MIDLAND®

40 Channel Mobile
Citizen Band Transciever

SERVICE MANUAL
77-250

MIDLAND® INTERNATIONAL
1690 North Topping Avenue
Kansas City, Missouri 64120

77-250000
05-250-SM-6/86-3C

SPECIFICATIONS

General Construction.

1. Unit size: 2×5/16" H×7 9/32" W ×7 5/16" D
2. Unit weight: 4.52 lbs. (approximate)
3. Shipping weight: 19.84 lbs. (approximate)
4. Dyn-Type microphone connector.
5. No mechanical relays. All switching is solid state using diodes and transistors for high reliability.
6. Transmitter output stage is protected from mismatch, no-load or short-circuit conditions.
7. Input power is suitably filtered and bypassed to prevent alternator "whine" on transmit or receive.

Electrical Specifications.

All test conditions and methods are in accordance with EIA standards RS-382 and RS-424 or applicable government regulations.

Frequency Control: PLL

Receiver Sensitivity: 0.3μV for 10 dB (S+N)/N.

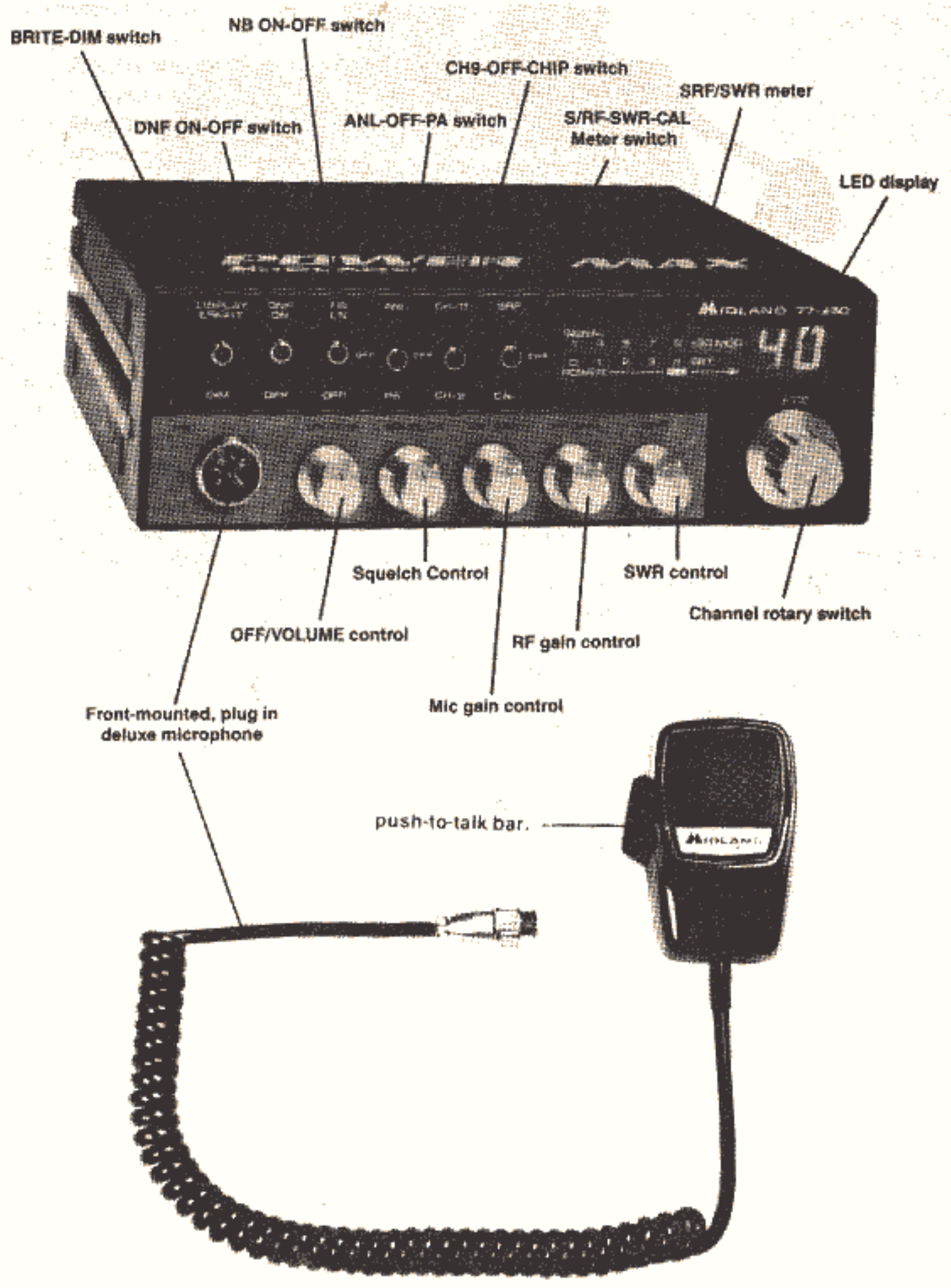
Receiver Selectivity: More than 50 dB±10 KHz

Controls: On/off/volume. Variable squelch. S/RF/SWR meter. SWR-CAL-S/RF meter switch. CB/PA. RF Gain. DNF, NB, CH9/CH19 switchs. ANL Brite-Dim switch. Mic Gain. Channel selector. LED digital readout channel indicator. Push-to-talk (on microphone).

Jacks and Connections: Microphone. 50-ohm antenna. 8-ohm external speaker. PA speaker.

Accessories Included: 500-ohm push-to-talk microphone with coil cord and plug-in connector. Microphone clip. Slotted mounting bracket and hardware. Owner's manual. FCC forms 505, 555-B, Part 95 Subpart D, DC power cord with 3-pin connector.

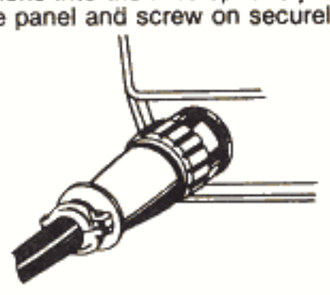
OPERATING CONTROLS



Midland 77-250 Operating Instructions

Having properly installed and wired your CB and antenna, you are now ready for the ten steps designed to get you you into effective, satisfactory operation:

Step 1: Insert the plug from the microphone into the mircrophone jack on the face panel and screw on securely.



Step 2: Make sure your antenna is securely connected to the antenna connector.

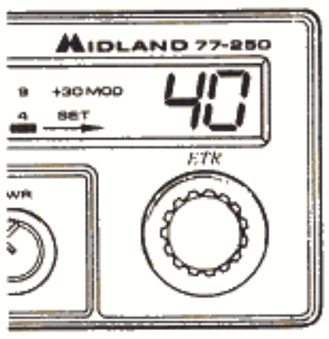
Step 3: Make sure the Squelch control is in the 9 o'clock position.

Step 4: Make sure the Mic gain control is fully clockwise.

Step 5: Turn the power on and adjust the "Volume" control for a satisfactory sound level.

Step 6: Make sure the RF Gain Control is fully clockwise.

Step 7: Select your desired channel by turning the Channel Selector dial below the LED digital indicator clockwise (up) or counter-clockwise (down).



Step 8: Place SRF/SWRICAL switch in "S-RF" position.

Step 9: Make sure the ANL/OFF/PA switch is in the "OFF" or "ANL" position.

Step 10: To transmit, press the push-to-talk bar on the microphone. To receive, release the bar.

Mechanical mounting.

Step 1: Heeding the caution, use the mounting bracket as a template for marking the location of screwholes under your dash. Use an awl, nail or other sharp, pointed object to mark the metal.

Step 2: Drill a 1/8" hole for each screwhole in the mounting bracket. Attach the bracket to the dash with the 3/8" Phillips machine screws provided. *Extreme care should be exercised when drilling into dash to avoid damage to under-dash electronic ignition, cruise control, instrument and/or accessory wiring.*

Step 3: Locate and secure the radio into the mounting bracket allowing working space for later power connections.

Power wiring.

Step 1: If you have not determined whether your vehicle has a negative or positive ground, do so now. Then disconnect the leads from the battery to prevent short circuits that can occur during wiring.

Step 2: With negative ground, connect the red wire — the one with in-line fuse holder — to either the (a) fuse block, (b) cigarette lighter or (c) directly to the positive post on your battery.

(Usually, the fuse block is the most convenient connecting point. It is also possible to connect to the Accessory terminal on the ignition switch, so that your CB automatically goes off when the ignition goes off, preventing accidental battery drainage.)

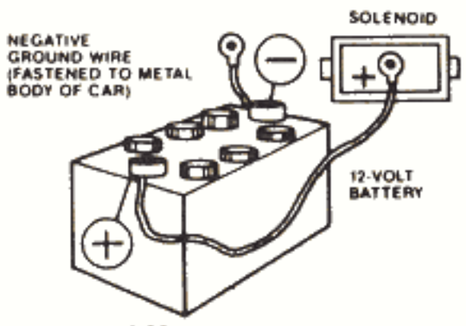
Then tightly connect the black wire directly to the vehicle's metal frame.

With a **positive ground**, reverse the wires, connecting the red/fuse-holder wire to the frame, the black wire to your DC power source. A light or meter can be a good aid in locating a suitable power source and ground.

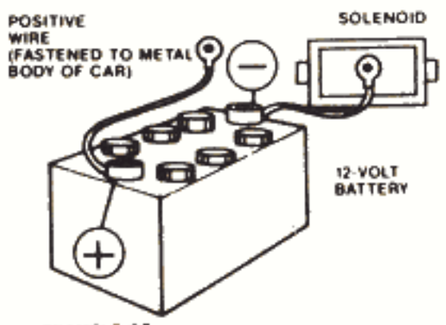
In either case, a good, direct metal-to-metal ground is essential for optimum performance.

Step 3: Plug-in the power cord to the receptacle provided on the back of the transceiver.

CAR'S MOTOR BLOCK OR FIRE WALL GROUND

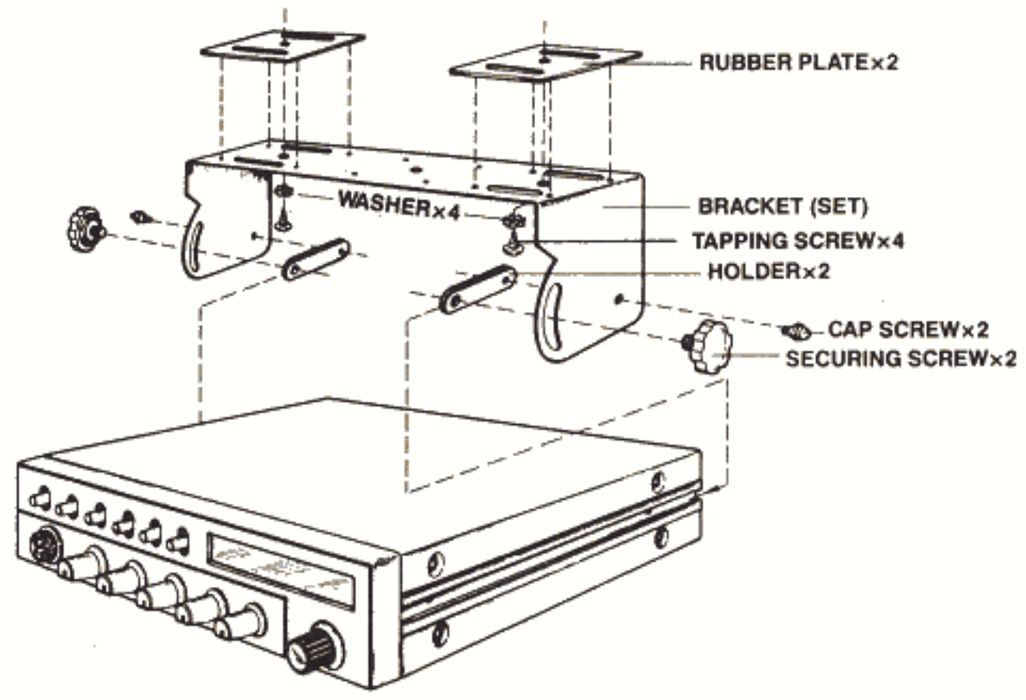


EXAMPLE OF
NEG. GROUND 12-V DC CAR BATT
CONNECTION ILLUSTRATION
MOST CARS & TRUCKS ARE
THIS TYPE



EXAMPLE OF
POS. GROUND 12-V DC CAR BATT
CONNECTION ILLUSTRATION FEW
18-WHEELERS & OLDER CARS

How to install your Midland mobile CB.



This transceiver may be installed in any **12-volt negative or positive ground-system** car or truck. Most current U.S. and foreign vehicles use a negative system, but some older models and some newer large trucks may have a positive ground.

Check the requirements for your vehicle before you begin installation.

Generally, you have a **negative-ground** system if the minus (–) battery terminal is connected to the motor block. Contact your dealer in the event you are unable to determine your vehicle's polarity system.

Installation and operating accessories furnished with your Midland Mobile CB:

1. Easy-removal mounting bracket system.
2. Microphone bracket system.
3. All main-unit and microphone mounting hardware needed for normal installation.
4. Plug-in microphone with coil cord.
5. Owner's Manual.

Where to locate your CB transceiver.

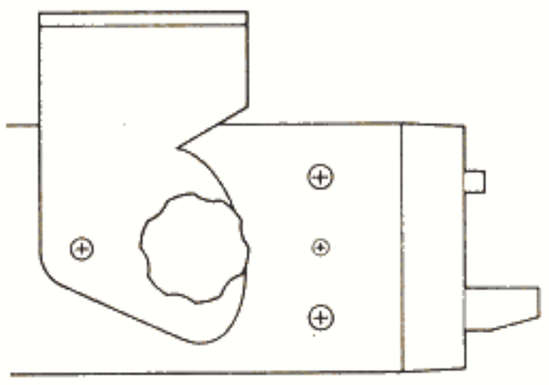
Your new Midland CB is designed to be installed under the dash of your vehicle.

Safety and convenience are the primary considerations in deciding exactly where to locate your radio.

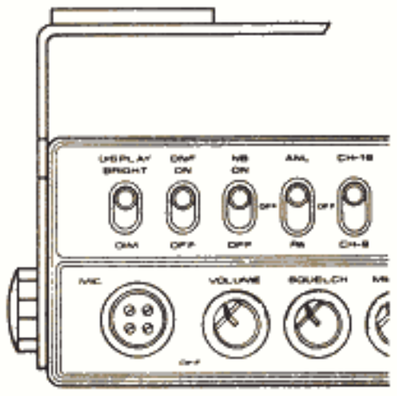
Caution: *Be sure that the unit is located so that it does not interfere with the driver or impair access to any controls. Connecting cables must be routed and secured in such a manner as not to interfere with the operation of the brake, accelerator or other controls. Interference from either the unit or connecting cables may contribute to the loss of control of the vehicle.*

Mounting the main unit.

Step 1: Position the main unit between the bracket arms in line with the retention knobs. Set the angle for optimum operating comfort and accessibility.

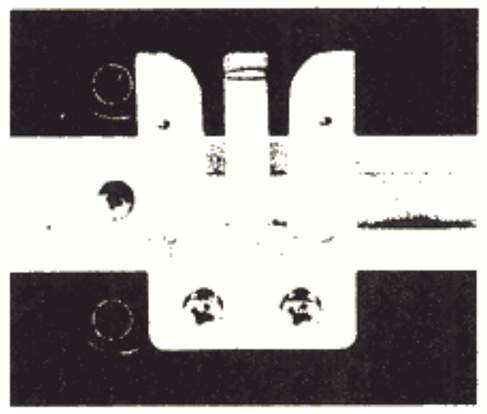


Step 2: Tighten the retention knobs.



Installation of microphone hanger.

Mounting holes are provided on the side of the transceiver for the microphone hanger bracket. Alternately, the bracket can be attached to the vehicle dash.



Connecting optional remote speaker.

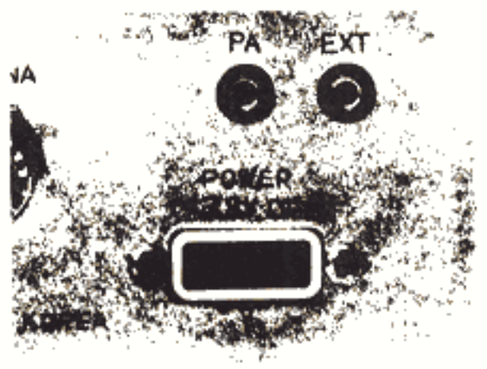
Locate the "EXT" jack on the main unit rear panel. Firmly insert and seat the speaker wire plug into the jack.

When connected, the external speaker will override and "blank out" the in-unit speaker standard with your Midland Mobile CB.

Connecting optional Public Address speaker.

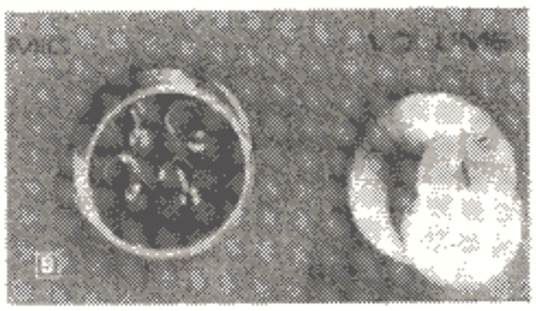
Locate the "PA" jack on the main unit back panel. Firmly insert and seat the speaker wire plug into the jack.

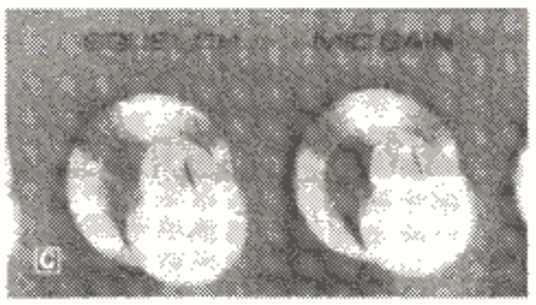
Directions for mounting the optional PA speaker are included along with mounting hardware, with the speaker.



OPERATING CONTROLS

Operating controls, connectors: Their functions and uses.





Starting at the upper left (driver's side) of your Midland 77-250 and moving counter-clockwise:

A **Electronic SRF/SWR Meter** This new high visibility, black-on-light meter is used three ways. (1) When receiving, it gives the relative strength of incoming signals. (2) When transmitting, it shows RF (Radio Frequency) power output. (3) As an "SWR" meter, it helps match your antenna installation to your transceiver.

B **Microphone Connector.** Securely links your microphone to the main unit during use, yet allows quick disconnection when out of service.

B **Off/Volume Control.** Turns your CB on and adjusts the sound level for comfortable reception.

C **Squelch Control.** Turned clockwise, it quiets the receiver when signals are not being received and allows a quiet standby operation.

The Squelch control functions only in the receive mode and does not affect receiver volume when signals are being received.

To adjust, when no signals are present, rotate the Squelch control clockwise until the receiver is quieted. Incoming signals will automatically release the squelch action.

Careful adjustment is necessary as a setting too far clockwise will not allow weaker signals to release the squelch action.

C **Mic (Microphone) Gain Control.** Adjusts the sensitivity of the microphone amplifier circuit to suit individual voice characteristics and ambient noise conditions to provide maximum intelligibility.

Rotating the control counter-clockwise reduces the sensitivity and requires "close talking" into the microphone.

When operating from a noisy vehicle, reducing the Mic Gain setting will usually improve your transmitted voice clarity. Check with other operators to determine the exact setting best for your voice and car.

D **RF Gain Control**
Controls the reception sensitivity (range) of your CB. To decrease RF Gain — to reduce interference, for example, in congested urban areas — rotate counter clockwise. For full sensitivity position. The RF Gain switch affects reception only. It will not affect transmitter output power.

D **To Measure SWR.**
1. Set the slide switch to SWR-CAL (forward) position.
2. Activate the transmitter (by pressing the microphone push-to-talk bar) and rotate the calibrate control to set the meter to the right side "SET" position.
3. Set the slide switch to SWR position and read the SWR. For example, a reading of 1.5 actually means an SWR of 1.5:1.

E **Lighted LED Digital Channel Indicator.** Clearly displays the channel selected by use of the selector dial just below.

Turn the dial to the right to select a higher-numbered channel spectrum, left to select channels below the number indicated.

F **Brite-Dim Switch.** Dims or brightens lighted controls for more comfortable day or night visibility.

F **DNF-OFF** Dynamic noise filter adds heavy duty filtering in car's electrical system to filter out high level noise.

F **NB ON-OFF** Noise blanker switch screens out atmospheric noise.

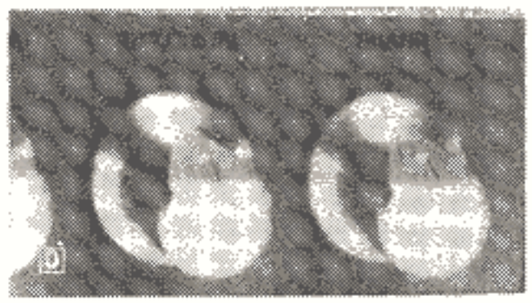
G **ANL/OFF/PA Switch.** Switches your CB speaker system from a CB function, using the internal, main-unit speaker, to a Public Address function, using an external PA speaker, and back again. When turned on, it operates in the receiver to reduce atmospheric and ignition noise.

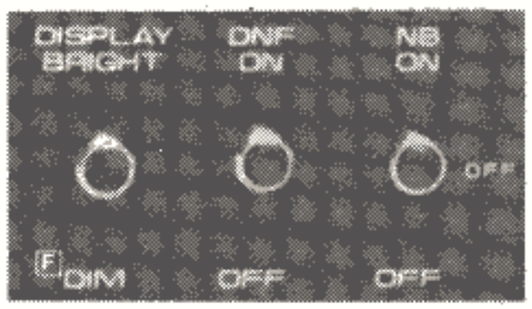
G **CH9-OFF-CH19** Switch instantly selects channel 9 (highway emergency channel) or channel 19 (highway talk channel)

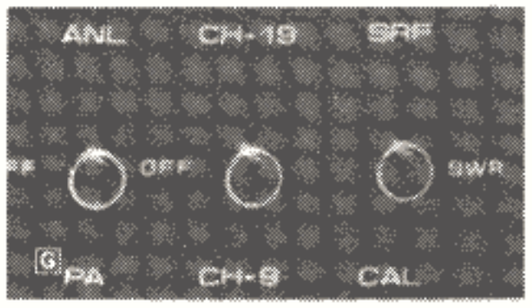
G **S/RF-SWR-CAL Meter Switch.** Selects the mode of the SWR/CAL-S/RF Meter. Rotate to right.

H **External Speaker Jack.** Allows you to attach an external speaker that will override the unit's internal speaker. Connection is made through the External Speaker Jack on the back panel.

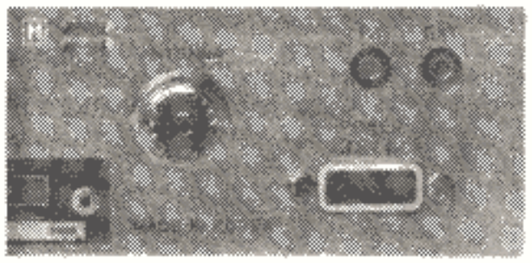
H **PA Jack.** An optional PA speaker may be attached to your transceiver through the PA output jack on the back panel. This allows you to communicate with pedestrians or other vehicles through your CB microphone.



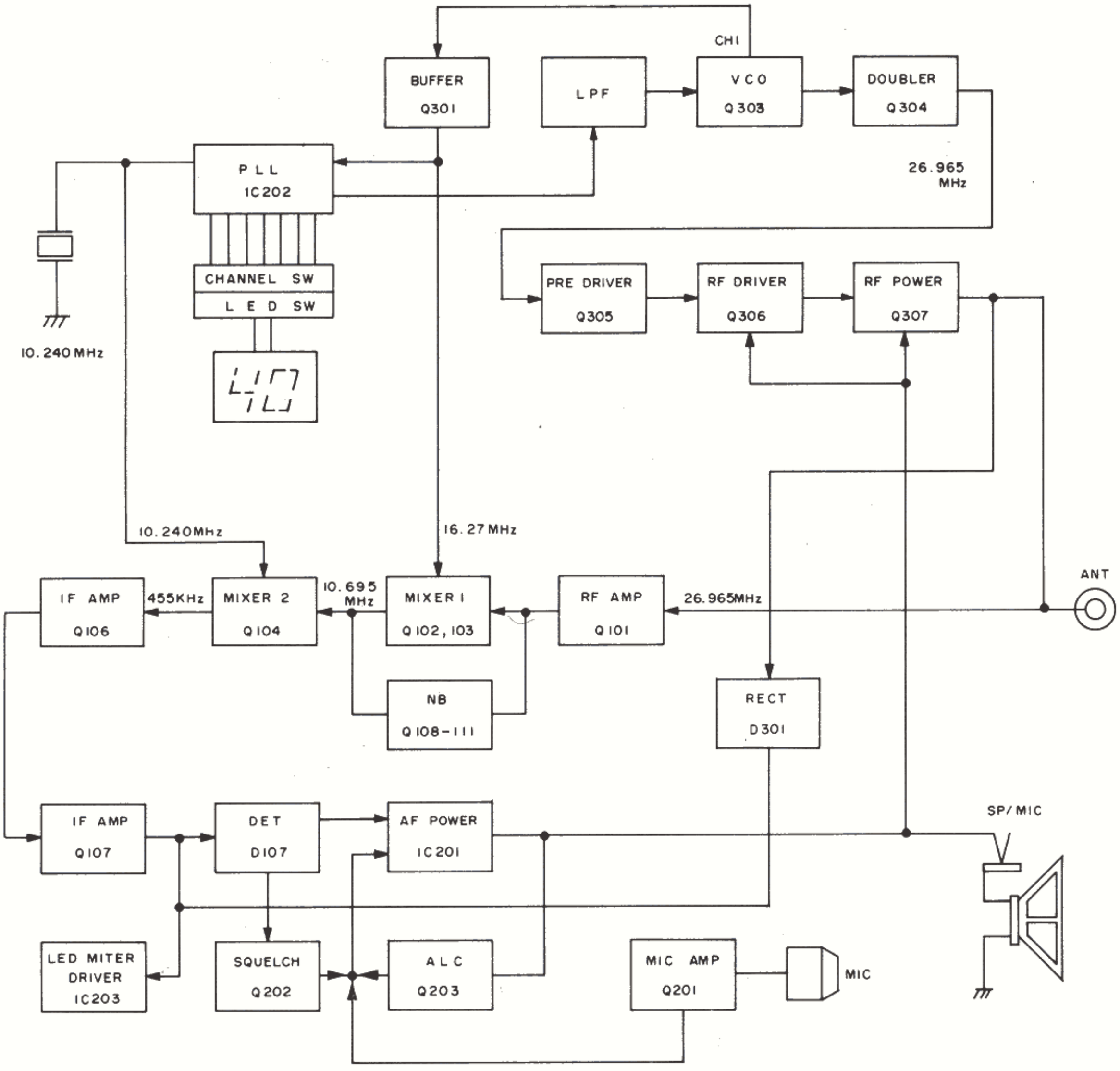




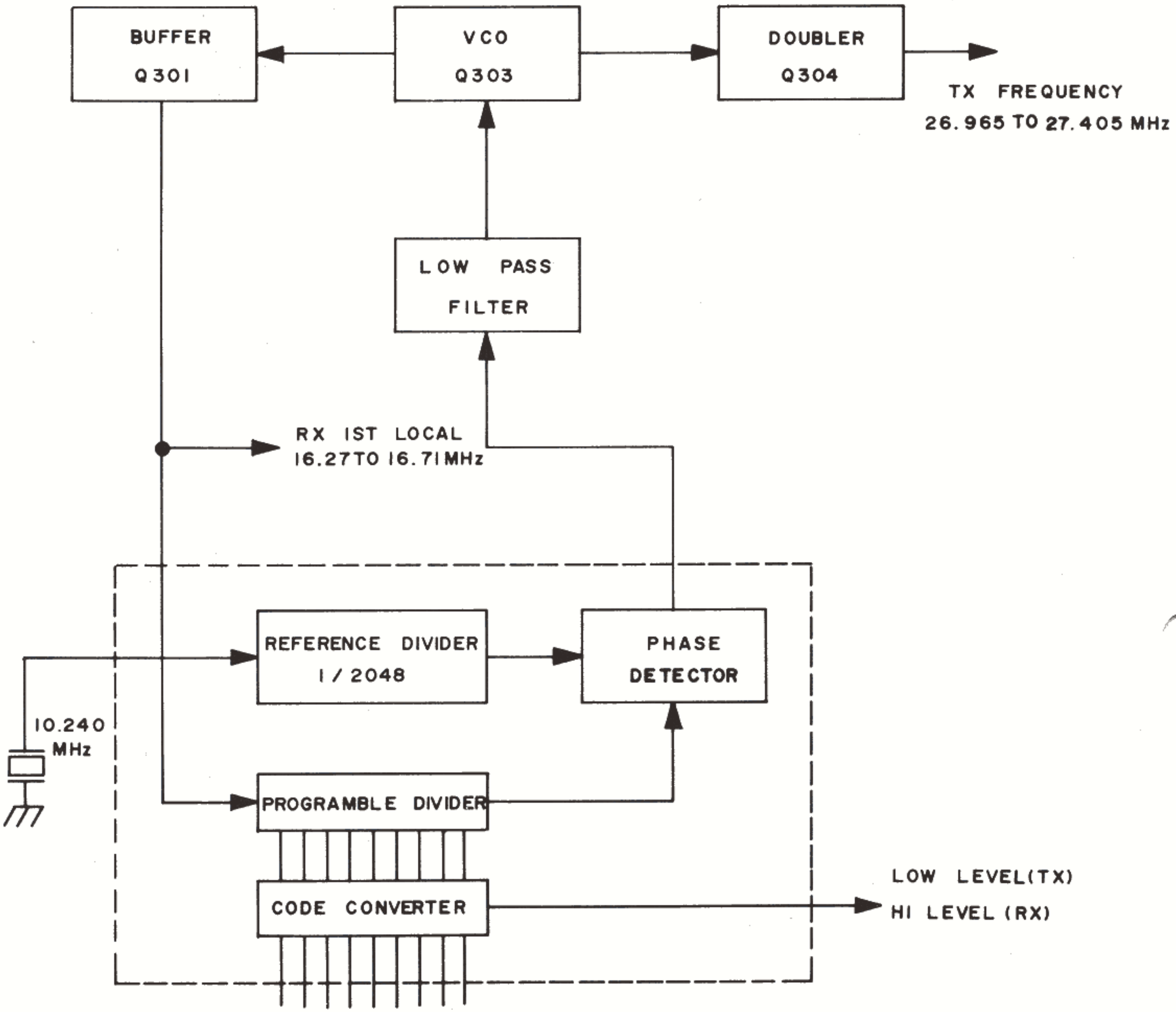
I **Microphone Push-To-Talk Bar.** Simply push this bar in to transmit; release when receiving.



BLOCK DIAGRAM



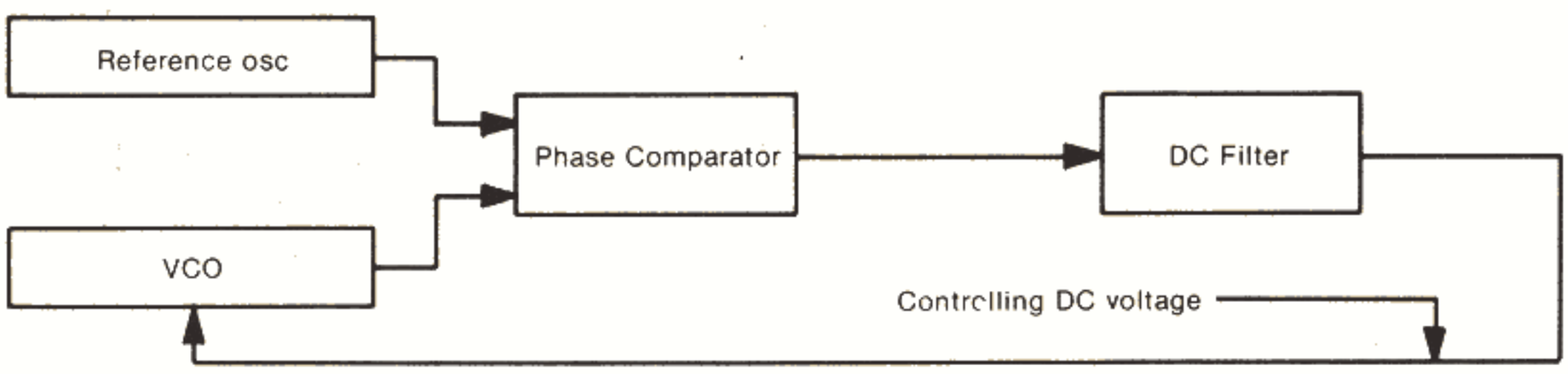
PLL CIRCUIT BLOCK DIAGRAM



1. **Fundamental theory of PLL Circuitry**

The purpose of P.L.L. (Phase Locked Loop) circuit is to generate multiple number programmable frequencies from a signal reference frequency with quartz crystal accuracy.
A basic PLL circuitry consists of reference oscillator. VCO. phase comparator and DC filter (low pass filter).
With the above circuit the VCO (Voltage Controlled Oscillator) Frequency is effectively locked to the reference oscillator, and its accuracy is as good as the reference oscilaltor.
Since the CB radio's adjacent channel spacing is 10KHz (or multiple of 2.5KHz), our purpose should be to produce multiple of programable frequencies that are spaced apart by 10KHz.

(Fig. 1)



Therefore the basic PLL circuitry is expanded as follow:

Note that the reference frequency of 2.5KHz is obtained by dividing the 10.24MHz by 4096 times. (2.5KHz reference is used instead of 10KHz for division convenience).

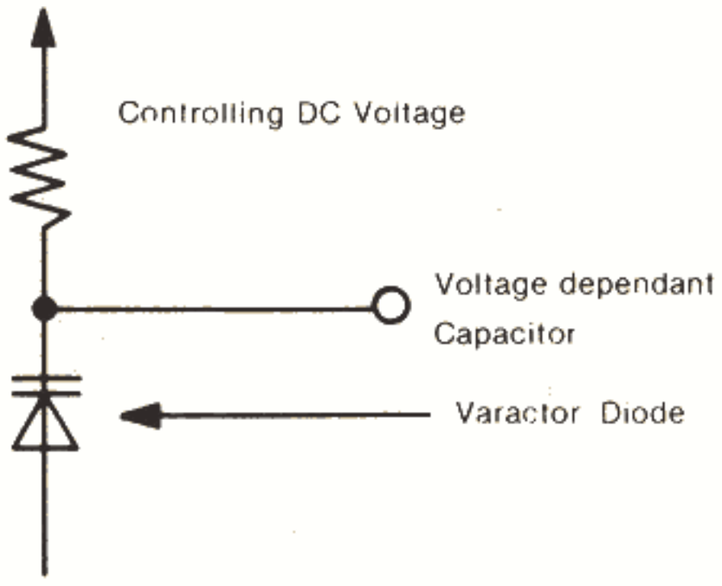
See Table 1 for transmit/receive mode VCO frequencies.

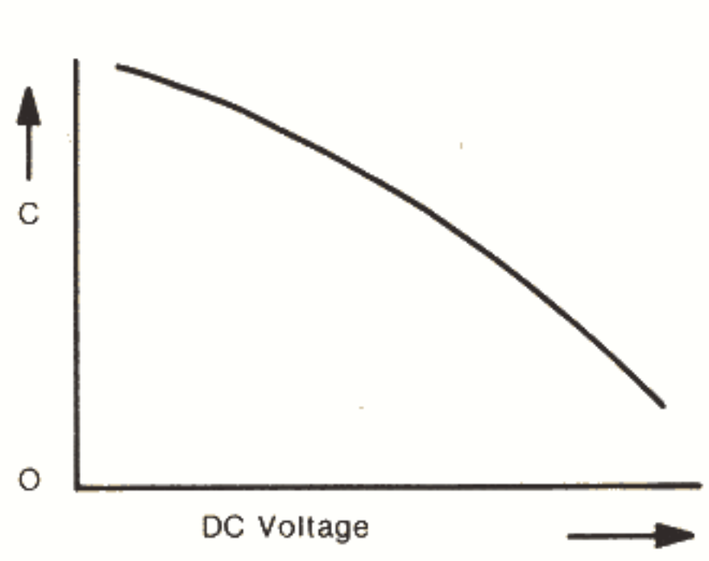
2. **Transmitter Circuit**

The VCO frequency selected by the channel selector switch is doubled to generate desired transmit frequency. The doubling is done by the Q304.

The resulting transmit frequency is filtered by L301 and L302.
Q305 is an amplifier/switch circuit. When VCO frequency is out of "Lock" condition pin 14 of IC202 pulls down bias voltage of Q305 to ground disabling Q305 from passing possible illegal frequencies.
Q306 is a RF power driver circuit, and Q307 is the final RF power amplifier.
The most important part of VCO circuitry is a voltage controlled variable capacitor called vari-cap or varactor diode whose cacapacitance depends on DC voltage appilied to its cathode

(Fig.2)





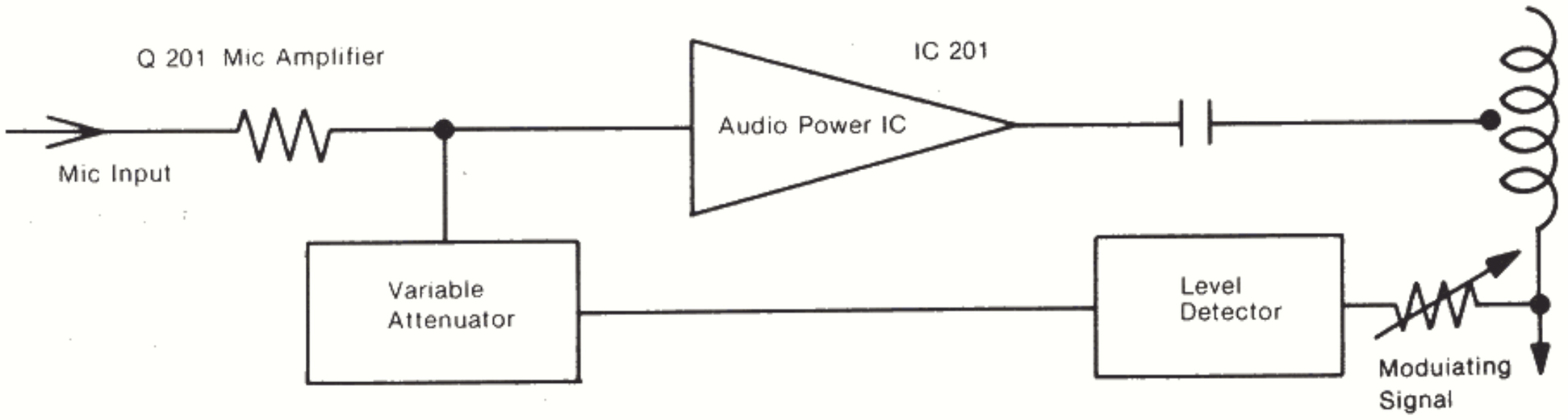
The varactor diode is responsible for setting VCO frequency, and once set it regulates the VCO frequency against the reference.
The VCO frequencies are chosen in 13 to 16MHz range as shown on Table 1.
To obtain transmitt signal the VCO is doubled. As an example for channel 1:
13.4825 x 2 = 26.965 MHz
For receiver mode the VCO is used as a first local oscillator. For cahnnel 1:
26.965 – 16.27 = 10.695MHz
The above first IF of 10.695MHz is mixed again with 10.24MHz crystal oscillator frequency which serves as the second local oscillator.
10.695 – 10.24 - 0.455MHz
As can be seen above the VCO frequency shifts from 13.485 16.27MHz when changed from transmitt to receive for the same channel 1.
The shift is accomplished by "read only memory" incorporated inside the PLL IC202 between the selector switch and the VCO divider (programable).
When transmitt logic signal is applied to the IC202 through pin 20, the programable divider will divide incoming VCO frequency by 5393 to produce 2.5KHz sampling signal.
13.485 ÷ 5393 = 2.5KHz
For the receiver mode the programable divider will automatically change to divde the VCO frequency by 3254.
16.27 ÷ 3254 = 5KHz

A modulating audio signal is applied to the collectors of Q306 and Q307 through a audio power transformer T1.

The audio signal (mic input) amplified by a single power IC201.

The modulation limiting is accomplished by a automatic level control circuit switch is as follow:

(Fig. 3)



L305 and C325 are series resonator, and L306, C326, L307 and C329 make up pie-low pass filter.
C320 is factory selected and limits the RF output power level to within the FCC limit of 4 watts.

3. Receiver Circuit

In the receiver mode of operation, Q207 transistor is turned off.
Also bias voltage is applied to Q208 and a proper bias and AGC voltage is established to and Q101 is a 27MHz RF input amplifier and any excessive input signal is limited by diodes D101 and D105.
The amplified 27MHz is mixed with VCO frequency selected by channel switch.
For channel 1 VCO is set at 16.27MHz. The resulting first IF is 26.965 – 16.27 = 10.695MHz.

Q102, Q103 is the first converter, and the 10,695 MHz is sharply filtered by L105, and a crystal filter XF-1

The first IF is again mixed with a second local oscillator of 10.24MHz. 10.694 – 10.24 = 0.445MHz. is the second converter and the 455KHz second IF is filtered by a razor sharp ceramic filter of CF-2, CF-3 coupled with L107.

Q106 is a first 455 KHz amplifier.

D107 is a detector diode which produces audio signal as well as a negative DC voltage for AGC action. The negative voltage also provides forward biasing to the cathode of ANL clipping diode of D109.
The biasing voltage has a time constance determined by R127 and C121.

1. **Test Voltage**

   DC 13.8V ± 5%, unless otherwise specified.

2. **Test Equipment**

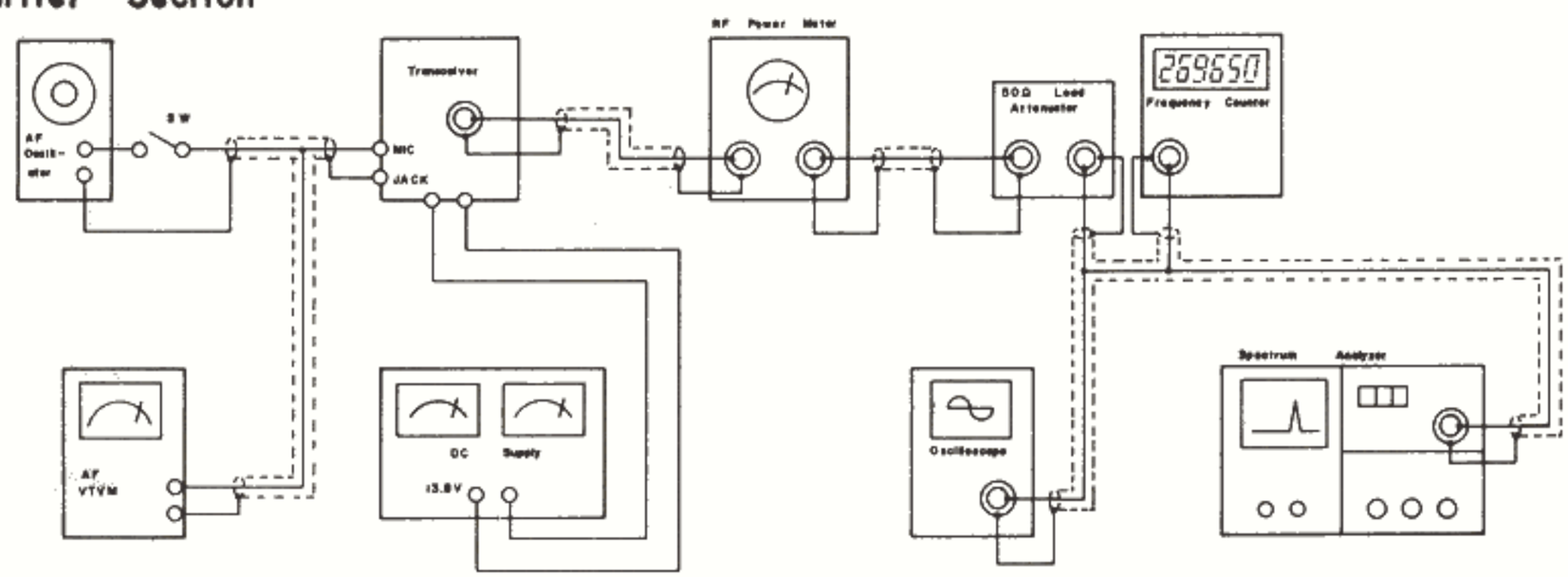
   All Test equipment should be properly callibrated.

   1. Audio signal generator, 10Hz-20KHz.
   2. VTVM 1 mV measurable
   3. DC ampere meter, 2A
   4. Regulated power supply, DC 0-20V, 2A or higher
   5. Frequency counter, 0-40MHz, high input impedance type
   6. RF VTVM probe type
   7. Oscilloscope, 30MHz, high input impedance
   8. RF watt meter, thermo-couple type, 50 ohm, 5W
   9. Standard signal generator, 100KHz-500MHz, -10-100dB, 50 ohm unbalanced.
   10. Speaker dummy resistor, 8 ohm, 5W
   11. Circuit tester, DC, 20K ohm/V

3. **Alignment of Transmitter Circuitry**

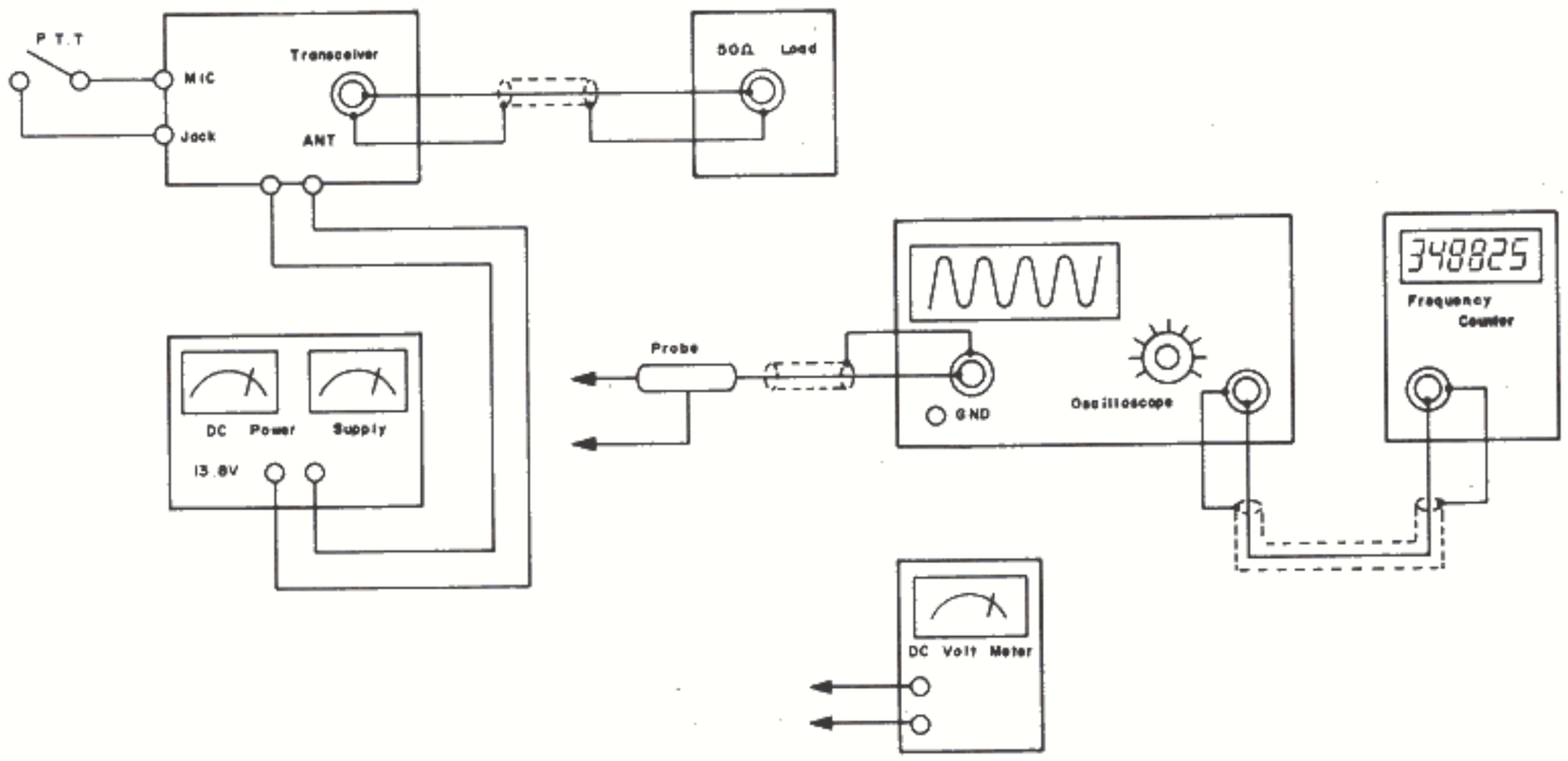
   3.1 Test Setup

Transmitter Section



3.2 PLL Circuit alignment

PLL AND CARRIER SECTION



3.2.1 10.24MHz

Connect a frequency counter to the pin 12 and check to see 10.240000MHz-100Hz. When a defective crystal is replaced, and if the frequency is higher than by 100Hz, the CT201 should be increased. If the frequency is lower, the CT201 should be reduced in capacitance.

3.2.2 VCO alignment

1. Set the Radio to channel 40 and in receive mode.
2. Connect a circuit tester between R224/and ground
3. Adjust L201 obtain 3.1V DC.
4. Set the Radio to channel 1 and in transmit mode. (make certain 50 ohm dummy load or wattmeter is connected to antenna terminal)
5. Check to see the TP/DC voltage dropping to a level between 1.3 to 1.5 volt DC.

As long as the DC level stays between 3.1V DC for receive at channel 40 and 1.3 to 1.5V DC for transmit at channel 1 the VCO is set properly.

3.3 RF driver stage alignment

1. Select channel "19".
2. Connect an oscilloscope to the base of Q305 and ground.
3. Adjust L301 and L302 for maximum amplitude of scope display (27.185MHz signal)
4. Connect the scope to Q306 collector.
5. Adjust L303 for maximum amplitude of scope display.

3.4 RF Power amplifier alignment

1. Set power supply voltage to 13.8V and set the radio into channel 19 position.
2. Connect a watt metter to the antenna connector.
3. Adjust L301, L302 and L303 for maximum power indication in high position of Hi/Lo Switch.
4. Adjust L304 for maximum power indication in Low position of Hi/Lo Switch.
5. Adjust L305 and L306 for maximum power indication in high position of Hi/Lo Switch.
6. When all coils are peaked, the power meter should indicate above 4.0 watts.
7. Turn L305 and L306 until the power reading of 4.0 watt is obtained.

3.5 Transmit frequency check

1. Set the radio into transmit mode with no modulation.
2. Connect the frequency counter to the antenna load or to the tab provided at the wattmeter.

   The frequency should be within ± 800Hz from each channel center frequency as tabulated in the frequency table attached.

3.6 Modulation sensitivity alignment

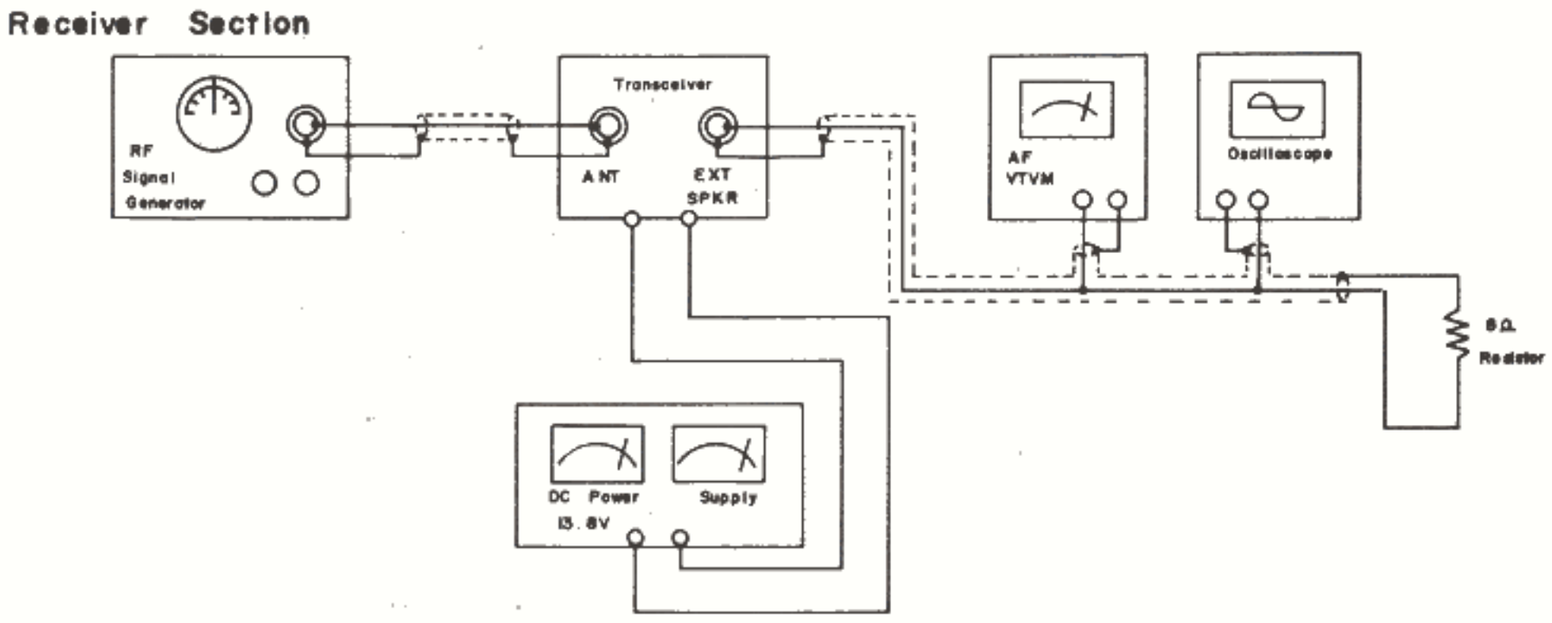
1. Set the unit into transmit mode and apply 6mV, 1KHz signal to the Mic input circuit.
2. RV201 should be adjusted to obtain 85% modulation at this condition.
3. Next, decrease signal input to 10mV and observe that the modulation ratio is keeping the value higher than 30%.

3.7 Transmit power indicator alignment

1. Set the unit into transmit mode with no modulation.
2. Adjust RV301 right after the NO 5 LED just light on.

4. Alignment of Receiver Circuitry

4.1 Test Set-up



4.2 Receiver Sensitivity Alignment

1. Set the signal generator at 27.185MHz, 1KHz and 30% modulation.
   Also set the radio at channel 19 position.
2. Adjust L101, L102, L103, L104, L105, L106, L107, L108, and L109 for maximum audio output across the 8 ohm dummy load resistor.
   This alignment should be performed by gradually decreasing the signal output signal to a minimum level required for tuning to aboid inaccurate alignment due to AGC action.

4.3 Squelch circuit alignem

1. Set the signal generator to provide RF input signal of 60dB (1KHz, 30% modulation)
2. Rotate the squelch control in full clockwise direction.
3. Temperarily adjust RV101, for maximum audio output, and note the audio output level. Then adjust RV101 so that the audio output level decreases by 6 dB.

4.4 Receive signal indicator alignment

1. Set the signal generator to provide RF input signal of 40 dB (1KHz, 30% modulation).
2. Adjust RV102 right after the NO. 5 LED just on.
3. Reduce antenna input signal level to 0-10, and check to see the first LED light on.

VOLTAGE CHART

: MEASURED CH19
: NO SIGNAL
: NO MODULATION

1) TRANSISTOR

TR NO		G1	G2	D	S	TR NO		G	S	D
Q101	R X	0	5.6	11.28	0.6	Q104	R X	0	2.76	11.80
	T X	0	5.6	11.28	10.4		T X	0	2.76	11.36
Q102	R X	0	0.34	11.18	0	Q109	R X	0	3.70	5.30
	T X	0	0	10.88	0		T X	0	3.0	5.35
Q103	R X	0	0.34	11.18	0					
	T X	0	0	10.88	0					

TR NO		E	B	C	TR NO		E	B	C	TR NO		E	B	C
Q106	R X	0.8	1.6	9.63	Q202	R X	0	0	0.6	Q301	R X	0	0.8	8.5
	T X	0	0.13	11.86		T X	0	0	0.6		T X	0	0.7	8.5
Q107	R X	0.5	1.2	11.40	Q203	R X	0	0	0	Q302	R X	0	0	0
	T X	0	0.12	11.86		T X	0	0	0		T X	0	0.6	0
Q108	R X	0	0.74	6.60	Q204	R X	0	0.6	0	Q303	R X	4	4.7	8.2
	T X	0	0.73	6.44		T X	0	0.6	0		T X	4	4.7	8.2
Q110	R X	8.46	7.89	0.69	Q205	R X	11.5	12.4	13.2	Q304	R X	0	0	0
	T X	0.46	7.89	0.69		T X	11.5	12.4	13.2		T X	8.4	2.7	8.5
Q111	R X	0	0	0	Q206	R X	8.6	9.5	12.4	Q305	R X	0.2	0.2	10
	T X	0	0	0		T X	9	9.5	11.8		T X	0.8	0.2	10
Q112	R X	0	0.6	1.3	Q207	R X	8.4	7.8	8.4	Q306	R X	0	0	13
	T X	0	0	10.5		T X	8.8	8.6	0		T X	0	0	13
Q201	R X	11	6.5	11.6	Q208	R X	8	8.5	8.5	Q307	R X	0	0	13
	T X	1.4	2	7.5		T X	0.8	0.8	8.5		T X	0	0	13

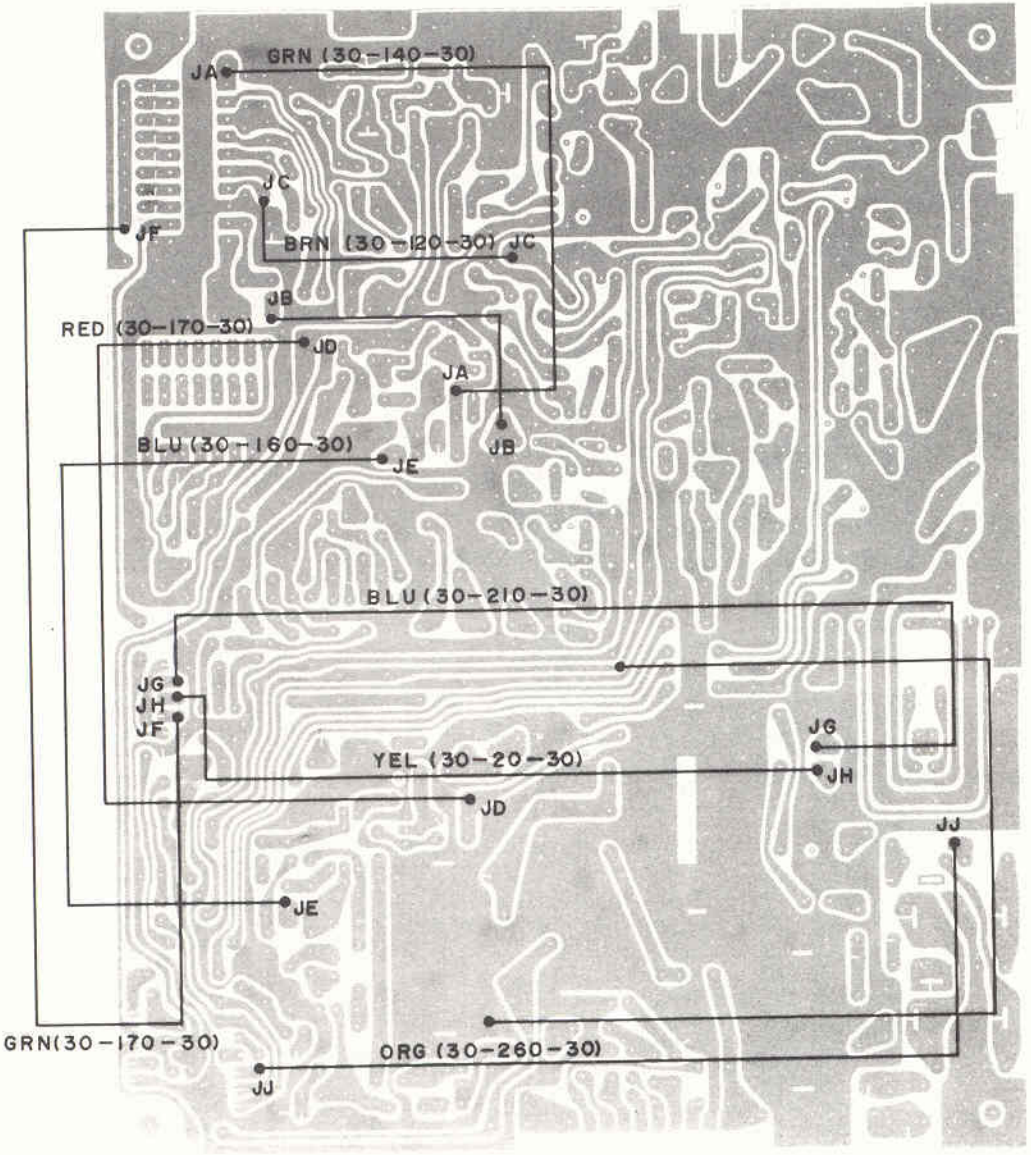
2) IC

IC NO	IC 201									
PIN NO	1	2	3	4	5	6	7	8	9	10
R X	13.2	12.04	3.86	7.82	1.51	3.24	3.24	1.26	0	6.52
T X	13.2	12.04	3.85	7.82	1.51	3.24	3.24	1.26	0	6.52

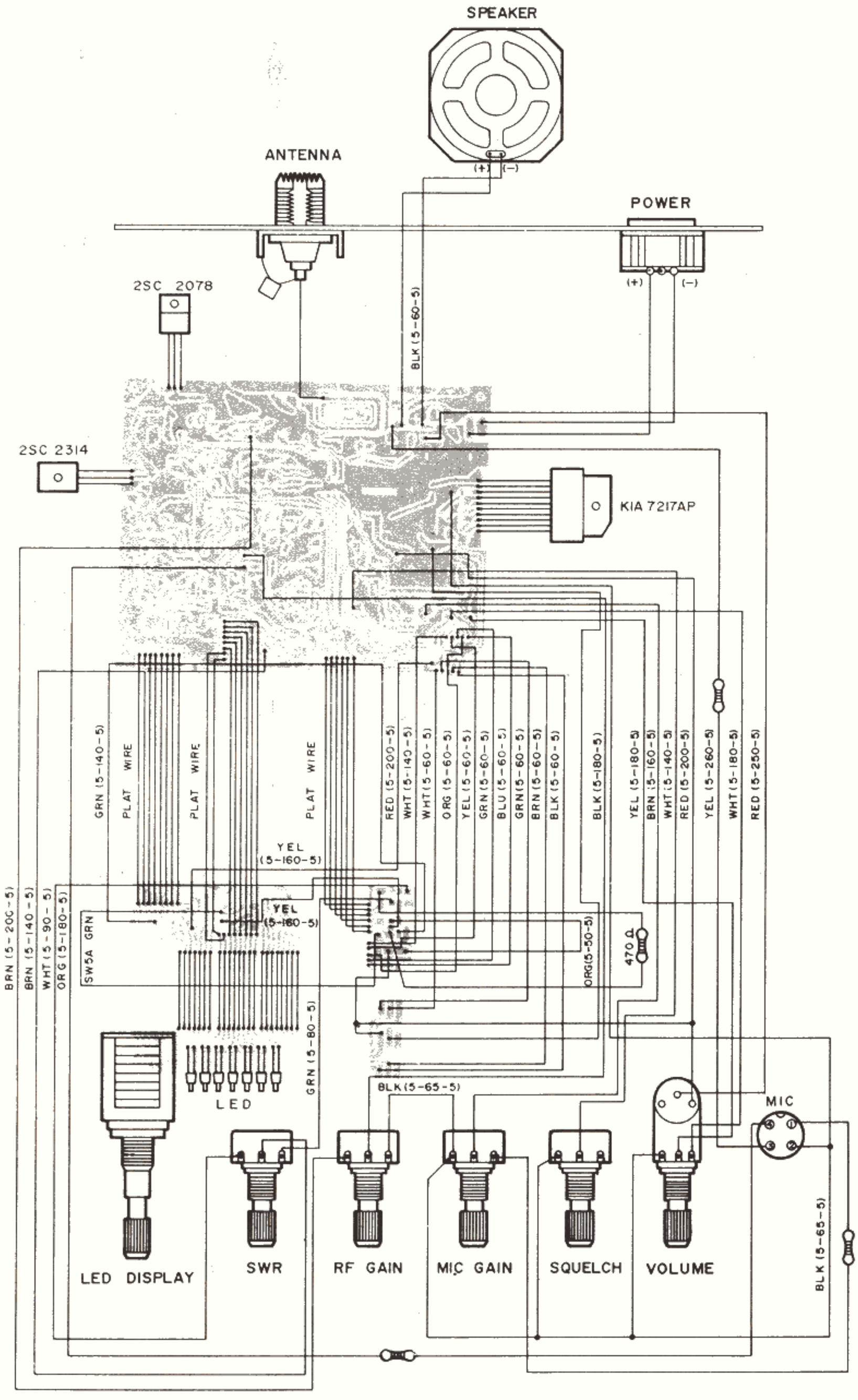
IC NO	IC 202					IC 202													
PIN NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
R X	8.30	0	0	8.30	8.30	0	0	0	0	0	3.8	4.5	0	1.2	2	2	1.8	8.4	4.2	8
T X	0	0	0	12.8	8.30	0	0	0	0	0	3.7	4.5	0	4.7	2.1	2.1	4.64	8.4	4.2	1

IC NO	IC 203													
PIN NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14
R X	12.6	3	3	0	0	1	0	11.2	11.2	11.2	11.2	11.2	11.2	11.2
T X	12.6	3	3	0.2	0.2	1.5	0	0.2	0.2	0.2	0.2	0.2	10.8	10.8

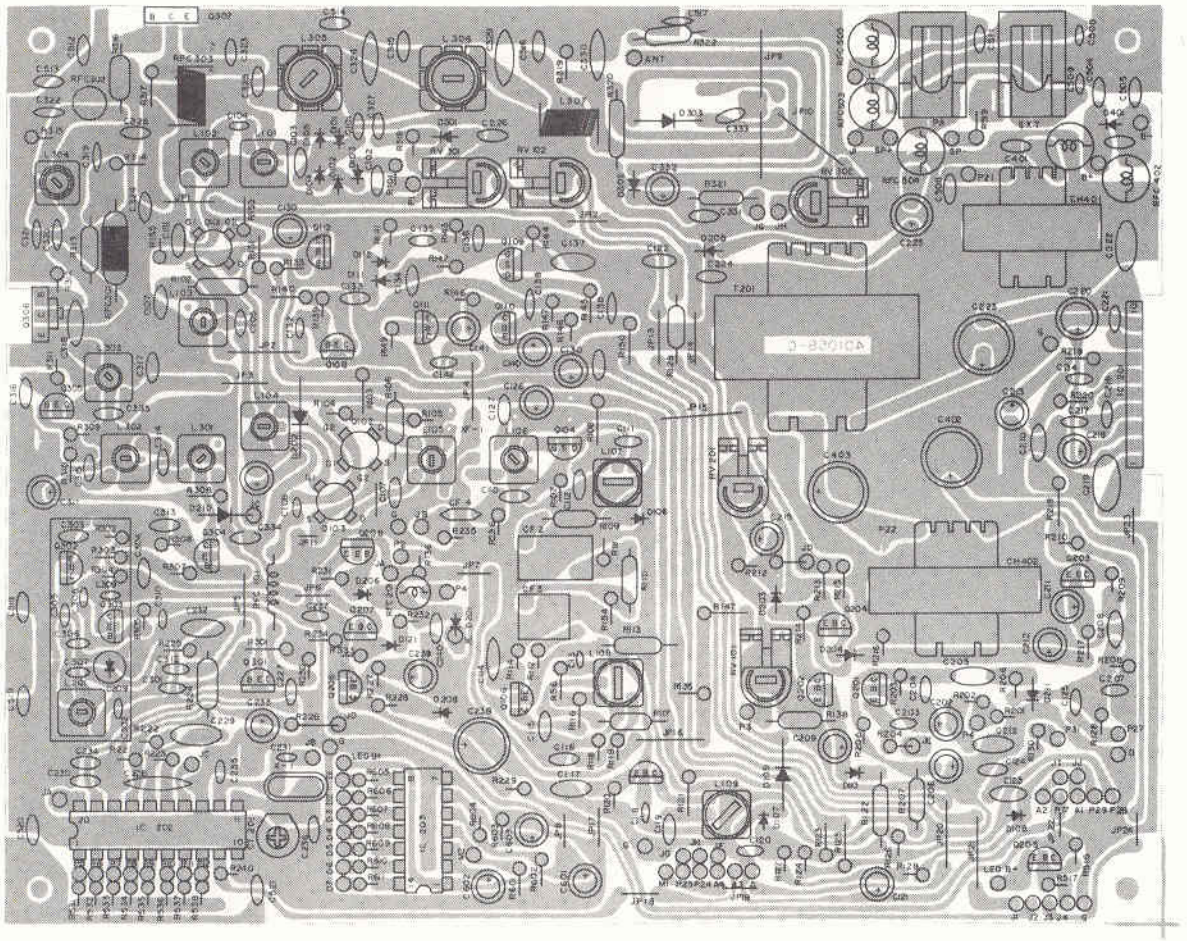
PC BOARD , WIRING DIAGRAM

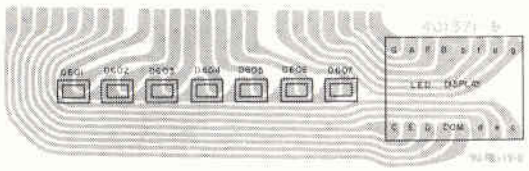


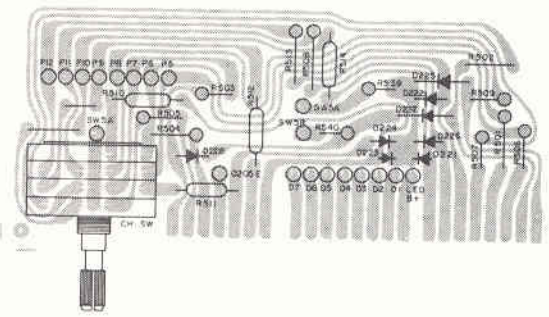
WIRING DIAGRAM

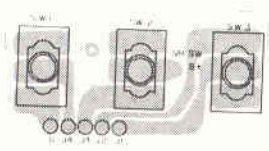


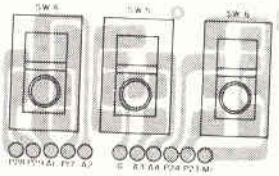
PC BOARD (TOP VIEW)



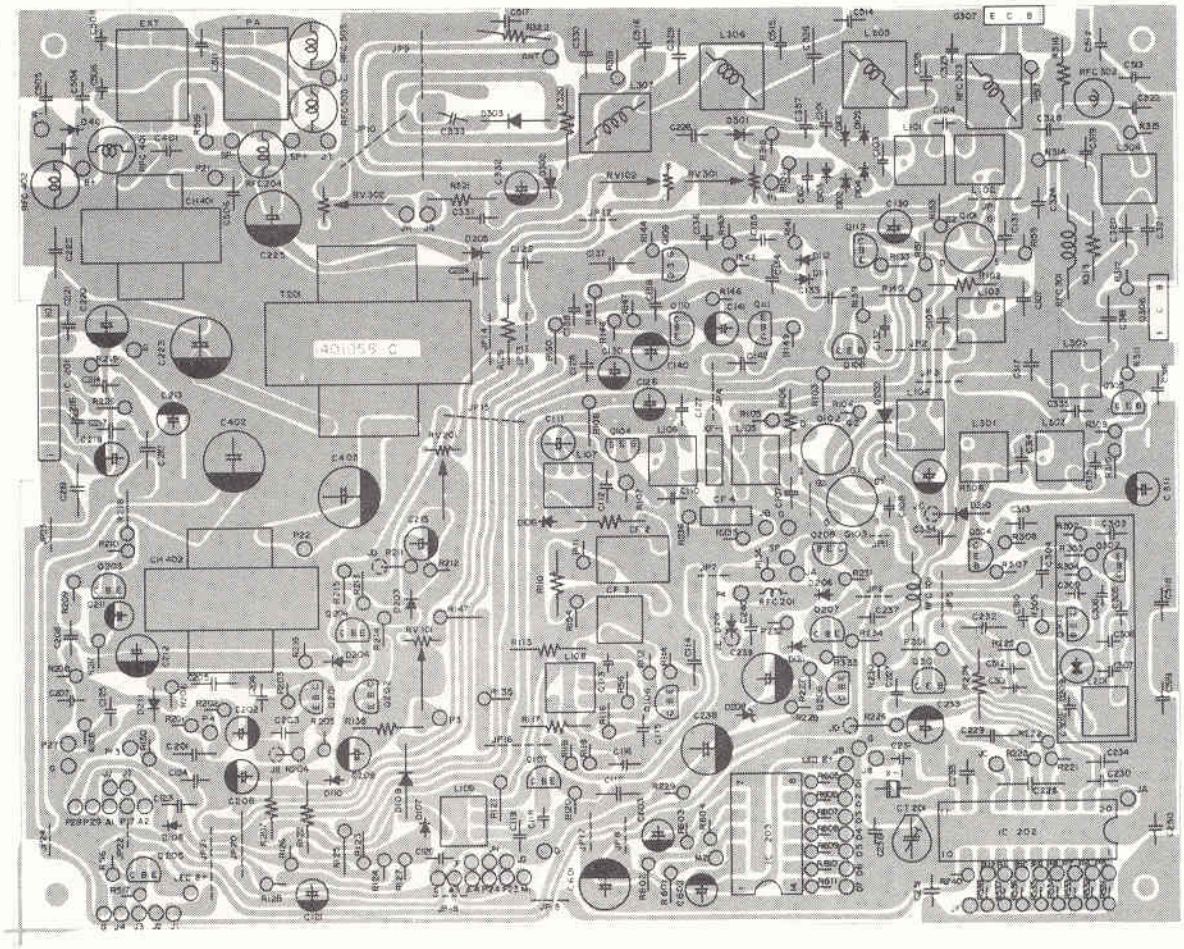


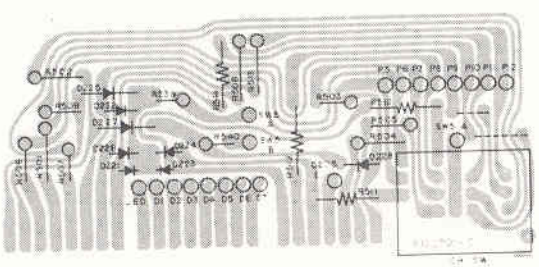


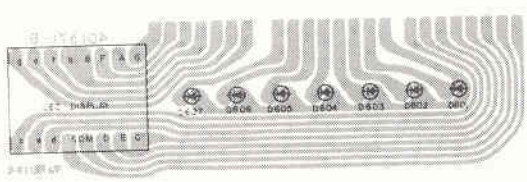


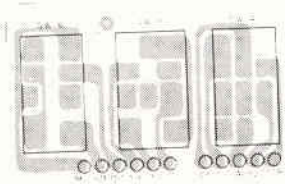


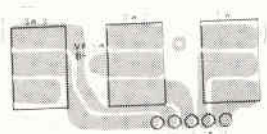
PC BOARD (BOTTOM VIEW)











REF. NO.	DESCRIPTION	PART NO.
	CASE PARTS EXPLODED VIEW	
1	Knob (Control)	77-110033
2	Knob (Channel	77-115053
3	Control Plate	76-020004
4	Channel Plate	76-115006
5	Screw 2x6	77-151194
6	Escutcheon	77-011042
7	Overlay	77-020116
8	Lens	77-020117
9	Front Body	77-010091
10	Felt	77-157150
11	Felt	76-157009
12	Bracket	77-158166
13	MIC	77-159091
14	Rotary Switch	77-180030
15	Insulator	77-157151
16	Slide Switch	76-183004
17	Slide Switch	77-183043
18	P.C.B Led	77-070092
19	LED Display	77-202043
20	LED	80-202005
21	LED	77-202046
22	P.C.B CH9	77-070093
23	P.C.B DNF	77-070094
24(VR105)	Control, SWR	70-166006
25(VR102)	Control, SW.	70-160011
26(VR103)	Control, Mic	70-160034
26(VR104)	Control, RF	70-160034
27(VR101)	Control, Vol.	70-160035
28	Main Body	77-015027
29	Mica	80-089013
30	2SC 2314	01-032314
31	2SC 2078	01-032078
32	Mica	77-089078
33	KIA 7217 AP	02-437217
34	Mica	77-157152
35	Jack Earphone	77-153017
36	Antenna Jack	77-153019
37	Holder, Antenna	76-158023
38	Name Plate	77-020118
39	Rivet	77-151123
40	Shield	77-089102
41	Fiber	77-157153
42	Shield	77-089084
43	PCB Main	77-070095
44	Heat Sink (IC)	77-089097
45	P.C.B SW	77-070096
46	Housing	77-159087
47	Lug	77-159088
48	Bracket	77-158167
49	Bottom Cover	77-011043
50	Upper Cover	77-011044
51	Felt	77-157154
52	Speaker	77-060017
53	Holder	77-158160
54	Cap	77-157086
55	Felt	77-157155
56	Bracket Set	77-158168
57	Insl Rubber	77-157156
58	Holder	77-158169
59	Screw	77-151203
60	Screw	77-151204
61	Screw	80-151046
62	Washer	77-151180
63	Screw	70-151105
64	Screw	70-151105
65	Screw	70-151121
66	Screw	70-151444
67	Screw	77-151183
68	Screw	80-151079
69	Screw	70-151437
70	Screw	70-151381
71	Screw	77-151186
72	Screw	75-151043
73	Screw	77-151067
74	Nut	77-151185
75	Washer	80-151076
76	Washer Rubber	77-151130
77	Bracket Mic	76-158024
78	Screw	77-151191
79	Washer	77-151192
	MISCELLANEOUS	
	Mic Ass'y	77-038041
	Power Cord Ass'y	77-034053
	FILTERS	
CF-3	CFU 455HT	77-179022
CF-2	CFW 455HT	77-179024
CF-4	10.24MS-3-A	77-179033
XF-1	10L08A	77-179034

REF. NO.	DESCRIPTION	PART NO.
	CRYSTAL	
X201	10.240MHZ	77-128022
	COILS & TRANSFORMERS	
CH401	Choke	77-178095
T201	Transformer OPT	77-096027
CH402	Transformer Choke	77-178120
RF401,402	Coil Choke 10UH	77-178067
RFC301	Coil Choke 1UH	77-178119
RFC503, 504,505	Coil Choke 1UH	77-178059
RFC303	Coil Choke 0.5UH	77-178064
RFC101	Coil Choke 6.8UH	77-178065
RFC202	Coil 4UH	76-178010
RFC302	Inductor 6.8UH	77-178099
L307	Coil ANT 27MHZ	77-090086
L305	Coil ANT 27MHZ	77-090087
L306	Coil IFT 27MHZ	77-090135
L303	IFT 27MHZ	77-090124
L201	Coil VCO	77-090074
L301,302	Coil 27MHZ RF	77-090075
L304	Coil 27MHZ RFC	77-090077
L101	Coil 27MHZ ANT	77-090136
L102	Coil 27MHZ ANT	77-090137
L103	Coil 27HMZ AMP	77-090138
L106	Coil 10.7MHZ	77-090139
L107	Coil 455KHZ	77-090140
L108	Coil 455KHZ	77-090141
L109	Coil 455KHZ	77-090142
L104	Coil 27MHZ	77-090143
L105	Coil 10.7MHZ Mix.	77-090144
	TRANSISTORS	
Q301	2SC 380 (O)	01-030380
Q203,204	MPS 9634 (C)	01-349634
Q202	MPS 9634 (D)	01-349634
Q108,303, 4,5	MPS 9426 (C)	01-349426
Q110,207	MPS 9681 (T)	01-349681
Q205,206	MPS 9418 (T)	01-349418
Q106	MPS 9623 (H)	01-349623
Q107	MPS 9623 (I)	01-349623
Q111,112, 201,208, 302	MPS 9631 (T)	01-349631
Q104,109	JF 1033S	01-401033

REF. NO.	DESCRIPTION	PART NO.
Q101,102, 103	BF 964 (A)	01-400964
	CARBONFILM RESISTORS	
R156	390 Ohm 1/16W	67-143014
R150,227,312	100 Ohm 1/8W	04-661010
R112,6,8, 130,140,202, 216,217,601, 605,606, 607,608, 609,610, 611,501, 502,503, 504,505, 506,507, 508,509, 513	1K 1/8W	77-164056
R103,141,8, 211,2,221, 232,302, 303,602, 240	10K 1/8W	77-164048
R104,139, 146,151,153, 213,225,301	100K 1/8W	80-140011
R147	1M 1/8W	80-140067
R317	1.2K 1/8W	04-661023
R517	1.5K 1/8W	04-881053
R603	15K 1/8W	04-881530
R125,307	150K 1/8W	80-140021
R531,532, 533,534,535, 536,537,538	18K 1/8W	04-881830
R226,9	22 Ohm 1/8W	80-140135
R215,218, 223,516	2.2K 1/8W	04-882023
R123,131, 133,137	22K 1/8W	80-140118
R305	220K 1/8W	04-662203
R107,214, 304	2.7K 1/8W	04-882073
R135	27K 1/8W	04-882730
R101,114, 120,121	330 Ohm 1/8W	04-883310
235,236		

PARTS LIST

REF. NO.	DESCRIPTION	PART NO.
	CARBONFILM RESISTORS, CONT.	
R201,205, 209	3.3K 1/8W	04-663033
R127,222	33K 1/8W	04-663330
R308	390 Ohm 1/8W	80-140038
R105	3.9K 1/8W	80-140006
R234,251, 311	47 Ohm 1/8W	04-664700
R108,228, 231	470 Ohm 1/8W	80-140043
R119,143, 233,306, 309,310	4.7K 1/8W	04-664073
R124,128	47K 1/8W	04-884730
R142,210	470K 1/8W	80-140142
R204	560 Ohm 1/8W	80-140143
R111,136, 144,145, 149,154	5.6K 1/8W	04-885063
R219,315	68 Ohm 1/8W	04-140052
R318	680 Ohm 1/8W	04-140053
R126	68K 1/8W	04-140055
R220,230	820 Ohm 1/8W	04-140057
R206,208	8.2K 1/8W	04-140059
R203	820K 1/8W	80-140061
R604	91K 1/8W	98-140153
R320,322	100 Ohm 1/8W	80-140001
R109,113, 207,313,510, 511,512,514,	1K 1/8W	04-881300
R110	1.5K 1/8W	80-140020
R138	1.8K 1/8W	80-140023
R122	22K 1/8W	80-140030
R102,106, 117	470 Ohm 1/8W	80-140043
R129,224	4.7K 1/8W	80-140044
R316	4.7 Ohm 1/8W	04-004070
R540	270 Ohm 1/2W	04-992710
R319	4.7K 1/2W	80-140044
R314	10 Ohm 1W	04-661100
R539	100 Ohm	80-140002
	TRIM POTENIOMETERS	
R519	4.7 Ohm	04-024007
RV101,201, 302	10K	80-140072
RV102,301	20KB	80-140078

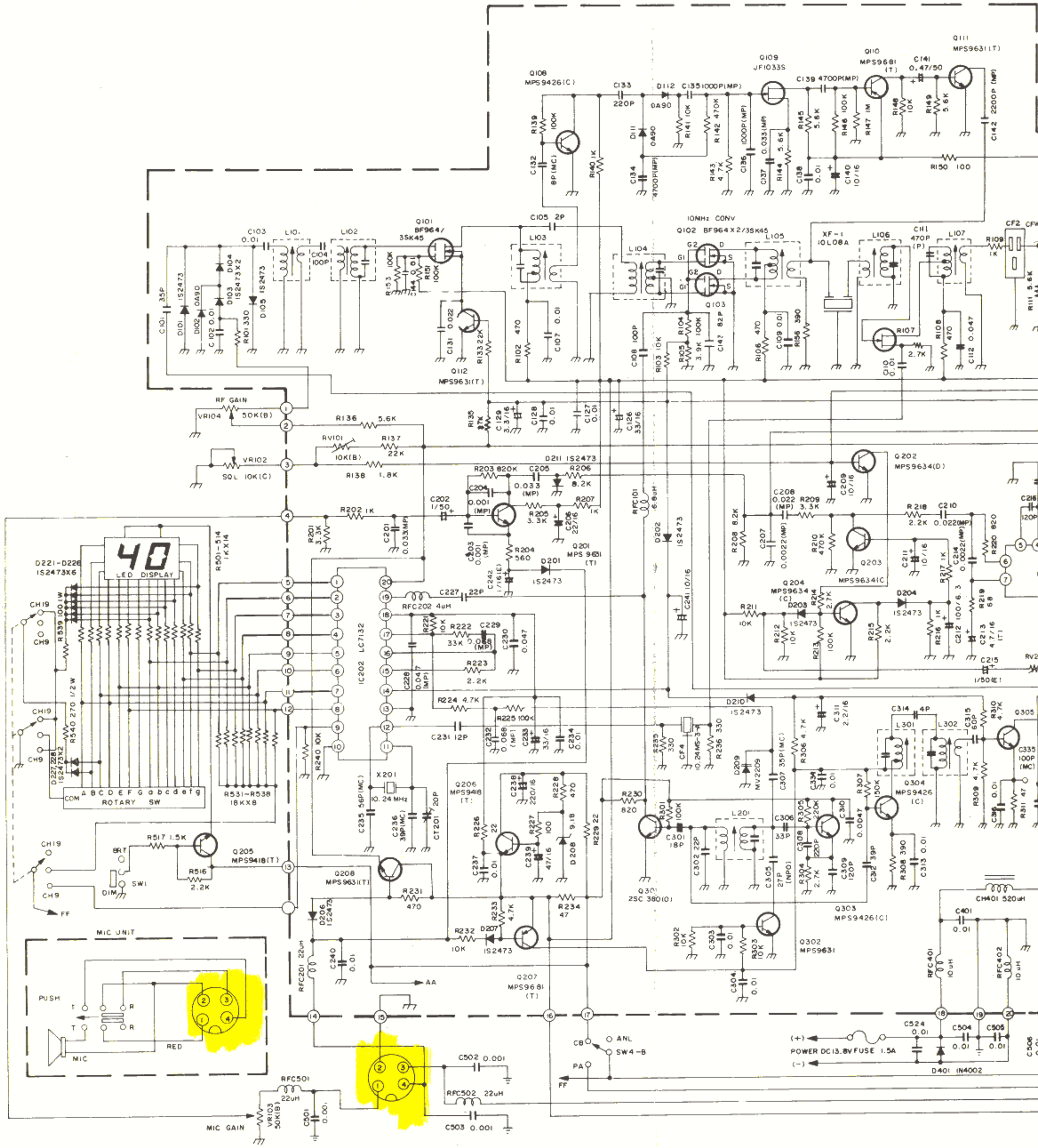
REF. NO.	DESCRIPTION	PART NO.
	ELECTROLYTIC CAPACITORS	
C141	0.47UF 50WV	00-132575
C242	1.0UF 16WV	00-132035
C202,215, 602	1.0UF50WV	00-132805
C140,209, 211,241	10UF 16WV	00-132115
C212	100UF 6.3WV	00-132160
C225,601	100UF 16WV	00-132175
C223,402, 403	1000UF 16WV	19-135005
C121,311	2.2UF 50WV	00-132280
C206	22UF 16WV	00-132300
C238	220UF 16WV	00-132380
C129	3.3UF 50WV	00-132475
C218	33UF 10WV	00-132505
C126,233	33UF 16WV	00-132510
C332,603	4.7UF 16WV	00-132595
C220,239	47UF 16WV	00-132161
	MYLAR CAPACITORS	
C122	0.01UF 50WV	03-002128
C135,136, 203,204	0.001 UF 50WV	03-000210
C219	0.1UF 50WV	03-000200
C142,207, 214	0.0022UF 50WV	03-002083
C123,208, 210	0.022UF 50WV	03-002083
C137,201, 205	0.033UF 50WV	03-002107
C120,134, 139	0.0047UF 50WV	03-000305
C114,117, 228	0.047UF 50WV	03-000300
C124,125	0.0068UF 50WV	03-000360
C222,9,232	0.068UF 50WV	03-000356
	CERAMIC CAPACITORS	
C508,509, 511	0.001UF 50WV	06-000016

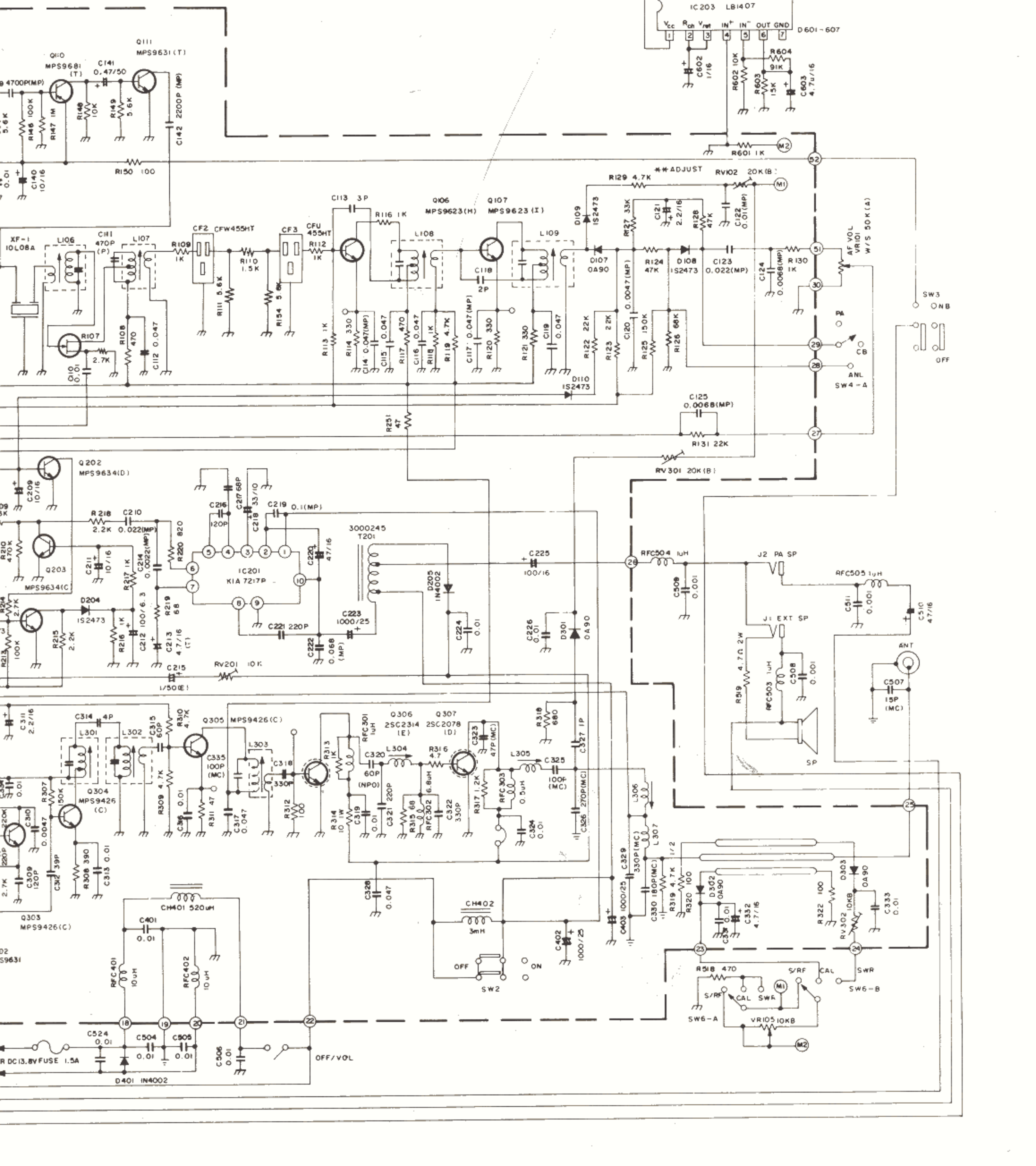
REF. NO.	DESCRIPTION	PART NO.
	CERAMIC CAPACITORS CONT.	
C102,103, 107,109, 110,127,128, 138,144,224, 226,234,237, 240,303,304, 313,316,319, 324,331,333, 334	0.01UF 50WV	06-000042
C131	0.022UF 50WV	06-000706
C310	0.0047UF 50WV	06-000707
C112,115, 116,119,230, 317,328	0.047 50 WV	06-000230
C327	1PF 50WV	06-000055
C104,108	100PF 50WV	06-000060
C231	12PF 50WV	06-000140
C216,309	120PF 50WV	06-000290
C301	18PF 50WV	06-000170
C105,118	2PF 50WV	06-000085
C227,302	22PF 50WV	06-000180
C133,221, 308,321	220PF 50WV	06-000320
C305	27PF 50WV	06-000195
C113	3PF 50WV	06-000090
C306	33PF 50WV	06-000210
C318,322	330PF 50WV	06-000340
C101	35PF 50WV	06-000697
C312	39PF 50WV	06-000433
C314	4PF 50WV	06-000100
C320	60PF 50WV	06-000255
C315	68PF 50WV	06-000265
C217	68PF 50WV	06-000265
C143	82PF 50WV	06-000640
	POLY CAPACITOR	
C111	470PF 50WV	67-138028
	MICA CAPACITORS	
C325,335	100 PF 50WV	03-001206
C330	180PF 50WV	03-001207
C326	270PF 50WV	03-001226

REF. NO.	DESCRIPTION	PART NO.
	MICA CAPACITORS CONT.	
C329	330PF 50WV	03-001256
C307	35PF 50WV	03-001246
C236,323	47PF 50WV	03-001266
C235	56PF 50WV	03-001243
C132	8PF 50WV	03-001244
	TANTALUM CAPACITOR	
C213	4.7UF 16WV	00-132595
	TRIMMER CAPACITOR	
CT-1	20PF	77-135012
	INTEGRATED CIRCUITS	
IC201	KIA7217	02-437217
IC202	LC7132	02-507132
IC203	LB1407	02-131407
	DIODES	
D208	UZ9.1B	05-860910
D209	MV2209	05-472209
D109,202, 210,225, 227	1S2473	80-085002
D101,103, 104,105, 108,110, 201,203, 204,206,207, 211,221,222, 223,224,226, 228	1S2473	80-085002

SCHEMATIC DIAGRAM

77-250




C601 100u/16
AA
R605-611 1K X7
D7 D6 D5 D4 D3 D2 D1
IC203 LB1407
Vcc Rch Vref IN+ IN- OUT GND
D601-607
C602 1/16
R602 10K
R603 15K
R604 91K
C603 4.7u/16
R601 1K
M2
52
**ADJUST
RV102 20K(B)
M1
R129 4.7K
D109 1S2473
R27 33K
C121 2.2/16
R128 47K
C122 0.01(MP)
Q111 MPS9631(T)
Q110 MPS9681 (T)
C141 0.47/50
4700P(MP)
R146 100K
R147 1M
R148 10K
R149 5.6K
C142 2200P (MP)
C140 10/16
R150 100
C113 3P
R116 1K
Q106 MPS9623(H)
Q107 MPS9623(I)
L108
L109
CF2 CFW455HT
CF3
CFU 455HT
R109 1K
R110 1.5K
R112 1K
XF-1 10L08A
L106
L107
C111 470P (P)
R107
2.7K
R108 470
C112 0.047
C101 0.01
R111 5.6K
R154 5.6K
R113 1K
R114 330
C114 0.047(MP)
C115 0.047
R117 470
C116 0.047
R118 1K
R119 4.7K
C117 0.047(MP)
R120 330
C118 2P
R121 330
C119 0.047
D110 1S2473
R122 22K
R123 22K
C120 0.0047(MP)
R125 150K
R126 68K
D107 0A90
R124 47K
D108 1S2473
C123 0.022(MP)
C124 0.0068(MP)
R130 1K
51
AF VOL VR101 W/S 50K(A)
SW3
NB
PA
CB
ANL
OFF
SW4-A
30
29
28
C125 0.0068(MP)
R131 22K
27
RV301 20K(B)
R251 47
Q202 MPS9634(D)
C209 10/16
R218 2.2K
C210 0.022(MP)
R210 470K
Q203
MPS9634(C)
C211 10/16
R217 1K
C214 0.0022(MP)
R220 820
C216 120P
C217 68P
C218 33/10
C219 0.1(MP)
3000245 T201
IC201 KIA7217P
C220 47/16
C221 220P
C222 0.068 (MP)
C223 1000/25
C224 0.01
D205 IN4002
C225 100/16
RFC504 1uH
J2 PA SP
C508 0.001
RFC505 1uH
C511 0.001
C510 47/16
J1 EXT SP
4.7Ω 2W
R219 68
D204 1S2473
R214 2.7K
R215 2.2K
R216 1K
C212 100/6.3
C213 4.7/16
C215 1/50(E)
Rv201 10K
C226 0.01
D301 0A90
ANT
C507 15P (MC)
R213 100K
C311 2.2/16
C314 4P
L301
L302
C315 60P
R310 4.7K
Q305 MPS9426(C)
L303
C318 330P
R313 1K
RFC301 1uH
Q306 2SC2314 (E)
Q307 2SC2078 (D)
C323 47P(MC)
R316 4.7
L304
L305
C320 60P (NPO)
C321 220P
R315 68
6.8uH
RFC302
C322 330P
R317 1.2K
RFC303 0.5uH
C325 100P (MC)
R318 680
C327 1P
C326 270P(MC)
L306
L307
C329 330P(MC)
C330 180P(MC)
R319 4.7K
R320 100
D302 0A90
C331 0.01
C332 4.7/16
R322 100
D303 0A90
C333 0.01
RV302 10KB
C328 0.047
R307 150K
C334 0.01
C310 0.0047
C309 120P
C312 39P
R308 390
C313 0.01
R309 4.7K
C305 0.01
R311 47
C317 0.047
R312 100
R314 10 1W
C319 0.01
C321 220P
Q304 MPS9426 (C)
Q303 MPS9426(C)
CH401 520uH
C401 0.01
RFC401 10uH
RFC402 10uH
CH402 3mH
C402 1000/25
C403 1000/25
OFF
ON
SW2
R518 470
S/RF
CAL
SW6
M1
SWR
SW6-A
SW6-B
VR105 10KB
M2
C524 0.01
C504 0.01
C505 0.01
C506 0.01
D401 IN4002
OFF/VOL
R DC13.8V FUSE 1.5A
18
19
20
21
22
23
24
25
26

EXPLODED MECHANICAL VIEW