

GONSET

INSTRUCTION MANUAL

GSB-100

SSB TRANSMITTER



GONSET DIVISION / YOUNG SPRING & WIFE CORPORATION



GONSET GSB-100 TRANSMITTER

The GONSET GSB-100 Transmitter is a complete single-sideband suppressed carrier transmitter. In addition, the unit may be used for CW, PM, and AM modes of transmission. Automatic voice-operate transmit-receive switching is provided for SSB, PM, and AM, with full range VFO frequency control. The output frequency is heterodyned from a stable variable-frequency oscillator operating from 5.0-5.6 mc. All other oscillators are crystal controlled for maximum stability. Suppression of the carrier and unwanted sideband in SSB mode is accomplished with a combination of crystal filtering and phasing circuitry, resulting in outstanding long term suppression stability,

making it unnecessary to keep constant check of carrier suppression as in other types of SSB equipment.

The GSB-100 uses a 6DQ5 power amplifier capable of producing 100 watts PEP input. This power level is sufficient to give excellent performance as a complete self-contained SSB transmitter.

Complete bandswitching of the 80-40-20-15 and two 600 KC segments in the 10 meter band is available.

Normal factory units are shipped with 10 M coverage of 28.5 mc - 29.1 mc and 29.1 - 29.7 mc.

SPECIFICATIONS

TYPE OF EMISSION:

- (1) Upper and lower sideband, suppressed carrier
- (2) CW
- (3) Phase modulation
- (4) Amplitude modulation

POWER INPUT TO FINAL AMPLIFIER:

SSB: 100 watts PEP
CW: 100 watts
PM: 75 watts
AM: 50 watts

POWER OUTPUT:

65 watts PEP into 50 ohm load

PRIMARY POWER SOURCE:

117 VAC nominal, 50-60 cycles

OUTPUT IMPEDANCE:

30-200 ohms nominal, unbalanced

SPURIOUS EMISSION:

Better than -50 db

FREQUENCY CONTROL:

Variable frequency oscillator, built in

FREQUENCY STABILITY:

250 cycles max. over a two hour period from a cold start

FREQUENCY RANGE:

3.4 - 4.0 mc. (Band 1)
6.9 - 7.5 mc. (Band 2)
14.0 - 14.6 mc. (Band 3)
21.0 - 21.6 mc. (Band 4)
28.5 - 29.1 mc. (Band 5)
29.1 - 29.7 mc. (Band 6)

NOTE

Crystals available on request for band 6 to cover the range from 28.0 - 28.6 mc.

TRANSMIT-RECEIVE CONTROL:

Voice-operate or manual

CARRIER SUPPRESSION (SSB EMISSION)

-60 db

UNWANTED SIDEBAND SUPPRESSION

(SSB EMISSION)

-40 db

INSTALLATION

The accompanying diagrams show the interconnections between the GSB-100 and a companion receiver, speaker, antenna, and antenna change-over relay. Also indicated are the additional connections required to install the unit with the GONSET GSB-101 Linear Amplifier, or with other similar linear amplifiers. The

microphone cord-plug (type 75MC1P or equivalent) connects to the MIC jack on the panel. If a telegraph key is to be used for CW operation, the key-cord plug (type PL-55 or equivalent) is inserted in the jack marked "Key" on the front panel.

TYPICAL CONNECTIONS FOR GSB-100 USED ALONE AS A TRANSMITTER

Refer to the diagram. The receiver audio output line (low impedance or 500 ohms, as desired) connects to the RCVR terminals on the RCVR-SPKR strip. If one side of the speaker audio line is grounded, the grounded line must connect to the terminal marked GND on the strip to avoid shorting out the speaker. The receiver speaker is then connected to the terminals marked SPKR on the strip. If one of the speaker leads is grounded to a metal speaker cabinet, this grounded lead must also connect to the other terminal marked GND on the strip. The above connections interlock the receiver speaker with the voice-operate circuit to silence the speaker during transmitting periods, preventing audio feedback.

An external antenna change-over relay is required when the receiver and transmitter are operated on the same antenna. The chassis receptacle marked ANT RELAY provides keyed 115VAC power for automatic operation of the antenna change-over relay. If the relay used has a 115VAC coil, simply connect a line cord and plug to the relay terminals, and insert the plug into the receptacle as shown. If the relay has a coil voltage other than 115VAC, a suitable transformer or dropping resistor must be used in series with the coil, or, in the case of DC relays, a proper rectifier and filter circuit is required.

A Type 83-1SP or equivalent coaxial connector is required to mate with the RF output (antenna) connector.

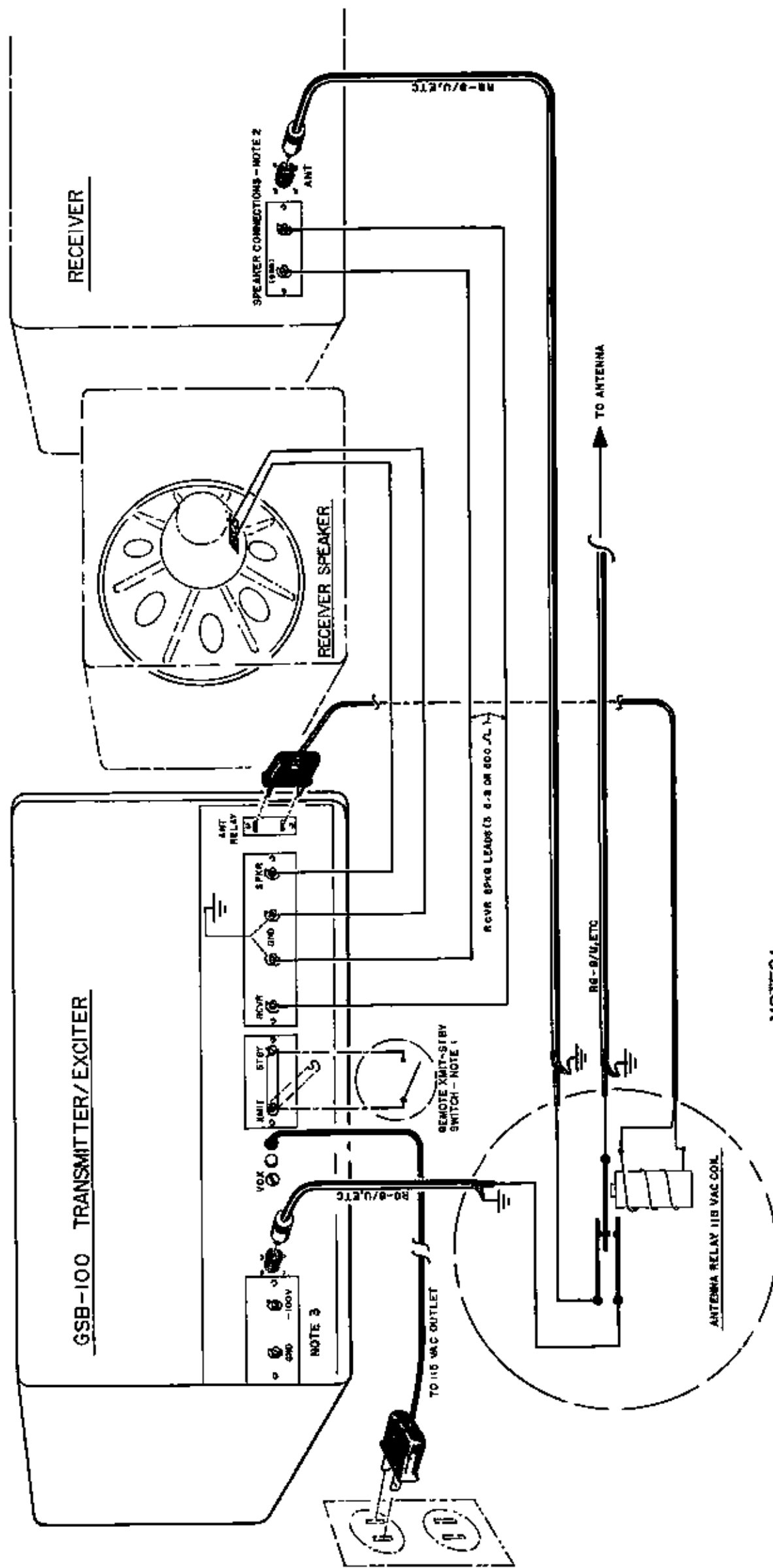
TYPICAL CONNECTIONS FOR GSB-100 USED AS EXCITER FOR GONSET GSB-101 LINEAR AMPLIFIER (and other similar linear amplifiers)

The receiver speaker connections are the same in this type of service as when the GSB-100 is used alone, as explained above.

The GSB-101 linear amplifier has an internal antenna change-over relay, and no additional external relay is required. The AC relay cord ("cheater"), supplied with the amplifier, is connected between the ANT RELAY receptacle on the GSB-100 and the mating ANT RELAY plug on the GSB-101 amplifier. Coaxial connectors, type 83-1SP or equivalent, are required on both ends of the RF cable connecting the exciter output to the RF INPUT jack on the GSB-101 amplifier. Connectors of this type are also required on the antenna transmission line, and on the end

of the receiver antenna lead between the RCVR jack on the GSB-101 and the receiver antenna connections. RG-8/U cable is recommended for all coaxial leads.

Cut-off bias for the linear amplifier, during receive periods, is supplied by the exciter through a pair of leads interconnecting the -100 terminals and the GND terminals on the BIAS terminal strips on both units. When connecting these leads, be extremely careful not to interchange the wires, i.e., do not inadvertently ground the bias lead. The ground lead is not necessary if an external ground is provided elsewhere between the two chassis. The bias voltage is present ONLY WHEN THE EXCITER IS IN STAND-BY CONDITION. This is not operating bias for



NOTES:

1. REMOTE XMIT-STBY SWITCH CAN BE USED IN PLACE OF STANDBY-MANUAL CONTROL ON FRONT PANEL. REMOVE JUMPER AND CONNECT LEADS AS SHOWN.
2. IF ONE SIDE OF RECEIVER SPEAKER LINE IS GROUNDED, THIS LEAD MUST CONNECT TO GND TERMINAL ON RCVR-SPKR BOARD.
3. BIAS LINE USED TO CUT OFF LINEAR AMPLIFIER, WHEN USED. TERMINALS NOT CONNECTED WHEN GSB-100 USED ALONE.
4. ALL COAXIAL LINES TERMINATED IN TYPE 83-15 P COAXIAL CONNECTORS OR EQUIVALENT.

TYPICAL CONNECTIONS FOR GSB-100 USED ALONE AS TRANSMITTER

GSB-100 INSTALLATION DIAGRAM

the amplifier; it serves only to cut off the amplifier tubes during stand-by periods, mainly to prevent residual "hash" in the receiver from the mercury vapor rectifiers, and as a safety feature if the main operating bias supply

should fail.

If other linear amplifiers are used with the GSB-100 exciter, interconnect the exciter and amplifier using the typical connections for the GSB-101 as a guide.

INSTALLATION OF OPTIONAL CRYSTAL FOR 10 METER CW OPERATION

When shipped from the factory, the GSB-100 is supplied with the proper first-mixer crystals for 10 meter operation in the 28.5-29.1 mc. and 29.1-29.7 mc. ranges. On special order an additional crystal is available to replace the 29.1-29.7 mc. range with the 28.0-28.6 mc. range (10 meter CW). The 10H meter dial range on the dial drum is calibrated for both of the above ranges; the calibration for the range not in use is neglected. If the equipment is to be converted from the factory-supplied range to the optional range by the insertion of a new first mixer crystal (in place of that supplied), a padding capacitor in the unit must be realigned to cover the new range for this crystal. The following steps are required:

1. Refer to the TROUBLE SHOOTING AND ALIGNMENT section of the instruction manual, procedure 8: REMOVAL OF THE TRANSMITTER FROM THE CABINET. Remove the transmitter as directed.
2. Refer to the PARTS PLACEMENT drawing, TOP VIEW.

To convert the 10H range for 10 meter CW operation (28.0 - 28.6 mc.) remove the 10H crystal supplied with the unit

(43.7 mc.) and insert the special 10H crystal (42.6 mc.) in its place.

3. Refer to the OPERATION section of the instruction manual and set up the equipment for normal operation on the 10H band, AM emission. Use a frequency near the center of the band. With the METER control rotated into the OUTPUT IND. range, peak the DRIVER TUNING control for maximum RF output.
4. Adjust C36 and C48 for maximum RF output. As the trimmers are adjusted, rotate the CARRIER LEVEL control counterclockwise (reduce the carrier insertion) to hold the pa plate current to 50 ma. or less. Plate current is checked by switching the METER control to PLATE MA position.
5. When the trimmers are adjusted, the procedure is completed. Replace the unit in the cabinet, and it once again is ready for operation. On the converted band, the upper drum dial calibrations now apply.

ANTENNAS

Any of the common antenna systems designed for use on the high-frequency amateur bands may be used with the GSB-100 or GSB-101 combination, providing the input impedance to the transmission line is not outside the limits of the output matching network of the units. An antenna system that reflects an SWR on 50 ohm or 70 ohm coaxial line below approximately 3:1 on the proposed operating frequency, or a system that results in a transmission line input impedance that is essentially resistive and between about 30 and 200 ohms, will take power from the GSB-100 with very little difficulty.

If "tuned" open-wire transmission line is used to excite the antenna, a suitable antenna "tuner" should be used between the transmitter output and the transmission line to provide a reasonable impedance match between the unbalanced coaxial output and the balanced open-wire line. Methods of constructing and operating tuners of this sort are

described in detail in the ARRL Antenna Handbook and similar publications.

For operation on the 20 meter, 15 meter, and 10 meter amateur bands, the efficiency of the station will be greatly increased if a good directional rotary beam antenna is used. The Gonset 3-Bander antennas, Model #3219 (2 element) and #3220 (3 element) are excellent beams for this purpose, providing exceptional gain on all three bands with a single antenna installation. For single-band operation with adequate gain in a small structure area, the GONSET Bantam series of antennas will also do an excellent job.

For operation on the 75-80 or 40 meter bands, a simple dipole antenna, cut to resonance in the most-used portions of the band, will perform satisfactorily. The height of the antenna should be great enough to prevent undue ground losses and similar effects.

OPERATION

PRELIMINARY

Be sure an antenna or other load is connected to the RF output connector. Before transmitting with any of the four types of emission, the transmitter is "set up" and tuned by the following procedure. Perform the steps in the order given:

- (1) With the CALIB LEVEL control at POWER OFF position, set the front panel controls to the following positions:
 - a. Set the FUNCTION switch to one of the STBY positions.
 - b. Set the BAND switch to the desired band. The dial drum will automatically rotate to the scale with the frequency spread within the band.
 - c. Set the EMISSION switch to CW position.
 - d. Set the CARRIER LEVEL control to 0 (full counterclockwise).
 - e. Set the METER switch to PLATE MA position.
 - f. Set the FINAL LOADING control to MIN (full counterclockwise).
 - g. Set the AT GAIN and VOX GAIN controls to 0 (full counterclockwise).
- (2) Turn the CALIB LEVEL control clockwise past the click, applying AC power to the unit. Allow unit to properly heat up.
- (3) After a two minute, or longer, warm-up period, set the FREQUENCY control for the approximate desired frequency within the band. Do not attempt to "zero beat" at

this time but use the slide-rule dial frequency as a reference.

- (4) Set the FUNCTION switch to MAN (manual) position. This will actuate the VOX relay.
- (5) The PLATE MA meter should read about 20 MA on the upper scale (0-200 MA). 20 MA is the first "heavy" line on the meter.

NOTE

If the meter reading does not fall between 20 MA and 25 MA (meter graduations are 5 MA apart), refer to ADJUSTMENTS paragraph and reset the PA BIAS control as explained. Do not operate the transmitter for more than a few seconds unless the "resting" plate current is below 25 MA.

- (6) Turn the CARRIER LEVEL control clockwise to about 5.
- (7) Turn the DRIVER TUNING control slowly through its range until the meter reading "peaks". If the reading exceeds 100 MA as the control is rotated, quickly decrease the CARRIER LEVEL control counterclockwise to keep the current below 100 MA. As soon as the peak is obtained, rotate the CARRIER LEVEL control to 0 (full counterclockwise) immediately.

CAUTION

Do not leave the PA PLATE CURRENT at greater than 25 MA during this step for more than 5 or 10 seconds. The final amplifier tube could be damaged if the plate dissipation is

exceeded for more than a brief period while adjusting the DRIVER TUNING control.

- (8) Set the FINAL TUNING control until the indicator is within the range for the band of operation used.
- (9) Rotate the CARRIER LEVEL control for a meter reading of 100 MA or less and QUICKLY rotate the FINAL TUNING control for a pronounced dip in the meter reading. Do not allow the plate current to remain at 100 MA for more than 5 or 10 seconds.
- (10) While the plate current is "dipped", rotate the CARRIER LEVEL control to 8.
- (11) Rotate the FINAL LOADING control slowly clockwise while continually readjusting the FINAL TUNING control for minimum plate current, i.e., keep the plate current "in the dip". As the loading control is rotated clockwise, the plate current, while "in the dip", will increase. Continue adjusting the two controls until the plate current at resonance is approximately 160 MA.

NOTE

If, during steps 9 and 10, the plate current does not behave as indicated (no "dip" can be found, or repeated clockwise adjustment of the loading control does not cause an appropriate increase in plate current at resonance), the antenna or other load is not within the specified impedance range. See the ANTENNA paragraphs in the manual, and make required antenna adjustments.

Advancing the CARRIER control will cause the plate current to reach a peak level after which further increase causes the plate current to fall. DO NOT advance the carrier control beyond the peak plate current point.

- (12) Turn the METER SWITCH clockwise into the OUTPUT IND range. Adjust the control for a 1/2 scale meter reading (approximately 5 on lower meter scale).
- (13) Continue to rotate the FINAL LOADING and FINAL TUNING control in small increments, this time tuning for a MAXIMUM reading on the meter. At some position of the FINAL LOADING and FINAL TUNING controls there will be a point where further clockwise rotation of the FINAL LOADING control will not result in any further increase in meter reading. The tuning will be quite "broad" at this degree of loading, and the peak will be approached slowly and smoothly. Set the FINAL LOADING slightly beyond (clockwise) this point and the transmitter will be properly tuned, or just slightly "overloaded", as required for best linear operation. This step should be performed as quickly as possible.
- (14) Rotate the CARRIER LEVEL control counterclockwise to 0.
- (15) Set the FUNCTION switch to STBY. This completes the preliminary tune-up procedure. Repeat this procedure in full each time the transmitter is first turned on, or at any time when the band of operation is changed. Steps 4 through 14 should also be repeated each time the transmitter frequency is changed more than a few kc. while operating within a given band.

"ZERO-BEATING"

Before transmitting with a given type of emission, it is usual practice to set the transmitter to a precise given frequency (such as the frequency of the

station to be contacted), using the receiver as a monitor. In SSB operation, this procedure is particularly important for "roundtable" contacts, since the

reference carrier frequency must be very close to the listening frequency of the other receiver(s) for intelligible copy. The GSB-100 "CALIBRATE" feature provides a convenient and effective system for precise zero-beating. The procedure is as follows:

- (1) Tune the receiver in the normal manner, with the BFO turned on, until the receiver is set to the exact desired frequency. In the case of SSB operation, tune the station(s) you wish to contact until they sound "natural", indicating that the receiver is tuned so that the injected carrier is at precisely the correct reference frequency.
- (2) Turn the FUNCTION switch on the GSB-100 to CALIB position. Set EMISSION switch to AM position.
- (3) Set the CALIB LEVEL control to approximately 8.
- (4) Turn the FREQUENCY control on the GSB-100 until the transmitter "note" is heard on the receiver. Adjust the CALIB LEVEL control until the note

is at a comfortable listening level.

If no note can be heard, or it is extremely weak with the CALIB LEVEL control full clockwise, the FREQUENCY control has been rotated too far from the tuned-up frequency of the GSB-100. Repeat steps (4) through (15) in the PRELIMINARY operation procedure, with the FREQUENCY control rotated so that the slide-rule dial setting is within a few kilocycles (as close as possible) of the receiver frequency. Then repeat steps (1) through (4) above.

- (5) Run the transmitter frequency into precise zero-beat with the receiver. Turn the FUNCTION switch back to STBY. Reset EMISSION switch.
- (6) If the "new" transmitter frequency is more than a few kilocycles from the frequency at which the PRELIMINARY tune-up procedure was conducted, repeat steps (4) through (15) of this procedure before transmitting.

SINGLE-SIDEBAND, SUPPRESSED-CARRIER OPERATION

After completing the preliminary tune-up procedure (and after "zero-beating" the transmitter as desired), the GSB-100 is set up for SSB emission as follows:

- (1) Turn the EMISSION switch to CW.
- (2) Turn the FUNCTION switch to MAN (manual).
- (3) Turn the METER SWITCH clockwise past the click into the OUTPUT IND range.
- (4) Turn the CARRIER LEVEL control clockwise until the meter reading does not increase with further clockwise rotation.
- (5) Adjust the METER SWITCH potentiometer control knob until the meter reads exactly full scale (10 on the lower scale).
- (6) Turn the CARRIER LEVEL control

to 0 (full counterclockwise).

- (7) Turn the EMISSION switch to UPPER SB or LOWER SB, as desired.
- (8) With the microphone about three inches from your mouth, talk in a normal voice and slowly increase the AUDIO GAIN control until the meter "peaks" at 8 (maximum) on the lower scale. The meter reading should average between 5 and 7 during speech, with occasional peaks as high as 8. To receive, switch the FUNCTION switch back to STBY. The transmitter is now operating with SSB emission and MANUAL control. The remaining steps detail the additional adjustments for voice-operate (VOX) control with anti-trip action.
- (9) Turn the FUNCTION switch to VOX.

- (10) While talking in a normal voice (see step 8), slowly increase the VOX GAIN control until the transmitter "keys on" with voice control as you start talking. Adjust the control until the "key-on" is clean, and does not release too quickly, or "clip".
- (11) Tune in a steady modulated carrier on the receiver (such as an AM station) and adjust the tuning for a heterodyne (with the BFO on) of about 1000 cycles. Keep the audio level low enough to prevent the receiver speaker output from "triggering" the transmitter.
- (12) Turn the receiver volume up to a comfortable listening level on the heterodyne. The audio will begin to "trigger" the VOX circuit, causing the transmitter to "cycle" (repeatedly turn ON and OFF).
- (13) Slowly advance the AT GAIN control until the VOX circuit stops

cycling.

NOTE

Too much AT level will make it impossible to talk the VOX into operation.

The adjustment of the VOX GAIN and AT GAIN controls will require some practice on the part of those not familiar with these types of circuits. After a few SSB contacts, however, the technique will become practically "second nature", and should greatly increase your operating pleasure.

From time-to-time it will be desirable to use manual control of the transmitter, particularly when the station facilities are being used by someone not familiar with voice-operate techniques. The XMIT-STBY terminal board on the back of the GSB-100 cabinet provides a convenient point to connect a "foot-pedal" switch or other special arrangement for manual keying. If such a switch is used, the FUNCTION switch is left on MAN position, and the transmit-receive function actuated by the external switch.

AM OPERATION

The GSB-100 may be used for AM operation with both sidebands present. Since the output tube operates as a linear amplifier, it must be operated at reduced power input to prevent damage to the power amplifier tube as a result of increased plate dissipation during carrier-present conditions. After completing the PRELIMINARY tune-up procedure (and "zero-beating" to a given frequency, as desired), the equipment is set up for AM operation as follows:

- (1) Set the EMISSION switch to AM position.
- (2) Set the FUNCTION switch to MAN position.
- (3) Set the METER switch to PLATE MA position.

- (4) Slowly rotate the CARRIER LEVEL control until the meter reading increases to 75 MA (maximum, upper scale).
- (5) While holding the microphone about three inches from the mouth, talk in a normal voice and slowly increase the AUDIO GAIN control until the meter "kicks" upward by a barely perceptible amount with modulation peaks.
- (6) To receive, turn the FUNCTION switch to STBY.

The transmitter is now properly adjusted for AM operation with manual control. Voice-operate control may be used for AM operation. See SSB OPERATION section.

CW OPERATION

The GSB-100 provides a clean, stable CW note, free of clicks and chirps, with

excellent keying characteristics. The final amplifier loading is slightly

reduced in this type of operation to provide maximum efficiency, since linear operation is not essential for CW emission. After completing the PRELIMINARY tune-up procedure (and "zero-beating" the desired frequency), adjust the equipment for CW operation as follows:

- (1) Set the METER switch counterclockwise, past the click, into the OUTPUT IND area.
- (2) Set the EMISSION switch to CW position.
- (3) Close the key (withdraw the key plug from the jack, if desired).
- (4) Rotate the CARRIER LEVEL control clockwise while observing the front panel meter. As the control is rotated, the meter reading will increase up to a point, then "level off" and cease to increase with further clockwise rotation of the control. Set the CARRIER LEVEL control to a point just below (slightly counterclockwise from) the setting where the meter reading ceases to increase; i.e., "back off" from the "leveling off" point by a few degrees. If the meter goes off-scale as the CARRIER LEVEL control is rotated, turn the METER SWITCH control counterclockwise to keep the meter reading on scale.
- (5) Adjust the METER SWITCH OUTPUT IND control for an exact full scale meter reading (10 on the lower scale).
- (6) Rotate the FINAL LOADING control counterclockwise towards minimum in small steps, restoring resonance with the FINAL TUNING con-

trol ("peaking" the meter reading), until the meter reading is approximately 9 on the lower scale.

- (7) Open the key and set the FUNCTION switch to STBY position.

The equipment is now properly adjusted for CW operation with manual control. The STBY-XMIT terminal strip on the back of the cabinet provides convenient connections for external transmit-receive keying, as with a foot-switch or other special arrangement. When such a switch is connected across these terminals, the FUNCTION switch is left on MAN position (not STBY) and the transmit-receive function performed by the external switch.

The ARRL RADIO AMATEURS HANDBOOK and similar publications describe circuits that can be adapted for break-in operation and signal monitoring during CW operation.

When the GSB-100 is used to excite an amplifier in CW operation, do not insert carrier beyond the point needed to excite the amplifier properly.

Under no conditions is it advisable to rotate the CARRIER LEVEL control clockwise beyond the point where the output indicator meter reading "levels off". When additional carrier is inserted beyond this point, the transmitter power output does not increase, but the spurious emission (harmonics, etc.) increases rapidly as the 6DQ5 power amplifier is "overdriven". Spurious radiation is greatly attenuated when the CARRIER LEVEL control is adjusted for an output level, (as read by the front panel meter) that is at least 10% below the maximum reading obtained at the "leveling off" point.

PM (PHASE MODULATION) OPERATION

The GSB-100 provides facilities for narrow-band phase modulation operation. This type of operation is particularly valuable where TVI from fundamental overload is a problem with high-power transmissions, as when the GSB-100 is used to excite an amplifier. After completing the PRELIMINARY tune-up procedure, (and "zero-beating" the desired frequency), adjust the equipment for PM

operation as follows:

- (1) Perform the operations detailed in steps (1) through (7) in the CW OPERATION instructions.
- (2) Turn the EMISSION switch to PM position.
- (3) Turn the FUNCTION switch to MAN.

- (4) Turn the METER SWITCH to PLATE MA position.
- (5) With the microphone about 3 inches from your mouth, talk in a normal voice and rotate the AUDIO GAIN control slowly clockwise while observing the meter. At some point, as the control is rotated, the meter will begin to flicker slightly with modulation. Set the AUDIO GAIN control just at or slightly below this point, and the deviation will be approximately correct.

While using phase-modulation, the characteristics of the listening receiver greatly influence the amount of deviation required for "solid" copy. PM is usually detected in AM receivers by setting the carrier on the "slope" of

the IF passband. The frequency (phase) deviation is then converted to AM by the passband "skirt". When the receiver passband "skirts" are narrow, as with receivers using crystal and mechanical filters, the deviation required is not as great as for receivers with "wide skirts" (broad selectivity) in the passband characteristics. During PM operation of the GSB-100, it is advisable to adjust the audio gain control for best reception, as directed by the receiving station. Always use the smallest deviation (lowest setting of the AUDIO GAIN control) that is compatible with intelligible reception in the receiver.

As with CW operation, the CARRIER LEVEL control setting should be kept below the point where the final amplifier plate current "levels off" to prevent unnecessary spurious radiation.

ADDITIONAL OPERATING PROCEDURES

HEADPHONE RECEPTION

When headphones are used with the receiver, they may be plugged into the PHONES jack on the front panel of the GSB-100. This will automatically silence the speaker, and the headphones will be keyed, or muted, by the transmit-

receive circuitry in the same manner as the speaker. This will avoid the "blasting" effect during transmit that could occur if the headphones were plugged directly into the receiver.

TELEPHONE-PATCH OPERATION

A telephone-patch unit can be connected to the audio input of the GSB-100 through the PATCH jack on the front panel, with a PL-55 or equivalent-type plug. Insertion of this plug automatically disconnects the first audio amplifier and microphone from the audio section of the transmitter.

Do not connect the telephone line directly to the PATCH jack. A suitable hybrid-balancing and isolation transformer must

be used to inter-connect telephone line, the receiver output, and the transmitter audio input. With such an arrangement, it is possible to use the voice-operate system during SSB emission in the normal manner if the VOX GAIN, AT GAIN, and AUDIO GAIN controls are adjusted carefully for the individual conditions and voices during the patch conversation.

Suitable telephone-patch units are available commercially.

ADJUSTMENTS ON THE GSB-100

There are several adjustments on the GSB-100 that must be made from time to time in addition to the settings of the main controls. The reasons for these

adjustments, and the procedures for making them, are explained in the following paragraphs.

CARRIER NULL ADJUSTMENT

The balanced modulator potentiometers may occasionally need "retouching" to maintain maximum carrier suppression. The carrier is normally in excess of 60 db below the level of either sideband when the CARRIER LEVEL control is at zero. If listening stations report that carrier is present on your signal, or there are other indications that the carrier is not fully suppressed, the two potentiometers should be adjusted after a fifteen-minute warm-up as follows:

- (1) Turn the FUNCTION switch to CALIB position. Adjust CALIB level for sufficient receiver signal.
- (2) "Zero-beat" the transmitter frequency on the receiver according to the instructions in the OPERATION section. Make sure the AVC line in the receiver is not grounded, i.e., the "S meter" must be working. Tune in the calibrate signal for a peak "S meter" reading, adjusting the receiver RF gain control as necessary to prevent overloading. If receiver pick-up is not sufficient, additional coupling to the transmitter will be required.
- (3) Turn the CARRIER LEVEL control to 0 (full counterclockwise).

(4) any reading on the receiver "S meter" will be the residual carrier from the GSB-100. Adjust the receiver RF gain control for as high a reading as possible on the meter.

(5) Set the EMISSION switch to either upper or lower SB position.

(6) The two balance potentiometers are screw driver adjusted through two small holes in the GSB-100 front panel. The holes are located between the AUDIO GAIN control and the EMISSION control. While watching the receiver "S meter", adjust the two potentiometers alternately for a "dip" or minimum on the "S meter". It will be necessary to work "back and forth" between the controls several times, adjusting them carefully until no further reduction in carrier level ("S meter" reading) can be obtained. As the carrier is balanced out, it may be necessary to hook a short pick-up antenna on the receiver and place this lead in the vicinity of the transmitter RF output (as near the antenna change-over relay as possible) to obtain enough signal to overcome the noise level in the receiver.

VOX SET ADJUSTMENT

The bias control for the voice-operate relay tube is located on the rear of the GSB-100 cabinet labelled "VOX SET". If the voice-operate function will not ac-

tuate when the VOX GAIN is full open, or the relay will not release quickly and completely during pauses you take, this control must be adjusted. Extreme

changes in line voltage and tube-aging may affect the required setting for this control. To adjust the control, perform the following steps:

- (1) "Set-up" the GSB-100 for SINGLE-SIDEBAND SUPPRESSED-CARRIER OPERATION by performing the first 3 steps in that procedure.
- (2) Turn the AUDIO GAIN control, VOX GAIN control and AT GAIN control full counterclockwise to 0
- (3) Set FUNCTION switch to VOX position.
- (4) With a screw driver, slowly rotate

the VOX SET control until the transmitter "snaps on". Find the exact setting where the relay just actuates.

- (5) Now rotate the control back a few degrees from this point until the relay drops out, or releases.
- (6) Perform the remainder of the steps (9 through 12) in the SINGLE-SIDEBAND SUPPRESSED-CARRIER OPERATION instructions. If the VOX and AT circuit seem erratic, repeat the above adjustment procedure until the VOX and AT action is clean and normal

PA BIAS ADJUSTMENT

At any time that the resting power amplifier plate current does not fall between 20 MA and 25 MA, the PA BIAS potentiometer (R75) must be adjusted to set up the proper idling current. This control is located on top of the main chassis, between the power transformer and the rectifier tube (5U4GB) nearest the back of the chassis. See PARTS LOCATION DIAGRAM, TOP VIEW. The potentiometer is adjusted with a screw driver. To make the adjustment, perform the following steps:

CAUTION

HIGH VOLTAGE THAT COULD CAUSE SERIOUS INJURY OR DEATH IS EXPOSED WHEN THE COVER IS LIFTED. USE EXTREME CARE WHILE WORKING UNDER THE COVER. BE PARTICULARLY CAREFUL TO AVOID CONTACT WITH THE PLATE WIRING NEAR THE CAP OF THE 6DQ5 FINAL AMPLIFIER TUBE.

- (1) Remove the two upper right-hand and two upper left-hand screws from the front panel of the equipment. Lift the top half of the cabinet up - it is hinged at the back and will open readily when the upper front "lip" is pressed upward.
- (2) Perform the first 4 steps in the PRELIMINARY OPERATION procedure.
- (3) Adjust the PA BIAS potentiometer until the meter reads exactly 20 MA (first heavy line on the upper scale). Be sure the METER SWITCH is in PLATE MA position and the FUNCTION switch is in MAN (manual) position, with CARRIER LEVEL control at 0.
- (4) Close the cover and replace the 4 front panel screws.

CIRCUIT DESCRIPTION

Refer to the accompanying block diagram for references

SIGNAL DERIVATION

The SSB, AM, CW, and PM basic signal are all generated at a reference frequency of 9 mc. The 9 mc reference carrier is generated by a crystal oscillator, V2B. The oscillator signal forms one injection to the RF phase-shift network.

In SSB, AM, and PM operation, microphone audio is amplified by microphone amplifier stage V1A, fed through audio driver stage V2A, and the speech components outside the 300-3500 cycle range attenuated by an audio low-pass filter. The output of a low-pass filter is applied to an audio phase-shift network, where speech components throughout the entire audio passband are "split" into 90 degree phase differentials. The two phased audio components are introduced into separate modulators (V3A and V3B), and transformers in the plate circuit of the modulators develop 180 degree phased outputs from each of the components. These latter four components form the second injection to the RF phase-shift network.

During SSB operation, the phased outputs are switched to cancel one sideband in the balanced modulator output. During AM operation, the AM signal on one phased output is grounded from the phase-shift network and both sidebands appear in the transmitter output. During PM operation the PM output of the phase-shift network is selected, causing a phase-shift (proportional to the audio amplitude) to appear on the carrier output. During CW operation the audio out-

put of the modulators is removed entirely from the carrier output.

The composite signal output from the RF phase-shift network is applied to a balanced modulator. When the carrier control is at 0 (full counterclockwise), the modulator attenuates the carrier portion of the composite signal by as much as 40-45 db, but sideband energy appears unattenuated in the balanced modulator output. When the carrier control is rotated clockwise the modulator is unbalanced proportionally and a variable amount of carrier injection results from the unbalance.

During SSB operation, with the carrier control at 0, residual carrier present after the balanced modulator is removed by a unique notch filter, and carrier attenuation is increased by as much as 30 db over that obtained with the balanced modulator alone. This feature results in the remarkable long-term stability of the carrier attenuation during SSB operation with the GSB-100.

During AM, PM, and CW operation, the notch filter is shunted (by-passed), and the required carrier level inserted by adjustment of the CARRIER LEVEL control.

The SSB output from the notch filter (SSB) or the modulated or steady carrier output from the balanced modulator (AM, PM, CW) forms the signal injection at 9 mc to the first mixer amplifier, V4.

FREQUENCY DERIVATION

On the 20 meter and 80 meter amateur bands, V4 operates as a straight-

through amplifier, and the 9 mc reference signal directly forms the signal

input to the second mixer, V5. On the 40 meter, 15 meter, and 10 meter amateur bands, the output from crystal oscillator stage V10 forms the injection frequency to V4, operating as a mixer. On these bands, the difference frequency of the signal input (9 mc) and the injection frequency (the crystal oscillator frequency, as selected) is the signal input to the second mixer, V5.

The output frequency of the variable frequency oscillator, V9A, isolated by cathode follower stage V9B, is injected to the second mixer grid, V5. The VFO operates from 5.0 to 5.6 mc. The crystals in oscillator stage V10 are selected, or the 9 mc frequency fed "straight through", so that the difference fre-

quency (80, 40, 15, and 10 meter bands) or sum frequency (20 meter band) of the signal and injection frequencies to V5 will fall across the amateur bands as the VFO is tuned through its 600 kc range. The proper heterodyned frequency-spread is selected in the plate circuit of V5 and forms the excitation for driver stage V6.

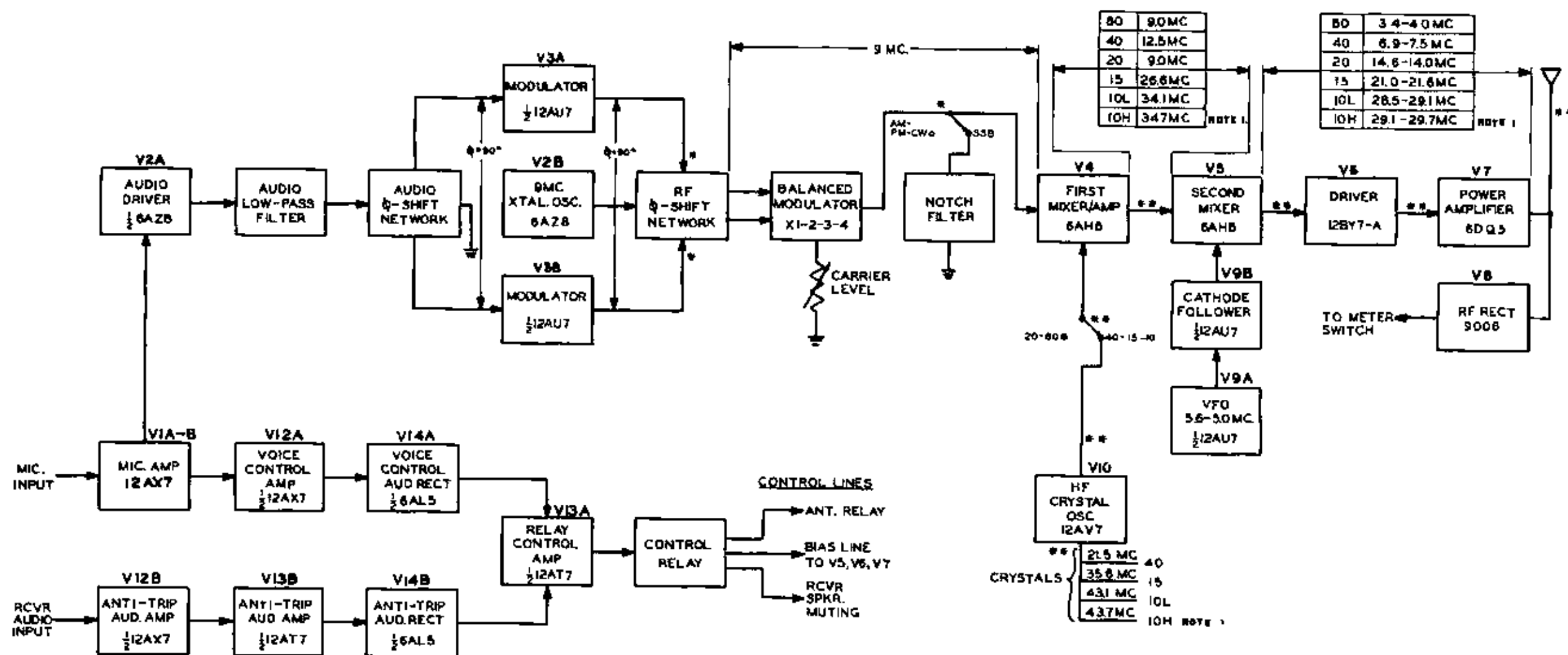
The signal, now at final output frequency, is amplified by the driver stage and the power amplifier stage and coupled into the antenna system. The carrier level is detected by RF rectifier V15 and the resulting DC level applied to the front panel meter and indicator circuit for tune-up reference.

VOX AND ANTI-TRIP CIRCUIT

When audio is applied to the microphone, audio output of microphone amplifier stage V1A is coupled to voice control amplifier V12A, and the amplified output is rectified by voice-control-audio-rectifier V14A. The resulting DC voltage is applied to relay control amplifier V13A, the relay actuates, and relay lines mute the receiver speaker, remove the bias from 3 stages, and actuate the antenna relay. These functions place the transmitter on the air and silence the receiver.

During receiving periods, audio output from the receiver is applied to anti-

trip audio amplifier V12A. This audio is amplified in a second stage, V13B, rectified by audio rectifier V14B, and the resulting DC voltage applied to relay control amplifier V13A. Rectifier V14B is polarized so that the rectified DC voltage opposes the output of V14A. Since both audio circuits are energized simultaneously (the microphone picks up audio from the speaker, the anti-trip circuit picks it up directly from the receiver), the two outputs cancel, and the relay control amplifier V9B is not operative. The relay is not actuated, therefore, when receiver audio output is "heard" by the microphone.



NOTES

1 CRYSTAL AVAILABLE FOR 10M.CW (10H) AS FOLLOWS.

XTAL FREQ	V4 OUTPUT FREQ	OPERATING FREQ. RANGE
42.6MC.	35.6MC.	28.0-28.6MC. (10M.CW)

- 2 * SWITCHING OF THESE LINES CONTROLS TYPE OF EMISSION
 ** SWITCHING OF THESE LINES CONTROLS BAND OF OPERATION

GONSET BURBANK, CALIF.		
ENG. C.H.	BLOCK DIAGRAM GSB-100 XMTR./EXCITER MODEL 3233	B
OWN. T.L.		
CKD. W.D.		
APP. C.H.		
		505-066

TUBES AND FUNCTIONS

SYMBOL	TUBE TYPE	FUNCTION
V1	12AX7	Microphone Amplifier (one triode section) Second Audio Amplifier (one triode section)
V2	6AZ8	Audio Frequency Driver (triode section) 9 mc. Crystal Oscillator (pentode section)
V3	12AU7	Audio Frequency Modulator
V4	6AH6	Amplifier First Mixer
V5	6AH6	Second Mixer
V6	12BY7A	RF Driver
V7	6DQ5	RF Power Amplifier
V8	9006	RF Output Voltage Rectifier
V9	12AU7	Variable-frequency Oscillator (one triode section) VFO Cathode Follower (one triode section)
V10	12AT7	High-frequency Crystal Oscillator
V11	OA2	Voltage Regulator
V12	12AX7	Voice Control Audio Amplifier (one triode section) Anti-trip Audio Amplifier (one triode section)
V13	12AT7	Second Anti-trip Audio Amplifier (one triode section) Relay Control Amplifier (one triode section).
V14	6AL5	Voice Control Audio Rectifier (one diode section) Anti-trip Audio Rectifier (one diode section)
V15	5U4GB	High Voltage Rectifier
V16	5U4GB	Low Voltage Rectifier
CR1-2-3-4	1N34A Germanium Diodes	Balanced Modulator Diodes
CR5	Selenium Diode	Bias Rectifier

TROUBLE SHOOTING AND ALIGNMENT

The information in this section is to be used whenever the GSB-100 becomes defective, and must be repaired before it can be returned to use. The procedures outlined, in the order given, represent a systematic approach to servicing. 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, general trouble shooting:

Vacuum-tube voltmeter, with scales to 1000 volts.

Tube tester or set of replacement tubes.

Dummy load, 50-70 ohms non-reactive

to 30 mc, 100 watt minimum rating.

Communications receiver, 2-30 mc, with 100 kc calibrator or equivalent.

Equipment Required, alignment:

Vacuum tube voltmeter (as above) with RF probe accurate to 30 mc.

1200 cycle audio oscillator, sine-wave output.

Communications receiver (as above) with accurate calibration, 2-30 mc.

Type 8606 (General cement) alignment tool.

Oscilloscope with direct connection to vertical plates.

TROUBLE SHOOTING PROCEDURE

Whenever the GSB-100 is presumed defective, there are several external checks that should be made before the unit is opened or removed from the cabinet. Check-out of the following items will often reveal the trouble externally.

(1) Review the procedures given in the OPERATION section of the manual carefully. Apparent faulty operation can occasionally be traced to improper settings of controls or improper tune-up procedure. This is particularly true when the unit is "new" and still somewhat unfamiliar to the operator.

(2) When the final amplifier plate

current or RF output indications are erratic, check the entire antenna system: transmission lines, antenna change-over relay, and associated wiring. This is particularly important if trouble is apparent while receiving as well as while transmitting. As a final check when uncertain, check transmitter operation with a dummy load connected directly to the RF OUTPUT connector on the transmitter (with the change-over relay out of the circuit). If the transmitter operates normally into the dummy load, trouble can probably be traced to the antenna system.

- (3) If operation is erratic only when the microphone is in use (SSB, AM, and PM operation), check the microphone plug, cord, and element. Substitute a known good microphone, when possible, and recheck. Similarly, when trouble is experienced during CW operation only, check the key contacts, connections, cord, and plug. Check for normal keying while pulling the key plug in and out, actuating the closed-circuit key-jack.
- (4) If operation is erratic only while the voice-operate (VOX) circuitry is in use, check the receiver audio and speaker lines for intermittent grounds, etc. Also, adjust the VOX controls (VOX GAIN and AT GAIN) carefully, as outlined in the OPERATION section, to make sure the erratic operation is not the result of improper balance between the voice-operate and anti-trip levels.
- (5) Check any additional external wiring (phone-patch leads, AC cords, etc.) carefully. Check all ground connections thoroughly.

If the preceding checks indicate that the trouble is not of external origin, the GSB-100 can be presumed faulty. In this event, perform the following additional steps:

- (6) OPENING TOP LID: Remove the two upper right-hand and two upper left-hand screws from the front panel of the unit. Lift the top half of the cabinet up - it is hinged at the back and will open readily when the upper front "lip" is pressed upward.

CAUTION

HIGH VOLTAGE THAT COULD CAUSE SERIOUS INJURY OR DEATH IS EXPOSED WHEN THE COVER IS LIFTED. USE EXTREME CARE WHILE WORKING UNDER THE COVER, AND AT ALL TIMES WHEN THE UNIT IS REMOVED FROM THE CABINET. BE PARTICULARLY CAREFUL TO AVOID CONTACT WITH THE PLATE WIRING NEAR THE CAP OF THE 6DQ5 FINAL AMPLIFIER TUBES AND ALL POWER SUPPLY WIRING BENEATH THE CHASSIS.

- (7) TUBE CHECK: All tubes except the 9006 RF rectifier diode (V8) are exposed when the cover is lifted. Systematically check all exposed tubes with a tube-tester and/or by direct substitution with known good tubes. The tubes connected with various circuits can be located with the aid of the BLOCK DIAGRAM and the PARTS LOCATION drawing (TOP VIEW).

DO NOT RELY COMPLETELY ON TUBE TESTER RESULTS, BUT SUBSTITUTE KNOWN GOOD TUBES FOR SUSPICIOUS TUBES AND RECHECK PERFORMANCE. A LARGE PERCENTAGE OF EQUIPMENT FAILURES ARE THE RESULT OF FAULTY TUBES.

If all tubes check-out satisfactorily, trouble can be presumed to be a faulty component or components within the unit. Do not attempt detailed trouble shooting, as outlined below, unless you are qualified to the extent of understanding the general circuit details, as explained in the CIRCUIT DESCRIPTION, and/or by reference to the schematic diagram.

Component failure can be determined, and remedied, in the majority of cases by performing the following additional steps:

- (8) REMOVAL OF THE TRANSMITTER FROM THE CABINET: Remove all connections to plugs and terminals on the back of the cabinet. Remove the AC plug from the power source and check to make sure the cord is free to slide forward as the transmitter is withdrawn.

Remove all (remaining) screws from the front panel. Remove the four screws from the back of cabinet, two on each side of the clearance hole in the cabinet back.

Slide the transmitter chassis and panel forward, free of the cabinet. Be careful that the AC cord and plug do not get caught as the unit is withdrawn.

To replace the unit in cabinet, reverse the above steps.

- (9) DETAILED TROUBLE SHOOTING: The isolation and replacement of a faulty component or components in the GSB-100 consists of intelligent application of the VOLTAGE CHART, the SCHEMATIC DIAGRAM, and a thorough understanding of the CIRCUIT DESCRIPTION and BLOCK DIAGRAM.

The equipment is properly aligned before leaving the factory, and most of the alignment components will seldom require readjustment throughout the life of the unit. Do not indiscriminantly perform alignment procedures as "a matter of course" whenever the unit is serviced. Ordinarily, a specific alignment or adjustment procedure is required only when a component, or, occasionally, a tube, has been replaced that is part of, or directly connected with, a tuned circuit or other special adjustment. Do not perform unnecessary

alignment procedures, but align only those circuits that are affected by a particular parts replacement. It is seldom, if ever, necessary to perform the complete alignment procedure.

When a component or tube connected with a tuned circuit (or adjustment) has been replaced, refer to the applicable procedure in the following section, "ALIGNMENT", and perform the steps as indicated.

- (10) CHECK-OUT OF REPAIRED UNIT: When the unit has been repaired (and necessary re-alignment performed), and is presumed to be operating satisfactorily, perform the entire OPERATION procedures, with all interconnections present. If the transmitter performs normally, replace it in the cabinet (if not done previously) and the equipment is again ready for use.

ALIGNMENT PROCEDURES

If more than one alignment procedure is to be done, perform the procedures in the order listed. Components referenced in the procedures can be located by the PARTS LOCATION DIAGRAMS, TOP and BOTTOM view. All coil and transformer slugs

(except those in the VFO) are adjusted with a GC type 8606 alignment tool. Hand capacity effects will be reduced if a fiber tool is used to adjust the ceramic trimmers.

A. ADJUSTMENT OF THE 9 MC CRYSTAL OSCILLATOR

- (1) Set up the equipment in standby (STBY) condition on the 80 meter band, upper sideband emission.
- (2) Connect RF probe of VTVM to pin #4 of coil L1-L2. Set meter on 10V scale. Connect shield (ground) clip of probe to chassis.
- (3) Set carrier balance potentiometers R44 and R47 to the approximate middle (1/2 total rotation) of their range. Set carrier level potentiometer at 0.
- (4) Adjust L1 (bottom slug of L1-L2 can) for peak reading on meter.

Bottom slug is reached by passing tip of tool clear through top slug, engaging bottom slug in hex-faced tool tip.

- (5) Connect RF probe to pin #6 of coil L1-L2.
- (6) Adjust L2 (top slug in L1-L2 can) for maximum reading on meter.

When both slugs are properly adjusted, peak readings should balance within $\pm 5\%$.

When coils are properly tuned, refer to CARRIER NULL ADJUSTMENT.

B. ADJUSTMENT OF THE VFO

- (1) Set the FUNCTION switch to STBY, the BAND switch to 80 M, and other controls to normal settings for any type of emission.
- (2) Place the antenna lead from a calibrated receiver in the vicinity of the VFO compartment.
- (3) Set the FREQUENCY control for an exact dial reading of 4.0 mc.
- (4) Tune receiver to exactly 5.000 mc.
- (5) Adjust the slug of L6 (screw driver adjustment on top of VFO shield) for precise zero-beat with standard signal at 5.000 mc.
- (6) Set FREQUENCY control for an exact dial reading of 3.4 mc.
- (7) Tune receiver to accurate standard signal at 5.600 mc.
- (8) Adjust padder capacitor C57 (screw driver adjustment through the long "tube" on top of the VFO shield) for precise zero-beat with standard signal at 5.600 mc.
- (9) Repeat steps 3 through 8, checking dial limits and direction of change, until dial calibration at above points holds at each end of band.

NOTE

A 100 kc crystal calibrator or other accurate standard signal should be used to set the receiver to precise frequency.

C. ALIGNMENT OF CRYSTAL OSCILLATOR

- (1) Set the FUNCTION switch to STBY, and the BAND switch to positions as indicated in the following steps. Set all other controls to normal settings for any type of emission.
- (2) Connect the RF probe of the VTVM to pin #1 of V4. Set up the 3V scale on the meter.
- (3) Set the band switch and adjust trimmers according to the following table:

BAND SWITCH POSITION:	ADJUST FOR MAX. METER READING:
15 M	Slug of coil L5
10 M (28.5 - 29.1 mc)	Trimmer C37
10 M (29.1 - 29.7 mc)	Trimmer C36
40 M	Trimmer C39

D. ALIGNMENT OF L3-L4 CIRCUIT

- (1) Set the EMISSION switch to AM position. Set the FUNCTION switch to STBY position. Set the BAND switch to 80 M. Set other controls to normal positions for AM emission.
- (2) Connect the RF probe of the VTVM to pin #1 of V4 (shield clip to ground). Set to 10V scale.
- (3) Set CARRIER LEVEL control (R43) to 10.
- (4) Adjust slug of L4 for maximum (peak) meter reading..
- (5) Back out top and bottom slugs of L3 until they are even with ends of coil.
- (6) Adjust both slugs toward center of coil in 1/2 turn increments (keeping both slugs approximately equally inserted into coil) to obtain maximum (peak) meter reading.
- (7) Rotate CARRIER LEVEL control (R43) counter-clockwise to 0.

- (8) Alternately adjust Carrier Balance Controls R44 and R47 for minimum (null) reading on meter. Work back and forth between the controls several times until no

further reduction in meter reading can be obtained. As null is approached, switch meter scales as necessary to emphasize reading.

E. ALIGNMENT OF SECOND MIXER AND DRIVER CIRCUITS - 80 METER BAND

- (1) Set the EMISSION switch to AM, the FUNCTION switch to MANUAL, the BAND switch to 80 M, the METER control to PLATE MA, and other controls as required for AM emission. Connect a 50 ohm DUMMY LOAD to the RF output connector.

maximum meter reading. (front panel meter)
- (2) Set the DRIVER TUNING control to 6.
- (3) Rotate the FREQUENCY control for a dial reading of 4.0 mc.
- (4) Rotate the CARRIER LEVEL control for a meter reading of 50 MA. Throughout steps 5 and 6, as the meter reading increases with adjustments, reduce the CARRIER LEVEL control as necessary to maintain a meter reading of not more than 50 MA.
- (5) Adjust slug of L9 (top of can) for
- (6) Adjust slug of L11 (mounting-clip end of coil) for maximum meter reading.
- (7) Adjust the FINAL TUNING and FINAL LOADING controls for loaded resonance in the normal manner, increasing the CARRIER LEVEL control clockwise until no further increase in meter reading (plate current) is obtained. With this adjustment, and with the amplifier properly loaded, plate current should be approximately 150 ma.
- (8) Reduce carrier insertion (rotate CARRIER LEVEL control counter-clockwise) for a plate current of approximately 100 ma. Adjust C51 for maximum plate current (peak meter reading).

F. ALIGNMENT OF THE SECOND MIXER AND DRIVER CIRCUITS 40, 20, 15, AND 10 METER BAND

- (1) Set the EMISSION switch to AM, the FUNCTION switch to MANUAL, the meter control to PLATE MA, and other controls as required for AM emission. The BAND switch, FREQUENCY control, DRIVER TUNING control, CARRIER LEVEL control, FINAL TUNING, and FINAL LOADING controls are adjusted as directed in the following steps. A 50 ohm dummy load must be connected to the RF output connector of the transmitter. The procedure is essentially the same as in PROCEDURE E (80 M), but the other bands are tracked.

tracked tuned circuits on each of the remaining bands of operation. As each adjustment is made, rotate the CARRIER LEVEL control to keep the plate current (front panel meter reading) between the idling point (approx. 25 ma) and 50 ma. Do not let the plate current exceed 50 ma for more than a few seconds as the alignment procedure progresses. When each circuit has been properly aligned, always adjust the FINAL TUNING and FINAL LOADING controls in the normal manner for AM EMISSION as a check on performance before proceeding to alignment of the next referenced band.
- (2) The table in the following step indicates the settings and adjustments required to align the

(3) Alignment Table
(when more than one band is to be aligned,
align bands in the order listed in the table):

BAND	FREQUENCY control (VFO) setting	DRIVER TUNING control setting	Adjust for maximum plate current in order listed:
40 M	7.300 mc	6	1. Slug of L8 2. Trimmer C69 3. Trimmer C85
10 M (2) 29.1 - 29.7 mc	29.700 mc	5 1/2	1. Trimmer C48 2. Slug of L9 (slug nearest chassis) 3. Slug of L11 (slug farthest from chassis)
10 M (1) 28.5 - 29.1 mc	29.100 mc	(10 M range) Tune for max. plate current (peak).	1. Trimmer C49 Note: If unable to obtain peak, repeat 10 M (2) ad- justment above.
15 M	21.450 mc	5	1. Trimmer C50 2. Trimmer C76 3. Trimmer C87
20 M	14.400 mc	5	1. Trimmer C74 2. Trimmer C90 3. Trimmer C51 (re-peak)
NOTES: 1. If other optional frequency ranges are in use in 10 Meter band, this procedure is not affected. 2. If unable to obtain drive on any band, repeat previous alignment procedures (A, B, C, D, and/or E as necessary).			

G. PA NEUTRALIZING ADJUSTMENT

- (1) Set EMISSION SWITCH to AM, BAND switch to 15 M, FREQUENCY control for a dial reading of 21.300 mc, and other controls as required for AM emission. Adjust the FINAL TUNING and FINAL LOADING control for proper loading into a 50 ohm dummy load.
- (2) Connect a VTVM with RF probe across the dummy load. Set on 100V scale.
- (3) Further adjust CARRIER LEVEL control, DRIVER TUNING control, FINAL TUNING control, and FINAL LOADING control for maximum reading on the VTVM. (maximum RF voltage across load)
- (4) Leaving the other controls untouched, turn the CALIB LEVEL control to PWR OFF position (or pull the plug).
- (5) Remove the high-voltage rectifier tube V15 from its socket.
- (6) Carefully unsolder the tube socket end of R88 (100 ohm, 1 watt) from pin #8 (screen connection) of PA amplifier tube V7.
- (7) Turn on the AC power. Adjust CARRIER LEVEL control to 10 (max. clockwise). Set VTVM for lower scale until reading is obtained.
- (8) Adjust neutralizing capacitor C97 for minimum (null) reading on VTVM. Readjust PA tuning as necessary to keep meter reading at maximum point ("peaked") as neutralizing

condenser null setting is approached. Use lower and lower scales, as necessary, to assure good indication on VTVM, as full

null is approached.

- (9) Turn off AC power (pull plug), resolder R88 in place, replace V15.

H. ADJUSTMENT OF CARRIER NOTCH FILTER

- (1) Set up equipment for normal operation with upper sideband (USB) emission, 80 M (80 meter band), 3.900 mc. Load transmitter into 50 ohm dummy load.
- (2) Set FUNCTION switch to MANUAL, CARRIER LEVEL control to 8.
- (3) Set METER control to RF output range and rotate for as high a reading as possible, keeping needle on scale.
- (4) Adjust notch trimmer C31 for minimum (null) reading on meter. As null is approached, rotate meter control clockwise to keep as high a reading as possible on meter. Continue to adjust C31 until no further decrease in output can be obtained.

I. ADJUSTMENT OF 5 MC TRAP L10

- (1) Set up equipment for normal operation with AM emission, FUNCTION switch in MANUAL, CARRIER LEVEL control at 0, on the 80 M (80 meter) band at a frequency of 4.000 mc. Load the transmitter into a 50 ohm dummy load.
- (2) Tune a communications receiver to approximately 5 mc, and tune in the transmitter signal at this frequency. If no signal can be heard, place a pick-up loop connected to the receiver antenna terminals near the transmitter output (adjacent to the dummy load), increasing coupling until the 5 mc signal is heard. Increase the receiver RF gain control and/or increase the coupling until a substantial "S meter" reading is obtained.
- (3) Adjust the slug of L10 for minimum (null) reading on the "S meter". Continue to increase the RF gain and/or coupling to maintain a sizeable "S meter" reading as the null is approached. Adjust the slug of L10 until no further reduction in "S meter" reading can be obtained.

J. SIDEBAND AND CARRIER SUPPRESSION ADJUSTMENTS

- (1) Set up equipment for normal operation into a 50 ohm dummy load with upper sideband emission, 80 meter operation at 3.9000 mc, manual control.
- (2) A 1200 cycle (approx.) audio oscillator and oscilloscope with direct connection to the vertical plates is required for the following adjustments. Connect the audio output of the 1200 cycle oscillator to the PATCH jack on the GSB-100 front panel. Set the AUDIO GAIN control on the GSB-100 to 2.
- (3) Make a link by coiling up 3 - 4 turns of insulated wire into a circle about 1 1/2 inches in diameter. Connect the link to a short transmission line (lamp cord will work well), and the other end of the line directly to the vertical plates on the oscilloscope. Couple the link tightly to the 80 meter tank coil adjacent to the 6DQ5 final amplifier tube (the coil, ceramic form, with largest number of turns).
- (4) Set the oscilloscope horizontal sweep oscillator for approx. 300 CPS. Adjust the audio output of the 1200 cycle oscillator for a definite "RF bar" pattern on the

oscilloscope screen (if the audio oscillator does not have a variable output level, connect a 10,000 ohm potentiometer across the output, and feed the PATCH jack between the potentiometer "arm" and ground. The audio level can then be controlled by the setting of the potentiometer). Use as low an audio level as possible, consistent with a definite pattern. Adjust the oscilloscope horizontal sweep rate for a stable pattern.

- (5) Unless the carrier and sideband suppression is already adequate, the pattern will have "ripples" of some form along the upper and lower edges, as in the accompanying figure 1. Adjust the slug in coil L2, potentiometer R12, and potentiometer R15, in that order, decreasing the amplitude of the ripples with each adjustment. Repeat the adjustment of these components several times until no further reduction in ripple amplitude can be obtained. At this point, the oscilloscope pattern will resemble figure 2.
- (6) Adjust the carrier balance potentiometers (screw driver adjustment through the front panel) to further reduce the ripple amplitude.

Work back and forth between these potentiometers until no further reduction in ripple amplitude can be achieved. Figure 3 is an ideal perfect pattern, i.e., upper and lower edges of pattern perfectly straight. At this point, the pattern should approach the ideal.

- (7) Switch the EMISSION switch to lower sideband (LSB) position. The ripple amplitude may increase slightly in this position. If this is the case, readjust the slug of L2 for minimum ripple amplitude. Switch back and forth several times between upper sideband (USB) and lower sideband (LSB) emission, adjusting the slug of L2 for the best "balance" between residual ripple amplitude. When this step is complete, the oscilloscope pattern should appear essentially identical in both positions, and the ripple amplitude should be very slight.
- (8) As an aid to making the above adjustments, figures 4, 5, and 6 indicate the patterns obtained with various conditions of maladjustment of the slug of L2, potentiometers R12 and R15, and the carrier balance potentiometers.

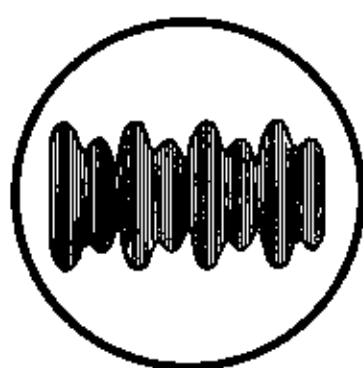


FIG. 1
CARRIER AND SIDEBAND SUPPRESSION
QUITE POOR (L2, R12, AND R15
IMPROPERLY ADJUSTED)

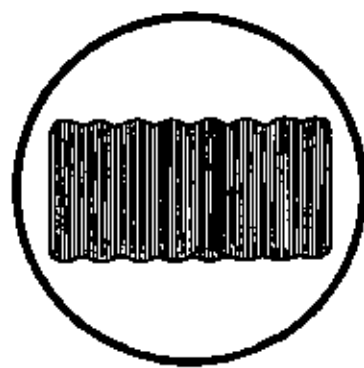


FIG. 2
CARRIER AND SIDEBAND SUPPRESSION
FAIRLY HIGH

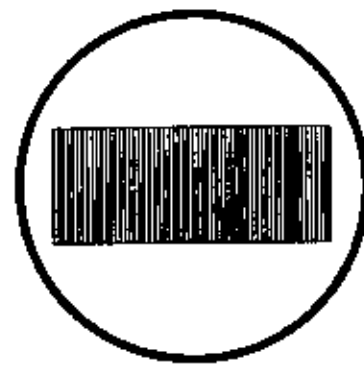


FIG. 3
IDEAL PATTERN WHEN CARRIER AND
SIDEBAND SUPPRESSION PERFECT
(INFINITE)

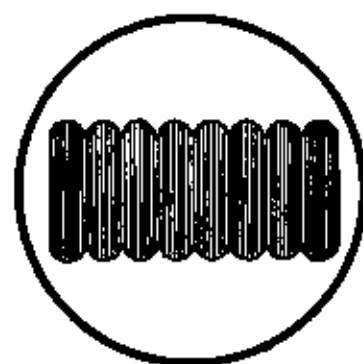


FIG. 4
L2 AND CARRIER BALANCE POTENTIOMETERS
PROPERLY ADJUSTED, R12 AND R15
IMPROPERLY ADJUSTED

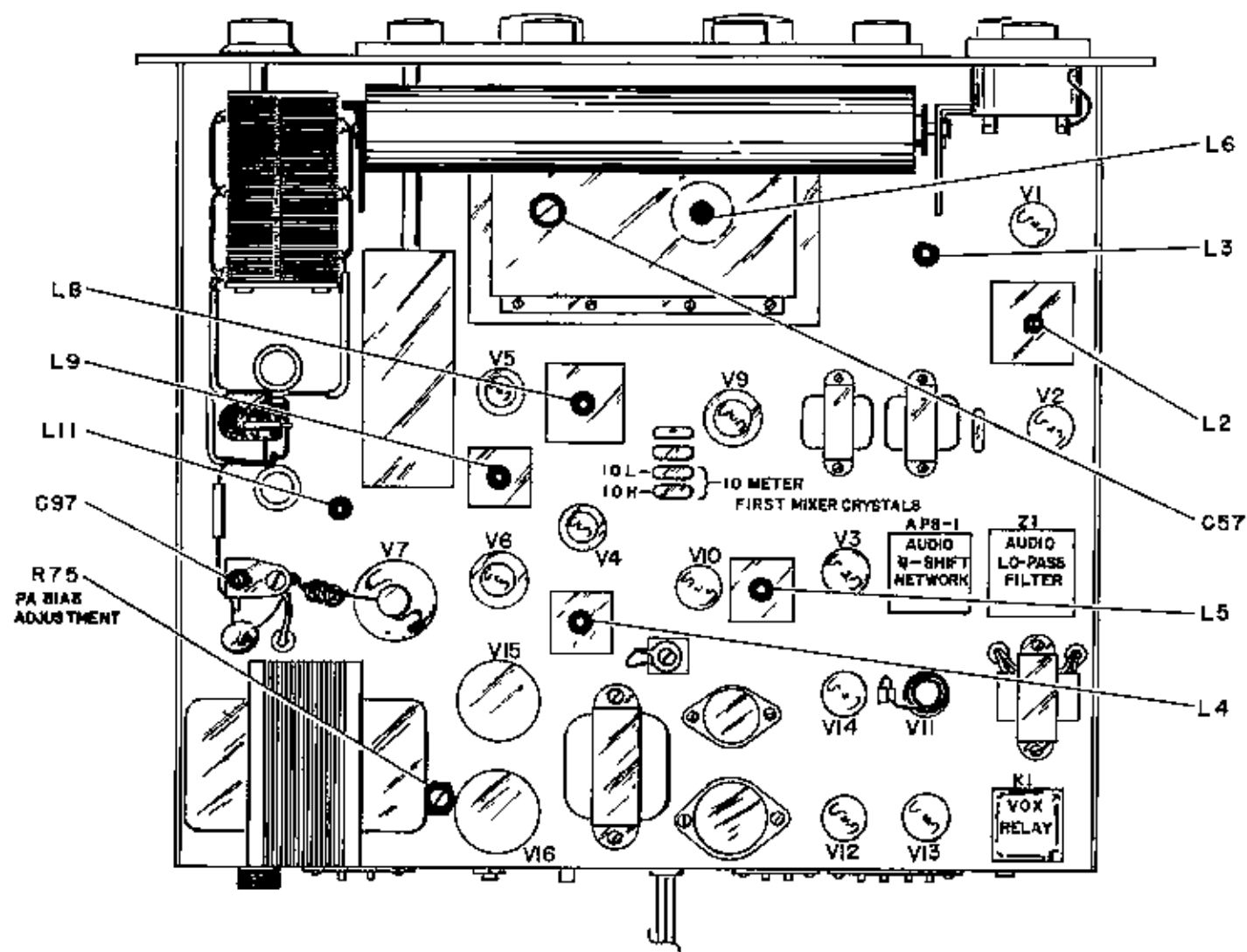


FIG. 5
R12, R15 AND CARRIER BALANCE
POTENTIOMETERS PROPERLY
ADJUSTED, L2 IMPROPERLY
ADJUSTED

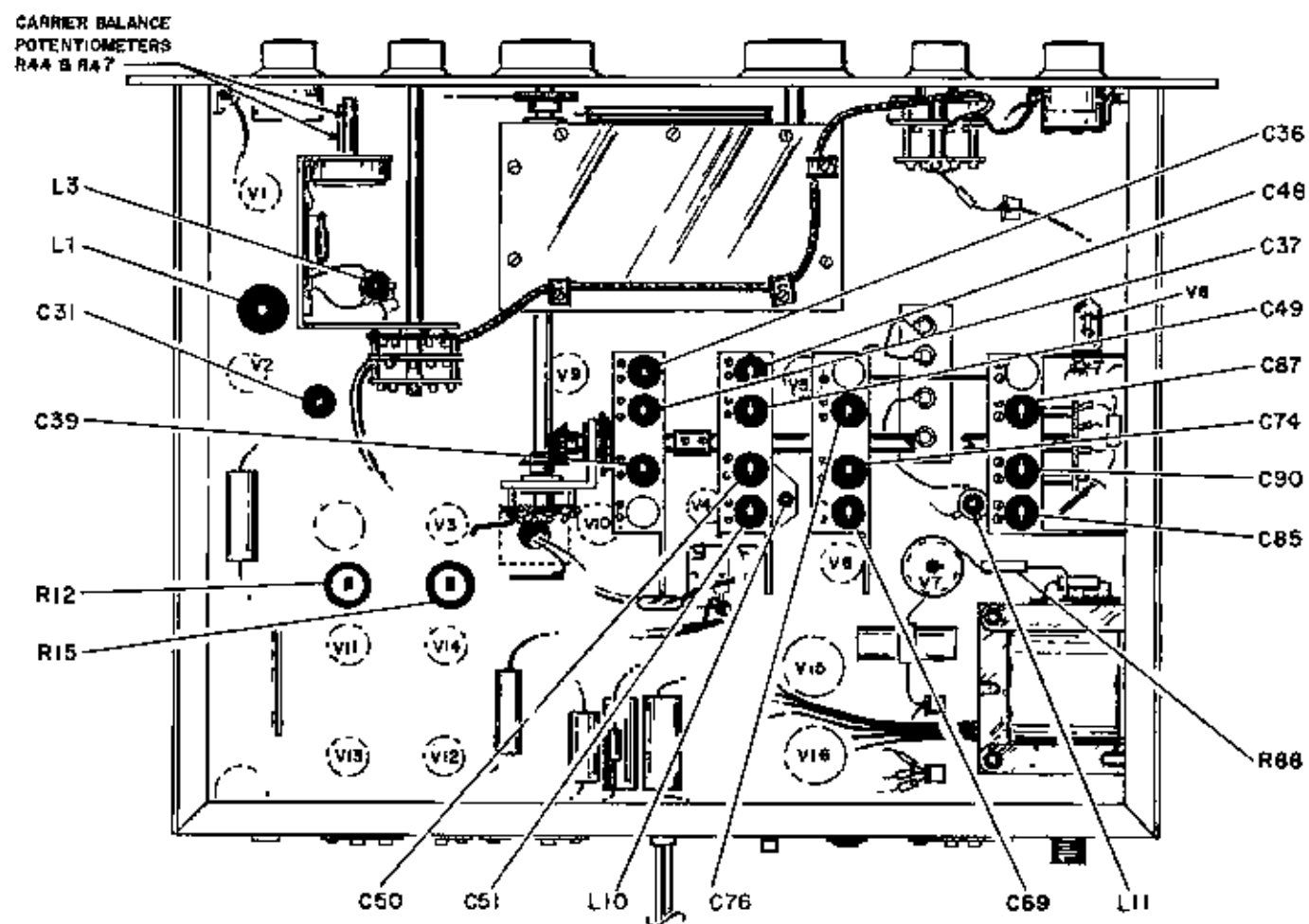


FIG. 6
R12, R15, AND L2 PROPERLY ADJUSTED,
CARRIER BALANCE POTENTIOMETERS
IMPROPERLY ADJUSTED

SAMPLES OF OSCILLOSCOPE PATTERNS OBTAINED DURING ALIGNMENT OF GSB-100 TRANSMITTER
WITH SINGLE TONE MODULATION (1200 CYCLES APPROX) SSB EMISSION, 300 CYCLE HORIZ SWEEP FREQ



GSB-100 PARTS LOCATION DIAGRAM
TOP VIEW



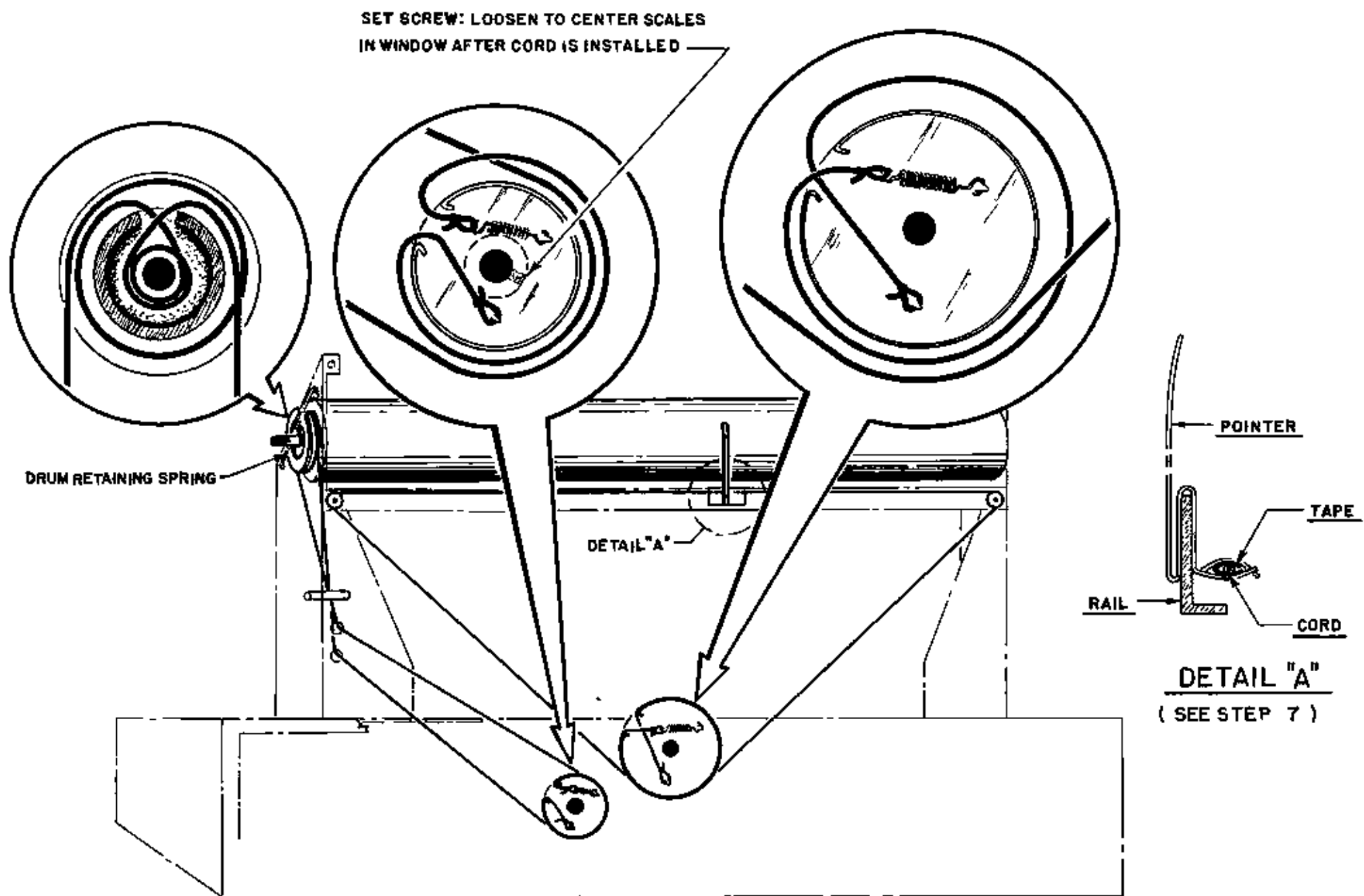
GSB-100 PARTS LOCATION DIAGRAM
BOTTOM VIEW

VOLTAGE CHART-GSB-100 TRANSMITTER

TUBES	PIN NUMBERS								
	1	2	3	4	5	6	7	8	9
V1 12AX7	110V DC	0	1.0V DC	6.3V AC	6.3V AC	150V DC	0	1.4V DC	0
V2 6AZ8	275V DC 26V RF	150V DC	0 1V RF	6.3V AC	0	-10V DC 9V RF	10V DC	255V DC	0
V3 12AU7	270V DC	0	9V DC	6.3V AC	6.3V DC	270V AC	0	9V DC	0
V4 6AH6	0 1.1V RF** .43V RF	2V DC	0	6.3V AC	270V DC 2V RF* 6V RF	100V DC	2V DC	-	-
V5 6AH6	-3.0V DC .3V RF*** 1V RF	0	0	6.3V AC	270V DC 2.5V RF	150V DC	0	-	-
V6 12BY7A	0	-3V DC 3V RF	0	6.3V AC	6.3V AC	0	270V DC 50V RF	150V DC	0
V7 6DQ5	-48V DC 50V RF	6.3V AC	2.0V DC	150V DC	-48V DC 50V RF	2.0V DC	0	150V DC	-
V8 9006	0	26V DC approx.	6.3V AC	0	0	-	26V DC approx.	-	-
V9 12AU7	54V DC	-3.0V DC 3V RF	0	6.3V AC	6.3V AC	140V DC	0 .6V RF	6.3V DC 1.0V RF	0
V10 12AT7	140V DC	0	1.4V DC	6.3V AC	6.3V AC	140V DC	0 10V RF*	1.4V DC	0
* with band switch set on 15 M band. ** with band switch set on 15 M band and carrier level at 0. *** with band switch set on 20 M band and carrier level at 0.									

TUBES	PIN NUMBERS								
	1	2	3	4	5	6	7	8	9
V11 0A2	150V DC	0	-	-	150V DC	-	0	-	-
V12 12AX7	170V DC	0	1.8V DC	6.3V AC	6.3V AC	185V DC	0	1.5V DC	0
V13 12AT7	130V DC	0	1.8V DC	6.3V AC	6.3V AC	140V DC	.2V DC	0	0
V14 6AL5	-7. V DC	-7. V DC	0	6.3V AC	-7. V DC	0	7.2V DC	-	-
V15 5U4GB	-	610V DC 5V AC to pin 2-8	-	720V AC	Tie point	720V AC	-	610V DC 5V AC to pin 2-8	-
V16 5U4GB	-	300V DC 5V AC to pin 2-8		260V AC	-	260V AC	-	300V DC 5V AC to pin 2-8	/

All DC voltages taken with VTVM.
 DC voltages with max. carrier inserted band 20 M 14200 KC
 RF voltages measure with RF voltmeter HP-410B
 Line voltage 117V AC
 All voltages measured to ground

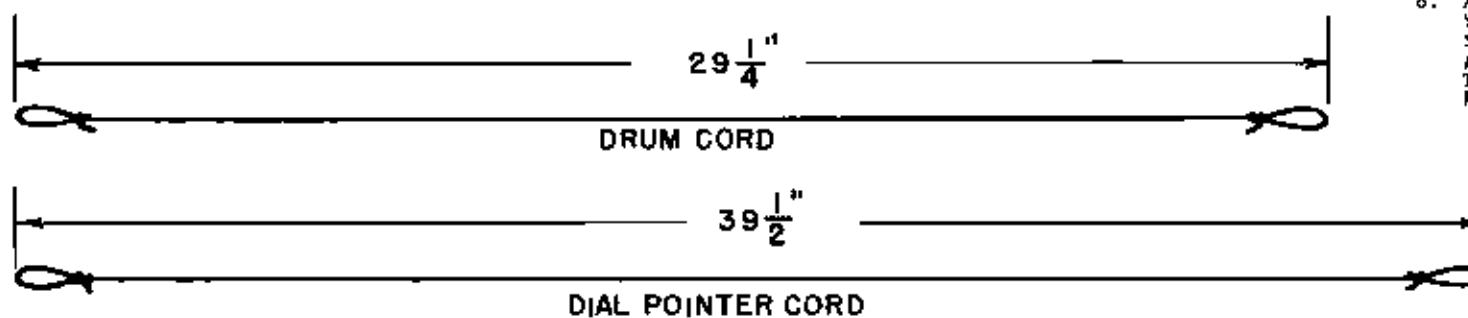


DIAL STRINGING DIAGRAM GSB-100

DIAL STRINGING PROCEDURE

1. REFER TO TROUBLE SHOOTING PROCEDURES, STEP (8). REMOVE TRANSMITTER FROM CABINET.
2. REMOVE ALL KNOBS FROM FRONT PANEL. SOME KNOBS HAVE SMALL SET-SCREWS, AND A MINIATURE SCREWDRIVER MUST BE USED.
3. REMOVE RETAINING NUTS FROM ALL CONTROLS AND JACKS. DO NOT ATTEMPT TO REMOVE PANEL BUSHING ON EMISSION SWITCH SHAFT.
4. LOOSEN TERMINAL SCREWS ON BACK OF METER. REMOVE METER LEADS FROM TERMINALS.
5. UNSOLDER CENTER-CONDUCTOR LEAD TO MIXE JACK (LOWER LEFT-HAND CORNER OF PANEL). UNSOLDER LEADS ON MIXE JACK GROUND LOG.
6. REMOVE 8 PHILLIPS-HEAD SCREWS FROM FRONT PANEL. WORK PANEL FREE OF ALL CONTROLS AND SHAFTS AND REMOVE FROM CHASSIS. THE DIAL CORDS AND ASSOCIATED MECHANISM ARE NOW ACCESSIBLE.
7. BEFORE REPLACING EITHER DIAL CORD, REMOVE THE DRUM RETAINING SPRINGS.

REPLACE DIAL CORD(S), USING THE DIAGRAMS AS REFERENCE. THE TUNING DIAL SLIDER SHOULD BE LEFT FREE (DO NOT CLAMP ON CORD) UNTIL THE UNIT IS REASSEMBLED. WHEN FIRST TESTED, SET THE OSCILLATOR UP FOR EMISSION ON 4,000 MC. (USING A CALIBRATED RECEIVER AS REFERENCE, 80 METER BAND) AND SET THE DIAL POINTER TO EXACTLY 4.0 ON THE DRUM DIAL. THEN CLAMP THE POINTER TO THE STRING WITH LONG-NOSE PLIERS, WORKING FROM BEHIND THE PANEL.
8. AFTER REPLACING DIAL CORD(S), REVERSE STEPS 1 THROUGH 6 TO REASSEMBLE PANEL. BE SURE ALL CONTROL AND PANEL JACK RETAINING NUTS ARE TIGHTENED SECURELY BEFORE INSTALLING KNOBS.



LENGTH OF DIAL CORDS

SCHEMATIC NO.	DESCRIPTION	CONSET PART NO.	SCHEMATIC NO.	DESCRIPTION	CONSET PART NO.	SCHEMATIC NO.	DESCRIPTION	CONSET PART NO.
C1	150 μ F 0.1% CERAMIC NP2 TOL. $\pm 10\%$		C109	.01 μ F 0.1% OMV 500 WVDC		L1-2	COIL, 0 MC PHASE SHIFT	C14-C17
C2	.001 μ F 0.1% CERAMIC OMV 500 WVDC		C109	.01 μ F 0.1% OMV 500 WVDC		L3	COIL, BALANCED MODULATOR	C14-C18
C3	5 μ F ELECTROLYTIC 450 WVDC		C110	220 μ F SILVER NICA TOL. $\pm 5\%$		L4	COIL, CRYSTAL NOTCH	C14-C19
C4	.01 μ F 0.1% OMV 500 WVDC		C111	33 μ F SILVER NICA TOL. $\pm 5\%$		L5	COIL, CRYSTAL OSCILLATOR	C12-C73
C5	.001 μ F 0.1% OMV 500 WVDC		C112	.01 μ F 0.1% OMV 500 WVDC		L6	COIL, VFO	C12-C72
C6	.01 μ F 0.1% OMV 500 WVDC		C113	.01 μ F 0.1% OMV 500 WVDC		L7	COIL, FIRST MIXER (80-20 MC.)	C12-C76
C7	.001 μ F 0.1% OMV 500 WVDC		C114	.05 μ F 0.1% OMV 500 WVDC		L8	COIL, FIRST MIXER (40-15-10 MC.)	C12-C69
C8	.01 μ F 0.1% OMV 500 WVDC		C115-16	.001 μ F 0.1% OMV 500 WVDC		L9	COIL, SECOND MIXER (80 THRU 10 MC.)	C12-C70
C9	.01 μ F 0.1% OMV 500 WVDC		R1	4700 Ω 1/2 W. 10%		L10	COIL, 5 MC TRAP	C12-130
C10	.01 μ F 0.1% OMV 500 WVDC		R2	1 MC20 1/2 W. 10%		L11	COIL, DRIVER (80 THRU 10 MC.)	C12-C71
C11	.01 μ F 0.1% OMV 500 WVDC		R3	2200 Ω 1/2 W. 10%		L12A	COIL, FINAL (80 THRU 40 MC.)	C12-C75
C12	.1 μ F TUBULAR 200 WVDC		R4	220K Ω 1/2 W. 10%		L12B	COIL, FINAL (20-15-10 MC.)	C12-C78
C13	.01 μ F 0.1% OMV 1500 WVDC		R5	470K Ω 1/2 W. 10%		RFO1	.5 MM CHOKER	C27-C26
C14	.01 μ F 0.1% OMV 1500 WVDC		R6	2200 Ω 1/2 W. 10%		RFO2	100 μ H CHOKER	C27-C29
C15-A	40 μ F ELECTROLYTIC 450 WVDC		R7	100K Ω 1/2 W. 10%		RFO3	100 μ H CHOKER	C27-C28
C15-B	40 μ F ELECTROLYTIC 450 WVDC		R8	1 MC20 AUDIO GAIN POTENTIOMETER	052-027	RFO4	.5 MM CHOKER	C27-C28
C16	.01 μ F 0.1% OMV 500 WVDC		R9	47K Ω 1/2 W. 10%		RFO5	.5 MM CHOKER	C27-C28
C17	.01 μ F 0.1% OMV 500 WVDC		R10	1000 Ω 1/2 W. 10%		RFO6	.5 MM CHOKER	C27-C28
C18	40 μ F ELECTROLYTIC 450 WVDC		R11	270 Ω 1/2 W. 10%		RFO7	.5 MM CHOKER	C27-C28
C19	40 μ F ELECTROLYTIC 450 WVDC		R12	500 Ω POTENTIOMETER WIRE WOUND	053-022	RFO8	80 μ H CHOKER	C27-C28
C20	20 μ F ELECTROLYTIC 150 WVDC		R13	1200 Ω 1/2 W. 10%		RFO9	.5 MM CHOKER	C27-C28
C21	20 μ F ELECTROLYTIC 150 WVDC		R14	1000 Ω 1/2 W. 10%		RFO10	FILAMENT CHOKER	C27-C28
C22	.1 μ F TUBULAR 400 WVDC		R15	2000 Ω RHEOSTAT	051-002	RFO11	FILAMENT CHOKER	C27-C28
C23	.01 μ F 0.1% OMV 1500 WVDC		R16	47K Ω 1/2 W. 10%				
C24	.01 μ F 0.1% OMV 1500 WVDC		R17	1 MC20 POTENTIOMETER (ANTI-TRIP)	052-023			
C25	4 μ F ELECTROLYTIC 150 WVDC		R18	4700 Ω 1/2 W. 10%				
C26	.25 μ F TUBULAR 200 WVDC		R19	330K Ω 1/2 W. 10%				
C27	.02 μ F 0.1% OMV 500 WVDC		R20	100K Ω 1/2 W. 10%				
C28	.01 μ F 0.1% OMV 500 WVDC		R21	1000 Ω 1/2 W. 10%				
C29	.01 μ F 0.1% OMV 500 WVDC		R22	100K Ω 1/2 W. 10%				
C30	.01 μ F 0.1% OMV 500 WVDC		R23	100K Ω 1/2 W. 10%				
C31	.01 μ F 0.1% OMV 500 WVDC		R24	470K Ω 1/2 W. 10%				
C32	10 μ F TUBULAR CERAMIC NP2 TOL. $\pm 10\%$		R25	25K Ω 30 WATT WIRE WOUND	049-007			
C33	5-25 μ F CERAMIC TRIMMER NP0		R26	6800 Ω 1 W. 10%				
C34	.005 μ F 0.1% OMV 500 WVDC		R27	15K Ω 1 W. 10%				
C35	.005 μ F 0.1% OMV 500 WVDC		R28	100K Ω 1 W. 10%				
C36	.001 μ F 0.1% OMV 500 WVDC		R29	100 Ω 1 W. 10%				
C37	.001 μ F 0.1% OMV 500 WVDC		R30	100K Ω 1 W. 10%				
C38	5-25 μ F CERAMIC TRIMMER NP0		R31	100K Ω 1 W. 10%				
C39	5-25 μ F CERAMIC TRIMMER NP0		R32	100K Ω 1 W. 10%				
C40	5-25 μ F CERAMIC TRIMMER NP0		R33	2-2 000 Ω 1/2 W. 10%				
C41	5-25 μ F CERAMIC TRIMMER NP0		R34	150K Ω 1/2 W. 10%				
C42	5-25 μ F CERAMIC TRIMMER NP0		R35	100K Ω 1/2 W. 10%				
C43	5-25 μ F CERAMIC TRIMMER NP0		R36	2-2 000 Ω 1/2 W. 10%				
C44	5-25 μ F CERAMIC TRIMMER NP0		R37	2200 Ω 1/2 W. 10%				
C45	5-25 μ F CERAMIC TRIMMER NP0		R38	4700 Ω 1/2 W. 10%				
C46	5-25 μ F CERAMIC TRIMMER NP0		R39	100K Ω 1/2 W. 10%				
C47	5-25 μ F CERAMIC TRIMMER NP0		R40	100K Ω 1/2 W. 10%				
C48	5-25 μ F CERAMIC TRIMMER NP0		R41	100K Ω 1/2 W. 10%				
C49	5-25 μ F CERAMIC TRIMMER NP0		R42	3000 Ω 10 W. WIRE WOUND TOL. $\pm 5\%$				
C50	5-25 μ F CERAMIC TRIMMER NP0		R43	1000 Ω POTENTIOMETER (CARRIER LEVEL)	002-021			
C51	5-25 μ F CERAMIC TRIMMER NP0		R44	1000 Ω POTENTIOMETER (CARRIER BALANCE)	052-071			
C52	5-25 μ F CERAMIC TRIMMER NP0		R45	150 Ω 1/2 W. 10%				
C53	5-25 μ F CERAMIC TRIMMER NP0		R46	150 Ω 1/2 W. 10%				
C54	5-25 μ F CERAMIC TRIMMER NP0		R47	1000 Ω POTENTIOMETER (CARRIER BALANCE)	052-071			
C55	5-25 μ F CERAMIC TRIMMER NP0		R48	47 Ω 1/2 W. 10%				
C56	5-25 μ F CERAMIC TRIMMER NP0		R49	1000 Ω 1/2 W. 10%				
C57	5-25 μ F CERAMIC TRIMMER NP0		R50	10K Ω 1/2 W. 10%				
C58	5-25 μ F CERAMIC TRIMMER NP0		R51	10K Ω 1/2 W. 10%				
C59	5-25 μ F CERAMIC TRIMMER NP0		R52	10K Ω 1/2 W. 10%				
C60	5-25 μ F CERAMIC TRIMMER NP0		R53	10K Ω 1/2 W. 10%				
C61	5-25 μ F CERAMIC TRIMMER NP0		R54	1000 Ω 1/2 W. 10%				
C62	5-25 μ F CERAMIC TRIMMER NP0		R55	100K Ω 1 W. 10%				
C63	5-25 μ F CERAMIC TRIMMER NP0		R56	270 Ω 1/2 W. 10%				
C64	5-25 μ F CERAMIC TRIMMER NP0		R57	1000 Ω 1/2 W. 10%				
C65	5-25 μ F CERAMIC TRIMMER NP0		R58	47K Ω 1/2 W. 10%				
C66	5-25 μ F CERAMIC TRIMMER NP0		R59	100K Ω 1 W. 10%				
C67	5-25 μ F CERAMIC TRIMMER NP0		R60	47K Ω 1 W. 10%				
C68	5-25 μ F CERAMIC TRIMMER NP0		R61	47K Ω 1 W. 10%				
C69	5-25 μ F CERAMIC TRIMMER NP0		R62	220K Ω 1/2 W. 10%				
C70	5-25 μ F CERAMIC TRIMMER NP0		R63	2200 Ω 1/2 W. 10%				
C71	5-25 μ F CERAMIC TRIMMER NP0		R64	4700 Ω 1/2 W. 10%				
C72	5-25 μ F CERAMIC TRIMMER NP0		R65	47K Ω 1/2 W. 10%				
C73	5-25 μ F CERAMIC TRIMMER NP0		R66	1000 Ω 1/2 W. 10%				
C74	5-25 μ F CERAMIC TRIMMER NP0		R67	22K Ω 1/2 W. 10%				
C75	5-25 μ F CERAMIC TRIMMER NP0		R68	10 Ω 1/2 W. 10%				
C76	5-25 μ F CERAMIC TRIMMER NP0		R69	700K Ω 1/2 W. 10%				
C77	5-25 μ F CERAMIC TRIMMER NP0		R70	39K Ω 2 W. 10%				
C78	5-25 μ F CERAMIC TRIMMER NP0		R71	15K Ω 2 W. 10%				
C79	5-25 μ F CERAMIC TRIMMER NP0		R72	10K Ω POTENTIOMETER (CLLIS. LEVEL)	052-010			
C80	5-25 μ F CERAMIC TRIMMER NP0		R73	3300 Ω 1/2 W. 10%				
C81	5-25 μ F CERAMIC TRIMMER NP0		R74	100K Ω 1/2 W. 10%				
C82	5-25 μ F CERAMIC TRIMMER NP0		R75	250K Ω POTENTIOMETER (FINAL BIAS)	052-010			
C83	5-25 μ F CERAMIC TRIMMER NP0		R76	100 Ω 1 W. 10%				
C84	5-25 μ F CERAMIC TRIMMER NP0		R77	10K Ω 1/2 W. 10%				
C85	5-25 μ F CERAMIC TRIMMER NP0		R78	10K Ω 1/2 W. 10%				
C86	5-25 μ F CERAMIC TRIMMER NP0		R79	10K Ω 2 W. 10%				
C87	5-25 μ F CERAMIC TRIMMER NP0		R80	10 Ω 1 W. 10%				
C88	5-25 μ F CERAMIC TRIMMER NP0		R81	47 Ω 2 W. 10%				
C89	5-25 μ F CERAMIC TRIMMER NP0		R82	6800 Ω 1/2 W. 10%				
C90	5-25 μ F CERAMIC TRIMMER NP0		R83	3900 Ω 1/2 W. 10%				
C91	5-25 μ F CERAMIC TRIMMER NP0		R84	1000 Ω 1/2 W. 10%				
C92	5-25 μ F CERAMIC TRIMMER NP0		R85	1000 Ω 1/2 W. 10%				
C93	5-25 μ F CERAMIC TRIMMER NP0		R86	100K Ω POTENTIOMETER (METER LEVEL)	052-017			
C94	5-25 μ F CERAMIC TRIMMER NP0		R87	470 Ω 2 W. 10%				
C95	5-25 μ F CERAMIC TRIMMER NP0		R88	100 Ω 1 W. 10%				
C96	5-25 μ F CERAMIC TRIMMER NP0		R89	470K Ω 1/2 W. 10%				
C97	5-25 μ F CERAMIC TRIMMER NP0		R90	1000 Ω 1/2 W. 10%				
C98	5-25 μ F CERAMIC TRIMMER NP0		R91	1000 Ω 1/2 W. 10%				
C99	5-25 μ F CERAMIC TRIMMER NP0		T1	DRIVER TRANSFORMER	273-004			
C100	5-25 μ F CERAMIC TRIMMER NP0		T2	MODULATION TRANSFORMER	273-011			
C101	5-25 μ F CERAMIC TRIMMER NP0		T3	MODULATION TRANSFORMER	273-010			
C102	5-25 μ F CERAMIC TRIMMER NP0		T4	POWER TRANSFORMER	271-000			
C103	5-25 μ F CERAMIC TRIMMER NP0							
C104	5-25 μ F CERAMIC TRIMMER NP0							
C105	5-25 μ F CERAMIC TRIMMER NP0							
C106	5-25 μ F CERAMIC TRIMMER NP0							
C107	5-25 μ F CERAMIC TRIMMER NP0							
C108	5-25 μ F CERAMIC TRIMMER NP0							
C109	5-25 μ F CERAMIC TRIMMER NP0							
C110	5-25 μ F CERAMIC TRIMMER NP0							
C111	5-25 μ F CERAMIC TRIMMER NP0							
C112	5-25 μ F CERAMIC TRIMMER NP0							
C113	5-25 μ F CERAMIC TRIMMER NP0							
C114	5-25 μ F CERAMIC TRIMMER NP0							
C115	5-25 μ F CERAMIC TRIMMER NP0							
C116	5-25 μ F CERAMIC TRIMMER NP0							
C117	5-25 μ F CERAMIC TRIMMER NP0							
C118	5-25 μ F CERAMIC TRIMMER NP0							
C119	5-25 μ F CERAMIC TRIMMER NP0							
C120	5-25 μ F CERAMIC TRIMMER NP0							
C121	5-25 μ F CERAMIC TRIMMER NP0							
C122	5-25 μ F CERAMIC TRIMMER NP0							
C123	5-25 μ F CERAMIC TRIMMER NP0							
C124	5-25 μ F CERAMIC TRIMMER NP0							
C125	5-25 μ F CERAMIC TRIMMER NP0							
C126	5-25 μ F CERAMIC TRIMMER NP0							
C127	5-25 μ F CERAMIC TRIMMER NP0							
C128	5-25 μ F CERAMIC TRIMMER NP0							
C129	5-25 μ F CERAMIC TRIMMER NP0							
C130	5-25 μ F CERAMIC TRIMMER NP0							
C131	5-25 μ F CERAMIC TRIMMER NP0							
C132	5-25 μ F CERAMIC TRIMMER NP0							
C133	5-25 μ F CERAMIC TRIMMER NP0							
C134	5-25 μ F CERAMIC TRIMMER NP0							
C135	5-25 μ F CERAMIC TRIMMER NP0							
C136	5-25 μ F CERAMIC TRIMMER NP0							
C137	5-25 μ F CERAMIC TRIMMER NP0							
C138	5-25 μ F CERAMIC TRIMMER NP0							
C139	5-25 μ F CERAMIC TRIMMER NP0							
C140	5-25 μ F CERAMIC TRIMMER NP0							
C141	5-25 μ F CERAMIC TRIMMER NP0							

NOTES:

1. RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED.
2. CAPACITORS ARE IN μMFD UNLESS OTHERWISE SPECIFIED.
3. BAND SWITCH SHOWN IN FULL CLOCKWISE POSITION FROM PANEL.
4. SWITCH S4A IS VIEWED FROM KNOB END OF SHAFT.
5. OTHER BAND SWITCH SECTIONS VIEWED FROM REAR OF GEAR DRIVEN SHAFT.

6. SWITCH DESIGNATIONS:

- FS - FUNCTION SWITCH
- ES - EMISSION SWITCH
- BS - BAND SWITCH
- SS - SIDEBAND CORRECTING SWITCH

