NEVER ATTEMPT TO TRANSMIT WITHOUT AN ANTENNA CONNECTED TO THE TRANSCEIVER.

Make sure the transceiver is properly installed for base or mobile operation (as indicated previously) and that the antenna and correct power source are connected. If you have not already done so, plug in the microphone.

RECEIVER

Rotate squelch control to the extreme counterclockwise position, place the Silencer switch in the off position and select desired channel. Rotate the volume control knob until the switch operates. Advance the volume control to about 1/3 setting. Since the transceiver is fully transistorized, operation will be instantaneous. Adjust to a comfortable listening level. The receiver is now ready to operate.

SQUELCH ADJUSTMENT

The Squelch control is used to eliminate any annoying background noise when no signals are present. To adjust the SQUELCH control properly during reception, turn up SQUELCH until background noise just disappears. At this point, the receiver will be quiet under "no-signal" conditions, but an incoming signal will overcome the squelch action and be heard. Since this control is variable, it can be used to provide varying degrees of sensitivity to incoming signals. As the control is advanced (from counter-clockwise position), the squelch action is progressively increased and progressively stronger incoming signals are needed to overcome it. To receive extremely weak signals or to disable the squelch circuit, turn the control fully counter-clockwise.

NOTE: In areas of extremely high noise, you may have to increase the setting of the Squelch control in order to achieve a "quiet" condition. However, under these conditions an extremely weak signal may not be able to overcome the squelch action and will not be heard. If severe noise is generated by your own vehicle, proper vehicle ignition suppression should be carried out.

DELTA TUNING

The Δ Tune control acts as a "fine tuning" control ($\pm$1.8 Kc) and may be used for reception of a station that is slightly off-frequency. Try all positions and select the one that provides best reception and highest "S" meter readings.

IMPORTANT NOTE: When better reception is obtained with the Δ Tune control in either the plus or minus position, there is always the possibility that the station you are receiving is actually on an adjacent channel. While this is not usual, it can occur when the received station is off frequency or when the incoming signal is of sufficient strength to overcome the normal high selectivity of the receiver. To determine whether you are actually tuned to the correct channel, simply switch to each adjacent channel in turn, and note whether better reception (and higher "S" reading) is obtained with the Δ Tune switch in the normal (center) position.

NOISE SILENCER

Your transceiver is equipped with a special RF noise silencer switch which will be found highly effective in combating auto ignition noise.

The RF noise silencer is a unique 3-stage circuit which, when switched in, literally "chops out" ignition noise by silencing the receiver for the brief duration of each noise impulse. The period during which the receiver is silenced is of such short duration (10 microseconds or less) that there is virtually no audible effect on the output. You may notice a lower reading on the "S" meter when you switch the Silencer into the circuit. This is caused by the reduction of noise passing through the receiver IF stages, and does not indicate a reduction in the actual signal which is virtually unaffected by the Noise Silencer (you may notice a slight "hissing" noise, however).

NOTE: The RF Noise Silencer is not designed for use against interference caused by neons, atmospherics and various types of electrical machinery. Switching the Silencer into the circuit when this type of interference is present may, in certain cases, actually produce an increase in noise heard at the receiver output. The Silencer may also produce this reaction when two or more stations are transmitting on the same channel.

ILLUMINATED METER

During reception, the meter provides a relative indication of signal strength in "S" units and thus offers a basis for comparison between one incoming signal and another. The S-meter circuit has been pre-adjusted at the factory to indicate "S-9" with 100 microvolts at the antenna input. During transmit, the meter provides a relative indication of RF antenna power. The RF power meter will read true antenna power output only when the transceiver is connected to a 50 Ω resistive load. If the antenna and transmission line do not offer such a load, the meter readings will not be completely accurate.

EXT SP JACK

The recommended plug for this jack is a "TINI PLUG" subminiature phone plug, available from Lafayette under catalog number 34-6031. The impedance of earphones or speakers connected to this jack should be 8-16 ohms. Insertion of a plug into the jack automatically silences the internal speaker.

TRANSMITTER

Before operating the transmitter the following MUST be done:

1. A valid Class "D" Citizens Band equipment license shall be posted at the main control (fixed) station location.

2. A properly filled out and SIGNED mobile identification card, 452C, must be affixed to the unit.

3. Rules Part 95 must be obtained, read and understood.

To transmit, depress the push-to-talk button on the microphone. The channel indicator dial light will go out and a colored lamp on the front panel will light up, indicating that you are on the air. Hold the microphone 3 to 5 inches from the mouth and slightly to one side so that the voice does not project directly into the microphone (this provides best results). Speak at a normal level -- NEVER RAISE YOUR VOICE OR SHOUT INTO THE MICROPHONE. A design feature of this transceiver is that high average modulation can be achieved easily at normal voice levels.

During periods of transmission, the receiver is silenced and reception is therefore impossible. In the same way, your signal cannot be heard by another station when he is transmitting -- each must take turns. To receive again, simply release the microphone push-to-talk button.

MAXIMUM RF OUTPUT POWER

The transceiver may be peaked for maximum RF power output at the actual installation with the antenna connected. This can be done by adjusting the ANT LOADING trimmer (at rear) for maximum radiated power on an RF field strength meter. Be sure to place the meter at least 30 feet from the antenna to ensure accurate results.

PUBLIC ADDRESS OPERATION

Special provision has been made for Public Address (PA) operation, utilizing the microphone and audio stages in the transceiver. For PA operation, you should use an external 8-16 ohm speaker connected to the "PA" jack. Set the channel selector control to PA, press the push-to-talk button on the microphone and talk into it -- your voice will be heard from the external speaker (which may be mounted on the exterior of a car or building).

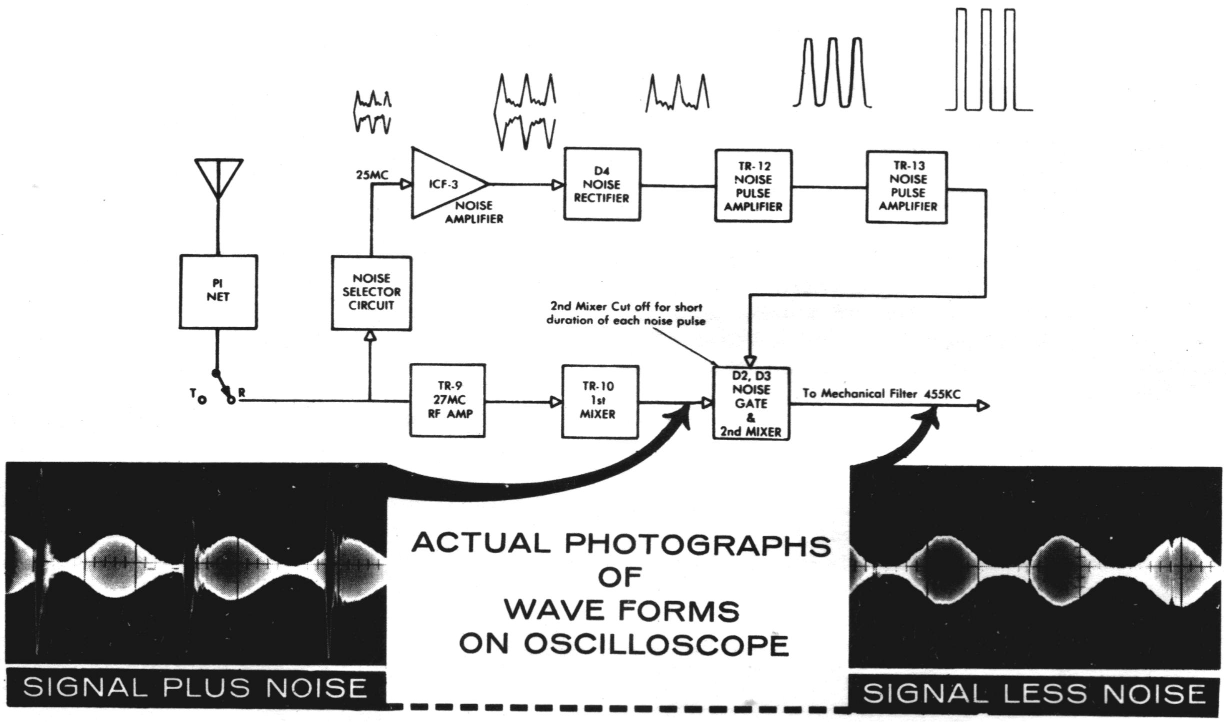
Note that the Volume control on the transceiver does not control the speaker output during PA operation.

USING THE HB-625 AS AN AUDIO AMPLIFIER

Plug the program source (hi-fi tuner, tape recorder, etc.) into the "EX" jack and set the channel selector to the "EX" position. Use the transceiver volume control to adjust the sound output which will be heard through the built-in speaker (or external speaker connected to EXT. SP jack).

OPERATING PROCEDURES

A Citizens Band station is NOT intended to be a replacement for a ham station. Transmission of a "CQ" (calling any station) to alert any station that might be listening is in violation of Citizens Band Regulations (except in an emergency). For information on permissible types of communications, you should always refer to Part 95 of the FCC Rules and Regulations.



RF NOISE SILENCER

The RF noise silencer circuit is designed primarily to combat impulse-type noise (such as that generated by ignition systems, brush-type electrical motors). This type of noise consists of rapid pulses of very short duration, and frequently having amplitudes considerably higher than those of the desired signals themselves. Other noise reducing circuits that operate in the audio stages merely limit the amplitudes of the noise pulses so that they do not greatly exceed those of the desired signal. This system makes no attempt to remove the noise entirely and is most effective only when the noise pulses are considerably greater than the signal. The RF Noise Silencer, on the other hand, silences the receiver for the entire duration of each noise pulse, providing actual elimination of the noise from the signal. Because the period during which the receiver is silenced is of such short duration (10 microseconds or less for each pulse), a high degree of noise reduction is achieved with minimum effect on the audio output.

HOW THE RF NOISE SILENCER WORKS

The first stage of the RF Noise Silencer consists of a 25 Mc tuned circuit (Noise Selector) which acts to select the noise only, and reject the signals. One of the characteristics of impulse noise is that it is distributed over a fairly wide range of frequencies. Thus, when ignition noise generated in any auto installation is heard in the output of a receiver tuned to 27 Mc, the same noise will be heard even when the receiver is tuned to 25 Mc, for example. By means of a circuit tuned to 25 Mc, it is therefore possible to select the identical interfering noise alone.

An Integrated Circuit, IC-2 (consisting of 10 transistors and 7 diodes) is employed as a multi-stage amplifier for the noise voltages to make them more suitable for handling by the next stage. The Noise Rectifier stage (D4) acts as a rectifier to change the AC pulse waveform into DC pulse voltages. These are fed to the Noise Pulse amplifiers TR-12 and TR-13 which shape and amplify the DC pulse voltages, making them more suitable for use by the Noise Gate and 2nd Mixer.

The DC pulse output voltages from TR-13 are used to control the operation of the Noise Gate and 2nd Mixer which consists of diodes D2 and D3 in a balanced circuit. When no noise pulses are picked up by the antenna, there is no output from TR-13 and the balanced mixer operates normally. When noise is picked up by the antenna however, the output of TR-13 consists of DC pulse voltages which occur at precisely the same rate as the noise pulses that are superimposed on the signal being fed to the 2nd mixer from TR-10. Each pulse from TR-13 momentarily cuts off the operation of the 2nd mixer, literally "chopping out" that portion of the modulated signal which has a noise pulse superimposed on it. Because of the short duration of each noise pulse (10 microseconds or less), the momentary silencing of the 2nd mixer is unnoticeable.

INTEGRATED CIRCUITS

The HB-625 incorporates revolutionary new devices known as Integrated Circuits (IC's).

An outgrowth of aerospace electronics, the IC represents the ultimate in miniaturization and reliability. No larger than a tiny transistor, an IC is a complete circuit in miniature containing many transistors and other electronic components.

Utilizing the newly-developed art of microphotographic etching, each IC is reproduced directly from a microscopically accurate photographic master of a much larger original circuit. This process virtually eliminates the possibility of hidden flaws or defects and ensures a uniformity in these microcircuits that is unattainable in any other way. IC miniaturization permits additional circuitry to be used in small, compact units to achieve higher standards of performance. Added to this are the benefits of increased reliability and reduced power drain.

Three IC's are employed in the receiver section of the HB-625. A complete circuit diagram for each IC is provided in this section. Lead configurations are illustrated on the main circuit diagram for the HB-625. For removal and insertion of each IC, use similar techniques as for transistors.

RCA CA3011 (IC-2 on Main Schematic)

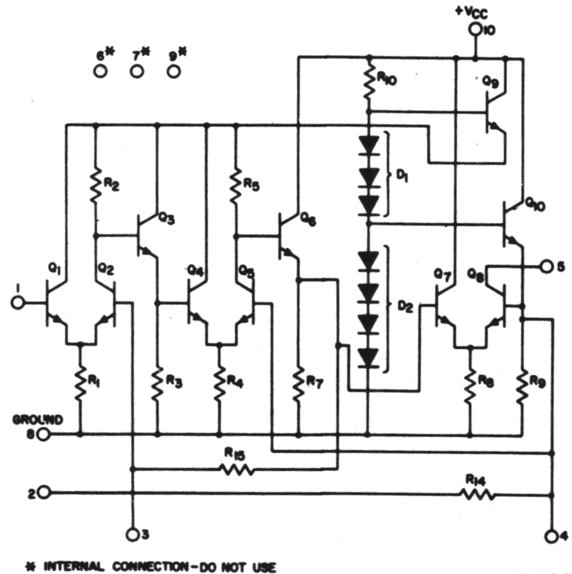
This is a 10-transistor, 7-diode, 11-resistor unit employed in the RF Noise Silencer as a multi-stage 25 Mc noise amplifier.

RCA CA3020 (IC-3 on Main Schematic)

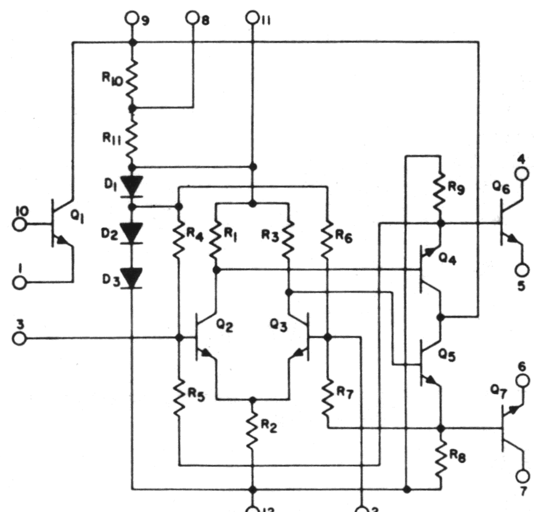
This is a 7-transistor, 3-diode, 11-resistor unit employed as an audio amplifier/driver/phase inverter.

LAFAYETTE ICF-1 (IC-1 on Main Schematic)

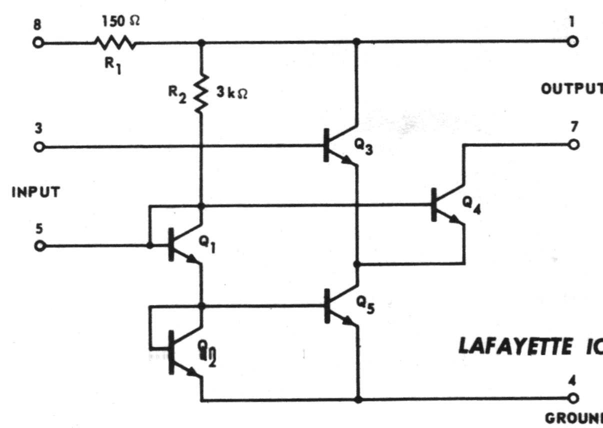
This is a 5-transistor, 2-resistor unit employed as a multi-stage 455 Kc IF amplifier.



RCA CA3011



RCA CA3020



LAFAYETTE ICF-1

FREQUENCY SYNTHESIZING SYSTEM

GENERAL

This transceiver employs a method whereby 10 crystals are used in various combinations to produce 23 fundamental oscillator frequencies (see Table A). This arrangement, known as frequency synthesis, permits full 23 channel crystal-controlled operation on both transmit and receive using relatively few crystals. Selection of the proper combinations of crystals in the transceiver is completely automatic in each case, and no special procedures are required by the operator other than the normal operation of a single-control channel selector switch. The tables which follow show the particular crystals used for each channel. It should be noted that failure of one crystal will lead to malfunction on a number of channels. If malfunction on a number of channels is experienced therefore, refer to Table B which will offer a quick means of determining which crystal may have failed.

TABLE A

U. S. Channel	Channel Frequency	Crystals Used	Derived Freq.
1	26.965 Mc	1 and 7	38.240
2	26.975 Mc	1 and 8	38.250
3	26.985 Mc	1 and 9	38.260
4	27.005 Mc	1 and 10	38.280
5	27.015 Mc	2 and 7	38.290
6	27.025 Mc	2 and 8	38.300
7	27.035 Mc	2 and 9	38.310
8	27.055 Mc	2 and 10	38.330
9	27.065 Mc	3 and 7	38.340
10	27.075 Mc	3 and 8	38.350
11	27.085 Mc	3 and 9	38.360
12	27.105 Mc	3 and 10	38.380
13	27.115 Mc	4 and 7	38.390
14	27.125 Mc	4 and 8	38.400
15	27.135 Mc	4 and 9	38.410
16	27.155 Mc	4 and 10	38.430
17	27.165 Mc	5 and 7	38.440
18	27.175 Mc	5 and 8	38.450
19	27.185 Mc	5 and 9	38.460
20	27.205 Mc	5 and 10	38.480
21	27.215 Mc	6 and 7	38.490
22	27.225 Mc	6 and 8	38.500
23	27.255 Mc	6 and 10	38.530

Note that the derived frequency is exactly 11.275 Mc higher than the channel frequency in each case. During transmit, the derived frequency is converted to the channel frequency by the 11.275 Mc crystal oscillator TR-4. During receive, the derived frequency is heterodyned with the incoming channel frequency at the 1st Mixer/IF (TR-10) to produce a 1st IF of 11.275 Mc.

TABLE B

Crystal	Frequency	Used In Channels (Transmit & Receive)
1	23.290 Mc	1, 2, 3, 4
2	23.340 Mc	5, 6, 7, 8
3	23.390 Mc	9, 10, 11, 12
4	23.440 Mc	13, 14, 15, 16
5	23.490 Mc	17, 18, 19, 20
6	23.540 Mc	21, 22, 23
7	14.950 Mc	1, 5, 9, 13, 17, 21
8	14.960 Mc	2, 6, 10, 14, 18, 22
9	14.970 Mc	3, 7, 11, 15, 19
10	14.990 Mc	4, 8, 12, 16, 20, 23

Failure of any one of the ten crystals used will cause a malfunction on a group of channels, as indicated above. For example, failure of crystal 1 would cause the transceiver to be inoperative on channels 1, 2, 3 and 4; failure of crystal 7 would cause the transceiver to be inoperative on channels 1, 5, 9, 13, 17 and 21.

NOTE: XTAL 11 (11.275 Mc) is used during transmit for all channels. XTAL 12 (11.730 Mc) is used during receive for all channels.

SYSTEM DESCRIPTION

In order to understand the manner in which the system operates, it is first necessary to know which crystals are selected for each channel. This information is provided in Table A. Figure A is a partial block diagram showing the various frequency conversions that take place during transmit and receive on channel 1 (26.965 Mc). Table A shows that the crystals used in the synthesizer on channel 1 are Xtal 1 (23.290 Mc) and Xtal 7 (14.950 Mc).

In transmit or receive mode, TR-1 is connected to Xtal 1 and TR-2 is connected to Xtal 7. The output frequencies of these two crystal oscillators are fed to the mixer stage TR-3. The output of the mixer stage contains tuned circuits which will only pass frequencies in the 38 Mc range. Thus, only the sum frequency (23.290 + 14.950 = 38.240 Mc) is applied to TR-5. This system of "beating" of two crystal

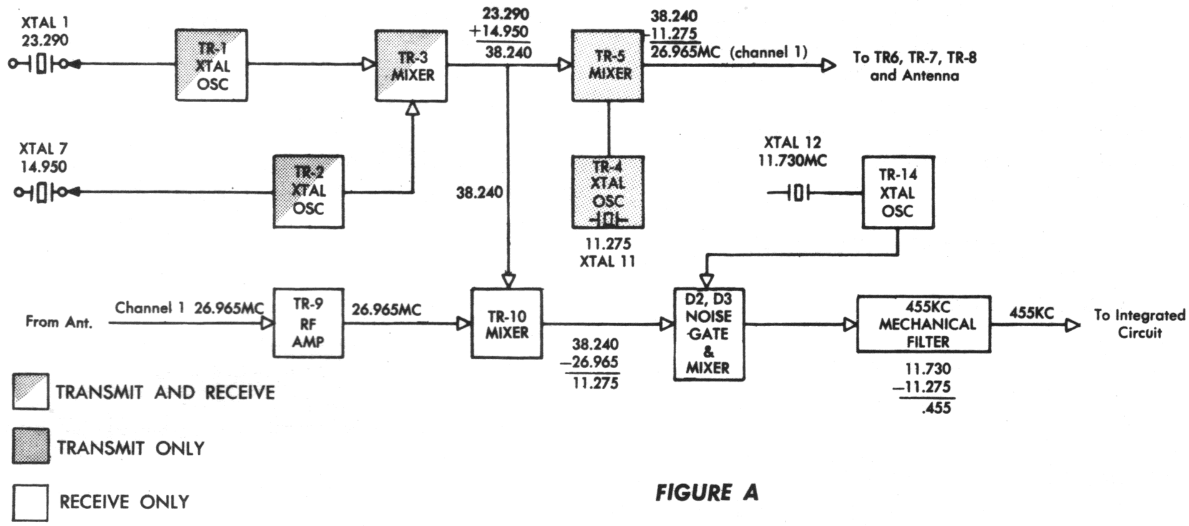


FIGURE A

frequencies takes place on every channel, the appropriate pair of crystals (for TR-1 and TR-2) being automatically selected in each case to produce a sum or "derived" frequency which can be used for either transmit or receive operation. During transmit, the derived frequency (on channel 1 this is 38.240 Mc) is fed to TR-5. The output of Xtal oscillator TR-4 which operates at a fixed frequency of 11.275 Mc, is also fed to TR-5. Because the output of TR-5 contains tuned circuits which will only pass frequencies in the 27 Mc range, the difference frequency will be fed to TR-6, TR-7 and TR-8, and then to the antenna. In the receive mode, the output of TR-3 (38.240 Mc) is mixed with the incoming signal of 26.965 Mc (which has been passed through RF amplifier TR-9).

The output of the mixer TR-10 contains tuned circuits which will only pass frequencies in the 11 Mc range. Thus, only the difference frequency (38.240 – 26.965 = 11.275 Mc) is applied to the following stage consisting of D2 and D3. TR-14 operates as a crystal oscillator with a fixed frequency of 11.730 Mc (± 1.8 Kc, depending on Delta switch). The output of this oscillator is also fed to D2 and D3 which act as noise gate and mixer. The output of D2 and D3 contains a sharply tuned mechanical filter which will only pass 455 Kc, this being the difference of the two frequencies (11.730 – 11.275 = 455 Kc). This system of converting the incoming frequency twice to produce a second IF of 455 Kc takes place on every channel.

RETURNING THE UNIT FOR REPAIR

In the event that repair is necessary (either in or out of warranty), we recommend that you return the transceiver to the Lafayette store from which it was purchased. If the unit is to be shipped to our main office for service, please read the instructions which follow.

SHIPPING INSTRUCTIONS

Pack the unit very carefully to avoid damage in transit, preferably in its original carton. If the original carton is not available, use a sturdy carton with at least 3 inches of shredded paper or excelsior around the unit. In the latter case, wrap the unit in paper first to avoid particles of packing material getting into it. Include with the unit a letter explaining exactly what difficulties you have encountered (remember to add an extra 5¢ postage and indicate on the outside of the carton that First Class Mail is enclosed). Ship by prepaid express if possible and mark ELECTRONIC EQUIPMENT -- FRAGILE. Clearly address the carton as follows:

SERVICE DIVISION
LAFAYETTE RADIO ELECTRONICS CORP.
111 JERICHO TURNPIKE
SYOSSET, L.I., N.Y. 11791

As an aid to the service technician, this manual contains a layout diagram identifying transistors, transformers, coils, etc., a schematic diagram, and a functional block diagram. Also included are instructions for aligning the receiver and transmitter sections.

ALIGNMENT PROCEDURE

COVER REMOVAL

1. Place the transceiver upside down (speaker grille upward) with the front control panel facing you.
2. Remove the four Phillips head screws (two on each side of the unit) fastening the uppermost chassis cover.
3. Remove the chassis cover with caution because the speaker is connected directly into the unit by means of two leads terminated with push-type lugs.

CAUTION: Certain coil cores in this unit have been sealed with wax. Before attempting to adjust a core, be sure to melt the wax so as to permit free movement. Failure to do this may result in damaged cores.

RECEIVER

TR-1 OSCILLATOR ALIGNMENT

1. Connect a DC VTVM between the emitter of TR-1 and ground, and apply DC power (12.6 volts) to the transceiver.
2. Set the channel selector to channel 13.
3. Adjust the core of L1 for maximum on the VTVM. This should provide a reading of between 3 and 4 volts.

TR-2 OSCILLATOR ALIGNMENT

1. Connect a DC VTVM between the emitter of TR-2 and ground.
2. Adjust the core of L2 for maximum on the VTVM. This should provide a reading of between 3 and 4 volts.

RF AND IF ALIGNMENT

1. Connect signal generator to antenna connector.
2. Connect AC VTVM across speaker terminals; turn Volume to mid-position, Squelch and RF Noise Silencer off, Delta △ Tune to mid-position.
3. Set signal generator to 27.115 Mc (channel 13) modulated 30% with a 1 Kc tone. Set signal generator output to 10 μV.
4. Set transceiver to channel 13 and vary signal generator frequency around 27.115 Mc to produce a maximum reading on the AC VTVM.
5. Adjust L15 and L16 to produce maximum output on AC VTVM.
6. Reduce generator output to approximately 1 μV. Adjust L3, L4, L5, L15, L16, L17, L18, MF (mechanical filter), L19, L20 and L21 for maximum reading on VTVM. Repeat until no further improvement is noted.
7. Increase generator output to 100 μV and adjust VR-4 so that "S" meter reads S-9.

TR-14 OSCILLATOR ALIGNMENT

The second receiver conversion oscillator is fully crystal-controlled, its operating frequency being determined by the position of the Delta Tune switch. In the normal (zero) position of the Delta Tune switch, the oscillator operates at 11730 Kc; in the minus (−) position, the oscillator operates at 11728.2 Kc (−1.8 Kc detuning); in the plus (+) position at 11731.8 Kc (+1.8 Kc detuning).

Make sure Delta Tune switch is in the normal (center) position and adjust L25 for maximum output on an AC VTVM connected across the speaker terminals. When obtained, rotate the slug 1/8 turn clockwise from the peak.

GAIN ADJUSTMENTS

1. Connect DC VTVM between junction of resistor R59 and resistor R58 and ground.

2. With no signal applied to the antenna, adjust potentiometer VR-3 to produce a reading of 7.0 volts DC on VTVM.

RF NOISE SILENCER CIRCUIT

Set NOISE SILENCER control on and CHANNEL selector to channel 1. Connect a VTVM (-DC reading) to the output side of D4 (see diagram), with VTVM ground lead connected to negative side of "EX" jack (board ground). Feed a channel 1 signal (26.965 Mc, non-modulated) into the antenna input and increase level until a -DC reading is obtained on the VTVM. Adjust L22 and VC3 for minimum reading.

Set the generator to 25.0 Mc and adjust L23 and L24 for maximum -DC reading.

TRANSMITTER

OSCILLATORS

The synthesizer oscillators TR-1 and TR-2 are used for both receive and transmit functions of the transceiver. These oscillators have already been adjusted during alignment procedures for the receiver and thus require no further alignment.

ALIGNMENT PROCEDURE

1. Connect a 50 ohm wattmeter to the antenna connector on the transceiver.

2. Set transceiver channel selector to 13.

3. Apply power to transceiver (12.6 volts DC). Depress microphone button and adjust cores of L6, L7, L8, L9, L10 and L11 for maximum on the wattmeter.

   NOTE: Adjustment of L10 is fairly critical. Misadjustment of this coil can reduce the transmitter output to zero.

4. Check power output on all channels. If low on some channels, readjust L6, L7, L8, L9, L10 and L11 for equal output on channels 1 and 23. This will usually ensure equal output on all 23 channels.

5. Adjust L12, L13 and VC-2 for maximum output on the wattmeter.

   NOTE: L12 is adjusted by either compressing or expanding the coil turns. Use a non-metallic tuning tool to spread the wire turns.

6. Press the microphone button and adjust VR-5 so that the transceiver meter reads the same power as on the wattmeter.

7. The transceiver may be peaked for maximum RF power output at the actual installation with the antenna connected by re-adjusting VC-2 (through hole in chassis rear) for maximum radiated power on an RF field strength meter.

MODULATION ADJUSTMENT

1. Connect a modulation monitor to the transceiver.

2. Connect an audio generator between ground and the center pin on the microphone connector on the transceiver. Set generator frequency to 1 Kc and adjust output level to 10 mV.

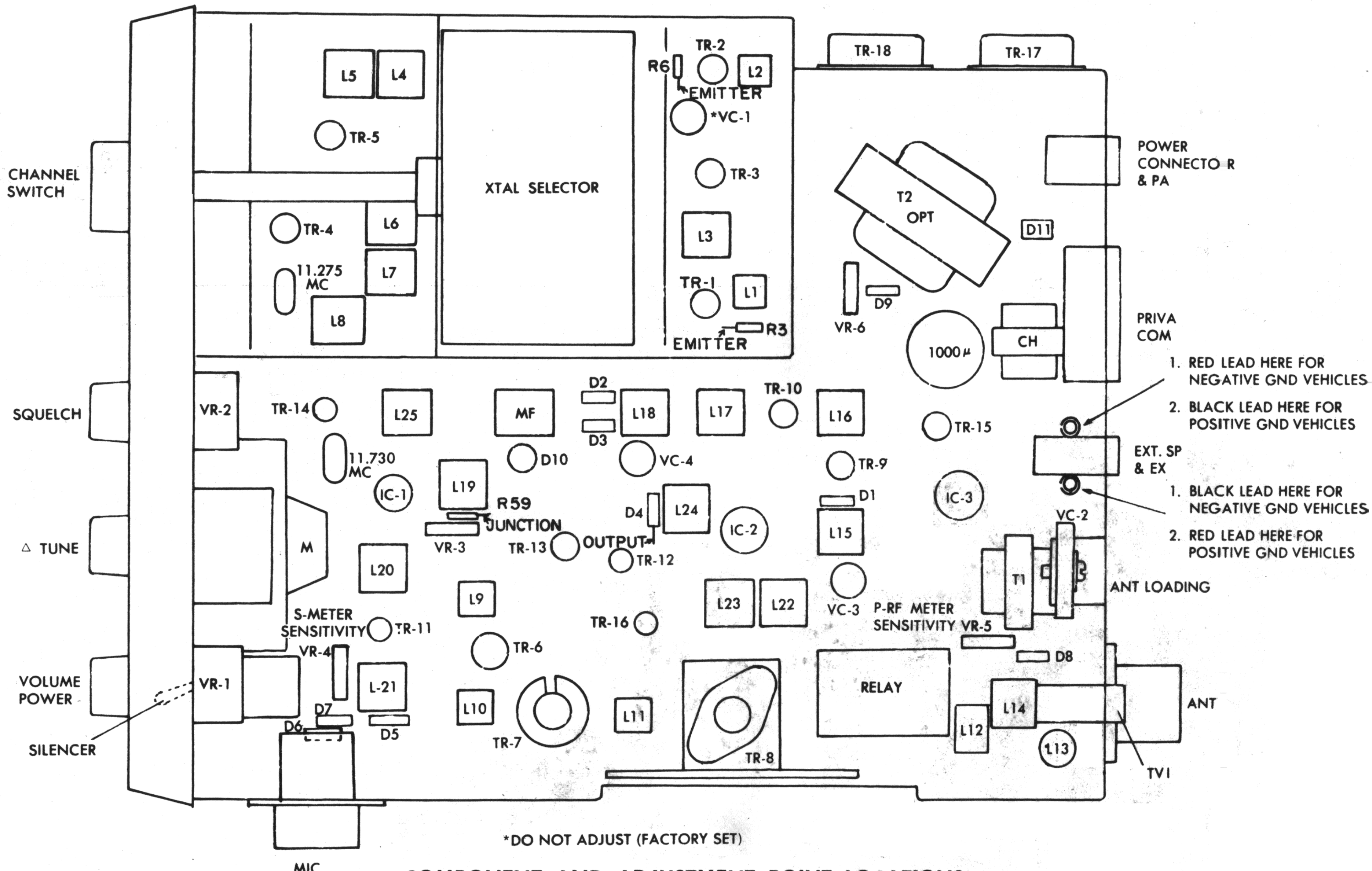
3. Apply power to transceiver and depress microphone button. Adjust potentiometer VR-6 to produce 80% modulation as indicated by the modulation monitor.

   NOTE: Following above steps will produce 100% modulation on voice signals. In no case shall the modulation exceed 100%.

TVI ADJUSTMENT

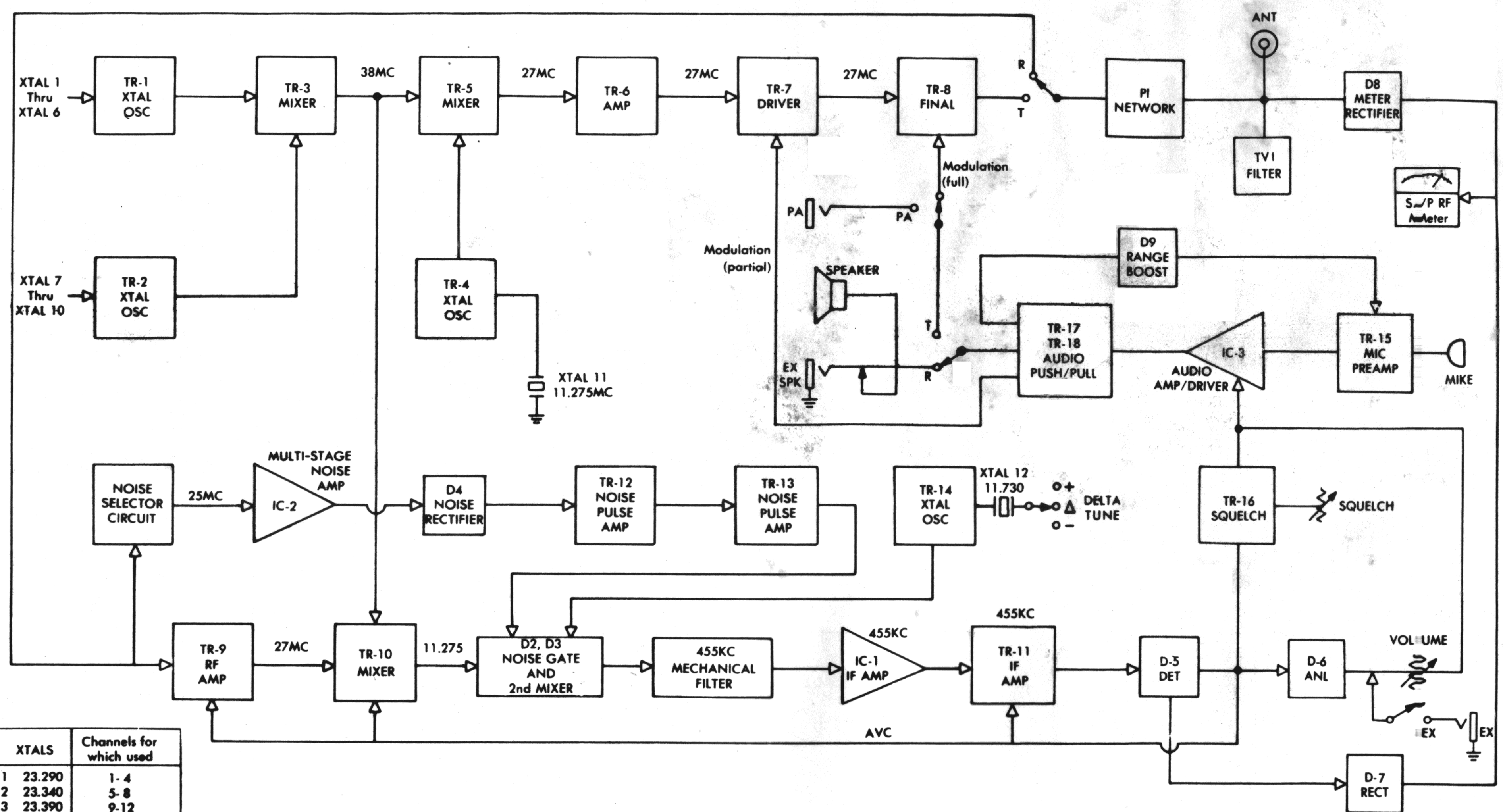
1. Use a TV receiver set to channel 2 as an indicator.

2. Depress transceiver microphone button and adjust L14 (rear of transceiver) for minimum interference on TV receiver.



*DO NOT ADJUST (FACTORY SET)

COMPONENT AND ADJUSTMENT POINT LOCATIONS



XTALS		Channels for which used
1	23.290	1- 4
2	23.340	5- 8
3	23.390	9-12
4	23.440	13-16
5	23.490	17-20
6	23.540	21-23
7	14.950	1,5,9,13,17,21
8	14.960	2,6,10,14,18,22
9	14.970	3,7,11,15,19
10	14.990	4,8,12,16,20,23

FUNCTIONAL BLOCK DIAGRAM