MIDLAND®

7001
FCC DATA: 79-007

SSB/AM 40-CHANNEL MOBILE TRANSCEIVER

MANUAL NO. **79-007000**
DATE: **APRIL 27, 1979**

Midland 7001 Mobile CB Transceiver: Technical Specifications.

General Construction.

1. Three-pin polarized jack for DC power.
2. Four-pin screw connector for microphone.
3. No mechanical relays. All switching is solid state using diodes and transistors for high reliability.
4. Transmitter output stage is protected from mismatch, no-load or short-circuit conditions.
5. Input power is suitably filtered and bypassed to deter alternator "whine" on transmit or receive.

Electrical Specifications.

General:

Voltage ..... 13.8 V. Positive/Negative Ground Operating Range 10 V to 16 V
Frequency Stability ... ± 005%
Temperature Range ... -30° to +50°C (Per FCC Part 15)
Humidity 5-90%
Vibration ..... EIA Standard RS-424
Shock ..... EIA Standard RS-424

Receiver (AM):

Sensitivity
Less than 0.7 uv for 10 dB SN+N to N
Automatic Gain Control Figure of Merit
80 dB
Audio Squelch Sensitivity
Threshold: Less than 10 dB SN+N to N
Tight: 100 uv minimum, 500 uv maximum
Adjacent Channel Selectivity and Desensitization
60 dB (Two-generator method)
Spurious Response Attenuation
60 dB (excluding image at 50 dB)
Audio Power Output
3 W @ 10% distortion (load impedance 8 ohms resistive)
Audio Frequency Response (1 KHz, 0 dB reference)
300 Hz @ -6 dB
1000 Hz @ 0 dB
3000 Hz @ -6 dB
Hum and Noise: Squelched
-45 dB
Noise Limiting
Provided with Switchable ANL
S Meter Sensitivity at "S-9"
100 uv
RF Gain Range
30 dB
Antenna Input Impedance
50 ohms, unbalanced

Transmitter (AM):

Carrier Power, No Modulation
4 W maximum, 3.6 minimum
Conducted Spurious Emissions
-65 dB
Radiated Spurious Emissions
(Complies with FCC Part 95)
Audio Frequency Harmonic Distortion
10% maximum @ 80%
Audio Frequency Response (1 KHz, 0 dB reference)
300 Hz @ -6 dB
1000 Hz @ 0 dB
3000 Hz @ -6 dB
6 dB/octave falling above 3000 Hz
Hum and Noise
-40 dB
Output Impedance
50 ohms, unbalanced
Output Protection
Withstands for 5 minutes all VSWR around Smith Chart at 20:1 without damage or failure.
Output Stability
Does not exceed FCC Limits For Spurious Emissions when operated into a mismatch load with 5:1 VSWR at any point on the Smith Chart.

Controls: Off/AF gain control. Squelch control. RF gain control. Microphone Gain control. CB/PA switch. Hi/Lo Tone switch. ANL-Off switch. S/RF/PWR Meter. Green color Numerical LED Channel indicator. Rotary Analog-Numeral Channel selector.

Jacks and Connections: 4-pin/screw-type Microphone Connector. 50-ohm antenna. 8-ohm external speaker. PA speaker.

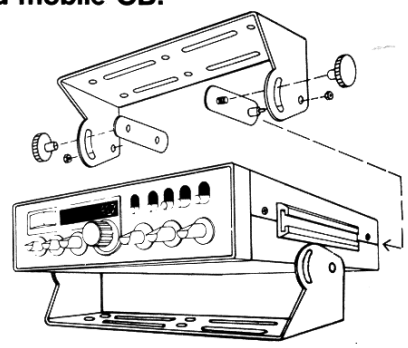
Accessories Included: 500-ohm push-to-talk microphone with coil cord and screw-on, 4-pin connector. Microphone clip. Mounting bracket and hardware. Owners manual. FCC forms 505, 555-B, Part 95.

MIDLAND®

Distribution and Service Center
1690 North Topping Street
Kansas City, Missouri 64120
Telephone: (913) 384-4200

Midland 7001 Mobile CB Operating Controls.

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. "Take-it-with-you" adjustable mounting bracket system.
2. Microphone bracket system.
3. All main-unit and microphone mounting hardware needed for normal installation.
4. DC power cord with plug.
5. Plug-in microphone with coil cord.
6. FCC Form 505.
7. FCC Part 95, Subpart D.
8. FCC Form 555-B.
9. Owner's Manual.
10. Customer Registration Card.

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.

The transceiver is designed with most-often-used controls nearest the driver. Still, make sure other controls are easily reached.

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 to not 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.

Mechanical mounting.

Step 1: Heeding the preceding caution, use the mounting bracket as a template for marking the location of screwholes under your dash. Use an awl, nail or other 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 caution should be exercised when drilling into dash to avoid damage to under-dash electronic ignition, cruise control, instrument and/or accessory wiring.

Step 3: Attach removable 3-pin, plug-in DC cord to 3-pin polarized DC jack on the rear of the transceiver.

Step 4: 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.

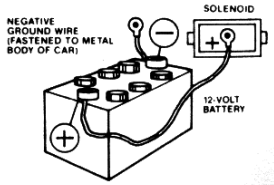
(Usually, the fuse block is the most convenient connecting point. It is also possible to connect to the Accessory terminal on the fuse block or ignition switch, so that your CB automatically goes off when the ignition goes off, preventing accidental battery drainage.)

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

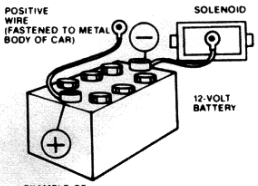
With a **positive ground,** reverse the wires, connecting the red/fuse-holder wire to the frame, the black wire to your DC power source. A light or meter can be a good aid in locating a suitable power source and ground.

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

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



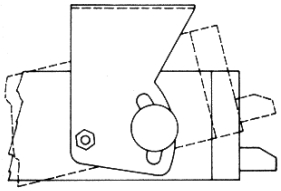
EXAMPLE OF POS. GROUND 12-V DC CAR BATT. CONNECTION ILLUSTRATION. FEW 18-WHEELERS & OLDER CARS

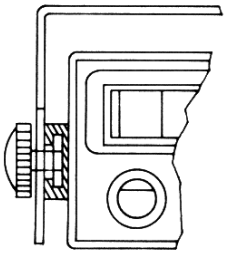
Mounting the main unit.

Step 1: Loosen the retaining knobs on each side of the mounting bracket to give enough space for the unit to slide between the two bracket arms.

Step 2: Position the main unit between the bracket arms in line with the retaining knobs. Set the height and angle for optimum operating comfort and accessibility.

Step 3: Tighten the retaining 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.

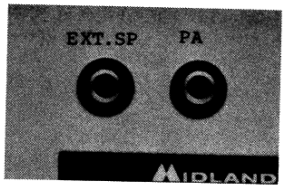
Locate the "EXT" jack on the main unit rear panel. Firmly insert and seat the speaker wire plug into the jack.

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

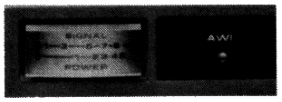
Connecting optional Public Address speaker.

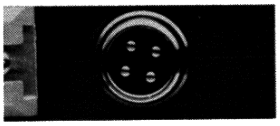
Locate the "PA" jack on the main unit back panel. Firmly insert and seat the speaker wire plug into the jack.

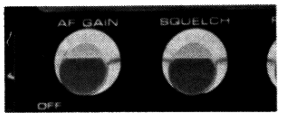
Directions for mounting the optional Public Address speaker are included, along with mounting hardware, with the speaker.

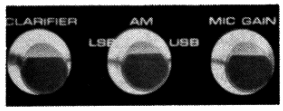


Operating controls, connectors: Their functions and uses.









Starting at the upper left (driver's side) of your Midland 7001 and moving counter-clockwise:

S/RF Power Meter. This new high-visibility, black-on-light green meter is used two ways. (1) When receiving, it gives the relative strength of incoming signals. (2) When transmitting, it shows RF (Radio Frequency) power output.

4-pin/screw-type Microphone Connector. Securely links your microphone to the main unit during use, yet allows quick disconnection when out of service.

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.

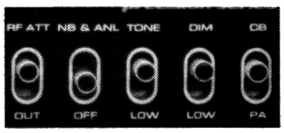
LED Digital Channel Display. Illuminated in easy-to-read green, it displays the channel selected by use of the analog-numbered dial just below.

RF (Radio Frequency) Gain Control. Controls the reception sensitivity (range) of your CB. To decrease RF gain — to reduce interference, for example, in congested urban areas — turn the knob counter-clockwise; to increase turn clockwise. The RF Gain Control affects reception only. It will not affect transmitter output power.

Clarifier Control. "Fine-tunes" signals received on either the upper or lower sideband.

LSB-AM-USB Mode Selector Switch. Selects the mode of transmission and reception. Either the upper sideband or lower sideband of a channel can be selected, or conventional AM operation.

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.



CB/PA Switch. 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. The CB/PA switch changes your CB speaker system from a CB function, using the internal main-unit speaker, or optional external speaker, to a Public Address function.

Dimmer Switch. Dims or brightens lighted controls for more comfortable day or night visibility.

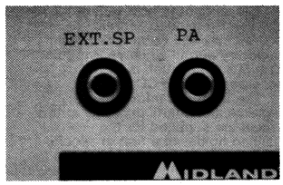
Tone Switch. Controls the tonal quality of received signals in accordance with the user's preference.

NB/ANL Switch. Set in the NB (Noise Blanker) position, it reduces electrical impulse noises, such as those caused by engine ignition systems. In the ANL (Automatic Noise Limiter) position, it reduces atmospheric noise and other electrical interference.

RF Attenuation Switch. Reduces the incoming signal strength before reaching the sensitive receiver circuits. Use the "on" position to improve receiver cross-modulation and blocking performance in strong signal metropolitan and urban areas.

Dual red/green TX/RX Indicator. When red, it indicates the unit is transmitting and acts as a warning when the microphone push-to-talk bar is accidentally keyed. When green, it indicates your transceiver is in the "receive" mode.

AWI (Antenna Warning Indicator). Alerts you to trouble in your antenna system that could damage your transceiver. When the AWI light comes on, you should stop transmitting immediately.



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.

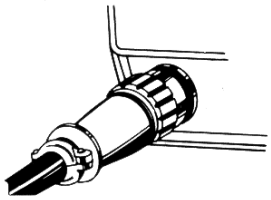
PA Jack. An optional PA speaker may be attached to your transceiver through the PA output jack on the back panel. This allows you to communicate with pedestrians or other vehicles through your CB microphone.

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

Midland 7001: Operating Instructions.

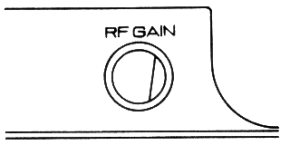
Having properly installed and wired your CB and antenna, you are now ready for the eight steps designed to get you into effective, satisfactory operation:

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



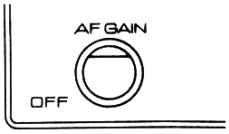
Step 2: Make sure your antenna is securely connected to the antenna connector.

Step 3: Make sure the Squelch Control is in the 9:00 position.

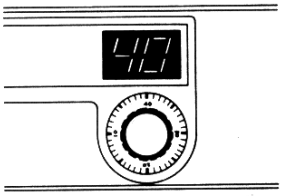


Step 4: Make sure the RF Gain Control is fully clockwise.

Step 5: Select the desired mode of operation, USB, AM or LSB, using the selector switch.



Step 6: Turn the power on and adjust the Audio Frequency (AF) Gain Control for a satisfactory sound level.



Step 7: Select your desired channel by turning the Channel Selector dial below the LED digital indicator.

Step 8: To transmit, press the push-to-talk bar on the microphone. To receive, release the bar.

Antennas: How to select, position, install and tune the right one for you.

Basically, you have two types of mobile CB antennas — full-length whip and loaded whip — and a variety of types of mounts (depending on where you locate your antenna) to choose from.

Midland markets a broad line of high-performance antennas. The dealer who sold you your Midland CB can advise which type is best for you.

Where you locate your antenna does make a difference.

Some general rules for antenna location that can aid CB performance:

1. Put your mount as high on the vehicle as possible.
2. The higher the proportion of antenna length that is above the roof, the better.
3. If possible, mount the antenna in the center of whatever surface you choose.
4. Keep antenna cables away from noise sources, such as ignition system, gauges, etc.
5. Make sure you have a solid metal-to-metal ground.
6. Exercise care to prevent cable damage.

Essentially, you have five location choices: the roof, gutter, rear deck, front cowl or rear bumper.

Where you decide to locate your antenna will determine the type of antenna you install. Again, consult your Midland CB Dealer for advice and guidance, and measure your needs against the attributes of the various Midland antenna models he carries.

Antenna installation.

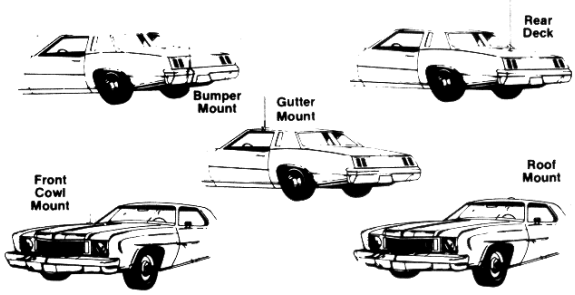
Follow the manufacturer's installation instructions carefully.

Warning: Never operate your CB radio without attaching an antenna or with a broken antenna cable. This can result in damage to transmitter circuitry.

Tuning your antenna.

Some antennas are factory tuned. However, performance can usually be improved by slightly lengthening or shortening its length, using a Standing Wave Ratio (SWR) meter. For the exact procedures to be used, refer to the antenna manufacturer's installation manual.

You can buy an SWR meter separately or have your antenna checked by your Midland CB Dealer's service department.



FCC requirements for CB users.

Your new Midland Mobile CB is a combination receiver/transmitter (transceiver) designed and built for licensed Class D operation on any of the 40 frequencies designated for citizens band use by the Federal Communications Commission.

You are required to have or have ordered a current copy of Part 95, Subpart D, of the FCC rules and regulations (a current copy as of the date of manufacture is included with your new CB) prior to operation of this unit.

You are also required to complete FCC Form 505 (also included with your CB) and submit it to the **FCC, Gettysburg, PA 17326** in order to obtain your license to operate this unit.

(Disregard the above paragraph if you have a current CB license less than 5 years old.)

FCC regulations will be violated if you transmit with this unit without complying with procedures explained on FCC temporary license, Form 555-B, which is included as well.

You may use Form 555-B as a temporary permit while your regular Form 505 application is being processed by the FCC.

The technical information, diagrams and charts provided in this manual are supplied for the use of a qualified holder of a first or second class radio-telephone license. It is the user's responsibility to see that this unit is operating at all times in accordance with FCC Citizens Band Radio Service regulations.

If you install your own transceiver, do not attempt to make any transmitter or receiver tuning adjustments. These adjustments are prohibited by the FCC unless you hold a first or second class radio-telephone license. A Citizens Band or Amateur license is not sufficient.

When service is performed by an authorized and licensed person, care must be taken that only authorized replacement parts are used in order to not void the type acceptance or certification of this model.

Midland International Corporation hereby certifies that this unit has been designed, manufactured, FCC type accepted and certified in accordance with Part 95 and Part 15, Subpart C, of the current FCC rules and regulations as of the date of manufacture.

General CB information.

In 1958, The Federal Communications Commission approved the use of 23 channels by duly licensed Citizens Band radio operators. The authorization was expanded to 40 channels in 1977.

A simple, basic means of communication, CB requires no more skill or knowledge than the operation of a standard AM or FM receiver.

Still, there are certain facts, procedures and "rules of the road" you'll need to know in order to make the most of your CB experience.

Make it "short and sweet." When using your CB, get on and off the air as quickly as possible. Never use profanity — which is against the law and subject to heavy penalties. Follow the FCC rules outlined in Part 95.

Use Channel 9 in emergencies only. Emergency channel 9 is designated for this purpose and this purpose alone.

The FCC has given public safety agencies various "call signs" including "0911" numbers, coinciding with the "911" phone numbers these agencies use in telephone communications.

The call signs for state-level agencies use 3 letters and 4 numbers, with the second and third letters being the official Post Office state abbreviation, e.g., "KS" for "Kansas."

Why and how to use the "10 Code." Developed over the years by official agencies in order to save time and provide precise, clear messages, the "10-Code" has become a popular tool for CBers.

The table below lists some of the more common codes and their meanings.

Code	Meaning
10-1	Receiving poorly.
10-2	Receiving well.
10-3	Stop transmitting.
10-4	OK, message received.
10-5	Relay message.
10-6	Busy, stand by.
10-7	Out of service; leaving the air.
10-8	In service, subject to call.
10-9	Repeat message.
10-10	Transmission completed, standing by.
10-11	Talking too fast.
10-12	Visitors present.
10-13	Advise weather/road conditions.
10-16	Make pickup at.
10-17	Urgent business.
10-18	Anything for us?
10-19	Nothing for you, return to base.
10-20	My location is.
10-21	Call by telephone.
10-22	Report in person to.
10-23	Stand by.
10-24	Completed last assignment.
10-25	Can you contact?
10-26	Disregard last information.
10-27	I am moving to Channel.
10-28	Identify your station.
10-29	Time is up for contact.
10-30	Does not conform to FCC rules.
10-32	I will give you a radio check.
10-33	Emergency traffic.
10-34	Trouble at this station.
10-35	Confidential information.
10-36	Correct time is.
10-37	Wrecker needed at.
10-38	Ambulance needed at.
10-39	Your message delivered.
10-41	Please turn to Channel.
10-42	Traffic accident at.
10-43	Traffic tie-up at.
10-44	I have a message for you.
10-45	All units within range report.
10-50	Break channel.
10-60	What is next message number?
10-62	Unable to copy; use phone.
10-63	Network directed to.
10-64	Network clear.
10-65	Awaiting your next message/ assignment.
10-67	All units comply.
10-70	Fire at.
10-71	Proceed with transmission in sequence.
10-77	Negative contact.
10-81	Reserve hotel room at.
10-82	Reserve room for.
10-84	My telephone number is.
10-85	My address is.
10-91	Talk closer to mike.
10-93	Check my frequency on this channel.
10-94	Please give me a long count.
10-99	Mission completed; all units secure.
10-200	Police needed at.

Musts and mustn'ts of CB usage.

You must identify your official licensed call sign at the finish of every conversation.

You mustn't carry on a conversation with another station for more than 5 minutes at a time without taking a 1-minute break, to give others use of the channel.

You mustn't blast others off the air by overpowering them with illegal transmitter power or illegally high antennas.

You mustn't use CB to promote illegal activities.

You mustn't use profanity.

You mustn't play music on your CB.

You mustn't use your CB to sell merchandise or commercial services.

Factors affecting effective CB range.

Essentially, they're the same influences that optimize or limit AM, FM and other kinds of performance in moving vehicles:

Terrain: Hills and valleys naturally interrupt and shorten CB signals.

Weather. You can expect that CB range will be reduced — perhaps drastically — in times of atmospheric disturbance, such as in a thunderstorm or heavy snow. Sunspots, too, are known to adversely affect CB performance.

Obstructions. Inside a tunnel, covered parking garage or viaduct, CB transmitting/receiving capability may be cut off altogether.

In short, you can expect to maintain maximum transmitting/ receiving performance in flat, open country in stable (not necessarily clear) weather conditions.

Should effective range be limited in these conditions, check to see that your CB is connected properly and your antenna adjusted correctly. It may be necessary to consult your Midland CB Dealer's service department.

What causes noise?

If you have an abnormal noise problem, the chances are your vehicle itself is the cause.

A CB receiver is a very sensitive instrument, able to pick up small noise signals and amplify them — particularly if the source of these signals is within a few feet of your CB.

Any noise that comes from your CB almost certainly comes from outside the unit itself. Devices have been designed into your Midland CB (a noise blanker or an automatic noise limiter, for example) to minimize this kind of distraction.

Trouble-shooting aids.

Frequently, there are simple, quick actions you can take to eliminate or minimize such problems as interference and noise.

Noise suppression.

A very common source of excessive noise is the ignition system of a CB owner's vehicle. If you suspect this is true, simply turn off the ignition and set the key in the accessories (ACC) position.

This way you'll provide power to the transceiver, minus any ignition interference that might exist. If the noise goes away, you know instantly that the ignition system is the culprit.

Still, there are a number of places in the ignition system where noise can originate.

Sparkplugs and sparkplug wires are probably the worst noise producers. To eliminate this kind of noise, you can take any of four simple measures: (1) Install resistive sparkplug suppressors, (2) resistor sparkplugs or (3) resistance-wire cabling, between plugs and the distributor and also between the distributor and ignition coil. (4) Replace old plugs and sparkplug wiring and properly tune the engine. This generally cures most noise.

Many cars come suppressor-cable equipped. If yours didn't (consult your vehicle owners manual or dealer service department to be sure), you can get it at any auto supply store and, given a moderate amount of mechanical skill, install it yourself.

Caution: Do not undertake any ignition-system repairs or modifications without either professional help or some automotive service experience.

Generator-brush sparking can create an annoying "whine." It's caused by a dirty commutator, and is eliminated by polishing its surface with fine-grade emery cloth, and cleaning grooves with a small, sharp tool.

Voltage regulators can cause a "hashy" sound in your CB when relay contacts jitter open and closed when the battery is fully charged. To eliminate this noise, mount coaxial feedthrough capacitors at the battery and armature terminals on the regulator box.

Alternator slip rings should also be kept clean and good brush contact maintained to minimize CB noise.

In addition, single-contact alternator regulator boxes need a coaxial capacitor at the ignition terminal. Double-contact units should have a second capacitor at the battery terminal. Shielding between the regulator and alternator may be needed as well. Be sure to ground the shield at both ends.

Infrequent, though real, noise generators like your car's heater fan, turn signals, electric windows and windshield-wiper motors can also be silenced with a coaxial capacitor (consult your serviceman).

Wheels and tires can also cause CB noise. Wheel noise is eliminated by putting static-collector springs between the wheel spindle bolt and grease retainer cup. Tire static can be quieted with antistatic powder applied inside each wheel.

Antenna corona-discharge noise — most frequently occurring with sharp-pointed "whip" models — can happen just before or during electrical storms. The only cure is for the storm to blow over or pass.

Frequency-channel number chart.

Frequency	Channel
26.965 MHz	1
26.975 MHz	2
26.985 MHz	3
27.005 MHz	4
27.015 MHz	5
27.025 MHz	6
27.035 MHz	7
27.055 MHz	8
27.065 MHz	9
27.075 MHz	10
27.085 MHz	11
27.105 MHz	12
27.115 MHz	13
27.125 MHz	14
27.135 MHz	15
27.155 MHz	16
27.165 MHz	17
27.175 MHz	18
27.185 MHz	19
27.205 MHz	20
27.215 MHz	21
27.225 MHz	22
27.255 MHz	23
27.235 MHz	24
27.245 MHz	25
27.265 MHz	26
27.275 MHz	27
27.285 MHz	28
27.295 MHz	29
27.305 MHz	30
27.315 MHz	31
27.325 MHz	32
27.335 MHz	33
27.345 MHz	34
27.355 MHz	35
27.365 MHz	36
27.375 MHz	37
27.385 MHz	38
27.395 MHz	39
27.405 MHz	40

OPERATION THEORY OF PLL FREQUENCY SYNTHESIZING AM/SSB CB TRANCEIVER

1. PLL CIRCUIT

1. Fundamental Theory of PLL Circuitry

The word PLL is an abbreviation of the "Pnase Locked Loop" in which a given signal is processed to track the frequency and phase of a reference signal. In other words, the PLL is of an automatic frequency control loop or automatic phase control. The PLL circuitry consists of the three main units in simple form as shown in Figure 1.

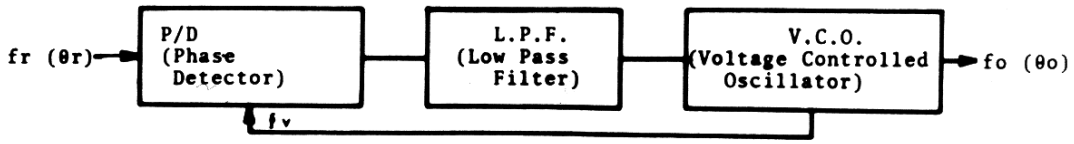


Fig. 1 Fundamental Block Diagram of PLL Circuitry

Fig. 1 Fundamental Block Diagram of PLL Circuit

In the above block diagram when the reference frequency fr and the VCO output frequency fv are applied to the Phase Detector P/D, the fv is compared with fr in terms of phase lag and lead. Then the resulting output (phase difference) is converted into DC output voltage corresponding to the phase difference. Since the pnase comparation is made at every cycle and it may contain noise, the DC output is fed to the low pass filter (LPF) and integrated or filtered to continuous DC voltage in proportion to the pnase difference. The frequency of the voltage controlled oscillator (VCO) is controlled by the LPF output voltage. Thus controlled VCO output is then split in two: one is used as an operating frequency of the unit and another is returned to the P/D to make a closed loop. The closed loop will continue to operate until the following condition is met:

$$\theta r(t) = \theta o(t)$$

This condition is called locked.

Employing the PLL system into a CB tranceiver requires some modifications so that the VCO generates a specific frequency corresponding to each channel frequency (26.965MHz-27.405MHz) in relation to a channel selection.

2. Operation Theory of Actual PLL Circuit

The actual frequency synthesizing circuit of the tranceiver includes two standard crystal oscillators. The first oscillator (OSC 1) consists of a crystal X1 and IC1 and is oscillating at a frequency of 10.240MHz during all modes of operation. The 10.240MHz frequency is divided in two frequencies by tne divider provided inside the IC1. The two frequencies are 5.120MHz and 5KHz.

(a) The 5.120MHz is tnen tripled through a tripler circuit and the tripled output (15.36MHz) is applied to the IC2 mixer.

(b) The 5KHz signal is applied to the phase detector (P/D) inside the IC1 and used as tne reference signal.

The second oscillator consisting of crystal X2 and transistor Q3 is designed to oscillate at 10.46675MHz during AM mode of operation (10.46800 MHz during USB and 10.46550MHz during LSB). The Q3 oscillator is oscillated at USB frequency of 10.46800MHz, but when the mode switch is placed in the LSB position, the LSB shift switch transistor Q4 is turned on, thereby connecting the shift capacitors, (C22 & CT3) to the crystal X2 and shifting the frequency to 10.46550MHz. When the mode switch is placed in the AM position, the AM shift switch Q5 operates and connects CT2 to the crystal. In this way 10.4655MHz and 10.46675MHz frequencies are generated for LSB and AM mode of operation respectively. Thus produced oscillator 2 frequency is fed to the doubler circuit (T1) and the doubled output (20.9335MHz for AM, 20.9360MHz for USB and 20.9310MHz for LSB) is applied to the IC3 mixer.

On the other hand, the voltage controlled oscillator (VCO) consisting of the VCO OSC block and VCO inside IC3 is designed to be controlled by the DC voltage provided by the phase detector of IC1 and is oscillated at 16.725MHz when channel 1 is selected (17.165MHz for channel 40). The VCO output frequency is fed to the IC3 mixer and mixed with the doubler output (T1) frequency. The resultant output is 37.6585MHz for AM channel 1, 37.661MHz for USB channel 1 & 37.656MHz for LSB channel 1. This output frequency is used as a 37MHz 1st local oscillator frequency to gererate transmit or receive IF frequencies.

A part of the VCO output (16.725MHz for CH1-- 17.165MHz for CH40) is fed to the IC2 mixer (pin4) and mixed with the 15.360MHz signal fed from the tripler network (C21, L1). The resultant difference output is 1.365MHz (for CH1) and this is fed to the programmable divider of IC3, which is preset to divide its input into 5KHz frequency by the channel selector. Then, the divided 5KHz signal is fed to the phase detector and compared with the phase of another 5KHz reference signal sent from the fixed divider of IC1. The phase detector develpoes a DC error signal corresponding to the phase difference between the two signals. This DC error signal is then fed to the VCO OSC block through an active low pass filter (IC1,R2,R3,C3)and controls the VCO frequency until the VCO frequency (more accurately the VCO frequency divided by programmable divider) exactly coincides with the 5KHz reference signal. Once the phase lock is established, the VCO output frequency is stabilized in the same order as that of crystal-controlled oscillator.

AM/SSB TRANSMITTER

SSB Transmission

During transmit mode of operation, the third crystal oscillator consisting of crystal X3 and transistor Q6 is powered and oscillates at a frequency of 10.6935MHz for AM, 10.696MHz for USB and 10.6910MHz for the LSB mode of operation. Actually, the Q6 is being oscillated at USB frequency of 10.696MHz, but when the mode switch is placed in the LSB position, the base shift switch transistor Q7 is biased and the shift network consisting of CT6 and C33 is grounded (connected to crystal X3), resulting in decreasing oscillating frequency to 10.6910 Hz. In the similar way, when the mode switch is placed in the AM position, the transistor Q8 is turned on and connects the CT5 to the crystal, thus decreasing the oscillating frequency to 10.6935MHz. Thus generated oscillator frequency is fed to the Balanced Modulator IC5 (pin3). The balanced modulator is designed to produce a carrier suppressed double side band (DSB) signal when an audio signal amplified with the MIC amplifier IC7 is applied to the pin 1 of IC5.

Thus produced DSB signal is fed to the narrow band crystal filter CF through R109, C132, & D24 to separate a desired side band (USB or LSB). The selected side band signal is applied to the IC4 and the amplified output is finally fed to the balanced mixer consisting of Q9 and Q10 through a coupling capacitor C44 and T4. Since 37.661MHz first local frequency is being applied to this mixer through T2, T3 and C43 (in case of CH1 USB mode of operation), the side band signal (10.696MHz in case of CH1 USB mode of operation) is mixed with the 37.661MHz signal, thus resulting in transmit frequency of 26.965MHz (CH1). The transmit SSB signal is then fed to the linear amplifiers: balanced pre-amplifier (Q11 and Q12), driver Q13 and final RF power amplifier Q14. The amplified output is applied to the antenna connector through a low pass filter (L14, L15, L16 etc.) and an antenna warning circuit provided on a separate printed circuit board. The low pass filter serves to pass the 27MHz signal but attenuates undesirable higher frequency signals. It also serves to match the impedance to the RF power amplifier output circuit.

2. AM Transmission

Since the balanced modulator IC5 is designed to suppress carrier frequency, no carrier signal is obtained if the 10.6935MHz signal for AM is applied to its input circuit (pin 3). However if modulator balance is upset by adding an external circuit, the carrier can be generated. This operation is performed by the transistor Q27. When the mode switch is placed in the AM position, the base of Q27 is biased and Q27 is turned on, making the balanced modulator unbalanced, and develops a carrier signal. Thus produced 10.6935MHz carrier signal is led to the TX mixer (Q9 and Q10) in the same way as stated in the SSB transmission above, and mixed with the first local frequency (37.6585MHz for CH1) being applied from the PLL section. The resultant frequency is 26.965MHz (CH1) transmit signal. The signal is then fed to the RF amplifiers consisting of Q11, Q12, Q13, and Q14, and the amplified output is applied to the antenna connector in the same way as shown in "SSB Transmission".

Q28 is a switching transistor which is biased during AM TX mode of operation, thereby increasing AM carrier level of the IC5.

During AM TX mode of operation, the microphone signal is applied to the pin 6 of MIC amplifier IC7 through the MIC gain control R501 and C136, --C140, and the amplified output is fed to pin 1 of AF amp: IC8 through C143--RV9--R139. Thus amplified audio output is then applied to each collector of Q13 and Q14 through a matching transformer T13 and a diode D47, thereby modulating the 27MHz transmit carrier signal up to 100%.

Q34 and Q35 are switching transistors. During AM transmit mode of operation, the base of Q35 is biased and Q35 is turned on and this makes Q34 turn off, then the input circuit of IC8 is released. On the other hand the Q35 is turned off during SSB transmit mode and Q34 is turned on, thus the input circuit of IC8 is grounded through C186 and emitter-collector junction of Q34, because the IC8 is non-functional during SSB transmit operation. In the similar way the transistor switch Q33 is turned on during SSB transmit operation and connects the input circuit of AF pre-amplifier Q32 to ground silencing the AF amplifier.

A portion of the MIC amplifier output is fed to the ALC amplifier Q31 and its output is rectified by diodes D42 and D43, the resultant DC output voltage is applied to the gate of ALC FET Q30, thus controlling the

input signal level to the microphone amplifier to prevent over modulation.

3. AM/SSB RECEIVER CIRCUIT

When an incoming signal is applied to the antenna it is fed to the RF amplifier Q8 through a coupling capacitor C79 and T8 and amplified. The amplified signal is fed to the mixer (Q19 and Q20) through a tuned circuit T9 and mixed with the first local oscillator frequency being applied to the bases of the mixer from the PLL section through a coupling capacitor C85. The resultant IF signal (10.69MHz band) is applied to the crystal filter, IF amplifier IC4 and Q24. The amplified IF output is split in two: (a) one is applied to the AM detector diode D33 and (b) another is fed to the SSB detector of Q29 (where 10.696MHz for USB or 10.691MHz for LSB signal is being applied from OSC 3 to detect audible signal from the SSB signal). Each detected audio signal is fed to the pre-amplifier Q32, then to the power amplifier IC8 to drive the speaker.

Transistors Q17 and Q39 comprise a switching circuit which makes the input circuit of RF amplifier short-circuit to ground, thus protecting the RF amplifier from breakdown during transmit. Diodes D17 and D18 in the input circuit are provided to prevent signal overload distortion during receive operation.

Squelch Circuit

When the receiver receives a weak or no signal, the AGC voltage applied to pin 1 of IC6 decreases, this increases the output voltage of IC6 and makes Q26 turn on. Since the collector of Q26 is connected to the audio detector output/volume control, the audio signal is passed to ground, thus muting the audio signal. With a proper strength of signal input received, Q26 is cut off and the audio signal is fed to the audio amplifier.

AGC Circuit

A portion of the IF signal is sampled from IF amplifier Q24 to obtain AGC voltage. The sampled IF signal is applied to diode D27 through C104 and the rectified output is fed to the AGC amplifier Q25 and a DC switch Q41 provided to improve AGC attack time. The amplified DC output is split in two: one is applied to the base of RF amplifier through RF gain control and the other if fed to the IF amplifier through R82 and to the squelch control IC6 through R83.

Noise Blanker

Undesirable noise such as ignition or any other impluse noises are mixed with incoming signals received. They are picked up at the mixer output and amplified by the noise amplifier Q21. The amplified outputs are rectified by D20 and D21, and the rectified outputs are further fed to the noise amplifier Q22. The final noise outputs are then fed to the switching transistor Q23 and Q23 turns on. Since the Q23 is connected to the secondary coil of T10, the mixer output is short-circuited to the ground and no mixer output is transferred to the next stage during reception of impulse noises, thus blanking out the undesirable noises.

Clarifier

Receiver clarifying is performed by varying the 1st local oscillator frequency. In actual circuit, the OSC 2 (Q3) frequency is varied by changing the DC voltage applied to the varicap diode D4 connected to the oscillator.

4. POWER SUPPLY CIRCUIT

The power supply circuit consists of three types:
(a) Transmit power supply circuit controlled by the transistor Q38.
(b) Receive power supply circuit controlled by transistor Q37.
(c) Regulated power supply circuit for biasing critical circuits Q36.

ALIGNMENT PROCEDURES FOR AM/SSB TRANCEIVER

1. MEASUREMENT CONDITION

(1) Test Voltage :DC 13.8V + 1%, unless otherwise specified

2. TEST EQUIPMENT

All test equipment should be properly calibrated.

(1) Oscillator, Sine Wave 500 Hz/2.4 kHz, Output Impedance 600 ohm unbalanced.
(2) V.T.V.M., 1 mVrms - Vrms measurable, or higher.
(3) Regulated Power Supply, DC 0 - 17 V, 3A or higher.
(4) Frequency Counter, 0 - 30 MHz High Input Impedance Type.
(5) RF V.T.V.M., Probe Type
(6) Oscilloscope, 30 MHz High Input Impedance.
(7) RF Watt Meter, Thermo-couple Type, 50 Ohm, 5W/15W.
(8) Spectrum Analyzer, Band Width, Nearby Spurious, Measurable.
(9) Standard Signal Generator, 100 kHz - 50 MHz, -10 dB - 100dB 50 ohm unbalanced.
(10) Dummy Resistive Load, 8 ohms + 2%, 5W
(11) Circuit Tester, DC 20k ohm/V, High Input Impedance Type.
(12) Pulse Generator, Repeat Frequency 10 - 500 Hz Variable Impedance 50 ohm unbalanced.

3. PLL CIRCUIT ALIGNMENT

3.1 Setting

Set the power supply voltage to 13.8V DC.
Couple the high input impedance probe to the frequency counter.
Place the channel selector to any channel position.
Place the CB-PA switch in the CB position.
NOTE: This alignment should be performed with a frequency counter having high sensitivity and high input impedance.

3.2 10.240MHz Frequency

Set the tranceiver into the transmit or receive mode.
Couple the frequency counter probe to the test point TP1, and adjust the trimmer capacitor CT7 to obtain a frequency reading of :

10.24000MHz + 50Hz

3.3 10.691MHz Frequency

(1) Set the tranceiver in the receive or transmit mode with the mode switch in USB position. Couple the frequency counter probe to the test point TP4, and adjust CT4 to obtain the frequency reading of:

10.696MHz + 50Hz

(2) Set the tranceiver in the transmit mode with the mode switch in AM position. Couple the counter probe to TP4 and adjust CT5 to obtain the reading of:

10.6935MHz + 50Hz

(3) Set the tranceiver in the receive or transmit mode with the mode switch in LSB position. Couple the counter probe to TP4, and adjust CT6 to obtain 10.691MHz + 50Hz.

(4) Repeat above steps until no further improvement is obtained.

3.4 10.4667MHz Frequency

(1) Set the tranceiver in the transmit mode with the mode switch in USB position. Couple the frequency counter probe to the test point TP3, and adjust CT1 to obtain frequency reading of:

20.9360MHz + 50Hz

(2) Next, place the mode switch in the AM postiton, and adjust CT2 to obtain the frequency reading of:

20.9335MHz + 50Hz

(3) Place the mode switch in LSB position, and adjust CT3 to obtain the reading of:

20.9310MHz + 50Hz

(4) Repeat above steps until no further improvement is obtained.

(5) Set the tranceiver in the receive mode, and verify the frequency obtained in each above step will vary by more than 1KHz when the clarifier control is adjusted in its fully counter clockwise or clockwise position. Place the clarifier in "12" o'clock position and verify the frequency obtained in each above step is obtained again.

NOTE: *All adjustments described above should be performed in the sequence instructed.
*Frequency adjust-trimmers should be preset at their center position before adjustment.

3.5 VCO Circuit

(1) Set the tranceiver in the transmit or receive mode. Connect a circuit tester (DC 12V range) between the TP2 and ground.

(2) Place the channel selector at CH40 position.

(3) Adjust slug provided on the VCO block to obtain voltage reading of 4.0V + 0.1V.

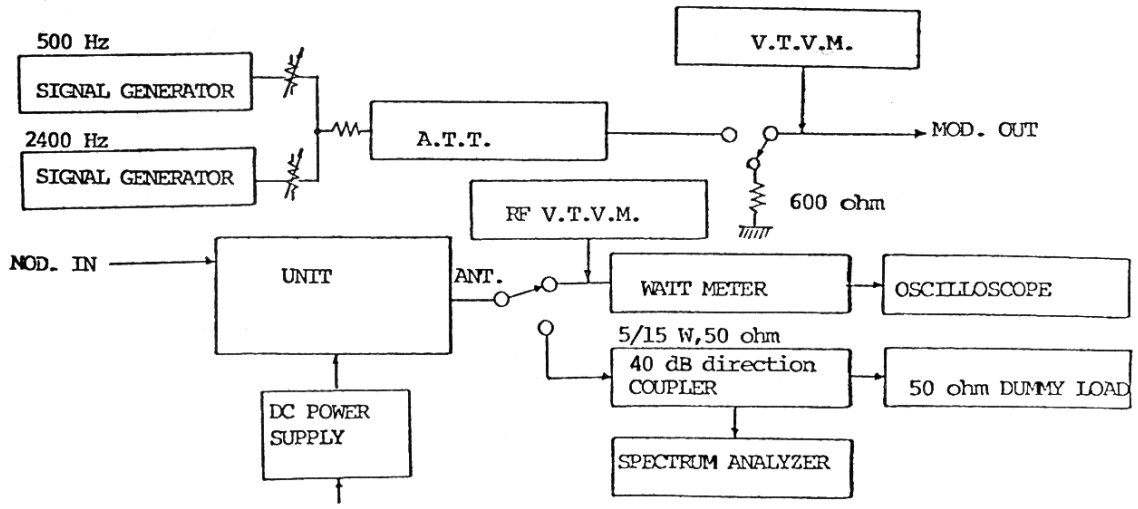
(4) Next, place the channel selector at CH1 position, and verify the voltage reading is within 1.8 - 2.2V.

NOTE: The circuit tester used in this alignment should be calibrated and has input impedance of higher than 20KHz/V.

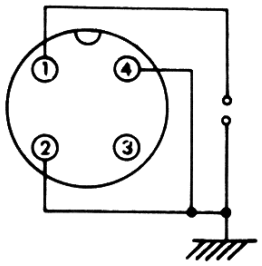
4. ALIGNMENT OF TRANSMITTER CIRCUIT

4.1 Test Set-Up

Connect all test equipment as shown below.



4.2 To place the tranceiver in the transmit mode without the microphone, insert the plug wired as shown into the MIC jack on the tranceiver. When injecting audio modulation signal to the microphone input circuit, use the same plug also.

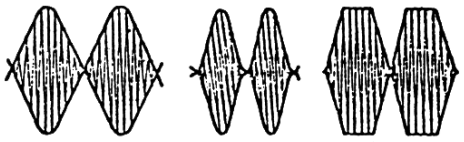


4.3 Presetting

Temporarily set RV1 fully clockwise position and L14 and L16 slugs to be flush with their coil bobbins.

4.4 Pre-Driver and Power Amplifier Stage

(1) Place the mode switch in USB position and channel selector at CH20 position.
(2) Apply single (2.4KHz) or two tone (500Hz and 2400KHz) signal of 10mV to the microphone input circuit and adjust the modulation signal level with RV8 to obtain RF power output of about 2W.
(3) Next, adjust T1, T2, T3, T11, T4, T5 and T6 in this order to obtain maximum amplitude of scope display. (Repeat this procedure 2-3 times.)
(4) Place RV8 in fill counter clockwise position and RV10 in full clockwise position.
(5) Apply single tone (2.4KHz) of modulation frequency to the microphone input circuit, and adjust T7, L10, L14 and L16 for maximum power output. (Repeat this procedure 2-3 times.)
(6) Turn L10 slug clockwise until power output of 14.0 Watts is obtained.
(7) First, apply 2400Hz 10mV single tone signal to the microphone input circuit. Next, apply 500Hz signal to the microphone input circuit and increase or decrease 500Hz signal level to observe crossover display on the oscilloscope. Also, verify the scope display of output wave form shown below is obtained.



A-Correct B-Incorrect C-Incorrect

Then, adjust:
RV8 to obtain 73V (P-P) on the RF VTVM and
RV10 to obtain 66V (P-P) reading.

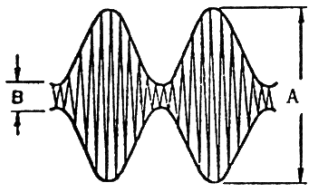
(8) Make sure the power output is within 64V (P-P) to 68V (P-P) at any channel in both USB and LSB mode of operation.

4.5 AM Power Output and RF Power Meter

(1) Place the mode switch in AM position and channel selector to CH20 position.
(2) Adjust VR1 to obtain RF power output of 3.75W.
(3) Make sure the power output is between 3.6-3.9W on any channel.
(4) Adjust RV2 so that AM RF power meter of the tranceiver indicates the same wattage (3.75W) as that of RF watt meter connected to the antenna connector.

4.6 AM Modulation

(1) Apply 1KHz, 100mV modulation signal to the microphone input circuit and place channel selector to CH20 position.
(2) Adjust RV9 to obtain 100% modulation.
(3) Decrease the input signal level to 10mV and make sure the modulation ratio is still within 85-95% at any channel



$$\text{Modulation ratio} = \frac{A - B}{A + B} \times 100(\%)$$

4.7 SSB Carrier Supression

(1) Set the tranceiver in transmit mode, no modulation.
(2) Place the mode switch in USB position and adjust RV6 and RV7 alternately for minimum carrier leakage on scope display.
(3) Place the mode switch in LSB position and make sure the carrier leakage level is almost the same as that in USB mode. If not, readjust RV6 and RV7 alternately.

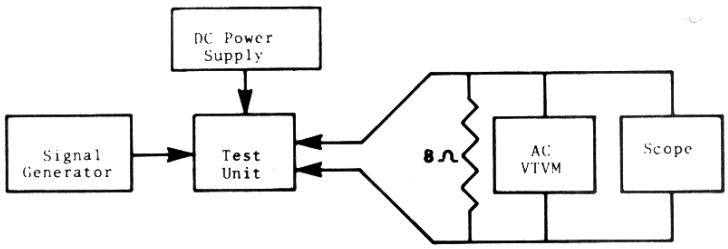
4.8 AWI Lamp

(1) Set the tranceiver in AM transmit mode with no modulation.
(2) Increase power supply voltage to 16.0V.
(3) Connect 250 Ohm (SWR 5) dummy antenna load to the antenna connector and adjust R501 so that the AWI indicator just turns off at any channel selected.
(4) Connect 10 Ohm dummy antenna load to the antenna connector and also make sure the indicator is turned off.
(5) Next, decrease power supply voltage to 10.5V, and check the indicator turned off for both 250 and 10 Ohm dummy loads connected.
(6) Temporarily make the antenna circuit short-circuit or open, and check for turned on indication at any channel.
(7) Connect cable and check for turned on indication at any channel with the power supply voltage adjusted to both 16.0V and 10.5V. When connecting the cable to the antenna connector, always use a connector (do not solder the cable to ANT.

5. ALIGNMENT OF RECEIVER CIRCUIT

5.1 Test Set-Up

Connect test equipment to the receiver as shown below.



Unless otherwise specified, place the controls and switches on the tranceiver as follows:

(a) CB/PA switch in CB position
(b) AF Gain control in Max. position
(c) Squelch control in Min. position
(d) Clarifier in "12" o'clock position
(e) RF gain control in Max. position
(f) Channel selector on CH20
(g) Tone switch in Hi position
(h) ANL & NB switch in Off position

5.2 To set the tranceiver in receive mode, insert the micorphone plug into the microphone jack.

5.3 AGC Voltage

(1) Place the mode switch in the USB position. Open the antenna circuit of the receiver. Connect the circuit tester plus lead to RV4 and minus lead to the ground.

(2) Adjust RV4 to obtain the voltage leading of about 1.4V.

5.4 RF Stage and Det. Coil

(1) Set the tranceiver in AM mode and adjust signal generator to provide channel frequency of 27.305MHz, 1KHz 30% modulation.
(2) Adjust T8, T9, T10 and T12 for maximum audio output. When adjusting slugs, always keep the generator output low so that the audio output is not saturated.
(3) Next, adjust signal generator to provide 0.5uV antenna input and verify the audio output is higher than 4V.

5.5 Squelch

(1) Place the mode switch in AM position and adjust signal generator to provide 54dE antenna input voltage, 1KHz 30% modulation. Rotate the squelch control in full clockwise direction.
(2) Adjust RV5 so that the audio output just appears at the speaker jack (scope display).

5.6 S-Meter

(1) Adjust the signal generator to provide 40dB antenna input, and place the receiver mode switch in AM position.
(2) Adjust RV3 so that the S-Meter pointer indicates "9" on the meter scale.

5.7 AM 100dB Distortion

(1) Adjust the signal generator to provide 100dB antenna input, 1KHz 30% modulation, and adjust RV4 (AGC) so that audio distortion decreases to minimum.

FREQUENCY AND CODE CHART FOR AM/SSB TRANSCEIVER

CHANNEL NO.	CHANNEL FREQ. (MHz)	"N" BCD CODES	VCO FREQ.(MHz)	CHANNEL SW.OUTPUT						RX LOCAL FREQ. (MHz)		
			AM/USB/LSB	P1	P2	P3	P4	P5	P6	AM	LSB	USB
1	26.965	273	16.725	1	0	0	0	0	0	37.6585	37.656	37.661
2	26.975	275	16.735	0	1	0	0	0	0	37.6685	37.666	37.671
3	26.985	277	16.745	1	1	0	0	0	0	37.6785	37.676	37.681
4	27.005	281	16.765	0	0	1	0	0	0	37.6985	37.696	37.701
5	27.015	283	16.775	1	0	1	0	0	0	37.7085	37.706	37.711
6	27.025	285	16.785	0	1	1	0	0	0	37.7185	37.716	37.721
7	27.035	287	16.795	1	1	1	0	0	0	37.7285	37.726	37.731
8	27.055	291	16.815	0	0	0	1	0	0	37.7485	37.746	37.751
9	27.065	293	16.825	1	0	0	1	0	0	37.7585	37.756	37.761
10	27.075	295	16.835	0	0	0	0	1	0	37.7685	37.766	37.771
11	27.085	297	16.845	1	0	0	0	1	0	37.7785	37.776	37.781
12	27.105	301	16.865	0	1	0	0	1	0	37.7985	37.796	37.801
13	27.115	303	16.875	1	1	0	0	1	0	37.8085	37.806	37.811
14	27.125	305	16.885	0	0	1	0	1	0	37.8185	37.816	37.821
15	27.135	307	16.895	1	0	1	0	1	0	37.8285	37.826	37.831
16	27.155	311	16.915	0	1	1	0	1	0	37.8485	37.846	37.851
17	27.165	313	16.925	1	1	1	0	1	0	37.8585	37.856	37.861
18	27.175	315	16.935	0	0	0	1	1	0	37.8685	37.866	37.871
19	27.185	317	16.945	1	0	0	1	1	0	37.8785	37.876	37.881
20	27.205	321	16.965	0	0	0	0	0	1	37.8985	37.896	37.901
21	27.215	323	16.975	1	0	0	0	0	1	37.9085	37.906	37.911
22	27.225	325	16.985	0	1	0	0	0	1	37.9185	37.916	37.921
23	27.255	331	17.015	1	1	0	0	0	1	37.9485	37.946	37.951
24	27.235	327	16.995	0	0	1	0	0	1	37.9285	37.926	37.931
25	27.245	329	17.005	1	0	1	0	0	1	37.9385	37.936	37.941
26	27.265	333	17.025	0	1	1	0	0	1	37.9585	37.956	37.961
27	27.275	335	17.035	1	1	1	0	0	1	37.9685	37.966	37.971
28	27.285	337	17.045	0	0	0	1	0	1	37.9785	37.976	37.981
29	27.295	339	17.055	1	0	0	1	0	1	37.9885	37.986	37.991
30	27.305	341	17.065	0	0	0	0	1	1	37.9985	37.996	38.001
31	27.315	343	17.075	1	0	0	0	1	1	38.0085	38.006	38.011
32	27.325	345	17.085	0	1	0	0	1	1	38.0185	38.016	38.021
33	27.335	347	17.095	1	1	0	0	1	1	38.0285	38.026	38.031
34	27.345	349	17.105	0	0	1	0	1	1	38.0385	38.036	38.041
35	27.355	351	17.115	1	0	1	0	1	1	38.0485	38.046	38.051
36	27.365	353	17.125	0	1	1	0	1	1	38.0585	38.056	38.061
37	27.375	355	17.135	1	1	1	0	1	1	38.0685	38.066	38.071
38	27.385	357	17.145	0	0	0	1	1	1	38.0785	38.076	38.081
39	27.395	359	17.155	1	0	0	1	1	1	38.0885	38.086	38.091
40	27.405	361	17.165	0	0	0	0	0	0	38.0985	38.096	38.101

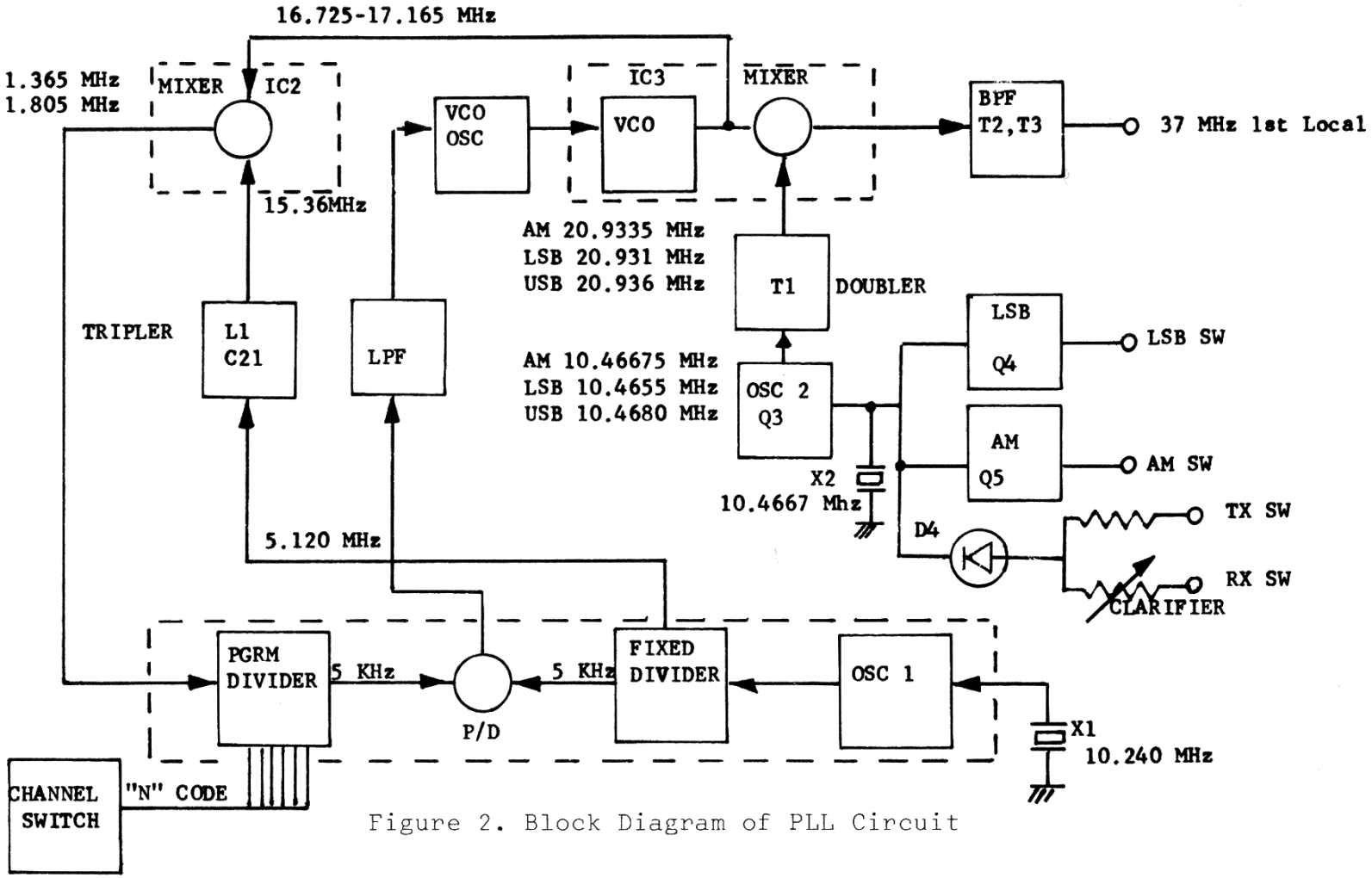
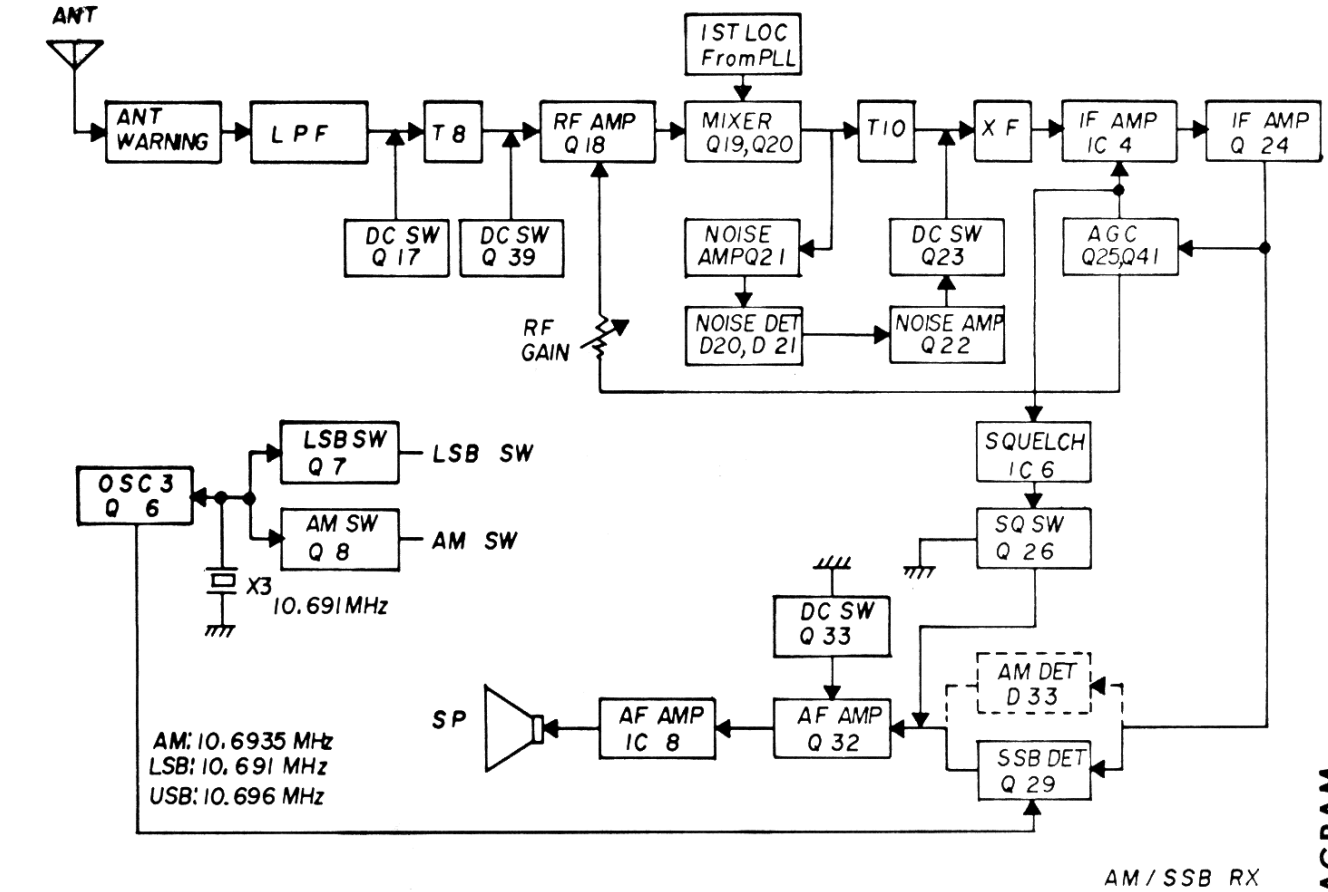
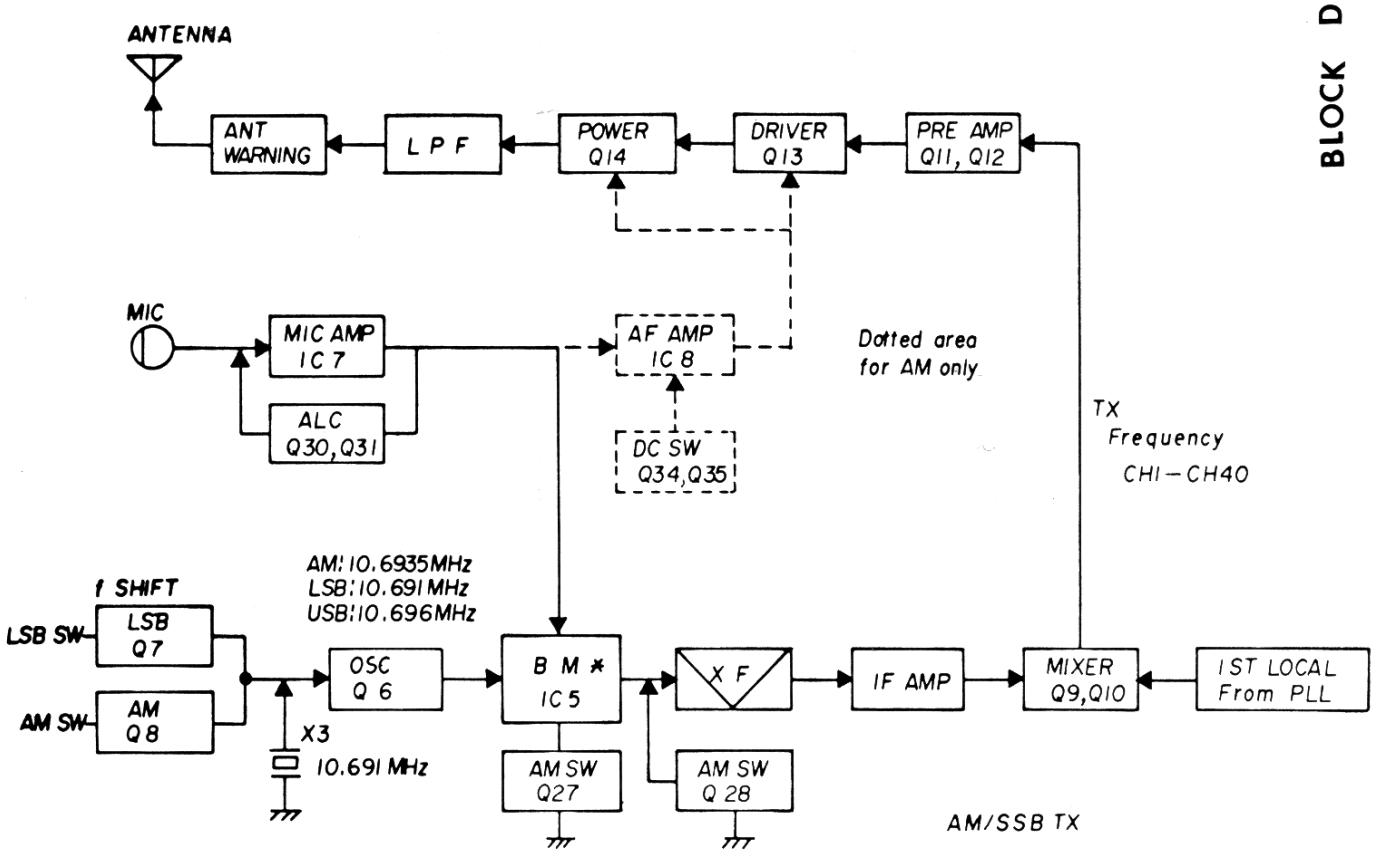


Figure 2. Block Diagram of PLL Circuit

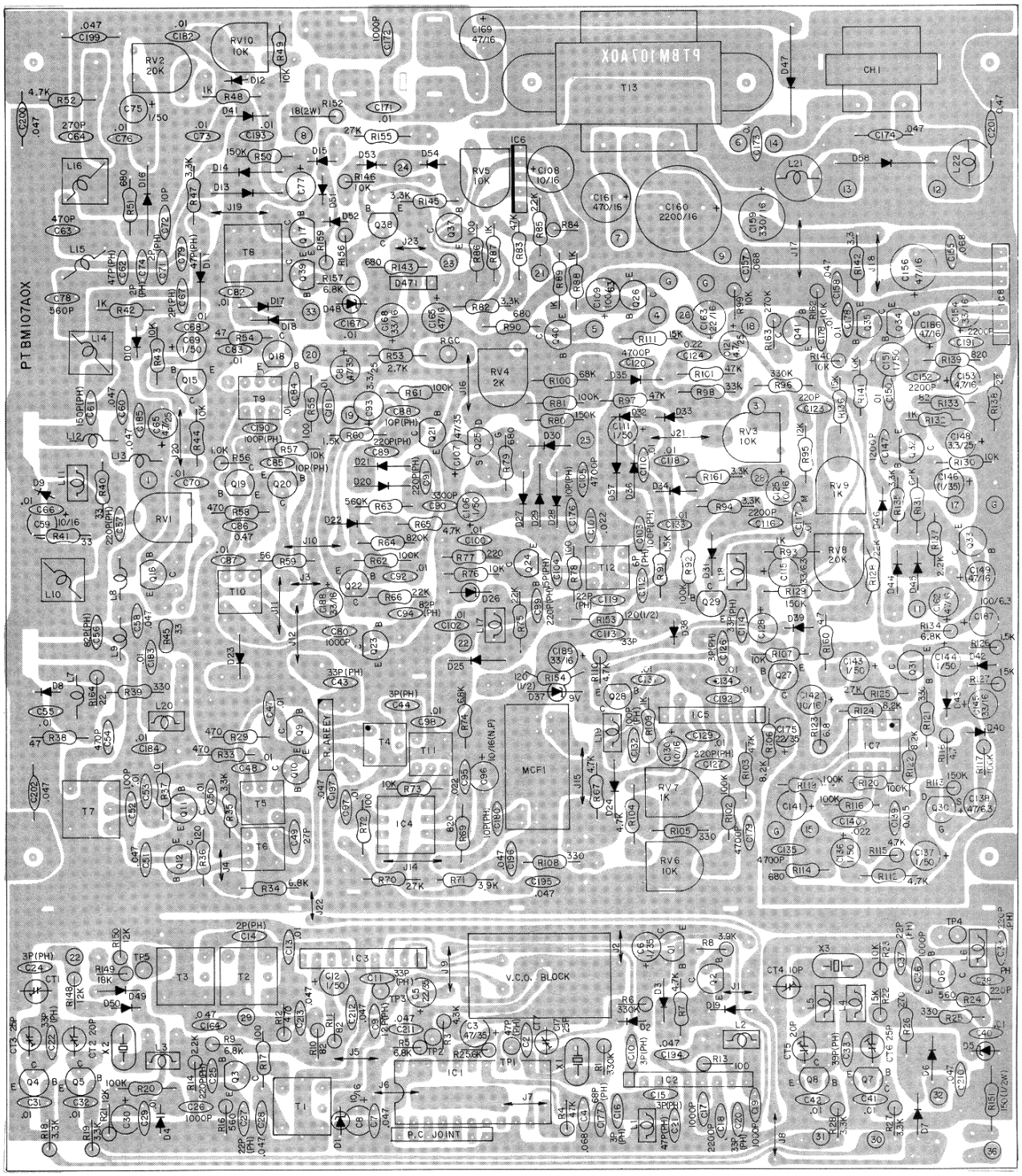
BLOCK DIAGRAM



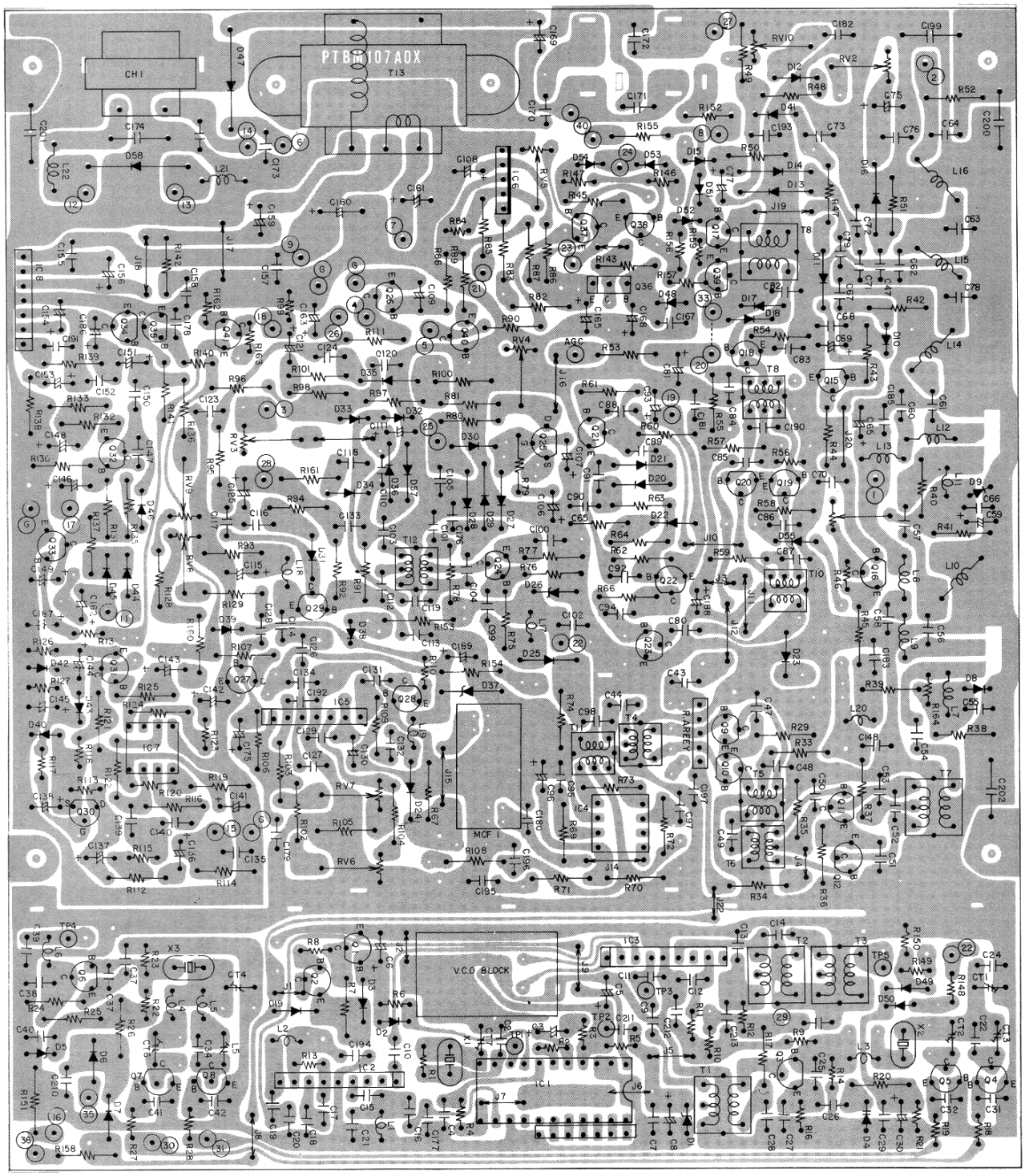
AM / SSB RX



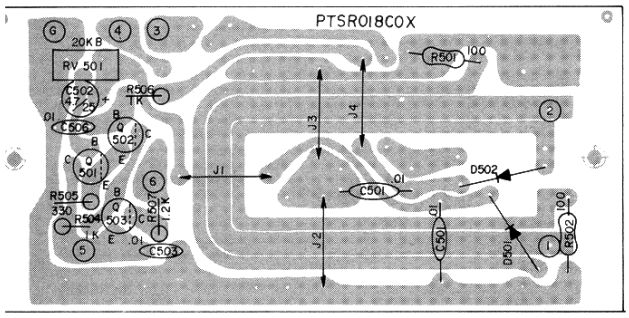
AM/SSB TX

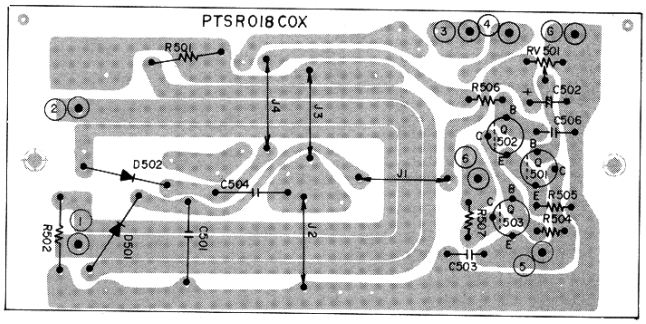

PT BM107AOX
PT BM107AOX
T13
CH1
V.C.O. BLOCK
MCF1
P.C. JOINT
RV1 10K
RV2 20K
RV3 10K
RV4 2K
RV5 10K
RV6 10K
RV7 1K
RV8 20K
RV9 1K
RV10 10K
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
IC1
IC2
IC3
IC4
IC5
IC6
IC7
R.AREEY

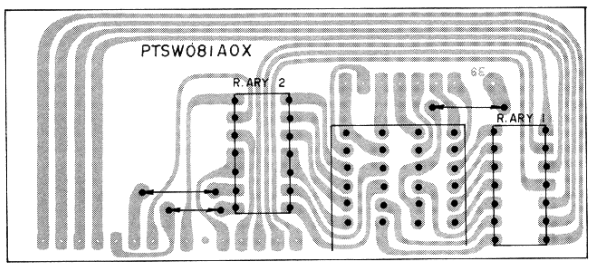
Top View

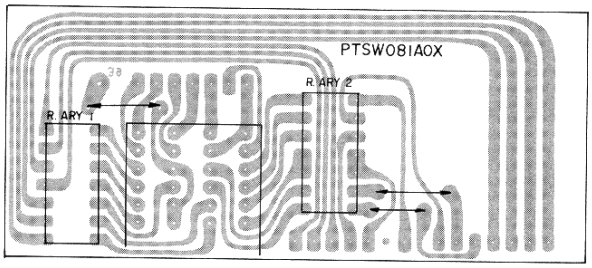


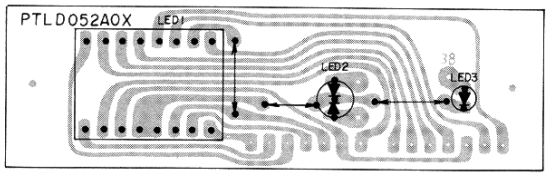
BOTTOM VIEW

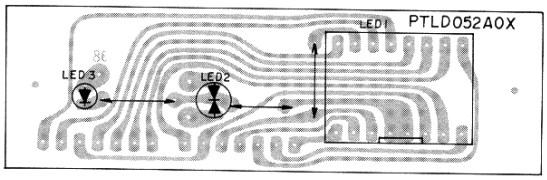

PTSR018C0X
20KB
RV 501
R501
100
C502
47
R506
TK
C506
Q 502
Q 501
R505
330
R504
Q 503
R507
1.2K
C503
J1
J2
J3
J4
C501
D502
D501
C504
R502
100

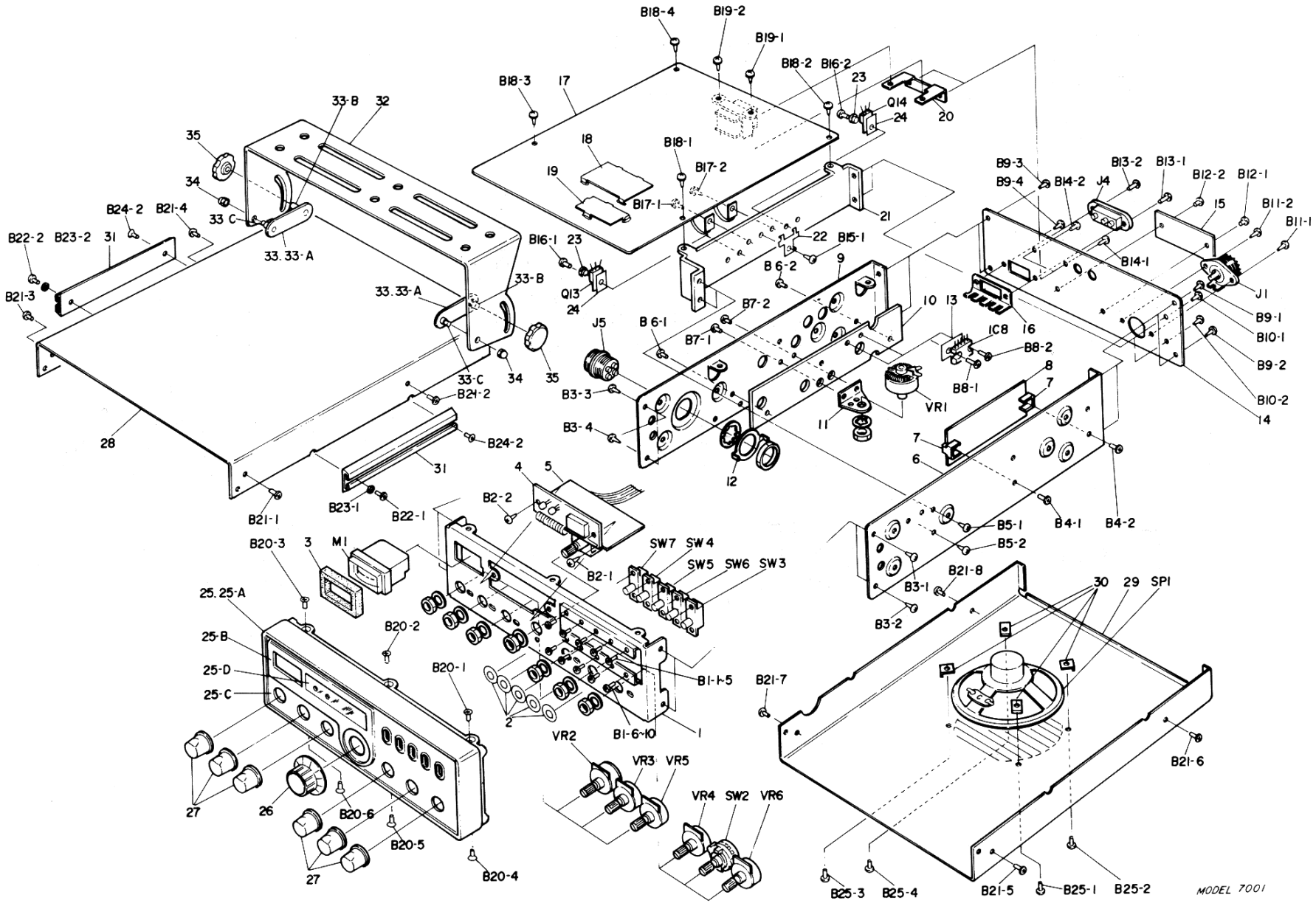

PTSR018C0X
R501
RV 501
R506
C502
C506
Q 502
Q 501
Q 503
R505
R504
R507
C503
D502
C504
D501
C501
R502
J1
J2
J3
J4


PTSW081A0X
R.ARY 2
R.ARY 1


PTSW081A0X
R.ARY 2
R.ARY 1


PTLD052A0X
LED1
LED2
LED3


PTLD052A0X
LED1
LED2
LED3



Exploded View

PARTS LIST

MODEL NO. 79-007

REF. NO.	DESCRIPTION	PART NO.
	CASE MATERIAL	
25-C	Escutcheon	79-020010
25-B	Escutcheon	79-020011
25-A	Frame	79-010011
1	Front Panel	79-018001
25	Escutcheon Assy.	79-020012
14	Panel, Rear	79-013006
28	Cover A	79-011004
29	Cover B	79-011005
27-1,2,3,4	Knob, VR	79-115007
15	Plate, Serial #	79-012001
26	Knob, Channel	79-115008
	MISCELLANEOUS	
	Guide	79-156002
	Stud B	79-156003
	Stud A	79-156004
7-1,7-2	Bracket	79-158021
	Terminal	79-154001
	Short, Jumper	79-034004
M1	Meter	79-200004
	Conn., Cord Assy.	79-159010
	Conn., Cord Assy.	79-159011
	Wire, Assy. Kit	79-034005
SP1	Speaker	79-060003
323-1,2	Lockwasher	79-157006
	Bracket	79-158022
31-1	Rail A	79-159012
30-1,2,3,4	Bracket	79-158023
11	Bracket	79-158024
20	Retainer	79-151010
16	Bracket	79-158025
9	Side Bracket L	79-158026
6	Bracket, Side R	79-158027
22	Terminal	79-154002
10	Heatsink	79-089026
12	Washer	79-157007
21	Pt. Bracket	79-158028
23-1,2	Busning	79-157008
	Label	79-012002
	DC Cord Assy.	79-034006
	Box Nut	79-151011
	Pan Tap Screw	79-151012
	Trass Tap Screw	79-151013
	Bras. Tap Screw	79-151014
	O.T. Lock Washer	79-157009
	I.T. Lock Washer	79-157010
	Handle	79-028001
	Mic Holder	79-158029
	Screw	79-151015
	MISCELLANEOUS (cont'd)	
	Microphone	79-038004
	JACKS	
J2	3p Jack	79-153001
J4	DC Jack	79-153002
J1	Antenna Jack	79-153003
J5	Jack	79-153004
	CONTROLS & SWITCHES	
RV9	1K ohm A-curve, control sens.	79-164019
RV3,RV5,RV7	10K ohm A-curve, control sens.	79-164020
RV4	2K ohm A-curve, control, sens.	79-164021
RV2,6,8	20K ohm A-curve, control,sens.	79-164022
RV1	Control, sens.	79-164023
RV501	20K ohm A-curve, control sens.	79-164024
SW1	Channel Selector Switch	79-180008
VR6	5K Control, Mic Gain	79-164025
VR3,VR4	Clarifier 50K, Control, Squelch	79-164026
VR5	50K, Control, RF Gain	79-164027
VR2	50K, Control, AF Gain	79-164028
VR1	6 ohm A-curve, Control	79-164029
SW2	USB/LSB/AM Switch	79-180009
SW3,4,5,6,7	Slide Switch	79-183004
	CRYSTALS	
X1	Crystal 10.240 mhz	79-128013
X2	Crystal 10.4667	79-128015
X3	Crystal 10.691	79-128016

REF. NO.	DESCRIPTION	PART NO.
	P.C. BOARDS	
V.C.O.	VCO Block	79-075008
	LED Display, PC Board w/o Comp.	79-070006
	Ant. Warning, PC Board w/o Comp.	79-070007
	Resistor, PC Board w/o Comp.	79-070008
	PC Joint	79-070009
	PC Joint	79-070010
	LED Display, PC B Assy. w/comp.	79-075010
	Ant. Warning, PC B Assy. w/comp.	79-075011
	Resistor, PC B Assy. w/comp.	79-075012
	L.E.D.'s	
LED2	L.E.D.	79-202003
LED1	L.E.D.	79-202004
LED3	L.E.D.	79-202005
	COILS & TRANSFORMERS	
L15	Coil	79-176037
L21,L22	Choke Coil	79-178023
L12	R.F.C.	79-178024
L7,9	R.F.C.	79-178025
L8,L13	RF Coil	79-176038
L17	R.F.C.	79-178026
L1,3,6	RF Coil	79-178027
L4,5	R.F.C.	79-178028
L2,11,18, 19,20	RF Coil	79-176048
CH1	Choke Coil	79-178029
T13	AF O.P.T.	79-090015
T5	RF Coil	79-176039
T6	RF Coil	79-176040
T9	RF Coil	79-176041
T4,10,11	IFT	79-090016
T12	I.F.T.	79-090017
T8	R.F.T.	79-090019
T7	RF Coil	79-176042
L10	RF Coil	79-176043
L16	RF Coil	79-176044
L14	RF Coil	79-176045
T1	RF Coil	79-176046
T2	IFT	79-090018
T3	RF Coil	79-176047
	RESISTOR MODULES	
R-Arey	Resistor Module	79-123003
	RESISTORS, CARBON TYPE	
R37	10 ohm, 1/4W	04-001030
R13,17,55 72,78,86, 108	100 ohm, 1/4W	04-001200
R15,42,48, 58,87,88, 89,93,109, 133	1K ohm, 1/4W	04-000013
R23,35,43, 44,49,57, 73,76,99, 107,130,134, 140,141,147, 150	10K ohm, 1/4W	04-001030
R20,61,62, 81,92,102, 115,119,120,	100K ohm, 1/4W	04-001003
R84	1M ohm, 1/4W	04-001600
R36	120 ohm, 1/4W	04-001210
R158	1.2K ohm, 1/4W	04-001240
R60,126	1.5K ohm, 1/4W	04-001540
R22,34,91, 111,127,136	15K ohm, 1/4W	04-001530
R50,80,113, 129	150K ohm, 1/4W	04-001503
R148,149	18K ohm, 1/4W	04-001800
R77	220 ohm, 1/4W	04-002210
R14,56,85, 137	2.2K ohm, 1/4W	04-002400
R66,75,128, 155	22K ohm, 1/4W	04-002230
R123	27 ohm, 1/4W	04-002700
R26	270 ohm, 1/4W	04-002710

REF. NO.	DESCRIPTION	PART NO.
	RESISTORS, CARBON TYPE (cont'd)	
R53,159	2.7K ohm, 1/4W	04-002740
R70,125	27K ohm, 1/4W	04-002730
R142	3.3 ohm, 1/4W	04-003340
R40,41,45	33 ohm, 1/4W	04-003330
R25,39,46, 105,121,132	330 ohm, 1/4W	04-003310
R18,19,27, 28,47,82, 94,135,145, 146,156,161	3.3K ohm, 1/4W	04-003340
R21,95,98	33K ohm, 1/4W	04-003330
R1,6,96	330K ohm,1/4W	04-003303
R8,71	3.9K ohm, 1/4W	04-003940
R3	4.3K ohm, 1/4W	04-004340
R38,54,160	47 ohm, 1/4W	04-004700
R12,29,33	470 ohm, 1/4W	04-004710
R7,52,65,104, 110,112,115, 118	4.7K ohm, 1/4W	04-004740
R83,97,101, 103	47K ohm, 1/4W	04-004730
R59,138	56 ohm, 1/4W	04-005600
R16,24	560 ohm, 1/4W	04-005610
R9	5.6K ohm, 1/4W	04-005063
R2	56K ohm,1/4W	04-005630
R63	560K ohm, 1/4W	04-005603
R51,79,90 114,143	680 ohm, 1/4W	04-006810
R5,74,144, 157	6.8 ohm, 1/4W	04-006083
R100,131	68K ohm, 1/4W	04-006830
R10,11	82 ohm, 1/4W	04-008200
R69,139	820 ohm, 1/4W	04-008210
R106,122, 124	8.2K ohm, 1/4W	04-008023
R4,64	820K ohm, 1/4W	04-008213
R501,502	100 ohm, 1/4W	04-001200
R504,505	1K ohm,1/4W	04-000013
R507	1.2K ohm, 1/4W	04-001020
R505	330 ohm, 1/4W	04-003310
R202	100K ohm, 1/4W	04-001003
R201	470 ohm, 1/4W	04-004710
	RESISTORS, M-OXIDE FILM TYPE	
R153,154	120 ohm, 1/2W	04-991210
R151	150 ohm, 1/2W	04-991510
R203	180 ohm, 2W	04-021800
	INTEGRATED CIRCUTS	
IC5	AN612	02-010612
IC2,IC3	TA7310P	02-257310
IC8	UPC1182	02-301182
IC7	4558D	02-455804
IC6	M51204	02-151204
IC4	SN76600	02-276600
IC1	UPD2816C	02-392816
	TRANSISTORS	
Q2,Q22	2SA733	01-030733
Q16,38	2SB564	01-020564
Q1,3,4,5,6, 7,8,9,10,11, 12,19,20,21, 23,24,26,28, 39	2SC710	01-030710
Q17,31	2SC900	01-030900
Q15,27,29,32, 33,34,35,40, 501,502	2SC945A	01-030945
Q14	2SC1969	01-031969
Q18	2SC1973	01-031973
Q13	2SC2166	01-032166
Q36,37	2SD471	01-040471
Q25	2SK34	01-070034
Q30	2SK136	01-070136
Q503	2SA733	01-010733
	FILTERS	
25-D	Filter	77-179007
MXF	M-Xtal Filter	77-179008
	DIODES	
D4	ITT310	05-200310

REF. NO.	DESCRIPTION	PART NO.
	DIODES (cont'd)	
D10,16,20, 21,29,32	1K261	05-190261
D47	GP25G	05-141025
D2,3,6,7,11, 12,13,14,15, 17,18,19,22, 23,24,25,27, 28,30,31,34, 35,38,39,41, 42,43,44,45, 46,49,50,51, 52,53,54,55, 56,D201	IN4448	05-174448
D58	RA1Z	05-540001
D1	MZ205XE	05-480205
D5,26,37,48	RD9E	05-540091
D40	SV03	05-780003
D8,9	MV1YH	05-470000
	CAPACITORS, CERAMIC TYPE	
C26	1000P, 50V	06-000439
C124,140,150	.022mf, 50V	06-000072
C155,158	.068mf, 36V	06-000041
C139	.015mf, 50V	06-000052
C157,C4	.068mf, 50V	06-000108
C14,67,71,74	2pf, 50V	06-000085
C10,15,16,44	3pf, 50V	06-000090
C126	8pf, 50V	06-000130
C176,180	10pf, 50V	06-000135
C112	6pf, 50V	06-000115
C9	12pf, 50V	06-000140
C64,147	270pf, 50V	06-000332
C54,63	470pf, 50V	06-000355
C78	560pf, 50V	06-000370
C103,127,132	100pf, 50V	06-000285
C104	15pf, 50V	06-000160
C61	150pf, 50V	06-000300
C1,37,85,119	22pf, 50V	06-000180
C25,38,39,57, 99	220pf, 50V	06-000320
C89,91,123	220pf, 50V	06-000320
C11,27,43,45, 46,49,113,114	33pf, 50V	06-000210
C2,21,62,79	47pf, 50V	06-000235
C20	56pf, 50V	06-000250
C177	68pf, 50V	06-000265
C56,94	82pf, 50V	06-000280
C17,19,36,80, 172,207	1000pf, 50V	06-000439
C13,29,31,32, 41,42,47,48, 50,51,53,55, 68,70,73,76, 82,83,84,86, 87,92,97,98, 100,102,110, 118,122,129, 131,133,134, 167,170,171, 173,178,181, 182,205,206, 501,503,504, 505	0.01mfd, 50V	06-000046
C18,116,152	2200pf, 50V	06-000375
C95,101	0.022mfd, 50V	06-000076
C90	3300pf, 50V	06-000380
C105,120,135, 179	4700pf, 50V	06-000382
C7,28,40,58, 60,66,164, 174,184,185, 201,202,203, 204	0.047mfd, 50V	06-000106

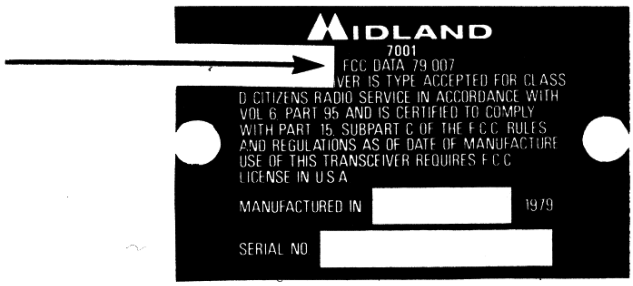
PARTS LIST

MODEL NO. 79-007

REF. NO.	DESCRIPTION	PART NO.
	CAPACITORS, ELECTROLYTIC TYPE	
C96	10mfd, 16V	00-132115
C109,161,166	100mfd, 16V	00-132175
C160	2200mfd, 16V	00-132400
C159	330mfd, 16V	00-132540
C115	33mf, 6.3V	00-132500
C138	47mfd, 6.3V	00-132620
C163	22mfd, 16V	00-132300
C141,168	33mfd, 10V	00-132505
C149,165	47mfd, 10V	00-132625
C8,59,108, 125,130,142	10mfd, 16V	00-132115
C145,154	33mfd, 16V	00-132510
C156,162,169	47mfd, 16V	00-132630
C93,144,148	3.3mfd, 25V	00-132465
C121	4.7mfd, 25V	00-132600
C12,30,69,75, 111,136,137, 143,146,151	1mfd, 50V	00-132055
C65	4.7mfd, 50V	00-132610
C502	4.7mfd, 25V	00-132600
	CAPACITORS, Mylars	
C210,117	0.01mfd, 50V	03-000205
	CAPACITORS, TANTALUM TYPE	
C153	4.7mfd, 16V	03-003020
C5,128,175	0.22mfd, 35V	03-003030
C3,81,107	0.47mfd, 35V	03-003026
C6,77,106	0.1mfd, 35V	03-003035
	CAPACITORS, TRIMMERS	
CT1,2,3,4, 5,6	Trimmer Cap.	79-123004
CT7	Trimmer Cap. 25P	79-123005
	RESISTORS	
R501,502	100ohm, 1/4W	04-001003
R504,506	1K, 1/4W	04-000013
R505	330 ohm, 1/4W	04-003303
R507	1.2K, 1/4W	04-001240
RV501	20KB, 1/4W	04-002030

REF. NO.	DESCRIPTION	PART NO.
	FRONT PANEL	
C505,506,510	.01uf, 50V	06-000042
C507	.001uf, 50V	06-000050
	DIODES	
D501	IN4448	05-174448
	RESISTORS	
R501	470 ohms, 1/4W	04-004710
R502	56K, 1/4W	04-005630
R503	180 ohm, 1/2W	04-001810
	ANTENNA WARNING BOARD	
	DIODES	
D501,502	IN60	05-170060
	TRANSISTORS	
Q501,502	2SC945	01-030945
Sub	2SC828	01-030828
Q503	2SA719	01-010719
Sub	2SA733	01-010733
	CAPACITORS	
C503,504,506	.01mf, 50wv	06-000046
CAPACITORS	CAPACITORS (cont'd)	
C502	4.7uf, 25V	00-132600
C501	.01mf, 50WV	06-000046
	REAR PANEL, CAPACITORS	
C170,171	.01mf, 50V	06-000046
C172	.001mf, 50V	06-000016
C503,504	.047mf, 50V	06-000106

IMPORTANT: FCC Data Number Must Be Supplied When Requesting Replacement Parts And Service Information 79-007



HOW AND WHERE TO ORDER REPLACEMENT PARTS

NOTE: To eliminate error and speed delivery of replacement parts, always include the following information on your order:

1. Complete identification of merchandise for which the part is wanted.

   A. FCC Data Number
   B. Model Number
   C. Serial Number

2. Best possible identification of the part itself.

   A. Part Number
   B. Schematic Reference Number
   C. Part Description
   D. Quantity Requested
   E. If necessary, return old part as sample.

3. Customer should use address listed below when ordering replacement parts.

MIDLAND
CUSTOMER SERVICE (PARTS DEPT.)
1690 NORTH TOPPING AVENUE
KANSAS CITY, MISSOURI 64120

Parts List Change

Model No: 79-007

REF.NO:	DESCRIPTION:	OLD PART NO:	NEW PART NO:
RV5	Control, RF Gain	79-164027	79-164030
	Handle	79-028001 (bracket)	79-158035 (handle)

PARTS CHANGES

7001 FCC DATA NO: 79-007

	lot No. 21000001 21000750		lot No. 24000001 24000750		lot No. 27000001 27000750	
REF.NO.	ORIGINAL	CHANGED TO	ORIGINAL	CHANGED TO	ORIGINAL	CHANGED TO
R2	56K OHM	4.7K OHM				
C3	0.47/35	1/50				
R172	ADD	1K OHM				
R4	47K OHM	4.2K OHM	4.2K OHM	3.3K OHM	3.3K OHM	3.9K OHM
C4	0.068 uF	10/16				
C209			ADD	33/10		
C204			ADD	10/16		
R85	2.2K OHM	1.2K OHM				
R130	10K OHM	5.6K OHM				
C56	82PF(PH)	56PF(PH)			56PF(PH)	82PF(PH)
C158	0.047 uF	10/16				
C223	ADD	10/16				
C207	ADD	0.047 uF				
C221	ADD	33PF (PH)			33PF (PH)	47PF (PH)
R166	ADD	1K OHM			1K OHM	DELETE
C205	ADD	4700 pF	4700 pF	1000 pF		
C509	ADD	0.01 uF	0.01 uF	0.047 uF		
D502	ADD	IN4448				
R167			ADD	2.2K OHM		
C190			100 pF(PH)	(R168) 1K OHM		
C219			ADD	47PF(PH)		
C220			ADD	47PF(PH)		
R169			ADD	5.6K OHM		
Q1			2SC710	2SC900		
Q26			2SC710	2SC900		
C216			0.01 uF	1/50		
C65	4.7uF/50	DELETE	ADD	1/50		
C208			ADD	0.047 uF		
D5					RD9E	RD10E
D26					RD9E	RD10E
D37					RD9E	RD10E
D48					RD9E	RD10E
R41					330 OHM	10 OHM
L8					LDADB3524M	DELETE
C70					0.01 uF	0.047 uF
R46					330 OHM	150 OHM
R102					100K OHM	220K OHM
R127					220PF(PH)	330PF(SL)
R170					ADD	27K OHM
C224					ADD	33PF(PH)
C215					0.01 uF	0.047 uF

C45			
C46			33PF(PH) 22PF(PH)
R171			33PF(PH) 22PF(PH)
L7			ADD 220 OHM
C222			LDAD3524M DELETE
C206	ADD	1500 PF	ADD 27PF(PH)
R112	12K OHM	4.7K OHM	
C54			
R173			470PF(SL) 390PF(SL)
			ADD 2.2K OHM

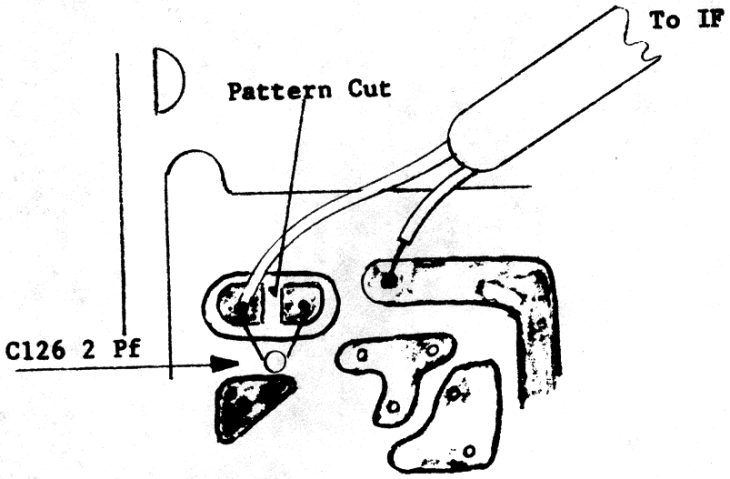
Model 6001, FCC Data 79-006

Circuit Modifications: Serial No. 26000001 - 26001000

Model: 7001 (FCC Data 79-007)

Circuit modifications, Serial No. 27000001 - 27000750

1. Pattern of printed circuit board between TP-4 and hot side of local shield (10.691) was cut as shown in diagram. A 2 Pf capacitor (C126) was moved from previous location and placed across cut pattern.



New shield wire was added, it was placed between pattern of TP-4 and C114 (33 Pf capacitor). Hot side is C114.

Hot side of shield wire (10.691 output) was changed to IC side where C126 was previously located.

Ground pattern near Pin 15 and pattern for black wire coming from microphone were connected using wire.