

SHARP

OUTSTANDING RECEPTION THE WORLD OVER

SERVICE MANUAL

CB-2460



40 Channel C.B. Transceiver MODEL CB-2460

"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 ± 0.004%
 Others ± 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 0.7µV/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
 11.730MHz ± 0.003%
 Selectivity 6dB down at ±3kHz;
 50dB down at ± 10kHz.
 Intermediate frequency.... 1st-IF: 11.275MHz,
 2nd-IF: 455kHz

Circuit type..... Dual conversion superheterodyne: P.L.L. circuit 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 2-1/4"(H) x 5-3/4"(W) x 7-7/8"(D)
 Weight 4 lbs. with microphone
 Cabinet..... Metal body with plastic front

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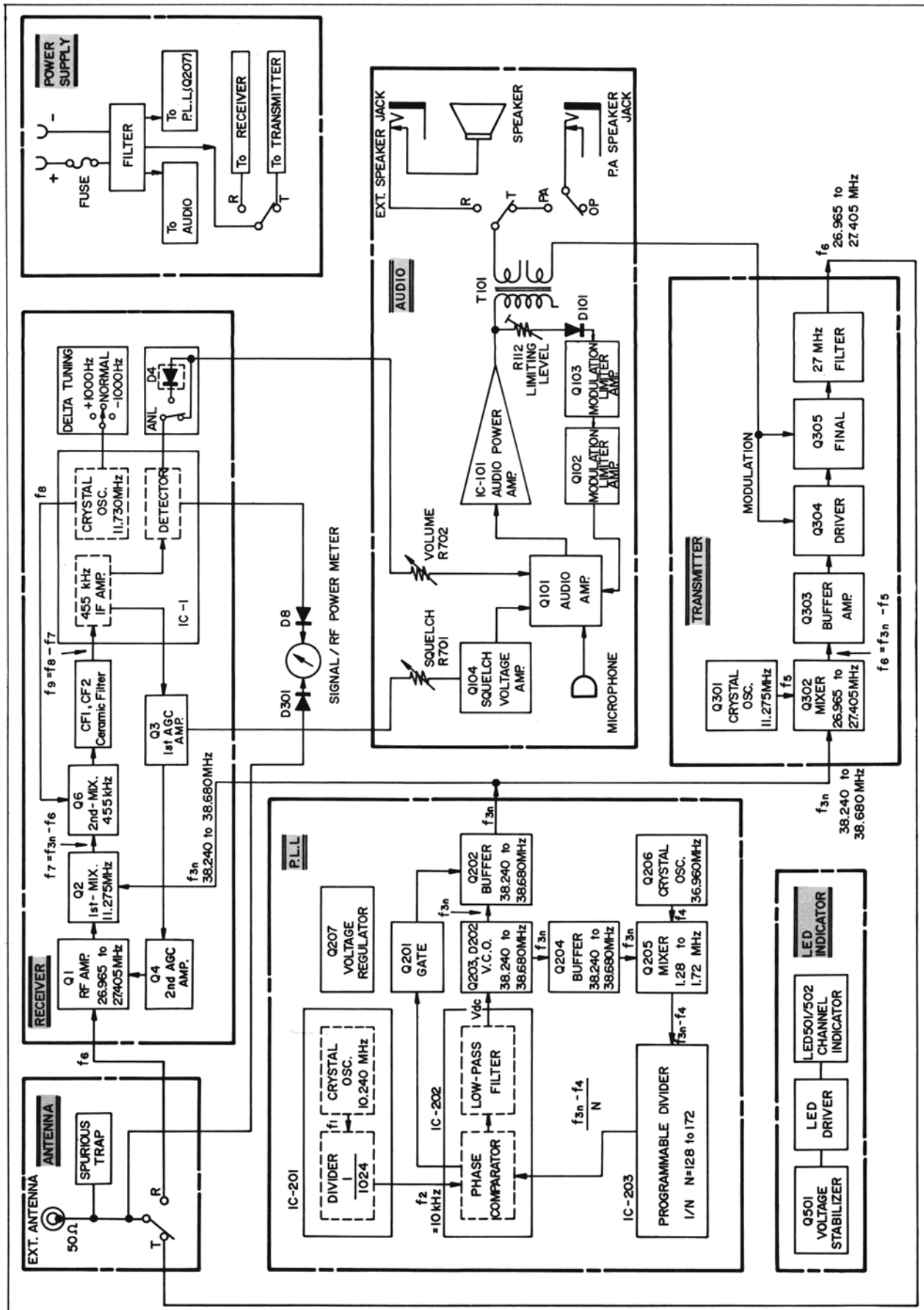


Figure 1 BLOCK DIAGRAM

GENERAL DESCRIPTION (Refer to Figure 1)

RECEIVER SECTION

An input signal sent from the antenna is applied to the 1st-mixer of transistor Q2 via the RF amplifier of transistor Q1, and an oscillator signal sent from transistor Q202 is also applied to the 1st-mixer of transistor Q2. In this stage the above-mentioned input signal is converted to 1st-IF signal of 11.275 MHz.

The 1st-IF signal (11.275 MHz) is applied to the 2nd-mixer of transistor Q6 via the transformers T3 and T4 to be converted to 2nd-IF signal of 455 kHz. The 2nd-IF signal is applied to the pin ⑦ of IC-1 via the transformer T5 and ceramic filters CF1 and CF2. (The 2nd-IF signal is amplified between the pin ⑦ and pin ⑧ of IC-1 and it is also detected between the pin ⑫ and pin ⑪).

The detected output signal developed at the pin ⑪ of IC-1 is further applied to IC-101 consisting of drive circuit and power amplifier via audio amplifier of transistor Q101.

TRANSMITTER SECTION

The audio signal from the microphone is applied through the audio amplifier Q101 and the output of IC-101 to the final stage Q305 and the drive stage Q304.

The carrier signal synthesized in the P.L.L. circuit, the oscillator Q301 and mixer Q302 is supplied to the final amplifier Q305 where it is modulated with the audio signal and applied to the antenna for transmission.

A DESCRIPTION OF PHASE-LOCKED-LOOP (P.L.L.) CIRCUIT (Figure 2)

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 two crystals, the synthesizer serves as an oscillator to oscillate step by step (10 kHz) in the range of 38.240 MHz ~ 38.680 MHz.

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.

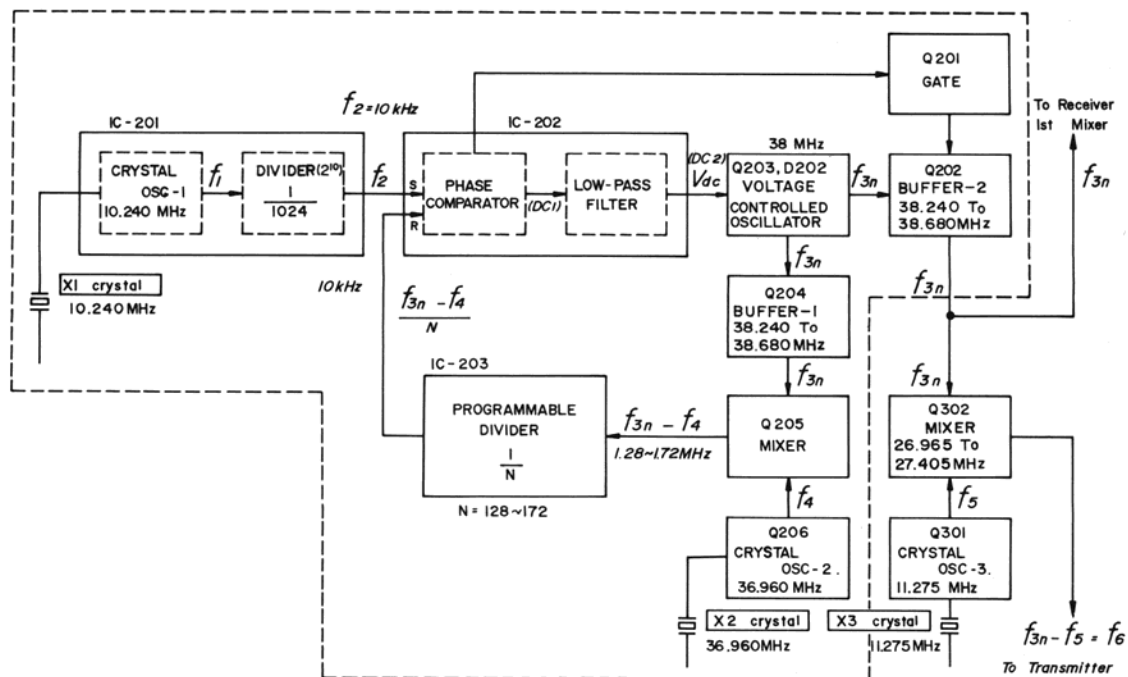


Figure 2 P.L.L. CIRCUIT FREQUENCY SYNTHESIZER

2) Frequency Synthesizer

The frequencies for both transmitter and receiver are synthesized by three crystal controlled oscillators and the Phase-Locked-Loop (or P.L.L.) consisting of six basic building blocks: the phase detector (phase comparator) IC-202, the low-pass filter

IC-202, the voltage controlled oscillator (or V.C.O.) Q203, the buffer amplifier Q204, the mixer Q205 and the programmable divider IC-203 as shown in Figure 2.

3) Frequency Determining (Refer to Figure 2)

- 1 - A crystal oscillator consisting of a crystal X 1 (10.240MHz) and IC-201 generates a basic frequency f_1 (=10.240MHz) and it is divided down through a fixed divided network (a portion of IC-201) to 10kHz frequency (f_2). The frequency 10kHz is applied to the input of a phase comparator IC-202.
- 2 - A second oscillator Q203 is a voltage controlled oscillator (V.C.O.) and its frequency (f_{3n}) is determined with a DC voltage (V_{dc}) from IC-202. The output frequency (f_{3n}) is applied to a mixer (Q205) through a buffer amplifier (Q204).
- 3 - A third oscillator consisting of a crystal X 2 (36.960MHz) and a transistor Q206 generates a frequency f_4 (=36.960 MHz) and feed its frequency to the mixer Q205 also.
- 4 - Although the mixer Q205 produces two frequency signals $f_{3n} + f_4$ and $f_{3n} - f_4$, the frequency $f_{3n} - f_4$ only is applied to a programmable divider IC-203 through a low-pass filter consisting of a coil L201 and capacitors C214 and C216.
- 5 - The programmable divider IC-203 divides the frequency $f_{3n} - f_4$ by the frequency divider number N, which is programmable by the switch position of the channel selector connected to the terminal pins 1 to 6 and 8 of IC-203. The assigned number is shown in Table 1. The output frequency $(f_{3n} - f_4) / N$ is close to 10kHz and is fed back to the phase comparator of IC-202.
- 6 - The phase comparator of IC-202 compares the frequency f_2 (= 10kHz) and the other frequency $(f_{3n} - f_4) / N$ from the programmable divider and generates a D.C. voltage V_{dc} proportional to the phase differences of both frequencies. The voltage V_{dc} goes back to the V.C.O. Q203 through a low-pass filter.
- 7 - In this method, a closed-loop frequency-feedback system, which is so called P.L.L., is formed and the frequency f_{3n} of V.C.O. Q203 is locked.
- 8 - When the P.L.L. is in lock, two frequencies to phase comparator input are the same and therefore the frequency f_{3n} is determined as follows:

$$f_{3n} = Nf_2 + f_4$$

Where $f_2 = 10\text{kHz}$

$$f_4 = 36.960\text{MHz}$$

$N = 128$ to 172 Determined by channel selector as shown in Table 1.

For example, the frequency f_{3n} of channel 1 is calculated as follows:

$$\begin{aligned} f_{3n} &= 128 \times 0.01 + 36.960 \text{ (MHz)} \\ &= 38.240 \text{ (MHz)} \end{aligned}$$

Where "N = 128" is assigned for channel 1 by channel selector.

This frequency f_{3n} is applied to the first mixer of receiver and a mixer Q302 of transmitter through a buffer amplifier Q202 and a filter block T202.

- 9 - DC voltage condition may vary according to the frequencies as tabulated below.

Lock frequency condition: $f_2 = \frac{f_{3n} - f_4}{N}$

f_{3n}	$f_{3n} - f_4$	$\frac{f_{3n} - f_4}{N}$	$f_2 \cdot \frac{f_{3n} - f_4}{N}$	Voltage DC ₁	Voltage DC ₂	f_{3n}	Final frequency
Rise (↑)	Rise (↑)	Rise (↑)	<	Rise (↑)	Drop (↓)	Drop (↓)	Lock
Drop (↓)	Drop (↓)	Drop (↓)	>	Drop (↓)	Rise (↑)	Rise (↑)	Lock
Lock	Still	Still	=	Still	Still	Still	Lock

- 10 - The Transmitter Frequency

The transmitter frequency f_6 is determined by mixing f_{3n} and f_5 signal which is generated by a crystal oscillator consisting of Q301 and crystal X 3. (= 11.275 MHz) and

$$\begin{aligned} f_6 &= f_{3n} - f_5 \\ &= (Nf_2 + f_4) - f_5 \end{aligned}$$

Where $f_5 = 11.275\text{MHz}$

Consequently, the transmitter frequency f_6 is all crystal controlled. Table 1 shows the synthesized frequencies for each channel.

- 11 - Gate (transistor Q201) shown in the block diagram works to detect a lock condition of the P.L.L. circuit and to take out an output only at the lock condition, controlling the buffer-2 (transistor Q202) amplifier --- it is thus prevented that an unstable signal is emitted when the P.L.L. circuit can not be locked for some reason.

FREQUENCY OF SYNTHESIS CHART

TUNING FREQUENCY (MHz)	CHANNEL	N	f_1 (MHz)	f_2 (kHz)	f_{3n} (MHz)	f_4 (MHz)	f_5 (MHz)	$f_{3n}-f_4$ (MHz)	$f_{3n}-f_5$ (MHz)
26.965	(1)	128	10.240	10	38.240	36.960	11.275	1.280	26.965
26.975	(2)	129	10.240	10	38.250	36.960	11.275	1.290	26.975
26.985	(3)	130	10.240	10	38.260	36.960	11.275	1.300	26.985
27.005	(4)	132	10.240	10	38.280	36.960	11.275	1.320	27.005
27.015	(5)	133	10.240	10	38.290	36.960	11.275	1.330	27.015
27.025	(6)	134	10.240	10	38.300	36.960	11.275	1.340	27.025
27.035	(7)	135	10.240	10	38.310	36.960	11.275	1.350	27.035
27.055	(8)	137	10.240	10	38.330	36.960	11.275	1.370	27.055
27.065	(9)	138	10.240	10	38.340	36.960	11.275	1.380	27.065
27.075	(10)	139	10.240	10	38.350	36.960	11.275	1.390	27.075
27.085	(11)	140	10.240	10	38.360	36.960	11.275	1.400	27.085
27.105	(12)	142	10.240	10	38.380	36.960	11.275	1.420	27.105
27.115	(13)	143	10.240	10	38.390	36.960	11.275	1.430	27.115
27.125	(14)	144	10.240	10	38.400	36.960	11.275	1.440	27.125
27.135	(15)	145	10.240	10	38.410	36.960	11.275	1.450	27.135
27.155	(16)	147	10.240	10	38.430	36.960	11.275	1.470	27.155
27.165	(17)	148	10.240	10	38.440	36.960	11.275	1.480	27.165
27.175	(18)	149	10.240	10	38.450	36.960	11.275	1.490	27.175
27.185	(19)	150	10.240	10	38.460	36.960	11.275	1.500	27.185
27.205	(20)	152	10.240	10	38.480	36.960	11.275	1.520	27.205
27.215	(21)	153	10.240	10	38.490	36.960	11.275	1.530	27.215
27.225	(22)	154	10.240	10	38.500	36.960	11.275	1.540	27.225
27.235	(24)	155	10.240	10	38.510	36.960	11.275	1.550	27.235
27.245	(25)	156	10.240	10	38.520	36.960	11.275	1.560	27.245
27.255	(23)	157	10.240	10	38.530	36.960	11.275	1.570	27.255
27.265	(26)	158	10.240	10	38.540	36.960	11.275	1.580	27.265
27.275	(27)	159	10.240	10	38.550	36.960	11.275	1.590	27.275
27.285	(28)	160	10.240	10	38.560	36.960	11.275	1.600	27.285
27.295	(29)	161	10.240	10	38.570	36.960	11.275	1.610	27.295
27.305	(30)	162	10.240	10	38.580	36.960	11.275	1.620	27.305
27.315	(31)	163	10.240	10	38.590	36.960	11.275	1.630	27.315
27.325	(32)	164	10.240	10	38.600	36.960	11.275	1.640	27.325
27.335	(33)	165	10.240	10	38.610	36.960	11.275	1.650	27.335
27.345	(34)	166	10.240	10	38.620	36.960	11.275	1.660	27.345
27.355	(35)	167	10.240	10	38.630	36.960	11.275	1.670	27.355
27.365	(36)	168	10.240	10	38.640	36.960	11.275	1.680	27.365
27.375	(37)	169	10.240	10	38.650	36.960	11.275	1.690	27.375
27.385	(38)	170	10.240	10	38.660	36.960	11.275	1.700	27.385
27.395	(39)	171	10.240	10	38.670	36.960	11.275	1.710	27.395
27.405	(40)	172	10.240	10	38.680	36.960	11.275	1.720	27.405

CRYSTAL

- X 1 crystal 10.240MHz = f_1
- X 2 crystal 36.960MHz = f_4
- X 3 crystal 11.275MHz = f_5

Table 1 FREQUENCY OF SYNTHESIS CHART

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 3 to be connected to it.

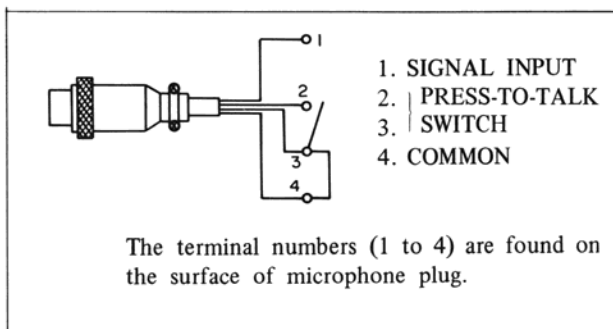


Figure 3 CONNECTION OF MICROPHONE PLUG

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

STEP	CONNECTION OF MEASURING INSTRUMENT	ADJUSTMENT	PROCEDURE
1 (10.240MHz)	Connect a frequency counter, through 5pF capacitor, to the test point [201] (the terminal No. 1 of IC-201).	C202	Adjust so that the frequency counter reads within 10.240MHz \pm 300Hz. (The oscillation voltage then is about 0.4 to 0.5V the value on RF V.T.V.M.)
2 (36.960MHz)	1) Connect an RF voltmeter to the test point [211] (the base of Q205). 2) Make the secondary of V.C.O. coil T201 be short-circuited.	T203	1) Adjust so that the RF voltmeter reads the maximum. 2) Next, rotate the core of T203 counterclockwise so that such maximum reading of the voltmeter is lowered by 0.5dB. (The oscillation voltage then is about 0.7 to 1.2V.)
3 (36.960MHz)	1) Connect the frequency counter, through 5pF capacitor, to the test point [211] (the base of Q205). 2) Make the secondary of V.C.O. coil T201 be short-circuited.	C222	Adjust so that the frequency counter reads within 36.960MHz \pm 300Hz.
4 (V.C.O.)	1) Connect a DC V.T.V.M. to the test point [205] (the terminal No. 1 of IC-202). 2) Connect the frequency counter, through 5pF capacitor, to the test point [206] (the secondary of T201).	T201	1) Set the channel selector to "19" channel. 2) Adjust so that the DC V.T.V.M. reads exactly 3.0V. 3) Make sure the frequency counter is reading 38.460MHz. (The oscillation voltage at the test point [206] is about 0.7 to 1.2V.) 4) Set in turn the channel selector to "1" channel and/or "40" channel and make sure the DC V.T.V.M. reads within 2.0V to 4.0V.
5 (P.L.L. Lock)	Connect the DC V.T.V.M. to the test point [204] (the terminal No. 4 of IC-202).		Make sure the DC V.T.V.M. is reading about 6.4V. If it otherwise reads "0" this means the P.L.L. has not been locked.
6 (38MHz Filter)	Connect a synchroscope to the test point [208] (the output terminal of the filter coil T202).	T202	1) Set the channel selector to "19" 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. Note: Generally speaking, the T202 requires no alignment even at the time of parts replacement since it has been factory-delivered only after undergoing the alignment.

RECEIVER ALIGNMENT

STEP	CONNECTION OF MEASURING INSTRUMENT	ADJUSTMENT	PROCEDURE
1 (11.730MHz)	Connect the frequency counter, through 5pF capacitor to the test point [3] (the secondary of T6)	T6	Adjust so that the frequency counter reads within 11.730MHz \pm 300Hz. (The oscillation voltage then is about 0.5 to 0.9V.)
2 (IF)	1) Connect an AC V.T.V.M. to both sides of the speaker voice coil lug. 2) Connect a signal generator, through 0.01MFD capacitor, to the test point [1] (the base of Q2). 3) Set the signal generator to 11.275MHz, modulation 1000H, 30%. Note: Be sure to connect the ground wire of signal generator to the ground of the external antenna socket.	T5 T4 T3	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 27.185MHz (19 channel), modulation 1000Hz, 30%.	T2 T1	1) Set the channel selector to 19 channel. 2) Adjust the AC V.T.V.M. until it reads the maximum.

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 Q305 may be damaged.
- 2- When making the connection of measuring instruments, see Figure 4.

STEP	CONNECTION OF MEASURING INSTRUMENT	ADJUSTMENT	PROCEDURE
1 (11.275MHz)	1) Connect the frequency counter, through 5pF capacitor, to the test point [302] (the drain of Q301). 2) Make the secondary of V.C.O. coil T201 be short-circuited.	T301	Adjust so that the frequency counter reads within 11.275MHz \pm 300Hz. (The oscillation voltage then is about 0.8 to 1.8V.)
2 (27MHz Filter)	Connect the synchroscope to the test point [304] (the secondary of T302).	T302	1) Set the channel selector to "19" 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. Note: Generally speaking, the T302 requires no alignment even at the time of parts replacement since it has been factory-delivered only after undergoing the adjustment.
3 (Driver)	1) Remove the plug which have been inserted in the test points [309] and [310] of the set. 2) Connect in turn DC milliammeter, through the RF rejection filter shown in Figure 5, to the test points [309] and [310].	T303	Adjust so that the DC milliammeter connected to the test point [310] reads the maximum (driver current).
4 (Driver)	Same as the above	T304	Adjust so that the DC milliammeter connected to the test point [310] indicates the dip point. The amperage then is about 60 to 90 mA.
5 (Final)	Same as the step 3	L302	Adjust so that the DC milliammeter connected to the test point [309] reads 450 \pm 30 mA (final current).
6 (π -Filter)	Connect the RF output power meter and 50 ohms dummy load to the antenna socket.	L303	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.)
7	Repeat the steps 3 to 6 until the best results will be obtained.		
8 (Second harmonic)	Connect the RF output power meter, 50 ohms dummy load and spectrum analyzer (or field strength meter), through CM coupler, to the antenna socket.	L305	1) Set the channel selector to "19" channel. 2) Adjust so that 54MHz output component (second harmonic) becomes the minimum on the spectrum analyzer (or field strength meter).
9 (Third harmonic)	Same as the above.	L304	1) Set the channel selector to "19" channel. 2) Adjust so that 81MHz output component (third harmonic) becomes the minimum on the spectrum analyzer (or field strength meter).

STEP	CONNECTION OF MEASURING INSTRUMENT	ADJUSTMENT	PROCEDURE
10 (Modulation)	1) Connect the RF output power meter, 50 ohms dummy load and synchroscope, through CM coupler, to the antenna socket. 2) Connect audio signal generator, attenuator and AC V.T.V.M. to the microphone socket (using the microphone plug shown in Figure 3). 3) Keep the output of signal generator to 1000Hz, 1V.	R112	1) Turn R112 clockwise until the modulation limiter circuit stops its function. 2) Make the attenuator operate so that the modulation factor of RF output waveform appeared on the synchroscope becomes 50%. Then adjust the attenuator so that the microphone input signal increases 20dB over the original one. (The microphone input then is about 30mV.) 3) Adjust R112 so that the modulation factor of RF output waveform appeared on the synchroscope becomes about 80%. (See Figure 6.)

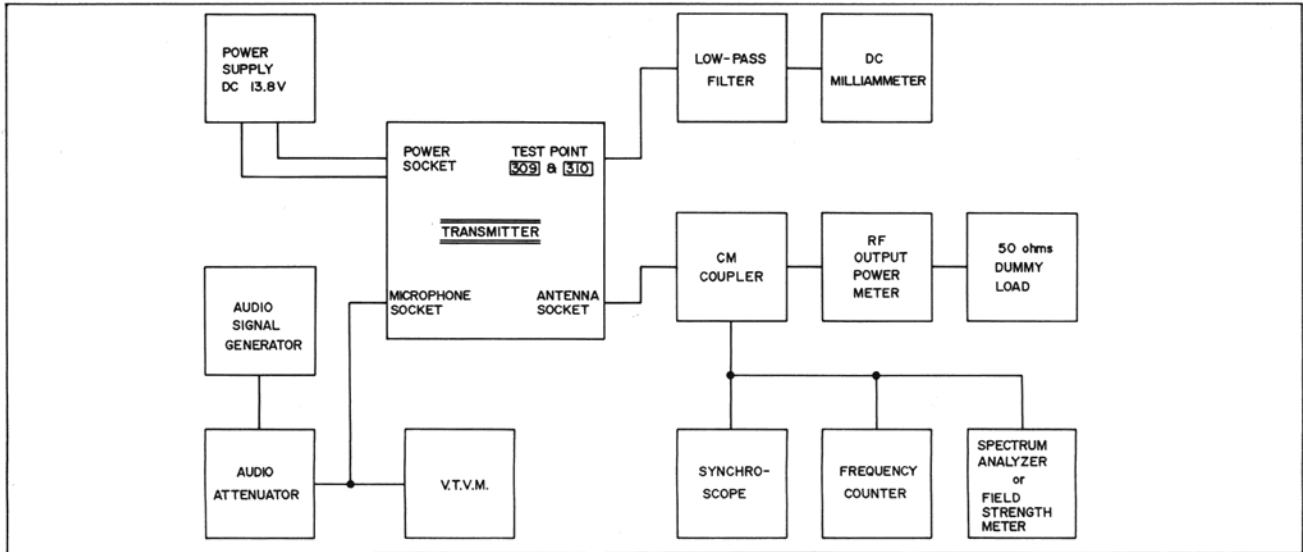


Figure 4

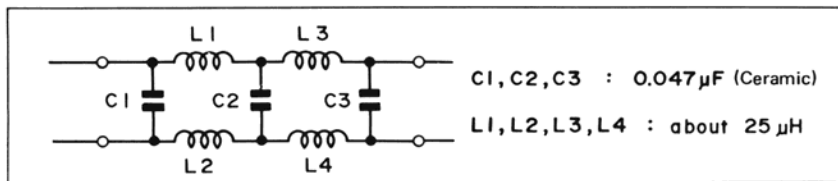


Figure 5 RF REJECTION FILTER
(LOW-PASS FILTER)

SIGNAL/RF POWER METER ADJUSTMENT

STEP	CONNECTION OF MEASURING INSTRUMENT	ADJUSTMENT	PROCEDURE
1	Connect the signal generator to the antenna socket and set the frequency to 27.185MHz ("19" channel) and the modulation to 1000Hz, 30%. Keep the output of signal generator to 40dB.	R19	1) Set the channel selector to "19" channel. 2) Adjust so that the signal/RF power meter indicates "9" on the "SIGNAL" scale.
2	Connect the RF output power meter and 50 ohms dummy load to the antenna socket.	R319	1) Set the channel selector to "19" 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 R319 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.)

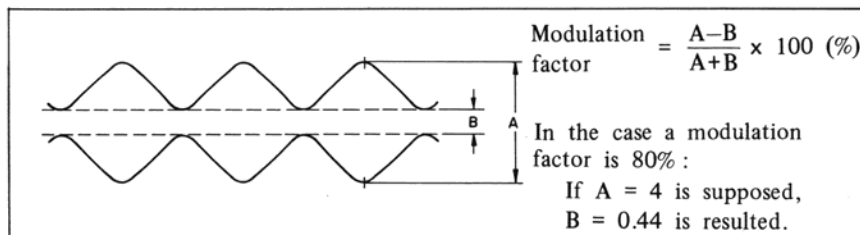


Figure 6

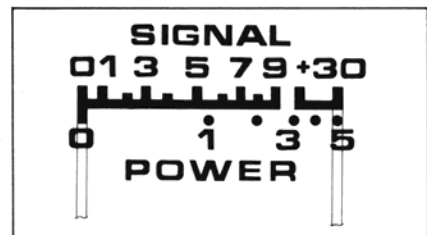


Figure 7 SIGNAL/RF POWER METER (ME601)



Figure 8 FRONT PARTS LAYOUT

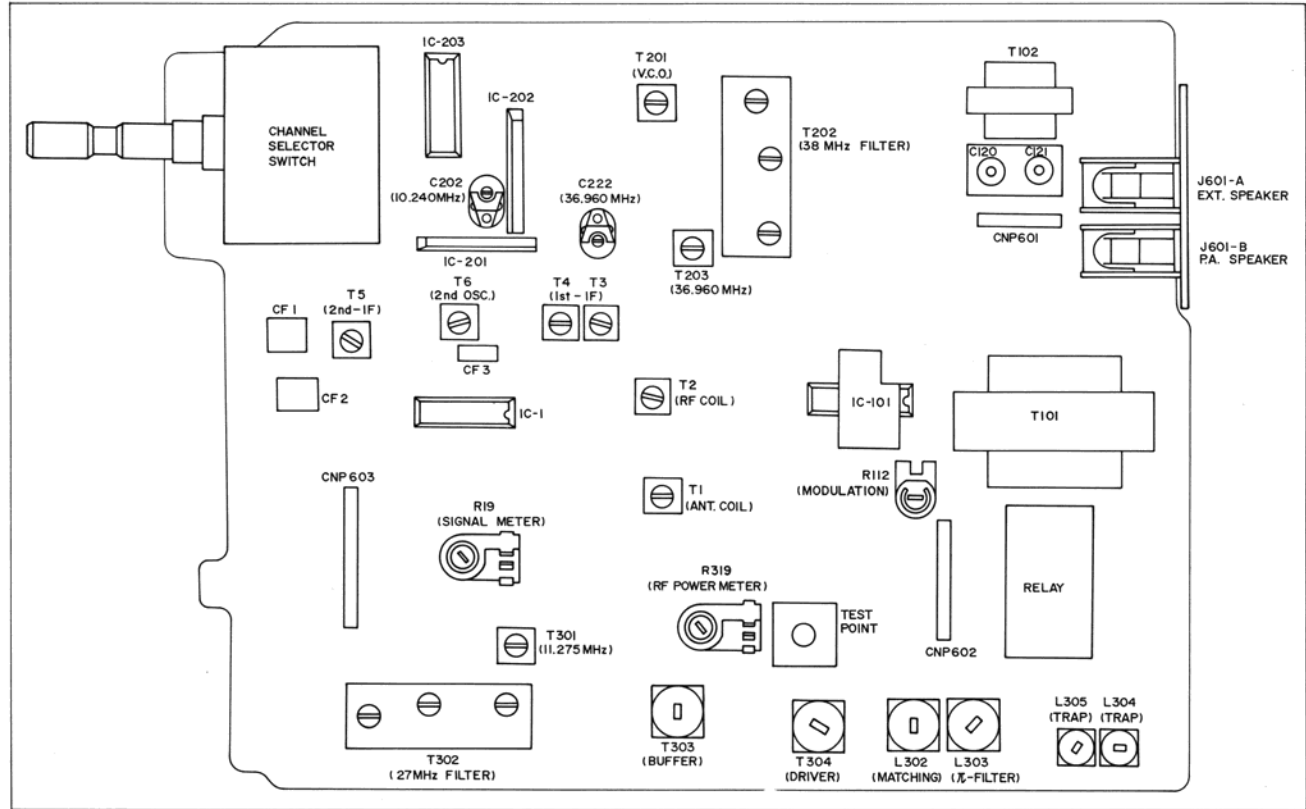


Figure 9 ALIGNMENT POINTS

CHANNEL SELECTOR SWITCH

A) Connection table of channel selector switch (SW4-A) for each channel.

CHANNEL	TERMINAL NO. OF THE SW4-A (1st)	1	2	3	4	5	6	-	-	8	N
	TERMINAL NO. OF IC-203	1(1)	2(2)	3(4)	4(8)	5(16)	6(32)	7(64)	8(128)	12	
1										●	128
2		○									129
3			○							●	130
4				○						●	132
5		○		○							133
6			○	○							134
7		○	○	○							135
8		○			⊙					●	137
9			○		⊙					●	138
10		○	○		⊙						139
11				○	⊙					●	140
12			○	○	⊙						142
13		○	○	○	⊙						143
14						⊙				●	144
15		○				⊙					145
16		○	○			⊙					147
17				○		⊙				●	148
18		○		○		⊙					149
19			○	○		⊙				●	150
20					⊙	⊙				●	152
21		○			⊙	⊙					153
22			○		⊙	⊙				●	154
23		○		○	⊙	⊙				●	155
24		○	○		⊙	⊙				●	156
25				○	⊙	⊙				●	157
26			○	○	⊙	⊙					158
27		○	○	○	⊙	⊙					159
28							⊙			●	160
29		○					⊙				161
30							⊙			●	162
31		○	○				⊙				163
32				○			⊙			●	164
33		○		○			⊙				165
34			○	○			⊙			●	166
35		○	○	○			⊙				167
36					⊙		⊙			●	168
37		○			⊙		⊙				169
38			○		⊙		⊙			●	170
39		○	○		⊙		⊙				171
40				○	⊙		⊙			●	172

NOTES:

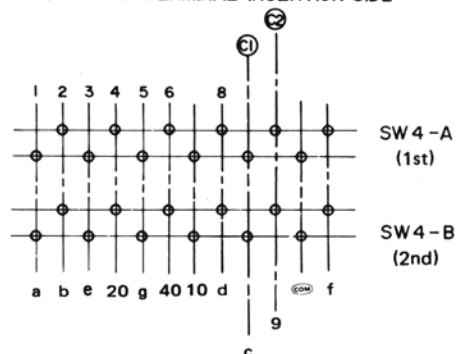
1. Terminals marked ○ are connected with the terminal C1.
2. Terminals marked ⊙ are connected with the Terminal C2.
3. The mark ● given on the terminal No.8 of SW4-A shows that this terminal comes in contact with the COMMON terminal if the set gets in a channel-to-channel situation.
4. The terminal No. 8 of IC203 is always in connection with +B and kept to "HIGH" level.

QSW-R0138AFZZ

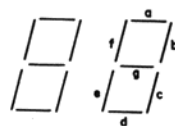
B) Connection table of channel selector switch (SW4-B) for each channel.

CHANNEL	TERMINAL NO. OF THE SW4-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 FASE



- to be continued -

TERMINAL NO. OF THE SW4-B (2nd) CHANNEL	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	○	○	○	○	○	○			○		○

NOTE:

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

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 (SiO₂). 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.

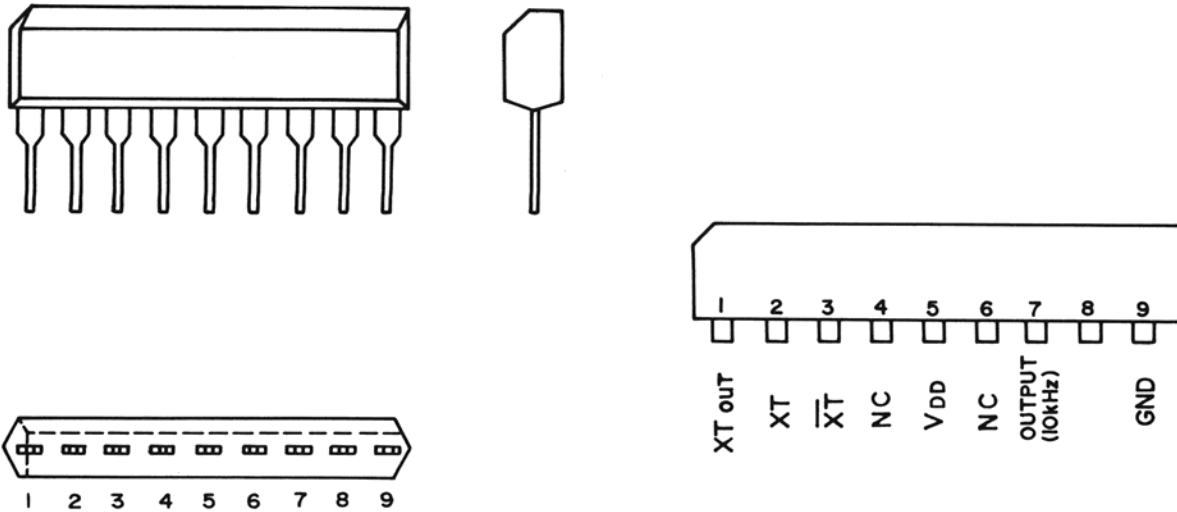
Note: Never put MOS IC in a mal-conductive container such as made of polystyrene.

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.)

RH-IX1039AFZZ (IC-201) OSCILLATOR AND DIVIDER

OUTER VIEW



LOGIC DIAGRAM

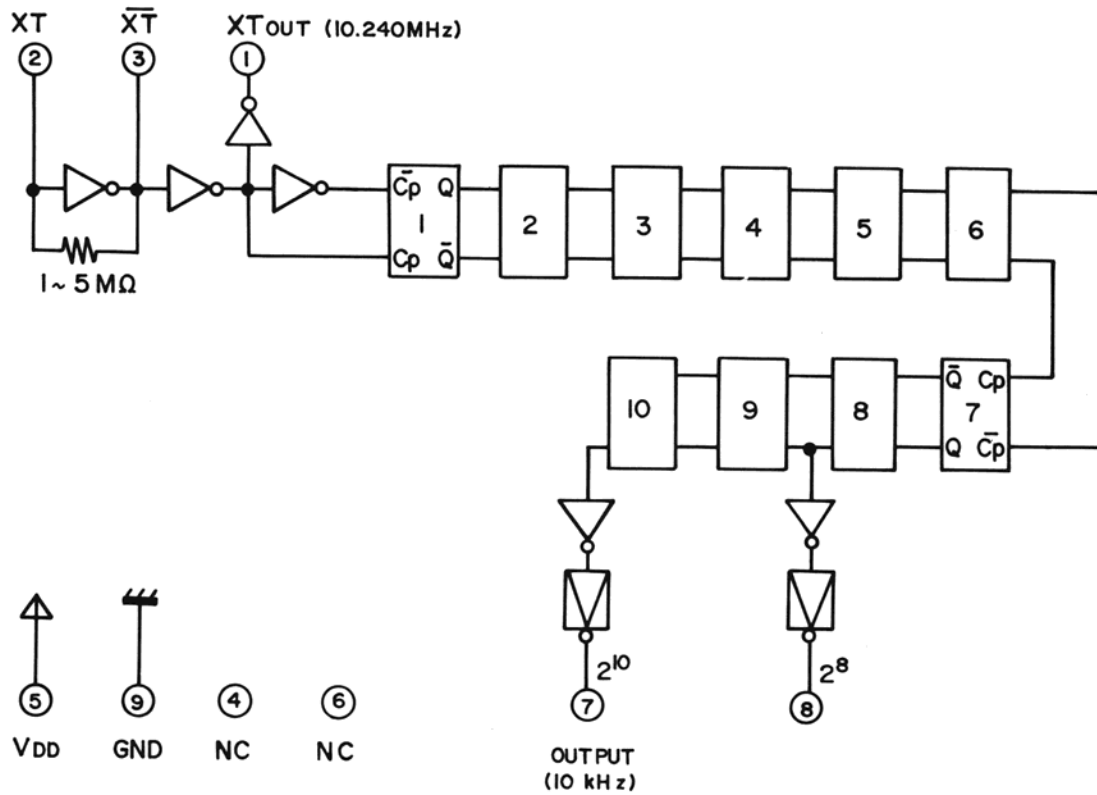
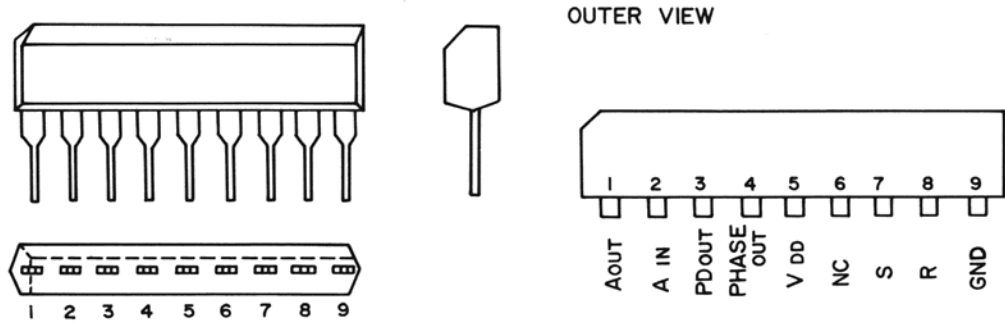
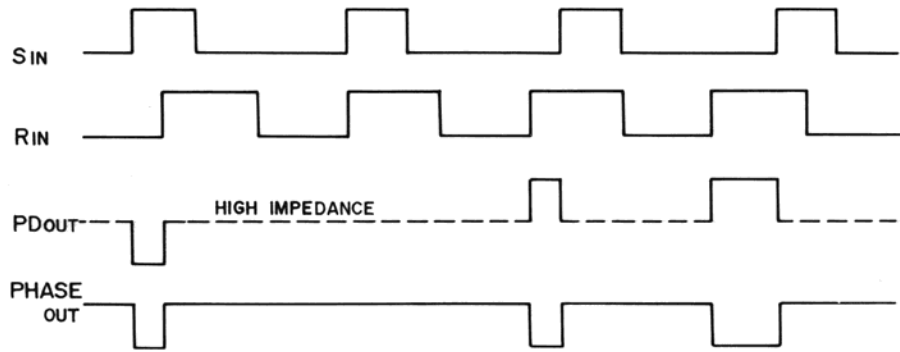


Figure 10 EQUIVALENT CIRCUIT OF IC201

RH-IX1038AFZZ (IC-202) PHASE COMPARATOR



PHASE COMPARATOR TIMMING CHART



LOGIC DIAGRAM

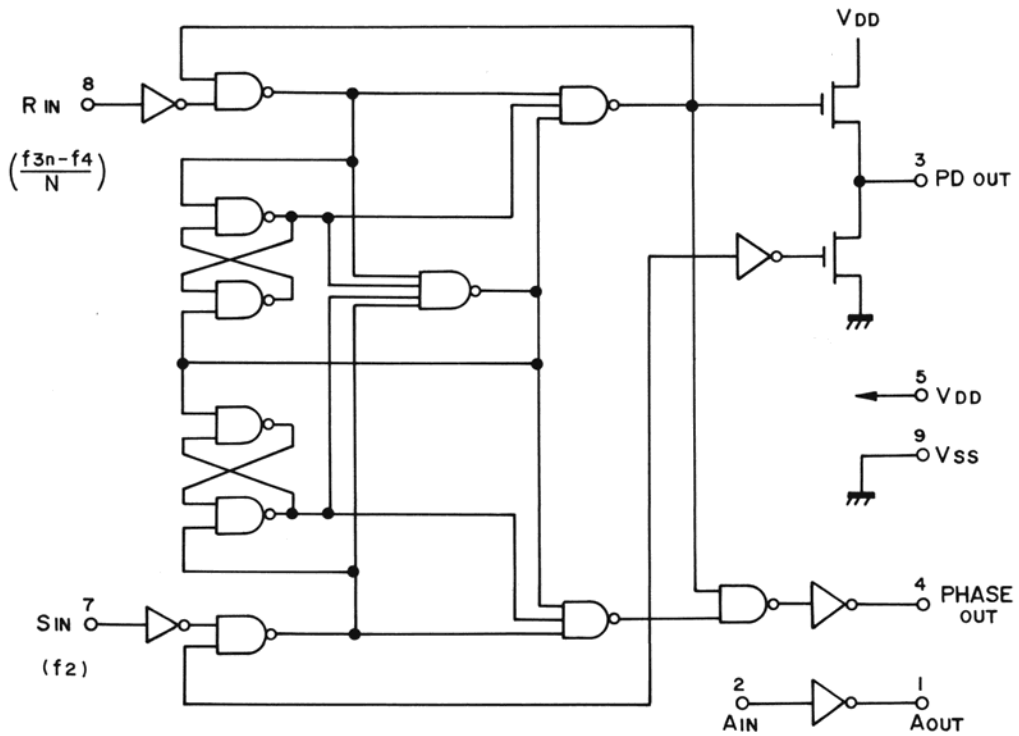


Figure 11 EQUIVALENT CIRCUIT OF IC202

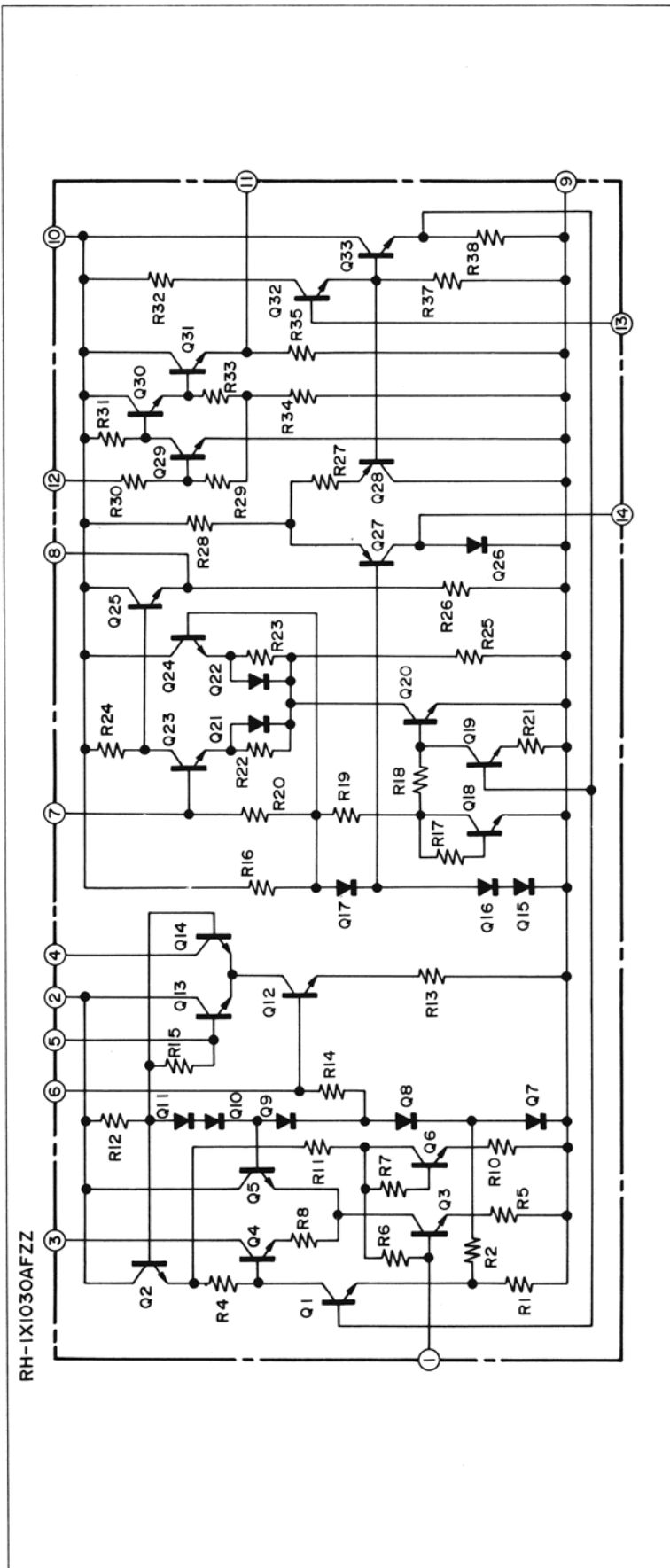


Figure 13 EQUIVALENT CIRCUIT OF IC1

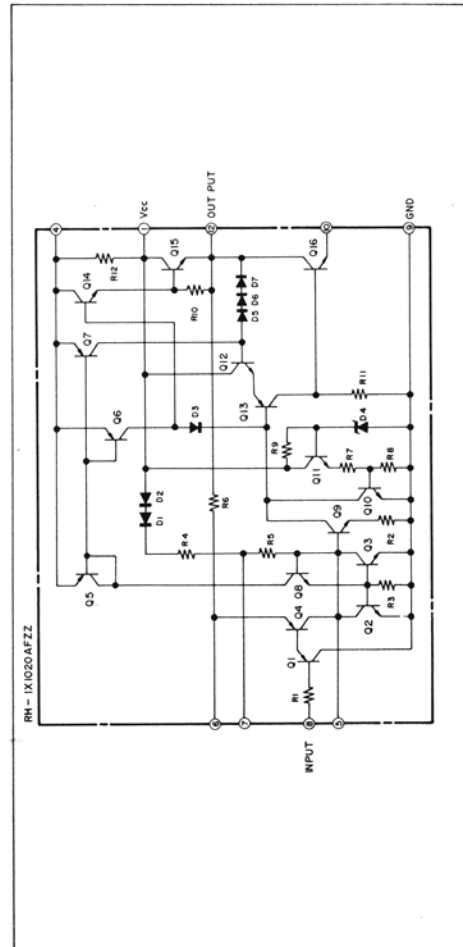


Figure 14 EQUIVALENT CIRCUIT OF IC101

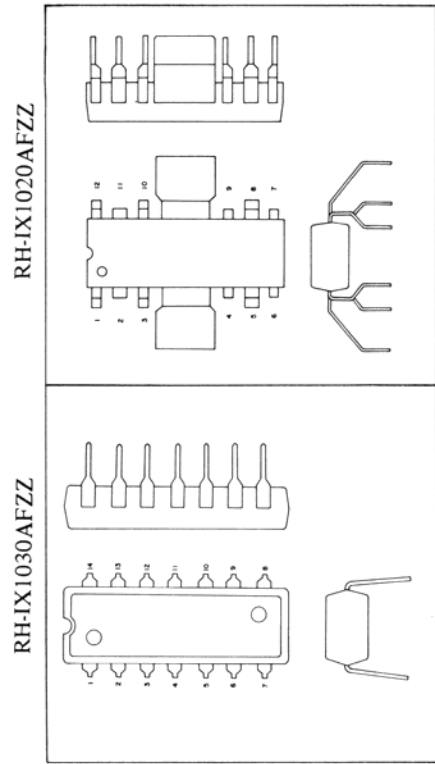
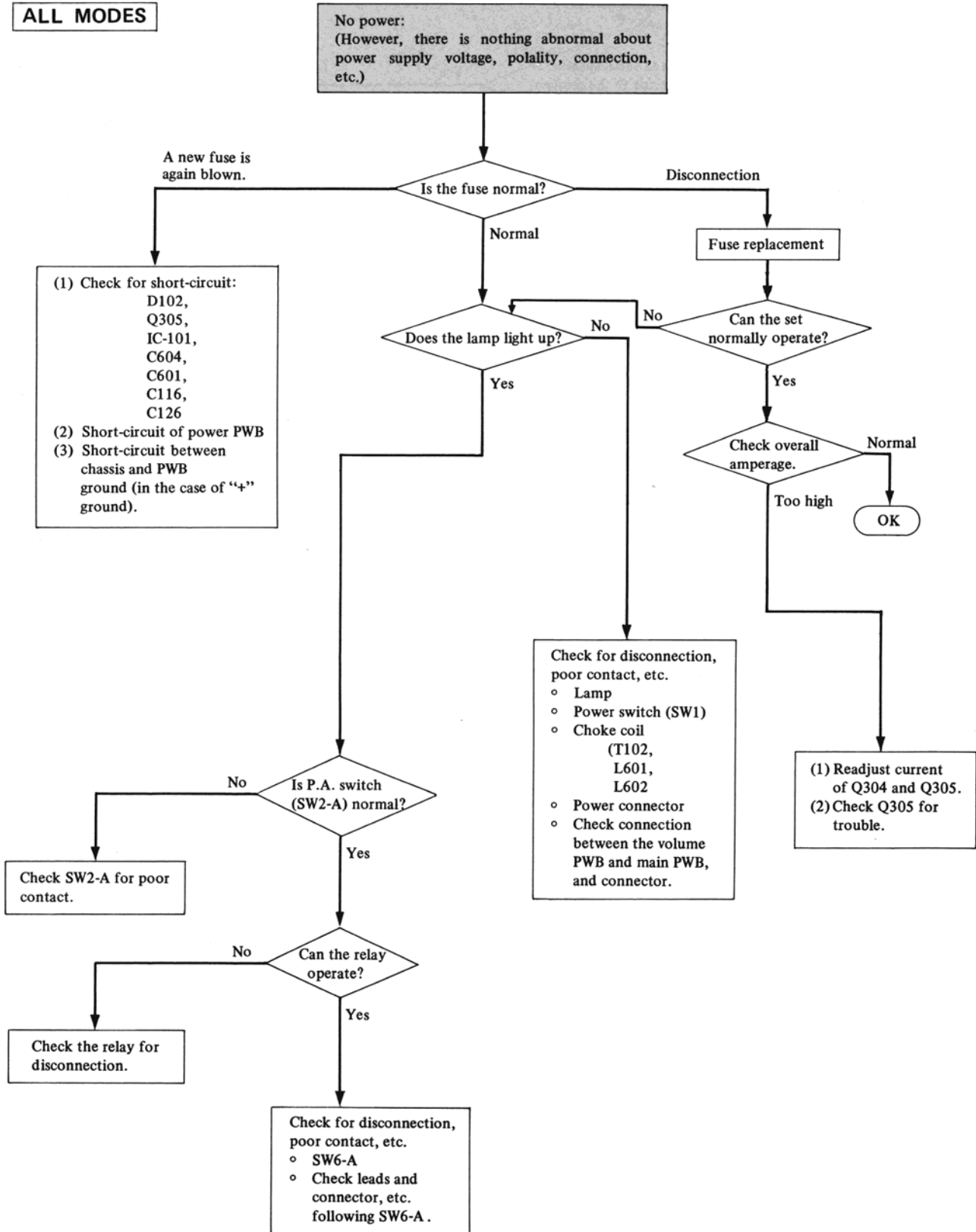


Figure 15 IC BASING

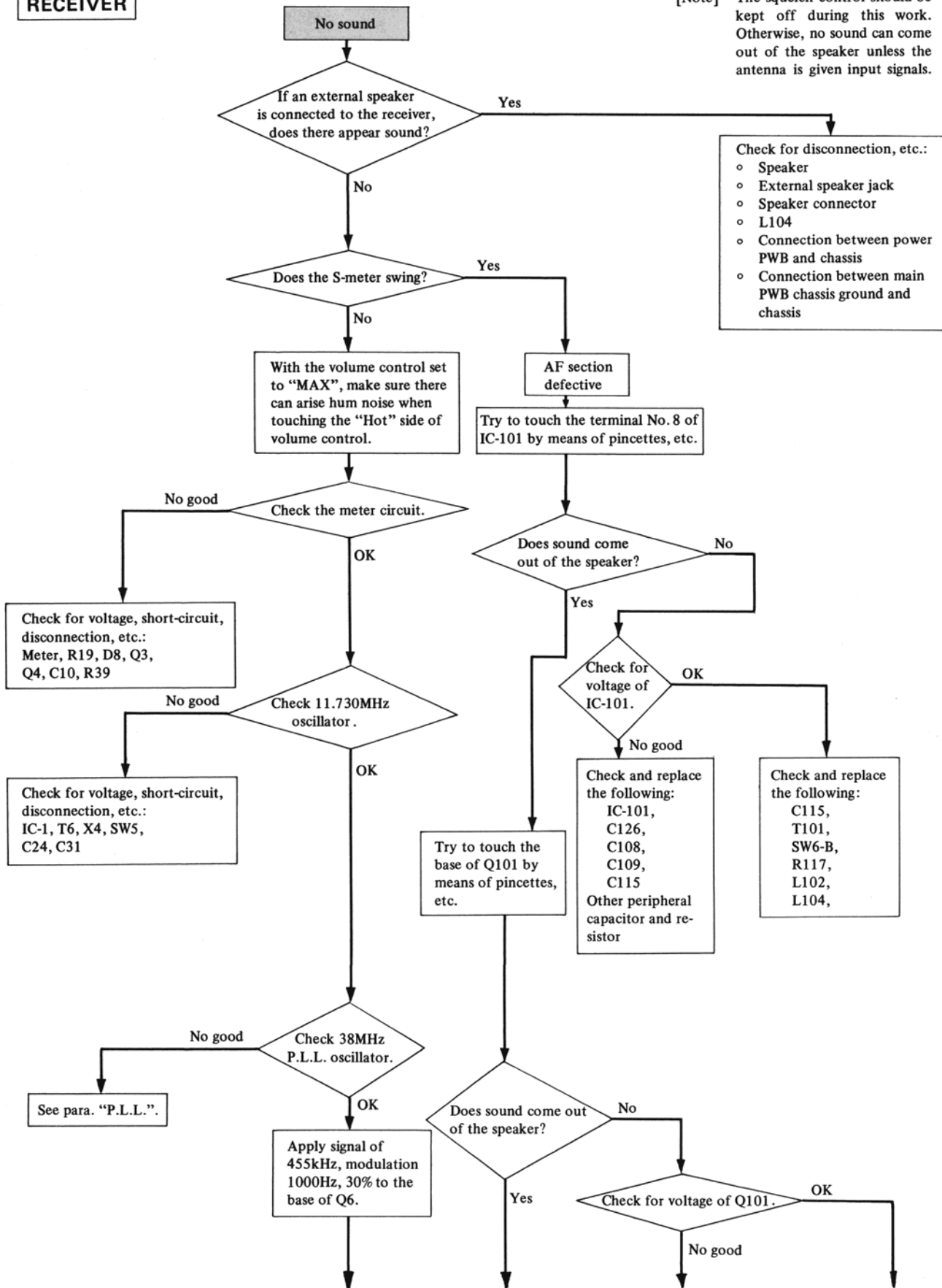
TROUBLE SHOOTING GUIDE

ALL MODES

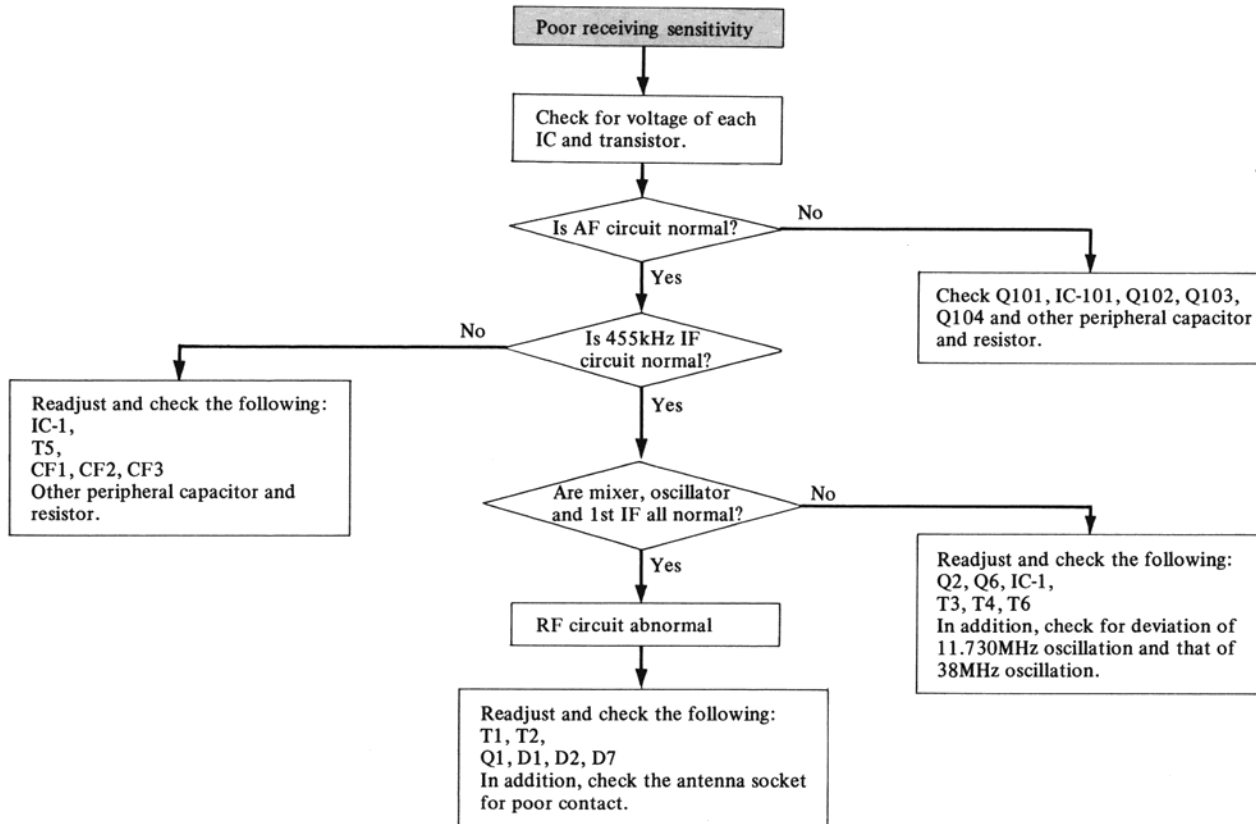
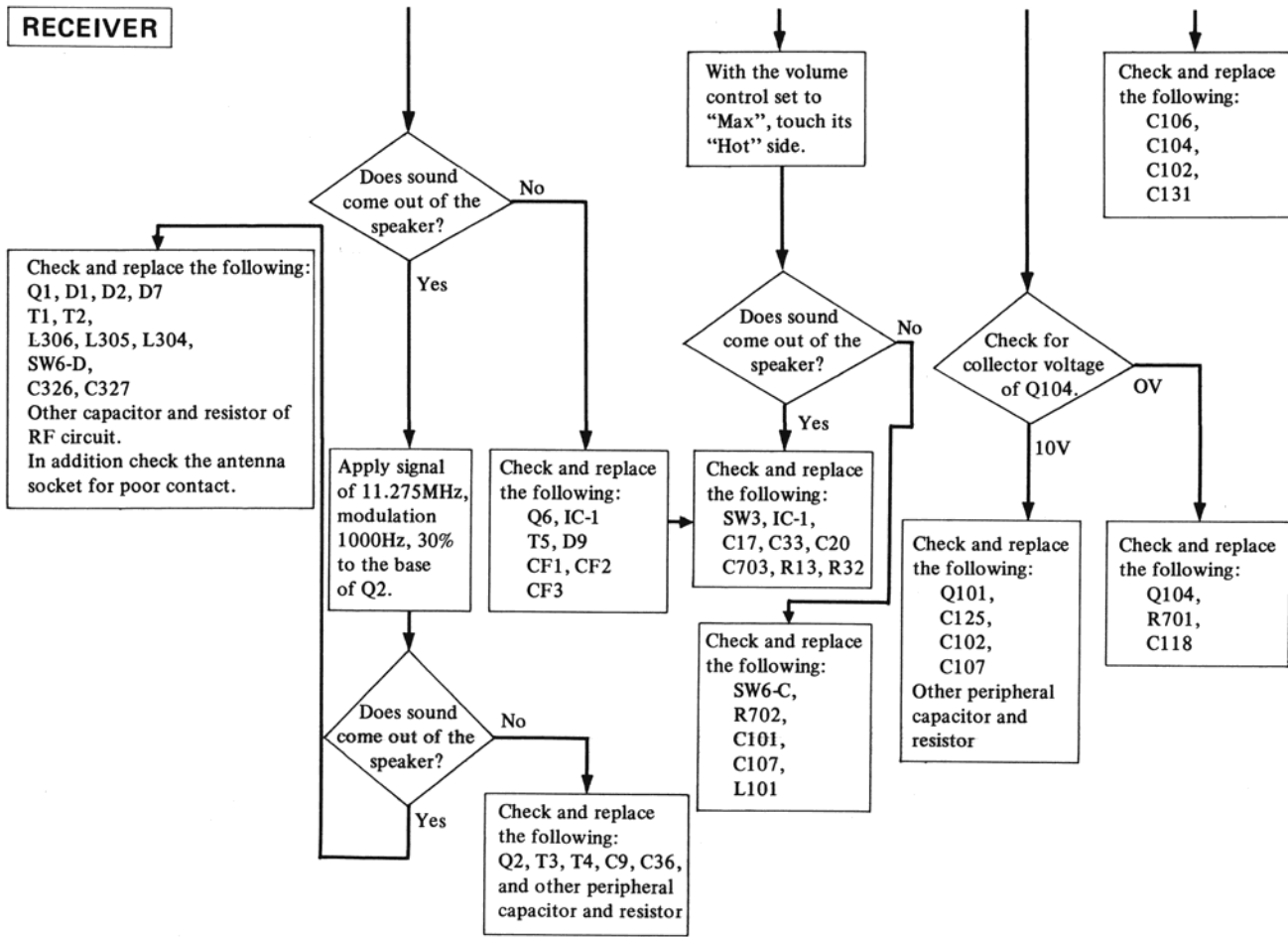


RECEIVER

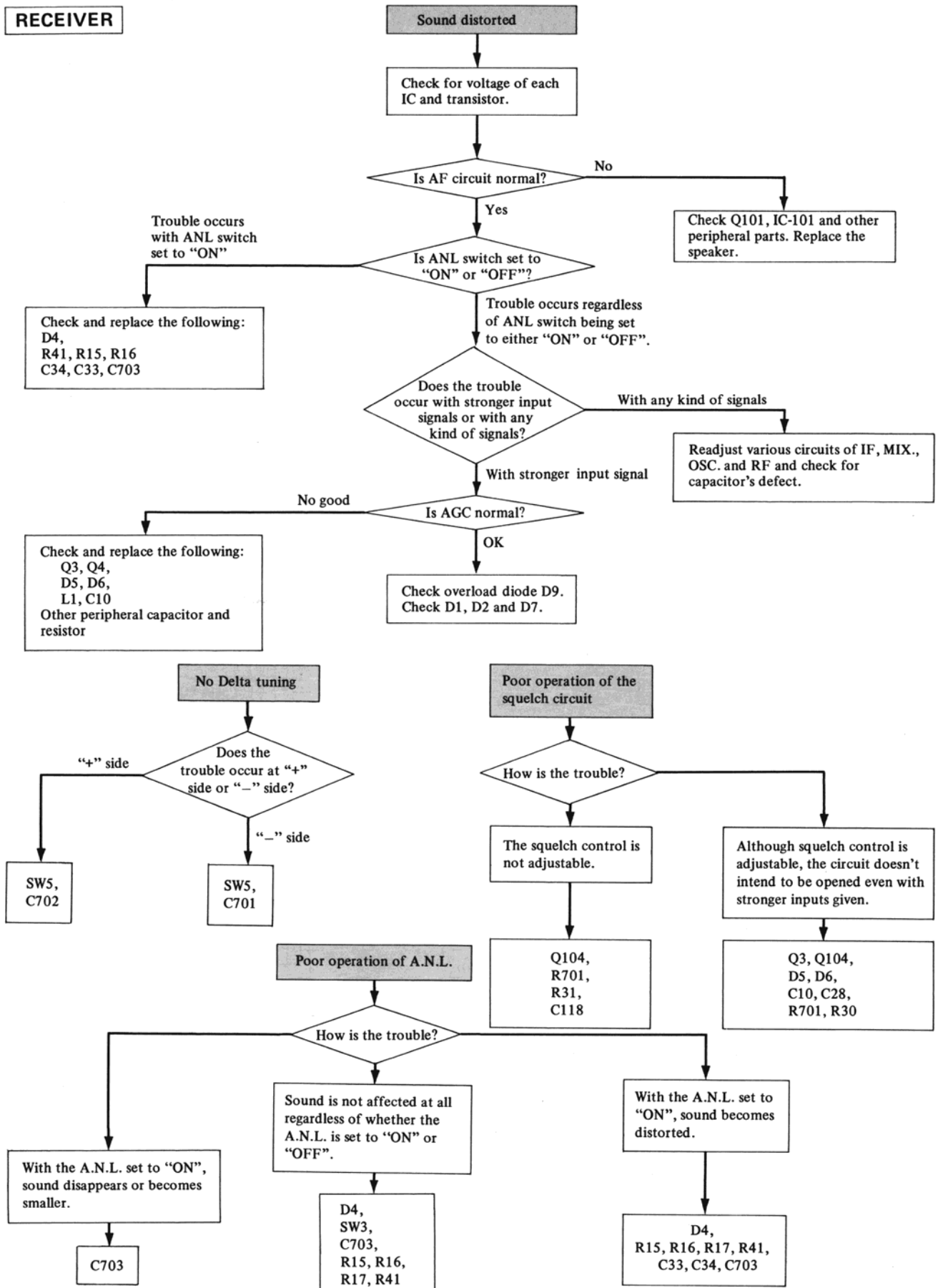
[Note] The squelch control should be kept off during this work. Otherwise, no sound can come out of the speaker unless the antenna is given input signals.



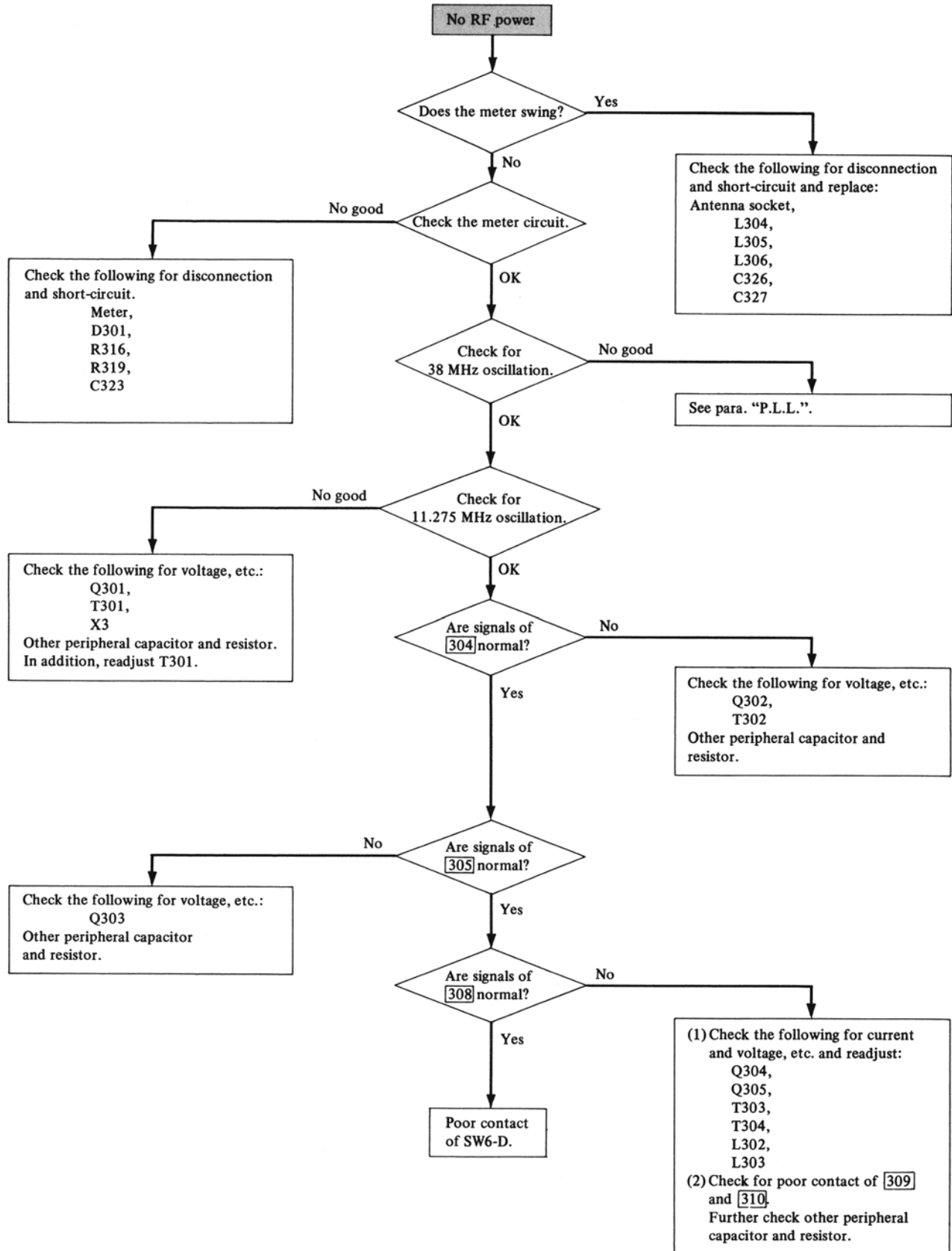
RECEIVER



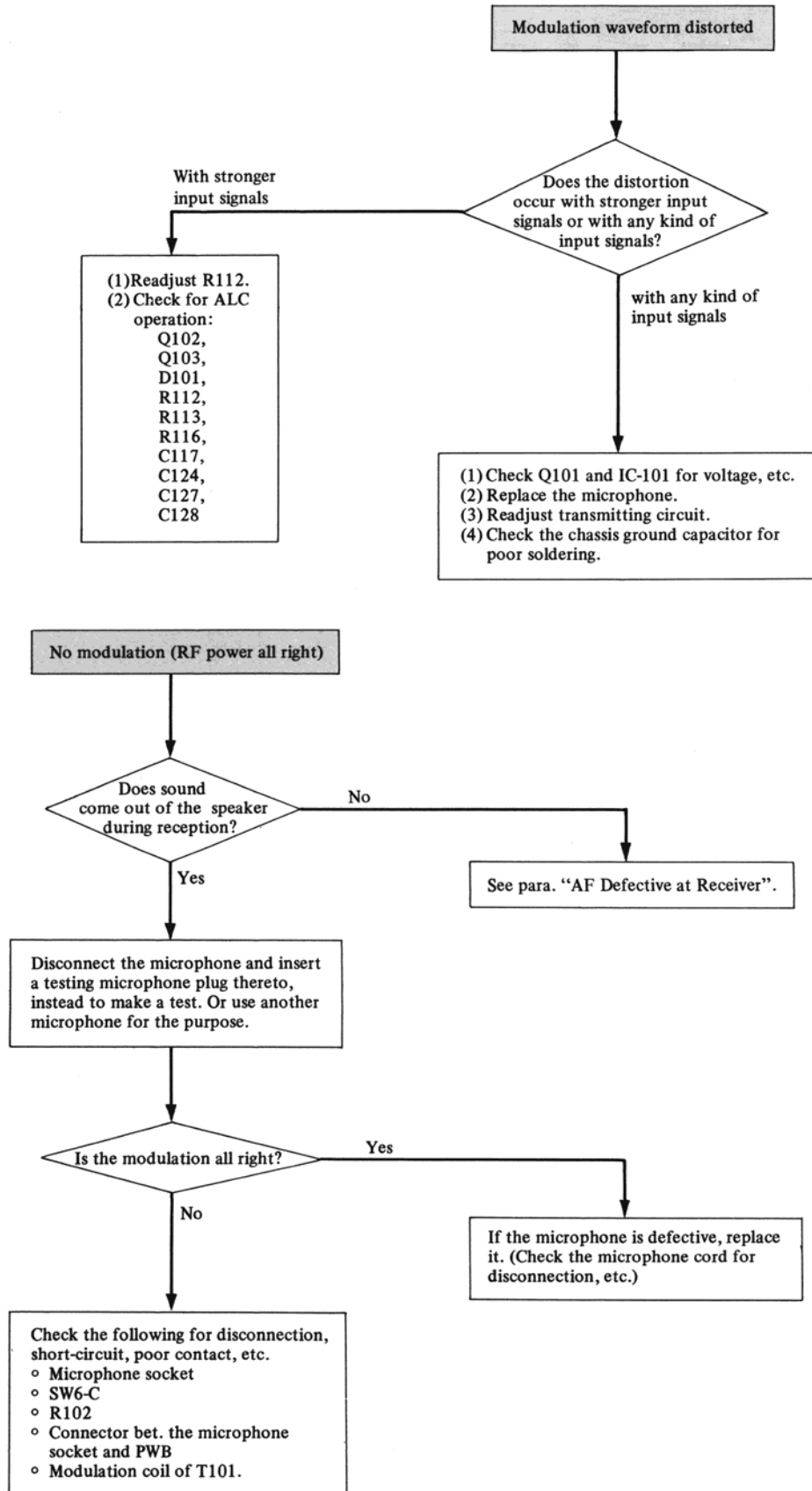
RECEIVER



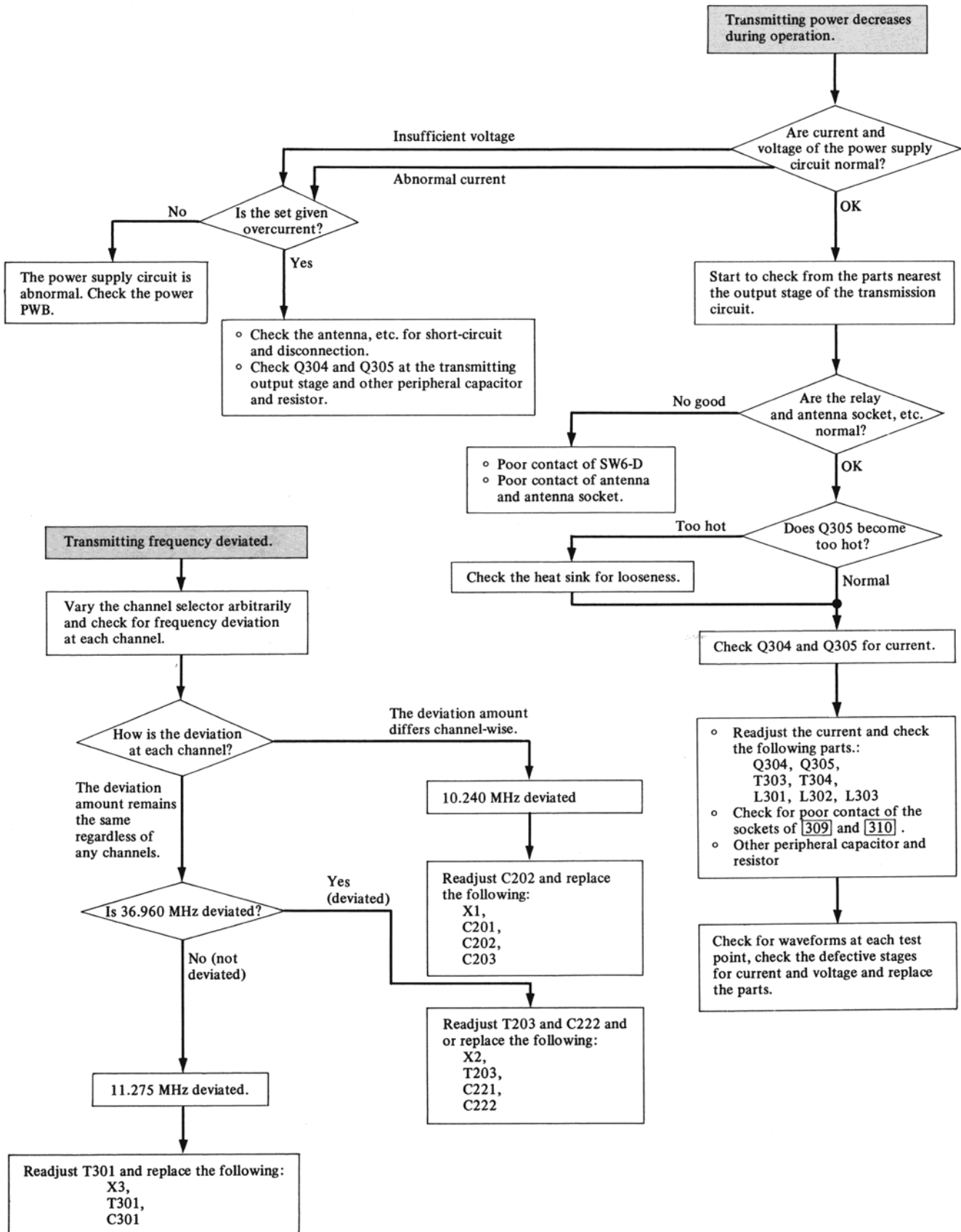
TRANSMITTER



TRANSMITTER



TRANSMITTER



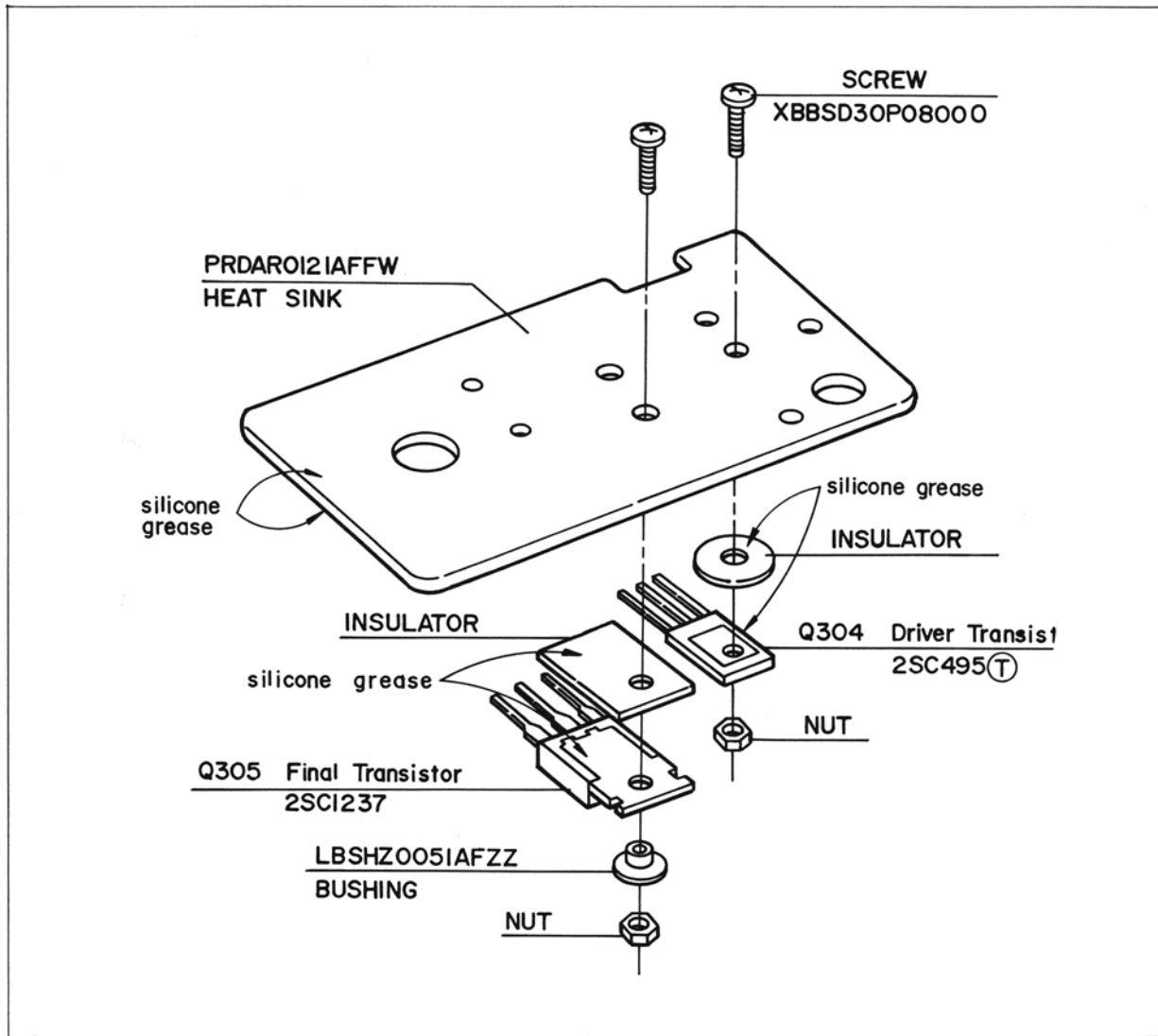


Figure 18 HOW TO SET THE TRANSISTOR Q304 AND Q305

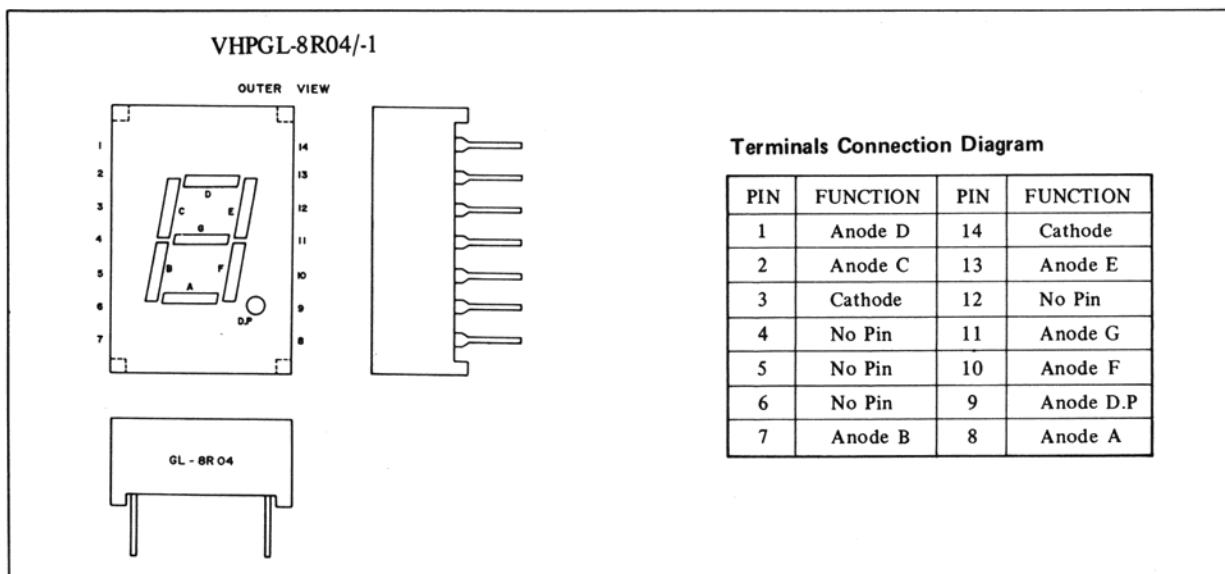


Figure 19 CHANNEL INDICATOR (LED)

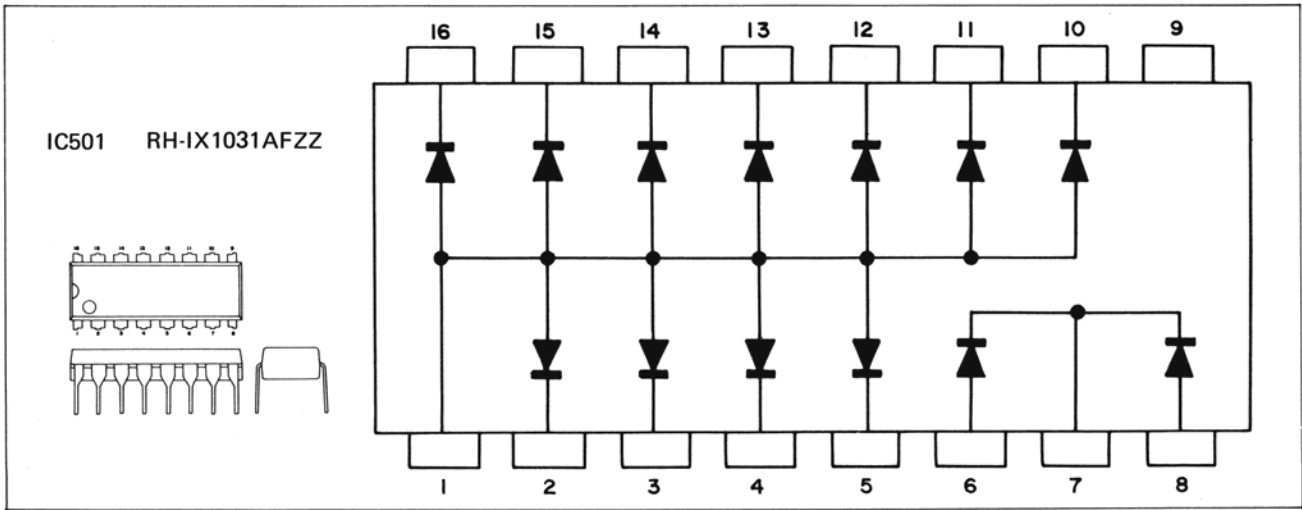


Figure 20 DIODE ARRAY (IC501)

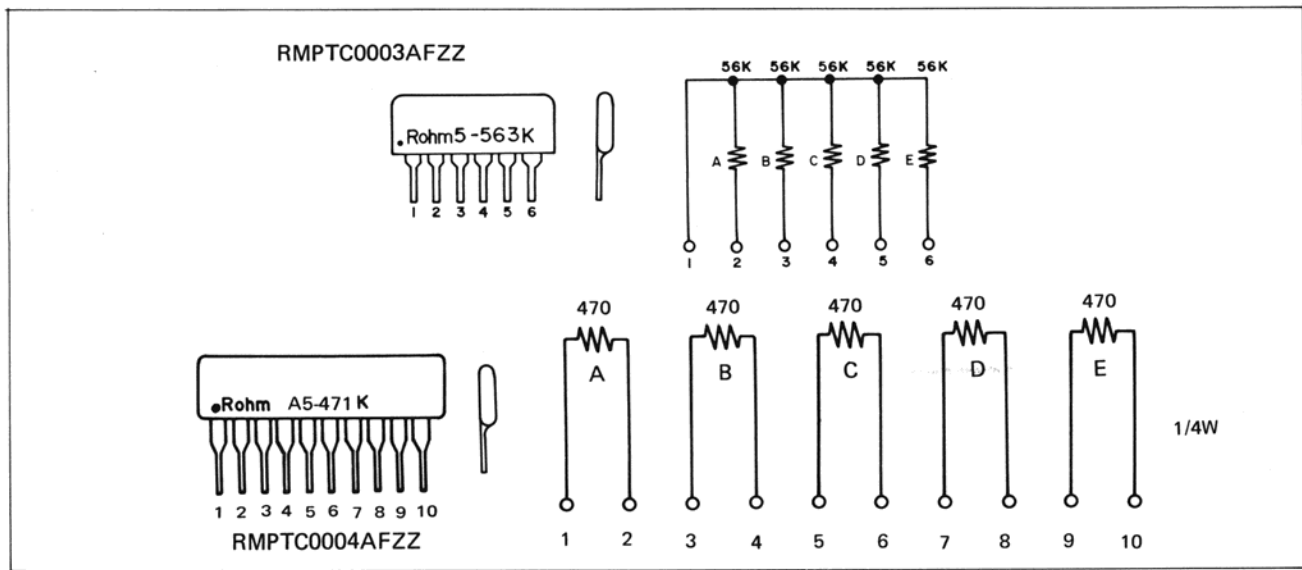


Figure 21 RESISTOR ARRAY

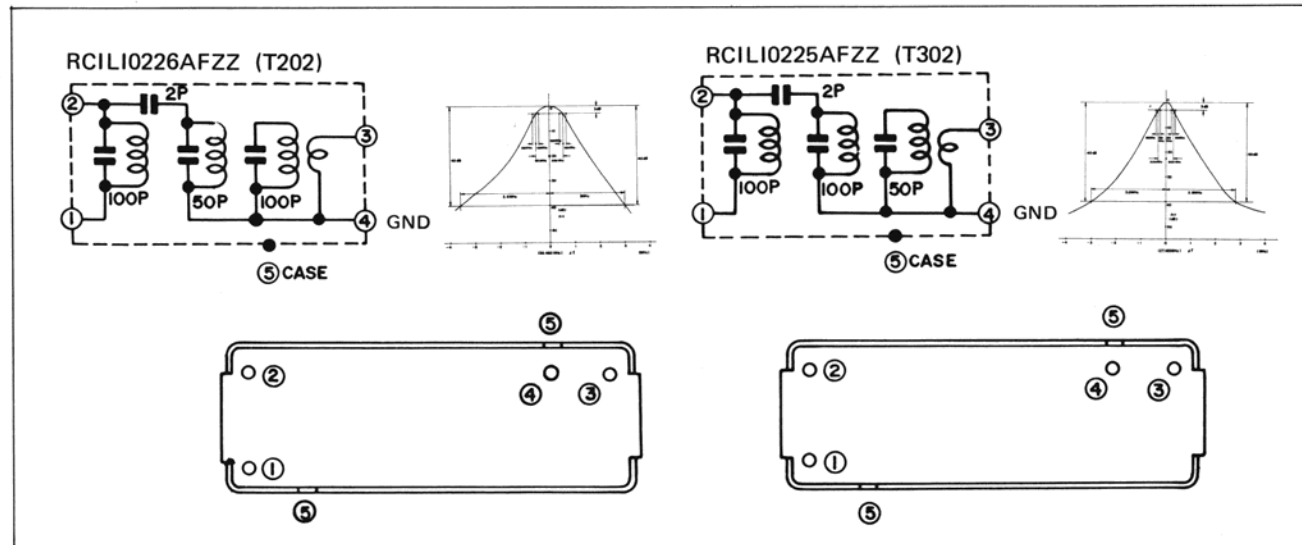


Figure 22 TRANSFORMERS (T202 and T302) BASING

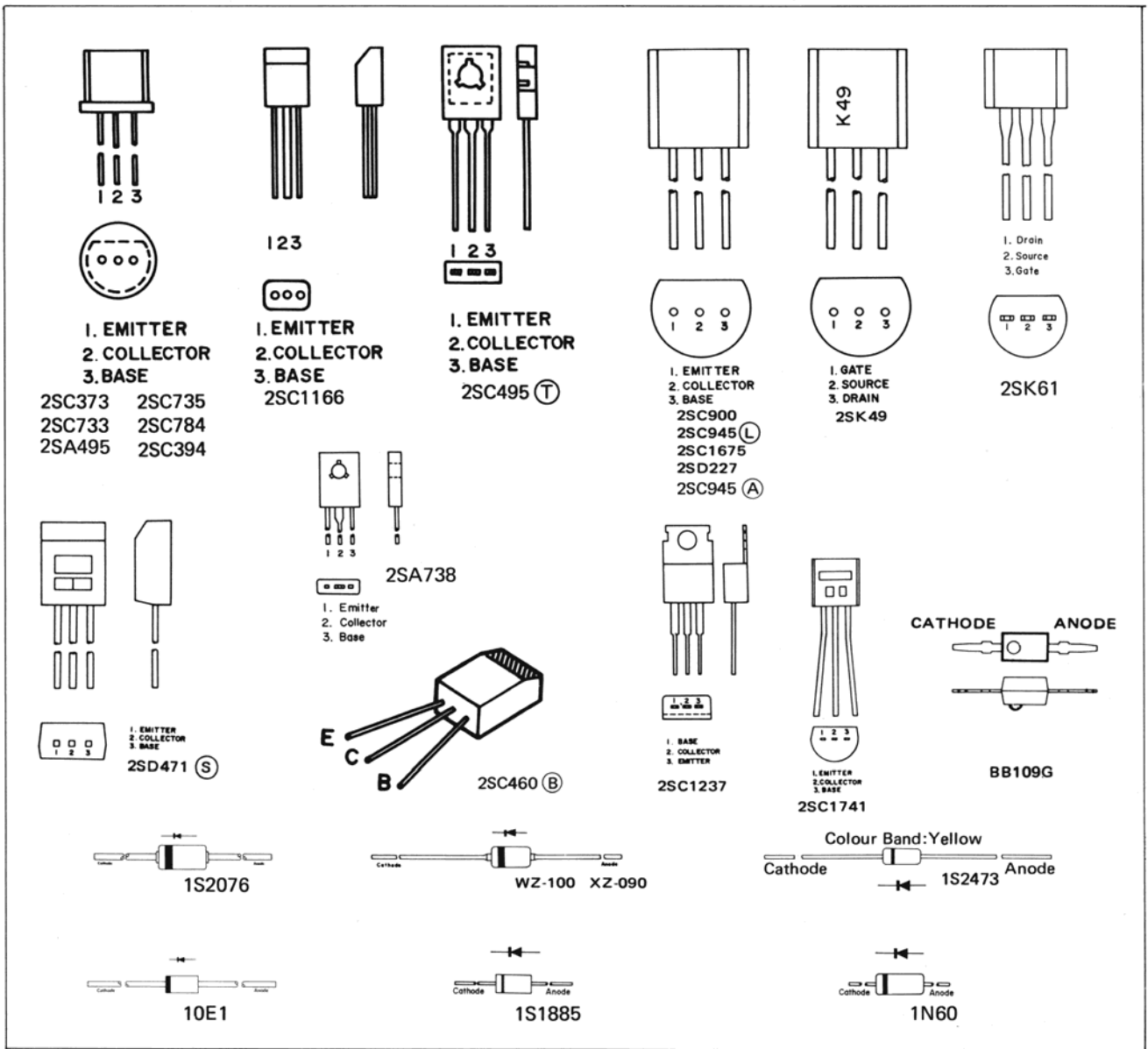


Figure 23 SEMICONDUCTORS BASING

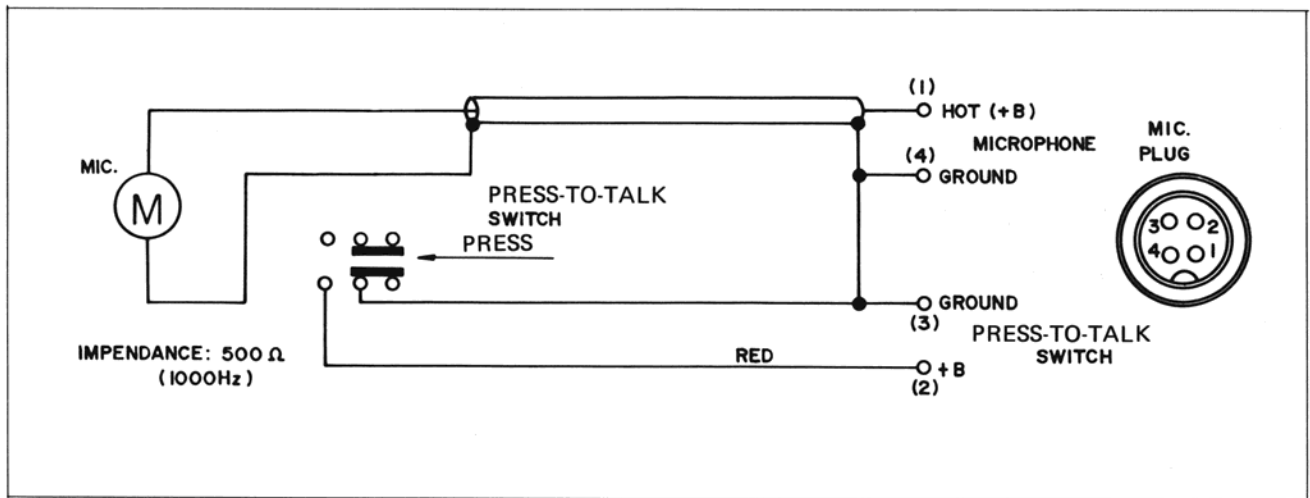


Figure 24 MICROPHONE

REPLACEMENT PARTS LIST

"HOW TO ORDER REPLACEMENT PARTS"

To have your order filled promptly and correctly, please furnish the following informations.

1. MODEL NUMBER
2. REF. NO.
3. PART NO.
4. DESCRIPTION

REF. NO.	PART NO.	DESCRIPTION	PRICE	REF. NO.	PART NO.	DESCRIPTION	PRICE	
INTEGRATED CIRCUITS								
IC1	RH-IX1030AFZZ	2nd-IF Amplifier and Detector		Q303	VS2SC1166-Y-1 or VS2SC1166-O-1	Transmitter, Buffer Amplifier (2SC1166 $\text{\textcircled{Y}}$ or $\text{\textcircled{O}}$)		
IC101	RH-IX1020AFZZ	Driver and Audio Amplifier		Q304	VS2SC495-T/-1	Transmitter, Driver (2SC495 $\text{\textcircled{T}}$)		
IC201	RH-IX1039AFZZ	Oscillator and Divider		Q305	VS2SC1237-1F	Transmitter, Final (2SC1237)		
IC202	RH-IX1038AFZZ	Phase Comparator and Low Pass Filter		Q501	VS2SA738-C/-1	LED Driver (2SA738 $\text{\textcircled{C}}$)		
IC203	RH-IX1061AFZZ	Programmable Divider		Q502, Q503	VS2SC373-G/-1	9-channel Flashing Oscillator (2SC373)		
IC501	RH-IX1031AFZZ	Diode Array, LED Indicator		Q504	VS2SA495-O/-1	LED Driver (2SA495 $\text{\textcircled{O}}$)		
TRANSISTORS								
Q1	VS2SC1675M/-1 or VS2SC784-R/1F	RF Amplifier (2SC1675 $\text{\textcircled{M}}$ or 2SC784 $\text{\textcircled{R}}$)		D1	VHD1S2076//-1	Static Protector (1S2076)		
Q2	VS2SC1675M/-1 or VS2SC394-Y/-1	1st-Mixer (2SC1675 $\text{\textcircled{M}}$ or 2SC394 $\text{\textcircled{Y}}$)		D2	VHD1S2076//-1	Static Protector (1S2076)		
Q3	VS2SC945AK/-1 or VS2SC373-G/-1	AGC Amplifier (2SC945 $\text{\textcircled{A}}$ or 2SC373)		D3	VHEWZ-100//1F	Zener Diode, Voltage Regulator (10V \pm 0.5V)		
Q4	VS2SC945AP/-1 or VS2SC373-G/-1	AGC Amplifier (2SC945 $\text{\textcircled{A}}$ or 2SC373)		D4	VHD1N60////-1	A.N.L. (Automatic Noise Limiter) (1N60)		
Q6	VS2SC460-B/-1 or VS2SC394-Y/-1	2nd-Mixer (2SC460 $\text{\textcircled{B}}$ or 2SC394 $\text{\textcircled{Y}}$)		D5	VHD1N60////-1	AGC Detector (1N60)		
Q101	VS2SC945LP/-1	AF Amplifier (2SC945 $\text{\textcircled{L}}$)		D6	VHD1N60////-1	AGC Detector (1N60)		
Q102	VS2SD227-V/-1 or VS2SC735-Y/-1	Modulation Limiter Amplifier (2SD227 $\text{\textcircled{V}}$ or 2SC735 $\text{\textcircled{Y}}$)		D7	VHD1S2076//-1	Static Protector (1S2076)		
Q103	VS2SC945AP/-1 or VS2SC373-G/-1	Modulation Limiter Amplifier (2SC945 $\text{\textcircled{A}}$ or 2SC373)		D8	VHD1N60////-1	S (Signal) Meter (1N60)		
Q104	VS2SC900-U/-1 or VS2SC733-B/-1	Squelch Voltage Amplifier (2SC900 $\text{\textcircled{U}}$ or 2SC733 $\text{\textcircled{B}}$)		D9	VHD1N60////-1	Overload (1N60)		
Q201	VS2SC945AP/-1 or VS2SC373-G/-1	P.L.L. Synthesizer, Gate (2SC945 $\text{\textcircled{A}}$ or 2SC373)		D101	VHD1N60////-1	Modulation Detector (1N60)		
Q202	VS2SC945AP/-1 or VS2SC394-Y/-1	P.L.L. Synthesizer, Buffer (2SC945 $\text{\textcircled{A}}$ or 2SC394 $\text{\textcircled{Y}}$)		D102	VHD1S1885//-1	Circuit Protector (1S1885)		
Q203	VS2SK49-F//1 or VS2SK61-Y//1	P.L.L. Synthesizer, FET, V.C.O. (Voltage Controlled Oscillator) (2SK49 $\text{\textcircled{F}}$ or 2SK61 $\text{\textcircled{Y}}$)		D103	VHD10E1////-1	Protector (10E1)		
Q204	VS2SC945AP/-1 or VS2SC373-G/-1	P.L.L. Synthesizer, Buffer (2SC945 $\text{\textcircled{A}}$ or 2SC373)		D201	VHEXZ-090//1	Zener Diode, Voltage Regulator (9V \pm 0.25V)		
Q205	VS2SC945AP/-1 or VS2SC373-G/-1	P.L.L. Synthesizer, Mixer (2SC945 $\text{\textcircled{A}}$ or 2SC373)		D202	VHCBB109G//-1	Varicap, V.C.O. (BB109G)		
Q206	VS2SK61-Y//1 or VS2SK49-F//1	P.L.L. Synthesizer, FET, 36.960MHz Oscillator (2SK61 $\text{\textcircled{Y}}$ or 2SK49 $\text{\textcircled{F}}$)		D301	VHD1S2076//-1	RF Power Meter (1S2076)		
Q207	VS2SD471-S/-1 or VS2SC1741//1	P.L.L. Synthesizer, Voltage Regulator (2SD471 $\text{\textcircled{S}}$ or 2SC1741)		D501	RH-DX1006AFZZ	Detector, LED Indicator (10E1)		
Q301	VS2SK49-F//1 or VS2SK61-Y//1	Transmitter, FET, Crystal (11.275MHz) Oscillator (2SK49 $\text{\textcircled{F}}$ or 2SK61 $\text{\textcircled{Y}}$)		D502	VHD1S2473//-1	LED Indicator		
Q302	VS2SC945AP/-1 or VS2SC735-Y/-1	Transmitter, 27MHz Mixer (2SC945 $\text{\textcircled{A}}$ or 2SC735 $\text{\textcircled{Y}}$)		D503	VHD1S2473//-1			
				D504	VHD1S2473//-1			
				D505	VHD1S2473//-1			
				LED501, LED502	VHPGL-8R04/-1	LED (Light Emitting Diode), Channel Indicator (Matched Pair)		
CRYSTALS								
				X1	RCRSB0053AFZZ	10.240MHz		
				X2	RCRSB0054AFZZ	36.960MHz		
				X3	RCRSB0015AFZZ	11.275MHz		
				X4	RCRSB0016AFZZ	11.730MHz		
CERAMIC FILTERS								
				CF1	RFILA0055AFZZ	455kHz, 2nd-IF		
				CF2	RFILA0050AFZZ	455kHz, 2nd-IF		
				CF3	RFILA0001AFZZ	455kHz		

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PRICE	REF. NO.	PART NO.	DESCRIPTION	PRICE
COILS							
L1	RCILZ0014AGZZ	2nd-IF, 1mH		C25	VCKZPU1HF103Z	.01MFD	
L101	RCILC0023AFZZ	AF Choke		C26	VCKZPU1HF103Z	.01MFD	
L102, L103, L104	RCILC0011AFZZ	RF Choke		C30	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic	
L201	RCILC0024AFZZ	Low Pass Filter		C31	VCCSPU1HL470J	47PF, 50V, ±5%, Ceramic	
L301	RCILC0011AFZZ	RF Choke		C32	VCKZPU1HF103Z	.01MFD	
L302	RCILR0135AFZZ	Transmitter, Matching (Loading)		C33	VCQYKU1HM333M	.033MFD, 50V, ±20%, Mylar	
L303	RCILR0055AFZZ	Transmitter, π-Filter		C35	VCCSPU1HL120J	12PF, 50V, ±5%, Ceramic	
L304	RCILC0055AFZZ	Trap, 81MHz		C36	VCCSPU1HL470J	47PF, 50V, ±5%, Ceramic	
L305	RCILC0055AFZZ	Trap, 54MHz		C37	VCCSPU1HL681J	680PF, 50V, ±5%, Ceramic	
L306	RCILR0310AFZZ	Choke		C101	VCQYKU1HM333M	.033MFD, 50V, ±20%, Mylar	
L601, L602	RCILC0059AFZZ	Power Choke		C102	VCQYKU1HM102M	.001MFD, 50V, ±20%, Mylar	
TRANSFORMERS							
T1	RCILA0377AFZZ	Antenna		C104	VCQYKU1HM103M	.01MFD, 50V, ±20%, Mylar	
T2	RCILR0304AFZZ	RF		C106	VCQYKU1HM223M	.022MFD, 50V, ±20%, Mylar	
T3	RCILIO210AFZZ	1st-IF (11.275MHz)		C107	VCQYKU1HM222M	.0022MFD, 50V, ±20%, Mylar	
T4	RCILIO210AFZZ	1st-IF (11.275MHz)		C108	VCQYKU1HM103M	.01MFD, 50V, ±20%, Mylar	
T5	RCILIO154AFZZ	2nd-IF (455kHz)		C109	VCQYKU1HM222M	.0022MFD, 50V, ±20%, Mylar	
T6	RCILIO210AFZZ	2nd Local Oscillator (11.730MHz)		C119	VCKZPU1HF104Z	.1MFD	
T101	RTRNM0050AFZZ	Output and Modulation		C122	VCKZPU1HF104Z	.1MFD	
T102	RTRNC0003AFZZ	Power Choke		C123	VCKZPU1HF103Z	.01MFD	
T201	RCILB0383AFZZ	Voltage Controlled Oscillator		C124	VCKZPU1HF103Z	.01MFD	
T202	RCILIO226AFZZ	38MHz Filter		C125	VCQYKU1HM222M	.0022MFD, 50V, ±20%, Mylar	
T203	RCILB0383AFZZ	36.960MHz Oscillator		C126	VCQYKU1HM333M	.033MFD, 50V, ±20%, Mylar	
T301	RCILB0378AFZZ	Transmitter, 11.275MHz Oscillator		C127	VCKZPU1HF103Z	.01MFD	
T302	RCILIO225AFZZ	Transmitter, 27MHz Filter		C131	VCKZPU1HF222Z	.0022MFD	
T303	RCILB0221AFZZ	Transmitter, Buffer		C201	VCCCPU1HH150J	15PF(CH), 50V, ±5%, Ceramic	
T304	RCILR0037AFZZ	Transmitter, Driver		C202	RTO-H1009AFZZ	Trimmer Capacitor, 10.240MHz Oscillator	
				C203	VCCCPU1HH100F	10PF (CH), 50V, ±1PF, Ceramic	
				C205	VCKZPU1HF103Z	.01MFD	
				C206	VCKZPU1HF103Z	.01MFD	
				C207	VCKZPU1HF103Z	.01MFD	
				C208	VCCCPU1HH180J	18PF (CH), 50V, ±5%, Ceramic	
				C209	VCCCPU1HH100F	10PF (CH), 50V, ±1PF, Ceramic	
				C210	VCKZPU1HF103Z	.01MFD	
				C211	VCCUPU1HJ150J	15PF (UJ), 50V, ±5%, Ceramic	
				C213	VCCCPU1HH220J	22PF (CH), 50V, ±5%, Ceramic	
				C214	VCCSPU1HL680J	68PF, 50V, ±5%, Ceramic	
				C215	VCQYKU1HM223M	.022MFD, 50V, ±20%, Mylar	
				C216	VCCSPU1HL121J	120PF, 50V, ±5%, Ceramic	
				C218	VCCCPU1HH5R0C	5PF (CH), 50V, ±0.25PF, Ceramic	
				C219	VCKZPU1HF103Z	.01MFD	
				C220	VCCCPU1HH5R0C	5PF (CH), 50V, ±0.25PF, Ceramic	
				C222	RTO-H1009AFZZ	Trimmer Capacitor, 36.960MHz Oscillator	
				C223	VCKZPU1HF103Z	.01MFD	
				C224	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic	
				C226	VCCSPU1HL390J	39PF, 50V, ±5%, Ceramic	
				C227	VCKYPU1HB102M	.001MFD, 50V, ±20%, Ceramic	
				C228	VCCCPU1HH5R0C	5PF (CH), 50V, ±0.25PF, Ceramic	
				C230	VCCUPU1HJ120J	12PF (UJ), 50V, ±5%, Ceramic	
				C231	VCKZPU1HF103Z	.01MFD	
				C232	VCKZPU1HF103Z	.01MFD	
				C233	VCCSPU1HL680J	68PF, 50V, ±5%, Ceramic	
CAPACITORS							
(Unless otherwise specified capacitors are 50V, +80 -20%, Ceramic Type)							
C1	VCKZPU1HF103Z	.01MFD					
C2	VCKZPU1HF103Z	.01MFD					
C3	VCKZPU1HF103Z	.01MFD					
C4	VCKZPU1HF103Z	.01MFD					
C5	VCKYPU1HB223M	.022MFD, 50V, ±20%, Ceramic					
C6	VCKYPU1HB472M	.0047MFD, 50V, ±20%, Ceramic					
C7	VCKZPU1HF223Z	.022MFD					
C8	VCKZPU1HF103Z	.01MFD					
C9	VCCSPU1HL2R0C	2PF, 50V, ±0.25PF, Ceramic					
C10	VCCSPU1HL150J	15PF, 50V, ±5%, Ceramic					
C11	VCKYPU1HB472M	.0047MFD, 50V, ±20%, Ceramic					
C12	VCCSPU1HL330J	33PF, 50V, ±5%, Ceramic					
C13	VCKZPU1HF103Z	.01MFD					
C15	VCKZPU1HF103Z	.01MFD					
C16	VCKZPU1HF103Z	.01MFD					
C17	VCQYKU1HM103M	.01MFD, 50V, ±20%, Mylar					
C20	VCQYKU1HM223M	.022MFD, 50V, ±20%, Mylar					
C22	VCCSPU1HL121J	120PF, 50V, ±5%, Ceramic					
C23	VCKYPU1HB102M	.001MFD, 50V, ±20%, Ceramic					
C24	VCCSPU1HL820J	82PF, 50V, ±5%, Ceramic					

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PRICE	REF. NO.	PART NO.	DESCRIPTION	PRICE
C301	VCCSPU1HL560J	56PF, 50V, $\pm 5\%$, Ceramic		C28	VCEAAU1EW475A	4.7MFD, 25V, +75 -10%	
C302	VCKZPU1HF103Z	.01MFD		C29	VCEAAU1CW106Y	10MFD, 16V, +50 -10%	
C304	VCCSPU1HL330J	33PF, 50V, $\pm 5\%$, Ceramic		C34	VCEAAU1CW106Y	10MFD, 16V, +50 -10%	
C305	VCCSPU1HL101J	100PF, 50V, $\pm 5\%$, Ceramic		C103	VCEAAU1EW475A	4.7MFD, 25V, +75 -10%	
C308	VCKZPU1HF103Z	.01MFD		C105	VCEAAU1CW106Y	10MFD, 16V, +50 -10%	
C309	VCKZPU1HF103Z	.01MFD		C110	VCEAAU1CW476Y	47MFD, 16V, +50 -10%	
C310	VCCSPU1HL151J	150PF, 50V, $\pm 5\%$, Ceramic		C111	VCEAAU1AW336Y	33MFD, 10V, +50 -10%	
C311	VCCSPU1HL180J	18PF, 50V, $\pm 5\%$, Ceramic		C112	VCAAKU1CA104M	.1MFD, 16V, $\pm 20\%$, Aluminum	
C312	VCKZPU1HF103Z	.01MFD		C113	VCEAAU1CW476Y	47MFD, 16V, +50 -10%	
C313	VCKZPU1HF103Z	.01MFD		C114	VCAAKU1CA104M	.1MFD, 16V, $\pm 20\%$, Aluminum	
C314	VCCSPU1HL221J	220PF, 50V, $\pm 5\%$, Ceramic		C115	VCEAAU1AW477Y	470MFD, 10V, +50 -10%	
C315	VCCSPU1HL471J	470PF, 50V, $\pm 5\%$, Ceramic		C116	VCEAAU1CW108Y	1000MFD, 16V, +50 -10%	
C316	VCCSPU1HL220J	22PF, 50V, $\pm 5\%$, Ceramic		C117	VCEAAU1EW475A	4.7MFD, 25V, +75 -10%	
C317	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic		C118	VCEAAU1CW106Y	10MFD, 16V, +50 -10%	
C318	VCCSPU1HL511J	510PF, 50V, $\pm 5\%$, Ceramic		C128	VCEAAU1CW106Y	10MFD, 16V, +50 -10%	
C319	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic		C204	VCEAAU1HW105A	1MFD, 50V, +75 -10%	
C320	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic		C212	VCAAAU1AB104M	.1MFD, 10V, $\pm 20\%$, Aluminum	
C321	VCCSPU1HL181J	180PF, 50V, $\pm 5\%$, Ceramic		C217	VCEAAU1CW106Y	10MFD, 16V, +50 -10%	
C322	VCCSPU1HL680J	68PF, 50V, $\pm 5\%$, Ceramic		C225	VCEAAU1AW107Y	100MFD, 10V, +50 -10%	
C324	VCCSPU1HL220J	22PF, 50V, $\pm 5\%$, Ceramic		C229	VCEAAU1AW108Y	1000MFD, 10V, +50 -10%	
C325	VCCSPU1HL560J	56PF, 50V, $\pm 5\%$, Ceramic		C323	VCAAKU0XA474M	.47MFD, 6.3V, $\pm 20\%$, Aluminum	
C326	VCKZPU1HF103Z	.01MFD		C413	VCEAAU1CW106Y	10MFD, 16V, +50 -10%	
C327	VCCSPU1HL101J	100PF, 50V, $\pm 5\%$, Ceramic		C501	VCAAKU0XA474M	.47MFD, 6.3V, $\pm 20\%$, Aluminum	
C328	VCCSPU1HL4R0C	4PF, 50V, ± 0.25 PF, Ceramic		C502	VCEAAU1EW335A	3.3MFD, 25V, +75 -10%	
C329	VCCSPU1HL560J	56PF, 50V, $\pm 5\%$, Ceramic		C503	VCEAAU1EW335A	3.3MFD, 25V, +75 -10%	
C330	VCCSPU1HL220J	22PF, 50V, $\pm 5\%$, Ceramic					
C402	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic					
C404	VCKZPU1HF103Z	.01MFD					
C405	VCKZPU1HF103Z	.01MFD					
C406	VCKZPU1HF223Z	.022MFD					
C407	VCKZPU1HF103Z	.01MFD					
C408	VCKZPU1HF103Z	.01MFD					
C409	VCKZPU1HF103Z	.01MFD					
C410	VCKYPU1HB103M	.01MFD, 50V, $\pm 20\%$, Ceramic					
C411	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic					
C412	VCKYPU1SD103Z	.01MFD (Z5T), 30V, +80 -20%, Ceramic					
C414	VCKZPU1HF103Z	.01MFD					
C420	VCCSPU1HL151J	150PF, 50V, $\pm 5\%$, Ceramic					
C421	VCCSPU1HL151J	150PF, 50V, $\pm 5\%$, Ceramic					
C422	VCCSPU1HL151J	150PF, 50V, $\pm 5\%$, Ceramic					
C423	VCCSPU1HL151J	150PF, 50V, $\pm 5\%$, Ceramic					
C424	VCKZPU1HF103Z	.01MFD					
C601	VCKZPU1HF103Z	.01MFD					
C602	VCCSPU1HL221J	220PF, 50V, $\pm 5\%$, Ceramic					
C603	VCCSPU1HL221J	220PF, 50V, $\pm 5\%$, Ceramic					
C604	VCKZPU1HF103Z	.01MFD					
C701	VCCSPU1HL820J	82PF, 50V, $\pm 5\%$, Ceramic					
C702	VCCSPU1HL330J	33PF, 50V, $\pm 5\%$, Ceramic					
C703	VCQYKU1HM153M	.015MFD, 50V, $\pm 20\%$, Mylar					
ELECTROLYTIC CAPACITORS							
C14	VCEAAU1AW107Y	100MFD, 10V, +50 -10%					
C18	VCEAAU1CW106Y	10MFD, 16V, +50 -10%					
C27	VCEAAU1HW105A	1MFD, 50V, +75 -10%					
				RESISTORS			
				(Unless otherwise specified resistors are 1/4W, $\pm 5\%$, Carbon Type.)			
				R1	VRD-SU2EY562J	5.6K ohm	
				R2	VRD-SU2EY152J	1.5K ohm	
				R3	VRD-ST2EE102J	1K ohm	
				R5	VRD-SU2EY333J	33K ohm	
				R6	VRD-SU2EY472J	4.7K ohm	
				R7	VRD-SU2EY102J	1K ohm	
				R9	VRD-SU2EY153J	15K ohm	
				R10	VRD-SU2BY102J	1K ohm, 1/8W, $\pm 5\%$, Carbon	
				R12	VRD-ST2EE151J	150 ohm	
				R13	VRD-SU2EY472J	4.7K ohm	
				R14	VRD-SU2EY223J	22K ohm	
				R15	VRD-SU2EY153J	15K ohm	
				R16	VRD-SU2EY223J	22K ohm	
				R17	VRD-SU2EY124J	120K ohm	
				R19	RVR-M0119AFZZ	5K (B) ohm, Pot., S (Signal) Meter Adjust	
				R20	VRD-ST2EE224J	220K ohm	
				R21	VRD-ST2EE223J	22K ohm	
				R22	VRD-ST2EE272J	2.7K ohm	
				R23	VRD-ST2EE471J	470 ohm	
				R24	VRD-ST2EE224J	220K ohm	
				R25	VRD-ST2EE333J	33K ohm	
				R29	VRD-ST2EE103J	10K ohm	
				R30	VRD-ST2EE472J	4.7K ohm	
				R31	VRD-ST2EE473J	47K ohm	
				R32	VRD-SU2EY103J	10K ohm	
				R35	VRD-SU2EY333J	33K ohm	
				R36	VRD-SU2EY472J	4.7K ohm	

PARTS LIST

	REF. NO.	PART NO.	DESCRIPTION	PRICE	REF. NO.	PART NO.	DESCRIPTION	PRICE
	R37	VRD-SU2EY222J	2.2K ohm		R502- A~E	RMPTC0004AFZZ	Resistor Array, 470 ohm x 5	
	R38	VRD-ST2EE122J	1.2K ohm		R505	VRD-ST2EE222J	2.2K ohm	
	R39	VRD-ST2EE473J	47K ohm		R506	VRD-SU2EY181J	180 ohm	
L	R40	VRD-SU2EY100J	10 ohm		R507	VRD-SU2EY154J	150K ohm	
L	R41	VRD-ST2EY683J	68K ohm		R508	VRD-SU2EY154J	150K ohm	
L	R102	VRD-ST2EE331J	330 ohm		R509	VRD-SU2EY102J	1K ohm	
L	R103	VRD-ST2EY104J	100K ohm		R510	VRD-SU2EY471J	470 ohm	
L	R104	VRD-ST2EE154J	150K ohm		R511	VRS-PT3DB180K	18 ohm, 2W, ±10%, Oxide Film	
L	R105	VRD-ST2EE153J	15K ohm		R512	VRD-ST2EE103J	10K ohm	
L	R106	VRD-ST2EE102J	1K ohm		R513	VRD-ST2EE471J	470 ohm	
L	R107	VRD-ST2EE103J	10K ohm		R514	VRD-ST2EE471J	470 ohm	
L	R108	VRD-ST2EE331J	330 ohm		R515	VRD-ST2EE471J	470 ohm	
L	R109	VRD-ST2EE222J	2.2K ohm		R516	VRD-ST2EE471J	470 ohm	
L	R110	VRD-ST2EE333J	33K ohm		R517	VRS-PT3DB470K	47 ohm, 2W, ±10%, Oxide Film	
L	R111	VRD-ST2EE2R2J	2.2 ohm		R701/ SW2-A, B	RVR-B0131AFZZ	10K (B) ohm, Squelch/P.A. Switch	
L	R112	RVR-M0116AFZZ	1K (B) ohm, Modulation Level Adjust		R702/ SW1	RVR-D0103AFZZ	5K (D) ohm, Off-On/Volume Control	
L	R113	VRD-ST2EE103J	10K ohm		R703	VRD-ST2HA220K	22 ohm, 1/2W, ±10%, Carbon	
L	R114	VRD-SU2EY222J	2.2K ohm					
L	R115	VRD-ST2EE220J	22 ohm					
L	R116	VRD-ST2EY332J	3.3K ohm					
L	R117	VRS-PT3DB2R2K	2.2 ohm, 2W, ±10%, Oxide Film					
T	R202	VRD-ST2EY563J	56K ohm					
T	R203	VRD-SU2EY103J	10K ohm					
T	R204	VRD-SU2EY222J	2.2K ohm					
T	R205	VRD-ST2EY224J	220K ohm					
T	R206	VRD-SU2EY151J	150 ohm					
T	R207	VRD-SU2EY102J	1K ohm					
T	R208	VRD-ST2EY823J	82K ohm					
T	R209	VRD-SU2EY331J	330 ohm					
T	R210	VRD-SU2EY105J	1 Meg ohm					
T	R216	VRD-SU2EY104J	100K ohm					
T	R217	VRD-ST2EY104J	100K ohm					
T	R218	VRD-SU2EY122J	1.2K ohm					
T	R219	VRD-SU2EY124J	120K ohm					
T	R220	VRD-SU2EY102J	1K ohm					
T	R221	VRD-SU2EY154J	150K ohm					
T	R222	VRD-ST2EY105J	1 Meg ohm					
T	R223	VRD-ST2EE470J	47 ohm					
T	R224	VRD-SU2EY182J	1.8K ohm					
(U	R225- A~E	RMPTC0003AFZZ	Resistor Array, 56K ohm x 5					
C	R226	VRD-SU2EY563J	56K ohm					
C	R301	VRD-ST2EE105J	1 Meg ohm					
C	R302	VRD-SU2EY102J	1K ohm					
C	R304	VRD-ST2EE223J	22K ohm					
C	R305	VRD-ST2EE102J	1K ohm					
C	R306	VRD-ST2EE101J	100 ohm					
C	R307	VRD-ST2EE470J	47 ohm					
C	R308	VRD-ST2EE223J	22K ohm					
C	R309	VRD-ST2EE332J	3.3K ohm					
C	R310	VRD-ST2EE101J	100 ohm					
C	R311	VRD-ST2EE101J	100 ohm					
C	R312	VRD-SU2EY680J	68 ohm					
C	R313	VRD-ST2HA220K	22 ohm, 1/2W, ±10%, Carbon					
C	R314	VRD-ST2HA471J	470 ohm, 1/2W, ±5%, Carbon					
C	R315	VRD-ST2EE332J	3.3K ohm					
C	R316	VRD-ST2EE392J	3.9K ohm					
C	R318	VRD-ST2HA220K	22 ohm, 1/2W, ±10%, Carbon					
C	R319	RVR-M0010AFZZ	30K (B) ohm, Pot., RF Power Meter Adjust					
C	R501- A~E	RMPTC0004AFZZ	Resistor Array, 470 ohm x 5					

MISCELLANEOUS

GCABA3432AFSA	Cabinet, Top
GCAB-3031AFSA	Cabinet, Bottom
GWAKP1063AFSA	Front Panel
HINDM1080AFSB	Emblem "SHARP"
HINDM1119AFSA	Indication Metal, 40 Channel
JHNDM3051AF00	Mobile Mounting Bracket
JKNBM0219AFSA	Knob, A.N.L. Switch and Delta Fine Tuning Switch
JKNBN0299AFSA	Knob, Channel Selector
JKNBN0300AFSA	Knob, Off-On/Volume and Squelch/P.A. Switch
LBSHZ0051AFZZ	Bushing, Transistor Q305
LCHSZ0054AFFC	Chassis, Front
LX-BZ0021AGFD	Bolt (5φ x 8mm)
LX-BZ0053AFFD	Bolt (5φ x 10mm)
LX-NZ0052AFFD	Nut, Front Chassis
PCAPH0001AGZZ	Cap, A.N.L. Switch
PCOV8151AF00	Cover, A.N.L. and Delta Fine Tuning Switches
PCOV83058AFFW	Shield Cover, P.C. Board Component Side
PCOV83059AFFW	Shield Cover, P.C. Board Wiring Side
PCUSS0081AF00	Sponge, Shield Cover (P.C.B. Wiring Side) (50 x 30 x 7mm)
PCUSS0082AF00	Sponge, Bottom Cabinet, Top Cabinet (50 x 20 x 3mm)
PCUSS0083AF00	Sponge, Front Panel (LED) (29 x 6.5 x 1mm)
PCUSS0084AF00	Sponge, Bottom Cabinet, Top Cabinet (140 x 8 x 3mm)
PCUSS0085AF00	Sponge, Bottom Cabinet (75 x 8 x 3mm)
PCUSS0086AF00	Sponge, Shield Cover (P.C.B. Wiring Side) (30 x 15 x 9mm)
PFILW0003AFSA	Film (Smoke Panel), PLL
PFILW0001AFZZ	Film, LED

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PRICE	REF. NO.	PART NO.	DESCRIPTION	PRICE
	PFLT-0127AF00	Felt, Chassis (60 x 13 x 0.5mm)			QPLGE0403AGZZ	Plug, Test Point <u>309</u> and <u>310</u>	
	PFLT-0301AF00	Felt, Top Cabinet, Bottom Cabinet (130 x 7mm)			QPWBE0076AFZZ	Printed Circuit Board, LED Indicator	
	PFLT-0303AF00	Felt, Bottom Cabinet (105 x 50mm)			QPWBF0576AFZZ	Printed Circuit Board, Main Circuit	
	PGUMM0002AF00	Rubber Washer, Mounting Bracket			QPWBF0577AFZZ	Printed Circuit Board, Volume	
	PGUMM0113AFZZ	Rubber, Shield Cover (P.C.B. Component Side)			QPWBF0580AFZZ	Printed Circuit Board, Power Supply	
	PHAG-8001AFFC	Hanger, Microphone		PG601	QSOCZ2464AFZZ	Socket, Test Point <u>309</u> and <u>310</u>	
	PRDAR0121AFFW	Heat Sink, Transistors (Q304 and Q305)		SO601	QSOCZ2453AFZZ	Plug, Power Supply	
	PRDAR0122AFFW	Heat Sink, Integrated Circuit IC101			QSOCZ2465AFZZ	Socket, External Antenna (50 ohms)	
	PRDAR0129AFFW	Heat Sink, Transistor Q501		SO602	QSOCZ2465AFZZ	Socket, Microphone	
CNP601	QCNCM0503SGZZ	Plug, 5 Pin		SW1/	RVR-D0103AFZZ	5K (D) ohm, Off-On/Volume Control	
CNP602	QCNCM0806SGZZ	Plug, 8 Pin		R702			
CNP603	QCNCM0902AGZZ	Plug, 9 Pin		SW2-A, B/R701	RVR-B0131AFZZ	10K (B) ohm, Squelch/P.A. Switch	
CNP604	QCNCM097HAFZZ	Plug, 8 Pin		SW3	QSW-B0028AGZZ	Switch, A.N.L.	
CNP605	QCNCM098KAFZZ	Plug, 10 Pin		SW4-A, B	QSW-R0138AFZZ	Switch, Channel Selector	
CNP606	QCNCM131BAFZZ	Plug, 2 Pin		SW5	QSW-B0003AFZZ	Switch, Delta Fine Tuning	
CNP607	QPLGZ1250AFZZ	Plug, LED Indicator P.C. Board		SW6-A	RRLYZ0007AFZZ	Relay with Receiver/Transmitter Switch	
CNS601, CNS602-A, CNS603, CNS604, CNS605	QCNW-0138AFZZ	Connection Cord with Socket Assembly		~D/RY101			
CNS602-B	QCNW-0195AFZZ	Connection Cord with Socket, Microphone		C120, C121	RC-KZ1009AFZZ	Feed Through Capacitors with Bracket	
CNS606	QCNW-0194AFZZ	Connection Cord with Socket, Speaker		PL1	RCORF0050AFZZ	Ferrite Core	
CNS607	QCNTZ0052AFZZ	Socket, 12 Pin, LED Indicator P.C. Board			RLMPM0058AFZZ	Lamp, Illumination (14V, 80mA)	
F1	QFS-A232AAFNA	Fuse, 2.3 Ampere			RMICD0205AFZZ	Microphone Assembly (with Press-to-talk Switch)	
	QFSHJ9052AFZZ	Power Supply Cord with Fuse Holder and Socket		ME601	RMTRE0061AFZZ	Meter, Signal/RF Power	
J601-A, B	QJAKB0050AFZZ	Jack, External Speaker (J601-A) and P.A. Speaker (J601-B)		SP601	VSP0080P-208A	Speaker, 8 ohms	
					XBBSC30W08000	Screw (3φ x 8mm), Plus and Minus	
					XNESD50-40000	Nut (5φ)	
					XWHSD30-05000	Washer (3φ)	
					XWHSD50-05000	Washer (5φ)	
					XWSSJ50-13000	Spring Washer (5φ)	