Westinghouse

TYPE JY CARRIER DOUBLE RECEIVER
50-150 and 150-300 Kc
100-150, 200-300 V. d-c or 115 V. 50 or 60 Cycles a-c

INSTRUCTIONS

CAUTION

Before working on this equipment, turn off the power supply and ground or open circuit the RF lead.

APPLICATION

The type JY double carrier receivers consist of a narrow band, saturated receiver and a broad band TRF receiver. They are used to receive either continuous wave carrier signals or modulated wave carrier signals for carrier relaying, telemetering, supervisory control, remote tripping, automatic load control, emergency communication or any other functions which utilize power line carrier channels to transmit intelligence from point to point on a power system.

These receivers are suitable for use with the directional comparison or current comparison systems of carrier relaying, using the narrow band portion of the receiver, and for the reception of modulated carrier (audio tone or voice) on the broad band portion, using either the double sideband or single sideband system of modulation. The broad band portion is suitable for the high quality reception of speech (100 to 3000 cycles) or for the reception of ten audio tones between 150 and 2900 cycles.

CONSTRUCTION AND OPERATION

The outline dimensions of these units are shown in Fig. 1. The receivers consist of an aluminum chassis welded to a vertical panel, and are arranged to mount on the swinging rack of the Type JY power line carrier cabinet. All the tubes, except the neon lamps which are screwed into sockets on the rear of the chassis, may be inserted and removed from the front of the vertical panel. Connections are made to a terminal block at the rear of the unit. Metering jacks are located on the front of the vertical panel at the right, and all of the electrical parts are on the rear of the panel.

Each receiver includes the equipment listed below for its particular operating voltage.

1 Carrier Receiver, Style# 867935 (50-150 Kc range) or S# 1352337 (150-300 Kc. range.)

1 set of tubes, as follows: 2 Type S14 (neon glow lamp), 1 Type 25L6 (relay detector), 2 Type 25Z6 (AVC and audio detector), and 2 Type 6SK7 (r-f amplifier).

If the receiver is to be operated from a 100 to 150 volt or from a 200 to 300 volt d-c supply, the following equipment is also supplied:

1 Accessory Group; Style 867936 (consisting of 3 ferrule type resistors).

1 Auxiliary Resistor Panel Style 1352070 for 3 Resistors.

If this Unit is to be operated from a rectifier, the following equipment is supplied:

1 Accessory Group, (consisting of 1 ferrule type resistor).

1 Auxiliary Resistor Panel Style 1352066 for 1 Resistor.

This resistor has two adjustable sliders. One is used for adjustment of the grid bias to relay tube V-3; the other is used, in case the supply voltage exceeds 125 volts, for limiting the plate supply to 125 volts so that the tube ratings will not be exceeded.

The electrical circuits of these receivers are shown in Fig. 2. Input transformer T-1 is provided with taps to adjust independently the input signal voltage to each portion of the receiver. One portion employs a single vacuum tube of the beam-power type as a biased detector for relaying. The other channel is designed for receiving modulated carrier; it has greater sensitivity and incorporates automatic volume control (AVC). The selectivity may be adjusted by the coupling dial and by the "Q control", which is variable resistor R-1. In this channel, two remote cut-off pentodes are used in a push-pull, radio-frequency amplifier stage. A full-wave rectifier is used as the audio detector, and a second similar rectifier supplies AVC voltage to the grid circuit of the radio-frequency amplifier. In the AVC circuit, radio-frequency energy from transformer T-2 is rectified in tube V-6 to develop across resistor R-5 AVC bias for the amplifier tubes. Resistor R-4 and capacitor C-5 form a filter network to prevent the audio-frequency component of the AVC voltage from reaching the grids of the amplifier tubes. Voltage-dividing resistor R-7 is used to introduce an adjustable AVC "delay" voltage between the cathode and the plates of tube V-6.

Except for the taps on the input transformer, the two portions of the receiver are independent and can be adjusted independently to any frequency in the band. Each portion is provided with adjustable coupling between a primary and secondary tuned circuit to control the selectivity. A neon protector lamp is connected in each primary tuned circuit to limit the voltage which can be developed across the primary inductor or tuning capacitor when surges or very strong signals are received.

Metering jacks are provided on the front panel for measuring the relay receiver plate current, the RF amplifier plate currents, the detector diode current, the audio frequency output voltage, and the tube-heater currents.

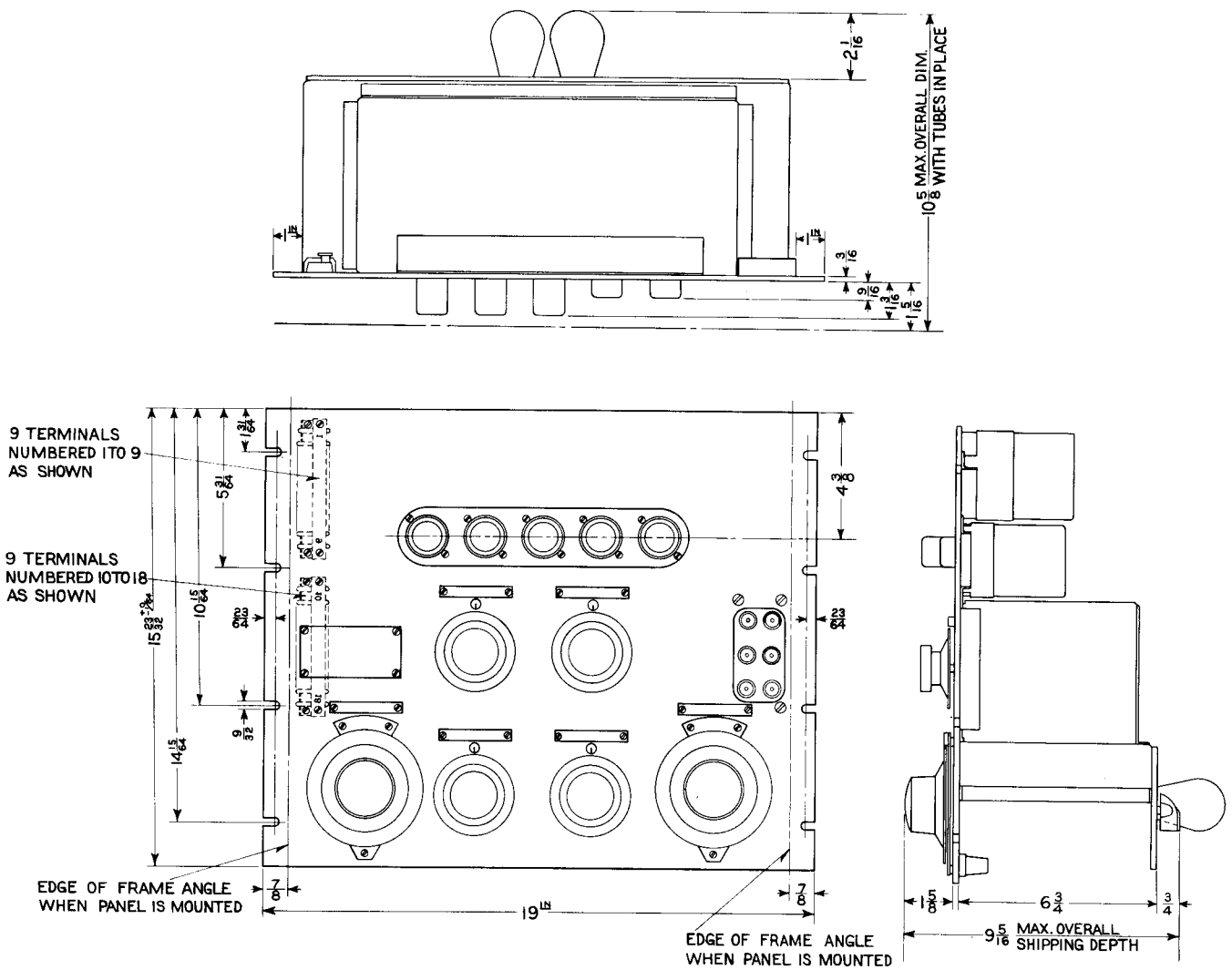


Figure 1
Outline of the Type JY Carrier Double Receiver. For Reference Only.

Plate, bias, and heater voltages are obtained from the auxiliary resistor panel when the carrier receiver is operated from a station battery. The auxiliary resistor panel consists of three adjustable resistors. Plate voltage is obtained from the slider of resistor R-102 and bias voltage for tube V-3 is obtained from the slider of resistor R-103. For 100 to 150 volt operation, resistors R-102 and R-103 are connected in series across the 100 to 150 volt supply. Resistor R-101 and the tube heaters are all in series across the 100 to 150 volt supply. For 200 to 300 volt operation, the tube heaters are in series with resistor R-101 and also with paralleled resistors R-102 and R-103.

CHARACTERISTICS

The frequency range of both portions of the receiver is either 50 to 150 kc or 150 to 300 kc with a 10% overlap at each end of the frequency range. The relaying (narrow band) portion of the receiver will operate through an attenuation of 30 db when used with a 10 watt transmitter (35 db with a 30 watt transmitter) for the type HZ or HZM relaying system. For the HKB relaying system, the ratings are 24 db with a 10 watt transmitter, or 29 db with a 30 watt transmitter. The broad band (TRF) portion of the receiver will operate through an attenuation of 50 db using a 10 watt transmitter and 55 db. using a 30 watt transmitter.

The TRF portion is equipped with automatic volume control which holds the audio output within 6 db for an input signal variation of 20 db. This gives good voice communication over a wide variation in signal strength and provides a large factor of safety in the reception of audio tones. It provides a maximum output of 10 milliwatts when feeding loads of 600 or 1500 ohms.

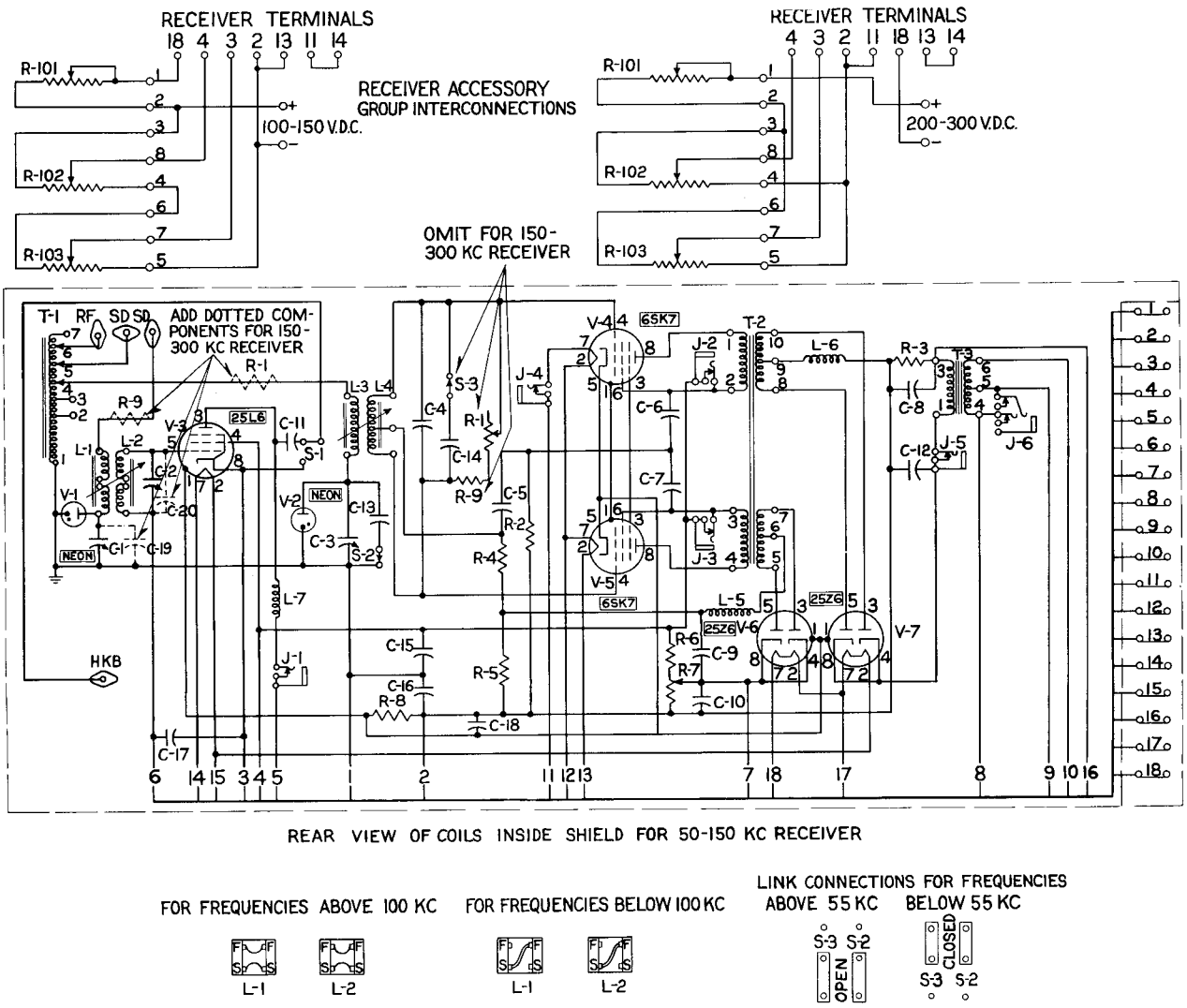
The receivers can be operated either from a 125 or 250 volt station battery, or from a 50 or 60 cycle a-c source in conjunction with suitable power supply units.

INSTALLATION

The receiver is usually supplied as part of a type JY power line carrier equipment assembly. In these cases, it is shipped assembled with the other units in a cabinet, completely wired.

When the unit is shipped separately, proceed as follows:

Unpack the unit and install it on a standard relay rack in the equipment assembly with which it is to be used. The mounting screws are contained in a cloth bag tied to the terminal strip of the receiver. Place the tubes in the tube sockets at the rear of the unit.



REAR VIEW OF COILS INSIDE SHIELD FOR 50-150 KC RECEIVER

Figure 2
Internal Schematic of the Type JY Carrier Double Receiver.

Mount the auxiliary resistor panel near the receiver unit.

Refer to the interconnection diagram for the equipment assembly of which this unit forms a part, and make connections accordingly. The diagram, Fig. 2, shows how to interconnect the auxiliary resistor panel and the carrier receiver for 100-150 and 200-300 volt d-c operation. The vertical terminals are on the auxiliary resistor unit and the horizontal terminals are on the receiver chassis.

When the carrier receiver is used with a rectifier, one external resistor is used. The following connections are required. The resistor is connected across the 125-volt d-c supply from the rectifier. Receiver terminal 4 is connected to a slider on the resistor for screen and plate voltage. Receiver terminal 3 is connected to a slider on the resistor to obtain grid bias for tube V-3. The negative terminal of the 125-volt d-c supply goes to receiver terminals 6 and 2. One side of the 25-volt a-c heater supply goes to receiver terminals 14 and 17; the other side goes to terminals 15 and 18. The 6.3 volt a-c supply is connected to receiver terminals 11 and 12. Receiver terminals 11 and 13 are jumpered together.

When the input signal is carried by a coaxial cable, the center conductor connects to the receiver terminal marked "RF", and the sheath connects to receiver terminal 1 and to the station ground. The relay coil connects to receiver terminals 4 and 5, and the handset connects to receiver terminals 8 and 9 for 600 ohms impedance, or to terminals 8 and 10 for 1500 ohms impedance.

For external connections, #22 wire is ample for any circuit except tube heater circuits. Use #18 wire for series connected tube heater circuits, and where all the heaters are connected in parallel use #14 for 25L6 tubes and #12 for 6L6 tubes.

ADJUSTMENTS AND MAINTENANCE

The Type JY power line carrier equipment assembly with which the carrier receiver is used should be provided with fuse protection and with a means of turning the equipment on and off The following adjustment information is supplemented by adjustment information in the instruction book for the equipment assembly.

Before closing the power supply switch proceed as follows:

1. Connect the RF INPUT terminal to tap 6 on auto-transformer T-1.
2. Connect primary inductor L-1 to tap 5 on auto-transformer T-1.
3. Connect primary inductor L-3 to tap 4 on auto-transformer T-1.

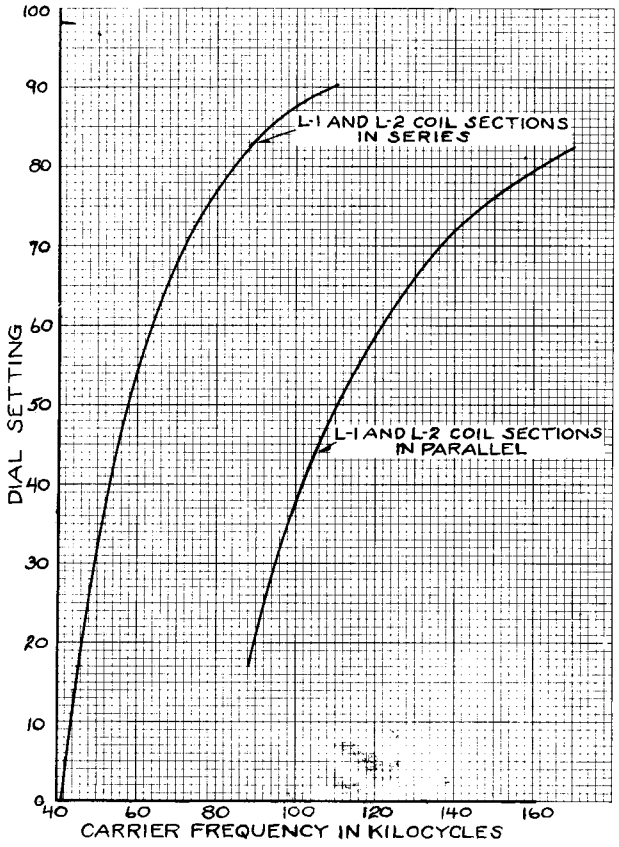


Figure 3
Dial Calibration Curve of the 50-150 kc Narrow Band Relay Receiver of the S#867935 Type JY Carrier Receiver.

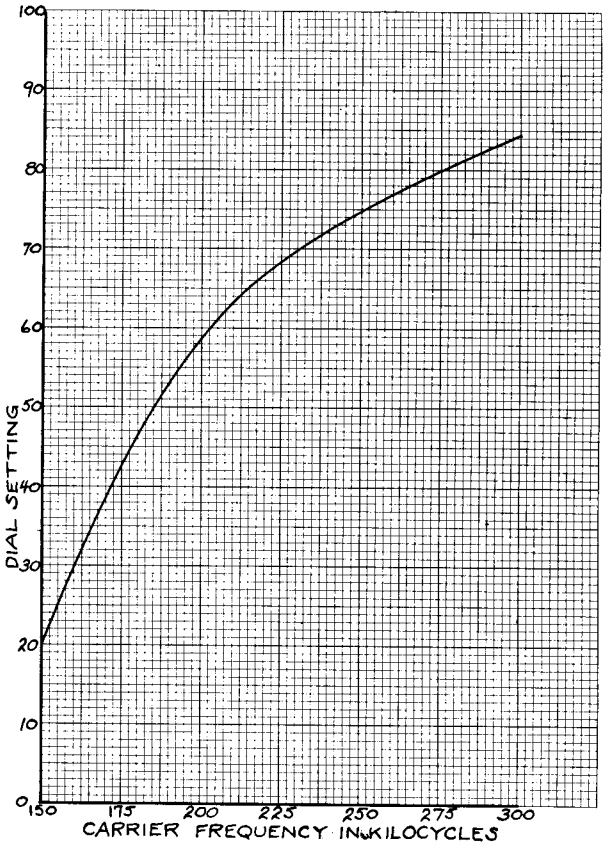


Figure 4
Dial Calibration Curve of the 150-300 kc Narrow Band Relay Receiver of the S#1352337 Type JY Carrier Receiver.

4. Set link S-1 on NORMAL for Westinghouse Type HZ or HZM relaying, or on HKB when connection is made to the Type JY HKB control unit.

5. Set the slider on tube-heater resistor R-101 for maximum resistance. Tube-heater resistor R-101 is on the Auxiliary Resistor Panel. (Omit this step when the tube-heaters are operated from a-c.)

6. Move the slider of the bias resistor for Receiver relay tube V-3, which is resistor R-103, to mid-position.

7. Measure the supply voltage and if it is approximately 125 or 250 volts, close the power supply switch from the station battery or from the rectifier supply unit as the case may be.

8. Set the slider on auxiliary resistor R-102 so as to obtain 125 volts between Receiver terminals 2 and 4. If the supply voltage is less than 125 volts, set the slider for maximum voltage. (In this case, it is better to remove the lead from the slider and connect the lead directly to the resistor mounting clip at this end.)

9. Insert an ammeter in jack 4. Adjust auxiliary resistor R-101 for the correct tube-heater current of 0.280 ampere. (Omit this step when the tube-heaters are operated from a-c.)

10. Ground the RF INPUT terminal to eliminate any signal input.

11. Measure the voltage between terminals 2 (neg.) and 4 (pos.) with a voltmeter of at least 1000 ohms per volt. Adjust the slider on auxiliary resistor R-103 to bias tube V-3 to cut off. Cut off is the voltage which will reduce the plate current, measured at J-1, to 0.1 milliampere or less. The bias voltage for this condition should be in the order of 21 to 25 volts. If the bias voltage and plate current values are materially different from the above, a defective tube is indicated and should be replaced.

12. Insert a milliammeter in jack 2 and jack 3 to read the sum of the plate and screen currents of each RF amplifier tube. They shall be in the range of 10 to 18 milliamperes. If the current is outside these limits, a defective tube is indicated and should be replaced.

TUNING ADJUSTMENTS

Tuning adjustments should be made under conditions of minimum line attenuation; that is, during good weather with line switching conditions that permit reception of the strongest signal possible. The tuning adjustments for each of the two channels follow:

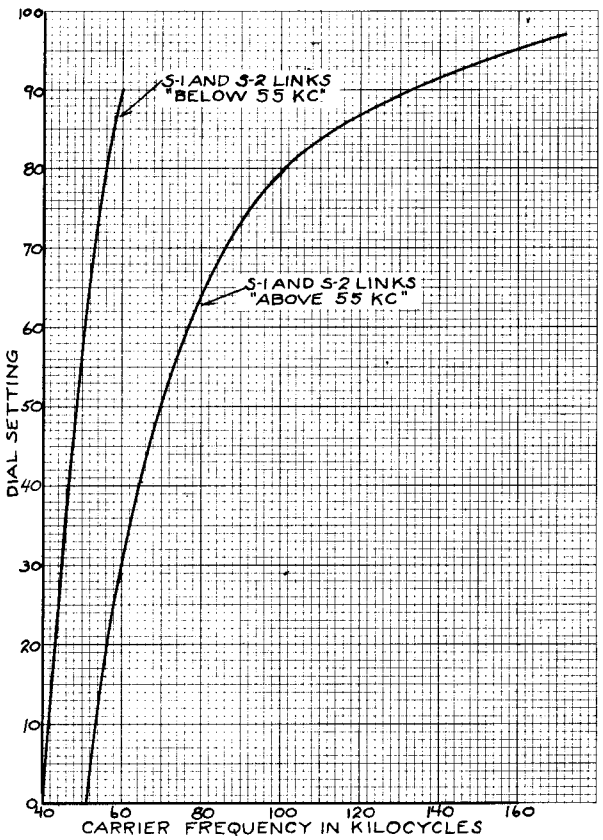


Figure 5
Dial Calibration Curve of the 50-150 kc Broad Band TRF Receiver of the S#867935 Type JY Carrier Receiver.

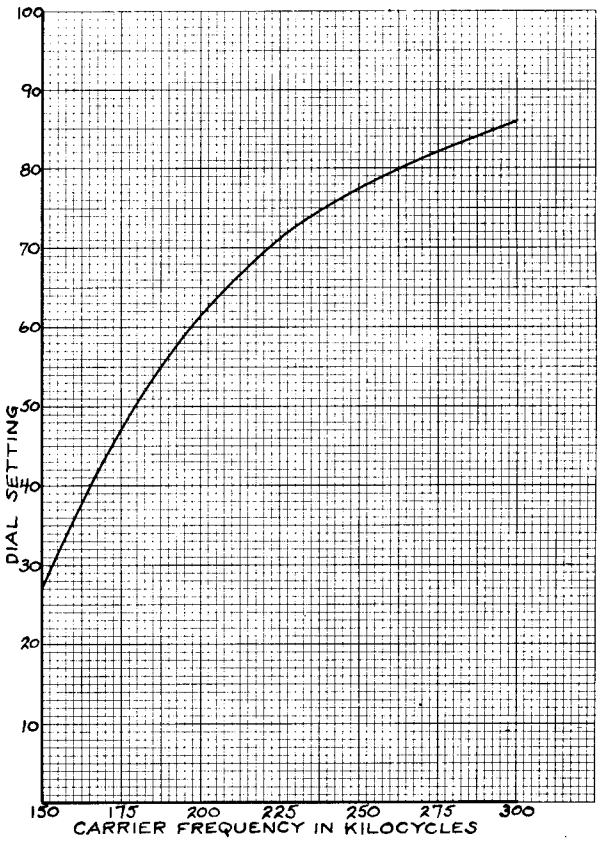


Figure 6
Dial Calibration Curve of the 150-300 kc Broad Band TRF Receiver of the S#1352337 Type JY Carrier Receiver.

Relay Channel-Receiver #1

a. Remove the cover plate from the coil shield assembly (for the 50-150 kc receiver only) and connect the sections of inductors L-1 and L-2 in parallel for frequencies above 100 kilocycles, and in series if the frequency is below 100 kilocycles. Replace the cover plate before proceeding further.

b. Set the PRIMARY TUNING NO. 1 and the SECONDARY TUNING NO. 1 dials for the desired frequency as indicated on dial calibration curves, Figs. 3 and 4. Use the "L1-L2 Sections in Series" curve on the 50-150 kc receiver for frequencies below 100 kilocycles and the "L1-L2 Sections in Parallel" curve for frequencies above 100 kilocycles. For exactly 100 kc the parallel connection is recommended. These curves show the approximate dial settings.

NOTE: If the receiver is used with a modulator panel connected for sleet detection, the adjustable tap on resistor R-5 furthest from the modulator panel should be moved to the end of R-5 furthest from the panel. This shorts out the attenuating resistor used in the sleet detection circuit.

c. Set the PRI.-SEC. COUPLING NO. 1 dial to 3. (Slightly above minimum coupling.)

d. Remove the ground from the RF input terminals of the receiver and supply an unmodulated signal from the distant transmitter.

e. Tune the SECONDARY TUNING NO. 1 dial for maximum current at jack 1.

f. Tune the PRIMARY TUNING NO. 1 dial for maximum current at jack 1.

g. If neon lamp V-1 lights during step f, move the L-1 connection to a lower tap on transformer T-1. If necessary, also move the RF input lead to a higher tap on transformer T-1 so that the neon lamp does not light. Lighting of the neon lamp broadens the tuning and makes it difficult to tune the receiver accurately.

h. Retune the PRIMARY TUNING NO. 1 dial if the taps were changed in step g above.

i. Increase the setting of the PRI.-SEC. COUPLING NO.1 dial to obtain maximum detector plate current at jack 1. After increasing the coupling, do not readjust the TUNING dials.

j. After the above adjustments are

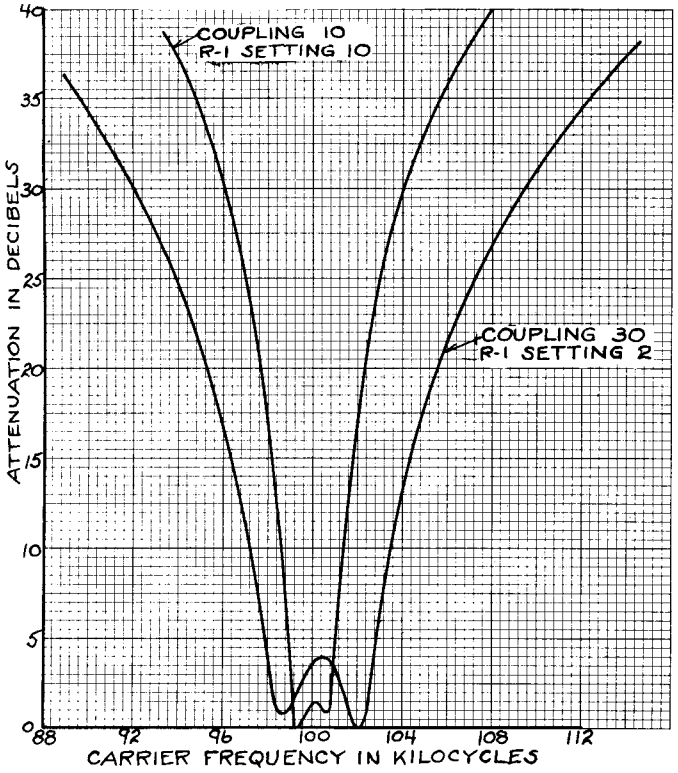


Figure 7
Selectivity Curve at 100 kc of the 50-150 kc Broad Band TRF Receiver of the S#867935 Type JY Carrier Receiver.

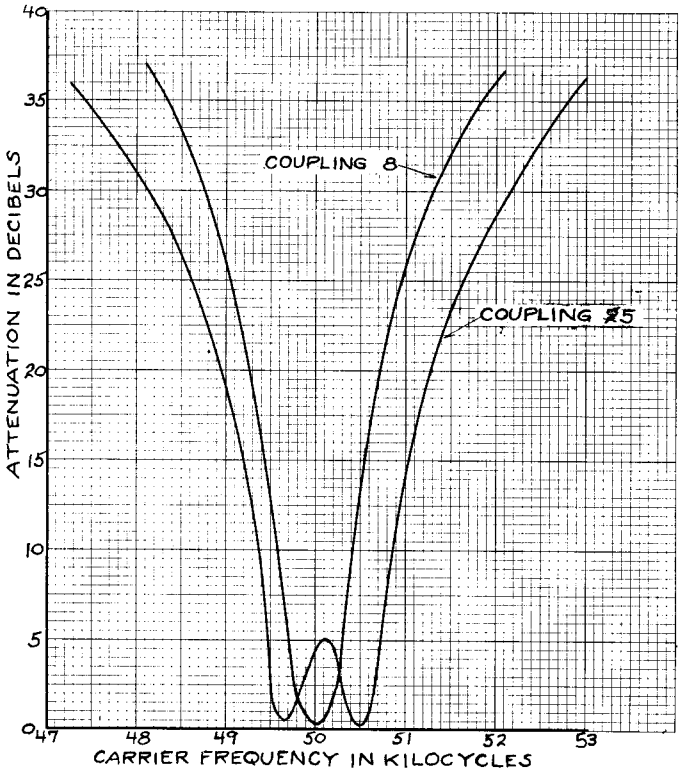


Figure 8
Selectivity Curve at 50 kc of the 50 to 150 kc Narrow Band Relay Receiver of the S#867935 Type JY Carrier Receiver.

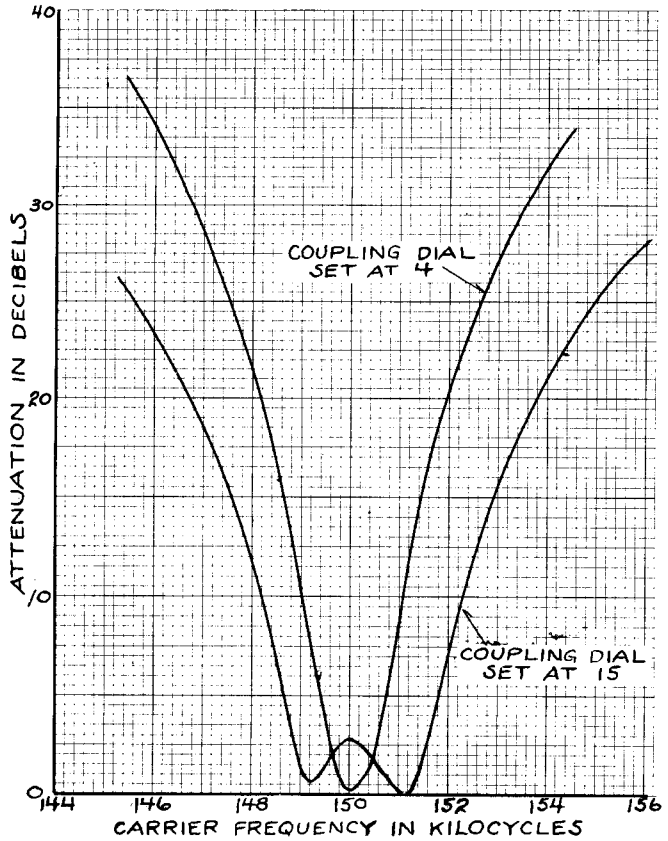


Figure 9
Selectivity Curve at 150 kc of the 50-150 kc Narrow Band Relay Receiver of the S#867935 Type JY Carrier Receiver.

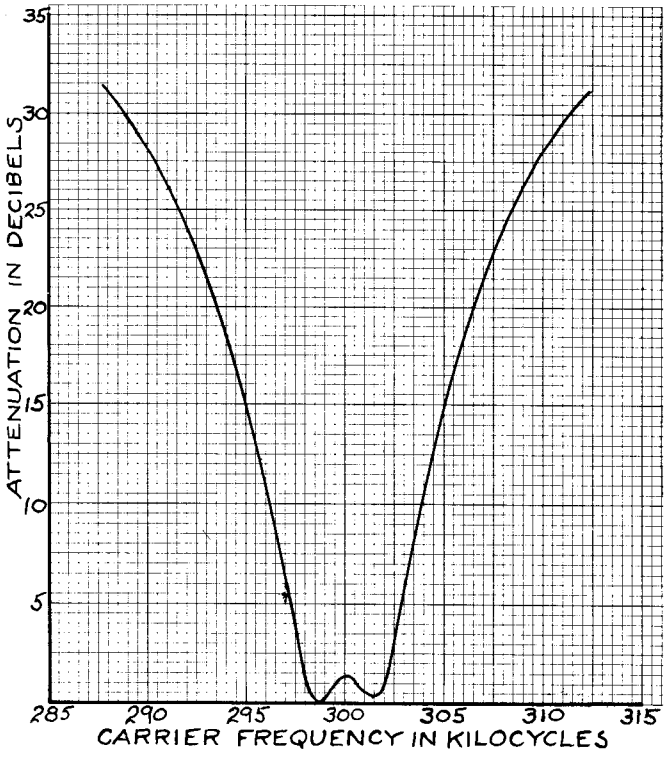


Figure 10
Selectivity Curve at 200 kc of the 150-300 kc Broad Band TRF Receiver of the S#1352337 Type JY Carrier Receiver.

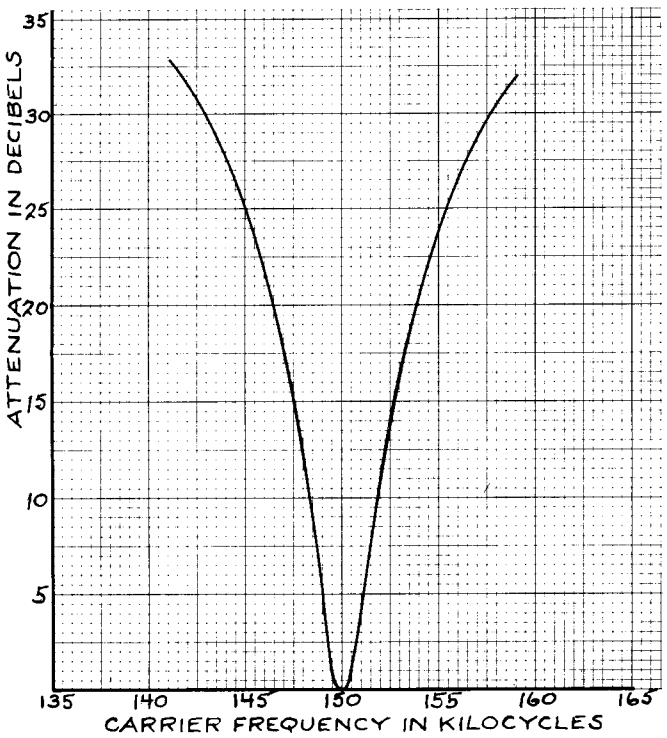


Figure 11
Selectivity Curve at 150 kc of the 150-300 kc Narrow Band Relay Receiver of the S#1352337 Type JY Carrier Receiver.

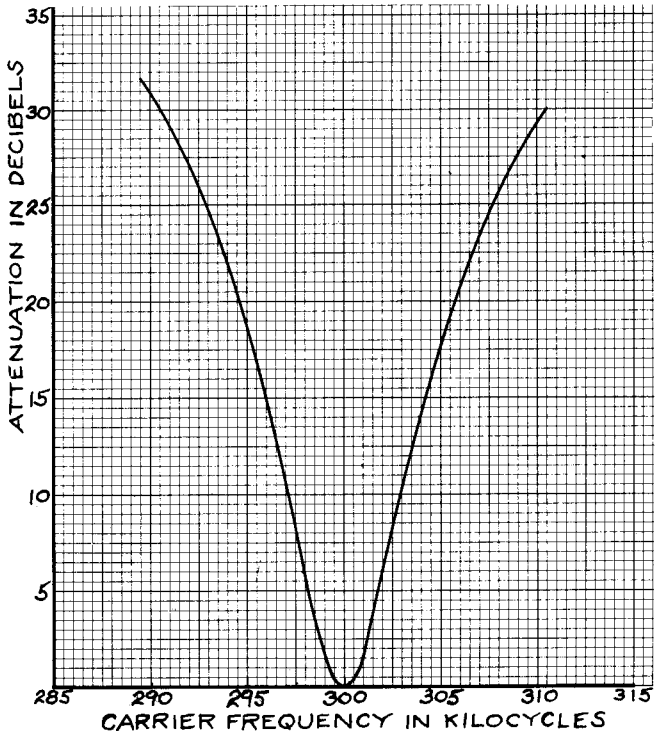


Figure 12
Selectivity Curve at 300 kc of the 150-300 kc Narrow Band Relay Receiver of the S#1352337 Type JY Carrier Receiver.

made, reconnect the lead from inductor L-1 to tap 5 on transformer T-1 and the RF input lead on tap 6. This may result in the neon lamp lighting on the received carrier signal, but this is of no consequence after the receiver has been properly tuned.

Broad Band (TRF) Channel Receiver #2

a. Ground the RF terminal to eliminate any signal input. Connect a milliammeter at jack 5 and measure the diode output current. It should not exceed 0.5 milliampere. Current in excess of this indicates a defective tube which should be replaced.

b. On the 50-150 kc receiver using frequencies below 55 kilocycles, connect capacitors C-13 and C-14 into the circuit by placing the link connectors S-2 and S-3 to the BELOW 55 KC positions. For frequencies above 55 kilocycles, disconnect capacitors C-13 and C-14 from the circuit by placing links S-2 and S-3 to the ABOVE 55 KC positions.

c. Set the PRIMARY TUNING NO. 2 dial and the SECONDARY TUNING NO. 2 dial for the desired frequency, as indicated on dial calibration curve Figs. 5 and 6. If the desired frequency is below 55 kilocycles on the 50-150 kc receiver, use the curve marked BELOW 55 KC. If the desired frequency is above 55 kilocycles, use the curve marked ABOVE 55 KC. These curves show the approximate dial settings.

d. Set the PRI.-SEC. COUPLING NO. 2 dial to 3 (slightly above minimum coupling).

e. Rotate the Q-control (R-1) to position 10 for maximum Q.

f. Move the slider on resistor R-7 to the end farthest from the panel to obtain maximum AVC "delay" voltage.

g. Remove the ground from the RF INPUT terminal of the Receiver, and apply an unmodulated signal from the distant Transmitter.

h. Connect a milliammeter at jack 5 and tune the SECONDARY TUNING NO.2 dial for maximum current.

i. Tune the PRIMARY TUNING NO. 2 dial for maximum current.

j. If neon lamp V-2 lights or the current at jack 5 exceeds 3 milliamperes during step i, move the lead from inductor L-3 to a lower tap on transformer T-1 and retune the PRIMARY TUNING NO. 2 and the SECONDARY NO. 2 dials for maximum current at jack 5. Do not disturb the lead from inductor L-1 or the RF input lead on transformer T-1.

k. Increase the setting of the PRI.-SEC. COUPLING NO. 2 dial for maximum current at jack 5.

l. For the 50-150 kc receiver, adjust the PRI.-SEC. COUPLING NO. 2 dial and the R-1 knob (Q control) for a bandwidth of 6 kilocycles. Approximate settings for these con-

RECEIVER PARTS LIST
(CONT'D)

DIAGRAM	SYMBOL.	NUMBER REQ'D.			
50-150 Rec.	150-300 Rec.	50-150 Rec.	150-300 Rec.	FUNCTION	RATING
				METER JACKS (Cont'd.)	
J-3	J-3	1	1	V-5 Plate Current	One Circuit Opening
J-4	J-4	1	1	V-3 Heater "	" " "
J-5	J-5	1	1	Diode "	" " "
J-6	J-6	1	1	Audio Output	Two " "
				COILS	
L-1		1		Primary Tuning Rec. #1	17 MH. Two Sections
	L-1		1	" " " "	
L-2		1		Secondary " " "	17 MH. " "
	L-2		1		
L-3		1		Primary Tuning Rec. #2	" "
	L-3		1	" " " "	
L-4		1		Secondary " " "	" "
	L-4		1	" " " "	" "
L-5	L-5	1	1	Choke AVC Filter	250MH., 60 MA.
L-6	L-6	1	1	" Detector Filter	10MH., 125 MA.
L-7	L-7	1	1	" RF	10MH., 125 MA.
				RESISTORS	
R-1		1		Band width Control	2.5 Megohm, Variable
	R-1		1	Primary Series Rec. #2	22 Ohms. 1 Watt
R-2	R-2	1	1	Cathode	150 Ohms 1 Watt
R-3	R-3	1	1	Limiting	2200 Ohms 1 Watt
R-4	R-4	1	1	Isolation	10,000 Ohms 1 Watt
R-5	R-5	1	1	AVC.	10,000 Ohms 1 Watt
R-6	R-6	1	1	Voltage Dropping	8,000 Ohms 4 inch.
R-7	R-7	1	1	AVC Delay	2,000 Ohms 4 inch-Adj.
R-8	R-8	1	1	Static Leak	150,000 Ohms 1 Watt
R-9		1		Resistor	68,000 Ohms 1 Watt
	R-9		1	Primary Series Rec. #1	12 Ohms 1 Watt
				SWITCHES	
S-1	S-1	1	1	HKB Relay	Link Connector
S-2		1		Primary Tuning	" "
S-3		1		Secondary Tuning	" "
				TRANSFORMERS	
T-1	T-1	1	1	Input Matching	Auto-Transformer
T-2	T-2	1	1	R.F. Output	Push-Pull Output Untuned Iron Core
T-3	T-3	1	1	Audio	Diode-1500-800 Ohms
				TUBE SOCKETS	
X-1	X-1	1	1	Neon Lamp	Medium Screw Base
X-2	X-2	1	1	" "	" " "
X-3 to X-7	X-3 to X-7	5	5	V3,V4,V5,V6,V7 Tubes	Ceramic Wafer- Octal Base.

FROM DWGS. T-7613883 AND T-7613884

ACCESSORY PARTS LIST

DIAGRAM	SYMBOL.	NUMBER REQ'D.			
50-150 KC.	150-300 KC.	50-150 KC.	150-300 KC.	FUNCTION	RATING
				RESISTORS	
R-101				Accessory	250 Ohms 10 inch 1 adjustable band.
R-102				"	1600 Ohms 10 inch 2 adjustable bands.
R-103				"	Same as R-101.
				TUBES	
V-1	V-1	1	1	Protector Rec. #1	Gas 2 Watt 115 V neon Type S-14
V-2	V-2	1	1	" " #2	" " " " " " "
V-3	V-3	1	1	Relay Detector-Vacuum	25L6
V-4	V-4	1	1	R.F. Amplifier-Vacuum	6SK7
V-5	V-5	1	1	" " "	"
V-6	V-6	1	1	AVC - Vacuum	25Z6
V-7	V-7	1	1	Detector - Vacuum	25Z6

FROM DWGS. T-7613883 AND T-7613884

WESTINGHOUSE ELECTRIC CORPORATION
Meter Division, Newark, N. J.

PRINTED IN U.S.A.

7-46

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE JY CARRIER DOUBLE RECEIVER

50-150 and 150-300 KC

100-150, 200-300 V. D-C or 115 V., 50 or 60 cycles A-C

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1 Accessory Group; Style 867936 (consisting of 3 ferrule type resistors).

1 Auxiliary Resistor Panel Style 1352070 for 3 Resistors.

If this Unit is to be operated from a rectifier, the following equipment is supplied:

1 Accessory Group, (consisting of 1 ferrule type resistor).

1 Auxiliary Resistor Panel Style 1352068 for 1 Resistor.

This resistor has two adjustable sliders. One is used for adjustment of the grid bias to relay tube V-3; the other is used, in case the

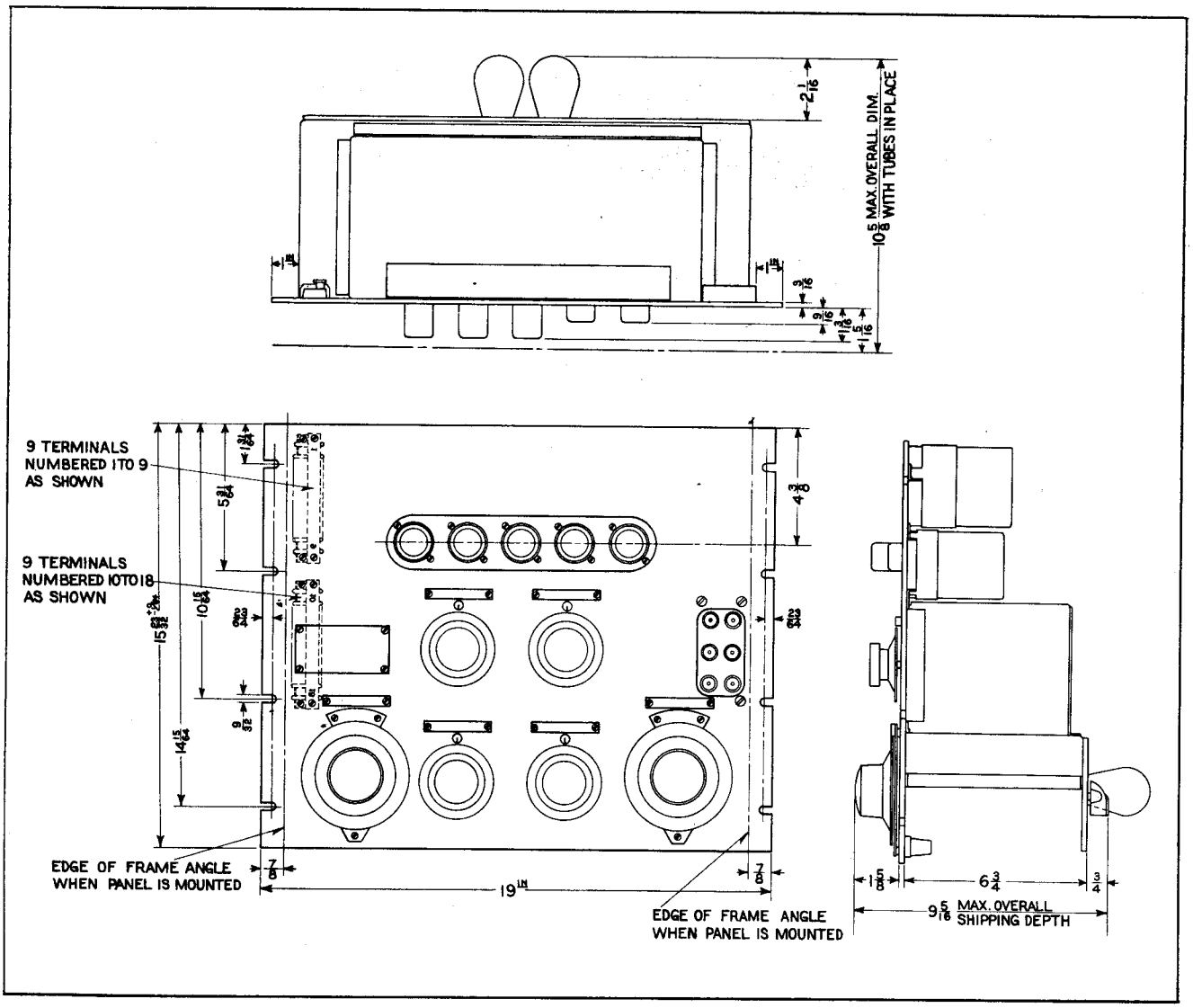

Fig. 1—Outline of the Type JY Carrier Double Receiver. For Reference Only.

supply voltage exceeds 125 volts, for limiting the plate supply to 125 volts so that the tube ratings will not be exceeded.

The electrical circuits of these receivers are shown in Fig. 2. Input transformer T-1 is provided with taps to adjust independently the input signal voltage to each portion of the receiver. One portion employs a single vacuum tube of the beam-power type as a biased detector for relaying. The other channel is designed for receiving modulated carrier; it has greater sensitivity and incorporates automatic volume control (AVC). The selectivity may be adjusted by the coupling dial and by the "Q control", which is variable resistor R-1. In this channel, two remote cut-off pentodes are used in a push-pull, radio-frequency amplifier stage. A full-wave rectifier is used as the audio detector, and a second similar rectifier supplies AVC voltage to the grid circuit of the radio-frequency amplifier. In the AVC circuit, radio-frequency energy from transformer T-2 is rectified in tube V-6 to develop across resistor R-5 AVC bias for the amplifier tubes. Resistor R-4 and capacitor C-5 form a filter network to prevent the audio-frequency component of the AVC voltage from reaching the grids of the amplifier tubes. Voltage-dividing resistor R-7 is used to introduce an adjustable AVC "delay" voltage between the cathode and the plates of tube V-6.

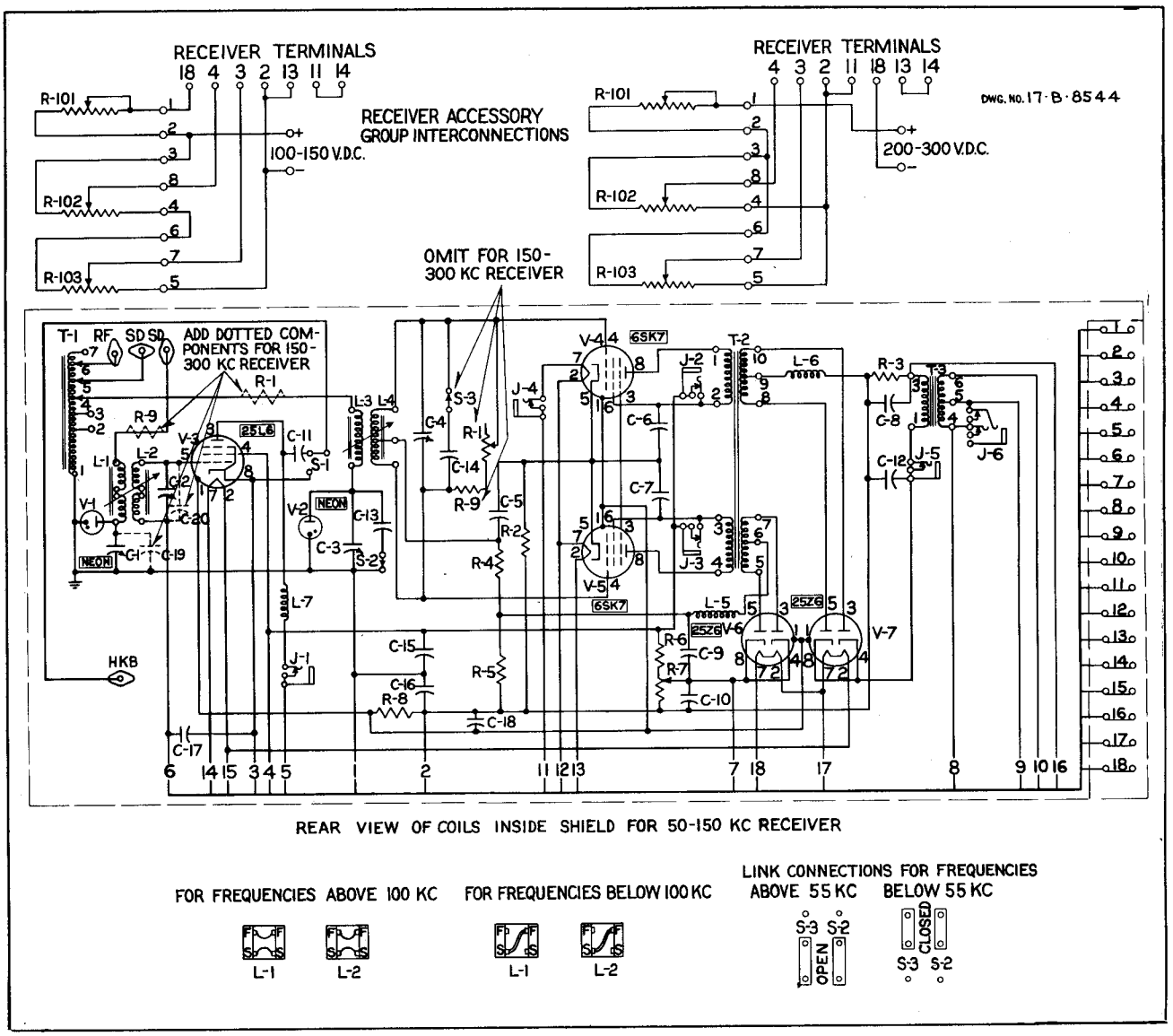

Fig. 2—Internal Schematic of the Type JY Carrier Double Receiver.

Except for the taps on the input transformer, the two portions of the receiver are independent and can be adjusted independently to any frequency in the band. Each portion is provided with adjustable coupling between a primary and secondary tuned circuit to control the selectivity. A neon protector lamp is connected in each primary tuned circuit to limit the voltage which can be developed across the primary inductor or tuning capacitor when surges or very strong signals are received.

Metering jacks are provided on the front panel for measuring the relay receiver plate current, the RF amplifier plate currents, the detector diode current, the audio frequency output voltage, and the tube-heater currents.

Plate, bias, and heater voltages are obtained from the auxiliary resistor panel when the carrier receiver is operated from a station battery. The auxiliary resisotr panel consists of three adjustable resistors. Plate voltage is obtained from the slider of resistor R-102 and bias voltage for tube V-3 is obtained from the slider of resistor R-103. For 100 to 150 volt operation, resistors R-102 and R-103 are connected in series across the 100 to 150 volt supply. Resistor R-101 and

the tube heaters are all in series across the 100 to 150 volt supply. For 200 to 300 volt operation, the tube heaters are in series with resistor R-101 and also with paralleled resistors R-102 and R-103.

CHARACTERISTICS

The frequency range of both portions of the receiver is either 50 to 150 kc or 150 to 300 kc with a 10% overlap at each end of the frequency range. The relaying (narrow band) portion of the receiver will operate through an attenuation of 30 db when used with a 10 watt transmitter (35 db with a 300 watt transmitter) for the type HZ or HZM relaying system. For the HKB relaying system, the ratings are 24 db with a 10 watt transmitter, or 29 db with a 30 watt transmitter. The broad band (TRF) portion of the receiver will operate through an attenuation of 50 db using a 10 watt transmitter and 55 db using a 30 watt transmitter.

The TRF portion is equipped with automatic volume control which holds the audio output within 6 db for an input signal variation of 20 db. This gives good voice communication over a wide variation in signal strength and provides a large factor of safety in the reception of audio tones. It provides a maximum output of 10 milliwatts when feeding loads of 600 or 1500 ohms.

The receivers can be operated either from a 125 or 250 volt station battery, or from a 50 or 60 cycle a-c source in conjunction with suitable power supply units.

INSTALLATION

The receiver is usually supplied as part of a type JY power line carrier equipment assembly. In these cases, it is shipped assembled with the other units in a cabinet, completely wired.

When the unit is shipped separately, proceed as follows:

Unpack the unit and install it on a standard relay rack in the equipment assembly with which it is to be used. The mounting screws are contained in a cloth bag tied to the terminal strip of the receiver. Place the tubes in the tube sockets at the rear of the unit. Mount the auxiliary resistor panel near the receiver unit.

Refer to the interconnection diagram for the equipment assembly of which this unit forms a part, and make connections accordingly. The diagram, Fig. 2, shows how to interconnect the auxiliary resistor panel and the carrier receiver for 100-150 and 200-300 volt d-c operation. The vertical terminals are on the auxiliary resistor unit and the horizontal terminals are on the receiver chassis.

When the carrier receiver is used with a rectifier, one external resistor is used. The following connections are required. The resistor is connected across the 125-volt d-c supply from the rectifier. Receiver terminal 4 is connected to a slider on the resistor for screen and plate voltage. Receiver terminal 3 is connected to a slider on the resistor to obtain grid bias for tube V-3. The negative terminal of the 125-volt d-c supply goes to receiver terminals 6 and 2. One side of the 25-volt a-c heater supply goes to receiver terminals 14 and 17; the other side goes to terminals 15 and 18. The 6.3 volt a-c supply is connected to receiver terminals 11 and 12. Receiver terminals 11 and 13 are jumpered together.

When the input signal is carried by a coaxial cable, the center conductor connects to the receiver terminal marked "RF", and the sheath connects to receiver terminal 1 and to the station ground. The relay coil connects to receiver terminals 4 and 5, and the handset connects to receiver terminals 8 and 9 for 600 ohms impedance, or to terminals 8 and 10 for 1500 ohms impedance.

For external connections, #22 wire is ample for any circuit except tube heater circuits. Use #18 wire for series connected tube heater circuits, and where all the heaters are connected in parallel use #14 for 25L6 tubes and #12 for 6L6 tubes.

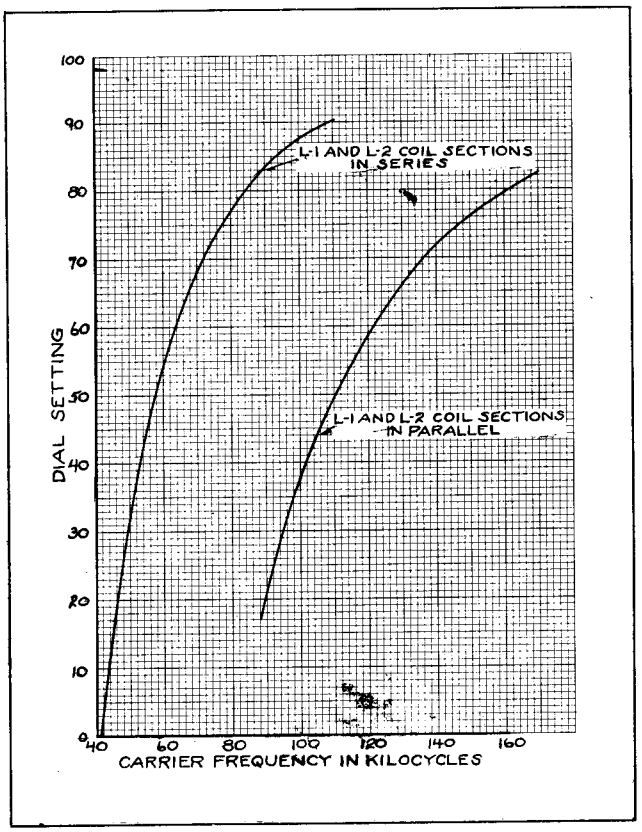

Fig. 3—Dial Calibration Curve of the 50-150 Kc Narrow Band Relay Receiver of the S#867935 Type JY Carrier Receiver.

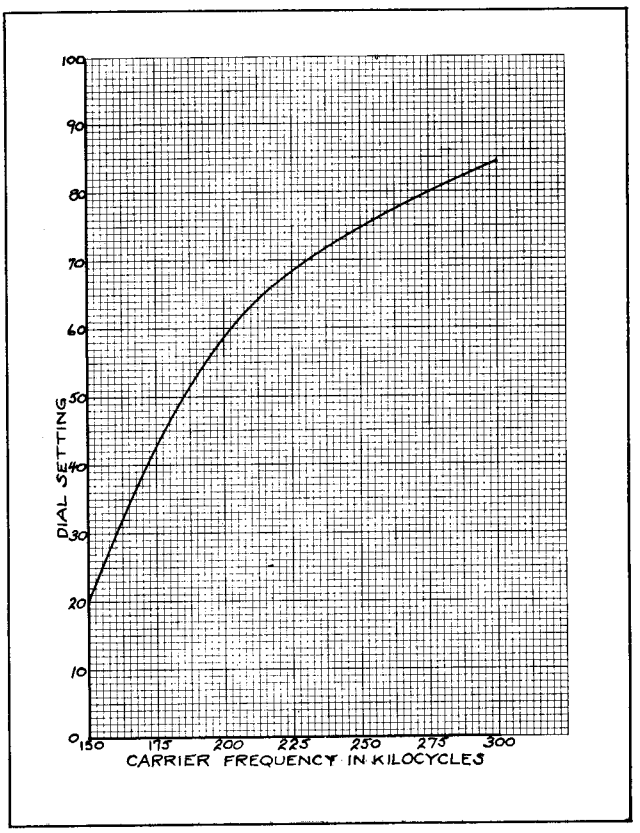

Fig. 4—Dial Calibration Curve of the 150-300 Kc Narrow Band Relay Receiver of the S#1352337 Type JY Carrier Receiver.

ADJUSTMENTS AND MAINTENANCE

The Type JY power line carrier equipment assembly with which the carrier receiver is used should be provided with fuse protection and with a means of turning the equipment on and off. The following adjustment information is supplemented by adjustment information in the instruction book for the equipment assembly.

Before closing the power supply switch proceed as follows:

1. Connect the RF INPUT terminal to tap 6 on auto-transformer T-1.

2. Connect primary inductor L-1 to tap 5 on auto-transformer T-1.

3. Connect primary inductor L-3 to tap 4 on auto-transformer T-1.

4. Set link S-1 on NORMAL for Westinghouse Type HZ or HZM relaying, or on HKB when connection is made to the Type JY HKB control unit.

5. Set the slider on tube-heater resistor R-101 for maximum resistance. Tube-heater resistor R-101 is on the Auxiliary Resistor Panel. (Omit this step when the tube-heaters are operated from a-c.)

6. Move the slider of the bias resistor for Receiver relay tube V-3, which is resistor R-103, to mid-position.

7. Measure the supply voltage and if it is approximately 125 or 250 volts, close the power supply switch from the station battery or from the rectifier supply unit as the case may be.

8. Set the slider on auxiliary resistor

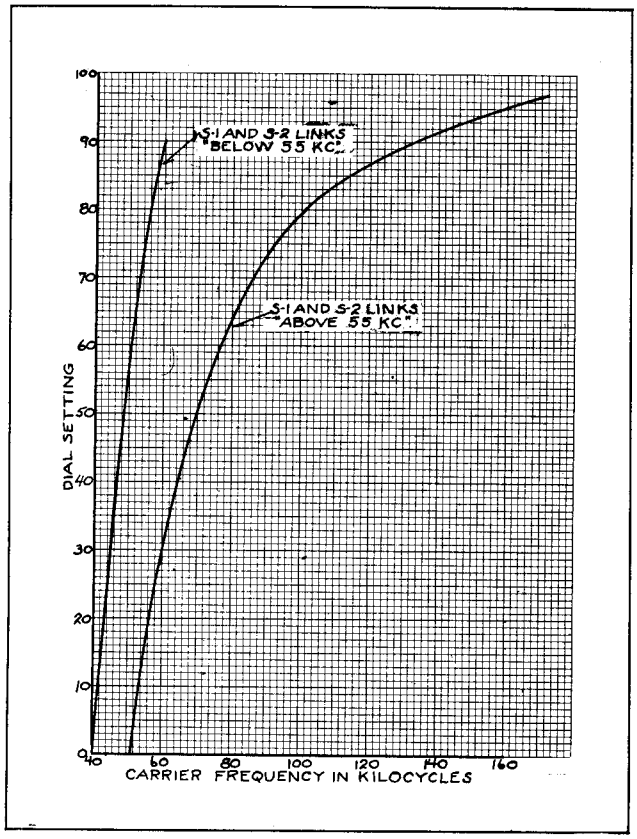

Fig. 5—Dial Calibration Curve of the 50-150 Kc Broad Band TRF Receiver of the S#867935 Type JY Carrier Receiver.

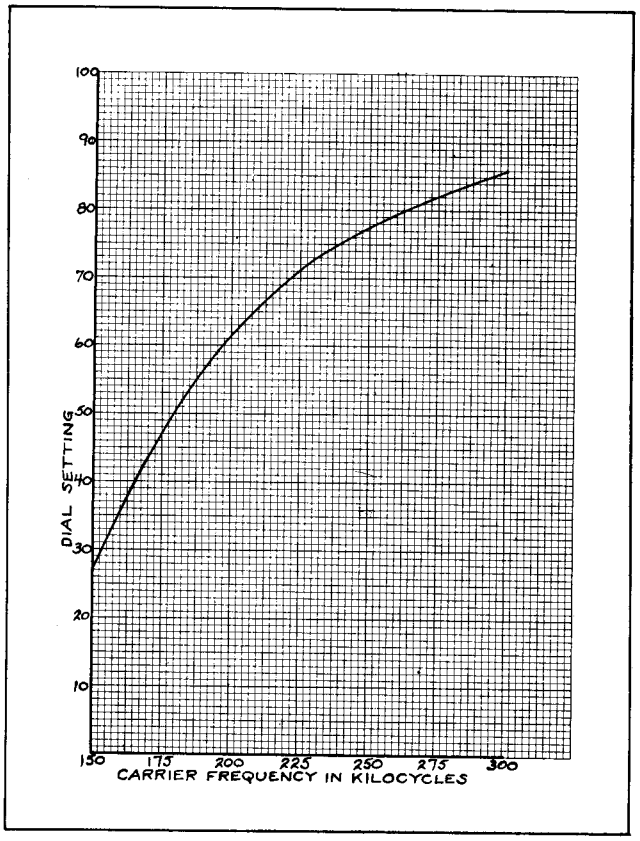

Fig. 6—Dial Calibration Curve of the 150-300 Kc Broad Band TRF Receiver of the S#1352337 Type JY Carrier Receiver.

R-102 so as to obtain 125 volts between Receiver terminals 2 and 4. If the supply voltage is less than 125 volts, set the slider for maximum voltage. (In this case, it is better to remove the lead from the slider and connect the lead directly to the resistor mounting clip at this end.)

9. Insert an ammeter in jack 4. Adjust auxiliary resistor R-101 for the correct tube-heater current of 0.280 ampere. (Omit this step when the tube-heaters are operated from a-c.)

10. Ground the RF INPUT terminal to eliminate any signal input.

11. Measure the voltage between terminals 2 (neg.) and 4 (pos.) with a voltmeter of at least 1000 ohms per volt. Adjust the slider on auxiliary resistor R-103 to bias tube V-3 to cut off. Cut off is the voltage which will reduce the plate current, measured at J-1, to 0.1 milliampere or less. The bias voltage for this condition should be in the order of 21 to 25 volts. If the bias voltage and plate current values are materially different from the above, a defective tube is indicated and should be replaced.

12. Insert a milliammeter in jack 2 and jack 3 to read the sum of the plate and screen currents of each RF amplifier tube. They shall be in the range of 10 to 18 milliamperes. If the current is outside these limits, a defective tube is indicated and should be replaced.

TUNING ADJUSTMENTS

Tuning adjustments should be made under conditions of minimum line attenuation; that is,

during good weather with line switching conditions that permit reception of the strongest signal possible. The tuning adjustments for each of the two channels follow:

Relay Channel-Receiver #1

a. Remove the cover plate from the coil shield assembly (for the 50-150 kc receiver only) and connect the sections of inductors L-1 and L-2 in parallel for frequencies above 100 kilocycles, and in series if the frequency is below 100 kilocycles. Replace the cover plate before proceeding further.

b. Set the PRIMARY TUNING NO. 1 and the SECONDARY TUNING NO. 1 dials for the desired frequency as indicated on dial calibration curves, Figs. 3 and 4. Use the "L1-L2 Sections in Series" curve on the 50-150 kc receiver for frequencies below 100 kilocycles and the "L1-L2 Sections in Parallel" curve for frequencies above 100 kilocycles. For exactly 100 kc the parallel connection is recommended. These curves show the approximate dial settings.

NOTE: If the receiver is used with a modulator panel connected for sleet detection, the adjustable tap on resistor R-5 furthest from the modulator panel should be moved to the end of R-5 furthest from the panel. This shorts out the attenuating resistor used in the sleet detection circuit.

c. Set the PRI.-SEC. COUPLING NO. 1 dial to 3. (Slightly above minimum coupling.)

d. Remove the ground from the RF input terminals of the receiver and supply an unmodulated signal from the distant transmitter.

e. Tune the SECONDARY TUNING NO. 1 dial for maximum current at jack 1.

f. Tune the PRIMARY TUNING NO. 1 dial for maximum current at jack 1.

g. If neon lamp V-1 lights during step f, move the L-1 connection to a lower tap on transformer T-1. If necessary, also move the RF input lead to a higher tap on transformer T-1 so that the neon lamp does not light. Lighting of the neon lamp broadens the tuning and makes it difficult to tune the receiver accurately.

h. Retune the PRIMARY TUNING NO. 1 dial if the taps were changed in step g above.

i. Increase the setting of the PRI.-SEC. COUPLING NO. 1 dial to obtain maximum detector plate current at jack 1. This is called "critical coupling." After increasing the coupling, do not readjust the TUNING dials.

j. After the above adjustments are made, reconnect the lead from inductor L-1 to tap 5 on transformer T-1 and the RF input lead on tap 6. This may result in the neon lamp lighting on the received carrier signal, but this is of no consequence after the receiver has been properly tuned.

Broad Band (TRF) Channel Receiver #2

a. Ground the RF terminal to eliminate any signal input. Connect a milliammeter at jack 5 and measure the diode output current. It should not exceed 0.5 milliampere. Current in excess of this indicates a defective tube which should be replaced.

b. On the 50-150 kc receiver using frequencies below 55 kilocycles, connect capacitors C-13 and C-14 into the circuit by placing the link connectors S-2 and S-3 to the BELOW 55 KC positions. For frequencies above

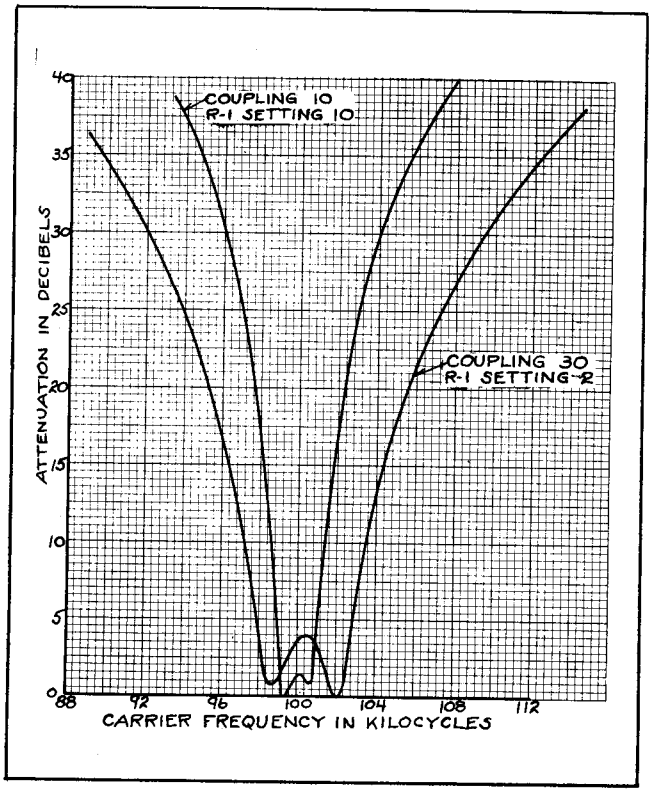

Fig. 7—Selectivity Curve at 100 Kc of the 50-150 Kc Broad Band TRF Receiver of the S#867935 Type JY Carrier Receiver.

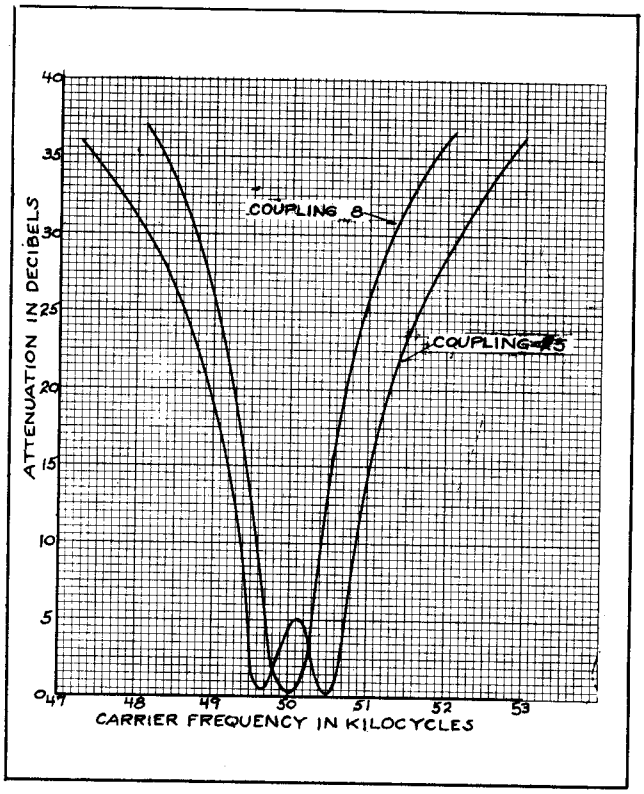

Fig. 8—Selectivity Curve at 50 Kc of the 50 to 150 Kc Narrow Band Relay Receiver of the S#867935 Type JY Carrier Receiver.

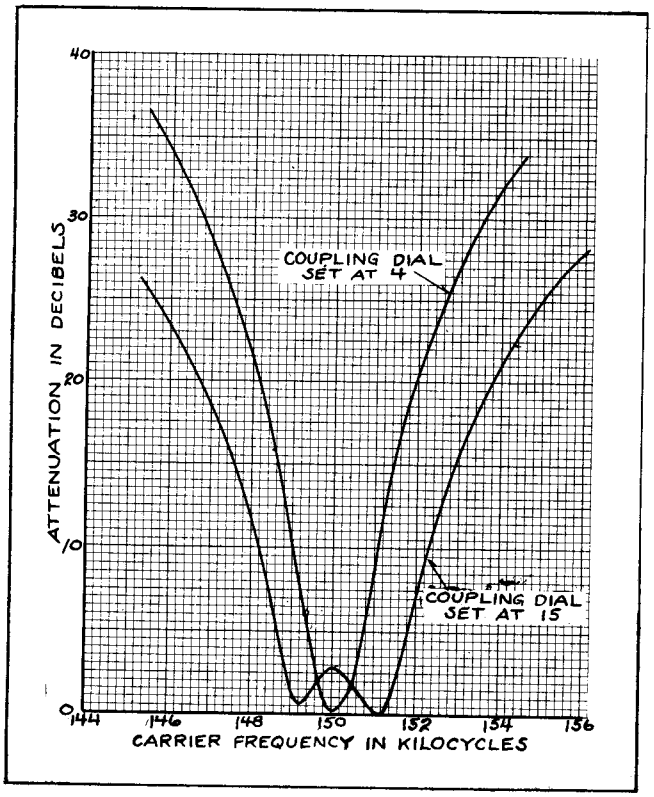

Fig. 9—Selectivity Curve at 150 Kc of the 50-150 Kc Narrow Band Relay Receiver of the S#867935 Type JY Carrier Receiver.

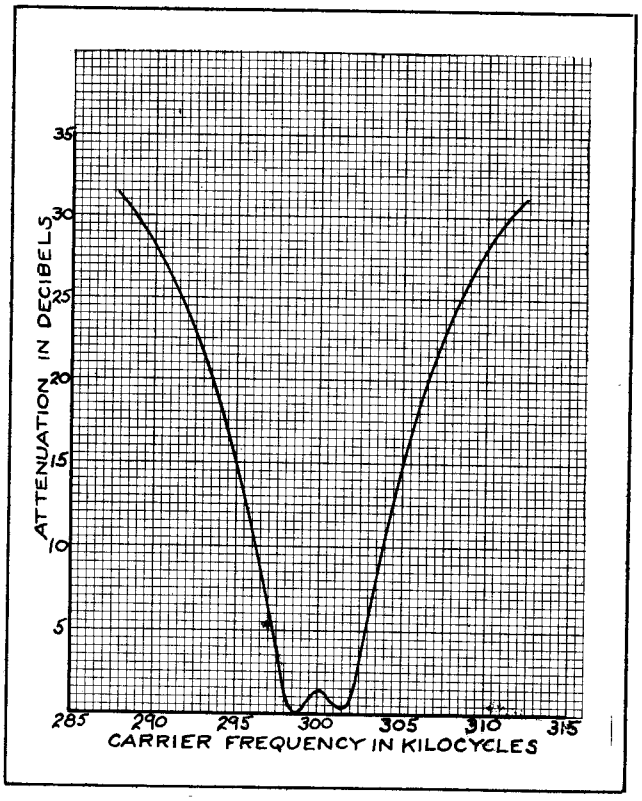

Fig. 10—Selectivity Curve at 200 Kc of the 150-300 Kc Broad Band TRF Receiver of the S#1352337 Type JY Carrier Receiver.

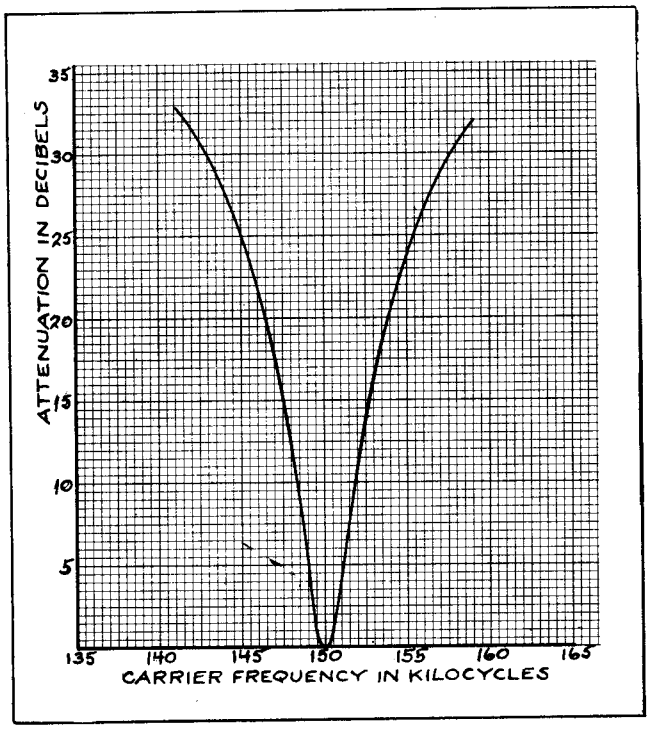

Fig. 11—Selectivity Curve at 150 Kc of the 150-300 Kc Narrow Band Relay Receiver of the S#1352337 Type JY Carrier Receiver.

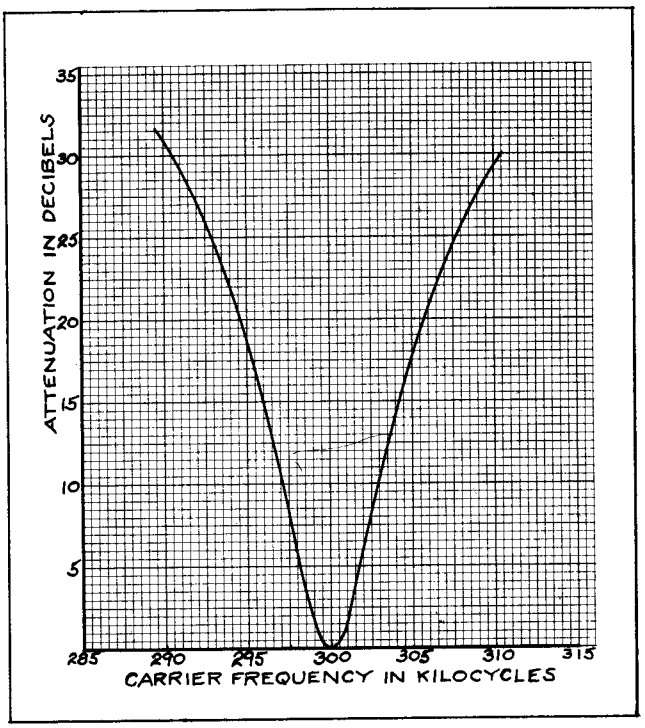

Fig. 12—Selectivity Curve at 300 Kc of the 150-300 Kc Narrow Band Relay Receiver of the S#1352337 Type JY Carrier Receiver.

55 kilocycles, disconnect capacitors C-13 and C-14 from the circuit by placing links S-2 and S-3 to the ABOVE 55 KC positions.

c. Set the PRIMARY TUNING NO. 2 dial and the SECONDARY TUNING NO. 2 dial for the desired frequency, as indicated on dial calibration curve Figs. 5 and 6. If the desired frequency is below 55 kilocycles on the 50-150 kc receiver, use the curve marked BELOW 55 KC. If the desired frequency is above 55 kilocycles, use the curve marked ABOVE 55 KC. These curves show the approximate dial settings.

d. Set the PRI.-SEC. COUPLING NO. 2 dial to 3 (slightly above minimum coupling).

e. Rotate the Q-control (R-1) to position 10 for maximum Q.

f. Move the slider on resistor R-7 to the end farthest from the panel to obtain maximum AVC "delay" voltage.

g. Remove the ground from the RF INPUT terminal of the Receiver, and apply an unmodulated signal from the distant Transmitter.

h. Connect a milliammeter at jack 5 and tune the SECONDARY TUNING NO. 2 dial for maximum current.

i. Tune the PRIMARY TUNING NO. 2 dial for maximum current.

j. If neon lamp V-2 lights or the current at jack 5 exceeds 3 milliamperes during step i, move the lead from inductor L-3 to a lower tap on transformer T-1 and return the PRIMARY TUNING NO. 2 and the SECONDARY NO. 2 dials for maximum current at jack 5. Do not disturb the lead from inductor L-1 or the RF input lead on transformer T-1.

k. Increase the setting of the PRI.-SEC. COUPLING NO. 2 dial for maximum current at jack 5.

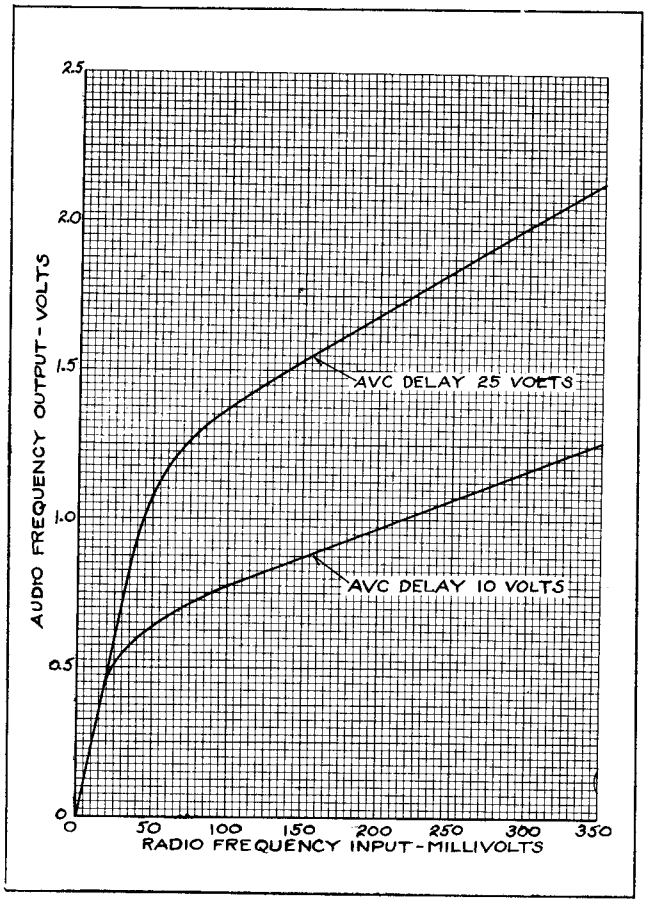

Fig. 13—A. V. C. Sensitivity Curve of the 50-150 Kc Broad Band TRF Receiver of the S#867935 Type JY Carrier Receiver. The curve is taken with a 100 Kc Signal, 80% Modulation at 400 Cycles, RF Lead to Tap 6 of T1, L3 to Tap 7 of T1, Coupling 30, R1 Setting 2.5, Audio Lead 600 Ohms.

1. For the 50-150 kc receiver, adjust the PRI.-SEC. COUPLING NO. 2 dial and the R-1 knob (Q control) for a bandwidth of 6 kilocycles. Approximate settings for these controls are given in the table below. If an accurately calibrated signal generator is available, it may be used to obtain the correct bandwidth.

Basic Frequency	50 KC	65 KC	85 KC	110 KC	150 KC
Coupling Dial Setting	50	50	30	25	15
R-1 Dial Setting	0	1	2	3	10

Improved selectivity at a sacrifice in audio fidelity may be obtained by using higher values of R-1 and lower values of coupling. The effect is shown in Fig. 7. When R-1 is set at 10, the selectivity of the receiver #2 approximates that of the relay channel (receiver #1) for which see Figs. 8 and 9.

m. For the 150-300 kc receiver adjust the PRI.-SEC. COUPLING NO. 2 dial for a bandwidth of 6 kilocycles. Approximate setting for this control is given in the table below. If an accurately calibrated signal generator is available, it may be used to obtain the correct bandwidth.

Frequency	150 KC	200 KC	250 KC	300 KC
PRI-SEC COUPLING #2 Dial Setting	35	27	20	14

Improved selectivity, at a sacrifice in audio fidelity, may be obtained by using lower values of coupling. The effect is shown in Fig. 10. The selectivity curves for the relay channel receiver #1 are shown in Figs. 11 and 12.

n. The tap on transformer T-1 which gives the most satisfactory operation will usually be tap 4 for power lines with low values of attenuation. In the case of very weak signals, tap 7 gives the greatest sensitivity. The RF INPUT terminal will normally remain connected to tap 6. If it is found desirable to connect the relay channel and the communication channel to the same tap, the insulating cover may be unscrewed from one of the Rajah clips and both leads attached to the same clip. Neon lamp V-2 should not light with maximum signal from the distant Transmitter.

o. Automatic volume control (AVC)

action may be secured at a lower signal input by reducing the AVC "delay" voltage. This is done by setting the slider on resistor R-7 closer to the panel. Such a change will at the same time reduce the maximum audio output. See Fig. 13.

This completes the adjustments for the receiver. The significant quantities shown in table I should be recorded, and if the values show a progressive departure at maintenance periods from their original values, it is probable that one or more tubes need replacement. Check the tubes in a tube-checker. The limits given in the tube-checker instruction book will usually be found satisfactory for indicating a defective tube.

RENEWAL PARTS

When ordering renewal parts for this unit, include the following data from the nameplate:

(1) The name of the unit

(2) The style or DL number

(3) The serial number

TABLE I

Adjustment Data for Double Receiver

Supply voltage, nominal	125 volts d-c.
Tube heater current (J-4)	0.28 amp. d-c or a-c.
Relay receiver tube (V-3) grid bias	21 to 25 volts d-c.
Relay receiver tube (V-3) plate current J-1	
No signal	0.1 ma. (0.5 ma. max.)
Strong signal (link-NORMAL)	18-25 ma. d-c.
" " (link-HKB)	13-20 " "
R. F. amplifier tube V-4 plate and screen current (J-2)	10 to 18 ma. d-c.
R. F. amplifier tube V-5 plate and screen current (J-3)	10 to 18 ma. d-c.
Diode output current J-5 (no signal)	0.5 ma. d-c.

RECEIVER PARTS LIST

DIAGRAM 50-150 Rec.	SYMBOL 150-300 Rec.	NUMBER REQ'D 50-150 Rec.	NUMBER REQ'D 150-300 Rec.	FUNCTION	RATING
				CAPACITORS	
C-1		1		Primary Tuning-Rec. #1	0.001 MFD. Variable
	C-1		1	" " " "	0.0009 " "
C-2		1		Secondary " " "	0.001 " "
	C-2		1	" " " "	0.0009 " "
C-3		1		Primary Tuning Rec. #2	0.001 " "
	C-3		1	" " " "	0.0009 " "
C-4		1		Secondary " " "	0.001 " "
	C-4		1	" " " "	0.0009 " "

RECEIVER PARTS LIST
(CONT'D.)

DIAGRAM 50-150 Rec.	SYMBOL. 150-300 Rec.	NUMBER REQ'D 50-150 Rec.	NUMBER REQ'D 150-300 Rec.	FUNCTION	RATING
				CAPACITORS (Cont'd.)	
C-5	C-5	1	1	Grid By-Pass	0.1 MFD., 600 V. d-c, Paper
C-6	C-6	1	1	Screen By-Pass	0.1 " " " "
C-7	C-7	1	1	" " "	" " " " "
C-8	C-8	1	1	A.F. By-Pass	1.0 MFD., " " "
C-9	C-9	1	1	AVC By-Pass	0.5 MFD., " " "
C-10	C-10	1	1	Delay Voltage By-Pass	0.1 MFD., " " "
C-11	C-11	1	1	Plate By-Pass	0.0056 MFD., 600 V. d-c, Mica
C-12	C-12	1	1	R. F. By-Pass	0.022 MFD., " " "
C-13		1		Primary Compensator	0.00056 " 2500 V. d-c "
	C-13		1	" " Rec. #2	0.000022 MFD., 500 V. d-c
C-14		1		Secondary "	0.00056 MFD., 2500 V. d-c "
	C-14		1	" " " "	0.000022 MFD., 500 V. d-c
C-15	C-15	1	1	By-Pass	1.0 MFD., 600 V. d-c Paper
C-16	C-16	1	1	" "	" " " " " "
C-17	C-17	1	1	" "	0.1 " " " " "
C-18	C-18	1	1	Static Leak By-Pass	0.001 MFD., 600 V. d-c. Mica
	C-19		1	Primary Compensator Receiver #1	0.000022 MFD. 500 V. d-c
	C-20		1	Secondary Compensator Receiver #1	" " " " "
				METER JACKS	
J-1	J-1	1	1	V-3 Plate Current	One Circuit Opening
J-2	J-2	1	1	V-4 " "	" " "
J-3	J-3	1	1	V-5 " "	" " "
J-4	J-4	1	1	V-3 Heater "	" " "
J-5	J-5	1	1	Diode "	" " "
J-6	J-6	1	1	Audio Output	Two " "
				COILS	
L-1		1		Primary Tuning Rec. #1	17 MH. Two Sections
	L-1		1	" " " "	
L-2		1		Secondary " " "	17 MH. " "
	L-2		1		
L-3		1		Primary Tuning Rec. #2	" "
	L-3		1	" " " "	
L-4		1		Secondary " " "	" "
	L-4		1	" " " "	" "
L-5	L-5	1	1	Choke AVC Filter	250 MH., 60 MA.
L-6	L-6	1	1	" Detector Filter	10 MH., 125 MA.
L-7	L-7	1	1	" RF	10 MH., 125 MA.
				RESISTORS	
R-1		1		Band width Control	2.5 Megohm, Variable

RECEIVER PARTS LIST
(CONT'D.)

DIAGRAM 50-150 Rec.	SYMBOL. 150-300 Rec.	NUMBER REQ'D. 50-150 Rec.	NUMBER REQ'D. 150-300 Rec.	FUNCTION	RATING
				RESISTORS (Cont'd.)	
	R-1		1	Primary Series Rec. #2	22 Ohms 1 Watt
R-2	R-2	1	1	Cathode	150 Ohms 1 Watt
R-3	R-3	1	1	Limiting	2200 Ohms 1 Watt
R-4	R-4	1	1	Isolation	10,000 Ohms 1 Watt
R-5	R-5	1	1	AVC.	10,000 Ohms 1 Watt
R-6	R-6	1	1	Voltage Dropping	8,000 Ohms 4 inch.
R-7	R-7	1	1	AVC Delay	2,000 Ohms 4 inch-Adj.
R-8	R-8	1	1	Static Leak	150,000 Ohms 1 Watt
R-9		1		Resistor	68,000 Ohms 1 Watt
	R-9		1	Primary Series Rec. #1	12 Ohms 1 Watt
				SWITCHES	
S-1	S-1	1	1	HKB Relay	Link Connector
S-2		1		Primary Tuning	" "
S-3		1		Secondary Tuning	" "
				TRANSFORMERS	
T-1	T-1	1	1	Input Matching	Auto-Transformer
T-2	T-2	1	1	R.F. Output	Push-Pull Output Untuned Iron Core
T-3	T-3	1	1	Audio	Diode-1500-800 Ohms
				TUBE SOCKETS	
X-1	X-1	1	1	Neon Lamp	Medium Screw Base
X-2	X-2	1	1	" "	" " "
X-3 to X-7	X-3 to X-7	5	5	V3, V4, V5, V6, V7 Tubes	Amphenol MIP8T

FROM DWGS. T-7613883 AND T-7613884

ACCESSORY PARTS LIST

DIAGRAM	SYMBOL.	NUMBER REQ'D.			
50-150 KC.	150-300 KC.	50-150 KC.	150-300 KC.	FUNCTION	RATING
				RESISTORS	
R-101				Accessory	400 Ohms 10 inch adjustable.
R-102				"	800 Ohms 10 inch adjustable.
R-103				"	Same as R-102
				TUBES	
V-1	V-1	1	1	Protector Rec. #1 Gas	2 Watt 115 V neon Type S-14
V-2	V-2	1	1	" " #2 "	" " " " " " "
V-3	V-3	1	1	Relay Detector-Vacuum	25L6
V-4	V-4	1	1	R. F. Amplifier-Vacuum	6SK7
V-5	V-5	1	1	" " "	"
V-6	V-6	1	1	AVC - Vacuum	25Z6
V-7	V-7	1	1	Detector - Vacuum	25Z6

FROM DWGS. T-7613883 AND T-7613884

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