal is amplified by the 2nd-IF amplifier (transistors Q4 and Q5) and detected by the diode D2.

The output signal thus detected is applied to the terminal ⑥ of the integrated circuit IC-101 through the volume control (R705), amplified by the driver circuit and audio power amplifier circuit inside the IC-101 and finally applied to the speaker via the transformer T101.

### TRANSMITTER SECTION

An audio signal sent from the microphone is applied to the terminal ⑥ of the integrated circuit IC101 so that it be audio-amplified and then applied to the final-stage transistor Q304 and drive-stage transistor Q303 via the transformer T101. Meanwhile, a carrier signal synthesized by the P.L.L. synthesizer circuit is amplified by the 27MHz amplifier (transistors Q301 and Q302) and applied to the final-stage transistor Q304 through the drive-stage transistor Q303, in which it is modulated together with the aforesaid audio signal and finally transmitted through the antenna.

## DESCRIPTION OF PHASE-LOCKED-LOOP (P.L.L.) CIRCUIT (Refer to Figure 3)

### 1) What is P.L.L. ?

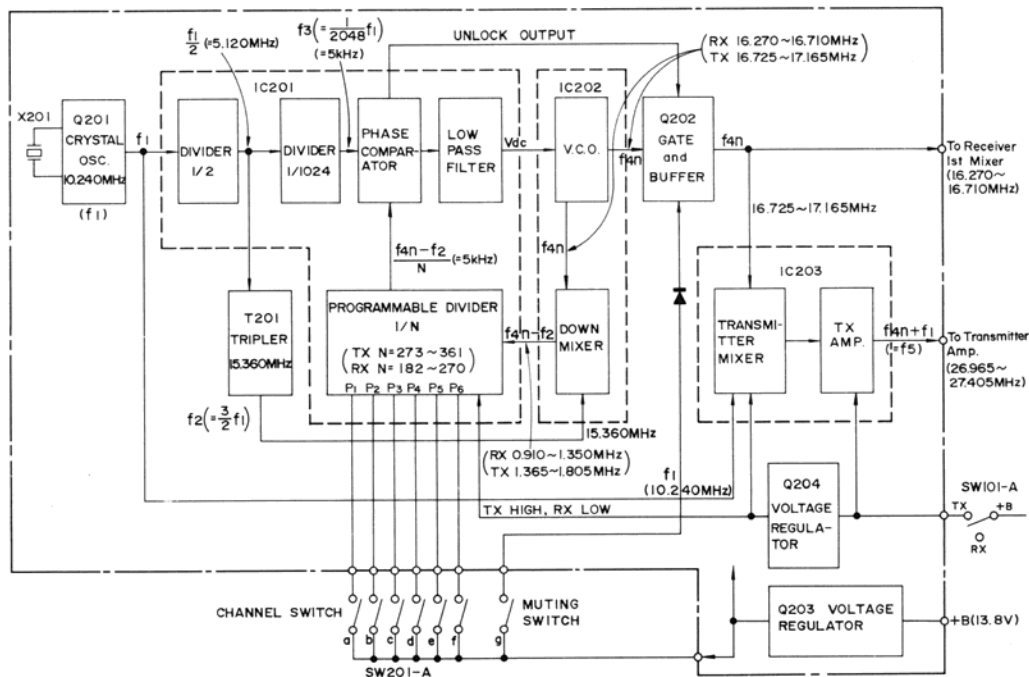
P.L.L. is abbreviation of Phase-Locked-Loop which synchronizes with frequency and phase of the stable standard input (crystal oscillation) given from the outside, namely working not only as automatic frequency control but also as automatic phase control.

The P.L.L. is now used to realize a synthesizer. Consisting of one crystal, the synthesizer serves as an oscillator to oscillate step by step (5kHz) in the receiver section range of 16.270MHz to 16.710MHz and the transmitter section range of 16.725 MHz to 17.165MHz.

Therefore, this synthesizer can be said to be on the same level in the connection with the accuracy and stability of oscillation as the crystal oscillator.

### 2) Frequency Synthesizer

The frequencies for both transmitter and receiver are synthesized by one crystal controlled oscillator and the Phase-Locked-Loop (or P.L.L.) consisting of eight basic building blocks: the divider (1/2) IC201, the divider (1/1024) IC201, the phase detector (phase comparator) IC201, the low-pass filter IC201, the voltage controlled oscillator (or V.C.O.) IC202, the down mixer IC202, the programmable divider IC201 and the tripler T201 as shown in Figure 3.



**Figure 3 P.L.L. CIRCUIT FREQUENCY SYNTHESIZER**

### 3) Frequency Determining (Refer to Figure 3 and Table 1)

- 1- The crystal oscillator consisting of a crystal X201 (10.240MHz) and transistor Q201 generates a basic frequency  $f_1$  (=10.240MHz).
- 2- The basic frequency  $f_1$  is applied to the fixed divided (1/2) network in the IC201 to be divided down to 5.120MHz signal (equivalent to 1/2 of the basic frequency  $f_1$ ). The 5.120MHz signal is further divided down to a 5kHz ( $f_3 = 1/2048 \cdot f_1$ ) signal by the fixed divided (1/1024) network and this frequency signal  $f_3$  (5kHz) is applied to the input of phase comparator.  
In addition to the above, the frequency signal  $f_1$  (10.240MHz) is also applied to the transmitter mixer inside the IC203 and the frequency signal  $f_1/2$  (5.120MHz) is converted to a signal  $f_2$  (15.360MHz) ( $f_2 = 3/2 \cdot f_1$ ) by the tripler network (transformer T201) and this frequency signal  $f_2$  is applied to the down mixer inside the IC202.
- 3- Frequency signal  $f_{4n}$  is the one that is generated by the voltage controlled oscillator (V.C.O.) inside the IC202 and this signal level is determined by DC voltage ( $V_{dc}$ ) coming from the IC201. This frequency signal  $f_{4n}$  is applied to the down mixer.  
The following will describe how the signal  $f_{4n}$  generated by the V.C.O. serves to make the P.L.L. (phase locked loop) circuit be locked.
- 4- The V.C.O. frequency signal  $f_{4n}$  is mixed down with the above-mentioned signal  $f_2$  (15.360MHz) by the down mixer inside the IC202, as a result of which there appears a mixed-down signal  $f_{4n} \cdot f_2$ . This frequency signal  $f_{4n} \cdot f_2$  is applied to the programmable divider inside the IC201.
- 5- The programmable divider (a portion of IC201) divides the frequency  $f_{4n} \cdot f_2$  by the frequency divider number  $N$  (Receiver 182 to 270, transmitter 273 to 361), which is programmable by the switch position of the channel selector connected to the terminal pins (11) to (16) of IC201. The assigned number is shown in Table 1. The output frequency  $(f_{4n} \cdot f_2) / N$  (near 5kHz) of the programmable divider is applied to another input of the phase comparator.
- 6- The phase comparator (IC201) compares the frequency  $f_3$  (=5kHz) and the other frequency  $(f_{4n} \cdot f_2) / N$  from the programmable divider and generates a DC voltage  $V_{dc}$  (voltage control signal) proportional to the phase differences of both frequencies. The signal  $V_{dc}$  moves downward when  $(f_{4n} \cdot f_2) / N$  goes higher than  $f_3$  and moves upward when  $(f_{4n} \cdot f_2) / N$  goes lower than  $f_3$ . When  $(f_{4n} \cdot f_2) / N$  equals to  $f_3$ , the  $V_{dc}$  does not move.  
The voltage signal  $V_{dc}$  from the output of phase comparator goes back to the V.C.O. (voltage controlled oscillator) IC202 via the low-pass filter. Then the closed feedback loop is established.
- 7- In this method, a closed-loop frequency-feedback system, which is so called P.L.L., is formed and the frequency  $f_{4n}$  of V.C.O. IC202 is locked.
- 8- When the P.L.L. is in lock, the two input signal frequencies to the phase comparator input are equal. Therefore the frequency  $f_{4n}$  is determined as follows:

#### The Receiver Frequency

$$f_{4n} = N \times f_3 + f_2$$

where  $f_2 = 15.360\text{MHz}$  ( $=3/2 \cdot f_1$ )  
 $f_3 = 5\text{kHz}$  ( $=1/2048 \cdot f_1$ )  
 $N = 182$  to  $270$  . . . . . Determined channel selector as shown in Table 1.

For example, the frequency  $f_{4n}$  of "channel 1" is calculated as follows:

$$f_{4n} = 182 \times 0.005 + 15.360 \text{ (MHz)}$$

$$= 16.270 \text{ (MHz)}$$

Namely " $N=182$ " is assigned for "channel 1" by channel selector. This frequency  $f_{4n}$  is applied to the first mixer Q2 of receiver and the mixer IC203 of transmitter through the buffer amplifier Q202 and the filter coils T205 and T206.

#### The Transmitter Frequency

(1)  $f_{4n} = N \times f_3 + f_2$   
 where  $f_2 = 15.360\text{MHz}$   
 $f_3 = 5\text{kHz}$   
 $N = 273$  to  $361$  . . . . . Determined by channel selector as shown Table 1.

(During the transmission, switching signal becomes high level (DC) so that the frequency divider number  $N$  is changed from one to another and then the number will be applied to the programmable divider.)

For example, the frequency  $f_{4n}$  of "channel 1" is calculated as follows:

$$f_{4n} = 273 \times 0.005 + 15.360 \text{ (MHz)}$$

$$= 16.725 \text{ (MHz)}$$

Namely " $N=273$ " is assigned for "channel 1" by channel selector.

This frequency  $f_{4n}$  is applied to the first mixer Q2 of receiver and the mixer IC203 of transmitter through the buffer amplifier Q202 and the filter coils T205 and T206.

(2) The transmitter frequency  $f_s$  is determined by mixing the frequency  $f_{4n}$  and the frequency  $f_1$  (= 10.240MHz).

$$f_s = f_{4n} + f_1$$

$$= N \times f_3 + f_2 + f_1$$

where  $f_1 = 10.240\text{MHz}$   
 $f_2 = 15.360\text{MHz}$   
 $f_3 = 5\text{kHz}$   
 $N = 273$  to  $361$

For example, the frequency  $f_s$  of "channel 1" is calculated as follows:

$$f_s = 273 \times 0.005 + 15.360 + 10.240 \text{ (MHz)}$$

$$= 26.965 \text{ (MHz)}$$

Table 1 shows the synthesized frequencies for each channel.

- 9- The gate and buffer circuit made of transistor Q202 works to prevent emission of unnecessary waves when the P.L.L. circuit is unlocked or when one channel is changed over to another.
- 10- The frequency divider number  $N$  of programmable divider is decided by the value set by either of the channel selector switches SW201-A (a ~ f). In any of the channels, it is designed that the frequency divider number  $N_T$  at the transmission is larger than that  $N_R$  at the reception by a difference of 91.  
 $N_R = N_T - 91$

### FREQUENCY OF SYNTHESIS CHART

CHANNEL	$f_s$ (MHz)	$f_1$ (MHz)	$f_2 (=3/2f_1)$ (MHz)	$f_3 (=f_1/2048)$ (kHz)	RECEIVER					TRANSMITTER			
					N	$f_{4n}$ (MHz)	$f_{4n-f_2}$ (kHz)	$f_5-f_{4n}$ (= $f_6$ ) (MHz)	$f_7$ (MHz)	$f_7-f_6$ (= $f_8$ ) (kHz)	N	$f_{4n}$ (MHz)	$f_{4n-f_2}$ (kHz)
1	26.965	10.240	15.360	5	182	16.270	910	10.695	11.150	455	273	16.725	1365
2	26.975	10.240	15.360	5	184	16.280	920	10.695	11.150	455	275	16.735	1375
3	26.985	10.240	15.360	5	186	16.290	930	10.695	11.150	455	277	16.745	1385
4	27.005	10.240	15.360	5	190	16.310	950	10.695	11.150	455	281	16.765	1405
5	27.015	10.240	15.360	5	192	16.320	960	10.695	11.150	455	283	16.775	1415
6	27.025	10.240	15.360	5	194	16.330	970	10.695	11.150	455	285	16.785	1425
7	27.035	10.240	15.360	5	196	16.340	980	10.695	11.150	455	287	16.795	1435
8	27.055	10.240	15.360	5	200	16.360	1000	10.695	11.150	455	291	16.815	1455
9	27.065	10.240	15.360	5	202	16.370	1010	10.695	11.150	455	293	16.825	1465
10	27.075	10.240	15.360	5	204	16.380	1020	10.695	11.150	455	295	16.835	1475
11	27.085	10.240	15.360	5	206	16.390	1030	10.695	11.150	455	297	16.845	1485
12	27.105	10.240	15.360	5	210	16.410	1050	10.695	11.150	455	301	16.865	1505
13	27.115	10.240	15.360	5	212	16.420	1060	10.695	11.150	455	303	16.875	1515
14	27.125	10.240	15.360	5	214	16.430	1070	10.695	11.150	455	305	16.885	1525
15	27.135	10.240	15.360	5	216	16.440	1080	10.695	11.150	455	307	16.895	1535
16	27.155	10.240	15.360	5	220	16.460	1100	10.695	11.150	455	311	16.915	1555
17	27.165	10.240	15.360	5	222	16.470	1110	10.695	11.150	455	313	16.925	1565
18	27.175	10.240	15.360	5	224	16.480	1120	10.695	11.150	455	315	16.935	1575
19	27.185	10.240	15.360	5	226	16.490	1130	10.695	11.150	455	317	16.945	1585
20	27.205	10.240	15.360	5	230	16.510	1150	10.695	11.150	455	321	16.965	1605
21	27.215	10.240	15.360	5	232	16.520	1160	10.695	11.150	455	323	16.975	1615
22	27.225	10.240	15.360	5	234	16.530	1170	10.695	11.150	455	325	16.985	1625
23	27.255	10.240	15.360	5	240	16.560	1200	10.695	11.150	455	331	17.015	1655
24	27.235	10.240	15.360	5	236	16.540	1180	10.695	11.150	455	327	16.995	1635
25	27.245	10.240	15.360	5	238	16.550	1190	10.695	11.150	455	329	17.005	1645
26	27.265	10.240	15.360	5	242	16.570	1210	10.695	11.150	455	333	17.025	1665
27	27.275	10.240	15.360	5	244	16.580	1220	10.695	11.150	455	335	17.035	1675
28	27.285	10.240	15.360	5	246	16.590	1230	10.695	11.150	455	337	17.045	1685
29	27.295	10.240	15.360	5	248	16.600	1240	10.695	11.150	455	339	17.055	1695
30	27.305	10.240	15.360	5	250	16.610	1250	10.695	11.150	455	341	17.065	1705
31	27.315	10.240	15.360	5	252	16.620	1260	10.695	11.150	455	343	17.075	1715
32	27.325	10.240	15.360	5	254	16.630	1270	10.695	11.150	455	345	17.085	1725
33	27.335	10.240	15.360	5	256	16.640	1280	10.695	11.150	455	347	17.095	1735
34	27.345	10.240	15.360	5	258	16.650	1290	10.695	11.150	455	349	17.105	1745
35	27.355	10.240	15.360	5	260	16.660	1300	10.695	11.150	455	351	17.115	1755
36	27.365	10.240	15.360	5	262	16.670	1310	10.695	11.150	455	353	17.125	1765
37	27.375	10.240	15.360	5	264	16.680	1320	10.695	11.150	455	355	17.135	1775
38	27.385	10.240	15.360	5	266	16.690	1330	10.695	11.150	455	357	17.145	1785
39	27.395	10.240	15.360	5	268	16.700	1340	10.695	11.150	455	359	17.155	1795
40	27.405	10.240	15.360	5	270	16.710	1350	10.695	11.150	455	361	17.165	1805

#### CRYSTAL

- X1 crystal      11.150MHz =  $f_7$
- X201 crystal    10.240MHz =  $f_1$

Table 1 FREQUENCY OF SYNTHESIS CHART

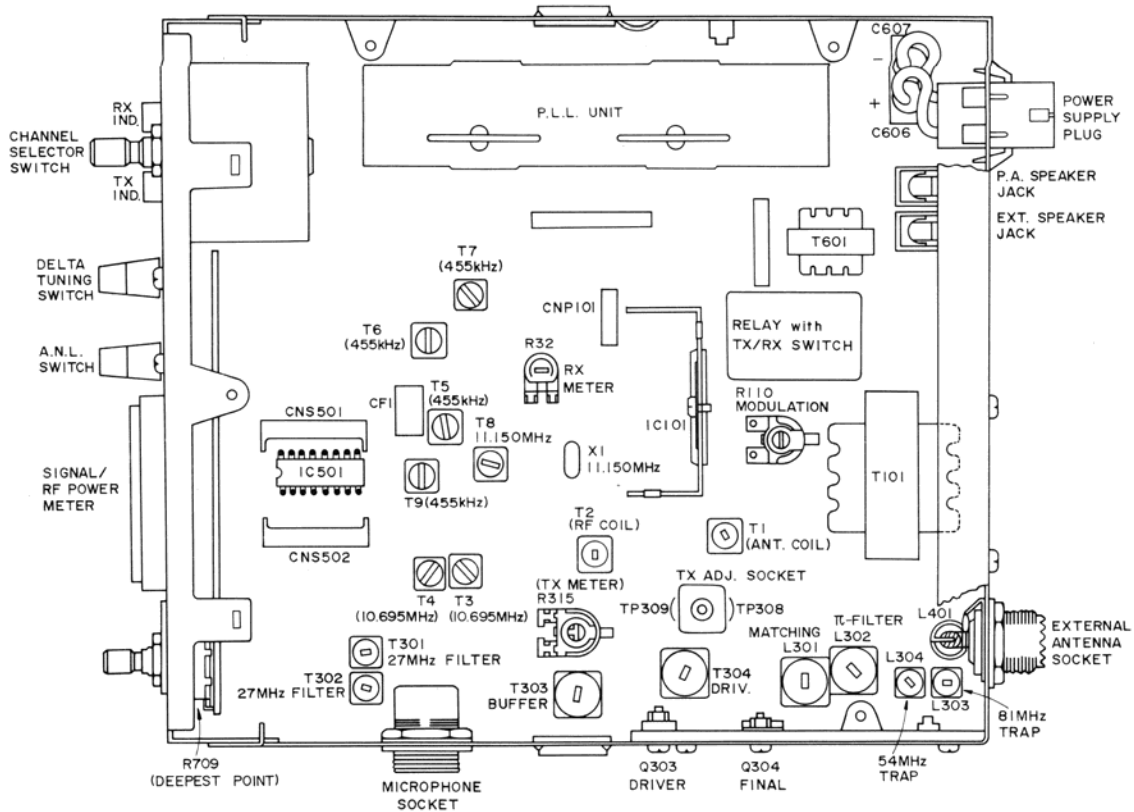
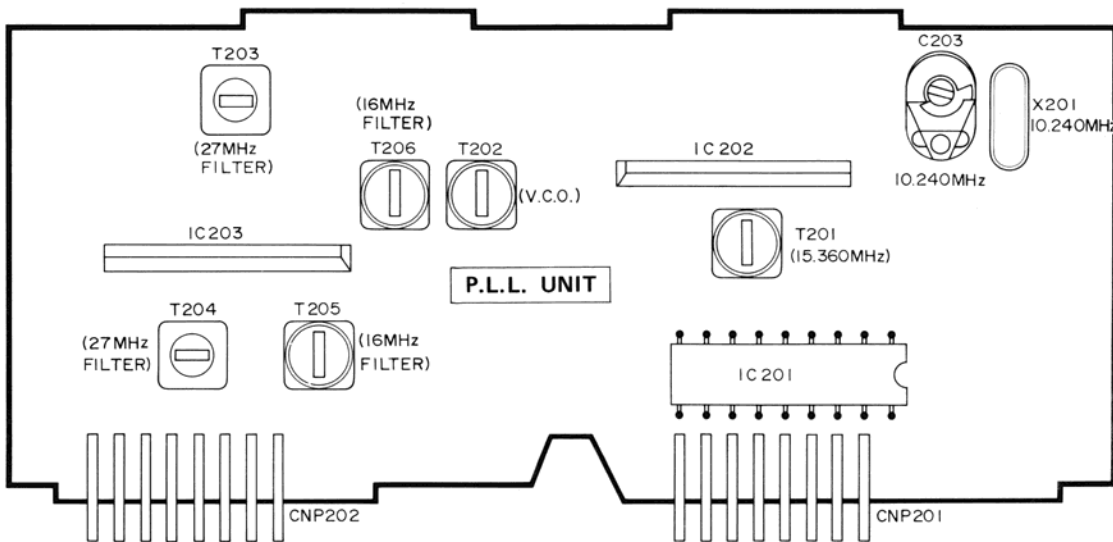


Figure 4 ALIGNMENT POINTS



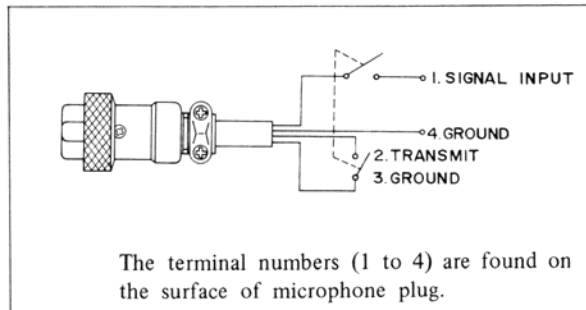
## ALIGNMENT

### EQUIPMENT REQUIRED

Frequency Counter:	0 to 40MHz (High Sensitivity)	DC V.T.V.M.:	0 to 10V
Synchroscope:	0 to 50MHz	DC Milliammeter:	0 to 500mA with Low-pass Filter
Signal Generator:	10MHz to 30MHz with 1000Hz AM mod.	Dummy Load 8 ohms and 50 ohms:	Non-inductive
Audio Signal Generator:	1000Hz (sine wave)	Spectrum Analyzer or Field Strength Meter	
Audio Attenuator:	0 to 100dB	CM Coupler	
RF Output Power Meter:	0 to 5W at 27MHz	DC Power Supply:	13.8V, 2A
RF Voltmeter:	0 to 3V, 0 to 50MHz		
AC V.T.V.M.:	0 to 10V		

### [NOTE]

- 1- Keep supply voltage to 13.8V always during the alignment.
- 2- The tools to be used for the alignment should be non-metallic ones.
- 3- Be sure to keep 50 ohms dummy load connectable with the antenna terminal all the way during the transmitter alignment.
- 4- As to the alignment of the modulation circuit, be sure to use the microphone plug shown in Figure 5 to be connected to it.

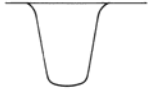


**Figure 5 CONNECTION OF MICROPHONE PLUG**

### PHASE LOCKED LOOP (P.L.L.) CIRCUIT ALIGNMENT

STEP	CONNECTION OF MEASURING INSTRUMENT	ADJUSTMENT	PROCEDURE
1 (10.240 MHz)	Connect a frequency counter, through 5PF capacitor, to the test point <b>TP201</b> (Emitter of transistor Q201).	C203	Adjust so that the frequency counter reads within 10.240 MHz $\pm$ 300 Hz.
2 (15.360 MHz)	1) Connect an RF voltmeter to the test point <b>TP202</b> (the terminal No.4 of IC 202). 2) Connect a frequency counter, through 5PF capacitor, to the test point <b>TP202</b> .	T201	1) Adjust so that the RF voltmeter reads the maximum. 2) Make sure the frequency counter is reading within 15.360 MHz $\pm$ 450 Hz.
3 (V.C.O.)	Connect a D.C. V.T.V.M. to the test point <b>TP203</b> .	T202	1) Set the channel selector to "1" channel. 2) Adjust so that the D.C. V.T.V.M. reads exactly 2.0V. 3) Set in turn the channel selector to "1" channel and/or "40" channel and make sure the D.C. V.T.V.M. reads within 2.0V to 4.3V.
RX	4 (16MHz Filter)	T205 T206	1) Set the channel selector to "40" channel. 2) Adjust so that the RF voltmeter reads the maximum. (about 400mV $\pm$ 200mV)
	5 (16MHz Frequency)	---	1) Set the channel selector to "1" channel. 2) Make sure the frequency counter is reading 16.270 MHz. 3) Set the channel selector to "40" channel. 4) Make sure the frequency counter is reading 16.710 MHz.
TX	6 (27MHz Filter)	T203 T204	1) Set the channel selector to "20" channel. 2) Adjust so that the RF voltmeter reads the maximum. (about 2.5V to 3.5V)
	7 (27MHz Frequency)	---	1) Set the channel selector to "20" channel. 2) Make sure the frequency counter is reading within 27.205 MHz $\pm$ 300 Hz.

## RECEIVER ALIGNMENT

STEP	CONNECTION OF MEASURING INSTRUMENT	ADJUSTMENT	PROCEDURE
1 (11.150 MHz)	Connect a frequency counter, through 5PF capacitor, to the test point [TP1] . (Base of transistor Q3)	T8	1) Set the delta tuning switch to "0" position. 2) Adjust so that the frequency counter reads within 11.150 MHz $\pm$ 100 Hz. (The oscillation voltage then is about 60 mV to 80 mV)
2 (1st-IF and 2nd-IF)	1) Connect an AC V.T.V.M. to both sides of the speaker voice coil lug. 2) Connect a signal generator, through 0.01 MFD capacitor, to the test point [TP2] (the secondary of the transformer T2). 3) Set the signal generator to 10.695 MHz, modulation 1000 Hz, 30%. NOTE: Be sure to connect the ground wire of signal generator to the ground of the external antenna socket.	T3 T4 T5 T6 T7 T9	Adjust so that the AC V.T.V.M. reads the maximum. 
3 (RF)	1) Connect the AC V.T.V.M. to both sides of the speaker voice coil lug. 2) Connect the signal generator to the external antenna socket. 3) Set the signal generator to 27.175 MHz (18 channel), modulation 1000 Hz, 30%.	T2 T1	1) Set the channel selector to "18" channel. 2) Adjust the AC V.T.V.M. until it reads the maximum.
4 (Deepest Point of Squelch)	1) Connect a signal generator to the external antenna socket, keeping the frequency of signal generator to 27.175 MHz ("18 channel") and modulation 1000Hz, 30%. 2) Connect a low-frequency wattmeter to the external speaker jack.	R709 (5K ohms -B)	1) Set the channel selector of the unit to "18 channel" and the volume control to "maximum". 2) Adjust the output level of signal generator to "40dB". At the time make sure the output signal is maximum (about 4W). 3) Rotate the squelch control knob of the unit fully clockwise. 4) Adjust the semi-fixed resistor R709 so that the low-frequency output becomes 0.5W.

## TRANSMITTER AND MODULATOR ALIGNMENT

- 1- When the set is made ready for the transmitting operation, be sure to always connect the RF output power meter and 50 ohms dummy load to the external antenna socket--this should never be forgotten even if it is not noted down specifically. If otherwise, the final transistor Q304 may be damaged.
- 2- When making the connection of measuring instruments, see Figure 6.

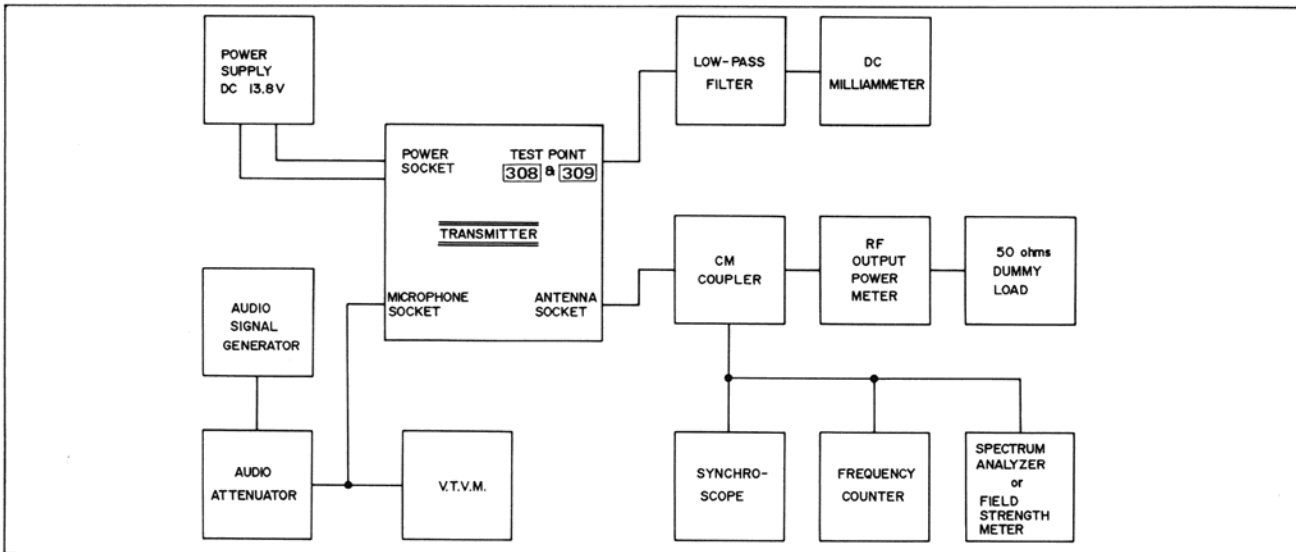


Figure 6

STEP	CONNECTION OF MEASURING INSTRUMENT	ADJUSTMENT	PROCEDURE
1 (27 MHz Filter)	Connect the synchroscope to the test point <b>TP301</b> (Base of transistor Q302).	T301 T302	1) Set the channel selector to "20" channel. 2) Adjust so that the maximum waveform (amplitude) appears on the synchroscope. 3) Set in turn the channel selector to "1" channel and/or "40" channel to make sure the waveform doesn't decrease in size.
2 (Buffer)	1) Remove the plug which have been inserted in the test points <b>TP308</b> and <b>TP309</b> of the set. 2) Connect in turn DC milliammeter, through the RF rejection filter shown in Figure 7, to the test points <b>TP308</b> and <b>TP309</b> .	T303	1) Set the channel selector to "20" channel. 2) Adjust so that the DC milliammeter connected to the test point <b>TP309</b> , reads the maximum. (Driver current)
3 (Driver)	Same as above.	T304	Adjust so that the DC milliammeter connected to the test point <b>TP309</b> indicates the dip point. The amperage then is about 45 to 80mA.
4 (Final)	Same as step 2, and connect the RF output power meter and 50 ohms dummy load to the external antenna socket.	L301	Adjust so that the DC milliammeter connected to the test point <b>TP308</b> reads 450mA $\pm$ 50mA (Final current).
5 ( $\pi$ -Filter)	Same as above.	L302	Adjust so that the RF output power meter reads the maximum. The reading then should not exceed 4W. (FCC Rules and Regulations Part 95, Section 95. 43.)
6	Repeat the steps 2 to 5 until the best results will be obtained.		
7 (Second harmonic)	Connect the RF output power meter, 50 ohms dummy load and spectrum analyzer (or field strength meter), through CM coupler, to the external antenna socket.	L304	1) Set the channel selector to "20" channel. 2) Adjust so that 54 MHz output component (second harmonic) becomes the minimum on the spectrum analyzer (or field strength meter).
8 (Third harmonic)	Same as above.	L303	1) Set the channel selector to "20" channel. 2) Adjust so that 81 MHz output component (third harmonic) becomes the minimum on the spectrum analyzer (or field strength meter).
9 (Modulation)	1) Connect the RF output power meter, 50 ohms dummy load and synchroscope, through CM coupler, to the external antenna socket. 2) Connect a audio signal generator, attenuator and AC V.T.V.M. to the microphone socket (using the microphone plug shown in Figure 5). 3) Keep the output of audio signal generator to 1000 Hz, 700mV.	R110 (1Kohms -B)	1) Turn R110 counterclockwise until the modulation limiter circuit stops its function. 2) Make sure there appears 700mV input signal at the microphone terminal from an audio signal generator. 3) Adjust R110 so that the modulation factor of RF output waveform appeared on the synchroscope becomes 95 to 99% (See Figure 8). 4) Set the attenuator to "-41dB" (6 mV). 5) Make sure the modulation factor of RF output waveform on a synchroscope is more than, 50%.

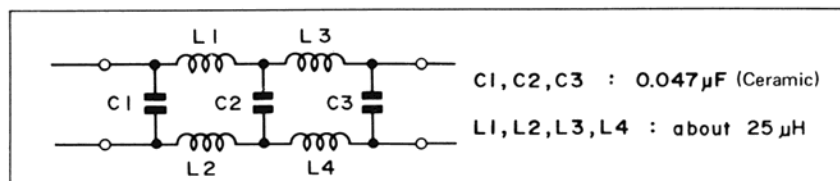


Figure 7 RF REJECTION FILTER  
(LOW-PASS FILTER)

**SIGNAL/RF POWER METER ADJUSTMENT**

STEP	CONNECTION OF MEASURING INSTRUMENT	ADJUSTMENT	PROCEDURE
1 (RX)	Connect the signal generator to the antenna socket and set the frequency to 27.175 MHz ("18" channel) and the modulation to 1000Hz, 30%. Keep the output of signal generator to 40dB.	R32	1) Set the channel selector to "18" channel. 2) Adjust so that the signal/RF power meter indicates "9" on the "SIGNAL" scale.
2 (TX)	Connect the RF output power meter and 50 ohms dummy load to the antenna socket.	R315	1) Set the channel selector to "20" channel and make the set be ready for the transmitting operation (non-modulation however). 2) First make sure of what value the pointer of signal/RF power meter indicates on the "POWER" scale and then adjust R315 so that such a value becomes nearly the same as that of the RF output power meter connected to the antenna socket. (The RF power output then is about 3.5W.)

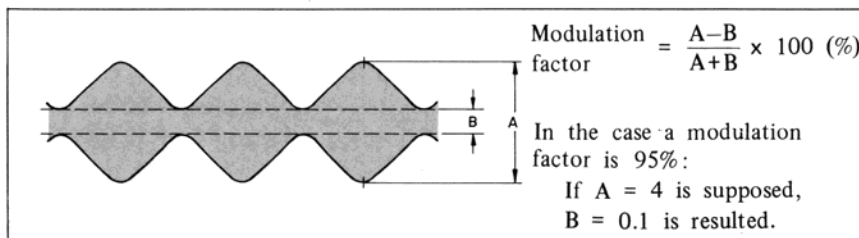


Figure 8

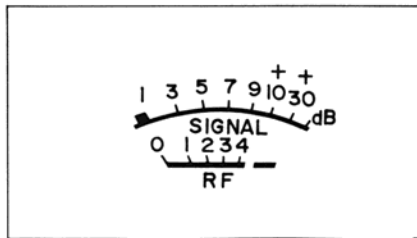


Figure 9 SIGNAL/RF POWER METER (ME701)

## CHANNEL SELECTOR SWITCH

A) Connection table of channel selector switch (SW201-A) for each channel.

CHANNEL	TERMINAL NO. OF THE SW201-A (1st)	(P <sub>0</sub> )	1(P <sub>1</sub> )	2(P <sub>2</sub> )	3(P <sub>3</sub> )	4(P <sub>4</sub> )	5(P <sub>5</sub> )	6(P <sub>6</sub> )	8
	TERMINAL NO. OF IC201	—	16	15	14	13	12	11	—
1			○						●
2			○						●
3				○					●
4					○				●
5			○		○				
6				○	○				
7			○	○	○				
8			○			○			●
9				○		○			●
10			○	○		○			●
11					○	○			●
12				○	○	○			
13			○	○	○	○			
14							○		●
15			○				○		
16			○	○			○		
17					○		○		●
18			○		○		○		●
19				○	○		○		●
20						○	○		●
21			○			○	○		●
22				○		○	○		●
23			○		○	○	○		●
24			○	○		○	○		●
25					○	○	○		●
26				○	○	○	○		●
27				○	○	○	○		●
28			○			○	○	○	●
29			○					○	●
30				○				○	●
31			○	○				○	●
32					○			○	●
33			○					○	●
34				○	○			○	●
35			○	○	○			○	●
36						○		○	●
37			○			○		○	●
38				○		○		○	●
39			○	○		○		○	●
40					○	○		○	●

**NOTES:**

1. Terminals marked ○ are connected with the terminal (C1).
2. Terminals marked ⊙ are connected with the terminal (C2).
3. The mark ● given on the terminal No.8 of SW201-A shows that this terminal comes in contact with the COMMON terminal if the set gets in a channel-to-channel situation.

QSW-R0143AFZZ

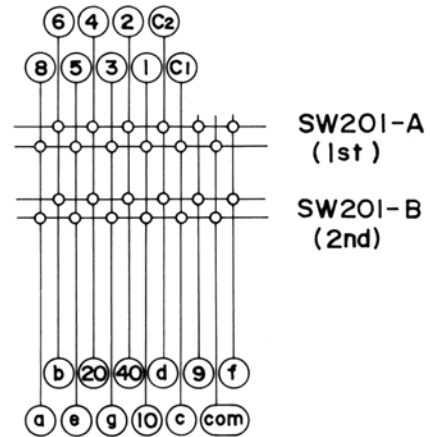
B) Connection table of channel selector switch (SW201-B) for each channel.

**NOTE:**

Terminals marked ○ are connected with the terminal (COM).

CHANNEL	TERMINAL NO. OF THE SW201-B (2nd)	a	b	c	d	e	f	g	9	10	20	40
	1			○	○							
2		○	○		○	○		○				
3		○	○	○	○			○				
4			○	○			○	○				
5		○		○	○		○	○				
6				○	○	○	○	○				
7		○	○	○								
8		○	○	○	○	○	○	○				
9		○	○	○	○	○	○	○	○			
10		○	○	○	○	○	○			○		
11			○	○						○		
12		○	○		○	○		○		○		
13		○	○	○	○			○		○		
14			○	○			○	○		○		
15		○		○	○		○	○		○		
16				○	○	○	○	○		○		
17		○	○	○						○		
18		○	○	○	○	○	○	○		○		
19		○	○	○			○	○		○		
20		○	○	○	○	○	○				○	
21			○	○						○		
22		○	○	○	○	○		○		○		
23		○	○	○	○			○		○		
24			○	○			○	○		○		

**VIEW FROM TERMINAL INSERTION SIDE**



**MOUNTING FACE**

- to be continued -

CHANNEL	TERMINAL NO. OF THE SW2018 (2x8)	a	b	c	d	e	f	g	9	10	20	40
25		○		○	○		○	○			○	
26				○	○	○	○	○				
27		○	○	○							○	
28		○	○	○	○	○	○	○			○	
29		○	○	○			○	○			○	
30		○	○	○	○	○	○			○	○	
31			○	○						○	○	
32		○	○		○	○		○		○	○	
33		○	○	○	○			○		○	○	
34			○	○			○	○		○	○	
35		○		○	○		○	○		○	○	
36				○	○	○	○	○		○	○	
37		○	○	○						○	○	
38		○	○	○	○	○	○	○		○	○	
39		○	○	○			○	○		○	○	
40		○	○	○	○	○	○			○		○

Table 2 CHANNEL SELECTOR SWITCH

### CAUTIONS ON HANDLING MOS IC

MOS IC is to control the electric conductivity between the source and drain by using the voltage at the gate electrode through insulating oxide film (SiO<sub>2</sub>). If overvoltage is applied to the gate electrode, the insulator at the gate electrode undergoes dielectric breakdown. Once such dielectric breakdown occurs, the junction between the gate and other terminals is shortcircuited and MOS IC is so damaged that its quality will not be recovered again.

And, MOS IC is highly sensitive to static charge because its gate oxide film is as thin as 1000Å to 1500Å. Input protective circuit is provided to protect MOS IC but this circuit can not always play its role according to the conditions of using MOS IC.

Therefore, pay due attention to the following when handling it.

#### 1. Cautions on Transportation and Preservation

As for MOS IC, either the input or output terminal has remarkably high impedance in comparison with ordinary semiconductor IC. Therefore, MOS IC is liable to be affected by the induction of nearby high-tension power source or A.C. power source and it may be given a larger voltage unexpectedly due to body discharged possibly causing dielectric breakdown of the gate. To eliminate this, during transportation and preservation of MOS IC all the terminals should be kept at the same potential in the following methods (to shortcircuit all the terminals).

- ① Wind thin wire around MOS IC.
- ② Fit metallic ring on it.
- ③ Pack it with aluminum foil.
- ④ Hold it by electric conductive jig.
- ⑤ Put it in a special case for LSI.

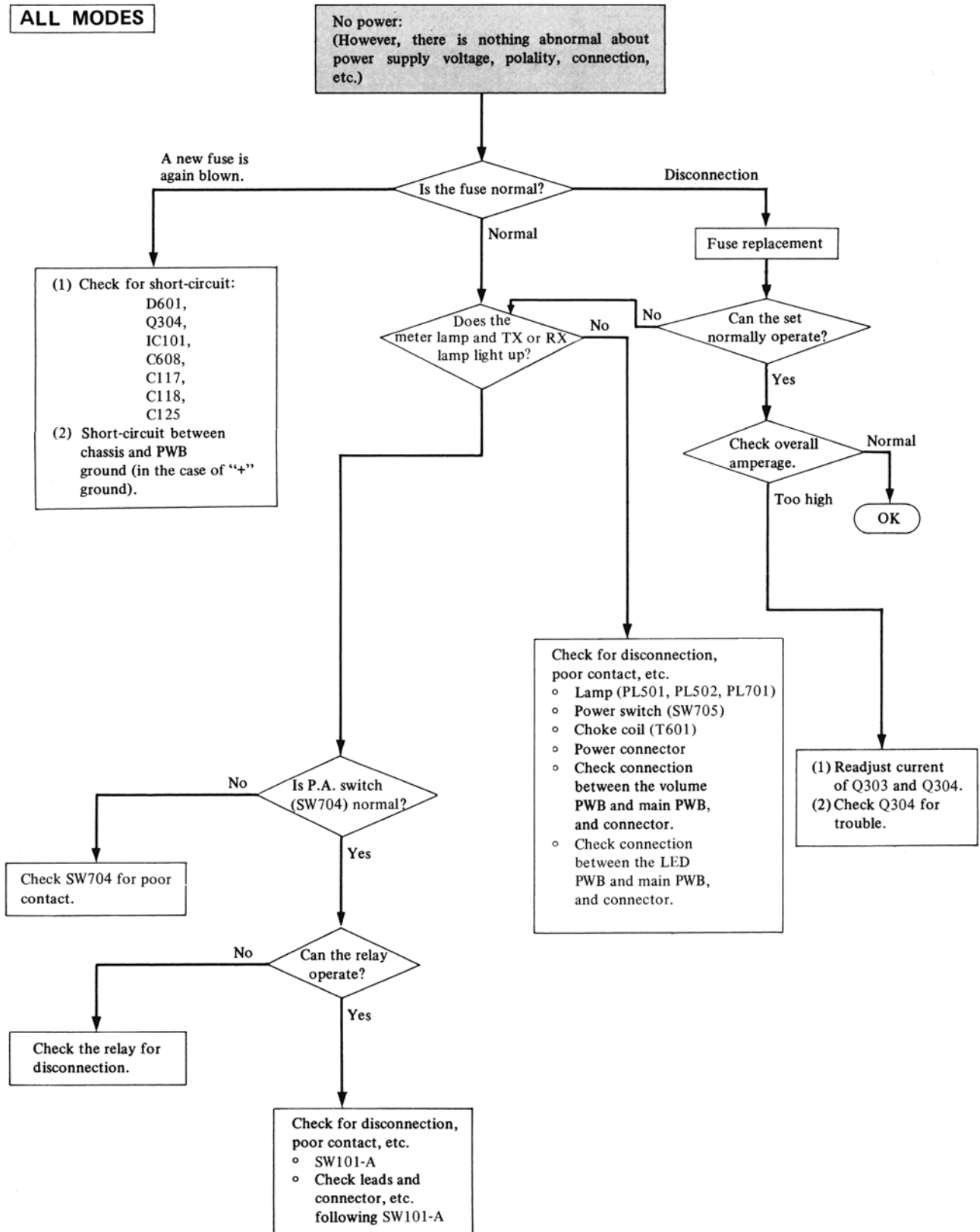
Note: Never put MOS IC in a mal-conductive container such as made of polystyrene.

#### 2. Cautions on Servicing

- ① A soldering tool to be used should be the less-leak one (more than 100K ohm of leak resistance – there may be a soldering tool of more than 1 Meg. ohm to be used for semiconductor). Otherwise, ground the soldering tool when using it.
- ② Ground the earth terminal of a measuring instrument.
- ③ Ground a bench.
- ④ Before insertion or removal of LSI to or from P.W.B., be sure to turn off the power switch.
- ⑤ When inserting LSI to P.W.B., ground the earth terminal of P.W.B.
- ⑥ Never touch the terminals of LSI by hand.
- ⑦ Be sure to ground the earth terminal of D.C. power source.
- ⑧ To prevent LSI from being broken due to human body discharge, it is necessary to ground the human body. But this requires the greatest care as otherwise the body encounters large current (absolutely avoid touching A.C. power source).
- ⑨ As MOS IC is actuated with a small current, be sure to remove soldering flux and perform moisture-proof treatment after repairing. (Apply moisture-proof agent for electronic calculator.)

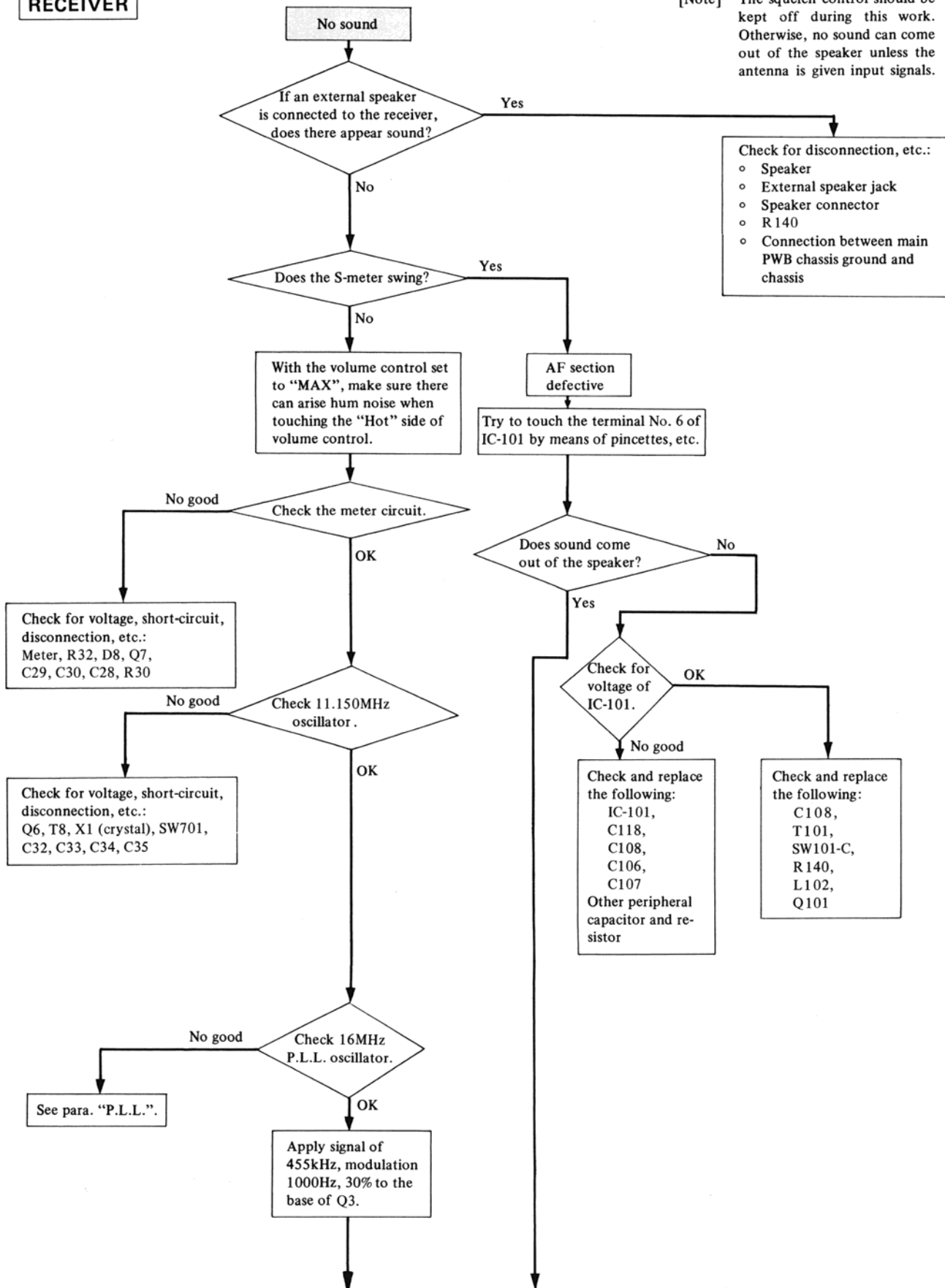
## TROUBLE SHOOTING GUIDE

**ALL MODES**



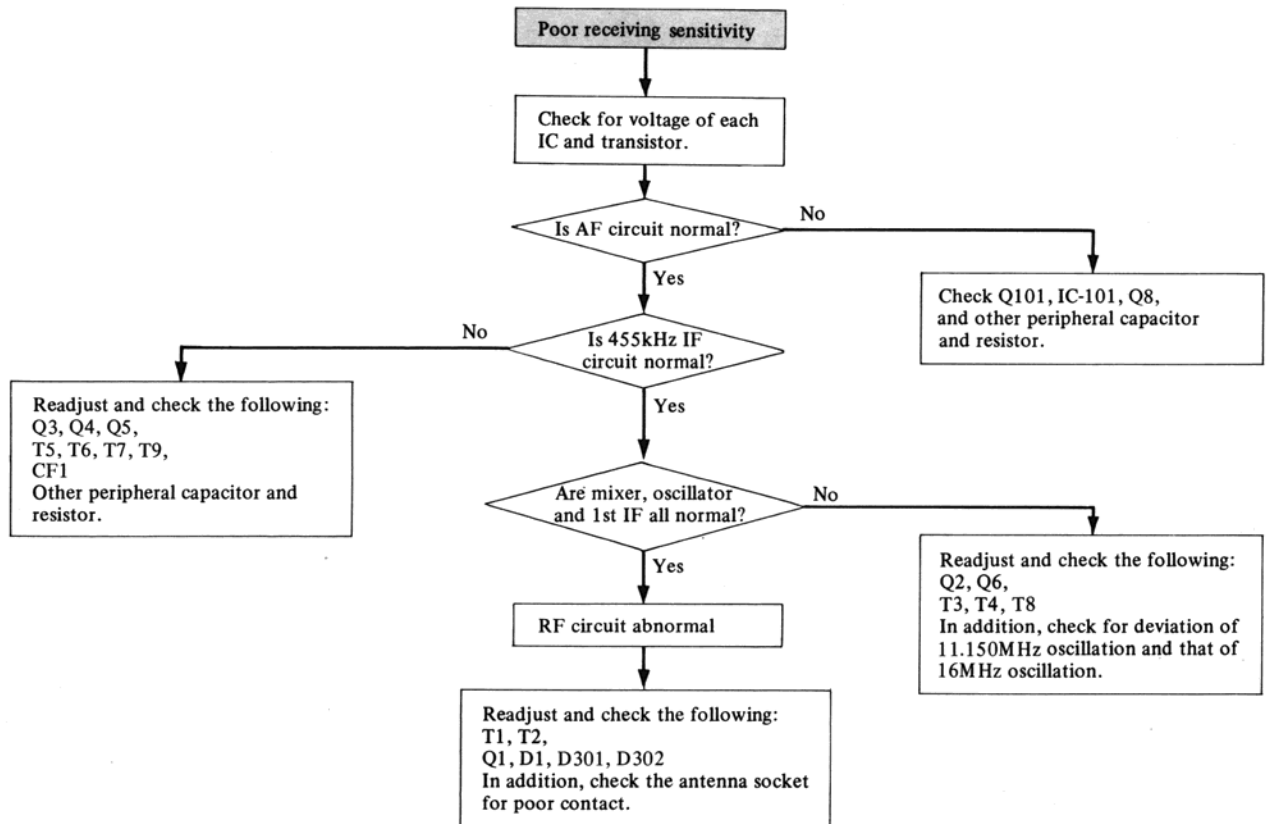
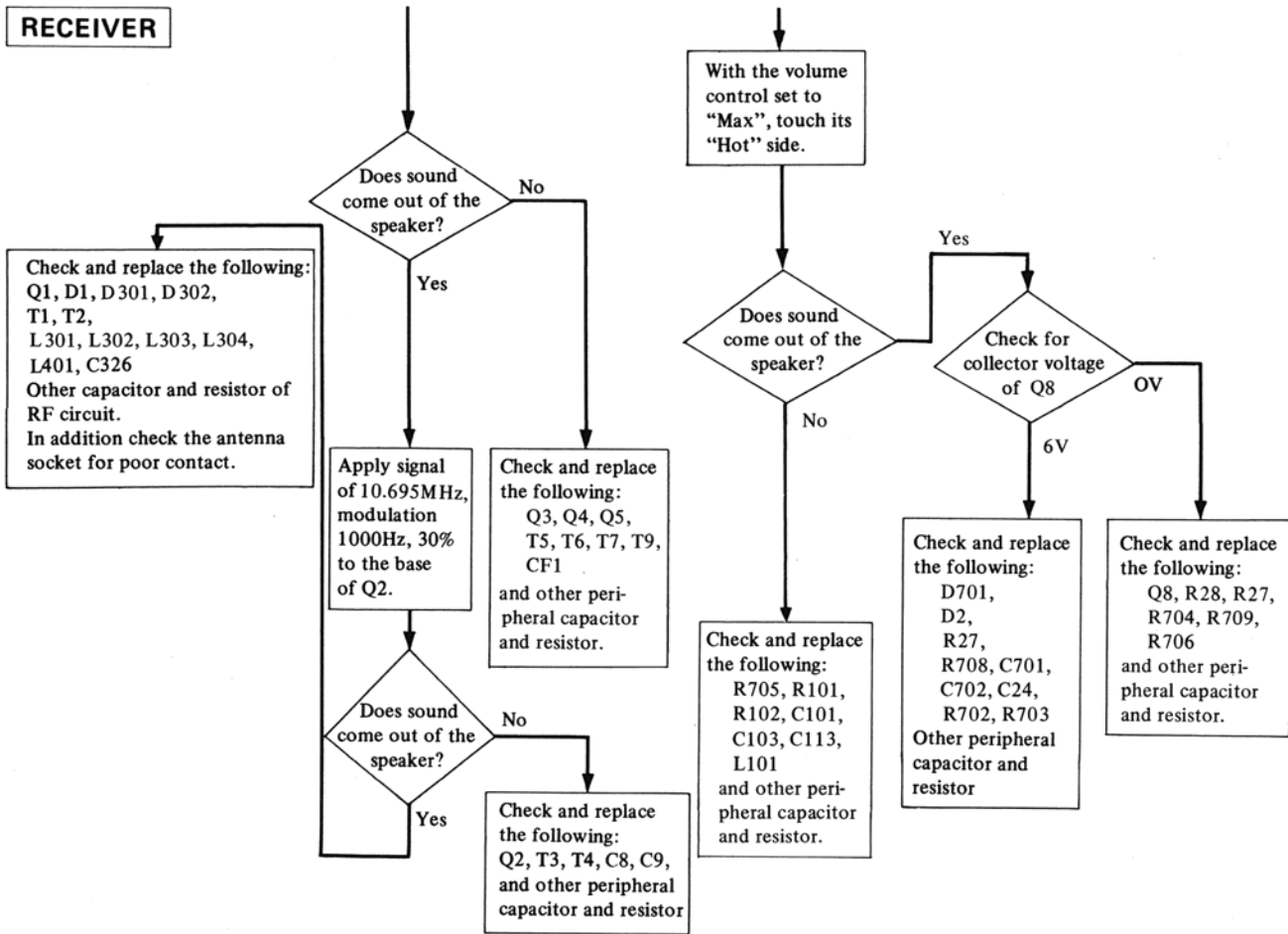
# RECEIVER

[Note] The squelch control should be kept off during this work. Otherwise, no sound can come out of the speaker unless the antenna is given input signals.

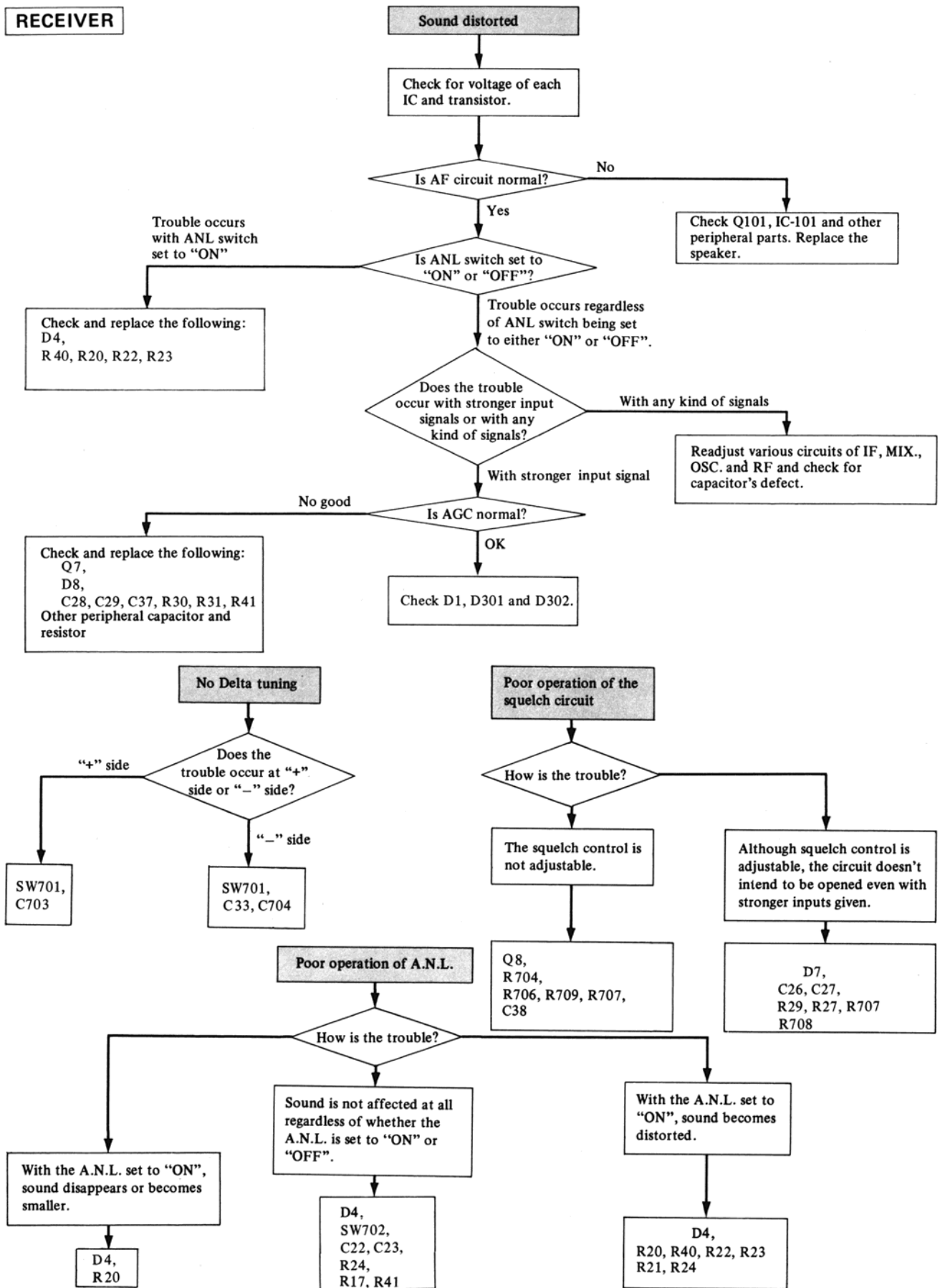




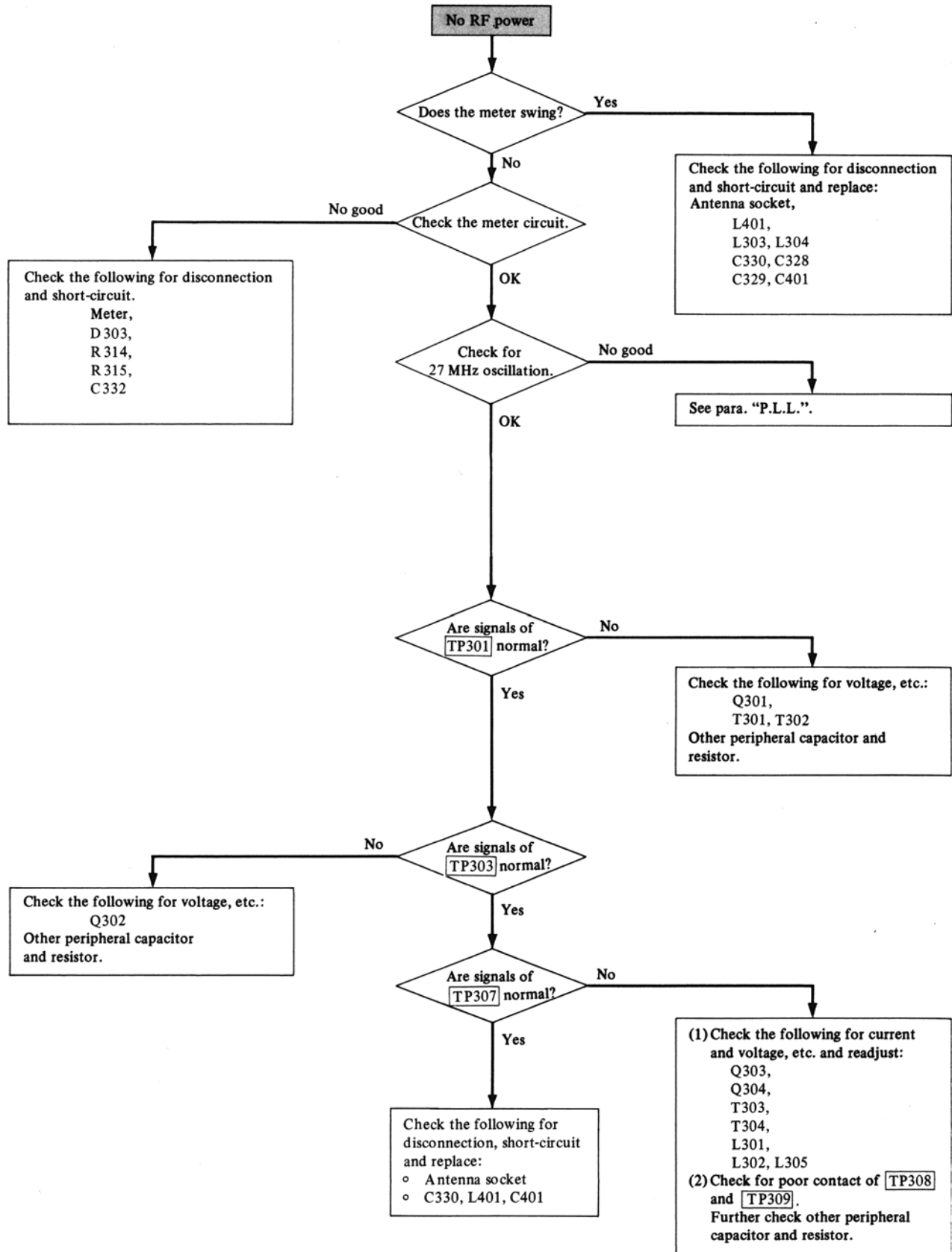
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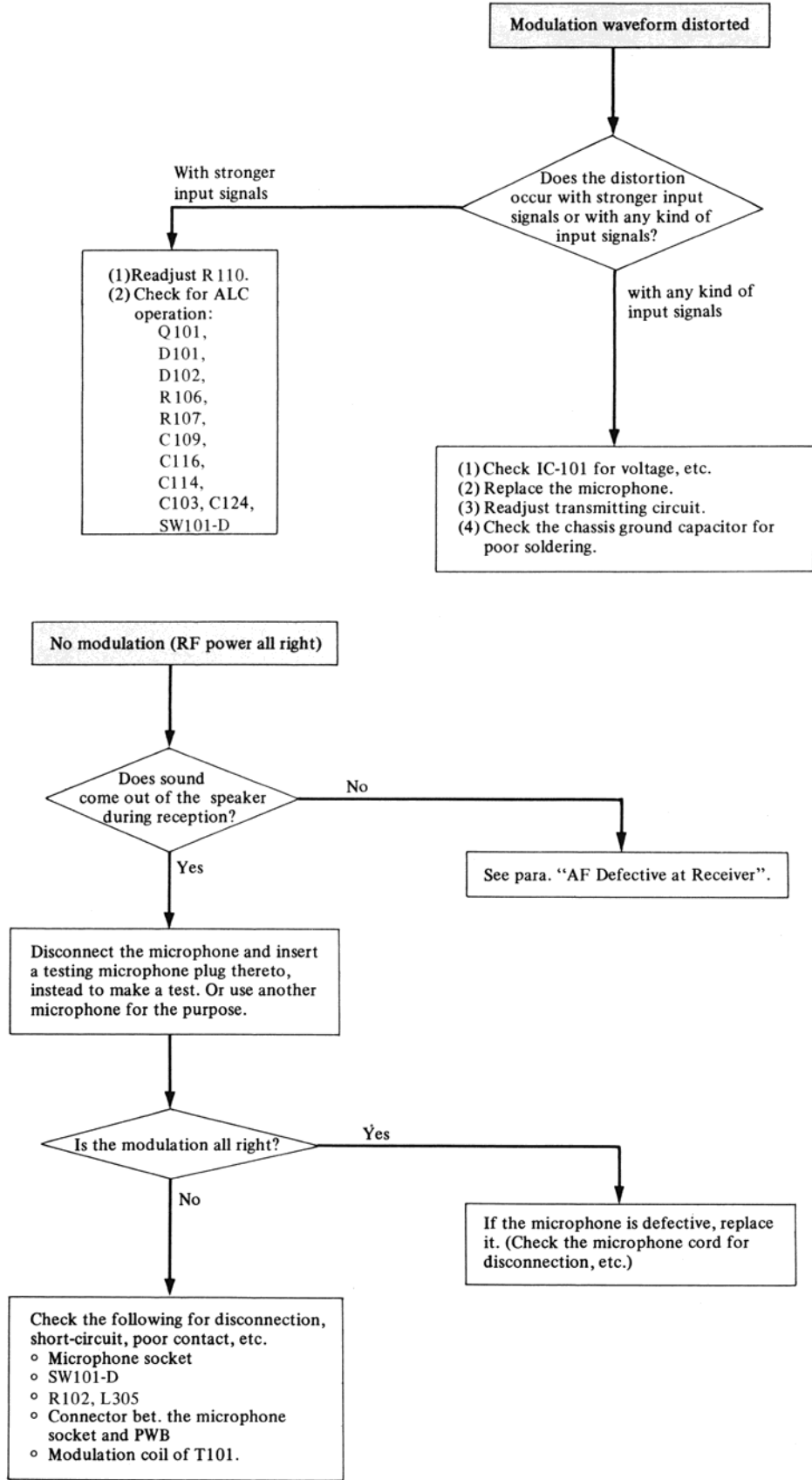
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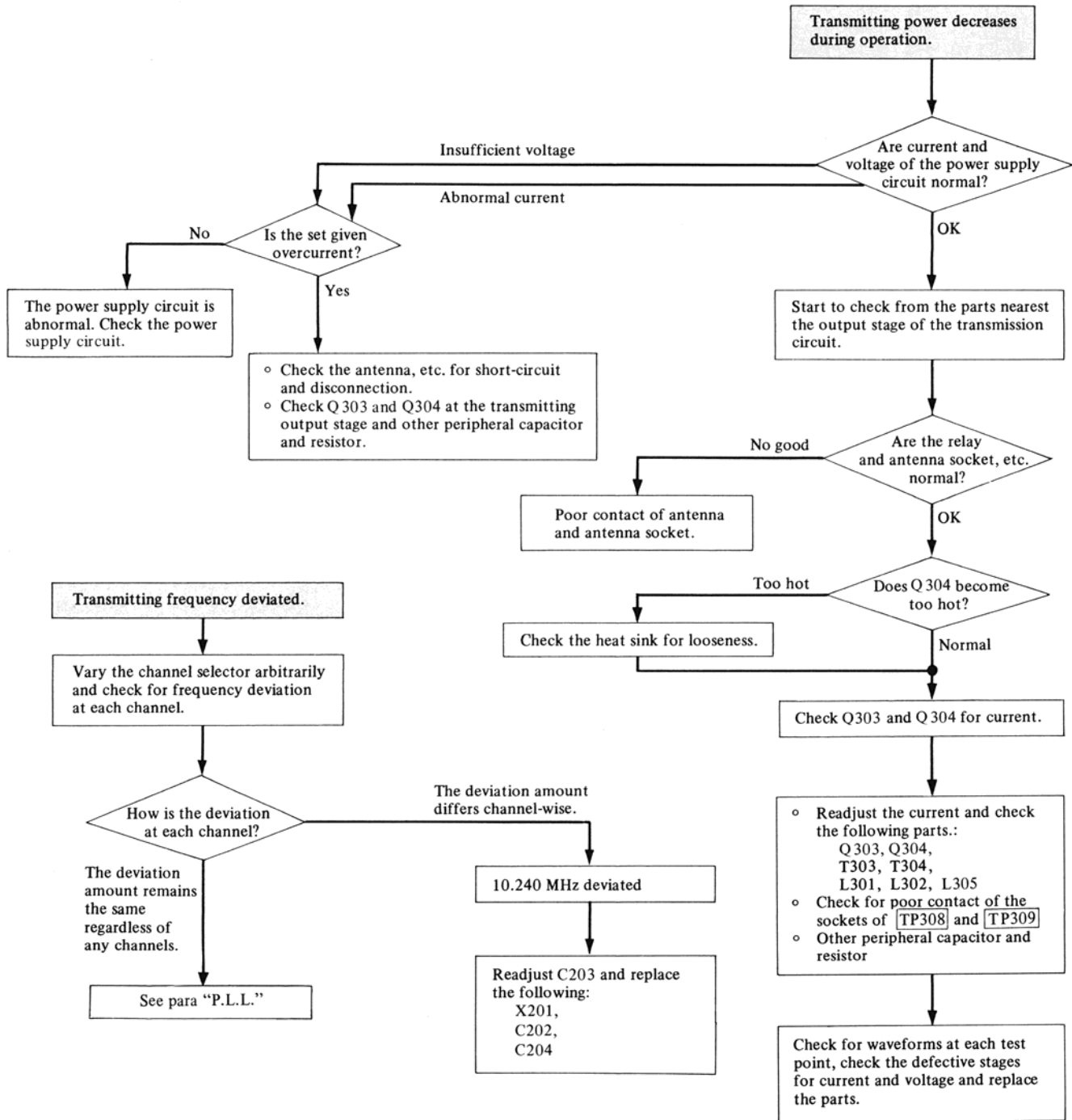
# TRANSMITTER



**TRANSMITTER**



# TRANSMITTER



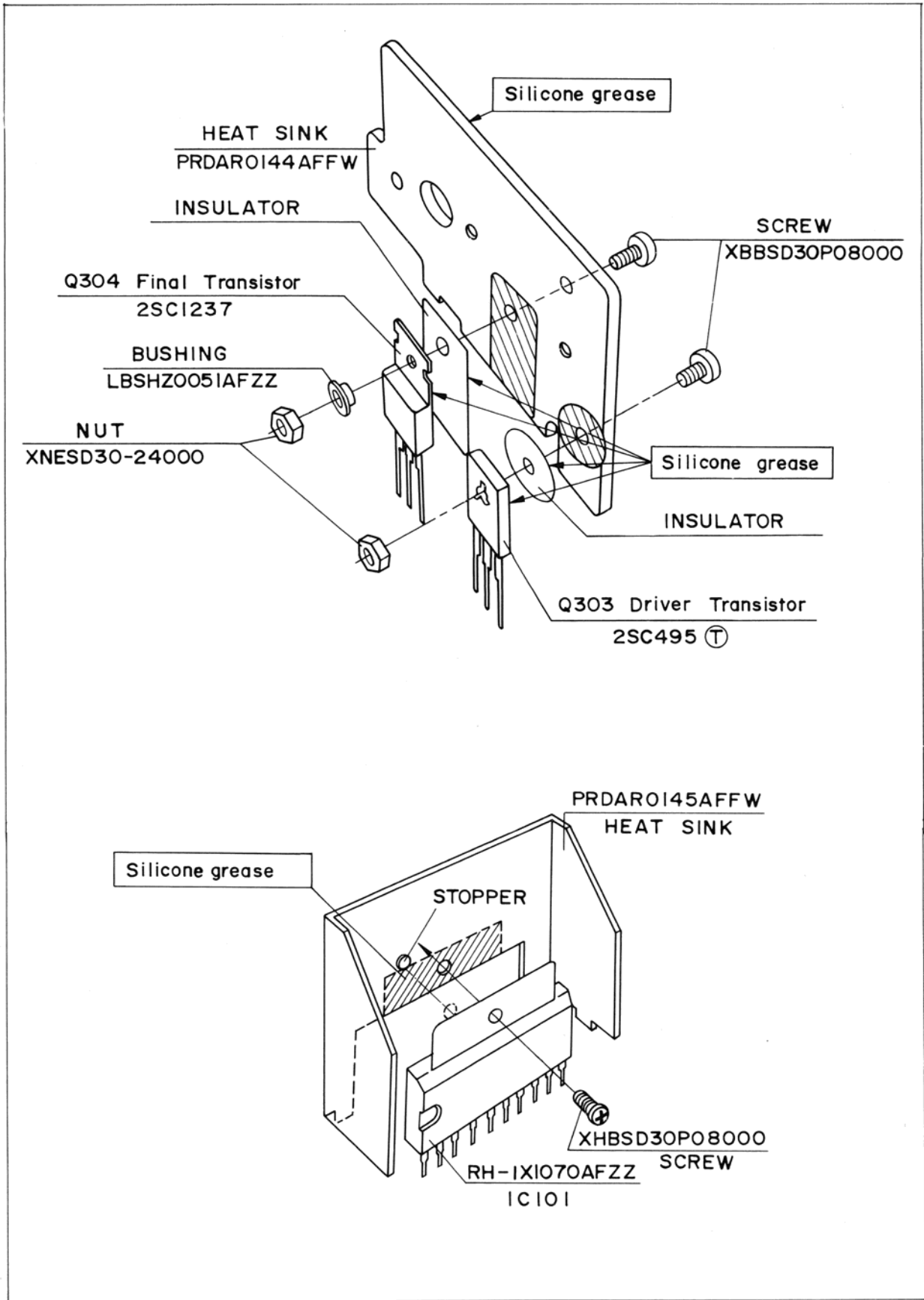
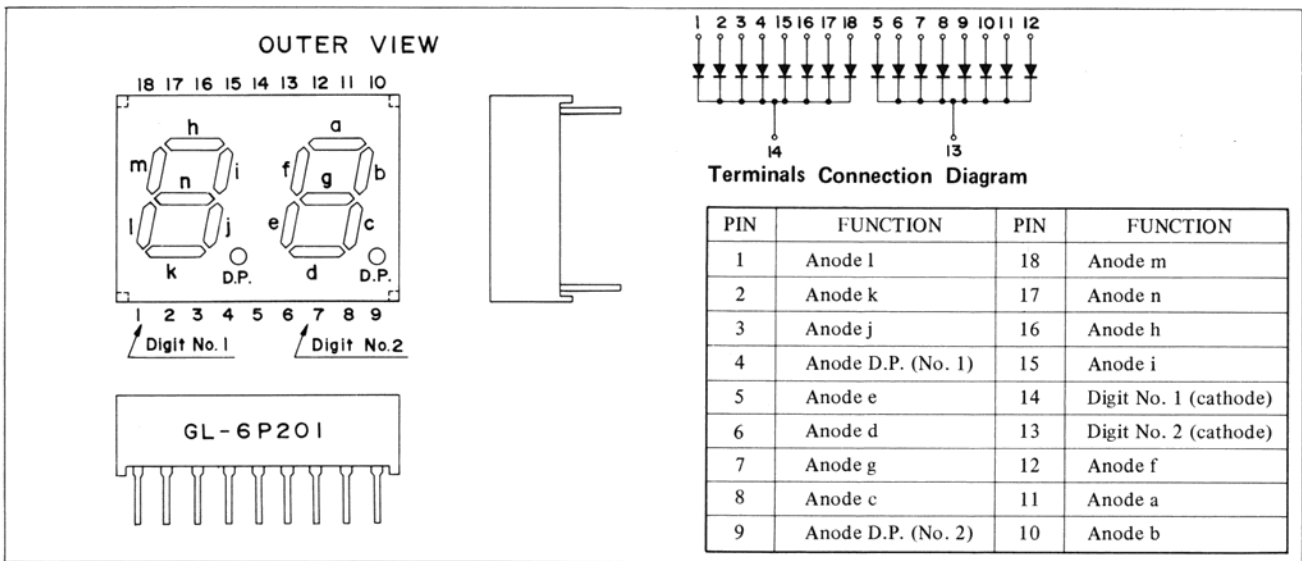
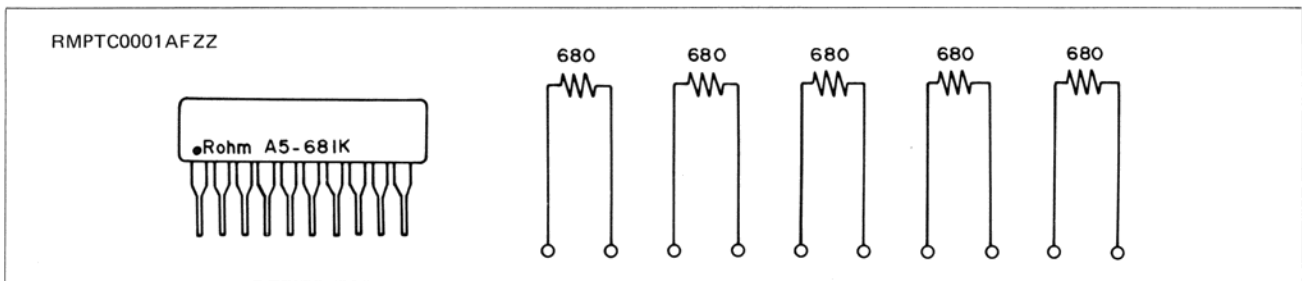


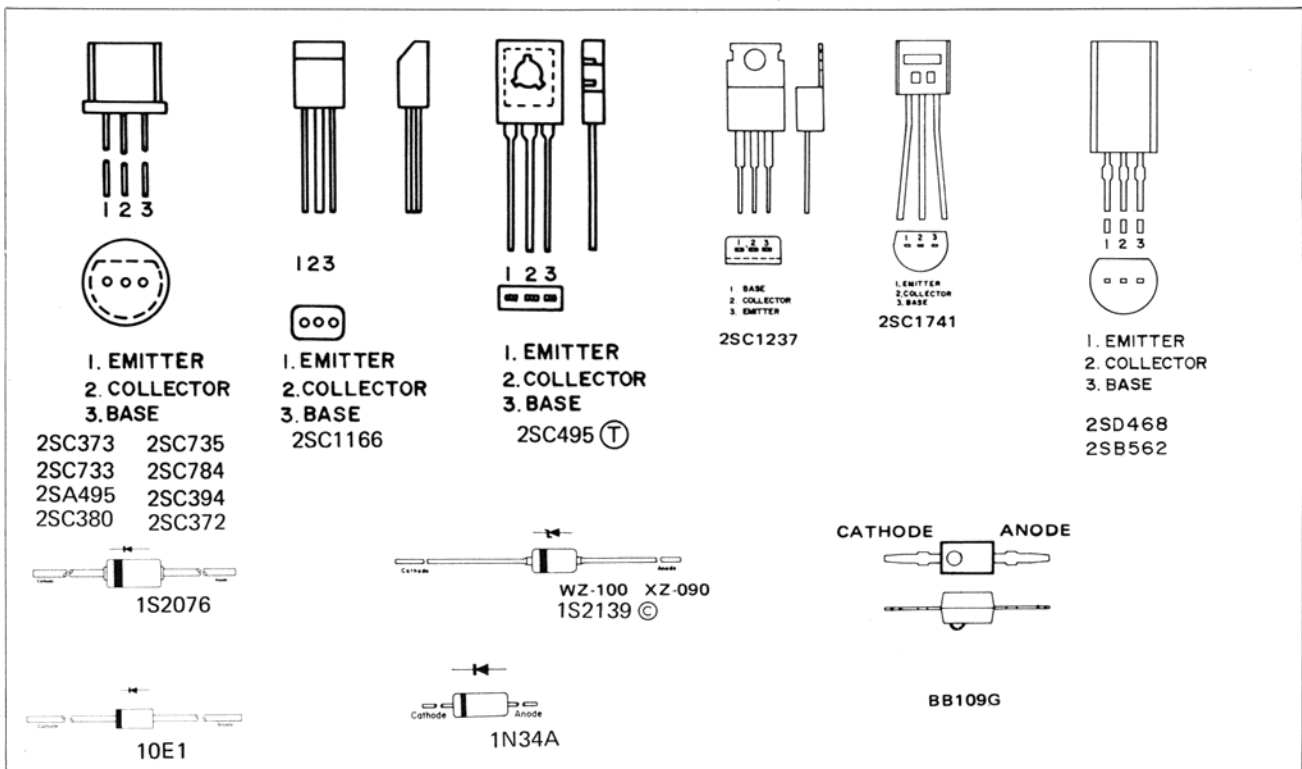
Figure 12 HOW TO SET THE TRANSISTORS AND IC



**Figure13 CHANNEL INDICATOR (LED501)**



**Figure 14 RESISTOR ARRAY**



**Figure 15 SEMICONDUCTORS BASING**





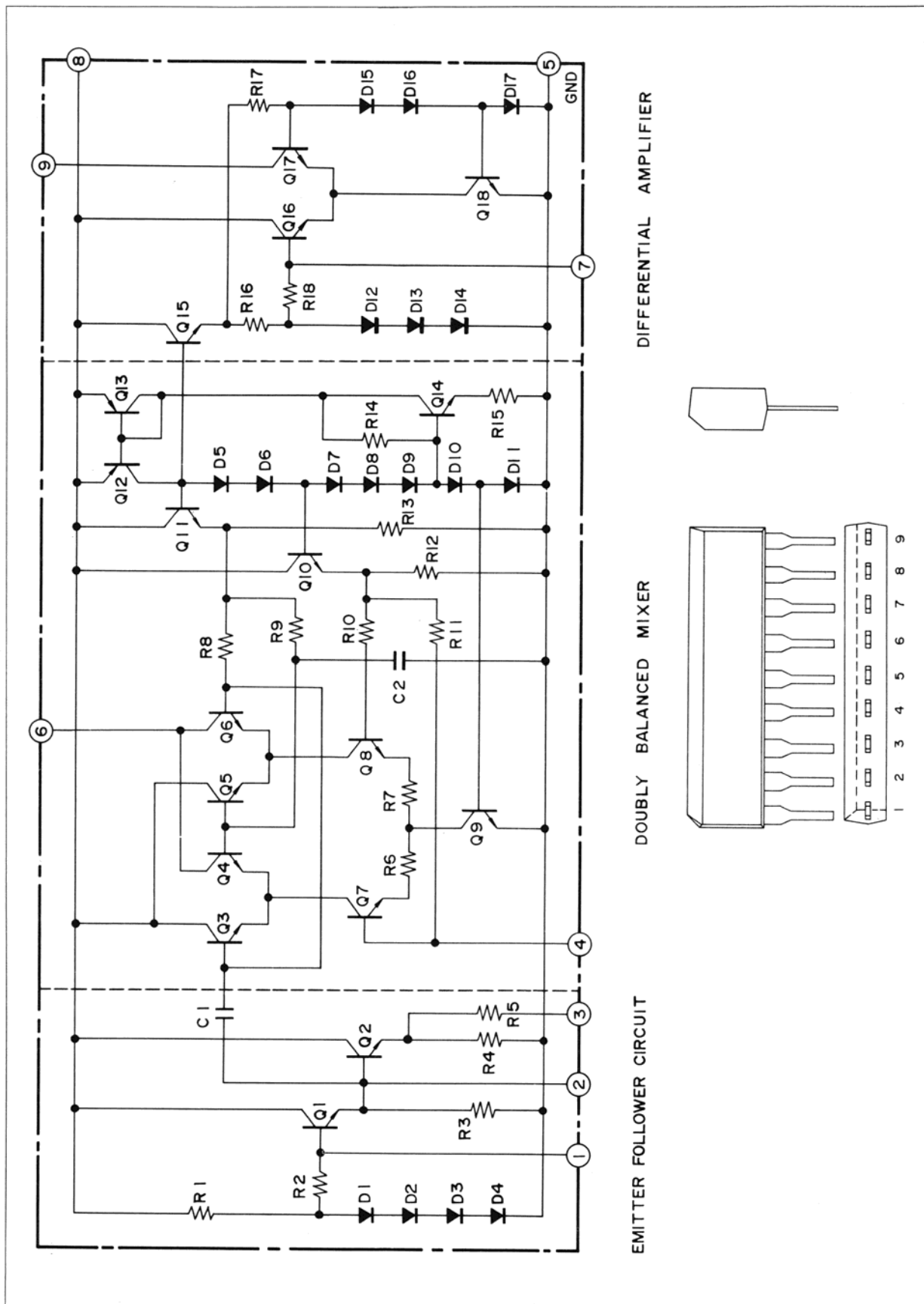


Figure 18 EQUIVALENT CIRCUIT OF IC202 and IC203

RH-IX1070AFZZ

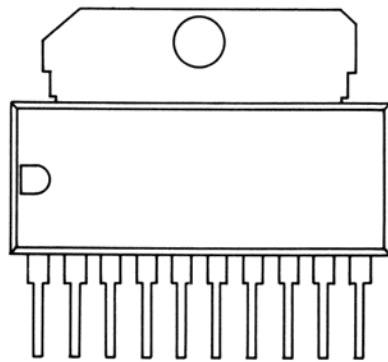
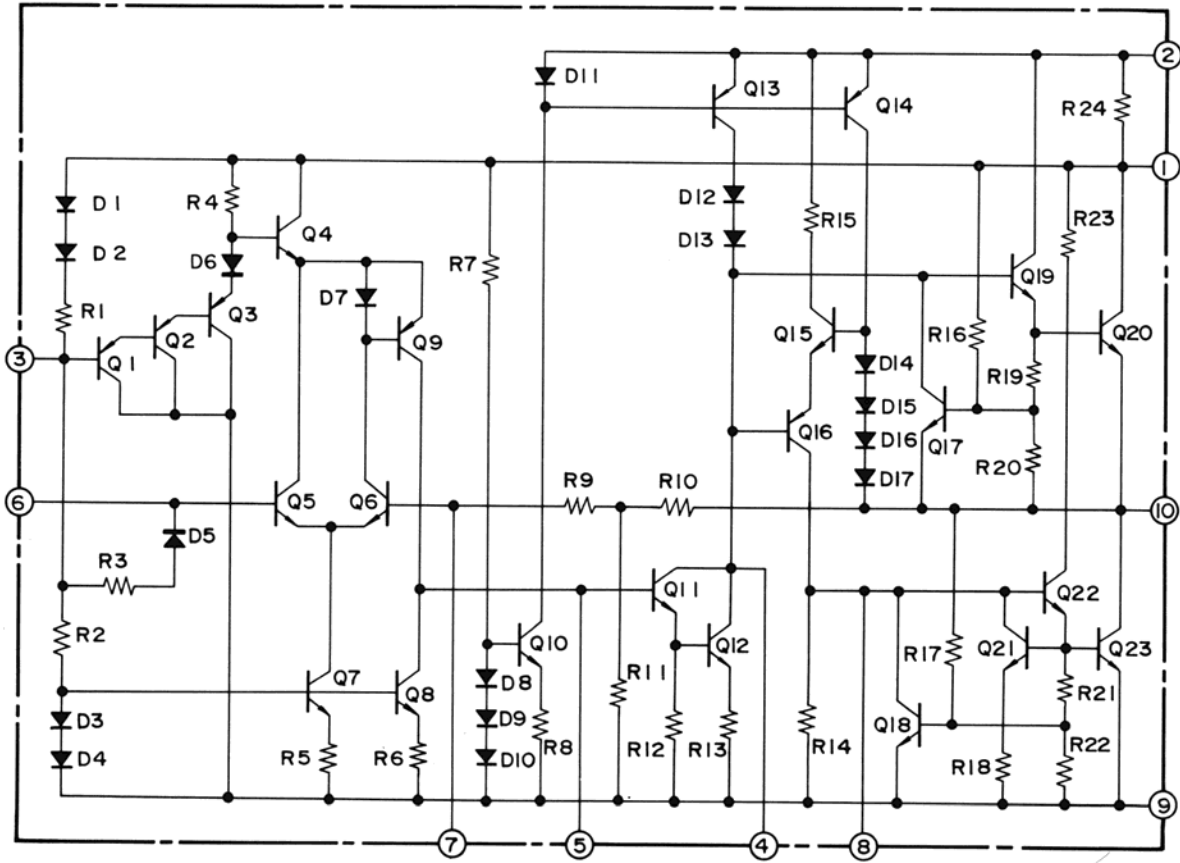


Figure 19 EQUIVALENT CIRCUIT OF IC101



# PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PRICE	REF. NO.	PART NO.	DESCRIPTION	PRICE
<b>TRANSFORMERS</b>				C502	VCEAAU1EW335A	3.3MFD, 25V, +75 -10%	
T1	RCILA0412AFZZ	Antenna		C503	VCAAKU0XA474M	.47MFD, 6.3V, ±20%, Aluminum	
T2	RCILR0304AFZZ	RF		<b>CAPACITORS</b>			
T3	RCILIO157AFZZ	1st-IF (10.695MHz)		(Unless otherwise specified capacitors are 50V, +80 -20%, Ceramic Type.)			
T4	RCILIO157AFZZ	1st-IF (10.695MHz)		C1	VCKZPU1HF103Z	.01MFD	
T5	RCILIO228AFZZ	2nd-IF (455kHz)		C2	VCKZPU1HF103Z	.01MFD	
T6	RCILIO229AFZZ	2nd-IF (455kHz)		C3	VCKZPU1HF103Z	.01MFD	
T7	RCILIO169AFZZ	2nd-IF (455kHz)		C4	VCCSPU1HL271J	270PF, 50V, ±5%, Ceramic	
T8	RCILB0421AFZZ	2nd Local Oscillator (11.150MHz)		C5	VCCSPU1HL220J	22PF, 50V, ±5%, Ceramic	
T9	RCILIO228AFZZ	2nd-IF (455kHz)		C6	VCKYPU1HB103M	.01MFD, 50V, ±20%, Ceramic	
T101	RTRNM0050AFZZ	Output and Modulation		C7	VCKZPU1HF103Z	.01MFD	
T201	RCILR3242AAZZ	Tripler (15.360MHz)		C8	VCCSPU1HL2R0C	2PF, 50V, ±0.25PF, Ceramic	
T202	RCILB3241AAZZ	V.C.O. (Voltage Controlled Oscillator)		C9	VCCSPU1HL330J	33PF, 50V, ±5%, Ceramic	
T203	RCILB0383AFZZ	27MHz Filter		C10	VCCSPU1HL330J	33PF, 50V, ±5%, Ceramic	
T204	RCILB0383AFZZ	27MHz Filter		C11	VCKYPU1HB103M	.01MFD, 50V, ±20%, Ceramic	
T205	RCILR3243AAZZ	16MHz Filter		C12	VCKZPU1HF103Z	.01MFD	
T206	RCILR3243AAZZ	16MHz Filter		C13	VCCSPU1HL5R0C	5PF, 50V, ±0.25PF, Ceramic	
T301	RCILB0383AFZZ	Transmitter, 27MHz Filter		C14	VCKZPU1HF103Z	.01MFD	
T302	RCILB0383AFZZ	Transmitter, 27MHz Filter		C15	VCCSPU1HLR50C	0.5PF, 50V, ±0.25PF, Ceramic	
T303	RCILB0221AFZZ	Transmitter, Buffer		C16	VCQYKU1HM333M	.033MFD, 50V, ±20%, Mylar	
T304	RCILR0037AFZZ	Transmitter, Driver		C17	VCKZPU1HF103Z	.01MFD	
T601	RTRNC0003AFZZ	Power Choke		C18	VCKZPU1HF103Z	.01MFD	
<b>CRYSTALS</b>				C19	VCQYKU1HM333M	.033MFD, 50V, ±20%, Mylar	
X1	RCRSB0055AFZZ	11.150MHz		C20	VCQYKU1HM333M	.033MFD, 50V, ±20%, Mylar	
X201	RCRSB0051AFZZ	10.240MHz		C21	VCKYPU1HB472M	.0047MFD, 50V, ±20%, Ceramic	
<b>CERAMIC FILTER</b>				C24	VCQYKU1HM103M	.01MFD, 50V, ±20%, Mylar	
CF1	RFILA0056AFZZ	455kHz		C25	VCKZPU1HF223Z	.022MFD	
<b>ELECTROLYTIC CAPACITORS</b>				C27	VCCSPU1HL330J	33PF, 50V, ±5%, Ceramic	
C22	VCEAAU1EW335A	3.3MFD, 25V, +75 -10%		C28	VCCSPU1HL680J	68PF, 50V, ±5%, Ceramic	
C23	VCEAAU1EW335A	3.3MFD, 25V, +75 -10%		C29	VCQYKU1HM333M	.033MFD, 50V, ±20%, Mylar	
C26	VCAAKU0XA474M	.47MFD, 6.3V, ±20%, Aluminum		C32	VCCSPU1HL271J	270PF, 50V, ±5%, Ceramic	
C30	VCEAAU1CW106Y	10MFD, 16V, +50 -10%		C33	VCCSPU1HL121J	120PF, 50V, ±5%, Ceramic	
C31	VCEAAU1AW227Y	220MFD, 10V, +50 -10%		C34	VCCSPU1HL221J	220PF, 50V, ±5%, Ceramic	
C37	VCEAAU1CW336Y	33MFD, 16V, +50 -10%		C35	VCKZPU1HF103Z	.01MFD	
C107	VCEAAU1CW106Y	10MFD, 16V, +50 -10%		C36	VCKZPU1HF103Z	.01MFD	
C108	VCEAAU1AW227Y	220MFD, 10V, +50 -10%		C38	VCKZPU1HF103Z	.01MFD	
C109	VCEAAU1CW106Y	10MFD, 16V, +50 -10%		C40	VCKZPU1HF103Z	.01MFD	
C112	VCEAAU1EW335A	3.3MFD, 25V, +75 -10%		C101	VCKYPU1HB472M	.0047MFD, 50V, ±20%, Ceramic	
C113	VCEAAU1CW336Y	33MFD, 16V, +50 -10%		C102	VCKYPU1HB472M	.0047MFD, 50V, ±20%, Ceramic	
C116	VCEAAU0JW476Y	47MFD, 6.3V, +50 -10%		C103	VCQYKU1HM223M	.022MFD, 50V, ±20%, Mylar	
C117	VCEAAU1CW108Y	1000MFD, 16V, +50 -10%		C104	VCKYPU1HB222M	.0022MFD, 50V, ±20%, Ceramic	
C119	VCEAAU1CW106Y	10MFD, 16V, +50 -10%		C105	VCCSPU1HL271J	270PF, 50V, ±5%, Ceramic	
C211	VCSATU1VF224M	.22MFD, 35V, ±20%, Tantalum		C106	VCQYKU1HM683M	.068MFD, 50V, ±20%, Mylar	
C225	VCSATU1EF105M	1MFD, 25V, ±20%, Tantalum		C110	VCCSPU1HL470J	47PF, 50V, ±5%, Ceramic	
C228	VCEAAU1AW107Y	100MFD, 10V, +50 -10%		C111	VCQYKU1HM104M	.1MFD, 50V, ±20%, Mylar	
C232	VCEAAU1AW476Y	47MFD, 10V, +50 -10%		C114	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic	
C237	VCEAAU1HW105A	1MFD, 50V, +75 -10%		C118	VCQYKU1HM333M	.033MFD, 50V, ±20%, Mylar	
C244	VCEAAU1AW107Y	100MFD, 10V, +50 -10%		C123	VCCSPU1HL680J	68PF, 50V, ±5%, Ceramic	
C332	VCAAKU1CA104M	.1MFD, 16V, ±20%, Aluminum		C124	VCCSPU1HL680J	68PF, 50V, ±5%, Ceramic	
C501	VCEAAU1EW335A	3.3MFD, 25V, +75 -10%		C125	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic	
				C201	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic	
				C202	VCCCPU1HH330J	33PF (CH), 50V, ±5%, Ceramic	

# PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PRICE	REF. NO.	PART NO.	DESCRIPTION	PRICE
C203	RTO-H1009AFZZ	Trimmer Capacitor, 10.240MHz Oscillator		C323	VCCSPU1HL471J	470PF, 50V, ±5%, Ceramic	
C204	VCCSPU1HL391J	390PF, 50V, ±5%, Ceramic		C324	VCCSPU1HL271J	270PF, 50V, ±5%, Ceramic	
C205	VCCSPU1HL151J	150PF, 50V, ±5%, Ceramic		C325	VCCSPU1HL820J	82PF, 50V, ±5%, Ceramic	
C206	VCCSPU1HL330J	33PF, 50V, ±5%, Ceramic		C326	VCCSPU1HL220J	22PF, 50V, ±5%, Ceramic	
C207	VCQYKU1HM223M	.022MFD, 50V, ±20%, Mylar		C327	VCKZPU1HF103Z	.01MFD	
C208	VCCCPU1HH150J	15PF (CH), 50V, ±5%, Ceramic		C328	VCCSPU1HL220J	22PF, 50V, ±5%, Ceramic	
C209	VCCCPU1HH5R0C	5PF (CH), 50V, ±0.25PF, Ceramic		C329	VCCSPU1HL560J	56PF, 50V, ±5%, Ceramic	
C210	VCCSPU1HL3R0C	3PF, 50V, ±0.25PF, Ceramic		C330	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic	
C212	VCCCPU1HH470J	47PF (CH), 50V, ±5%, Ceramic		C331	VCKZPU1HF103Z	.01MFD	
C213	VCCUPU1HJ100J	10PF (UJ), 50V, ±5%, Ceramic		C333	VCCSPU1HL511J	510PF, 50V, ±5%, Ceramic	
C214	VCCSPU1HL101J	100PF, 50V, ±5%, Ceramic		C334	VCKZPU1HF103Z	.01MFD	
C215	VCCSPU1HL101J	100PF, 50V, ±5%, Ceramic		C335	VCCSPU1HL511J	510PF, 50V, ±5%, Ceramic	
C216	VCCUPU1HJ180J	18PF (UJ), 50V, ±5%, Ceramic		C336	VCCSPU1HL330J	33PF, 50V, ±5%, Ceramic	
C217	VCQYKU1HM223M	.022MFD, 50V, ±20%, Mylar		C401	VCCSPU1HL151J	150PF, 50V, ±5%, Ceramic	
C218	VCKYPU1HB102M	.001MFD, 50V, ±20%, Ceramic		C402	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic	
C219	VCCSPU1HL101J	100PF, 50V, ±5%, Ceramic		C601	VCKZPU1HF103Z	.01MFD	
C220	VCCSPU1HL101J	100PF, 50V, ±5%, Ceramic		C604	VCKZPU1HF333P	.033MFD, 50V, +100 -0%, Ceramic	
C221	VCCSPU1HL101J	100PF, 50V, ±5%, Ceramic		C605	VCKZPU1HF333P	.033MFD, 50V, +100 -0%, Ceramic	
C222	VCKYPU1HB102M	.001MFD, 50V, ±20%, Ceramic		C608	VCKZPU1HF103Z	.01MFD	
C223	VCQYKU1HM223M	.022MFD, 50V, ±20%, Mylar		C701	VCQYKU1HM333M	.033MFD, 50V, ±20%, Mylar	
C224	VCCSPU1HL101J	100PF, 50V, ±5%, Ceramic		C702	VCQYKU1HM223M	.022MFD, 50V, ±20%, Mylar	
C226	VCCCPU1HH330J	33PF (CH), 50V, ±5%, Ceramic		C703	VCCSPU1HL220J	22PF, 50V, ±5%, Ceramic	
C227	VCKZPU1HF103Z	.01MFD		C704	VCCSPU1HL560J	56PF, 50V, ±5%, Ceramic	
C229	VCKZPU1HF103Z	.01MFD		C705	VCQYKU1HM332M	.0033MFD, 50V, ±20%, Mylar	
C230	VCCCPU1HH100F	10PF (CH), 50V, ±1PF, Ceramic					
C231	VCKZPU1HF103Z	.01MFD					
C233	VCCRPU1HH390J	39PF (RH), 50V, ±5%, Ceramic					
C234	VCKZPU1HF103Z	.01MFD					
C235	VCCRPU1HH330J	33PF (RH), 50V, ±5%, Ceramic					
C236	VCKZPU1HF103Z	.01MFD					
C238	VCKYPU1HB102M	.001MFD, 50V, ±20%, Ceramic					
C239	VCCSPU1HL820J	82PF, 50V, ±5%, Ceramic					
C240	VCCSPU1HL101J	100PF, 50V, ±5%, Ceramic					
C241	VCCSPU1HL101J	100PF, 50V, ±5%, Ceramic					
C243	VCCSPU1HL151J	150PF, 50V, ±5%, Ceramic					
C245	VCQYKU1HM103M	.01MFD, 50V, ±20%, Mylar					
C301	VCCSPU1HL330J	33PF, 50V, ±5%, Ceramic					
C302	VCCSPU1HL390J	39PF, 50V, ±5%, Ceramic					
C303	VCCSPU1HL390J	39PF, 50V, ±5%, Ceramic					
C304	VCCSPU1HL3R0C	3PF, 50V, ±0.25PF, Ceramic					
C305	VCKZPU1HF103Z	.01MFD					
C306	VCKZPU1HF103Z	.01MFD					
C307	VCCSPU1HL151J	150PF, 50V, ±5%, Ceramic					
C308	VCCSPU1HL4R0C	4PF, 50V, ±0.25PF, Ceramic					
C309	VCKZPU1HF103Z	.01MFD					
C310	VCCSPU1HL100D	10PF, 50V, ±0.5PF, Ceramic					
C311	VCKZPU1HF103Z	.01MFD					
C312	VCCSPU1HL221J	220PF, 50V, ±5%, Ceramic					
C313	VCCSPU1HL471J	470PF, 50V, ±5%, Ceramic					
C314	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic					
C315	VCCSPU1HL511J	510PF, 50V, ±5%, Ceramic					
C316	VCCSPU1HL180J	18PF, 50V, ±5%, Ceramic					
C317	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic					
C318	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic					
C319	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic					
C320	VCCSPU1HL511J	510PF, 50V, ±5%, Ceramic					
C321	VCCSPU1HL331J	330PF, 50V, ±5%, Ceramic					
C322	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic					

## RESISTORS

(Unless otherwise specified resistors are 1/4W, ±5%, Carbon Type)

R1	VRD-ST2EE472J	4.7K ohm
R2	VRD-ST2EE152J	1.5K ohm
R3	VRD-ST2EE102J	1K ohm
R4	VRD-ST2EE222J	2.2K ohm
R5	VRD-ST2EE473J	47K ohm
R6	VRD-ST2EE562J	5.6K ohm
R7	VRD-ST2EE471J	470 ohm
R8	VRD-ST2EE472J	4.7K ohm
R9	VRD-ST2EE333J	33K ohm
R10	VRD-ST2EE681J	680 ohm
R12	VRD-SU2EY223J	22K ohm
R13	VRD-ST2EE472J	4.7K ohm
R14	VRD-ST2EE102J	1K ohm
R15	VRD-ST2EE273J	27K ohm
R16	VRD-SU2EY562J	5.6K ohm
R17	VRD-SU2EY102J	1K ohm
R18	VRD-SU2EY102J	1K ohm
R20	VRD-SU2EY224J	220K ohm
R21	VRD-SU2EY333J	33K ohm
R22	VRD-SU2EY223J	22K ohm
R23	VRD-ST2EE333J	33K ohm
R24	VRD-ST2EE153J	15K ohm
R27	VRD-SU2EY104J	100K ohm
R28	VRD-SU2EY224J	220K ohm
R29	VRD-SU2EY104J	100K ohm
R30	VRD-SU2BY333J	33K ohm, 1/8W, ±5%, Carbon
R31	VRD-SU2EY154J	150K ohm
R32	RVR-M0146AFZZ	30K (B) ohm, Signal Meter Adjust
R34	VRD-ST2EE222J	2.2K ohm
R35	VRD-SU2EY222J	2.2K ohm
R36	VRD-ST2EE223J	22K ohm



# PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PRICE	REF. NO.	PART NO.	DESCRIPTION	PRICE
	PGUMM0041AG09	Holder, Meter, Rubber			QSOCE0401AFZZ	Socket, Test Point <b>TP308</b> and <b>TP309</b>	
	PGUMM0116AF09	Holder, Lamp (TX and RX), Rubber			QPLGE0403AGZZ	Plug, Test Point <b>TP308</b> and <b>TP309</b>	
	PGUMS0110AF00	Cushion, P.L.L. Unit, Rubber			PG601	Plug, Power Supply	
	PHAG-001MAFFC	Hanger, Microphone		SO101	QSOCZ2468AFZZ	Socket, Microphone	
	PRDAR0144AFFW	Heat Sink, Transistors (Q303 and Q304)		SO401	QSOCZ2470AFZZ	Socket, External Antenna (50 ohms)	
	PRDAR0145AFFW	Heat Sink, Integrated Circuit IC101		SW101- A ~ D/ RY601	RRLYZ0007AFZZ	Relay with Receiver/Transmitter Switch	
	PSPAG0057AF00	Rubber Washer, Mounting Bracket		SW201- A, B	QSW-R0143AFZZ	Switch, Channel Selector	
CNP101	QCNCM0402SGZZ	Plug, 4 Pin, Microphone		SW701	QSW-B0003AFZZ	Switch, Delta Tuning	
CNP701	QCNCM111KAFZZ	Plug, 10 Pin (U-bend)		SW702	QSW-B0028AGZZ	Switch, ANL (Automatic Noise Limiter)	
CNP702	QCNCM155GAFZZ	Plug, 7 Pin (U-bend)		SW703, SW704/ R704	RVR-B0131AFZZ	Switch, P.A. (Public Address) with Squelch Volume (10K-B ohms)	
CNS101	QCNW-0229AFZZ	Connecting Cord with Socket (4 Pin), Microphone		SW705/ R705	RVR-D0107AFZZ	50K (D) ohms, Off/Volume Control	
CNS501	QCNCW134JAFZZ	Socket, 9 Pin, LED		C606, C607	RC-KZ1009AFZZ	Feed Through Capacitors with Bracket	
CNS502	QCNCW134JAFZZ	Socket, 9 Pin, LED		PL501	RCORF0051AFZZ	Ferrite Core	
CNS701, CNS702	QCNW-0222AFZZ	Connecting Cord with Socket (10 Pin and 7 Pin) and Plug (10 Pin and 7 Pin) Assembly		PL502	RLMPM0069AFZZ	Lamp, RX (Receiver) Indication (14V, 50mA)	
CNW501	QCNW-0224AFZZ	Connecting Cord, 8 Pin		PL701	RLMPM0019AGZZ	Lamp, Meter Illumination	
CNW502	QCNW-0225AFZZ	Connecting Cord, 7 Pin			RMICD0211AFZZ	Microphone Assembly (with Press-to-talk Switch)	
CNW503	QCNW-0226AFZZ	Connecting Cord, 3 Pin		ME701	RMTRE0063AFZZ	Meter, Signal/RF Power	
CNW504	QCNW-0227AFZZ	Connecting Cord, 2 Pin			RTUNS0050AFZZ	P.L.L. Unit	
CNW505	QCNW-0228AFZZ	Connecting Cord, 4 Pin			SPAKC1005AFZZ	Packing Case	
	QCNW-0238AFZZ	Connecting Cord with Socket, Speaker		SP601	SSAKZ0053AFZZ	Polyethylene Bag, Set	
	QFS-A232AAFNA	Fuse, 2.3 Ampere			VSP0080P-288A	Speaker, 8 ohms, 8cm	
	QFSHJ9052AFZZ	Power Supply Cord with Fuse Holder and Socket			XBBS30W08000	Screw, 3φ × 8mm, Microphone Hanger	
J601-A, B	QJAKB0050AFZZ	Jacks, External Speaker (J601-A) and P.A. Speaker (J601-B)			XNESD50-40000	Nut (5φ)	
	QPWBF0052AAZZ	Printed Wiring Board, P.L.L. Circuit			XWHSD50-05000	Washer (5φ)	
	QPWBF0612AFZZ	Printed Wiring Board, Main Circuit			XWSSD50-13000	Spring Washer (5φ)	
	QPWBF0613AFZZ	Printed Wiring Board, Volume Circuit					
	QPWBF0614AFZZ	Flexible Printed Circuits, Channel Indicator					
PG201	QPLGZ0850AFZZ	Plug, 8 Pin					
PG202	QPLGZ0850AFZZ	Plug, 8 Pin					