THE HAMMARLUND CB-23
CITIZENS BAND TRANSCEIVER

SERVICE MANUAL

CONTENTS OF THE SERVICE MANUAL

OPERATING CONTROLS

The CB-23 Citizens Band Transceiver has six operating controls, five on the front panel, and one on the microphone. To put the unit in operation, turn VOLUME knob (See Diagram Page 2) clockwise about one half turn. The channel indicator should be illuminated by the internal pilot lamp to indicate that electric power is being applied. Allow about one minute of warm-up time before proceeding further.

RECEIVING

Set the unit to the desired channel with the SECTOR knob and the CHANNEL knob as described below:

SECTOR knob setting	CHANNEL knob settings
Extreme left	Channels 1, 2, 3, 4, 5, 6, 7 or 8
Mid position	Channels 9, 10, 11, 12, 13, 14, 15 or 16
Extreme right	Channels 17, 18, 19, 20, 21, 22 or 23

Squelch Setting

Turn the SQUELCH knob clockwise just beyond the point that background noise from the speaker is silenced -- when a radio signal is "not" being received. If you hear a radio transmission, wait until the channel is clear and then set the SQUELCH control as above.

Volume Setting

When you hear a radio transmission adjust the VOLUME knob until the sound level suits your needs.

Tune Setting

When you hear a radio transmission, rotate the TUNE knob for maximum sound clarity and for maximum reading on the meter. This knob does "not" affect transmitter frequency, but helps you fine-tune incoming signals. At the extreme clockwise and counter-clockwise positions of the TUNE knob you may hear strong, undesired adjacent channel stations. An on-channel station should be received best with this knob set at some point between the two extremes.

Sensitivity Control

The ability of the CB-23 to pick up weak signals depends upon the setting of the SQUELCH knob and TUNE knob. The SQUELCH knob adjusts the threshhold at which your receiver will accept signals. If turned to the extreme clockwise

position, only strong signals will be heard. Thus, you can cut out unwanted weak (and noisy) transmissions from distant stations. When turned to the extreme counter-clockwise position, but not far enough to click the ANL OFF switch (controlled by the same knob), the loud-speaker will be live at all times and all stations within range will be heard. If turned farther so that the ANL OFF switch clicks, the Automatic Noise Limiter will be cut out and maximum sensitivity will be achieved. The optimum position of the SQUELCH knob is the point where background noise is silenced between incoming transmissions, and the stations you want to receive can be heard.

TRANSMITTING

To transmit, adjust the CB-23 to receive on the desired channel as described above. Listen to make sure the channel is not in use, hold the microphone not less than three inches from the lips and, when the channel is clear, press the microphone push button and talk. That's all there is to it.

As soon as you have transmitted your message, release the microphone push button so you can hear the reply. The microphone push button converts your transceiver into a transmitter when it is pressed, and converts the transceiver back into a receiver when the push button is released.

To transmit and receive on another channel, select the desired channel with SECTOR knob and CHANNEL knob. Adjust TUNE knob, VOLUME knob and SQUELCH knob as described above. Before transmitting, by pressing microphone push button, "listen" to make sure the channel is not in use.

WARNING A valid radio station license is required in order to use the CB-23 as a transmitter. Severe penalties can be imposed if you operate a radio transmitter without a radio station license. You may not use someone else's license. However, you may use the CB-23 as a receiver only without, or until you get, a license.

OPERATING PROCEDURES

You and other Citizens Band users will get more satisfaction from the use of your Citizens Radio if you and they employ proper operating procedures.

RECEIVING

Check the operating controls to make certain they are set properly for receiving on the selected channel. The number of the channel you have selected will appear at channel indicator window. You may listen on any channel by selecting the desired channel with SECTOR knob and CHANNEL knob, and adjusting for optimum operation with the VOLUME, SQUELCH and TUNE knobs. The relative strength of a received signal is indicated by the meter.

TRANSMITTING

The effectiveness of your transmissions depends upon the channel being clear and upon the way you use the microphone. Hold the microphone close to the lips. If you hold it too far away, your transmitter's effective range and loudness will be impaired. Talk in a normal speaking voice when transmitting, enunciate clearly and don't shout or speak too softly.

INITIATING CALLS

To call a station of another licensee, press the microphone push button and announce your call letters and the call letters of the station you are calling in the following manner "KRT-794 calling KRO-242". Release the microphone push button and listen for a reply. When a reply is heard, adjust TUNE knob for best reception.

To call a mobile unit or base station covered by your own station license, announce your call letters and unit number and the unit number of the station being called in the following manner "KRT-794 Unit One calling Unit Two". Release the microphone push button and listen for a reply.

RESPONDING TO CALLS

When you hear someone calling you, wait until the caller has stopped transmitting. Then pick up your microphone, press the microphone push button and acknowledge the call in the following manner "KRT-794 back to KRO-242, over". Release the microphone push button (8) and listen for the message. If the call is from one of your own units reply like this "KRT-794 Unit One back to Unit Two".

CONCLUDING TRANSMISSIONS

Two-way radio communication is maintained by alternately pressing the microphone push button to transmit and releasing it to listen. At the conclusion of a conversation announce your station call letters and sign off in the following manner "KRT-794 out".

ON-THE-AIR COURTESY

Since others may want to use the channel on which you are operating, keep all transmissions as short as possible, make no unnecessary transmissions and don't transmit when your channel is in use. To avoid loss of your license, or possible fine or imprisonment or both, by inadvertent or deliberate violation of the law, read and comply with F.C.C. (or D.O.T. in Canada) regulations. Get a copy of Volume VI, F.C.C. Rules and Regulations, which contains Part 19, from your CB-23 dealer, a field office of the U.S. Department of Commerce, or from the U.S. Government Printing Office, Washington 25, D. C.

COMMUNICATING RANGE

Intercommunication by Citizens Radio Stations operating in the 26.96-27.23 Mc/s band are limited by law to 150 miles. This range is seldom achieved. The purpose of Citizens Radio is to provide short-range personal and business communications facilities. Communicating distance is determined by "effective antenna elevation", noise, receiver sensitivity, effective radiated transmitter power and the way you use your microphone. Range may vary from one mile or so to 20 miles or more, depending upon many factors.

EFFECTIVE ANTENNA ELEVATION, which is not the same as antenna height, is the "effective elevation" of the antenna above surrounding objects and those intervening in the radio transmission path. In general, the greater the effective antenna elevation, the greater the range you will enjoy.

The "height" of your antenna is specifically limited by F.C.C. regulation. Refer to Volume VI, F.C.C. Rules and Regulations.

NOISE

Your CB-23 is a very sensitive receiver. If there were no "noise" to contend with, your receiving range would be greatly extended. Its receiving range, which cannot be increased by making the receiver more sensitive, can be extended by reducing noise pick-up. This can be done by installing the antenna where it will pick up less noise and more signal, and by suppressing the noises at their source.

Noise generated by the ignition systems of automobiles is the worst offender. It is a "popping" noise, much of which is eliminated or reduced by the Automatic Noise Limiter (ANL) built into your CB-23.

Noise is a form of radio signal which is generated by sparking electrical contacts, such as the brushes and commutator of a sewing machine motor, the vibrating contacts of an electric shaver, etc.

Information about suppression of ignition interference is contained elsewhere in this manual. Techniques for locating and suppressing other man-made electrical interference are described in several books on the subject which are available at radio parts stores and technical book shops.

You can do something about the noise generated by your own automobile or boat and in your home. But, there is little you can do about noise generated by other cars.

VEHICULAR INSTALLATIONS

The CB-23 is designed to be installed under the dashboard of a car or truck by means of the mounting plate furnished. Since the CB-23 is compact, it can be installed at any convenient location.

Under-dash Mount

Using the mounting bracket as a template, find the best location under the dash of the vehicle, taking into consideration handles, controls and the glove compartment. Bolt the mounting frame securely in place. Find a convenient location for the microphone mounting clip and fasten it securely, taking into consideration that the microphone cord might hamper the driver if the microphone mounting clip is not correctly placed.

Power Cable

Route the DC power cable so that its leads will reach the power take-off point. This can be at the ignition key, the ammeter or the storage battery, the red lead secured to the ungrounded line and the black lead secured to the vehicle frame. The best way is to connect the red lead directly to the ungrounded battery terminal and the black lead to the grounded battery terminal.

Antenna

You have a wide choice of mobile antennas. Install your antenna and connect the antenna end of the coaxial cable as instructed in the directions furnished with the antenna. Make sure the ground contact of the antenna base makes excellent contact with the car body. If you use a bumper mount, ground the bumper to the car frame with a short piece of flat metal braid.

Route the coaxial cable to the CB-23 location. The set end of the coaxial cable must be terminated in a PL-259 UHF connector.

Attach the antenna plug to the antenna receptacle at the back of the CB-23, and insert the coaxial socket at the set end of the DC power cable into the octal power connector, also at the back of the CB-23. Turn VOLUME knob clockwise. The pilot lamp behind the channel number window should now light. If your power take-off point is at the ignition switch, turn the ignition switch on if the pilot lamp doesn't glow.

After a minute or so, you should be able to hear CB stations by setting the CB-23 to various channels. You are now ready to receive and transmit (if you have a license).

Antenna Tune-Up

Your CB-23 has been adjusted for optimum output into a 50 ohm dummy antenna at Channel 12. Since channel 12 is approximately the center of the range of the 23 channels, it is suggested that all antenna tune-up adjustments be made on this channel. This is especially true if all 23 channels are to be utilized. The antenna tune-up procedure, which follows, should only be employed to check the antenna system or when it is desirable to favor one particular channel or group of channels or in the event that an antenna system deviating from 50 ohms impedience is employed. In all cases, it is advisable not to make the antenna tune-up adjustment unless you are experienced and have the necessary equipment to do this job properly.

To get maximum capability from your transmitter you should tune your CB-23 to the antenna system. To do so, you need a field strength meter (Lafayette TM-14, Monarch FS-1) or a thru-line type RF power meter (Seco 520, Cesco CB-52C, Lafayette TM-58).

If you use a field strength meter, place it a few feet from the antenna, but where you can see it. Turn the CB-23 on its side to expose the two alignment holes in the bottom. Set the CB-23 to Channel 12 and insert the tuning tool (General Cement Co., No. 8606) into hole A (see diagram) so that the tool engages the core of the transmitter tank coil (L106). When the channel is clear, press the microphone push button and turn the core for maximum field strength meter reading. Release the microphone push button and insert an insulated screw driver in hole B so that it engages with the screw of the antenna trimmer (C152). Press the microphone push button when the channel is clear, and turn the screw for maximum reading on the field strength meter. Release the microphone push button and re-insert the special tuning tool into hole A. When the channel is clear, again press the microphone push button and readjust the core (L106) for maximum field strength meter reading.

If you use a thru-line RF power meter, disconnect the antenna plug from the CB-23 and connect it to the output receptacle of the RF power meter. Using a coaxial jumper (with plugs at both ends), connect the input terminal of the RF power meter to the CB-23 antenna receptacle. Set the RF power meter switch to measure "power output" or "incident power". Tune L106 and C152 as described in the above paragraph for maximum meter reading. Set the RF power meter to measure "reflected" power. Retune L106 and C152, if necessary, until there is a maximum difference between "reflected" (low reading) and "incident" (high reading) meter indications.

Whenever making these adjustments, announce the station call letters at the beginning and end of a series of test transmissions.

If you do not have a field strength meter or RF power meter, have the antenna tune-up performed by a competent technician.

BOAT INSTALLATIONS

Fasten the mounting plate, furnished with your CB-23, at a convenient location, preferably at a distance from the engine to reduce ignition noise pick-up. Route the DC power cable, extending it, if necessary, to the boat's battery. The battery must be a 12-volt lead - acid type storage battery. If it is an Edison battery, measure the voltage across it while the engine is running. The voltage must not exceed 14.5 volts.

On a non-metallic boat, a coaxial antenna will probably be most effective since it is like a mast (18 feet tall) and has no horizontal ground radials. You can use a base-loaded whip or a full-length (9-foot) whip if you also install a ground plane (sheet metal or screening) at the base of the antenna. Connect one end of the coaxial cable to the antenna as instructed in the directions furnished with the antenna.

The other end of the coaxial cable must be terminated in a PL-259 UHF connector which is inserted in the SO-239 antenna connector at the rear of your CB-23.

When the antenna and power connectors have been properly connected to your CB-23, turn VOLUME knob clockwise. The channel indicator window should be illuminated. After a minute or so, you should be able to hear CB stations on one or more channels. You are now ready to receive and transmit (if you have received your license).

To get maximum transmission capability, tune the CB-23 to the antenna as described under ANTENNA TUNE-UP, or have this done for you by a competent technician.

FIXED INSTALLATIONS

To use the CB-23 at a fixed location, you must also have a suitable antenna system and a source of electric power at 115 volts (nominal), 60-cycle AC or 12 volts DC (where utility power is not available). To operate the CB-23 from a 220-volt AC source, an external step-down transformer is required. Where only 24-, 32-, 36- or 110-volt DC power is available, a suitable DC-to-AC inverter is required.

Insert the octal socket of the AC power cable into the octal plug at the rear of the CB-23 and the two-prong plug at the other end of the cable into an AC outlet. If operation from a 12-volt DC source is required, use the DC power cable and connect its leads to the battery of other DC source. Turn VOLUME knob clockwise. The pilot lamp behind the channel number window should glow.

The antenna may be one of the many types now available which are designed to operate in the 27-mc band and to be fed through a 50-ohm coaxial cable. Install the antenna, and connect the coaxial cable to the antenna as instructed in the directions furnished with the antenna.

The other end of the coaxial cable must be terminated in a PL-259 UHF connector in order to mate with the SO-239 connector at the rear of your CB-23. If you have had no experience with attaching a connector to coaxial cable, have this work performed by a competent technician, or buy a piece of coaxial cable of sufficient length which is already equipped with a PL-259 connector.

Never splice coaxial cable. If the coaxial cable is only a few feet longer than required, don't cut it; instead use it as it is, the excess coiled up if necessary. For runs of less than 50 feet, you can use RG-58/U coaxial cable. Better, for any length requirement is the lower loss RG-8/U coaxial cable, Foamflex, balloon or other type of low-loss coaxial cable of 50-ohm impedance. If you are not technically qualified to select coaxial cable, consult your CB-23 dealer.

To provide lightning protection, consult your CB-23 dealer about a coaxial-type lightning arrester and install it as instructed. Or, ground the antenna support pipe or bracket through a straight-as-possible length of No. 12 or larger wire to a cold water pipe or ground rod driven into moist earth, using a ground clamp to make a secure ground connection. Or connect a flexible wire from one of the screws at the back of your CB-23 to a cold water pipe or ground rod.

After you have connected your CB-23 to the antenna system and to a suitable power source, you are ready to use the CB-23 as a receiver. If you have a station license, or when you receive it, you are ready to transmit. To get maximum capability from your transmitter, tune the transmitter to your antenna system, as described under Antenna Tune-Up, or have a competent technician do it for you.

IGNITION NOISE SUPPRESSION

You can do something about noise generated by your own car, truck or boat, but you cannot do anything about stopping the radiation of noise generated by other nearby vehicles.

The typical modern automobile is equipped at the factory for suppression of noise that will interfere with the operation of AM broadcast band receivers. But, this treatment may not be adequate for Citizens Band reception.

Noise suppression kits are made by several manufacturers (SPRAGUE, HALLETT, ESTES, G-C ELECTRONICS) which are designed specifically for suppressing noise at Citizens Band frequencies.

To determine if your car, truck or boat is the source of noise, turn on your CB-23 and turn SQUELCH knob fully counter clockwise (beyond the click). Listen to the background noise with the engine off. Then start the engine and listen for an increase in noise. Vary the speed of the engine. If there is a change in the rate at which the popping noise occurs, your engine is the culprit. If you hear a whining noise, which changes in pitch as you accelerate the engine, it is again your engine that is at fault.

It would require an entire book of this size to explain the how, why and what-to-do of noise problems. If you are plagued with this problem, you can get informative advice from a booklet entitled "Giving Two-Way Radio Its Voice" which is available from Automotive Technical Service Dept., Champion Spark Plug Co., Inc., Toledo 1, Ohio.

TROUBLE SHOOTING

The CB-23 was designed for long life and to give reliable service. It contains many resistors, capacitors and other components which were carefully selected by the manufacturer. Even so, a component in any piece of electronic equipment may fail or change in characteristics, necessitating replacement. The tubes, vibrator and pilot lamp can wear out and may require periodic replacement. These can be replaced by the user, if he wishes to do so, preferably by a competent technician.

TUBES

You can test the tubes yourself if you have a tube tester, or with a do-it-yourself tube tester in a neighborhood store, or by taking the tubes to a radio shop for testing. Replace all weak, shorted or burned out tubes with new tubes of identical type. When you remove the tubes for testing, note which tube belongs in which socket. Sometimes, a tube which checks OK on a tube tester may not function properly in your set because all tube testers are not sufficiently critical.

VIBRATOR

The vibrator, which is active only when you operate your CB-23 on a 12-volt battery, is a plug-in device similar in appearance to a metal can. To replace it, pull the vibrator out of its socket and install a new one of identical type. If replacement of defective tubes and the vibrator does not restore operation, re-install the original vibrator and have your CB-23 checked by a competent technician.

NOTE: If your CB-23 should be totally inoperative, or if smoke or a burning odor is noticed, turn it off immediately and have it checked by a competent technician. Continued operation under such circumstances can cause additional damage.

WARNING

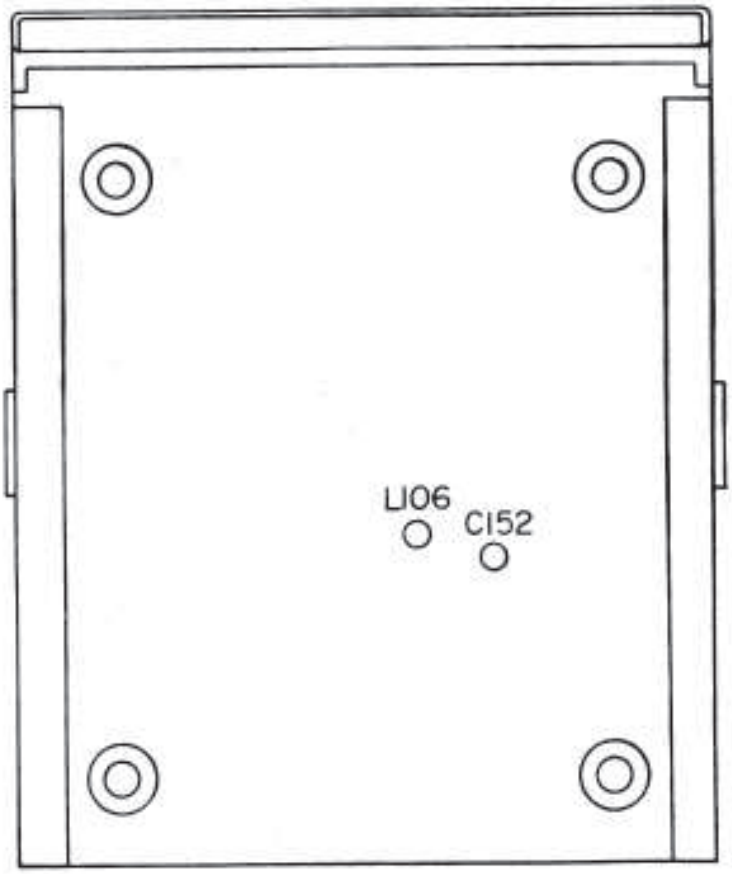
Certain repairs and adjustments to the CB-23 may be made legally only by a person, or working under the direct supervision of a person, possessing a valid First Class or Second Class F.C.C. Radiotelephone Operator License (or equivalent in Canada). This particularly pertains to those repairs or adjustments, such as replacement of crystals and transmitter oscillator components, which might affect the transmitter's ability to comply with government regulations.

GETTING A LICENSE

The CB-23 may not be operated as a transmitter except when covered by a valid Class D Citizens Radio Station license in the United States or a General Radio Service license in Canada. Any U. S. citizen (in Canada a landed immigrant is eligible) over 18 years of age may apply for such a radio station license.

The license application consists of F.C.C. form 505, which when completed, must be submitted to the Federal Communications Commission. These forms are available from your CB-23 dealer, your nearest F.C.C. field office or the Federal Communications Commissions, Washington 25, D.C. Instructions for completing the license application are furnished with the forms.

After you have filed your license application, you may have to wait several weeks for your license. But, you may not legally operate your transmitter until after your license has been granted and is in your possession.



BOTTOM VIEW OF CABINET

Antenna Tune-Up

Your CB-23 has been adjusted for optimum output into a 50 ohm dummy antenna at Channel 12. Since channel 12 is approximately the center of the range of the 23 channels, it is suggested that all antenna tune-up adjustments be made on this channel. This is especially true if all 23 channels are to be utilized. The antenna tune-up procedure, which follows, should only be employed to check the antenna system or when it is desirable to favor one particular channel or group of channels or in the event that an antenna system deviating from 50 ohms impedance is employed. In all cases, it is advisable not to make the antenna tune-up adjustment unless you are experienced and have the necessary equipment to do this job properly.

CB-23 CIRCUIT DESCRIPTION

Many transmitter or receiver troubles can frequently be resolved simply by testing and changing tubes and by making a few minor adjustments, but in order to properly service this set, it is important to be able to diagnose obscure troubles through an understanding of the circuits involved. It is for this purpose that this section is provided. A transceiver of this type contains several special circuits that are not usual in the normal transmitter or receiver commonly available. While not difficult to understand or service, the best operation is obtained when the set is adjusted in accordance with these instructions.

The complete circuit of the CB-23 is shown in the schematic diagram included at the end of this book. To help in understanding this diagram, a block version is presented on the next page. While reading the text, follow both the block and schematic diagrams -- one will illustrate the overall scheme, while the other will provide all of the connection details.

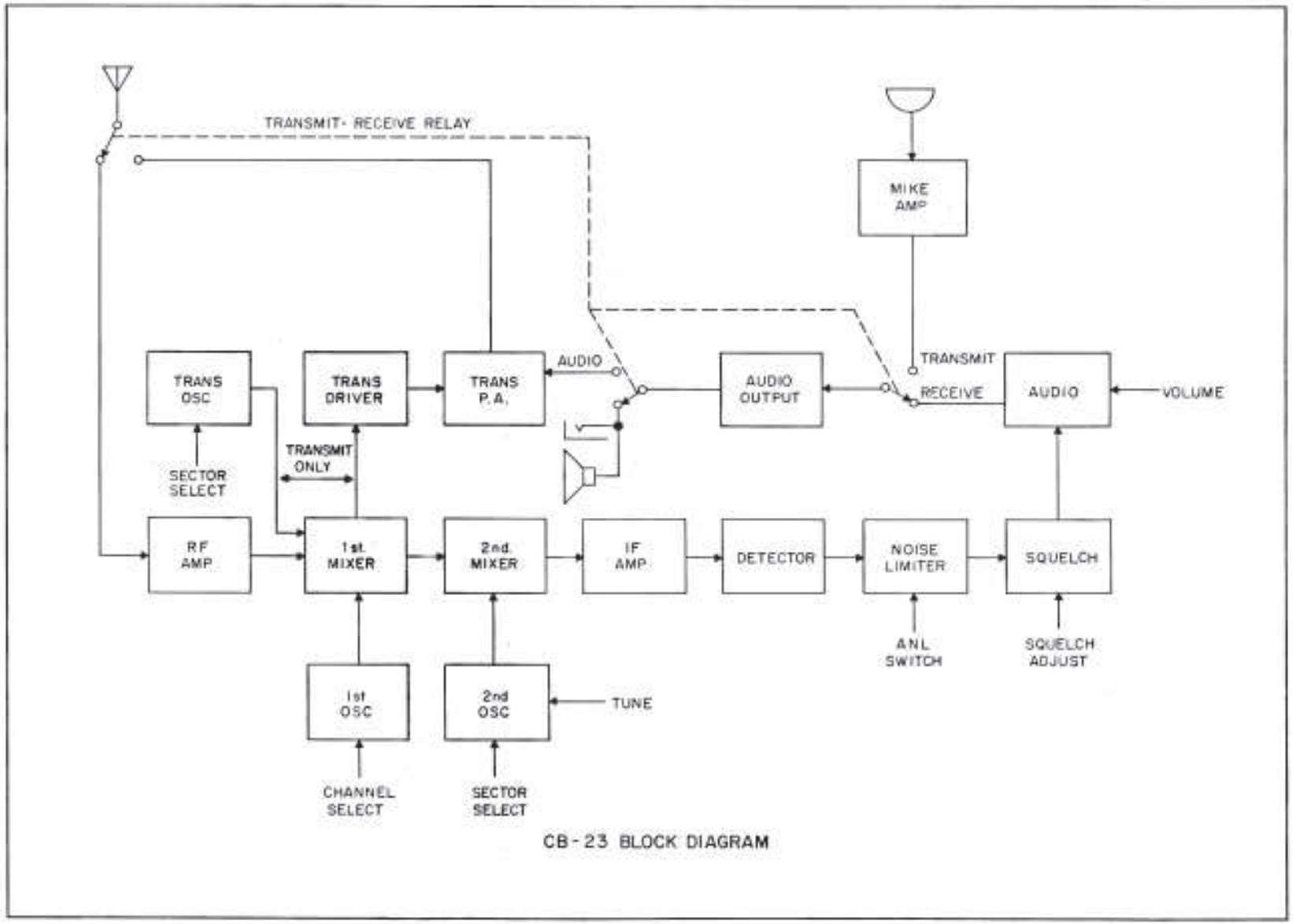
RECEIVER GENERAL CIRCUITRY

The receiver is a sensitive double superheterodyne using a crystal controlled first oscillator, and a temperature compensated second oscillator that is capable of sufficient front panel tuning control to compensate for slight frequency differences of received transmissions. A diode detector, an automatic noise limiter and an adjustable squelch system are included, and an efficient audio amplifier circuit provides ample power for the self-contained loudspeaker.

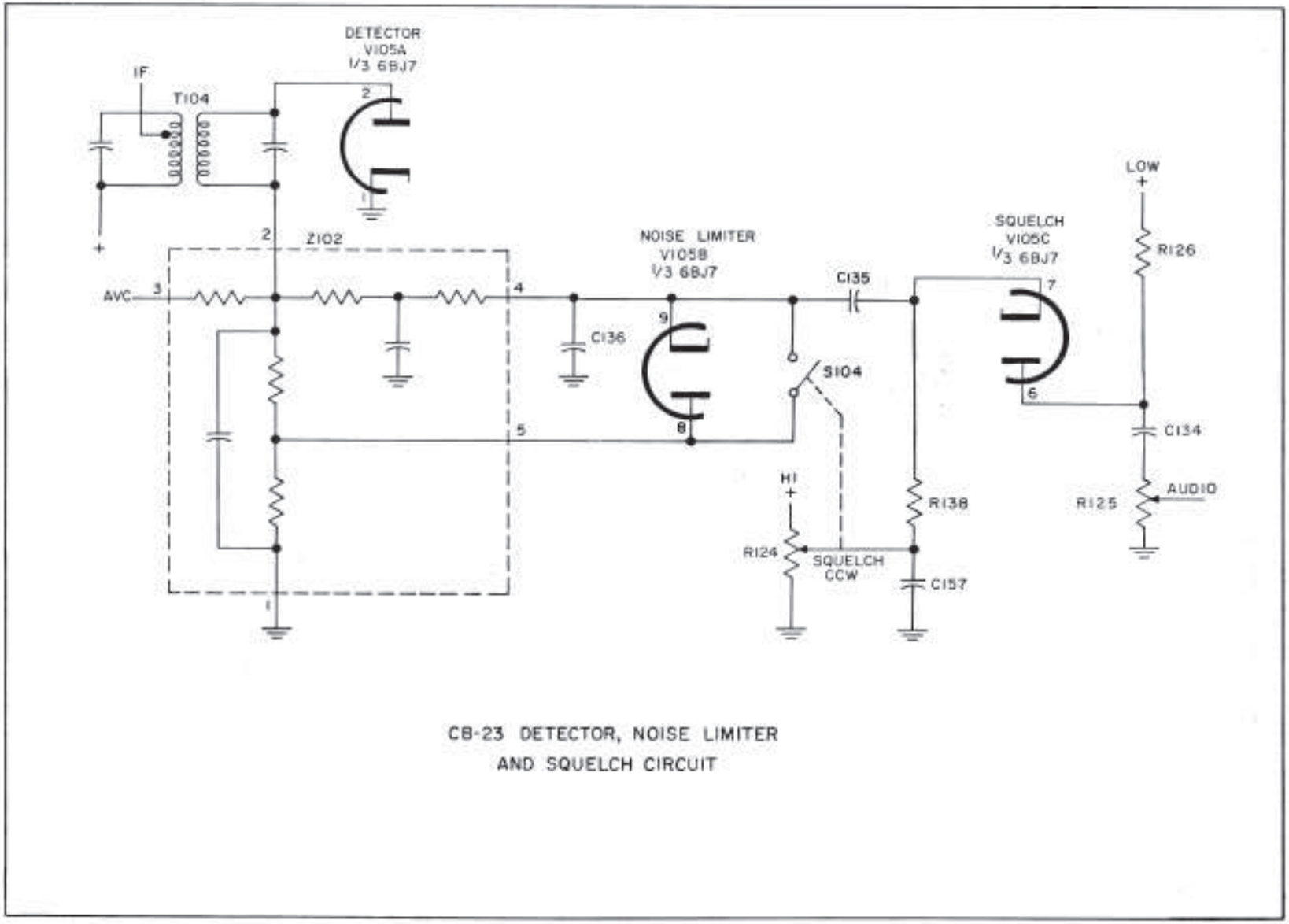
The received signal is applied to the RF stage through the transmit-receive relay contacts. Frequency conversion occurs in the first mixer to produce the first intermediate frequency (IF). The second mixer follows to produce the second IF. The second IF amplifier applies 262 KCS to the detector for the development of the audio signal.

The recovered audio is then applied to the noise limiter and squelch circuits as shown in the accompanying detailed diagram of this area. Assuming the squelch control turned fully counterclockwise and the ANL off, the audio is applied through the squelch tube to the volume control. The squelch tube is conducting at this time because V105 is conducting and clamps the grid and cathode return of V107 providing normal bias.

The automatic noise limiter is activated when the switch S104 is opened by turning the squelch control clockwise past the switch. The diode now opens the audio path when high noise signals such as ignition or similar pulse types are received. This audio discontinuity is momentary and does not effect intelligibility of the signal. Note that only the elimination of such noise at its source will provide the complete answer to ignition noise problems.



CB-23 BLOCK DIAGRAM



CB-23 DETECTOR, NOISE LIMITER
AND SQUELCH CIRCUIT

Turning the squelch control clockwise applies a positive voltage to the cathode of the squelch tube. This voltage results in a high negative bias applied to the grid, effectively cutting off conduction. When no signal is being received, no audio in the form of set or atmospheric noise is permitted to pass. When a signal is received, the signal produced counteracts the squelch control voltage until the cathode and grid returns are clamped and conduction occurs. The received audio is then passed to the volume control. From the above it is seen that the signal produced must be great enough to overcome the squelch control voltage. For this reason the correct setting of the squelch control is to turn it clockwise with no signal being received, until the background noise just disappears. Now when a signal is received, the squelch is overcome, and audio is heard.

A conventional audio amplifying circuit, consisting of V107A and B applies audio to the loudspeaker. The carrier level meter is in a bridge arrangement and is balanced between the cathode voltage of the second IF tube and the cathode voltage of the audio output tube. With no signal received the meter is set to zero by R128. When a signal is received, AVC is produced, and the second IF is biased to reduce plate current, unbalancing the meter circuit to cause the meter to read. The AVC is proportional to the strength of the received signal so that the meter reading will increase accordingly.

TRANSMITTER GENERAL CIRCUITRY

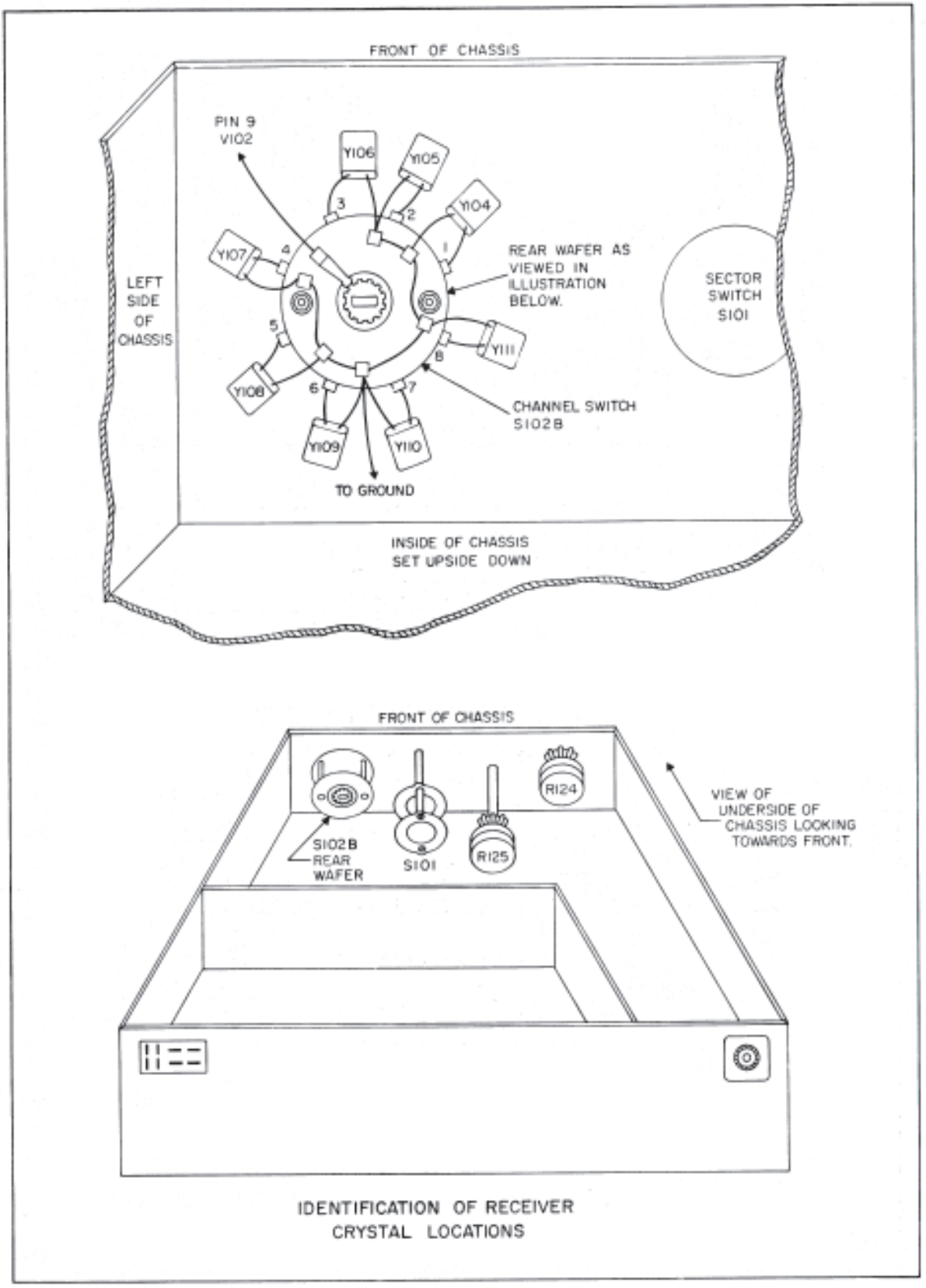
When the microphone button is depressed, the transmit-receive relay operates to mute the receiver and to turn on the transmitter. This occurs through the removal of B+ from the screens of the receiver RF and second mixer stages, transferring it to the transmitter oscillator and driver.

Transmitter modulation is developed by applying the microphone audio through the microphone amplifier and the audio output stage of V107B. The audio output transformer T107 acts in this case as the modulation transformer to produce plate modulation of the transmitter power output tube. The resulting modulated RF is applied to the antenna through the contacts of the transmit-receive relay. Antenna loading and tuning are accomplished by the adjustments of L106 and C152.

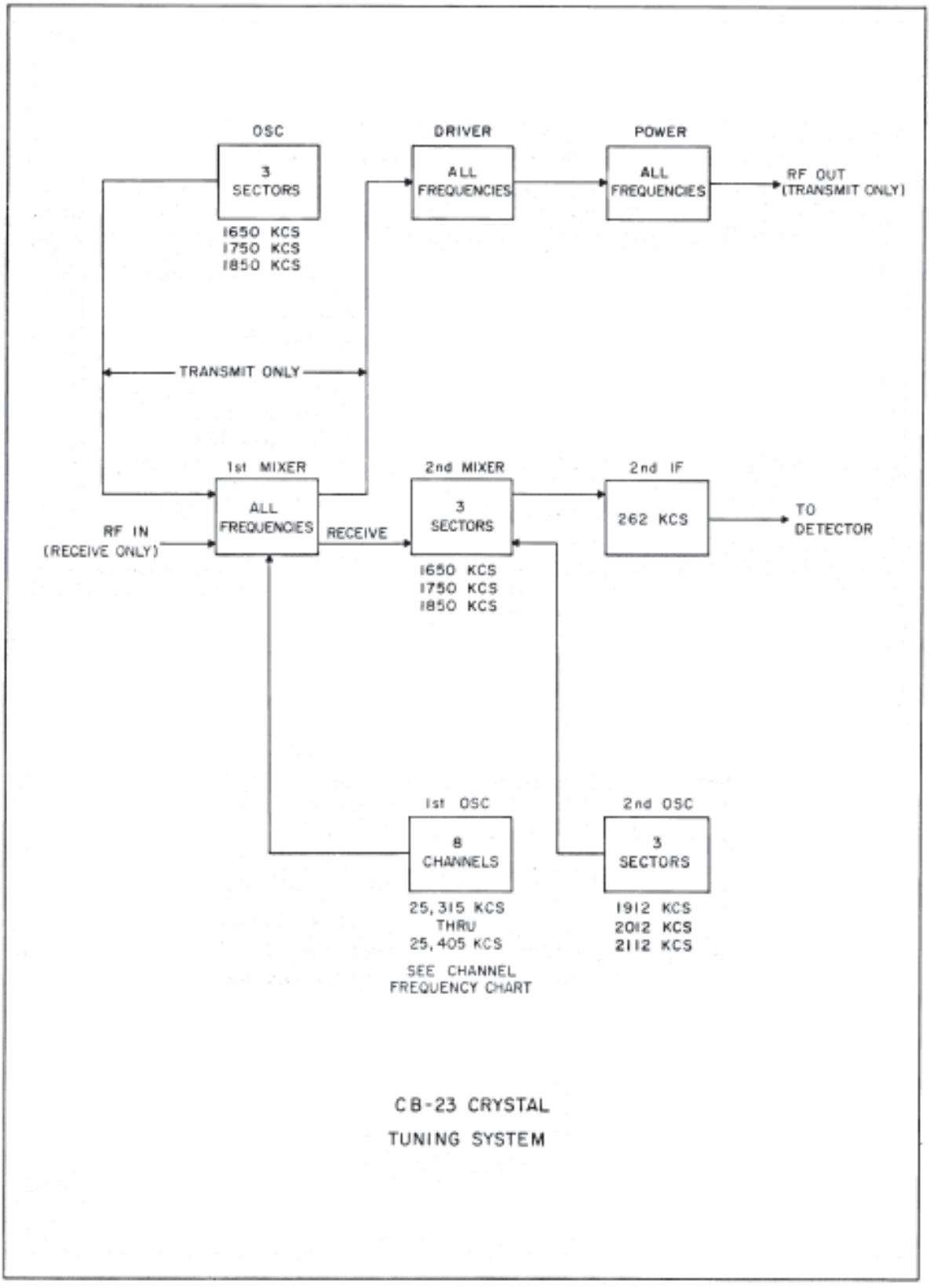
23-CHANNEL CRYSTAL SELECTION SYSTEM (Refer to Channel-Frequency Chart.)

While the receiver and transmitter electronic circuits are quite straight forward, the crystal oscillator arrangements to cover all 23 channels using a minimum of crystals is novel. This system is shown on the diagram, and the list of frequencies illustrates the method of obtaining the final IF for the receiver, and the RF output for the transmitter.

The design of the receiver, using crystals, is made possible by the fact that the spacing between channels is repeated in groups of four: 10 KCS spacing between channels 1 and 2, and between channels 2 and 3; 20 KCS spacing between channels 3 and 4. This pattern is repeated up to channel 23 except that the 23rd frequency is



IDENTIFICATION OF RECEIVER CRYSTAL LOCATIONS



CB-23 CRYSTAL

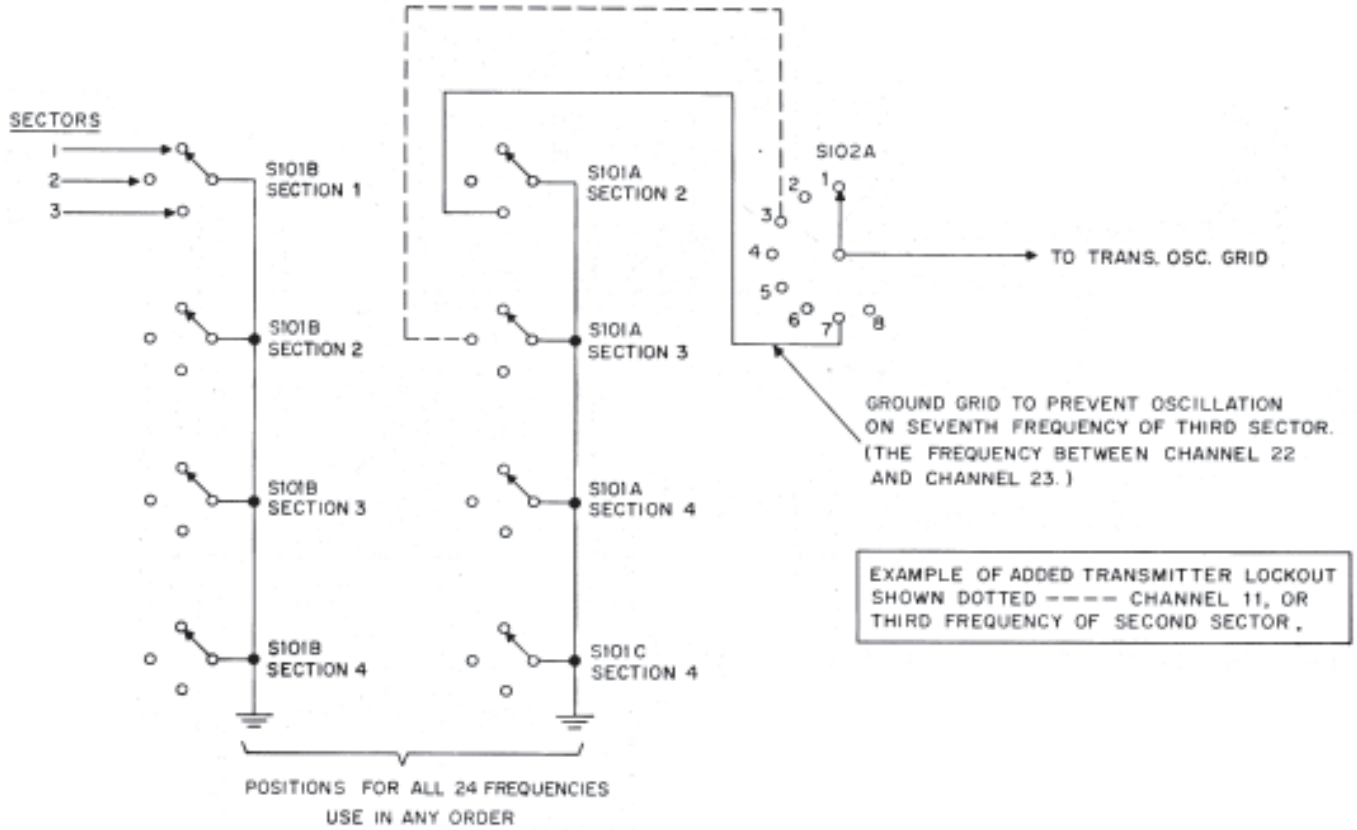
TUNING SYSTEM

		RECEIVER						TRANSMITTER	
	Channel	Freq.	RF Amp.	1st Osc.	1st IF	2nd Osc.	2nd IF	Oscillator Freq.	Output Freq.
SECTOR 1	1	26,965	26,965	25,315	1650	1912	262	1650	26,965
	2	26,975	26,975	25,325	1650	1912	262	1650	26,975
	3	26,985	26,985	25,335	1650	1912	262	1650	26,985
	4	27,005	27,005	25,355	1650	1912	262	1650	27,005
	5	27,015	27,015	25,365	1650	1912	262	1650	27,015
	6	27,025	27,025	25,375	1650	1912	262	1650	27,025
	7	27,035	27,035	25,385	1650	1912	262	1650	27,035
	8	27,055	27,055	25,405	1650	1912	262	1650	27,055
SECTOR 2	9	27,065	27,065	25,315	1750	2012	262	1750	27,065
	10	27,075	27,075	25,325	1750	2012	262	1750	27,075
	11	27,085	27,085	25,335	1750	2012	262	1750	27,085
	12	27,105	27,105	25,355	1750	2012	262	1750	27,105
	13	27,115	27,115	25,365	1750	2012	262	1750	27,115
	14	27,125	27,125	25,375	1750	2012	262	1750	27,125
	15	27,135	27,135	25,385	1750	2012	262	1750	27,135
	16	27,155	27,155	25,405	1750	2012	262	1750	27,155
SECTOR 3	17	27,165	27,165	25,315	1850	2112	262	1850	27,165
	18	27,175	27,175	25,325	1850	2112	262	1850	27,175
	19	27,185	27,185	25,335	1850	2112	262	1850	27,185
	20	27,205	27,205	25,355	1850	2112	262	1850	27,205
	21	27,215	27,215	25,365	1850	2112	262	1850	27,215
	22	27,225	27,225	25,375	1850	2112	262	1850	27,225
	--	--	27,235	25,385	1850	2112	262	--	--
	23	27,255	27,255	25,405	1850	2112	262	1850	27,255

HETERODYNE FOR TRANSMIT

FREQUENCY

CHANNEL - FREQUENCY CHART



PREVENTING TRANSMISSION ON
SPECIFIC CHANNELS

omitted and the 24th is numbered channel 23. For the best design results, the CB-23 includes 8 crystals for the first 8 channels then reuses them, in order, for the remaining two 8-channel groups.

An inspection of the frequencies of channels 1, 9 and 17 will show that they are 100 KCS apart in turn. The heterodyne between each of the channel frequencies, produces three different intermediate frequencies in turn, each 100 KCS apart. In the receiver, the tuned circuits between the first and second mixers are switched to tune to the proper intermediate frequency as required.

Since there are three first intermediate frequencies, the second oscillator is also adjusted in frequency to produce the final IF of 262 KCS for all channels received.

The technique designed to obtain three intermediate frequencies in the receiver is reversed to produce the RF output for the transmitter. Now the receiver first oscillator frequency is heterodyned with three transmitter oscillator frequencies to produce all of the channel frequencies. The receiver first mixer is used for this frequency heterodyning process, and the final channel signal is applied to the transmitter driver through the top sections of the interstage coils T102 and T107.

Finally, switch sections are reserved to permit channels to be inactivated for transmission. These are: S101A, sections 2, 3 and 4; S101B, all sections; S101C, section 4; S102A all sections. The wiring provided with the CB-23 does not permit the frequency between channel 22 and 23 to be transmitted. In the same manner, it is possible to prevent any other channel or channels from transmitting. This wiring does not affect the receiver; all channels can be received. The switch wiring system is shown in the illustration.

POWER SUPPLY SECTION

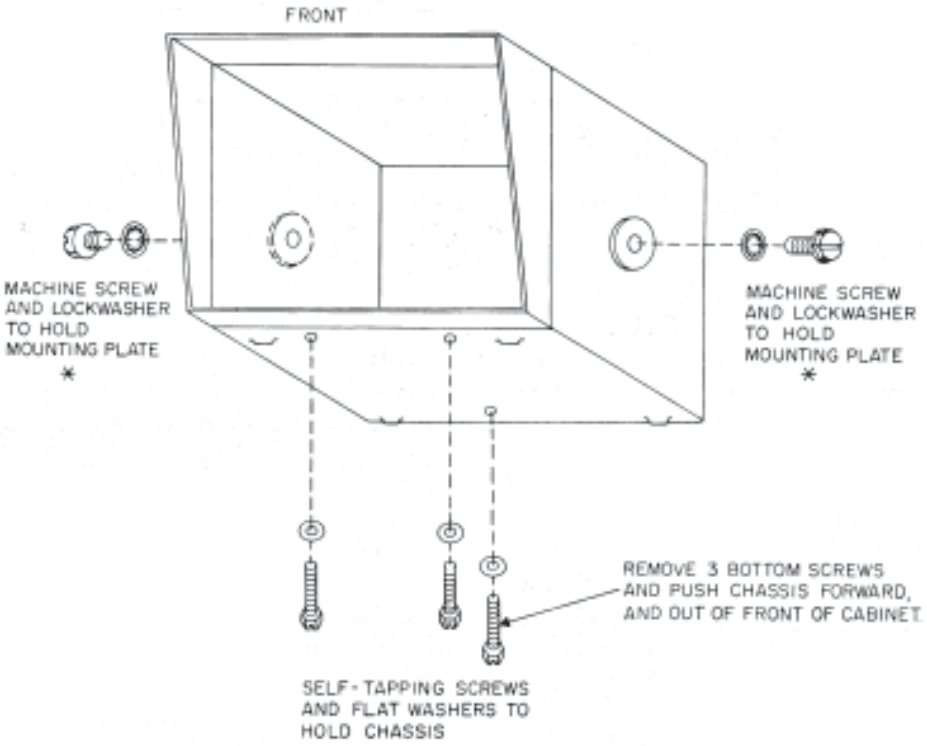
The cables supplied permit the use of the CB-23 from either 115-volt AC 60-cycle, or a 12-volt DC source. In either case the secondary of the power transformer feeds a voltage doubler circuit using two diode rectifiers.

CB-23 SERVICE AND MAINTENANCE

REMOVING AND REPLACING THE CHASSIS

Disconnect the antenna and the power cables, remove the screws from the bottom of the cabinet, and pull out the chassis.

When replacing the chassis, line up the holes in the cabinet with the chassis points designed to receive the screws.



* MOUNTING PLATE MAY BE ABOVE OR BELOW CABINET DEPENDING ON INSTALLATION – SEE USER'S MANUAL FOR INSTALLATION DETAILS. NOTE THAT REAR SECTION OF MOUNTING PLATE HOOKS OVER CABINET EDGE.

CHASSIS MOUNTING IN CABINET

REPLACING THE CHANNEL DIAL DRIVE BEAD CHAIN

Normally it should not be necessary to remove the front panel except to repair a part of the channel or sector indicator dials or dial drives. The instructions below show how the panel is to be removed, and provide the proper method to replace the channel dial drive bead chain. Refer to the diagrams for the location and identification of all parts.

Step 1. Remove the chassis from the cabinet.

Step 2. Remove the five knobs from the controls. The tune knob is held by a set screw, the others just pull off.

Step 3. Set the tune control so that its plates are fully meshed. Remove the nuts holding the headphone jack and the tune control.

Step 4. At the rear of the panel, remove the two nuts holding the meter wire lugs. Be careful not to turn the nuts against the meter back, these are internal mounting points.

Step 5. Remove the three screws and nuts holding the panel to the chassis. Note that two of the stand-offs will be loose, but the third holds the microphone cable clamp.

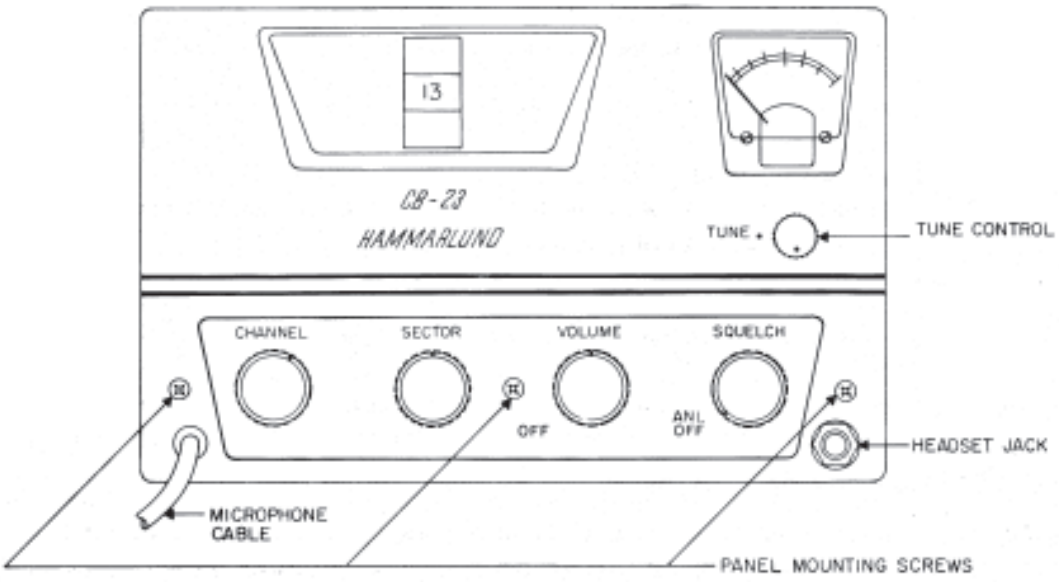
Step 6. Turn the panel around towards the microphone cable to expose the dials.

Step 7. Loosen but do not remove the two set screws holding the sector plate to its control shaft. Pull off the plate.

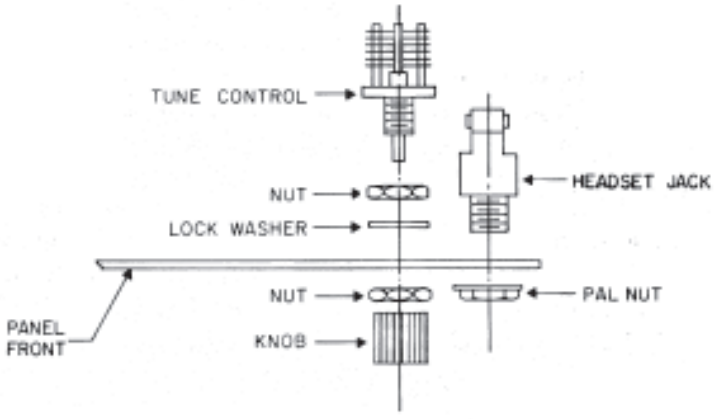
At this point you are ready to replace the bead chain. Because the chain must fit over the pulley on the dial shaft behind the dial, the dial and pulley must be removed. While removing the dial by loosening the pulley set screws may be a simple method, it is recommended that the C-washer be removed, and the dial and shaft be pulled out. This retains the dial positioning on its shaft.

The bead chain is intended to fit tightly. If difficulty is found in inserting the shaft into the bushing when the chain is in place, loosen the bushing nut sufficiently to tilt the bushing. Now the shaft will be inserted easily. CHECK THAT THE DIAL INDICATION AGREES WITH THE CHANNEL SWITCH POSITION. See illustration. Tighten the bushing nut, using two wrenches if necessary. Replace the C-washer.

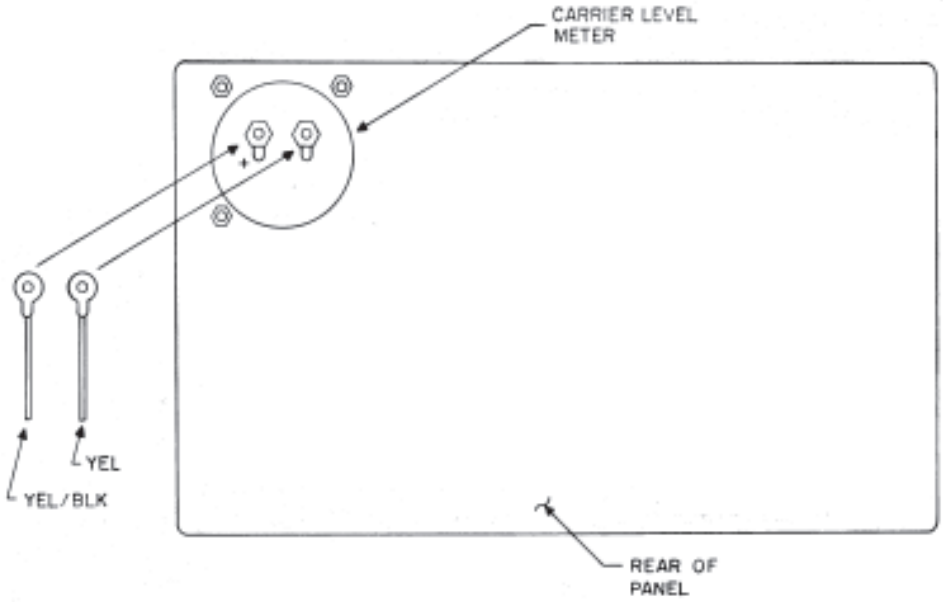
Reverse the steps above to replace the sector dial, the panel, the knobs, etc. Follow the illustrations for the proper locations of all parts. Position the sector dial plate so that the open spaces expose the numbers properly.


13
CB-23
HAMMARLUND
TUNE
TUNE CONTROL
CHANNEL
SECTOR
VOLUME
SQUELCH
OFF
ANL OFF
HEADSET JACK
MICROPHONE CABLE
PANEL MOUNTING SCREWS

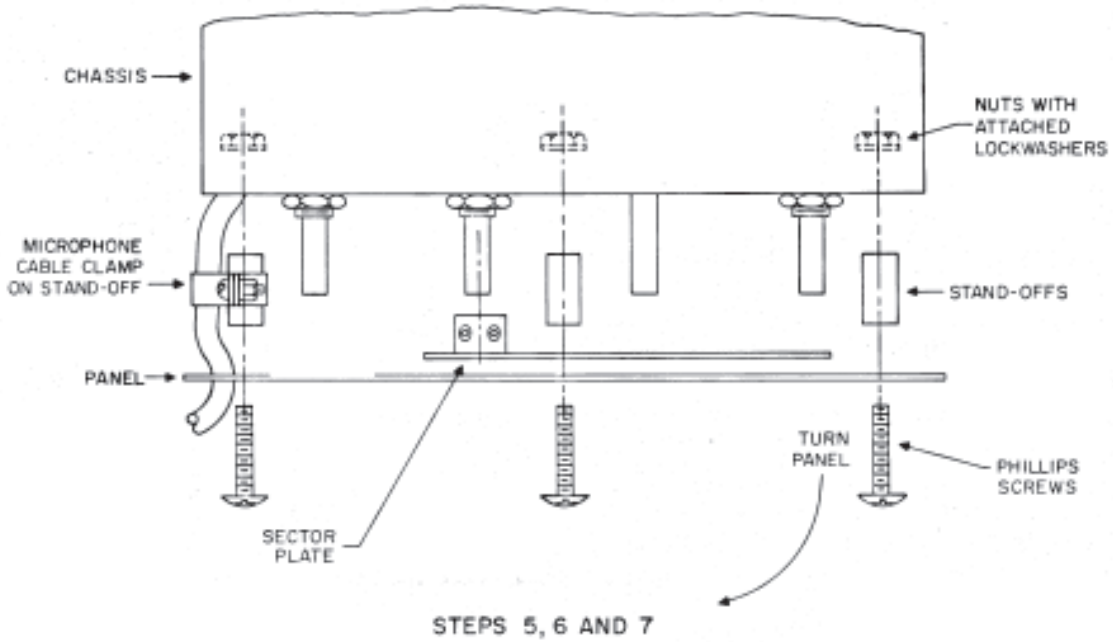
STEP 2


TUNE CONTROL
NUT
LOCK WASHER
NUT
KNOB
HEADSET JACK
PAL NUT
PANEL FRONT

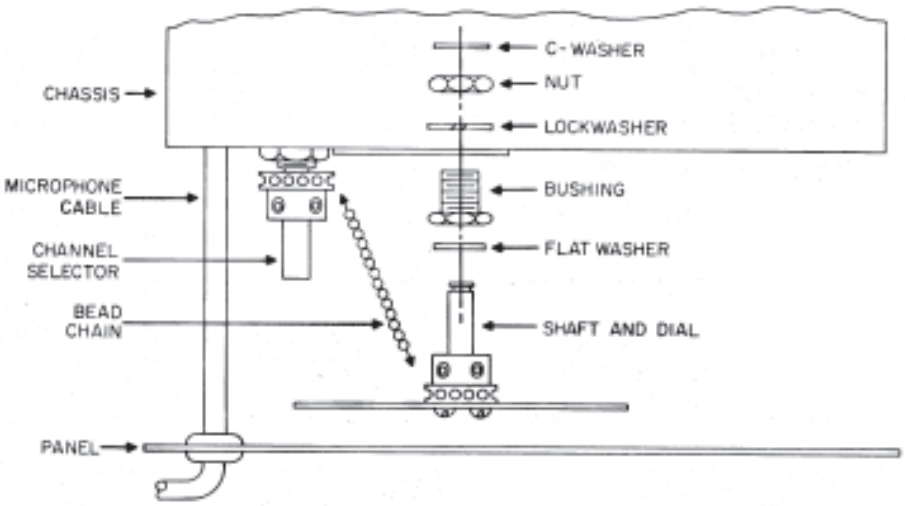
STEP 3



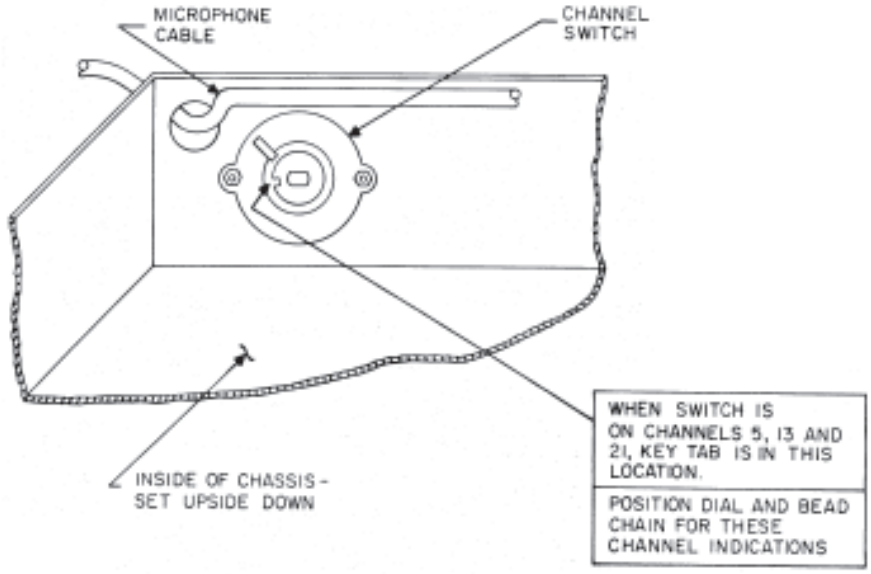
STEP 4



STEPS 5, 6 AND 7



BEAD CHAIN REPLACEMENT



DIAL CHANNEL POSITIONING

ALIGNMENT PROCEDURE

The CB-23 has been carefully aligned at the factory and should not require any more than a slight adjustment to retain the peak of its performance. If alignment is necessary, follow the instructions provided below with care.

For the alignment procedure, the equipment listed below is required:

Thin shaft insulated screwdriver.
Non-metallic alignment tool. (General Cement Co., No.8606)
DC vacuum-tube voltmeter.
Signal generator(s) capable of accurately producing unmodulated signals of: 262 KCS, 1650 KCS, 1850 KCS, 27.1 MCS.
Field strength meter (Lafayette TM-14 or Monarch FS-1) or through-line type power meter for RF (Lafayette TM-58, Seco 520 or Cesco CB-52C)

Alignment must be undertaken with the CB-23 chassis out of its cabinet. Remove the chassis from the cabinet as instructed in this Manual. (Service and Maintenance, Page 19.)

Connect the CB-23 line cord into the correct source of power and turn it on. BEFORE ALIGNMENT, THE SET MUST BE ALLOWED TO WARM UP FOR AT LEAST A HALF HOUR. This is to assure frequency stability.

After warm up, check that no signal is being received and adjust the meter zero control on the right side of the chassis for zero on the meter scale, if required.

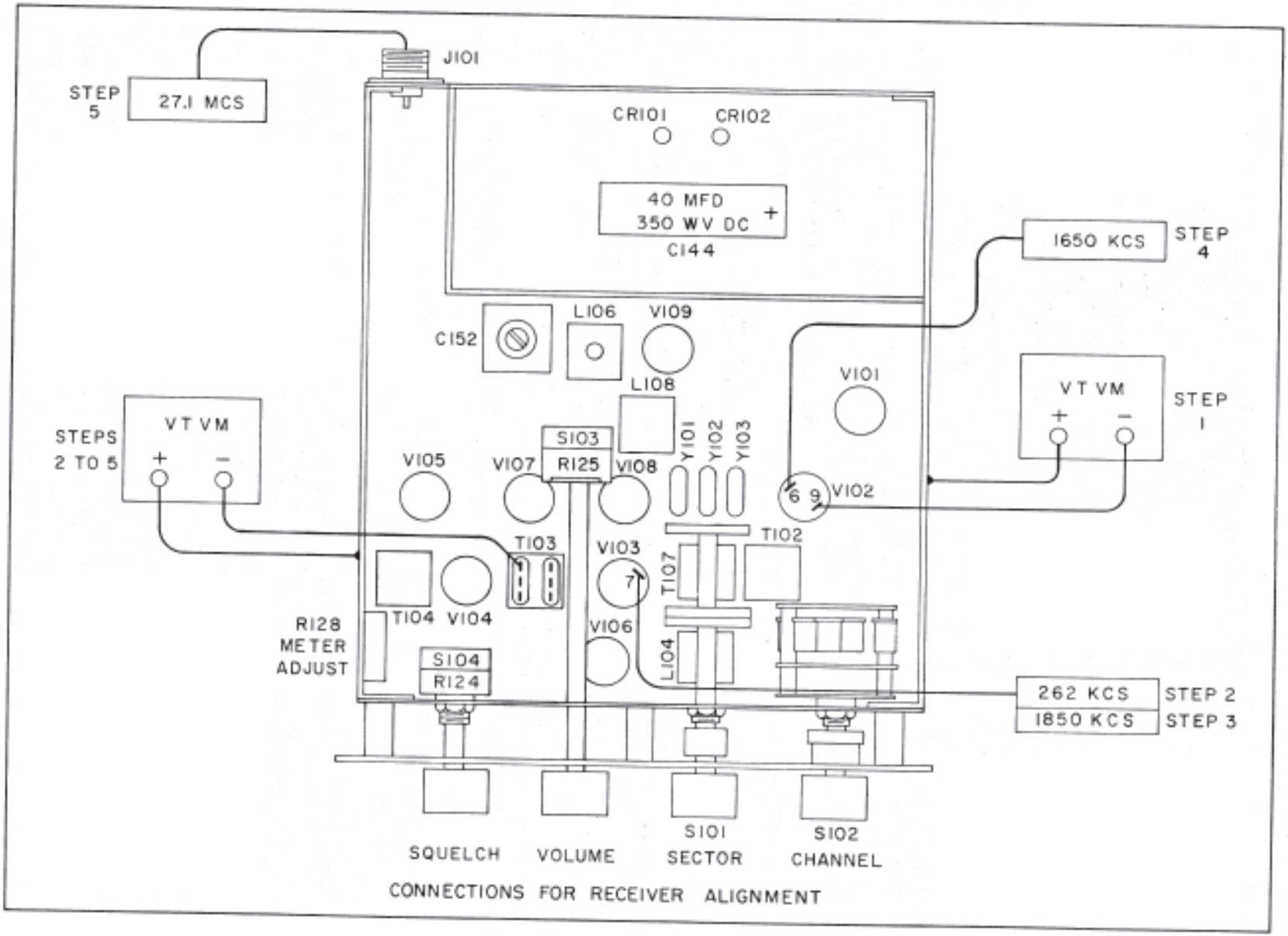
Turn squelch control off. Set the tune control so that the plates are in half mesh (dot on knob in line with dot on panel).

Note that the coil slugs are adjusted from the top of the can. Be sure you are turning the correct slug when there are two slugs in the same can; it is easy to be turning the wrong one, or even to be turning both at once if they happen to be close together inside the coil.

Receiver

Step 1. First Oscillator - The common connection of the RF amplifier and the first oscillator feed at the grid of V102A can cause interaction in the tuning of L102 and L103, resulting in feedback that sounds as a loud burbling noise in the loudspeaker. Follow these instructions to be sure of correct tuning without feedback.

Connect the VTVM between pin 9 of V102 and ground as shown in the diagram. Turn the slug of L102 counterclockwise as far as possible. Turn the slug of L103 counterclockwise as far as possible.



CONNECTIONS FOR RECEIVER ALIGNMENT

Now turn the slug of L103 slowly clockwise until the VTVM shows 20 volts DC. This is the correct tuning point. Note that if the slug is continued to be turned clockwise, the voltage will continue to rise and then fall off until oscillation finally stops. Be sure you have tuned L103 as directed above for correct operation.

Step 2. Second IF - Connect the VTVM between the pin of T103 and ground as shown in the diagram. This connection will remain for all of the receiver alignment procedure to follow.

Apply an unmodulated 262 KCS signal to pin 7 of V103 as shown in the diagram. Adjust both slugs of T103 and T104 for a peak reading. Set the input signal level so that the VTVM reads between -1 and -1.5 volts when the coils are peaked. Repeat these adjustments until no further improvement can be noticed.

Step 3. Second Oscillator - Set the sector switch extreme clockwise, to the highest sector. Apply an unmodulated 1850 KCS signal in place of the 262 KCS signal of Step 2 as shown in the diagram. Adjust L104 for a peak negative reading of the VTVM. Remember to reduce the input signal level as necessary to maintain about -1 to -1.5 volts.

Step 4. First IF - Set the sector switch counterclockwise, to the lowest sector. Apply an unmodulated 1650 KCS signal to pin 6 of V102 as shown in the diagram. Adjust the TOP slugs of T102 and T107 for a peak reading on VTVM, maintaining -1 to -1.5 volts as in Step 3.

Step 5. RF and Mixer - Set the sector and channel switches to receive channel 12. Apply an unmodulated 27.1 MCS signal to the antenna input connector J101. Adjust L102 and T101 for a peak reading, again maintaining -1 to -1.5 volts as in step 3 and 4.

Transmitter

Connect the transmitter RF output to an RF power meter and 50 ohm dummy load. To activate the transmitter for these adjustments, press the microphone switch.

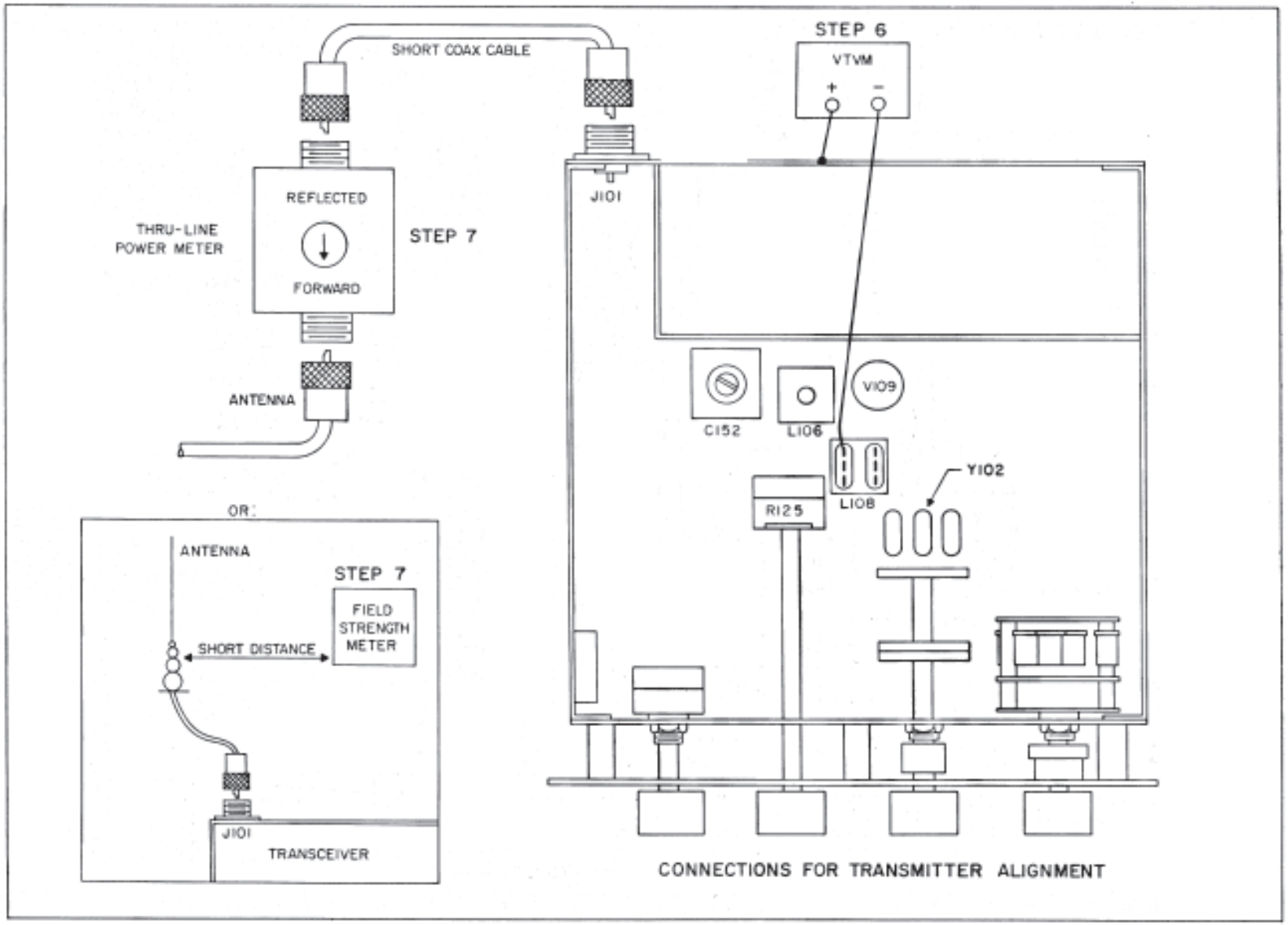
Step 6. Mixer and Driver - Set the sector and channel switches to receive channel 12. Connect the RF output into a 50-ohm dummy load. Connect the VTVM between the pin of L108 and ground as shown in the diagram. Adjust the BOTTOM slugs of T102 and T107, and L108 for peak VTVM reading. Check for proper adjustment by shorting crystal Y102 (see diagram for location). If the adjustments were correct, the meter reading should drop to zero.

Step 7. RF Output - Set up the field strength meter or the thru-line RF power meter to measure the output of the transmitter. Set the sector and channel switches as above to channel 12.

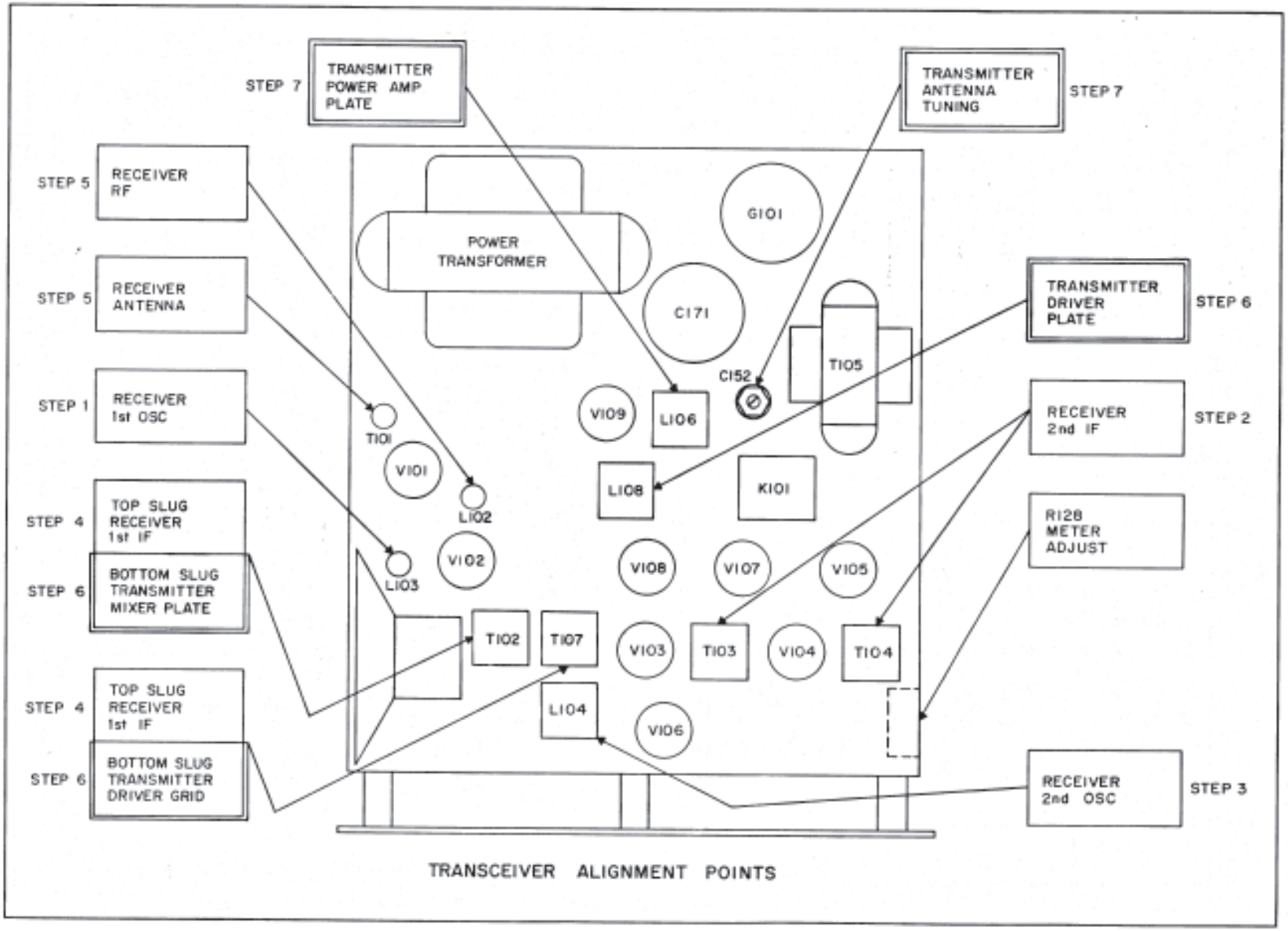
Using the RF thru-line meter: Set the meter to read Power Output of Incident Power. Adjust L106 for a peak RF thru-line meter reading. Now adjust C152 for a peak reading

and repeak L106 again. Continue alternate tuning of C152 and L106 until no further improvement can be noted on R.F. thru-line meter.

This completes the entire alignment procedure for the transceiver. Return the chassis to the cabinet, reconnect the antenna and power cables, ready for operational use.



CONNECTIONS FOR TRANSMITTER ALIGNMENT



TRANSCEIVER ALIGNMENT POINTS

TUBE	Pin 1	Pin 3	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
6AZ8 V101	*50K	*50K	75	.4	0	2 meg	0		47K
6AZ8 V102	*50K	*50K	100	.4	0	47K	0	50K	100K
6BE6 V103	47K	100	.4	.5	*50K	*50K	2.2 meg		
6BA6 V108	0	0	.4	.6	*50K	50K	100		
6BJ7 V105	0	180K		2	0	2 meg	56K	100K	
12AX7 V106	*50K	47K	4.2	0	0	*50K	4.7 meg	2.2K	.4
6GW8 V107	1 meg	180	*50K	.5	.2	*50K	170	56K	*50K
6BA6 V104	2 meg	0	.4	0	*50K	*50K	100		
6DS5 V109	10K		.4	.6	*50K	*50K			

*This is a B+ point and takes a while to come up to a higher resistance. Any reading above 50K is normal.

CONDITIONS

NL. OFF. PWR. OFF Channel 8 Selector extreme CCW. PWR. Cable OFF.
Meter is connected from point of test and chassis.

RESISTANCE MEASUREMENT CHART

TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V101 6AZ8									
Receive	230	110	1.5	6.2 AC	0	-.8	0	0	0
Transmit	---	0	0	6.2 AC	0	-25	10	160	---
V102 6AZ8	175	107	.55	6.2 AC	0	0	0	172	-20 Max.
V103 6BE6	0	6	6.2 AC	12.4 AC	235	67	-.6		
V104 6BA6 IF Amp	0	0	6.2 AC	0	215	107	1.1		
V105 6BJ7	0	0	---	6.2 AC	0	100	110	0	0
V106 12AX7	235	0	0	0	0	220	0	0	6.2 AC
V108 6BA6									
Receive	0	0	6.2 AC	12.4 AC	240	0	.15		
Transmit	---	0	6.2 AC	12.4 AC	170	100	1.35		
V109 6DS5									
Receive	0	65	6.2 AC	12.4 AC	280	280	-----		
Transmit	#-17	0			*182.5	155	-----		
V107 6GW8									
Receive	0	110	265	12.4 AC	6.2AC	280	6	0	210
Transmit	00	32	240	12.4 AC	6.2AC	255	5	0	170

*Transmitter on and volts read at junction of R113 and C179
#Transmitter on and volts read at junction of R112 and R148
-- Indicates points not to be measured.

CONDITIONS

115V AC line source. Receiver on Channel 8. 50 ohm dummy load connected to Antenna
Reading taken W/20K ohm per volt meter. N.L. OFF; Transmitter properly ADJUSTED.

VOLTAGE MEASUREMENT CHART

PARTS LIST CB-23

SCHEMATIC DESIGNATION	DESCRIPTION	PART NO.
C101, C108, C147	CAPACITOR, Dur-Mica DM-15 10MMF ±10% 500V	K23006-8
C102, C103, C104, C105,) C110, C116, C117, C118,) C120, C121, C122, C146,) C153, C156, C158, C160,) C177, C178, C179)	" Disc Ceramic .001MFD, GMV, 1000V	M23034-20
C107, C128	" Dur-Mica DM-15 47MMF ±10%, 500V	K23006-6
C111, C112, C125, C126,) C134, C135, C137, C184,) C186	" Disc Ceramic .01MFD +80-20%, 600V	M23034-19
C113, C124	" Dur-Mica DM-15 405MMF ±2%, 100V	K23006-131
C114, C123	" Dur-Mica DM-15 820MMF ±5%, 100V	K23006-132
C115, C155, C161	" Dur-Mica DM-15 1MMF ±.5MMF, 500V	K23006-36
C127, C129, C130, C131,) C132, C133, C163, C164,) C183)	" Disc Ceramic .02MFD +80-20%, 500V	M24034-27
C136, C145, C150, C181	" Dur-Mica DM-15 300MMF ±10%, 500V	K23006-128
C138, C139	" Dur-Mica, DM-19 3000MMF ±1%, 100V	K23027-28
C140	" Dur-Mica DM-15 720MMF±1%, 100V	K23006-140
C141	" Dur-Mica DM-19 1770MMF ±1%, 100V	K23027-30
C142	" Disc Ceramic .005MFD, GMV, 1000V	M23034-10

SCHEMATIC DESIGNATION	DESCRIPTION	PART NO.
C143	CAPACITOR, Variable, 1.9-15.8MMF	K34602-G3
C144	" Electrolytic 40MFD, 350V	K23073-83
C148	" Dur-Mica DM-15 30MMF ±10%, 500V	K23006-130
C152	" Trimmer 65-340MMF	K23935-1
C157, C187	" Mylar, .1MFD, 400V	K23927-4
C159	" Disc Ceramic .005MFD +80-20%, 500V	M23034-37
C166	" Metallized Paper Tubular 1MFD, 200V	K23035-7
C167	" Disc Ceramic .01MFD ±20%, 500V	M23034-16
C168	" Dur-Paper .15MFD ±10%, 600V	K23045-8
C169, C170	" Disc Ceramic .001MFD GMV, 2000V	M23034-50
C171	" Electrolytic 40-40-40/100	K15504-73
C171A	" 40MFD - 350V	Part of C171
C171B	" 40MFD - 350V	Part of C171
C171C	" 40MFD - 350V	Part of C171
C171D	" 100MFD - 25V	Part of C171
C173, C174, C175, C176	" Feed-Thru 1500MMF +80-20%	K23094-1
C180	" Dur-Mica DM-15 8MMF ±.5MMF, 500V	K23006-73
C182	" Temp. Compensating 47MMF + 5%	K23010-7
C187	" Mylar, .1MFD, 400V	K23927-4
CR101, CR102	RECTIFIER, Silicon (1N3756)	M41223-1

SCHEMATIC DESIGNATION	DESCRIPTION	PART NO.
G101	VIBRATOR	K51038-1
I101	LAMP, Incandescent #47	K16004-1
J101	CONNECTOR, Receptacle (Antenna)	K16111-1
J102	PHONE JACK	K41113-2
J103	CONNECTOR, Female	K16086-3
K101	RELAY, 4 PDT	K40417-1
L101	CHOKE, R.F. Plate, 25 Mh	K42356-21
L102	COIL, Mixer Grid	K39135-1
L103	COIL, H.F. Osc. Plate	K39135-1
L104	COIL, 2nd Conversion Tank	M39139-2
L105	CHOKE, 2nd Conversion Cathode, 100 Mh	K42356-22
L106	COIL, Final Tank	M39137-1
L107	CHOKE, P.A. Shunt Feed	K39161-1
L108	COIL, Driver Plate	M39138-1
M101	METER	K39191-1
MK101	MICROPHONE	P39190-1
R102	RESISTOR, Fixed, 180Ω ±10%, 1/2 W	K19309-31
R103, R106, R134, R154, R159	" " 100K ±10%, 1/2W	K19309-97
R104, R107, R108, R117, R119, R139, R156	" " 2.2K ±10%, 1/2W	K19309-57
R105, R109, R114, R120, R137	" " 100Ω ±10%, 1/2W	K19309-25
R110	" " 18K ±10% 1W	K19310-79
R112	" " 6.8K ±10%, 1/2W	K19309-69
R113	" " 10K ±10%, 1/2W	K19309-73
R115, R127, R135, R136, R157	" " 47K ±10%, 1/2W	K19309-89
R116	" " 33K ±10%, 1W	K19310-85
R121	" " 56K ±10%, 1/2W	K19309-91
R124	" Var. { 1MEG ±30%, 1/4W	K15382-10
	" " { Includes S104	
R125	" " { 1MEG ±30%, 1/4W	K15382-9
	" " { Includes S103	

SCHEMATIC DESIGNATION	DESCRIPTION	PART NO.
R126, R138, R153	RESISTOR, Fixed, 1MEG ±10%, 1/2W	K19309-121
R128	" Var., 170Ω	K19444-1
R131	" Fixed, 4.7MEG ±10%, 1/2W	K19309-137
R132	" " 4.7K ±10%, 1/2W	K19309-65
R133	" " 10K ±10%, 1W	K19310-73
R141, R142	" " 270Ω ±10%, 1W	K19310-35
R143	" " 470K ±10%, 1/2W	K19309-113
R144	" " 10Ω ±10%, 2W	K19304-154
R145	" " 100Ω ±10%, 2W	K19304-153
R146	" " 1K ±10%, 10W	K19337-1
R147	" " 15K ±10%, 2W	K19304-46
R148	" " 1.5K ±10%, 2W	K19304-22
R150	" " 910Ω ±5%, 1/2W	K19309-207
R151	" " 220K ±10%, 1/2W	K19309-105
R152	" " 3.3MEG ±10%, 1/2W	K19309-133
R155	" " 22K ±10%, 1/2W	K19309-81
R158	" " 1K ±10%, 1/2W	K19309-49
R160	" " 82K ±10%, 1/2W	K19309-95
R161	" " 33K ±10%, 1/2W	K19309-85
S101	SWITCH, Selector	K39156-1
S102	SWITCH, Channel	K39155-1
S103	"	Part of R125
S104	"	Part of R124
SP101	SPEAKER	M39067-2
T101	TRANSFORMER, Antenna	K39136-1
T102	" 1st High I.F.	M39141-1
T103	" 1st Low I.F.	M39170-1
T104	" 2nd Low I.F.	M39170-1
T105	" Modulation	K39035-2
T106	" Power	T39169-1
T107	" 2nd High I.F.	M39140-1
V101, V102	TUBE, Electron, 6AZ8	K16394-1
V103	TUBE, Electron, 6BE6	K16284-1
V104, V108	TUBE, Electron, 6BA6	K16283-1
V105	TUBE, Electron, 6BJ7	K16397-1
V106	TUBE, Electron, 12AX7	K16300-1
V107	TUBE, Electron, 6GW8	K40924-1
V109	TUBE, Electron, 6DS5	K40925-1

SCHEMATIC DESIGNATION	DESCRIPTION	PART NO.
Y101	CRYSTAL, 1650KC	M39193-1
Y102	" 1750KC	M39193-2
Y103	" 1850KC	M39193-3
Y104	" 25315KC	M39210-1
Y105	" 25325KC	M39210-2
Y106	" 25335KC	M39210-3
Y107	" 25355KC	M39210-4
Y108	" 25365KC	M39210-5
Y109	" 25375KC	M39210-6
Y110	" 25385KC	M39210-7
Y111	" 25405KC	M39210-8
Z102	RC-Printed Network Diode Detector, AVC-Limiter	K38885-1

MISCELLANEOUS PARTS

DESCRIPTION	
Line Cord Assy	M39174-G1
Fuse Cartridge, 1 AMP	K15928-5
Battery Cord Assy	M39175-G1
Fuse Cartridge, 6-1/4 Amps, Slo-Blow	K51010-1
Instruction Book	41391-2
Screw, #10 Self-Tapping Bd Hd, 1/2" Long (for Dash Board Mtg)	K40127-4
Microphone Clip	K39211-1
Cable Connector Plug	K16071-1
Screw, #6 Self-Tapping Hex Head (for Mtg Chassis to Cabinet)	K10080-63
Washer, Flat #6, 5/16 O.D. x 5/32 I.D. x .032 Thk	K10007-237
Knob LARGE	K39164-1
Knob SMALL	K39195-1
Bead Chain, Endless Loop	K35572-4
Service Manual	K52785-1

CB-23 TECHNICAL SPECIFICATIONS

CB CHANNELS COVERED:	23 Receive, 23 Transmit, both functions simultaneous and crystal controlled (all crystals supplied)
METER:	Both transmitting and receiving indication
POWER SUPPLY:	Dual-115V 60 cycle AC,/12 V DC interchangeable. No modification required. Primary power selection accomplished by choice of power cable.

TUBE COMPLEMENT:

12AX7	2nd conversion oscillator and audio preamp
6AZ8	RF amplifier and LF oscillator
6AZ8	1st mixer, 1st conversion oscillator
6BA6	IF amplifier
6BJ7	Detector, limiter and squelch
6GW8	Audio amplifier audio power amplifier
6DS5	RF power amplifier
6BA6	Driver
6BE6	2nd Mixer
	Plus 2 silicon rectifiers and vibrator for 12V DC supply

RECEIVER SECTION:

±3 KC VERNIER TUNING CONTROL- (no effect on transmit frequencies)

DUAL CONVERSION- Superheterodyne using 262 KC last IF for high selectivity

BANDWITH- 4 KC at 6 db down 16.5 KC at 40 db down

SENSITIVITY- .8 μV input will produce maximum audio output

SIGNAL-TO-NOISE RATIO- better than 1 μV for a 10:1 signal-to-noise ratio

SQUELCH- Adjustable

NOISE LIMITER- Highly effective self-adjusting series type

AUDIO OUTPUT- 2 1/2 watts to built-in PM speaker

HEADPHONE JACK- Cuts off speaker for personal listening

TRANSMITTER SECTION:

POWER OUTPUT- 2 1/2 watts minimum over complete range of 23 channels for legal input of 5 watts

MODULATION- 100% assured, "hi-level" type

MICROPHONE- High quality ceramic push-to-talk type.