

GENERAL PURPOSE COMMUNICATION RECEIVER

R.C.A.F. TYPE G.R.-10

REFERENCE No.

Receiver — 10D/3526

Loudspeaker, Type 3-10A/3527

R.C.A.F. Specification Rad. 11-1

INSTRUCTIONS

Manufactured for

Royal Canadian Air Force

by

RCA Victor Company, Limited

Montreal, Canada

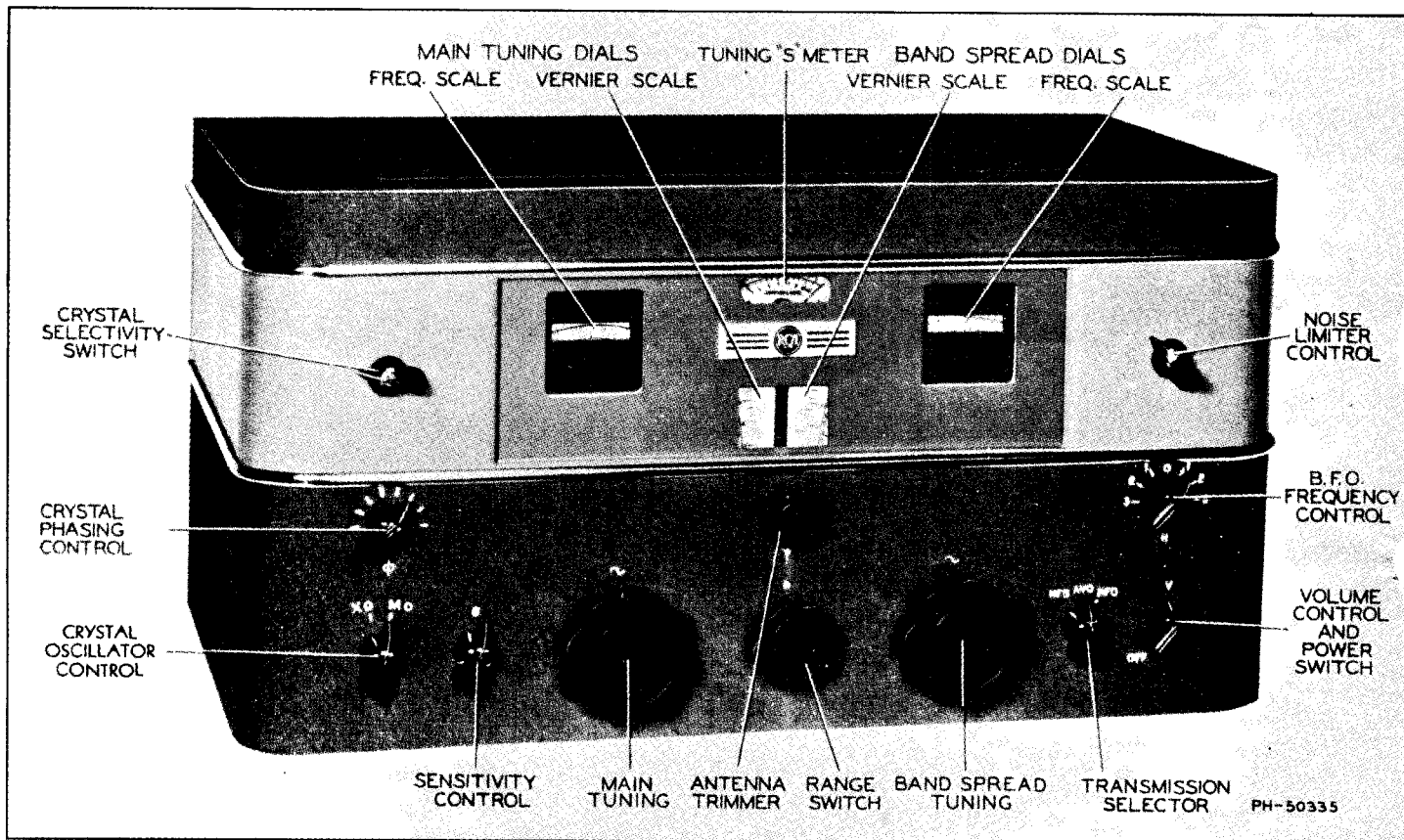


Figure 1—General Purpose Communication Receiver
R.C.A.F. Type G.R.-10

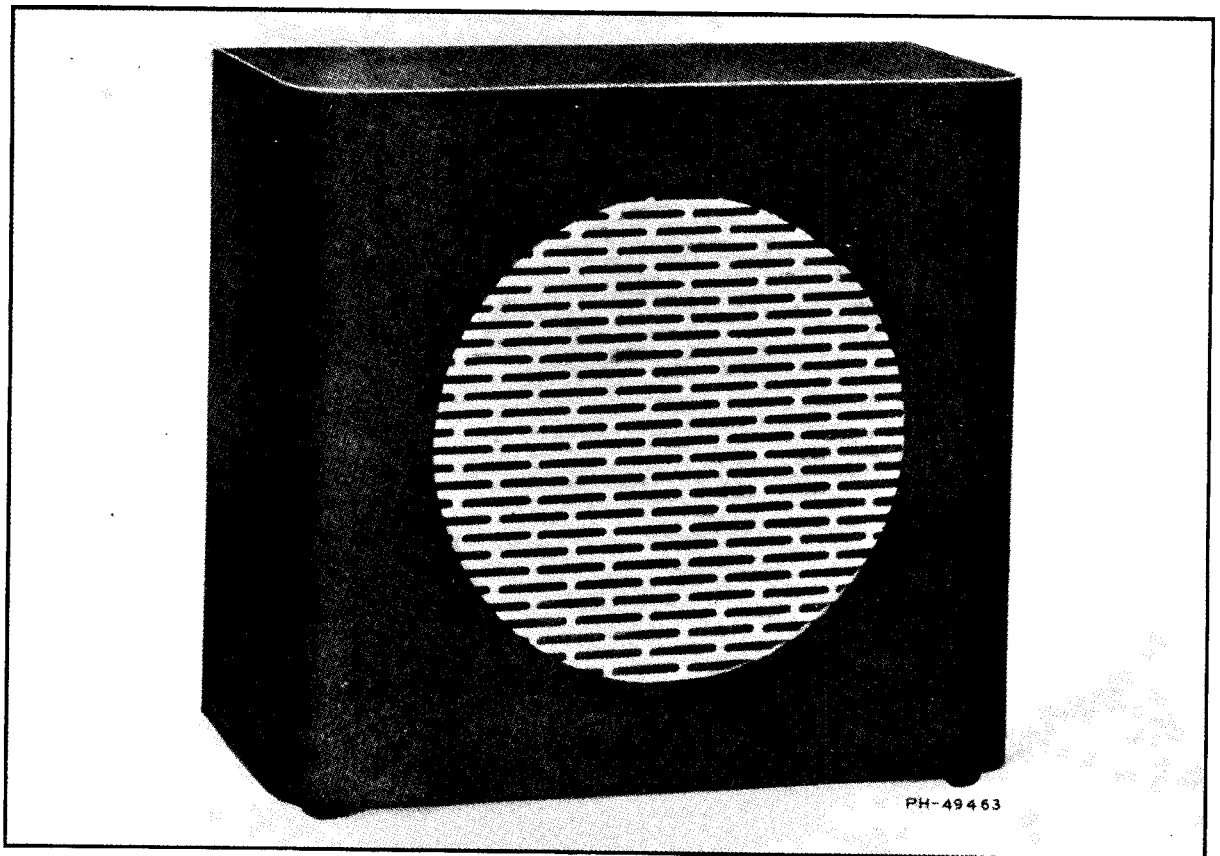


Figure 2—Loudspeaker

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GENERAL PURPOSE COMMUNICATIONS RECEIVER

TYPE GR-10

Stores Reference No. 10D/3526

INSTRUCTIONS

1. GENERAL

1.1 The R.C.A.F. Type G.R.-10 receiver is designed for use as a ground station receiver, for point to point or air to ground communications.

1.2 The following features have been incorporated into the design of this unit:—

- (a) Electrical band spread.
- (b) Variable selectivity, with expansion of the normal selectivity characteristic for stand-by and an adjustable crystal filter for maximum selectivity.
- (c) Noise limiter.
- (d) Automatic volume control (Not available for C.W. reception).
- (e) Carrier strength meter.
- (f) Provision for crystal control on any one frequency up to 6.8 Mc/s.
- (g) Temperature compensation of the frequency changing oscillator.
- (h) Regulation of anode voltage of the frequency changing oscillator.

1.3 Frequency range:—

Band 1	195 to 410 Kc/s.
Band 2	1400 to 3300 Kc/s.
Band 3	3300 to 5800 Kc/s.
Band 4	5800 to 10200 Kc/s.
Band 5	10200 to 18000 Kc/s.
Band 6	18000 to 31000 Kc/s.

1.4 Sensitivity:—Better than 5 microvolts for 2:1 signal to noise ratio.

1.5 Output power (maximum undistorted):—3 Watts.

1.6 Power supply requirements:—115 volts, 25 to 60 c.p.s., 70 watts.

1.7 Output load:—Loudspeaker, type 3, R.C.A.F. Ref. No. No. 10A/3527 has been designed for use with this receiver. An output jack has also been provided, into which may be plugged a set of head telephone receivers, type C-1, or equivalent. (Care should be taken to guard against the possibility of receiving an acoustic shock when the head-phones are plugged in, as the full output of the receiver is then connected to the head-phones).

2. TECHNICAL DETAILS

2.1 Circuit Details and Features.—The schematic diagram of the Type G.R.-10 receiver is shown in figure 5; special features of the unit are outlined below.

2.2 Input Coupling.—The antenna coupling system is designed to provide optimum coupling from transmission lines of 50 to 500 ohms, or from conventional antenna and ground systems. The coupling coils are balanced to ground and may be connected directly to a balanced transmission line. An antenna trimmer condenser adjustment is provided on the front panel to insure first circuit resonance with any antenna system.

2.3 Radio-Frequency Amplifier.—The r-f amplifier is designed to provide as much selectivity as possible

ahead of the first detector. The amplification is adjusted to provide optimum signal to noise ratio by making noise contributions of circuits following the first tube negligible in comparison with the noise contributed by the first r-f grid circuit. A uniform amplification is obtained over all frequency ranges. On the two highest frequency ranges the oscillator frequency is placed below the signal frequency. This gives better freedom from image signals in the higher frequency amateur bands.

2.4 Band Spread.—Band spreading is accomplished by means of a condenser gang with an auxiliary set of plates with a capacity equal to a small percentage of the capacity of the main section. The sections of this auxiliary condenser are connected by the band switch, so that in each frequency range provided with band-

spread, a suitable size of condenser is used for the purpose.

The main tuning dial is calibrated directly in frequency and reads correctly when the band-spread dial is set at the mark at its maximum clockwise position.

2.5 R.F. Heterodyne Oscillator.—The R.F. oscillator is of the tuned grid type, with plate circuit feedback. A voltage regulator is used to stabilize the plate voltage. Temperature changes are compensated for by a special condenser, C-18. This condenser is constructed of a small bi-metal plate, which is adjusted to have a temperature coefficient, which will compensate for all other circuit changes, which adjustment is made at the factory for best results at the high frequency end of each band. At the low frequency end more tuning capacity is present in the circuit, and less compensation is required. Since the capacity of the compensating condenser is then proportionately smaller, less compensation results. Thus a fairly uniform temperature characteristic is obtained over a wide frequency range.

When S-9 is switched to the "X.O." position, a single frequency crystal controlled oscillator is provided with the use of an additional crystal, X-2. Because of the variation in crystals that may be used, a potentiometer, R-52, is provided to adjust the oscillator strength to the correct value. R-52 is a 250,000 ohm potentiometer that is switched by S-9 in series with the 6K8 oscillator plate. When R-52 is in its maximum counter-clockwise position, its resistance is minimum, and thus the oscillator is at its maximum strength.

With this arrangement, crystal controlled oscillators can be used to receive signals of any frequency normally within the range of the receiver up to 6.8 mc. *For any of these r.f. frequencies, the Crystal Frequency must be 455 kc above the desired r.f. frequency.*

2.6 Intermediate-Frequency Amplifier.—As may be seen from the schematic diagram, two stages of i-f amplification are used. Variable selectivity is provided, and is adjustable by a control on the front panel. Referring to the schematic diagram, figure 5, and to the selectivity curves, figure 6, when the front panel control, S-5, is in position 1., T-2 is slightly over-coupled, resulting in the wide band-pass selectivity as

shown by the curve. When S-5 is in position 2, there is normal coupling throughout the i.f. amplifier, and the normal selectivity, as indicated by curve No. 2 is obtained. In positions 3, 4, 5, and 6 of S-5 a crystal fitter (X-1 and L-21) is connected between the first detector and the first intermediate frequency amplifier. By use of an attenuator (R-10, R-11, and R-12) four positions of selectivity are obtained with the crystal, position 6 of S-5 being the sharpest. A crystal phasing control of the usual type is also provided on the front panel. The intermediate frequency is 455 kc.

2.7 Beat-Frequency Oscillator.—The BFO second heterodyne oscillator used for CW reception is a separate pentode. The coupling to the second detector is just sufficient to provide suitable heterodyne action. A panel control is provided for changing the beat frequency a small amount so that any desired audio beat-frequency may be obtained.

2.8 Automatic Volume Control and "S" Meter.—The A.V.C. circuit is a simple diode rectifier. Referring to the schematic diagram, Figure 5, the received signal carrier produces a voltage across R-44 which is filtered by R-53 and C-77 and applied to the control grids of the r-f and i-f amplifiers. The "S" meter is connected in the cathode circuit of the first i-f tube and thus records changes in plate current caused by changes of A.V.C. voltage applied to the grid. This type of "S" meter circuit provides the desired wide range and the greater portion of the scale is approximately linear with respect to db input.

2.9 Noise Limiter.—A noise limiter is provided in the second detector circuit. The limiter is manually adjusted; by means of this circuit, signals are made readable which are below the effective noise voltage.

Referring to the schematic diagram, Figure 5, the signal and noise voltages appear across R-26 and the noise peaks alone appear across R-27, since the bias applied to R-29 by the potentiometer R-28 prevents this diode from operating with the signal voltage. The sum of these voltages (across R-26 and R-27) are applied to the audio amplifier. It is apparent that the noise peak voltage across R-26 is out of phase or opposed to that across R-27. The "balance" of this circuit is adjusted by potentiometer R-27. The potentiometer R-28 is the front panel bias control.

3. INSTALLATION

3.1 Power Supply.—The power supply circuit is integral with the receiver in the G.R.-10. At installation, the line voltage and frequency should be determined and checked for conformance to the nominal rating of the receiver, i.e. 115 volts, 25/60 cycle. This power supply will accommodate line voltage variations from 105 to 125 volts, and A.C. power frequencies from 25 cycles to 60 cycles.

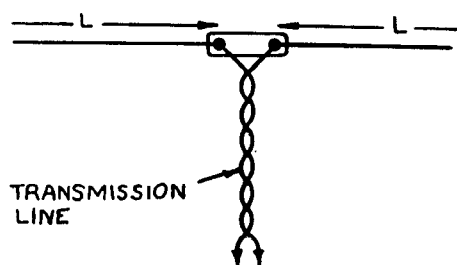
For connection of an external source of direct current for operation of the receiver, two pairs of terminals have been provided on the rear apron of the chassis. These are the terminals shown in Fig. 3 and designated respectively "6 volt A.C. heater" and jacks J-2 and

J-3. For A.C. operation, the A.C. heater terminals are normally strapped. For operation of the heaters from a 6 volt storage battery, this link should be removed, and the battery connected to these terminals. Similarly, for operation from A.C., the jacks J-2 and J-3 are normally strapped together. For operation of the valve anode circuits from an external source such as dry batteries, this strap should be left in place and a lead run from this strap to the positive terminal of the battery; the negative terminal of the battery may be connected to the terminal marked ground, in the center of the antenna terminal strip. A "B" battery voltage of at least 180 is required for the operation of the receiver.

If the receiver is to be used for continuous service, especially while unattended, the mains should be fused for 3 amperes.

3.2 **Valves.**—Inspect the chassis before applying power to make certain that all valves are firmly seated in their sockets and that the grid lead to the Type-6K8 valve is in place.

3.3 **Antenna.**—For general use, it is recommended that an antenna of the doublet types, either single or double, be used. Connections to either type and recommended antenna lengths for certain spot frequencies are shown in the accompanying diagram. Both types will give good performance over a frequency range of 2 to 1.

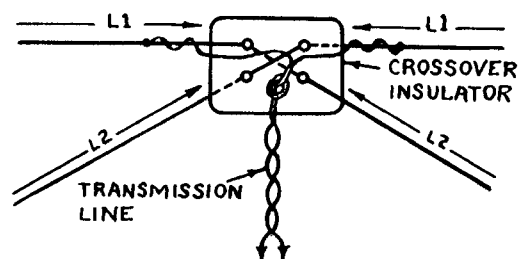


SINGLE DOUBLET ANTENNA

Freq.	L
1400 - 2700 kc	130 ft.
2700 - 5400 kc	65 ft.
5400 - 11000 kc	33 ft.
11000 - 22000 kc	16 ft.
22000 - 44000 kc	8 ft.

Any of the directive type antennas used for transmission may be satisfactorily employed for reception with this receiver. Good results may also be obtained with a single wire antenna from 25 to 75 feet long.

In locations where the antenna transmission line is near power wiring or other sources of noise interference, it is recommended that a coupling transformer be connected between the receiver and the transmission line. In locations where the antenna is near strong sources of interference, or powerful transmitters, it is recommended that a lightning arrester, type C-1, Ref. No. 10B/2391 be used to protect the antenna coils within the receiver.



DOUBLE DOUBLET ANTENNA

Freq. $L' \text{ \& } L''$

(Lengths to be taken from table to left; any combination of lengths may be used; these are typical values only).

Doublet Antenna Connections

The terminal board at the back of the chassis, near the centre, contains the connecting terminals for the transmission line or the antenna lead-in and ground. If an antenna is used without transmission line, the ground terminal should be strapped to the adjacent transmission line terminal, and the antenna connected to the remaining transmission line terminal.

3.4 **Speaker or phones.**—The G.R.-10 receiver is designed for use with a permanent-magnet dynamic speaker, having a voice coil impedance of from 2 to

3 ohms, such as the R.C.A.F. type C-3, Ref. No. 10A/3527. The terminals for connection to the speaker are designated in Figure 3.

A jack is provided on the right hand side of the cabinet, near the front for plugging in a pair of head telephones. Although low impedance headphones form a better match, any type may be used, as there is far more power available at the output jack than can be used in one pair of headphones. The speaker is disconnected when the headphones are plugged in.

4. OPERATION

4.1 Before attempting to operate the G.R.-10 receiver, the information contained in this section should be thoroughly understood by the operator. The symbols on the panel used to designate the various controls should be learned with respect to function, as shown in Figure 1, and described herein.

4.2 **Volume and Sensitivity Controls.**—For R/T (A.3) reception, the sensitivity control should be set at maximum, and the audio volume control used to obtain the desired volume. For W/T (A.1) reception, the audio volume control should be set at three fourths to maximum position, and the desired volume obtained by adjustment of the sensitivity control.

4.3 **Tuning.**—Select the frequency band desired by rotating control knob "R", until the proper scale

appears in the slot at the upper left of the panel. Before proceeding, adjust the antenna trimmer for maximum in this band (see para. 4.4, below). The frequency calibrations on the main dial scale are correct when the band spread dial is turned to its maximum clockwise position only. The left hand large knob is the main tuning control; the right hand large knob is the fine tuning control. The dials associated with these knobs, besides carrying frequency calibrations, carry decimal scale with associated verniers, by means of which the tuning adjustment for any particular frequency can be accurately logged and reset.

4.4 **Antenna Trimmer.**—Before tuning on any frequency range, the antenna trimmer should be adjusted for maximum performance on that band. This control may be adjusted by tuning for maximum background noise.

Occasionally it is desirable to test a signal that seems out of place to see whether or not it is a fundamental or an image. This may be accomplished by varying the antenna trimmer. If the maximum signal point coincides with the adjustment for maximum background noise, the signal is a fundamental. If the control does not affect the signal strength, or if its maximum occurs at some other point, the signal heard is an image.

4.5 Crystal Selectivity Switch.—For general operation while tuning, it is recommended that the crystal selectivity switch be in position No. 2. For phone or modulated signal reception, positions 1 and 2 of the crystal selectivity switch are recommended. Position No. 3 is not recommended for modulated signal reception, but may be used where sharp selectivity is required. The fidelity in this position will be poor. Position No. 1 should be used where a wide band-pass is desired, i.e.—for “Stand-by” reception, Position No. 2 where normal band-pass is desired. Positions 3, 4, 5 and 6 of the crystal selectivity switch are recommended for CW telegraph reception. In these positions the crystal filter is in the circuit, and the receiver should be tuned as follows: after the main tuning dial has been set at the desired point with switch in position 2, the crystal is switched into the circuit, and the set retuned (with the band spread control, when tuning on the short-wave bands).

It will be noted that when tuning in a modulated signal with the crystal in, the speaker volume is greater on either side of the point which gives the maximum tuning meter indication. The reason for this is that carrier voltage controls the gain of the receiver by means of the A.V.C. circuit, and if the carrier frequency is detuned slightly from resonance, the gain of the receiver increases so that part of the side band frequencies are amplified very much more than they are when the carrier is tuned to exact resonance. This is characteristic and normal for receivers with this degree of selectivity and provided with A.V.C. Care should be taken to tune the receiver for maximum meter indication. The background noise and adjacent channel interference will be materially reduced.

The G.R.-10 receiver has been designed to give a wide band-pass selectivity characteristic which is flat at resonance in position 1 of the crystal selectivity switch. This characteristic is primarily intended for “stand-by” use. When the receiver is switched to normal selectivity (position 2 of the switch) slight retuning may be necessary. The normal selectivity curve is also slightly flat, and thus when the crystal filter is placed into the circuit, another slight adjustment in tuning may be necessary. These slight adjustments are necessary as more exact tuning is essential the sharper the selectivity characteristic.

4.6 Crystal Phasing Control.—There is a normal or “neutral” position for this control, in which position it should be set for all normal reception. To locate this position, set the Crystal Selectivity Switch on position 4 or 5, and, using high gain with no incoming signal, adjust the phasing control for minimum noise. This control should be changed from this position only

when a strong signal is producing a heterodyne action with the desired signal. In this case, the control should be adjusted for a minimum heterodyne effect.

4.7 “X.O.—M.O.” Switch.—These letters stand for “CRYSTAL OSCILLATOR”—“MASTER OSCILLATOR”. The Master Oscillator position (pos'n. 2) is the position for normal operation using one of the coils L-14, L-15, L-16, L-17, L-18, L-19 as the r.f. heterodyne oscillator. (Refer to the schematic diagram—Figure 5). With the switch (S-9) in the “X.O.” position (pos'n. 1), the crystal, X-2, is placed in the circuit, and the r.f. heterodyne oscillator frequency becomes crystal controlled at the frequency of the crystal. The frequency of X-2 may be such as to provide a crystal controlled receiving channel of any frequency up to 6.8 mc. that can normally be received by the receiver. IT SHOULD BE REMEMBERED THAT THE R.F. HETERODYNE OSCILLATOR FREQUENCY IS ABOVE THE FREQUENCY OF THE RECEIVED SIGNAL BY 455 KC. The appropriate crystal is plugged into the three contact, ceramic socket at the left-center of the chassis. The receiver is then tuned to the crystal controlled receiving frequency.

Because of the variation in crystals that may be used, provision has been made to adjust the oscillator strength to give correct operation. The oscillator strength may be varied by adjusting R-52, located on the rear apron at the left hand side (see Figure 3). For correct operation, there should be oscillation at the receiving frequency, and approximately plus and minus one quarter of an inch on the dial. If the extent of oscillation is greater than this, the oscillator strength should be reduced by adjusting R-52 in a clockwise direction. If the extent of oscillation is less than this, the oscillator strength should be increased by adjusting R-52 in a counter-clockwise direction. The normal position of R-52 is the midway position. Oscillation is indicated by the presence of background noise in the speaker.

For normal operation with the crystal oscillator not in use, the “X.O.—M.O.” switch should be in the “M.O.” position (pos'n. 2).

4.8 NFB—AVC—BFO Switch.—These letters stand for Negative Feed Back, Automatic Volume Control and Beat Frequency Oscillator.

In the NFB position, the switch places the compensated negative feedback in the audio circuits, resulting in an increase in fidelity. In this position, the overall gain of the amplifier is reduced slightly, and the A.F. gain control should be advanced accordingly. This position should not be used for other than voice reception; as the noise level is likely to be higher when this feature is used, better results will usually be obtained on a communications voice circuit when AVC is used; in later production of this receiver, this N.F.B. feature will be replaced by an audio band limiting device, which will reduce the audio band width to only that required for intelligible reception of the voice frequencies.

The A.V.C. is in operation on both the “NFB” and “AVC” position of this switch.

The A.V.C. is "OFF" when the switch is in the "BFO" position. This position connects the beat-frequency oscillator.

4.9 BFO Frequency Control.—This control is provided to secure any desired audio beat frequency, for the reception of CW code signals. It should be set slightly off the central position, in normal use. The exact position may be found by experiment. With the crystal switch the desired beat note may be obtained by tuning the receiver. However, in conditions of interference, when the crystal filter is used, the receiver must first be tuned to the desired signal, regardless of the beat frequency produced. If the beat note is not satisfactory, it may be changed with the BFO control. In other words, first tune for maximum signal strength, then adjust for the desired audio pitch.

When tuning in the same direction (that is, going from the high frequency to the low frequency end of the band, or vice versa), ALL signals will be changing in pitch in the same direction when resonance is reached. That is, the pitch will either be increasing or decreasing, depending on whether the BFO control is on one side or the other side of I-F resonance. It does not matter on which side the BFO control is placed, the CHANGE OF PITCH should be noted when tuning. If the change of pitch is opposite to that known to exist when passing through resonance, the signal is an audio image. Never try to receive an audio image. The signal can be made much stronger by tuning to the other side of zero beat.

4.10 Noise Limiter Level Control.—When starting to tune the receiver, this control should be set in the "OUT" position, or advanced about one-quarter to three-quarters of the way in the counter-clockwise direction. Should external noise conditions interfere with reception, this control may be advanced as necessary, avoiding distortion of the signal. This control may be found especially helpful for reducing certain types of interference encountered above 15 mc/s. For CW reception with the noise-limiter, the sensitivity control should be advanced, and the volume control reduced until limiting action occurs.

4.11 Tuning or S Meter.—This meter is provided to give an indication of when the receiver is properly tuned to an R/T transmission, and to give an indication of the relative strength of the received signal.

The calibration of this meter is arbitrary, since no standard has been set for the conversion of the S units to microvolts. However in this receiver, S-1 is equi-

valent to approximately 0.5 microvolt input to the receiver. Each subsequent unit is 6 db. above the previous step, up to S-9. Thus S-2 is equivalent to 1 microvolt, S-3 to 2 microvolts. Above S-9 the meter is calibrated to 40 db, which would be equivalent to 12,800 microvolts input.

The meter functions on the plate current of the first I.F. amplifier tube and will only read zero when the sensitivity control is fully advanced and no signal is being received.

4.12 Jacks—J-2 and J-3.—Jacks J-2 and J-3 are located to the left on the rear apron of the chassis, adjacent to R-17. These Jacks are connected by a link outside the receiver, and are in the B-plus line to the plates of the tubes. This arrangement is provided so that, if desired, the plate circuit of the receiver may be opened by a transmitter relay or switch. To use this provision, remove the link connection between the Jacks, and connect the Jacks to the transmitter relay or switch. Remember that these terminals are at plate potential.

4.13 Break-in Operation.—Break-in operation may be obtained on CW telegraph operation by connecting a separate antenna to the receiver. A single wire antenna or a doublet tuned to a different band than that on which the transmitter is working is recommended. If a doublet antenna tuned to the transmitter frequency is used, sufficient voltage may be induced in the receiving antenna to damage the receiver.

4.14 Diversity Reception.—Two or three of these receivers may be connected together for diversity reception of modulated signals, with no additional equipment necessary. Each receiver must be provided with a separate antenna in the usual manner. The A.V.C. terminal on the back of the receiver, shown in Figure 3, is connected inside the receiver to the A.V.C. circuits. This terminal must be connected to the corresponding terminals of the No. 2 and No. 3 receivers. The receiver outputs should all be connected in parallel. Note that one of the output terminals of this receiver is at ground potential.

Connecting a pair of headphones in the jack on each receiver will disconnect it from the combined output so that the tuning or other adjustments may be checked. Obviously, the audio volume control on each receiver should be set to approximately the same level. For CW diversity reception it is recommended that a combining and tone-keyer unit be used.

5. MAINTENANCE

Routine maintenance of this equipment shall be carried out in accordance with the latest issue of CAP237, Maintenance Schedules and Inspection Forms for the Receiver, Type G.R.-10.

5.1 Removal of the Chassis from the Cabinet.—To remove the chassis from the cabinet, proceed as follows: first remove all knobs from the control shafts. Next remove the perforated metal screen on the back of the cabinet by taking out the five self-tapping screws. Remove the five $\frac{1}{4}$ inch machine screws underneath the cabinet. Next, disconnect the tuning meter on the

front panel. The chassis is now ready to be removed from the cabinet. The chassis should be tipped up at the rear just before entirely removing to prevent hitting the two front brackets against the upper angle at the rear of the cabinet.

5.2 Valves.—In a receiver which is used quite consistently, the first trouble which is likely to occur is that of deficient valves. Usually the symptom of deficient valves is a noticeable decrease in the sensitivity of the receiver. If the receiver will operate on all bands, but with low sensitivity, the valves should

be removed and checked. The valve locations are shown on the label on the large metal shield on top of the chassis.

5.3 Band Change Switch.—After a long period without being operated, the band change switch may become noisy or inoperative because of dust or oxide film on contacting surfaces. In some cases, normal operation may be restored by rotating the switch a number of times. If it is found impossible to clean the switch sufficiently by rotation, the defective switch section must be located and replaced. The receiver should be removed from the cabinet and operated in a position such that the switch sections are accessible.

With the switch in the defective position, a slight movement of each section with an insulated screwdriver will usually determine the defective section.

To remove a switch section it will first be necessary to remove the switch shaft. The antenna trimmer control shaft must also be removed in order to unsolder the leads on the tuning condenser. After all leads are disconnected the entire coil and switch assembly may be removed by taking out the screws holding the assembly to the chassis.

5.4 Test of Circuit Alignment.—Under normal operating conditions the r-f amplifier and oscillator circuits should remain in line. If, however, it is found desirable to check the alignment of these circuits, the following test should first be made. Disconnect the antenna or transmission line and connect a 50- to 300-ohm carbon resistor across the two antenna terminal posts. Connect an output voltmeter to the output of the receiver and connect a 20-ohm resistor across the meter. Turn the sensitivity and volume controls to maximum. The A.V.C. switch should be on the A.V.C. position. The output noise voltage should be at least 0.1 volt, with the antenna trimmer tuned to resonance. The maximum noise voltage is a direct measurement of the sensitivity of the receiver. If the test shows that this voltage is less than 0.1 volt, the circuits should be realigned. First be sure that the decreased sensitivity is not caused by poor valves. It probably will not be necessary to align all bands; however, the correct procedure for all bands is given below.

5.5 Alignment of I-F Circuits.—Remove the bottom cover plate of the receiver cabinet, tune in a steady outside signal on one of the lower frequency bands with the A.V.C. switch on the BFO position and the

crystal filter switch in position 4 or 5. The signal should be tuned for a peak response at the crystal frequency. Do not use too strong a signal. The sensitivity control should be adjusted for approximately 1 volt output. Referring to Figure 5 adjust T-1, L-21, T-2, T-3 and T-4 for a maximum output voltage. The signal should now be detuned approximately 1,000 cycles and adjustments T-1, L-21 and T-2 retuned for a maximum output.

The T-2 adjustment on top of the chassis is sealed with polystyrene cement. Applying a soldering iron to the adjusting screw for a few seconds will soften the cement. The intermediate frequency is 455 kc.

5.6 Alignment of R-F and Oscillator Circuits.—Under usual conditions, the oscillator frequency will not shift far enough to throw the frequency calibration off, therefore, unless it is found that the frequency calibration is incorrect, the oscillator adjustments should not be changed. In any case, the oscillator circuit should not be changed unless a frequency calibrated test oscillator is available. The following procedure is for the r-f alignment of band No. 1 (195 to 410 kc). Tune in a signal near the high-frequency end of the band. (Do not use too strong a signal.) Reduce the sensitivity control until the output is approximately 1 volt. Referring to Figure 4, adjust C-49 and the antenna trimmer control on the front panel for maximum output. Next, tune in a signal near the low frequency end of the bands. Adjust L-2 and L-8 for a maximum signal output. The same procedure may be followed for all bands. Make sure that the bandspread tuning is at the high-frequency end of the scale. The bottom cover should be held over the oscillator trimmer condensers while adjusting the high oscillator trimmer capacitors while adjusting the high frequency end of each band, so that when the cover is replaced, the frequency will not shift. The adjustments for each particular band are shown in the table herewith.

	R-F	Det.	Det.	Band	
				Osc.	Osc.
	Ind.	Ind.	Cap.	Ind.	Cap.
195- 410	L-2	L-8	C-49	L-15	C-65
1,400- 3,300	L-1	L-7	C-47	L-14	C-62
3,300- 5,800	L-6	L-13	C-56	L-19	C-71
5,800-10,200	L-5	L-12	C-55	L-18	C-69
10,200-18,000	L-4	L-11	C-54	L-17	C-68
18,000-31,000	L-3	L-10	C-53	L-16	C-67

Signal-to-Noise and Image Ratios for standard output: These are average values only. Slight variations above or below these values may be encountered due to practical manufacturing tolerances. A 300 ohm dummy antenna should be used in series with the receiver input for measurement purposes.

Band	Frequency KC	Microwatts Input for 2:1 Signal-to- Noise Ratio	Image Ratio
1	195	2.5	75,000
	410	4	50,000
2	1,400	1.7	5,000
	3,300	1.9	910
3	3,300	1.4	1,000
	5,800	1.2	320
4	5,800	1.4	550
	10,200	1.2	100

5	}	10,200	1.8	380
		18,000	1.6	88
6	}	18,000	1.7	60
		31,000	1.0	15

5.7 Dial Shutter Adjustment.—If the dial shutters do not line up with the dial calibration, they may be adjusted by means of an idler pulley bracket which adjusts the tension of the cord. By loosening the two screws which clamp the idler pulley bracket to the chassis the bracket may be shifted until the shutter opening lines up with the dial scale.

Another adjustment may be made by loosening the two nuts on adjusting screw fastened to back of shutter. To raise or lower the shutter, adjust the nuts accordingly.

5.8 Noise Balance Adjustment.—This adjustment is the potentiometer mounted on the right flange of the chassis (R-27). The correct adjustment has been carefully made at the factory and should ordinarily require no further attention. However, in servicing the receiver, in the event that the adjustment is accidentally moved, it may be reset as follows: First tune in a strong modulated signal such as a broadcast station. Next turn the noise control on the front panel all the way clockwise. Now adjust the potentiometer for a minimum signal output. This point will be found to be very sharp. When properly adjusted, the signal output will be quite low until the noise control on the

front panel is turned back counterclockwise.

5.9 Tuning Meter Adjustment.—The tuning meter should normally give a low scale reading when no signal is being received. To adjust this meter, tune the receiver to a point free of signals, turn the sensitivity control to maximum, switch in A.V.C., XO-MO switch in MO position, tune the antenna trimmer off resonance; adjust the potentiometer R-17 at the back of the receiver (ref. Fig. 3) until the meter pointer coincides with the mark at the left end of the scale. The meter will usually rise slightly when the antenna trimmer is tuned to resonance.

5.10 Valve Socket Voltages.—If the receiver is found to be completely inoperative, it is likely that a resistor is open-circuited or a capacitor is short-circuited. The bottom cover plate of the receiver cabinet should be removed. The valve socket terminal voltages should be measured and should be approximately the values given in the table below. The valves should remain in the sockets for this test. A voltmeter having a resistance of at least 20,000 ohms should be used. Place switch on BFO and turn Sensitivity Control to maximum.

VALVE SOCKET VOLTAGES

Valve	Symbol	Cathode to Ground	Screen Grid to Ground	Plate to Ground	Suppressor Grid to Ground	Oscillator Plate to Ground	Heater (A-C) Pin No. 2 to Pin No. 7
Type-6SK7 (R-F Amplifier)	V8	3.0 (Pin No. 5)	90 (Pin No. 6)	180 (Pin No. 8)	3.0 (Pin No. 3)	—	6.1
Type-6K8 (Det. Osc.)	V6	2.6 (Pin No. 8)	75 (Pin No. 4)	240 (Pin No. 3)	—	60 (Pin No. 6)	6.1
Type-6SK7 (1st I-F Amp.)	V5	3.0 (Pin No. 5)	82 (Pin No. 6)	200 (Pin No. 8)	0 (Pin No. 3)	—	6.1
Type-6SJ7 (Beat Freq. Osc.)	V2	0 (Pin No. 5)	50 (Pin No. 6)	15 (Pin No. 8)	—	—	6.1
Type-6SK7 (2nd I-F Amp.)	V7	4.5 (Pin No. 5)	115 (Pin No. 6)	220 (Pin No. 8)	4.5 (Pin No. 3)	—	6.1
Type-6H6 (2nd Det.)	V1	—	—	—	—	—	6.1
Type-6SQ7 (A-F Amp. A.V.C.)	V3	0.7 (Pin No. 3)	—	85 (Pin No. 6)	—	—	6.1 (Pin No. 7 to Pin No. 8)
Type-6F6G (Output)	V4	16 (Pin No. 8)	260 (Pin No. 4)	250 (Pin No. 3)	—	—	6.1 5.1 (Pin No. 2 to Pin No. 8)
Type-5Y3G (Rectifier)	V10	300.0 (Pin No. 8)	—	375 a.c. (Pins Nos. 4 & 6)	—	—	(Caution—300 v. d.c., voltage to ground)
Type-VR-150 (Voltage Regulator)	V9	—	—	150 (Pin No. 5)	—	—	—

6. PARTS LIST RECEIVER PARTS

Item	Nomenclature	DESCRIPTION	R.C.A.F. Type No.	R.C.A.F. Ref. No.
C-1, C-2; (C-6, C-7; C-16, C-17)	Condenser	3 gang, 6 section, main tuning — less split gear, brass pinion gear, and bearing assembly.....	C223	10C/3528 *
*C-3	Condenser	180 mmfd., 400 volts.....	C230	10C/4557
*C-4, C-5	Condenser	0.01 mfd., 1000 volts.....	C231	10C/3536
C-6, C-7		See C-1, C-2.....		
*C-8	Condenser	68 mmfd., 400 volts.....	C232	10C/3537
C-9	Condenser	Same as C-4.....		
C-10	Condenser	3.6 to 35 mmfd., 10 plate antenna adjuster.....	C225	10C/3530
C-11, C-12	Condenser	Same as C-4.....		
*C-13	Condenser	120 mmfd., 400 volts.....	C241	10C/3546
*C-14	Condenser	0.05 mfd., 400 volts.....	C239	10C/3544
*C-15	Condenser	10 mmfd., 400 volts.....	C233	10C/3538
C-16, C-17		See C-1, C-2.....		
*C-18	Condenser	Temperature compensating stabilizer condenser.....	C240	10C/3545
*C-19	Condenser	100 mfd., 400 volts.....	C242	10C/3547
*C-20	Condenser	2.5 to 17.9 mfd., 5-plate crystal phase adjusting condenser.....	C229	10C/3534
C-21, C-22, C-23	Condenser	Same as C-19.....		
C-24	Condenser	Same as C-4.....		
C-25, C-26, C-27	Condenser	Same as C-14.....		
*C-28, C-29	Condenser	220 mmfd., 400 volts.....	C243	10C/3548
C-30, C-31, C-32	Condenser	Same as C-14.....		
C-33	Condenser	Same as C-19.....		
*C-34	Condenser	56 mmfd., 400 volts.....	C244	10C/3549
*C-35	Condenser	12 mmfd., 400 volts.....	C245	10C/3550
*C-36	Condenser	47 mmfd., 400 volts.....	C246	10C/3551
C-37, C-38	Condenser	Same as C-28.....		
*C-39	Condenser	4 to 100 mmfd. mica trimmer.....	C251	10C/3556
*C-40	Condenser	1200 mmfd., 400 volts.....	C247	10C/3552
C-41	Condenser	Same as C-19.....		
C-42	Condenser	Same as C-14.....		
*C-43	Condenser	6.8 mmfd.....	C248	10C/4555
C-44, C-45, C-46 (C-58, C-59, C-60, C-74, C-75, C-76)	Condenser	3-gang, 9-section band-spread — less split gear, brass pinion gear, and bearing assembly.....	C224	10C/3529
*C-47	Condenser	Air trimmer.....	C226	10C/3531
C-48	Condenser	Same as C-3.....		
C-49	Condenser	Same as C-47.....		
C-50	Condenser	Same as C-15.....		
*C-51	Condenser	4.7 mmfd., 400 volts.....		10C/4558
*C-52	Condenser	470 mmfd., 400 volts.....		10C/4559
C-53, C-54	Condenser	Same as C-47.....		
*C-55, C-56	Condenser	Air trimmer.....	C227	10C/3532
*C-57	Condenser	0.1 mfd., 400 volts.....	C234	10C/3539
C-58, C-59, C-60		See C-44, C-45, C-46.....		
*C-61	Condenser	1000 mmfd., 400 volts.....	C235	10C/3540
C-62	Condenser	Same as C-47.....		
C-63	Condenser	Same as C-14.....		
*C-64	Condenser	39 mmfd., 400 volts.....		10C/4556
C-65	Condenser	Same as C-47.....		
*C-66	Condenser	150 mmfd., 400 volts MICA ELL 680-M.....	C237	10C/3542
C-67, C-68	Condenser	Same as C-47.....	1664	10C/3542
C-69	Condenser	Same as C-55.....		
*C-70	Condenser	2700 mmfd., 400 volts.....	C238	10C/3543
C-71	Condenser	Same as C-55.....		
C-72	Condenser	Same as C-61.....		
C-73	Condenser	Same as C-14.....		
C-74, C-75, C-76		See C-44, C-45, C-46.....		
C-77, C-78	Condenser	Same as C-14.....		
*C-79	Condenser	3 to 25 mmfd., 7 plate beat-frequency oscillator control.....	C228	10C/3533
C-80	Condenser	Same as C-36.....		
C-81	Condenser	Same as C-19.....		
C-82	Condenser	Same as C-14.....		
*C-83	Condenser	.25 mfd., 400 volts.....		10C/4560
C-84	Condenser	Same as C-36.....		
C-85	Condenser	Same as C-35.....		
C-86	Condenser	Same as C-43.....		
C-87	Condenser	Same as C-14.....		
C-88	Condenser	Same as C-57.....		
*C-89, C-90	Condenser	5-5.5 mfd., 350 volts.....	C249	10C/3554
C-91	Condenser	Same as C-4.....		
*C-92, C-93	Condenser	20-20 mfd., 450 volts.....	C250	10C/3555
C-94	Condenser	Same as C-14.....		
C-95	Condenser	Same as C-51.....		

Item	Nomenclature	DESCRIPTION	R.C.A.F. Type No.	R.C.A.F. Ref. No.
J-1	Jack	Headphone jack		10H/3558
J-2, J-3	Jack	Phone tip jack for transmitter relay connections		10H/3559
*L-1	Coil	Antenna 1400-3300 kc.		10D/3561
*L-2	Coil	Antenna 195-410 kc.		10D/3560
*L-3	Coil	Antenna 18.0-31.0 mc.		10D/3565
*L-4	Coil	Antenna 10.2-18.0 mc.		10D/3564
*L-5	Coil	Antenna 5.8-10.2 mc.		10D/3563
*L-6	Coil	Antenna 3.3-5.8 mc.		10D/3562
*L-7	Coil	Detector 1400-3300 kc.		10D/3567
*L-8	Coil	Detector 195-410 kc.		10D/3566
*L-9	Coil	Intermediate frequency wave Trap	C25	10A/4596
*L-10	Coil	Detector 18.0-31.0 mc.		10D/3571
*L-11	Coil	Detector 10.2-18.0 mc.		10D/3570
*L-12	Coil	Detector 5.8-10.2 mc.		10D/3569
*L-13	Coil	Detector 3.3-5.8 mc.		10D/3568
*L-14	Coil	Oscillator 1400-3300 kc.		10D/3573
*L-15	Coil	Oscillator 195-410 kc.		10D/3572
*L-16	Coil	Oscillator 18.0-31.0 mc.		10D/3577
*L-17	Coil	Oscillator 10.2-18.0 mc.		10D/3576
*L-18	Coil	Oscillator 5.8-10.2 mc.		10D/3575
*L-19	Coil	Oscillator 3.3-5.8 mc.		10D/3574
*L-20	Reactor	Filter reactor		10C/3579
L-21	Crystal Filter Assembly	Coil, core, form and capacitor less shield can — includes C-22		10D/3578
*M-1	Meter	Carrier level "S" meter, complete		10A/3580
*R-1	Resistor	470,000 ohms, 1/2 watt	C204	10C/3581
*R-2	Resistor	10,000 ohms, 1/2 watt	C205	10C/3582
*R-3	Resistor	330 ohms, 1/2 watt	C206	10C/3583
*R-4	Resistor	150,000 ohms, 1/2 watt	C208	10C/3585
*R-5	Resistor	100,000 ohms, 1/2 watt	C218	10C/3595
R-6	Resistor	Same as R-3		
*R-7	Resistor	22,000 ohms, 1/2 watt	C207	10C/3584
R-8	Resistor	Same as R-4		
R-9	Resistor	Same as R-2		
*R-10	Resistor	6,800 ohms, 1/2 watt	C210	10C/3587
R-11	Resistor	Same as R-7		
*R-12	Resistor	68,000 ohms, 1/2 watt	C212	10C/3589
R-13	Resistor	Same as R-1		
*R-14	Resistor	220 ohms, 1/2 watt	C213	10C/3590
*R-15	Resistor	68 ohms, 1/2 watt	C255	10C/4597
R-16	Resistor	Same as R-1		
*R-17	Control	80-ohm tuning meter zero adjustment	C214	10C/3591
R-18	Resistor	Same as R-7		
R-19	Resistor	Same as R-2		
R-20	Resistor	Same as R-12		
R-21	Resistor	Same as R-3		
*R-22	Resistor	47,000 ohms, 1/2 watt	C216	10C/3593
*R-23	Resistor	4,700 ohms, 1/2 watt	C217	10C/3594
R-24	Resistor	Same as R-5		
R-25	Resistor	Same as R-4		
R-26	Resistor	Same as R-22		
*R-27	Control	100,000-ohm noise balance adjustment	C219	10C/3596
*R-28	Control	30,000-ohm limiter control	C220	10C/3597
R-29	Resistor	Same as R-4		
R-30	Resistor	Same as R-7		
R-31	Resistor	Same as R-2		
R-32	Resistor	Same as R-7		
*R-33	Resistor	10 ohms, 1/2 watt	C209	10C/3586
R-34	Resistor	Same as R-1		
*R-35	Control	30,000-ohm sensitivity control	C215	10C/3592
*R-36	Resistor	5600 ohms, 1/2 watt	C223	10C/3600
R-37	Resistor	Same as R-1		
*R-38	Resistor	820 ohms, 1/2 watt	C226	10C/3603
R-39, R-40, R-41	Resistor	Same as R-5		
*R-42	Resistor	3000 ohms, 10 watts	C228	10C/3605
*R-43	Control	500,000-ohm volume control and power switch (S-10)	C221	10C/3598
*R-44	Resistor	1 megohm, 1/2 watt	C224	10C/3601
*R-45	Resistor	1000 ohms, 1/2 watt	C225	10C/3602
R-46, R-47	Resistor	Same as R-5		
R-48	Resistor	Same as R-1		
*R-49	Resistor	470 ohms, 1 watt	C227	10C/3604
R-50, R-51	Resistor	Same as R-5		
*R-52	Control	250,000-ohm Crystal Oscillator voltage control		10C/4554
*R-53	Resistor	220,000 ohms 1/2 watt	C222	10C/3599

Item	Nomenclature	DESCRIPTION	R.C.A.F. Type No.	R.C.A.F. Ref. No.
*S-1	Switch	Range switch wafer.....	C75	10F/3606
*S-2	Switch	Range switch wafer.....	C76	10F/3607
S-3	Switch	Same as S-1.....		
*S-4	Switch	Range switch wafer.....	C77	10F/3608
*S-5	Switch	Crystal selectivity switch.....	C78	10F/3609
S-6	Switch	Same as S-1.....		
S-7	Switch	Same as S-4.....		
*S-8	Switch	N.F.B.-A.V.C. B.F.O. Switch.....	C79	10F/3610
*S-9	Switch	Master Oscillator—Crystal Oscillator Switch.....	C80	10F/3611
S-10	Power Switch	Combined with R-43.....		
*T-1	Transformer	First detector plate I.F. transformer, complete includes C-13, R-9.....	C78	10A/3612
*T-2	Transformer	I.F. transformer, complete, includes C-28, C-29.....	C79	10A/3613
*T-3	Transformer	I.F. link transformer complete, includes C-33, C-35, R-23.....	C80	10A/3614
*T-4	Transformer	Diode I.F. transformer complete, includes C-34, C-36.....	C81	10A/3615
*T-5	Transformer	CW Oscillator transformer, complete, includes C-80, C-81, R-37.....	C82	10A/3616
*T-6	Transformer	Output transformer.....	C83	10A/3617
*T-7	Transformer	Power transformer 115 volt, 25/60 cycle.....	C84	10A/3618
*V-1	Valve	2nd Detector.....	6H6	10E/1297
*V-2	Valve	Beat Frequency Oscillator.....	6SJ7	10E/1577
*V-3	Valve	A.F. Amplifier; A.V.C.....	6SQ7	10E/1513
*V-4	Valve	Output.....	6F6G	10E/1451
*V-5	Valve	1st I.F. Amplifier.....	6SK7	10E/1302
*V-6	Valve	Converter.....	6K8	10E/1300
*V-7	Valve	2nd I.F. Amplifier.....	6SK7	10E/1302
*V-8	Valve	R.F. Amplifier.....	6SK7	10E/1302
*V-9	Valve	Voltage Regulator.....	VR150	10E/3010
*V-10	Valve	Rectifier.....	5Y3G	10E/3657
X-1	Crystal	455 kc. crystal filter and case.....		
X-2	Crystal	Crystal oscillator frequency as desired.....		
MISCELLANEOUS				
*	Bracket	Flywheel mounting bracket.....		10A/3619
*	Board	5 contact terminal board.....		10A/3621
*	Cord	Dial drive or range shutter control cord.....		10A/4551
*	Cord	Dial drive or range shutter control cord.....		10A/4552
*	Cord	Dial drive or range shutter control cord.....		10A/4553
	Coupling	Range switch coupling with set screws.....		10A/3623
	Detent	Range switch detent plate assembly.....		10A/3624
	Dial	Translucent band spread dial complete with hub and set screws.....		10D/3625
	Dial	Translucent main tuning dial complete with hub and set screws.....		
	Drum	Large dial drive drum complete.....		10D/3626
	Flywheel	Tuning flywheel with set screws.....		10D/3627
	Gear	Brass pinion gear and bearing assembly.....		10D/3628
	Gear	Split main or band spread condenser drive gear.....		10D/3629
	Guide	Band indicator shutter, guide rods and strap assembly.....		10D/3630
	Knob	Antenna adjuster control knob.....		10A/3644
	Knob	Bar type control knob (8 used).....		10A/3644
	Knob	Main tuning or band spread control knob.....		10A/3645
	Knob	Range switch control knob.....		10A/3646
	Lamp	6.3 volt dial lamp, Mazda No. 44.....		10A/3647
	Link	Transmitter relay link connected across J-2 & J-3.....		10H/4598
	Mask	Metal window mask plate.....		10A/3648
	Nut	Clamping nut for air trimmers.....		10C/3649
	Pulley	Left-hand band indicator idler pulley and bracket.....		10D/3631
	Pulley	Right-hand band indicator idler pulley and bracket.....		10D/3632
	Pulley	Small dial drive pulley and hub with set screws.....		10D/3633
	Scale	Calibrated stationary vernier scale—less support.....		10D/3634
	Screw	No. 8-32 set screw for dial drive drum.....		10D/3635
	Shaft	Dial drive flywheel shaft.....		10D/3636
	Shaft	Range switch shaft—10¼ inches long.....		10D/3637
	Shutter	Left-hand band indicating shutter and pilot lamp bracket assembly.....		10D/3638
	Shutter	Right-hand band indicating shutter and pilot lamp bracket assembly.....		
	Socket	8-contact phenolic socket.....		10D/3639
*	Socket	8-contact wafer socket.....		10H/2283
*	Socket	3-contact ceramic socket.....		10H/2109
*	Socket	Pilot lamp socket.....		10D/2435
				10H/3650

Item	Nomenclature	DESCRIPTION	R.C.A.F. Type No.	R.C.A.F. Ref. No.
	Socket	Pilot lamp socket and clip.....		10H/3651
	Spring	Band indicator shutter lift spring		10D/3640
	Spring	Dial drive cord tension spring		10D/3641
	Spring	Triple loop spring used on rear end of band switch shaft		10D/3642
	Support	Vernier scale support and hub assembly		10D/3643
	Window	Clear dial window sheet.....		10D/3652
		SPEAKER PARTS		
	Cone	Speaker cone and voice coil		10A/3653
	Escutcheon	"RCA" escutcheon		
*	Plug	3-contact male plug for speaker		10H/3654
*	Socket	3-contact female socket for speaker cable		10H/3655
*	Speaker	Speaker unit only, less panel		10A/3656

*All parts marked thus are included in the spare parts.

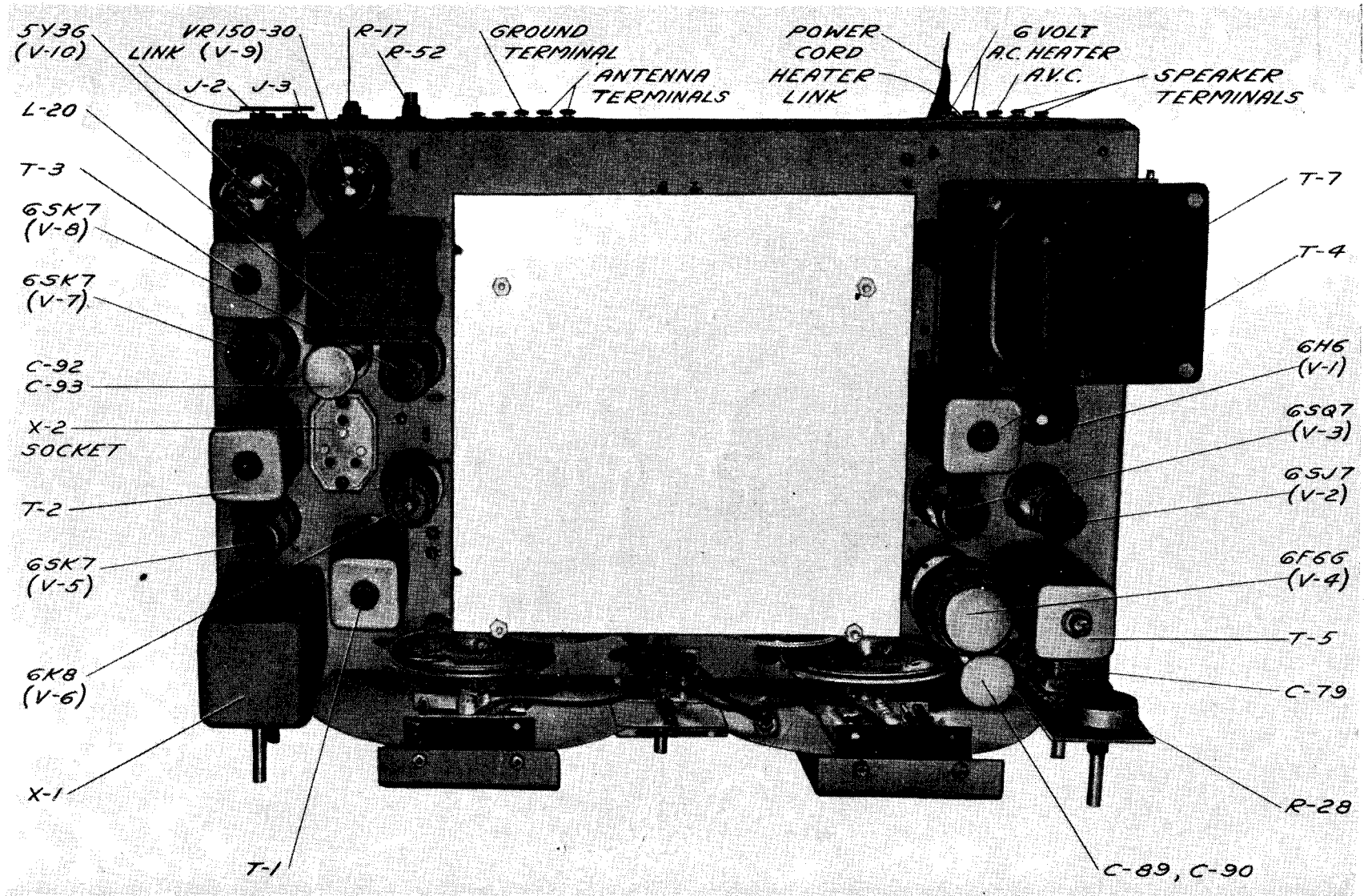


Figure 3—General Purpose Communication Receiver
 R.C.A.F. Type G.R.-10
 (Chassis—Top View)

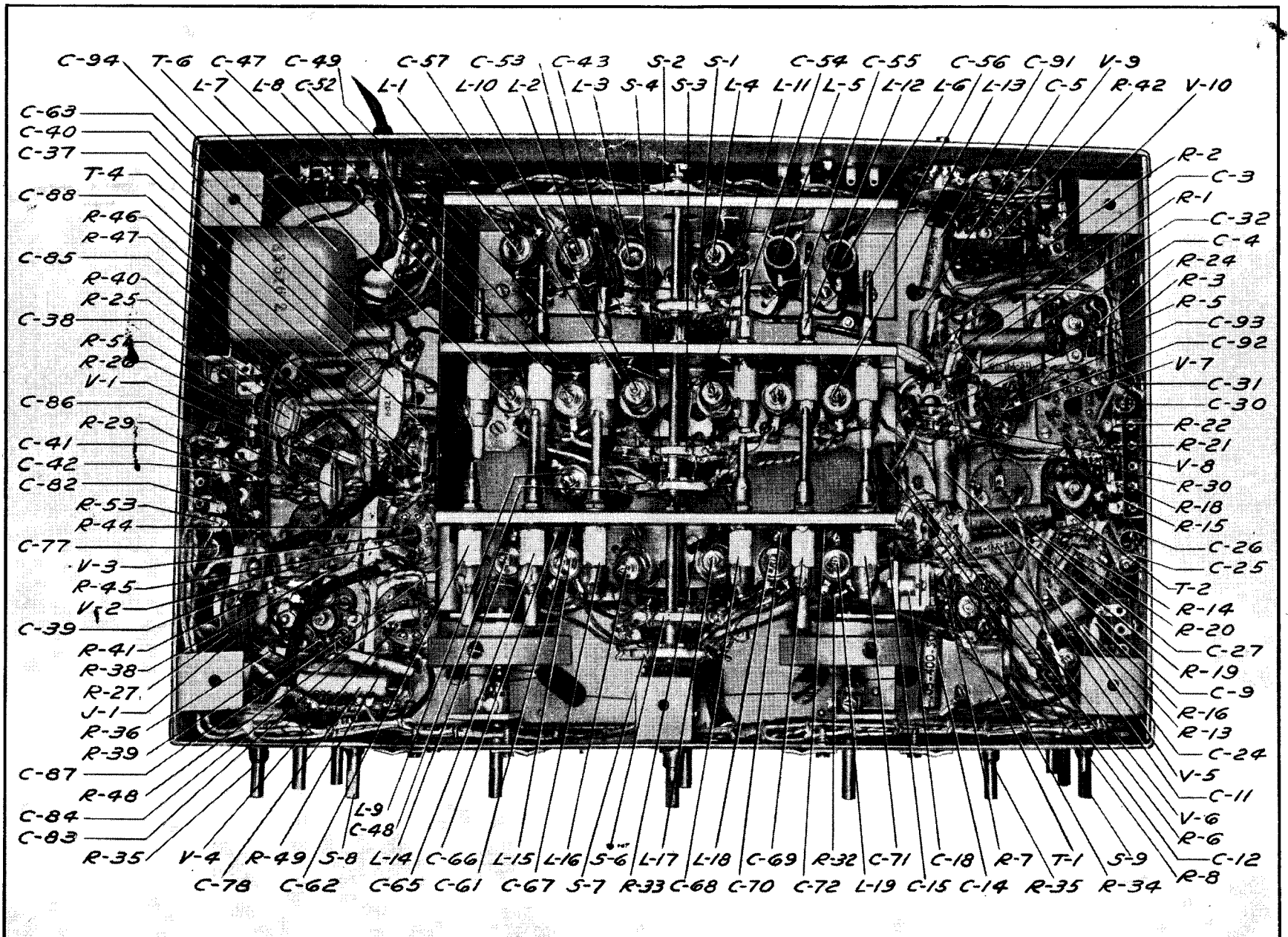


Figure 4—General Purpose Communication Receiver
 R.C.A.F. Type G.R.-10
 (Chassis—Bottom View)

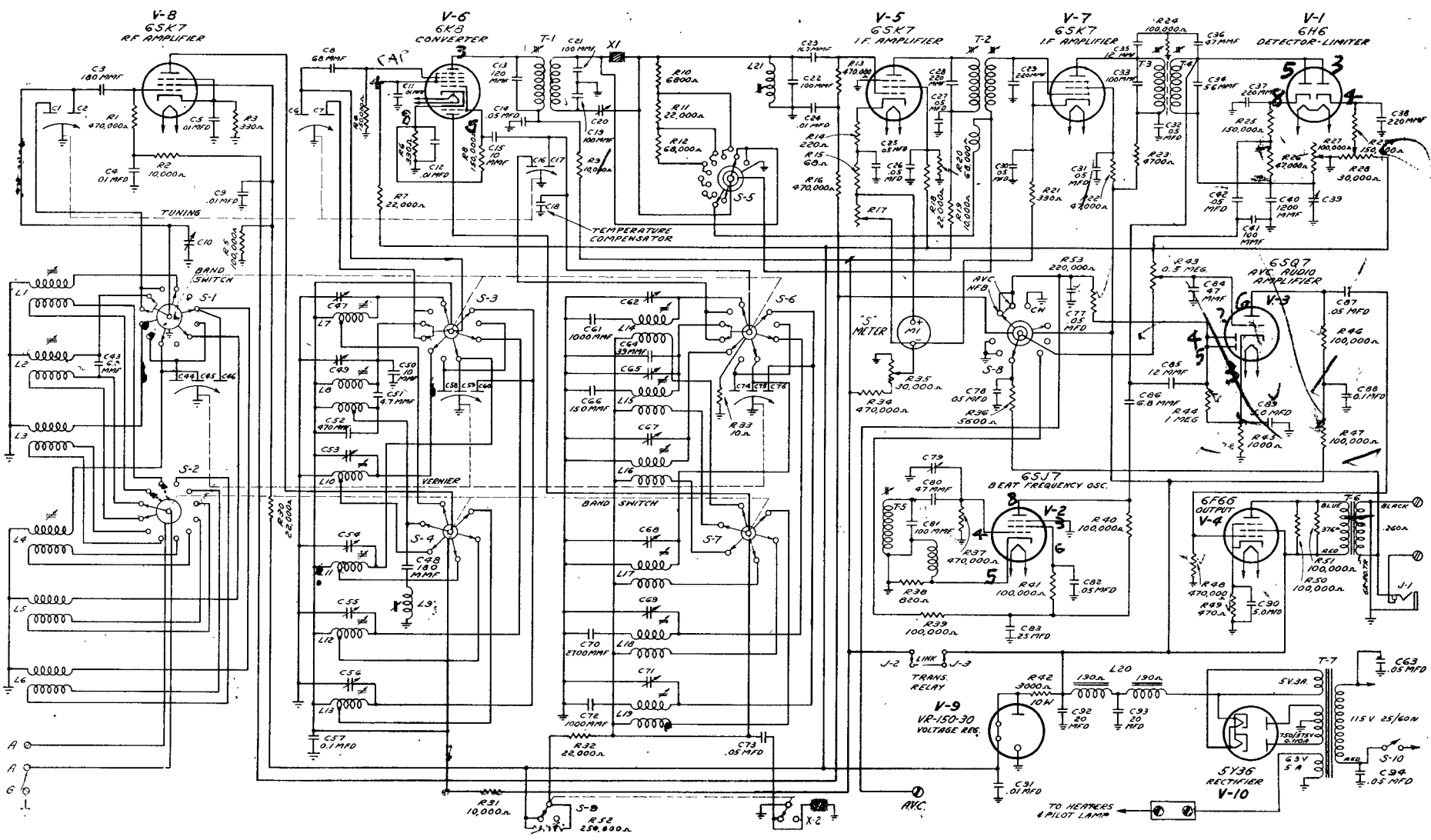


Figure 5—General Purpose Communication Receiver

R.C.A.F. Type G.R-10

(Schematic Diagram)

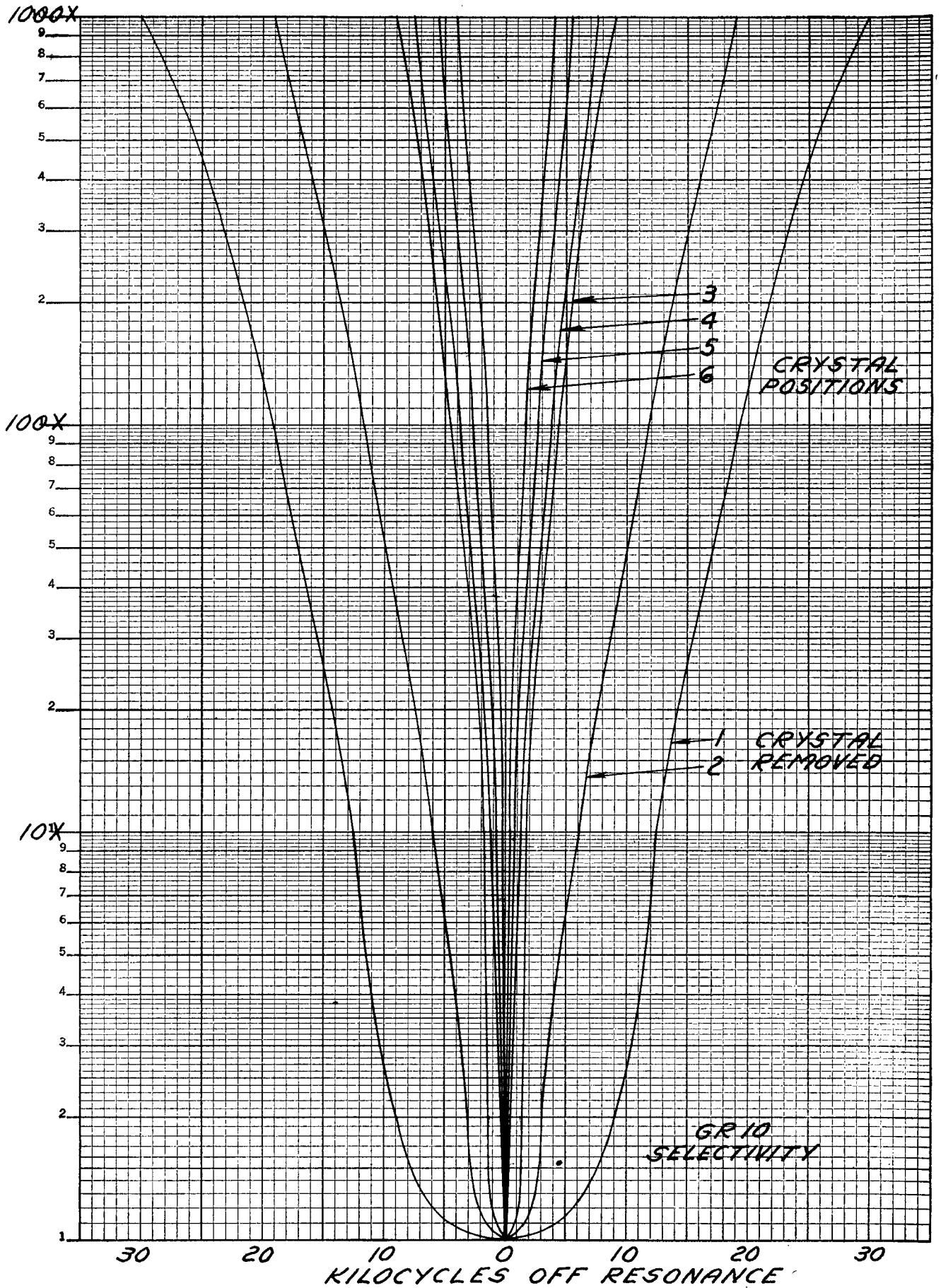


Figure 6—Selectivity Curves
R.C.A.F. Type G.R.-10