INSTRUCTION BOOK

FOR

REMOTE CONTROL EQUIPMENT FOR SCR-573-A AND SCR-574-A

CONSISTING OF

NAVY TYPE CNW-10205 CARRYING CASE
NAVY TYPE CRB-23367 SELECTOR CONTROL UNIT
NAVY TYPE CRB-23368 SELECTOR UNIT
NAVY TYPE CRB-29218 RELAY UNIT
NAVY TYPE CRB-49295 AUDIO MONITOR UNIT

NAVSHIPS *900,297* IB

RESTRICTED

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MANUFACTURED
BY
BENDIX RADIO
DIVISION OF BENDIX AVIATION CORPORATION
Baltimore, Maryland
FOR
U. S. NAVY DEPT. BUREAU OF SHIPS

Contracts *NXss-28012*
NXsr-44530
NXsr-64101

Approved 4 August 1944

WARNING

OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. OPERATING PERSONNEL MUST AT ALL TIMES OBSERVE ALL SAFETY REGULATIONS.

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All such defective items will be subject to ultimate return to the contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communications. In such cases the return of the defective items for examination by the contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for affecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactory due to any such defects, and any items repaired or replaced by the contractor will be guaranteed anew under this provision.

TABLE OF CONTENTS

I
INTRODUCTION

II
TYPE CNW-10205 CARRYING CASE

III
TYPE CRB-23367 SELECTOR CONTROL UNIT

IV
TYPE CRB-23368 SELECTOR UNIT

TABLE OF CONTENTS—*Continued*

V

TYPE CRB-49295 AUDIO MONITOR UNIT

VI

TYPE CRB-29218 RELAY UNIT

VII

APPENDIX

LIST OF ILLUSTRATIONS

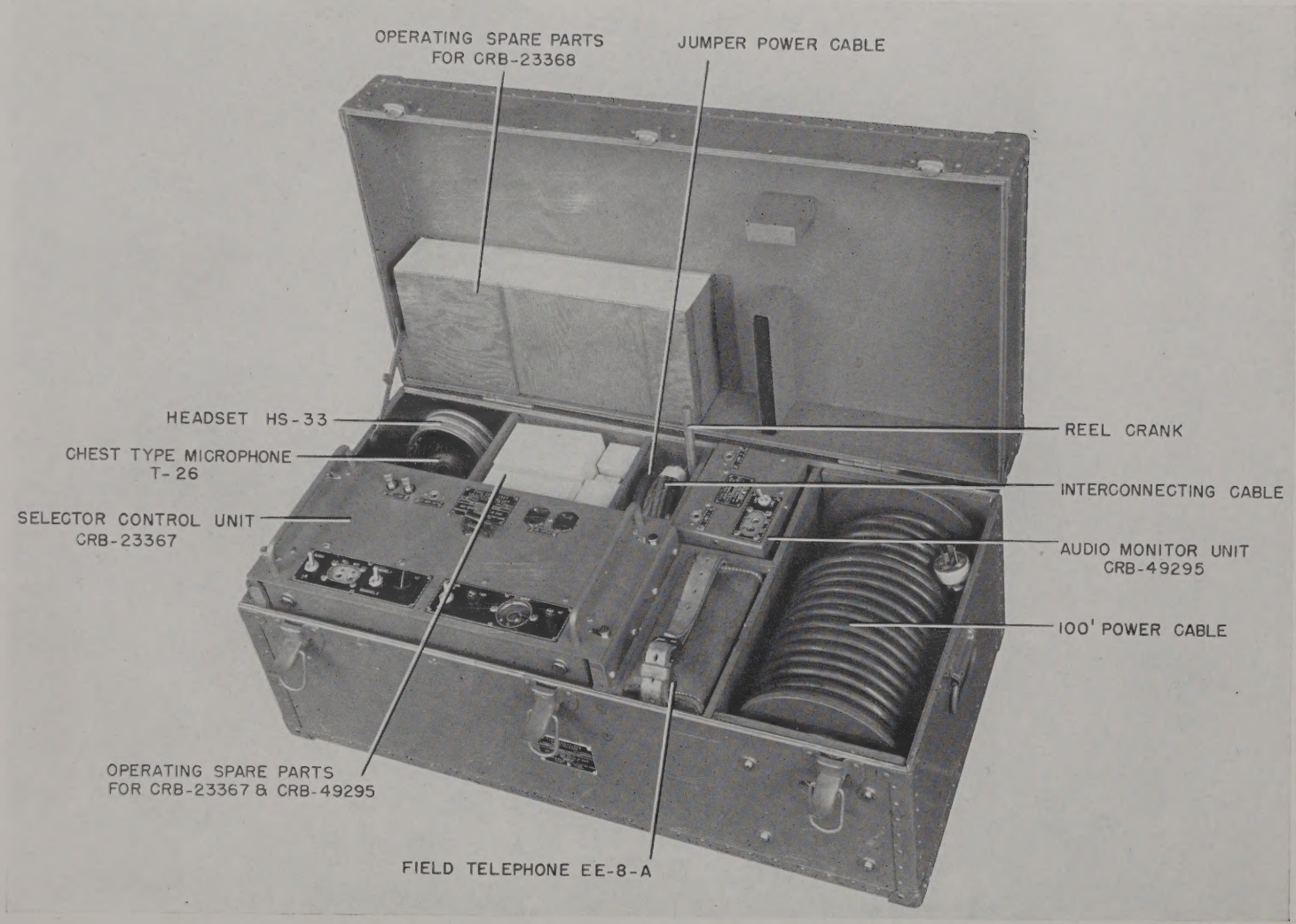


FIGURE 1 — TYPE CNW 10205 CARRYING CASE, SHOWING CONTENTS

I
INTRODUCTION

1. FUNCTIONING OF THE SYSTEM COMPOSED OF THIS EQUIPMENT

The purpose of this equipment is to provide a flexible means of operating Radio Set SCR-574-A (receiver station) and Radio Set SCR-573-A, (an adjoining transmitter station controlled by SCR-574-A) from a location quite remote from these stations. See figure 2. The Selector Control Unit is the principal unit at the controlling station. The operator of the Selector Control Unit can modulate either one of the two remote transmitters and monitor either one of the two remote receivers. In operation, pressing the press-to-talk switch on the telephone set causes the Selector Control Unit to send a particular type of audio frequency control signal over the two wire line to the remote station. Upon receiving this control signal, the Selector Unit at the remote station automatically switches the input line of the selected transmitter to the connecting telephone line. The operator can now modulate this transmitter. Upon release of the press-to-talk switch, the Selector Control Unit sends another control signal over the line to the Selector Unit at the SCR-574-A. The Selector Unit puts a receiver on the line, which the operator now hears. The other transmitter and receiver available at the remote location may be used by the operator of the Selector Control Unit by operation of a channel switch on the unit. Operation of this switch causes control signals exactly as before except of a different audio frequency. At the other end of the line, the Selector Unit interprets these signals so as to use the alternate transmitter and receiver.

To provide additional flexibility, the Audio Monitor Unit may be used with the Selector Control Unit at the controlling station. See figure 3.

The Audio Monitor Unit may also be used in conjunction with the Relay Unit at the controlled station to make possible the local operation of the station from some point near to, but outside the station. See figure 4.

FIGURE 2 — BLOCK DIAGRAM OF CONTROL SYSTEM

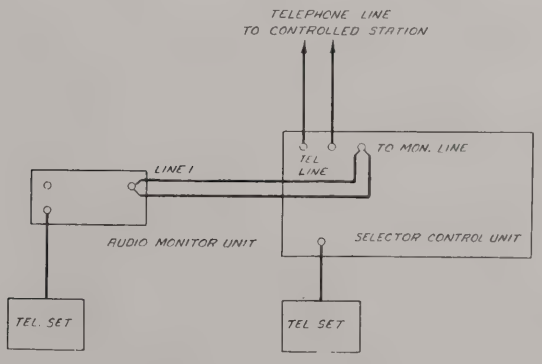


FIGURE 3 — BLOCK DIAGRAM OF CONTROLLING STATION SHOWING USE OF AUDIO MONITOR UNIT

II

TYPE CNW-10205 CARRYING CASE

1. PURPOSE

The Carrying Case has been provided to transport the major components, operating accessories, and spare parts for the controlling station. In addition, the spares for the units at the controlled station are shipped in the Carrying Case, although it is assumed that upon arrival of the equipment at the location at which it is to be operated, these latter spare parts will be removed and placed in SCR-574-A where they belong. See figure 1.

3. DESCRIPTION

The Carrying Case is a trunk type, wood and fiber case with metal reinforcing strips and corners. It is partitioned inside to provide convenient compartments for the contents. The case contains, as a fixture, a cable reel which carries 100 ft. of two conductor power cable. In use the cable is laid out, as required, and the free end attached to the source of power. Connection to the inside end is made on the case itself, the reel not being removed.

2. CONTENTS

Item	*Quantity*	*Mfrs. Dwg. No.*	*Navy Type No.*	*Description*
1	1	OAR96152	CRB-23367	Selector Control Unit
2	1	AL74611	CRB-49295	Audio Monitor Unit
3	2		*ANB-H-1	Telephone Headset
4	2		**T-26	Chest Type Microphone
5	1	A110391	**EE-8-A	Field Telephone Set
6	1			Cable Reel, installed, rotatable
7	1			Crank for above
8	1	AL74676		100 ft. Cable for connection to power supply
9	1	AL74675		Jumper power cable from Reel to Selector Control Unit
10	1	AA112244		Cable for Interconnection of Audio Monitor Unit and Selector Control Unit
11				Set Operating Spare Parts for CRB-23367 and CRB-49295
12	1			Set Operating Spare Parts for CRB-23368, to be removed and placed with SCR-574-A spares

* Army Navy British Designation. ** Army type Designation.

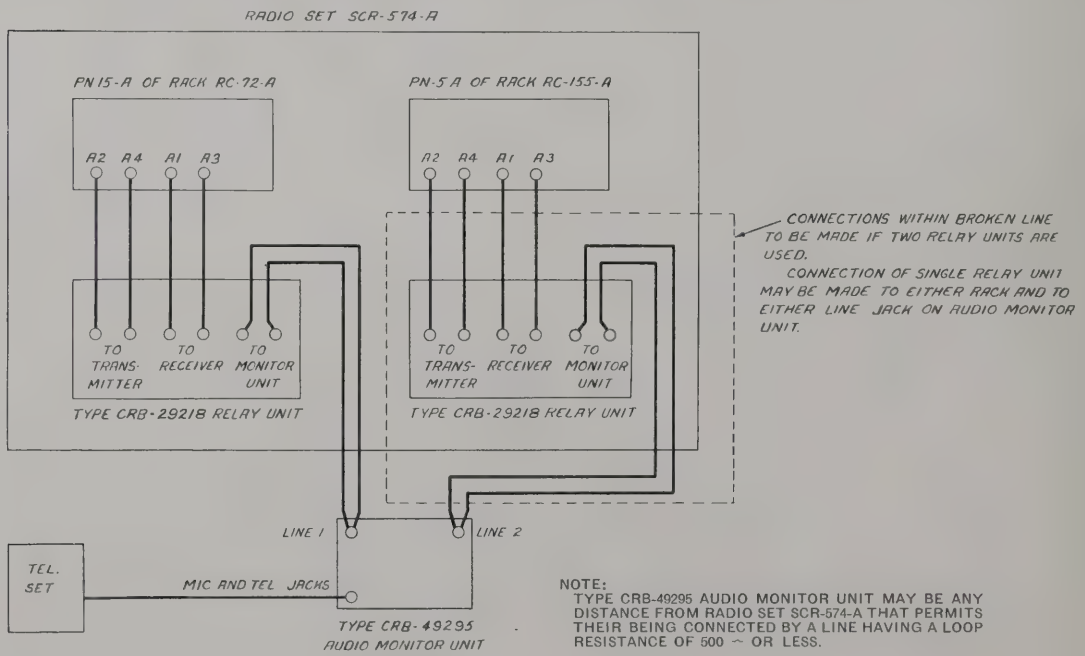


FIGURE 4 - BLOCK DIAGRAM OF CONTROLLED STATION SHOWING USE OF AUDIO MONITOR UNIT AND RELAY UNIT

III
TYPE CRR-23367 SELECTOR CONTROL UNIT

1. INTRODUCTION

1-1. FUNCTION

The Type CRB-23367 Selector Control Unit is designed: to generate and transmit over a telephone line (with an input level of 0 db. referred to a 600 ohm line) the necessary signals to actuate Type CRB-23368 Selector Unit and associated equipment at the other end of the line; to modulate the remote transmitter selected by the Selector Unit; to engage in telephone intercommunication with the remote station personnel and/or the operator at the Type CRB-49295 Audio Monitor Unit if used; and to amplify speech signals received from the remote station over the telephone line (intercommunication or radio).

1-2. DESCRIPTION

Type CRB-23367 Selector Control Unit is a self-contained, line-powered unit, arranged for standard relay rack mounting.

1-3. ADDITIONAL UNITS

Additional Units needed for operation: none.

1-4. POWER CONSUMPTION

Type CRB-23367 Selector Control Unit requires for operation approximately 50 volt-amperes.

2. DETAILED DESCRIPTION

Type CRB-23367 is 19″ wide, 8¾″ high, and 12¾″ deep overall and weighs 47 lbs. net, with tubes. Except for certain hardware and controls etc., it is finished in matte olive drab lacquer.

2-1. LOCATION OF COMPONENTS

2-1-1. Front Panel and Rear of Unit

Duplicate A.C. INPUT connections are provided as well as duplicate jacks TO MON. UNIT, one of each being on the front panel and one of each accessible at the rear of the unit. A pair of terminals TEL. LINE are located on the front panel and a duplicate pair at the rear of the unit. There is a dual female A-C OUTLET on the front panel, also a pair of extractor-type fuse holders for 1 amp. line fuses, a POWER-ON-OFF switch, a RADIO-I/C switch, a CHANNEL 1-CHANNEL 2 switch, a VOLUME CONTROL for the Line Amplifier circuit, and a pair of jacks for the operators head-chest-set or similar equipment. See figures 5, 6. The Hand-generator crankshaft extends through the front panel and carries the folding crank on the outside of the panel.

If the unit is used mounted in Type CNW-10205 Carrying Case, all connections are made to the proper receptacles etc., provided on the front panel. If the unit is set upon a table or

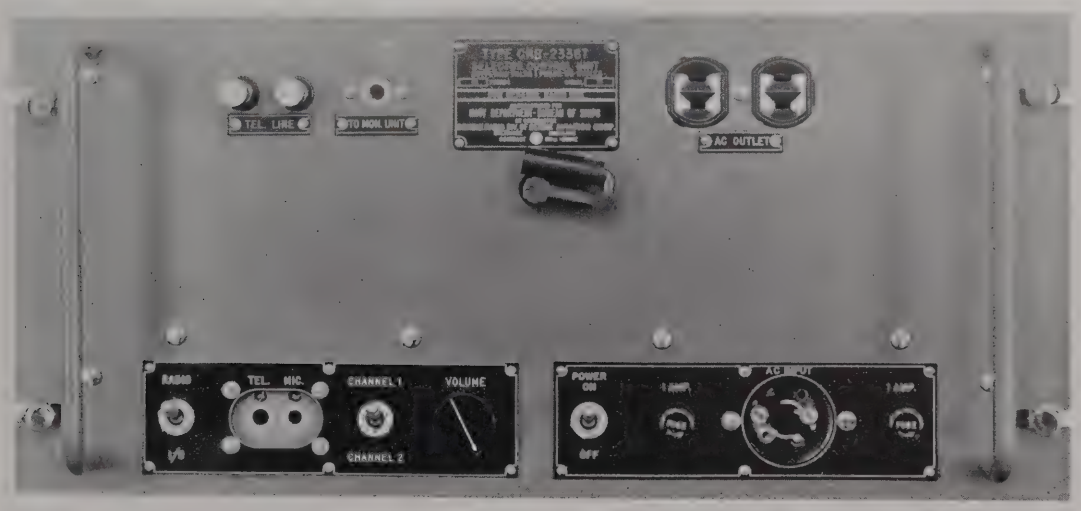


Figure 5 — Type CRB-23367 Selector Control Unit—Panel View

mounted in a rack etc., all connections except those to the operators telephone equipment may be made to appropriate fixtures at the rear of the unit.

2-1-2. Vacuum Tubes

The following vacuum tubes are used in the Selector Control Unit.

Ref. No.	*Function*	*Army Type*	*Navy Type*
1184-2	Timing	VT-201-C	25L6 GT/G
1184-3	Fixed Osc.	VT-201-C	25L6 GT/G
1184-4	Variable Osc.	VT-201-C	25L6 GT/G
1184-5	Osc. Amp.	VT-201-C	25L6 GT/G
1184-1	Line Amp.	VT-201-C	25L6 GT/G
1186	Power Rect.	(25Z5)	25Z5

2-2. DESCRIPTION OF CIRCUITS

2-2-1. Power Circuits

2-2-1-1. *Drawing Reference*

Refer to Schematic Diagram, figure 7, pages 6 and 7.

2-2-1-2. *Description*

The line input of 110 volts a-c enters the unit on plug 1220-1 or 1220-2 and is fused in each side for 1 ampere. From the fuses it goes through the POWER ON-OFF switch, 1177-3 to terminals 1 and 4 of the power transformer 1224. The secondary winding between terminals 8-9 of the power transformer furnishes approximately 25-volts RMS a-c, and is connected to the heaters of all tubes except the power rectifier tube 25Z5 in socket 1186. This latter tube is supplied with 25 volts for its heater by the winding connected to terminals 10 and 11 of the power transformer 1224. The high voltage secondary supplies 250 volts and is connected to terminals 5 and 7 which are wired to the two plates respectively of the 25Z5 power rectifier tube. The high voltage secondary winding is center-tapped and the center-tap is connected to terminal 6 which is grounded. The two cathodes of the power rectifier tube are tied together and lead to a filter choke, 1225. The input and output ends of the filter choke are connected through 30 mfd. filter condensers 1226-1 and 1226-2 to ground. The point at which the filter choke, 1225, is connected to the filter condenser 1226-2, is the origin of all B+ plate power in the unit. Reference to the Schematic Diagram will indicate that this main B+ distribution lead is connected to the following: to the screen of Timing Tube 25L6 in socket 1184-2, to the P-1 coil terminal and the 2-T contact of the Time Relay, 1162, to the R terminal of audio isolation transformer 1232, to the screen of the 25L6 Osc. Amp. Tube in Socket 1184-5, and to resistors 1170 and 1171.

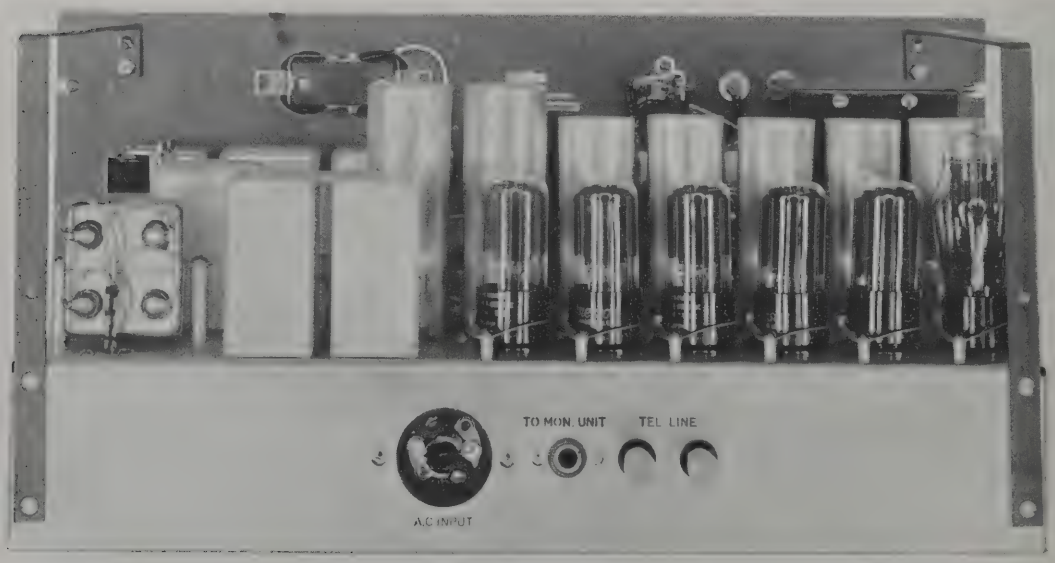


FIGURE 6 — TYPE CRB 23367 SELECTOR CONTROL UNIT—REAR VIEW, COVER REMOVED

High plate voltage is not desired in equipment of this type and the characteristics of the filter choke 1225 are such that the filter choke and the resistance of the power rectifier drop the voltage sufficiently to deliver a potential of the order of 25 or 30 volts d-c at the output of the filter circuit.

2-2-2. Control and Audio Frequency Circuits

2-2-2-1. Drawing Reference

Refer to Schematic Diagram figure 7 and to Simplified Diagram Showing Operation of CRB-23367, figure 8, page 8.

2-2-2-2. Description

The Fixed Oscillator and the Variable Oscillator are operated simultaneously and only when B+ voltage is applied through contacts 2-T and 1-T on Time Relay 1162. Current flow can occur only when the mentioned contacts are closed, i.e. when 1162 is in the release position; B+ is not applied to these two oscillators if the Radio - I/C switch, 1177-1, is open (the I/C position).

One function of all resistors, capacitors and relay contacts which are shown to the left of the Time Relay, 1162, in Figure 8 as well as the Relay itself and the Timing Tube, is to key the B+ into the oscillators for .12 second (1162 in release position) and 1.25 seconds (1162 in operate position).

All relay contacts are shown in the release position so the following description of the timing action will begin with the assumption that the S/R Relay is in the release position.

With the unit warmed-up, the Timing Tube will draw sufficient plate current to operate the Time Relay. In order to make the Timing Tube draw the required current, a fixed positive grid bias of approximately 5 volts is developed across the voltage divider composed of resistors 1170 and 1169, and applied to the grid of the Timing Tube through its grid resistor, 1168. As has been mentioned, the S/R Relay 1161 is in the release (or "receive") position. It will be seen that capacitor 1155-2 is connected, on one side, to ground through contacts 2-T, 1-T and on the other side to B+ through contacts 2-B, 1-B and resistor 1171; it is therefore being charged. Now, when the S/R Relay is operated, capacitor 1155-2 is placed across the grid resistor, 1168, of the Timing Tube so that its negatively charged electrode is connected to the grid. The charge accumulated by the capacitor 1155-2 (when the S/R Relay was in the release position) now opposes the positive fixed bias on the Timing Tube grid; and, since the charge on the capacitor is greater than the applied bias, the resultant bias on the tube is negative, and sufficiently so to cut-off the plate current of the timing tube, causing the Time Relay to drop out. Since the capacitor 1155-2 is shunted by the grid resistor, it slowly discharges. As it does so, the negative bias gradually falls and at the end of 1.25 seconds is low enough to permit the rising plate current to again operate the Time Relay. As previously mentioned the oscillators are keyed on when the Time Relay releases and keyed off when it operates. Therefore the operation of the S/R relay causes the oscillators to oscillate for 1.25 seconds.

As the S/R Relay operates, the paralleled capacitors 1151-2 and 1151-3 are placed, one side of each, to ground through contacts 5-T, 6-T and, the other side, to B+ through contacts 5-B, 6-B. These capacitors are now being charged. When the S/R Relay releases, the capacitors are placed across grid resistor 1168 by contacts 4-T, 5-T and contacts 4-B, 5-B. The same timing action again takes place; but, because the capacity of 1151-2 and 1151-3 in parallel is less than the capacity of 1155-2, capacitors 1151-2 and 1151-3 are discharged by the grid resistor 1168 more rapidly, and the Time Relay stays in the release position for a shorter interval, this time .12 seconds. Hence, the oscillators are keyed on for .12 seconds.

The Fixed Oscillator employs a conventional circuit of the Hartley type. B+ is supplied to tap 4 on the audio pack, 1180-1, and the plate of the Fixed Oscillator is connected to tap 3 of 1180-1. The grid of the tube, and its associated grid resistor are connected through a capacitor, 1219-1 to terminal 5 on the audio pack 1180-1. The output frequency of the Fixed Oscillator is 290 cycles per second.

The Variable Oscillator is similar to the Fixed Oscillator except that it can be operated at either 210 cycles per second or at 250 cycles per second, and has provision for frequency adjustment. Frequency changing is accomplished by CHANNEL 1 - CHANNEL 2 switch, 1177-2 which connects the plate of the tube to either terminal 1 or terminal 2 of audio pack, 1180-2. Frequency adjustment is accomplished by the potentiometer 1173 which is connected across capacitor 1154. Capacitor 1153-2 and 1154 are connected effectively across that portion of audio pack 1180-2 in use (which depends on the position of the CHANNEL 1-CHANNEL 2 switch). These two series connected capacitors and the potentiometer across one of them constitute, with audio pack 1180-2, a variable, parallel resonant circuit. Since 1173 bypasses one of the capacitors, it varies somewhat the output frequency of the oscillator. It is used to tune the Variable Oscillator so that the beat note, or heterodyne between the two oscillators is exactly 40 cps. for CHANNEL 1 and 80 cps. for CHANNEL 2.

The outputs of the two oscillators are combined and amplified in the Oscillator Amplifier, to which they are coupled by two coupling capacitors and resistors, 1152-1, 1152-2, 1156 and 1174. The capacitors block the oscillators' d-c components and pass the generated tones. The coupling resistors prevent the two oscillators from "loading" each other.

CAPACITORS

SYM. Nº	DESCRIPTION	DWG. Nº
1219	.1 MFD. ± 20% 400V. D.C.W.	A18016-104
1152	.01 MFD. ± 20% 400V. D.C.W.	A18016-103
1153	.25 MFD. ± 5% 400V. D.C.W.	A112703-1
1154	1 MFD. ± 5% 600V. D.C.W.	C60532
1155	2 MFD. ± 5% 600V. D.C.W.	C60531
1226	30 MFD. +100% −10% 450V. D.C.W.	A110890
1229	2 MFD. ± 20% 600V. D.C.W.	A104107
1151	.25 MFD. ± 10% 200V. D.C.W.	A18181-254

RELAYS

1161	S/R RELAY 500 OHM COIL SINGLE WOUND CONTACTS 6C	L73226-37
1162	TIME RELAY 1000 OHM COIL SINGLE WOUND CONTACTS 1C	L73226-35

TRANSFORMERS

1178	REC. AMPLIFIER INPUT	A103046
1179	REC. AMPLIFIER OUTPUT	A103040
1180	AUDIO PACK (250 ~)	A103212
1224	POWER TRANSFORMER	A103180
1233	INDUCTION COIL	A106996

SWITCHES

1177	D.P.D.T.	A112239

TUBE SOCKETS

1184	8 CONTACT OCTAL	A18955-7
1186	6 CONTACT	A18955-3

FUSES

1221	FUSE HOLDER	A32049
1222	FUSE 1 AMP.	A111302-11

REACTOR

SYM. Nº	DESCRIPTION	DWG. Nº
1181	BAND ELIMINATION	A103150
1182	BAND ELIMINATION	A103152
1183	BAND ELIMINATION	A103154
1232	REACTOR COIL	A106995
1225	FILTER CHOKE	A103178

RESISTORS

1156	75,000 OHMS ± 10% 1/2 W	A11207-46
1163	10,000 OHMS ± 20% 1/2 W	A110488-103
1165	100,000 OHMS POTENTIOMETER	0A104128-9
1166	25,000 OHMS ± 20% 1/2 W	A110488-253
1167	230 OHMS ± 20% 1/2 W	A110488-231
1168	330,000 OHMS ± 5% 1/2 W	A110415-334
1169	4000 OHMS ± 5% 1/2 W	A110415-402
1170	20,000 OHMS ± 5% 1/2 W	A110415-203
1171	1000 OHMS ± 20% 1/2 W	A110488-102
1172	50,000 OHMS ± 20% 1/2 W ± 5%	A110488-503 15-50
1173	2000 OHM ± 10% POTENTIOMETER	C60534-1
1174	200,000 OHMS ± 10% 1/2 W	A11207-50
1164	5000 OHMS ± 10% 1/2 W	A11207-23

RINGER AND GENERATOR

1228	RINGER	C59619
1227	GENERATOR GN-38	L72886

JACKS

1230	TELEPHONE	A106286
1231	MICROPHONE	A106284

RECEPTACLES AND PLUGS

1249	A.C. OUTLET	A106756
1220	CONNECTOR BASE & CAP	A108265

TUBES

VT-201C	25L6-GT/G	
	25Z5	

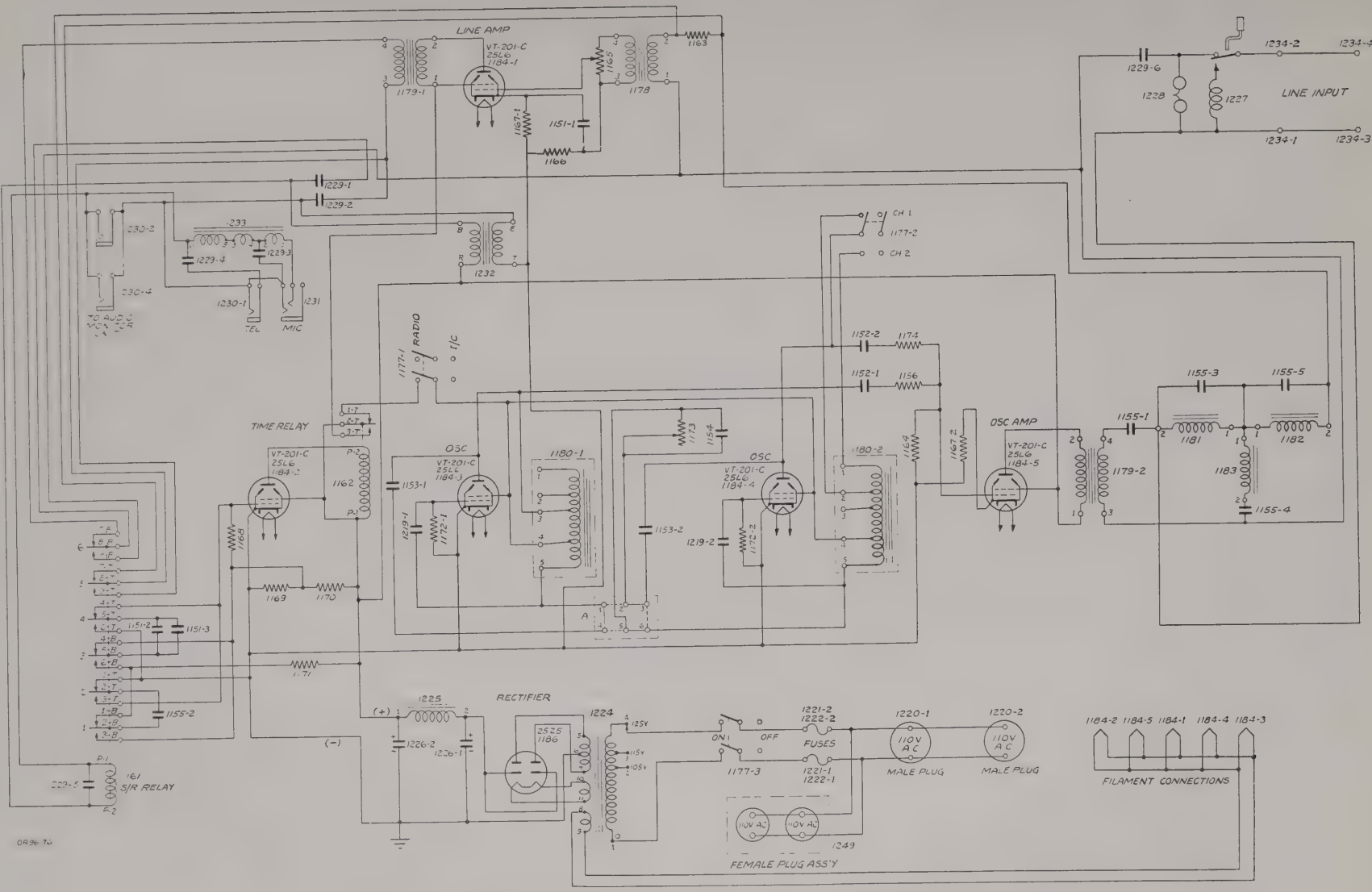


FIGURE 7 — SCHEMATIC DIAGRAM, TYPE CRB-23367 SELECTOR CONTROL UNIT

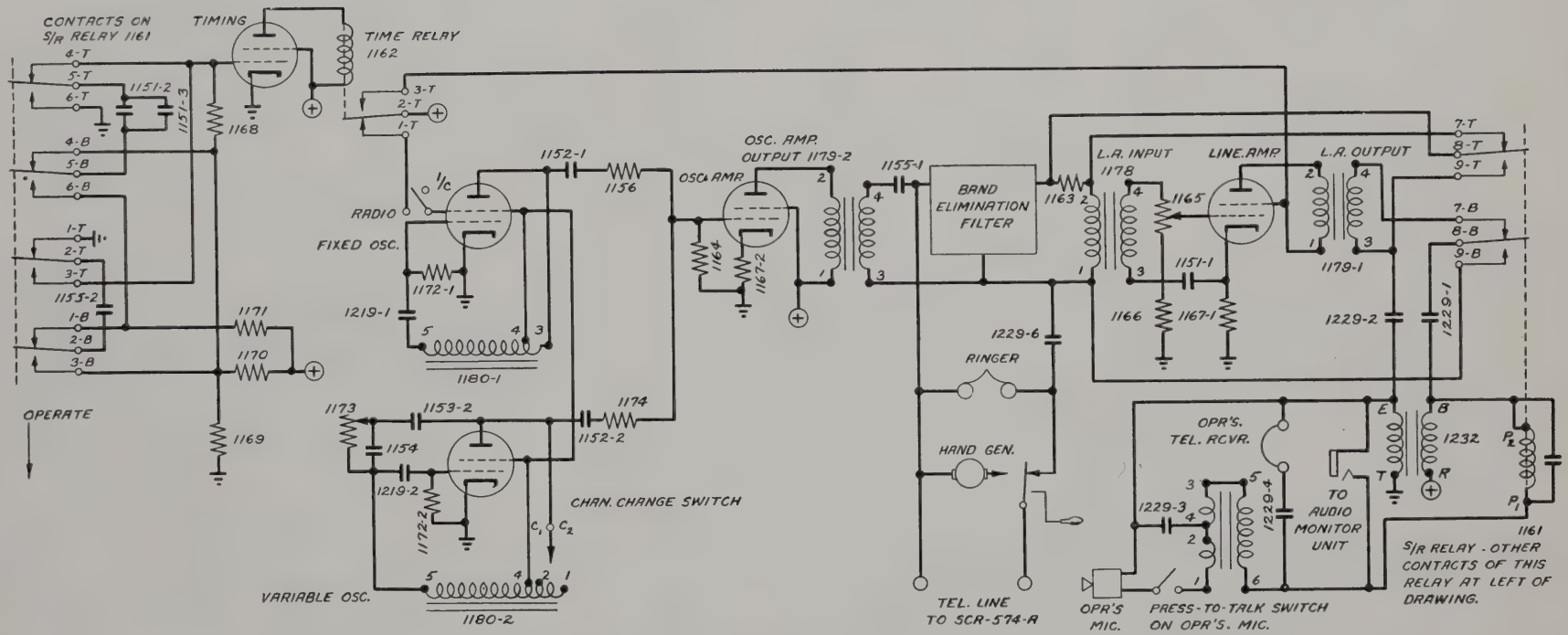


FIGURE 8 — SIMPLIFIED SCHEMATIC DIAGRAM TYPE CRB-23367 SELECTOR CONTROL UNIT

The Oscillator Amplifier is a conventional single stage audio amplifier and is biased by the usual cathode-to-ground self-biasing resistor. The output signal is developed across the secondary of the Oscillator Amplifier Output Transformer, 1179-2, terminals 3 and 4. In series with terminal 4 of 1179-2, is a protective blocking capacitor, 1155-1. The other side of capacitor 1155-1 is connected to one of the Line Terminals marked TEL. LINE. Terminal 3 of 1179-2 is connected through capacitor 1229-6 to the other Line Terminal.[8] Across these two lines is a ringer (bell set) and a hand generator for signalling (ringing) purposes, which is so arranged that it is not electrically across the line except when being cranked, and so that at the time it is being cranked, it disconnects all inside circuits from the line. These two Line Terminals are located on the front panel and are connected during installation to the line from the remotely located Radio Set SCR-574-A. The capacitor, 1155-1 on terminal 4 of 1179-2 is connected to the left terminal (as shown in the drawings) of the Band Elimination filter which consists of reactors 1181, 1182, 1183, and capacitors 1155-3, 1155-4 and 1155-5. Terminal 3 of 1179-2 is connected to the common terminal of the Band Elimination filter and to terminal 1 of Line Amplifier Input Transformer, 1178. The right terminal (as shown in the drawings) of the Band Elimination filter passes through resistor 1163 to terminal 2 of 1178. The secondary of 1178, terminals 3 and 4 is shunted with a volume control, 1165, and the wiper terminal of this control feeds the grid of the Line Amplifier Tube. The Line Amplifier Tube derives its grid bias from cathode biasing resistor 1167-1. The input circuit to this tube operates above ground by the resistance of 1166. Terminal 3 of 1178 is coupled to the cathode of the tube through capacitor 1151-1. This type of input coupling is necessary to provide adequate gain without excessive distortion and the circuit can be described as follows. If the transformer terminal 3 were to be grounded, the cathode resistor would have to be heavily bypassed to ground in order to avoid degeneration from signal (audio) voltage drop across the cathode resistor. Even with a large value of capacitor across the cathode resistor there would be some degeneration. To leave the transformer ungrounded and couple it to the cathode with a capacitor would solve the problem but there would be no grid return for the tube. Hence, resistor 1166 is used here and can be considered, together with volume control 1165 as a grid resistor.

The output of the Line Amplifier appears across the secondary (terminals 3 and 4) of Line Amplifier Output Transformer, 1179-1.

Audio isolation transformer, 1232 is supplied with d-c at one end of each winding (terminals T and R). The other end of each winding (terminals E and B) can be considered as the two sides of the telephone circuit, across which microphone voltage is placed by 1232. The function of 1232 is to place microphone voltage across the telephone circuit. Resistance used here would too severely drop the voltage and a source of d-c power placed across the circuit would short-circuit all audio signals, both transmitted and received. The coil of the S/R Relay 1161 is in series with the telephone circuit so that operation of the press-to-talk switch on the operators microphone will energize and operate the relay.

The coil of the S/R Relay is bridged with capacitor 1229-5 to prevent the reactance of the coil from attenuating the signals to which the capacitor offers almost no reactance. When the operator releases his press-to-talk switch, the d-c circuit through 1232 and the S/R Relay is broken so the relay is de-energized and releases. In addition to the timing function already discussed, the S/R Relay, 1161 performs other switching functions.

The telephone circuit of terminals E and B at 1232 is coupled by d-c blocking condensers to S/R Relay contacts 9-T and 8-B respectively.

With the S/R Relay in the operate (or send) position, the contact 9-T switches its side of the telephone circuit back into the band elimination filter, through it, and out onto the line terminals. Similarly, the 8-B contact switches its side of the telephone circuit back to the common terminal of the band elimination filter and out through capacitor 1229-6 onto the line terminals. Resistor 1163 prevents the primary (terminals 1 and 2) of 1178 from placing a reactive load on the band elimination filter during transmission. For reception, 1163 is short-circuited by contacts 7-T and 8-T of 1161. In the release position of the S/R Relay 1161, the contact 9-T is blind and this side of the telephone circuit is fed by terminal 3 of the line amplifier output transformer, 1179-1.

Plate voltage is furnished the Line Amplifier except when the oscillators are operating, by contacts 2-T and 3-T of the Time Relay 1162. Therefore the Line Amplifier is idle while the tones are being transmitted.

TO SUM UP:

Closing the microphone press-to-talk switch bleeds microphone current through the S/R Relay causing it to operate. Contacts on the relay switch components in the timing circuits so as to key the Oscillators to produce 1.25 second tones which are combined and amplified by the Oscillator Amplifier and sent out through the line terminals. The only action of the CHANNEL 1-CHANNEL 2 switch is to change the frequency of one of the tones. At the same time the telephone circuit is placed on the line terminals through a band elimination filter the function of which is to remove frequencies in the outgoing speech which might actuate the remote equipment.

Opening the press-to-talk switch, breaks the d-c circuit to the S/R Relay which now releases. Another switching action of the timing circuits causes a .12 second tone to be sent over the line, during which time, as before, the Line Amplifier is idle. At the same time the telephone circuit is fed with the signal coming in from the remote receivers, through the band elimination filter which is amplified by the Line Amplifier and

thence to the telephone circuit and operators headset.

For I/C with the remote station, opening the Radio-I/C-switch merely disables the oscillators and the circuit is otherwise the same. Cranking the hand generator rings the bell-set at the remote station. Similarly the remote station can ring the bell-set in the Selector Control Unit. The Line Amplifier amplifies the received intercom. signals just as it does the received radio signals.

If the Type CRB-49295 Audio Monitor unit is connected to the Audio Monitor Unit jack, the circuits operate exactly the same, from that unit. The Audio Monitor Unit is, in effect, an extension of the telephone circuit of the Selector Control Unit and derives its microphone voltage from the Selector Control Unit. It can be seen, however, that channel switching of the Selector Control Unit, cannot be done at the Audio Monitor Unit.

3. INSTALLATION OF TYPE CRB-23367 SELECTOR CONTROL UNIT

3-1. INSPECTION OF UNIT

3-1-1. Removal of Dust Cover

Loosen and disengage the two captive thumbscrews at the rear of the Unit. Set the unit on the handles, front panel downward and carefully withdraw the dust cover.

CAUTION: EXERCISE EXTREME CARE TO AVOID DAMAGING THE RELAYS.

3-1-2. Inspection

With the dust cover removed, inspect carefully for loose parts or wires. Install a set of vacuum tubes in accordance with type numbers stencilled near the tube sockets. Replace dust cover. Install 1 AMP. fuses in holders.

3-2. INSTALLATION

The unit may be mounted in a standard relay rack but it is expected that it will be either operated from its compartment in Type CNW-10205 Carrying Case or placed upon the desk or table at which the operator sits.

3-3. ELECTRICAL CONNECTIONS

Connect the telephone line coming from the remote equipment to binding posts marked TEL. LINE on either the Front or Rear of the unit, whichever is the more convenient. Connect a 110-v line to the A-C INPUT on either the front or the rear of the unit. Plug the local telephone equipment into the MIC and TEL jacks if the unit is used without the Type CRB-49295 Audio Monitor Unit. If, however, the latter is used, plug the telephone set into it and connect the two units by a two conductor cable with a standard telephone plug on each end, the conductors connected to the "tip" and "sleeve" of each plug. Plug one end into LINE 1 jack on the Audio Monitor Unit and the other end into the jack marked "TO MON. UNIT" on the Selector Control Unit.

4. PRELIMINARY ADJUSTMENTS

It is necessary, only, to adjust the VOLUME CONTROL for a satisfactory degree of loudness of radio signals received from the remote station. This adjustment is made by adjusting the control until the signal strength is most desirable or convenient to listen-to.

5. OPERATION

The Selector Control Unit after connection as detailed is turned on with the POWER ON-OFF switch. For I/C, the RADIO-I/C switch is placed in the I/C position. It should now be possible to talk with the operator at the Audio Monitor Unit, if his telephone equipment is plugged-in. By giving the Hand Generator a few brisk turns, the operator at the remote station can be raised, and Intercom. established.

For Radio Operation, determine which Channel is to be used, and throw the channel switch to the appropriate position. Place the RADIO-I/C switch in the RADIO position. Now adjust the VOLUME CONTROL for optimum convenient volume. If any signal is being received by the remote receiver, it should be heard. Operating the press-to-talk switch on the telephone set connected to either the Selector Control Unit or to the Audio Monitor Unit should enable the operator of the equipment concerned to modulate the remote transmitter serving the channel in use by merely speaking into the handset or chest-set microphone.

6. MAINTENANCE

Maintenance instructions for the Selector Control Unit will parallel those for the Selector Unit to which reference is here made—Part IV, Section 6.

7. LOCATION AND REMEDY OF FAULTS

7-1. LOCATION OF FAULTS

7-1-1. Familiarity With Equipment

Familiarity with the Selector Control Unit and its associated equipment will greatly aid in locating defects in it.

7-1-2. Isolation of Defects

Determine by operational methods that the defect is in the unit itself and not in any associated equipment, telephone set, or cable, and that it is not in the telephone line nor the remote equipment.

7-1-3. Preliminary Checks

Determine that all connections are correctly made, and the fuses are not blown. Next, remove the cover and check the tubes with an approved tube checker. Replace the tubes which are defective in emission, or show interelement shorts or leaks. Connect the unit, as shown in figure 9, to a-c power and turn POWER switch to ON.

Put the RADIO-I/C switch in the Radio position. Block the Time Relay, 1162, in the release position by placing a piece of cardboard between armature and core. With CHANNEL 1 - CHANNEL 2 switch in CHANNEL 1 position check the frequency at TEL. LINE terminals as in figure 9. It should be 40 cps. If not, adjust 1173 until it is exactly 40 cps. If these checks do not reveal the difficulty, it will be necessary to employ the Detailed Trouble Shooting Procedure given below.

NOTE

Due to the fact that it is impractical to hold very close tolerances in the manufacture of transformers, the jumper connections on the Type 23367 Selector Control Unit, shown at "A" in figure 7, will be in either the position shown by the solid lines or by the dotted lines. The jumper terminals are located on the capacitor and resistor board near the left side of the unit.

In the event that either transformer 1180-1 or 1180-2 must be replaced the frequency of both oscillators must be checked.

Connect the unit as shown in figure 9 and turn the frequency adjustment control 1173 fully clockwise. Connect the unit to a-c power and turn the POWER switch to ON. Place the RADIO-I/C switch in the RADIO position. Block the time relay 1162 in the release position by placing a piece of cardboard between the armature and core. With the CHANNEL 1-CHANNEL 2 switch in the CHANNEL 1 position, check the frequency of each oscillator by pulling out one oscillator tube 1184-3 or 1184-4, then the other.

If the arithmetical difference between the two frequencies is more than 40 cps., the jumpers should be as shown by the solid lines at "A", figure 7. If the difference is less than 40 cps., the jumpers should be as shown by the dotted lines.

Replace both oscillator tubes and adjust as in Part II, Section 7-1-3.

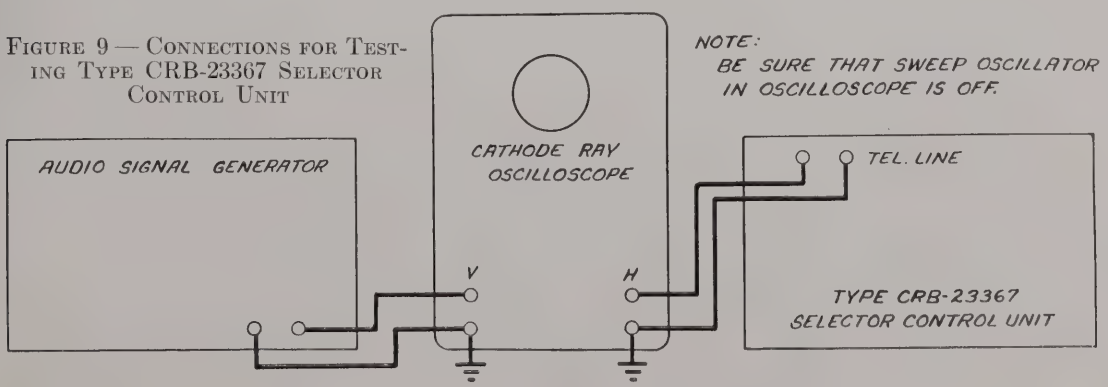
7-1-4. Detailed Trouble Shooting Procedure

Remove the unit from its mounting, if any, and remove the dust cover. Connect the a-c power cable and turn on the unit. Connect a headset across the terminals marked "TEL. LINE". Place the RADIO-I/C switch in the RADIO POSITION, and short-circuit the MIC. jack. A 1.25 second signal should be heard with the CHANNEL 1 - CHANNEL 2 switch in either position. Now remove either one of the two oscillator tubes and repeat. See figures 10 and 11. A "clean" tone (from only one oscillator) should be heard with either osc. tube (but not both) in place. In either case, when the mic. jack short is removed the "receive" signal of .12 second duration should be received. If one of these oscillators does not function properly, check its voltage supply and hunt for specific component failure in its circuit. If the Time Relay operates as it should, and neither oscillator works, voltage supply (or, rarely, component failure) in both oscillator circuits, is responsible. If the Time Relay does not operate, the Timing circuit in general including its contacts on the S/R Relay is at fault. If the S/R Relay doesn't operate with the MIC. jack short-circuited, look for an open in the telephone circuit including the audio isolation transformer 1232 which is the immediate voltage source for the telephone circuit and the S/R Relay.

To check the Line Amplifier, connect an audio signal generator in series with a resistance of 600-ohms to the TEL. LINE binding posts. Adjust the generator to 1000 cps, and with the VOLUME CONTROL on the Selector Control Unit rotated maximum clockwise, and a voltmeter connected to the TEL. jack, adjust the output of the generator until the meter at the TEL. jack reads 1.9 volts RMS. Now, remove the meter, leaving all adjustments alone, and put it directly across the generator. It should read not more than 0.3 volts and probably considerably less. (The S/R Relay must be in the "receive" or release position). If the Line Amplifier will not meet the gain requirement necessary to pass this test, its associated circuit, including the concerned contacts on the S/R Relay and the Band Elimination filter may be suspected. The Band Elimination Filter may be tested as described in Part IV, Section 7-1-4, the Band Elimination Filters in the two units being identical.

All capacitors except 1226-1 and 1226-2 should show resistance of more than 1 megohm to be considered satisfactory. Resistance values for other components will be found in the Material List.

FIGURE 9 — CONNECTIONS FOR TESTING TYPE CRB-23367 SELECTOR CONTROL UNIT



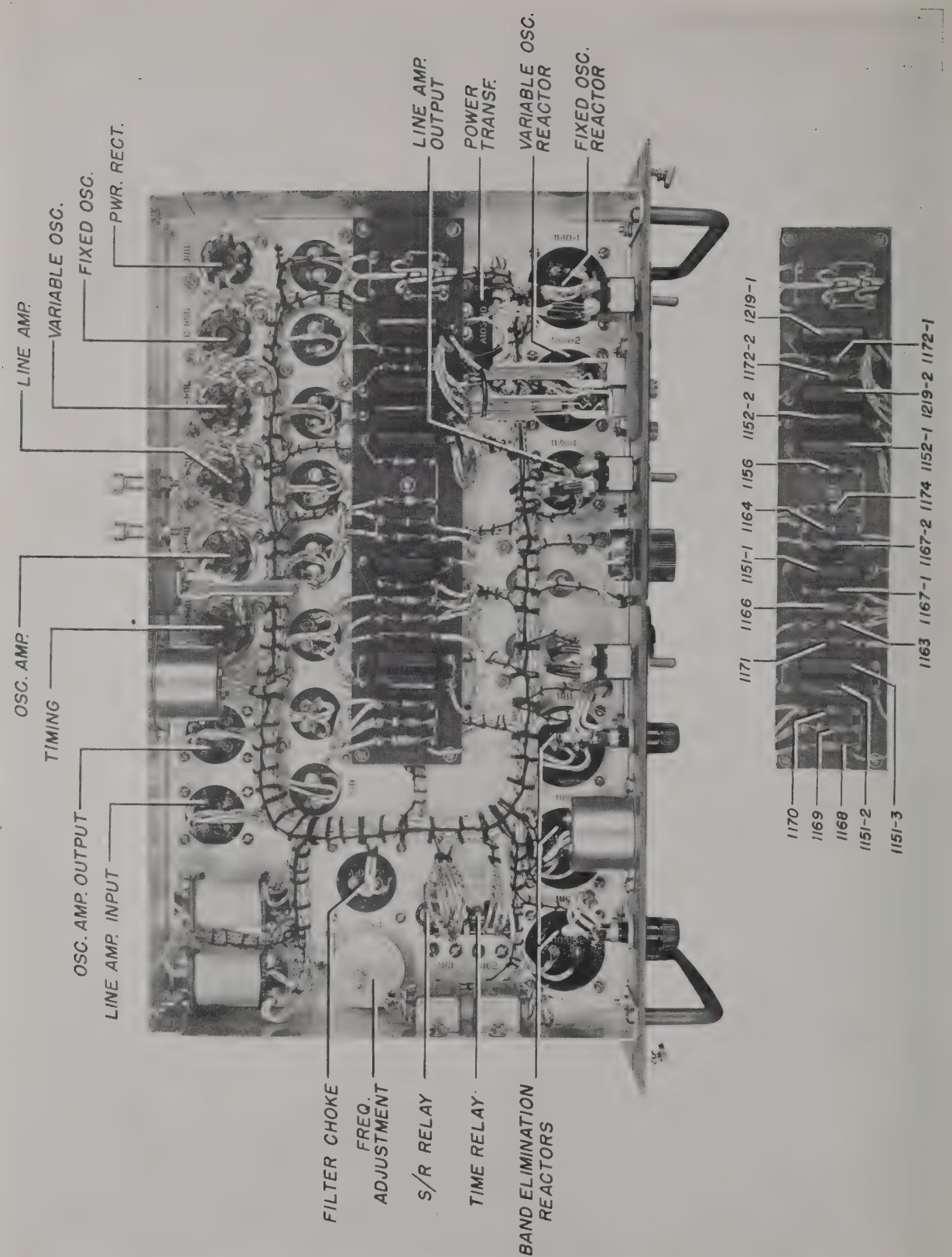


FIGURE 10 — Type CRB-23367 Selector Control Unit, Bottom View, Cover Removed

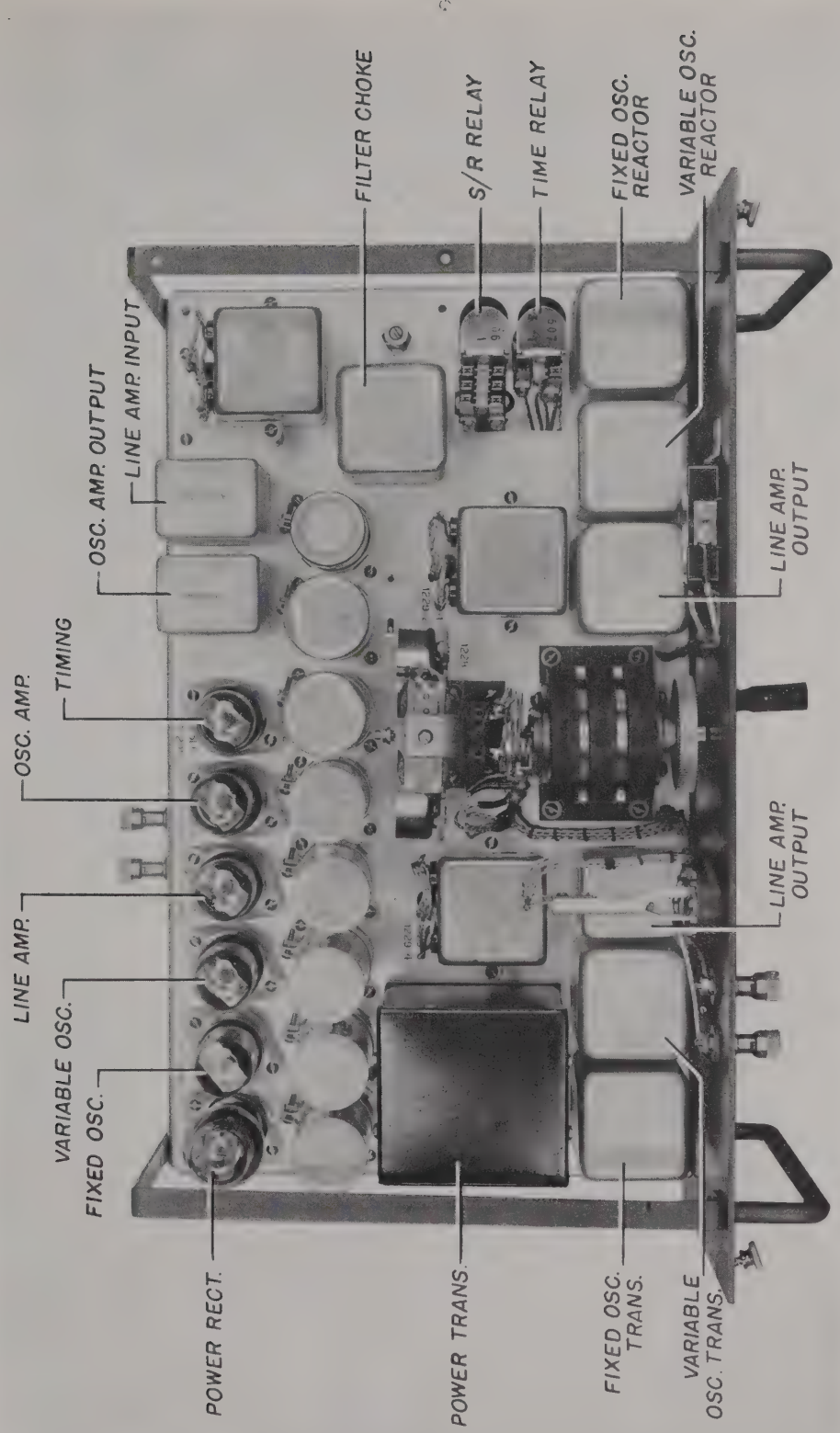


FIGURE 11 — Type CRB-23367 Selector Control Unit, Top View, Cover Removed

IV
TYPE CRB-23368 SELECTOR UNIT

1. INTRODUCTION

1-1. FUNCTION

The Type CRB-23368 Selector Unit has been developed to receive the control signals from the Type CRB-23367 Selector Control Unit over a two wire telephone line and in accordance with such signals to automatically effect the switching of the telephone line to either of two radio transmitters or of two radio receivers: that is, to provide automatic send-receive switching on either of two channels. The 2 wire telephone line can have a net loss of not greater than 25 db. for a frequency of 250 cycles per second, provided Line Amplifier (Army No.) BC-686-A is used as hereinafter indicated with the equipment. The unit is arranged for standard relay rack mounting and is intended for installation in Rack (Signal Corps des.) RC-72-A or RC-155-A of Radio Set SCR-574-A. In this installation, the unit is located so that the panel is visible to, and conveniently operable by the concerned personnel, and so that the rear of the unit, where the connecting terminals are located, is accessible when necessary.

1-2. DESCRIPTION

The Type CRB-23368 Selector Unit is self contained, weighs 38 lbs. net, with tubes and is 19″ wide, 8¾″ high and 14¼″ deep overall. All outer surfaces except nameplates, receptacles, controls etc. are finished with an olive drab matte lacquer.

1-3. ADDITIONAL UNITS

The following equipment, not supplied on this contract is necessary for the intended and described operation of same.

1—Radio Set SCR-574-A and accessories as supplied to U. S. ARMY SIGNAL CORPS.

1—Radio Set SCR-573-A and accessories as supplied to U. S. ARMY SIGNAL CORPS.

1-4. POWER CONSUMPTION

All power required by the e quipment is supplied by the 24v dc power supply, which is part of Radio Set SCR-574-A. Reliable operation is assured however if the voltage supplied is as low as 22 volts. The following tabulation lists the power requirements of the unit under various conditions.

Operating Condition	*D.C. Amps. Drawn*
Receive Channel One	1.5
Transmit Channel One	1.6
Receive Channel Two	1.6
Transmit Channel Two	1.7

2. DETAILED DESCRIPTION

2-1. LOCATION OF COMPONENTS

2-1-1. Front Panel

The Front Panel carries the following controls etc.: Sensitivity Control, Phone Jack for monitoring, Send-Receive indication lamp, Channel 1, Channel 2 indication lamps, two fuse holders for miniature cartridge fuses of 5 amp rating for

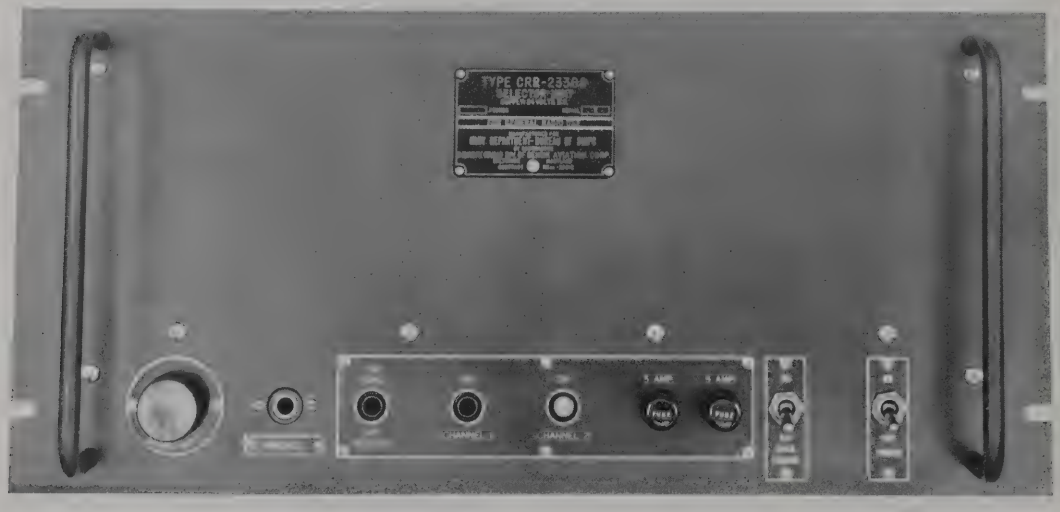


FIGURE 12 — TYPE CRB-23368 SELECTOR UNIT—PANEL VIEW

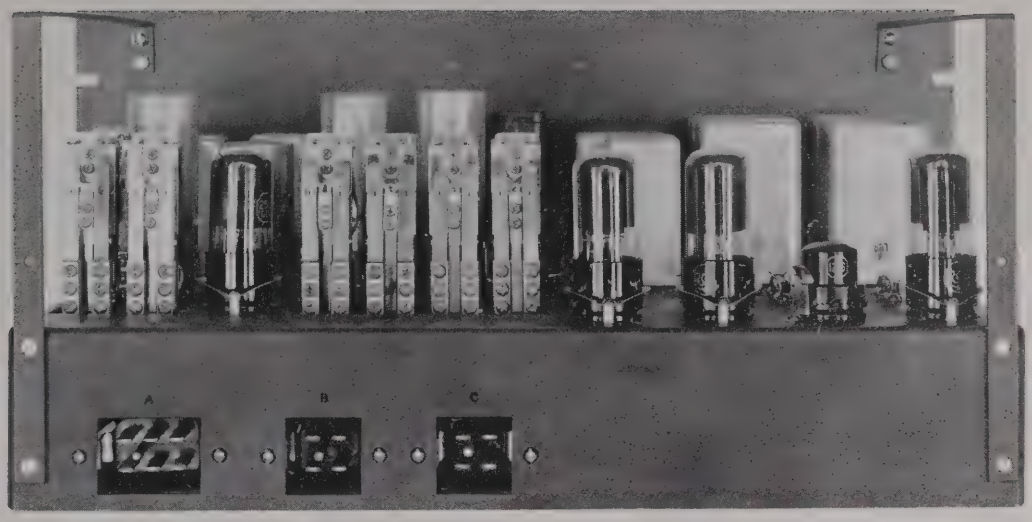


FIGURE 13 — TYPE CRB-23368 SELECTOR UNIT REAR VIEW, COVER REMOVED

power supply fusing, a Channel Change toggle switch and a Power toggle switch. See figure 12.

2-1-2. Provision for Connections

All connections to the unit are made to Jones plugs mounted on the rear of the chassis. The sheet steel dust cover which slides over the unit from the rear and seats against the protruding edges of the panel, is provided with three rectangular holes through which the Jones plugs on the associated wiring can engage the Jones plugs on the chassis. See figure 13.

2-1-3. Vacuum Tubes

All vacuum tubes in the unit are mounted in tube sockets on the chassis, accessible when sheet steel dust cover is removed. They are listed in the following tabulation:

Ref. No.	*Function*	*Comm'l Type*	*Army Type*	*Navy Type*
Same as Army Type	Detector	25L6GT	VT-201-C	25L6GT
	40 and 80 Cycle Rectifier	12H6	VT-214	12H6
	Channel One Relay Tube	25L6GT	VT-201-C	25L6GT
	Channel Two Relay Tube	25L6GT	VT-201-C	25L6GT
	Delay Tube	25L6GT	VT-201-C	25L6GT

2-2. DESCRIPTION OF CIRCUITS

2-2-1. Power Circuits

2-2-1-1. *Drawing Reference*

Refer to Schematic Diagram, figure 14.

2-2-1-2. *Description*

The supply voltage for the operation of the vacuum tubes and relays in Type CRB-23368 Selector Unit is 24 volts. The 25L6GT tubes are operated at 24 volts plate, less drops through plate load resistances, and are supplied with 24 volts on their heaters. The screens of three of the 25L6GT tubes are connected direct to 24 volts plus and the screen of the 25L6GT in the Detector stage, Socket No. 1216-1, is supplied with approximately 15 volts from the voltage divider across the 24 volt supply consisting of resistors 1217 and 1200.

The type 12H6 tube in the 40 and 80 Cycle Rectifier stage has a heater rated at 12 volts and is so supplied through series dropping resistors 1202-1 and 1202-2, which are in series with the tube heater across the 24v supply. Since this stage is a rectifier, no d-c is supplied to the plates and the plate power consists of the rectified signal.

The common grid, plate, and heater return connections are made to the negative supply voltage bus.

The CHAN. CHANGE switch, 1207-2 is provided to disable the Channel Selection Relay, 1194 by breaking its negative return circuit, into which 1207-2 is connected. If the CHAN. CHANGE switch 1207-2 is open or in the OFF position, the Channel Selection Relay, 1194 cannot become energized and remains unoperated. In this position of the Channel Selection Relay, Channel 1 only is available as will be described in Section 2-2-3.

The Plate Delay Relay, 1240, is the only relay in the unit that is fundamentally a component of the power circuits. Its purpose is to keep the Channel Selection Relay, 1194, and the Impluse Relay, 1195, from operating, which they would otherwise do, until the two Channel Relay Tubes have warmed up and are drawing normal plate current. The Plate Delay Relay, 1240, in its

CAPACITORS

1185	4 MFD. ± 5 % 600 V. D.C.W.	C60533
1186	25 MFD. ±10 % 200 V. D.C.W.	A18181-254
1187	1 MFD. ±20 % 400 V. D.C.W.	A18016-104
1188	2 MFD. ± 5 % 400 V. D.C.W.	C60531
1189	1 MFD. ± 5 % 400 V. D.C.W.	C60532

RECEPTACLES

1190	6 CONDUCTOR, MALE	A 104537
1191	4 CONDUCTOR, MALE	A 104586-1

JACKS

1192-1	LAMP JACK	A104502
1218	TELEPHONE JACK	A106286

RELAYS

1193	1000 Ω SINGLE WOUND; CONTACTS: 1C	L73226-35
1194	1000 Ω DOUBLE WOUND; CONTACTS: 2a, 1b	L73226-31
1195	500 Ω DOUBLE WOUND; CONTACTS: 2c, 1a, 1b	L73226-30
1196	1000 Ω SINGLE WOUND; CONTACTS: 2a	L73226-26
1240	1000 Ω DOUBLE WOUND; CONTACTS: 3a	L73226-1

RESISTORS

1197	0.1 MEG. POTENTIOMETER	QA104128-14
1198	1 MEG. ± 20 %, 1/2 W.	A110488-105
1217	1000 Ω ± 5 %, 1 W.	A110487-102
1199-1	1000 Ω ± 5 %, 1/2 W.	A110415-102
1200	400 Ω ± 5 %, 1 W.	A110487-401
1201-1	50,000 Ω ± 20 %, 1/2 W.	A110488-503
1202-1	38 Ω ± 5 %, 2 W.	A110417-380
1203	3500 Ω ± 5 %, 1/2 W.	A110415-352
1204	160,000 Ω ± 5 %, 1/2 W.	A110415-164

FUSES

1223	5 AMP. 250 V.	A11302-17

1205	5000 Ω ± 5 %, 1/2 W.	A110415-502
1206	20,000 Ω ± 5 %, 1/2 W.	A110415-203

SWITCHES

1207	S.P.S.T. TOGGLE	A104585-1

TRANSFORMERS

1208	DETECTOR INPUT	A103046
1212	AUDIO PACK 80 ~	A103210
1211	AUDIO PACK 40 ~	A103158

REACTORS

1209	BAND PASS	A103146
1210	BAND PASS	A103148
1213	BAND ELIMINATION	A103150
1214	BAND ELIMINATION	A103152
1215	BAND ELIMINATION	A103154

TUBE SOCKETS

1216	8 CONTACT OCTAL	A18955-7

TUBES

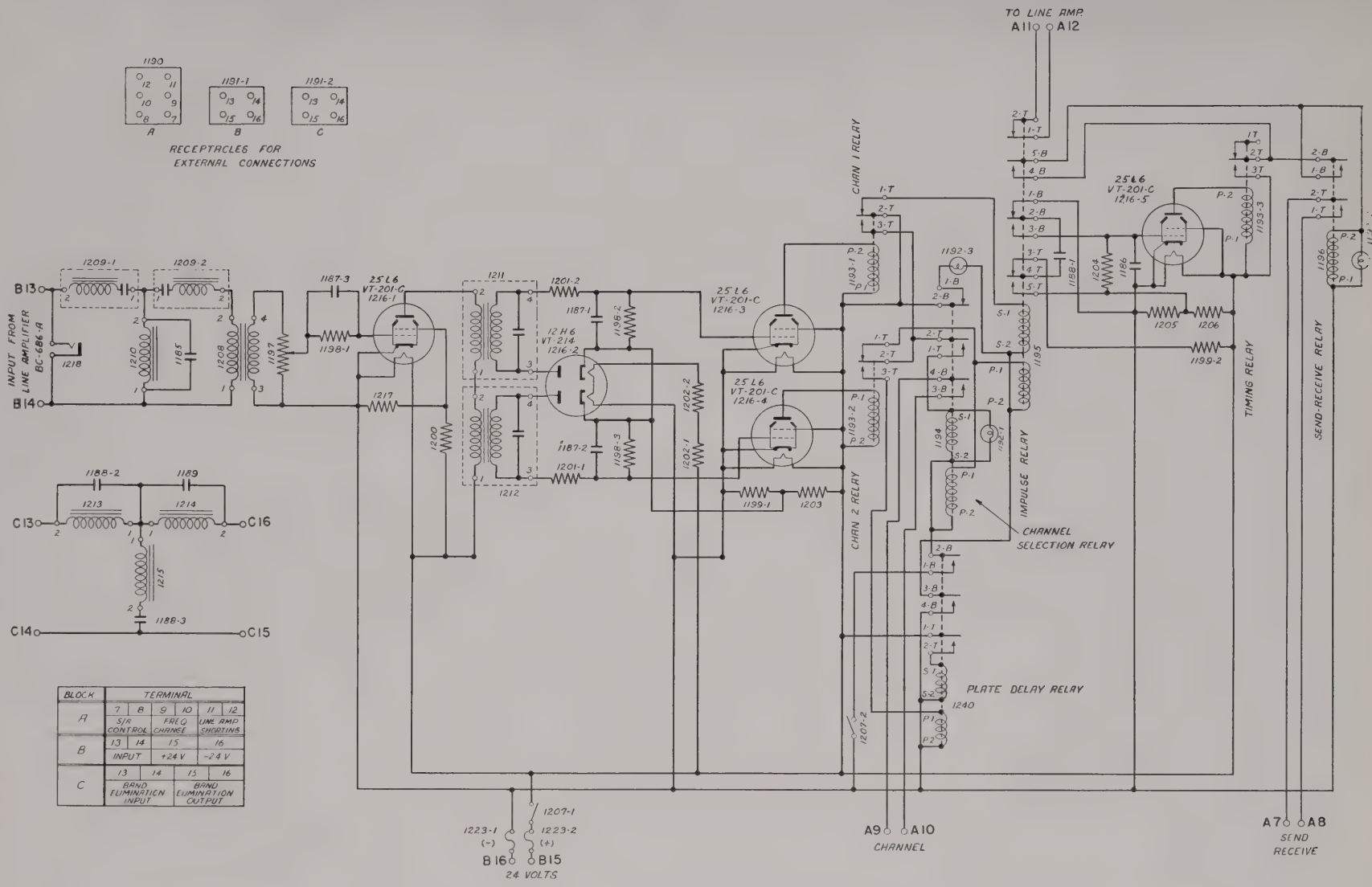
VT-201-C	25-L-6 GT/G	
VT-214	12-H-6	

INDICATOR LAMPS

1192	LAMP, 24 VOLT	A106879

LAMP CAPS

	WHITE	A104503-3
	RED	A104503-1
	GREEN	A104503-2



BLOCK	TERMINAL					
A	7	8	9	10	11	12
	S/R CONTROL		FREQ CHANGE		LINE AMP SHORTING	
B	13	14	15		16	
	INPUT		+24 V		-24 V	
C	13	14	15		16	
	BAND ELIMINATION INPUT		BAND ELIMINATION OUTPUT			

FIGURE 14 — SCHEMATIC DIAGRAM, TYPE CRB-23368 SELECTOR UNIT

unoperated position, opens the negative return circuit to 1194 and 1195 to accomplish this. As soon as the Channel Relay Tubes warm up and draw normal plate current, their associated relays, Channel 1 Relay, 1193-1 and Channel 2 Relay 1193-2, operate. The contacts 2-T, 3-T on each of these now are closed, completing the circuit to the pull-up coil of the Plate Delay Relay, 1240. Two pairs of contacts on 1240 complete the negative returns to 1194 and 1195, as mentioned. A third pair of contacts on 1240 complete the 24v supply to its own holding coil so that from now on it will stay in the operated position, regardless of the operation of 1193-1 and 1193-2, and until the unit is turned off.

2-2-2. Audio Frequency Circuits

2-2-2-1. *Drawing Reference*

Refer to the Schematic Diagram figure 14.

2-2-2-2. *Description*

The control signal for remotely controlling the functions of the Type CRB-23368 Selector Unit reaches this unit over a telephone line. This control signal consists of the amplified output of two audio oscillators in the Selector Control Unit CRB-23367, which generate 250 and 290 cps, for the Channel 1 signal and 210 and 290 cps, for the Channel 2 signal. It will be seen that the Channel 1 signal will have a difference frequency of 40 cps, and the Channel 2 signal will have a difference frequency of 80 cps. It is this difference frequency, or beat note, that controls the type CRB-23368 Selector Unit.

In each of the two Racks RC-72-A or RC-155-A in both of which this unit is installed, there is a Line Amplifier BC-686-A. This Line Amplifier has a hybrid network which must be adjusted for balance. The hybrid network is fundamentally a bridge circuit which keeps the receiver output from reaching the Type CRB-23368 Selector Unit, since the receiver in use and the Selector Unit are both connected to the telephone line.

If the hybrid network in Line Amplifier BC-686-A is balanced, there should be no signal from the receiver in use to either modulate the transmitter or to cause false operation of the Type CRB-23368 Selector Unit. However, to eliminate the slightest possibility of false operation of the unit, there has been incorporated within the Selector Unit a low frequency Band Elimination Filter. This filter is connected solely to the four terminals of Plug C. The external connection of this filter will be dealt with in the subsequent Section 3-3.

When a control signal is impressed upon the line, it passes through Line Amplifier BC-686 and is received in CRB-23368 on terminals 13 and 14 of Jones Plug "B". Across these signal input terminals is connected PHONES jack, 1218, which is used as a convenient metering connection during preliminary adjustment. The control tone thus received passes through a band pass filter circuit consisting of reactors 1209-1, 1209-2, 1210, capacitor 1185 and coupling transformer 1208. This band pass filter attenuates line noise or other signals which otherwise might cause false operation of the unit.

The secondary winding of transformer 1208 is shunted with a .1 megohm potentiometer 1197, the moving contactor of which is connected through a paralleled grid leak 1198-1 of 1 megohm and condenser 1187-3 of .1 mfd., to the grid of a type 25L6GT grid leak detector. The signal at this point is a complex wave of four tones, i.e., the two generated frequencies and their sum and difference frequencies. The Detector demodulates the heterodyne of 40 or 80 cycles per second, depending on which channel is being sent, and feeds it to the 40 and 80 Cycle Rectifier stage. The Detector plate load consists of the series connected primaries of the transformers in the two Audio Packs 1211 and 1212. The secondaries of these transformers together with their respective shunt condensers are tuned to 40 and 80 cycles. Therefore when the Detector passes the 40 cycle tone for Channel 1 it will be rejected by 1212 but passed by 1211 and fed into the Channel 1 section of the type 12H6 duodiode, 40 and 80 Cycle Rectifier.

The output of each of the two rectifier sections is shunted by a resistor and condenser, 1198-2 and 1187-1 respectively, for Channel 1 and 1198-3 and 1187-2 for Channel 2. The two resistors are the grid resistors of the two Channel Relay Tubes and are connected together at the common cathode of the 40 and 80 Cycle Rectifier. This junction point is connected to a voltage divider consisting of resistors 1199-1 and 1203 which are in series across the 24v supply. This voltage is about 5 volts positive with respect to ground and serves as positive, fixed, grid-bias since it is fed into the return ends of the grid resistors 1198-2 and 1198-3. This positive bias permits sufficient plate current to flow to energize, and therefore operate, Channel Relays 1193-1 and 1193-2 respectively in the plate circuits of the two Channel Relay Tubes.

Assume, for example, that a Channel 2 control tone is received. It will be passed through the Band pass filter and Detector. In the plate circuit of the Detector, this 80 cycle control tone is rejected by the 40 cycle audio pack 1211, but is fed by the 80 cycle audio pack 1212 into the 80 cycle (or Channel 2) section of the 12H6 40 and 80 Cycle Rectifier. The connections of these rectifier sections are such that the d-c voltage resulting from the rectified tone is referred to the relay tube control grid negative with respect to the grid return. This negative voltage produced by rectification of the control tone, and applied to the grid of the Channel 2 Relay Tube, bucks the positive bias which is being applied, causing the plate current to decrease to the point where it is insufficient to hold-operated the Channel 2 Relay 1193-2.

For Channel 1 the operation is exactly the same thus far except that the Channel 1 control tone of 40 cycles passes through the 40 cycle audio pack, 1211, into the 40 cycle section of the 40-80 cycle rectifier, the negative voltage from which cuts off plate current in Channel 1 Relay tube causing the Channel 1 Relay, 1193-1, to fall out.

From the foregoing it can be seen that Channel One Relay, 1193-1 and Channel Two Relay, 1193-2 are normally operated.

It has been shown that the frequency of a control tone (80 or 40 cps) determines whether Channel 1 or Channel 2 will be selected. It will be remembered that the duration of this tone (either 40 or 80 cps) i.e. a Morse "dot" or "dash", determines whether it is desired to "receive" or "transmit." Specifically, the "transmit" signal is a "dash" of approximately 1.25 seconds duration and the "receive" signal is a "dot" of approximately .12 second.

To sum up, a 40 cps "dot" is sent over the line when it is desired to "receive" on Channel 1, a 40 cps "dash" for "transmit" on Channel 1, an 80 cps "dot" for "receive" on Channel 2, and an 80 cps "dash" for" transmit" on Channel 2.

2-2-3. Control Circuits

2-2-3-1. *Drawing Reference*

Refer to the Schematic Diagram Figure 14, and to the Simplified Diagram of Relay Switching, Figure 15.

2-2-3-2. *Description*

When a Control Tone of 40 cps, 1.25 seconds long is received, transmission on Channel 1 is being called for. When this control tone reaches the relay tube, the normally operated Channel 1 Relay 1193-1 now falls out, and will remain in the release position for the duration of the control tone, or 1.25 seconds. As 1193-1 falls out, its contacts 2-T, 3-T close to energize the S-1, S-2 winding of Impulse Relay, 1195. It will be seen that 1195 has two windings, either one of which will, if energized, operate the relay. As this relay pulls up, three things happen simultaneously. *First*, contacts 4-B, 5-B are closed completing the circuit through the closed contacts 2-T, 3-T of Timing Relay 1193-3, to the Send-Receive relay 1196 thus energizing 1196 which, by its 1-T, 2-T contacts puts a short across terminals A-7 and A-8. *Second*, the operation of the Impulse Relay opens contacts 1-T, 2-T and removes the short across terminals A-11 and A-12. *Third*, two pairs of contacts 2-B, 3-B and 4-T, 5-T close to place across the grid circuit of the 25L6GT Delay Tube the capacitor 1188-1, which in the release position of 1195 was, through contacts 1-B, 2-B and 3-T, 4-T, in series with resistor 1199-2 across the voltage supply and being charged. The Delay Tube obtains positive fixed grid bias of about 5 volts through its grid resistor 1204 from the pair of resistors 1205, 1206 which are in series across the 24v supply as a voltage divider. It is this positive grid bias which permits the flow of sufficient plate current to normally hold-operated the Timing Relay 1193-3 in its plate circuit. From the grid of the Delay Tube to the negative 24v supply there is a capacitor 1186 which is effectively across the positive bias being applied to the grid of this tube.

When Capacitor 1188-1 is placed across the grid circuit of the Delay Tube, it is connected with its positively charged electrode to the negative 24v supply and its negatively charged electrode to the grid. This places an effective negative bias on the grid of the tube, reducing its plate current enough to permit Timing Relay 1193-3 to fall out. 1193-3 does not fall out instantaneously as capacitor 1188-1 is placed across the grid circuit, however, because the negative charge on 1188-1 must first overcome the lesser but opposite charge on capacitor 1186 and then charge it up negatively as itself. This minute delay is necessary to allow the Timing Relay 1193-3, to remain operated momentarily in order to complete the circuit through the 4-T, 5-T contacts on the Impulse Relay 1195 to the Send-Receive Relay 1196.

Approximately .7 second after the Impulse Relay, 1195, has placed capacitor 1188-1 across the grid circuit of the Delay Tube, 1188-1 has discharged through resistors 1204 and 1205, thus causing the fixed positive bias to assume control of plate current which increases sufficiently to operate the Timing Relay 1193-3. The "dash" signal of 1.25 seconds is still holding the Impulse Relay, 1195, operated; so the circuit is again closed through contacts 4-B, 5-B on 1195 and contacts 2-T, 3-T on 1193-3 to the Send-Receive Relay 1196. The 1-B, 2-B contacts on this relay, which are in series with the coil of 1196 as long as it stays operated, cause 1196 to stay operated. Since this relay is operated for transmission, and since the Channel Selection Relay 1194 is in the release position (the condition for Channel 1) CRB-23368 is now in the normal condition for transmission on Channel 1. Since the Send-Receive Relay 1196 is locked up, the SEND-ON lamp 1192-2 will light indicating unit is in transmit; and, since the Channel Selection Relay 1194, is unoperated, the circuit is completed through 1-B, 2-B, through the 24v supply and through the CHANNEL 1 ON lamp, 1192-3, which lights indicating unit is in Channel 1.

To "receive" on Channel 1 a .12 second "dot" is received. This signal causes operation similar to the "dash" except that since it will hold the Impulse Relay 1195 for only .12 seconds, this relay will fall out before capacitor 1188-1 has discharged. Therefore, the series connection lasting for .12 seconds through contacts 4-B, 5-B on 1195 and 1193-3 which supply the Send-Receive Relay 1196 and the SEND-ON lamp, is broken by contacts 4-B, 5-B on 1195 as it falls out, before

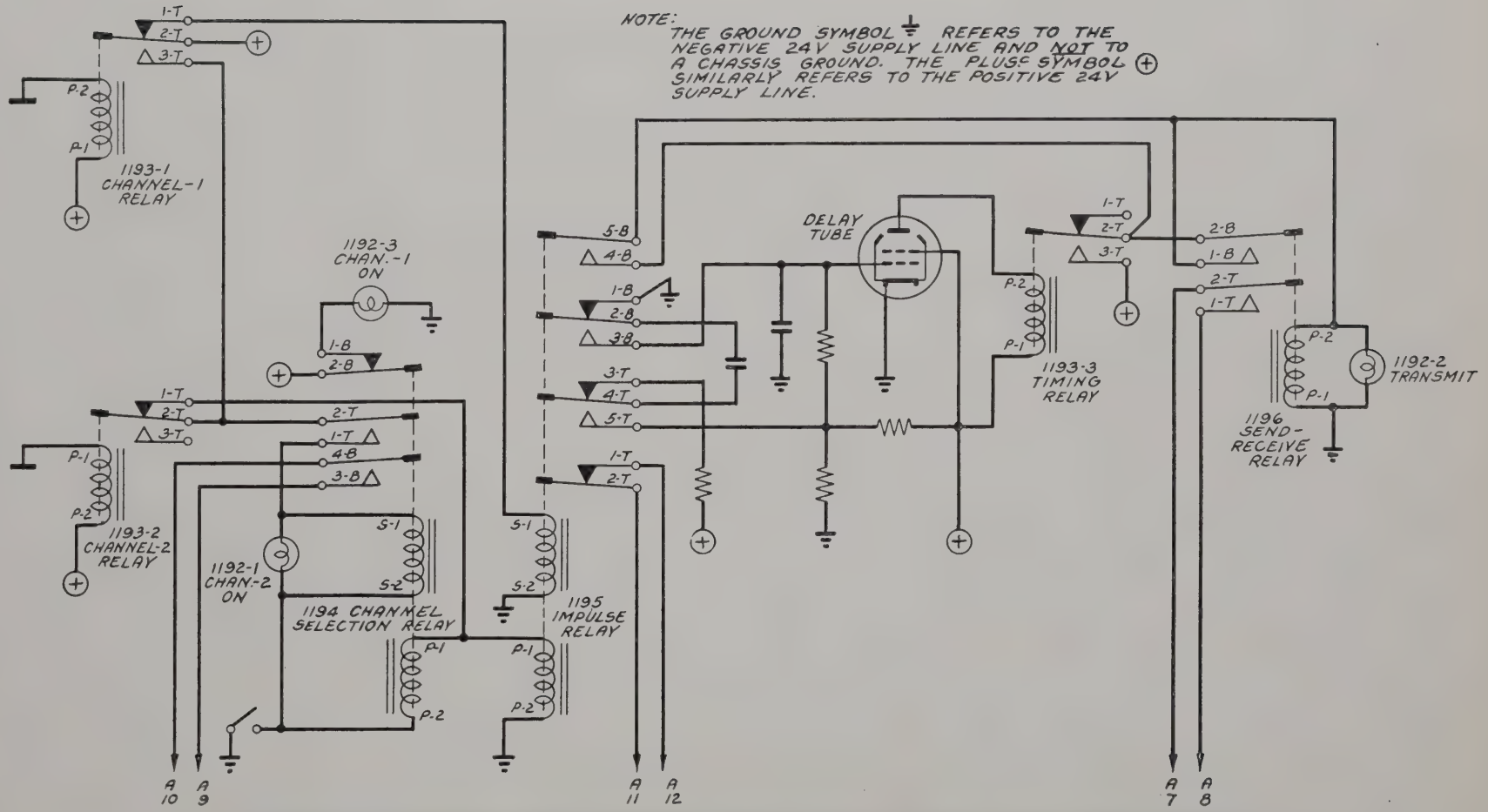


FIGURE 15 — SIMPLIFIED, PARTIAL SCHEMATIC DIAGRAM OF TYPE CRB-23368 SHOWING RELAY SWITCHING

the Timing Relay operates which requires .7 second from the time the capacitor 1188-1 is placed across the Delay Tube grid circuit by 1195, therefore Send-Receive relay will not operate, and its parallel connected SEND-ON lamp 1193-2 will remain unlighted indicating "receive." The Channel Selection Relay 1194 remains in the release position as previously and in this position causes CHANNEL 1 ON lamp, 1192-3 to light indicating Channel 1 as before.

Send-Receive switching on Channel 2 is effected as in the following description.

The control tone is received as for Channel 1, but as described before, causes Channel Two Relay 1193-2 to fall out. Channel 1 Relay 1193-1 remains in its normally operated position. As 1193-2 falls out, with 1193-1 operated, the 24v supply circuit is extended through contacts 2-T, 3-T on 1193-2 to the second winding P-1, P-2 of the Impulse Relay 1195 which operates, and to the pull-up, or "making" coil P-1, P-2 on Channel Selection Relay 1194. As 1194 operates, the circuit of CHANNEL 1 ON lamp, 1192-3, is opened by contacts 1-B, 2-B and it goes out. Contacts 3-B, 4-B on 1194 put a short on Terminals A-9 and A-10 which terminate in Control Unit RM-18-A to actually change the radio units in use. Also contacts 1-T, 2-T on 1194 energize its own lock-up or "holding" coil S-1, S-2 which holds the Channel Selection Relay 1194 in the operated or Channel 2 position. The CHANNEL 2 ON lamp 1192-1 across the holding coil S-1, S-2 of 1194 now lights indicating that Channel 2 is in use. As 1195 operates the ensuing operation of the unit will be exactly as for Channel 1 as already described. It can be seen that holding coil S-1, S-2 of 1194 will hold if this relay is in the operated (or Channel 2) position, until a Channel 1 control tone is received which will cause Channel One Relay 1193-1 to fall out, breaking the circuit through contacts 2-T, 3-T on 1193-1, contacts 1-T, 2-T on the channel Selection Relay 1194 and through holding coil, S-1, S-2. 1194 then drops out to the release, or Channel 1 position.

3. INSTALLATION OF TYPE CRB-23368 SELECTOR UNIT

3-1. INSPECTION OF UNIT

3-1-1. Removal of Dust Cover

To remove the dust cover, place the unit, panel down, so that the handles support the unit, on a table or similar surface. Unscrew the two captive knurled screws on the back of the unit. Remove the dust cover by pulling it gently upward.

NOTE: EXERCISE EXTREME CAUTION TO ENSURE THAT THE RELAYS IN THIS EQUIPMENT ARE NOT THROWN OUT OF ADJUSTMENT.

3-1-2. Inspection of Unit

Inspect Unit for loose connections and loose parts. Near each socket is stencilled the type number of the tube to be used there. Install a complete set of tubes in the tube sockets. Replace dust cover.

3-2. INSTALLATION IN RACK

3-2-1. Preparation

Because of the physical equivalence of the Type CRR-23368 Selector Unit to the equipment formerly used in Racks (Signal Corps designation) RC-72-A and RC-155-A, it should not be necessary to drill or tap the rack. The unit will occupy the same space as the superseded equipment and the mounting holes on the rack channel frame should line up with the screw slots on the panel of the unit.

3-2-2. Mounting

Mount the Type CRB-23368 Selector Unit in Rack 72-A in the space immediately beneath the Frequency Meter BC-638-A. In Rack RC-155-A the unit should be mounted in the space at the top of the rack, making it the uppermost unit in the rack. In either case, the unit is secured to the rack frame by means of 10-32 fillister head, nickel plated, brass machine screws ½″ to 1″ long. One flat washer and one lockwasher should be used under each screw. The screws should be carefully driven to avoid burring the heads and not set-up so tight that the threads are damaged.

3-3. ELECTRICAL CONNECTIONS

3-3-1. Drawing References

Refer to Figures 16 and 17.

3-3-2. General

Connections to the Type CRB-23368 are made at the rear of the unit by means of three Jones Plugs, designated on all drawings concerned, and on both separable parts of each plug, by the letters "A," "B" and "C." The two racks into which these units are to be installed are wired and equipped to be used with superseded units not furnished and not now in the racks. These superseded units were to be used with two Jones plug connections and the existing wiring harness on these racks provides only two plugs for the connection of the Type CRB-23368 Selector Unit, and their designations as Plug "A" and Plug "B" remain unchanged. The Type CRB-23368 Selector Unit however has, as mentioned, an additional plug connection, designated plug "C".

A change must therefore be made in the rack wiring harness in order to accommodate the unit. A change must also be made in the wiring of existing Plug "A."

3-3-3. Method

All soldering must be done with *Rosin Core Solder*. PASTE FLUX, ZINC-CHLORIDE, ACID CORE SOLDER, "SAL AMMONIAC", AMMONIUM-CHLORIDE OR ANY OTHER SIMILAR OR CORROSIVE COMPOUND

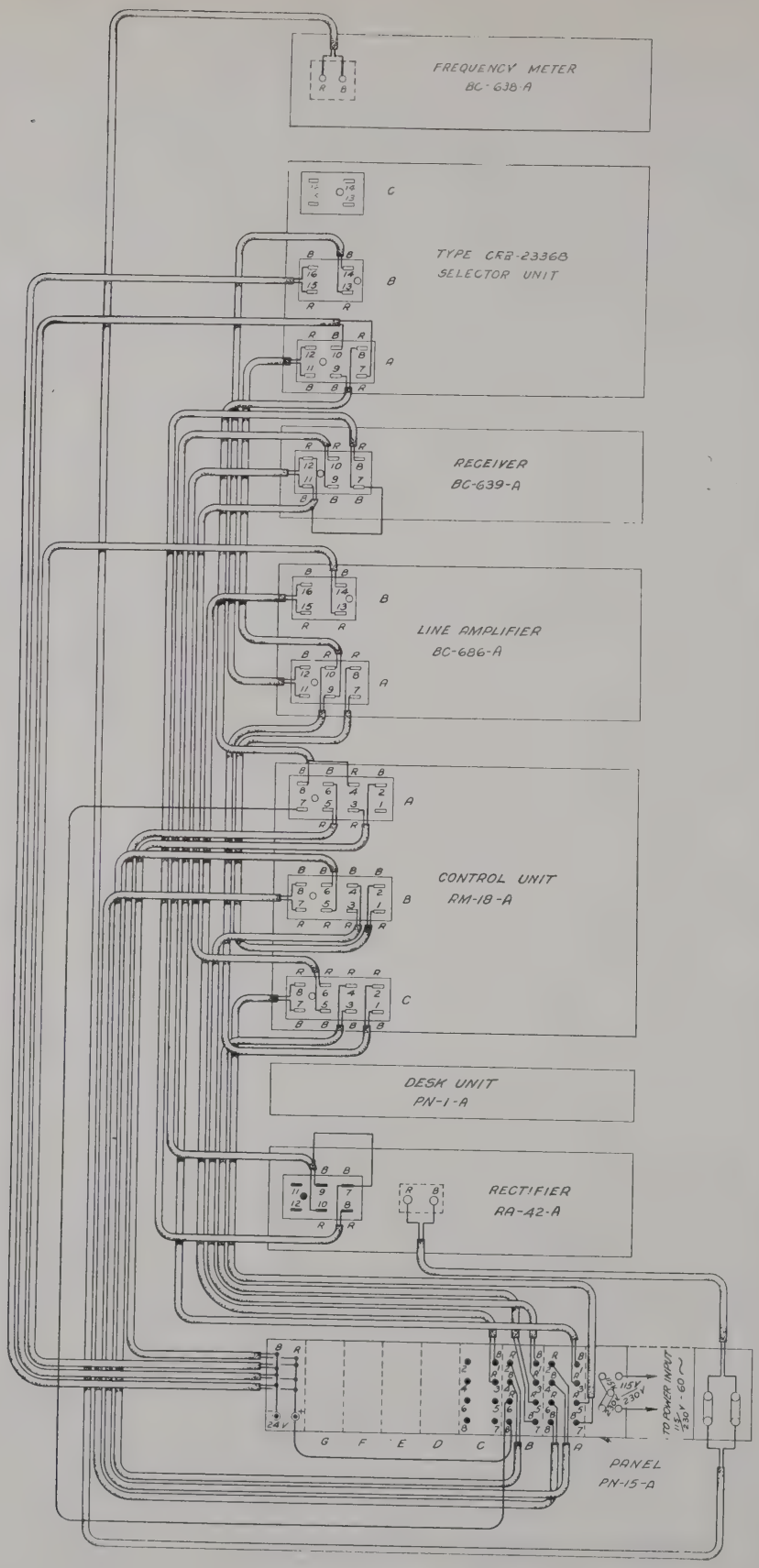


FIGURE 16 — WIRING OF RACKS RC-72-A AND RACKS RC-155-A BEFORE MODIFICATION FOR USE WITH CPB-23367

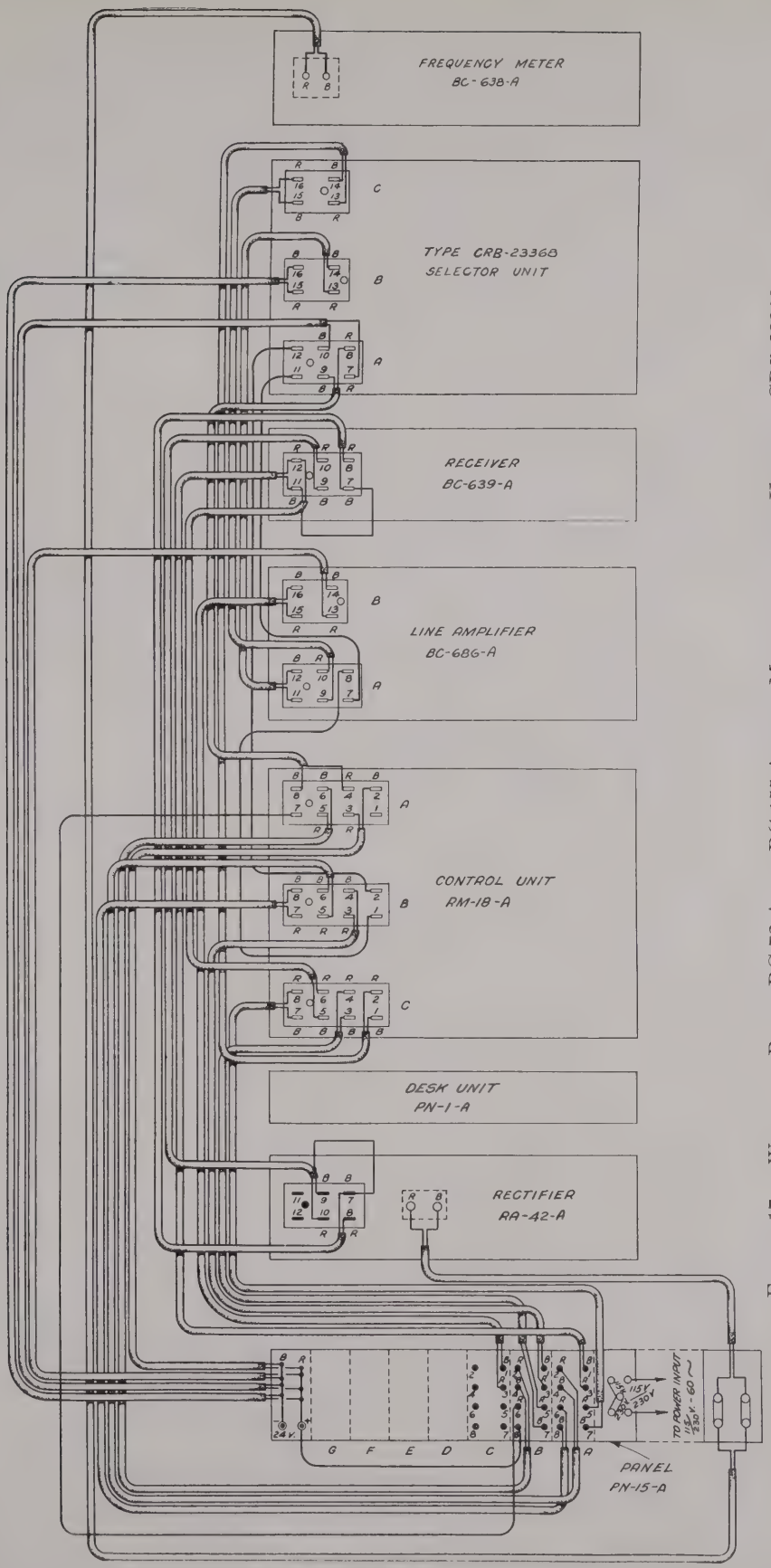


FIGURE 17 — WIRING OF RACKS RC-72-A AND RC-155-A AFTER MODIFICATION FOR USE WITH CRB-2336B

MUST NEVER BE USED ON RADIO GEAR. All solder joints should be mechanically strong as well as electrically perfect. Exercise extreme care to prevent strands of cable shielding from contacting any of the terminals.

3-3-4. Wiring Change Number One

As can be seen from the drawings, Plug "C" on Type CRB-23368 Selector Unit is so wired as to be effectively inserted in the line from Plug "A" on Line Amplifier BC-686-A to Plug "C" on Control Unit RM-18-A.

The specific procedure to be followed in making the wiring change is as follows:

(a) Remove leads from terminals 1 and 2 on wiring harness Plug "C" of Control Unit RM-18-A.

(b) Remove the other end of this cable from terminals 9 and 10 of Plug "A" of Line Amplifier BC-686-A.

(c) Connect one end of a piece of two conductor shielded #18 gauge cable to terminals 13 and 14 of Plug "C" on Type CRB-23368, red wire to 13 and blue to 14. Dress this cable neatly with the other cables in the harness. Connect the red and blue wires respectively to terminals 2 and 1 on Plug "C" of Control Unit RM-18-A.

(d) Connect one end of a piece of two conductor shielded #18 gauge cable to terminals 15 and 16 of Plug "C" of Type CRB-23368, blue to 15 and red to 16. With the other end of this cable connect the red and blue wires respectively to terminals 10 and 9 of Plug A on Line Amplifier BC-686.

3-3-5. Wiring Change Number Two

As can be seen from the drawings, terminals 11 and 12 of Plug "A" on Type CRB-23368 Selector Unit are disconnected from A-9 and A-10 of Line Amplifier BC-686-A and instead, these terminals A-11 and A-12 of Type CRB-23368 Selector Unit are placed, effectively, in series with the conductor joining terminal A-7 of Line Amplifier BC-686-A and terminal B-2 of Control Unit RM-18-A.

The specific procedure to be followed in making this wiring change is as follows:

(a) Remove the leads from terminals A-11 and A-12 of wiring harness Plug "A" of Type CRB-23368 Selector Unit. Remove this cable entirely by disconnecting its other end from terminals A-9 and A-10 on Line Amplifier BC-686-A.

(b) Remove the two-conductor cable connecting A-7 and A-8 of Line Amplifier BC-686A to B-1 and B-2 of Control Unit RM-18-A.

(c) Connect one end of a piece of single conductor shielded #18 gauge cable to A-12 of Type CRB-23368 Selector Unit. Dress this cable into the harness, while leading downward to Control Unit RM-18-A. Connect it to B-2 of this unit.

(d) Connect one end of a piece of single conductor shielded #18 gauge cable to terminal A-11 of Type CRB-23368 Selector Unit. Dress this cable into the harness and run it down to the Line Amplifier BC-686-A. Connect it to terminal A-7 of this unit.

(e) Connect one end of a piece of single conductor shielded #18 gauge cable to terminal A-8 of Line Amplifier BC-686-A. Dress this cable into the harness and run it down to Control Unit RM-18-A. Connect it to terminal B-1 of this unit.

4. PRELIMINARY ADJUSTMENTS

4-1. CONNECTION OF ASSOCIATED EQUIPMENT

Reference should here be made to the Instruction book pertaining to the entire Station SCR-574-A to obtain detailed information concerning connections beyond the Rack Wirng.

4-2. ADJUSTMENTS

4-2-1. Power Circuits

If the Station SCR-574-A has been correctly tied in with the Station SCR-573-A (Transmitting Station), the two Stations supplied with the requisite power, the transmitters in the Transmitting Station placed in operation and the receivers in racks RC-72-A and RC-155-A of SCR-574-A turned on, it should be possible by manipulation of the proper controls on Control Unit RM-18-A, to modulate the transmitters and monitor the receivers locally.

4-2-2. Audio Frequency and Control Circuits

The procedure for adjustment of Type CRB-23368 Selector Unit including adjustment specifications is as follows:

Turn on the Frequency Meter BC-638-A in Rack RC-72-A and tune it to some frequency. Set the Output Control to MAX. position. The frequency selected is entirely optional, but it is of paramount importance that the Frequency Meter is emitting a signal. Plug a headset into the LINE jack on one of the receivers in the rack being adjusted. Tune in, on the Receiver, the signal from the Frequency Meter. Set the AVC control on the Receiver to the AVC position and accurately adjust the tuning dial on the Receiver to the precise minimum reading on the Tuning Meter located on the receiver panel. Now reset the Output Control on the Frequency Meter from MAX. to MED. As this adjustment is made, the Tuning Meter on the Receiver should indicate a weaker signal by a higher reading. The receiver dial setting at which this meter dips will be the same as before, but the dip will not be so pronounced. This procedure assures that signal from the Frequency Meter is weak enough to permit the AVC circuits in the Receiver to operate.

Remove the headset from the LINE jack of the Receiver and in its place insert a jack to which has been connected a reliable A.C. voltmeter. An RMS Reading vacuum tube voltmeter such as the Ballantine 300-A is preferable. With the controls

left as last described, adjust the audio control on the Receiver until the voltmeter reads 1.9 volts. Leave the control in this position. Now remove the meter jack from the Receiver. Plug a headset into Phone jack on Type CRB-23368 Selector Unit. Turn on Line Amplifier BC-686-A. Set the key in the LINE TO RADIO position. Now balance the Hybrid Network. One of the purposes of the Hybrid Network is to keep the receiver signals from reaching the Selector Unit. Therefore the reactance balancing controls on the Line Amplifier BC-686-A must be adjusted until the signal in the headset is completely inaudible. Because a telephone line is always comparable to a tuned circuit, the balancing operation will be correct only for the audio frequency used in balancing. Since this adjustment is being made at 1000 cps (the frequency of the modulating oscillator in the Frequency Meter), the balance obtained will hold true exactly for 1000 cps; and for practical purposes the balance will be satisfactory for any audio frequency in the speech range. Further information on balancing the Hybrid Network can be found in the Instruction Book on this Station.

With the Hybrid Network balanced as indicated and the telephone line connected to the correct terminals on the Control line terminal Board of the Station, the gain control on the Line Amplifier BC-686-A and the Sensitivity Control on the Type CRB-23368 Selector Unit can be adjusted. For this adjustment it will be necessary to have a control signal on the line. It is highly desirable that the adjustments be made with the particular line with which the equipment is to be operated. First turn off the Frequency Meter BC-638-A and the Receiver. It is necessary then that communication be established with personnel at the Controlling Station in order that the tests be made. Request the operator at the Type CRB-23367 Selector Control Unit at the controlling Station to remove the dust cover of that unit and place it in operation with cover removed. Now request the operator at the Controlling Station to block-unoperated the relay 1162 in Type CRB-23367 Selector Control Unit. This can be done by placing a small piece of cardboard between the armature of the relay and the end of the core, preventing the relay from operating even if energized. This procedure causes the Type CRB-23367 to send out a continuous signal over the telephone line. Under these circumstances, with the control signal on the line, the voltmeter is plugged into the phonejack on Type CRB-23368 Selector Unit and the gain control on line amplifier is adjusted to the point where the voltmeter reads 1.75 volts. This reading is the optimum value but any voltage between 1.50 and 2.00 would be satisfactory. Actually, the Selector Unit, itself, will operate on inputs that are lower, but adjustment to the values indicated will provide a signal level most desirable for speech input to the transmitters.

Now turn on the Type CRB-23368 Selector Unit. Throw CHAN. CHANGE switch to ON position. The SENSITIVITY control on the Selector Unit should be rotated clockwise until the incoming signal just actuates the Unit. To provide a margin of safety, the SENSITIVITY control is now rotated farther clockwise by about one-eighth turn. The control should not be set any further clockwise than just described because an excessive degree of sensitivity will bring line noise, if any, up to the threshold level of the Selector Unit making the Unit liable to false operation by such noise. If the above adjustments have been carefully made, the equipment should be ready for operation.

5. OPERATION

The unit, once correctly adjusted, requires no operation or attention. The CHANNEL 1 ON lamp, the CHANNEL 2 ON lamp, are provided to show to personnel concerned, which of the various indicated switching functions are, at any particular time, being performed. The PHONES jack is used, in this application, chiefly for access to the input circuit for adjustment as described. However, it can be used to attach a headset for monitoring should that be desired, and, if so, a *high impedance* headset *must be used* to avoid attenuating the signal at this point. The Channel Change switch is provided to enable the operator to disable Channel 2 at will. This of course should not be necessary except in cases where some of the transmitting or receiving equipment has failed. When the switch is in the ON position, the controlling station has complete control of send-receive switching on both channels. If Channel 2 should become useless, for example, because of damage to, and consequent electrical failure of the transmitter serving this channel, the operator should throw the Channel Change Switch to the OFF position. This disables Channel 2 entirely and only Channel 1 would be available. Further, by referring to the circuit description of the unit, it can be seen that with the Channel Switch in the OFF position, any 80 cycle tone which would normally call for Channel 2 (either to "transmit" or "receive") will now operate Channel 1 because the Channel Selection Relay is in the release (or Channel 1) position.

If it is desired because of emergency, to close down radio facilities on Channel 1, it is presumed that the existing equipment (transmitter and receiver now serving Channel 2) be returned to the Channel 1 frequency and Channel 2 be disabled, as above, by throwing the CHAN. CHANGE switch to the OFF position.

6. MAINTENANCE

6-1. General

Except for the Vacuum Tubes, there is nothing in the Selector Unit subject to consumption or deterioration with use.

6-2. MAINTENANCE OF RELAYS

CAUTION

It must be remembered that when performing any operation involving the re-

moval of the dust cover, extreme care must be exercised to avoid damaging the relays. The reeds of these relays are manufactured and adjusted at the factory so as to cause the contacts to exert a "wiping" action during the operation and release of the relay armature. This fact, combined with knowledge of the small currents handled by the contacts, will explain why filing, dressing, or even burnishing, the contacts is never necessary or desirable.

If it has been definitely established that erratic operation is due to dirty relay contacts, it will be seen that infiltration of dirt and air-borne grease into the unit has proceeded to the point where it is interfering with the normal operation of all of the relays and that in this circumstance it is probable that other relays might fail for the same reason. This will be recognized as a very unlikely difficulty. To clean the contacts of a relay, soak a small camel's hair brush in clean, dry, grease-free Carbon Tetrachloride and swab the general vicinity of the contacts of the relay. Be careful to not spring the reeds. After allowing the relay to dry which should take no more than a minute, soak a small strip of clean paper such as ordinary letterhead, about ¼″ x 3″, in clean, dry, grease-free Carbon Tetrachloride. Gently separate the two reeds which are not making clean contact and insert the strip between them. Release the reeds and draw the strip between them, using no pressure except that which is afforded by the natural spring of the reeds themselves.

6-3. VACUUM TUBES

The vacuum tubes should be removed about every 1000 hours operation and checked on a reliable tube checker. In addition to the usual emission or dynamic transconductance life and quality tests, the tubes should be tested for interelement leaks. Any tubes which fail to meet the "satisfactory" requirements of the tube checker being used, should be replaced. It is good practice to check new tubes before they are installed.

7. LOCATION AND REMEDY OF FAULTS

7-1. LOCATION OF FAULTS

7-1-1. Familiarity with Equipment

Familiarity with the Selector Unit is vital to the rapid diagnosis of trouble. A thorough understanding of the Circuit Description (Sec. 2-2-1, Sec. 2-2-2 and Sec. 2-3-2 to which reference is here made) will enable the repair man to rapidly isolate the difficulty.

7-1-2. Isolation of Defects

First make sure that the Selector Unit is correctly connected and adjusted. (See Sections on Installation, Electrical Connections and Preliminary Adjustment.) Determine that the required power voltage is being delivered to the unit and that the signals for remote control of the unit are normal. If all the preceding checks have been made and do not reveal the trouble, the unit itself is at fault.

7-1-3. Preliminary Checks

Remove Dust Cover and check all the tubes. (Refer to Sec. 6–3). Inspect fuse holders for blown fuses. In each case replace the defective component and check the unit for operation. If these procedures do not disclose the cause of failure, the unit must be removed from the rack and given a detailed check.

7-1-4. Detailed Trouble Shooting Procedure

Refer to figures 14, 18, 19 and 20.

Connect an audio frequency signal generator across terminals 1 and 2 of the detector input coupling transformer with a "test" switch in series with the lead to terminal 1 and a 600 ohm resistor in series with the lead to terminal 2. Place a vacuum tube voltmeter across the audio generator before the resistor and switch. Turn on the generator and tune it to 40 cps. Adjust the output of the generator until the meter reads 4.0 RMS volts. Now open the "test" switch and turn on the Selector Unit. Set the sensitivity control to 50% clockwise rotation or mid-position. Close the "test" switch. Channel One Relay 1193-1 should operate. Open "test" switch and reset audio generator to 80 cps and close "test" switch. CHANNEL 2 relay should operate.

If neither of these tests produce the required results, the trouble is probably in the detector input or output circuits. If ONE of these two above tests is satisfactory BUT NOT THE OTHER, the trouble lies in the rectifier or delay tube circuit serving that channel. Here again, resistance or voltage measurements will isolate the trouble.

If both tests are satisfactory, the trouble lies in either the control circuits or in the band pass filter.

To test the band pass filter, connect the two leads shown in figure 18 to the input terminals test B-13 and B-14. Connect a vacuum tube voltmeter across terminals 1 and 2 of transformer 1208. With the generator output of 2 volts RMS for each of the following frequencies the voltmeter readings should be as follows for a satisfactory test:

Frequency of Audio Generator	*Voltmeter at 1208*
150 cps or less	less than 0.2v
200 cps	0.3v or more
300 cps	0.4v or more
400 cps	less than 0.2v

To test the band elimination filter, the two test leads shown in figure 18 should be connected to terminals C-13 and C-14, shown in figure 14. The vacuum tube voltmeter should be connected to terminals C-15 and C-16 and shunted with a 600 ohm resistor. With the audio generator output adjusted to 2.0 volts at each of the following frequencies, the voltages given on the following page will indicate satisfactory condition of the band elimination filter.

Audio Generator Frequency	*Voltmeter on C15 and C16*
100 cps or less	0.7v or more
200 cps	0.1v or less
300 cps	0.1v or less
500 cps or more	0.7 or more

If the above tests on the filter circuits indicate trouble, it can be localized by testing the accessible capacitors with an ohmmeter for shorts and leaks, and by testing the inductors for opens.

If all previous tests yield satisfactory results, the trouble is in the control circuits.

It has already been determined that 1193-1 and 1193-2 are operating satisfactorily.

Now, with the unit turned on and warmed up, and the CHAN. CHANGE switch in the ON position cause 1193-1 to drop out by manually (and with care) lifting the armature. With this operation, 1195 should operate for as long as the armature of 1193-1 is held up. 1194 should not operate.

Lifting the armature on 1193-2 will cause 1194 to operate and it will stay operated, because of its holding coil, after the armature on 1193-2 has been allowed to pull down. It should be possible to release 1194 by lifting the armature on 1193-1. 1194 when in the unoperated position lights CHANNEL 1 ON lamp 1192-3. In the operated position, 1194 lights CHANNEL 2 ON lamp 1192-1, and a check with an ohmmeter on terminals A-9 and A-10 should show a short across these two terminals. Lifting the armature on 1193-2 also causes 1195 to operate and stay operated as long as the armature is lifted up.

These manipulations will serve to localize any trouble in the circuits concerned, covering operation of the control circuits, up to and including, the performance of channel switching function and the operation of the impulse relay. If neither 1194 nor 1195 operate when they should do so, trouble may be expected in the continuity of the coil circuits of these two relays, which of course, includes the return circuit paths thru contacts on the Plate Delay Relay 1240. From now on, the testing will concern the send-receive switching function and timing circuits. It will be necessary to manually operate the Impulse Relay 1195 for periods of time closely approximating the duration of the "transmit" and "receive" control tones, or for approximately 1¼ seconds and approximately ⅒ second. A suggested method of accomplishing this is to say aloud the words "down-fifteen-ten-up" at a normal, conversational speed, depress the armature at the word "down" and release it at the word "up". This will produce an operated interval of about 1.2 seconds. For the ⅒ second interval, operate the relay and release it as indicated on the words "down-up". This will provide an interval of .1 to .2 sec. which is sufficiently precise for present purposes.

Operate 1195 as directed above for 1.25 sec. An ohmmeter across terminal A-11 and A-12 will show an open circuit as this relay is operated. Almost exactly as soon as it is operated, 1196 operates followed very rapidly by the release of the normally operated 1193-3, which stays unoperated for about .7 second. Since 1195 is being held in for 1.25 seconds, 1193-3 will pull up again before the 1.25 seconds period is past. The S-R Relay 1196 should stay operated and its Lamp 1192-2 should light, indicating Transmit.

Operation of 1195 for the short (.1 to .2 second) interval will produce the same result except that when it is released, 1193-3 has not yet pulled up so that the positive circuit to the Send-Receive relay is broken and it will not stay locked up, nor will the SEND ON lamp stay lighted. With 1196 operated, an ohmmeter check across terminals A-7 and A-8 will show a short between these terminals.

In case of trouble in the timing or send-receive circuits check the two capacitors 1186 and 1188-1 first. Next check any suspected relay contacts for resistance before cleaning as directed in Section 6-2.

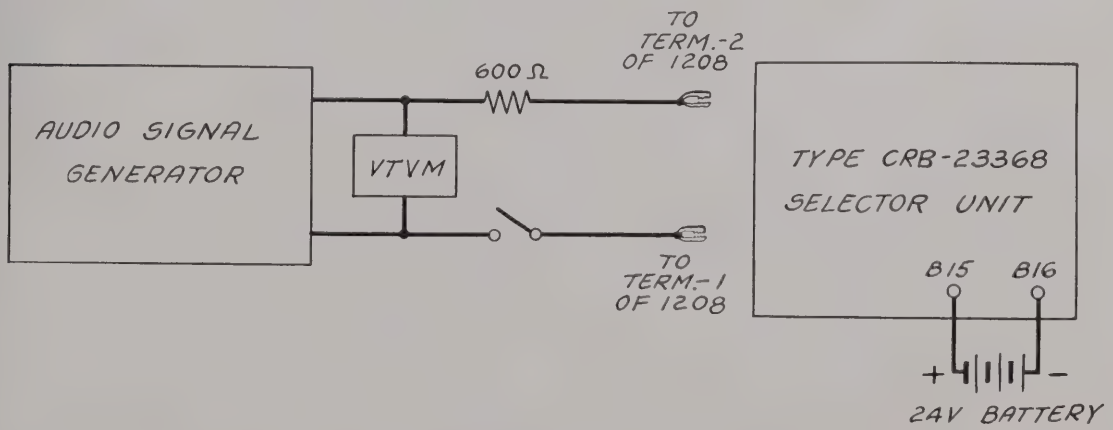


FIGURE 18 — CONNECTIONS FOR TESTING TYPE CRB-23368 SELECTOR UNIT

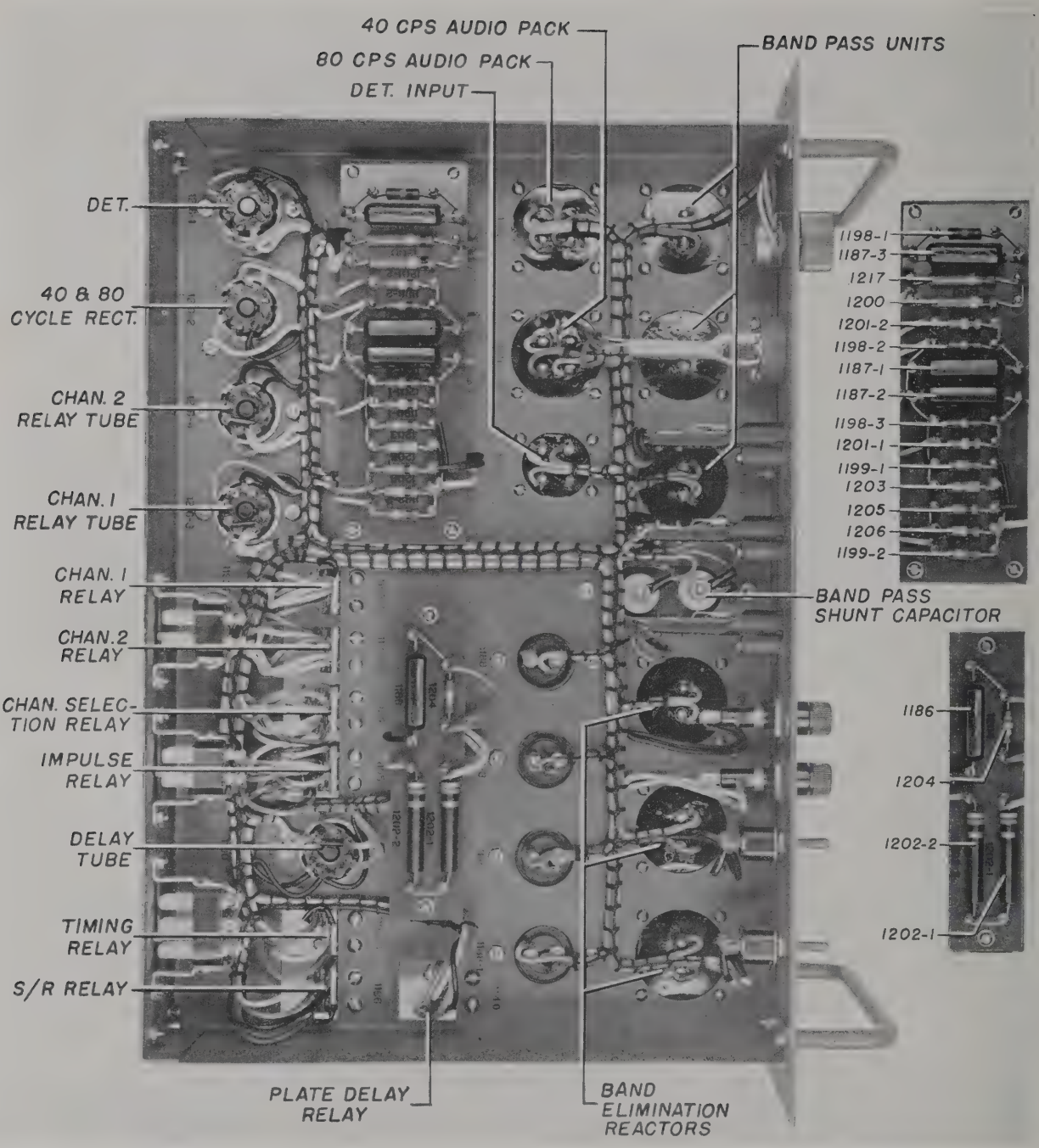


FIGURE 19—TYPE CRB-23368 SELECTOR UNIT, BOTTOM VIEW, COVER REMOVED

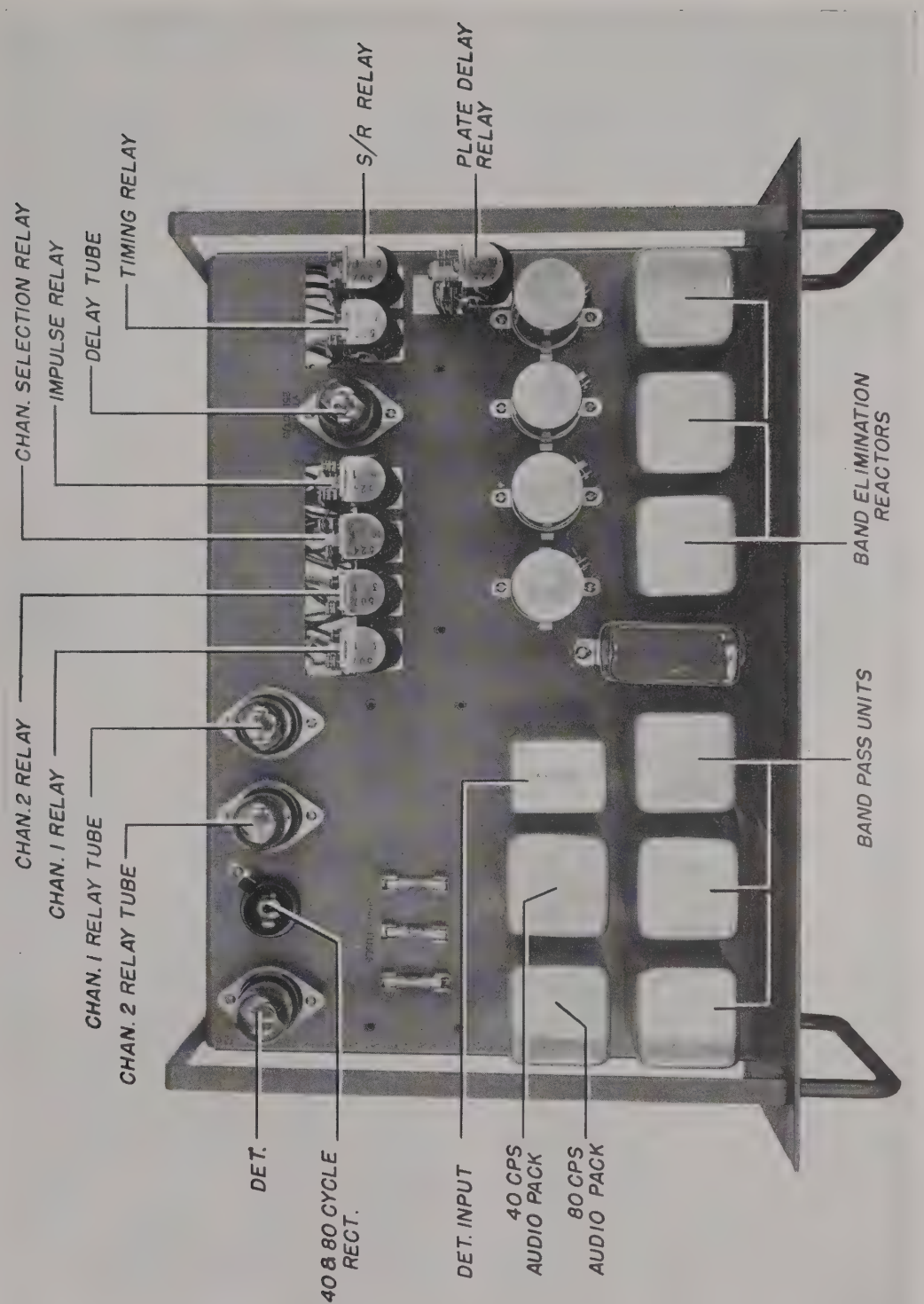


FIGURE 20—TYPE CRB-23368 SELECTOR UNIT, TOP VIEW, COVER REMOVED

V

TYPE CRB-49295 AUDIO MONITOR UNIT

1. INTRODUCTION

1-1. FUNCTION

The Type CRB-49295 Audio Monitor Unit is designed to permit operation of Type CRB-23367 Selector Control Unit at a distance of up to 2 miles from the Selector Control Unit. See Figure 2. Type CRB-49295 Audio Monitor Unit can also be used in conjunction with 1 or 2 Type CRB-29218 Relay Units, to operate Radio Set SCR-574-A at a distance of not less than 30 feet and not more than 2 miles from the Radio Set SCR-574-A. See figure 3.

1-2. DESCRIPTION

The Type CRB-49295 is a small steel encased unit, and is intended to be set upon a desk or similar location. All of the connections and controls are on the front panel which is the front piece of the case. All of the components within the unit are mounted on and behind the panel within the case.

1-3. ADDITIONAL UNITS

1-3-1. Additional Units Required When Operated With CRB-23367 or SCR-574-A

1—Interconnecting 1 pair cable of desired length up to 30 feet.
1—Head-Chest Set.

1-4. POWER CONSUMPTION

None

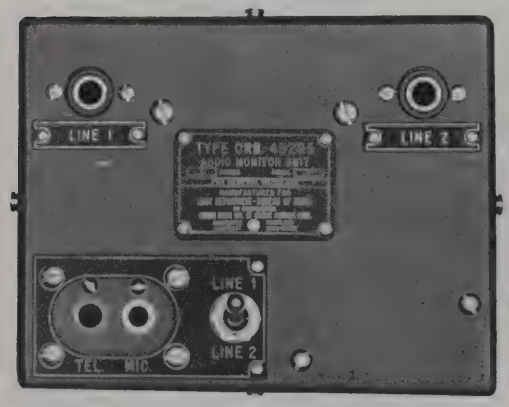


FIGURE 21 — TYPE CRB-49295 AUDIO MONITOR UNIT—FRONT

2. DETAILED DESCRIPTION

2-1. LOCATION OF COMPONENTS

All controls and connecting receptacles are mounted on the front panel and are as follows:

Two telephone type jacks for connecting lines, marked LINE 1 and LINE 2, a pair of jacks (for head-chest set) marked MIC. and TEL. and a line transfer switch marked LINE 1-LINE 2. See figure 21.

2-2. PHYSICAL DESCRIPTION

The Type CRB-49295 is 5″ high 6½″ wide and 5½″ deep. It weighs 3 lbs. less accessories and is finished in matte olive drab lacquer.

2-3. CIRCUIT DESCRIPTION

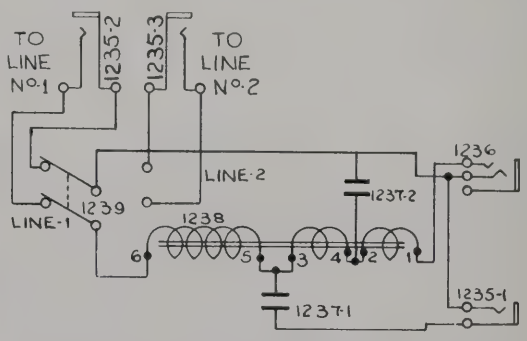
2-3-1. Drawing Reference

Refer to figure 22.

2-3-2. Description

The circuit is a fundamental and conventional anti-sidetone telephone circuit which is switched by the LINE 1-LINE 2 switch 1239 to either of two lines. These lines connect to LINE 1 jack, 1235-2, or LINE 2 jack, 1235-3.

Jack 1236 is used to plug-in the microphone unit of either the head-chest set. The jack 1235-1 is used to plug in the receiver unit of the above telephone set. Button current for



SYM. N°	DESCRIPTION	DWG. N°
1235	TEL. JACK CAT. N°. 144	A106286
1236	MICROPHONE JACK	A106284
1237	CAP. 2MFD. ± 20% 600V. D.C.W.	A104107
1238	INDUCTION COIL	A106996
1239	SWITCH TYPE #8824K2	A112239

FIGURE 22 — SCHEMATIC DIAGRAM, TYPE CRB-49295 AUDIO MONITOR UNIT

the microphone is supplied by the equipment to which the unit is connected. Capacitor 1237-1 blocks the d-c path thru the telephone-receiver which, if the capacitor were absent, would short circuit considerable microphone current. Capacitor 1237-2 connects the line side of the microphone to the coil, for a-c but prevents the low resistance winding of the induction coil from placing a d-c shunt path across the microphone which would short-circuit the microphone, almost entirely, for d-c.

3. INSTALLATION OF TYPE CRB-49295 AUDIO MONITOR UNIT (Refer to fig. 3)

The unit may be placed where convenient with the panel either front or top. The two lines are plugged into the line jacks, and the telephone set to be used is plugged into the MIC. and TEL. jacks. The unit should not be more than 2 miles from the associated equipment which it is to control.

4. PRELIMINARY ADJUSTMENT

None

5. OPERATION

When used with one Type CRB-23367 Selector Control Unit, there will be only one line connected to Type CRB-49295 Audio Monitor Unit. This one line will, logically be plugged in LINE 1 jack, the LINE 2 jack remaining empty. Under these circumstances the LINE 1-LINE 2 switch is left in LINE 1 position. The operator merely operates the press-to-talk switch on his telephone set when he desires to transmit and releases it when he desires to receive. He may converse over the connecting line or lines with persons at the Selector Control Unit provided that unit has been switched to the I/C (or "Intercommunication") Position.

When used with Radio Set SCR-574-A, the above operation data applies except that no provision is made for I/C operation of Radio Set SCR-574-A in this application.

6. MAINTENANCE

There is no necessity for routine maintenance of this unit of any kind. Replacement of defective components should be made by the usual methods employed for this type of gear.

7. LOCATION AND REMEDY OF FAULTS

Electrical failure of any component in this unit is presumed to be so improbable that unusual care should be exercised to determine that the fault is actually in the unit and not in the associated equipment. If the trouble has been positively localized to the unit itself, isolate it by checking the capacitors for shorts or leaks, making sure that the various jacks are affording good contact with their respective plugs, and that the LINE 1-LINE 2 switch is opening and closing the circuits required. See figures 22 and 23.

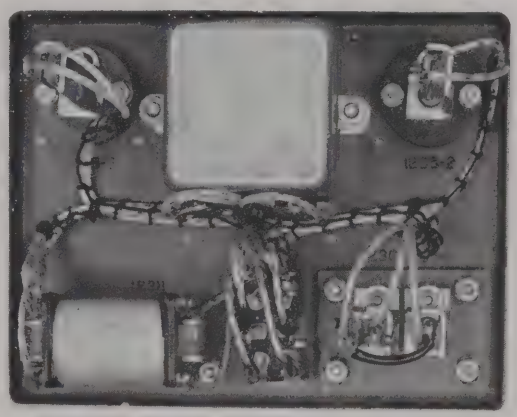


FIGURE 23 — TYPE CRB-49295 AUDIO MONITOR UNIT—REAR VIEW, CASE REMOVED

VI

TYPE CRB-29218 RELAY UNIT

1. INTRODUCTION

1-1. FUNCTION

Type CRB-29218 Relay Unit is designed to be used with and at Radio Set SCR-574-A and to be connected to Type CRB-49295 Audio Monitor Unit. The purpose of the Relay Unit is to provide send-receive switching of one receiver and one transmitter. To utilize both available transmission and reception channels afforded by Radio Set SCR-574-A and Radio Set SCR-573-A (to which the 574-A is connected) it will be necessary to employ two Type CRB-29218 Relay Units. From the Operator's position at Type CRR-49295 Audio Monitor Unit (which is located up to 2 miles, from SCR-574-A and the two Relay Units), the Operator can accomplish send-receive switching on either of two channels, thus controlling two transmitters and two receivers from some location outside the station. Refer to figure 3.

1-2. DESCRIPTION

The Type CRB-29218 is a small metal cased unit which can be placed on a table or other surface or screwed down if desired.

1-3. ADDITIONAL UNITS

Any additional units required are considered under Section V-Type CRB-49295 Audio Monitor Unit, Paragraph 1-3-2-Additional Units.

1-4. POWER CONSUMPTION

The Relay Unit requires no direct connection to any power source. Current required to operate the relay within the unit is derived from equipment to which it is connected, arising ultimately in the transmitter of Station SCR-573-A which the relay unit serves, and to which it is indirectly connected.

2. DETAILED DESCRIPTION

2-1. PHYSICAL DESCRIPTION

The Type CRB-29218 Relay Unit is a small steel encased unit $2\frac{3}{8}''$ high $6''$ wide and $5\frac{3}{8}''$ deep. It weighs 3 lbs net and is finished in matte olive drab lacquer. There are 6 marked terminals on the front of the unit for external connections. The top is removable and supports no components or connections. See figure 24.

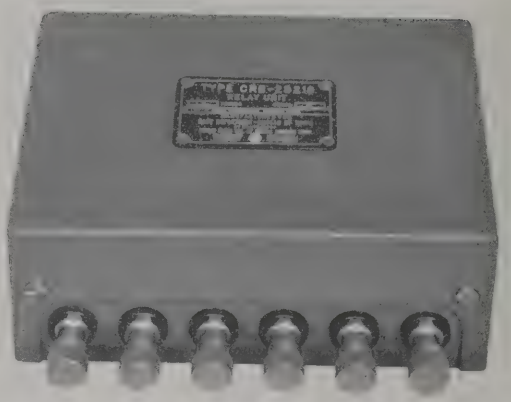


FIGURE 24 — TYPE CRB-29218 RELAY UNIT— OBLIQUE VIEW, TOP AND FRONT

2-2. CIRCUIT DESCRIPTION

2-2-1. Drawing Reference

Refer to figure 25.

2-2-2. Description

The transmitter microphone line, carrying current for operating a carbon microphone enters the unit on terminals marked TO TRANSMITTER. The receiver output line enters the unit on terminals marked TO RECEIVER. In the unoperated position the receiver line goes through the relay contacts to terminals marked TO MONITOR UNIT, whence it is wired to the Audio Monitor Unit and its telephone circuit. When the operator at the Audio Monitor Unit operates the press-to-talk switch on his telephone set he completes his microphone circuit. This completed circuit places a d-c path across the Relay Unit terminals marked TO MONITOR UNIT which from the schematic diagram can be seen to draw microphone current from the transmitter line through relay 1250. This current is sufficient to operate the relay. When the relay operates, its contacts open to take the Monitor Unit Line off the Receiver Line and put it on the Transmitter Line, permitting modulation of the transmitter by the Operator at the Audio Monitor Unit. The capacitors 1251-1 and 1251-2 prevent the Receiver Line (which is a closed circuit) from operating the relay and also prevent microphone current from the idle transmitter being fed to the receiver.

3. INSTALLATION OF TYPE CRB-29218 RELAY UNIT

The Relay Unit may be set on or fastened to a table or the floor in the Station or Vehicle of Radio Set SCR-574-A.

Two Relay Units should be connected as shown in figure 3 or one relay unit may be used by connecting it as either one shown. For the connection of the relay unit to the Rack, Number 16 stranded flameproof wire insulated for 500 volts is suggested. The cable from the Relay Unit or each of two Relay Units to the Audio Monitor Unit is described under the latter unit and is furnished with it. No preliminary adjustments necessary. Automatic operation eliminates necessity of supervision. Routine maintenance is not required.

SYM. N°	DESCRIPTION	DWG. N°.
1250	RELAY	L73226-36
1251	CAPACITOR 2 MFD. ±20% 600 V.D.C.W.	A104107

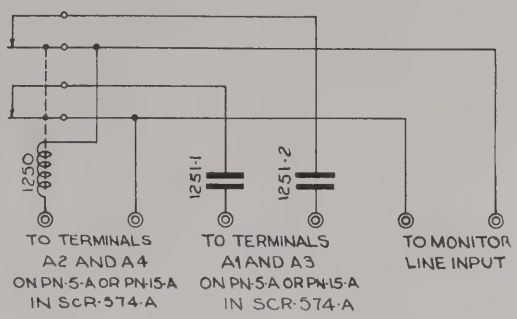


FIGURE 25 — SCHEMATIC DIAGRAM TYPE CRB-29218 RELAY UNIT

4. LOCATION AND REMEDY OF FAULTS

Place a source of about 24-volts d-c across the terminals marked TO TRANSMITTER. If a 600-ohm resistor is placed across the terminals marked TO MONITOR UNIT, the relay should operate. If it does not, check the coil of the relay for an open circuit. The resistance should be approximately 200 ohms and a source of 6 volts d-c applied to the coil terminals should operate the relay. With the relay unoperated check the contacts with an ohmmeter for contact resistance.

Check the capacitors for shorts or leaks with an ohmmeter. Unless they show a resistance of 1 megohm or more they are defective and should be replaced. See figures 25 and 26.

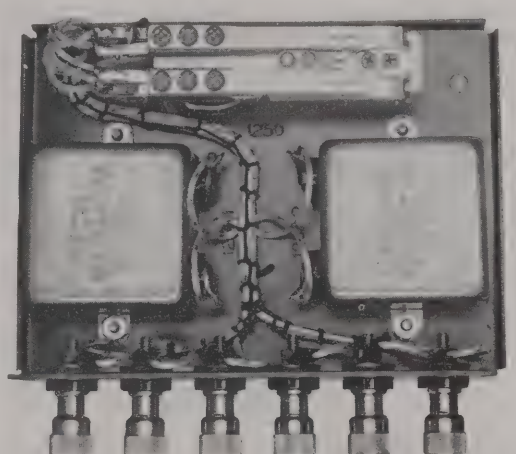
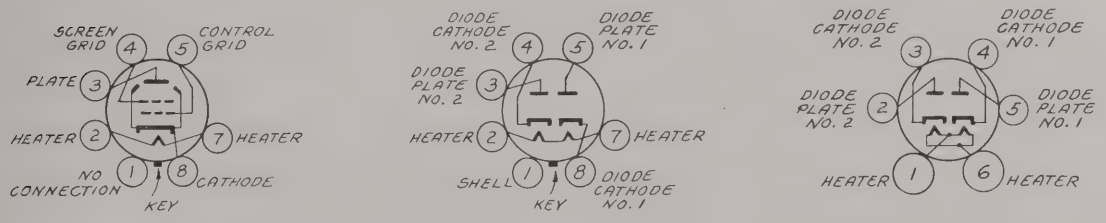


FIGURE 26 — TYPE CRB-29218 RELAY UNIT— TOP VIEW, COVER REMOVED



BOTTOM VIEW OF ALL TUBE SOCKETS SHOWN.

FIGURE 27 — BASING DIAGRAMS OF TUBES USED IN CRB-23367 AND CRB-23368

VII
APPENDIX

1. PARTS LIST FOR SELECTOR CONTROL UNIT, CRB-23367

Symbol Designation	*Function*	*Description*	*Navy Type Number*	*Mfr.*	*Mfr. Desig.*	*Bendix Dwg. No.*
		Capacitors				
1151-1	Line Amp. cathode bypass	.25 Mfd. ±10% 200 DCW v., paper		3	345-20	A18181-254
1151-2	Timing	Same as 1151-1				
1151-3	Timing	Same as 1151-1				
1152-1	Fixed Osc. Coup.	.01 Mfd. ±20% 400 DCW v., paper		3	342-9	A18016-103
1152-2	Variable Osc. Coup.	Same as 1152-1				
1153-1	Fixed Osc. Plate	.25 Mfd. ±5% 400 DCW v., paper		4		A112703-1
1153-2	Variable Osc. Plate	Same as 1153-1				
1154	Osc. Control by-pass	1 Mfd. ±5% 600 DCW v., paper		4	PO5	C60532
1155-1	Osc. Amp. Coupling	2 Mfd. ±5% 600 DCW v., paper		4	PO5	C60531
1155-2	Timing	Same as 1155-1				
1155-3	Band Pass Filter	Same as 1155-1				
1155-4	Band Pass Filter	Same as 1155-1				
1155-5	Band Pass Filter	Same as 1155-1				
1219-1	Fixed Osc. grid	.1 Mfd. ±20% 400 DCW v., paper		3	345-2	A18016-104
1219-2	Variable Osc. Grid	Same as 1219-1				
1226-1	Power Supply Filter	30 Mfd. +100% −10% 450 DCW v, Dry electrolytic		8	B-94755	A110890
1226-2	Power Supply Filter	Same as 1226-1				
1229-1	DC Blocking	2 Mfd. ±20% 600 DCW v., paper, dykanol	48403-B	9	DYR6200	A104107
1229-2	DC Blocking	Same as 1229-1				
1229-3	Mic Coupling	Same as 1229-1				
1229-4	Tel. Rec. Coupling	Same as 1229-1				
1229-5	SR relay coil bypass	Same as 1229-1				
1229-6	DC blocking	Same as 1229-1				

Symbol Designation	*Function*	*Description*	*Navy Type Number*	*Mfr.*	*Mfr. Desig.*	*Bendix Dwg. No.*
		Relays				
1161	Send-Receive Switching	S/R relay 500Ω coil single wound, contacts: six make-break, 24 v. d-c.		2	506-203-1	L73226-37
1162	Osc. Timing	Time relay, 1000Ω coil single wound, contacts: one make-break, 24 v. d-c.		2	507-3-1	L73226-35
		Transformers				
1178	Line Amp. Input	Primary (1–2) impedance 600Ω with sec. loaded with 100,000Ω; Frequency response ±1 db. from 100 to 4000 cycles per sec.; max. power level = +6 db.		1		A103046
1179-1	Line Amp. Output	Primary (1–2) impedance 3000Ω; Sec. (3–4) 600Ω; turns ratio pri. to Sec. 2.23 to 1; d-c resistance of pri. 100Ω, d-c resistance of Sec. 36Ω frequency response ±1 db. from 100 to 4000 cycles; Max. power level +6 db.		1		A103040
1179-2	Osc. Amp. Output	Same as 1179-1				
1180-1	Fixed Oscillator transformer	Inductance terminals 2-5, 1.78 h. ±5% measured at 250 cps; turns ratio: between 5-2 and 2-1, 5.26 to 1; between 5-3 and 3-2, 6.29 to 1; between 3-4 and 4-5, 4.0 to 1; d-c resistance from 5-1, 85Ω		1		A103212
1180-2	Variable Osc. transformer	Same as 1180-1				
1224	Power Transformer	Plate winding terminals 5-7 center-tapped at 6: total resistance 56Ω, total voltage ~~250 v., 125 v.~~ each side of center tap; rectifier filament winding, (10-11) res. 2.8Ω provide 25 v. at .3 amp.; main filament winding (8-9) resistance .65Ω provide 25 v. at 1.5 amp. Primary winding between terminal 1-4 tapped at terminal 2 for 105 v., tapped at terminal 3 for 115 v., total resistance (terminals 1-4) 7.5Ω	1184, 594	1		A103180
1233	Ind. Coil for local Telephone Set	Three-winding, anti Sidetone telephone induction coil		2	SCS-2-30	A106996
		Switches				
1177-1	Radio or I/C	Double-pole, double-throw toggle switch, with single hole mounting by means of 15/32 threaded bushing, having a threaded pitch of 32 threads to an inch. Contacts rated 20 amp.—24-Volt		15	8824K2	A112239
1177-2	Channel 1 or Channel 2	Same as 1177-1				
1177-3	Power ON-OFF	Same as 1177-1				

1. PARTS LIST FOR SELECTOR CONTROL UNIT, CRB-23367 (Cont'd)

Symbol Designation	*Function*	*Description*	*Navy Type Number*	*Mfr.*	*Mfr. Desig.*	*Bendix Dwg. No.*
		Tube Sockets and Tubes				
1184-1	Line Amp. tube Socket	8-contact octal, Silver-plated	49351	7	S 8	A18955-7
1184-2	Time Relay Tube Socket	Same as 1184-1				
1184-3	Fixed Osc. tube Socket	Same as 1184-1				
1184-4	Variable Osc. tube Socket	Same as 1184-1				
1184-5	Osc. Amp. tube Socket	Same as 1184-1				
1186	Power rect. tube Socket	6-contact, Silver-plated	49348	7	S 6	A18955-3
VT-201C	Line Amp. tube	J-25L6-GT/G	J-25L6-GT/G	6		
VT-201C	Time Relay Tube	J-25L6-GT/G	J-25L6-GT/G	6		
VT-201C	Fixed Osc. Tube	J-25L6-GT/G	J-25L6-GT/G	6		
VT-201C	Variable Osc. Tube	J-25L6-GT/G	J-25L6-GT/G	6		
VT-201C	Osc. Amp. Tube	J-25L6-GT/G	J-25L6-GT-G	6		
	Power rect. Tube	J-25Z5	J-25Z5	6		
		Fuses				
1221-1	Fuse holder	Fuse holder, for Ref. No. 1222		10	H K M	A32049
1221-2	Fuse holder	Same as 1221-1		10	H K M	A32049
1221-1	Fuse	One amp., at 250-volts		10 14	3AG1 1040	A11302-11
1222-2	Fuse	Same as 1222-1				
		Reactors				
1181	Band Elimination	.33 henry ±5% at 255 cps. and 2-volts Q of 18, approx.		1		A103150
1182	Band Elimination	.233 henry ±5% at 255 cps. and 2-volts Q of 18, approx.		1		A103152
1183	Band Elimination	.197 henry ±5% at 255 cps. and 2-volts Q of 18, approx.		1		A103154
1232	Audio Isolation	Double wound audio choke, D-C Res. 90Ω Inductance .95h. min. at 4v. and 800 cps.		2	SCS-2-53	A106995
1225	Power Supply filter choke	20 henry, at 60 ma d-c 600Ω res.				A103178

Symbol Designation	Function	Description	Navy Type Number	Mfr.	Mfr. Desig.	Bendix Dwg. No.
		Resistors*				
1156	Fixed Osc. coupling	75,000Ω ±10% ½ W, composition	63360	5	BT ½	A11207-46
1163	Attenuator	10,000Ω ±20% ½ W, composition	63360	5	BT ½	A110488-103
1164	Osc. Amp. grid	5000Ω ±10% ½ W, composition	63360	5	BT ½	A11207-23
1165	Line Amp. Gain	100,000Ω ±20%, logarithmic taper, carbon, 1 W, $\frac{13}{16}$" plain shaft		11	V-3986-D	A104128-9
1166	Line Amp. Cathode	25,000Ω ±20% ½ W, composition	63360	5	BT ½	A110488-253
1167-1	Line Amp. Cathode	230Ω ±20% ½ W, wire-wound	63678-20	5	BW½	A110488-231
1167-2	Osc. Amp. Cathode	Same as 1167-1				
1168	Time Relay Grid	330,000Ω ±5% ½ W, composition	63355	5	BT ½	A110415-334
1169	Time Relay Bias voltage divider	4,000 ±5% ½ W, composition	63355	5	BT ½	A110415-402
1170	Time Relay Bias voltage divider	20,000Ω ±5% ½ W, composition	63355	5	BT ½	A110415-203
1171	Timing capacitor charging	1000Ω ±20% ½ W, composition	63360	5	BT ½	A110488-102
1172-1	Fixed Osc. grid	50,000Ω ±5% ½ W, composition	~~63360~~ 63355	5	BT ½	A110415-503
1172-2	Variable Osc. grid	Same as 1172-1				
1173	Freg. adjusting	2000Ω ±10% Potentiometer, 4 watt, linear, wire-wound ½" screwdriver-slotted shaft		8	M2MP	C60534-1
1174	Variable Osc. Coupling	200,000Ω ±10% ½ W, composition	63360	5	BT ½	A11207-50
		Ringer and Generator				
1227	Telephone Signalling	Generator, Telephone, Signal Corps Type GN-38		2	SCS-2-187	L72886
1228	Telephone Signalling	Ringer, telephone bell			SCS-2-187	C59619
		Jacks				
1230-1	Tel. Receiver unit	Tip and sleeve contacts, clearance for .250 plug		2	No. 144	A106286
1230-2	To connect monitor unit	Same as 1230-1				
1230-4	To connect monitor unit	Same as 1230-1				
1231	Tel. Mic.	Tip, sleeve and ring contacts dia. .209 +.005 −.001		2	SK-3249-D	A106284

* NOTE: When ordering replacement resistors, specify resistance as well as Navy Type Number. Navy numbers not assigned to 20% resistors. Indicated numbers are for 10% resistors.

1. PARTS LIST FOR SELECTOR CONTROL UNIT, CRB-23367 (Cont'd)

Symbol Designation	*Function*	*Description*	*Navy Type Number*	*Mfr.*	*Mfr. Desig.*	*Bendix Dwg. No.*
		Receptacles and Plugs				
1220-1	Power Input	20 Amp., 250 volt, 2 wire twistlock Connector Base, with mounting cup		13 12		A108265-1
1220-2	Power Input	Same as 1220-1				
1249	Convenience outlet on panel	Duplex flush convenience outlet installation		13	H 142	A106756

2. PARTS LIST FOR SELECTOR UNIT, CRB-23368

Symbol Designation	*Function*	*Description*	*Navy Type Number*	*Mfr.*	*Mfr. Desig.*	*Bendix Dwg. No.*
		Capacitors				
1185	Band Pass Filter	4 mfd. ±5% 600 DCWv paper		4	609 MB	C60533
1186	Delay Tube Grid	.25 mfd. ±10% 200 DCWv paper		3	345-20	A18181-254
1187-1	40 cps. Rectifier Cathode	.1 mfd. ±20% 400 DCWv paper		3	345-21	A18016-104
1187-2	80 cps. Rectifier Cathode	Same as 1187-1				
1187-3	Detector Grid	Same as 1187-1				
1188-1	Delay Tube Grid	2 mfd. ±5% 400 DCWv, paper		4	440	C60531
1188-2	Band Elim. Fltr.	Same as 1188-1				
1188-3	Band Elim. Fltr.	Same as 1188-1				
1189	Band Elim. Fltr.	1 mfd. ±5% 400 DCWv		4	440	C60532
		Plugs, Jacks, Lamp Caps				
1190	Plug receptacle	6 conductor male receptacle	49251	16	P-406-AB	A104537
1191-1	Plug receptacle	4 conductor male receptacle	49255	16	P-404-AB	A104586-1
1191-2	Plug receptacle	Same as 1191-1				
1192-1	Chan. 2 Lamp Jk.	Lamp jack		2	13	A104502
1192-2	Transmit ON Lamp Jack	Same as 1192-1				
1192-3	Chan. 1 ON Lamp Jack	Same as 1192-1				
1218	Telephone Jack	Telephone Jack, 2 contact		2	144	A106286
	Lamp Cap	Lamp Cap, Red		2	31-B	A104503-1
	Lamp Cap	Lamp Cap, Green		2	31-C	A104503-2
	Lamp Cap	Lamp Cap, White		2	31-A	A104503-3
		Relays				
1193-1	Chan. 1	Single Wound; 1000Ω Coil; 1 make-break Contact		2	507-3-1	L73226-35
1193-2	Chan. 2	Single Wound; 1000Ω Coil; 1 make-break Contact		2	507-3-1	L73226-35
1193-3	Timing	Single Wound; 1000Ω Coil; 1 make-break Contact		2	507-3-1	L73226-35
1194	Chan. Selection	Double Wound; 500Ω each Coil; 2 make, 1 break contacts		2	524-16-1	L73226-31

2. PARTS LIST FOR SELECTOR UNIT, CRB-23368 (Cont'd)

Symbol Designation	*Function*	*Description*	*Navy Type Number*	*Mfr.*	*Mfr. Desig.*	*Bendix Dwg. No.*
		Relays—*Continued*				
1195	Impulse	Double Wound; 500Ω each Coil; 2 make-break, 1 make, 1 break Contacts		2	524-48-1	L73226-32
1196	Send-Receive	Sgl. Wound; 1000Ω Coil; 2 make Contacts		2	507-5-1	L73226-26
1240	Plate Delay	Dbl. Wound; 1000Ω each Coil; 3 make Contacts		2	525-15-1	L73226-1
		Resistors*				
1197	Sensitivity Control	100,000 potentiometer carbon, linear taper, 1 w. $\frac{1}{4}''$ shaft, $\frac{13}{16}''$ long; $\frac{3}{8}$ bushing		11	J	OA104128-14
1198-1	Detector Grid	1 megohm ±20% ½ watt composition	63360	5	BT ½	A110488-105
1198-2	40 cps. Rectifier Cathode	Same as 1198-1				
1198-3	80 cps. Rectifier Cathode	Same as 1198-1				
1199-1	Rectifier Bias	1000Ω ±5% ½ watt composition		5	BT ½	A110415-102
1199-2	Charging	Same as 1199-1				
1200	Detector Screen	400Ω ±5% 1 watt composition		5	BT 1	A110487-401
1201-1	80 cps. Rect. Limiting	50,000Ω ±20% ½ watt composition		5	BT ½	A110488-503
1201-2	40 cps. Rect. Limiting	Same as 1201-1				
1202-1	Rect. Heater Dropping	38Ω ±5% 2 watt composition		5	BT 2	A110417-380
1202-2	Rect. Heater Dropping	Same as 1202-1				
1203	Rect Bias	3500Ω ±5% ½ watt, composition	63355	5	BT ½	A110415-352
1204	Delay Tube Grid	160,000Ω ±5% ½ watt, composition	63355	5	BT ½	A110415-164
1205	Delay Tube Bias	5000Ω ±5% ½ watt, composition	63355	5	BT ½	A110415-502
1206	Delay Tube Bias	20,000Ω ±5% ½ watt, composition	63355	5	BT ½	A110415-203
1217	Detector Screen	1000Ω ±5% 1 watt, composition	63291	5	BT 1	A110487-102
		Switches				
1207-1	On-Off	S.P.S.T. Toggle; Contacts rated 20 amps, 24-volts		15	8801	A104585-1
1207-2	Channel	Same as 1207-1				

*NOTE: When ordering replacement resistors, specify resistance as well as Navy Type Number. Navy Numbers not assigned to 20% resistors. Indicated numbers are for 10% resistors.

Symbol Designation	Function	Description	Navy Type Number	Mfr.	Mfr. Desig.	Bendix Dwg. No.
		Lamps, Tubes and Tube Sockets				
1216-1	Detector	Octal, with Silver Plated Contacts	49373	7	SS8	A18955-7
1216-2	40 & 80 cps. Rect.	Same as 1216-1				
1216-3	Chan. 1 Relay Tube	Same as 1216-1				
1216-4	Chan. 2 Relay Tube	Same as 1216-1				
1216-5	Delay Tube	Same as 1216-1				
VT-201-c	Detector	J-25L6GT/G	J-25L6GT/G	6	J-25L6GT/G	
VT-201-c	Chan. 1 Relay Tube	J-25L6GT/G	J-25L6GT/G	6	J-25L6GT/G	
VT-201-c	Chan. 2 Relay Tube	J-25L6GT/G	J-25L6GT/G	6	J-25L6GT/G	
VT-201-c	Delay Tube	J-25L6GT/G	J-25L6GT/G	6	J-25L6GT/G	
VT-214	40 & 80 cps. Rect.	J-12H6	J-12H6	6	J-12H6	
	Indicator Lamp	Lamp, 24v., Telephone Switchboard type		2	24-B-2	A106879
	Indicator Lamp	Lamp, 24v., Telephone Switchboard type		2	24-B-2	A106879
	Indicator Lamp	Lamp, 24v., Telephone Switchboard type		2	24-B-2	A106879
		Transformers				
1208	Detector Input	Primary (1-2) impedance = 600Ω with sec. loaded with 100,000Ω. Frequency response ±1 db. from 100 to 4000 cycles per sec. Max. Power level = +6 db.		1		A103046
1211	Tuned Audio Circuit	Res. freq. sec. = 40 cps. ±5%; turns ratio of pri. to sec. = 1:6; pri. impedance 2500Ω, Sec. impedance 90,000Ω; pri. d-c resistance 130Ω, Sec. resistance 650Ω		1		A103058
1212	Tuned Audio Circuit	Res. freq. Sec. = 80 cps. ±5%; turns ratio of pri. to Sec. = 1:6; pri. impedance 2500Ω, sec. impedance 90,000Ω; pri. d-c resistance 90Ω, Sec. d-c resistance 450Ω		1		A103210
		Reactors				
1209-1	Band Pass	.78 henry at 255 cps. and 2 volts; Q of approx. 18; .5 mfd. capacitor connected from one end of winding to terminal #1. Resonant frequency = 255 cps. ±5%		1		A103146
1209-2	Band Pass	Same as 1209-1				

2. PARTS LIST FOR SELECTOR UNIT, CRB-23368 (Cont'd)

Symbol Designation	*Function*	*Description*	*Navy Type Number*	*Mfr.*	*Mfr. Desig.*	*Bendix Dwg. No.*
		Reactors—*Continued*				
1210	Band Pass	.0975 henry ±5% at 255 cps. and 2 volts. Q of 18, approx.		1		A103148
1213	Band Elimination	.33 henry ±5% at 255 cps. and 2 volts. Q of 18, approx.		1		A103150
1214	Band Elimination	.233 henry ±5% at 255 cps. and 2 volts. Q of 18, approx.		1		A103152
1215	Band Elimination	.197 henry ±5% at 255 cps. and 2 volts. Q of 18, approx.		1		A103154

3. PARTS LIST FOR AUDIO MONITOR UNIT, TYPE CRB-49295

Symbol Designation	*Function*	*Description*	*Navy Type Number*	*Mfr.*	*Mfr. Desig.*	*Bendix Dwg. No.*
		Jacks				
1236	Microphone	Tip, sleeve and ring contacts, dia. .209 $^{+.005}_{-.001}$		2	SK-3249-D	A106284
1235-1	Telephone Receiver	Tip and sleeve contacts, clearance for .250 plug		2	144	A106286
1235-2	Telephone Line #1 Input	Same as 1235-1				
1235-3	Telephone Line #2 Input	Same as 1235-1				
		Capacitors				
1237-1	Telephone Receiver Coupling	2 mfd, 400 or 600v dcw, paper, dykanol	48403-B	9	DYR 6200	A104107
1237-2	Microphone Coupling for anti sidetone circuit	Same as 1237-1				
		Induction Coils				
1238	Coupling microphone and telephone receiver to line	Three-winding, anti sidetone telephone induction coil		2	SCS-2-30	A106996
		Switches				
1239	Transfer local microphone and receiver to line 1 or line 2	Double-pole, double-throw toggle switch, with single hole mounting by means of 15/32 threaded bushing, having a threaded pitch of 32 threads to an inch. Contacts rated 20 amps, 24-volts		15	8824K2	A112239

4. PARTS LIST FOR RELAY UNIT, TYPE CRB-29218

Symbol Designation	*Function*	*Description*	*Navy Type Number*	*Mfr.*	*Mfr. Desig.*	*Bendix Dwg. No.*
		Relays				
1250	Modulation line circuit breaking	Single-winding, resistance 200Ω, two break contacts, 24v d-c (must close at 6v).		2	505-9-1	L73226-36
		Capacitors				
1251-1	D-C blocking	2 mfd. 400 or 600v dcw, paper, dykanol		9		A104107
1251-2	D-C blocking	Same as 1251-1				

5. LIST OF MANUFACTURERS

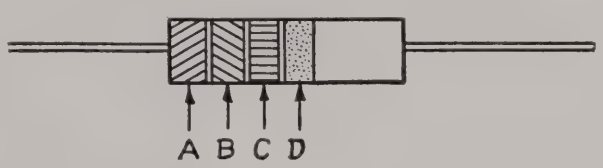
Code No.	*Manufacturer*
1	Bendix Radio Division of Bendix Aviation Corp. Baltimore, Md.
2	Stromberg-Carlson Company 100 Carlson Road Rochester, N. Y.
3	Micamold Radio Corp. 1087–1095 Flushing Ave. Brooklyn, N. Y.
4	Aerovox Corp. 742 Belleville Ave. New Bedford, Mass.
5	International Resistance Corp. 401 N. Broad St. Philadelphia, Pa.
6	R. C. A. Mfg. Co. (Radiotron Division) Harrison, N. J.
7	American Phenolic Corp. 1250 W. Van Buren St. Chicago, Ill.
8	P. R. Mallory Co., Inc. 1941 Thomas St. Indianapolis, Ind.
9	Cornell-Dubilier Corp. 1000 Hamilton Blvd. South Plainfield, N. J.
10	Bussman Mfg. Co. 2538 W. University St. St. Louis, Mo.
11	Allen-Bradley Co. 118 W. Greenfield Ave. Milwaukee, Wis.
12	Harvey Hubbell, Inc. 447 Concord Ave. Bridgeport, Conn.
13	Bryant Electric Co. Bridgeport, Conn.
14	Littlefuse Laboratories, Inc. 4765 Ravenswood Ave. Chicago, Ill.
15	Cutler Hammer, Inc. 1333 W. St. Paul Ave. Milwaukee, Wis.
16	Howard B. Jones 2300 Wabansia Ave. Chicago, Ill.

6. RMA COLOR CODE FOR RESISTORS AND CAPACITORS

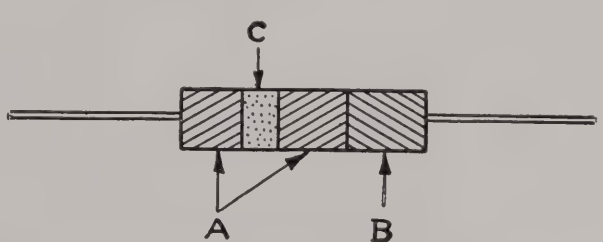
Color	*Significant Figure*	*Decimal Multiplier*	*Tolerance*	*Voltage Rating*
Black	0	1	..	..
Brown	1	10	1%	100 Volts
Red	2	100	2%	200 Volts
Orange	3	1,000	..	300 Volts
Yellow	4	10,000	..	400 Volts
Green	5	100,000	5%	500 Volts
Blue	6	1,000,000	..	600 Volts
Violet	7	10,000,000	..	700 Volts
Gray	8	100,000,000	..	800 Volts
White	9	1,000,000,000	..	..
Gold	..	0.1	5%	..
Silver	..	0.01	10%	..
No Color	..	..	20%	500 Volts

RESISTORS

The nominal resistance value of fixed composition resistors is indicated in two manners. The one in most common use indicates the value by bands of color as follows:



Band A indicates the first significant figure of the resistance of the resistor.
Band B indicates the second significant figure.
Band C indicates the decimal multiplier.
Band D, if any, indicates the tolerance limits about the nominal resistance value.
The least common system used for indicating nominal resistance value is as follows:

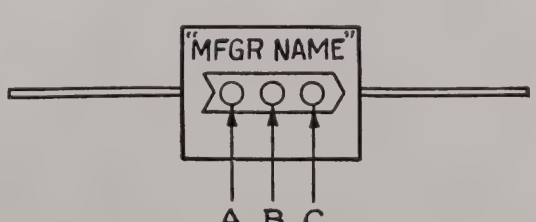


The body (A) of the resistor is colored to represent the first significant figure of the resistance value. One end (B) is colored to represent the second significant figure and a band, or dot (C) of color, located within the body color, indicates the decimal multiplier.

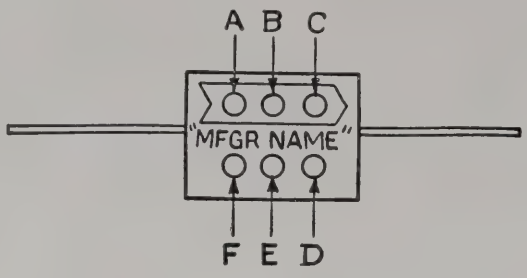
CAPACITORS

Two systems for color coding small fixed capacitors are in use. In either case, capacity is expressed in micromicrofarads and some means to avoid ambiguity in interpretation of colors provided. An arrow pointing from left to right or the manufacturer's name is generally used.

In general, capacitors having a working voltage of 500 volts are coded by means of three dots of color as follows:



Dot A indicates the first significant figure of the capacitance of the capacitor.
Dot B indicates the second significant figure.
Dot C indicates the decimal multiplier.
An additional dot is sometimes shown when the working voltage is other than 500 volts. This dot indicates the voltage rating of the condenser.
A second system now coming into common use involves six dots of color as follows:



Dot A indicates the first significant figure of the capacitance of the capacitor.
Dot B indicates the second significant figure.
Dot C indicates the third significant figure.
Dot D indicates the decimal multiplier.
Dot E indicates the tolerance about the nominal capacitance value.
Dot F indicates the voltage rating of the capacitor.