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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 <u>not</u> 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

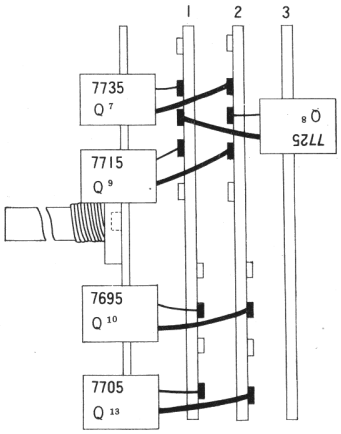
* Note that the derived frequency is exactly 6.2 Mc higher than the channel frequency in each case. During transmit, the derived frequency is converted to the channel frequency by the 6.2 Mc crystal oscillator/converter (V11). During receive, the derived frequency is heterodyned with the incoming channel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

TABLE B

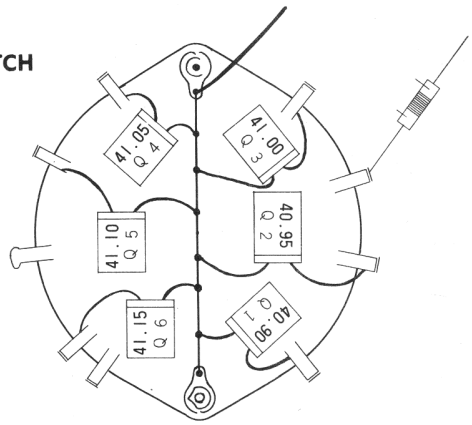
CRYSTAL	FREQUENCY	CHANNELS IN WHICH USED
Q1	40,900 Kc	1 thru 4
Q2	40,950 Kc	5 thru 8
Q3	41,000 Kc	9 thru 12
Q4	41,050 Kc	13 thru 16
Q5	41,100 Kc	17 thru 20

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.

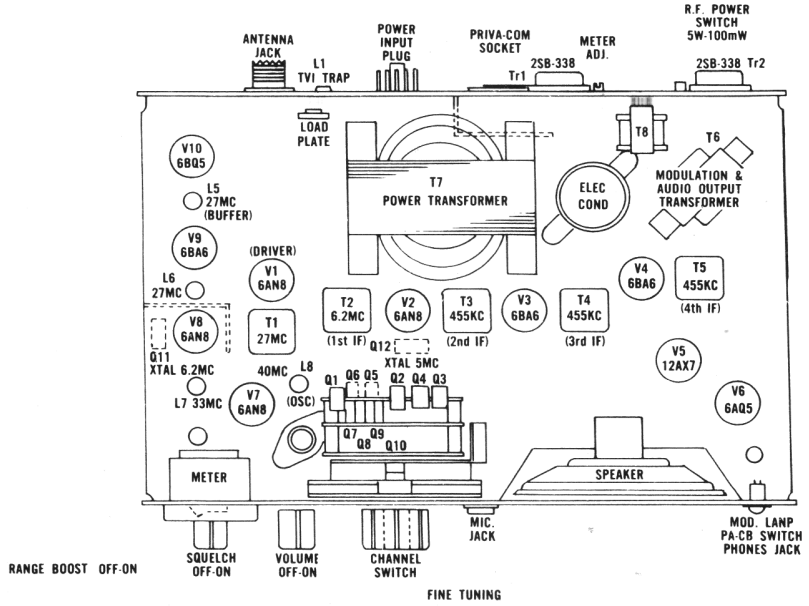
RECEIVER ALIGNMENT

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

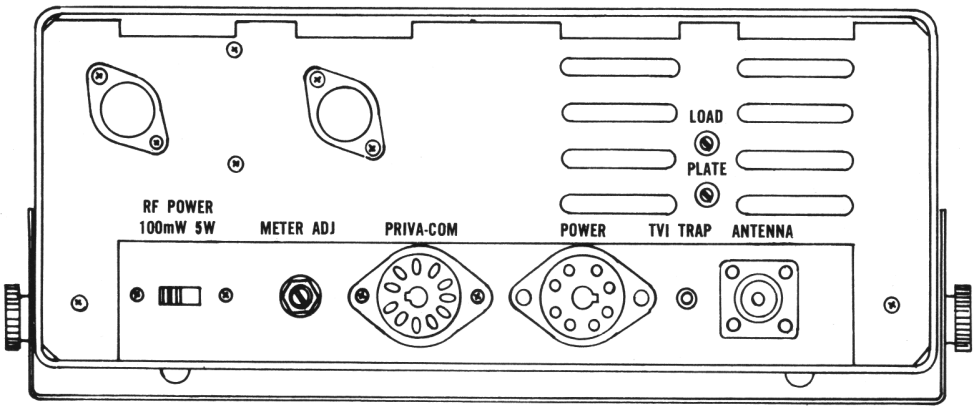
The second oscillator V2B (6AN8) is crystal-controlled and operates at 5.745 Mc. The Fine Tuning control permits fine tuning of the receiver and has a total range of about 2.5 Kc. A normally functioning oscillator will develop approximately −1.5 to −8 volts at pin 2 of V2B. Differences in individual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

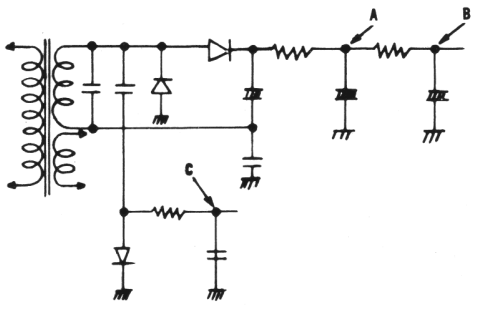
1. All readings taken with VTVM from chassis (negative) to point indicated.
2. Input to transceiver set at 117 volts AC. Identical readings are obtained with 12 volts DC input.
3. Transceiver set to channel 13.
4. PA switch in CB position, VOLUME and SQUELCH at minimum (counter-clockwise), FINE TUNING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

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

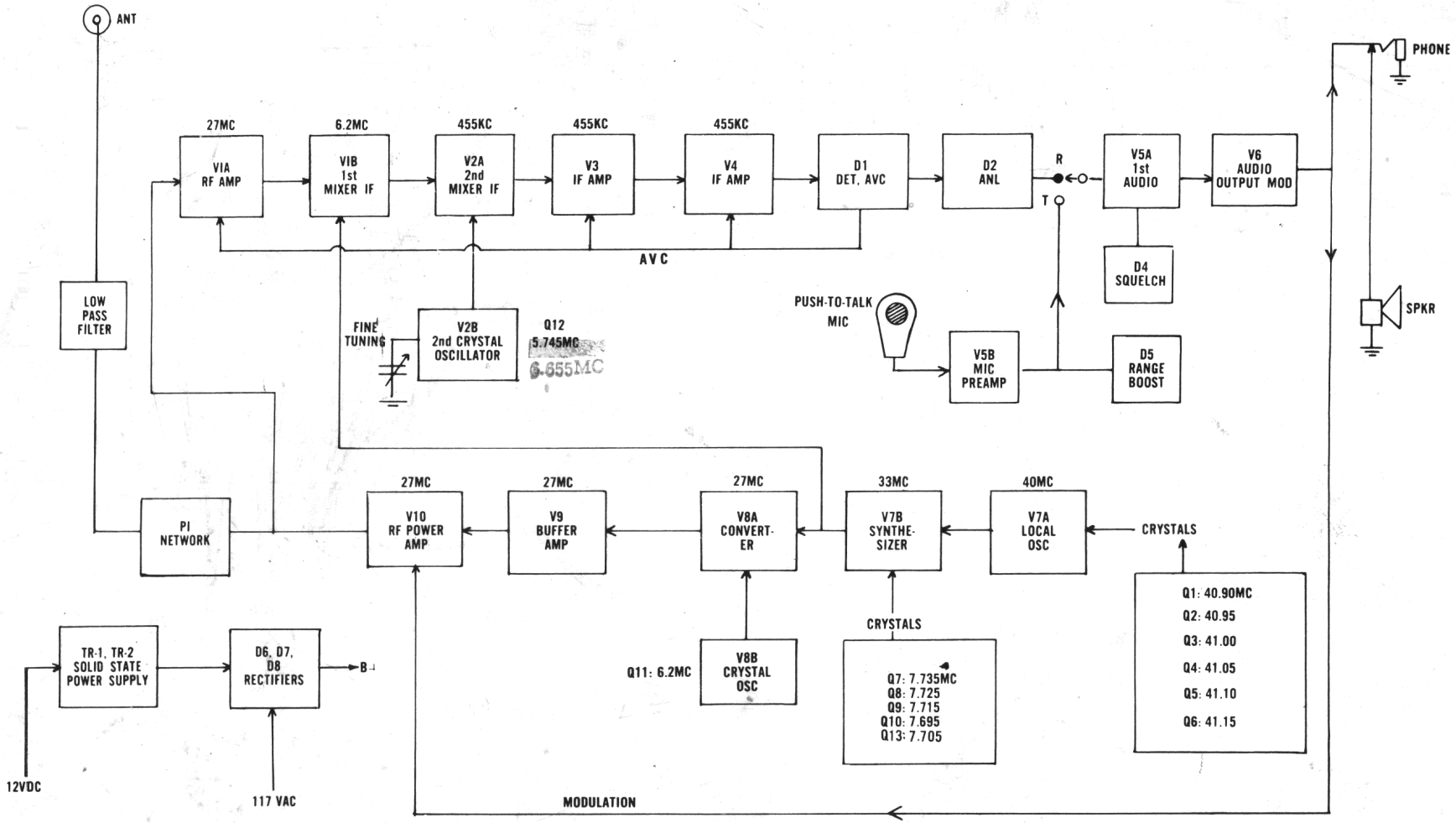
TUBE VOLTAGES

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	90	NDV	0.45	H	H	90	NDV	0.7	NC
	REC	70	NDV	0.6	H	H	100	NDV	0.8	NC
6AQ5 V6	TR	NDV	10	H	H	250	200	NDV		
	REC	NDV	11	H	H	270	220	NDV		
6AN8 V7	TR	40	--8*	0	H	H	135	70	-2.5*	0
	REC	40	-8.5*	0	H	H	150	80	-2.7*	0
6AN8 V8	TR	40	-11*	0	H	H	210	40	-5*	0
	REC									
6BA6 V9	TR	-6*	0	H	H	140*	120	1		
	REC									
6BQ5 V10	TR		-8.5*	0	H	H	0	NM		195
	REC	NC								

* 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



"COMSTAT 25" FUNCTIONAL BLOCK DIAGRAM

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