

GONSET

**10 METER
FIXED - STATION COMMUNICATOR**

INSTRUCTION MANUAL

**for
MODEL G-28**

801 S. Main St.



BURBANK, CALIF.



TRANSMITTER

Frequency Coverage:	28.0 - 29.7 mc.
Type of Modulation:	A-3 (AM)
PA Power input:	48 watts
PA Power output:	27 watts (nominal)
Modulation Capability:	90-95% (with integral speech clipping)
Output impedance:	50-70 ohms unbal.
Frequency Control:	Internal VFO or Xtal

RECEIVER

Frequency Coverage:	28.0 - 29.7 mc.
Signal-plus-noise to noise ratio:	6db. with 2uv. input
Image Ratio:	better than 200 X (46 db down)
Overall Selectivity:	6 db down at 6kc. 60 db down at 30 kc.
Input impedance:	50-70 ohms unbalanced

WARRANTY

The Gonset Division warrants this product to be free from defective material and workmanship when new, and will remedy any defect or replace any defective part free of charge for a period of 3 months from date of original purchase, provided warranty registration card is filled in and mailed to us. This warranty does not apply to units which have in any way been abused or misused, either deliberately or accidentally, or have been altered.

The defective unit or part must be returned to us transportation charges prepaid, after first getting authorization to return.

No dealer or other person is authorized to assume any further liability on our behalf when selling this unit.

OPERATOR LICENSE REQUIRED FOR TRANSMISSION

Operation of the transmitter in this equipment requires a Federal Communications Commission license. Operation without a license is illegal and is subject to penalty.

DANGER, HIGH VOLTAGE

The voltages employed in this unit are sufficient to cause fatal shock under some conditions. Do not attempt to work on the unit out of the cabinet unless you are qualified to the extent of knowing what precautions to observe with regard to avoiding electrical shock.

Made in U.S.A.

GONSET DIVISION
YOUNG SPRING & WIRE CORP.

801 S. MAIN STREET

BURBANK, CALIF.

**GONSET 10 METER FIXED STATION
COMMUNICATOR
MODEL G-28**

PERTINENT DATA

INSTALLATION:

Connect RG-8/U or similar 50 ohm or 70 ohm coaxial transmission line from a matched 10 meter antenna to coaxial connector on filter box attached to the rear of the cabinet. Use type 83-1SP or 83-850 transmission line connector. Insert power cord into any 115V AC 60 cycle outlet. Connect high-impedance dynamic, crystal, or ceramic microphone to microphone connector on rear of cabinet. Use type 75 MC1F microphone connector or equivalent.

OPERATION:

INITIAL:

Set RECEIVE-TRANSMIT switch to RECEIVE. Set DIAL LAMPS switch to on. Turn receiver VOLUME control clockwise past click, turning on unit. Dial lamps will light.

RECEIVER:

Allow two minutes warm-up. Turn SQUELCH control fully clockwise. Turn receiver VOLUME control clockwise until signal or noise is heard. Rotate RECEIVER tuning dial to tune signals. If pulse-type noise is present and objectionable, turn ANL switch to ON.

While receiving, front panel meter reads relative strength of received signals. Operation of the SQUELCH control for net operation and similar functions requiring long standby periods is discussed under SQUELCH operation paragraphs in the manual.

TRANSMITTER —

VFO CONTROL:

Switch XTAL-VFO switch to VFO. Rotate TRANSMITTER tuning dial to desired output frequency. To spot transmitter frequency on receiver dial, switch SPOT switch to ON. Rotate TRANSMITTER tuning dial or RECEIVER tuning dial for pronounced "kick" on front panel meter, indicating presence of VFO 10 meter harmonic on receiver frequency. Turn SPOT switch to OFF to remove SPOT signal for normal reception. Turn GRID-PLATE-MOD METER switch to PLATE. Rotate LOAD control fully counterclockwise to 0. Turn RECEIVE-TRANSMIT switch to TRANSMIT. Meter will indicate relative final amplifier cathode current. Quickly rotate PLATE TUNE control for pronounced dip (minimum) in meter reading. Reading should dip below 3. Rotate LOAD control slowly clockwise until meter reading increases to between 6 and 7. Again rotate PLATE TUNE control for pronounced dip in meter reading. When in dip, meter will read somewhat higher than formerly. Continue rotating LOAD control clockwise, while rotating PLATE TUNE control for minimum reading, until meter reads approximately 5.5 while in the dip (at resonance).

NOTE

"TUNE FOR MAX" instruction on meter face applies to received signals only. Neglect for transmit condition.

CAUTION:

If you are unable to adjust the PLATE TUNE and LOAD controls for proper current (5.5) at resonance, the SWR on the transmission line is probably too high for correct matching to the output network of the transmitter. Refer to the ANTENNA paragraphs in manual.

PERTINENT DATA (Continued)

OPERATION (Continued):

When transmitter is properly loaded, set GRID-PLATE-MOD switch to MOD position. The transmitter modulation control is the black, knurled shaft on the rear panel of the equipment. Speak into the microphone in a normal voice, adjusting the modulation control until the meter peaks at approximately half-scale (5). If the control is adjusted properly, the meter will rise to at least 9 while whistling. To operate, after transmitter is fully tuned, use the RECEIVE-TRANSMIT switch as required. Each time the operating frequency is changed, readjust the PLATE TUNE and LOAD controls as detailed above.

TRANSMITTER—

CRYSTAL CONTROL:

Crystals used must have a fundamental frequency of $\frac{1}{4}$ the desired output frequency. For AM operation, the crystal frequency must fall between 7.125 mc. and 7.425 mc. to multiply into the 28.500 mc to 29.700 mc. range. For crystal controlled transmitter operation, insert the crystal into the XTAL socket. Switch the XTAL-VFO switch to XTAL position. Rotate the TRANSMITTER tuning control to the approximate multiple of the crystal frequency in the 10 meter band. To spot the output frequency on the receiver dial, turn SPOT switch to ON. Rotate the RECEIVER tuning dial for pronounced "kick" on front panel meter, indicating presence of crystal 10 meter harmonic on receiver frequency. Turn SPOT switch to OFF to remove spot signal for normal reception.

Switch RECEIVE-TRANSMIT switch to TRANSMIT and adjust PLATE TUNE and LOAD controls in same manner as in TRANSMITTER-VFO CONTROL above. When loading is correct with RECEIVE-TRANSMIT switch still in TRANSMIT position, turn GRID-PLATE-MOD METER switch to GRID position and rotate TRANSMITTER tuning dial for maximum meter reading. This resonates the tracked tuned circuits following the oscillator stage. To operate, after transmitter is fully tuned, use RECEIVE-TRANSMIT switch as required. Each time a new crystal of different frequency is installed, repeat tune-up procedure before commencing normal operation.

CAUTION:

Do not place any object on top or along the sides of the Communicator cabinet that will block air flow through the perforated venting. The unit could become overheated if this venting is obstructed, causing damage to components. The transmitter should not be operated for more than five minutes in any ten minute period. Extended transmitter "ON" time may cause damage to components.

GENERAL

The GONSET fixed-station communicator is a complete, compact, AM amateur station for use in the 10 meter amateur band, from 28.00 to 29.700 mc. The transmitter frequency is controlled by a stable built-in VFO, or by a 40 meter crystal inserted in the XTAL socket on the front panel. All transmitter multiplier tuned circuits are ganged to the VFO tuning and only the power amplifier tuning and loading control must be adjusted separately when the operating frequency is changed. The receiver uses an extremely sensitive double-conversion superheterodyne circuit, with intermediate frequencies of 2250 KC and 455 KC. The receiver audio section includes an automatic noise limiter and squelch circuit to improve operating ease and convenience.

Two 6L6GB beam tetrode amplifiers provide high-level audio amplification for both the receive and transmit function. The power supply is also common to both functions, providing high voltage output

during transmitter operation, and operating at reduced voltage while receiving.

A low-pass filter, attached to the rear panel of the communicator, attenuates transmitter harmonics and spurious emissions above 40 MC by 80 db or more, reducing the possibility of interference to television reception and other services caused by harmonic and spurious radiation. Maximum efficiency occurs only when the SWR on the line is reasonably low (2:1 or less). The filter may be removed from the transmission line, if desired, and the line attached directly to the output of the power amplifier Pi-network tank circuit. When properly matched, loss through the filter is no more than .3 db.

A front-panel meter provides a measurement of carrier strength while receiving, and measures power amplifier cathode current, grid current, or modulation percentage while transmitting.

TUBE COMPLEMENT

TYPE	SYMBOL	FUNCTION
6AU6	V1	Transmitter variable-frequency oscillator-doubler
12BY7A	V2	Transmitter frequency doubler
6146	V3	Transmitter Power Amplifier
12AX7	V4	Transmitter Microphone Amplifier (one triode section) Transmitter and receiver audio amplifier (one triode section)
(2) 6L6 GB	V5, V6	Transmitter Modulators Receiver Audio Power Amplifiers
6BZ6	V7	Receiver RF Amplifier
6U8	V8	Receiver 1st mixer (pentode section) Receiver high-frequency oscillator (triode section)
6BE6	V9	Receiver Low-frequency converter (2nd mixer)
6BH6	V10	Receiver 455 kc IF amplifier
6AV6	V11	Receiver Second detector (one diode section) Receiver AVC Protector (one diode section) Receiver 1st audio amplifier (triode section)
6AL5	V12	Automatic noise limiter (one diode section) Squelch limiter (one diode section)

CONTROLS AND FUNCTIONS

The following table details the controls and their functions as an aid to a thorough understanding of the transceiver operation. "Reduced" B+ is power

supply output during receive condition, "Normal" B+ is power supply output during transmit condition.

CONTROL	FUNCTION
TRANSMITTER tuning control	Rotates the VFO tuning capacitor, the multiplier plate circuit tuning capacitor, and the power amplifier grid circuit tuning capacitor. The three tuned circuits are properly tracked for single-shaft tuning. The VFO output circuit is broad-band, requiring no tuning when the operating frequency is changed.
RECEIVER tuning control	Rotates the antenna coil tuning capacitor, the RF amplifier plate circuit tuning capacitor, and the high-frequency oscillator tuning capacitor. The three tuned circuits are properly tracked for single-shaft tuning. All other receiver tuned circuits are fixed-tuned.
GRID-PLATE-MOD switch	Selects circuit to be monitored by the front panel meter during TRANSMIT function, as follows: GRID position Meter reads relative grid current of power amplifier (6146) by measuring voltage drop across metering resistor (R-12) in 6146 grid return. PLATE position: Meter reads relative current through power amplifier (6146) by measuring voltage drop across metering resistor (R-14) in 6146 cathode return. MOD position: Meter reads relative modulation percentage by measuring rectified audio voltage built up by 6L6 audio power amplifiers across low-impedance winding on audio transformer T3 during transmission. Normal voice modulation of the proper level will cause the meter to peak at approximately mid-scale (5), while sinusoidal modulation (whistling, etc.), of the proper level results in a meter reading of 9 or more. Either type of audio represents a modulation percentage of more than 90%
LAMPS ON-OFF switch	Switch turns dial lamps on and off.
PLATE TUNE control	Rotates input capacitor of power amplifier PI-network plate tank circuit. Controls resonant frequency of circuit.
LOAD control	Rotates output capacitor of power amplifier PI-network plate tank circuit. Controls match of network to antenna transmission line input impedance.

CONTROLS AND FUNCTIONS (Continued)

CONTROL	FUNCTION	
RECEIVE-TRANSMIT switch	Switches function of transmitter from receive condition to transmit condition. Switch is 12 pole 2-position. Functions switched as follows:	
SWITCH SECTION	RECEIVE	TRANSMIT
A & B Voltage control, Reduced (receive) B+, or normal (transmit) B+	Dropping resistor included in B+ lead, power supply delivers reduced B+	Dropping resistor shorted in B+ lead, power supply delivers normal B+.
C V7, V8A, and V10 plate and Screen.	B+ applied to V7, V8A, and V10 plate and screen.	B+ removed from V7, V8A, and V10 plate and screen.
D B+ control on V8B (rcvr. Hi-Freq. Osc.)	Reduced B+ applied directly to V8A plate circuit (R49 shorted).	Normal (Transmit) B+ applied to V8A plate through dropping resistor R49.
E Low-level stage B+ distribution	Reduced B+ applied to Receiver stages V9, V11, and V12.	Normal (transmit) B+ applied to transmitter stages V2 and V4A.
F Transmitter VFO B+ line.	VFO B+ applied to SPOT switch.	VFO B+ applied directly to VFO
G Audio input to V4B.	Receiver audio output (V11) applied to input of V4B.	Microphone Audio output (V4A) applied to input of V4B.
H 6146 cathode	Cathode lead broken, de-activating tube.	Cathode lead connected, activating tube.
I & J Meter leads	Meter leads connected to "S" meter circuit.	Meter leads connected to PLATE-GRID-MOD switch for transmitter metering.
K Low-impedance audio output	Audio output to speaker Circuit completed.	"Hot" speaker lead grounded. Modulation monitor circuit connected.
L Antenna	Antenna connected to receiver input.	Antenna connected to transmitter output.

CONTROLS AND FUNCTIONS (Continued)

CONTROL	FUNCTION
SPOT OFF-ON switch	<p>Switches on transmitter oscillator stage during receive function to permit spotting of transmitter frequency on receiver dial. Switch is Single-pole double throw, with functions as follows:</p> <p>SPOT position: Reduced B+ from power supply applied to VFO tube (V1) plate and screen through 4.7 k resistor R5.</p> <p>OFF position: Normal (transmit) B+ from power supply applied to VFO tube (V1) plate and screen through 22 K resistor R-6 when RECEIVE-TRANSMIT switch in TRANSMIT position. B+ removed from V1 when RECEIVE-TRANSMIT switch in RECEIVE position.</p> <p style="text-align: center;">NOTE</p> <p>The values of R5 and R6 (4.7K and 22K) selected to provide identical plate and screen voltages on V1 during receive and transmit condition, as power supply voltage varies from reduced to normal level.</p>
VFO-XTAL switch	<p>Double pole throw switch. Selects type of frequency control used with transmitter, as follows:</p> <p>VFO position: Cathode of oscillator tube V1 connected to feed-back tap on VFO tuned circuit. Grid of Oscillator tube V1 connected to high-impedance end of VFO tuned circuit.</p> <p>XTAL position: Cathode of oscillator tube connected to cathode divider capacitor for crystal feed-back. Grid of oscillator tube connected to high-impedance side of crystal through isolating capacitor.</p>
SQUELCH control	<p>Potentiometer. Adjusts squelch action by varying conduction threshold of squelch diode V12B.</p>
ANL OFF-ON switch	<p>Single-pole double-throw switch, positions as follows:</p> <p>ON position: ANL diode (V12A) inserted in series with second detector audio output. Noise peaks bias the diode, halting conduction.</p> <p>OFF position: Diode shorted out, audio path uninterrupted.</p>
VOLUME-OFF control & switch	<p>Single-pole single-throw switch removes 115 VAC input when control is in extreme counter-clockwise position. Switch on in all other settings. Potentiometer controls receiver audio level.</p>

ANTENNA

The communicator transmitter output network and low-pass filter are designed to deliver power to a load impedance of 50-70 ohms, with reasonably low reactance. Coaxial transmission line with a characteristic impedance of 50 or 70 ohms should be used, terminated with an antenna or antenna matching network that matches this impedance reasonably well. RG-58/U or RG-59/U line is satisfactory for short runs of 40 or 50 ft., but RG-8/U or RG-11/U should be used when the run is longer to prevent excessive power loss on the line.

The efficiency of the communicator installation will be substantially improved if a directional rotary beam antenna for the 10 meter amateur band is used. The GONSET 3 element 10 meter beam, model 1587 is available for this purpose at moderate cost. If the communicator is used in addition to other equipment operating on the 15 and 20 meter amateur bands, the GONSET TRI-BANDER series of antennas, Model 3219 or 3220, are excellent multi-band beam antennas for the entire station.

If the communicator does not load properly, i.e., the LOAD control cannot be adjusted for approximately 5.5 on the Meter at resonance, the SWR on the transmission line is probably too high for satisfactory operation. This can result from a shorted or open coaxial connector, transmission line of the wrong characteristic impedance, or an improperly tuned antenna. The line SWR can be checked with any one of a number of instruments designed for this purpose, available commercially, or home-built from directions in the RADIO AMATEURS HANDBOOK (ARRL) or similar publications. If the SWR is greater than 3 : 1, the transmitter usually cannot be loaded properly. In addition, a high line SWR decreases the efficiency of the low-pass filter installed on the rear panel of the transmitter. Under severe mis-matched conditions, it is possible to damage components in the transmitter output network and low-pass filter. Do not operate the transmitter for more than a few seconds unless the power amplifier plate current, at resonance, is less than 6 or more than 4 on the meter. Methods of adjusting antennas for best match to the transmission line are given in detail in the ANTENNA HANDBOOK (ARRL) and similar publications.

CAUTION:

Do not under any conditions operate the transmitter without a load connected to the antenna terminal.

SQUELCH OPERATION

The 10 meter Communicator employs a highly effective carrier-actuated squelch circuit which may be used or not as desired. In the absence of a signal, the exceptionally flat a-v-c characteristic of the 10 meter Communicator receiver normally will cause a high background noise which becomes objectionable if prolonged, as when maintaining a standby watch on local net frequencies. The squelch facility permits muting of this background noise.

The squelch circuit employs a biased series-gate diode which is indirectly actuated by the a-v-c voltage. The combination is very effective, gating cleanly on an a-v-c voltage change as small as .01 volt when the threshold control is set carefully. The circuit is

designed so that compensating factors tend to hold the threshold setting substantially constant over a moderate change in supply voltage to the communicator.

To disable the squelch, just turn the squelch control slightly past the point where the gate "opens" on background noise with no station tuned in. It is not necessary to turn it full clockwise.

To use the squelch, back off the threshold control counter-clockwise just to the point where the background noise disappears, and stop there. This makes the squelch the most sensitive (so that it will open on weak signals). Unfortunately, this also makes the squelch sensitive to electrical noise that is sufficiently strong to cause the a-v-c voltage to change. This means that, if such noise (such as very strong ignition noise or interference from a nearby commutator motor) is intermittent in nature, the threshold control must be backed off enough to prevent the intermittent noise from triggering the squelch. It will then take a stronger carrier to open the squelch. In extremely noisy locations it may be necessary to turn the threshold control full counter-clockwise to prevent triggering of the squelch by noise. Such operation will be possible only if the desired signals are quite strong.

Certain limitations to the operation of the squelch should be kept in mind. For instance, the normal change in quiescent a-v-c voltage that occurs as the receiver is tuned over the band will cause the threshold setting to change slightly as one tunes over the band. For this reason it is recommended that the squelch be used only after a station is tuned in.

RECEIVER AUDIO SYSTEM

The second detector, noise clipper, and audio system of the COMMUNICATOR receiver have been designed for maximum intelligibility of weak signals. Because the individual characteristics all have been engineered to complement each other as an overall system, often it will be found that it is possible to copy weak signals which are not intelligible on a receiver having a comparable sensitivity. This is true even in a quiet location where a noise clipper ordinarily would not be needed for suppression of impulse type noise.

It is recommended that the noise clipper be left on all the time, the clipper in-out switch being provided primarily to assist in aligning the r-f and i-f coils on background noise when a signal generator is not available.

TRANSMITTER AUDIO SYSTEM

It will be noted that Class A single-ended beam tetrodes are used in preference to a Class B modulator. The reason for this is that when "square wave" audio is involved, as when heavy speech clipping is employed at high modulation percentages, the former type modulator compares very favorably with the latter, with the advantages of more constant plate current drain and elimination of a driver stage and its transformer. It also facilitates designing the modulator for integral speech clipping, making the incorporation of a separate speech clipper unnecessary (as well as adjustment thereof).

The speech system of the COMMUNICATOR is designed so that to obtain maximum practical speech clipping one need only talk closer to or louder into

the microphone, up to the point where the maximum tolerable distortion is obtained.

With voice waveforms and sufficient audio input to produce heavy speech clipping, the percentage modulation is held to approximately 90 per cent, and under no condition is it possible to exceed this modulation percentage. This means that "splatter" from negative peak clipping is avoided, and no critical adjustments are involved.

The audio characteristics of the transmitter, from microphone input through the modulator, have been engineered to provide maximum utilization of the carrier power from the standpoint of intelligibility under favorable receiving conditions.

CIRCUIT DESCRIPTION

BLOCK DIAGRAM

The arrangement of stages and the major transmit-receive switching is shown functionally in the accompanying block diagram. The switches are shown in TRANSMIT (T) position. The operating frequency in the 10 meter band (between 28,000 and 29,700 mc.) is designated "F" on the diagram.

When transmitting, the VFO or crystal oscillator, V1, generates a carrier at $F/4$, or one-fourth of the output frequency. The second harmonic of this frequency, $F/2$, is selected by the plate circuit of V1 and forms the excitation for the frequency doubler stage, V2. The output of V2, at the final operating frequency F , drives power amplifier stage V3. This final stage operates "straight through" on 10 meters. The RF output from the power amplifier stage is fed to the antenna through the low-pass filter.

Microphone amplifier stage V4A drives the second audio amplifier stage V4B. The output of V4B drives parallel modulator stage V5-V6. The high-impedance audio output line from this stage modulates the RF amplifier stage V3. The low impedance audio output from this stage is rectified and the resulting DC actuates the front panel meter as indication of modulation percentage, when the meter switch is in MOD position.

When receiving, signal input (F) from the antenna is applied to RF amplifier stage V7 through the low-pass filter. The amplified output of V7 forms one injection to the high frequency mixer V8A. The second injection to this mixer is the output of the high-frequency oscillator, V8B. The tuned circuits in the RF amplifier stage are tracked with the oscillator tuning, such that the oscillator frequency is always removed from the RF amplifier tuned circuit frequency by 2250 kc. This difference frequency is the first IF, fixed tuned in the plate circuit of the HF mixer V8A. This IF forms the signal injection to converter V9. The oscillator portion of the converter is fixed tuned at 2706 kc, resulting in a difference frequency at the second IF (2705-2250), 455 kc. The 455 kc IF, in the plate circuit of V9, is amplified by V10, and forms the signal input for detection by V11B, one diode section V11. The other diode section, V11C, protects the AVC line from positive voltage that could appear as a result of tube or component failure. The AVC voltage, derived from V11B, is applied to the grids of V7, V9, and V10.

The audio output recovered by V11B is filtered for residual RF and fed through to the 1st audio amplifier V11A through series diode sections of V12. The

first diode section, V12B, limits noise-pulsed audio, while the second section, V12A, uses a variable conduction level to control the squelch threshold. The bias level for squelch action is derived from plate and screen voltage variation in V10. These variations are in turn controlled by the magnitude of the AVC bias on the grid of V10, rendering the squelch action proportional to the received carrier level.

The amplified audio output of V11A is applied to second audio amplifier V4B, and V4B output drives the parallel audio amplifiers V5 and V6. The low impedance output of V5-V6 drives the receiver speaker.

CIRCUIT DETAILS

Most of the circuitry used in the COMMUNICATOR is conventional, requiring no special explanation. The transmit-receive switching is detailed in the CONTROLS AND FUNCTIONS table, and reference to this table, together with the schematic diagram, will clarify this circuitry. Operation of two of the receiver circuits, the automatic-noise-limiter and the squelch, may not be immediately evident. These circuits are described in the following paragraphs. Refer to the schematic diagram for component references.

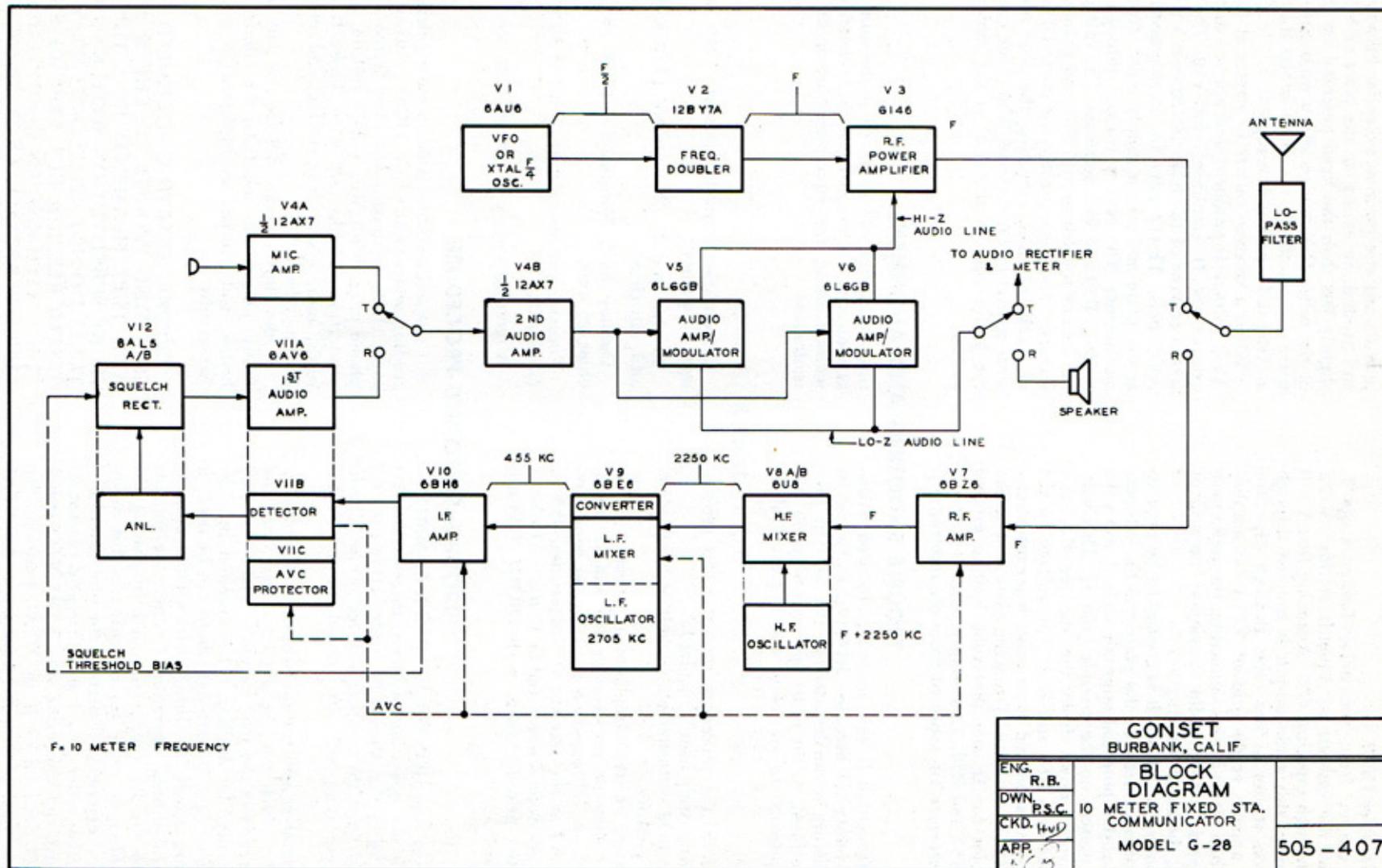
Automatic Noise Limiter V12A.

Detected audio appears at pin D of IF output transformer T8, adjacent to V11. When the ANL switch S6 is OFF (closed), the ANL diode V12A is shorted out. The detector audio output appears uninterrupted at pin 1 of V11, to be coupled off through C70. The audio path is through R64. The voltage divider composed of R64 and R65 to ground reduces the audio voltage level by a ratio of two-to-one. C79 removes residual RF present on the detected audio. Resistors R65, R67, and capacitor C69 are not effective in the circuit when the ANL switch is OFF.

A negative potential of approximately -1 volt or more is always present between pin D of T8 and ground, as a result of space charge in the diode detector, residual noise and detected carrier level (AVC). When the ANL switch S6 is on (ANL position), diode V12A is in series with the audio path. The resistive divider R64-R66 places a negative potential on the plate of V12A of 1/2 the static detector output. The entire static output appears on the cathode of V12A through resistors R65 and R67. The plate of the diode is therefore positive with respect to the cathode, the diode conducts, and audio couples through via the electron stream.

When a noise pulse appears at the detector output, the negative potential between pin D of T8 and ground instantaneously changes to more than the static level. One-half of the pulse level appears immediately at the plate of V12A (pin 7). The time constant of the network of R65-C69-R67 prevents the pulse voltage change from appearing on the cathode of V12A, and this level does not change during the short duration of the pulse. The plate of V12A is thus negative with respect to the cathode while the pulse lasts, the diode is biased, or "cut off", and the audio path is interrupted. Pulse duration is so short that the "cut off" time is not noticeable in the audio output, and the only detectable change is the reduction of the noise output in the audio.

The diode introduces some distortion in the normal audio output, since the diode conduction curve is



GONSET BURBANK, CALIF		
ENG. R.B.	BLOCK DIAGRAM 10 METER FIXED STA. COMMUNICATOR MODEL G-28	505-407
DWN. P.S.C.		
CKD. <i>hvj</i>		
APP. <i>hvj</i>		

not linear over the range of operating levels encountered.

Squelch Rectifier V12B.

Audio output from the noise limiter stage is coupled to the cathode of squelch rectifier V12B (pin 5) through capacitor C70. Assuming that V12B is conducting, this audio output is coupled through the electron stream in the tube, through capacitor C68, and appears at the grid of V11A for amplification. When V12B is not conducting, the audio path is interrupted, and no audio appears at the grid of V11A, i.e., the audio is silenced.

The Conduction of V12B is controlled by regulating the potential between the plate and the cathode. A fixed positive potential approximately +100 volts is always present on the cathode (pin 5). This voltage is divided down from the receiver B+ line through resistors R69 and R68. The voltage on the plate (pin 2) is derived from squelch potentiometer setting (R58), connected from the plate and screen supply point for IF amplifier tube V10 to ground between R57 and R56. This supply point is terminal C of transformer T8, supplied from the receiver B+

line through dropping resistors R59 and R60. In the absence of received carrier, the squelch control is adjusted until the positive potential between the arm and ground, appearing on the plate of V12B, is just slightly less than the fixed potential on the cathode of the tube. This renders the plate negative with respect to the cathode, the diode is biased or "cut off", and the audio path is interrupted.

When a received carrier is present at the detector, AVC voltage is produced and applied to the control grid of the IF amplifier tube, V10. The plate and screen current of the tube decreases as a result of the AVC bias. This results in an increased potential at the plate and screen supply point, terminal C of transformer T8, as the current through dropping resistors R59 and R60 decreases. The voltage between the arm of squelch control R58 and ground therefore increases, and consequently, the potential on the plate of V12B increases, rendering the plate now positive with respect to the cathode. The diode conducts, and the audio couples through to the audio amplifier stages.

TROUBLE SHOOTING AND ALIGNMENT

The information in this section to be used whenever the transceiver becomes defective, and must be repaired before it can be used on the air. The procedures outlined, in the order given, represent a systematic approach to servicing, and a great deal of

time and effort can be saved if the unit is serviced as indicated. Do not attempt to do detailed servicing without using the equipment listed, or equivalent equipment.

EQUIPMENT REQUIRED

To perform the procedures given in this section, the following equipment is required:

Vacuum tube voltmeter with 1 volt or 3 volt scale, reversible polarity.

Tube tester or set of replacement tubes.

Signal Generator for receiver RF and IF alignment touch-up, calibrated on the 10 meter band (28-30 mc.) and at the receiver IF frequencies, 455 kc and 2250 kc. Accuracy required at 30 mc.: ± 10 kc.

Calibrated grid-dip meter with DIODE (absorption) position.

Transmitting crystal (quartz), 7250 kc approximate frequency.

50 ohm and 27 ohm resistor (1/2 watt) and .01 mfd. capacitor.

Dummy load, Non-reactive at 30 mc., 50 or 70 ohms, 25 watt.

Communications receiver, 2 mc to 30 mc. (optional).

Alignment tool, GC type 8606 or equivalent.

TROUBLE SHOOTING PROCEDURE

Whenever your GONSET 10 METER COMMUNICATOR is not operating properly, there are several external checks that should be made before the unit is removed from the cabinet, as listed below. Check-out of these items will often reveal the trouble externally.

If the receiver and transmitter both are operating improperly, check out the antenna, feed line, and any connectors in the feed system to make sure they are not faulty. Try loading the transmitter into the dummy load (a 100 watt light bulb can be used; it should glow a dull red with full transmitter output) to check for normal operation. Connect the antenna directly to the RF output terminal, by-passing the low-pass filter, to check for operation in this condition, and to determine if parts in the filter are faulty.

Check transmitter power amplifier grid current. If low or zero, check to make sure XTAL-VFO switch is in VFO position, or if in XTAL position, that there is a crystal of proper frequency in the XTAL socket and that the dial is tuned to the crystal multiplied frequency.

If transmitter audio is not present (meter shows no reading when switch is in MOD position while talking), check mike cord and plug. Remove the microphone plug. With MIC GAIN full on, touch center connection of mike jack with finger. If meter then reads, audio system is operating, and microphone or cord may be faulty.

If the above checks indicate the unit is internally faulty, remove the unit from the cabinet as detailed below, and proceed as indicated in the following paragraphs.

BEFORE STARTING DETAILED TROUBLE SHOOTING PROCEDURE, CHECK ALL TUBES AND TUBE FILAMENTS IN A TUBE TESTER, OR BY SUBSTITUTION WITH KNOWN GOOD TUBES. DO NOT RELY COMPLETELY ON TUBE TESTER RESULTS, BUT REPLACE SUSPICIOUS TUBES WITH KNOWN GOOD TUBES AND RECHECK PERFORMANCE. OVER 90% OF EQUIPMENT FAILURES ARE THE RESULT OF FAULTY TUBES.

REMOVAL AND REPLACEMENT OF THE TRANSCIVER CHASSIS AND PANEL ASSEMBLY

To remove the transceiver chassis from the cabinet, perform the following steps:

- 1 Remove the two #10 screws from the rear of the cabinet. These screws are located on either side of the back panel near the base.
- 2 Remove connectors from the rear panel (mike and antenna). Remove the low-pass filter plug from the antenna jack. Remove the power-line plug from the AC outlet.
- 3 Grasp the main body of the cabinet firmly with one arm. Push on antenna jack and/or the microphone connector with the thumb until the cabinet works free of the main panel-and-chassis assembly. A great deal of pressure on the connectors is required to free the cabinet, as a pressure-contact surface exists around the mating lips of the cabinet and panel.
CAUTION: Be extremely careful not to damage the MIC GAIN control shaft (black knurled shaft) as the cabinet is withdrawn.
- 4 When the cabinet and panel are initially separated, withdraw the cabinet carefully, feeding the AC line cord through the clearance hole as the cabinet is removed.
- 5 To replace cabinet, reverse steps 1 through 4 above.

NOTE: If transmitter VFO tube V1 is replaced, use tube from same manufacturer as in equipment

ALIGNMENT PROCEDURE

For complete alignment, always align the receiver first. Do not attempt to align the transmitter unless the receiver is in good alignment. Referenced parts can be located by using the call-out photographs in the back of the manual. Before starting alignment, set the controls to the following positions:

SQUELCH: Full Clockwise

VOLUME: One-quarter open from full counter-clockwise

RECEIVE-TRANSMIT switch: RECEIVE position

RECEIVER ALIGNMENT:

GENERAL: Transformer slugs must always be adjusted for the tuning peak with the slug towards the "outside" of the coil, near the top or bottom of the can.

After turning unit on, wait at least 5 minutes before starting alignment procedure. Place a .01 UF capacitor in series with the signal generator output and the signal injection point in the receiver.

All receiver alignment procedures are based on the negative AVC voltage developed by the detector. This voltage is measured with a VTVM connected to terminal D on IF transformer T8. While adjusting transformers, vary the signal generator output level to keep the VTVM reading at -2 volts or less (down to approximately -1/2 volt, where static diode bias is always present).

RECEIVER ALIGNMENT STEPS:

STEP

PROCEDURE

- 1 Set signal generator to 455 kc. Inject signal on Pin 1 to V10. Adjust both slugs (top and bottom) of IF transformer T8 for maximum meter

when shipped from the factory. Tubes from some manufacturers cause the VFO output signal to be frequency-modulated or amplitude-modulated during transmitter operation.

DETAILED TROUBLE SHOOTING

If the tubes check out in good condition, the trouble can be assumed to be a faulty component in the transceiver circuitry. Before attempting detailed trouble shooting, become thoroughly familiar with the operation of all circuits in the equipment by reference to the CONTROLS AND FUNCTIONS chart, the CIRCUIT DESCRIPTION information, and the schematic diagram. When circuitry is fully understood, the location of faulty components consists of systematic and intelligent use of the voltage chart, the schematic diagram, and in the case of faulty tuned circuits, the alignment data.

Do not attempt to align the equipment unless it is evident that alignment is incorrect, or you have replaced a tuned circuit, part of a tuned circuit, or an RF or oscillator tube. In most cases it is not necessary to align the entire equipment. Individual tuned circuits can, in most cases, be aligned by adjusting the tuned circuit individually, using the applicable steps in the alignment procedure. Individual IF transformers can be aligned without a signal generator by "peaking" the tuned circuits for maximum noise in the speaker. Be sure the ANL switch is OFF position while adjusting transformers in this manner. If more than one transformer or tuned circuit is to be adjusted, perform the applicable detailed alignment procedure.

ANL OFF-ON switch: OFF position (up)

VFO-XTAL switch: XTAL position

SPOT OFF-ON switch: OFF position (counter-clockwise)

GRID-PLATE-MOD switch: PLATE position

LAMPS OFF-ON switch: ON position

MIC GAIN control (rear panel): Full counter-clockwise

Adjust all slugs with type 8606 (General Cement) tool or equivalent.

- 2 reading.
- 2 Leave signal generator at 455 kc. Inject signal on Pin 7 of V9. Adjust both slugs of IF transformers T6 and T7 for maximum meter indication. If a beat note (heterodyne) is heard in speaker, trim oscillator coil L7 slightly to remove beat.
- 3 Readjust slugs of T6, T7, and T8 for maximum meter indication. Repeat adjustments until no further increase can be obtained. Keep signal generator output as low as possible, consistent with positive meter indication.
- 4 Adjust signal generator to 2250 kc \pm 10 kc. Calibration accuracy is important. If calibration is in doubt, check signal generator frequency on good quality communications receiver.
- 5 With generator output still connected to Pin 7 of V9, adjust slug of low frequency oscillator coil L7 for maximum meter reading. There will be several small peaks, but the correct peak is the "broadest" peak, with amplitude considerably above the small peaks.

- | STEP | PROCEDURE |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | Using a grid-dip meter in DIODE (absorption) position, check oscillating frequency of L11. Oscillator is set properly if grid-dip meter indicates oscillation at 2705 kc (2.705 mc.). In lieu of using grid-dip meter, set signal generator to image frequency, 3160 kc. Adjust generator ± 10 kc for peak meter reading. VTVM meter should show reading of the same level (approximate) as obtained at the completion of step 5. |
| 7 | With signal generator (still) set to 2250 kc, inject signal on pin 2 of V8. Adjust both slugs of T4 and T5 for maximum meter reading. Readjust as necessary until not further increase in meter reading can be obtained. |
| 8 | Connect a 47 ohm composition resistor across the signal generator output line. Connect a 27 ohm resistor between the antenna terminal and the signal generator output.
Note: 47 ohm resistor is sometimes included in signal generator output cable. |
| 9 | Set the dial pointer on the RECEIVER TUNING dial to 28.0 MC. Set the signal generator output to 28.0 mc. Signal generator output should be 250 uv. or greater. Adjust the slug of the high frequency oscillator transformer, T10, for maximum meter indication. On factory pre-aligned units, this adjustment should not exceed $\frac{1}{2}$ turn of the slug.
CAUTION: Beware of setting oscillator on a spurious peak. Correct peak is of much greater amplitude than spurious peaks, and is much "broader."
To check oscillator coil settings, use a grid-dip meter in DIODE (absorption) position and check oscillating frequency. Meter should register at 30250 kc (30.25 mc.). In lieu of this, set signal generator to image frequency, 32500 kc (32.5 mc.), increase generator output considerably, and check for response on VTVM. Though much weaker, this response should be readable with high generator output level. |
| 10 | Set receiver dial pointer to 29.7 mc. Swing signal generator frequency between 29 and 31 mc, with output reduced to that used in step 9. Note signal generator frequency when signal is tuned, i.e., when VTVM "peaks." |

- | STEP | PROCEDURE |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 | If, in step 10, Signal generator frequency is 29.7 mc, proceed to step 13. If signal generator frequency is lower than 29.7 mc, increase capacity of C49 (on top of oscillator section of ganged tuning capacitor) by no more than 1 uuf (9 degrees rotation) and repeat steps 9 and 10. If signal generator frequency (in step 10) is higher than 29.7 mc, decrease capacity of C42 by no more than 1 uuf (9 degrees rotation) and repeat steps 9 and 10. |
| 12 | Repeat steps 9, 10, and 11 until a signal generator frequency of 28.0 mc and 29.6 mc. corresponds exactly with the 28.0 and 29.7 mc setting of the dial pointer.
NOTE: If the tracking does not improve, but gets worse as steps 9, 10, and 11 are continually repeated, capacitor C49 is being turned in the wrong direction, i.e., clockwise when rotation should be counter-clockwise, or vice-versa. Minimum capacity occurs when the "slot" on C42 is toward the rear of the chassis. |
| 13 | Set the receiver dial pointer to 29.0 mc. Set the signal generator to the same frequency ("peak" generator on VTVM). Keeping signal generator output as low as possible, peak transformer T9 and coil L6 for maximum meter reading.
CAUTION: Correct slug setting of antenna coil of T9 corresponds with the first VTVM peak reading as the slug enters from the open end of the coil (opposite end for the link).
NOTE: Tuning of L-6 will pull oscillator frequency (T10) slightly. To compensate, tune signal generator slightly to one side (± 2.5 kc) of alignment frequency, and re-peak L6 and T9. If meter reading increases, continue this procedure until no further increase can be obtained. If meter reading decreases, adjust signal generator frequency to opposite side of original frequency, and adjust L6, as described, until no further increase in VTVM reading is obtained. |
| 14 | Using a crystal calibrator, repeat steps 9, 10, 11, and 12, while "zero-beating" the signal generator against the proper crystal calibrator harmonic. |
| 15 | Disconnect the signal generator and VTVM. Set the dial pointer to 28.0 mc. Adjust the S-meter potentiometer R59 for zero meter reading. |

TRANSMITTER ALIGNMENT:

GENERAL: The receiver must be in complete alignment before commencing the transmitter alignment procedure, because the receiver calibration is used to align the transmitter VFO. Set the controls as listed in the beginning of the alignment section. After turning unit on, wait at least 5 minutes before starting alignment procedure to allow oscillator frequencies to stabilize.

ALIGNMENT PROCEDURE: (All alignment should be done with the VFO box cover in place, except as otherwise noted.)

- 1 Place a crystal of approximately 7250 kc (7.25 mc.) in the XTAL socket. Turn the VFO-XTAL switch to XTAL position. Turn the SPOT switch to ON. Turn the LOAD control to 10 (maximum clockwise).
- 2 Turn the RECEIVER tuning dial to the fourth multiple of the crystal frequency (approximately 29.0 mc.) to make sure the crystal is oscillating, as indicated by the presence of the crystal multiple as a signal in the receiver.
- 3 Turn the TRANSMITTER tuning dial to the approximate crystal multiplied frequency.
- 4 Connect the 50-70 ohm dummy load to the antenna jack. Turn the RECEIVE-TRANSMIT switch to TRANSMIT. "Dip" the final amplifier plate current to minimum, and load the transmitter into the dummy load in the normal manner, as explained in the front of the manual.

STEP PROCEDURE

NOTE: If no resonance point can be found (PA plate current will not dip), tracked transmitter tuned circuits are probably far out of alignment. Remove the VFO compartment bottom plate. Set the transmitter tuning dial to 29.0 mc. With a grid-dip meter, adjust the slugs in L2, L3, and L4 to the following frequencies:

L2: 14.5 mc.

L3: 29 mc.

L4: 29 mc.

Replace the VFO bottom plate and repeat step 4.

- 5 Turn the meter switch to GRID position. Adjust the slugs in L2, L3, and L4 for maximum meter reading. Repeat the adjustment of these coils until no further increase in meter reading can be obtained. Final meter reading should be between 5 and 7 (with a final amplifier loaded to 5.5 on meter at resonance.)
- 6 Turn the RECEIVE-TRANSMIT switch to RECEIVE. Turn the XTAL-VFO switch to VFO. Turn the RECEIVER and TRANSMITTER tuning dials to 28.0 mc. Turn the SPOT switch to ON.
- 7 Adjust the slug in the VFO grid circuit L1 for maximum reading on the front panel meter.
- 8 Set the transmitter tuning dial to 29.7 mc. Tune the receiver dial from 29 mc to the upper end of the scale (29.7+ mc.) until the transmitter VFO signal is located.
- 9 If the VFO signal is at exactly 29.7 mc, proceed to step 11. If the VFO signal is heard *below* 29.7

STEP PROCEDURE

mc, *decrease* the capacity of C4 (the ceramic trimmer located on top of the transmitter ganged capacitor assembly) by no more than 1 uuf (9 degrees rotation). Repeat steps 6 through 8. If the VFO signal is not heard (as when it's above 29.7+ mc.), *increase* the capacity of C4 by no more than 1 uuf (9 degrees rotation). Repeat steps 6 through 8.

- 10 Continue adjusting C4 in 1 uuf increments or less until the VFO signal at 28.0 mc and 29.7 mc. exactly tracks with the receiver tuning at the same points. Recheck receiver against crystal calibrator at 29.7 mc and 28.0 mc.
NOTE: If frequency "spread" does not improve, but gets worse, as C4 is adjusted, you are turning the capacitor in the wrong direction (increasing capacity when you should be decreasing capacity, or vice-versa). Minimum capacity occurs when the "slot" on C4 is towards the rear of chassis.
- 11 Turn the RECEIVE-TRANSMIT switch to TRANSMIT. Turn the TRANSMITTER tuning dial to 29.0 mc. Adjust the PLATE TUNE and LOAD controls for normal loading into the dummy load. Turn the meter switch to GRID position. Meter should read more than 5. If reading is too low, repeat step 5, using the VFO signal.
- 12 Alignment is complete. Remove the dummy load, install the unit back in the cabinet, and check for normal operation into the antenna as described in the front of the manual.

**10 METER FIXED STATION COMMUNICATOR — MODEL G-28
TUBE SOCKET VOLTAGE CHART**

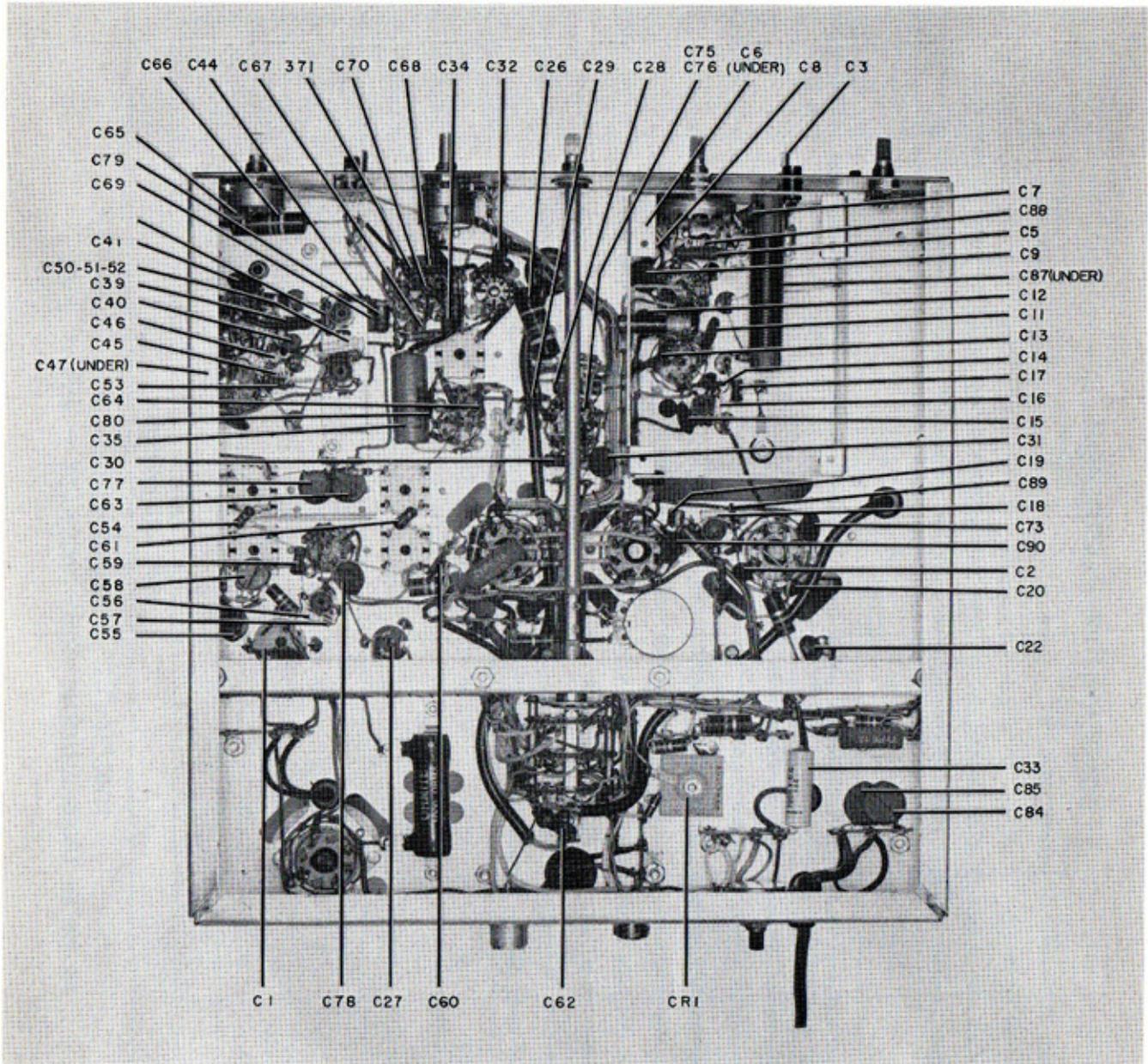
TUBE	SYMBOL	TUBE PIN NUMBERS									
		1	2	3	4	5	6	7	8	9	CAP
6AU6	V1 (T)	-2.7 (note 3)	0	6.1 ac	0	+215 (note 4)	+122	0	....	....	....
12BY7A	V2 (T)	0	-.7 (note 5)	0	6.1 ac	6.1 ac	0	+260 (note 4)	+195	0	....
6146	V3 (T)	+1.4	0	+170	+1.4	-88 (note 6)	+1.4	6.1 ac	-88 (note 6)	....	+360 (note 7)
12AX7	V4 (T)	+175	0	+1.4	6.1 ac	6.1 ac	+145	0	+1.4		
12AX7	V4 (R)	+102	0	+1.0	6.1 ac	6.1 ac	-1.2	-.57	0	0	....
6L6GB	V5-V6 (T)	0	0	+360	+360	0	V5 (O) V6 +370	6.1 ac	+30	0	....
6L6GB	V5-V6 (R)	0	0	+252	+252	0	0	6.1 ac	+20	....	....
6BZ6	V7 (R)	-0.7	+1.4	0	6.1 ac	+208	0	....	....	....	....
6U8	V8 (R)	+80	0	+84	0	6.1 ac	+170	+5.5	0	....	....
6BE6	V9 (R)	-5.4	0	0	6.1 ac	+101	+101	-0.7	....	-1.8 (note 8)	....
6BH6	V10 (R)	-0.7	+0.5	0	6.1 ac	+150	+132	0	....	....	....
6AV6	V11 (R)	-0.7	0	6.1 ac	0	-0.6	-0.75	+63	....	....	....
6AL5	V12 (R) (Note 9)	-.33 to -.14	+4.5 to +110	6.1 ac	2.2 ac	+107 to +110	....	-.33	....	....	....
5U4GB	V13 (R)	....	+353	....	376 ac	....	376 ac	....	+353	....	....

CONDITIONS OF MEASUREMENT

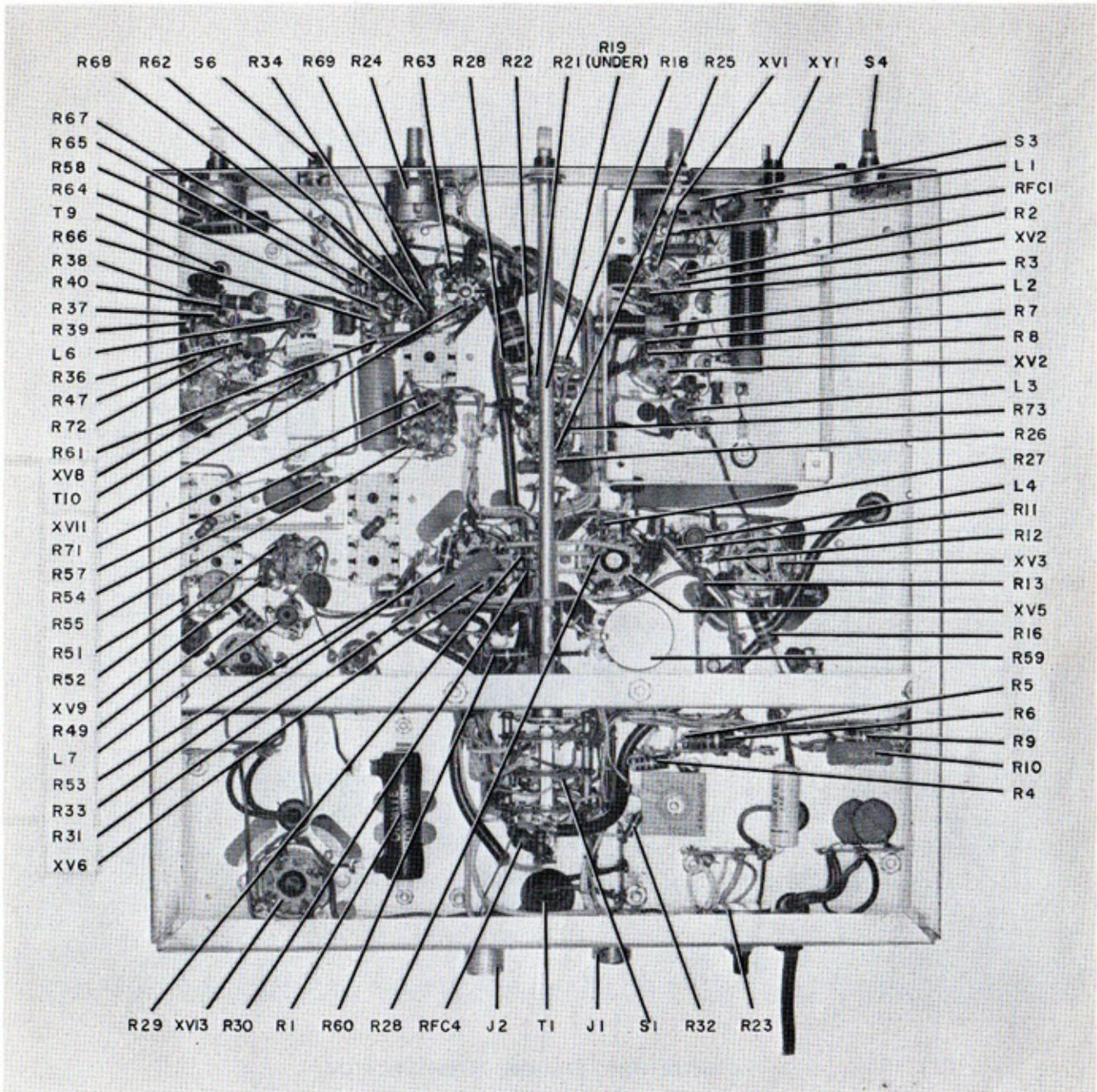
- A. All voltages measured with VTVM after 30 minute warm-up.
- B. LINE VOLTAGE 115V AC, 60 cycles.
- C. Transmitter crystal-controlled with output at 29.0, feeding dummy load with cathode current at 5.5 on meter at resonance.
- D. ANL switch OFF, audio gain controls minimum (full counter-clockwise), squelch control OFF (full clockwise) except as noted.

NOTES

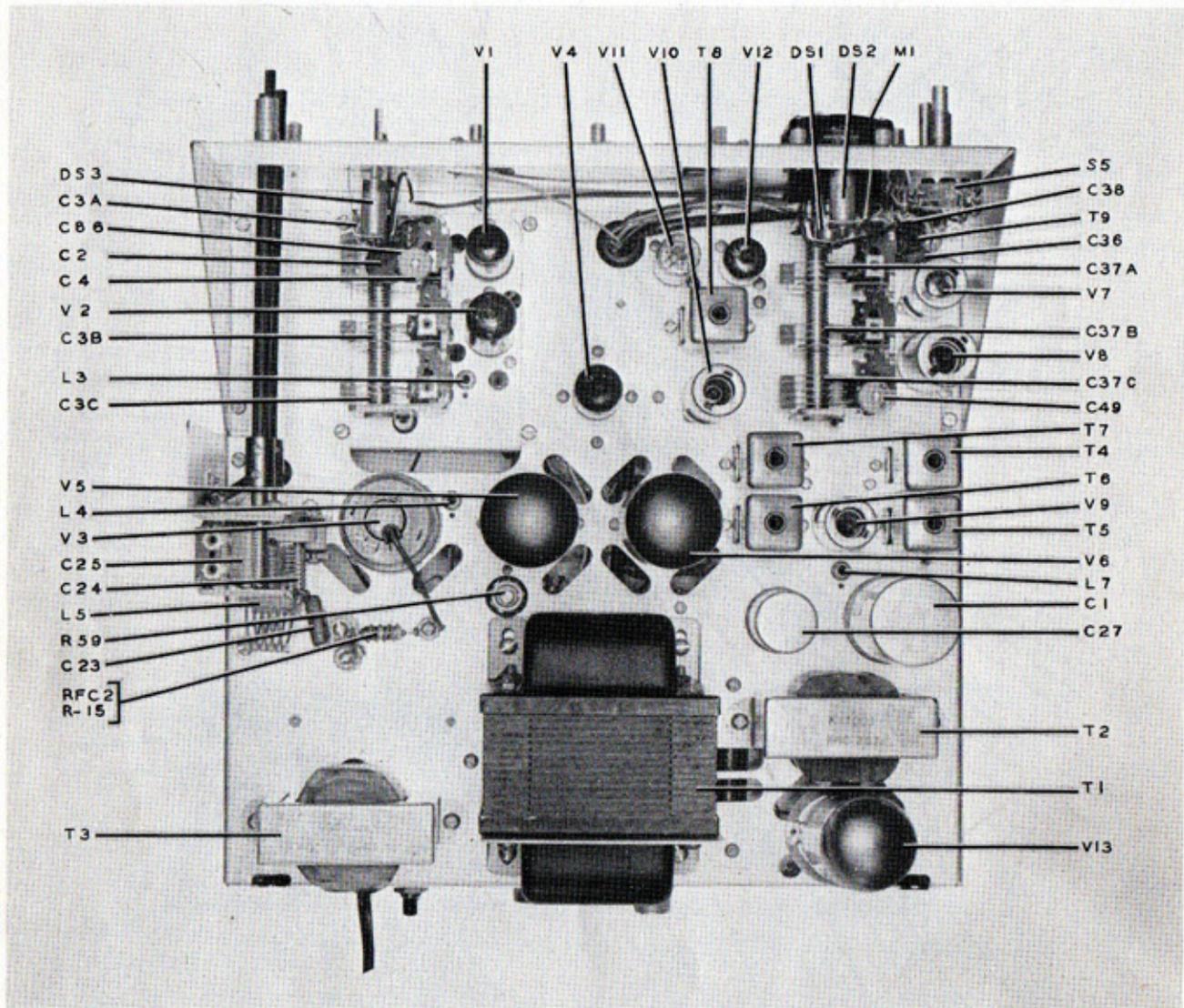
- 1. (T) following tube symbol indicates that RECEIVE-TRANSMIT switch is in TRANSMIT position. (R) following tube symbol indicates that the RECEIVE-TRANSMIT switch is in RECEIVE position.
- 2. All voltage readings are nominal. Voltages vary somewhat with individual units.
- 3. Voltage at this point depends on activity of crystal used.
- 4. Measurements referencing this note made on "cold" side of tuned circuit.
- 5. Measurements referencing this note made across resistor R8. Voltage varies with activity of crystal used.
- 6. Measurements referencing this note made between "top" of R11 and ground. Measurement varies with activity of crystal used.
- 7. Measurement made between "cold" side of RFC-3 and ground.
- 8. Measurement varies as receiver is tuned across band.
- 9. Measurements vary within limits shown, depending on setting of SQUELCH control and ANL switch.



TEN METER FIXED-STATION COMMUNICATOR
 BOTTOM VIEW—CAPACITOR LOCATIONS

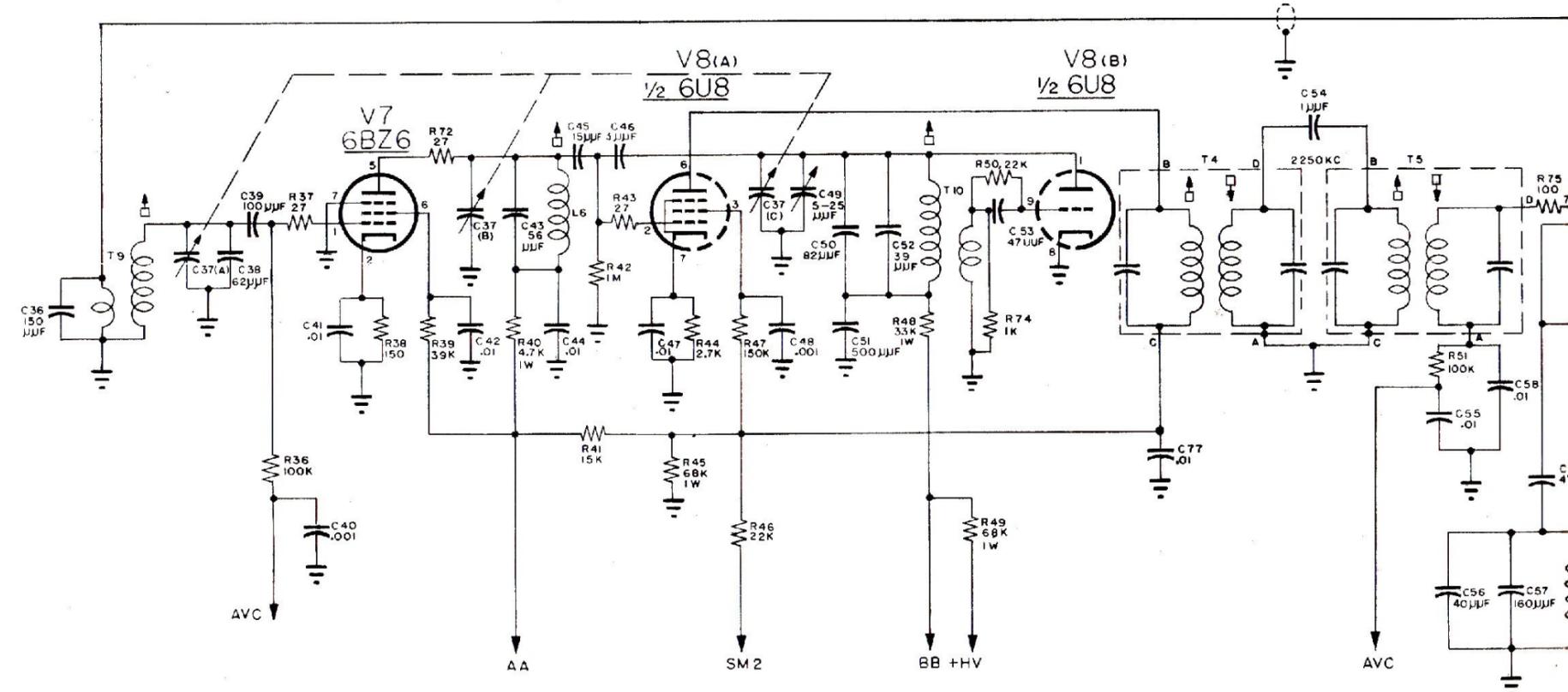
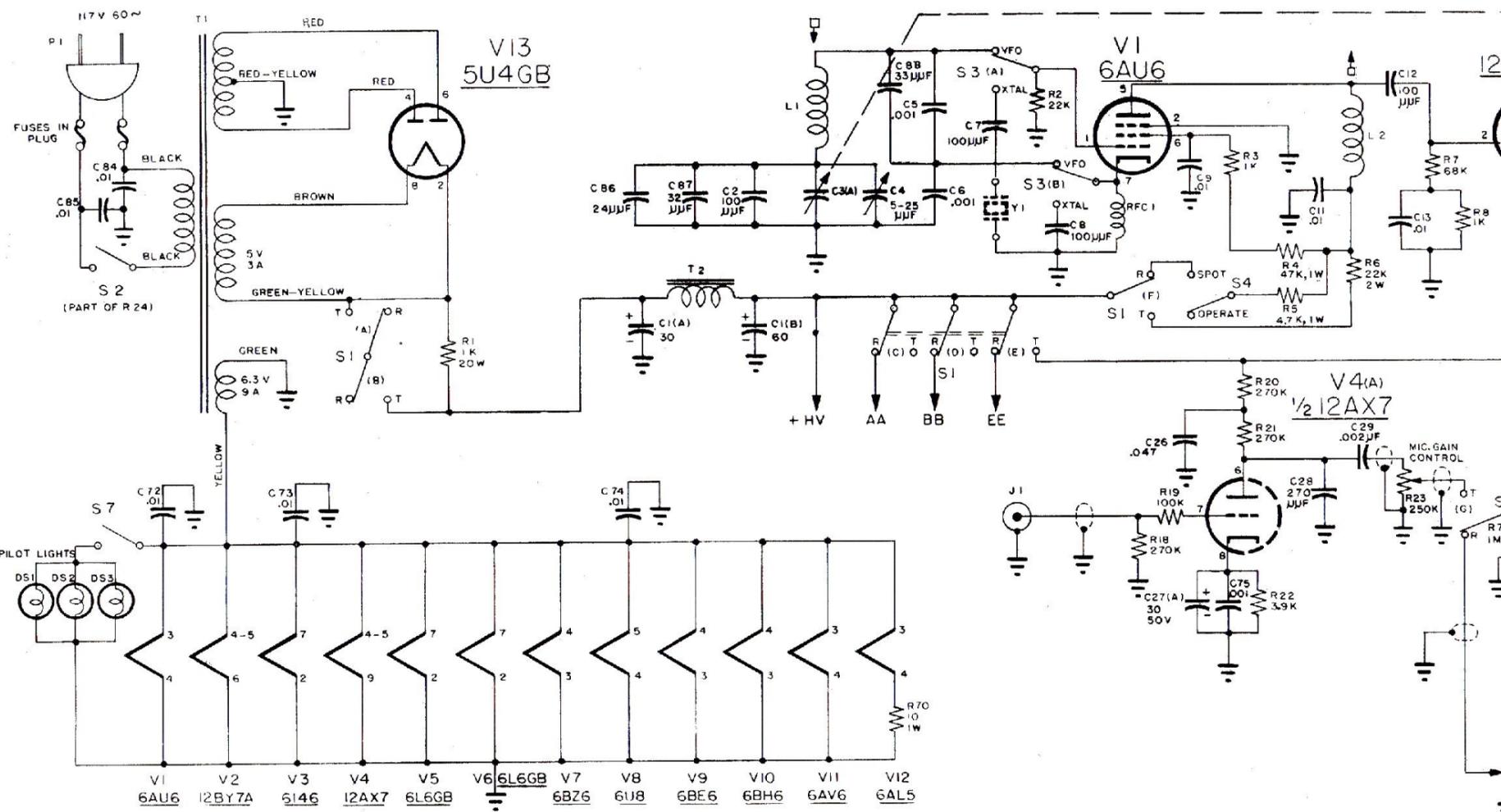


TEN METER FIXED-STATION COMMUNICATOR
BOTTOM VIEW—PARTS LOCATIONS

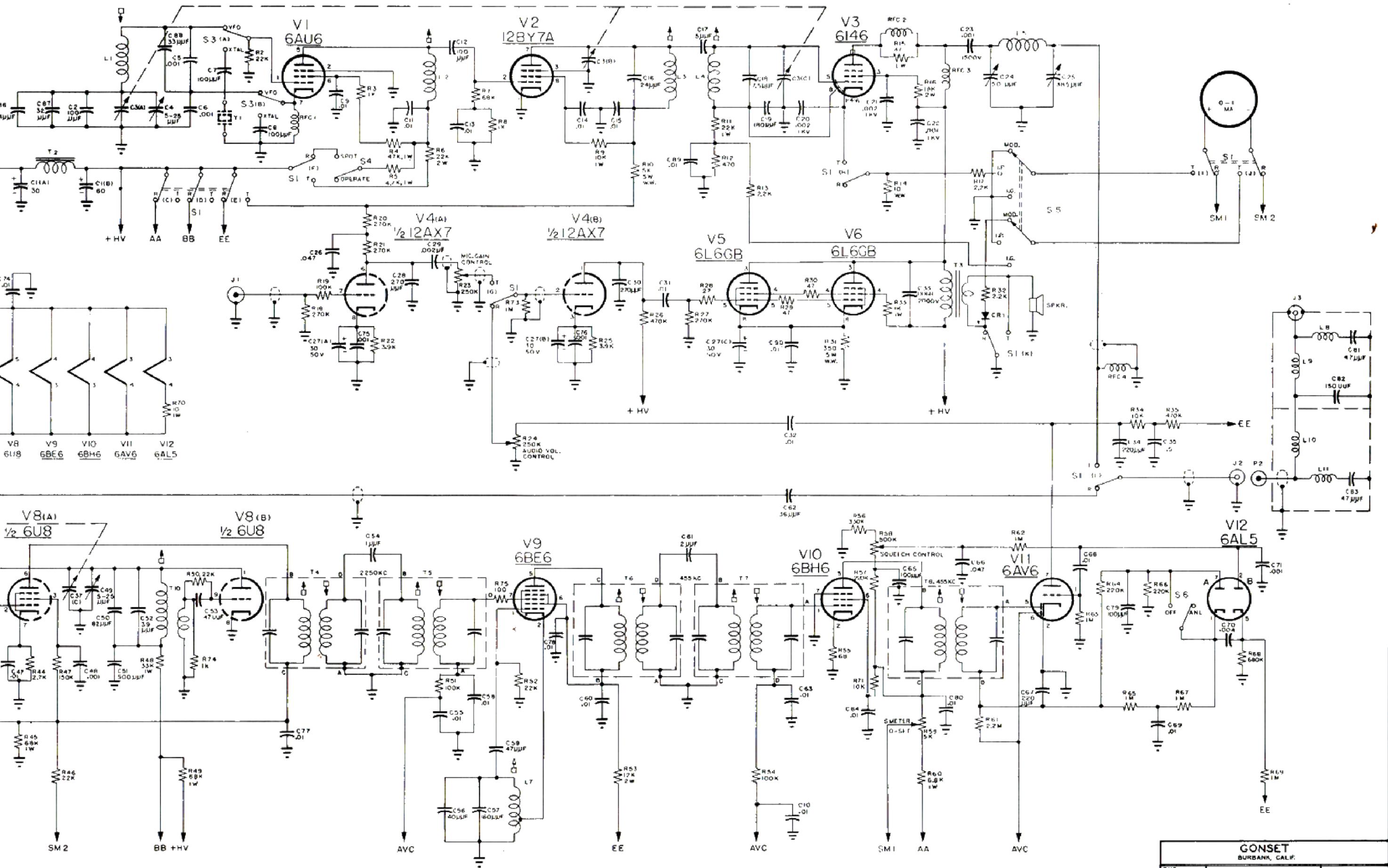


10 METER FIXED-STATION COMMUNICATOR
TOP-VIEW

NOTES



CONDENSERS IN μF AND RESISTORS $\frac{1}{2}$ W, EXCEPT WHERE MARKED



CONDENSERS IN μ F AND RESISTORS $\frac{1}{2}$ W.
EXCEPT WHERE MARKED

GONSET BURBANK, CALIF.	
ENG. P.J.L.E. DWN. H.V.D. CRO. C.W. APP.	SCHMATIC 10 METER COMMUNICATOR MODEL 2001
	510-016

