



**LAFAYETTE®**

**"COMSTAT 25"**



Stock No. 99-3065WX

## **25-CHANNEL CB TRANSCEIVER**

*INSTALLATION AND OPERATING INSTRUCTIONS*



LAFAYETTE RADIO ELECTRONICS

## SPECIFICATIONS

### RECEIVER

CIRCUIT TYPE ..... Dual conversion superheterodyne; crystal-controlled 25 channel reception with "fine tuning" capability of 2.5 Kc on each channel. 13 crystals used in frequency synthesized circuit to provide 25 channel operation on transmit and receive. (23 CB channels plus two extra channels for proposed H. E. L. P. program).

SENSITIVITY ..... 0.8  $\mu$ v for 10 db S  $\neq$  N to N ratio

SELECTIVITY ..... 6 Kc bandwidth -26 db

INTERMEDIATE FREQUENCY ..... 1st IF 6.2 Mc, 2nd IF 455 Kc.

IMAGE REJECTION ..... -75 db

AUDIO OUTPUT ..... 4 watts into 5 x 3" oval speaker.

EXTERNAL SPEAKER IMPEDANCE ..... 4-8 ohms.

AUXILIARY CIRCUITS ..... Full-time Automatic Noise Limiter, Adjustable Squelch, AVC.

### TRANSMITTER

PLATE POWER INPUT TO FINAL .. 5 watts or 100 milliwatts, switchable.

MODULATION ..... AM, via plate modulation; up to 100% capability.

RANGE-BOOST ..... Yields high average modulation at all times at average speaking levels.

HARMONIC SUPPRESSION ..... Exceeds FCC requirements.

CARRIER DEVIATION ..... Exceeds FCC requirement of  $\pm .005\%$ .

ANTENNA MATCHING ..... Will match resistive antenna loads of 50-75 ohms.

TRANS/REC SWITCHING ..... Relay switching, push-to-talk on microphone.

PUBLIC ADDRESS ..... PA facilities using microphone and audio stage in conjunction with an external speaker.

## TUBES & SEMI-CONDUCTORS

		<u>Receiver Function</u>	<u>Transmitter Function</u>
V1	6AN8	RF Amp/1st Mixer	-----
V2	6AN8	2nd Mixer/2nd Osc.	-----
V3	6BA6	IF Amp (455 Kc)	-----
V4	6BA6	IF Amp (455 Kc)	-----
V5	12AX7	1st Audio	Modulator/Mic Preamp
V6	6AQ5	Audio Output	Modulator
V7	6AN8	Local Oscillator, Synthesizer	
V8	6AN8	-----	Converter/6.2 Mc Osc.
V9	6BA6	-----	Buffer Amp
V10	6BQ5	-----	RF Power Amp
D1	1N60	Det, AVC	-----
D2	1S72	ANL	-----
D5	1N702	-----	Range-Boost
D3, D9	SD46	Meter Rectifier ("S")	Meter Rectifier (RF power)
D6, D8	5GJ	B+ Rectifiers (voltage doubler)	
D7	5GJ	Rectifier (Bias Supply)	

## COMMON

POWER SUPPLY ..... 105-120 volts, 50/60 cycles AC or 11.5-14.5 volts DC.

POWER CONSUMPTION ..... 117 volts AC: 80 watts max.  
12 volts DC: 3-1/2 amps (rec), 4 amps (trans).

DIMENSIONS ..... 12" W x 5" H x 8-1/4" D (excluding knobs and plugs at rear).

NET WEIGHT ..... 17 lbs.

SHIPPING WEIGHT ..... 20 lbs.

## GENERAL INSTRUCTIONS

IMPORTANT: 2 extra channels have been provided which permit operation on 27.235 Mc and 27.245 Mc. These frequencies, selected by positions A and B on the Selector, are for future operation on the proposed H. E. L. P. program. DO NOT TRANSMIT ON THESE FREQUENCIES UNTIL THE FCC HAS GIVEN APPROVAL FOR THEIR USE IN THIS PROGRAM.

The Lafayette "Comstat 25" is a combination transmitter and receiver designed for use in Class "D" operation in the 11 meter citizens radio service. It is designed to meet the Federal Communications Commission requirements applicable to equipment operating in this service under class "D" emission, and not to be used for any other purpose. Rules Part 95 of the FCC regulations defines operation in this service and the licensee is required to read and understand these regulations prior to operating a CB transmitter. Copies of Manual VI (covering the FCC regulations for the Citizens Band Radio Service) includes Part 95 and are available for \$1.25 from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. A station license may be obtained by submitting a properly completed Station License Application, Form 505 as directed.

It is illegal to operate the transmitter section of this transceiver prior to receiving a valid station license and call sign. NOTE: It is the transmitter that is licensed NOT the operator. Anyone may operate a properly licensed CB transmitter but the licensee will be held responsible for any violations incurred during use. A properly completed Identification Card Form 452-C must be attached to the transmitter.

The transceiver will provide economical and reliable radio communication in its intended application if installed and operated in accordance with instructions contained herein.

## **GENERAL DESCRIPTION**

### **RECEIVER SECTION**

The receiver is designed to receive amplitude modulated signals in the 26.965 to 27.255 Mc (11-meter) citizens band. The circuit is a highly sensitive and selective dual-conversion superheterodyne type, with one RF and two IF amplifiers. The unit employs a frequency-synthesized circuit in which 13 crystals (all supplied) are used to provide full 25 channel crystal-controlled operation (receive and transmit), switch-selected from the front panel. The unit is equipped with an 11-pin socket at the rear of the chassis which offers direct plug-in facilities for the Lafayette Priva-Com Selective Call unit.

Features incorporated into the receiver section include an S-meter for reading signal strength, a full time automatic noise limiter, and an adjustable squelch control which can be used to "quiet" the receiver when no signal is being received. As a further aid to better reception, the circuit includes a control that offers "fine tuning" on receive. This control, which has a range of 2.5 Kc, permits optimum reception of stations that are slightly off frequency.

### **TRANSMITTER SECTION**

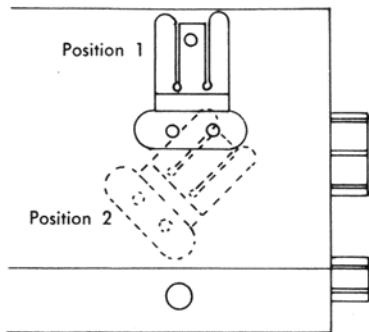
The transmitter is designed to transmit amplitude modulated signals in the 26.965 to 27.255 Mc (11-meter) citizens band. The frequency synthesized circuit used for receive is also common to the transmitter and used in the transmit mode to provide full 25 channel crystal-controlled operation. A push-to-talk button on the ceramic microphone (supplied) offers reliable relay switching. Plate modulation is employed (100% capability), with up to 5 watts plate power input to the final RF. Also included is a special "Range-Boost" circuit which, when "on", concentrates more audio power into the sidebands by providing maximum modulation on all syllables. This feature offers maximum communication distance when noisy conditions make reception of your signal difficult. A relative RF power meter (which automatically functions as an S-meter on receive) indicates relative RF power at the antenna. A special switch at the rear of the transceiver allows a choice of either full 5-watt operation or 100 milliwatt operation, as desired. An added feature is a provision for public address, utilizing the microphone and audio circuits to feed an external speaker connected to the Phones output jack.

### **POWER SUPPLY**

The transceiver is designed to operate from either 105-120 volts, 50/60 cycles AC or 11.5 to 14.5 volts DC. Two power supply cables are supplied -- one for AC operation, the other for DC operation. All that is required is that the appropriate power cable be plugged into the 8-pin power socket on the transceiver. On 12 volts DC operation, the transceiver employs a built-in solid-state power supply circuit (no vibrator is used).

## **BASE STATION INSTALLATION**

The transceiver should be placed in a convenient operating location, close to an AC power outlet, suitable ground and the antenna lead-in cable.



**Figure 1** Microphone bracket installation. Bracket may be attached to either side of the transceiver. If desired, the bracket may be attached in any other convenient location (car dashboard, etc.).

### **MICROPHONE BRACKET INSTALLATION**

The microphone bracket may be installed on the left or right-hand side of the transceiver in either of the two positions shown in Figure 1, whichever is most convenient.

### **MOUNTING BRACKET**

The mobile mounting bracket may be used in a base installation by attaching it to the underside of the transceiver as shown in Figure 2, diagram B. When so used, the four rubber feet (supplied) may be attached to the bracket as shown in Figure 2, diagram C. Note that the bracket has additional holes for the front pair of securing screws. These will allow the transceiver to be set to an angle which provides the operation with the best view of the front panel.

### **AC POWER CONNECTION**

Select the AC power cord and attach the 8-pin female connector to the 8-pin male power connector at the rear of the transceiver. **CAUTION:** Always line up the keyway properly before pushing the cable connector onto the transceiver. Do not attempt to force the connector onto the pins -- when properly lined up, the connector will slip on easily. Making sure the transceiver is off (switch is located at the extreme counter-clockwise of the VOLUME control), insert the AC plug at the other end of the cord into an outlet supplying 105-120 volts, 50/60 cycles AC. For protection, the AC input to the transceiver is fused (the fuse is located within the transceiver).

### **MICROPHONE CONNECTION**

Attach the 4-pin male connector at the end of coil cord to the 4-pin female connector at the lower left front of the transceiver. Secure it firmly by means of the knurled securing ring.

### **ANTENNA CONNECTION**

The antenna lead-in cable (RG-58/U or RG-8/U) should be terminated with a PL-259 type male coaxial connector which should then be attached to the matching antenna connector at the rear of the transceiver.

## **MOBILE INSTALLATION**

### **MICROPHONE BRACKET INSTALLATION**

The microphone bracket may be installed on the left or right side of the transceiver in one of the two positions shown in Figure 1. The position that must be used will depend on the position of the mobile mounting bracket.

If the mounting bracket is attached to the top of the transceiver (as would be normal in a car installation), it will be necessary to use position 2.

## TRANSCEIVER INSTALLATION

Before installing the transceiver in a car, truck, boat, etc., be sure to choose a location which is convenient to the operating controls, and will not interfere with the normal functions of the driver. The transceiver may be mounted to the underside of the instrument panel or dashboard of a car, truck, etc., by means of the special bracket that is supplied with the transceiver. Remove the bracket from the transceiver by loosening the four large knurled screws at the sides. Attach the bracket to the underside of the instrument panel using the four self-threading screws provided.

Figure 2 illustrates the manner in which the transceiver is mounted. Secure the transceiver to the bracket by means of the large knurled screws (two each side). Note that the bracket has additional holes for the front pair of securing screws. These will allow the transceiver to be set to an angle which provides the operator with the best view of the front panel.

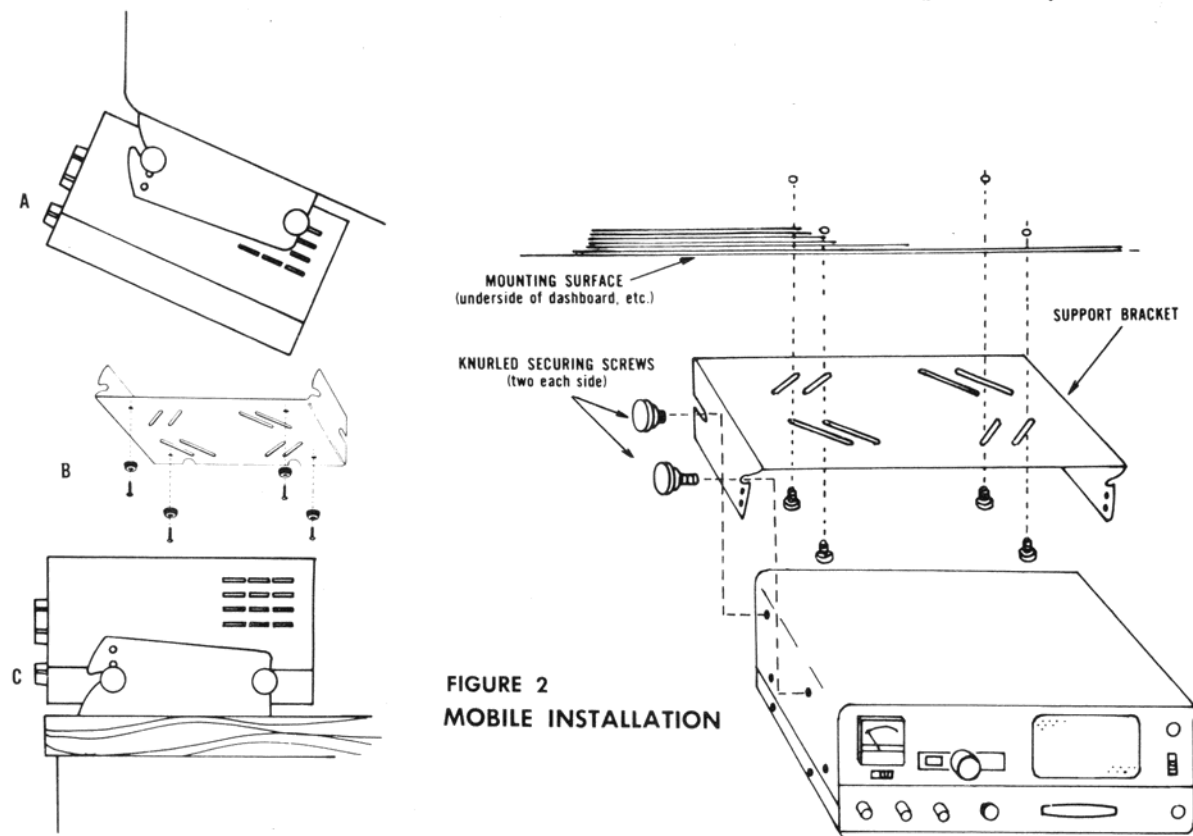
## DC POWER CONNECTION

**CAUTION:** This transceiver is designed for use only in vehicles employing a negative ground system. **DO NOT USE IN POSITIVE GROUND VEHICLES.**

The Red lead in the DC power cable (this is the lead that is fused for 8 amps) should be connected to the main positive battery source in the vehicle. "Hot" points normally available are the accessory post on the ignition switch or the accessory side of the fuse block. The Black lead should be connected to the metal firewall or any other point that is connected to the vehicle chassis (negative battery potential). Make sure the Red lead has been connected to a point which provides power only when the ignition switch is turned on.

**IMPORTANT.** The solid-state (2-transistor) DC power supply circuit is designed to operate within an input voltage range of 11.5 to 14.5 volts DC. To avoid possible failure of the transistors, you should make sure that the vehicle supply voltage does not exceed 14.5 volts at any time. If necessary, adjust the voltage regulator to cut out at this voltage (14.5).

As a final step, the 8-pin female connector at the other end of the DC power cable should be attached to the 8-pin male power connector at the rear of the transceiver. **CAUTION:** Always line up the keyway properly before pushing the cable connector onto the transceiver. Do not attempt to force the connector onto the pins -- when properly lined up, the connector will slip on easily.



**FIGURE 2**  
**MOBILE INSTALLATION**

## **ANTENNAS**

The results obtained with your new Lafayette Citizens Band Transceiver will be greatly determined by the efficiency of the antenna system used.

Due to the complexity of the subject, it is not within the scope of this manual to provide detailed information on antenna systems. Although this section does contain some general information which may be of value to the beginning CB enthusiast, we suggest you purchase one of the numerous books available which covers this subject in greater detail. The Howard W. Sams publication by David E. Hicks, "CB Radio Antenna Guidebook", is particularly recommended. This book offers a complete guide to the selection and installation of CB antennas and includes a great deal of information that will be useful in obtaining optimum results with your antenna system.

### **ANTENNA CABLE**

For optimum results in a mobile installation, the length of the RG-58/U 50 ohm coaxial cable should be 11 ft. 9 inches, or multiples thereof (23 ft. 6 inches, etc.). Lengths other than multiples of 11 ft. 9 inches may be used when perfect antenna matching exists. However, this ideal condition is generally difficult to obtain because of a number of factors which affect impedance, such as the type of antenna, its tuning, its height above ground, and the transmission line employed.

When the use of the particular lengths specified results in an over-long line, the excess should be wound in a neat coil not less than 8 inches in diameter.

In a base station installation, an exceptionally long lead-in cable may be required. When lengths of over 50 feet are necessary, RG-8/U coaxial cable is more suitable since it offers lower loss than RG-58/U.

## **MOBILE ANTENNAS**

The type of antenna best suited for mobile service is a vertically polarized whip antenna. The vertical whip is non-directional and can be of the loaded type (top, center or base loaded), or a full quarter-wave, the latter usually being more efficient. Both types use the metal body of the vehicle as a "ground plane". There are a number of locations that may be used for the installation of an antenna on a car. Four of the most popular locations are those shown in Figure 3.

### **FRONT COWL MOUNTING**

Front cowl mounting offers a number of advantages. The CB antenna can be mounted in place of the regular auto radio antenna and will thus provide the minimum of installation problems. The antenna can then be used for both the CB and standard auto radio by employing any of the commercially made two-way couplers available (such as the Lafayette HP-202, Stock #42-0903). In this location you can install a short loaded whip, with only a small loss of efficiency.

The horizontal radiation pattern in such a location is slightly irregular, radiation being slightly greater in the direction of the rear fender opposite to the side on which the front cowl antenna is mounted.

### **ROOF MOUNTING**

Roof mounting is usually the best location because it provides an almost perfect omnidirectional radiation pattern. However, the use of a full 108-inch quarter-wave antenna on the roof of a vehicle is fairly impracticable and a shorter loaded whip is usually installed in this location, even though this type offers lower efficiency.

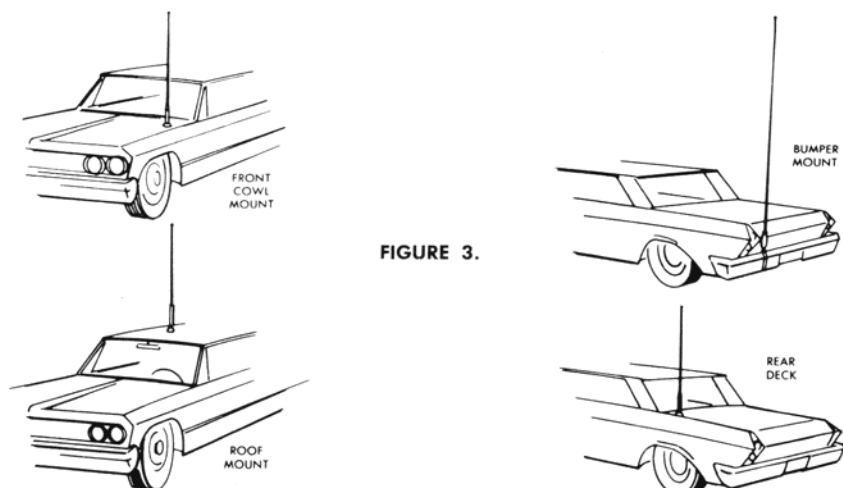


FIGURE 3.

### REAR DECK MOUNTING

Rear deck mounting permits the use of a full quarter-wave antenna or a shorter, loaded whip. The radiation pattern in such a location is somewhat irregular, radiation being slightly greater in the direction of the front fender opposite to the side on which the rear deck antenna is mounted.

### BUMPER MOUNTING

This arrangement uses the rear bumper of the car and is by far the most practical for use with full 108-inch quarter-wave whips. Another advantage is that removal of the antenna is simple and leaves no holes in the car body. The radiation pattern produced by an antenna mounted on the left rear bumper is fairly irregular, with greatest radiation being in two directions -- one to the right and forward slightly, the other to the rear and left slightly.

## BASE STATION ANTENNAS

### SHORT RANGE

The Lafayette HE-19 (Lafayette Stock No. 99-3015) is a small base loaded whip designed for short range communications work -- intercommunication between buildings, etc. It mounts directly onto the back of the transceiver. Extended -- it measures 45", closed -- 15".

### LONG RANGE

There are three basic types of long-range antennas as shown in Figure 4.

- A. Vertical Ground Plane Antennas. These are omnidirectional antennas that provide optimum performance for contacting other fixed stations using vertical type antennas in addition to all mobile stations. For medium and long-range communications work.



FIGURE 4.

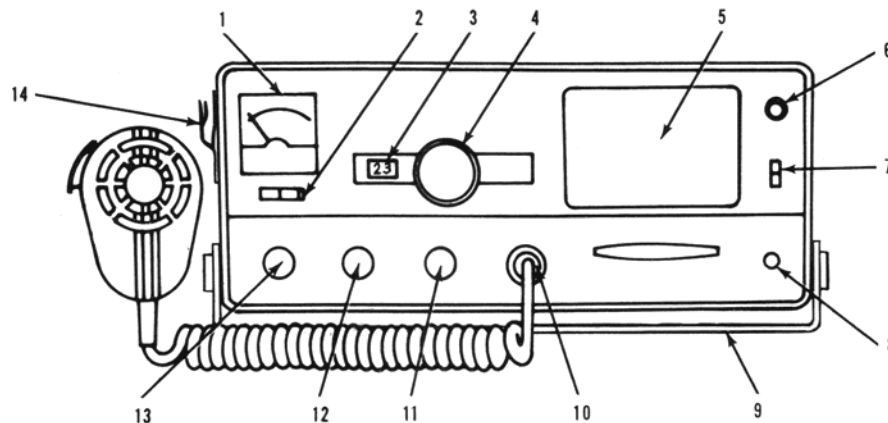


- B. Coaxial Antennas. These are high efficiency type radiators with omnidirectional characteristics, performing as well in most applications as the ground plane type. Ideal for those installations where a vertical ground plane is not feasible. For medium and long range communications work.
- C. Directional Beam Antennas. Highly efficient and directional antennas generally intended for fixed-to-fixed long range communications. An average 3-element beam provides an equivalent of 8 db increase in transmitter power.

## IGNITION INTERFERENCE

### AUTO

The suppression carried out on vehicles equipped with a standard broadcast radio will usually prevent any serious ignition interference from occurring. However, because of the high sensitivity of the receiver, sufficient noise may be picked up from your own vehicle to make reception of weaker stations difficult. In such a case, additional suppression is recommended. Several noise suppressor kits are available (such as the Lafayette HP-204, Stock No. 42-0905) which include all necessary parts and instructions for effectively suppressing ignition noise. Alternatively, you can take the vehicle to a skilled auto radio technician who will be able to carry out the suppression for you.



### OPERATING CONTROLS AND FEATURES

- |                                |                                                                                                                                                                                                                          |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1) ILLUMINATED METER .....    | Automatically indicates relative strength (in "S" units) of incoming signal or RF antenna power (in watts) of the transmitter.                                                                                           |
| (2) RANGE-BOOST .....          | Concentrates more audio power into the transmitted sidebands by providing high average modulation on all syllables. Offers maximum communication distance when noisy conditions make reception of your signal difficult. |
| (3) CHANNEL INDICATOR .....    | Illuminated dial shows channel to which the transceiver is set.                                                                                                                                                          |
| (4) CHANNEL SELECTOR .....     | Continuously rotating switch that selects any one of 25 channels (23 CB channels plus 2 extra for future use).                                                                                                           |
| (5) SPEAKER .....              | PM-type 5 x 3" oval speaker located behind grille.                                                                                                                                                                       |
| (6) MODULATION INDICATOR ..... | Functions as modulation indicator on transmit.                                                                                                                                                                           |
| (7) PA-CB .....                | "CB" position provides normal operation. "PA" position permits Public Address operation on transmit using an external speaker. On receive, "PA" position provides channel monitoring over the external speaker.          |

- (8) PHONE JACK ..... Standard phone jack for headphones or external speaker (4-8 ohms). Insertion of plug into the jack automatically silences the internal speaker.
- (9) MOUNTING BRACKET ..... Specially designed mounting bracket simplifies mobile installation -- also permits fast removal of transceiver.
- (10) MICROPHONE ..... Four-pin socket for push-to-talk ceramic microphone with coiled cord and dependable screw-on connector.
- (11) FINE TUNING ..... Permits "fine" tuning of receiver for reception of stations that are off frequency.
- (12) VOLUME/ON-OFF ..... Varies the sound output from the speaker. Also incorporates an on-off power switch at the extreme counter-clockwise position.
- (13) SQUELCH/STANDBY ..... This control is used to "quiet" the receiver during "no-signal" conditions. Degree of sensitivity to incoming signals is adjustable. Fully counter-clockwise position switches to standby.
- (14) MICROPHONE CLIP ..... Hang-up clip for microphone (supplied separately for installation in various positions).

## OPERATING INSTRUCTIONS

**WARNING:** The frequencies selected by channels A and B must not be used until the FCC has given approval for their use in the proposed H.E.L.P. program (see page 12 for further information).

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

### RECEIVING

Place the PA-CB switch in the CB position, rotate the squelch control to the extreme counter-clockwise position (without operating the standby switch), and select desired channel. Rotate the volume control knob until the switch clicks. The "S" meter dial light should glow softly. Advance the volume control to about 1/3 setting. As the unit warms up, the characteristic noise (rushing sound) of a high gain receiver should be heard. Adjust to a comfortable listening level. The receiver is now ready to operate.

### SQUELCH ADJUSTMENT

The Squelch control is used to eliminate annoying background noise when no signals are present. To adjust the SQUELCH control properly during reception, turn up VOLUME until background noise is heard (no signals should be present). Rotate the SQUELCH slowly clockwise until the background noise just disappears. At this point, the receiver will be relatively 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 the extreme 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, simply turn the control fully counter-clockwise -- but without operating the Standby switch.

In the "Standby" position of the Squelch control, the high voltages (B+) in the transceiver are switched off but filament voltages are still maintained. This reduces power consumption when the unit is not in actual use while allowing the transceiver to remain in a "warmed-up" condition ready for instant use when needed (simply rotate Squelch clockwise to operate the switch).

## FINE TUNING

The FINE TUNING control has a total range of approximately 2.5 Kc and may be used for reception of a station that is slightly off frequency. Simply tune for best reception and highest "S" meter reading.

**IMPORTANT NOTE:** When better reception is obtained with this control in either the extreme left or right 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 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 Fine Tuning control in the normal (center) position.

## "S"/RF POWER METER

This meter is automatically switched to indicate incoming signal strength in the receive mode, and relative RF power output in the transmit mode.

During reception, the "S" 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. The meter reading may be readjusted by means of a control located at the rear of the transceiver. Normally, the "S" meter should read "0" with no antenna connected.

During transmission, the RF power meter will read true antenna power output only when the transceiver is connected to a 50-ohm resistive load. If the antenna and transmission line do not offer such a load, the meter readings will not be completely accurate.

## PRIVA-COM SOCKET

An 11-pin socket at the rear of the transceiver is provided for use with the Lafayette "PRIVA-COM" selective call unit. A jumper plug (with pins 2 & 3 and pins 4 & 5 shorted) is normally inserted into the socket and should be removed only when the selective call unit is used.

## TRANSMITTING

**WARNING: NEVER PLACE THE TRANSCEIVER IN THE TRANSMIT MODE WITHOUT AN ANTENNA CONNECTED. THIS MAY DESTROY THE RF POWER OUTPUT TUBE.**

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.

VIOLATORS OF ANY OF THE ABOVE ARE SUBJECT TO SEVERE PENALTIES.

Before attempting to transmit, always make sure that the PA-CB switch is in the CB position. Also, check the RF POWER switch at the rear to make sure that it is in the desired position, either 100 MW or 5 watts. To transmit, simply press the microphone button. Hold the microphone at the corner of the mouth so that your voice projects forward (this provides best results) and speak at a normal level. The Modulation indicator light should "flicker", indicating that you are modulating the RF carrier. 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 they are transmitting. Each must take turns.

## RANGE-BOOST

If the station you are attempting to contact reports difficulty in receiving you due to ignition noise, interference, excessive background noise, etc., switch the Range-Boost "on" and speak normally into the microphone. Special circuitry will increase the modulation density in the sidebands and increase the average audio in your signal, permitting it to be heard under conditions which might otherwise make its reception impossible. Never shout or raise your voice when using "Range-Boost" since this will not increase the range of your transmission in any way.

## 100 MILLIWATT OPERATION

The transceiver is equipped with a 5W-100MW switch at the rear which, in the 100MW position, will reduce the RF output and permit short-range operation (within buildings, building-to-building, etc.).

## 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 4-8 ohm speaker connected to the PHONES jack. Set the PA-CB switch to PA and 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: As soon as the microphone push-button is released, the transceiver will return to the normal receive mode to provide CB reception.

## OPERATING PROCEDURES

WARNING: The frequencies selected by channels A and B must not be used until the FCC has given approval for their use on the proposed H. E. L. P. program.

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. For information on permissible types of communications, you should always refer to Part 95 of the FCC Rules and Regulations.

## CHANNELS A and B

The Comstat 25 offers two extra channels in addition to the existing 23 CB channels. These two extra channels, which are selected by positions A and B on the channel selector, have been provided for future operation on the two frequencies listed below. These frequencies are derived in the normal synthesizing circuit in the transceiver and no extra crystals need be added.

A - 27.235 Mc.

B - 27.245 Mc.

DO NOT TRANSMIT ON ANY OF THESE FREQUENCIES UNTIL THE FCC HAS GIVEN APPROVAL FOR THEIR USE IN THE H. E. L. P. PROGRAM. In a petition to the FCC, the Automobile Manufacturers Association has requested the use of the above frequencies in the proposed nation wide H. E. L. P. plan (Highway Emergency Locating Program).

Approval is therefore still pending, and these frequencies may not be used until the FCC has assigned them officially to the H. E. L. P. program.

## SERVICE AND MAINTENANCE

The transceiver was carefully designed to provide reliable service over a long period of time. However, in common with all electronic equipment, a component may fail or change characteristics, and thus necessitate replacement of the faulty part. Certain items, such as tubes and pilot lamps, will age and may become defective. However, these can be easily replaced by the user if he wishes to do so. More serious failures will usually require the services of a competent technician.

### WARNING

FCC REGULATIONS REQUIRE THAT ANY ADJUSTMENTS MADE TO THE TRANSMITTER WHILE ON THE AIR WHICH MIGHT RESULT IN GENERATION OF A SPURIOUS FREQUENCY MUST BE MADE UNDER THE SUPERVISION OF, OR BY, A PERSON HOLDING A VALID FIRST OR SECOND CLASS RADIO TELEPHONE OPERATOR'S LICENSE.

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

### CABINET REMOVAL

Disconnect the power cable and the antenna cable. To detach the top cover, remove four large slotted-head screws (two each side). To detach the bottom cover, remove six screws on the underside of the cabinet.

### SIMPLE TROUBLE SHOOTING

**IMPORTANT:** If trouble is experienced with transmission (low RF output, reduced range, etc.), make sure that the 5W-100MW switch at the rear of the transceiver is in the "5W" position.

### TUBES

Tubes may be checked in a do-it-yourself tube tester in a neighborhood store, or may be taken to a service shop for testing. Replace any weak or defective tubes with new ones of identical type. Before replacing tubes in the transceiver, refer to the diagram (on a following page) which shows the correct tube locations.

### SOLID-STATE DC POWER SUPPLY

This transceiver employs a solid-state (2-transistors) power supply circuit during 12 volts DC operation (no vibrator is used). The transistors, which are located on the rear panel, have been treated with a light protective coating to avoid possible oxidation. Under no circumstances should the transistors be allowed to come into contact with the vehicle chassis, metal brackets, etc. This will cause a short-circuit and may destroy the transistors.

### PILOT LAMPS

There are three pilot lamps used in the transceiver. Two of these are built into the meter, and the third provides illumination for the channel dial plate. All three are run considerably below their maximum rating and should therefore last almost indefinitely.

### FUSES

The 12-volt DC power cable uses an "in-line" fuse. The value of this fuse is 8 amp. Provision has also been made for fusing the primary circuit during 117 volt AC operation by means of a 1 amp fuse located within the transceiver (remove bottom cover for access to the fuse).

In the event of complete failure (tube filaments and pilot lamps not lighting), the fuse should always be checked first. If it has failed, replace only with one of a similar rating. Repeated failure of a fuse would indicate a serious fault in the transceiver which should be investigated.

#### FREQUENCY SYNTHESIZING SYSTEM

This transceiver employs a method whereby 13 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 -- not just one. 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	Q1 + Q7	33.165
2	26.975 Mc	Q1 + Q8	33.175
3	26.985 Mc	Q1 + Q9	33.185
4	27.005 Mc	Q1 + Q10	33.205
5	27.015 Mc	Q2 + Q7	33.215
6	26.025 Mc	Q2 + Q8	33.225
7	27.035 Mc	Q2 + Q9	33.235
8	27.055 Mc	Q2 + Q10	33.255
9	27.065 Mc	Q3 + Q7	33.265
10	27.075 Mc	Q3 + Q8	33.275
11	27.085 Mc	Q3 + Q9	33.285
12	27.105 Mc	Q3 + Q10	33.305
13	27.115 Mc	Q4 + Q7	33.315
14	27.125 Mc	Q4 + Q8	33.325
15	27.135 Mc	Q4 + Q9	33.335
16	27.155 Mc	Q4 + Q10	33.355
17	27.165 Mc	Q5 + Q7	33.365
18	27.175 Mc	Q5 + Q8	33.375
19	27.185 Mc	Q5 + Q9	33.385
20	27.205 Mc	Q5 + Q10	33.405
21	27.215 Mc	Q6 + Q7	33.415
22	27.225 Mc	Q6 + Q8	33.425
23	27.255 Mc	Q6 + Q10	33.455
A	27.235 Mc	Q6 + Q9	33.435
B	27.245 Mc	Q6 + Q13	33.445

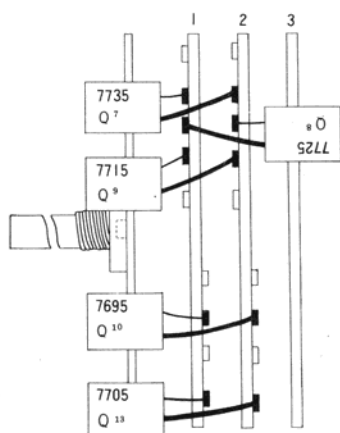
\* Note that the derived frequency is exactly 6.2 Mc higher than the channel frequency in each case. During transmit, the derived frequency is converted to the channel frequency by the 6.2 Mc crystal oscillator/converter (V11). During receive, the derived frequency is heterodyned with the incoming channel frequency at the 1st Mixer/IF to produce a 1st IF of 6.2 Mc.

TABLE B

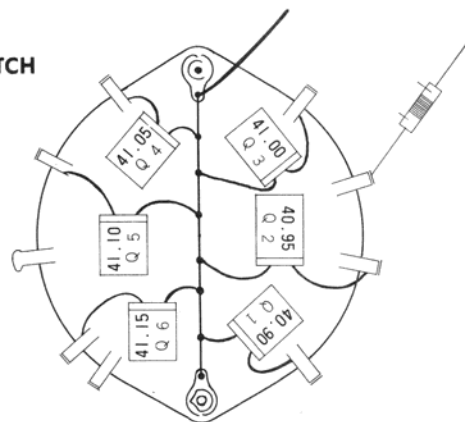
CRYSTAL	FREQUENCY	CHANNELS IN WHICH USED
Q1	40,900 Kc	1 thru 4
Q2	40,950 Kc	5 thru 8
Q3	41,000 Kc	9 thru 12
Q4	41,050 Kc	13 thru 16
Q5	41,100 Kc	17 thru 20

Q6	41,150 Kc	21 thru 23 plus A
Q7	7,735 Kc	1, 5, 9, 13, 17, 21
Q8	7,725 Kc	2, 6, 10, 14, 18, 22
Q9	7,715 Kc	3, 7, 11, 15, 19 A
Q10	7,695 Kc	4, 8, 12, 16, 20, 23
Q13	7,705 Kc	B

Failure of any one of the eleven crystals used will cause a malfunction on a group of channels, as indicated above. For example, failure of crystal Q1 would cause the transceiver to be inoperative on channels 1, 2, 3 and 4; failure of crystal Q7 would cause the transceiver to be inoperative on channels 1, 5, 9, 13, 17 and 21.



**CHANNEL SELECTOR SWITCH**



### COMPLETE ALIGNMENT INSTRUCTIONS

The transceiver has been fully aligned at the factory before shipment to you and does not normally require further adjustment. When necessary, however, the receiver and transmitter may be aligned as indicated.

Only qualified technicians with proper test equipment should undertake realignment or tuning adjustments of either the receiver or transmitter sections. It should also be noted that FCC regulations require that all transmitter adjustments be made by, or under the supervision of a person holding a 1st or 2nd class commercial radiotelephone license.

### CABINET REMOVAL

Disconnect the power cable and the antenna cable. To detach the top cover, remove four large slotted-head screws (two each side). To detach the bottom cover, remove six screws on the underside of the cabinet.

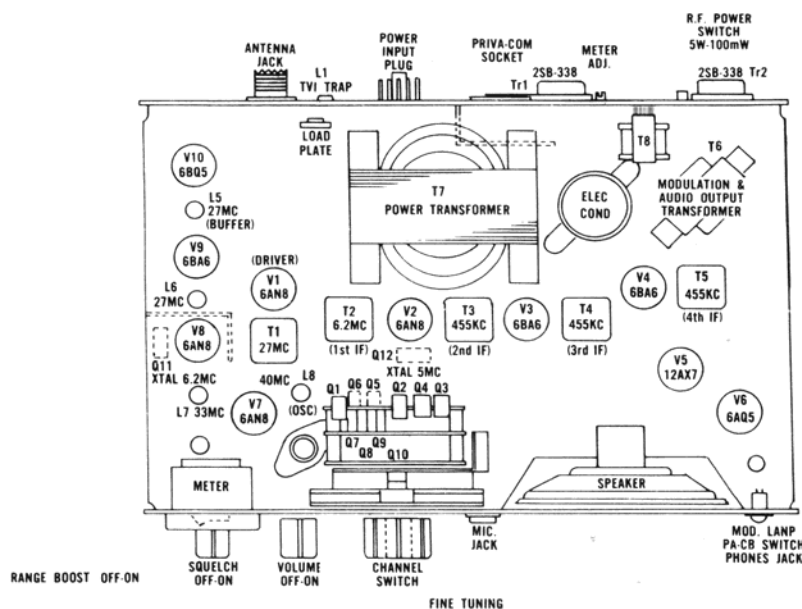
### RECEIVER ALIGNMENT

#### 455 KC IF ADJUSTMENT

Connect the transceiver to a power source and attach the microphone. Turn volume to its mid-position, squelch at minimum, and the PA switch in the CB position. Set FINE TUNING to the mid-position (normal) and the CHANNEL selector to channel 13.

Connect an AC voltmeter (VTVM) across the speaker terminals in the transceiver. Alternatively, the meter can be connected to the "Phone" jack by means of a standard phone plug.

Connect a 455 Kc signal generator (modulated 30% at 1 Kc) to pin 8 of V2(6AN8). Make certain the output frequency of the generator is within 1 Kc of 455 Kc. Increase generator output until the VTVM reads approximately 0.5 volts.



Adjust the top and bottom tuning cores of T3, T4 and T5 for maximum output. Reduce generator output progressively as circuits come into line so that VTVM reading does not exceed about 0.5 volts. When no further increase can be obtained by adjusting the cores, disconnect the signal generator and proceed with the 6.2 Mc IF adjustments.

#### 6.2 MC IF ADJUSTMENT

Connect the signal generator to pin 2 of V1 (6AN8), with the VTVM connected to the speaker terminals. Make sure the Fine Tuning control is in the normal, center position. Tune the generator in the vicinity of 6.2 Mc until a maximum reading is obtained on the VTVM. Reduce generator output level until the meter reads about 0.5 volts. Adjust top and bottom cores of T2 for maximum reading, reducing generator output if necessary so that reading does not exceed 0.5 volts.

#### SECOND OSCILLATOR

The second oscillator V2B (6AN8) is crystal-controlled and operates at 5.745 Mc. The Fine Tuning control permits fine tuning of the receiver and has a total range of about 2.5 Kc. A normally functioning oscillator will develop approximately -1.5 to -8 volts at pin 2 of V2B. Differences in individual crystal activity will cause a variation in grid voltage from crystal to crystal.

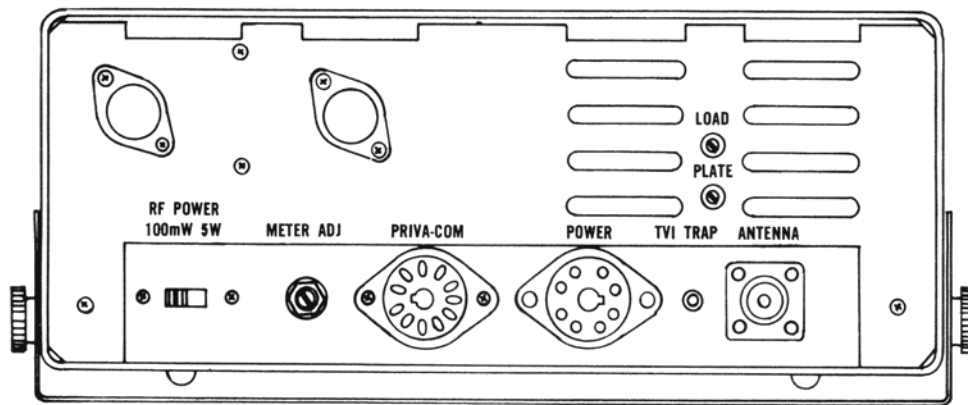
#### LOCAL OSCILLATOR

The master local oscillator, V7A, is crystal-controlled and is used during both transmit and receive. This oscillator operates between 40.900 and 41.150 Mc, as chosen by the channel selector switch. A normally functioning oscillator will develop approximately -8 volts at pin 2 of V7 (see voltage chart). Differences in individual crystal activity will cause a variation in the voltage measured at this point.

The local oscillator is tuned as follows: adjust the bottom core of L8 for maximum negative reading at pin 2 of V7A with the channel selector switch set to channel 23, then back off from peak in a clockwise direction to about 70% of the maximum reading. Check all channels for activity. A defective crystal will produce zero voltage at pin 2 in four consecutive channels.

After this adjustment has been made, check transmitter output frequency to make sure it is within FCC specification on all channels. Readjust L8 if necessary.





## SYNTHESIZER

The synthesizer oscillator (V7B) is crystal-controlled and is used during both transmit and receive. This oscillator operates between 7.735 and 7.695 Mc, as chosen by the channel selector switch. A normally functioning oscillator will develop approximately -2.5 volts at V7 pin 8 (see voltage chart), depending upon crystal activity. The 40 Mc output from V7A and the 7 Mc output generated in the screen circuit of V7B produce a 33 Mc output in the plate circuit of V7B, L7 being tuned to this frequency.

## RF ADJUSTMENTS

When it has been ascertained that all oscillators are functioning normally, connect the signal generator (modulated 30% at 1 Kc) to the antenna connector. Use RG58/U or equivalent 52 ohm cable. Set generator output to approximately 10  $\mu$ V, and switch receiver to channel 13. Tune the generator around 27.115 Mc until a signal is heard in the receiver. Adjust the generator output frequency for maximum output voltage reading on the VTVM (at speaker terminals). Adjust the top and bottom tuning cores of T1 for maximum output.

## "S" METER ADJUSTMENT

After receiver alignment has been completed, adjust VR1 for a "0" reading on the "S" meter with no signal input and transceiver set to channel 13.

## TRANSMITTER ALIGNMENT

The detailed operation and alignment of the local oscillator and synthesizer has been covered previously. Both oscillators are used for the transmit operation.

In the receive mode, B+ is removed from V8 and V9 in the transmitter, and a large bias is applied to the grid of the RF power output tube V10. In the transmit mode, B+ is removed from V1, V2, V3 and V4 in the receiver and re-applied to V8 and V9 in the transmitter. The bias formerly applied to V10 is also removed.

NOTE: Connect a 50 dummy load to antenna connector before proceeding (use two 100 ohm 2 watt resistors in parallel).

Connect VTVM (with 1 megohm resistor in series with DC probe) to pin 1 of V9. With mike button pressed, adjust L6 for maximum reading on channel 13. A reading of approximately -2.0 volts is normal. Failure to obtain any reading may indicate trouble in the 6.2 Mc converter stage. If the receiver is normal, it is likely that the trouble lies beyond L7, in which case V8 or the 6.2 Mc crystal should be suspected. After this adjustment has been made, check transmitter output frequency to make sure it is within FCC specification on all channels. Readjust L6 if necessary.

Connect VTVM (with series resistor) to pin 2 of V10. Adjust L5 for maximum reading on channel 13. A reading of approximately -15 volts is normal. At this point, check all channels with an RF wattmeter connected to the antenna connector. Make sure that there is approximately equal power output on all channels. If output is low on some channels, slight re-adjustment of L5 for equal reading on channels 1 and 23 will usually ensure adequate output on all 23 channels.

#### MAXIMUM RF OUTPUT

VC3 (Load) and VC4 (Plate) should now be adjusted for maximum power output on the RF wattmeter. Adjustment of VC3 and VC4 affects the power input to the final amplifier. Remember, maximum RF input power has been set at 5 watts by the FCC. Power input may be determined as follows: Check the voltage across resistor R55 (1K, 2W) -- it should not exceed 21 volts. This figure has been arrived at on the basis of an average of 225 volts on the plate with 23 ma plate current --  $225 \times 0.023 = 5.17$  watts.

If the voltage measured across R55 is higher than 21 volts, set VC3 fully clockwise and then peak VC4 for maximum. Now adjust VC3 clockwise until a reading of 20-21 volts is measured across R55.

#### MODULATION

The modulation should be checked by a modulation monitor. The gain is pre-set and should result in 100% modulation with 60 mv of a 1.5 Kc tone applied to pin 1 of the mike jack. With "Range-Boost" switched on, 9 mv should yield 100% modulation. In no case should the unit exceed 100% modulation.

#### TV INTERFERENCE TRAP

This transceiver contains a built-in series-resonant trap in parallel with the antenna. When tuned correctly, it suppresses television interference. The trap is a filter which offers little opposition to the transmitter frequency but will help eliminate the second harmonic to which it is tuned.

Turn on a TV receiver that you can see from your transmitting location, and tune to one of the three lower TV channels that has a station operating in your vicinity. If you notice a "cross-hatch" or "wavy line" pattern on the screen while you are transmitting, it will be necessary to adjust the RF trap coil slug screw (L1), in rear of cabinet, to eliminate or minimize this interference. This will usually only be necessary when the transmitter antenna is located near the TV antenna, or that of a neighbor.

#### 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.

## VOLTAGE CHART

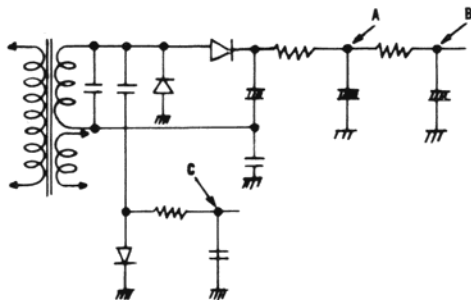
1. All readings taken with VTVM from chassis (negative) to point indicated.
2. Input to transceiver set at 117 volts AC. Identical readings are obtained with 12 volts DC input.
3. Transceiver set to channel 13.
4. PA switch in CB position, VOLUME and SQUELCH at minimum (counter-clockwise), FINE TUNING in center (normal) position.
5. 50 ohm dummy load connected to antenna connector.
6. Readings on individual units may vary by as much as  $\pm 20\%$ .

NDV = No detectable voltage. NC = No connection. NM = Not measurable.

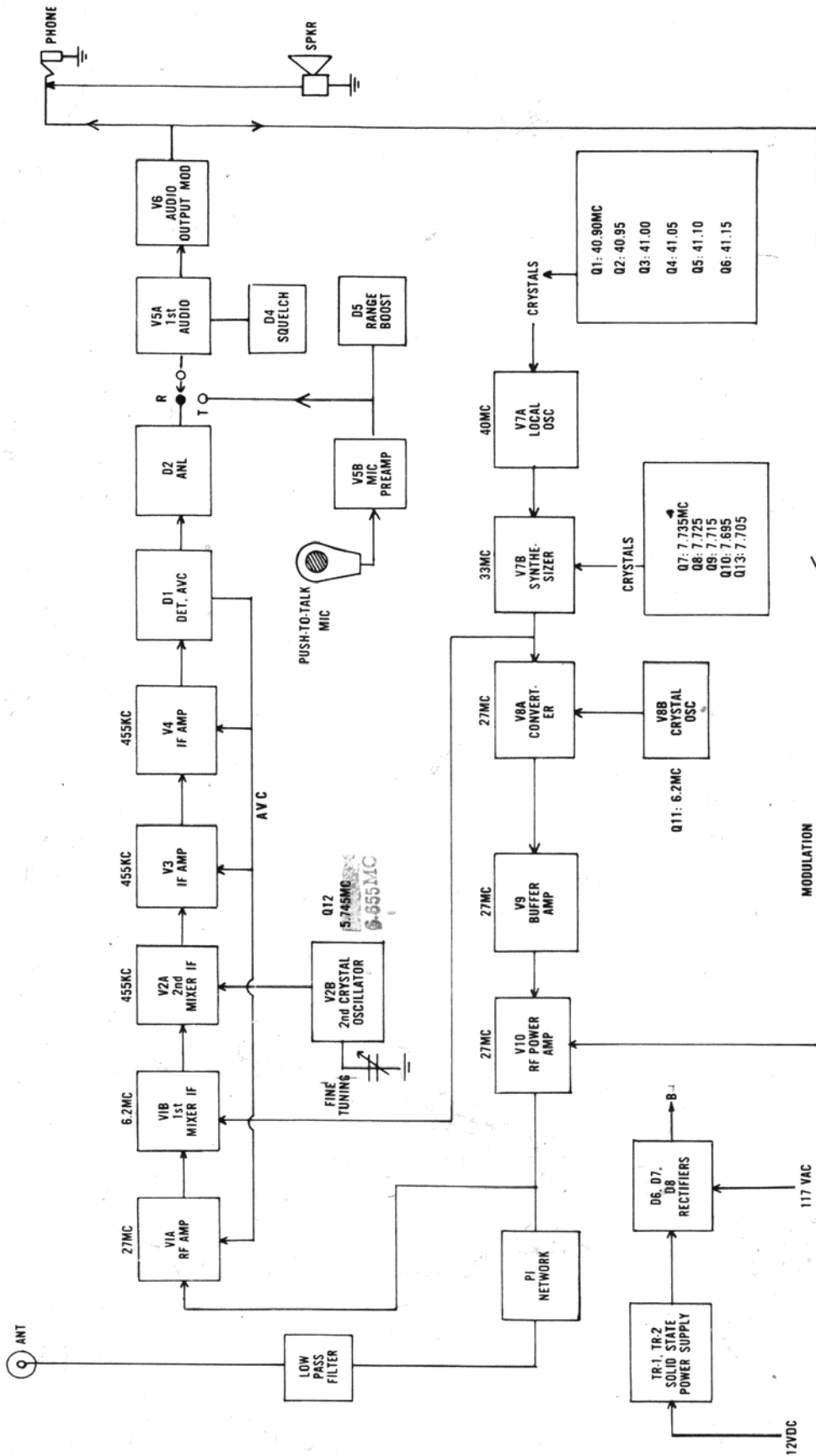
### TUBE VOLTAGES

TUBE	MODE	PIN NUMBERS								
		1	2	3	4	5	6	7	8	9
6AN8 V1	TR REC	70	NDV	3.1	H	H	230	90	NDV	0.8
6AN8 V2	TR REC	40	-2*	0	H	H	90	110	NDV	2.3
6BA6 V3	TR REC	NDV	0	H	H	210	60	0.6		
6BA6 V4	TR REC	NDV	0	H	H	220	65	0.5		
12AX7 V5	TR REC	90 70	NDV NDV	0.45 0.6	H H	H H	90 100	NDV NDV	0.7 0.8	NC NC
6AQ5 V6	TR REC	NDV NDV	10 11	H H	H H	250 270	200 220	NDV NDV		
6AN8 V7	TR REC	40 40	--8* -8.5*	0 0	H H	H H	135 150	70 80	-2.5* -2.7*	0 0
6AN8 V8	TR REC	40	-11*	0	H	H	210	40	-5*	0
6BA6 V9	TR REC	-6*	0	H	H	140*	120	1		
6BQ5 V10	TR REC	NC	-8.5*	0	H	H	0	NM		195

\* Measured with 1 megohm resistor in series with DC probe. Reading may vary at grid pins, depending on crystal activity.



Point	TR	REC
A	260 V	280 V
B	215 V	235 V
C	-90V	-120V



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"COMSTAT 25" FUNCTIONAL BLOCK DIAGRAM