COLLINS

instruction book

Collins Radio Company

51S-1/1A/1F/1AF/1B Receiver

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(F) Cause of trouble if known
(G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
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(C) Item or symbol number obtained from parts list or schematic
(D) Collins type number, name and serial number of principal equipment
(E) Unit subassembly number (where applicable)

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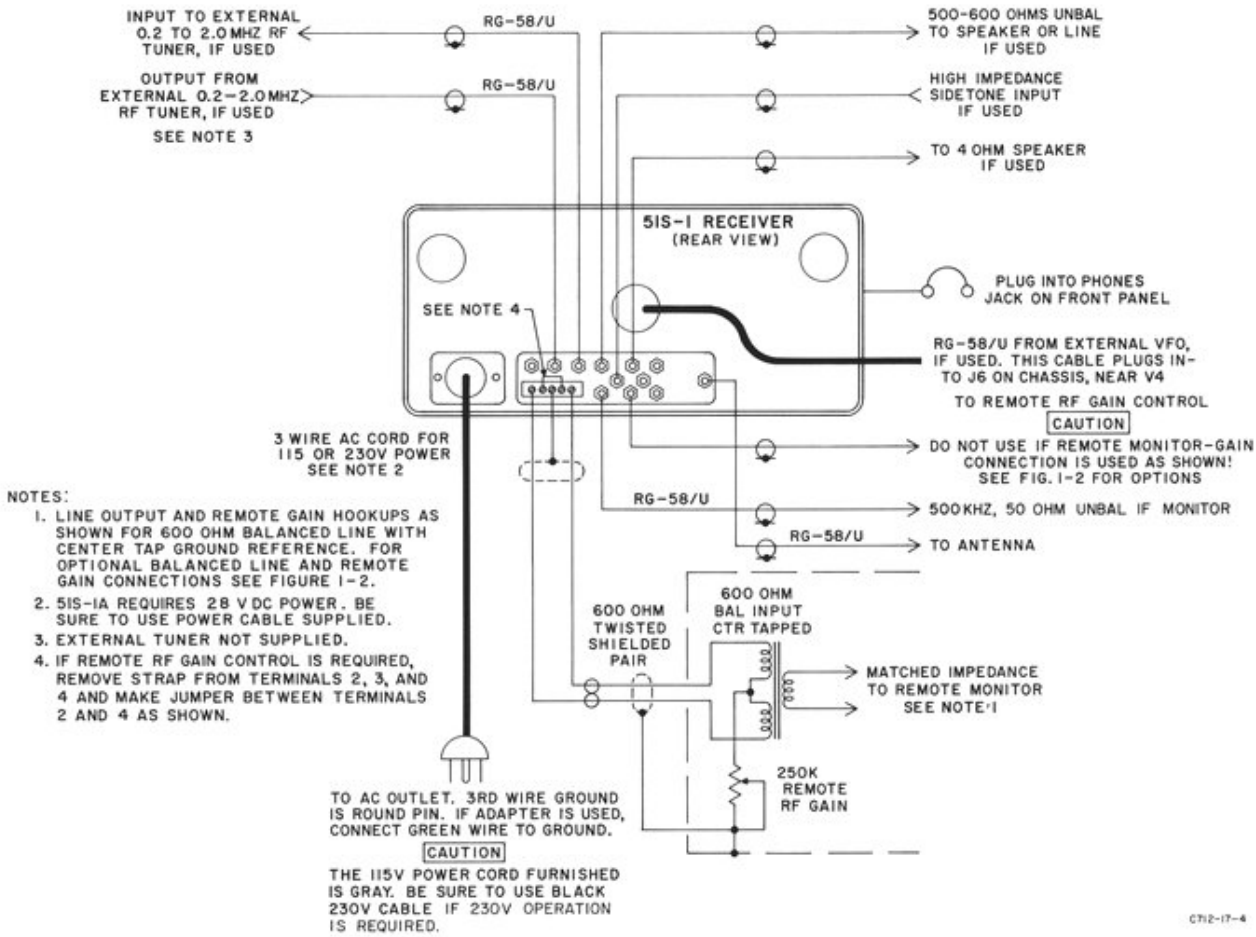


Figure 1-1. External Connections to 51S-1/1A/1F/1AF

section 1
installation

1.1 UNPACKING

Carefully lift the 51S-1 out of the packing material. Examine the unit for visible damage. If the receiver has been damaged in shipment, save the carton and packing material, and notify the transportation company. Look for the warranty card inside the unit. Check that tubes and crystals are seated properly in their sockets. Check all controls and switches for freedom of action. A cloth bag, tied inside the receiver, contains small hardware, tools, and spare items. See tables 1-1 and 1-2.

1.2 MOUNTING AND CABLING FOR 51S-1/1A/1F/1AF

Connect 51S-1/1A/1F/1AF Receiver as shown in figures 1-1 and 1-2. Figures 1-3 and 1-4 show outline and mounting dimensions for 51S-1/1A and 51S-1/1A with 351E-4 Mount. Figure 1-5 shows outline and mounting dimensions for 51S-1F/1AF.

1.2.1 Power Cable

The power cable kits available for the 51S-1/1F are listed in table 1-2. For 115-volt operation, connect the gray ac power cable to the 51S-1/1F. Make sure that the key slot of the 9-pin cable connector is aligned with the key of the chassis connector. Plug the power cable into a 115-volt ac outlet. If the outlet is not equipped with a mating receptacle, use the power cable adapter, and ground the green wire of the adapter. For 230-volt operation, use the black ac cord to connect to a 230-volt ac outlet. For the 51S-1A/1AF, a 28-volt dc cord, with mating plug for the chassis connector, is furnished.

Caution

If both the 115-volt and 230-volt cables are on hand, be sure the correct cord is used for the power source. If the 51S-1 is plugged into 230 volts ac with the gray cord, the receiver may be damaged. Use 1.5-ampere fuse for 115-volt operation, and a 0.75 ampere fuse for 230-volt operation.

1.2.2 Audio Outputs

Connect a 4-ohm speaker, equipped with a phono-type plug, to the jack marked 4Ω on the rear of the 51S-1. If the speaker is equipped with a line-to-voice-coil transformer, connect the phono plug to the jack marked 600Ω UNBAL on the rear of the receiver.

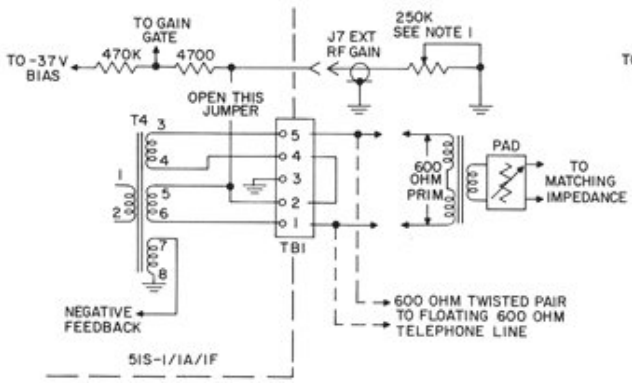
Earphones equipped with PL-55 type connector may be plugged into the jack marked PHONES on the front panel. Plugging in earphones automatically disables the speaker connected to the 4Ω jack. A speaker connected to the 600Ω UNBAL output will not be disabled by plugging earphones into the PHONES jack.

1.2.3 Antenna

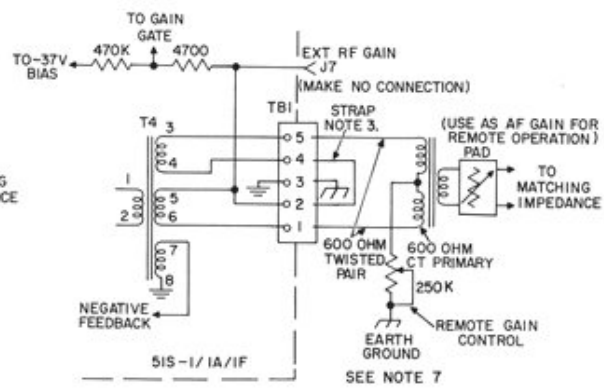
The ANT jack on the rear of the 51S-1 is provided to connect a 52-ohm transmission line to the receiver. The transmission line should be equipped with a phono plug.

1.3 MOUNTING AND CABLING FOR 51S-1B

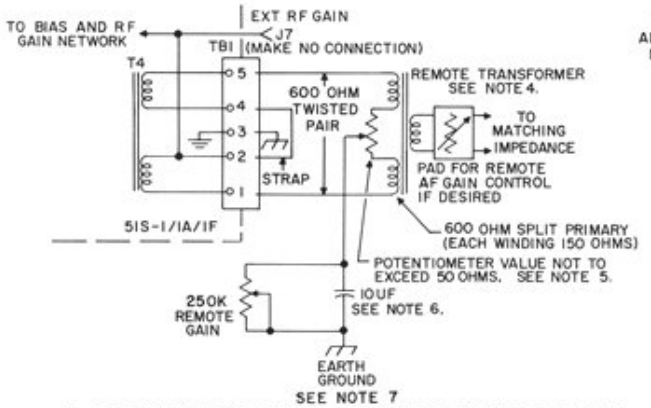
Figure 1-6 shows outline and mounting dimensions for 51S-1B with 350D-5 Base Shockmount. An aluminum mounting plate is fastened to the bottom of the 51S-1B instead of the rubber feet used on other 51S-1 series receivers. The 51S-1B mounts on the shockmount so that the rear flange of the mounting plate fits into a channel in the rear of the shockmount. Thumbnut operated clamps engage tabs on the front of the mounting plate to secure the receiver on the shockmount.



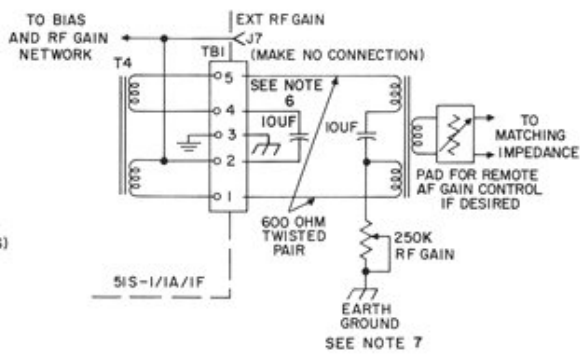
A. 600 OHM FLOATING BAL LINE CONNECTION.



B. 600 OHM BAL CONNECTION WITH CT GROUND REFERENCE AND REMOTE GAIN CONTROL.



C. 600 OHM BAL LINE CONNECTIONS WITH PROVISIONS FOR BALANCE ADJUST AT REMOTE POINT



D. 600 OHM BAL 2-WIRE CONNECTIONS WITH REMOTE RF GAIN

NOTES:

1. KEEP THE REMOTE GAIN CONTROL CONNECTED TO J7 OR FULL BIAS WILL BLOCK THE 5IS-1/1A/1F. J7 MUST BE SHORTED TO GROUND IF REMOTE GAIN IS NOT USED.
2. REMOTE GAIN CONTROL, TRANSFORMER, AND SPEAKER OR PHONES MAY BE MOUNTED ON COMMON PANEL OR BOX.
3. WHEN TBI GROUND STRAP IS LIFTED FROM TBI-3, J7 MUST BE RETURNED TO GROUND THRU TRANSFORMER WINDINGS AND EXTERNAL RF GAIN CONTROL. IF J7 GROUND RETURN IS LEFT OPEN, FULL BIAS WILL BLOCK THE RECEIVER.
4. REMOTE TRANSFORMER (AT DISTANCE UP TO SEVERAL MILES) TO MATCH MONITOR OR LINE.
5. ADJUST 50 OHM POT TO BALANCE OUT NOISE OR HUM. IF REMOTE GAIN CONTROL IS NOT REQUIRED, GROUND SLIDER TO EARTH.
6. 10UF CAPACITORS NONPOLARIZED.
7. IF EARTH GROUND IS NOT SATISFACTORY, USE SHIELDED TWISTED PAIR AND MAKE GROUND CONNECTION TO BOTH ENDS OF SHIELD.

C712-20-5

Figure 1-2. 600-Ohm Line and Remote RF Gain Control Options for 5IS-1/1A/1F/1AF

Figure 1-7 shows the junction box on the rear of the 51S-1B. The junction box provides military-type connectors for power, control, audio, and antenna. Figure 7-4 is a schematic diagram of the junction box.

1.4 SUPPLEMENTARY INSTALLATION DATA FOR 51S-1/1A/1F/1AF

1.4.1 If. Output

The 51S-1 Receiver is equipped with an IF OUT jack located on the rear of the chassis apron. Intermediate-frequency output from this jack is available for operation of an RTTY converter, oscilloscope, or other device requiring a 500-kHz if. input signal. The IF OUT jack mates with a phono plug.

1.4.2 External RF Gain

The EXT RF GAIN jack on the rear of the receiver provides means of connecting a remote gain control to the 51S-1. A cable connecting the receiver EXT RF GAIN jack with the remote location should be terminated with a 250K potentiometer connected as shown in figures 1-1 and 1-2. The minimum resistance position of the potentiometer will result in maximum receiver gain. When receiver gain is to be controlled in this manner, the RF GAIN on the front panel of the receiver should be left set at maximum (fully clockwise), and one of the options of figure 1-2 must be used. As shipped, J7 is jumpered to ground through T4 secondary. The strap on terminals 2, 3, and 4 of the rear apron terminal board must be removed when external rf gain is used and new jumpers made of wire for the options shown. Jack J7 must not be left open or ungrounded or the receiver will be muted.

1.4.3 Mute

The MUTE jack on the rear of the 51S-1 chassis provides connections for external standby-receive switching. The external switch may be contacts of a transmit-receive relay. For proper muting of the 51S-1, the contacts of a transmit-receive relay should be in closed position during receiving and open position during transmitting. When muting is being used, the OFF-STBY-ON-CAL switch on the front panel of the 51S-1 must be in the STBY position.

1.4.4 Sidetone

The 51S-1 is equipped with a SIDETONE input jack on the rear of the chassis. Audio-frequency monitoring signals may be injected into this jack for all EMISSION switch settings except AM. The jack mates with a phono plug.

1.4.5 Line Output

The 600Ω terminals of the terminal block on the rear of the 51S-1 provide a 600-ohm balanced output to match a telephone line or a remote monitoring arrangement. Refer to figures 1-1 and 1-2. Figure 1-2 shows various options for these connections.

1.4.6 External VFO Connection

An external vfo jack, J6, labeled EXT VFO, is located on the chassis near the vfo subassembly. This jack is a switching type which opens its contacts when a plug is inserted. With no plug in J6, the vfo signal is connected to the last mixer, but when an external signal is plugged in, the internal vfo signal is disconnected and the external signal is substituted. This allows plugging in an external stabilized master oscillator for improved stability, precise calibration, or fixed-channel selection purposes.

Note

When an external signal source is used, such as stabilized master oscillator or crystal-controlled oscillator, the injection frequency must be between 3.5 and 2.5 MHz. In addition, the 51S-1 must be tuned to the desired channel frequency after each change in injection frequency. Disconnect the vfo B+ line to prevent creation of a spurious response and shunt the output of the external signal source with a 220-mh rf choke to provide a low-resistance dc path for the cathode current of mixer V4A.

Jack J6 mates with a miniature phone plug, such as Electrocraft CR (manufacturer's catalog no.

200-2) or Switchcraft Inc., TA (manufacturer's catalog no. XA-7956); military-type plugs are MIL-F-3115 and MIL-F-642, respectively; Collins part numbers are 361-0051-00 and 361-0119-00, respectively.

1.4.7 Rejection Tuning

The Q-multiplier may become slightly detuned during shipping. Refer to paragraph 4.4.13 for alignment procedure.

1.5 SUPPLEMENTARY INSTALLATION DATA FOR 51S-1B

1.5.1 If. Output

The 51S-1B Receiver is equipped with an IF OUT jack located on the rear of the chassis apron. Intermediate-frequency output from this jack is available for operation of an RTTY converter, oscilloscope, or other device requiring a 500-kHz if. input signal. The IF OUT jack mates with a phono plug.

1.5.2 External RF Gain Control Line

The external rf gain control line on the 51S-1B is not connected to terminal 2 on TB1 as it is on other 51S-1 series receivers. A 100-ohm resistor terminates the external rf gain control line at J7.

1.5.3 Mute

Connector J101 on the 51S-1B junction box provides connections for external standby-receive switching as shown in figure 7-4. The external switch may be contacts of a transmit-receive relay. For proper muting of the 51S-1B, the contacts of the transmit-receive relay should be in closed position during receiving and open position during transmitting. When muting is used, the OFF-STBY-ON-CAL switch on the front panel of the 51S-1B must be in the STBY position.

1.5.4 Sidetone

The 51S-1B is equipped with a SIDETONE input jack on the rear of the chassis. Audio-frequency monitoring signals may be injected into this jack for all EMISSION switch settings except AM. The jack mates with a phono plug.

1.5.5 Line Output

Connector J101 on the 51S-1B junction box provides connections for a 150-ohm interphone line as shown in figure 7-4.

1.5.6 External VFO Connection

Provisions for connection of an external frequency standard to the 51S-1B are the same as those described in paragraph 1.4.6 for other 51S-1 series receivers.

1.5.7 Rejection Tuning

The Q-multiplier may become slightly detuned during shipping. Refer to paragraph 4.4.13 for alignment procedure.

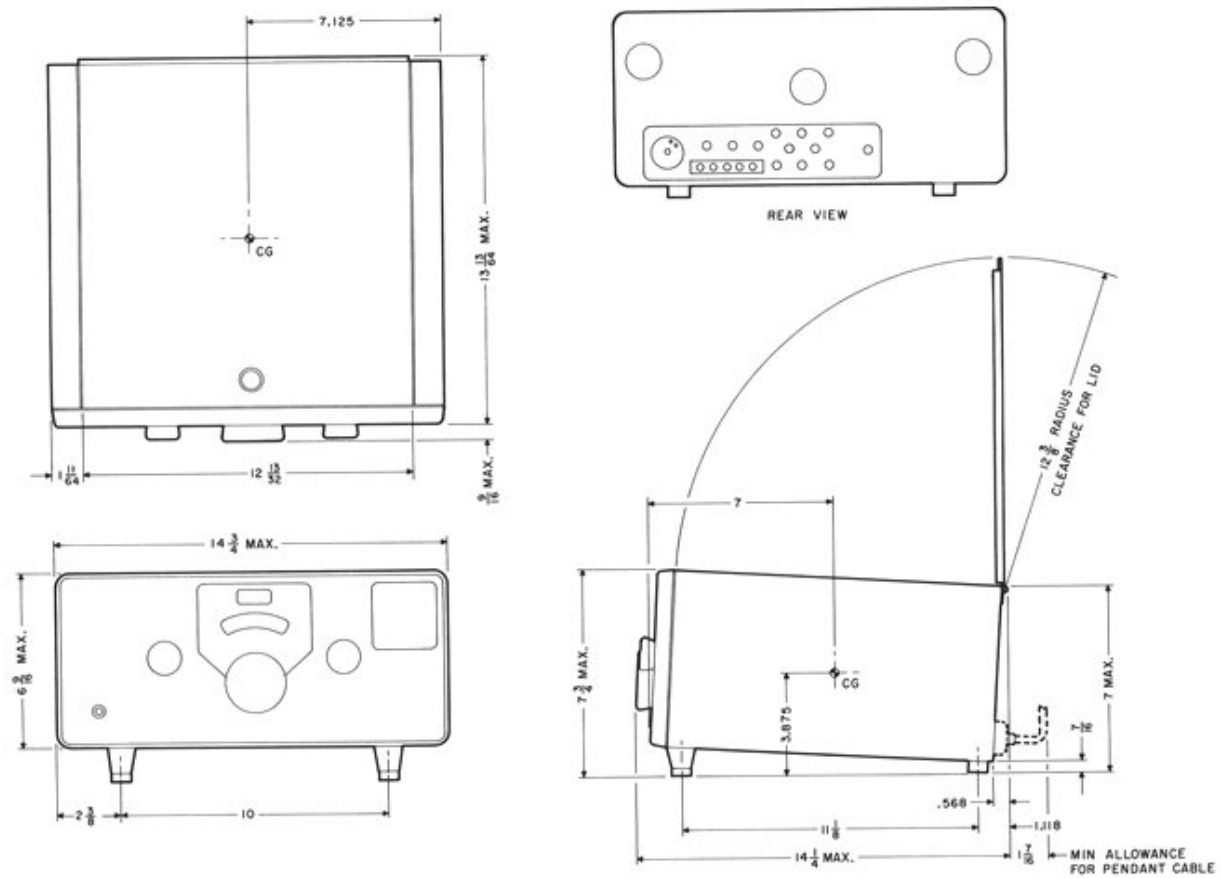
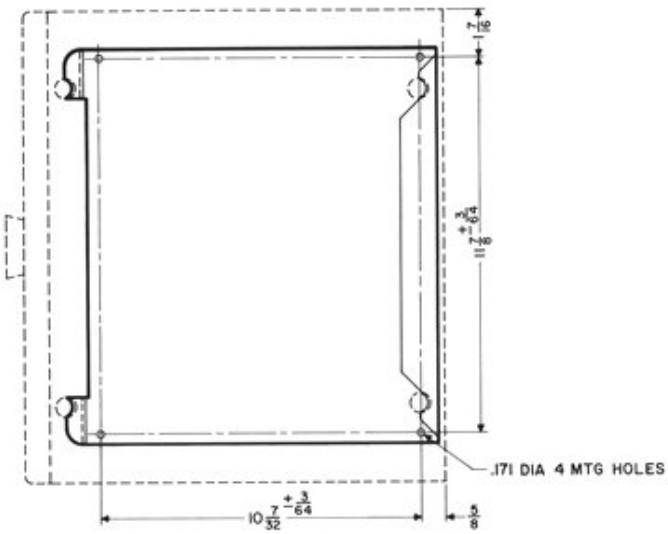
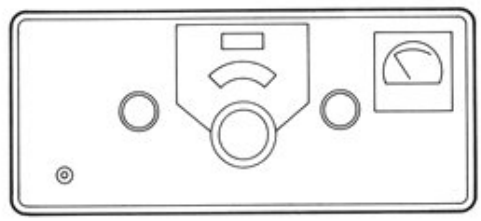


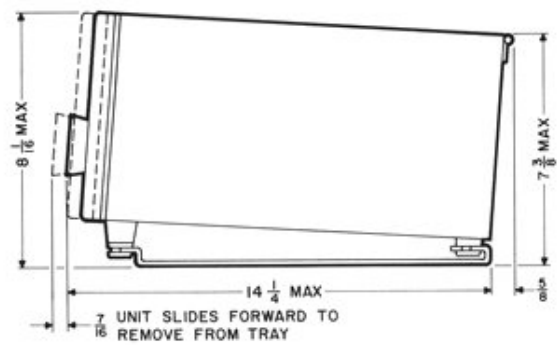
Figure 1-3. 51S-1/1A Receiver, Outline and Mounting Dimensions



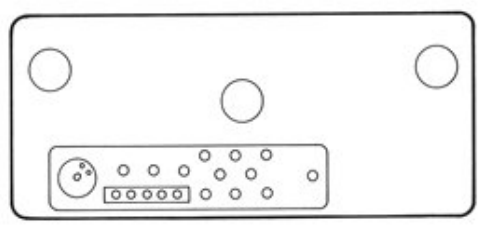
VIEW OF MOUNTING TRAY



FRONT VIEW



SIDE VIEW MOUNTED



REAR VIEW

Figure 1-4. 51S-1/1A Receiver, Outline and Mounting Dimensions with 351E-4 Mount

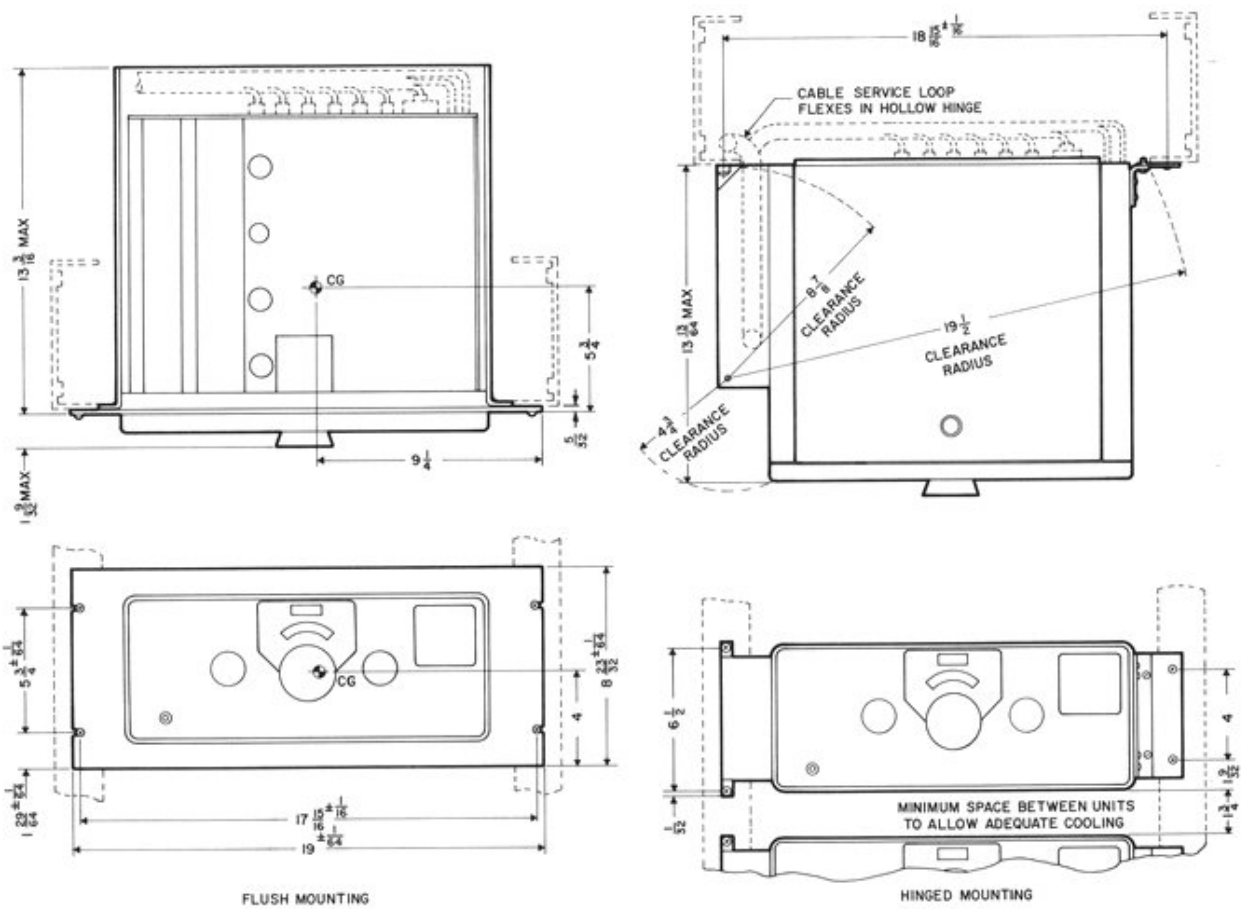
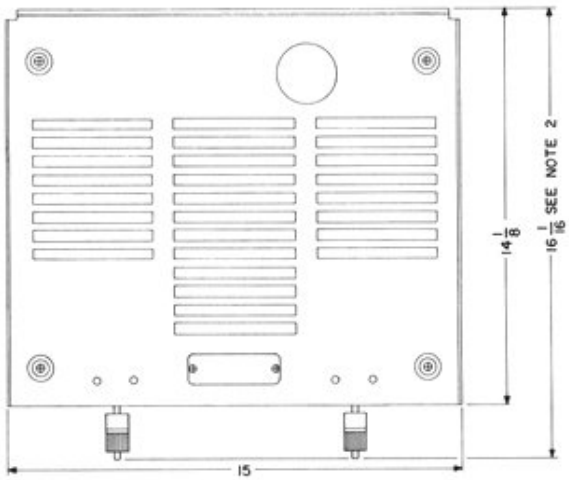
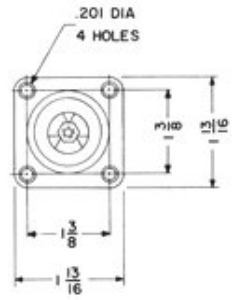


Figure 1-5. 51S-1F/1AF Rack Mount and 51S-1/1A Hinged Mount, Outline and Mounting Dimensions



SHOCKMOUNT FEET DIMENSIONS



NOTES:
1. MAXIMUM SWAY FOR SHOCKMOUNT TRAY, LOADED, IS 3/8 IN.
2. THIS DIM. APPLIES ONLY WHEN ADAPTER PLATE IS MOUNTED ON SHOCKMOUNT TRAY.
3. UNIT WT ACT. 1.7 LB.

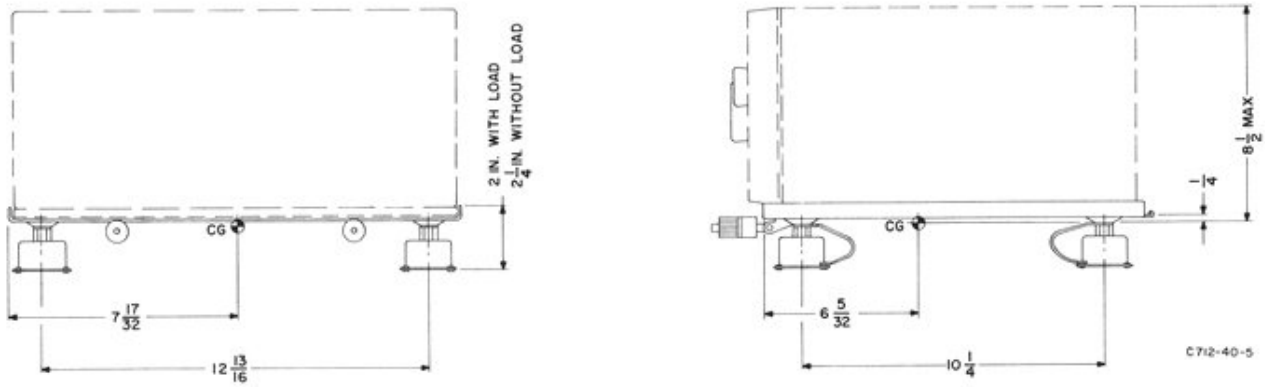


Figure 1-6. 51S-1B Receiver, Outline and Mounting Dimensions with 350D-5 Base Shockmount

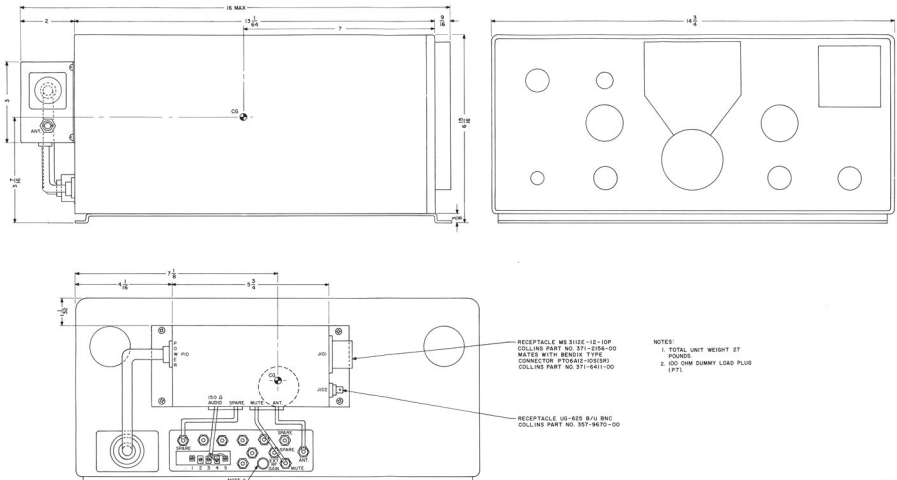


Figure 1-7. 51S-1B Receiver, Installation Details

Table 1-1. Items Supplied with Receiver

QUANTITY	WITH MODEL	ITEM DESCRIPTION	COLLINS PART NUMBER
1	*51S-1/1F/1B	Power cable kits, 115/230 volts ac	See table 1-2
1	51S-1A/1AF	Power cable, 28 volts dc	548-8245-00
1	51S-1A/1AF	Fuse, 6 amperes	264-4100-00
1	51S-1/1A/1F/1AF/1B	Bristol wrench #4	024-2900-00
1	51S-1/1A/1F/1AF/1B	Bristol wrench #6	024-9730-00
1	51S-1/1A/1F/1AF/1B	Bristol wrench #8	024-0019-00
6	51S-1/1A/1F/1AF/1B	Phono plugs	361-0062-00
1	51S-1/1A/1F/1AF/1B	6-volt pilot lamp bulb #47	262-3240-00
1	51S-1/1A/1F/1AF/1B	6-volt pilot lamp bulb #44	262-3220-00
4	51S-1F/1AF	12 24 x 5/8-inch screws	348-0008-00
4	51S-1F/1AF	10 32 x 1/2-inch screws	319-0165-00
4	51S-1F/1AF	Finishing washers	310-0092-00
4	51S-1F/1AF	Finishing washers	310-0086-00
1	51S-1/1A/1F/1AF/1B	Alignment tool	547-2792-002

*115-volt ac power cable kit, CPN 554-7055-00, is supplied with 51S-1B.

Table 1-2. Power Cable Kits Available for 51S-1/1F

QUANTITY	DESCRIPTION	COLLINS PART NUMBER
	115-VOLT AC POWER CABLE KIT	554-7055-00
1	Power cable	547-2795-00
1	Adapter plug	368-0138-00
2	Fuse, 1.5 amperes	264-0007-00
	230-VOLT AC POWER CABLE KIT	554-7056-00
1	Power cable	547-2674-00
3	Fuse 0.75 ampere	264-4270-00

section 2
operation

2.1 GENERAL

Make sure that the 51S-1 is connected to the proper power source. (See installation section.) Check to see that the antenna and speaker (or earphones) are connected to the proper jacks of the 51S-1.

2.2 FREQUENCY READING

Frequency is read on the 51S-1 by adding the indications of the megahertz counter, tenth megahertz counter, and kilohertz dial. See figure 2-1. The frequency indicated is 5.295 megahertz.

2.3 SINGLE-SIDEBAND RECEPTION

a. Turn the OFF-STBY-ON CAL switch to the ON position.

b. Turn the MEGACYCLES control to obtain an indication on the megahertz counter corresponding to the desired band.

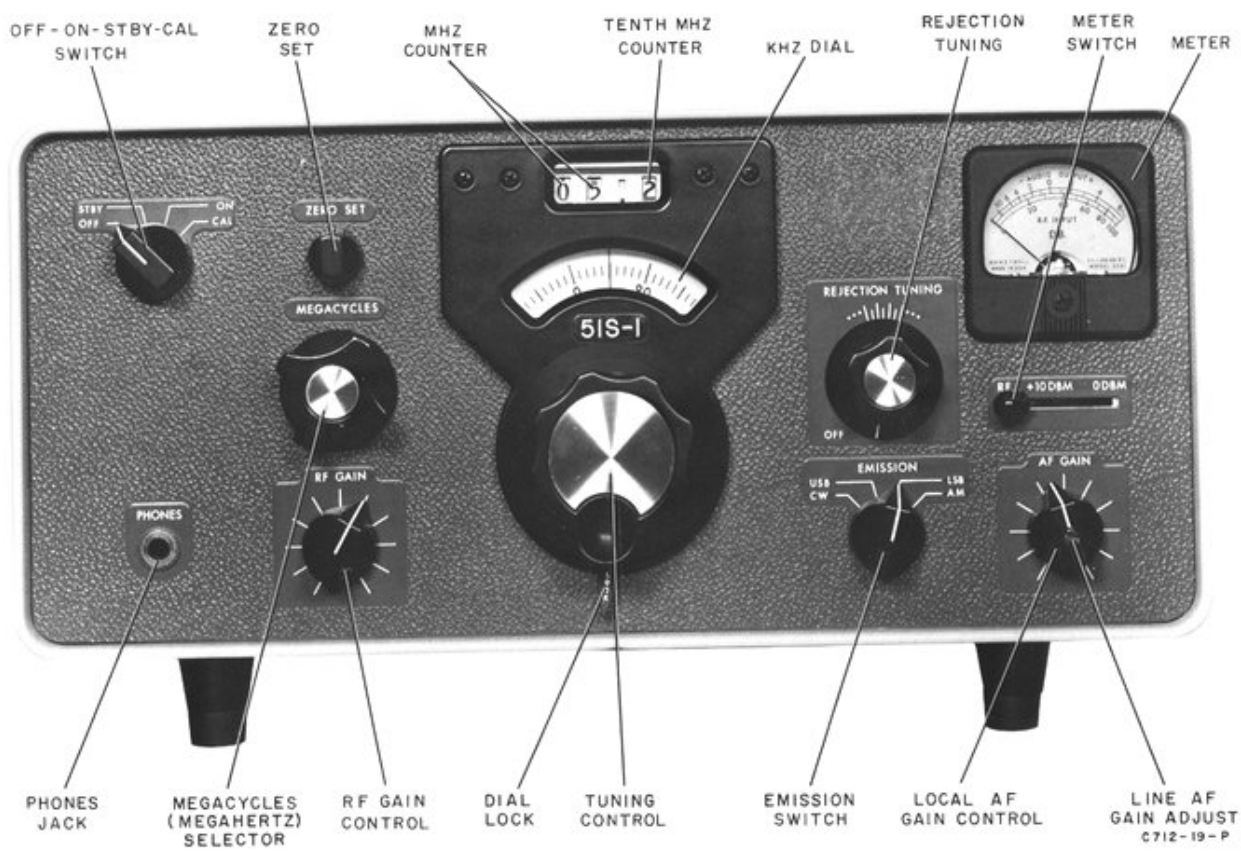


Figure 2-1. Operating Controls

c. Turn the RF GAIN control fully clockwise.

d. Move the EMISSION switch to USB for upper sideband reception or to LSB for lower sideband reception.

e. Set the AF GAIN control for a comfortable listening level.

f. Turn the tuning knob to obtain the most natural-sounding audio output.

g. Adjust the RF GAIN control to the position that yields the best reception to background noise ratio.

h. Readjust the local AF GAIN control if necessary.

An interfering heterodyne may be tuned out by adjusting the REJECTION TUNING control for minimum interference.

Relative rf input levels (signal strengths) may be observed by moving the RF - +10 DBM - 0 DBM selector to RF position. To adjust the LINE AF GAIN, set the meter switch to the 0 or 10 DBM position and set the LINE AF GAIN adjust to the desired level. The LINE AF GAIN adjust is a screwdriver adjustment located in the center of the local AF GAIN control knob (see figure 2-1).

2.4 CW RECEPTION

a. Move the OFF-STBY-ON-CAL switch to ON position.

b. Turn the MEGACYCLES control to obtain an indication on the megahertz counter corresponding to the desired band.

c. Turn the RF GAIN control to fully clockwise.

d. Move the EMISSION switch to USB position. If interference is present, move the EMISSION switch to CW for greater selectivity.

e. Tune in the signal by turning the tuning knob. If the EMISSION switch is in the CW position, tune for a definite peak in signal strength.

f. Turn the AF GAIN control to approximately 12 o'clock position, and adjust the RF GAIN control for a comfortable listening level.

2.5 AM RECEPTION

a. Move the OFF-STBY-ON-CAL switch to ON position.

b. Turn the MEGACYCLES control to obtain an indication on the megahertz counter corresponding to the desired band.

c. Turn the RF GAIN control fully clockwise.

d. Move the EMISSION switch to AM position.

e. Set the local AF GAIN for a comfortable listening level.

f. Turn the tuning knob to obtain the best reception.

g. Adjust the RF GAIN control to obtain the best reception to background noise ratio.

h. Readjust the local AF GAIN control if necessary. Adjust line AF GAIN control to obtain desired line level.

An interfering heterodyne may be tuned out by adjusting the REJECTION TUNING control for minimum interference.

Note

During AM reception (EMISSION switch in AM position) with an interfering signal present, the resulting heterodyne may be tuned out by either of two settings of the REJECTION TUNING control. However, only one of the settings will allow the desired signal to be detected properly. Select the REJECTION TUNING setting which yields the better intelligibility.

If interference and/or selective fading are present, better reception of AM signals may be obtained by moving the EMISSION switch to USB or LSB position, zero beating the desired

carrier and proceeding as in paragraph 2.3, steps f, g, and h. Move the EMISSION switch to either USB or LSB, whichever results in the better reception.

2.6 CALIBRATION

a. Move the OFF-STBY-ON-CAL switch to CAL position.

b. Move the EMISSION switch to USB or LSB.

c. Turn the tuning knob to obtain an indication of 0 kHz on the kilohertz dial. (The megahertz counter and tenth megahertz counter reading should be close to the desired frequency of operation.)

d. Turn the tuning knob to obtain an indication of zero beat.

e. Using the ZERO SET knob, move the hairline to 0 on the kilohertz dial.

f. Return OFF-STBY-ON-CAL switch to ON position.

2.7 DIAL LOCK

a. To lock the tuning knob at a particular frequency, move the dial lock mechanism, located under the tuning knob, in a counterclockwise direction.

b. To unlock the tuning knob, turn the dial lock mechanism in a clockwise direction.

section 3
principles of operation

3.1 GENERAL

Figure 3-2 is a block diagram of the 51S-1, and figure 7-1 is a schematic diagram of the 51S-1. Figure 7-2 is a schematic diagram of the 51S-1A. Figure 7-3 is a partial schematic of the receiver, showing the complete front-end switching arrangement. The 51S-1 is a dual- or triple-conversion communications receiver which operates in the range of 0.2 to 30 megahertz. The 0.2- to 2.0-MHz portion of the coverage is intended for laboratory applications and broadcast monitoring. In this range, internally generated spurious whistles occur at 333 kHz, 666 kHz, 1000 kHz, 1500 kHz, and 2000 kHz. Triple conversion is used for the 0.2- to 7.0-MHz bands, and double conversion is used for the 7.0- to 30.0-MHz bands. For 7.0- to 30.0-MHz operation, the 14.5- to 15.5-MHz bandpass network and second mixer are bypassed.

The 51S-1 is basically a 2.0- to 30.0-MHz receiver with a built-in low-frequency converter. The tuning mechanism, counter dials, and turret are arranged so the two lowest bands, 0.2 to 1.0 MHz and 1.0 to 2.0 MHz, use the 28.0- to 29.0- and the 29.0- to 30.0-MHz bands of the receiver as a variable if. (conversion) frequency. As the megahertz counter is reduced in setting below 2.0 MHz (lowest band on the turret), a segment switch, S6, connects the low-frequency converter and its bandpass filter between the antenna and the turret input, which is now the 29.0- to 30.0-MHz band. When the megahertz counter setting is reduced below 1.0 MHz, the segment switch, S6, maintains the low-frequency converter connection, but the turret is changed to the 28.0- to 29.0-MHz band. In this manner, the 28 positions of the turret plus two positions of overtravel provide 30 bands, each 1 megahertz wide. The 0.2-MHz limitation of the lowest band is a function of the frequency roll-off in the bandpass filter and mixer considerations.

3.2 CIRCUIT DESCRIPTIONS

3.2.1 RF Amplifier

Signals from the antenna are fed from J1 through S6 contacts to an impedance-matching transformer, L30. The output of L30 is coupled to the first section of the double-tuned input network. Refer to figure 3-1. The double-tuned input circuits are composed of C40, L33, L32, L31, C71, L69, L68, L67, and the components mounted upon turret wafers A1 through A5. All rf section components and turret wafers are shown in figure 7-3. The first section of this network is tuned by C40, C_p, L_p - L_m and L33-L32-L31. For any position of the turret, L33, L32, L31, and C40 are in the circuit, and the band changing is accomplished by connecting the turret-mounted components in shunt. The tuning slug of L32 is coupled mechanically to the tuning control of the receiver, and is varied to accomplish tuning throughout the 1-MHz band. The second section of the network is tuned by C71, C_n, Ln -L_m and L69-L68-L67. The tuning slug of L68 is ganged to the tuning control of the receiver to accomplish tuning in the same manner as that of L32 in the first section of the network. The turret-mounted components are selected by the MEGACYCLES control. This control positions the turret wafers so that the proper set of components is connected into the circuit according to the megahertz information on the counter dial. Coupling between the two sections of the input network is provided by mutual inductance L_m. The output network consists of a single-tuned system using a band-switching and tuning scheme similar to that of the input network.

3.2.2 First Mixer

The first mixer, V2A, is a triode. The rf signal is fed to the grid, and the hf crystal oscillator signal is injected at the cathode.

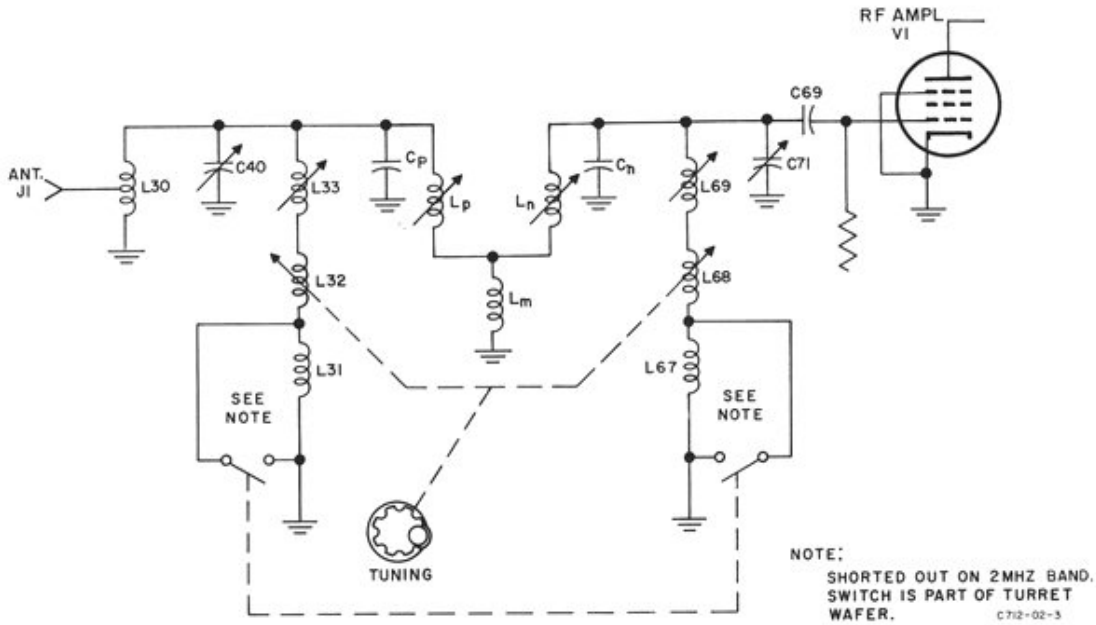


Figure 3-1. RF Input Circuits, Simplified Schematic Diagram

The output network consists of a 14.5- to 15.5-MHz bandpass filter for 2- to 7-MHz operation and a 3- to 2-MHz variable, triple-tuned network for 7- to 30-MHz operation. The slugs of the 3- to 2-MHz variable if. network inductors are coupled mechanically to the tuning control of the receiver and tracked with the slug-tuned inductors in the rf circuits to produce the 1-MHz coverage for each band.

3.2.3 Second Mixer

During 2- to 7-MHz operation, the second mixer, triode V3A, uses a 3- to 2-MHz variable if. for its output network. This is the same output network that is used by the first mixer during 7- to 30-MHz operation. The signal from the first mixer plate is fed through the 14.5- to 15.5-MHz bandpass filter network, T12 and T13, to the grid of the second mixer. The 17.5-MHz oscillator signal is injected into the cathode circuit of this mixer. The second mixer is inoperative during 7- to 30-MHz operation.

3.2.4 Third Mixer

The third mixer, pentode V4A, receives its input signal from the 3- to 2-MHz variable if. network. The input signal from the first or second mixer is fed to the grid of the third mixer and the vfo signal is injected into its cathode. An external vfo signal may be injected through J6 if external frequency control is desired. Such an external injection signal might also be a selected crystal oscillator frequency if precise fixed channel tuning is desired. In such a case, the tuning dial would have to be set to the channel frequency in order to properly resonate all the rf and if. gang-tuned circuits.

The output network of the third mixer is selected with the EMISSION switch on the front panel. In USB and LSB positions, mechanical filters FL2 and FL3, are used. These mechanical filters provide a 2.75-kHz bandwidth for single-sideband reception on upper or lower sideband, respectively. The CW position of the EMISSION switch selects a crystal filter, FL4. The crystal filter provides a 800-Hz bandwidth for reception of CW signals. The AM position of the EMISSION switch selects a network composed of two lightly coupled 500-kHz if. transformers, T14 and T15, which provides a bandwidth of 5-kHz for reception of amplitude-modulated signals.

3.2.5 First IF. Amplifier

The first if. amplifier, pentode V5, receives its input signal from the third mixer through one of the four selective networks described in paragraph 3.2.4. The output signal is coupled to the Q-multiplier through if. transformer T1.

3.2.6 Q-Multiplier

The Q-multiplier, V6, is a twin triode. The first triode section is a cathode follower, the output of which is coupled to the cathode of the second triode section. When REJECTION TUNING is being used, the signal from the plate of the second triode is coupled through a parallel-tuned circuit to the grid of the second if. amplifier. The parallel-tuned circuit consists of L108, C145, and C146 and a small voltage sensitive capacitor. These components, plus R33 and R34, form a bridged-T rejection notch filter. The end of the parallel-tuned circuit, away from the plate of the second triode section, is coupled to the grid of the second triode. This feedback arrangement forms a Q-multiplier. The Q of L108 is 250. The feedback loop has a gain of 10, resulting in an overall Q of 2500 and a rejection notch depth of not less then 40 db. Turning the REJECTION TUNING control fully counterclockwise deactivates the rejection network by forward biasing capacitance diode C315 into conduction.

3.2.7 Second IF. Amplifier

The second if. amplifier, pentode V7, receives its input signal from the Q-multiplier network. The output network of the second if. amplifier is if. transformer T2. The secondary of T2 is coupled to the third if. amplifier, V8, and cathode follower V11A.

3.2.8 Third IF. Amplifier

The third if. amplifier, V8, receives its input signal from the second if. amplifier through transformer T2. The third if. amplifier output is coupled to the product demodulator through if. transformer T3 and to the AM detector through C158.

3.2.9 Product Demodulator

The product demodulator is composed of CR1, CR2, CR3, and CR4 in a diode-ring configuration. Signal from the beat-frequency oscillator, V17, is injected into the product demodulator at the junction of R135 and R136. The audio output is fed to the SSB/CW preamplifier, Q1. The bfo supplies a reinserted carrier to replace the suppressed carrier of the SSB signal. The demodulator functions as a mixer, and its output is a full-wave rectified signal consisting of the if. and bfo signals plus their mixing products. C161, L123, and C310 form a low-pass filter that passes the if. and bfo mixing difference frequency and blocks the rest of the demodulator output. The mixing difference frequency is the desired audio signal.

3.2.10 SSB/CW Preamplifier

The output impedance of the diode demodulator is approximately 600 ohms. Transistor Q1 provides impedance match and gain between the product demodulator and the following audio amplifier grid. The SSB/CW preamplifier is an npn transistor, connected in a common emitter configuration. Audio signals from the product demodulator and sidetone signals from the cathode follower, V11B, are coupled to the base of Q1. The SSB/CW preamplifier output signal is coupled from the collector of Q1 through C165 to switch S2C. During SSB and CW operation, the contacts of S2C connect the audio output signal to first local af amplifier, V14B, and the first line amplifier, V14A.

3.2.11 Audio Amplifiers

The 51S-1 includes two, two-stage, audio-frequency amplifiers. The local amplifier, consisting of V14B and V12, provides audio power to local headphones, speaker, or phone patch. The line amplifier, consisting of V14A and V13, provides power for a 600-ohm remote line.

Note

The line output impedance of 51S-1B is 150 ohms. Figure 7-5 is a partial schematic diagram of the 51S-1B output circuit.

The first local and the first line af amplifiers obtain input signal from either the SSB/CW preamplifier, Q1, or from AM detector CR15. The signal source, Q1 or CR15, is selected by contacts of the EMISSION switch, S2. The first local and first line af amplifiers drive their respective second local and line amplifiers V12 and V13. The line amplifier distortion is reduced by use of negative feedback from output transformer T4 to the cathode of V14A.

3.2.12 Low-Frequency Mixer

For receiving signals in the 0.2- to 2.0-MHz range, the 51S-1 uses a low-frequency mixer, V10A-V16A, and converts the signal to the 28- and 29-MHz bands. The low-frequency input to the mixer is passed through a bandpass filter, and the output of the mixer is tuned by the turret and slug-tuned circuits. External tuners for low-frequency operation may be used. Jacks J14 and J13 on the rear apron are provided for this use. When an external low-frequency tuner is used, the jumper between J14 and J13 must be removed. See figure 7-1.

3.2.13 Oscillators

The calibration oscillator, V16B, is a crystal-controlled oscillator operating at 100 kilohertz. Variable capacitor C227 trims the frequency of the oscillator. The output of the calibration oscillator is coupled to the antenna jack, J1.

The low-frequency crystal oscillator, V10B, uses a 14-MHz crystal. The plate circuit of this oscillator is tuned to the second harmonic of the crystal. The low-frequency crystal oscillator operates only when the 51S-1 is receiving signals in the 0.2- to 2.0-MHz bands. The output of this oscillator is coupled to the low-frequency balanced mixer, V10A and V16A. Capacitor C2 trims the crystal oscillator to frequency.

The high-frequency crystal oscillator, V2B, operates on all bands. Frequency of oscillator operation is determined by one of sixteen crystals mounted on a wafer in the turret (see table 3-1). The proper crystal is selected by positioning the band-switch MEGACYCLES control. Individual turret-mounted piston trimmer capacitors trim each crystal to frequency.

The 17.5-MHz oscillator, V3B, is crystal controlled. This oscillator operates only when the 51S-1 is operating in the 2- to 7-MHz range. The crystal may be trimmed to frequency by variable capacitor C233.

The variable-frequency oscillator is a Collins 70K-7 permeability-tuned oscillator. The frequency of this unit is varied by changing the inductance of L501. This change of inductance is accomplished by turning the 51S-1 tuning knob which is coupled mechanically to the slug of L501. The output of the oscillator tube, V15, is coupled to the cathode of the third mixer through T501.

The beat-frequency oscillator, V17, is a 500-kHz crystal-controlled oscillator which operates only when the EMISSION switch of the 51S-1 is in USB, LSB, or CW position. No beat-frequency oscillator is needed for AM operation. The output of the bfo is coupled to the product demodulator. There is no provision for trimming the bfo frequency.

3.2.14 Special Circuits

Cathode follower V11A receives if. excitation from the second if. amplifier. The output of this cathode follower is fed to agc amplifier V9. The output of the agc amplifier is coupled to the agc rectifier, CR14, and to the if. output jack, J9.

The agc rectifier, CR14, rectifies the if. signal from agc amplifier V9. The dc output from the agc rectifier is used for automatic gain control of the rf and if. amplifiers.

Cathode follower V11B receives sidetone signal from J8 on the rear apron of the 51S-1. The sidetone audio output from this stage is fed to the SSB/CW preamplifier, Q1.

Diode CR16 in the rf amplifier grid return line is used to stabilize the agc circuit and prevent agc pumping.

Diode CR17 suppresses transients occurring on the rf gain control bus during mute on-off switching.

Remote gain gate V4B presents a high-impedance isolation between the remote gain line and the agc circuit. This prevents the low-impedance remote gain circuit and the bias supply from loading the high-impedance agc circuits.

Table 3-1. 51S-1 Crystal Utilization

RECEIVER FREQUENCY RANGE IN MEGAHERTZ	TURRET CRYSTAL		17.5 MHz OSCILLATOR	LF CRYSTAL OSCILLATOR (2 x 14 MHz – 28 MHz)
	FREQUENCY (MHz)	SYMBOL		
0.2 - 1.0	10.333	Y20	Off	On
1.0 - 2.0	16.0	Y12	Off	On
2.0 - 3.0	12.5	Y1	On	Off
3.0 - 4.0	11.5	Y2	On	Off
4.0 - 5.0	10.5	Y3	On	Off
5.0 - 6.0	9.5	Y4	On	Off
6.0 - 7.0	8.5	Y5	On	Off
7.0 - 8.0	10.0	Y6	Off	Off
8.0 - 9.0	11.0	Y7	Off	Off
9.0 - 10.0	12.0	Y8	Off	Off
10.0 - 11.0	13.0	Y9	Off	Off
11.0 - 12.0	14.0	Y10	Off	Off
12.0 - 13.0	15.0	Y11	Off	Off
13.0 - 14.0	16.0	Y12	Off	Off
14.0 - 15.0	8.5	Y5	Off	Off
15.0 - 16.0	9.0	Y13	Off	Off
16.0 - 17.0	9.5	Y4	Off	Off
17.0 - 18.0	10.0	Y6	Off	Off
18.0 - 19.0	10.5	Y3	Off	Off
19.0 - 20.0	11.0	Y7	Off	Off
20.0 - 21.0	11.5	Y2	Off	Off
21.0 - 22.0	12.0	Y8	Off	Off
22.0 - 23.0	12.5	Y1	Off	Off
23.0 - 24.0	13.0	Y9	Off	Off
24.0 - 25.0	13.5	Y18	Off	Off
25.0 - 26.0	14.0	Y10	Off	Off
26.0 - 27.0	14.5	Y19	Off	Off
27.0 - 28.0	15.0	Y11	Off	Off
28.0 - 29.0	10.333	Y20	Off	Off
29.0 - 30.0	16.0	Y12	Off	Off

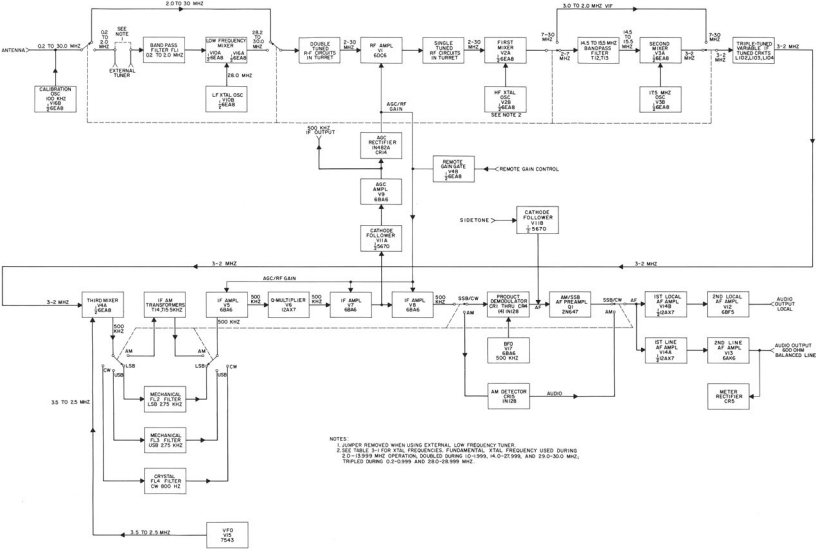


Figure 3-2. Block Diagram

section 4
service instructions

4.1 GENERAL

Included in this section are signal tracing procedures, alignment and adjustment procedures, voltage and resistance measurements, and replacement procedures. If any soldered parts are removed or replaced at terminals to which any diode or transistor is connected, be sure to attach an alligator clip to the diode or transistor lead. This clip acts as a heat sink to protect the diode or transistor.

Internally generated spurious signals may result from improper placement of certain components and rf leads in the vfo, hf oscillator, 17.5-MHz oscillator, and mixer compartments. Maintain proper lead dress and component placement when probing in these compartments.

4.2 RECEIVER SIGNAL TRACING

Table 4-1 lists significant test points and normal signal levels. All rf and if. measurements up to V8-1 are made on USB as follows: A signal generator with calibrated output attenuator is connected at the listed test point. A vacuum-tube voltmeter is connected to the agc bus. Signal generator output is increased until the reading on the vtvm just starts to increase (agc

Table 4-1. Receiver Signal Levels

TEST POINT	TEST POINT FREQUENCY	SIGNAL LEVEL	REFERENCE
J8	1000 Hz	0.22 volt	1-watt af output
V12-1	1000 Hz	6.0 volts	1-watt af output
V14-2	1000 Hz	0.2 volt	1-watt af output
V13-1	1000 Hz	0.45 volt	10 milliwatts in 600 ohms
V14-7	1000 Hz	0.18 volt	10 milliwatts in 600 ohms
	Above measurements with ac vtvm from test point to ground, and audio oscillator connected at test point.		
V8-1	500 kHz	35,000 microvolts	1-watt af output
V7-1	500 kHz	5000 microvolts	Agc threshold
V6-2	500 kHz	15,000 microvolts	Agc threshold
V5-1	500 kHz	450 microvolts	Agc threshold
V4-2	*2.9 MHz	200 microvolts	Agc threshold
V2-9	*6.1 MHz	30 microvolts	Agc threshold
V2-9	**14.1 MHz	100 microvolts	Agc threshold
V3-9	*14.6 MHz	100 microvolts	Agc threshold
	For following measurements, signal generator and 51S-1 must be tuned to same frequency.		
V1-1	14.1 MHz	4.0 microvolts	Agc threshold
V1-1	6.1 MHz	1.5 microvolts	Agc threshold
J1	14.1 MHz	1.5 microvolts	Agc threshold
J1	6.1 MHz	0.5 microvolts	Agc threshold

*Radio tuned to 6.1 MHz
**Radio tuned to 14.1 MHz

threshold). The level indicated on the output attenuator at this point is the signal level listed in the table. The signal generator is tuned to the frequencies listed in TEST POINT FREQUENCY column. Signal voltage at V7-1 and all following are measured with agc threshold as reference level. Local audio signal levels are measured with 1-watt audio output as reference. Line audio signal levels are measured with 10 milliwatts into a 600-ohm balanced line terminated with a 600-ohm balanced load. All values are nominal and may vary ±20 percent.

4.3 VOLTAGE AND RESISTANCE MEASUREMENTS

4.3.1 Vacuum Tube Measurements

Table 4-2 lists voltage and resistance measurements for all tube sockets of the 51S-1 except those of vfo tube V15. Do not open the vfo oscillator can. Ac voltages shown in table 4-2 apply to 51S-1/1F/1B. These are dc voltages for 51S-1A/1AF. Measurements are made under the following conditions:

a. All measurements are made with a vtvm and with all tubes in sockets. All measurements are made with RF GAIN at maximum (fully clockwise) setting. All voltage measurements are made with power applied and OFF-STBY-ON-CAL in ON position except for measurements of calibration oscillator V16B. Voltage measurements of V17, bfo, are made with EMISSION switch in USB, LSB, or CW position.

b. Resistances of less than 0.9 ohm are listed as zero. All resistance measurements are made with power plug P10 removed from J10, and EMISSION switch in USB position.

c. All measurements are made from tube socket pin to ground.

d. All measurements are nominal and may vary ±10%.

Table 4-2. Voltage and Resistance Measurements

TUBE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V1	Dc volt	1.2	0	0	0	145	75	0		
	Ac volt				6.3					
	Ohms	11 megohm	0	0	0	10K	10K	0		
V2	Dc volt	164	-7	158	0	0	158	0	4.3	0
	Ac volt				19.5	12.8			*1.5	
	Ohms	8500	470K	9500	0	0	8500	0	1000	270K
V3	Dc volt [b]	160	-6.2	105	0	0	165	0	4.3	0
	Ac volt				19.5	12.9			*1.5	
	Ohms	8500	100K	60K	0	0	8500	5	1000	35
V4	Dc volt	-1.2	0	165	0	0	165	4.3	-0.32	-1.5
	Ac volt				6.4	12.5		*0.7		
	Ohms	250K	35	8500	0	0	8500	1000	5000	250K
V5	Dc volt	-1.2	0			162	162	5.4		
	Ac volt				6.4					
	Ohms	500K	0	0	0	8500	8500	320		

Table 4-2. Voltage and Resistance Measurements (Cont)

TUBE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V6	Dc volt Ac volt Ohms	167 8500	0 0	0.25 680	0 25.5 0	0 25.5 0	167 8500	0.22 **300K	0.25 680	0 19.5 0
V7	Dc volt Ac volt Ohms	-1.2 390K	0 0	0 0	6.4 0	155 8500	70 18K	0.13 20		
V8	Dc volt Ac volt Ohms	-1.0 900K	0 0	0 19.5 9	0 13 0	162 8500	67 19K	0 0		
V9	Dc volt Ac volt Ohms	0 100K	0 0	25.6 0	19.5 0	140 8500	140 8500	1.6 76		
V10	Dc volt [c] Ac volt Ohms	140 8500	-10 100K	140 8500	13 0	19.5 0	145 8500	5	2.2 *1.4 220	0 0
V11	Dc volt Ac volt Ohms	13 0	3.3 1000	0 5	155 11.2K	0 0	155 11.2K	0 360K	3.1 1000	6.8 0
V12	Dc volt Ac volt Ohms	-12.3 240K	1.6 0	19.5 0	25.8 0	155 8000	146 12K	-12.3 240K		
V13	Dc volt Ac volt Ohms	-8.2 470K	0 0	19.5 0	13 0	153 8500	153 8500	0 0		
V14	Dc volt Ac volt Ohms	106 100K	0 [a]	0.96 2200	6.8 0	6.8 0	85 460K	[a]	7000	0
V15	Dc volt Ac volt Ohms	VFO TUBE -- MAKE NO ATTEMPT TO MEASURE -- THIS WOULD REQUIRE OPENING VFO CAN								
V16	Dc volt Ac volt Ohms	135 8500	-72 1 megohm	72 100K	6.8 0	13.2 0	118 115K	0 0	2.5 270	0 *1.4 0
V17	Dc volt Ac volt Ohms	-2.5 1 megohm	0 0	13.2 0	6.8 0	150 *4.0 15K	54 100K	0.18 0		

*Oscillator injection voltage measured with vtvm and rf probe. May vary from band to band.
**With Q-multiplier turned off.

[a] Varies with AF GAIN setting.
[b] 2 to 6 MHz only.
[c] 0.2- and 1-MHz bands only.

4.3.2 Transistor Measurements

Make dc voltage measurements for transistor Q1 with a vtvm. Apply primary power to the receiver and set OFF-STBY-ON-CAL switch to ON. Operating voltages for Q1 should be as follows:

a. Emitter to ground, +1.95 volts dc.

b. Base to ground, +2.05 volts dc.

c. Collector to ground, +16.5 volts dc.

All measurements are nominal and may vary by ±10 percent.

4.4 ALIGNMENT

Refer to figures 4-1 and 4-2 for adjustment points. For alignment of T9, T11, T12, T13, T1, T2, T3, T14, T15, T7, use Walsco #2543 or General Cement #8282 alignment tool.

4.4.1 100-kHz Calibrator Adjustment

a. Tune in Radio Station WWV or WWVH on a convenient frequency, 2.5, 5, 10, 15, 20, or 25 MHz.

b. Move the EMISSION switch to AM position.

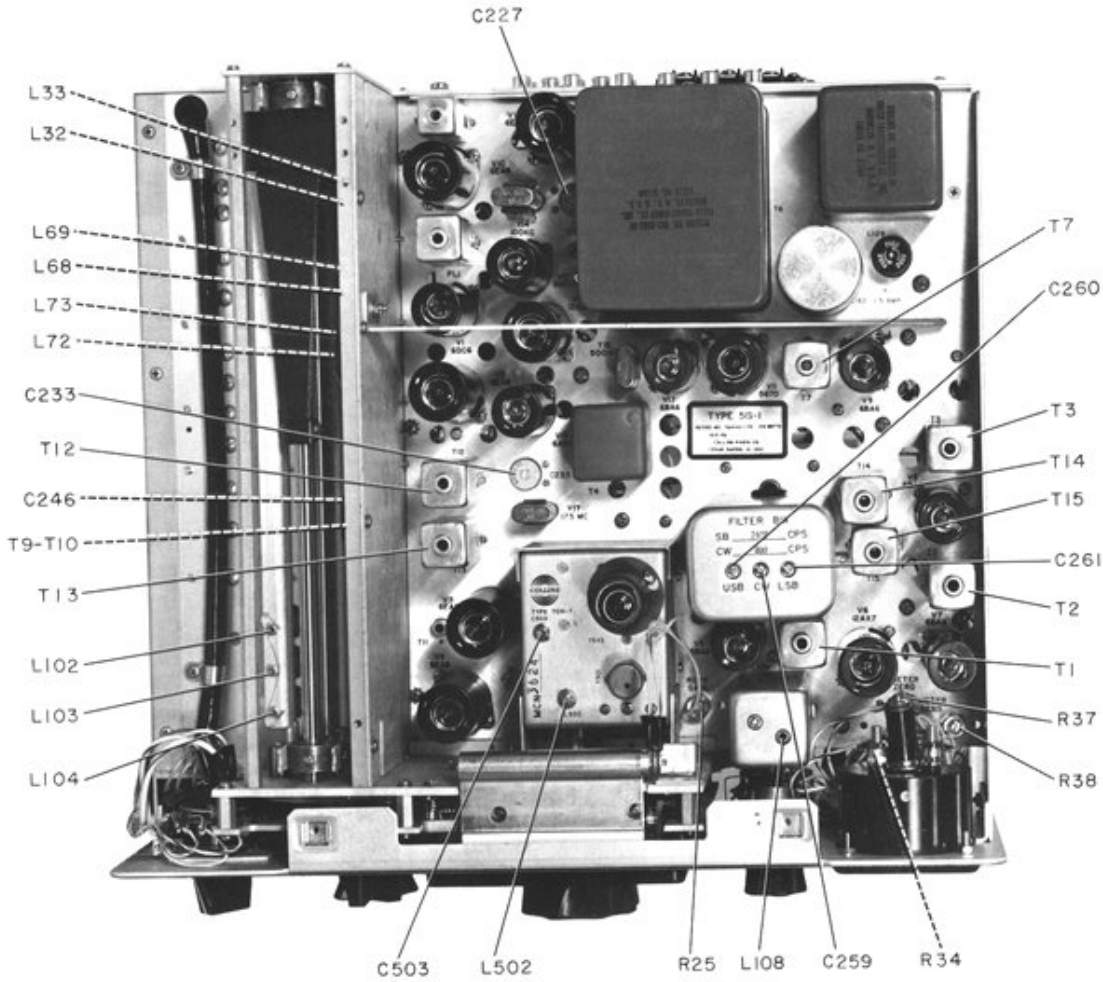


Figure 4-1. Top Chassis, Alignment and Adjustment Locations

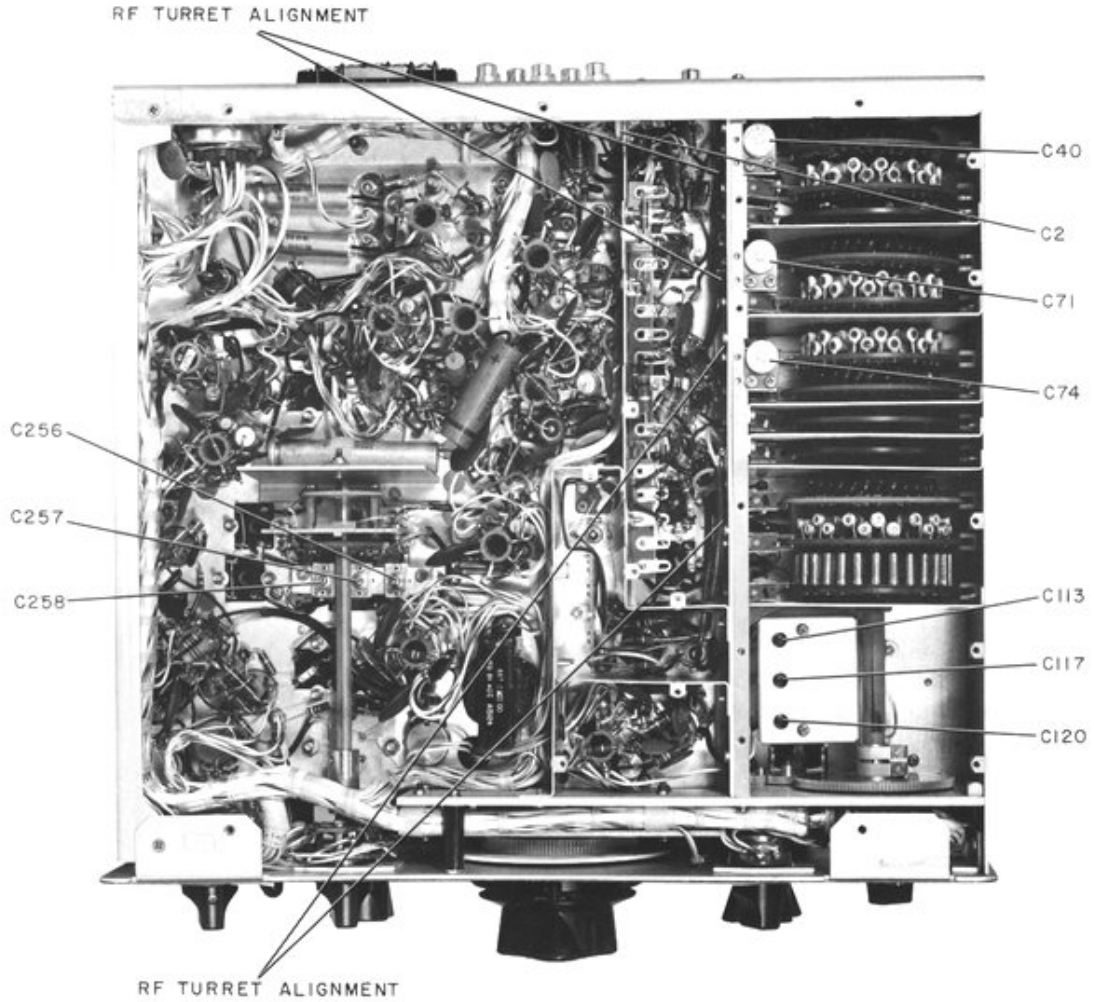


Figure 4-2. Bottom Chassis, Alignment and Adjustment Locations

c. Move the OFF-STBY-ON-CAL switch to CAL position.

d. Adjust C227, CAL ZERO, capacitor near the rear of the chassis to zero beat.

Note

Be careful not to zero beat one of the tone sidebands. Wait for the tone modulation of WWV or WWVH to go off before zeroing the calibrator.

4.4.2 RF Meter Zeroing

a. Set RF GAIN control, located on the front panel, to maximum (fully clockwise).

b. Move the meter switch to RF position.

c. Tune the 51S-1 to a clear, noise-free frequency and adjust R37, METER ZERO, to obtain an indication of 0 on the rf meter.

4.4.3 IF. Alignment

a. Connect a signal generator to the standoff side of R20 (the 33-ohm resistor that connects to pin 2 of V4).

b. Set the 51S-1 EMISSION switch to LSB.

c. Tune the signal generator around 500 kHz to zero beat in the 51S-1. Make sure that the 51S-1 vfo is tuned to a frequency which does not produce spurious signals in the output of the 51S-1.

d. Set the EMISSION SWITCH TO AM. Peak transformers T1, T2, T7, T14, and T15 for maximum indication on the 51S-1 rf meter, adjusting the signal generator output for a consistent 20-db reading (as monitored on the 51S-1 rf meter).

e. Turn on the signal generator modulation, and peak T3 for maximum audio output. Turn off modulation.

f. Place swamping tools, composed of a 0.01-uf capacitor in series with a 1000-ohm resistor, across terminals 1 and 2 of transformers T14 and T15 (see figure 4-3 for terminal identification). Tune the top slugs of T14 and T15 for maximum reading on the 51S-1 rf meter, again varying the signal generator output level for a consistent 20-db reading.

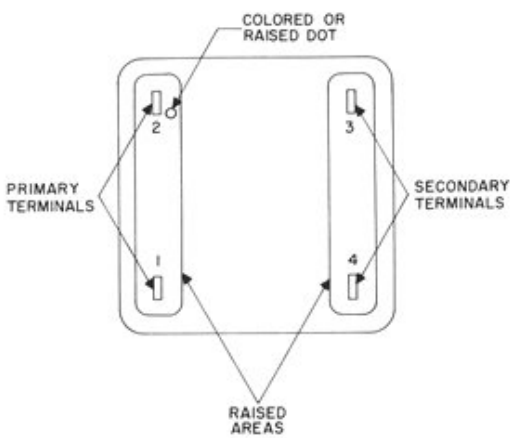


Figure 4-3. RF and IF. Transformer Terminal Identification

g. Move the swamping tools to terminals 3 and 4 of transformers T14 and T15. Tune the bottom slugs of T14 and T15 for maximum reading on the 51S-1 rf meter, again varying the signal generator output level for a consistent 20-db reading. Remove the swamping tools.

h. Set the 51S-1 EMISSION switch to USB and adjust the signal generator frequency to 502.500 kHz. A note of 2500 Hz should be heard at the 51S-1 output.

i. Connect a swamping tool, identical to that used above, across terminals 1 and 2 (primary) of T1.

Note

Keep the signal generator output level below that required for agc threshold during T1 and T2 tune up.

j. Peak the top slug of T1 (secondary) for maximum audio output. Move swamping tool to terminals 1 and 2 (primary) of T2 and repeat tuning procedure. Remove swamping tool.

k. Set 51S-1 EMISSION switch to LSB and adjust the signal generator frequency to 497.500 kHz. A note of 2500 Hz should be heard at the 51S-1 output.

l. Connect a swamping tool, identical to that used above, across terminals 3 and 4 of transformer T1. Peak the bottom slug of T1 for maximum audio output.

m. Move swamping tool to terminals 3 and 4 of T2 and repeat the tuning procedure (step 1). Remove swamping tool.

n. Tune signal generator for a 1500-Hz beat note. Adjust trimmers C258 and C261 for maximum meter indication.

o. Repeat the above step (step n) with the 51S-1 EMISSION switch in the USB position,

except adjust trimmers C257 and C260 instead of C258 and C261.

p. Set the 51S-1 EMISSION switch to CW and tune signal generator for a peak in rf meter reading. Adjust C256 and C259 for maximum 51S-1 rf meter indication.

4.4.4 3- to 2-MHz Variable IF. Alignment

a. Set the MEGACYCLES control of the 51S-1 to 4 MHz and the EMISSION switch to AM.

b. Connect a signal generator to pin 9 of V3.

c. Tune the 51S-1 to 4.9 MHz.

d. Tune the signal generator to 2.1 MHz, the 51S-1 variable if. frequency.

e. Set C113, C117, and C120 to half capacity. See figure 4-4.

f. Adjust L102, L103, and L104 for an indication of maximum on the rf meter. The meter switch should be in the RF position during this operation. Keep the signal generator output level adjusted to obtain an indication of 20 db.

g. Tune the 51S-1 to 4.1 MHz and the signal generator to 2.9 MHz.

h. Adjust C113, C117, and C120 for an indication of maximum on the rf meter of the 51S-1. Maintain an indication of 20 db on the rf meter by adjusting the signal generator output level.

i. Repeat steps c, d, f, g, and h until no increase in rf meter reading can be obtained at either the 4.1- or 4.9-MHz setting.

4.4.5 14.5- to 15.5-MHz Bandpass Alignment

a. Connect a signal generator to pin 9 of V2.

b. Set the frequency of the signal generator to exactly 15 MHz.

c. Tune in the signal on the 51S-1 by setting the tuning dial to 4.5 MHz.

d. Connect a swamping tool, consisting of a 0.01-uf capacitor in series with a 1000-ohm resistor, across each of the primary windings of T12 and T13.

e. Adjust the top slugs, which are associated with the secondary windings, of T12 and T13 for an indication of maximum on the rf meter of the 51S-1. Keep the signal generator output level adjusted for an indication of 20 db on the rf meter.

f. Remove the swamping tools from the primary windings, and place one across each of the secondary windings of T12 and T13.

g. Adjust the bottom slugs, which are associated with the primary windings, of T12 and T13 for an indication of maximum on the rf meter of the 51S-1. Keep the signal generator output level adjusted for an indication of 20 db on the rf meter.

4.4.6 RF Alignment

a. Remove the turret shield on the bottom of the 51S-1.

b. Turn the MEGACYCLES control to 29- to 30-MHz range, and tune the 51S-1 to 29.000 MHz. Move the EMISSION switch to AM position.

c. Set the main tuning slugs, L32, L68, and L72, to 5/16 inch less than full insertion into the coils.

d. Set the main trimmer capacitors, C40, C71, and C74, to 1/2 capacity. See figures 4-1 and 4-4.

e. Connect a signal generator to ANT, J1, on the rear of the 51S-1. Connect a vtvm to the 600Ω UNBAL jack, J11, on rear apron.

f. With the signal generator modulation turned on, tune the signal generator until a 29-MHz signal is heard on the 51S-1.

Note

Throughout rf alignment, keep the output level of the signal generator adjusted to the minimum level that will produce a discernible audio signal at the output of the 51S-1; this level must be below agc threshold as indicated by zero reading on rf meter.

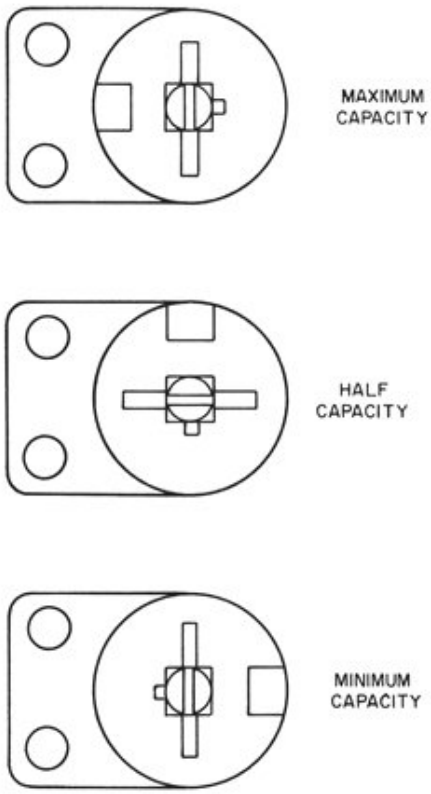


Figure 4-4. Trimmer Capacitor Settings

g. Insert the tuning tool through the slots in the turret side shield, and tune the slugs of the appropriate turret-mounted coils for maximum 51S-1 audio output.

h. Tune the 51S-1 and the signal generator to 29.9 MHz, and tune the main rf trimmer capacitors, C40, C71, and C74, for maximum 51S-1 audio output on vtvm.

i. Tune the 51S-1 and the signal generator to 29 MHz on the 29- to 30-MHz band, and repeat step g above.

j. Move the MEGACYCLES control of the 51S-1 to the 2.0- to 3.0-MHz band, and tune to 2.0 MHz.

k. Tune the signal generator so as to receive a 2.0-MHz signal on the 51S-1.

l. Place swamping tool across first rf tuned circuit to ground. Adjust 2.0-MHz turret coils L39 and L74 for maximum audio output from the 51S-1.

m. Remove swamping tool and place across second rf tuned circuit to ground. Adjust L2 for maximum audio output from the 51S-1.

n. Tune the 51S-1 and signal generator to 2.9 MHz and adjust slug in L33 for maximum output from the 51S-1.

o. Remove swamping tool and place across first tuned circuit to ground. Adjust slugs in L69 and L73 for maximum output on the 51S-1.

p. Recheck 2.0 MHz and touch up alignment if necessary. The swamping tool must be used on the opposite front end rf stage from the one that is being tuned.

q. All the other bands are aligned by peaking the appropriate turret coil slugs at the low frequency end of the band. The 3.0-, 4.0-, and 5.0-MHz coils must be tuned using the swamping tool. The swamping tool is not needed on the 6- to 29-MHz bands.

r. Repeat for all bands up to and including 29 MHz.

4.4.7 Megahertz Oscillator Alignment

a. Connect the rf probe of a vtvm to pin 8 of V2, and ground the vtvm to the chassis of the 51S-1.

b. Set the MEGACYCLES control of the 51S-1 to the 6- to 7-MHz band.

c. Tune the slug of T9 for maximum rf voltage as indicated on the vtvm. The slug of T9 is the slug farther from the chassis in the T9-T10 assembly.

d. Set the MEGACYCLES control of the 51S-1 to the 14- to 15-MHz band.

e. Tune the slug of T10 for maximum rf voltage as indicated on the vtvm. The slug of T10 is the slug closer to the chassis in the T9-T10 assembly.

f. Set the MEGACYCLES control of the 51S-1 to the 29- to 30-MHz band.

g. Tune trimmer C246 for maximum rf voltage as indicated on the vtvm.

h. Repeat steps b through g above.

4.4.8 17.5-MHz Oscillator Alignment

a. Connect a vtvm with rf probe to pin 8 of V3.

b. Set the MEGACYCLES control of the 51S-1 to the 4.0- to 5.0-MHz band.

c. Adjust T11 for 1.5 volts indicated on the vtvm.

d. Loosely couple a carefully calibrated receiver to the shield of V3.

e. Tune the calibrated receiver to 17.5 MHz, and turn on the 100-kHz calibration oscillator of the calibrated receiver.

f. Adjust C233 of the 51S-1 for zero beat as indicated on the calibrated receiver.

4.4.9 LF Oscillator Alignment

a. Set the MEGACYCLES selector on the 51S-1 to the 1.0- to 2.0-MHz band.

b. Connect a vtvm probe to pin 8 of V10.

c. Tune the slug of T16 for maximum rf voltage.

d. Couple a pickup loop around V10 and connect to a calibrated receiver.

e. Tune the calibrated receiver to 28.0 MHz and turn on the calibration oscillator of the calibrated receiver.

f. Adjust C2 of the 51S-1 for a zero beat in the calibrated receiver.

4.4.10 Megahertz Injection Frequency Adjustment

Note

Be sure the 51S-1 vfo is aligned properly before attempting to adjust the megahertz injection frequency. See paragraph 4.4.13 for vfo alignment.

a. Set the MEGACYCLES control of the 51S-1 to the 2.0- to 3.0-MHz band.

b. Couple a pickup loop around V15. Connect the pickup loop leads to a carefully calibrated receiver.

c. Tune the calibrated receiver to 3.5 kHz. Switch on the 100-kHz crystal calibrator of the calibrated receiver. With the tuning knob on the front of the 51S-1, tune for zero beat between the vfo of the 51S-1 and the crystal calibrator of the calibrated receiver. (The 51S-1 dial will be very near the high end of the band.)

d. Set the hairline of the 51S-1 to read zero on the kilohertz scale.

e. Turn off the calibrated receiver.

f. Move the OFF-STBY-ON-CAL switch of the 51S-1 to CAL position.

g. Set the EMISSION switch of the 51S-1 to USB position.

h. Insert the tuning tool through the slot in the turret side shield, and tune the appropriate turret-mounted, trimmer capacitor for zero beat as heard on the 51S-1.

i. Move the MEGACYCLES switch to the next higher band.

Note

Be careful not to disturb the tuning knob which was set in steps b, c, and d above.

j. Repeat steps h and i above until all bands above 2.0 MHz are aligned.

4.4.11 Receiver Gain Adjustment

a. Connect a signal generator to J1, ANT, on the rear of the 51S-1 as shown in figure 4.5.

b. Tune the signal generator and 51S-1 to 14.5 MHz.

c. Set the EMISSION switch on the 51S-1 to LSB position.

d. Set the RF GAIN control of the 51S-1 fully clockwise.

e. Set the output level of the signal generator to 15 microvolts (1.5 microvolts at the junction of resistors R1 and R2). Adjust receiver tuning for a beat note of approximately 1000 Hz.

f. Connect a dc vtvm to the agc line of the 51S-1.

g. Adjust R25, RCVR GAIN, to the setting where the voltmeter indication starts to increase from a steady reading. This is the agc threshold.

h. Repeat paragraph 4.4.2.

4.4.12 RF Meter Calibration

a. Perform the alignment procedure of paragraph 4.4.11.

b. Tune the signal generator and 51S-1 to 14.5 MHz. Set signal generator output to 1000 microvolts (100 microvolts at the junction of R1 and R2).

c. Set the meter switch of the 51S-1 in the RF position.

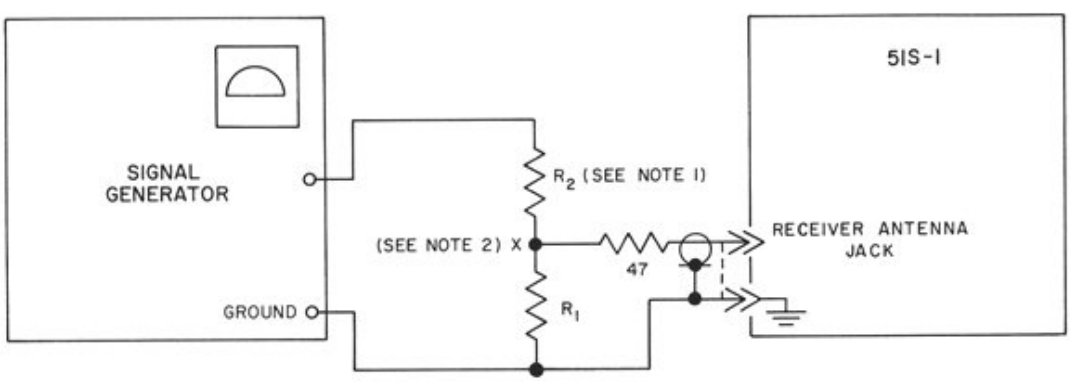
d. Adjust R48, METER SENS, to obtain 40 db indicated on the rf meter of the 51S-1.

4.4.13 Q-Multiplier Alignment

a. Tune the OFF-STBY-ON-CAL switch to CAL position.

b. Set the EMISSION switch to USB position.

c. Tune to zero beat with the calibrator signal at 6.5 MHz.



NOTES:
1. R_1 MUST BE 5 OHMS OR LESS; R_2 MUST BE 9 TIMES R_1. THIS FORMS A 10:1 VOLTAGE DIVIDER (20DB PAD). $R_1 + R_2$ MUST EQUAL PROPER TERMINATION FOR SIGNAL GENERATOR USED. EXAMPLE: FOR HP606A, $R_1 + R_2 = 50$ OHMS.
2. WITH THIS TERMINATION (20DB PAD), SIGNAL GENERATOR OUTPUT READS 10 TIMES ACTUAL OUTPUT AT "X".

C712-25-3

Figure 4-5. Receiver Gain Adjustment Test Setup

d. Set the EMISSION switch to AM position.

e. Turn the REJECTION TUNING on the front of the 51S-1 to the center calibration mark.

f. Set the meter switch to RF position.

g. Adjust L108 and R34 to obtain the lowest reading on the rf meter.

4.4.14 VFO Alignment

Vfo aging may cause a tuning dial calibration error of the same amount in the same direction for both 0 and 1000. To adjust for this condition, proceed as follows:

a. Set the hairline to zero with the ZERO SET knob.

b. Turn the EMISSION switch to LSB.

c. Turn the OFF-ON-STBY-CAL switch to CAL.

d. Set the receiver dial frequency at 7.200 MHz.

e. Locate the vfo shaft collar (just forward of L502). Loosen the pair of setscrews nearest the gear plate on the vfo shaft collar.

f. Align the 0 on the kHz dial with the hairline and lock the tuning control.

g. Manually twist the vfo shaft and collar until a zero beat is heard.

h. Tighten the setscrews. If the setscrews are no longer accessible, mark the collar and the tuning control shaft and move both together until each setscrew is accessible.

i. Check calibration at 0 and 1000.

If the tuning dial does not calibrate at 0 and 1000 $\pm$0.750 kHz without resetting the hairline, the error usually can be compensated with trimmer inductor L502. Proceed as follows:

a. Make sure the 51S-1 calibration oscillator has been aligned to Station WWV or WWVH. Tune the calibrate signal to zero beat at 1000 on the dial.

b. Set the hairline to zero with the ZERO SET knob.

c. Tune the 51S-1 to zero beat at the low end of the band (near 0 on the dial).

d. Note the dial error in kilohertz.

e. Multiply the dial error frequency noted in step d above by 1.5. Add the dial error to 1.5 times the dial error, and move the dial this compensating amount (passing through zero). For example, if the dial reading noted in step d is 1.0 kHz, 1.0 kHz plus 1.5 kHz equals 2.5 kHz. The dial reading 2.5 kHz lower is 98.5. Conversely, if the step d reading is 99, the compensation point is 2.5 kHz higher, or 001.5.

f. Leave the dial set as above, and adjust inductor L502 to zero beat with the calibration signal.

g. Repeat steps a through f until no error is present at end points.

4.5 MEGACYCLES DRIVE CHAIN REPLACEMENT

Refer to figures 4-6 and 4-7. Figure 4-6 shows the MEGACYCLES dial drive chain properly strung over MEGACYCLES band-switch drive sprocket, idlers, and counter dial drive sprocket. Figure 4-7 shows an exploded view of the complete mechanical band-switching and tuning mechanism.

a. Remove 51S-1 from cabinet. Turn 51S-1 on its side, and remove bottom shield plate from turret. Using a flashlight, locate the turret wafer printed circuit pad having a single round nib. Turn the MEGACYCLES control until this single-nibbed pad of each wafer is connected to the fixed turret contacts. This places the receiver in the 2.0- to 3.0-MHz position.

b. Remove the large tuning knob, the MEGACYCLES knob, and the ZERO SET knob from

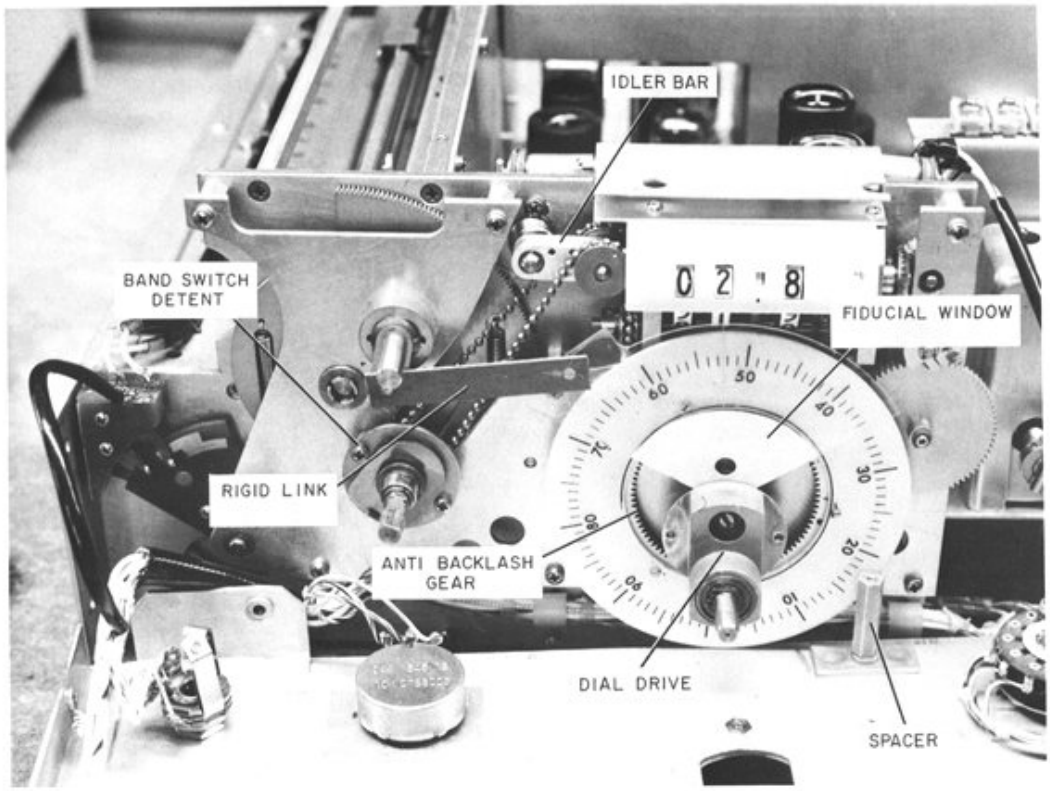


Figure 4-6. Band Indicator Bead Chain Stringing

their shafts. Remove the two small screws on either side of the tuning shaft. Loosen the coupling on the EMISSION switch shaft behind the detent plate and the first wafer. Remove the screw which secures the front gear plate to the panel, leaving the spacer fastened to the panel as shown in figure 4-6. At the front edge of each chassis side apron, remove the two screws which secure the front panel brackets to the side aprons. Remove the screw that secures the cable protecting rail to the front panel bottom bracket, and swing the rail aside. Move the panel out and down, taking care not to break any of the wiring between the back of the panel and the chassis. Remove zero set crank bar for easy access to the bead chain drive.

c. Remove the old bead chain. Remove the two screws holding the band-switch detent.

d. Thread the new chain over the MEGACYCLES drive sprocket and replace band-switch detent screws.

e. Press the idler bar downward, and thread the chain over the two idlers and under the counter drive sprocket. Release pressure on the idler bar. Idler bar should be horizontal after installation.

f. If the first two counter dials do not read 02., press the idler bar downward with one hand, and turn the counter dials manually with the other hand until the dials read 02. in the windows. Release pressure on the idler bar.

g. Replace panel, screws, knobs, and dust covers.

Note

If dial drive is removed, the antibacklash gear becomes unloaded. To preload, hold dial, and rotate front half of gear clockwise before meshing with drive pinion. Check to make sure EMISSION switch shaft grounding spring is under tension before tightening shaft coupler.

4.6 TURRET WAFER REPLACEMENT

If it is necessary to remove and replace turret wafers, refer to figure 4-7, and proceed as follows:

a. Set MEGACYCLES control to 2 MHz. Remove the 51S-1 from its case, and stand the chassis on its side.

b. Remove the turret bottom shield. Loosen the coupler clamp at the front end of the plastic turret shaft. This is the clamp farthest from the front panel. Do not loosen the clamp nearest the panel, or complete mechanical realignment will be necessary. This clamp is aligned at the factory.

c. Grasp the shaft end near the coupler and push gently toward the rear. The shaft and its rear bearing should slide easily.

Caution

Take care that the shaft does not bind in any one of the turret wafers. Proceed carefully to move the shaft to the rear. Gently loosen any wafer which appears to be binding.

d. Remove the defective wafer by withdrawing it straight out from the chassis.

e. Grasp the replacement wafer edgewise with the thumb and forefinger placed across the wafer diameter, and insert it into the wafer guides. Be careful not to bind or twist the fixed turret contacts. Leave the wafer aligned so that its single-nibbed contact pad is in a row with those of the other turret wafers.

Caution

Do not touch the contact pads with the bare finger tips. Acids and oils normally present on the fingers will cause intermittent operation of the wafer pads and the turret contacts. Wear clean rubber gloves, or handle as described in step e. If such an intermittent occurs, clean wafer with mild soap and warm water. Wipe dry with clean, lint-free cloth and replace.

f. When the wafer or wafers have been replaced and coarsely aligned as to turret position, insert the shaft from the rear, and start it through the rear wafer. As the shaft is brought to the wafer each time, twist the shaft enough to align it with the wafer hole and move it through. Use caution not to place undue stresses on the wafers or their guides.

g. As the shaft proceeds through the turret wafers and the coupler end approaches the coupler, the bearing on the rear end of the shaft will be entering the rear chassis bearing. At this time, grasp the shaft bearing with the fingers of the right hand, and keep the wafers free as necessary with the left hand. Guide the end of the shaft into the coupler with the left hand. Turn the shaft slightly back and forth as necessary with the right hand until the key in the coupler aligns with the keyway in the shaft. Push together until the shaft bearing enters the rear chassis bearing. While pressing the shaft bearing with the fingers of the right hand, rock the MEGACYCLES control with the left hand until the shaft bearing is flush with the rear chassis bearing. Tighten the clamp on the shaft coupler.

h. If two or more of the turret wafers are replaced at the same time, make sure all wafers are placed in the turret in proper order. Refer to figure 4-7. If new or repaired wafers are replaced in the turret, realign according to instructions of paragraph 4.4.6, 4.4.7, or 4.4.9.

Note

Wafers A2, A5, and A6 are identical in appearance as are A1, A4, and A7. However all turret wafers must be replaced in the exact position from which they were removed or complete realignment will be necessary. During removal, mark each wafer with pencil or tape, using care to keep all such foreign material off the circuit printing.

i. Replace the turret bottom shield, and replace the 51S-1 in its cabinet.

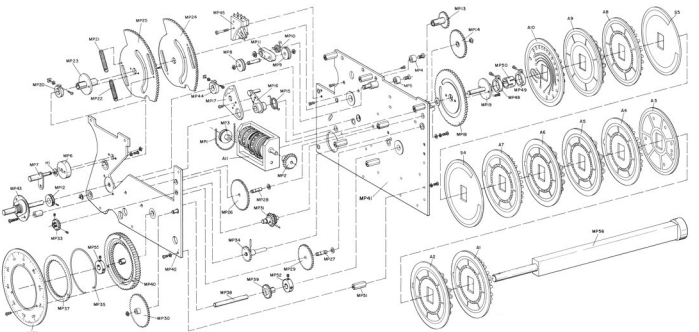


Figure 4-7. Mechanical Band and Tuning Linkage, Exploded View

section 5
specifications

5.1 51S-1/1A/1F/1AF/1B RECEIVER

The 51S-1/1A/1F/1AF/1B Receiver receives USB, LSB, AM, and CW signals in the range of 0.2 to 30.0 MHz. Coverage is continuous in thirty 1-megahertz bands. The model 51S-1 is mounted in a perforated wrap-around cabinet and equipped with an ac power supply capable of 115- or 230-volt, single-phase, 50- to 400-Hz operation. The 51S-1A is similar, except that it is fitted with a 28-volt dc transistorized power supply. The rack-mounted ac version is model 51S-1F (figure 5-1). The rack-mounted dc version is model 51S-1AF. The 51S-1B (figure 5-2) is similar to the 51S-1, but it has a rear-mounted junction box that provides military-type connectors for power, control, audio, and antenna lines.

5.2 REQUIREMENTS FOR OPERATION

The 51S-1 and 51S-1F Receivers require 115- or 230-volt, single-phase, 50- to 400-Hz power at approximately 125 watts. The 51S-1B requires 115-volt, single-phase, 50- to 400-Hz power at approximately 125 watts. The 51S-1A/1AF Receiver requires 28 volts dc at 4.5 amperes. The 51S-1/1A Receiver may be mounted on table or bench for fixed station operation, or may be mounted with a mounting plate similar to the 351E-4 on shelf, bench, or table in moving aircraft, ground vehicle, or boat. 51S-1/1F/1A/1AF Receivers require a 4- or 600-ohm speaker or headphones for local audio monitoring, but monitoring devices of any impedance may be matched with 600-ohm line-to-monitor transformers at remote locations up to several

Figure 5-1. 51S-1F in Rack Mount, Overall View

Figure 5-2. 51S-1B with 350D-5 Base Shockmount, Overall View

miles. Alternately, the 600-ohm line termination may be connected to telephone lines, or the 600-ohm local output may be used with a phone patch. The 51S-1B has the same local audio provisions as those described above, but the remote audio line has a 150-ohm impedance. 51S-1 series receivers require a good antenna with 50-ohm unbalanced feed.

5.3 SPECIFICATIONS

Frequency range	0.2 to 30.0 megahertz in thirty 1-megahertz bands continuous coverage.
Modes	Upper sideband, lower sideband, AM or CW.
Power consumption	125 watts.
Type of service	Fixed station attended with provision for remote control of rf gain.
Rf input impedance	50 ohms, unbalanced.
500-kHz if. output at J9	50 mv minimum into 50-ohm load with 5-uv input signal.
Matching speaker impedance	4 or 600 ohms.

Balanced line output impedance..... 600 ohms balanced, center-tap ground reference or floating. (For 51S-1B, 150 ohms floating.)

Matching phone patch impedance (local)..... 500 to 600 ohms.

Frequency stability..... During temperature change from 0 to +50 °C, after 20 minutes warmup, audio output frequency will not vary more than ±885 Hz for carrier frequencies from 2 to 7 MHz. From 7 MHz to 30 MHz, stability varies from 36 PPM ±400 Hz at 7.00 MHz (652 Hz) to 27 PPM ±400 Hz at 30 MHz (1210 Hz). For ±10% line voltage variation, frequency varies not more than ±100 Hz.

Calibration accuracy..... When zeroed to nearest 100 kHz calibration point, the frequency will be within ±400 Hz.

Dial backlash..... Not more than 150 Hz.

Audio-frequency response AM..... 100 to 2500 Hz ±6 db (line channel).
200 to 2500 Hz ±6 db (local channel).

SSB (high-frequency limit determined by filter bandwidth)..... 350 to 3050 Hz ±3.5 db (line channel).
350 to 3050 Hz ±3.5 db (local channel).

Audio output distortion (SSB test signal 100-microvolt input, 1.0-watt local output, 1-mv (0 dbm) line output)

Local..... Not more than 10 percent.

Line..... Not more than 1.2 percent.

Q-multiplier rejection notch depth..... Not less than 40 db.

Receiver sensitivity (nominal)

AM..... 3.0 microvolts for not less than 10-db signal + noise/noise (2 to 30 MHz).

15.0 microvolts for not less than 10-db signal + noise/noise (0.5 to 2 MHz).

20.0 microvolts for not less than 10-db signal + noise/noise (0.2 to 0.5 MHz).

With 55G-1 Preselector, 5.0 microvolts for not less than 10-db signal + noise/noise (0.2 to 2.0 MHz).

SSB and CW	0.6 microvolt for not less than 10-db carrier on carrier off (2 to 30 MHz).
	3.0 microvolts for not less than 10-db carrier on carrier off (0.5 to 2.0 MHz).
	4.0 microvolts for not less than 10-db carrier on carrier off (0.2 to 0.5 MHz).
	With 55G-1 Preselector, 1.0 microvolt for not less than 10-db carrier on carrier off (0.2 to 2.0 MHz).

Selectivity

CW (at 6 db points)	800 hertz bandwidth, nominal. (650 Hz minimum, 950 Hz maximum, 300-Hz maximum bandwidth optional).
SSB (at 3.5 db points)	2.75 kilohertz bandwidth (2.4 kHz bandwidth optional).
AM (at 6 db points)	5.0 kilohertz bandwidth minimum.
(at 60 db points)	22.0 kilohertz per second bandwidth maximum.

Spurious responses (above 2 MHz)

Internal spurious signals	Less than one microvolt equivalent signal.
Other spurious signals	Not less than 70 db down, except from 4.8 to 5.2 MHz, not less than 40 db down.
Image response	Not less than 50 db down from 2 to 25 MHz; not less than 40 db down from 25 to 30 MHz; referenced to midband.
Size	Cabinet version: 7-3/4 in. high by 14-3/4 in. wide by 14 in. deep. Rack-mounted version: 8-3/4 in. high by 19 in. wide by 15 in. deep (see figures 1-3 and 1-5).
Weight	28 pounds.

5.4 TUBE AND SEMICONDUCTOR COMPLEMENT

Table 5-1. Tube and Semiconductor Complement

SYMBOL	FUNCTION	TYPE
V1	Rf amplifier	6DC6
V2	First mixer and hf crystal oscillator	6EA8
V3	Second mixer and 17.5 MHz oscillator	6EA8
V4	Third mixer and remote gain gate	6EA8
V5, V7, and V8	If. amplifiers	6BA6
V6	Q-multiplier	12AX7
V9	Agc amplifier	6BA6
V10	Lf mixer and If crystal oscillator	6EA8
V11	If. cathode follower and agc cathode follower	5670
V12	Second local af amplifier	6BF5
V13	Second line af amplifier	6AK6
V14	First line af amplifier and first local af amplifier	12AX7
V15	Variable-frequency oscillator	7543
V16	Lf mixer and calibration oscillator	6EA8
V17	Beat-frequency oscillator	6BA6
CR1 thru CR4	Product demodulator	1N128
CR5	Meter rectifier	1N67A
CR6 thru CR13	Power supply rectifier	1N1695
CR14	Agc rectifier	1N482A
CR15	AM detector	1N128
CR16	Agc stabilizer	1N482A
CR17	Muting transient suppressor	1N67A
CR401 thru CR403	Dc power supply rectifier	1N1492
Q1	SSB/CW af amplifier	2N388
Q401 thru Q404	Dc power supply switching	2N637B

5.5 AVAILABLE ACCESSORIES

Table 5-2. Available Accessories

ITEM	FUNCTION	COLLINS PART NUMBER
55G-1 Tuner	0.2- to 2.0-MHz lf preselector	522-3982-002
312B-3 Speaker	Station speaker	522-1166-00
351E-4 Mounting Plate	Mount on table or bench	522-1482-00
28-volt dc power supply conversion kit	Converts 51S-1 to 51S-1A	554-8355-00
351R-1 Rack Mount	Rack mounts 51S-1/1A Receiver	522-2665-00
Cabinet assembly	Cabinet mounts 51S-1F/1AF Receiver	553-2449-00
312C-1 Speaker	Rack-mounted speaker	522-3526-00
312C-2 Speakers	Two speakers rack mounted	522-3527-00
312C-3 Speakers	Three speakers rack mounted	522-3528-00
Shockmounting kit	51S-1/1A Shockmount	757-2787-001

section 6
parts list

ITEM	DESCRIPTION	COLLINS PART NUMBER
	51S-1 RECEIVER	522-2245-00
A1	CAPACITOR, ASSEMBLY, SOLDERED: incls printed circuit disk and capacitors C11A thru C38	547-2680-004
A2	COIL ASSEMBLY, SOLDERED: incls printed circuit disk and coils L2 thru L29	547-2685-004
A3	COIL ASSEMBLY, COUPLING SOLDERED: incls printed circuit disk and L34 thru L38, L110, L111	547-2682-004
A4	CAPACITOR ASSEMBLY, SOLDERED: same as A1 (incls C41A thru C68)	547-2680-004
A5	COIL ASSEMBLY, SOLDERED: same as A2 (incls L39 thru L66)	547-2685-004
A6	COIL ASSEMBLY, SOLDERED: same as A2 (incls L74 thru L101)	547-2685-004
A7	CAPACITOR ASSEMBLY, SOLDERED: incls printed circuit disk and capacitors C75AB thru C102	549-0630-004
A8	CAPACITOR ASSEMBLY, SOLDERED, CRYSTAL OSCILLATOR: incls printed circuit disk and C198 thru C218, C239 thru C245	547-2681-004
A9	CAPACITOR ASSEMBLY, TRIMMER, SOLDERED: incls printed circuit disk and C276 thru C304 and C321 (capacitors are piston trimmers)	547-2691-004
A10	CRYSTAL ASSEMBLY, SOLDERED: incls printed circuit disk and crystals Y1 thru Y13, Y18, Y19, Y20	547-2677-004
A11	COUNTER, ROTATING, FIXED MOUNTING: double bank mechanical counter; Veeder Root, Inc. part no. 1-145100	015-1220-00
C1	CAPACITOR, FIXED, CERAMIC: 1.0 uuf, ±1/4 uuf, 500 v dc; MIL type CC20CK010C	916-0070-00
C2	CAPACITOR, VARIABLE, CERAMIC: 5.0 to 25 uuf, 350 v dc; Erie Resistor part no. 557018 COPO 39R	917-1073-00
C3	CAPACITOR, FIXED, MICA: 100 uuf, ±2%, 500 v dc; Electro Motive part no. DM15F101G-500WV	912-2815-00
C4	CAPACITOR, FIXED, CERAMIC: 4700 uuf, +100% -20%, 500 v dc	913-3012-00
C5 thru C7	NOT USED	
C8	CAPACITOR, FIXED CERAMIC: 0.1 uf, +80% -20%, 500 v dc; Sprague Electric Co. of Wisconsin part no. 41C92	913-3152-00
C9	CAPACITOR, FIXED, CERAMIC: same as C4	913-3012-00
C10	CAPACITOR, FIXED, CERAMIC: same as C8	913-3152-00
C11A	CAPACITOR, FIXED, MICA: 510 uuf, ±2%, 300 v dc (p/o A1); Electro Motive part no. DM15F511G-300WV	912-2866-00
C11B	CAPACITOR, FIXED, MICA: 330 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15F331G-500WV	912-2851-00
C12	CAPACITOR, FIXED, MICA: 430 uuf, ±2%, 300 v dc (p/o A1); Electro Motive part no. DM15F431G-300WV	912-2860-00
C13	CAPACITOR, FIXED, MICA: 300 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15F301G-500WV	912-2848-00
C14	CAPACITOR, FIXED, MICA: 252 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15E2520G-500WV	912-3485-00
C15	CAPACITOR, FIXED, MICA: 200 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15F201G-500WV	912-2836-00
C16	CAPACITOR, FIXED, MICA: 180 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15F181G-500WV	912-2833-00
C17	CAPACITOR, FIXED, MICA: 150 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15F151G-500WV	912-2827-00
C18	CAPACITOR, FIXED, MICA: 130 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15F131G-500WV	912-2824-00
C19	CAPACITOR, FIXED, MICA: 110 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15F111G-500WV	912-2818-00
C20	CAPACITOR, FIXED, MICA: 100 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15F101G-500WV	912-2815-00
C21	CAPACITOR, FIXED, MICA: 91 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15F910G-500WV	912-2812-00
C22	CAPACITOR, FIXED, MICA: 82 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15E820G-500WV	912-2809-00
C23	CAPACITOR, FIXED, MICA: 68 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15E680G-500WV	912-2803-00
C24	CAPACITOR, FIXED, MICA: 62 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15E620G-500WV	912-2800-00
C25	CAPACITOR, FIXED, MICA: 56 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15E560G-500WV	912-2797-00
C26	CAPACITOR, FIXED, MICA: same as C25 (p/o A1)	912-2797-00
C27	CAPACITOR, FIXED MICA: 51 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15E510G-500WV	912-2794-00
C28	CAPACITOR, FIXED MICA: 43 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15E430G-500WV	912-2788-00
C29	CAPACITOR, FIXED MICA: same as C28 (p/o A1)	912-2788-00
C30	CAPACITOR, FIXED, MICA: 33 uuf, ±2%, 500 v dc (p/o A1); Electro Motive part no. DM15E330G-500WV	912-2779-00
C31	CAPACITOR, FIXED, MICA: 24 uuf, ±5%, 500 v dc (p/o A1); Electro Motive part no. DM15C240J-500WV	912-2771-00
C32	CAPACITOR, FIXED, MICA: 20 uuf, ±5%, 500 v dc (p/o A1); Electro Motive part no. DM15C200J-500WV	912-2765-00
C33	CAPACITOR, FIXED, MICA: same as C32 (p/o A1)	912-2765-00
C34	CAPACITOR, FIXED, MICA: 15 uuf, ±5%, 500 v dc (p/o A1); Electro Motive part no. DM15C150J-500WV	912-2759-00
C35	CAPACITOR, FIXED, MICA: 18 uuf, ±5%, 500 v dc (p/o A1); Electro Motive part no. DM15C180J-500WV	912-2762-00
C36	CAPACITOR, FIXED, MICA: same as C35 (p/o A1)	912-2762-00
C37	CAPACITOR, FIXED, MICA: same as C34 (p/o A1)	912-2759-00
C38	CAPACITOR, FIXED, MICA: 12 uuf, ±5%, 500 v dc (p/o A1); Electro Motive part no. DM15C120J-500WV	912-2756-00
C39	CAPACITOR, FIXED, MICA: 47 uuf, ±5%, 500 v dc Electro Motive part no. DM15E470J-500WV	912-2792-00
C40	CAPACITOR, VARIABLE, CERAMIC: 3.0 uuf to 12.0 uuf, 350 v dc; Erie Resistor part no. 557018 COPO 17R	917-1072-00
C41A	CAPACITOR, FIXED, MICA: same as C11A (p/o A4)	912-2866-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
C41B	CAPACITOR, FIXED, MICA: same as C11B (p/o A4)	912-2851-00
C42	CAPACITOR, FIXED, MICA: same as C12 (p/o A4)	912-2860-00
C43	CAPACITOR, FIXED, MICA: same as C13 (p/o A4)	912-2848-00
C44	CAPACITOR, FIXED, MICA: same as C14 (p/o A4)	912-3485-00
C45	CAPACITOR, FIXED, MICA: same as C15 (p/o A4)	912-2836-00
C46	CAPACITOR, FIXED, MICA: same as C16 (p/o A4)	912-2833-00
C47	CAPACITOR, FIXED, MICA: same as C17 (p/o A4)	912-2827-00
C48	CAPACITOR, FIXED, MICA: same as C18 (p/o A4)	912-2824-00
C49	CAPACITOR, FIXED, MICA: same as C19 (p/o A4)	912-2818-00
C50	CAPACITOR, FIXED, MICA: same as C20 (p/o A4)	912-2815-00
C51	CAPACITOR, FIXED, MICA: same as C21 (p/o A4)	912-2812-00
C52	CAPACITOR, FIXED, MICA: same as C22 (p/o A4)	912-2809-00
C53	CAPACITOR, FIXED, MICA: same as C23 (p/o A4)	912-2803-00
C54	CAPACITOR, FIXED, MICA: same as C24 (p/o A4)	912-2800-00
C55	CAPACITOR, FIXED, MICA: same as C25 (p/o A4)	912-2797-00
C56	CAPACITOR, FIXED, MICA: same as C25 (p/o A4)	912-2797-00
C57	CAPACITOR, FIXED, MICA: same as C27 (p/o A4)	912-2794-00
C58	CAPACITOR, FIXED, MICA: same as C28 (p/o A4)	912-2788-00
C59	CAPACITOR, FIXED, MICA: same as C28 (p/o A4)	912-2788-00
C60	CAPACITOR, FIXED, MICA: same as C30 (p/o A4)	912-2779-00
C61	CAPACITOR, FIXED, MICA: same as C31 (p/o A4)	912-2771-00
C62	CAPACITOR, FIXED, MICA: same as C32 (p/o A4)	912-2765-00
C63	CAPACITOR, FIXED, MICA: same as C32 (p/o A4)	912-2765-00
C64	CAPACITOR, FIXED, MICA: same as C34 (p/o A4)	912-2759-00
C65	CAPACITOR, FIXED, MICA: same as C35 (p/o A4)	912-2762-00
C66	CAPACITOR, FIXED, MICA: same as C35 (p/o A4)	912-2762-00
C67	CAPACITOR, FIXED, MICA: same as C34 (p/o A4)	912-2759-00
C68	CAPACITOR, FIXED, MICA: same as C38 (p/o A4)	912-2756-00
C69	CAPACITOR, FIXED, CERAMIC: 470 uuf, +100% -20%, 500 v dc; Sprague Electric Co. of Wisconsin part no. 19C372	913-3007-00
C70	CAPACITOR, FIXED, CERAMIC: same as C4	913-3012-00
C71	CAPACITOR, VARIABLE, CERAMIC: same as C2	917-1073-00
C72	CAPACITOR, FIXED, CERAMIC: 0.01 uf, ±20%, 500 v dc	913-3013-00
C73	CAPACITOR, FIXED, CERAMIC: 0.001 uf, +100% -20%, 500 v dc; Erie Resistor part no. 851000 X5UO 102Z	913-3009-00
C74	CAPACITOR, VARIABLE, CERAMIC: same as C2	917-1073-00
C75A	CAPACITOR, FIXED, MICA: same as C11A (p/o A7)	912-2866-00
C75B	CAPACITOR, FIXED, MICA: same as C11B (p/o A7)	912-2851-00
C76	CAPACITOR, FIXED, MICA: 435 uuf, ±1%, 300 v dc; Electro Motive part no. DM15F4350F-300WV (p/o A7)	912-3987-00
C77	CAPACITOR, FIXED, MICA: same as C11B (p/o A7)	912-2851-00
C78	CAPACITOR, FIXED, MICA: same as C14 (p/o A7)	912-3485-00
C79	CAPACITOR, FIXED, MICA: 220 uuf, ±2%, 500 v dc; Electro Motive part no. DM15F221G-500WV (p/o A7)	912-2839-00
C80	CAPACITOR, FIXED, MICA: same as C16 (p/o A7)	912-2833-00
C81	CAPACITOR, FIXED, MICA: same as C17 (p/o A7)	912-2827-00
C82	CAPACITOR, FIXED, MICA: same as C18 (p/o A7)	912-2824-00
C83	CAPACITOR, FIXED, MICA: same as C19 (p/o A7)	912-2818-00
C84	CAPACITOR, FIXED, MICA: same as C20 (p/o A7)	912-2815-00
C85	CAPACITOR, FIXED, MICA: same as C21 (p/o A7)	912-2812-00
C86	CAPACITOR, FIXED, MICA: same as C22 (p/o A7)	912-2809-00
C87	CAPACITOR, FIXED, MICA: same as C23 (p/o A7)	912-2803-00
C88	CAPACITOR, FIXED, MICA: same as C24 (p/o A7)	912-2800-00
C89	CAPACITOR, FIXED, MICA: same as C25 (p/o A7)	912-2797-00
C90	CAPACITOR, FIXED, MICA: same as C25 (p/o A7)	912-2797-00
C91	CAPACITOR, FIXED, MICA: same as C27 (p/o A7)	912-2794-00
C92	CAPACITOR, FIXED, MICA: same as C28 (p/o A7)	912-2788-00
C93	CAPACITOR, FIXED, MICA: same as C28 (p/o A7)	912-2788-00
C94	CAPACITOR, FIXED, MICA: same as C30 (p/o A7)	912-2779-00
C95	CAPACITOR, FIXED, MICA: same as C31 (p/o A7)	912-2771-00
C96	CAPACITOR, FIXED, MICA: same as C32 (p/o A7)	912-2765-00
C97	CAPACITOR, FIXED, MICA: same as C32 (p/o A7)	912-2765-00
C98	CAPACITOR, FIXED, MICA: same as C34 (p/o A7)	912-2759-00
C99	CAPACITOR, FIXED, MICA: same as C35 (p/o A7)	912-2762-00
C100	CAPACITOR, FIXED, MICA: same as C35 (p/o A7)	912-2762-00
C101	CAPACITOR, FIXED, MICA: same as C34 (p/o A7)	912-2759-00
C102	CAPACITOR, FIXED, MICA: same as C38 (p/o A7)	912-2756-00
C103	CAPACITOR, FIXED, MICA: 22 uuf, ±5%, 500 v dc; Electro Motive part no. DM15C220J-500WV	912-2768-00
C104	CAPACITOR, FIXED, CERAMIC: same as C1	916-0070-00
C105	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C106	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C107	P/O T12	
C108	P/O T12	
C109	P/O T13	
C110	P/O T13	
C111	CAPACITOR, FIXED, CERAMIC: 2 uuf, ±1/4 uuf, 500 v dc; MIL type CC20CK020C	916-0075-00
C112	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C113	CAPACITOR, VARIABLE, CERAMIC: 8 to 50 uuf, 350 v dc; Electro Motive part no. 557018 U2PO 34R	917-1075-00
C114	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C115	CAPACITOR, FIXED, MICA: same as C11B	912-2851-00
C116	CAPACITOR, FIXED, MICA: 10 uuf, ±5%, 500 v dc; Electro Motive part no. DM15C100J-500WV	912-2753-00
C117	CAPACITOR, VARIABLE, CERAMIC: same as C113	917-1075-00
C118	CAPACITOR, FIXED, MICA: 360 uuf, ±2%, 500 v dc; Electro Motive part no. DM15F361G-500WV	912-2854-00
C119	CAPACITOR, FIXED, MICA: 5 uuf, ±5%, 500 v dc	912-2750-00
C120	CAPACITOR, VARIABLE, CERAMIC: same as C113	917-1075-00
C121	CAPACITOR, FIXED, MICA: same as C118	912-2854-00
C122	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C123	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C124	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C125	CAPACITOR, FIXED, CERAMIC: same as C73	913-3009-00
C126	P/O T14	
C127	CAPACITOR, FIXED, MICA: same as C27	912-2794-00
C128	CAPACITOR, FIXED, MICA: same as C27	912-2794-00
C129	CAPACITOR, FIXED, MICA: same as C27	912-2794-00
C130	CAPACITOR, FIXED, MICA: same as C24	912-2800-00
C131	CAPACITOR, FIXED, MICA: same as C24	912-2800-00
C132	CAPACITOR, FIXED, MICA: same as C24	912-2800-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
C133	P/O T14	
C134	CAPACITOR, FIXED, CERAMIC: 3 uuf, ±1/2 uuf, 500 v dc; MIL type CC20CJ030D	916-0145-00
C135	P/O T15	
C136	P/O T15	
C137	CAPACITOR, FIXED, CERAMIC: same as C69	913-3007-00
C138	CAPACITOR, FIXED, CERAMIC: same as C69	913-3007-00
C139	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C140	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C141	P/O T1	
C142	P/O T1	
C143	CAPACITOR, FIXED, CERAMIC: same as C8	913-3152-00
C144	CAPACITOR, FIXED, CERAMIC: same as C73	913-3009-00
C145	P/O L108	
C146	P/O L108	
C147	CAPACITOR, FIXED, CERAMIC: same as C73	913-3009-00
C148	CAPACITOR, FIXED, CERAMIC: same as C69	913-3007-00
C149	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C150	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C151	P/O T2	
C152	P/O T2	
C153	CAPACITOR, FIXED, MICA: 120 uuf, ±5%, 500 v dc; Electro Motive part no. DM15F121J-500WV	912-2822-00
C154	CAPACITOR, FIXED, CERAMIC: same as C73	913-3009-00
C155	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C156	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C157	P/O T3	
C158	CAPACITOR, FIXED, MICA: same as C39	912-2792-00
C159	NOT USED	
C160	NOT USED	
C161	CAPACITOR, FIXED, CERAMIC: 22,000 uuf, -20% +100%, 500 v dc; Sprague Electric Co. of Wisconsin part no. 44C5	913-3014-00
C162	CAPACITOR, FIXED, ELECTROLYTIC: 2 uf, -10% +100%, 50 v dc; Sprague Electric part no. D33212	183-1183-00
C163	CAPACITOR, FIXED, CERAMIC: same as C69	913-3007-00
C164	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C165	CAPACITOR, FIXED, CERAMIC: 0.05 uf, -20% +80%, 50 v dc; Sprague Electric Co. of Wisconsin part no. 55C23A2	913-3885-00
C166	CAPACITOR, FIXED, ELECTROLYTIC: 250 uf, -10% +100%, 30 v dc; Sprague Electric part no. 4Y12B	183-1901-00
C167	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, -10% +100%, 15 v dc; Sprague Electric part no. D32359	183-1157-00
C168	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C169	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C170	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C171	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C172	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C173	CAPACITOR, FIXED, MICA: 330 uuf, ±5%, 500 v dc; Electro Motive part no. DM15F331J-500WV	912-2852-00
C174	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C175	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C176	CAPACITOR, FIXED, ELECTROLYTIC: 5 uf, -10% +100%, 50 v dc; Sprague Electric part no. D31536	183-1162-00
C177	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C178	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C179	CAPACITOR, FIXED, MICA: 39 uuf, ±5%, 500 v dc; Electro Motive part no. DM15E390J-500WV	912-2786-00
C180	CAPACITOR, FIXED, CERAMIC: 0.01 uf, ±20%, 1000 v dc; Centralab part no. DA134-048CB	913-3922-00
C181	CAPACITOR, FIXED, CERAMIC: same as C180	913-3922-00
C182	CAPACITOR, FIXED, ELECTROLYTIC: 3 sections, 120-40-40 uf, -10% +40%, 200 v dc	183-1763-00
C183	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, -10% +100%, 50 v dc; Sprague Electric Co. part no. A29238	183-1170-00
C184	NOT USED	
C185	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C186	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C187	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C188	P/O T7	
C189	NOT USED	
C190	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C191	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C192	CAPACITOR, FIXED, CERAMIC: 0.47 uf, +80% -20%, 25 v dc; Sprague Electric Co. part no. 5C11A	913-3804-00
C193	CAPACITOR, FIXED, CERAMIC: same as C8	913-3152-00
C194	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
C195	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C196	CAPACITOR, FIXED, MICA: 20 uuf, ±5%, 500 v dc; Electro Motive part no. DM15C200J-500WV	912-2765-00
C197	CAPACITOR, FIXED, MICA: 68 uuf, ±5%, 500 v dc; Electro Motive part no. DM10F680J	912-3867-00
C198	CAPACITOR, FIXED, MICA: same as C25 (p/o A8)	912-2797-00
C199	CAPACITOR, FIXED, MICA: same as C23 (p/o A8)	912-2803-00
C200	CAPACITOR, FIXED, MICA: same as C21 (p/o A8)	912-2812-00
C201	CAPACITOR, FIXED, MICA: 120 uuf, ±5%, 500 v dc; Electro Motive part no. DM15F121G-500WV (p/o A8)	912-2821-00
C202	CAPACITOR, FIXED, MICA: 160 uuf, ±5%, 500 v dc; Electro Motive part no. DM15F161G-500WV (p/o A8)	912-2830-00
C203	CAPACITOR, FIXED, MICA: same as C19	912-2818-00
C204	CAPACITOR, FIXED, MICA: same as C22 (p/o A8)	912-2809-00
C205	CAPACITOR, FIXED, MICA: same as C24 (p/o A8)	912-2800-00
C206	CAPACITOR, FIXED, MICA: same as C27 (p/o A8)	912-2794-00
C207	CAPACITOR, FIXED, MICA: 36 uuf, ±2%, 500 v dc; Electro Motive part no. DM15E360G-500WV (p/o A8)	912-2782-00
C208	CAPACITOR, FIXED, MICA: 27 uuf, ±2%, 500 v dc; Electro Motive part no. DM15E270G-500WV (p/o A8)	912-2773-00
C209	CAPACITOR, FIXED, MICA: same as C32 (p/o A8)	912-2765-00
C210	CAPACITOR, FIXED, MICA: 114 uuf, ±2%, 500 v dc; Electro Motive part no. DM15E1140G-500WV (p/o A8)	912-3482-00
C211	CAPACITOR, FIXED, MICA: same as C20 (p/o A8)	912-2815-00
C212	CAPACITOR, FIXED, MICA: same as C22 (p/o A8)	912-2809-00
C213	CAPACITOR, FIXED, MICA: 71 uuf, ±2%, 500 v dc; Electro Motive part no. DM15E710G-500WV (p/o A8)	912-3479-00
C214	CAPACITOR, FIXED, MICA: same as C24 (p/o A8)	912-2800-00
C215	CAPACITOR, FIXED, MICA: same as C27 (p/o A8)	912-2794-00
C216	CAPACITOR, FIXED, MICA: same as C28 (p/o A8)	912-2788-00
C217	CAPACITOR, FIXED, MICA: same as C207 (p/o A8)	912-2782-00
C218	CAPACITOR, FIXED, MICA: 30 uuf, ±2%, 500 v dc; Electro Motive part no. DM15E300G-500WV (p/o A8)	912-2776-00
C219	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C220	CAPACITOR, FIXED, MICA: 15 uuf, ±10%, 500 v dc; Electro Motive part no. DM15C150K-500WV	912-2760-00
C221	CAPACITOR, FIXED, CERAMIC: same as C8	913-3152-00
C222	CAPACITOR, FIXED, MICA: 100 uuf, ±2%, 500 v dc; Electro Motive part no. DM15E360G-500WV	912-2817-00
C223	CAPACITOR, FIXED, CERAMIC: 0.1 uf, -30% +80%, 75 v dc; Centralab part no. DA150-001CB	913-3794-00
C224	CAPACITOR, FIXED, MICA: 470 uuf, ±5%, 300 v dc; Electro Motive part no. DM15F471J-300WV	912-2864-00
C225	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C226	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C227	CAPACITOR, VARIABLE, CERAMIC: same as C2	917-1073-00
C228	CAPACITOR, FIXED, MICA: same as C116	912-2753-00
C229	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C230	CAPACITOR, FIXED, MICA: same as C222	912-2817-00
C231	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C232	CAPACITOR, FIXED, CERAMIC: 1.0 uuf, ±1/2 uuf, 500 v dc; MIL type CC20CK010D	916-0071-00
C233	CAPACITOR, VARIABLE, CERAMIC: same as C2	917-1073-00
C234	CAPACITOR, FIXED, MICA: same as C116	912-2753-00
C235	CAPACITOR, FIXED, MICA: same as C222	912-2817-00
C236	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C237	CAPACITOR, FIXED, MICA: same as C39	912-2792-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
C238	NOT USED	
C239	CAPACITOR, FIXED, MICA: 24 uuf, ±10%, 500 v dc; Electro Motive part no. DM15C240K-500WV (p/o A8)	912-2772-00
C240	CAPACITOR, FIXED, MICA: same as C32 (p/o A8)	912-2765-00
C241	CAPACITOR, FIXED, MICA: same as C34 (p/o A8)	912-2759-00
C242	CAPACITOR, FIXED, MICA: 12 uuf ±5%, 500 v dc; Electro Motive part no. DM15C120J-500WV (p/o A8)	912-2756-00
C243	CAPACITOR, FIXED, CERAMIC: 8.2 uuf, ±5%, 500 v dc; Stackpole Carbon Co, part no. GA-8.2UUFPORM5PCT (p/o A8)	913-2998-00
C244	CAPACITOR, FIXED, CERAMIC: 4.7 uuf, ±5%, 500 v dc; Stackpole Carbon Co. part no. GA-4.7UUFPORM5PCT (p/o A8)	913-2993-00
C245	CAPACITOR, FIXED, CERAMIC: 1.1 uuf, ±5%, 500 v dc; Stackpole Carbon Co. part no. GA-1.1UUFPORM5PCT (p/o A8)	913-2978-00
C246	CAPACITOR, VARIABLE, CERAMIC: same as C2	917-1073-00
C247	CAPACITOR, FIXED, ELECTROLYTIC: same as C183	183-1170-00
C248	BUILT IN P/O T16	
C249	CAPACITOR, FIXED, ELECTROLYTIC: same as C167	183-1157-00
C250	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C251	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C252	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C253	CAPACITOR, FIXED, ELECTROLYTIC: same as C167	183-1157-00
C254	CAPACITOR, FIXED, CERAMIC: same as C161	913-3014-00
C255	CAPACITOR, FIXED, CERAMIC: same as C161	913-3014-00
C256	CAPACITOR, VARIABLE, MICA: 7 to 60 uuf, 350 v dc; Electro Motive part no. T50410	918-0052-00
C257 thru C261	CAPACITOR, VARIABLE, MICA: same as C256	918-0052-00
C262	CAPACITOR, FIXED, ELECTROLYTIC: same as C167	183-1157-00
C263	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C264	CAPACITOR, FIXED, CERAMIC: same as C223	913-3794-00
C265	CAPACITOR, FIXED, CERAMIC: same as C223	913-3794-00
C266	CAPACITOR, FIXED, MICA: same as C224	912-2864-00
C267	NOT USED	
C268	NOT USED	
C269	CAPACITOR, FIXED, ELECTROLYTIC: same as C176	183-1162-00
C270	CAPACITOR, FIXED, CERAMIC: same as C69	913-3007-00
C271	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C272	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C273	NOT USED	
C274	NOT USED	
C275	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C276	CAPACITOR, FIXED, CERAMIC: 5.1 uf, ±5%, 500 v dc; Stackpole Carbon Co. part no. GA-5.1UUFPORM5PCT	913-2994-00
C277	CAPACITOR, VARIABLE, CERAMIC: 1 to 10 uuf, 100 v dc; Centralab part no. 917-1180-00	917-1180-00
C278 thru C340	CAPACITOR, VARIABLE, CERAMIC: same as C277 (p/o A9)	917-1180-00
C305	NOT USED	
C306	CAPACITOR, FIXED, MICA: 10 uuf, ±5%, 500 v dc; Electro Motive part no. DM10C100J	912-3837-00
C307	CAPACITOR, FIXED, CERAMIC: same as C8	913-3152-00
C308	CAPACITOR, FIXED, CERAMIC: same as C111	916-0075-00
C309	CAPACITOR, FIXED, CERAMIC: same as C111	916-0075-00
C310	CAPACITOR, FIXED, CERAMIC: same as C4	913-3012-00
C311	CAPACITOR, FIXED, MICA: same as C173	912-2852-00
C312	CAPACITOR, FIXED, CERAMIC: same as C223	913-3794-00
C313	NOT USED	
C314	P/O L108	
C315	P/O L108	
C316	CAPACITOR, FIXED, ELECTROLYTIC: 4 uf, -10% +100%, 350 v dc; Sprague Electric Co. part no. D29343	183-1783-00
C317	P/O L108	
C318	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
C319	CAPACITOR, FIXED, MICA: same as C173	912-2852-00
C320	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
C321	CAPACITOR, FIXED, CERAMIC: same as C276	913-2994-00
C322	CAPACITOR, FIXED, CERAMIC: same as C72	913-3013-00
CR1	SEMICONDUCTOR DEVICE, DIODE: germanium, JEDEC type 1N128	353-2027-00
CR2 thru CR4	SEMICONDUCTOR DEVICE, DIODE: same as CR1	353-2027-00
CR5	SEMICONDUCTOR DEVICE, DIODE: germanium; JEDEC type 1N67A	353-0147-00
CR6	SEMICONDUCTOR DEVICE, DIODE: silicon; JEDEC type 1N1695	353-1665-00
CR7 thru CR13	SEMICONDUCTOR DEVICE, DIODE: same as CR6	353-1665-00
CR14	SEMICONDUCTOR DEVICE, DIODE: silicon; JEDEC type 1N482A	353-2648-00
CR15	SEMICONDUCTOR DEVICE, DIODE: same as CR1	353-2027-00
CR16	SEMICONDUCTOR DEVICE, DIODE: same as CR14	353-2648-00
CR17	SEMICONDUCTOR DEVICE, DIODE: same as CR5	353-0147-00
DS1	LAMP, INCANDESCENT: 6.8 v; 0.25 amp; pilot light bulb with miniature bayonet base and T-3-1/4 bulb; 3/8 in. by 7/16 in. by 1-1/8 in; Type No. 44	262-3220-00
DS2	LAMP, INCANDESCENT: pilot light bulb; type no. 47	262-3240-00
E1	CORE: ferrite core for permeability tuning; 0.5 to 32 mc frequency range (slug for L32) Stackpole Carbon Co. part no. 57-634-7	288-0084-00
E2	CORE; same as E1 (slug for L68)	288-0084-00
E3	CORE: same as E1 (slug for L72)	288-0084-00
E4	CORE: powdered iron core for permeability tuning; 2 to 3 mc frequency range; Radio Core, Inc. part no. 5E-2788-32 (slug for L102)	288-2523-00
E5	CORE: same as E4 (slug for L103)	288-2523-00
E6	CORE: same as E4 (slug for L104)	288-2523-00
E7A	CONTACT ASSEMBLY, ELECTRICAL: c/o spring contacts, insulator block & insulator plate (p/o S6A)	547-2715-003
E7B	CONTACT ASSEMBLY, ELECTRICAL: same as E7A (p/o S6B)	547-2715-003
F1	FUSE, CARTRIDGE: glass enclosed, time log, 1.5 amps, 125 v max, 0.36 ohms resistance; MIL type F02B125V1-1/2AS	264-0007-00
FL1	FILTER, BANDPASS: bandpass 0.2 to 2 MHz; 3 in. lg overall; Communications Coil part no. X269-1	241-0342-00
FL2	FILTER, MECHANICAL: 500 kHz carrier frequency band width 2.75 kHz; lower sideband selector	526-9423-00
FL3	FILTER, MECHANICAL: 500 kHz carrier frequency, band width 2.75 kHz; upper sideband selector	526-9422-00
FL4	FILTER, BANDPASS: 500.8 kHz center frequency; 800 Hz at 6 db, passband; hermetically sealed in a metal case	293-0928-00
H1	WASHER, SPRING TENSION: beryllium copper; 0.140 in. id, 0.500 in. od, 0.062 in. h overall	547-2554-002
J1	JACK, TELEPHONE: steel; panel mtg, 5/8 in. od by 27/32 in. lg; Switchcraft, Inc. part no. 3505F	360-0195-00
J2 thru J5	JACK, TIP: small banana contact element; 0.375 in. by 0.4375 in. by 0.875 in.; Switchcraft, Inc. part no. 3501FP	360-0148-00
J6	JACK, TIP: 2 conductors closed circuit, miniature phone-jack; Electro Craft Industries, Inc. part no. 3505F	360-0194-00
J7 thru J9	JACK, TIP: same as J2	360-0148-00
J10	CONNECTOR, PLUG, ELECTRICAL: 9 male contacts; Amphenol Borg part no. 86-CP9-1003	372-1951-00
J11 thru J14	JACK, TELEPHONE: same as J2	360-0148-00
J15	NOT USED	
J16	JACK, TIP: spring leaf closed circuit contacts, fits type PL-55 phone plug or equivalent; Switchcraft, Inc. part no. 13E	360-0136-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
L1	COIL, RADIO FREQUENCY: 1.0 millihenry; James Millen Mfg. Co., Inc. part no. J301-1000	240-2540-00
L2	INDUCTANCE, VARIABLE: 13 uh nominal; Electro Assemblies, Inc. part no. 18-425 (p/o A2)	240-1125-00
L3	INDUCTANCE, VARIABLE: 10 uh nominal; Electro Assemblies, Inc. part no. 18-426 (p/o A2)	240-1126-00
L4	INDUCTANCE, VARIABLE: 5 uh nominal; Electro Assemblies, Inc. part no. 18-428 (p/o A2)	240-1128-00
L5	INDUCTANCE, VARIABLE: 4.2 uh nominal; Electro Assemblies, Inc. part no. 18-429 (p/o A2)	240-1129-00
L6	INDUCTANCE, VARIABLE: 3 uh nominal; Electro Assemblies, Inc. part no. 18-442 (p/o A2)	240-1142-00
L7	INDUCTANCE, VARIABLE: 2.2 uh nominal; Electro Assemblies, Inc. part no. 18-431 (p/o A2)	240-1131-00
L8	INDUCTANCE, VARIABLE: same as L7 (p/o A2)	240-1131-00
L9	INDUCTANCE, VARIABLE: 1.5 uh nominal; Electro Assemblies, Inc. part no. 18-432 (p/o A2)	240-1132-00
L10	INDUCTANCE, VARIABLE: same as L9 (p/o A2)	240-1132-00
L11	INDUCTANCE, VARIABLE: 1.2 uh nominal; Electro Assemblies, Inc. part no. 18-433 (p/o A2)	240-1133-00
L12	INDUCTANCE, VARIABLE: same as L11 (p/o A2)	240-1133-00
L13	INDUCTANCE, VARIABLE: same as L11 (p/o A2)	240-1133-00
L14	INDUCTANCE, VARIABLE: same as L11 (p/o A2)	240-1133-00
L15	INDUCTANCE, VARIABLE: 1.1 uh nominal; Electro Assemblies, Inc. part no. 18-434 (p/o A2)	240-1134-00
L16	INDUCTANCE, VARIABLE: 1.05 uh nominal; Electro Assemblies, Inc. part no. 18-435 (p/o A2)	240-1135-00
L17	INDUCTANCE, VARIABLE: 0.95 uh nominal; Electro Assemblies, Inc. part no. 18-437 (p/o A2)	240-1137-00
L18	INDUCTANCE, VARIABLE: 0.85 uh nominal; Electro Assemblies, Inc. part no. 18-443 (p/o A2)	240-1143-00
L19	INDUCTANCE, VARIABLE: same as L18 (p/o A2)	240-1143-00
L20	INDUCTANCE, VARIABLE: 0.75 uh nominal; Electro Assemblies, Inc. part no. 18-439 (p/o A2)	240-1139-00
L21 thru L23	INDUCTANCE, VARIABLE: same as L20 (p/o A2)	240-1139-00
L24	INDUCTANCE, VARIABLE: 0.65 uh nominal; Electro Assemblies, Inc. part no. 18-440 (p/o A2)	240-1140-00
L25	INDUCTANCE, VARIABLE: same as L24 (p/o A2)	240-1140-00
L26	INDUCTANCE, VARIABLE: 0.55 uh nominal; Electro Assemblies, Inc. part no. 18-441 (p/o A2)	240-1141-00
L27	INDUCTANCE, VARIABLE: same as L26 (p/o A2)	240-1141-00
L28	INDUCTANCE, VARIABLE: 0.52 uh nominal; Electro Assemblies, Inc. part no. 18-444 (p/o A2)	240-1144-00
L29	INDUCTANCE, VARIABLE: same as L28 (p/o A2)	240-1144-00
L30	AUTOTRANSFORMER, RADIO FREQUENCY: 28 turns tapped at 4 turns	546-7109-003
L31	COIL, RADIO FREQUENCY: 1.20 mh ±10% inductance; 0.42 ohms max dc resistance; 180 mc min resonant frequency; 675 ma dc rated current; Delevan Electronics part no. 1537-14	240-0786-00
L32	COIL, RADIO FREQUENCY: single layer wound; 35 turns no. 32 wire	547-2625-003
L33	COIL, RADIO FREQUENCY: 0.75 uh nominal	547-2591-002
L34	COIL, RADIO FREQUENCY: 1.00 uh, ±20%; Jeffers Electronics Div of Speer Carbon Co. part no. 10100-128 (p/o A3).	240-0062-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
L35	COIL, RADIO FREQUENCY: single layer wound; 8 turns (p/o A3)	547-2619-003
L36	COIL, RADIO FREQUENCY: single layer wound; 4 turns no. 26 wire; used on 10 to 13 mc bands (p/o A3)	547-2617-003
L37	COIL, RADIO FREQUENCY: single layer wound; 3 turns no. 26 wire; used on 14 to 21 mc bands (p/o A3)	547-2618-003
L38	COIL, RADIO FREQUENCY: same as L37 (used on 22 to 29 mc bands) (p/o A3)	547-2618-003
L39	INDUCTANCE, VARIABLE: same as L2 (p/o A5)	240-1125-00
L40	INDUCTANCE, VARIABLE: same as L3 (p/o A5)	240-1126-00
L41	INDUCTANCE, VARIABLE: same as L4 (p/o A5)	240-1128-00
L42	INDUCTANCE, VARIABLE: same as L5 (p/o A5)	240-1129-00
L43	INDUCTANCE, VARIABLE: same as L6 (p/o A5)	240-1142-00
L44	INDUCTANCE, VARIABLE: same as L7 (p/o A5)	240-1131-00
L45	INDUCTANCE, VARIABLE: same as L7 (p/o A5)	240-1131-00
L46	INDUCTANCE, VARIABLE: same as L9 (p/o A5)	240-1132-00
L47	INDUCTANCE, VARIABLE: same as L9 (p/o A5)	240-1132-00
L48 thru L51	INDUCTANCE, VARIABLE: same as L11 (p/o A5)	240-1133-00
L52	INDUCTANCE, VARIABLE: same as L15 (p/o A5)	240-1134-00
L53	INDUCTANCE, VARIABLE: same as L16 (p/o A5)	240-1135-00
L54	INDUCTANCE, VARIABLE: same as L17 (p/o A5)	240-1137-00
L55	INDUCTANCE, VARIABLE: same as L18 (p/o A5)	240-1143-00
L56	INDUCTANCE, VARIABLE: same as L18 (p/o A5)	240-1143-00
L57 thru L60	INDUCTANCE, VARIABLE: same as L20 (p/o A5)	240-1139-00
L61	INDUCTANCE, VARIABLE: same as L24 (p/o A5)	240-1140-00
L62	INDUCTANCE, VARIABLE: same as L24 (p/o A5)	240-1140-00
L63	INDUCTANCE, VARIABLE: same as L26 (p/o A5)	240-1141-00
L64	INDUCTANCE, VARIABLE: same as L26 (p/o A5)	240-1141-00
L65	INDUCTANCE, VARIABLE: same as L28 (p/o A5)	240-1144-00
L66	INDUCTANCE, VARIABLE: same as L28 (p/o A5)	240-1144-00
L67	COIL, RADIO FREQUENCY: same as L31	240-0786-00
L68	COIL, RADIO FREQUENCY: same as L32	547-2625-003
L69	COIL, RADIO FREQUENCY: same as L33	547-2591-002
L70	COIL, RADIO FREQUENCY: same as L1	240-2540-00
L71	COIL, RADIO FREQUENCY: same as L34	240-0062-00
L72	COIL, RADIO FREQUENCY: same as L32	547-2625-003
L73	COIL, RADIO FREQUENCY: same as L33	547-2591-002
L74	INDUCTANCE VARIABLE: same as L2 (p/o A6)	240-1125-00
L75	INDUCTANCE, VARIABLE: same as L3 (p/o A6)	240-1126-00
L76	INDUCTANCE, VARIABLE: same as L4 (p/o A6)	240-1128-00
L77	INDUCTANCE, VARIABLE: same as L5 (p/o A6)	240-1129-00
L78	INDUCTANCE, VARIABLE: same as L6 (p/o A6)	240-1142-00
L79	INDUCTANCE, VARIABLE: same as L7 (p/o A6)	240-1131-00
L80	INDUCTANCE, VARIABLE: same as L7 (p/o A6)	240-1131-00
L81	INDUCTANCE, VARIABLE: same as L9 (p/o A6)	240-1132-00
L82	INDUCTANCE, VARIABLE: same as L9 (p/o A6)	240-1132-00
L83	INDUCTANCE, VARIABLE: same as L11 (p/o A6)	240-1133-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
L84 thru L86	INDUCTANCE, VARIABLE: same as L11 (p/o A6)	240-1133-00
L87	INDUCTANCE, VARIABLE: same as L15 (p/o A6)	240-1134-00
L88	INDUCTANCE, VARIABLE: same as L16 (p/o A6)	240-1135-00
L89	INDUCTANCE, VARIABLE: same as L17 (p/o A6)	240-1137-00
L90	INDUCTANCE, VARIABLE: same as L18 (p/o A6)	240-1143-00
L91	INDUCTANCE, VARIABLE: same as L18 (p/o A6)	240-1143-00
L92 thru L95	INDUCTANCE, VARIABLE: same as L20 (p/o A6)	240-1139-00
L96	INDUCTANCE, VARIABLE: same as L24 (p/o A6)	240-1140-00
L97	INDUCTANCE, VARIABLE: same as L24 (p/o A6)	240-1140-00
L98	INDUCTANCE, VARIABLE: same as L26 (p/o A6)	240-1141-00
L99	INDUCTANCE, VARIABLE: same as L26 (p/o A6)	240-1141-00
L100	INDUCTANCE, VARIABLE: same as L28 (p/o A6)	240-1144-00
L101	INDUCTANCE, VARIABLE: same as L28 (p/o A6)	240-1144-00
L102	COIL, INTERMEDIATE FREQUENCY: single layer wound; 54 turns	547-2624-003
L103	COIL, INTERMEDIATE FREQUENCY: same as L102	547-2624-003
L104	COIL, INTERMEDIATE FREQUENCY: same as L102	547-2624-003
L105	COIL, RADIO FREQUENCY: 10 mh, ±5%, National Coil Co. part no. C-0047327	240-0199-00
L106	COIL, RADIO FREQUENCY: same as L1	240-2540-00
L107	NOT USED	
L108	COIL, INTERMEDIATE: aluminum shield can; 500 kHz center frequency; 1.296 in. by 1.296 in. by 3.375 in. o/a dim; 4 solder lug terminals; Communication Coil part no. X-707-1 (p/o A3)	278-1819-00
L109	REACTOR: 2.5 hys	668-0523-00
L110	COIL, RADIO FREQUENCY: single layer wound; 26 turns no. 23 AWG wire; 3.9 uh inductance, 0.16 ohm max dc resistance, 1440 ma max current rating; Jeffers Electronics Div of Speer Carbon Co. part no. 10102-114 (p/o A3)	240-0144-00
L111	COIL, RADIO FREQUENCY: single layer wound; enamel or formvar insulation; 1.5 uh inductance; 650 max current; 0.50 ohms max dc resistance; Jeffers Electronics; Div. of Speer Carbon Co. part no. 10100-129 (p/o A3)	240-0063-00
L112	COIL, RADIO FREQUENCY: same as L1	240-2540-00
L113	COIL, RADIO FREQUENCY: universal wound; 3 pi; 72 turns each section, #36 AWG wire; 220 uh inductance; 100 ma current; Delevan Electronics part no. BP 217	240-0198-00
L114	COIL, RADIO FREQUENCY: same as L113	240-0198-00
L115	COIL, RADIO FREQUENCY: same as L113	240-0198-00
L116	COIL, RADIO FREQUENCY: 10 uh; Delevan Electronics Corp. part no. 2150-24	240-0164-00
L117 thru L119	COIL, RADIO FREQUENCY: same as L116	240-0164-00
L120	NOT USED	
L121	COIL, RADIO FREQUENCY: same as L113	240-0198-00
L122	COIL, RADIO FREQUENCY: same as L110	240-0144-00
L123	COIL, RADIO FREQUENCY: encapsulated; 470 uh inductance, 10.0 dc resistance 180 ma dc; 5/32 in. dia by 3/8 in. lg; Delevan Electronics Corp. part no. 3715-45	240-1192-00
L124	COIL, RADIO FREQUENCY: 650 turns no. 40 AWG, polyurethene insulation; 2000 uh, 29 ohms, 99 ma; Delevan Electronics Corp. part no. 2500-42	240-2547-00
M1	MICROAMMETER: dc; 0.200 ua full-scale; 500 ohms resistance; Marion Electrical Instrument Co. part no. 52S1	458-0589-00
MP1	CHAIN, BEAD: stainless steel, no. 3 qualified bead chain; 3/32 in. dia, 0.117 pitch	015-1622-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
MP2	GEAR, BEVEL: phosphor bronze, 30 teeth 20° pressure angle; pitch angle 45°; 0.140 w of face, 0.250 in. w overall; set screw mtg	547-2595-002
MP3	SPROCKET, COUNTER SHAFT: brass, for use w/ no. 3 qualified bead chain, (3/32 in. dia. 0.117 pitch) 16 sockets, 0.656 od, 0.187 in. w of face, 0.3745 in. lg overall, 5/16 in. od of hub, 4-40 NF-2B mtg hole	547-2601-002
MP4	BEARING, SLV: bronze, 0.140 in. id, 0.377 in. od	756-0480-001
MP5	BEARING, SLV: same as MP4	756-0480-001
MP6	BLOCK, BEARING, ZERO SET: brass, 3/4 in. od, 0.125 in. id, 0.468 in. w overall	547-2558-002
MP7	ARM, ZERO SET STAKED: c/o cres shaft, shouldered; cres arm; 1.218 in. lg by 7/8 in. h overall	547-2584-002
MP8	PULLEY, IDLER: c/o one brass pulley, one oilite bronze bearing; 0.560 in. od, 0.1855 in. id, 0.150 in. w	547-2600-002
MP9	PULLEY, IDLER: same as MP8	547-2600-002
MP10	SPRING, HELICAL, TORSION: music spring wire; 0.045 in. dia of material; 4.750 turns close wound left hand; 0.410 in. id	547-2557-002
MP11	ARM, IDLER: aluminum; 0.187 in. by 1.078 in.	547-2552-002
MP12	SPROCKET MC SHAFT: for use w/ no. 3 qualified bead chain (3/32 in. dia, 0.117 pitch) 16 sockets, 0.3745 in. lg approx overall, 4-40 NF-2B thru hole one wall only	547-2592-002
MP13	GEAR, SPUR: aluminum; 18 teeth, 20° pressure angle, 0.186 in. id, 0.125 in. w face, 0.718 in. lg o/a	547-2541-002
MP14	GEAR, SPUR: aluminum gear w/ oilite bronze bearing; 32 teeth, 20° pressure angle, 0.125 in. w face, 0.281 in. lg o/a; 0.1255 in. id	547-2578-002
MP15	SPRING, HELICAL, TORSION: 0.033 in. dia music spring wire, 2 turns, rt hand helix of coils, 0.515 in. id	547-2650-003
MP16	ARM, DRIVER, PRESSED: c/o 2 bronze bearings, brass hub, arm & pin; approx 1.203 in. by 0.593 in.	547-2590-002
MP17	SEGMENT, SWITCH: glass base epoxy, copper both sides w/ rhodium over gold plate, 0.093 in. by 0.875 in. by 1.5937 in. approx (p/o S6)	547-2548-002
MP18	GEAR, SPUR: aluminum; 126 teeth, 20° pressure angle, 0.375 in. id, 0.125 in. w face	547-2543-002
MP19	SHAFT, SHOULDERED: CRES; undercut and grooved, 1 in. dia by 1.2185 in. lg	547-2537-002
MP20	CLAMP, LOOP: aluminum w/ anodize finish; 0.200 in. by 0.344 in. by 0.656 in. o/a	504-7537-002
MP21	SPRING, HELICAL, EXTENSION: CRES; cylindrical shape; rh helix of coils, 0.734 in. free lg of coils, 0.156 in. od of spring	500-2179-002
MP22	SPRING, HELICAL, EXTENSION: same as MP21	500-2179-002
MP23	HUB, SLUG RACK: brass, 1.000 in. dia by 1.000 in. lg	547-2563-002
MP24	GEAR SECTOR: aluminum anodized; 252 teeth on 150° circumference, 20° pressure angle; 0.3125 in. id	547-2606-003
MP25	GEAR SECTOR, DRIVE: aluminum; 252 teeth, 3.937 in. pitch dia	547-2607-003
MP26	GEAR CLUSTER, SPUR, PRESSED: c/o bronze bearings, and 2 aluminum spur gears one w/90 teeth, 1.406 in. pitch dia; other w/18 teeth; 0.281 in. pitch dia; 0.281 in. lg overall	547-2577-002
MP27	SHAFT, GROOVED: CRES; 0.1251 in. dia; 0.6866 in. lg overall; grooved 3 places	547-2561-002
MP28	SHAFT, GROOVED: same as MP27	547-2561-002
MP29	GEAR, SPUR, PRESSED: c/o bronze bearing; spur gear w/66 teeth, 1.032 in. pitch dia; 0.281 in. lg overall	547-2579-002
MP30	GEAR, SPUR, PRESSED: c/o bronze bearing & 75 tooth spur gear, pitch dia 1.5625 in.; 0.281 in. lg overall	547-2576-002
MP31	GEARSHAFT, BEVEL-SPUR: aluminum gear cluster; cres shaft; 21 teeth, 20° pressure angle, 48 diametrical pitch, spur gear; 30 teeth, 20° pressure angle, 48 diametrical pitch, 48° 12 min to 48° 52 min face angle, 45° pitch angle, bevel gear; 0.750 in. lg o/a	547-2593-002
MP32	NOT USED	
MP33	GEAR, SPUR: aluminum, w/anodize finish; 21 teeth, 20° pressure angle, 0.125 in. w face, 0.312 in. lg overall; 0.125 in. id	547-2572-002

ITEM	DESCRIPTION	COLLINS PART NUMBER
MP34	GEARSHAFT, SPUR: aluminum gear, anodized finish; cres shaft, passivated finish; 35 teeth, 20° pressure angle; 0.125 in. w of face; 0.770 in. od by 1.062 in. lg o/a dim.	547-2585-002
MP35	SPRING, DIAL: CRES, passivate finish, accommodates 1.325 in. dia material, 0.109 in. h o/a	549-4441-002
MP36	DIAL, SCALE: range of inscription 0 to 90 CW, 0 to 10 ccw, linear; 2.125 in. id, 3-13/16 in. od	547-2559-002
MP37	GEAR, INTERNAL: aluminum; 2.249 in. od, 0.050 in. w of face, 92 teeth	547-2574-002
MP38	SHAFT, STRAIGHT, DIAL: CRES, 0.1872 in. dia; 1.781 in. lg, slot one end 0.040 in. w by 0.078 in. deep	547-2560-002
MP39	GEAR SPUR: aluminum, anodize finish; 42 teeth; 20° pressure angle, 0.125 in. w face, 0.400 in. lg overall	547-2539-002
MP40	GEAR CLUSTER: aluminum anodize finish; c/o 1 internal gear, 92 teeth, 20° pressure angle; 1 spur gear, 126 teeth, 20° pressure angle	547-2615-003
MP41	PLATE, GEAR, PRESSED: c/o 5 bronze bearings, 2 steel posts, 3 angle fasteners, 1 pin & aluminum plate, 0.125 in. by 5.750 in. by 9.312 in.	547-2683-004
MP42	PLATE, GEAR, SECONDARY, PRESSED: c/o 3 bronze bearings, steel gear post & aluminum plate, 0.090 in. by 4.500 in. by 7.942 in. approx	547-2623-002
MP43	DETENT, SWITCH, ELECTRICAL: spring material 0.016 in.; 90° detent, no stops, 1-19/64 in. max dia; Oak Mfg. Co. part no. 212365-F	269-2224-00
MP44	CLAMP: aluminum; accommodates 0.251 in. dia material; 0.200 in. w	506-3189-002
MP45	CONTACT ASSEMBLY, ELECTRICAL, NO. 3; c/o 5 copper welded contact springs & 3 plastic insulator plates (p/o S6)	547-2715-003
MP46	NOT USED	
MP47	NOT USED	
MP48	CLAMP, COUPLING "C": aluminum; 0.200 in. w, accommodates 0.435 in. dia material	504-7576-002
MP49	CLAMP, COUPLING "C": same as MP48	504-7576-002
MP50	COUPLER, SHAFT, RIGID, PRESSED: c/o aluminum coupler, 1/2 in. w by 0.500 in. dia, and steel pin	547-2597-002
MP51	POST, GEAR PLATE: aluminum; 1/4 in. hex by 0.500 in. lg; 4-40 NC-2B thru	547-2575-002
MP52	CLAMP, DIAL: aluminum; 0.187 in. w by 0.253 in. id by 0.562 in. od	547-2556-002
MP53	NOT USED	
MP54	NOT USED	
MP55	CLAMP, DIAL: same as MP52	547-2556-002
MP56	SHAFT, SHOULDERED, TURRET, PRESSED: c/o CRES collar, 0.999 in. dia by 0.375 in. w & glass melamine or base epoxy shaft, 10.718 in. lg	547-2586-002
MP57	CONNECTING LINK, RIGID: aluminum, chromate dip finish; 0.032 in. by 3/8 in. by 2-15/64 in.	547-2634-002
MP58	WINDOW, DIAL: plastic, 0.031 in. thk; irregular shape	547-2643-002
MP59	BUSHING, PIVOT: brass; chemical polish finish; 0.187 in. id countersunk at 82 deg to 0.230 in; 0.310 in. od, 0.045 in. thk	757-8613-001
MP60	SPRING, DIAL LOCK: copper spring; cork pad; 0.105 in. by 0.500 in. by 0.843 in. o/a dim.	757-8610-001
MP61	ARM, LOCK: aluminum; black anodized finish; white markings marked "LOCK", 0.350 in. by 1.187 in. by 1.500 in. o/a dim.	757-8614-001
O1	KNOB ASSEMPLY: c/o one spring and one pointer	543-8039-00
O2	KNOB ASSEMBLY: same as O1	543-8039-00
O3	KNOB ASSEMBLY: same as O1	543-8039-00
O4	KNOB: plastic body w/ aluminum insert; setscrew type; w/ pointer; 3/4 in. by 15/16 in. by 1.093 in.	548-8243-004
O5	DIAL LOCK ASSEMBLY: Composed of MP59, MP60, and MP61	NPN
O6	KNOB: aluminum; black semi-gloss enamel	544-7268-002
O7	KNOB: fluted; black phenolic body; setscrew type; 1.125 in. dia by 0.750 in. thk; w/ skirt	546-1296-003
O8	KNOB ASSEMBLY: c/o skirt, black phenolic fluted knob and spun disk	548-8244-000
O9	KNOB: c/o skirt, disk and knob spinner	547-1824-003
P1 thru P9	NOT USED	
P10	CONNECTOR, RECEPTACLE, ELECTRICAL: 9 female socket contacts	372-1953-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
P11 thru P24	NOT USED	
Q1	TRANSISTOR: germanium; JEDEC type 2N388	352-0241-00
R1	RESISTOR, FIXED, COMPOSITION: 270 ohms ±5%, 1/2 w; MIL type RC20GF271J	745-1327-00
R2	RESISTOR, FIXED, COMPOSITION: 220 ohms, ±5%, 1/2 w; MIL type RC20GF221J	745-1323-00
R3	RESISTOR, FIXED, COMPOSITION: 100, 000 ohms, ±10%, 1/4 w; MIL type RC07GF104K	745-0821-00
R4	NOT USED	
R5	RESISTOR, FIXED, COMPOSITION: 10, 000 ohms ±10%. 1/4 w; MIL type RC07GF103K	745-0785-00
R6	RESISTOR, FIXED, COMPOSITION: same as R5	745-0785-00
R7	RESISTOR, FIXED, COMPOSITION: 1000 ohms, ±10%, 1w; MIL type RC32GF102K	745-3352-00
R8	RESISTOR, FIXED, COMPOSITION: same as R3	745-0821-00
R9	RESISTOR, FIXED, COMPOSITION: 47, 000 ohms, ±10%, 1/4 w; MIL type RC07GF473K	745-0809-00
R10	RESISTOR, FIXED, COMPOSITION: 100 ohms, ±10%, 1/2 w; MIL type RC20GF101K	745-1310-00
R11	RESISTOR, FIXED, COMPOSITION: same as R7	745-3352-00
R12	RESISTOR, FIXED, COMPOSITION: 33 ohms, ±10%, 1/2 w; MIL type RC20GF330K	745-1289-00
R13	RESISTOR, FIXED, COMPOSITION: 0.22 megohms, ±10%, 1/4 w; MIL type RC20GF224K	745-0833-00
R14	RESISTOR, FIXED, COMPOSITION: 1000 ohms, ±10%, 1/2 w; MIL type RC20GF102K	745-1352-00
R15	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R16	NOT USED	
R17	RESISTOR, FIXED, COMPOSITION: same as R12	745-1289-00
R18	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R19	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R20	RESISTOR, FIXED, COMPOSITION: same as R12	745-1289-00
R21	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R22	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R23	RESISTOR, FIXED, COMPOSITION: same as R9	745-0809-00
R24	RESISTOR, FIXED, COMPOSITION: same as R13	745-0833-00
R25	RESISTOR, VARIABLE, COMPOSITION: 2500 ohms, ±20%, 0.3 w; Chicago Telephone Supply Co. part no. 376-0204-00	376-0204-00
R26	RESISTOR, FIXED, COMPOSITION: 22, 000 ohms, ±10%, 2 w; MIL type RC42GF223K	745-5708-00
R27	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R28	NOT USED	
R29	RESISTOR, FIXED, COMPOSITION: 47 ohms, ±10%, 1/4 w; MIL type RC07GF470K	745-0701-00
R30	RESISTOR, FIXED, COMPOSITION: 120 ohms, ±10%, 1/2 w; MIL type RC20GF121K	745-1314-00
R31	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R32	RESISTOR, FIXED, COMPOSITION: 0.33 megohms, ±10%, 1/4 w; MIL type RC07GF334K	745-0839-00
R33	P/O L108	
R34	P/O L108	
R35	RESISTOR, FIXED, COMPOSITION: same as R3	745-0821-00
R36	RESISTOR, FIXED, COMPOSITION: same as R9	745-0809-00
R37	RESISTOR, VARIABLE, COMPOSITION: 250 ohms, ±20%, 0.3 w; Chicago Telephone Supply Co. part no. 376-0201-00	376-0201-00
R38	RESISTOR, VARIABLE, COMPOSITION: 1000 ohms, ±20%, 0.3 w; Chicago Telephone Supply Co. part no. 376-0203-00	376-0203-00
R39	RESISTOR, FIXED, COMPOSITION: 47, 000 ohms, ±10%, 1/2 w; MIL type RC20GF473K	745-1422-00
R40	RESISTOR, FIXED, COMPOSITION: same as R10	745-1310-00
R41	RESISTOR, FIXED, COMPOSITION: 15, 000 ohms, ±10%, 1 w; MIL type RC32GF153K	745-3401-00
R42	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R43	RESISTOR, FIXED, COMPOSITION: 3.9 megohms, ±10%, 1/4 w; MIL type RC07GF395K	745-0878-00
R44	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R45	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R46	RESISTOR, FIXED, COMPOSITION: 1500 ohms, ±10%, 1/4 w; MIL type RC07GF152K	745-0755-00
R47	RESISTOR, FIXED, COMPOSITION: 56 ohms, ±10%, 1/4 w; MIL type RC07GF560K	745-0704-00
R48	RESISTOR, FIXED, COMPOSITION: same as R46	745-0755-00
R49	RESISTOR, FIXED, COMPOSITION: same as R3	745-0821-00
R50	RESISTOR, FIXED, COMPOSITION: same as R3	745-0821-00
R51	RESISTOR, FIXED, COMPOSITION: 2700 ohms, ±10%, 1/4 w; MIL type RC07GF272K	745-0764-00
R52	RESISTOR, FIXED, COMPOSITION: 33, 000 ohms, ±10%, 1/4 w; MIL type RC07GF333K	745-0803-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
R53	RESISTOR, FIXED, COMPOSITION: 3300 ohms, ±10%, 1/4 w; MIL type RC07GF332K	745-0767-00
R54	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, ±10%, 1/4 w; MIL type RC07GF223K	745-0797-00
R55	RESISTOR, FIXED, COMPOSITION: 6800 ohms, ±10%, 1/2 w; MIL type RC20GF682K	745-1387-00
R56	RESISTOR, FIXED, COMPOSITION: same as R26	745-5708-00
R57	RESISTOR, VARIABLE, COMPOSITION: 500,000 ohms, ±20%, 1/4 w	376-2477-00
R58	RESISTOR, FIXED, COMPOSITION: 3300 ohms, ±10%, 1/2 w; MIL type RC20GF332K	745-1373-00
R59	RESISTOR, FIXED, COMPOSITION: same as R55	745-1387-00
R60	RESISTOR, FIXED, COMPOSITION: 0.47 megohms, ±10%, 1/2 w; MIL type RC20GF474K	745-1464-00
R61	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R62	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R63	RESISTOR, FIXED, COMPOSITION: same as R60	745-1464-00
R64	RESISTOR, FIXED, FILM: 2740 ohms, ±1%, 1/8 w; MIL type RN60B2741F	705-6617-00
R65	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R66	RESISTOR, FIXED, COMPOSITION: same as R58	745-1373-00
R67	RESISTOR, FIXED, COMPOSITION: same as R3	745-0821-00
R68	RESISTOR, FIXED, COMPOSITION: 82 ohms, ±10%, 1/2 w; MIL type RC20GF820K	745-1307-00
R69	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R70	RESISTOR, FIXED, COMPOSITION: 39,000 ohms, ±10%, 2 w; MIL type RC42GF393K	745-5719-00
R71	RESISTOR, FIXED, COMPOSITION: 1200 ohms, ±10%, 1/2 w; MIL type RC20GF122K	745-1356-00
R72	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R73	RESISTOR, FIXED, COMPOSITION: 0.22 megohms, ±10%, 1/2 w; MIL type RC20GF224K	745-1450-00
R74	RESISTOR, FIXED, COMPOSITION: 3900 ohms, ±10%, 1/4 w; MIL type RC07GF392K	745-0770-00
R75	RESISTOR, VARIABLE, COMPOSITION: same as R57	376-2477-00
R76	RESISTOR, FIXED, COMPOSITION: 2200 ohms, ±10%, 1/2 w; MIL type RC20GF222K	745-1366-00
R77	RESISTOR, FIXED, COMPOSITION: 0.10 megohms, ±10%, 1/2 w; MIL type RC20GF104K	745-1436-00
R78	RESISTOR, FIXED, COMPOSITION: same as R73	745-1450-00
R79	RESISTOR, FIXED, COMPOSITION: same as R76	745-1366-00
R80	RESISTOR, FIXED, FILM: 10,000 ohms, ±1%, 1/8 w; MIL type RN60B1002F	705-6644-00
R81	RESISTOR, FIXED, COMPOSITION: 1000 ohms, ±10%, 2 w; MIL type RC42GF102K	745-5652-00
R82	RESISTOR, FIXED, COMPOSITION: 5100 ohms, ±5%, 1/2 w; MIL type RC20GF512J	745-1382-00
R83	RESISTOR, FIXED, COMPOSITION: 750 ohms, ±5%, 1/2 w; MIL type RC20GF751J	745-1347-00
R84	RESISTOR, FIXED, COMPOSITION: 1500 ohms, ±5%, 1/2 w; MIL type RC20GF152J	745-1358-00
R85	RESISTOR, FIXED, COMPOSITION: 12,000 ohms, ±10%, 1/2 w; MIL type RC20GF123K	745-1398-00
R86	RESISTOR, VARIABLE: 10,000 ohms, ±30%, 3/4 w	376-4701-00
R87	RESISTOR, FIXED, COMPOSITION: 330 ohms, ±10%, 1/2 w; MIL type RC20GF331K	745-1331-00
R88	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, ±10%, 1/2 w; MIL type RC20GF223K	745-1408-00
R89	RESISTOR, FIXED, COMPOSITION: same as R60	745-1464-00
R90	RESISTOR, FIXED, COMPOSITION: 4700 ohms, ±10%, 1/2 w; MIL type RC20GF472K	745-1380-00
R91	RESISTOR, FIXED, COMPOSITION: 0.47 megohms ±10%, 1/4 w; MIL type RC07GF474K	745-0845-00
R92	RESISTOR, FIXED, COMPOSITION: 1200 ohms, ±10%, 1/4 w; MIL type RC07GF122K	745-0752-00
R93	RESISTOR, FIXED, COMPOSITION: 5600 ohms, ±10%, 1/4 w; MIL type RC07GF562K	745-0776-00
R94	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R95	RESISTOR, FIXED, COMPOSITION: 1.0 megohm, ±10%, 1/2 w; MIL type RC20GF105K	745-1478-00
R96	RESISTOR, FIXED, COMPOSITION: same as R77	745-1436-00
R97	RESISTOR, FIXED, COMPOSITION: 5600 ohms, ±10%, 1/2 w; MIL type RC20GF562K	745-1384-00
R98	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R99	RESISTOR, FIXED, COMPOSITION: 1 megohm, ±10%, 1/2 w; MIL type RC20GF105K	745-1478-00
R100	RESISTOR, FIXED, COMPOSITION: same as R77	745-1436-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
R101	RESISTOR, FIXED, COMPOSITION: same as R77	745-1436-00
R102	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R103	RESISTOR, FIXED, COMPOSITION: same as R3	745-0821-00
R104 thru R106	RESISTOR, FIXED, COMPOSITION: same as R14	745-1352-00
R107	RESISTOR, FIXED, COMPOSITION: 270 ohms, ±10%, 1/4 w; MIL type RC07GF271K	745-0728-00
R108	RESISTOR, FIXED, COMPOSITION: 47 ohms, ±10%, 1/2 w; MIL type RC20GF470K	745-1296-00
R109	RESISTOR, FIXED, COMPOSITION: 1.2 megohms, ±10%, 1/4 w; MIL type RC07GF125K	745-0860-00
R110	RESISTOR, FIXED, COMPOSITION: same as R58	745-1373-00
R111	RESISTOR, FIXED, COMPOSITION: 4700 ohms, ±10%, 1/4 w; MIL type RC07GF472K	745-0773-00
R112	RESISTOR, FIXED, COMPOSITION: same as R108	745-1296-00
R113	RESISTOR, FIXED, COMPOSITION: same as R39	745-1422-00
R114	RESISTOR, FIXED, COMPOSITION: 220 ohms, ±10%, 1/2 w; MIL type RC20GF221K	745-1324-00
R115	NOT USED	
R116	RESISTOR, FIXED, COMPOSITION: same as R39	745-1422-00
R117	RESISTOR, FIXED, COMPOSITION: same as R108	745-1296-00
R118	RESISTOR, FIXED, COMPOSITION: 68 ohms, ±10%, 1 w; MIL type RC32GF680K	745-3303-00
R119	RESISTOR, FIXED, COMPOSITION: 33 ohms, ±10%, 2 w; MIL type RC42GF330K	745-5589-00
R120	RESISTOR, FIXED, COMPOSITION: same as R118	745-3303-00
R121	RESISTOR, FIXED, COMPOSITION: 470 ohms ±10%, 1/2 w; MIL type RC20GF471K	745-1338-00
R122	RESISTOR, FIXED, COMPOSITION: 10 ohms, ±10%, 1/2 w; MIL type RC20GF100K	745-1268-00
R123	RESISTOR, FIXED, COMPOSITION: 39,000 ohms ±10%, 1/4 w; MIL type RC07GF393K	745-0806-00
R124	RESISTOR, FIXED, COMPOSITION: 10 megohms, ±10%, 1/4 w; MIL type RC07GF106K	745-0893-00
R125	RESISTOR, FIXED, COMPOSITION: same as R13	745-0833-00
R126	RESISTOR, FIXED, COMPOSITION: same as R9	745-0809-00
R127	NOT USED	
R128	RESISTOR, FIXED, COMPOSITION: 2200 ohms, ±10%, 1/4 w; MIL type RC07GF222K	745-0761-00
R129	RESISTOR, FIXED, COMPOSITION: 120 ohms, ±10%, 1 w; MIL type RC32GF121K	745-3314-00
R130	RESISTOR, FIXED, COMPOSITION: same as R129	745-3314-00
R131	RESISTOR, FIXED, COMPOSITION: same as R122	745-1268-00
R132	RESISTOR, FIXED, COMPOSITION: same as R29	745-0701-00
R133	RESISTOR, FIXED, COMPOSITION: same as R10	745-1310-00
R134	RESISTOR, FIXED, COMPOSITION: 39 ohms, ±10%, 1/2 w; MIL type RC20GF390K	745-1293-00
R135	RESISTOR, FIXED, COMPOSITION: 150 ohms, ±10%, 1/4 w; MIL type RC07GF151K	745-0719-00
R136	RESISTOR, FIXED, COMPOSITION: same as R135	745-0719-00
R137	RESISTOR, FIXED, COMPOSITION: same as R29	745-0701-00
R138	RESISTOR, FIXED, COMPOSITION: same as R85	745-1398-00
R139	RESISTOR, FIXED, COMPOSITION: same as R10	745-1310-00
R140	RESISTOR, FIXED, COMPOSITION: same as R119	745-5589-00
R141	RESISTOR, VARIABLE, COMPOSITION: 100,000 ohms, ±20%, 1/4 w; Chicago Telephone Supply Co. part no. LW9778	376-7410-00
R142	RESISTOR, FIXED, COMPOSITION: same as R85	745-1398-00
R143	RESISTOR, FIXED, COMPOSITION: same as R73	745-1450-00
R144	RESISTOR, FIXED, COMPOSITION: same as R60	745-1464-00
R145	RESISTOR, FIXED, COMPOSITION: 3.9 ohms, ±5%, 1/2 w; Allen Bradley part no. EB 39G5	745-1539-00
R146	RESISTOR, FIXED, COMPOSITION: 220 ohms, ±10%, 1/4 w; MIL type RC07GF221K	745-0725-00
R147	RESISTOR, FIXED, COMPOSITION: same as R146	745-0725-00
R148	RESISTOR, FIXED, COMPOSITION: same as R43	745-0878-00
R149	RESISTOR, FIXED, COMPOSITION: same as R54	745-0797-00
R150	P/O L108	
R151	RESISTOR, FIXED, COMPOSITION: same as R39	745-1422-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
R152	RESISTOR, FIXED, COMPOSITION: 0.10 meg, 10%, 1/4 w; MIL type RC07GF104K	745-0821-00
S1	SWITCH, ROTARY: 2 circuits, 4 positions, 1 section; 2 moving, 10 fixed & 2 dummy contacts; Oak Mfg. Co. part no. 210878-K1AC	259-1336-00
S2A&B	SWITCH SECTION, ROTARY: phenolic; 2 circuits, 12 positions; 2 moving contacts, 5 fixed contacts; Oak Mfg. Co. part no. 210874-F	269-2223-00
S2C	SWITCH, ROTARY: 2 circuits, 12 positions, 1 section; 2 moving contacts, 10 fixed contacts; Oak Mfg. Co. part no. 210430-F1	259-1337-00
S3	SWITCH, ROTARY: lever type; 4 circuit, 3 position, 1 section, 4 moving and 11 fixed contacts; Oak Mfg. Co. part no. 211952-187K1	259-1358-00
S4	DISK, SWITCHING: glass epoxy; 0.093 in. thk	547-2661-004
S5	DISK, SWITCHING: same as S4	547-2661-004
S6A	SEGMENT, SWITCH: glass base epoxy, rhodium gold plate; 0.093 in. thk (incls E7A)	547-2548-00
S6B	SEGMENT, SWITCH: same as S6A (incls E7B)	547-2548-00
S7	P/O R141	
T1	TRANSFORMER, INTERMEDIATE FREQUENCY: 485 kHz to 515 kHz, 500 kHz center freq, bandpass, 8 kHz min, 12 kHz max at 6 db, aluminum case; Communications Coil Co. part no. X-201-2	278-1764-00
T2	TRANSFORMER, INTERMEDIATE FREQUENCY: same as T1	278-1764-00
T3	TRANSFORMER, INTERMEDIATE FREQUENCY: 2 windings, freq range 485 kHz to 515 kHz, 500 kHz center freq, slug tuning, aluminum shield can; Communications Coil Co. part no. X-205-2	278-1765-00
T4	TRANSFORMER, AUDIO FREQUENCY: primary 10,000 ohms, secondary 150 ohms, 150 ohms; 600 ohms load; metal case	667-0522-00
T5	NOT USED	
T6	TRANSFORMER, POWER: primary 115 v, 115 v, 230 v connected; secondary 160 v dc, -30 v dc, 25.2 v; 50 to 60 Hz metal case; Stancor Electronics Inc. part no. 30400	662-0002-00
T7	TRANSFORMER, INTERMEDIATE FREQUENCY: tuning range 490 kHz to 510 kHz, 500 kHz center frequency, band pass 6 kHz min at 1 db, aluminum shield can; Communications Coil Co. part no. X-207-2	278-1766-00
T8	TRANSFORMER, AUDIO FREQUENCY: primary impedance 2500 ohms, secondary impedance 500 ohms tapped at 4 ohms, direct current rating pri 50 ma; Stancor Electronics, Inc. part no. 27232	667-0302-00
T9	TRANSFORMER, RADIO FREQUENCY: double tuned, primary resonant frequency 20 MHz shorted, 10 MHz; 2 windings; Communications Coil Co. part no. X-189-2	278-0542-00
T10	TRANSFORMER, RADIO FREQUENCY: same as T9	278-0542-00
T11	TRANSFORMER, RADIO FREQUENCY: 2 windings, 17.5 MHz resonant frequency; slug tuning; Communications Coil Co. part no. X-188-1	278-0541-00
*T12	TRANSFORMER ASSEMBLY: two matched units, 15.0 MHz, tunable from 14.6 to 15.5 MHz when used in conjunction w/ one another; pass band 1.1 MHz at 3 db points; Communications Coil Co. part no. X-209-2	278-0640-00
T13	TRANSFORMER ASSEMBLY: same as T12	278-0640-00
T14	TRANSFORMER, INTERMEDIATE FREQUENCY: 2 windings, frequency range 485 kHz to 515 kHz, center freq 500 kHz band pass 5 kHz min, 7 kHz max at 3 db, aluminum shield can; Communications Coil Co. part no. X-206-2	278-1763-00
T15	TRANSFORMER, INTERMEDIATE FREQUENCY: same as T14	278-1763-00
T16	TRANSFORMER, RADIO FREQUENCY: 2 windings, tuning range 24 to 32 megahertz, center freq 28 megahertz, aluminum shield can; Communications Coil Co. part no. X-364-1	278-0639-00
TB1	TERMINAL STRIP: barrier type w/ screw terminals; 800 v rms; 5 amps; 3/4 in. by 1-1/32 in. Kulka Electric Mfg. Co., Inc. part no. 599-2004-5	367-7343-00
TB2	TERMINAL BOARD: phenolic; 12 solder lug terminals; Vector Mfg. Co. part no. 6H-12	306-0909-00

*Replacement of both items is necessary to maintain desired electrical characteristics.

ITEM	DESCRIPTION	COLLINS PART NUMBER
TB3 thru TB12	TERMINAL BOARD: same as TB2	306-0909-00
V1	ELECTRON TUBE: glass envelope; pentode; Radio Corp. of America part no. 6DC6	255-0226-00
V2	ELECTRON TUBE: miniature pentode; Radio Corp. of America part no. 6EA8	255-0379-00
V3	ELECTRON TUBE: same as V2	255-0379-00
V4	ELECTRON TUBE: same as V2	255-0379-00
V5	ELECTRON TUBE: glass envelope; pentode; RCA type 6BA6	255-0185-00
V6	ELECTRON TUBE: twin triode; Radio Corp. of America part no. 12AX7	255-0201-00
V7	ELECTRON TUBE: same as V5	255-0185-00
V8	ELECTRON TUBE: same as V5	266-0185-00
V9	ELECTRON TUBE: same as V5	255-0185-00
V10	ELECTRON TUBE: same as V2	255-0379-00
V11	ELECTRON TUBE: double triode; Aeronautical Radio, Inc. part no. 5670	253-0002-00
V12	ELECTRON TUBE: pentode; General Electric part no. 6BF5	255-0330-00
V13	ELECTRON TUBE: pentode; Radio Corp. of America part no. 6AK6	257-0041-00
V14	ELECTRON TUBE: same as V6	255-0201-00
V15	ELECTRON TUBE: sharp cut off pentode; RCA type 7543	257-0301-00
V16	ELECTRON TUBE: same as V2	255-0379-00
V17	ELECTRON TUBE: same as V5	255-0185-00
XDS1	LAMPHOLDER: for use w/ miniature bayonet bulb; 1-3/8 in. lg overall; Micarta Fabrications, Inc. part no. DB 718	262-1210-00
XDS2	BUILT IN: P/O M1	
XF1	FUSEHOLDER: extractor post fuse; 15 amps, 250 v; Bussmann Fuse part no. HKP-HJR-ZZ	265-1019-00
XV1	SOCKET, ELECTRON TUBE: 7 pin miniature tube socket; molded construction, plastic; MIL type TS102P01	220-1111-00
XV2	SOCKET, ELECTRON TUBE: 9 pin miniature; brass & copper w/ plastic insulation; MIL type TS103P01	220-1103-00
XV3	SOCKET, ELECTRON TUBE: same as XV2	220-1103-00
XV4	SOCKET, ELECTRON TUBE: same as XV2	220-1103-00
XV5	SOCKET, ELECTRON TUBE: same as XV1	220-1111-00
XV6	SOCKET, ELECTRON TUBE: same as XV2	220-1103-00
XV7	SOCKET, ELECTRON TUBE: same as XV1	220-1111-00
XV8	SOCKET, ELECTRON TUBE: same as XV1	220-1111-00
XV9	SOCKET, ELECTRON TUBE: same as XV1	220-1111-00
XV10	SOCKET, ELECTRON TUBE: same as XV2	220-1103-00
XV11	SOCKET, ELECTRON TUBE: same as XV2	220-1103-00
XV12	SOCKET, ELECTRON TUBE: same as XV1	220-1111-00
XV13	SOCKET, ELECTRON TUBE: same as XV1	220-1111-00
XV14	SOCKET, ELECTRON TUBE: same as XV2	220-1103-00
XV15	SOCKET, TUBE: ceramic; 7 contacts; Cinch Mfg. Corp. part no. 111-11-22-057	220-1467-00
XV16	SOCKET, ELECTRON TUBE: same as XV2	220-1103-00
XV17	SOCKET, ELECTRON TUBE: same as XV1	220-1111-00
XY1 thru XY13	NOT USED	
XY14	SOCKET, CRYSTAL: 2 regularly spaced contact positions, cadmium plated phosphor bronze or beryllium copper; MIL type TS 0205C 01	292-0082-00
XY15	SOCKET, CRYSTAL: same as XY14	292-0082-00
XY16	NOT USED	
XY17	SOCKET, CRYSTAL: same as XY14	292-0082-00
Y1	CRYSTAL UNIT, QUARTZ: 12.50000 MHz frequency range; Midland Mfg. Co. Inc. part no. MO-1567 (p/o A10)	289-1567-00
Y2	CRYSTAL UNIT, QUARTZ: 11.50000 MHz frequency range; Midland Mfg. Co. Inc. part no. MO-1568 (p/o A10)	289-1568-00
Y3	CRYSTAL UNIT, QUARTZ: 10.50000 MHz frequency range; Midland Mfg. Co. Inc. part no. MO-1569 (p/o A10)	289-1569-00
Y4	CRYSTAL UNIT, QUARTZ: 9.50000 MHz frequency range; Midland Mfg. Co. Inc. part no. MO-1570 (p/o A10)	289-1570-00
Y5	CRYSTAL UNIT, QUARTZ: 8.50000 MHz frequency range; Midland Mfg. Co., Inc. part no. MO-1571 (p/o A10)	289-1571-00
Y6	CRYSTAL UNIT, QUARTZ: 10.00000 MHz frequency range; Midland Mfg. Co., Inc. part no. MO-1572 (p/o A10)	289-1572-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
Y7	CRYSTAL UNIT, QUARTZ: 11.00000 MHz frequency range; Midland Mfg. Co., Inc. part no. MO-1573 (p/o A10)	289-1573-00
Y8	CRYSTAL UNIT, QUARTZ: 12.00000 MHz frequency range; Midland Mfg. Co., Inc. part no. MO-1574 (p/o A10)	289-1574-00
Y9	CRYSTAL UNIT, QUARTZ: 13.00000 MHz frequency range Midland Mfg. Co., Inc. part no. MO-1575 (p/o A10)	289-1575-00
Y10	CRYSTAL UNIT, QUARTZ: 14.00000 MHz frequency range; Midland Mfg. Co., Inc. part no. MO-1576 (p/o A10)	289-1576-00
Y11	CRYSTAL UNIT, QUARTZ: 15.00000 MHz frequency range; Midland Mfg. Co., Inc. part no. MO-1577 (p/o A10)	289-1577-00
Y12	CRYSTAL UNIT, QUARTZ: 16.00000 MHz frequency range; Midland Mfg. Co., Inc. part no. MO-1582 (p/o A10)	289-1582-00
Y13	CRYSTAL UNIT, QUARTZ: 9.00000 MHz frequency range; Midland Mfg. Co., Inc. part no. MO-1578 (p/o A10)	289-1578-00
Y14	CRYSTAL UNIT, QUARTZ: 100.00000 kHz frequency range; Scientific Radio Products, Inc. part no. SC-37-100R	289-1424-00
Y15	CRYSTAL UNIT, QUARTZ: 500.00000 kHz frequency range; MIL type CR63U500-000KC	289-7064-010
Y16	CRYSTAL UNIT, QUARTZ: same as Y10	289-1576-00
Y17	CRYSTAL UNIT, QUARTZ: 17.50000 MHz frequency range; McCoy Electronics Co. part no. 289-1587-00	289-1587-00
Y18	CRYSTAL UNIT, QUARTZ: 13.50000 MHz frequency range; Midland Mfg. Co., Inc. part no. MO-1579 (p/o A10)	289-1579-00
Y19	CRYSTAL UNIT, QUARTZ: 14.50000 MHz frequency range; Midland Mfg. Co., part no. MO-1580 (p/o A10)	289-1580-00
Y20	CRYSTAL UNIT, QUARTZ: 10.333 MHz frequency range (p/o A10)	289-6996-010
	51S-1A RECEIVER	522-2546-00
	51S-1A is identical to 51S-1 with the exception of the following Power Supply Test.	
C401	CAPACITOR, FIXED, DRY ELECTROLYTIC: 150 uf, -10%, +100%, 50 v dc; Sprague Electric part no. D27276	183-1307-00
C402	CAPACITOR, FIXED, CERAMIC: 0.02 uf, +100%, -20%, 500 v dc; Erie Resistor part no. 841011 W5V0 203Z	913-2142-00
C403	CAPACITOR, FIXED, CERAMIC: same as C402	913-2142-00
C404	CAPACITOR, FIXED, ELECTROLYTIC: 3 sections each 40 uf, -10% +100%, 250 v dc	183-0723-00
C405	CAPACITOR, FIXED, ELECTROLYTIC: 35 uf, -10% +100%, 50 v dc; Sprague Electric part no. D27950	183-1381-00
C406	CAPACITOR, FIXED CERAMIC: 10,000 uuf, ±20% 500 v dc	913-3013-00
C407 thru C409	CAPACITOR, FIXED, CERAMIC: same as C406	913-3013-00
C410	CAPACITOR, FIXED, DRY ELECTROLYTIC: same as C401	183-1307-00
C411	CAPACITOR, FIXED, ELECTROLYTIC: same as C405	183-1381-00
C412	CAPACITOR, FIXED, CERAMIC: same as C406	913-3013-00
C413	CAPACITOR, FIXED, CERAMIC: same as C406	913-3013-00
CR401	SEMICONDUCTOR DEVICE, DIODE: silicon; Motorola Inc. part no. 1N1492	353-1665-00
CR402	SEMICONDUCTOR DEVICE, DIODE: same CR401	353-1665-00
CR403	SEMICONDUCTOR DEVICE, DIODE: silicon; Motorola, Inc. part no. 1N1693	353-1663-00
F401	FUSE, CARTRIDGE: 6 amps current; 250 v ac or dc; normal instantaneous; MIL type F02A250V6AS	264-4100-00
L401	COIL, RADIO FREQUENCY: single layer wound; 26 turns no. 14 AWG wire; 2.218 in. lg by 31/32 in. w	240-0021-00
L402	COIL, RADIO FREQUENCY: same as L401	240-0021-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
L403	COIL, RADIO FREQUENCY: single layer wound; 120 uh; 425 ma current; 4 ohms; Jeffers Electronics Div. of Speer Carbon Co. part no. 10404-36	240-0194-00
L404	COIL, RADIO FREQUENCY: same as L403	240-0194-00
L405	COIL, RADIO FREQUENCY: same as L403	240-0194-00
Q401	TRANSISTOR: germanium; Bendix part no. 2N637B	352-0203-00
Q402 thru Q404	TRANSISTOR: same as Q401	352-0203-00
R401	RESISTOR, FIXED, COMPOSITION: 150 ohms, ±10%, 1/2 w; MIL type RC20GF151K	745-1317-00
R402	RESISTOR, FIXED, COMPOSITION: 4700 ohms, ±10%, 1 w; MIL type RC32GF472K	745-3380-00
R403	RESISTOR, FIXED, COMPOSITION: same as R401	745-1317-00
R404	RESISTOR, FIXED, COMPOSITION: same as R402	745-3380-00
R405	RESISTOR, FIXED, COMPOSITION: same as R402	745-3380-00
R406	RESISTOR, FIXED, COMPOSITION: same as R401	745-1317-00
R407	RESISTOR, FIXED, WIREWOUND: 100 ohms, ±10%, 5 w; International Resistance Co. part no. PW5-1000-10	710-9109-00
R408	RESISTOR, FIXED, WIREWOUND: same as R407	710-9109-00
R409	RESISTOR, FIXED, COMPOSITION: 1000 ohms, ±10%, 1/2 w; MIL type RC20GF102K	745-1352-00
R410	RESISTOR, FIXED, COMPOSITION: same as R409	745-1352-00
R411	RESISTOR, FIXED, COMPOSITION: 1000 ohms, ±10%, 1 w; MIL type RC32F102K	745-3352-00
T401	TRANSFORMER, SATURABLE CORE: 5 windings, pri. secondary, 3 feedback, for use w/ transistorized dc to dc Power supply; Communication Accessories Co. part no. 76-0093-58	664-1023-00
XF401	FUSEHOLDER: extractor post type, 15 amps, 250 v; Bussmann Fuse Division of McGraw-Edision Co. part no. HKP-HJR-ZZ	265-1019-00
	70K-7 OSCILLATOR	522-2918-00
*C501	CAPACITOR, FIXED, CERAMIC: 20 uuf, ±20%, 500 v dc; Centralab part no. DA33-047	913-2877-00
*C501	CAPACITOR, FIXED, CERAMIC: 20 uuf, ±20%, 500 v dc; Centralab part no. DA933-052	913-2878-00
*C501	CAPACITOR, FIXED, CERAMIC: 20 uuf, ±20%, 500 v dc; Centralab part no. DA933-051	913-2879-00
*C501	CAPACITOR, FIXED, CERAMIC: 20 uuf, ±20%, 500 v dc; Centralab part no. DA933-050	913-2880-00
*C501	CAPACITOR, FIXED, CERAMIC: 20 uuf, ±20%, 500 v dc; Centralab part no. DA933-049	913-2881-00
*C501	CAPACITOR, FIXED, CERAMIC: 20 uuf, ±20%, 500 v dc; Centralab part no. DA933-048	913-2882-00
*C502	CAPACITOR, FIXED, CERAMIC: 20 uuf, ±20%, 500 v dc; Centralab part no. DA933-047	913-2877-00
*C502	CAPACITOR, FIXED, CERAMIC: 20 uuf, ±20%, 500 v dc; Centralab part no. DA933-052	913-2878-00
*C502	CAPACITOR, FIXED, CERAMIC: 20 uuf, ±20%, 500 v dc; Centralab part no. DA933-051	913-2879-00
*C502	CAPACITOR, FIXED, CERAMIC: 20 uuf, ±20%, 500 v dc; Centralab part no. DA933-050	913-2880-00
*C502	CAPACITOR, FIXED, CERAMIC: 20 uuf, ±20%, 500 v dc; Centralab part no. DA933-049	913-2881-00
*C502	CAPACITOR, FIXED, CERAMIC: 20 uuf, ±20%, 500 v dc; Centralab part no. DA933-048	913-2882-00
C503	CAPACITOR, VARIABLE, GLASS: 1.0 uuf min to 14.0 uuf max, 1000 v dc; JFD Electronics Corp. part no. MC601	922-0611-00
C504	CAPACITOR, FIXED, CERAMIC: 380 uuf, ±1%, 250 v dc; Sprague Electric Co. of Wisconsin part no. 81C1	913-2323-00
C505	CAPACITOR, FIXED, MICA: 68 uuf, ±2%, 500 v dc; Electro Motive Mfg. Co. part no. DM10F680G	912-3868-00
C506	CAPACITOR, FIXED, MICA: 27 uuf, ±2%, 500 v dc; Electro Motive Mfg. Co. part no. DM10E270G	912-3845-00

*Chosen per operational requirement.

ITEM	DESCRIPTION	COLLINS PART NUMBER
C507	CAPACITOR, FIXED, CERAMIC: 0.02 uf, -40% +60%, 250 v dc	913-2097-00
E501	TUBE, SHIELD: c/o base and envelope shield with liner; Atlas E-E Corp. part no. 9701B	141-0557-00
L501	COIL, RADIO FREQUENCY: molded; 21 turns no. 30 electrical wire; 2.600 in. lg, 1.000 in. dia	547-2780-003
L502	COIL, RADIO FREQUENCY: 6 turns, single layer wound; no. 28 AWG heavy formvar wire	555-0154-002
R501	RESISTOR, FIXED, COMPOSITION: 27,000 ohms, ±10%, 1/2 w; MIL type RC20GF273K	745-1412-00
R502	RESISTOR, FIXED, COMPOSITION: 120 ohms ±10%, 1/2 w; MIL type RC20GF121K	745-1314-00
R503	RESISTOR, FIXED, COMPOSITION: 68,000 ohms, ±10%, 1/2 w; MIL type RC20GF683K	745-1429-00
R504	RESISTOR, FIXED, COMPOSITION: 470 ohms, ±10%, 1/2 w; MIL type RC20GF471K	745-1338-00
T501	TRANSFORMER, RADIO FREQUENCY: 2 windings; 4.5 v ac input, 0.9 v ac output	549-0708-003
V501	ELECTRON TUBE: same as V15	257-0301-00
	51S-1AF RECEIVER All electrical parts same as 51S-1A	522-3156-00
	51S-1F RECEIVER All electrical parts same as 51S-1	522-2498-00
	28-VOLT DC POWER SUPPLY Parts are those listed for 51S-1A	547-3930-00
	ACCESSORIES FOR 51S-1/1A/1F/1AF RECEIVER	
	ALIGNMENT TOOL, ELECTRONIC EQUIPMENT: screwdriver type, 2 working ends; nonmetallic screwdriver tip; plastic body; 7 in. lg o/a (qty 1)	547-2796-002
MP1	Rubber mounting feet	200-5010-00
MP2	Front legs	543-8101-002
MP3	Knob springs p/o Q1	340-0802-00
MP4	Knob springs p/o Q2	340-0802-00
MP5	Knob springs p/o Q3	340-0802-00
	51S-1B RECEIVER	522-3857-003
	The 51S-1B is identical to the 51S-1 with the following exceptions:	
MP59	PLATE, MOUNTING: aluminum; 3/8 in. by 14-11/32 in. x 14-3/4 in.	767-6252-001
P7	DUMMY LOAD, ELECTRICAL: 100 ohms	544-3143-002
--	350D-5 BASE SHOCKMOUNT	522-3970-001
--	JUNCTION BOX	767-6254-001

ITEM	DESCRIPTION	COLLINS PART NUMBER
	350D-5 BASE SHOCKMOUNT	522-3970-001
MP1	BOLT ASSEMBLY, CLAMP: 3/4 in. dia by 2.593 in. by approx o/a dim.	757-4190-001
MP2	BOLT ASSEMBLY, CLAMP: same as MP1	757-4190-001
MP3	MOUNT RESILIENT: rubber and metal, designed to utilize air damping to limit excursion at resonance and give constant resonant frequency throughout an appropriate two-to-one load range 1.359 in. by 1.812 in. by 1.812 in. o/a dim; Barry Controls Division of Barry Wright Corp. part no. 770-9G	220-0312-00
MP4	MOUNT RESILIENT: same as MP3	200-0312-00
MP5	MOUNT RESILIENT: same as MP3	200-0312-00
MP6	MOUNT RESILIENT: same as MP3	200-0312-00
MP7	LEAD ASSEMBLY, ELECTRICAL: No. 18 AWG copper braided wire; 4.468 in. lg; terminated ea end w/lug terminal	505-2784-002
MP8	LEAD ASSEMBLY, ELECTRICAL: same as MP7	505-2784-002
MP9	LEAD ASSEMBLY, ELECTRICAL: same as MP7	505-2794-002
MP10	LEAD ASSEMBLY, ELECTRICAL: same as MP7	505-2784-002
	INTERCONNECTING BOX	767-6254-001
J101	CONNECTOR, RECEPTACLE, ELECTRICAL: 10 male contacts, 500 vac, 700 v dc, 7.5 amps; 0.743 in. by 1.031 in. by 1.031 in.; MS type MS3112E12-10P	371-2156-00
J102	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 female coaxial contact, 50 ohms nom impedance; Teflon insulation; Joint Electronic Type Designation System part no. UG-625B/U	357-9670-00
P1	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: 8 strands no. 36 AWG copper wire, 2 strands no. 31 AWG bronze wire, polyethylene dielectric, single shield, polyvinyl jacket; terminated one end w/phono plug, other end stripped and tinned; 9 in. lg excl terminations	426-1809-00
P4	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: 8 strands no. 36 AWG copper wire, 2 strands no. 31 AWG bronze wire, polyethylene dielectric, single shield, polyvinyl jacket; terminated one end w/phono-plug, other end stripped and tinned; 9 in. lg excl terminations	426-1811-00
P5	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: same as P1	426-1809-00
P10	CONNECTOR, RECEPTACLE, ELECTRICAL: 9 female contacts; 3800 v rms, 60 cps, 5 amps; Amphenol-Borg Electronics Corp., part no. 78-S9M-1001	372-1953-00

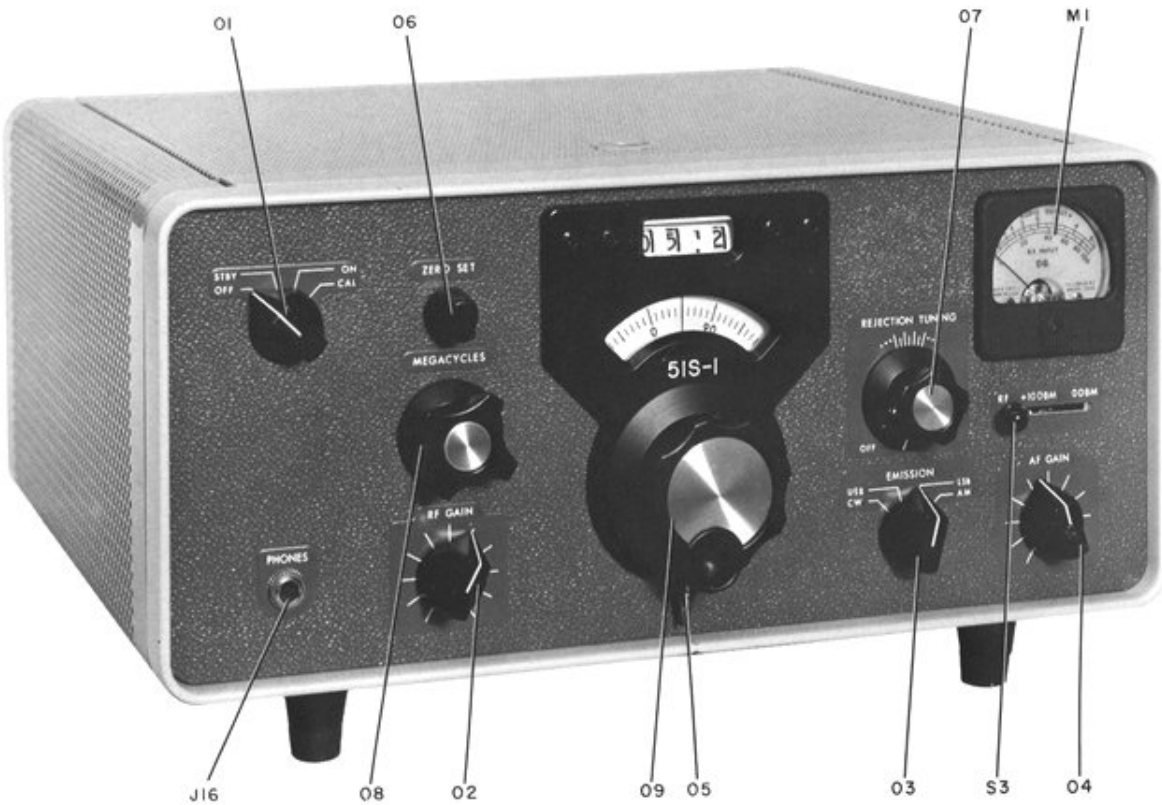


Figure 6-1. Panel Parts Location, Overall View

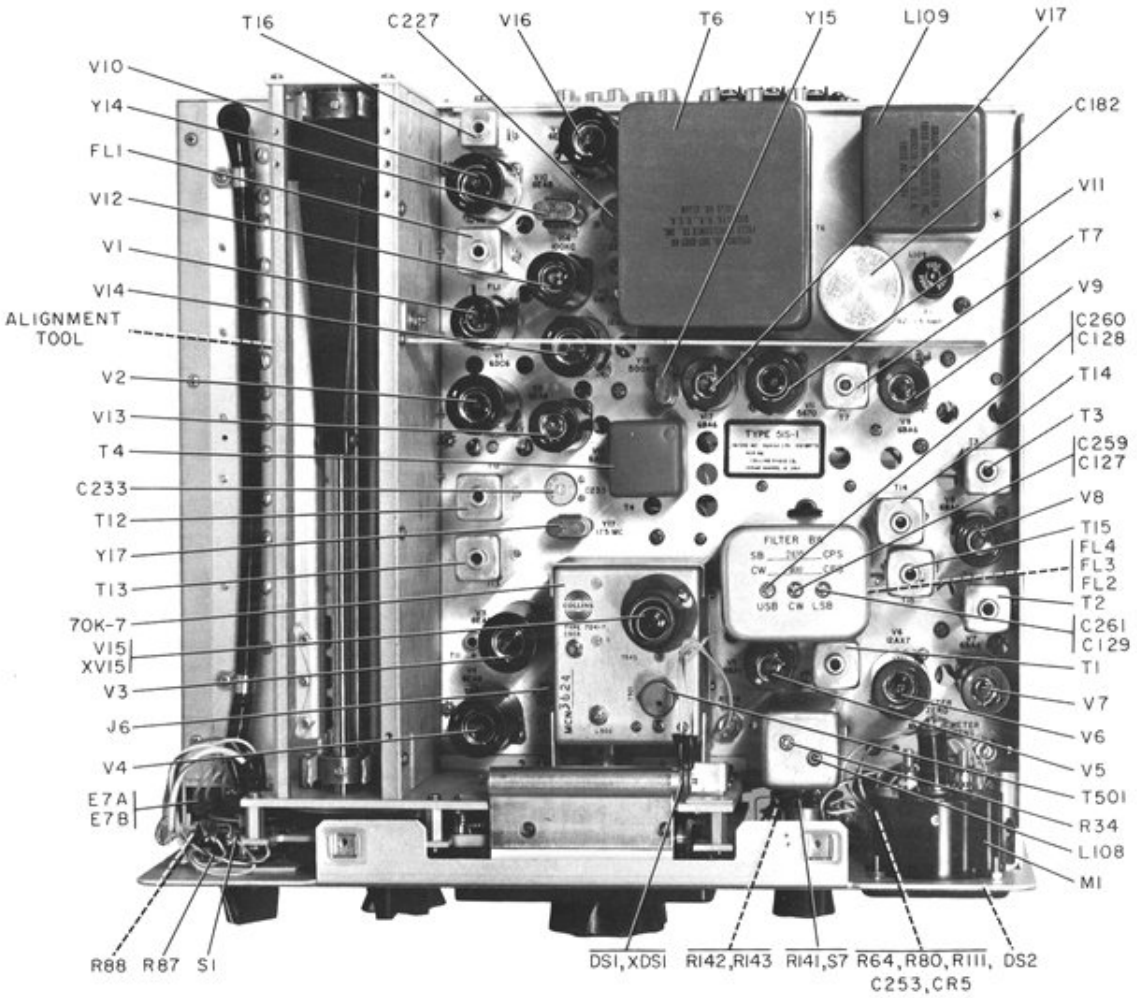


Figure 6-2. Top View, Parts Location

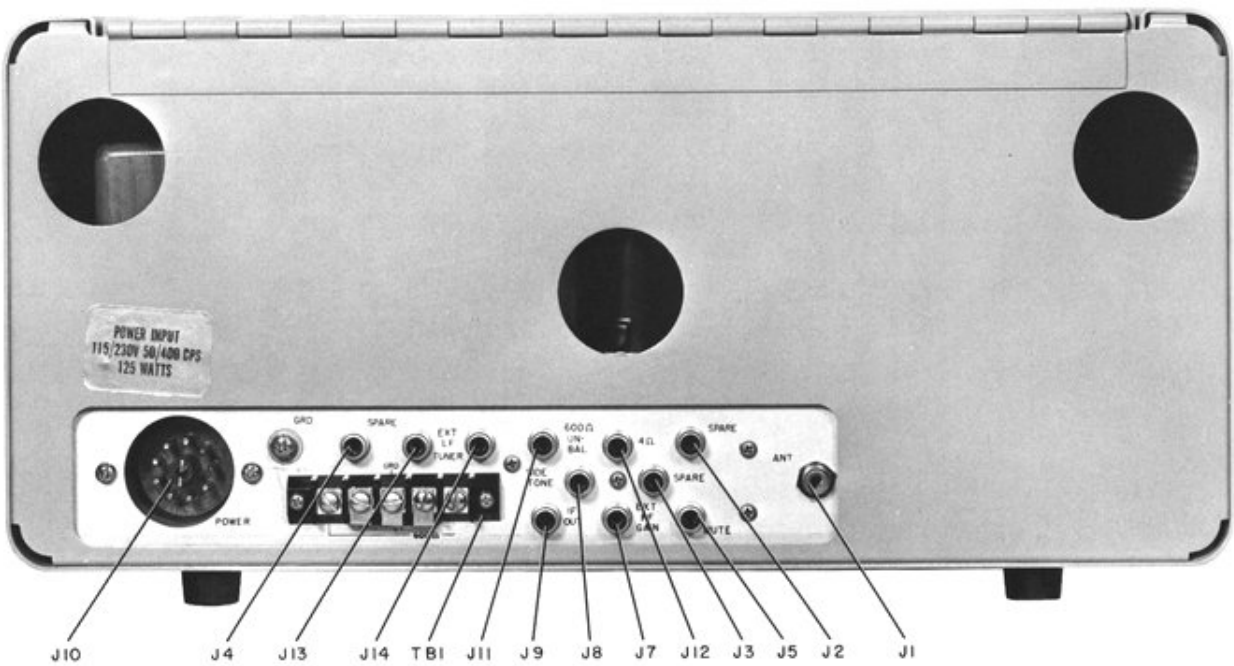


Figure 6-3. Rear View, Parts Location

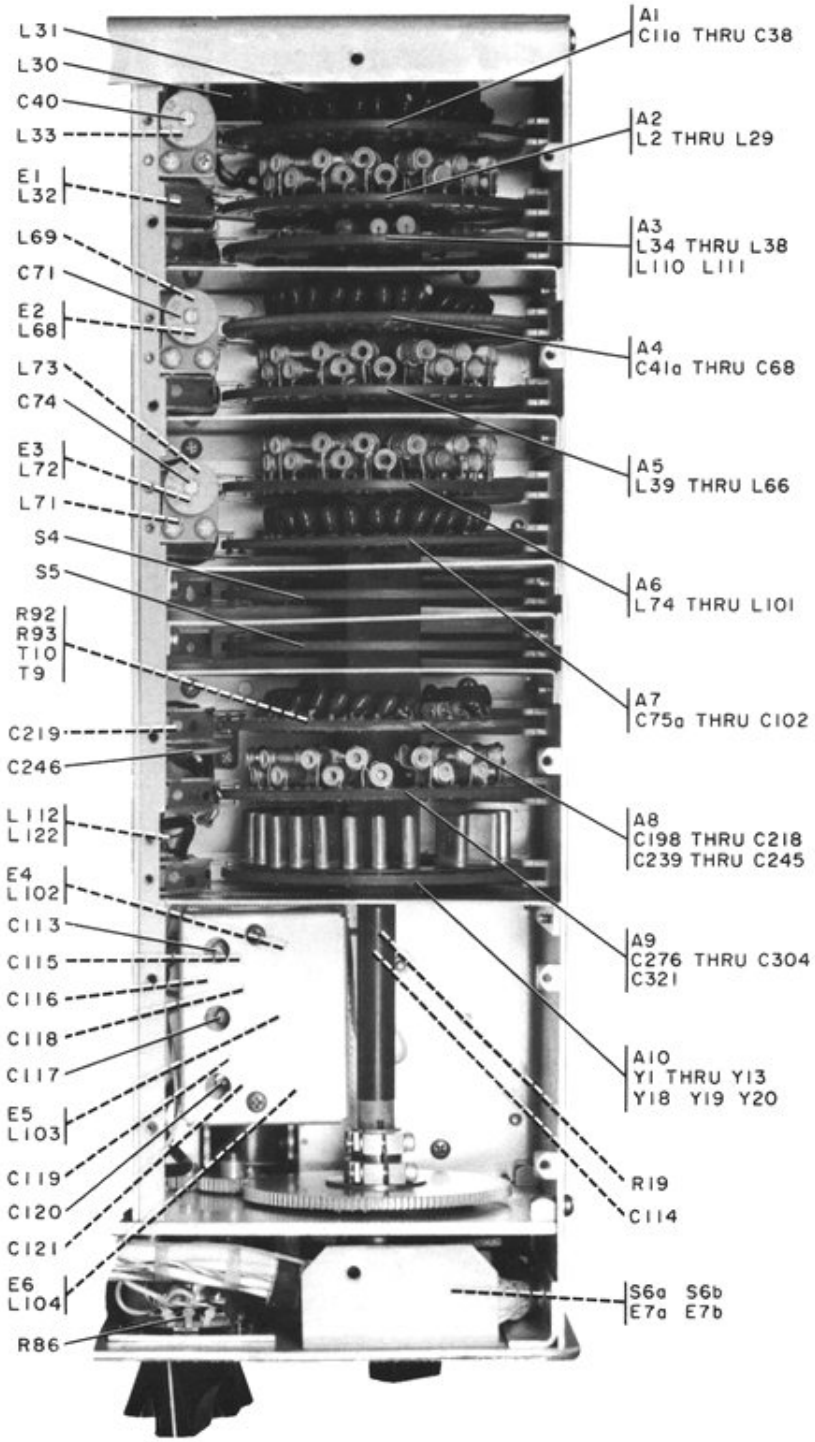


Figure 6-4. Bottom Right View, Parts Location

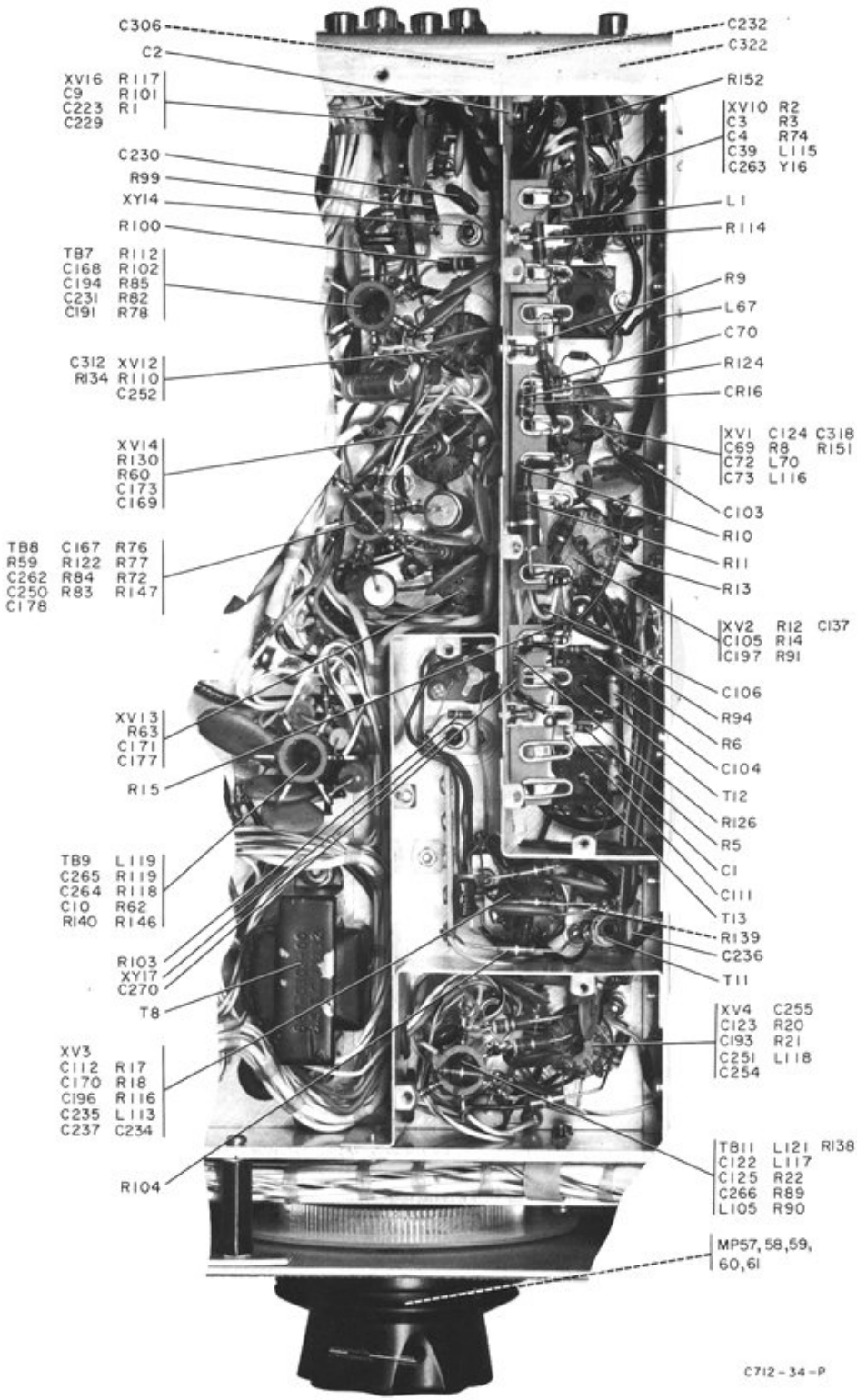


Figure 6-5. Bottom Center View, Parts Location

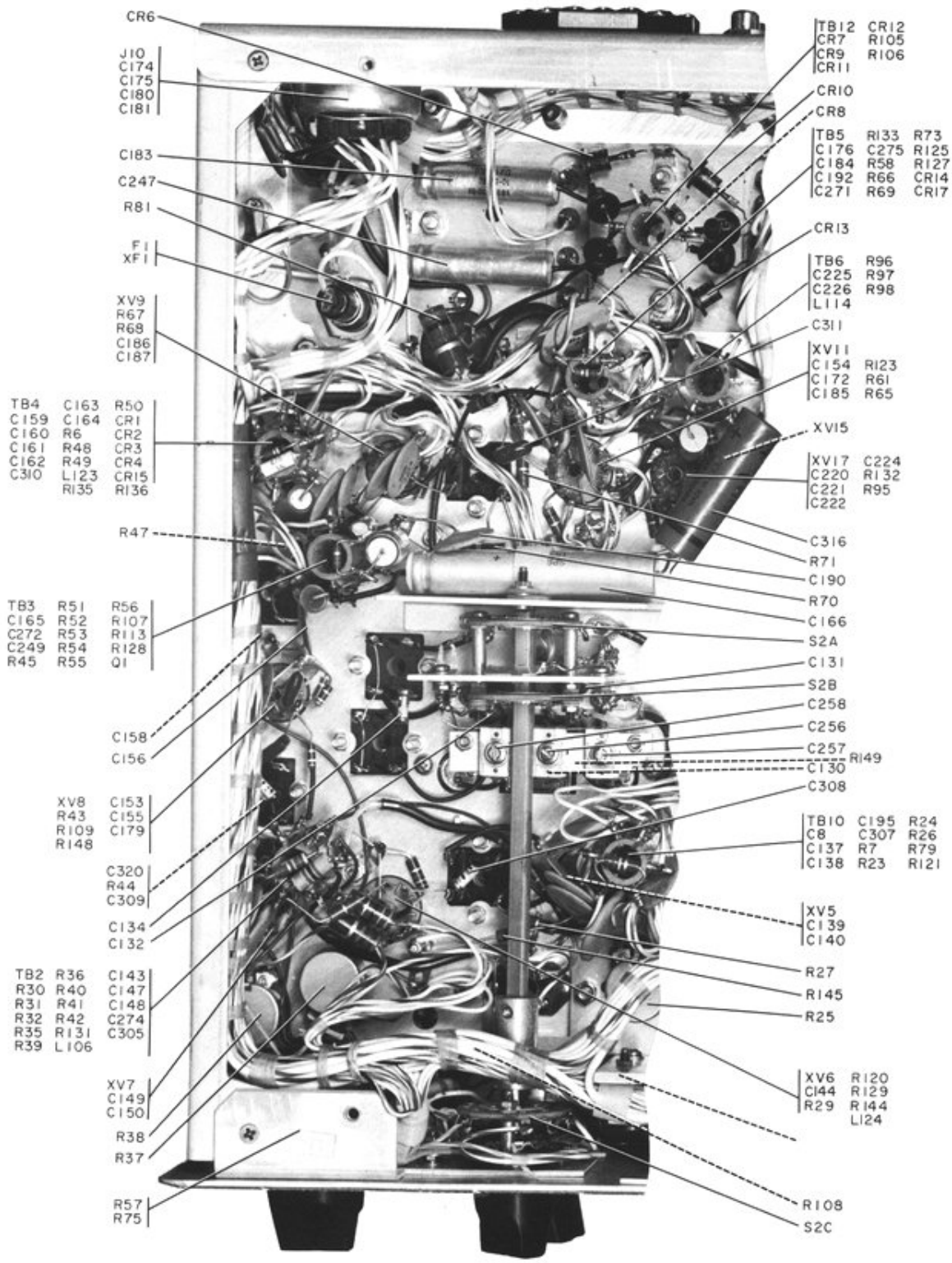


Figure 6-6. Bottom Left View, Parts Location

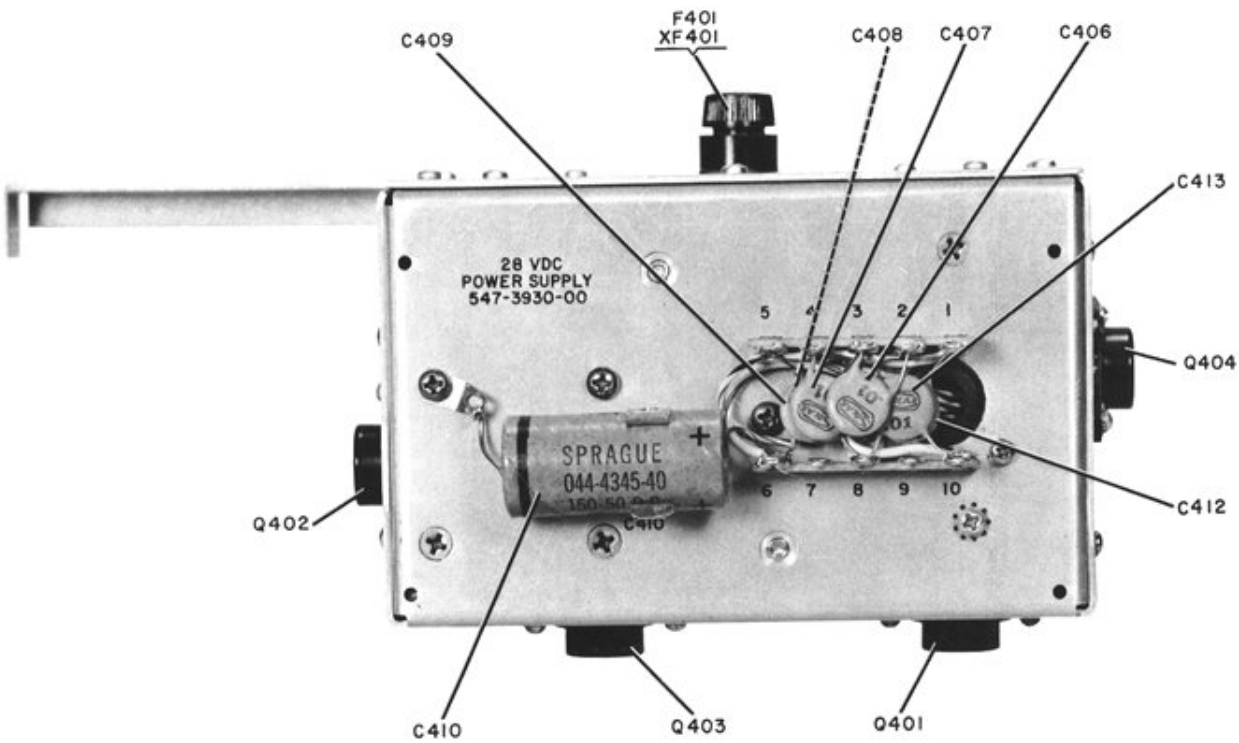


Figure 6-7. 28-Volt DC Power Supply, Bottom View, Parts Location

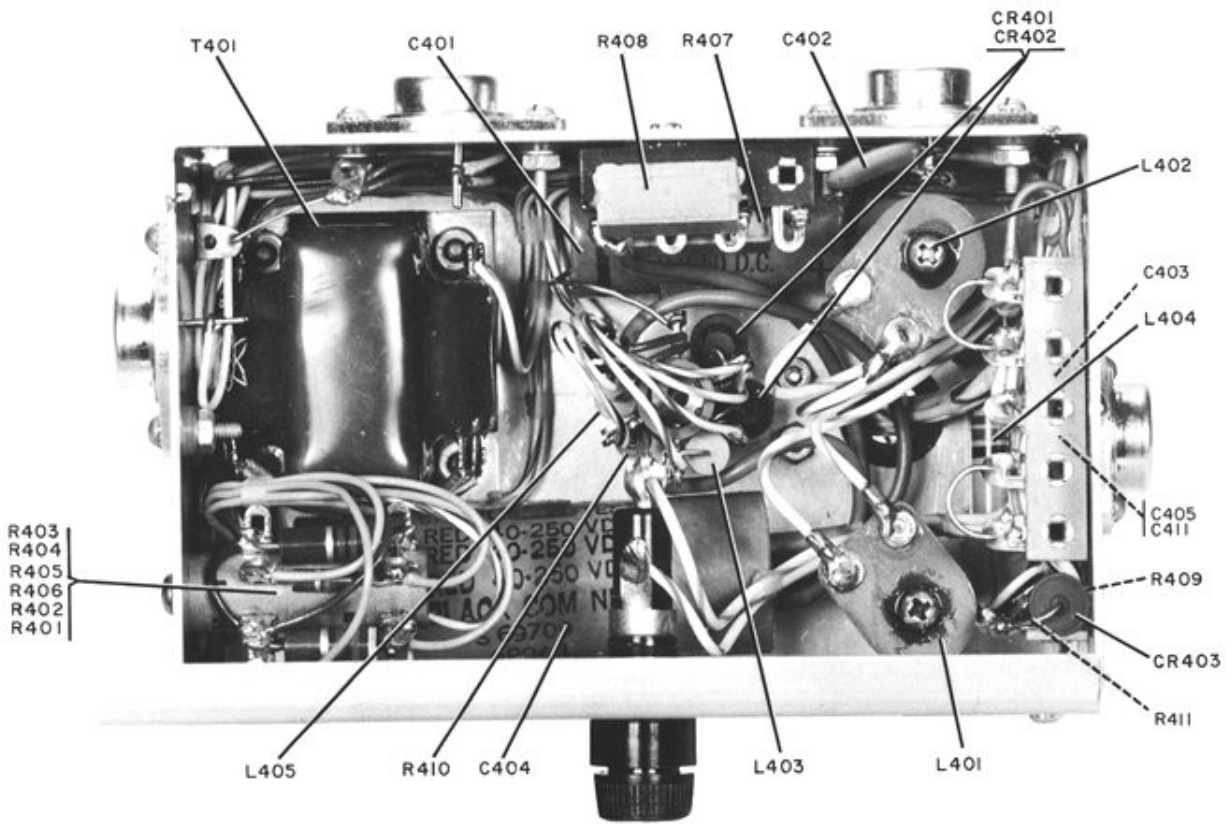


Figure 6-8. 28-Volt DC Power Supply, Top View, Parts Location

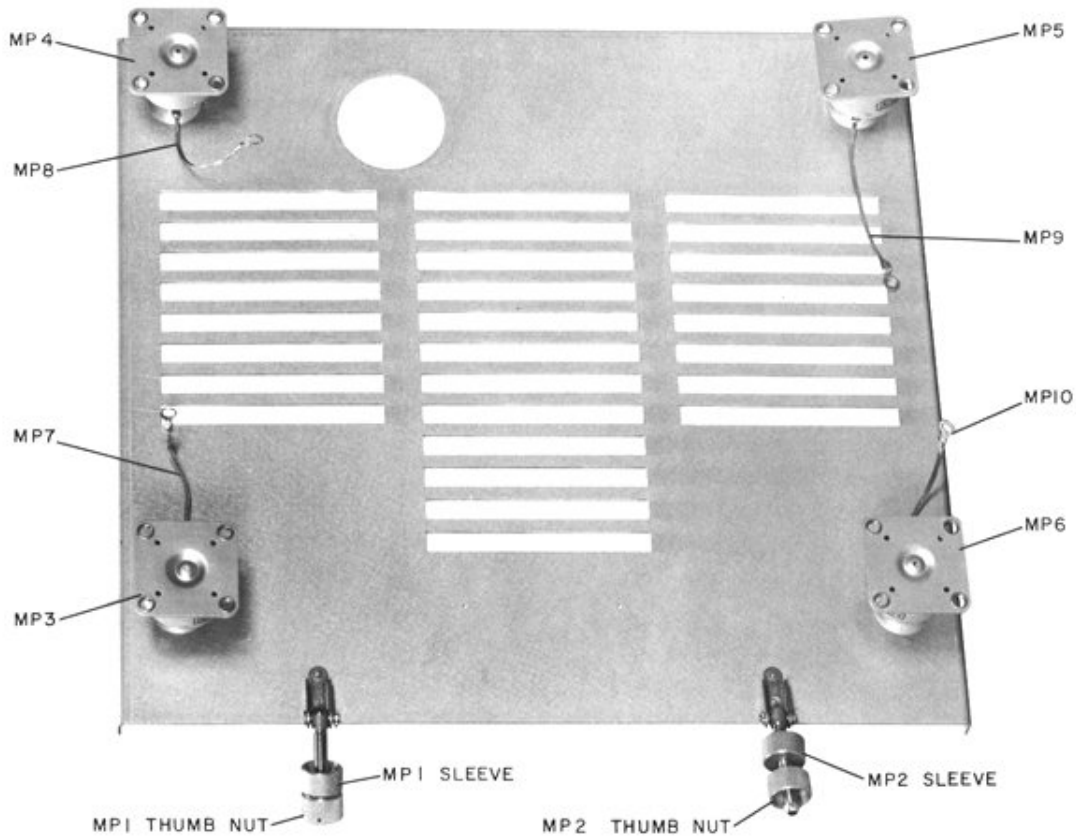
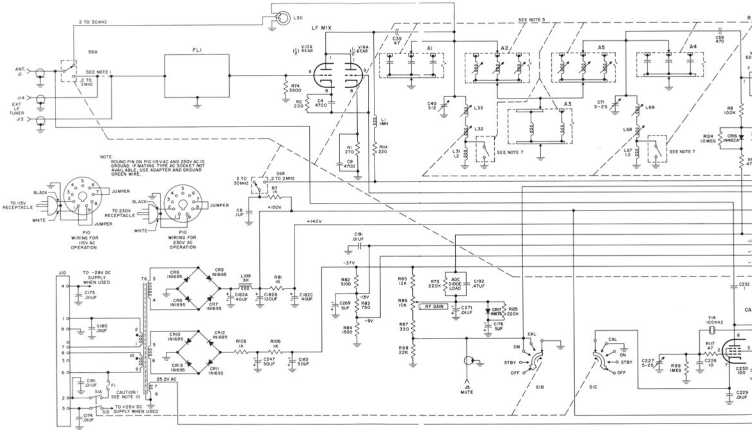
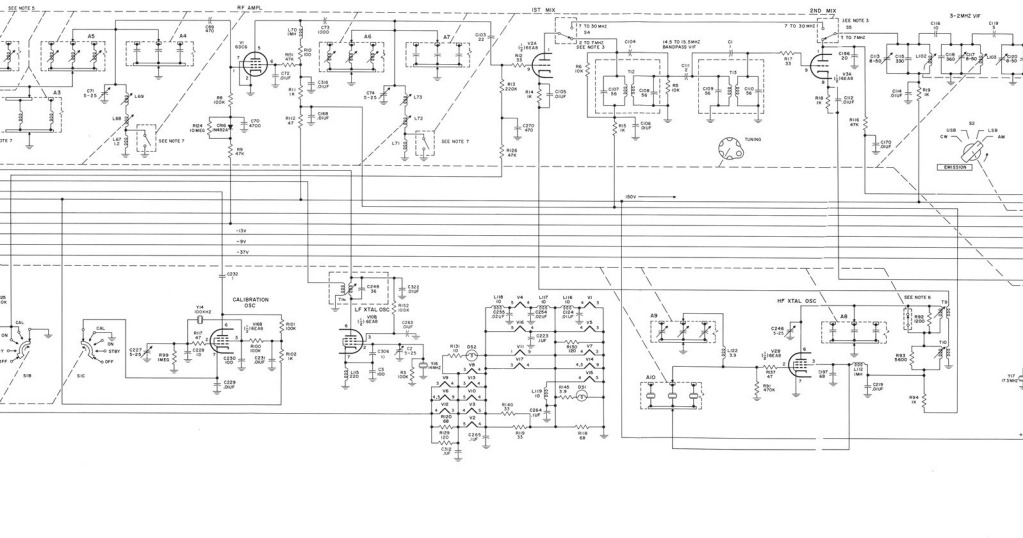
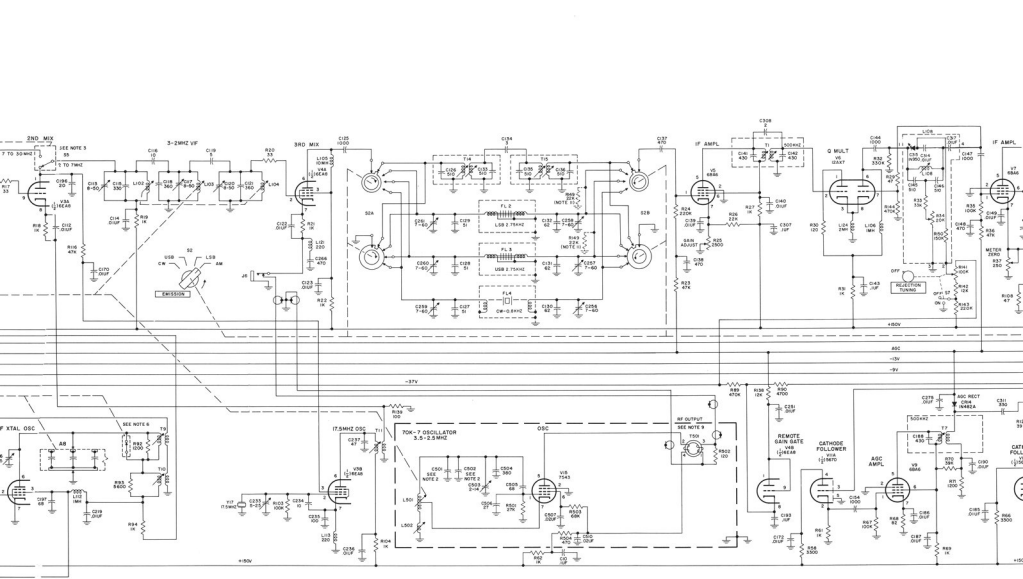


Figure 6-9. 350D-5 Base Shockmount, Bottom View, Parts Location







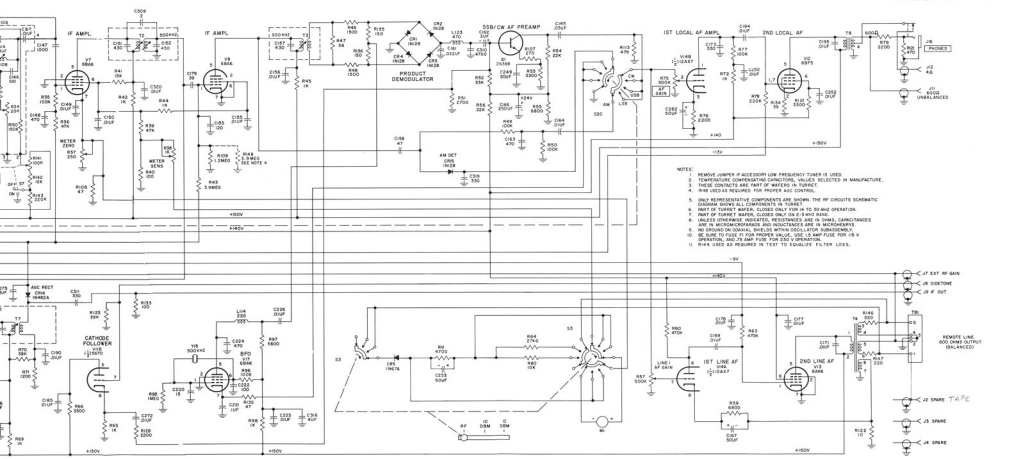
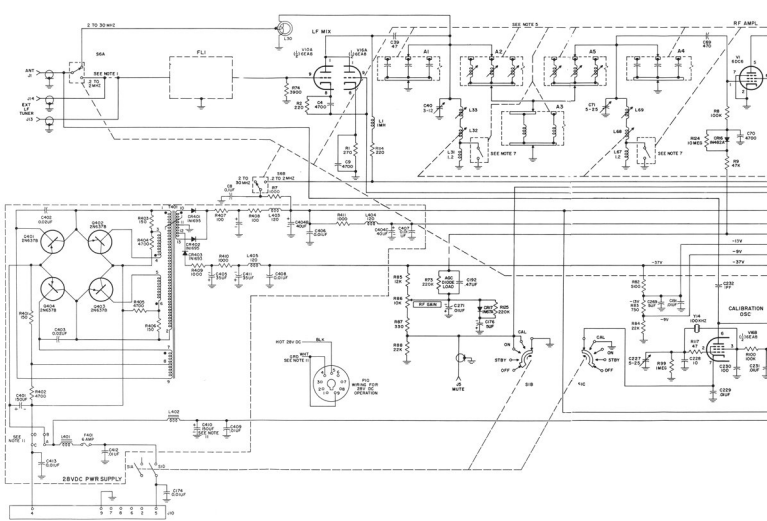
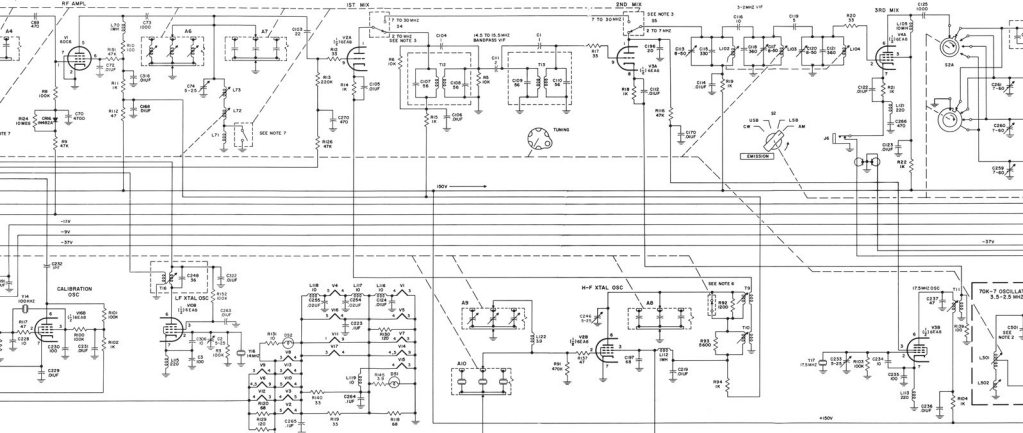
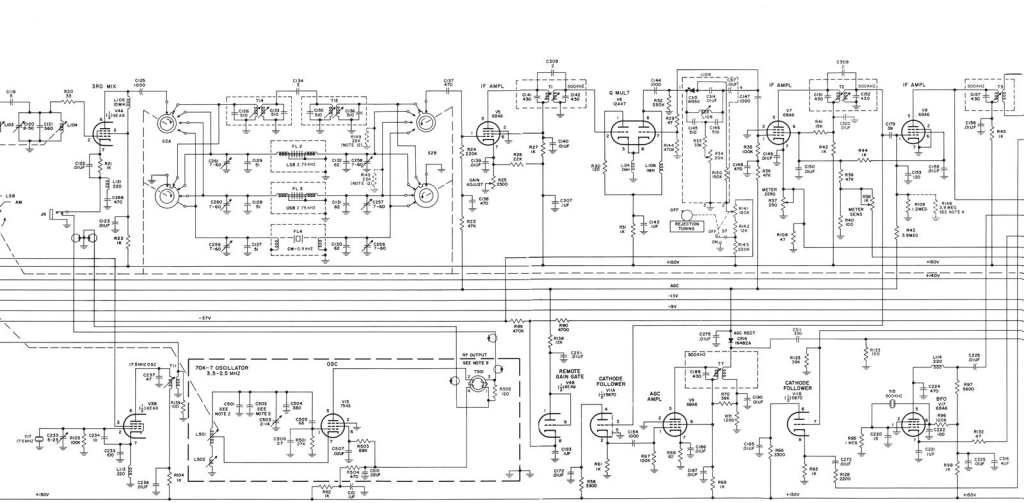


Figure 7-1. 51S-1/IF Receiver, Schematic Diagram







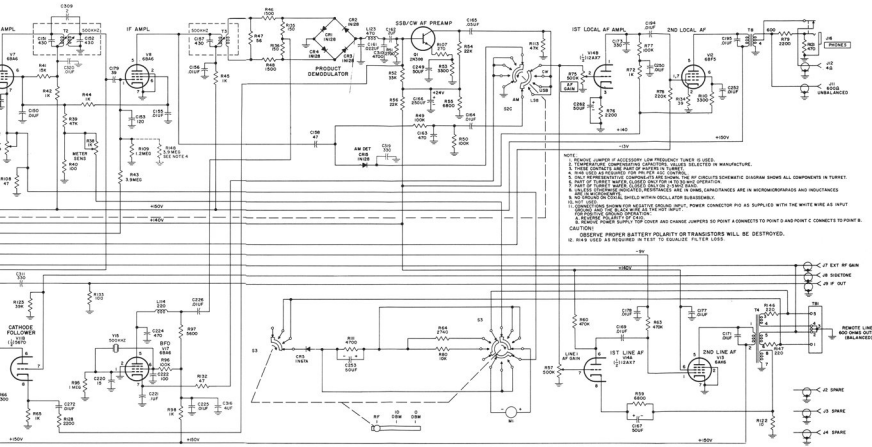
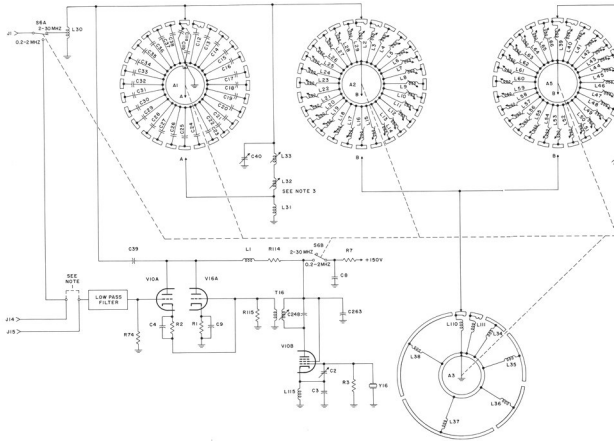
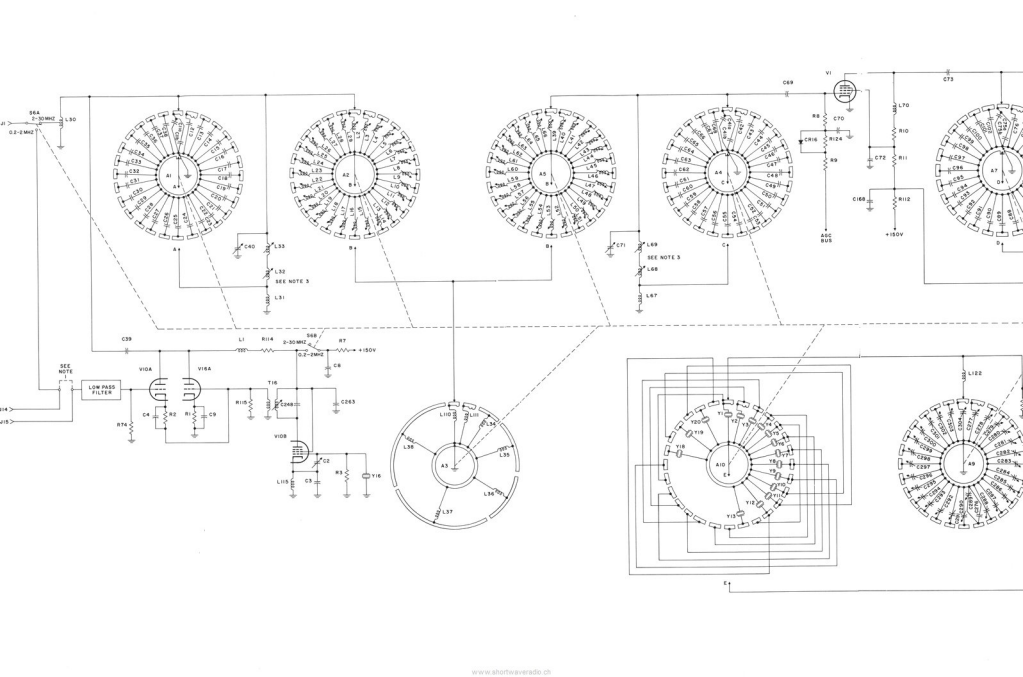


Figure 7-2. 51S-1A/1AF Receiver, Schematic Diagram





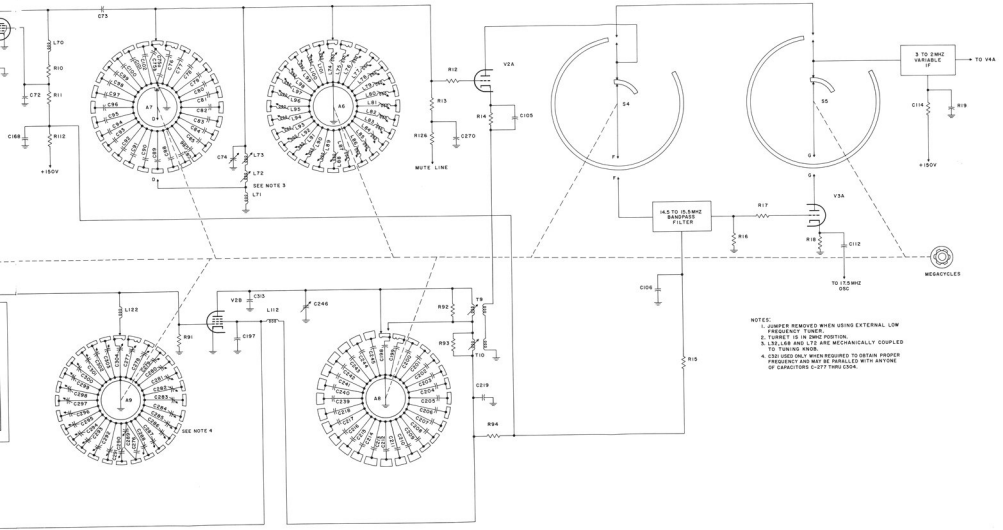


Figure 7-3. Turret and RF Section, Schematic Diagram

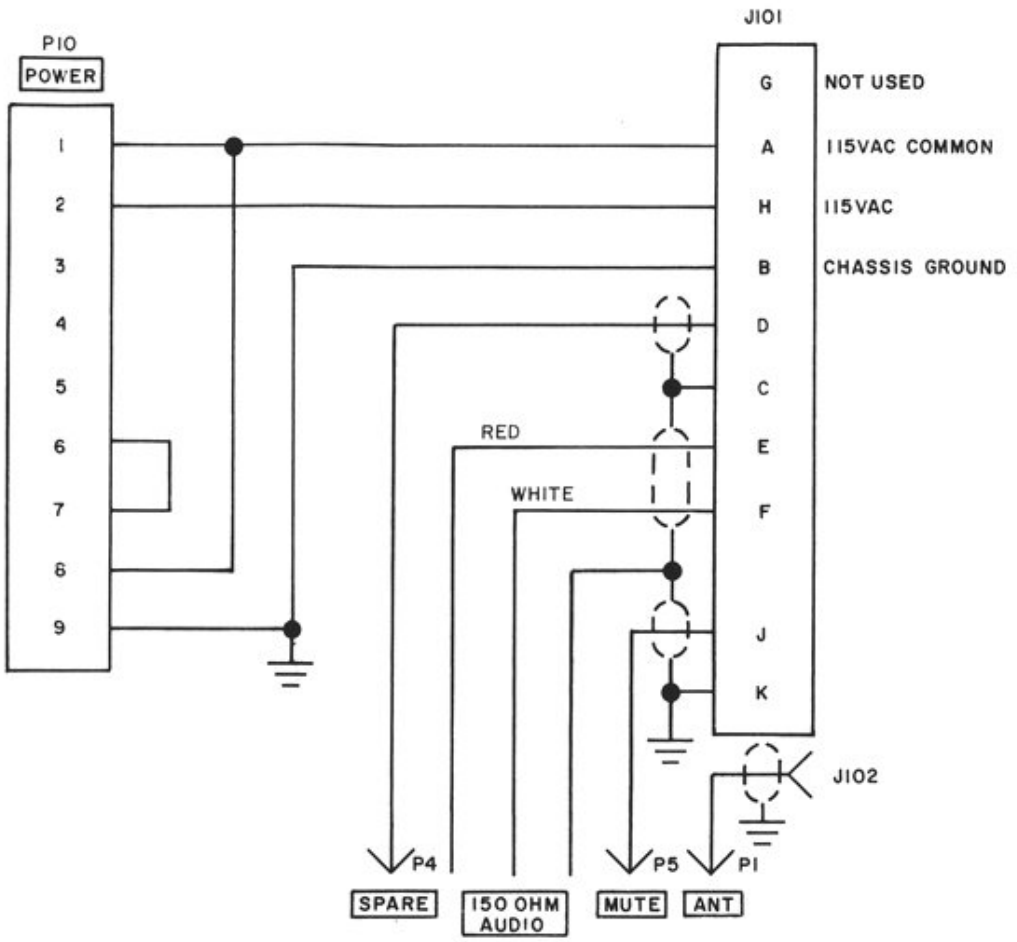


Figure 7-4. 51S-1B Junction Box, Schematic Diagram

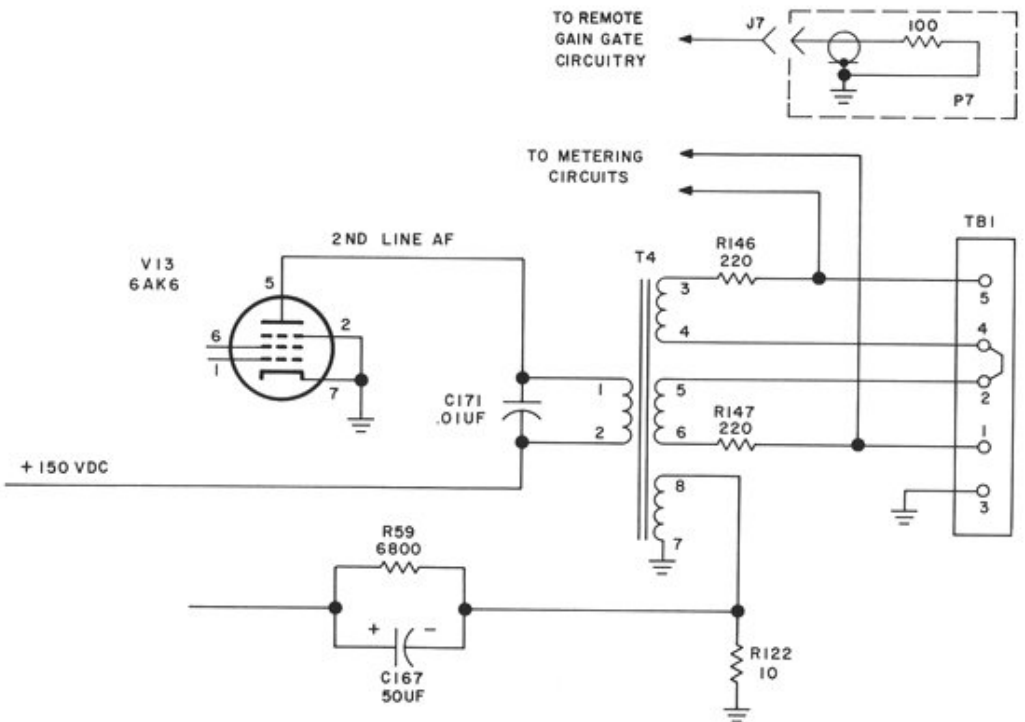


Figure 7-5. 51S-1B Output Circuit, Partial Schematic Diagram

COLLINS